TE AUAUNGA PRECINCT 2023 INTEGRATED TRANSPORT ASSESSMENT

EXECUTIVE SUMMARY:

TE AUAUNGA PRECINCT ITA

STANTEC FOR THE MINISTRY OF HOUSING AND URBAN DEVELOPMENT

October 2023

OVERVIEW

This executive summary covers several documents which together address transport matters related to the residential development of the Wairaka Precinct (the Precinct), to be renamed the Te Auaunga Precinct. These documents address the Precinct, and the surrounding areas which influence it, and were completed by Stantec for Te Tūāpapa Kura Kāinga – Ministry of Housing and Urban Development (**HUD**).

The **Precinct ITA** now comprises this collection of documents, being:

(a) this Executive Summary and Recommendations summarising key aspects, and setting out specific transport commitments – which supersedes and replaces the 2021 and 2022 Executive Summary documents;

(b) the primary June 2020 ITA document prepared by Stantec (**2020 ITA**) which was accepted by Auckland Council, on the recommendation of Auckland Transport (**AT**), on 30 March 2021 (reference SUB60223011), and anticipates the development of the Precinct for at least 2,049 dwellings by Year 2028;

(c) additional traffic modelling sensitivity testing by Stantec to support the ITA (**October 2020 Memorandum**) which included an assessment of the housing yields at which at least one intersection upgrade between the Precinct and Carrington Road should be delivered; and

(d) the updated "Transport Assessment and Modelling Report" produced in support of the plan change (**2022 TMR**) which anticipates the development of the Precinct for at least 4,000 dwellings by Year 2031.

(e) The responses to Council's C23 queries on transport matters provided as part of the notification process for the Te Auaunga Plan Change, especially where they provide additional material not already covered in the above.

The ITA Executive Summary, which was separately produced to bring together the 2020 ITA and the October 2020 Memorandum, is wholly updated in this document. This 2023 Executive Summary document brings together the key findings from the documents listed above, essentially forming the **2023 ITA**.

It identifies the key commonalities and differences and sets out the basis on which the residential development will proceed, including as established in the up-to-date modelling produced in support of the Te Auaunga Plan Change, which has been lodged with Council in December 2022.

An approved ITA is a requirement of the existing Wairaka Precinct of the Auckland Unitary Plan Operative in Part (**AUP**), with its provisions intended to guide transport matters associated with its development, including the land for residential development and the other uses enabled by the Precinct provisions.

Since the 2020 ITA was approved by Council, there have been some key changes which have been incorporated, particularly via the 2022 TMR:

a) further land ownership changes within the Precinct, including the setting apart of additional land for residential development, which now comprises 39.7 hectares;

b) increased certainty about the timing and scope of the Carrington Road Upgrade, with works now projected to begin in 2025, and to extend from Pt Chevalier and Mt Albert (with bus lanes and protected cycle lanes) rather than solely along the development frontage. As discussed further in the C23 responses, the relevant government funding for the upgrade has been approved through the Infrastructure Acceleration Fund and is explicitly tied to the development proposed within the precinct. As such, despite the Carrington Road Upgrade technically still being in the Business Case stage with Auckland Transport at this time, there is far more certainty about the project than for other transport projects funded through typical channels;

c) further iterations of the Rōpū masterplanning which have advanced the intended staging of retail within the precinct, and the assumptions around carparking, including the percentages of dwellings that will be delivered with low or no carparking, s - being one of the key constraints on added car traffic being generated;

d) detailed design for the internal site infrastructure, including roading design, which has confirmed that the future signalised intersections, where the residential development connects with Carrington Road, will be at 'Gate 1' and 'Gate 3', due to site constraints within the Precinct near 'Gate 2';

e) consideration of development enabled by the proposed Te Auaunga Plan Change, noting the 2020 ITA already anticipated 4,000 dwellings in the longer term, albeit beyond the original traffic model assessment period. The key change in the updated modelling has been to extend the assessment horizon to include more of the development already enabled by the existing zoning and Wairaka Precinct provisions, and to include Auckland Transport's updated network assumptions, which now extend to 2031.

The 2020 ITA, and the updated modelling, take account of all known existing and planned development within the Precinct as of December 2022, and include stated assumptions about other development within the study area. However, the updated modelling no longer assumes a primary school or ECE within the assessment horizon, as there is currently too much uncertainty about the future timing and location of the school to include it in the modelling with any confidence.

The 2022 TMR is accompanied by provisions in the plan change that will set new parameters around when the Precinct ITA will be reviewed and updated. The modelling of the TMR shows the Precinct can support development of 4,000 homes, and associated retail provision, if its assumptions around trip generation, transport upgrades and other improvements and behaviour changes in the wider network hold true. After 4,000 dwellings a new ITA would be required.

A check on these assumptions is proposed at 3,000 homes, to see whether they are bearing out, and determine whether or not the Te Auaunga Precinct 2023 ITA needs to be updated such as to extend or reduce the forecast yields, or to incorporate additional, or fewer, controls on trip generation.

The 2022 TMR builds upon the 2020 ITA, meaning proposals in that ITA, and the October 2020 Memorandum, continue to set the base case for development within the Precinct, but with the updates necessary to incorporate the new assumptions around residential development and the external network – with the most significant change between October 2020 and December 2022 being the increased certainty around the timing and extent of the Carrington Road Upgrade.

In the October 2020 Memorandum, there was identified a need for at least one intersection upgrade to be completed at around 600 homes with code compliance certificates, in order to ensure suitable car and active mode accessibility within and to the Precinct. This commitment was intended to give AT greater confidence that the network would function successfully and safely.

The timing and staging of this first intersection upgrade will now be confirmed with AT in conjunction with engagement on the Carrington Road Upgrade, as there is an opportunity for the intersection upgrade works and the Carrington Road Upgrade works to be completed together.

As previously, the modelling has been prepared for the Precinct as a whole but in the context of the broader network. The traffic modelling study area extends from Pt Chevalier and Great North Road in the north, through to Mt Albert in the south.

The Precinct is currently the largest contiguous brownfields development on the Isthmus, and a key site for the Crown in terms of delivering a high-quality urban environment for Auckland, consistent also with the Council's urban consolidation strategies and planning documents.

With a position much closer to key employment areas than comparable other residential developments, and with the Precinct's good connectivity to all forms of transport, including public transport and active mode networks, the projected transport effects are considered able to be more easily integrated than those of a comparable greenfield development.

WAIRAKA PRECINCT

The key landowners and traffic generators in the Precinct are:

(a) 39.7ha of Crown land held for housing purposes and intended for medium to high density residential development targeting at least 4,000 dwellings. This land will be developed by the Marutūāhu, Ngāti Whātua and Waiohua-Tāmaki Rōpū, in partnership with the Crown, who will undertake the development on the basis of their rights under their collective Treaty Redress Deed.

(b) Ngāti Whātua Ōrākei, whose 4.4ha block of land in the southern and western portion of the Precinct is targeted for medium density residential development with an expected yield, when combined with the Crown land holdings in the South, of around 500 units out of the 4,000 assumed.

(c) Unitec Institute of Technology (**Unitec**), whose 13.4 ha is currently used as a tertiary education campus. Unitec has a previous ITA for their campus consolidation, now in part superseded. Traffic generation assumed is based on Unitec:

i. growing the campus to 12,000 FTEs;

ii. constructing two parking buildings; and

iii. making operational changes to the campus with a key focus on public transport and the spreading of teaching time, to achieve a wider distribution of travel time. Current trends of enrolments and changes to teaching since the start of the Covid-19 pandemic have meant that operational changes to teaching practices (such as more teaching online) are already being implemented, making some of the requirements around dedicated parking buildings less critical. Unitec is also beginning to proactively manage demand for its parking, such as by introducing paid parking across much of its campus. The 2020 ITA modelling was based on Unitec's existing consents, publicly available information on its enrolment trends, and information supplied for a previous 2017 ITA about its intentions. This has not been updated for the 2022 modelling, as the existing information and assumptions are still considered appropriate as a conservative assumption of likely traffic impacts.

(d) Te Whatu Ora – Health New Zealand's 6ha Mason Clinic block that is a healthcare facility including a forensic hospital service. The 2020 ITA is based on projected growth for this facility, including the growth enabled by Te Whatu Ora – Health New Zealand's own private plan change (PC 75), and therefore has not needed to be updated for the 2022 modelling contained in the TMR.

(e) the Taylors Laundry site, which currently comprises a commercial laundry and catering service, under a lease to HUD which extends to 2036. The 2022 modelling contained in the 2022 TMR assumes that this will continue to operate at current levels to at least 2031, but without prejudice to commercial negotiations: they may remain longer. The ITA anticipated the transfer of this land for housing noting any changes to the timeframe for the commercial laundry to vacate may only change the order of the forecast dwelling stages within the Precinct but with all these locations accessed by Gates 1, 2 or 3.

As noted above, the ITA was based on current and projected traffic generators in the Precinct whilst also acknowledging the surrounding network traffic via surveyed flows and projected flow changes coordinated with AT's forecasting. This was updated (in a sensitivity testing process) in the October 2020 memorandum, and more comprehensively updated in the December 2022 TMR which also extends the assessment horizon to 2031.

ASSUMPTIONS UNCHANGED BETWEEN THE 2020 ITA AND THE 2022 TMR

The 2020 ITA was able to anticipate much of the development that is now modelled in the 2022 Memorandum, including the geographic distribution and numbers of dwellings across the areas of the Precinct that are not being rezoned. The 2020 ITA and 2022 TMR also adopt a consistent approach to the development generally, assuming that improved public transport in the wider area, and alternative transport modes, will enable "less-car dominated" residential development.

Other assumptions that have remained the same are:

- The proposals of the plan change regarding permitted height do not in themselves significantly affect the dwelling numbers. While changes in height permitted may slightly modify what number of dwellings might be able to be achieved in each sub-precinct in the north-and-centre, such potential slight shifts in the "centre of gravity" do not affect the traffic outcomes to any significant level, as the areas all use the same internally interconnected links to the wider road network as before.
- The student assumptions for Unitec (9,702 FTE), despite a reduction in size in the tertiary education-zoned area, as it can still incorporate an increase to FTEs in its consolidated campus.
- The trip generation assumptions for the extended Mason Clinic, as its increased area and development intentions were already known in 2020.
- The number and location of vehicle connections to the wider transport network, which remain Gates 1, 2 and 3 for the residential development to Carrington Road, with Gate 4 remaining the key Gate for the Unitec campus, and the permitted connections to the south, which then terminate in the south of the Precinct, which are unchanged through the Te Auaunga Plan Change.
- The level crossing over the rail line at Woodward Road staying in place in all traffic models.

  The assumptions for how much through traffic reductions on Carrington Road will occur due to displacement by the new site traffic.

KEY DIFFERENCES BETWEEN THE 2020 ITA AND THE 2022 TMR

The key differences between the 2020 ITA and the 2022 TMR are set out in the table below. To fully compare the differences, both documents should be read.

Area of difference	**2020 ITA**	**2022 TMR**
Time period using the background (wider-area) traffic data and Auckland-wide projected values.	Traffic modelling at Years 2024 and 2028	Extends traffic modelling to 2031
Number of dwellings / years	2,049 dwelling by Year 2028	4,000 dwellings by Year 2031
Distribution and size of dwellings (i.e. different spread for size of bedrooms),	Assumes the same average size of dwellings across the Precinct, at 1.5 bedrooms average	Assumes larger homes towards the south of the Precinct and smaller homes in the higher density north, at 2.5 bedrooms average
Retail incl. supermarket	Not in traffic model	Included in traffic model
School	375 students, by Year 2028	Not in traffic model
Taylor's Laundry	Included to Year 2028	Included to Year 2031
Per-dwelling carparking rate	Slightly less than 1 carpark per dwelling, averaged across the Precinct	1,000 dwellings with no car parking, with the remaining 3,000 dwellings with an average of 0.7 or less parking spaces per dwelling, averaged across the Precinct

Resident's Parking Schemes (areas surrounding Precinct)	Not assumed / required	Assumed as mitigation measure
Trip generation rates	2020 assumptions	2022 assumptions (revised down to account for changed factors such as greater parking restraints)
Signalised access	Gate 2 and Gate 3, with Gate 1 a LILO (left-in / left-out), once fully implemented	Gate 1 and Gate 3, with Gate 2 a LILO, once fully implemented
North-Western Shared Path crossing	Mid-block signalised crossing	Incorporated into Gate 1 signals
Carrington Road Upgrade (provision of bus lanes, protected cycle lanes, improved footpaths and various intersection upgrades)	Works starting in 2028, and extending from Woodward Road to Sutherland Road	Works starting in 2025, and extending from the intersections with Great North Road in Pt Chevalier to New North Road in Mt Albert

UPDATES TO DWELLINGS

The traffic modelling, as updated, continues to rely on a number of assumptions, and variables, that may change over time. This is why a review of the ITA at 3,000 dwellings occupied is proposed.

The 3,000 dwellings check-in point was selected on the basis of the 2020 ITA, which provided analysis and modelling to support up to 2,049 dwellings, and the 2022 TMR which sets the conditions for up to 4,000 dwellings, based on updated assumptions and variables, and the longer assessment horizon. In general terms, the 2020 ITA assumed development to progress at a rate of an average of 256 new dwellings per year across its 8-year period, whereas the 2022 Modelling assumes an average of 364 new dwellings per year across its 11-year period, but with lower average trip generation.

At 3,000 dwellings the key assumptions and variables to be reviewed will include the trip generation rates, including from the residential development and Unitec, and the performance of the wider network, including the Carrington Road Upgrades and other improvements to public transport.

There may be other changes to the Precinct before 3,000 dwellings which would require an earlier update to the 2022 TMR modelling, such as a primary school and early childhood education proposal, significant changes to Unitec's projected FTEs or car parking numbers, and any other significant land-use changes that may come about from a shift in government priorities – given the majority of the current landholdings are Crown or Crown entities.

It should be noted that the increase in dwellings from 2,049 to 4,000 does not represent a change in approach nor does the added development largely derive from rezoning in the proposed Te Auaunga Plan Change (with much of the increase being in areas not being rezoned).

The 4,000 dwellings have been signalled previously, with the 2020 ITA and associated processes also clarifying that the traffic model assumptions did not yet cover a full buildout. The impacts / associated mitigation for a larger dwelling number and a longer time horizon had not yet been identified and traffic modelled at the time of the 2020 ITA, unlike in the 2022 TAR.

For clarity, no assessment of dwellings numbers above 4,000 has occurred. Should there be a proposal at some future stage to provide greater dwelling numbers, this would not be aligned with the 2023 ITA composed of the documents set out in this 2023 Executive Summary and would require new assessment processes / a new ITA as set out in the precinct rules.

CONTEXT

The 2022 ITA and the 2022 TMR both assume, and encourage, greater use of alternate transport modes, including public transport and walking and cycling, through constraining car parking and the improvement of relevant infrastructure and, where applicable, services (more frequent, accessible, and direct routes by bus and train etc).

The proposed residential development will occur, to the extent feasible, as a low-car development. Parking will be limited and there will be a sizeable proportion of dwellings with no carparking. Parking will be provided "unbundled", i.e. prospective dwelling purchasers or tenants are not required to acquire or rent car parking as well. In addition, internal network design and connections to external transport networks will prioritise a high level of access for active modes and public transport to reduce the average levels of car use. Since the 2020 ITA was finalised, the Covid-19 pandemic has also changed travel and commuting habits. These are still to be fully understood but involve more working from home but may also have led to some (at least temporary) increases in private car use over public transport.

The 2020 ITA was informed by a number of significant land use or transport changes affecting the area which support the emphasis on creating a low-car development, which are still relevant to the 2022 TMR, including:

(a) The opening of the Waterview Tunnel and the connection of State Highway 16 and State Highway 20, which has had a significant impact on traffic volumes on Carrington Road. A number of cross-town journeys that previously relied on the arterial route of Mt Albert Road and Carrington Road are now serviced by the south-western and north-western motorways. The 2020 ITA assumes that through redistribution of traffic and growth, Carrington Road will return to previous traffic volumes over time with some level of congestion inevitable. The 2020 ITA and 2022 TMR also both assume that this congestion will result in some redistribution within the network – i.e. shift some existing trips to other times, routes, or modes of traffic, or lead to people to drive less.

(b) The completion of the North-Western Shared Path through to the City Centre, and interconnection with the Waterview / Avondale to New Lynn Shared Path. The cycleway network will also be significantly improved through the Carrington Road Upgrade, and other connections across the wider network.

(c) The increased frequency of trains on the Western rail line, particularly during peak times, which has increased the functionality and service levels for rail passenger transport on this route and compounded

some constraints for the ‘at grade’ rail crossing at Woodward Avenue. Further improvements to public transport access to the area are expected to occur with the opening of the City Rail Link, and the longer-term plans for rapid transit along SH16. The Precinct has good access to Baldwin Ave and Mt Albert Train Stations, and at its boundaries is on the edge of the 800-metre catchment used by AT, but within a 1,500-metre catchment practical for end-of-journey trips, particularly with the Carrington Road Upgrade making it easy to access the Mt Albert station safely by bicycle or scooter.

(d) The Carrington Road Upgrade, including dedicated bus and active mode facilities, which AT has now agreed to stage in time to support the residential development. Works are anticipated to start in 2025, and to eventually extend from the Mt Albert Town Centre (New North Road) to the Pt Chevalier Town Centre (Great North Road) including bridge upgrades at SH16 and the Mt Albert Rail Overbridge, which will result in better outcomes for public transport than the more limited upgrade proposed in the 2028 RLTP and 2020 ITA. As with the 2020 ITA however, the 2022 TMR still assumes that the Town Centre intersections themselves will not be significantly upgraded during the model period.

(e) Ongoing improvements to the high frequency bus services along both Carrington Road and Great North Road. Great North Road is accessed from the Precinct by the Oakley /Te Auaunga Creek overbridge and is therefore the closest public transport for development in the west of the Precinct.

The 2020 ITA and the 2022 TMR modelling take account of known and likely future trends for the precinct and the study area. The Marutūāhu, Ngāti Whātua and Waiohua-Tāmaki Rōpū, in partnership with HUD, are committed to developing the Crown land holdings based on this Te Auaunga Precinct 2023 ITA and the Te Auaunga precinct provisions as amended through the Te Auaunga Plan Change.

TRAFFIC SIGNALS

In its review of the 2020 ITA, AT officials generally supported the methodology and findings of the Stantec analysis and assumptions but sought the inclusion of a commitment to at least one signal upgrade earlier during the period of the ITA. The signal upgrade was intended to provide safe access to and from Carrington Road from around 600 dwellings. This commitment was considered necessary due to the (at that time) uncertainty around the Carrington Road Upgrade timeframes

In developing the 2022 TMR, Stantec had the benefit of a commitment by AT to deliver the Carrington Road Upgrade in time to support the development, with works now projected to start in October 2025.

However, as AT is yet to complete its Detailed Business Case for the Carrington Road Upgrade, and due to inherent uncertainties and complexities around major works such as these, there is still the outside possibility that the Rōpū will deliver at least one of the intersection upgrades ahead of Auckland Transport's upgrade.

The preference of all parties is that this intersection upgrade is completed 'in line' with the Carrington Road Upgrade to minimise traffic disruption and remove the need for any rework. However, in the event this is not possible because the Carrington Road Upgrades do not advance as projected, the first intersection upgrade will proceed ahead of the Carrington Road Upgrade.

The sensitivity analysis of the October 2020 Memorandum incorporates a high degree of tolerance should assumptions regarding traffic flows not eventuate. As noted in the October 2020 Memorandum, 600 dwellings with consent code compliance in the areas of the Precinct accessing Carrington Road, was the conservative estimate of the point at which signals would be required, with a possibility that 1,000 + dwellings of this type could in fact be built before signals would be necessary.

In addition, the October 2020 Memorandum was completed on the basis the new, upgraded, traffic signal-controlled intersection would be at or near the vicinity of the current Unitec Gate 2 or, if agreed with AT, an alternative location. The December 2022 TMR anticipates the new upgraded traffic signal-controlled intersection will be at the future Gate 1.

As in the October 2020 Memorandum, any intersection upgrade that proceeds ahead of the Carrington Road Upgrade will be future-proofed to tie into the likely future configuration of the Carrington Road Upgrade as much as possible and is intended to be based on the design for the Carrington Road Upgrade – which all parties anticipate will be available by this time.

INTERNAL NETWORK AND ACTIVE MODES

The 2020 ITA and 2022 TMR are based on a strongly interconnected road network within the precinct through to Carrington Road, with more restricted access to the adjacent southern residential streets. Limitations to the south are in response to strict controls in the AUP for transport connections in this location, which are unchanged through the Te Auaunga Plan Change. The AUP provisions are particularly targeted at:

(a) discouraging Unitec students from entering the Unitec campus (by vehicle) through the southern roads; and

(b) preventing potential "rat running" of vehicles short-cutting from New North Road to Great North Road avoiding the Woodward Road / Carrington Road intersections.

For completeness, it is also noted that Policies I334.3 (25) and (26) of the AUP's precinct rules currently do not identify (list) Mark Road, which in the Te Auaunga Plan Change's new version of Precinct Plan 1 is now shown as connected into the precinct (into the southern area of lower-density housing). However, for avoidance of doubt, the relevant policies are considered to also cover this fourth southern local street despite it not being formally named.

The 2022 TMR, as with the 2020 ITA, is based on the four intersections ("gates") on Carrington Road identified in the Precinct Plan providing the primary vehicular access, and more minor connections to the southern residential roads. Internal connections between the two areas may be provided by the internal roads but will discourage through traffic and student traffic as required by the Precinct rules. As set out in C23 responses by the applicant, recent planning and Fast Track consents are already giving effect to this intent, with the proposed new southern road connections being split off from the centre-and-north road system via proposed cul-de-sac-ends located west of the Unitec tertiary institute, and only walking and cycling connections crossing the "cut".

The detailed alignment of the internal roads accessing Carrington Road has been confirmed with Auckland Transport through Engineering Plan Approvals (ENG60396158) but are not significantly different from the alignment previously anticipated – as the internal roads overlay the existing internal network in most areas.

Each traffic model has anticipated interconnectivity between Gates 1, 2 and 3, and therefore the ability to distribute traffic across the gates. All models have also anticipated that there will not be traffic

movement between the south and these centre-and-north gates, except for alternative modes (walking, cycling), as well as the ability to provide at least one key signalised access for the residential development in the centre-and-north of the Precinct on to Carrington Road (i.e. Gate 1 or 2).

The other key requirement – expressed both in the precinct rules, 2020 ITA and the 2022 TMR – is ensuring a high level of active mode safety and convenience. This is to ensure good urban design and transport outcomes by encouraging walking, cycling and access for all modes – for local trips, for access to the wider network, and to public transport (bus stops, train stations etc).

To ensure this access, any sub-Precinct in the precinct, at building consent code compliance certificate time, will be provided with high-quality active mode links to, at least, the Waterview Shared Path in the West and Carrington Road in the East. These sub-precincts will be able to connect into the dedicated cycleways that have been provided through the precinct as part of the Engineering Plan Approvals noted above, which connect south to the Waterview Shared Pathway east/west to Carrington Road at Gate 1 and Gate 3 and traverse the length of Spine Road.

In addition, a safe connection for the North-Western Path will be provided over Carrington Road as part of or near the Gate 1 signals, with the crossing design to be integrated with that of the Carrington Road Upgrade.

Design philosophies for active mode design are set out in the 2020 ITA, and form part of the context for the 2022 TMR.

These aspects are enshrined within the existing precinct provisions and no changes are proposed through the Te Auaunga Plan Change, i.e. development enabled as a result of the plan change will be progressed consistent with this earlier strategy.

MODELLING ASSUMPTIONS AND RESULTS

The 2022 TMR modelling work by Stantec:

(a) Is a microsimulation model using a AIMSUN software package. It adopted normal, best practice modelling approaches in terms of utilising existing traffic surveys, setting a study area relevant to the precinct but beyond the precinct (Great North Road, New North Road, Carrington Road and Woodward Road and all adjacent streets), assessed peak demand, and calibrated the model to ensure integrity of the data.

(b) Set out a series of scenarios as summarised above. It established a base scenario and then assessed a plan change growth based on 4,000 dwellings and other development such as the retail components, with a future horizon of 2031.

(c) Allocated a trip distribution based on the individual uses within the precinct and allocated that distribution across the roading network (refer section 3.8 of the Stantec 2022 TMR).

The key modelling assumptions are summarised below.

Modelling Assumptions	Base 2019	ITA 2028	Plan Change 2031
Residential dwellings	✗	✓ (2,049 dwellings)	✓ (4,000 dwellings)
Tertiary Education	✓ (varied)	✓ (9,702 FTE students)	✓ (9,702 FTE students)
Commercial / Retail development (supermarket / retail cluster)	✗	✗	✓ (1,200 sqm specialty retail, 1,500 sqm supermarket)
Primary school / early childhood education	✗	✓ (375 students)	✗
Mason-clinic (including allowance for growth)	✓ (121 beds or less)	✓ (198 beds)	✓ (198 beds)
Taylors Laundry	✓	✓	✗
Residential car-parking	✗	✓ (2,049 spaces or less)	✓ (2,100 spaces or less, with more dwellings)
Unitec car parking	✓ (varies, more than 2,500 spaces)	✓ (2,500 spaces or less)	✓ (2,500 spaces or less)
Commercial / Retail car parking	✗	✗	✓ (75 spaces or less)
Resident's parking sold / leased unbundled from dwellings	✗	✓	✓
Resident's Parking schemes (areas adjacent to but outside of precinct)	✗	✗	✓
Carrington Road Corridor Upgrade (precinct Frontage)	✗	✓	✓
Carrington Road Corridor Upgrade (Full length including Woodward New North Road)	✗	✗	✓
Carrington Road through traffic reductions, 25%	✗	✓	✓
Peak Hour Profile Adjustment	✗	✓	✓
Great North Rd / Pt Chevalier Rd / Carrington Rd intersection adjustments (slip lane removal into Great North Road, southbound Carrington Road bus lane)	✗	✓	✓

Modelling Assumptions	Base 2019	ITA 2028	Plan Change 2031
Mid-block North-western Path crossing south of Sutherland Road	✓ (priority)	✓ (signal)	✗ (integrated into Gate 1 signal)
Gate 1 signalised	✗	✗ (LILO)	✓
Gate 2 signalised	✗	✓	✗ (LILO)
Gate 3 signalised	✗	✓	✓
Signalised mid-block pedestrian crossing between Gate 3 and 4	✗	✓	✗
Gate 4 signalised	✓	✓ (added lanes)	✓ (added lanes
Carrington Road / Woodward Road intersection signalised	✗	✓	✓
Signalised mid-block pedestrian crossing between Benfield Avenue and Willcott St	✗	✗	✓
Vehicle connections between Southern precinct area and southern local roads	✗	✓	✓
Vehicle connections between the Southern precinct area and the central / northern Precinct areas	✓	✗	✗
Vehicle connections between the Southern precinct area and Unitec Core	✓	✗	✗

Source: Stantec Transport Assessment and Modelling Report 2022 (**2022 TMR)**

As discussed earlier in this executive summary (key differences table) and expanded upon as part of the C23 discussions with Council, some trip generation values for certain activities were reduced compared to the 2020 ITA for the 2022 TMR.

These reductions are considered acceptable for a variety of reasons, starting with the fact that older trip rates were historically conservative and are considered inappropriate for a low-car development. This has been highlighted in the reporting and related C23 responses by comparison with, for example, a range of apartment development trip generation rates from suburban Sydney (with the 2022 TMR still using higher driving rates than these examples).

Historic sources also often implicitly assume that trip generation of development even in already-congested transport environments would not be affected by this existing or new congestion. Instead, it has been shown, including with added material provided as part of the C23 responses, that such congestion does indeed lower traffic generation itself (especially during peak hours) by way of encouraging mode change, or via trips being avoided fully, or deferred to other times.

Additionally, the 2022 TMR assumptions include a greater constraint on available development parking than in the 2020 ITA - both via lowering the average parking per dwelling in the precinct, as well as via the assumption of resident's parking schemes for the surrounding existing areas. The latter are intended to both discourage added trip generation within the precinct, as well as discourage "overspill" parking effects into surrounding suburbs.

Finally, the modelling now assumes greater provision for active modes and public transport via a more substantial / greater length of Carrington Road Upgrade, as well as assessing a point in time several years later (2031 versus 2028) than the 2020 ITA, allowing more time for gradual Auckland-wide modal change away from private cars.

For these reasons the lower trip generation rates described in the 2022 TMR are considered acceptable. They have been "sanity checked" and while found notably lower than those used historically in Auckland, they are achievable in comprehensively planned, parking-constrained and well-located developments such as those proposed for the precinct. Meanwhile, the previously described "check-in" at 3,000 dwellings provides authorities with an ability to assess whether the assumptions eventuate.

The modelling assesses the network, including the four Carrington Road access points. This is set out in section 4 of the 2022 TMR. The key findings are:

a) Great North Road/ Pt Chevalier/ Carrington Road intersection: will perform at expected and appropriate levels, albeit with some increases in delays from the Year 2028 approved base case of the 2020 ITA [Section 4: Table 10, 11, 12 and 13].

b) Gate 1 upgraded intersection (signals) / Carrington Road: will perform well and within acceptable tolerances [Section 4: Table 14,15,16 and 17].

c) Gate 2 upgraded (LILO)/ Carrington Road: an improvement compared to the modelling produced for the 2020 ITA i.e. compared to the 2028 scenario for peak periods [Section 4: Table 18,19,20 and 21].

d) Gate 3 Farm Road upgraded intersection (signals)/ Carrington Road: will perform acceptably at future peak periods [Section 4: Table 22, 23 24 and 25].

e) Gate 4 / Carrington Road: good to moderate performance compared with the Year 2028 base case, with the other gates taking some pressure off Gate 4. Queues increase from the western approach in both peak periods, but these queues are transitory [Section 4: Table 26, 27, 28, 29].

f) Woodward Road/ Carrington Road: a decline in performance but remains within generally acceptable parameters. An improvement in the AM peak queue lengths from the 2020 ITA [Section 4: Table 30, 31, 32 and 33].

g) Carrington Road/ New North Road/ Mt Albert Road: performance remains moderate to poor. However this is also the case in the Year 2028 approved base case. The precinct development does not appreciably further degrade the performance of this intersection [Section 4: Table 34, 36, 36 and 37].

h) Woodward Road/ New North Road/ Richardson Road: performance remains moderate, with some improvement compared to the base case in the AM [Section 4: Table 38, 39, 40 and 41].

The modelling demonstrates that the network with the upgrades identified will perform satisfactorily for the scenario of 4,000 dwellings and associated other active development within the precinct including the Mason Clinic, Unitec and the retail area. Some network improvements are due to improved performance in the wider network, but the modelling also demonstrates that the upcoming Carrington Road is beneficial and will improve the performance of buses along this route, and as part of the wider network.

CONCLUSIONS

The premise of the approval of the 2020 ITA, the October 2020 Memorandum and the 2022 TMR are that:

(a) Together, these documents set out the future transport strategy for the precinct but will be reviewed when the residential development reaches 3,000 dwellings with code compliance certificates. This review is an opportunity to re-validate the assumptions on which these documents are based. Should any assumptions prove to be inaccurate or out of date, then there is the ability to adjust either the land use or transport strategy of the ITA to reflect these.

(b) These documents cover the wider precinct transport related requirements. Individual consent applications will still need to address more fine-grained issues associated with any stage or proposal and be supported by an appropriate transport assessment that also shows compliance with the ITA where relevant, such as in terms of access and parking.

(c) The Precinct will be developed in accordance with the principles of four road connections onto Carrington Road, with an interconnected road network enabling residents/users of the Precinct to access these gates through different internal roads. Additionally, access but not through traffic, will be enabled for a smaller proportion of the overall Precinct development in the southern area, which will connect through existing residential streets to the south.

(d) Gates 1 and 3 will be upgraded in time to provide signalised access, with the timing of the intersection upgrades to be considered alongside the Carrington Road Upgrade by AT. Any intersection upgrade that proceeds ahead of the Carrington Road Upgrade will utilise the Carrington Road Upgrade designs where these have already been finalised but with the modifications necessary for a functional arrangement given this would be an interim upgrade.

(e) All applications for specific development proposals shall compare new yields to date, proposed yields and timing against those assumed within the 2022 TMR as well as the transport implications arising from any differences. The accumulative yields shall also be tracked against the 600 dwellings threshold. Additional trips associated with any non-residential activity not allowed for within these documents shall also count towards the threshold.

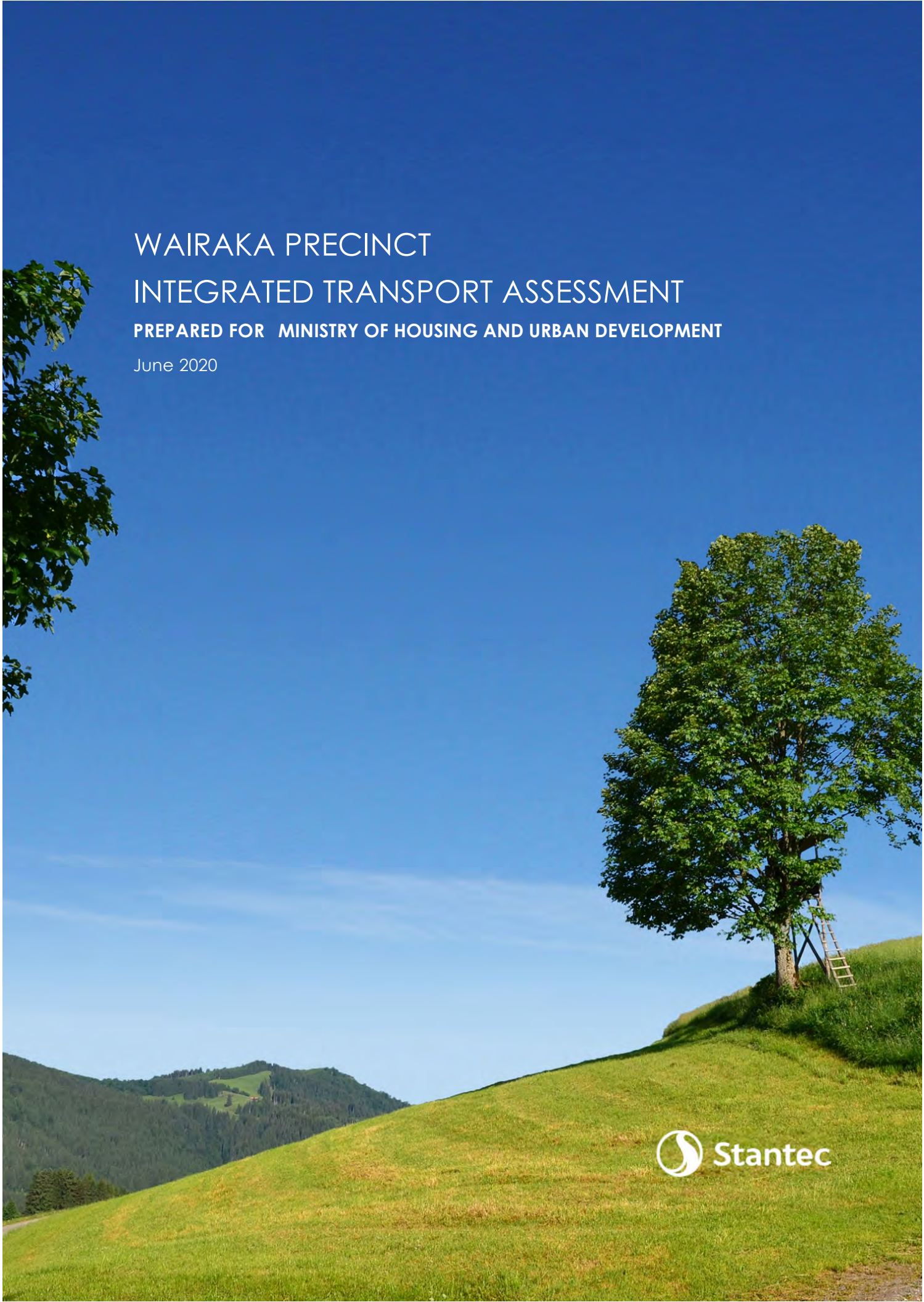
The Precinct will be developed to ensure that all new development is provided, early in the development phases, with internal high-quality active mode links to the future internal and external cycling and

pedestrian networks, to ensure safe and convenient active mode access to local destinations, the wider network, and public transport services.

WAIRAKA PRECINCT
INTEGRATED TRANSPORT ASSESSMENT

PREPARED FOR MINISTRY OF HOUSING AND URBAN DEVELOPMENT

June 2020



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REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
0	01.05.2020	Draft for initial client review	GS / MR	MR	MMT	MMT
1	29/05/2020	Final draft	GS	MR	MMT	MMT
2	04/06/2020	Final draft	GS	MR	MMT	MMT

Executive Summary

This Integrated Transportation Assessment (ITA) for the Wairaka Precinct has been prepared by Stantec, on behalf of the Ministry of Housing and Urban Development (HUD). This ITA is required in order, to fulfil the Auckland Unitary Plan Precinct Rules before any consents for further development within the Precinct can be obtained.

The development will see the Precinct become one of the largest brownfield redevelopments in the Inner Auckland Isthmus. The primary aim of the redevelopment of land acquired by the Crown for medium-density residential development is to improve affordability and quality of urban living with good economic, social, educational and cultural opportunities for residents, employees, students, and other users of the Precinct.

The ITA focuses on assessing the scale of development projected to occur within the next 8 to 10 years, primarily being residential housing in the northern and central Precinct sections owned by the Crown and managed by HUD in partnership with Nga Mana Whenua o Tāmaki Makaurau[1].

The ITA also includes assessment of proposed residential development in the southern area, that is being jointly progressed by Ngāti Whātua Rōpū and the Crown, existing and assumed future activities of Unitec (tertiary education provider), Mason Clinic, and the proposed primary school, early childhood education centre and special needs education centre.

A number of transport upgrades have been identified to enable the proposed land uses to be accommodated. The key upgrades include the "Carrington Road Upgrade" project by Auckland Transport to improve active modes and public transport along the corridor, implementation of traffic signal control at several accesses to the Precinct that currently operate as priority accesses, and a connection of the Precinct's internal road network (for non-through traffic) to existing cul-de-sac roads to the south.

Traffic modelling undertaken within this ITA demonstrates that congestion on the surrounding network may occur once development occurs, but recommended upgrades are anticipated to reduce external impacts in addition to improving people transport capacity on key corridors such as Carrington Road, via improved transport choice for active modes, improved public transport reliability and journey times. Therefore, it is recommended that the planning and delivery of key adjacent projects, such as the Carrington Road Upgrade and the Connected Communities project for New North Road are closely integrated with the Precinct development as it progresses.

Overall, the ITA demonstrates the Precinct's ability to capitalise on the unique opportunities provided by the Inner Isthmus site location and extensive multi-modal transport networks (existing and future both) available. This creates a high-quality, multi-modal, less car-dependent suburb that will be an exemplar in demonstrating how transport and land use can be integrated. From a transport perspective it will support the growing demand for residential development in Auckland in a sustainable manner.

[1] Ngāi Tai ki Tāmaki, Ngāti Tamaoho, Ngāti Te Ata, Te Ākitai Waiohua, Te Kawerau ā Maki, Ngāti Maru, Ngāti Paoa, Ngāti Tamaterā, Ngaati Whanaunga, Te Patukirikiri, Ngāti Whātua Ōrākei, Ngāti Whātua o Kaipara, Te Rūnanga o Ngāti Whātua

Abbreviations

AFC	Auckland Forecasting Centre
AT	Auckland Transport
AUP	Auckland Unitary Plan
CAS	Crash Analysis System
CBD	Central Business District
CRLL	City Rail Link Limited
DHB	District Health Board
ECE	Early Childhood Education
FRL	Fletcher Residential Limited
FTE	Full Time Equivalent
GNR	Great North Road
HCV	Heavy Commercial Vehicle
HUD	Ministry of Housing and Urban Development
ITA	Integrated Transportation Assessment
ITE	Institute of Transportation Engineers (USA)
LILO	Left In, Left Out
LOS	Level of Service
MOE	Ministry of Education
MSM	Macro Strategic Model
NZTA	Waka Kotahi NZ Transport Agency
PT	Public Transportation
SLA	Select Link Analysis
TDM	Travel Demand Management
TMDG	NZTA's Transport Model Development Guidelines

Ministry of Housing and Urban Development

Integrated Transport Assessment

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APPENDICES

1. Introduction

The Wairaka Precinct (Precinct), Mount Albert, Auckland extends from the North-western Motorway (SH16) at Point Chevalier south to Woodward Road, and from Oakley Creek / Te Auaunga in the west to Carrington Road in the east. The majority of the Precinct is owned by the Crown and its entities, Unitec Institute of Technology (tertiary education provider), Waitemata District Health Board, in addition to the landholdings of Ngāti Whātua Ōrākei, and one private landowner.

Overall, there is opportunity for substantial development across the Precinct in addition to Unitec and other various smaller commercial activities, primarily residential but also education and potentially business development. The resulting new suburb will be one of the largest redevelopments in the Inner Auckland Isthmus. The Precinct will bring together amenity, connectivity and density in an urban form for the new community being created.

The Ministry of Housing and Urban Development (HUD) and its development partners Nga Mana Whenua o Tāmaki Makaurau[2] are responsible for facilitating the development of land owned by the Crown within the Precinct and appointed Stantec to undertake the assessment work covered in this document.

An Integrated Transport Assessment (ITA) is a core requirement outlined in the Auckland Unitary Plan Precinct Rules to obtain any consents within the Precinct. The ITA focuses on development in the next 8 to 10 years, primarily in the northern and central Precinct sections owned by the Crown.

Within the ITA an assessment on impacts and integration with the southern development areas in the Precinct are considered. The southern areas encompass land owned by Ngāti Whātua Ōrākei and the Crown, as well as existing and assumed future transport impacts for Unitec.

The ITA has been prepared based on previous work undertaken during the Unitary Plan process and by Wairaka Land Company for Unitec, prior to large parts of the Precinct being sold by Unitec to the Crown. Changes that have subsequently occurred in terms of planned development and the surrounding transport environment are also incorporated.

The ITA provides guidance for further approvals of subsequent individual developments within the Precinct, by providing transport and traffic related expectations for developments at a high level, as well as identifying impacts on the surrounding transport networks. A number of further upgrades are recommended or required to allow the relevant development land uses to be accommodated from a transportation perspective.

At a strategic level, the ITA revolves around the aspiration for creation of a multi-modal, less car-dependent suburb than traditional Auckland residential developments, that takes full advantage of the unique opportunities provided by the site location in the Isthmus, with extensive multi-modal transport networks available for residents and visitors.

It is noted that the Auckland Plan 2050 has identified Mount Albert as well as nearby suburbs of Morningside and Saint Lukes as some of the focus development areas in Central Isthmus. Meanwhile, planning documents in the transport space, from Auckland Transport's Regional Land Transport Plan to the Government's National Policy Statement on Land Transport have identified the requirement for increased mode shift away from single-occupancy cars, that the location and proposed transport integration of the Precinct strongly supports.

[2] Ngāi Tai ki Tāmaki, Ngāti Tamaoho, Ngāti Te Ata, Te Ākitai Waiohua, Te Kawerau ā Maki, Ngāti Maru, Ngāti Paoa, Ngāti Tamaterā, Ngaati Whanaunga, Te Patukirikiri, Ngāti Whātua Ōrākei, Ngāti Whātua o Kaipara, Te Rūnanga o Ngāti Whātua

2. Existing Transport Environment

2.1 Site Location

The Precinct is located in the Auckland suburb of Mount Albert directly adjacent to Carrington Road between Mount Albert Town Centre and Point Chevalier.

Land to the east and south of the site is predominantly residential. Oakley Creek / Te Auaunga and adjacent esplanade areas run north-south to the west of the site, and also Great North Road that runs north-south between the site and the Waterview residential suburb.

Mount Albert Town Centre is around 500m south east of the Precinct, whilst Point Chevalier Town Centre is 200m to the north. Gladstone Primary School, Seaview Terrace are located to the southeast of and adjacent to the Precinct. Saint Francis Primary School is located on Montrose Street, north of SH16. Waterview Primary School is located to the west of Great North Road.

The proposed mixed-use developments in the Precinct will bring benefits to the wider transport network in Auckland, compared to a development located further away. Many new residential developments recently established to cater for Auckland's population growth are located on the outskirts of the current urban area including Albany, Whenuapai, and Silverdale. There are only few areas with opportunities for meaningful larger-scale intensification in the inner suburbs west of the Auckland City Centre.

As much of Auckland's economic activity remains more centrally concentrated, new greenfield development adds to the demands on the transport network via longer trips on already-congested routes. These longer trips are less likely to be undertaken by active modes such as walking and cycling, and public transport networks tend to be less developed.

The Precinct is located around 7km away from the Auckland City Centre. This means typical regular trips to the centre for commuting, education, or other purposes will be shorter, thereby reducing pressure on the network. Shorter travel distances also make non-car modes more attractive, reducing the uptake of private cars in relative terms to outer-edge greenfield development.

2.2 External Transport Network

2.2.1 General & Vehicular

The Precinct, as described above, is located at the edge of the Auckland Inner Isthmus, in a well-connected part of Auckland with good provisions for all travel modes.

In relation to connections in the immediate vicinity, the Precinct is "land locked" and partly isolated. The land-locking is due primarily to existing geographic and infrastructure barriers such as the Oakley Creek / Te Auaunga gully to the west of the Precinct. Combined with the barrier of the SH16 motorway along the northern edge, and the historical lack of street connectivity to the cul-de-sacs of the adjacent suburbs on the southern edge, this leaves Carrington Road along the eastern edge as the only existing vehicular frontage.

On other frontages, existing connections comprise walking and cycling paths, many that are unattractive, narrow or circuitous. However, creation of the Waterview Shared Path in recent years provides improved local / regional walking and cycling connectivity to the west, via a high-level bridge over the Creek spanning to Alford Street in Waterview and to the south, the neighbouring suburbs and Avondale on the eastern edge of Oakley Creek.

The nature of the site in relation to the immediate environment is shown in Figure 2-1 below.

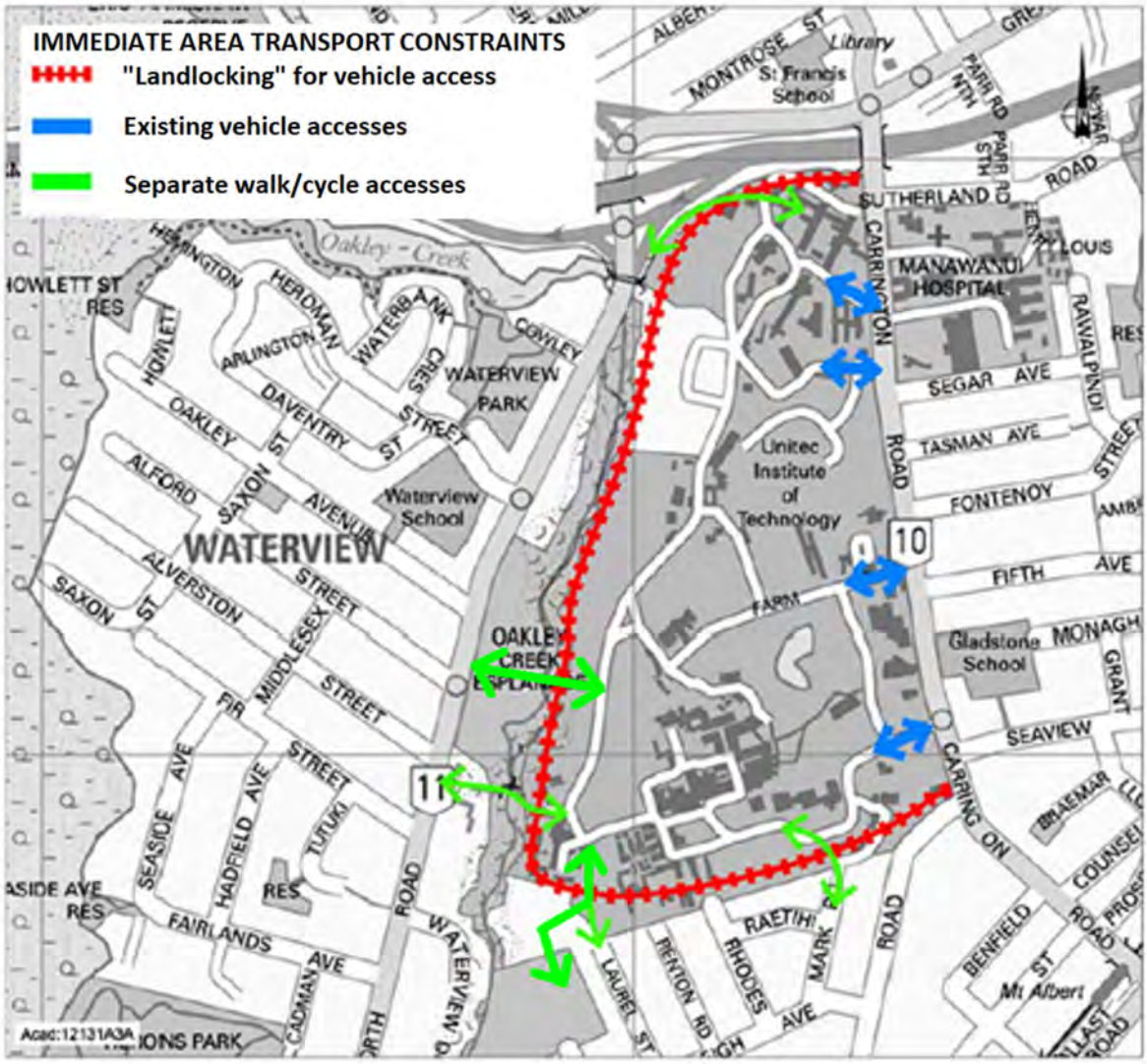

Figure 2-1: The "land locked" nature of the site in the immediate environment

By contrast, the wider area transport network in the vicinity of the Precinct provides good access options for vehicles, as well as several public transport, walking and cycling routes. The multi-modal transport routes are illustrated in Figure 2-2.

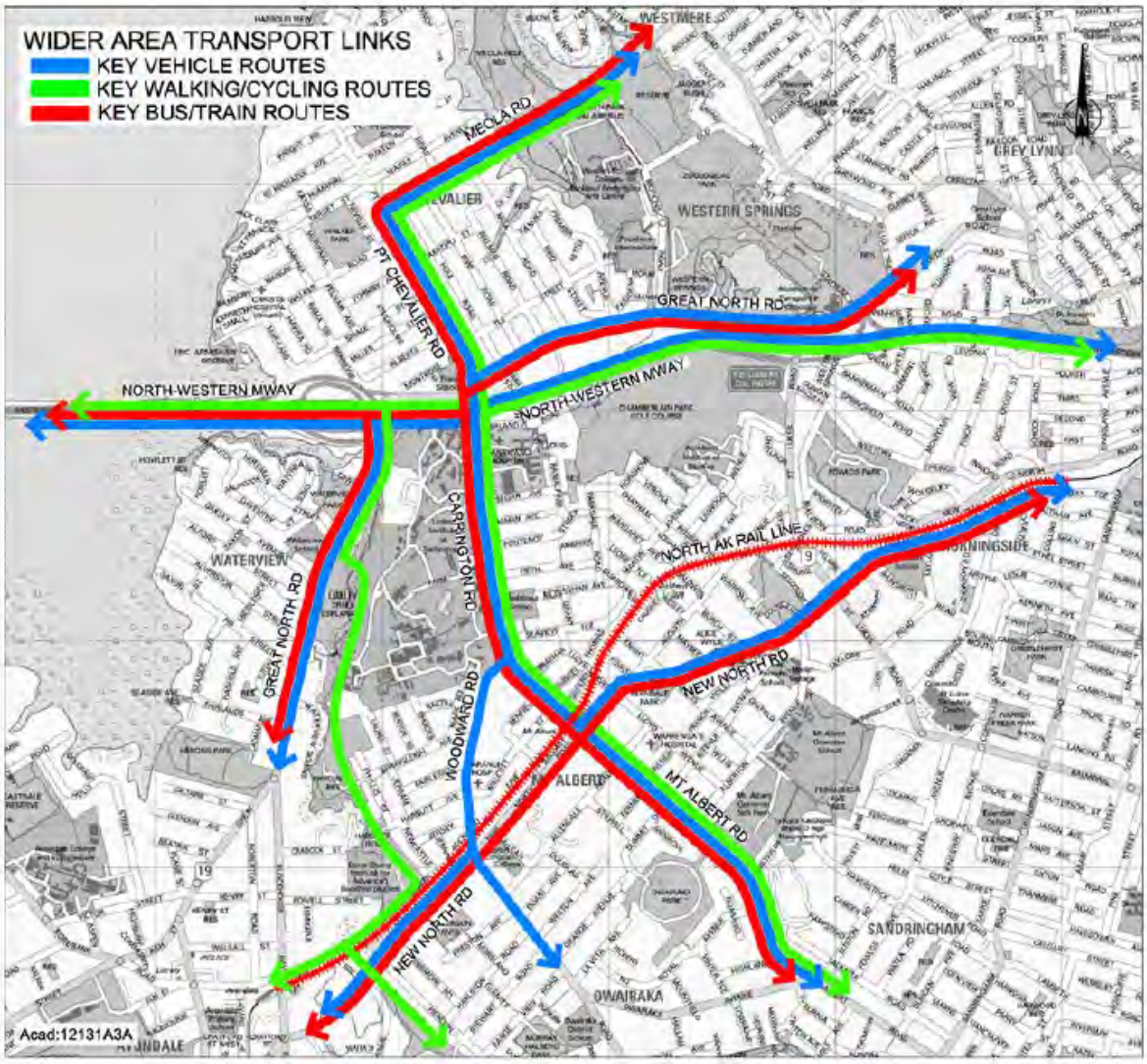

Figure 2-2: Existing multi-modal transport networks around the Precinct

By enhancing links into and through the Precinct, future development will strengthen these wider-area links.

The following ITA sections provide further detail on the existing transport environment, including committed and planned future transport projects surrounding the Precinct.

2.2.2 Public Transport (Infrastructure)

There are five northbound and five southbound bus stops on Carrington Road. Four bus stops in each direction are located along the Carrington Road frontage of the Precinct. There are also two bus stops on Great North Road by Alford Street on each side of the Waterview Shared Path bridge, that provides for active mode connection to the bus stops.

There are also bus shoulders on SH16 west of Point Chevalier and peak hour bus lanes on Great North Road east of Point Chevalier, assisting connecting or onward journeys from the Precinct on west-east bus routes.

There are two rail stations within (extended) walking distance from the Precinct, namely the Mt Albert Station and Baldwin Avenue Station, which are consecutive stations along the western Line of the Auckland Rail Network (discussed in more detail in the next section).

The southern edge of the Precinct is within 800m walking distance of the Mount Albert Train Station, that is considered within reasonable walking distance for a high-quality PT service. The centre of the Precinct is around 1,000m from Mount Albert and Baldwin Avenue train station. This distance slightly exceeds the maximum, however it still considered to provide a realistic transport option, particularly if combined with a cycle or scooter trip to the station. Overall, this provides a good connection between the Precinct and the western Rail Line.

Future improvements of relevant public transport infrastructure include:

- City Rail Link tunnel over the coming years (construction started, opening planned to be around 2024) which will significantly reduce the journey times from the west into the City Centre[3] ;
- A new southbound bus lane on Point Chevalier Road, from near Formby Avenue to the town centre (consulted on in December 2019[4]); and
- Bus lanes on Carrington Road between Woodward Road and Point Chevalier Town Centre, as part of the "Carrington Road Upgrade" by AT (discussed in more detail later).

Another potential future improvement, a Frequent Transport Network along SH16 will also assist the Precinct area (proposed as Light Rail, but potential a busway as an initial or alternative solution that also provides many of the relevant benefits). Benefits will particularly accrue if a Point Chevalier station is included, as seems likely. However, this transport infrastructure is considered unlikely to be in place within the 8 to 10-year timeframe covered by this ITA.

2.2.3 Public Transport (Services)

The Central Auckland Bus New Network was implemented in 2018. The network surrounding the Precinct is shown in Figure 2-3.

Figure 2-3: New Network around the Precinct

[3] https://www.cityraillink.co.nz/crl-travel-times
[4] https://at.govt.nz/projects-roadworks/point-chevalier-improvements/

The Western Rail Line runs every 10 minutes (during peak hours) between Swanson in the west and Newmarket and City Centre in the east. Two frequent bus routes connect the Mount Albert Train Station with the Precinct, connecting the Precinct to high frequency and quality public transport.

The Precinct has various frequent (at least every 15 minutes, 7am to 7pm) and connector services (at least every 30 minutes, 7am to 7pm) on its surrounding arterial roads including:

- **Outer Link**: Frequent service cross-town circular through Westmere, the City Centre, Parnell, Newmarket, Mt Eden, St Lukes and Mt Albert town centre.
    - AT recently currently consulted on proposed changes to the circular route of this service[5], which are expected to improve journey time and reliability of the overall journey. The route will still pass through Carrington Road and New North Road as per the current operation.
- **Route 66**: Frequent service between Mount Wellington and Point Chevalier through Mt Albert town centre and along Carrington Road.
- **Route 18**: Frequent service between New Lynn and City Centre via the direct route, accessible from the Precinct via Point Chevalier town centre or Great North Road stops.
- **Route 195**: Frequent service between New Lynn and City Centre via Green Bay and Blockhouse Bay Road, accessible from the Precinct via Point Chevalier town centre or Great North Road stops.
- Various other services running between West Auckland, Point Chevalier, and the City Centre

In addition, Unitec currently operate private shuttle bus services that are free to students. These connect the Mount Albert campus to the Waitakere campus (14 services each direction a day), however pick-ups from external bus stops are not included,[6] and the service has limited relevance for existing or future residents.

2.2.4 Cycling

The surrounding cycle network around the Precinct is extensive and of high quality for Auckland conditions, albeit with some key deficiencies. The network is shown in Figure 2-4.

The North-western cycleway runs parallel to SH16 across the northern edge of the site and provides an almost fully off-road cycle route between Westgate and the Auckland City Centre.

The Waterview Shared Path was opened in late 2017, as part of the Waterview Connection Project and connects Waterview, the North-western Cycleway and Great North Road at the north western end to Avondale and the SH20 Cycleway at the southern end, following the route of Oakley Creek / Te Auaunga to the west and south of the Precinct.

The Waterview Path also improved walking and cycling connectivity between the Precinct and Waterview via a new bridge over the creek near Alford Street.

In the south, it will link to the future Avondale to New Lynn Shared Path that is currently under construction, providing good links to these suburbs as well as various town centres, schools and event or sports locations along the route.

Carrington Road along the eastern site frontage has painted cycle lanes on both side of the road. While providing a consistent cycle route from Point Chevalier town centre to Mount Albert town centre (and onwards beyond it on Mount Albert Road), the route has no protective separators, therefore is unattractive for many potential riders. It is intended to be upgraded to a protected route as part of the Carrington Road Upgrade (discussed in more detail later).

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[5] https://ourauckland.aucklandcouncil.govt.nz/articles/news/2019/11/have-your-say-on-proposed-changes-to-the-outerlink/

[6] https://www.unitec.ac.nz/current-students/on-campus/shuttle-bus

Protected cycle lanes are also proposed on Point Chevalier Road to the north of the Precinct (consulted on by AT on December 2019[7]), that will link into the cycle facilities around the Precinct, providing improved cycling conditions to and from the north.

Figure 2-4 : Surrounding Cycle Infrastructure Network

2.2.5 Walking

The quality of the walking environment to and around the Precinct varies strongly.

Carrington Road adjacent to the Precinct has footpaths on both sides of the road, albeit the footpaths particularly on the western side along the Precinct frontage are relatively narrow, and in some areas hidden by hedges from the road.

Pedestrian connectivity across Carrington Road and over side streets and site accesses in the Precinct frontage area varies between adequate and poor:

- Signalised crossings are provided at the signalised Gate 4 / Carrington Road (albeit a signalised pedestrian crossing is missing on the northern Carrington Road approach to this signal as well).
- There is also a raised walk/cycle priority crossing over Carrington Road south of Sutherland Road, connecting the North-western Cycleway across the road.
- For the rest of the Precinct's Carrington Road frontage, no other crossing assistance is provided across the relatively wide and busy road except for a flush median, including no specific provisions to enable pedestrians to cross easily at bus stops.

[7] https://at.govt.nz/projects-roadworks/point-chevalier-improvements/

The side road intersections with Willcott Street, Woodward Road, Fifth Avenue, Fontenoy Street, Segar Avenue, and Sutherland Road all have pedestrian refuge islands to assist pedestrians, albeit some of the intersections allow fast turns due to their large geometry.

On the western side, the existing Precinct (existing and former Unitec) site gates are generally very wide, often with multiple approach lanes meaning fast vehicle turns are possible with limited to no assistance for pedestrians to cross the gate entrances.

It is intended to upgrade both pedestrian facilities along and across Carrington Road as part of the Carrington Road Upgrade (discussed in more detail later).

In the wider environment, walking benefits from more connectivity options to and from the Precinct than driving, as noted in the earlier comments about the "landlocked" nature of the Precinct. Extra connections to the south and west across Oakley Creek in particular are available. However, many of the (older, non-Waterview Path) connections have at least some sections of very narrow path width and often not accessible for mobility-impaired users.

The increasing popularity of the surrounding shared paths also offers challenges to pedestrians on these routes, as they have to compete with increasing numbers of people on bikes and e-scooters.

2.3 Existing Internal Transport Network

The existing internal transport network within the Precinct (currently all private roads) consists of a main loop running north-south along the western side of the precinct, that is connected via other internal roads to four external gates along Carrington Road. The northern three gates are priority control intersections, while the southern-most gate (closest to the Unitec Core) is traffic signal controlled . There are a number of other roads branching off the main loop that serve various areas in the Precinct.

Generally, the internal roads have footpaths, though these are often narrow, one-sided, and have no separation buffer between the carriageway and the footpath space.

Added walking and cycling links within the Precinct comprise the Waterview Shared Path from the northwest to the south as already discussed in Section 2.2.3 and a variety of smaller local shortcuts.

Pedestrian priority (zebra) crossings are available at many locations throughout the site.

The current speed limit within the Precinct is 30km/h with a number of traffic calming devices (raised tables and speed bumps) already located at the crossings and some mid-block sections. These encourage a safer transport environment. However, this speed environment is not fully consistent, with some sections still seeing speeds at inappropriate levels for a campus / future residential area.

2.4 Existing Transport Mode Shares

Evaluation on the existing transport mode share of the Precinct considers the latest available (2018) commuter census data, and the latest travel mode survey for the Unitec Mount Albert campus students (2018) and its staff (2016).

2.4.1 Area travel to Work Mode Share

For the assessment, a combined area comprising two census area units was reviewed:

- Mount Albert North census area (east of Oakley Creek / Te Auaunga, south of SH16, that includes most of the Precinct, as well as residential areas and Chamberlain Park to the east).
- Mount Albert West census area (south-east of the above, including the main future tertiary education core, and residential areas to the south and south east up the rail line).

The two census areas are shown in Figure 2-5.

It is noted that the census data focuses on residents travelling from the area to work, that may therefore, not specifically capture the travel behaviour of students and staff travelling to the site. This is further discussed based on Unitec students and staff travel mode survey data.

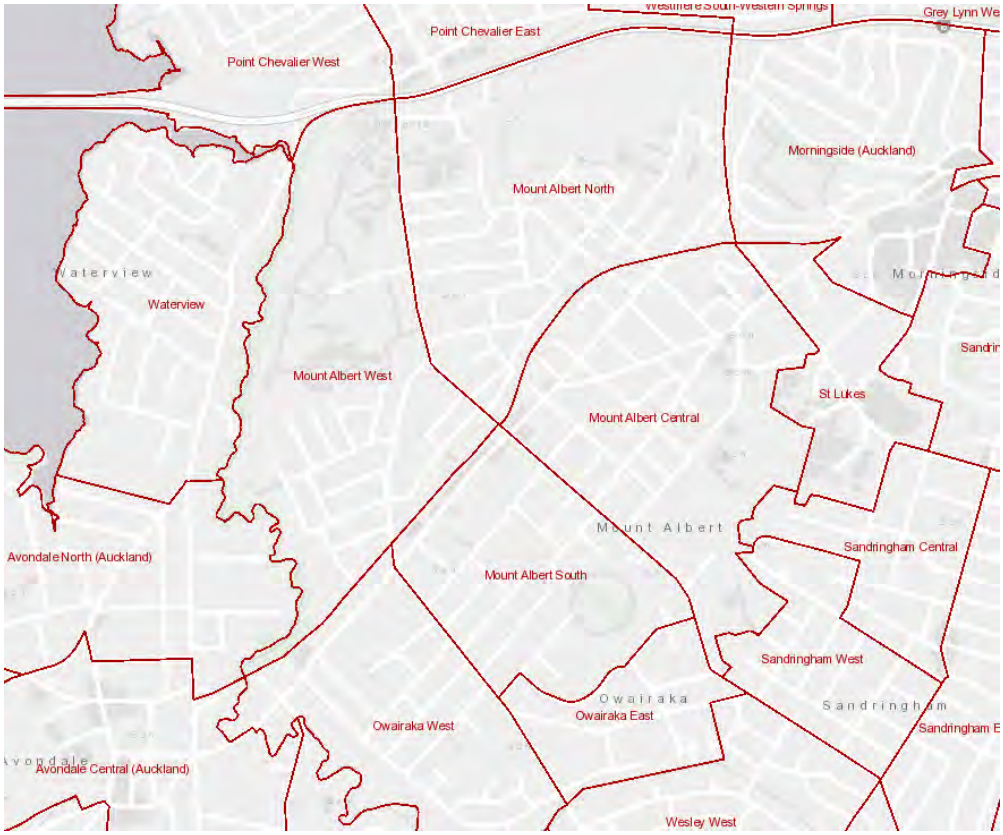


Figure 2-5: Mt Albert North and Mt Albert West Census Areas

The census data for the above areas are presented in Table 2-1, with comparison to the Auckland averages.

Table 2-1: Census 2018 Mode Share of the Local Area Versus Auckland Average

Travel to Work	Combined Area (Mt Albert North and West census areas)		Auckland	
	% total	**% travelling**	**% total**	**% travelling**
Worked at Home	8.2%		8.7%	
Drove a Private Car or Truck or Van	53.7%	58.5%	59.5%	65.2%
Drove a Company Car or Truck or Van	7.9%	8.6%	10.3%	11.3%
Passenger in a Car or Truck or Van	2.6%	2.8%	4.1%	4.5%
Public Bus	8.9%	9.7%	7.1%	7.8%
Train	9.7%	10.5%	3.0%	3.2%
Bicycle	3.1%	3.4%	1.0%	1.1%
Walked or Jogged	4.1%	4.4%	4.3%	4.7%
Ferry	0.0%	0%	0.6%	0.7%
Other	1.6%	1.8%	1.3%	1.4%
Not elsewhere Included	0.0%	0.0%	0.0%	0.0%
Totals	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Total private motor vehicle		69.9%		81.0%
Total public transport		20.2%		11.8%
Total active modes		7.8%		5.8%

The 2018 Census data identifies that the share of private motor vehicles (the first three categories above) is around 10% less than Auckland average. This is due to the public transport and active modes network improvements that have taken place in the area, and, as stated earlier, the location of the Precinct being closer to the centre of Auckland than many other residential areas.

The level of public transport use is nearly twice the average Auckland levels. With improved train services and new bus network improvements to come, there is potential that this will increase faster than the rise of public transport across Auckland in general.

Active mode travel is around 50% higher than Auckland average levels. This is due in part to substantial growth on key walking and cycling networks, in particular the Waterview Shared Path and North-western Cycleway.

Overall, the census results show that the "starting position" for the Precinct is already better (less private motor vehicle dominated) than for many areas of Auckland.

2.4.2 Unitec Student Mode Share

Auckland Transport prepared a Tertiary Student Travel Survey Report in 2014, 2016 and 2018 that includes the Unitec Mount Albert Campus. This provides a snapshot of current travel behaviours at the tertiary core with students and staff continuing to represent a high percentage of traffic movements associated with the Precinct. Results are shown in Table 2-2 below.

Note: Due to rounding up / down contained within the original source table, some columns tally up to 1-2% above or below 100%.

Table 2-2: 2014, 2016 and 2018 Results of Tertiary Student Travel Surveys

Travel mode	2014 All tertiary institutions	2016 All tertiary surveyed	2018 All tertiary surveyed	2014 Non-CBD tertiary	2016 Non-CBD tertiary	2018 Non-CBD tertiary	2014 Unitec	2016 Unitec	2018 Unitec
Walk/run	13%	10%	12%	Not available - smaller survey pool with only 2 non-CBD sites in the 2014 survey	5%	7%	13%	8%	9%
Cycle	1%	1%	2%		1%	1%	2%	2%	2%
Public bus	32%	36%	37%		25%	27%	27%	21%	27%
University shuttle bus	4%	3%	2%		5%	2%	2%	1%	1%
Train	8%	11%	13%		8%	10%	11%	12%	16%
Ferry	1%	1%	1%		0%	0%	0%	0%	0%
Drive alone in car	30%	27%	28%		42%	45%	33%	40%	39%
As passenger in a car (dropped off)	4%	6%	4%		9%	6%	3%	8%	2%
Drove self and others in a car	4%	3%	1%		4%	1%	6%	5%	3%
Car passenger (parked near campus)	2%	1%	1%		2%	1%	2%	1%	1%
Motorcycle / scooter	1%	1%	1%		1%	1%	0%	1%	<1%
Total (may exceed 100% due to source)	**99%**	**100%**	**102%**		**102%**	**101%**	**99%**	**99%**	**100%**
Total private motor vehicle	40%	37%	35%		57%	54%	44%	54%	45%
Total public transport	45%	51%	53%		38%	39%	40%	34%	44%
Total active modes	14%	11%	14%		6%	8%	15%	10%	11%
Total									

As can be seen, student driving levels at Unitec are relatively high (45%) compared to average levels at other Auckland institutions in Auckland (35%), however they compare well against non-CBD institutes surveyed within Auckland (54%).

Student driving levels at the Unitec Mount Albert have also fluctuated (increased between 2014 and 2016 but decreased between 2016 and 2018), unlike a more dependable population-wide trend for reduced driving. There are contributing factors that may influence this including availability of cheap / free parking (which has slowly been constrained over recent years but is still relatively easily available), fuel prices and a move to reduce full-time study that may favour modes able to be used more flexibly off-peak.

However, the volatility visible in the above studies also indicates there is likely to be a high ability to change behaviour by a "carrot and stick" approach of opportunities and constraints.

2.4.3 Unitec Staff Mode Share

Unitec undertook a staff survey in October 2016 to provide a baseline of staff travel modes for future TDM activities. The results are shown in Figure 2-5.

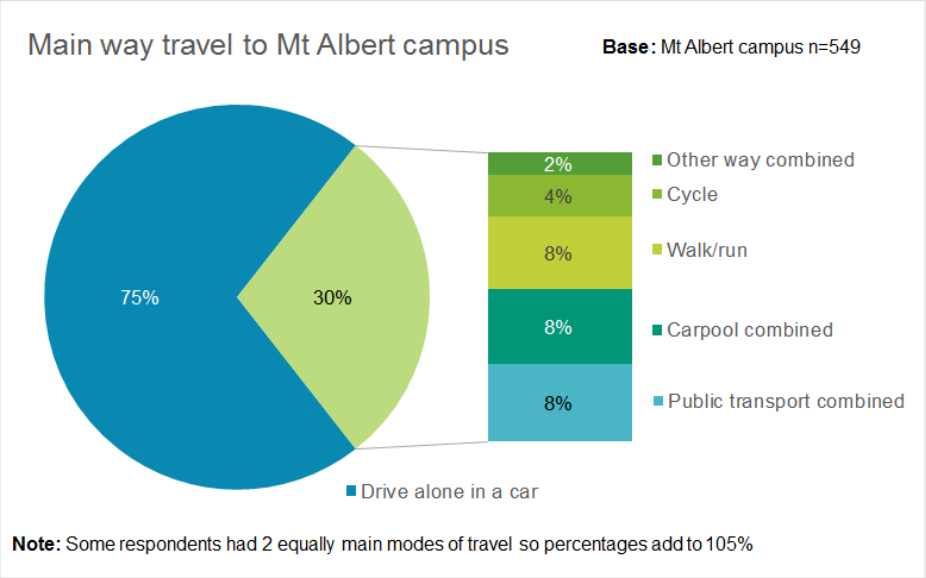


Figure 2-6: Main Mode of Travel to Unitec for Staff, October 2016

The results demonstrate that there is a relatively high level of driving among staff compared to Unitec students, with the overall use of car (including carpool) making up 83% of overall travel mode.

It is noted that there is no similar information available for the small number of existing non-Unitec businesses, or the Mason Clinic staff and visitors. However, these comprise only a small portion of overall trips with assumptions incorporated via existing (surveyed) trip generation and standard survey research literature discussed later in this report. Therefore, close study of their existing travel habits had less relevance to this ITA.

2.5 Road Safety

A road safety record search has been undertaken using the NZTA Crash Analysis System for the five-year period from 2015 to 2019, and up to January 2020. The search area included the full length of Carrington Road, Woodward Road, the Precinct and local roads between New North Road and the Precinct. Crashes that occurred on the motorway were discounted and a 50m radius was applied around all intersections. The search area is shown in Figure 2.7.

Figure 2-7: CAS Search Area

During the five-year period considered for the analysis, it is noted that several key infrastructure upgrades have occurred that may have an impact on the safety of the area surrounding the Precinct. For example, the opening of the Waterview Connection on SH20 has resulted in a reduction in traffic around the site and potentially influenced general safety of the arterial roads and intersecting local roads in proximity of the Precinct. Additionally, the traffic signals at New North Road / Carrington Road were changed halfway through the CAS timeframe, with some smaller changes also to lane disciplines at Great North Road / Carrington Road and New North Road / Woodward Road.

A total of 189 crashes have been recorded within the search area over the five-year period. A summary of the reported crashes is provided in the table below.

Table 2-3: CAS Summary Table

Location	Crash type				Total
	Fatal	Serious	Minor	Non-injury	
Great North Road / Pt Chevalier Road / Carrington Road Intersection	0	0	7	31	38
Carrington Road / Woodward Road intersection	0	0	5	4	9
New North Road / Mt Albert Road/ Carrington Road intersection	0	1	5	18	24
New North Road / Woodward Road / Richardson Road intersection	0	1	4	28	33
Carrington Road Mid-Block	0	5	15	32	52
Woodward Road Mid-Block	0	2	6	13	21
Wairaka Precinct	0	0	4	0	4
Other local roads	0	1	1	6	8
Total	**0**	**10**	**47**	**132**	**189**

The crash record at each of these locations and the impact of any proposed upgrades on the crash record is described in more detail in the following sections. For ease of reporting, only crashes resulting in serious injuries will be discussed in detail. A full list of the crashes can be found at Appendix A

2.5.1 Great North Road / Point Chevalier Road / Carrington Road intersection

The Great North Road / Point Chevalier Road / Carrington Road intersection is located at the northern end of the Carrington Road corridor. A total of 38 crashes have been reported at this intersection with seven resulting in injuries, which were all minor.

The crash record at this intersection is considered consistent with that expected for a complex intersection joining two busy arterial roads, with the absence of serious injuries despite the number of total crashes seen as a positive factor.

2.5.2 Carrington Road / Woodward Road intersection

The Carrington Road / Woodward Road intersection is currently a priority-controlled intersection that experiences congestion. A total of nine crashes have been reported at this intersection, of which five resulted in minor injuries.

As discussed above, no crossing facilities are currently provided at the intersection to assist pedestrian movement, specifically those walking between the Precinct and Mount Albert Train Station. Despite the absence of safe crossing facilities, no pedestrian crashes have been reported, potentially due to the lack of facilities that deters many pedestrians from trying to cross.

2.5.3 New North Road / Mount Albert Road / Carrington Road

The New North Road / Mount Albert Road / Carrington Road intersection is located at the southern end of the Carrington Road corridor. A total of 24 crashes were reported at this intersection with one resulting in serious injuries and five resulting in minor injuries.

The serious injury crash involved a vehicle turning right from New North Road onto Carrington Road colliding with a pedestrian on Carrington Road, who had stopped in the middle of the vehicle lane to clear some rubbish.

The crash record at this intersection is considered consistent with that expected for a complex intersection joining two busy arterial roads.

2.5.4 New North Road / Woodward Road / Richardson Road intersection

A total of 33 crashes have been reported at this intersection with one crash resulting in serious injury and four resulting in minor injuries.

The serious crash occurred when a person tried to jump on to the back of a delivery truck as it drove away from the intersection and hit their head on the road. This is not considered to be due to intersection design.

The New North Road / Woodward Road / Richardson Road intersection is located less than 100m south of the western railway line. No reported crashes at this intersection were related to the railway crossing.

2.5.5 Carrington Road Mid-Block

A total of 52 crashes have been reported at mid-block sections along Carrington Road. Of the 52 crashes, five resulted in serious injury and 15 resulted in minor injuries.

A cluster of crashes are recorded in the vicinity of the pedestrian crossing south of Sutherland Road. Eight crashes at this location involve vehicles hitting pedestrians or cyclists crossing the road or rear-ending vehicles who stopped or slowed down to allow pedestrians to cross the road. However, this crossing has recently (2019) been upgraded to a raised crossing to emphasise the need for drivers to slow down and give way, that is likely to lead to reduced crash incidents.

It is understood that Auckland Transport considers the corridor as high risk for active modes, in part due to the busy road with limited crossing facilities.

2.5.6 Woodward Road Mid-Block

A total of 21 crashes have been reported along the mid-block section on Woodward. Of these, two crashes resulted in serious injury and six in minor injuries.

The railway line crosses Woodward Road around 100m north of New North Road. No crashes were reported involving trains or vehicles that had stopped or slowed to allow a train to pass.

No specific trends have been identified along the Woodward Road corridor. The roads safety record is considered typical for an 800m long corridor that includes four intersections and many driveways.

2.5.7 Local Roads

A total of eight crashes have been reported on various local roads within the crash study area. These local roads primarily access the wider road network either via Woodward Road or Carrington Road.

Of the eight crashes, one resulted in serious injury, one resulted in minor injury with the remainder all non-injury crashes. The serious injury crash occurred when a driver reversed out of a petrol station into a pedestrian.

No specific trends or factors have been identified that might impact the road safety record in this area. The crash record is considered typical for the surrounding environment.

2.5.8 Wairaka Precinct

A total of four crashes have been reported within the Precinct. Two occurred in the parking area between Gate 3 and Gate 4 and two at driveways to the Mason Clinic. All of these crashes resulted in minor injuries.

All reported crashes are attributed to different factors with no common crash trends identified.

In summary, it is considered that there are no road safety reasons to preclude approval of development in the Precinct and that the proposed infrastructure upgrades discussed later in this report, particularly for Carrington Road, will improve existing road safety conditions.

3. Proposed Development

3.1 Introduction and Site Vision

Consultants appointed by HUD and Mana Whenua have produced a high-level Masterplan[8] outlining a wider site vision for residential development over the next decade, creating a new suburb.

The Precinct vision and Masterplan identifies how development will contribute to a rapidly growing Auckland, delivering a broader range of homes with high quality open space and community facilities, with good internal and external connections. The intention is to offer improved affordability and quality of urban living with good economic, social, educational and cultural opportunities for residents, employees, students, and other users of the Precinct.

From the Preface of the Masterplan:

> *"A well-designed built environment that respects the whenua is healthy for all people, promoting community wellbeing, activity and walkable neighbourhoods, safety, security and intergenerational living.*
>
> *It's responsive to the place of Mana Whenua and the needs and aspirations of people, now and into the future, inviting innovative use, interaction, productivity and enjoyment.*
>
> *It's integrated, by drawing together the relationships between parts and elements, considering human interfaces at multiple scales, and supporting common goals and aspirations.*
>
> *It's equitable by creating opportunities for all parts of our community. It supports mobility between public and private spaces, parks and buildings, employment, leisure and home. It's resilient to the dynamic and challenging conditions of our time and can adapt and evolve while retaining its essential qualities and values."*

The Masterplan primarily identifies general "bulk and location" planning for the Precinct's Crown land. Whilst there are indications on building form and location, as well as indicative transport layouts, this is not to a detailed level that will, for example, fix future buildings shapes, or internal road locations or layouts and cross-sections. The intention is to achieve an approved ITA setting out the key transport principles and transport-related assumptions of the Masterplan and subsequent HUD planning predominantly in relation to the number of dwellings, roading network with detailed master-planning and subsequent resource consent applications to provide more detail, over time.

[8] A Reference Masterplan & Strategic Framework, Grimshaw, 6th February 2019

3.2 Zoning & Precinct Plans

The Unitary Plan provides four key zones in the Precinct, as shown in Figure 3-1:

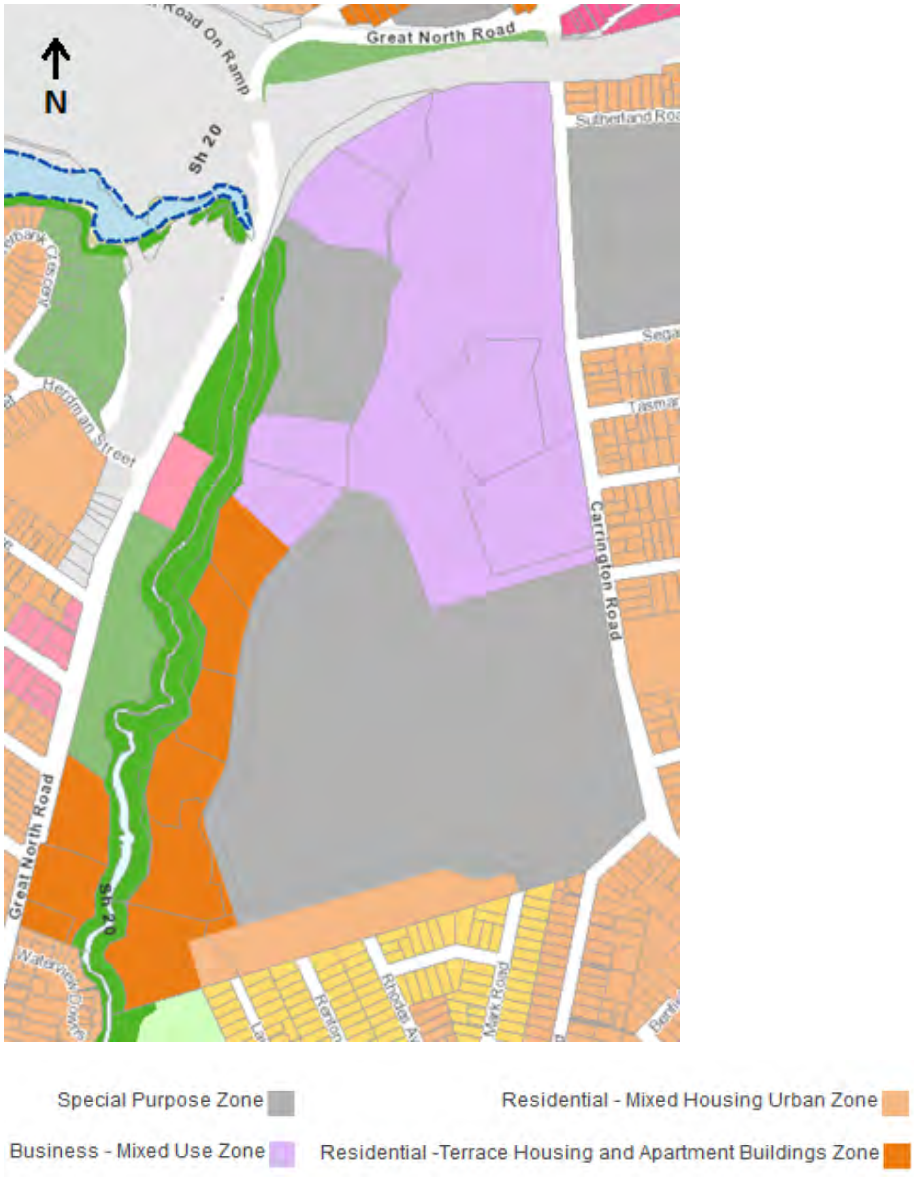


Figure 3-1: Site zoning as per the Unitary Plan / Precinct Plan

The largest zoning is "special purpose zone" in the south that covers the Unitec (tertiary education) "Core". All teaching activities are being consolidated here, with most activities already having moved to the Core areas. Those activities that remain on HUD land will relocate in subsequent years as leases expire. A secondary "special purpose zone" in the northwest covers the Mason Clinic. It is understood that Waitemata DHB are completing planning to expand this zoning to the north and south to incorporate 2.84 hectares of their expanded site.

The largest portions of Crown land managed by HUD for development are located in the "Business – Mixed Use Zone" in the north and centre of the site. The zoning allows residential development as now envisaged in the HUD Masterplan and includes an existing commercial development (Taylors Laundry) as well as other existing businesses along Carrington Road near Gate 3 / Farm Road.

Along the western edge, a "Residential – Terrace Housing and Apartment Buildings" zone runs along Oakley Creek / Te Auaunga, with mixed ownership, including Ngāti Whātua Ōrākei. Finally, a "Mixed Housing Urban" zone with some specific height limits occurs along the southern boundary, on Crown land.

The Unitary Plan also includes Precinct Plan 1 of Section I334 as shown in Figure 3-2 below, for transport. Section I334 contains objectives, policies, standards and requirements specific to the Precinct.

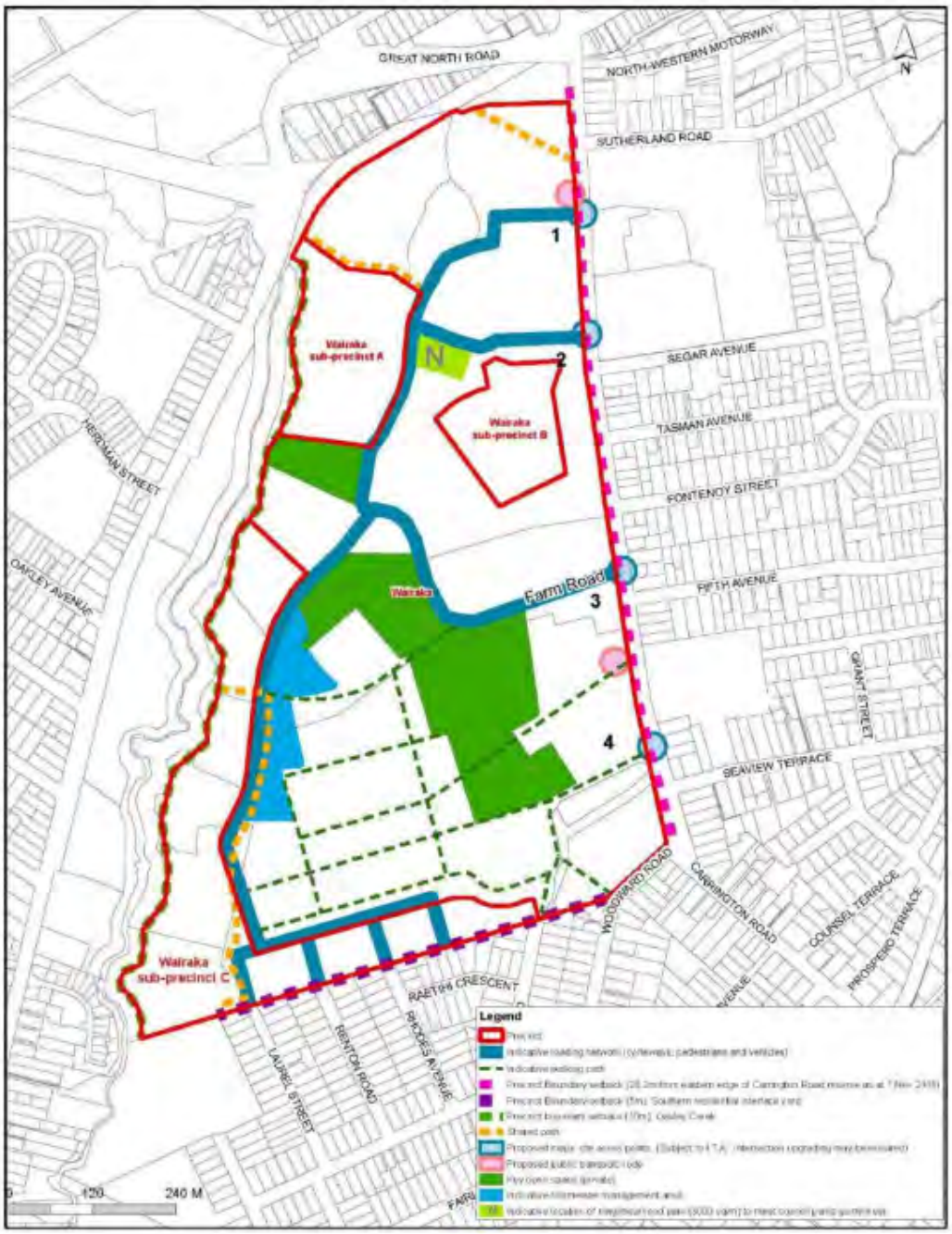


Figure 3-2: Precinct Plan 1 (Transport)

Precinct Plan 1 outlines a number of key features of the future Precinct transport network. These include a main roading network in blue, with smaller vehicular links shown. A north-south spine provides the key vehicular link, with four primary vehicle accessways on to Carrington Road, and vehicular connections to be established with the existing residential road network to the south. Networks are indicative / high level.

As explained in the associated Precinct rules, the Unitary Plan also identifies that the Unitec Core (tertiary education) will not have vehicular links to the rest of the Precinct's internal network (or southern residential streets), with Unitec traffic to use Gate 4.

3.3 Staging Areas

HUD have developed an indicative area and staging plan that identifies the various land parcels expected to be developed first. This uses the general areas as shown in Figure 3-3.

Figure 3-3: Masterplan – Indicative Staging Zones

As shown in the above figure, the key HUD land development areas, that this ITA focusses on, are:

- **Northwest** west of the heritage-protected former Unitec hospital main building
- **Northern** and **Carrington**, both along Carrington Road
- **Te Auaunga North** in the western centre of the Precinct, along Oakley Creek / Te Auaunga
- **Southern** along the southern edge of the Precinct, adjacent to the existing residential areas

Note: For the purpose of the ITA the "Southern" area includes the Ngāti Whātua Ōrākei iwi land in the very southwestern part of the southern area. Although this land is not owned by the Crown, it is expected to be developed together with the rest of the southern zone.

However, this "Southern" area excludes further iwi-owned land west of the F-Lots, between the Te Auaunga North area and the Southern area, as this part of the Ngāti Whātua Ōrākei land is not expected to be developed in the near future. This ITA refers to this area as Te Auaunga South.

Additionally, there are some other areas in the Precinct that are expected to see some changes within the ITA timeframe, but do not form part of the HUD development areas:

- **Unitec Core** in the southern centre – based on previous work by Wairaka Land Company for Unitec, some further transformation and site consolidation is expected, with the transport assumptions discussed later in this ITA
- **Mason Clinic** in the northwest – some redevelopment / expansion is planned over the coming decades, with the transport assumptions discussed later in this ITA

Finally, the following areas are assumed to have no significant (re)development for the purposes / timeframes of this ITA. Any proposals to develop these areas at a later stage, or within the ITA timeframes, will require a review as to whether they are significant enough to require an updated ITA.

- **F Lots -** West of the Unitec Core and directly north of the central part of the Southern area. These areas are part of the Unitec (tertiary education provider) land ownership at the time of writing of this ITA.
    - It is possible that these areas may be developed for residential use within the ITA timeframe, should the Crown acquire them.
    - If so, it has been signalled that, at least within the ITA timeframe, they are expected to replace rather than be in addition to some of the Crown residential development assumed further north on the site i.e. even if acquisition and development of the F Lots occurs, the changes to the overall staging plan for this part of the Precinct will mean that the basic assumptions of the ITA and the traffic modelling remain unchanged.
- **B Lots** - Along Carrington Road east of the Unitec Core (owned by Unitec)
- **Taylor's Laundry -** In the northern centre (owned by Taylor's Laundry)
- **Unitec Hospital (Heritage Main Building)** - In the north east (while adaptive re-use is expected to occur at some stage, no development plans are currently assumed within the ITA timeframe); and
- **Te Auaunga South** - Along the western edge of the site between the Te Auaunga North area and Southern area (owned by Ngāti Whātua Ōrākei), as already discussed earlier above.

The ITA traffic modelling will incorporate sensitivity assessment regarding potential traffic impacts of these areas being developed at a later stage.

3.4 Staging Levels & Scenarios

The current staging plans by HUD are high level and indicative and may change as development plans move closer to implementation. For the purposes of the development assessed in this report, as agreed with Auckland Transport, two future scenarios are proposed, along with a year when development is assumed to reach this level:[9]

- **Scenario A** – 41% of the 2,500 dwellings envisaged on Crown land, by around 2024
    - Development expected to focus mostly on the "Southern" area and some initial developments in the central and northern HUD areas
- **Scenario B** – 82% of the 2,500 dwellings envisages on Crown land, by around 2028
    - During this period, development is expected to occur largely in the central and northern areas.

The relevant scenarios are considered ambitious (fast development pace), therefore will have a level of robustness with impacts from development likely to progress slower in practice.

If development proceeds different in scope or key assumptions for the external transport environment change, then an updated ITA may be required. However, this ITA has been prepared to consider assessment of an ambitious development programme in the Precinct, thereby seeking to minimise a requirement for any new assessment solely due to a faster development pace than that assumed with a more conservative set of assumptions.

Unlike in previous planning for Wairaka Land Company, the current HUD / ITA development assumptions exclude, within the timeframe for this ITA:

- Significant townhouse developments – currently, only the "Southern" area includes any significant element of townhouse/terrace housing development (for the purposes of the determining the residential trip generation for the ITA traffic modelling, these terrace houses have been grouped together with apartments with similar number of bedrooms. This is discussed in Section 5.8.3.)
- Office / commercial / retail development above that currently present in the Precinct.
- Adaptive re-use of the old Unitec hospital main building (former Carrington Psychiatric Hospital) in the northeast
- Retirement homes or similar care facilities.
- New student housing – Notwithstanding that students may live in homes within the Precinct.

As per the assumptions for residential development above, if material changes to these assumptions occur within the timeframe of the ITA, then an updated ITA may become required.

[9] The levels of development and resulting scenarios / indicative timeframes were agreed with Auckland Transport and their consultants, Flow Ltd, during February 2020.

3.5 Proposed Development Levels

The anticipated development levels (dwelling numbers, student/staff numbers etc) for the proposed Precinct land uses assumed in this ITA are discussed below. In general, these ensure a conservative or robust assessment of the proposed development and considered the latest available information relevant to all land uses and related parties.

3.5.1 Education Land Uses

Education land uses are presented in terms of the number of full time equivalent (FTE) students and staff.

3.5.1.1 Tertiary Education

The land use assumptions for the Unitec Mount Albert campus have been calculated using a combination of available data on the Unitec website and using the information previous supplied by the Wairaka Land Company to Stantec in association with a previous ITA study (2017) prepared by TDG (the company since acquired by Stantec). HUD acquired the relevant IP of this previous, unfinished ITA as part of their due diligence with Unitec.

Unitec became part of the National Institute of Skills and Technology in April 2020, however it is not yet clear to what extent this, and other changes to the tertiary education environment, will change the assumptions that this ITA relies on, and which have been derived from Unitec's previous plans and publicly available material.

Additionally, COVID-19 impacts on the economy make predictions on future student numbers, and proportions of in-person vs online teaching, uncertain. While student numbers tend to go up during economic downturns, international student numbers may be slower to recover. The two future scenarios assessed in this ITA assume time horizons of four and eight years from now. Therefore, within this ITA several conservative assumptions have been incorporated.

Unitec publishes annual reports that contain information on overall student and staff numbers with corresponding targets each year, amongst other key success indicators. According to the 2018 annual report[10], Unitec's current target was 9,800 FTE students across all its campuses. However, actual student numbers have fallen below this target to 7,897 in the 2018 reporting.

However, a conservative figure has been assumed for Scenario A, by 2024 that the current target of 9,800 FTE students will be achieved.

In relation to Scenario B (2028) it has been assumed that a 10% increase from the Scenario A target allows for possible further growth, to 10,780 total FTE students.

Based on the above target being a combined target inclusive of all Unitec campuses in Auckland, it was necessary to estimate those FTE only applicable to the Mount Albert campus. However, no new data is currently available from Unitec. Historically, Stantec have been provided with actual 2014 FTE students and staff for the Unitec Mount Albert campus. According to the 2014 data, the Unitec Mount Albert campus contributed 90% of overall Unitec student numbers. This proportion is retained for the assessment scenarios and applied to target number discussed above to define the assumed FTE for Unitec in Scenarios' A and B.

Information on potential future Unitec staff numbers are not currently available, and like other factors, likely to be impacted by potential changes to student numbers, operational models etc. Therefore, the proportion of FTE staff numbers to FTE student numbers as reported by Unitec in 2018 (1 staff member per 8.17 students) is applied to the assumed future student numbers to estimate associated staff numbers.

[10] https://www.unitec.ac.nz/sites/default/files/public/documents/Unitec%20Annual%20Report%202018.pdf

Table 3-1: Unitec assumed student and staff numbers

	Scenario A [FTE equivalents]	Scenario B [FTE equivalents]
Students	8,820	9,702
Staff	1,079	1,187

3.5.1.2 Primary School, Early Learning Centre and Special Needs Education Centre

The Ministry of Education (MOE) through its transport consultant (Jacobs), have indicated their intention to establish a Primary School, that is co-located in the precinct with an Early Childhood Education Centre (ECE) and Special Needs Education Centre. The exact location and timing is still to be confirmed between MOE and HUD. Therefore, in agreement with the MOE, it has been assumed to be located in the centre of the Precinct i.e. in the wider vicinity of Gate 3 / Farm Road.

At full build-out, it is anticipated that the primary school will accommodate around 750 students, while the ECE and the Special Needs Education Centre will have 50 children and 18 students, respectively. A combined total of 62 full time equivalent staff are anticipated to serve these facilities.

Scenario A assumes that none of the primary school, ECE and special needs education facilities will be operational.

Scenario B assumes the facilities will operate at half of their full capacity, i.e. 375 primary school students, 25 ECE children, and 9 special needs students.

Table 3-2: Primary school (and associated facilities) assumed student and staff numbers

	Scenario A	Scenario B
Primary school students	0	375
ECE children	0	50 (see below explanation)
Special needs students	0	9
Staff (FTE equivalents]	0	31

The above assumptions and timing for school roll levels have been agreed with the Ministry of Education, as documented in the memorandum attached at Appendix B. The only difference to the assumptions is that the full ECE complement (50 children) has been assumed, as Auckland Transport indicated that a "half-open" childcare will be unlikely. This assumption change is considered conservative from a transport perspective (added traffic flows).

3.5.2 Residential Land Uses

3.5.2.1 Apartments

The Precinct residential development numbers are based on information provided by HUD that includes assumptions for the wider development of HUD-managed Crown land, in addition to initial land to be developed in the southwestern part of the site. Ngāti Whātua intends to partner in the development of the southern Crown land area.

The assessment incorporates a rate of development that corresponds to 1,023 dwellings in Scenario A and 2,049 dwellings in Scenario B as advised by HUD. Based on a total of 2,500 dwellings envisaged for the HUD Crown land owned by the time of the writing of this ITA, Scenario A and Scenario B represent 41% and 82% of HUD's target residential development, respectively.

The dwellings are provided in various apartment typologies categorised according to location within the Precinct or by number of bedrooms, to be discussed further in the trip generation section. A breakdown of the Scenario A and Scenario B residential development on HUD Crown land is shown in **Error! Not a valid bookmark self-reference.**.

Table 3-3: HUD residential development in Scenario A and Scenario B

Scenario	Indicative Year	Precinct Area				
		Northwest	Northern	Carrington	Te Auaunga North	Southern
A : 1023 dwellings (41% of the target HUD residential development)	2024	64	282	208	-	469
B : 2,049 dwellings (82% of the target HUD residential development)	2028	96	658	674	152	469

As can be seen, during Scenario A, development will focus first on the Southern area, and then progressively shift to the centre and northern areas. In relation to Scenario B, the southern areas included in this ITA will largely have been built out, with further development occurring largely to the centre and north.

The residential dwellings will comprise a mixture of apartments, ranging from studios to larger 3-4 bedroom units. However, it is likely that on average, most dwellings will be between 1 and 2 bedrooms. This has been confirmed by HUD, with these smaller typologies being more suitable for the targeted markets than larger dwellings. The precise breakdown will be defined during subsequent individual development stages.

Contrary to earlier Masterplan work undertaken by Wairaka Land Company, there is no student accommodation planned within the timeframe for this ITA and only a comparatively low level of townhouse development is planned, primarily in the Southern area.

3.5.3 Commercial Land Uses

The ITA assumptions do not include commercial development, with only existing commercial uses included.

3.5.3.1 Taylor's Laundry

Taylor's Laundry is an existing industrial facility in the north-eastern centre of the Precinct, the northern zone and Carrington zone (please refer to Figure 3-3) that is assumed will continue to operate for the time being.

It is noted that there is possibility for acquisition of this land by HUD in the future, however, this is likely to be outside the timeframes of this ITA. If this assumption changes, an update of the ITA may be required.

3.5.3.2 Retail

It is anticipated that a combination of small format and food & beverage retail will be available to primarily serve residents, students, employees, and other users of the Precinct. However, this will largely comprise existing entities including small café / restaurants in the north and centre, as well as existing facilities within Unitec's Core. No specific added retail or hospitality is assumed in this ITA in either scenario, particularly none that may be expected to attract external visitors (such as supermarkets).

3.5.3.3 Commercial / Offices

There are no (new) office / commercial developments included in the ITA. The small number of existing developments of this type (located primarily within the Unitec Core area) are covered via the wider trip generation assumptions for the Unitec Core, that in turn have been checked against surveyed flows.

A few other smaller commercial entities located in the "Carrington" zone north of Gate 3, such as a veterinary centre, are small in relative impact and expected to be progressively displaced to accommodate HUD development.

3.5.4 Other Land Uses

3.5.4.1 Mason Clinic

The existing healthcare facility in the north-western centre of the Precinct (west of the Northern zone and south of the Northwest zone) is currently preparing for an expansion of the relevant "special purposes" zoning north and southwards. The resultant 2.84 hectare reduction in development land for other purposes is already included within the assumptions .

Until the relevant planning processes are completed, the DHB and their transport consultants have only been able to provide indicative information regarding future development levels.

It is understood that Masons Clinic are currently undergoing reconstruction that is expected to happen in several stages. Based on information provided by email[11] by DHB's transport consultants, for Scenario A in 2024, the expected number of treatment beds will be around 121, rising to around 198 by Scenario B's 2028 timeframe.

It is anticipated that these numbers may change as part of the update / rezoning work currently ongoing, but any changes are unlikely to be of a magnitude to change the assessments in this ITA, particularly in relation to the overall Precinct transport impacts.

[11] Information provided by Flow Transportation (Bronwyn Coomer-Smit) to Stantec on 23/01/2020 via email.

3.6 Future Car Parking

3.6.1 Overall Parking Philosophy

The Masterplan, and this ITA, have been prepared on the basis that the Precinct will be less car-dependent than previous Auckland suburban and low to medium-density residential developments.

One of the key considerations to avoiding excess car dominance will be a reduced level of car parking, and controls on the use of "public" car parking (in particular on-street parking) to avoid it being excessively used for commuter parking within the Precinct and around it.

3.6.2 Residential Parking

The proposed residential land use car parking will be lower than traditionally in Auckland suburban areas. The HUD masterplan discusses various car parking ratios, depending on location within the Precinct and whether on-street parking will be included or only dedicated car parking. It envisages a further per-dwelling parking ratio reduction as the suburb matures and transport trends shift further away from private, single-occupancy car use.

Importantly, in the initial stages, the Masterplan and this ITA assumes that car parking provision will stay under 1 per dwelling, generally ranging from 0.9 to 0.95.

This provides a balance that many households will maintain at least one car, albeit not necessarily meaning they will use it daily, whilst also ensuring that any "mandatory" car parking provided with a purchased apartment will not be at a level to encourage households to own / operate extra cars just because they have already paid for extra car parking.

As one of the first developments to move to detailed design, the development proposed by Ngāti Whātua in the southern area of the Precinct, on Crown and Ngāti Whātua Ōrākei land in the southern area of the Precinct provides a ratio of 0.93 dedicated parking spaces per dwelling[12].

While actual numbers and rates of the final development in this southern area may vary slightly from the 2019 numbers quoted, it shows that the first development likely to occur within the ITA's Precinct follows the overarching strategy of ensuring a level of parking restraint. It is also noted that this southern development will be a mixture of low-rise and mid-rise buildings, whilst mid-rise developments of HUD's development are located more conveniently to public transport. This provides further confidence that a "less than 1 car park per dwelling" ratio will not be exceeded.

The type of car parking provision will vary depending on individual developments. Though the Masterplan indicates combination of dedicated parking buildings serving adjacent residential blocks, as well as more traditional arrangements such as at grade parking, underground and under croft parking, will be utilised.

3.6.3 Education Land Use Parking

It is anticipated that Unitec will reduce car parking available for students and staff, respectively convert free car parking to paid car parking, compared to pre-development levels, where there are a high numbers of free parking spaces available (especially if students and staff are willing to walk from other parts of the Precinct). Many of these other parking areas are land subsequently acquired by HUD, therefore will be redeveloped and progressively no longer available for students and staff.

At the time of writing of this ITA, the exact plans for Unitec's car parking are not available, therefore assumptions have been made based on what are considered to be conservative interpretations of previous work undertaken by Wairaka Land Company for Unitec.

[12] Based on information sourced from NGATI WHATUA DEVELOPMENT – MOUNT ALBERT NORTH, FEEDBACK ON ITA document by Terry Church, Flow Transportation for Auckland Transport, dated 30 August 2019.

For the purposes of this ITA it has been assumed that Unitec will proceed with a modified form of their original[13] car parking plan that aligns with consolidation of teaching activities around the Unitec Core in the south. The parking consolidation will be necessary because, as noted above, Unitec have sold off much of the land that accommodated their at-grade car parking.

The main element of this consolidation strategy is to construct more centralised car parking locations, primarily in one or two multi-storey parking buildings within the Unitec Core area, accessed via Gate 4. These will be expected to charge a small parking fee to discourage excessive use as well as help finance the parking building construction. It is understood that Unitec aim to retain around 2,500 car parking spaces for student / staff use, however this will have to be reconfirmed by Unitec at a future stage.

It is possible that particularly during the earlier parts of the ITA timeframe, HUD will continue to allow Unitec to use some future development land owned by the Crown for car parking. This will provide Unitec with an interim option until all car parking is consolidated within the Core.

The primary school is expected to be provided with a small amount of car parking and pick-up / drop-off facilities. However, the school, located within a surrounding new suburb with a very compact student catchment and high levels of walking and cycling amenity, is expected to provide limited car parking compared to typical new schools. Exact numbers have not yet been identified by MOE.

3.6.4 On-Street Parking

The level of on-street parking provided will vary depending on location within the Precinct, with "main streets" likely to provide few or no car parking and instead concentrate more on providing dedicated walk and cycle infrastructure. Provision of any on-street parking will be along other side streets instead. Indicative cross-sections are provided later in this ITA.

The specific of on-street parking rate will be set as part of the individual area development applications. It is suggested that this should not exceed 1 per 5 dwellings (0.2 rate per dwelling) and not push overall parking rates above 1 per dwelling.

3.6.5 Parking Controls

Residential parking is likely, to be dedicated to individual apartments. However, there is a possibility of some shared use arrangements, whether formal (car share schemes) or for visitor / servicing / delivery parking dedicated to specific apartment developments.

On-street parking spaces will be time or paid parking controlled with a bias towards short-stay usage, i.e. 2 / 3 hour maximum, thereby allowing their primary use to be visitors or uses such as couriers, car share services etc, with the specific time controls and or parking charges to be agreed with Auckland Transport as part of future development proposals and roading resolutions processes.

Unrestricted parking will be avoided to ensure residents do not see on-street parking as dedicated parking for their dwellings.

This ITA does not assume wide-spread parking controls in areas outside the Precinct. However, it is recommended, to minimise the potential for external impacts particularly from Unitec (tertiary education) parking, some controls may be beneficial. Surrounding streets, particularly directly to the south and east of the Unitec Core, may have sections of public on-street car parking restricted (time controls or paid parking) to ensure a level of parking is available at all times of the day for visitors and deliveries etc.

Discussions with Auckland Transport have identified that residential parking schemes are considered unlikely and will only be considered appropriate if parking issues arise for existing areas where sites do not have off-street parking. However, such impacts are not considered likely as it is expected that in the long term, Unitec may retain around 2,500 car parking spaces for its own use, and because the new residential developments, while "parking light" still provide dedicated parking for residents.

[13] As per the transport assessment for the 2015 Campus Consolidation consent - Unitec, Wairaka Campus, Campus Consolidation Project, Transportation Assessment Report, TDG, August 2014

4. Proposed Transport Environment

4.1 Transport Vision

The future transport vision for the Precinct is guided by the relevant Precinct Plan rules in the Unitary Plan and the principles identified in the Masterplan developed for HUD. The key principle is that of ensuring:

> *"a close-knit, healthy community with seamless access to vital daily services. A place that offers a safe, universally accessible and data-driven alternative to the private car for every journey".*

Developing this and relevant key requirements (moves[14]) further, the ITA envisages that the Precinct, in particular the Crown-land residential development, will have a transport environment that:

- Provides consistently safety for all road users, with particular emphasis on active modes;
- Provides great convenience for walking, cycling and public transport;
- Avoids excess vehicle dominance (whether for movement or car parking), and avoids "rat-running" opportunities for through traffic and short-cuts for students into the Campus Core;
- Integrates well with existing and future surrounding transport networks; and
- Manages the transport impacts of the new development with a combination of internal and external transport network upgrades.

The key actions to accommodate this transport environment are considered to be:

- Internal road, path and intersection designs that prioritise active modes while reducing vehicle speeds to safe and consistent levels by design (30kph on main internal roads, lower on others);
- Provision of safe and efficient links with Carrington Road and the existing southern residential roads, while discouraging vehicular through connectivity between the two access frontages, as well as between the southern frontage and the Unitec Core;
- Limiting car parking to 1 or less per dwelling, and implementing other operational and infrastructural measures such as cycle storage facilities, bike hire systems and carpool schemes;
- Upgrading Carrington Road for active modes, public transport services and road safety (the related "Carrington Road Upgrade").

All the above measures are not just objectives of the Masterplan and ITA but also in required or strongly implied through the Unitary Plan's precinct rules. They are also required from a practical perspective to ensure that the transport environment achieves high standards, and the large amount of new residential development can be accommodated successfully in an existing suburban environment.

If these measures are not implemented by developments within the Precinct or deferred to later stages / after the ITA timeframes, this may lead to differences in the practical outcomes. This may in particular lead to increases per-dwelling trip generation and congestion levels above and beyond those identified in this ITA's traffic modelling. As a result, this may reduce development levels within the Precinct or require further road capacity upgrades on the surrounding existing transport network.

As such, the "key moves" above are not "good to have" aspirations but crucial and critical to successful development of the proposed suburb from both a density and transport perspective.

[14] HUD masterplan, Grimshaw, February 2019, Section 3.3.2:
- key move 7 ("Create safe streets with reduced car access to encourage walking, cycling, strolling, sitting and socialising."),
- key move 8 ("Strengthen, enhance and establish new pedestrian and cycleway connections within and through the site") and
- key move 9 ("Support improved public transport connectivity including Carrington Road busway and the possibility for a transit loop within the site.")

4.2 Level of Detail in the ITA

Transport elements are discussed to a general level within this ITA, however, the internal road design have not yet proceeded to detail design.

These elements will be refined later as part of individual development proposals under the overarching ITA umbrella. Elements that have already been discussed in the Masterplan, including road cross-sections, will be modified and developed further as part of this ITA that include:

- Description of and indicative plans for the high-level internal network layout, including identifying the form and location of all primary connections to the external transport networks.
- Vehicular traffic modelling identifying, an area-wide network between Point Chevalier town Centre and Mount Albert town centre, the congestion impacts and mitigation requirements of additional vehicular traffic due to the new development comprising:
    - Quantification of key projected network queues and intersection delays;
    - Quantification of projected impacts on general / public transport journey times, in particular on Carrington Road, including identifying impacts of public transport priority measures that are identified to ensure the transport vision; and
    - Identification of key network capacity upgrades required or recommended, whether for general traffic or public transport.
- Indicative cross-sections and concept intersection designs to inform number of lanes, provision of crossings / active mode facilities, overall space requirements for internal roads, external connections, and Carrington Road upgrade.

Not included in the ITA are:

- Specific locations and designs of internal main roads.
    - Main internal streets are assumed to be located in general accordance with and fulfilling the same connective functions as set out in this ITA, particular in relation to existing roads and developments.
    - Future exact location and design however will still be able to change to allow some flexibility and responsiveness to local conditions and development party plans within the Precinct, including parties such as Mason Clinic, Unitec or Ngāti Whātua Ōrākei.
- Locations or designs of minor internal streets - these will be designed as part of individual area developments.
- Trip generation assessments for active mode and public transport. Due to the lack of comparative literature data in a New Zealand context, beneficial impacts of active modes and public transport have been calculated in the context of how they will instead lead to reduced vehicle trip generation.
- Individual intersection designs above concept level.

4.3 Transport Connectivity

4.3.1 General & Vehicular Connectivity

The proposed high-level connectivity for vehicles in the Precinct are shown in Figure 4-1:

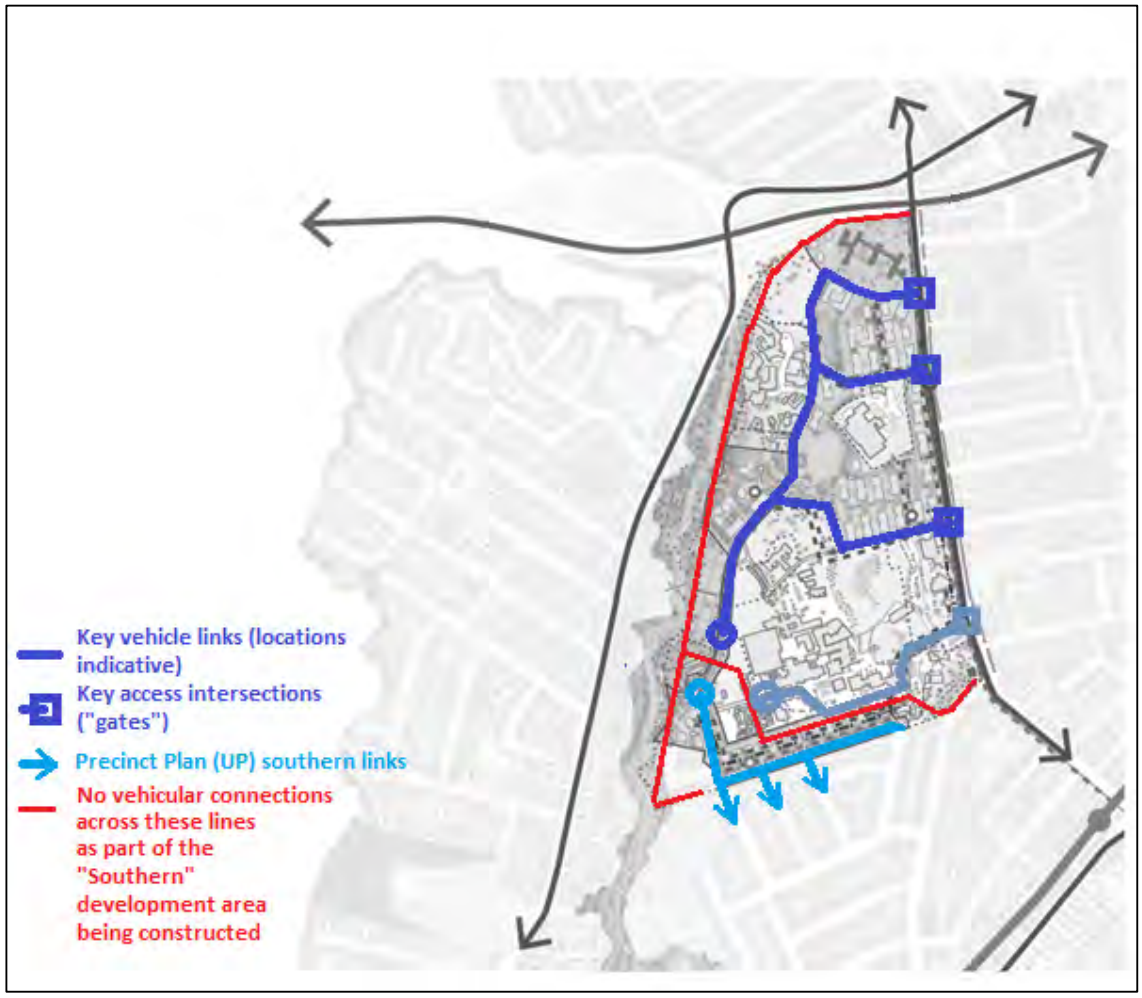


Figure 4-1: Proposed general and vehicular network

As discussed earlier in Section 4.2, the locations of these elements are intentionally high-level. Similarly, minor roads or accesses (such as vehicle crossings) are not shown. These will be designed as part of the detailed development proposals within each area. However, none of these are expected to provide through traffic connections across the red "boundary" lines shown in Figure 4-1 or allow direct access into the Unitec Core from the southern local roads.

Providing a comparison between the proposed layout against the indicative network assumed in the Unitary Plan, Precinct Plan 1 (as shown in Figure 3-1), the following key observations are made:

- The key internal road links and external connections are essentially identical, albeit slightly different in location. This aspect is indicative in all three reference documents: Precinct Plan, Masterplan and ITA;
- There is a further vehicle access / internal link shown for the Unitec Core that is existing (Gate 4), that was simply not highlighted in the Precinct Plan.
- Vehicular connectivity is shown between the existing cul-de-sac roads south of the Precinct and Southern development area as per the Unitary Plan. However, the exact form of these connections to the southern streets is still being developed;
- There are no vehicular links between the southern existing local roads and the Unitec Core area; and
- There are no vehicular links to be built between the Southern development area and central and northern areas of the Precinct as part of the construction of the "Southern" development area currently being advanced as one of the early areas for development.

4.3.2 Public Transport Connectivity

The proposed high-level connectivity for public transport in the Precinct is shown in Figure 4-2:

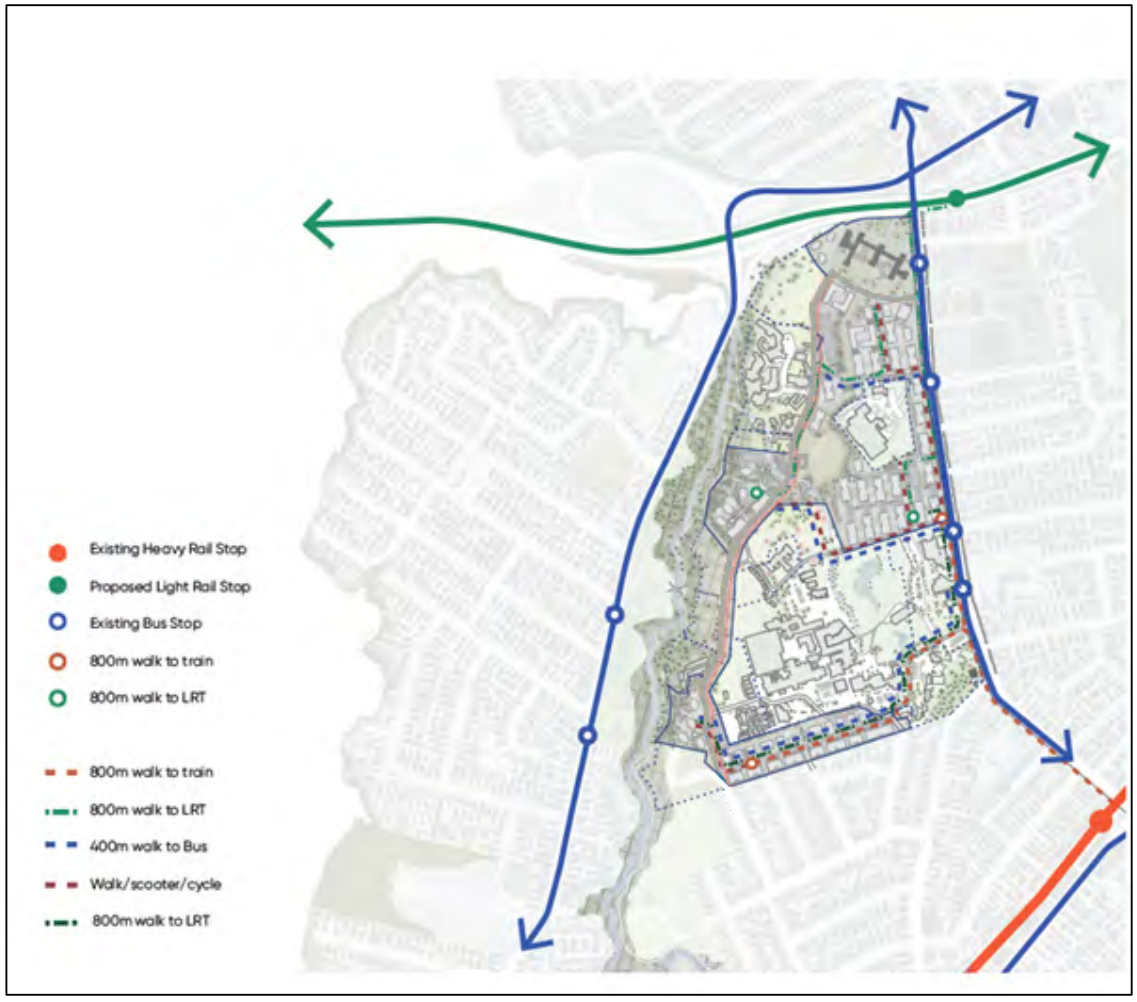


Figure 4-2: Proposed public transport network (indicative)

As indicated in the diagram and discussed earlier at Sections 2.2. / 2.3, the Precinct is surrounded by public transport routes with further improvements anticipated comprising:

- New southbound bus lane on Point Chevalier Road; and
- Bus lanes on Carrington Road along the frontage up to at least Woodward Road; and
- Future Rapid Transit (likely Light Rail) line along SH16 (outside of the ITA timeframe).

The above diagram, extracted from the Masterplan, indicates a number of key existing / potential public transport stops, and indicative walking distances to them. It is worth noting that it does not highlight that the Precinct also has good walking access to the Great North Road stops west of Oakley Creek via the Waterview Shared Path.

Overall, the Precinct is well served by high-frequency public transport within a convenient walking distance. When assuming an e-scooter / train or bike / train combined trip, this convenience will be increased by including convenient access to train stations at either Mount Albert town centre or Baldwin Avenue less than 2km distance from all parts of the Precinct.

The areas least accessible to public transport are the west and southwest of the Precinct. The Masterplan diagram considers the possibility for a bus route travelling on the back edge of the development via Woodward Road, and then along the western spine road, returning via Gate 1 to Carrington Road.

It is understood that this "back route" bus service generally is not supported by Auckland Transport, as it leads to slower bus journey speeds, and because there will be a greater overall benefit to public transport, if the same service frequency was added to Carrington Road, providing "walk up and go" frequencies.

Therefore, there is no allowance within this ITA that such a western "back route" will be implemented. Notwithstanding that, a route could be implemented at a future stage should demand / density make it more sensible. In this case, the proposed link in the internal road currently designed to prevent through traffic will need to be operationally managed i.e. a short section of road that permits buses only but prohibits through vehicle traffic movements.

4.3.3 Cycling Connectivity

The proposed high-level cycling connectivity in the Precinct is shown in Figure 4-2:

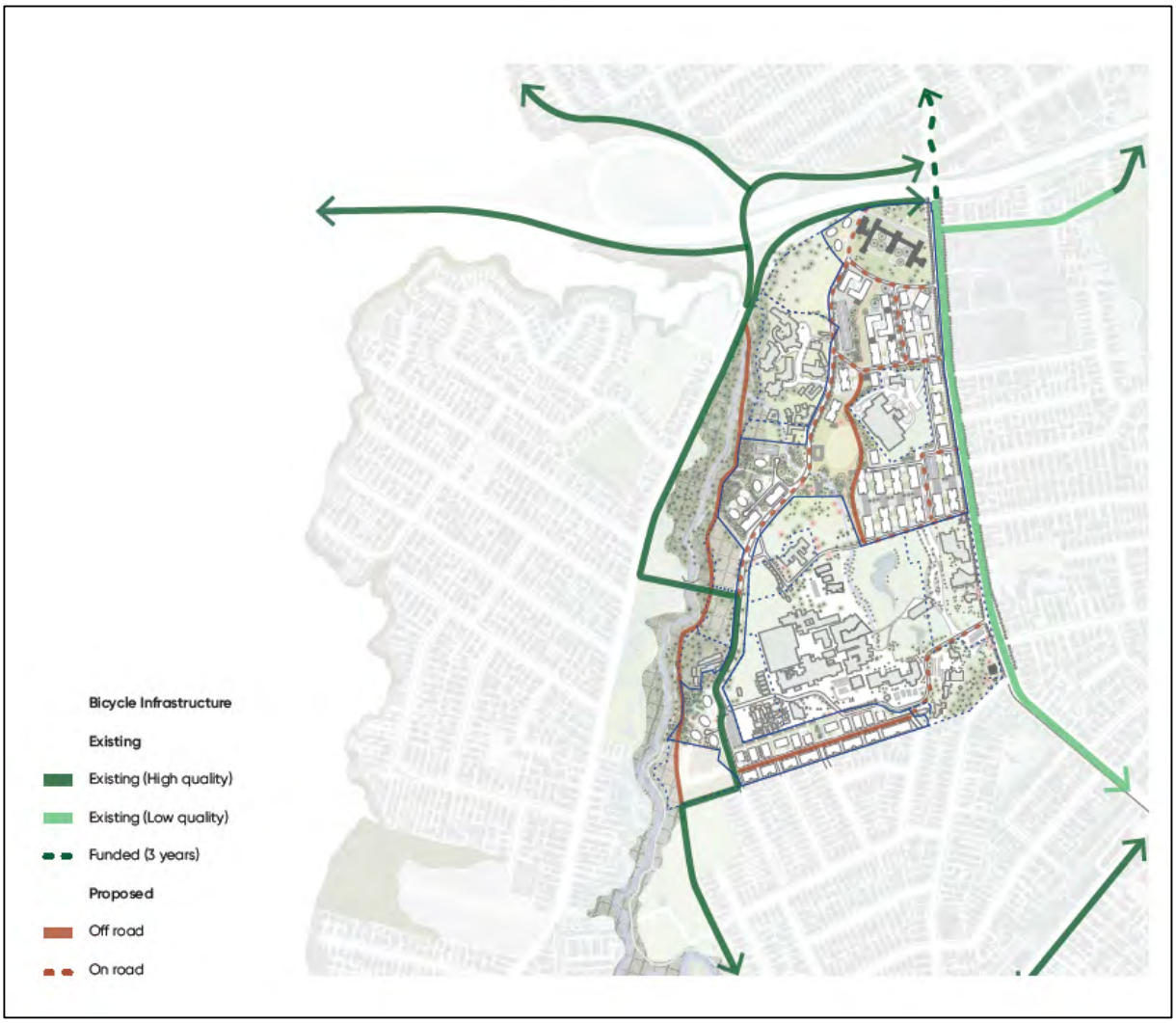


Figure 4-3: Proposed cycling network (indicative)

As can be seen from the diagram extracted from the Masterplan, existing / future cycling routes converge on to the Precinct from all directions, with improvements planned to include:

- Carrington Road Upgrade changing the existing painted cycle lanes to protected bike lanes offering much greater amenity and safety;
- Point Chevalier Road / Meola Road providing new protected cycle lanes, and
- Avondale to New Lynn Shared Path (outside the Masterplan area) with a continuation of Waterview Shared Path (under construction).

Within the Precinct, whilst the above figure shows a number of internal routes, these are high level. Further development of these will include expectations that all main internal roads as shown in Figure 4-1 will be high-quality protected cycle facilities. This is generally already shown in the Masterplan, albeit Gate 3 / Farm Road's cycle facilities in this plan do not currently connect through to the internal spine road, that is deemed important for internal network connectivity.

The Masterplan identifies additional north-south connections in the Precinct that will be beneficial, albeit their location may change as detailed master-planning is completed. Within the consideration of the cycling infrastructure, the following needs to be accounted for:

- Cycle permeability: As identified in the Precinct plans and rules, there will be walk and cycle permeability between all areas including between areas that are to be separated in terms of vehicular travel i.e. for example between the Unitec Core and the Southern development area. Design of development areas will need to show how connectivity will be provided whilst preventing vehicular connectivity.
- Avoidance of new shared paths: Internal cycle paths are assumed to be protected facilities, i.e. not shared paths. This acknowledges that in an environment where both walking and cycling volumes are high, forcing pedestrians and cyclists to share one facility discourages both modes as speeds are different. This is particularly, a problem for the elderly and the young that will compromise accessibility.
- Even compliant shared path designs such as the high-quality Waterview Shared Path in the southwest of the Precinct are already experiencing increased conflicts between walkers and cyclists, far in advance of the additional demand that a large new suburb will place on these routes. However, it is accepted as part of this ITA that existing shared paths in the Precinct are unlikely to be modified to provide separated walking and separate in the near future.
- Protected cycleways despite 30 kph speed limits: It is also important that, despite a slow-speed environment, on the main internal roads, cycling is not assumed to occur on-street. Due to the relatively high development density, even a less car-dominated Precinct will see significant traffic volumes entering and exiting the Precinct on these key links. Requiring people on bikes to ride on-road on high-volumes roads creates amenity and safety issues that undermine mode uptake.
- This is in line with guidance from Auckland Transport's Transport Design Guide (TDM) to avoid on-road riding on busy roads in favour of protected cycle lanes, even if speeds are slower for cyclists.

4.3.4 Walking Connectivity

There is currently no specific walking connectivity map available. This is due to the walking network following the same network as general vehicular and cycling connectivity discussed above. However, this will also provide further connectivity in an even more fine-grained network that is currently not able to be shown, even indicatively at this stage. The relevant design will occur during future design stages.

Good walking connectivity across the "vehicle boundaries" have been assumed in this ITA, i.e. to ensure good connectivity for walking into and out of the Unitec Core area.

Wherever possible, new walking connections should be accessible i.e. stair free and mobility-compliant.

4.4 Design for Road Safety & Pedestrian/Cyclist Priority

Any detailed design for roads within the Precinct will need to show how the built transport environment will achieve high road safety standards, including safe speeds and high amenity for walking and cycling.

The ITA is not prescriptive as to how this will occur, but any design will need to provide a "self-explaining" street where speed limit signs are an add-on rather than the primary means of communicating appropriate speeds. It will also be important that the design reinforces and prioritises pedestrians, and where appropriate, cyclists rather than assume a default vehicle priority at intersections and crossings.

Guidelines to be used for design of the internal street design to ensure this transport environment include:

1. Formal and by-design speed for 30 kph on all main internal roads and potentially lower on secondary internal roads, including consideration of the following:
    - Vertical traffic calming - Combined as much as possible with walk and cycle crossings, i.e. raised tables such as that shown below, as well as raised tables across side road approaches;
    - Horizontal traffic calming, i.e. avoidance of long, un-interrupted straight stretches of road, use of chicanes or off-set car parking areas;
    - Traffic lane widths set at the minimum for the appropriate design vehicles;
    - Lack of marked centre lines except where legally required i.e. at on the approaches to traffic signals; and
    - Landscaping (in particular trees) positioned close to the carriageway to create "visual friction".
2. Formal and by-design priority for pedestrian /cyclists at intersections, including:
    - Single-lane approaches at all internal intersections with multi-lane approaches to be used only on approaches to Carrington Road vehicle accesses; and
    - Use of mini-roundabouts and raised intersections to ensure all approaches are slowed down, rather than just side roads.
3. Separated cycle facilities on key routes that are likely to accommodate high vehicle volumes even where the design provides for speeds of 30 kph or less.
4. Vehicle crossings to be designed to clearly demonstrate pedestrian and cycle priority.

Figure 4-4: Example of a raised zebra crossing with the Precinct (near Gate 4)

Figure 4-5: One-way separated cycleway – horizontal separation – Tuam Street, Christchurch (photo: Jeanette Ward, via NZTA website)

4.5 Example Internal Cross-Sections

In this section, a number of internal road cross-sections are shown that exemplify the level of provision for various modes expected within the Precinct.

It is important to note that these street / path cross-sections differ from the examples in the Masterplan. This is predominantly due to them being developed further on the basis of this ITA and additional input, including showing walking and cycling elements more prominently.

Additionally, it is noted they are not "designs" that have to be used in future Precinct developments. However, it is recommended that any final road designs constructed will, at application time, be compared with these ITA designs to assess whether the quality standards particularly for walking and cycling and road safety have been achieved.

Additionally, there is no reason why future Precinct development road designs will not be able to exceed the quality standards in these examples i.e. for example wider footpaths where beneficial.

4.5.1 Main internal street

These will generally be "key links" within the Precinct, as shown in Figure 4-1, particularly the north-south spine road and west-east roads connecting with Carrington Road.

The main internal streets within the Unitec Core (blue-grey) and southern area (light blue) on Figure 4-1 are expected to diverge more from the example cross-sections shown below, as their condition and demands are different and as they tie into a different existing residential street network, particularly for the southern areas. As alluded to above these quality standards and cross-sections are examples and recommendations, rather than fixed designs.

Key quality standards for main internal streets:

1. Overall road corridor width of at least 20m that increases to 25m in the sections approaching Carrington Road to allow an additional turn lane exiting the Precinct and a solid median.
    - If there are sections of severe geographical or existing building constraints, the 20m corridor width may be reduced for local sections, whilst trying to retain the transport amenity and safety functions as much as possible i.e. back berms and landscaping areas will be affected first.
2. Relatively narrow 3.0m traffic lanes balancing the need for occasional access by moving trucks, rubbish collection trucks etc with traffic calming benefits of narrower lanes.
3. Minimum 2.2m width footpaths on each side.
4. Protected cycleways with sufficient separator (minimum 0.8m) from vehicle traffic. The form and location of the cycleway can be flexible, as shown in the example options, i.e. depending on landscaping placement and whether they are formed as two-way cycleways or two one-way cycleways.
5. Landscaping / rain garden areas (2m or more recommended to allow major trees) – location within the cross-section can be flexible, ideally will be located either side of the vehicular carriageway to create a visual narrowing supporting a slow-speed transport environment.
6. No car parking directly on the street.
7. Limited vehicle crossings - Vehicle crossings are not prohibited, but any vehicle crossings shall lead to a smaller number of joint car parking or servicing areas.

Examples of three cross-sections are shown below:

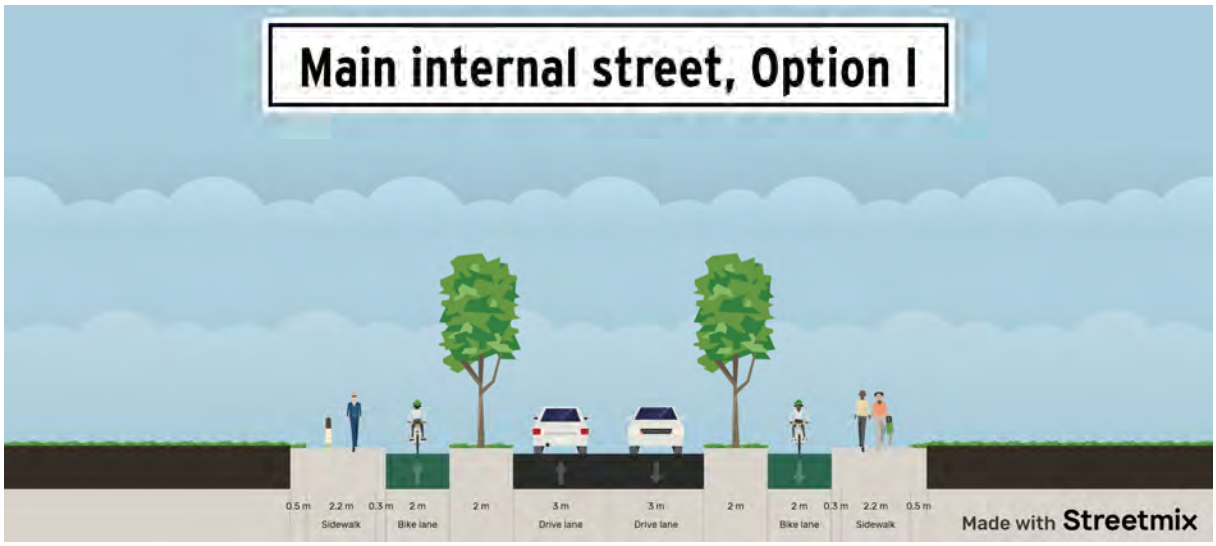


Figure 4-6: Main internal street with landscaping providing the cycle lane buffer

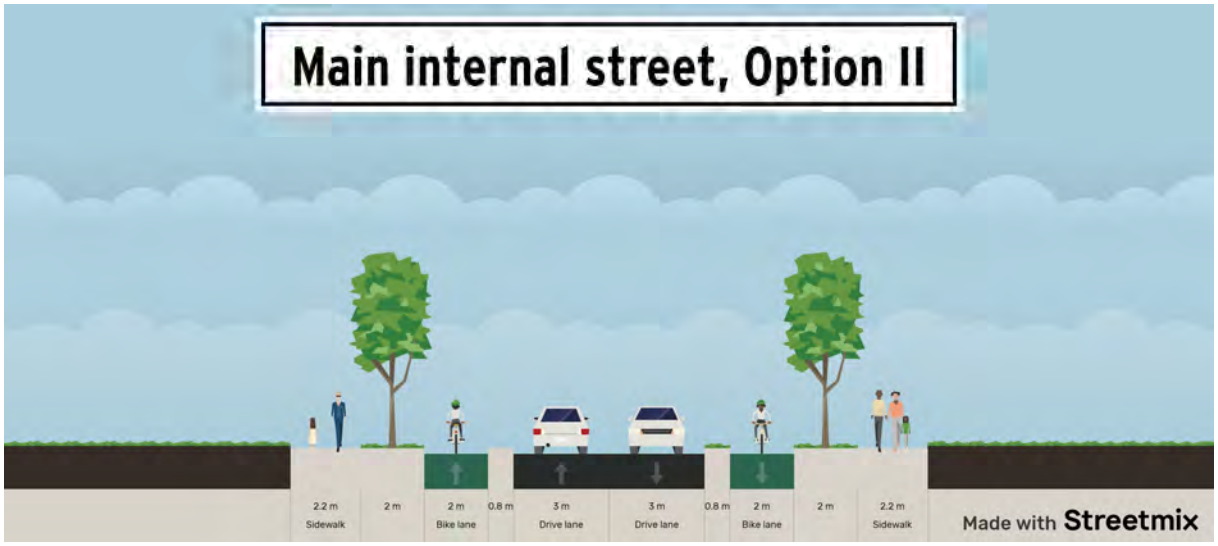


Figure 4-7: Main internal street with landscaping between footpath and cycle lane and separate buffer

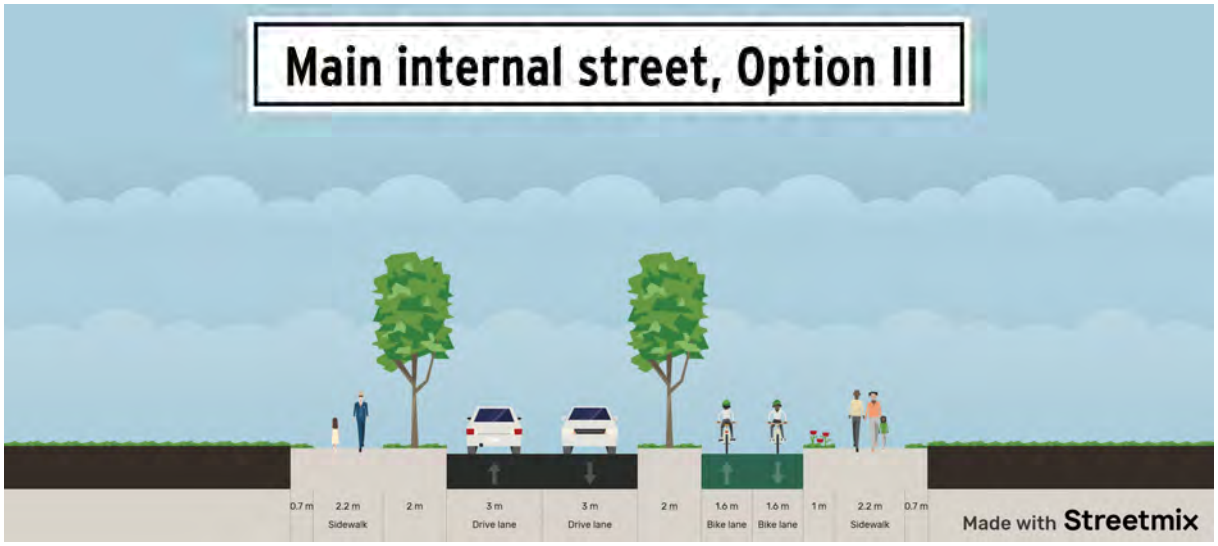


Figure 4-8: Main internal street with a two-way cycleway along one side of the road

An alternative Option 1 arrangement is shown to accommodate two approach lanes and a solid median on the approach to one of the major intersections with Carrington Road as shown in Figure 4-9 below.

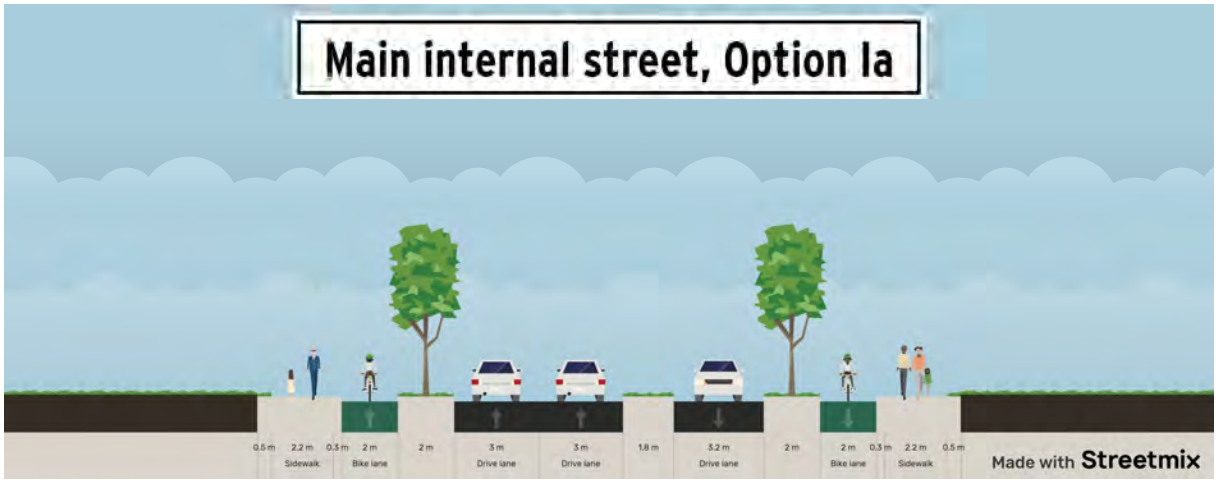


Figure 4-9: Main internal street variant on the approach to Carrington Road (example layout)

4.5.2 Minor Roads

There are no specific cross-sections for minor roads or non-road joint access lots (JOALs) provided in this ITA as their form may vary strongly, even within a Precinct area, from "classic" streets with footpaths and recessed parallel parking, to shared spaces / home zone environments.

It is proposed that any design should comply with the intention to provide a high-quality transport environment, in line with the design guidance summarised in Section 4.4.

4.6 Carrington Road Upgrade

The Carrington Road Upgrade is the main Precinct-external transport upgrade incorporated into this ITA and will be crucial to accommodate the anticipated development traffic levels as described in Scenario B. This is due to existing Carrington Road deficiencies in walking, cycling and public transport facilities, as well as a lack of safe and convenient vehicular access to / from the Precinct onto Carrington Road.

As discussed earlier, to achieve a reduction in vehicle dominance in the Precinct, thereby a reduced trip generation per dwelling, the convenience of walking, cycling and public transport facilities need to be upgraded. Without the Carrington Road Upgrade, a crucial element to achieve this will be missing.

The Carrington Road Upgrade is included for Auckland Transport funding in the Regional Land Transport Programme 2018-2028. An element of design funding is proposed within the earlier part of the decade, with primary works (indicative construction funding allocation) starting in 2025.[15] This aligns well with Scenario B timescales as it means the upgrade would be completed by around 2028.

4.6.1 Mid-block Upgrade

The Carrington Road Upgrade has yet to be designed. However, previous design work undertaken by Auckland Transport identified key improvements likely to be incorporated into the upgrade comprising:

- Improved pedestrian crossing (and where appropriate, cycle crossing) over Carrington Road;
- Improved footpaths, particularly on the western side;
- Upgrading the narrow, paint-only, cycle lanes to cycle lanes with protective separators;
- Provision of bus priority (exact form not confirmed, but the ITA assumes bus-only lanes each way); and
- Improving landscaping / tree planting / stormwater treatment.

Previous Auckland Transport corridor management plans for Carrington Road[16] included example cross-sections as shown in Figure 4-10 and Figure 4-11 below:

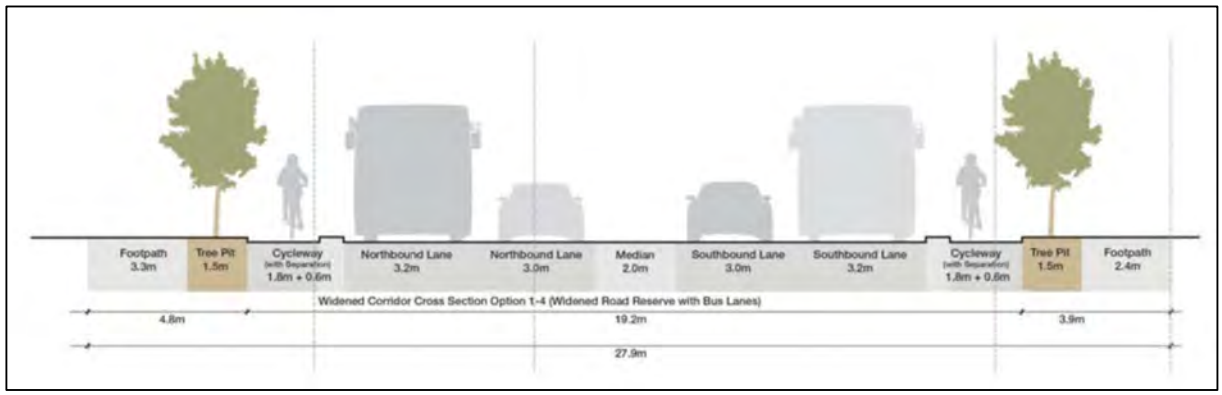


Figure 4-10: Carrington Road Upgrade mid-block cross-section

[15] Regional Land Transport Programme 2018-2028, Auckland Transport, Page 60

[16] Carrington Road / Mt Albert Road Corridor Management Plan, GHD for Auckland Transport, 2014 and subsequent study work by Opus for Auckland Transport testing preferred cross-sections and other corridor upgrade aspects

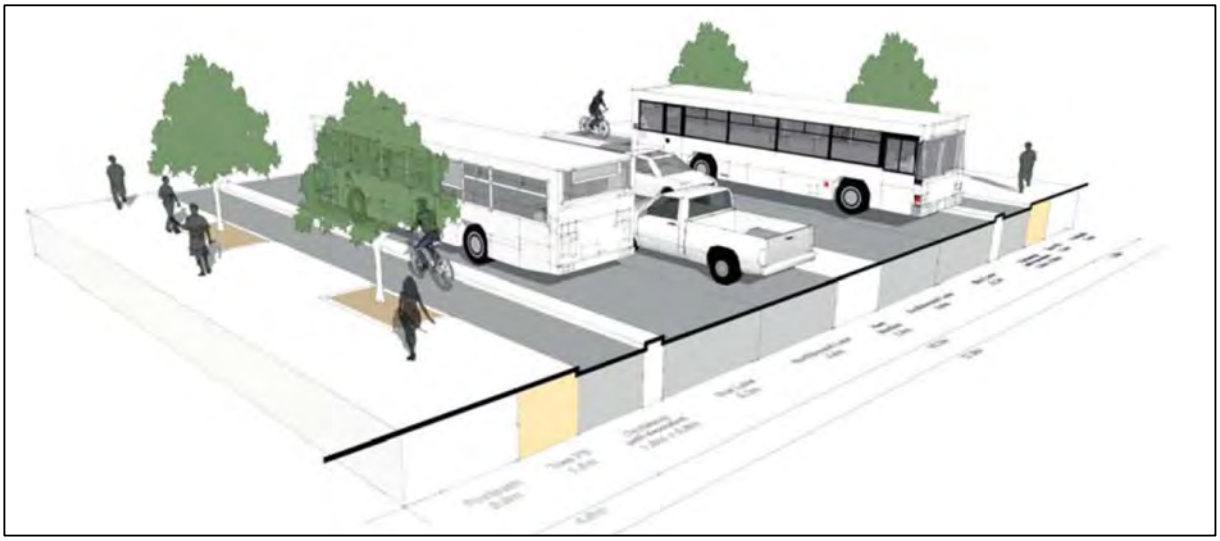


Figure 4-11: Carrington Road Upgrade mid-block visualisation

Similar to the internal cross-sections outlined in Section 4.5, it is not expected or required that future upgrades will precisely follow this cross-section, as long as the overarching outcomes are achieved.

4.6.2 Upgrade Extent

As part of the Unitary Plan processes (rezoning of the predominantly Unitec-owned land in the Precinct), agreement was reached that the existing corridor width of Carrington Road would be 28.2m.

Widening was assumed to take place exclusively or almost exclusively on the western side of Carrington Road, on land, that was Unitec-owned and comprises a mixture of Unitec land (southern third) and Crown land (northern two thirds).

The fact that two landholders are involved it is expected to reduce the complexity and delays for any upgrade project compared to road widening along a corridor requiring land acquisition from dozens or hundreds of individual property owners.

In terms of extents, the previous ITAs assumed that the proposed upgrade will extend from and include Great North Rd / Carrington Rd intersection and extend as far south as Woodward Rd / Carrington Rd.

For the purpose of this ITA and associated traffic modelling, while some small changes are assumed at the Great North Road / Carrington Road intersection, the primary Carrington Road Upgrade i.e. added bus lanes in particular, starts south of the SH16 motorway overbridge. This is due to the results of traffic modelling indicating that there was no requirement to add a second southbound lane on the motorway overbridge as previously identified in the 2017 ITA undertaken for Wairaka Land Company.

4.6.3 Signalised Precinct Accesses

In the existing transport environment, only one (Gate 4) of the four accesses from Carrington Road into the Precinct is signalised. As development within the Precinct is implemented, there will eventually be a requirement to construct one or more further traffic signal controlled intersections, to:

- Accommodate the added turning volumes,
- Ensure right turns in / out remain safe for all users, specifically once Carrington Road is four-laned via the addition of bus lanes; and
- Improve pedestrian crossing convenience and safety. This is an existing need but will become even more crucial with the addition of two bus lanes.

Based on traffic modelling scenarios and the fact that the addition of two bus lanes is not expected to occur until around 2028, no further traffic signalisation of intersections (Gates, 1,2 and 3) have been

included within Scenario A. All traffic entering / exiting have been shown to be accommodated within the existing priority intersections and Gate 4. The results of the modelling are discussed later in this ITA.

The modelling undertaken based on Scenario B development includes the Carrington Road upgrade and signalisation of Gate 2 (just north of Segar Avenue) and Gate 3 / Farm Road. These are anticipated to be the primary vehicular accesses to / from the central and northern development areas. Gate 2 will also continue to be the primary vehicle access / access easement for Mason Clinic and Taylors Laundry.

Gate 1 is not expected to be traffic signal controlled, even in Scenario B. Predominantly this is due to all right turn vehicle movements being accommodated sufficiently at the other gates, and partly to reduce interference with the existing walk/cycle mid-block crossing between Gate 1 and Sutherland Road. Within Scenario B, it is not proposed that Gate 1 will accommodate right turn movements out of the site and will be converted to a left-in / left-out only access.

4.6.4 Woodward Road Signals

As part of traffic modelling discussed later in this ITA, sensitivity testing has been undertaken to identify when Woodward Road / Carrington Road will need to be signalised.

As with the access intersections to the north, the eventual signalisation is also in part due to crossing demands for pedestrians and safety impacts of vehicles turning across added lanes arising from the implementation of added lanes within the Carrington Road Upgrade.

It is acknowledged that these lanes are not expected to extend south of the intersection, beyond possibly some short lead-in / lead-out stretches.

The results of traffic modelling demonstrated that signalisation in Scenario A will not be required. Therefore, only Scenario B, with the Carrington Road Upgrade, incorporates this improvement.

4.6.5 Unitec Feature Bus Stop and Crossing

Within Scenario B modelling, a new bus stop for improved public transport access to the Unitec Core is included between Gates 3 and 4. This will be accommodated by relocating existing bus stops slightly towards the middle of this mid-block location.

The improvements are also assumed to include bus shelters for waiting passengers and a traffic signal controlled mid-block pedestrian crossing to the southbound stops.

It is noted that as per previous plans, in association with their site redevelopment and consolidation, Unitec intended to improve walking routes between their Core buildings, and this bus stop. This walking route currently via sub-standard footpaths alongside the Gate 4 road will become more attractive, especially if some form of shelter were provided. However, the exact form of this pedestrian link is not currently known.

4.6.6 Carrington Road Walk/Cycle Crossings

In Scenario A, it is assumed that no improvements will occur on Carrington Road in terms of crossing opportunities, beyond potentially providing pedestrian refuges in the vicinity of Gate 2 and 3. The existing raised zebra crossing for pedestrians and cyclists located south of Sutherland Road will be retained.

In Scenario B, the pedestrian and cycle crossing to the south of Sutherland Road will be upgraded to a traffic signal controlled mid-block walk / cycle crossing.

As noted earlier in Section 4.6.5, Scenario B also incorporates a new mid-block traffic signal controlled pedestrian crossing between Gate 3 and Gate 4.

4.7 Other Transport Assumptions, Infrastructure

4.7.1 Southern Roads Connectivity

The provision of an internal through route within the Precinct linking to the southern existing roads had been discussed in the Unitary Plan stage, and is permitted as shown on Precinct Plan 1 provided at Figure 3-2. However, as acknowledged by the Precinct Plan rules, a through route would need to address concerns about the potential for an increase in vehicle traffic on the existing cul-de-sac roads located south of the Precinct, with connections into the core Unitec Campus not permitted, for example.

Previous traffic modelling assumed that an internal connection allowing development traffic will be required to ensure Carrington Road did not have excessive traffic movements, thereby requiring additional widening beyond that previously assumed for local access solutions.

However, changes in development and wider–area base traffic movements around the Precinct led to reconsideration of this link as part of this ITA. As discussed in the traffic modelling section later in this report, the internal link, incorporating development assumptions discussed earlier, is no longer required from a modelling perspective. On this basis, the link was removed from the traffic modelling, and no through connection shown on Figure 4-1.

It is clarified for avoidance of doubt that only through traffic between the southern and eastern frontages is to be deterred. Local development traffic within the Precinct may potentially still be accommodated in the future to serve developments in the centre and north. However, this will not occur during any of the development contemplated in the 'Southern' residential development area, even if this incorporates part of the southern F- Block (refer figure 3-3). This part of the development will be constructed without vehicle connections to either the Unitec Core or the road network to the north.

No matter the facility provision for general vehicles, access may still be provided for rubbish collection vehicles and potentially for public transport services - and will always be provided to ensure easy connectivity for walking and cycling, even where vehicular connections are to be discouraged.

4.8 Other Transport Assumptions, Operational

As outside the Southern area, no detailed plans for development have yet been developed beyond the Masterplan and associated bulk and location studies, the following operational measures are conceptual and only described at a high level. However, while not all may eventuate, they are part of the overall suite of initiatives that are available in seeking to reduce vehicle dominance.

4.8.1 Car Sharing

It is anticipated that all apartment blocks across the development will be provided with easy access to car sharing facilities. These may range from providing car sharing car parks for third-party operators or ensuring that a car share system is operated specifically for the use of the Precinct, with a dedicated number of vehicles always available to residents.

In either scenario, this will assist with increasing the number of people that are able to live in the Precinct without a car, or with only a single car per household, using the provided share cars mainly when other modes are too inconvenient. This will help reduce the average car ownership rate whilst retaining the benefits of access to cars.

4.8.2 Bike & E-Scooter Sharing

It is expected that all apartment blocks across the development will be provided with easy access to bike and e-scooter share facilities. These may range from providing share ranks for third-party operators to use, up to ensuring that a bike e-scooter share system is operated specifically for the use of the Precinct, with a dedicated number of cycles / e-scooters always available to residents.

In either scenario, this will assist with reducing the number of vehicle trips needing to be made (even for residents who have access to a car of their own) and encourage some residents to live without a car.

4.8.3 Unbundled car parking

It is expected that purchase of an apartment in the Precinct will not come with "mandatory" car parking.

Instead, at least a part of the provided car parking supply as per Section 3.6 may be sold separately as optional add-ons to an apartment purchase and / or provided as long-term leases. This will allow residents who do not require a car park to purchase an apartment more affordably.

If car parking up-take by residents in this fashion is lower than predicted, this will also allow a more flexible reduction in car parking rate per dwelling as the development proceeds, thereby in line with actually occurring demand rather than trying to predict an acceptable minimum ahead of time.

These arrangements are particularly beneficial for any parking buildings intended to be designed for later adaptive re-use, as they allow more flexible parking allocation even down the track compared to more rigid ownership structures.

4.8.4 End of trip facilities

As the proposed new development is almost exclusively residential it will not need to provide end of trip facilities such as showers from a transport perspective. However, all development will still need to provide dedicated, secure bike parking, at minimum Unitary Plan rates or better.

Going beyond this minimum, it is assumed that at least the larger apartment buildings will also provide added facilities such as dedicated storage lockers and e-bike charging facilities.

Non-residential developments across the Precinct, including Unitec and Mason Clinic, are assumed to progressively improve their own trip end facilities over the timeframes included within this ITA, with a focus on work and student commuting use, in line with the Unitary Plan requirements or better. This assumption is also consistent with previous work undertaken by Wairaka Land Company for Unitec.

4.8.5 Travel Demand Management

As residential development occurs, it is anticipated that organisations such as body corporates will, as one of their functions, take on at least basic travel demand management functions. Ideally this will be part of the relevant legal instruments. Potential activities include arranging for new residents to receive information about possible travel choices, arranging activation events etc.

Similarly, it is expected that as part of Unitec's further site consolidation, and move to paid parking etc, there will be greater operational importance on encouraging students and staff to use non-car modes via travel demand management measures.

4.9 Summary of Transport Assumptions

The following table summarises key transport assumptions discussed in Section 4, and the relevant scenario they are included within.

Assumption	Responsibility	Base	Scenario A	Scenario B
Active mode assumptions				
Internal network design prioritising walking and cycling	Developers	✓ (partial)	✓	✓
Internal 30 kph speed environment design	Developers	✓ (partial)	✓	✓
Walk/cycle link from Southern development area to central / northern / Unitec areas, (even where vehicle traffic discouraged)	Developers	✓	✓	✓
Northwestern Cycleway	NZTA	✓	✓	✓
Waterview Shared Path	AT	✓	✓	✓
Avondale to New Lynn Shared Path	AT	✗	✓	✓
Point Chevalier Rd/Meola Road Cycleway (incl related changes at Carrington / GNR)	AT	✗	✓	✓
Carrington Road painted cycle lanes	AT	✓	✓	✗
Carrington Road protected cycle lanes along Precinct (as part of Carrington Rd Upgrade)	AT	✗	✗	✓
Car share, bike share and travel demand management initiatives readily accessible	Developers / 3rd parties	✗	✓ (partial)	✓
Reduced parking rates per dwelling (≤1), unbundling parking from apartment purchase	Developers	✗	✓	✓
Public transport assumptions				
Point Chevalier Rd southbound bus lane	AT	✗	✓	✓
Carrington Road bus lanes along Precinct (as part of Carrington Rd Upgrade	AT	✗	✗	✓
Reduced train journey times from Mt Albert town centre to City Centre due to City Rail Link	CRLL	✗	✗	✓

Assumption	Responsibility	Base	Scenario A	Scenario B
Rapid Transport (likely Light Rail) with Point Chevalier station	MoT / NZTA	✗	✗	✗
General network assumptions				
Signalisation of raised table Carrington Rd walk/cycle crossing south of Sutherland Rd	AT	✗	✗	✓
Gate 1 / Carrington Road signalisation	AT / Developers	✗	✗	✗
Gate 2 / Carrington Road signalisation	AT / Developers	✗	✗	✓
Gate 3 (Farm Road) / Carrington Road signalisation	AT / Developers	✗	✗	✓
Mid-block signalised pedestrian crossing at main Unitec Core bus stop	AT / Unitec	✗	✗	✓
Gate 4 signalisation	N.A.	✓	✓	✓
Woodward Road / Carrington Road traffic signalisation	AT / Developers	✗	✗	✓
Connections from Southern development area to southern existing local roads	Developers	✗	✓	✓
Connection (vehicular) from the Southern or western (Oakley Creek / Te Auaunga - adjacent) development areas to Unitec Core	Developers / Unitec	✓	✗	✗
Level crossing at Woodward Road	KiwiRail	✓	✓	✓

5. Modelling Process

5.1 Methodology

A microsimulation traffic model of the Wairaka Precinct and the surrounding area has been developed using the AIMSUN software package to assess the traffic impacts of the proposal on the surrounding road network. The effects of the future infrastructure upgrades in the vicinity of the Precinct are also included in the modelled road network.

In development the model, Stantec have used versions from 2014 - 2015, and 2017 that were prepared in association with previous studies undertaken on Precinct development and draft ITAs prepared. The model has been adjusted to reflect latest land-use assumptions and traffic data obtained through surveys undertaken in 2019 and 2028 forecast traffic volumes from MSM provided by Auckland Forecasting Centre (AFC), that is an Auckland Council, NZ Transport Agency and Auckland Transport partnership.

The base model referred incorporates existing network and traffic data from the October 2019 survey.

The future testing Scenarios A and B have been developed based on network assumptions outlined in Section 4.9, MSM future traffic demand and the latest development as outlined at Section 3.5.

Localised sensitivity testing for additional development traffic at some key intersections has been undertaken using SIDRA to assist with understanding potential traffic impacts on the development of several Precinct zones that have not been included in the assumptions at Section 3.5, as they are unlikely to occur within the ITA assumption timeframes.

5.2 Existing Traffic Volumes

Traffic surveys have been undertaken on 17 October 2019 at the following intersections in the AM peak hour (6am to 9am) and PM peak hour (3pm to 6pm):

- Great North Road / Point Chevalier Road / Carrington Road;
- Unitec Gate 1 / Carrington Road;
- Unitec Gate 2 / Carrington Road;
- Unitec Gate 3 (Farm Road) / Carrington Road;
- Unitec Gate 4 / Carrington Road;
- Woodward Road / Carrington Road;
- Woodward Road / New North Rd / Richardson Road;
- Carrington Road / New North Rd / Mount Albert Road;
- Laurel Street / Springleigh Avenue;
- Jerram Street / Springleigh Avenue; and
- Harbutt Avenue / Woodward Rd / Willcott Street.

Traffic counts for the intersections not surveyed in 2019 have been sourced from previous surveys undertaken in association with Precinct development studies in 2014/2015 and 2017.

A seven day tube count was also undertaken on Carrington Road (opposite to 120 Carrington Road, between Gate 3 and Gate 4) between 17 October and 23 October 2020 to ascertain typical traffic demand on Carrington Road. The average weekday daily traffic was 7,889 vehicles per day (vpd), with average AM and PM peak hour traffic at 664 vehicles per hour (vph) and 555 vph, respectively.

A copy of the full traffic counts are provided at Appendix C.

5.3 Model Form

The modelled area includes the full extent of Carrington Road, Woodward Road, and the section of New North Road between Carrington Road and Woodward Road, all residential streets branching off Woodward Road and the Precinct internal road network.

The Precinct's external and internal connectivity are described in Section 4.3 and shown in Figure 4-1. The smaller side road links within the Precinct shown below are indicative only, whilst the extent of the model is shown in Figure 5-1.

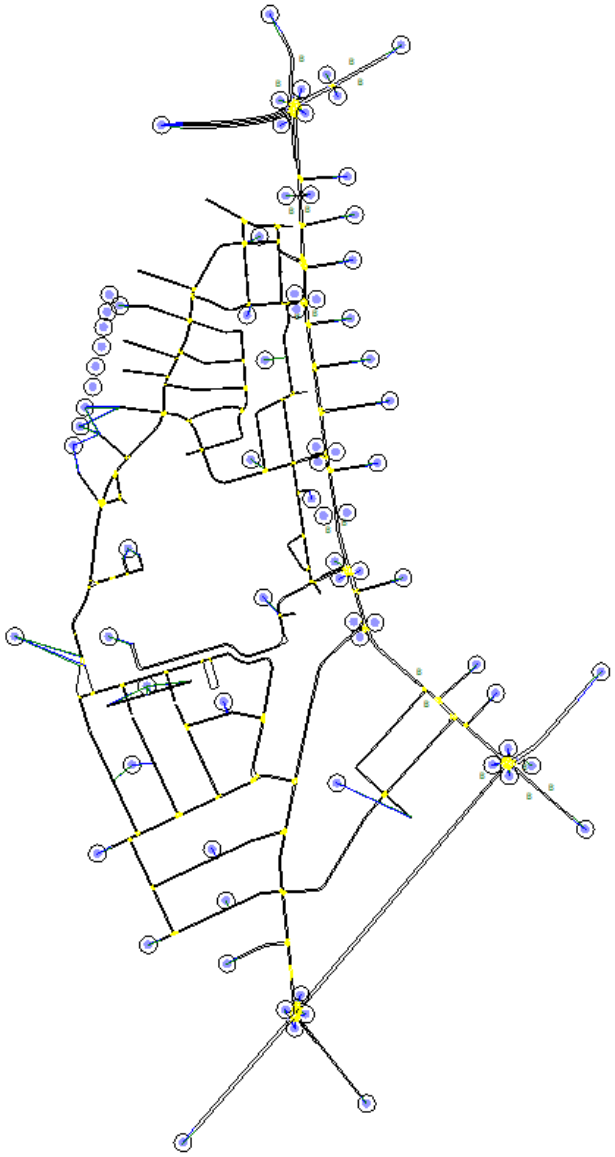


Figure 5-1: Extent of Modelled Area

The micro-simulation models have two hour durations, corresponding to the typical lead-in and lead-out period for more accurate analysis of peak hour statistics. The modelled times are as follows:

- Weekday Morning Peak ("AM') 7:00 - 9:00am.
- Weekday Evening Peak ("PM") 4:00 - 6:00pm.

In order to verify that the chosen periods for the modelling capture the peak road network times, the following figures illustrate flow variation at 15-minute intervals for the two respective peak periods. The figures show the overall time period surveyed, i.e. three -hour morning and afternoon peak.

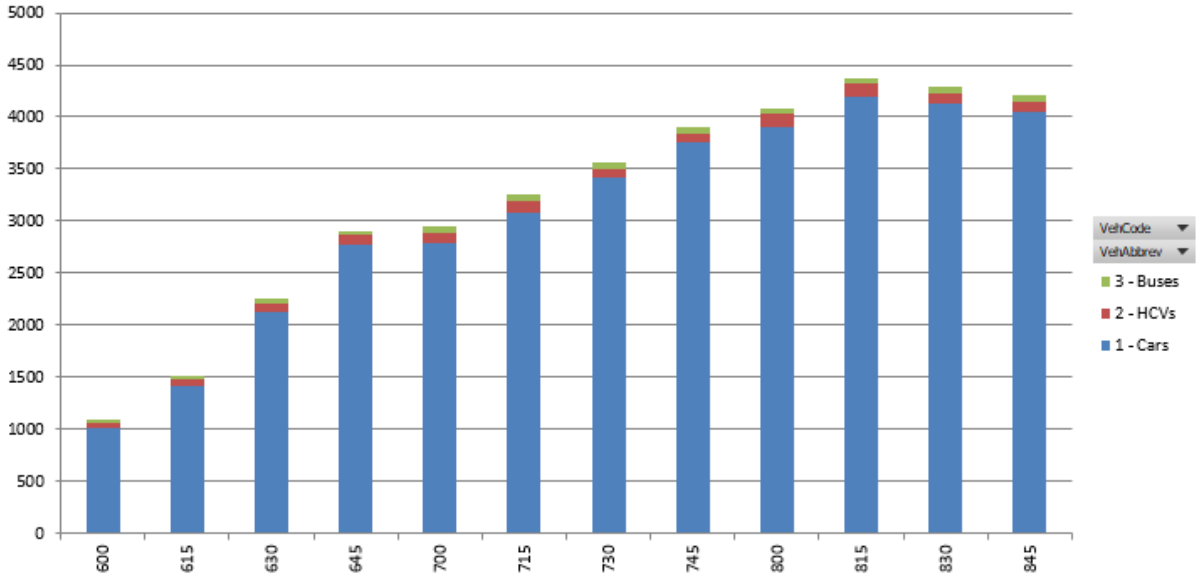


Figure 5-2: AM Peak Period Profile

As can be seen from the graph above, the weekend morning peak traffic volumes tend to increase steadily from the start of the surveyed period, peaking at 8:15am before reducing.

The profile demonstrates that the morning peak period has been appropriately captured within the two-hour model period.

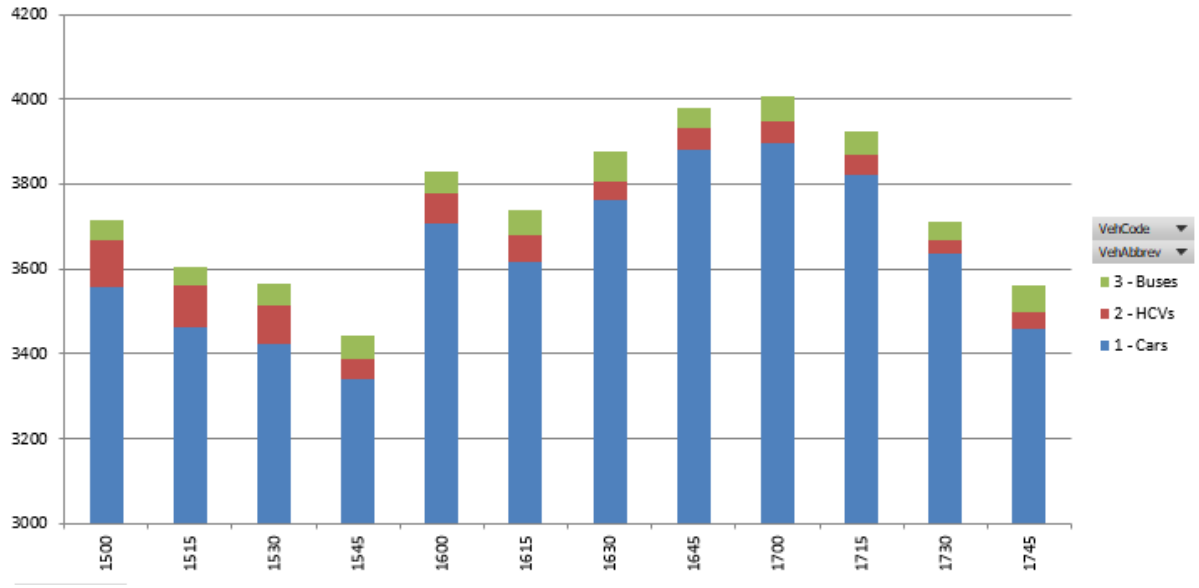


Figure 5-3: PM Peak Period Profile

As can be seen from Figure 5-3, the PM peak period traffic increases at 4:00pm then reduces at 4:15pm, and then continues rising and peaking at 5:00pm. After 5:00pm traffic volumes are seen to noticeably decrease.

The profile demonstrates that the afternoon peak period has been appropriately captured within the two-hour model period.

5.4 Calibration

The observed turning counts and volumes from the base model have been compared in order to ensure that the model has been calibrated appropriately. The comparison is included at Appendix C.

The NZTA Transport Model Development Guidelines (TMDG) recommends use of GEH statistics to compare observed and modelled flows for a given peak hour. The GEH statistic is similar in nature to the Chi Squared Statistic but is more applicable to traffic flow comparisons. The equation for calculating the GEH value is given below.

$$GEH = \sqrt{\frac{(m-o)^2}{\frac{(m+o)}{2}}}$$

Where m is the modelled count and o is the observed amount

A model of Carrington Road is considered to fall into model category E of the TMDG. The criteria targets for this model category are 85%, 90% and 95% for the three GEH ranges <5, <7.5 and <10 respectively. The model GEH values, for the AM and PM peak periods, have been compared to the TMDG thresholds described above. All GEH values of the model meet the TMDG thresholds, and are summarised in Table 5-1.

Table 5-1: GEH Statistics Thresholds

Threshold	TDMG Standard	Model AM	Model PM
<5	85%	93%	94%
<7.5	90%	98%	98%
<10	95%	99%	100%

The TMDG also recommends an XY scatter plot of modelled flows (Y) versus observed flows (X) for individual links be presented as a measure of model calibration. XY scatter plots of the observed peak hour turn volumes compared to the modelled volumes are shown in the following figures.

Table 5-2: Morning Peak Hour Modelled vs. Observed Flows Scatter Plot

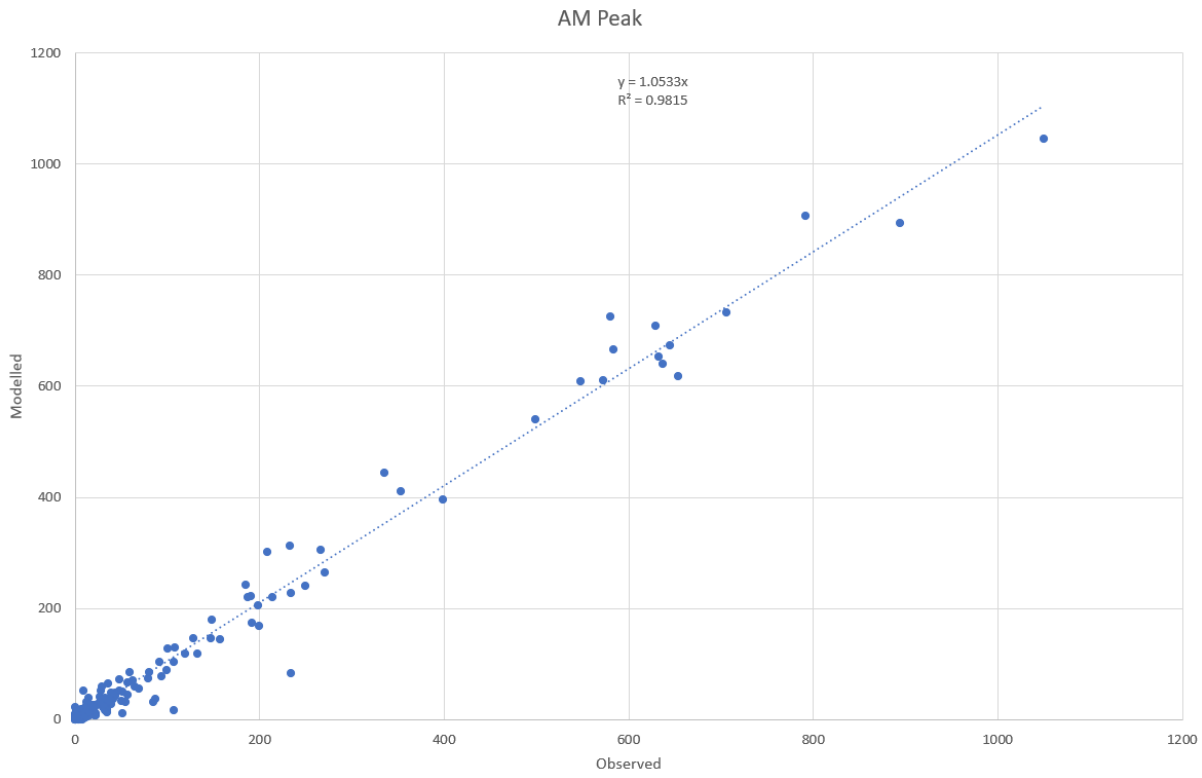
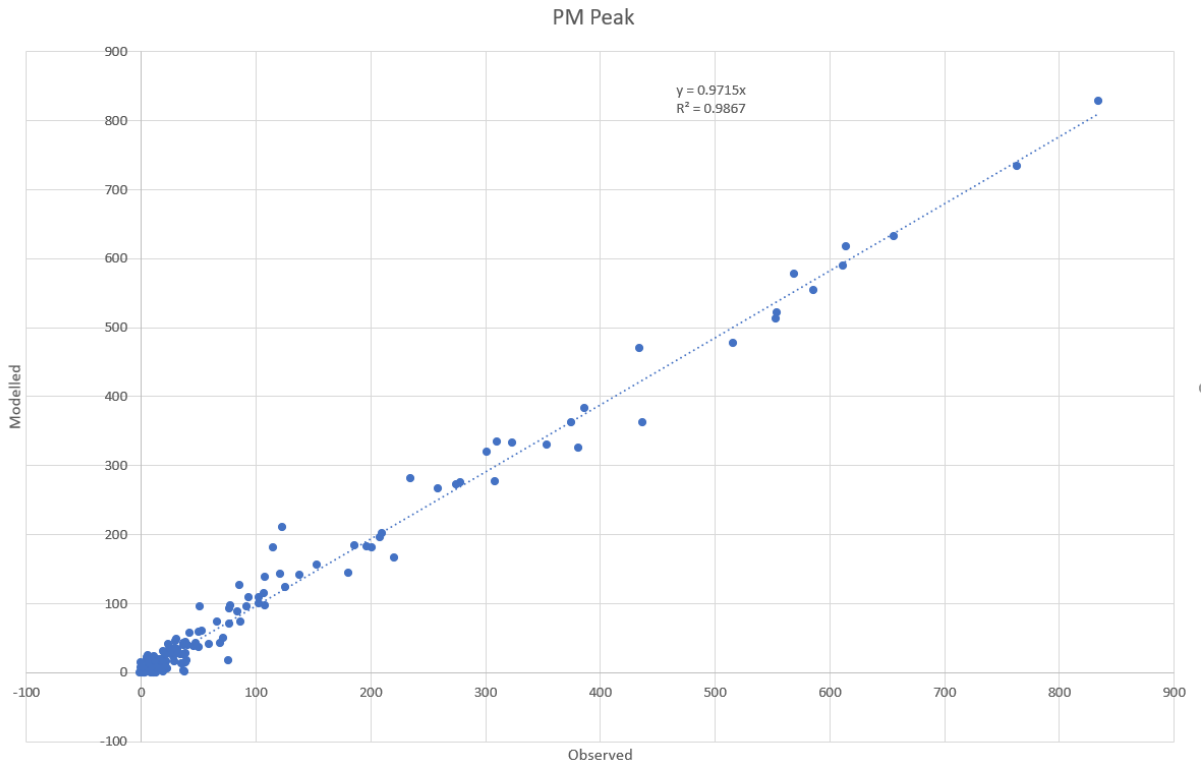


Table 5-3: Afternoon Peak Hour Modelled vs Observed Flows Scatter Plot



From the scatter plots above, it can be seen that for the AM and PM peaks, the modelled flows adequately represent the survey data as all data points lie close to line Y=X, and gradients of the linear regression line is close to 1, i.e. 1.0533 and 0.9715 for the AM and PM Peak respectively. The R squared values for the AM and PM peak are 0.9815 and 0.9867, respectively.

The calibration statistics show that the modelled turn counts match the observed turn counts for the morning and evening survey periods and within the targets set by the TMDG.

5.5 Scenario Compilation

The indicative development area and staging included within the modelling is discussed earlier at Sections 3.3 and 3.4 of this ITA. The traffic modelling for the Precinct has assessed the following scenarios for the AM and PM peak hour period:

- **Base Scenario:** Existing network with traffic demand from the October 2019 survey. This represents the situation where the Precinct is not developed and remains operating and with the same land-use currently on the site.
- **Scenario A**: This includes all land use development in the Precinct as discussed in Section 3.5, in addition to transport assumptions and network upgrades outlined at Section 4.9. In terms of the residential development, Scenario A represents 41% of the 2,500 dwellings envisaged on Crown land within the timeframe for this ITA, by around 2024. The development will occur in the southern area, with some initial developments in the central and northern areas.
- **Scenario B**: Scenario B assumes the land use development in the Precinct as discussed in Section 3.5, as well as transport assumptions and network upgrades as outlined in Section 4.9. In terms of the residential development, Scenario B represents 82% of the 2,500 dwellings envisaged on Crown land, by around 2028. By this time, development will occur largely in the central and northern areas of the Precinct.

5.6 Initial Modelling

Prior to commencement of the modelling, a meeting was held between Stantec, HUD and AT representatives on 16 February 2020 to discuss and agree the approach and assumptions to be incorporated.

Subsequently, Stantec requested information from Auckland Forecasting Centre (AFC) for inclusion in the modelling, including Select Link Analysis (SLA) for Carrington Road and traversal matrices for a cordon around the Unitec site (covering Great North Road / Carrington Road / Pt Chevalier Road intersection, New North Road / Woodward Road / Richardson Road, and the Mt Albert Rd / New North Road / Carrington Road intersection).

Subsequently, Stantec reviewed and analysed the data from AFC, leading to clarifications requested from AFC where needed. Following this, Stantec integrated the data from AFC into the project Aimsun model. The Aimsun model was then run for Scenario B, with its corresponding assumptions as discussed at the meeting with AT. A copy of the minutes was issued on 17 February 2020 and is attached at Appendix D.

The modelling results demonstrated that the future network will not have sufficient capacity to accommodate the overall forecast demand, based on the initial internal and external network assumptions derived from the AFC data, as well as the original Scenario B trip generation calculations.

The results indicated unrealistic high off-network queues in the AM and PM peak period, in particular on Point Chevalier Road (>700 cars queued in the AM peak and >500 cars queued in the PM peak), on New North Road (south of Richardson Road) in the AM peak (around 400 cars queued), as well as the Great North Road (east of Point Chevalier Road) in the PM peak (>400 cars queued).

The intersections along the study area were also shown to be constrained during the AM peak and/or PM peak, with Level of Service [17](LOS) F and overall intersection delay of over 100 seconds, particularly at Unitec Gate 4 / Carrington Road, Woodward Road / Carrington Road, Carrington Road / New North Road / Mount Albert Road, as well as Woodward Road / New North Road / Richardson Road.

Overall, the modelling results indicated congestion along Carrington Road and surrounding network in the long-term future, resulting from the use of these assumptions of no further adjustment in travel behaviour and traffic distribution beyond the assumptions discussed and agreed with AT.

The full results of this initial Scenario B modelling and the corresponding land use and trip generation assumptions are also included at Appendix D.

A congested network will encourage road users to consider possible alternative travel choices to avoid the delays. People will adapt in various ways; through mode shift (travelling by bus, train or active modes) by changing the times at which they travel (peak spreading), by not undertaking unnecessary trips (reduced total trips generated), or by changing travel route where possible to partially or completely avoid the congested network i.e. using a motorway route instead of a local road. This establishes a new equilibrium, whereby traffic is congested, but not as much as in the first model iteration described above.

This is especially relevant for corridors and intersections with land constraints i.e. Carrington Road and its intersections, particularly after the Carrington Road Upgrade, where the potential for capacity upgrade is limited, but which provide good access to high quality PT services and active mode options (with potential for these to be further improved outside the ITA timeframes).

Accordingly, Stantec has revisited and adjusted the modelling assumptions to better reflect likely changes to future travel behaviour and trip patterns in such a congestion environment. The revised assumptions have been incorporated in the revised Scenario A and Scenario B modelling and are discussed in

[17] Level of service (LOS) is a mechanism used to determine how well a transportation facility is operating from a traveler's perspective. Typically, six levels of service are defined and each is assigned a letter designation from A to F, with LOS A representing the best operating conditions, and LOS F the worst. (Source: https://www.trpc.org/DocumentCenter/View/2798/Appendix-O--Level-of-Service-Standard-and-Measurement

subsequent sections of this ITA. From this point onwards, 'Scenario A' and 'Scenario B' refer to these revised modelling scenarios with the latest assumptions.

The key changes made to the initial and revised modelling and ITA sections that contains relevant discussions regarding the adjustments are summarised in Table 5-4.

Table 5-4: Changes incorporated between Initial Modelling and Revised Modelling

Key changes	Initial Modelling	Revised Modelling	ITA Section
Through Traffic Reduction	0%	25%	5.7.1.2
eak Hour Profile (relative to the surveyed two-hour peak traffic)	0.56	0.52	5.7.1.3
Precinct trip distribution on wider network	As per the 2019 surveys	Combination of the 2019 surveys and the 2028 MSM data	5.11.2
Pass-by reduction for students	0%	10% for Unitec students, 20% for all other students	5.10

5.7 Scenario Modelling

5.7.1 Background Traffic

5.7.1.1 General Background Traffic

The background traffic incorporated for Scenario A and Scenario B are sourced from the 2028 MSM data. It is noted that there is no MSM data corresponding with the Scenario A timeframes (2024), therefore, 2028 data has also applied to Scenario A, representing a conservative approach.

Information from AFC, including SLA for Carrington Road and traversal matrices for a cordon around the Unitec site have been considered and analysed in determining the appropriateness on the level of background traffic, as shown in the 2028 MSM data, as well as potential reduction in future scenario.

5.7.1.2 Through Traffic Reductions

In both Scenario A and Scenario B, a reduction of 25% has been applied to the through traffic on Carrington Road. This reduction is considered acceptable taking into consideration the level of off-network queues that will otherwise be present, whilst also taking account that it is commonly understood that through traffic will avoid a congested network when alternative routes are available i.e. as with the recently constructed Waterview motorway. The through traffic reduction assumes that the removed trips do not use any part of the modelled network, i.e. they do not become through traffic on Great North Road or New North Road in the immediate vicinity of Carrington Road.

Through traffic is defined as traffic on the section of Carrington Road between the New North Road / Carrington Road / Mount Albert Road intersection and the Point Chevalier / Great North Road / Carrington Road intersection with destinations other than the Precinct or local roads along the section.

5.7.1.3 Peak Hour Profile

A flattening of peak hour profile over the 2-hour period has also been assumed, i.e. the proportion of peak hour traffic to the 2-hour traffic has been reduced from 0.56 to 0.52. This is considered typical within a congested network, i.e. peak spreading (some people travelling slightly earlier or later within the same 2-hour period than they would under more free-flowing conditions).

5.7.2 Carrington Road Corridor Upgrade

No mid-block changes are assumed within the model for Scenario A. As described in Section 4.6, the Carrington Road Upgrade is a key external transport upgrade that has been assumed as crucial by the time of Scenario B.

The Carrington Road Upgrade incorporates the addition of bus lanes in each direction of Carrington Road, between Woodward Road and SH16 overbridge, along with additional cycle and pedestrian facilities. This upgrade will provide substantial benefits to the public transport network, as demonstrated later in Section 0.

5.7.3 Great North Road / Pt Chevalier Road / Carrington Road

Within both Scenario A and Scenario B, several changes to the northern approach and departure (Point Chevalier Road) have been included. The changes modelled are based on information from the Point Chevalier Improvements project consultation material[18] (consultation by Auckland Transport (AT) completed in December 2019), that includes improvements to walking, cycling and public transport connections through infrastructure upgrades. It is understood that these improvements may be potentially constructed by 2021, therefore have been considered in both Scenario A and Scenario B.

To accommodate better road safety and the new separated cycleway on both sides of Point Chevalier Road, the current left-turn slip lane on Point Chevalier Road (into Great North Road East) is converted to a 20-metre-long short lane that forms part of the signalised northern arm. The outer, short departure lane on Point Chevalier Road is also excluded, resulting in a single northbound departure lane (**Note:** the existing intersection features no double turns into this existing dual lane departure arm).

The AT consultation included a proposed southbound bus lane on Point Chevalier Road, from just south of Wakatipu Street to near Great North Road. This new bus lane has not been included in the model, due to the northern extent of the project model only extending around 80m north of this intersection, and the bus lane is likely to not come all the way to the intersection, based on consultation plans.

Scenario B also includes the new northbound and southbound bus lanes on Carrington Road:

- The northbound bus lane is assumed to finish just before the SH16 overbridge
- Similarly, the single southbound general lane on Carrington Road away from Great North Road crosses the overbridge before the southbound bus lane then starts south of Sutherland Road
- As set out above, no widening / works is required on the motorway overbridge. If the final design for the Carrington Road Upgrade by AT does include widening and bus lanes of the overbridge, this would therefore result in greater potential bus / general capacity than assumed in the model even for Scenario B. However, to avoid doubt, this ITA does not assume any changes to the overbridge and is thus conservative in terms of assessing potential network and bus impacts.

The lane arrangements on Great North Road approaches remain as existing in both Scenario A and Scenario B. The proposed intersection layout, as modelled in Aimsun under Scenario A and B, is shown in Figure 5-4

[18] https://at.govt.nz/projects-roadworks/point-chevalier-improvements/

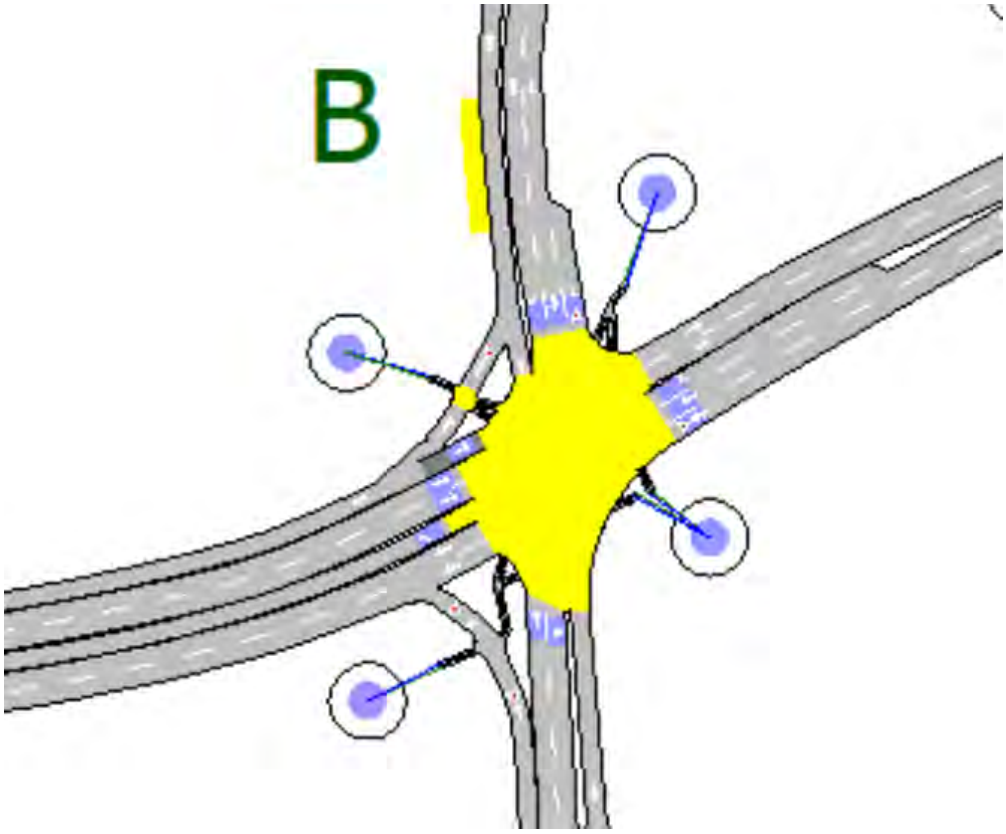


Figure 5-4: Proposed Great North Road / Pt Chevalier Road / Carrington Road Intersection Layout – Extracted from Aimsun model.

5.7.4 Carrington Road / Woodward Road Intersection

Carrington Road / Woodward Road currently comprises a give-way priority-controlled intersection. Results of modelling do not indicate that signalisation is required from a capacity perspective in Scenario A, and the intersection remains as per the base layout.

However, as discussed earlier, signalisation of this intersection is considered necessary for the longer term, to cater for pedestrian crossing as well as to ensure safety for traffic turning across multiply lanes once the bus lanes on Carrington Road are implemented.

Therefore, while it can remain as a priority intersection under scenario A, the intersection is assumed to be signalised in Scenario B. The modelled signalised intersection layout is shown below, with the additional bus lane on each direction on Carrington Road.

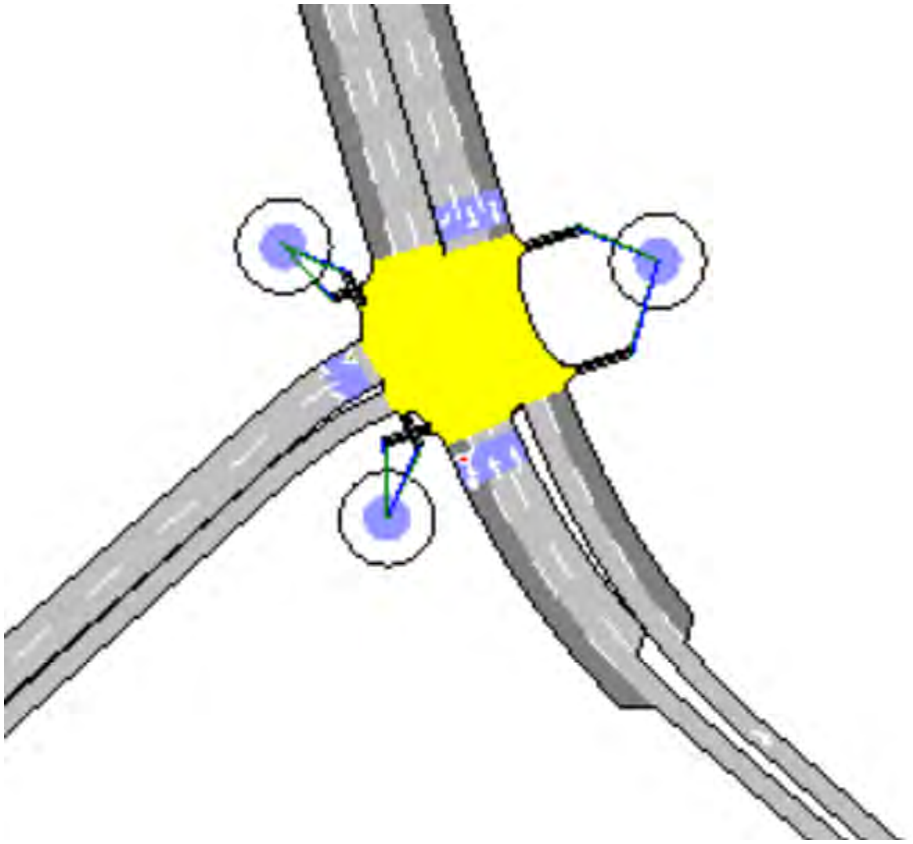


Figure 5-5: Proposed Woodward Road / Carrington Road Intersection for Scenario B – Extract from Aimsun model.

5.7.5 New North Road / Woodward Road / Richardson Road

There are no changes to the existing layout of the New North Road / Woodward Road / Richardson Road in Scenario A and Scenario B.

5.7.6 Pedestrian/Cyclist Crossings over Carrington Road

As per Section 4, Scenario A does not assume model-relevant upgrades to pedestrian and cyclist crossings over Carrington Road.

Within Scenario B signalisation of the existing walk and cycle crossing south of Sutherland Road, as well as a new mid-block signalised crossing serving the primary Unitec Core related bus stop are included.

For the latter, coordinated signal phasing has been assumed between the midblock crossing and adjacent "Gate 3" and "Gate 4" intersections. Adjacent existing bus stops have also been slightly relocated to place them downstream of each crossing side. The crossings as included in the model are shown below:

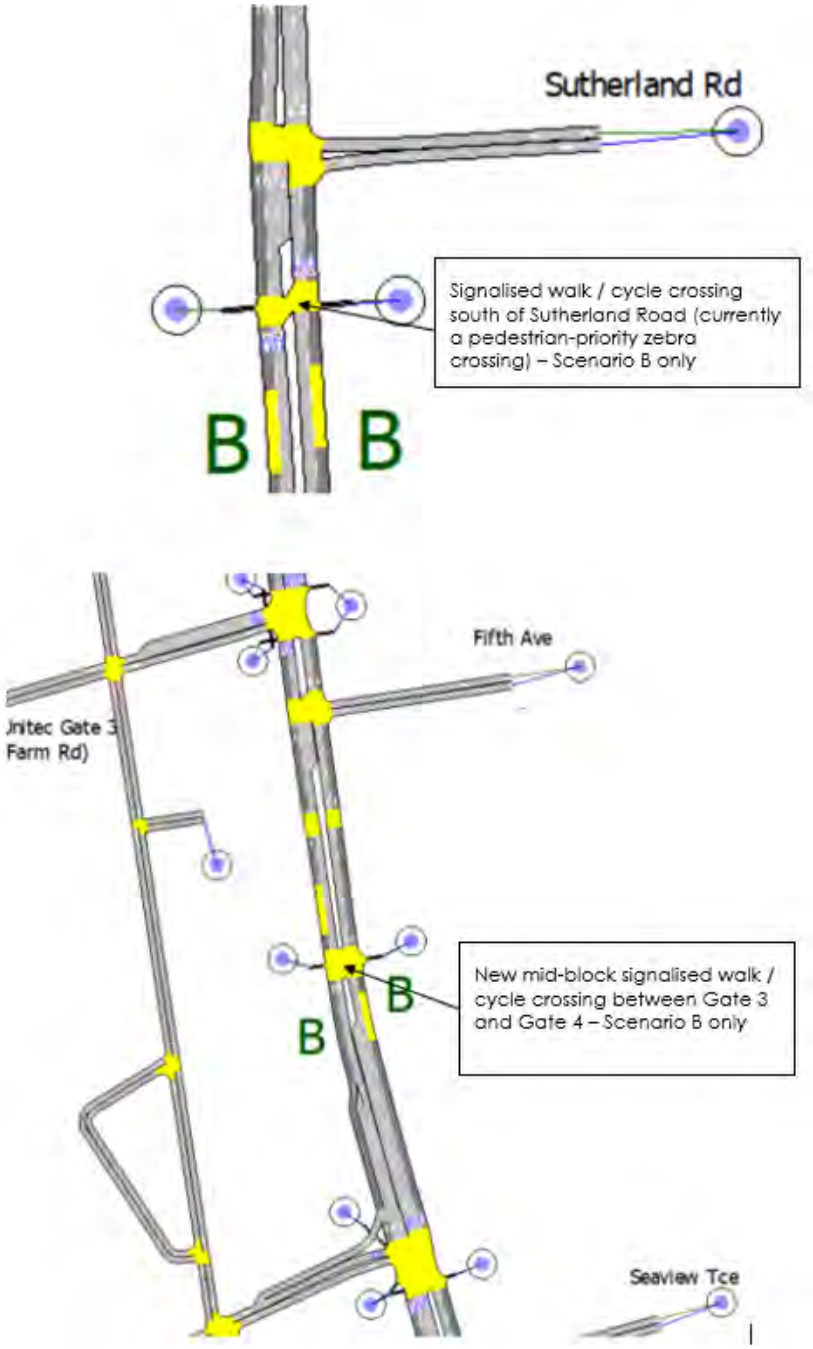


Figure 5-6: Proposed Mid-Block Crossings along Carrington Road – Extract from Aimsun model

5.7.7 Precinct Vehicle Accesses

This section discusses the modelling parameters for the four Precinct accesses off Carrington Road.

- **Gate 1**
  - Gate 1 is retained as a priority intersection in Scenario A and Scenario B.
  - However, in Scenario B, Gate 1 will potentially be relocated slightly north, and connect with Carrington Road opposite the driveway serving the healthcare facility around 100m south of Sutherland Road. Scenario B will also see this access accommodate only left-in / left-out movements (LILO arrangement) to reduce queuing generated by potential right-turning vehicles from Carrington Road extending towards Great North Road. As identified in the modelling results, it is considered that sufficient right turning capacity is provided at the nearby signalised access at Gate 2 to serve the demands of the northernmost part of the Precinct.
- **Gate 2 and Gate 3**
  - These gates will form the primary vehicular accesses to / from the central and northern areas of the Precinct. However, in Scenario A, the scale of development in these areas means that there is no requirement to signalise them, based on model iteration work.
  - It is proposed to signalise these intersections in Scenario B, once the scale of development increases turning flows, additional bus lanes along Carrington Road create a four-lane environment, and also to accommodate pedestrian crossings on all arms to facilitate pedestrian and cyclist access to the Precinct.
  - Gate 2 will remain the primary access to Mason Clinic and Taylor's Laundry in Scenario A and B.
- **Gate 4**
  - Gate 4 is the primary access to the Unitec Core and is currently the only signalised intersection into the Precinct. Pedestrian crossing facilities are provided on the western and southern arms of the intersection. No changes are proposed to occur at this intersection in Scenario A
  - In Scenario B, the intersection predominantly remains the same, with the exception of the additional bus lane in each direction on Carrington Road.

5.7.8 Internal Street Connection

As noted earlier in Section 4.7.1, an internal north-south connection for through traffic between the southern zone and the central and northern development areas of the Precinct is not assumed in the model, to ensure appropriate (conservative) testing.

5.7.9 Summary of Model Assumptions

The following table summarises the key network assumptions relevant to each modelling scenario.

Table 5-5: Summary of Modelling Assumptions

Modelling Assumptions	Base	Scenario A	Scenario B
Precinct development assumptions (See Section 3.5 and Section 5.9)	✗	✓	✓
Carrington Road Corridor Upgrade	✗	✗	✓
Carrington Road through traffic reductions	✗	✓	✓
Peak Hour Profile Adjustment	✗	✓	✓
Carrington Road Corridor Upgrade (bus lanes)	✗	✗	✓
Great North Rd / Pt Chevalier Rd / Carrington Rd intersection adjustments (slip lane removal into GNR)	✗	✓	✓
Carrington Road / Woodward Road intersection signalised	✗	✗	✓
Gate 1 signalised	✗	✗	✗ (Becomes LILO)
Gate 2 signalised	✗	✗	✓
Gate 3 signalised	✗	✗	✓
Gate 4 signalised	✓	✓	✓ (added lanes)
Mid-block crossing south of Sutherland Road signalised instead of zebra/cycle priority	✗	✗	✓
Signalised mid-block pedestrian crossing between Gate 3 and Gate 4	✗	✗	✓
Connections from southern development area to southern local roads	✗	✓	✓

5.8 Trip Generation

5.8.1 Overview and Methodology

The vehicle trip generation rates for the various land uses in the Precinct have been calculated through a number of methods. The methods consider existing traffic flows within and surrounding the Precincts, the likely influence of future transportation environment around the Precinct to the travel modes, and also literature research and historical values. The trip generation rates have also been chosen considering the outcomes of the initial Scenario B modelling, as outlined in Section 5.6.

Careful consideration is required in estimating trip generation rates for the Precinct, particularly as trip rates are estimated for approximately four and eight years into the future, and assume, particularly for Scenario B, infrastructure and congestion-assisted mode shift.

Over-optimistic calculations will underestimate the traffic impacts, while over-conservative calculation may lead to over-provision of capacity and subsequently induced demand.

The balancing of these two conflicting factors is expected to be through two main methods:

- Selection of trip rates that assume less car traffic but are not overly aspirational. **Note:** Several discussions on this matter between the project internal and external parties have occurred over several months during the preparation of the ITA, as previously mentioned.
- Regular review of the trip generation assumptions against actual generation (once development occurs) to correspond with the Precinct Rules requirement for traffic impact re-assessment of the Precinct. This will be a requirement for future ITA updates.

The following sections discuss the trip generation rates chosen for the various land uses and how they were sourced and derived. The full list of trip rates for the various land uses within the Precinct and the total trip generated in Scenario A and Scenario B are included at Appendix E.

5.8.2 Education Trip Rates

5.8.2.1 Tertiary Education Trip Rates

Unitec student trip rates has been obtained through literature research, according to the Institute of Transportation Engineers (ITE) Trip Generation Manual (2017 edition)19. The manual identifies that the typical trip rates for junior and community college are 0.11 trips per peak hour per FTE student/staff.

Considered as a base rate, this compares well with a previous survey undertaken in 2014 at the Precinct, where it was found that the overall peak hour trip rate averaged across the FTE student and staff was 0.129 trips per hour. The 2014 surveys excluded the Taylor's Laundry and Masons Clinic trips, however they did not exclude the other business activities in the southern part of the site and therefore are considered very conservative.

It is considered that by the time of the Scenario A development level, there will be growing multi-modal accessibility around the Precinct. Moreover, there is a likelihood of more remote learning as well as a higher variability of course schedules at Unitec, which may see fewer trips associated with the institution in the AM and PM peak hours. Therefore, a 10% reduction to the above original base rate is considered reasonable, that brings the trip rate for students down to 0.10.

In the longer term, by the time the Scenario B development level is achieved, it is expected that the transport environment around the Precinct has evolved even further to provide much higher accessibility through multi-modal transport, specifically bus and train services. Furthermore, as outlined in Section 5.6, it is expected that the future congestion on the transport network adjacent to the Precinct will further encourage alternative travel behaviour. As such, a 30% reduction to the above peak hour base rate is considered reasonable, bringing the trip rate for students down to 0.08.

[19] ITE Trip Generation Manual (2017)

Unitec staff trip generation has been calculated considering the latest available information from the Mount Albert staff travel survey, and how it compares with the latest tertiary student travel survey. Based on 2014, 2016, and 2018 Tertiary Student Travel Surveys, the average share of car travel (all types) for the Unitec Mount Albert students is 47%. In comparison, the 2016 staff travel survey indicates that 83% of Unitec Mount Albert staff travelled by car (including carpooling). Based on these data, the proportion of car travel among staff is 1.8 times higher than among students. This translates to a base trip rate of 0.20 for Unitec staff.

Similar to students, it is considered that staff travel behaviour will be directly influenced by the transport environment as well as potential teaching approach that Unitec may adopt in the future. The same levels of reduction to the base trip rate have therefore been applied, resulting in staff trip rates of 0.18 and 0.14 for Scenario A and Scenario B, respectively. These assumptions have been applied before the considerations that are likely to apply as tertiary institutions adapt to the impact of Covid-19.

Table 5-6: Student and Staff Trip Rates

	Scenario A AM and PM peak hour trip rate / FTE	Scenario B AM and PM peak hour trip rate / FTE
Students	0.10	0.08
Staff	0.18	0.14

5.8.2.2 Primary School, Early Childhood Education, and Special Needs Education Centre Trip Rates

The primary school, early childhood education, and special needs education centre students and staff trip rates are discussed in a technical memo titled 'Wairaka Precinct Primary School – Transport Assumptions and Vehicle Trip Generation' prepared by Stantec dated 16 December 2019. The memo is attached at Appendix B.

As previously discussed, the MOE have indicated that for the purposes of traffic assessments on the Precinct, any 2026 or earlier traffic model shall not include a school, whereas by around 2028 to 2030, it is assumed that the schools will be operating at half capacity.

As Scenario A is expected to occur before 2026, it does not contain any school trips, whilst for Scenario B the school trips, as set out in the aforementioned MOE memo are summarised in the table below

Table 5-7: Students and Staff Trip Rates (Primary, ECE, and Special Needs Education Centre)

	Scenario B AM peak hour trip rate	Scenario B PM peak hour trip rate
Students – Primary School	0.5 trips / student	0.13 trips / student
Students – Early Childhood Education	1 trip / student	0.25 trips / student
Students – Special Needs Education	1.8 trips/ student	0.45 trips / student
Staff (General)	0.5 trips / staff	0.33 trips / staff

5.8.3 Residential Trip Rates

Residential trip rates for the various residential land uses have been developed based on trip rates agreed by AT for the southern area development, as documented in the Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019.

The trip rates based on residential uses that form the base rates used for residential dwellings in this ITA are shown in the table below.

Table 5-8: Base Residential Trip Rates

Housing Typology	Base Peak Hour Trip Rate / Dwelling (as per the Commute memo)
Studio and 1/1.5 Bedroom without parking	0.35
1/1.5 Bedroom without parking	0.35
1.5 Bedroom with parking	0.40
2 Bedroom	0.50
2.5 Bedroom	0.65
3 and 4 Bedroom	0.85

At this stage, except for the southern area development, the Masterplanning of the HUD site has not gone above massing exercises and some typical block / building level layouts. Therefore, no proposed land use split currently exists.

The Masterplan focuses on 1-bedroom and 2-bedroom apartments, with very few 3-bedroom and / or 4-bedroom units proposed. The site-wide HUD average for car parking is proposed to be under 1 per unit.

Therefore, it is considered that the "1.5 bedroom with [one space of] parking" typology is a good interim default assumption for all the balance of the 2,500 proposed dwellings outside the southern area. The likely inclusion of a small number of larger apartments in the actual build-out will, in a vehicle trip generation sense, be balanced by the presence of studios and 1-bedroom apartments, of which some will have zero car parks, thereby correspondingly lower generation.

In Scenario A, it has been assumed that the above base trip rates apply to residential land use in all areas within the Precinct. This is considered conservative, as some trip reduction is likely to occur given the increasing multi-modal accessibility around the Precinct, that will be located much closer to existing public transport facilities than the southern areas, whereby the above base rates were agreed.

For Scenario B, it is considered appropriate to apply different reduction levels to different zones within the Precinct, based on their geographical proximity to Carrington Road and Great North Road, and the public transport / active modes provisions anticipated in the future. The reductions applied to the various zones for Scenario B are discussed below.

5.8.3.1 Southern area

Under Scenario B, the dwellings within the Southern area are assumed to have trip rates that are 5% lower than the above base rates.

As discussed at the AT / HUD / Stantec meeting on 16 February 2020, previously no reduction has been proposed. However, a reduction is now considered appropriate given the likelihood of congestion in the surrounding network in 2028 that will strongly encourage at least some future mode shift or other changes in travel behaviour, including in the southern area.

5.8.3.2 Te Auaunga North zone

Under Scenario B, the dwellings within the Te Auaunga zones are assumed to have trip rates 10% lower than the above base rates. Although not discussed at the AT / HUD / Stantec meeting on 16 February 2020, this reduction was proposed and documented in the corresponding meeting minutes that were issued on 17 February 2020, attached at Appendix D.

The reduction considers that this zone will have good access (less than 400m) to main PT routes on Great North Road via the new Oakley Creek / Te Auaunga pedestrian bridge. Although this zone is located 500m away from Carrington Road, and therefore does not have the same level of PT accessibility as the

Northern, North-west, and Carrington areas, the Te Auaunga North area is still considered better than the southern area in terms of public transport accessibility. Therefore, it sees less reduction than most areas, but more than the Southern area.

5.8.3.3 North-west, Northern, Carrington zones

Under Scenario B, dwellings within the North-west, Northern and Carrington zones are assumed to have trip rates that are 25% lower than the base rates. It is noted that a reduction of 20% was agreed at the AT / HUD / Stantec meeting on 16 February 2020, due to the anticipated quality of walking and cycling access to Carrington Road and the public transport provisions surrounding the Precinct.

The reduction has since been increased slightly to 25% to account for the anticipated congestion in the surrounding network that will drive a stronger mode shift.

The residential trip rates for Scenario A and Scenario B are summarised in the table below.

Table 5-9: Residential Trip Rates for Scenario A and Scenario B modelling

Zone(s)	Scenario A Peak Hour Trip Rate	Scenario B Peak Hour Trip Rate
Studio and 1/1.5 bedroom without parking		
Southern	0.35	0.33
Te Auaunga North	0.35	0.32
North-West, Northern, Carrington	0.35	0.26
1.5 bedroom with parking		
Southern	0.40	0.38
Te Auaunga North	0.40	0.36
North-West, Northern, Carrington	0.40	0.30
2 bedroom		
Southern	0.50	0.48
Te Auaunga North	0.50	0.45
North-West, Northern, Carrington	0.50	0.38
2.5 bedroom		
Southern	0.65	0.62
Te Auaunga North	0.65	0.59
North-West, Northern, Carrington	0.65	0.49
3 and 4 bedroom		
Southern	0.85	0.81
Te Auaunga North	0.85	0.77
North-West, Northern, Carrington	0.85	0.64

5.8.4 Other Trip Rates

5.8.4.1 Taylors Laundry

The traffic impact of Taylor's Laundry is assumed to be unchanged in both Scenario A and B, as it is assumed that there is no significant change to its operation within the timeframes for this ITA.

Therefore, instead of analysing trip rates for the business, the traffic models have used the existing trips surveyed in 2014 at approximately 21 trips and 35 trips in the AM and PM peak hours, respectively.

5.8.4.2 Mason Clinic

The Mason Clinic's traffic impacts have incorporated the estimated future peak hour trips based on the projections of the future numbers of patients' beds according to the 2019 Mason Clinic Masterplan, in comparison with the number of beds and the corresponding trip generation as surveyed in 2016. These trips have been provided by Flow Transportation (DHB's transport consultants), as discussed in Section 3.5.4.1.

The Mason Clinic trips are presented in the table below.

Table 5-10: Peak Hour Trips for Mason Clinic (source: Flow Transportation)

	AM Peak Hour Trips	PM Peak Hour Trips
Scenario A	100	39
Scenario B	156	61

5.9 Resulting Trips

A summary of the resulting vehicle trips in Scenario A and Scenario B are provided in the following table.

Table 5-11: Summary of Precinct Trips

Overall Precinct Trips	AM Peak Hour	PM Peak Hour
Scenario A	1,670	1,623
Scenario B	2,089	1,813

The full list of trips corresponding to both future scenarios from all land uses in the Precinct is included at Appendix E.

The following sections of the report will discuss the results of the traffic modelling on the surrounding transport network, and how bus networks in particular can be improved to improve overall people transport capacity, rather than vehicular capacity alone.

5.10 Secondary Trip Generation

New development within an already urban area is likely to draw a percentage of traffic from the surrounding road network rather than directly adding to the existing traffic volumes on nearby streets.

Vehicle trips generated by a development can be separated into primary and secondary trips. Secondary trips can further be split into pass-by trips and diverted trips. Figure 5-7 below diagrammatically summarises the different trip types.

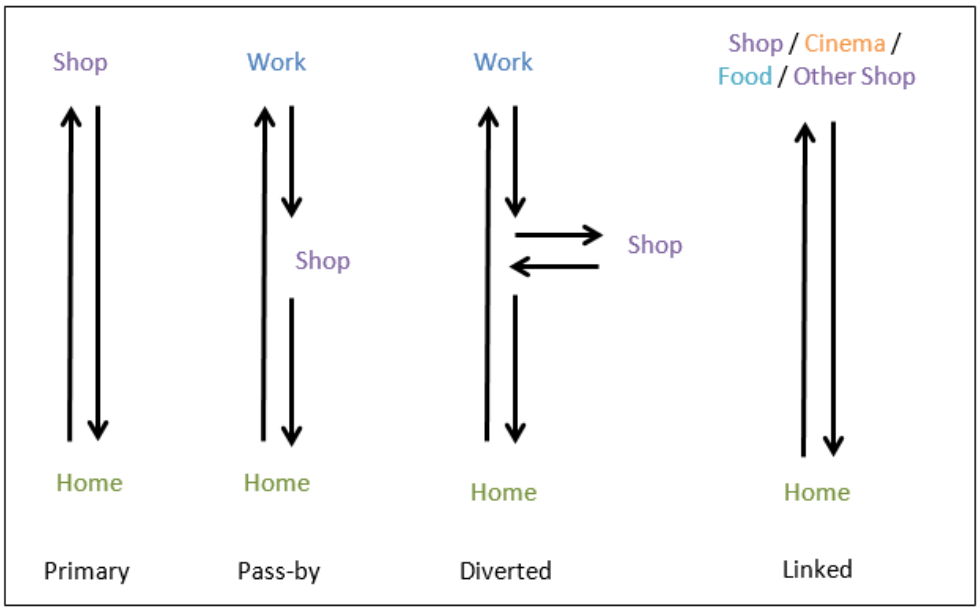


Figure 5-7: Trip Types

Currently the Precinct only has road frontage onto Carrington Road. No secondary trips through any internal links between the two frontages are assumed (as these links, if provided in reality at all, are to discourage through traffic – and are not present at all in the ITA model).

Any pass-by trips generated will therefore currently and in the future be using Carrington Road as part of their journey. Diverted trips will most likely be traffic that are currently using Great North Road or New North Road. The only secondary trips considered in this assessment are pass-by trips.

Of the land use activities proposed within the Precinct, the primary school, the early childhood education centre and Unitec, are the only activities that are considered likely to result in relevant secondary trips generation. These trips would involve parents able to drop off / pick up younger students on their way to / from work, or older students of Unitec carpooling with others who are heading in similar direction or attending the campus briefly for a single class or other purposes before continuing on with their journey along Carrington Road.

There is currently limited data available on what percentage of trips generated by a new school are secondary trips, specifically in relation to a newly constructed school within an urban environment.

The City of Spokane in Washington, USA[20] includes pass-by trip rates percentages for elementary (primary) and high (secondary) schools of 30% and 20% respectively. Research data on the pass-by trip rates for education land uses higher than secondary schools are not readily available.

Therefore, to remain conservative, a pass-by trip adjustment rate of 20% has been assumed for the primary, early childcare and special education students (in Scenario B), whilst a pass-by trip adjustment rate of only 10% has been assumed for Unitec students (Scenario A and Scenario B). These rates have been incorporated in the morning and evening peak periods. Conservatively, no secondary trips rates are considered to occur for staff at the schools and Unitec.

No research data on the potential diverted trip rates for education activity is available, therefore diverted trips associated with the Precinct have conservatively not been included in the assessment.

[20] Appendix C – *ITE Trip Rates, Pass-By Trips and Trip Length Adjustment Factors Used in Fee Schedule* from Spokane Municipal Code Section 17D.075.200

5.11 Trip Distribution

5.11.1 Inbound / Outbound Spit

The ITE Manual has been used to calculate the inbound and outbound trip distributions of the various activities within the Precinct. The split of the existing activities within the Precinct (Unitec, Taylors Laundry and Mason Clinic) were determined using the previous site survey by TDG (2014) that was undertaken for Unitec21.

The distribution used in the modelling and data source for each activity is summarised in Table 5-12.

Table 5-12: Inbound / Outbound Trip Distribution Splits

Activity	AM PEAK		PM PEAK		Source
	In-bound	Out-bound	In-bound	Out-bound	
Unitec students	84%	16%	43%	57%	From TDG Surveys (2014)
Unitec staff	84%	16%	43%	57%	From TDG Surveys (2014)
Primary School, ECE, Special Needs Students & staff	55%	45%	49%	51%	ITE Manual - Elementary School
Studios & 1/1.5 bed apartments	20%	80%	65%	35%	ITE Manual - Apartment
2 and 2.5 bed apartments	20%	80%	65%	35%	ITE Manual - Apartment
3 and 4 bed Apartments	20%	80%	65%	35%	ITE Manual - Apartment
Taylors Laundry	50%	50%	50%	50%	From TDG Surveys (2014)
Business Partnerships	88%	12%	17%	83%	ITE Manual - General Office Building
Mason Clinic	85%	15%	20%	80%	From TDG Surveys (2014)

5.11.2 Wider Network Distribution

The trip distribution adopted in Scenario A and Scenario B are based on observed 2019 surveys and the MSM year 2028 data. The network distribution is shown in Table 5-13.

[21] As per the transport assessment for the 2015 Campus Consolidation consent - Unitec, Wairaka Campus, Campus Consolidation Project, Transportation Assessment Report, TDG, August 2014

Table 5-13: Network Distribution

	AM Peak		PM Peak	
	From Precinct	To Precinct	From Precinct	To Precinct
New North Road (West)	13%	25%	21%	15%
Richardson Road	8%	10%	8%	12%
Mt Albert Road	20%	24%	20%	15%
New North Road (East)	5%	2%	2%	5%
Great North Road (East)	28%	8%	12%	14%
Pt Chevalier Road	11%	11%	15%	14%
Great North Road (West)	15%	20%	22%	25%
North	54%	39%	49%	53%
South	46%	61%	51%	47%

6. Model Results

The main intersections in the model have been analysed to assess the impact of the proposed development on the surrounding rod network. Comparisons have been made between the base, Scenario A and Scenario B, for the AM and PM peak periods l. The AM peak hour is from 7:45 to 8:45am, and PM peak hour is from 4:45pm to 5:45pm.

This section also outlines the travel time for general traffic and buses along key routes through the network, as a further measure of network performance especially from a transport system use perspective.

6.1 Intersection Results

The key intersections modelled are as follows:

- Great North Road / Pt Chevalier Road / Carrington Road;
- Unitec Gate 1 / Carrington Road;
- Unitec Gate 2 / Carrington Road;
- Unitec Gate 3 / Carrington Road;
- Unitec Gate 4 / Carrington Road;
- Woodward Road / Carrington Road;
- Carrington Road / New North Road / Mount Albert Road; and
- Woodward Road / New North Road / Richardson Road.

These intersections represent the major intersections along the Carrington Road, and main access locations into the Precinct.

The modelling results for each intersection are tabulated in Table 6-1 to

Table 6-32, in terms of average delay per vehicle (in seconds) and Level of Service (LOS), and 95th percentile queue length per approach (in metres).

6.1.1 Great North Road / Point Chevalier Road / Carrington Road

Table 6-1: Great North Road / Point Chevalier Road / Carrington Road - AM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B - Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Great North Road / Pt Chevalier Road / Carrington Road	**AM Peak**						
	S Left	9	E	14	E	15	E
	S Thru	82		95		97	
	S Right	85		93		97	
	E Left	81	E	72	F	73	F
	E Thru	65		60		62	
	E Right	79		106		130	
	N Left	72	F	104	F	110	F
	N Thru	89		94		99	
	N Right	81		87		88	
	W Left	16	D	29	F	25	F
	W Thru	50		97		105	
	W Thru (Bus)	32		50		48	
	W Right	108		154		170	
Intersection Total – AM Peak		**61**	**E**	**77**	**E**	**89**	**F**

Table 6-2: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B - Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Great North Road / Pt Chevalier Road / Carrington Road	**AM Peak**											
	158	66	119	166	163	100	155	238	141	96	159	242

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 108 seconds delay.

Worst approach: northern arm – LOS F

Overall Intersection: LOS E with 61 seconds delay

Queues: 166m (34 vehicles) on western arm

Scenario A

Worst Movement: western right turn – 154 seconds delay. An increase of 46 seconds compared to the Base.

Worst approach: eastern, northern, and western arms – LOS F.

Overall Intersection: LOS E with 77 seconds delay. An increase of 16 seconds compared to the base.

Queues 238m (48 vehicles) on western arm. An increase of 72m (14 vehicles) compared to the base.

Scenario B

Worst Movement: western right turn – 170 seconds delay. An increase of 62 seconds compared to the Base.

Worst approach: eastern, northern, and western arms – LOS F

Overall Intersection: LOS F with 89 seconds delay. An increase of 28 seconds compared to the base.

Queues: 242m (49 vehicles) on western arm. An increase of 76m (15vehicles compared to the base.

Table 6-3: Great North Road / Pt Chevalier Road / Carrington Road - PM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B - Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
	PM Peak						
Great North Road / Pt Chevalier Road / Carrington Road	S Left	16	D	23	E	20	E
	S Thru	69		99		104	
	S Right	69		76		79	
	E Left	58	E	65	E	71	E
	E Thru	53		48		49	
	E Right	105		90		91	
	N Left	67	E	82	E	95	F
	N Thru	81		72		85	
	N Right	79		61		69	
	W Left	10	C	17	E	18	E
	W Thru	40		50		50	
	W Thru(Bus)	38		49		47	
	W Right	64		141		180	
Intersection Total – PM Peak		**54**	**D**	**68**	**E**	**72**	**E**

Table 6-4: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B - Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Great North Road / Pt Chevalier Road / Carrington Road	**PM Peak**											
	88	169	165	42	141	193	150	39	123	213	150	44

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: eastern right turn – 105 seconds delay.

Worst approach: eastern and northern arms – LOS E

Overall Intersection: LOS D with 54 seconds delay

Queues: z169m (34 vehicles) on eastern arm

Scenario A:

Worst Movement: western right turn – 141 seconds delay. An increase of 77 seconds compared to the Base

Worst approach: all arms – LOS E

Overall Intersection: LOS E with 68 seconds delay. An increase of 14 seconds compared to the base

Queues: 193m (39 vehicles) on eastern arm. An increase of 24m (5 vehicles) compared to the base

Scenario B:

Worst Movement: western right turn – 180 seconds delay. An increase of 116 seconds compared to the Base

Worst approach: northern arm – LOS F

Overall Intersection: LOS E with 72 seconds delay. An increase of 18 seconds compared to the base

Queues: 213m (43 vehicles) on eastern arm. An increase of 44m (9 vehicles) compared to the base.

There are increases in delay at this intersection during AM and PM peaks, particularly the approach on Great North Road from the west in Scenario B.

Overall, the modelling results of this intersection during the AM and PM peak periods indicate that the development will not have a material impact on the overall operation.

6.1.2 Unitec Gate 1 / Carrington Road

Table 6-5: Unitec Gate 1 / Carrington Road - AM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Priority, Left-in/Left-out from Gate 1	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 1 / Carrington Road	**AM Peak**						
	S Left	6	A	13	B	12	D
	S Thru	5		13		29	
	S Right	0		0		0	
	E Left	0	A	0	A	0	A
	E Right	0		0		0	
	N Left	0	C	0	C	0	A
	N Thru	1		1		0	
	N Right	19		21		N/A	
	W Left	21	D	32	D	88	F
	W Right	31		25		N/A	
Intersection Total – AM Peak		**31**	**D**	**32**	**D**	**88**	**F**

Table 6-6: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Priority, Left-in/Left-out from Gate 1			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 1 / Carrington Road	**AM Peak**											
	21	--	21	8	0	--	7	0	49	--	21	30

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 31 seconds delay.

Worst approach: western arm – LOS D

Overall Intersection: LOS D with 31 seconds delay

Queues: 21m (4 vehicles) on southern and northern arms

Scenario A:

Worst Movement: western left turn – 32 seconds delay. An increase of 11 seconds compared to the base.

Worst approach: western arm – LOS D

Overall Intersection: LOS D with 32 seconds delay. An increase of 1 second compared to the base.

Queues: 7m (1 vehicle) on northern arm. A decrease of 14m (3 vehicles) compared to the base.

Scenario B:

Worst Movement: western left turn – 88 seconds delay. An increase of 67 seconds compared to the Base.

Worst approach: western arm – LOS F

Overall Intersection: LOS F with 88 seconds delay. An increase of 57 seconds compared to the base.

Queues: 49m (10 vehicles) on southern arm. An increase of 28m (6 vehicles) compared to the base.

Table 6-7: Unitec Gate 1 / Carrington Road - PM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Priority, Left-in/Left-out from Gate 1	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 1 / Carrington Road	**PM Peak**						
	S Left	1	B	11	B	6	A
	S Thru	1		12		10	
	S Right	13		0		0	
	E Left	15	C	37	F	13	E
	E Right	22		96		41	
	N Left	2	B	3	C	4	A
	N Thru	1		1		1	
	N Right	14		16		N/A	
	W Left	15	C	35	E	32	D
	W Right	18		24		N/A	
Intersection Total – PM Peak		**22**	**C**	**96**	**F**	**41**	**E**

Table 6-8: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Priority, Left-in/Left-out from Gate 1			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 1 / Carrington Road	**PM Peak**											
	0	--	16	11	21	--	16	7	42	--	21	21

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement:	eastern right turn – 22 seconds delay.
Worst approach:	eastern and western arms – LOS C
Overall Intersection:	LOS C with 22 seconds delay
Queues:	16m (3 vehicles) on northern arm

Scenario A:

Worst Movement:	eastern right turn – 96 seconds delay. An increase of 74 seconds compared to the Base.
Worst approach:	eastern arm – LOS F
Overall Intersection:	LOS F with 96 seconds delay. An increase of 74 second compared to the base.
Queues:	21m (4 vehicles) on southern arm. An increase of 21m (4 vehicles) compared to the base.

Scenario B:

Worst Movement:	eastern right turn – 41 seconds delay. An increase of 19 seconds compared to the Base.
Worst approach:	eastern arm – LOS E
Overall Intersection :	LOS E with 41 seconds delay. An increase of 19 seconds compared to the base.
Queues:	42m (8 vehicles) on southern arm. An increase of 42m (8 vehicles) compared to the base.

The results of the modelling demonstrates that Gate 1 AM performance remains good in Scenario A, with extra development traffic only small delays in movements. In Scenario B, even with a LILO arrangement, left turns out are delayed compared to the base case. However, this is internally within the development, not Carrington Road traffic, thus the overall Level of Service result is somewhat misleading. Unlike Gate 2, this gate is also not intended to provide a main egress to the wider network, only a secondary option.

During the PM, performance of Gate 1 reduces during Scenario A, then improves again in Scenario B with incorporation of a LILO arrangement. However, the delays primarily affect right turns out of one single (eastern) vehicle crossing only, rather than any of the through movements or development flows.

No notable queue length increase is predicted during both peak periods, with the highest increase being the south approach of Carrington Road. This is likely to be a downstream effect from the adjacent intersections (Great North Road / Pt Chevalier Road / Carrington Road and/or the midblock pedestrian crossing south of Sutherland Road), however at this magnitude it is not considered a notable increase.

It is noted that queue length is not reported for the eastern vehicle crossing, due to the unknown current and future traffic volumes at this vehicle crossing.

6.1.3 Unitec Gate 2 / Carrington Road

Table 6-9: Unitec Gate 2 / Carrington Road - AM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 2 / Carrington Road	**AM Peak**						
	S Thru	5	A	10	B	36	D
	N Thru	0	B	0	B	8	B
	N Right	11		12		53	
	W Left	14	D	29	D	33	C
	W Right	27		33		34	
Intersection Total – AM Peak		**27**	**D**	**33**	**D**	**26**	**C**

Table 6-10: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 2 / Carrington Road	**AM Peak**											
	82	--	8	8	112	--	8	24	123	--	57	44

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 27 seconds delay.

Worst approach: western arm – LOS D

Overall Intersection : LOS D with 27 seconds delay

Queues: 82m (17 vehicles) on southern arm

Scenario A:

Worst Movement: western right turn – 33 seconds delay. An increase of 6 seconds compared to the Base.

Worst approach: western arm – LOS D

Overall Intersection **:** LOS D with 33 seconds delay. An increase of 6 seconds compared to the base.

Queues: 112m (23 vehicles) on southern arm. An increase of 30m (6 vehicles) compared to the base.

Scenario B:

Worst Movement: northern right turn – 53 seconds delay. An increase of 42 seconds compared to the Base.

Worst approach: southern arm – LOS D

Overall Intersection: LOS C with 26 seconds delay. A decrease of 1 second compared to the base.

Queues: 1 23m (25 vehicles) on southern arm. An increase of 41m (8 vehicles) compared to the base.

Table 6-11: Unitec Gate 2 / Carrington Road - PM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 2 / Carrington Road	**PM Peak**						
	S Thru	1	A	13	B	11	B
	N Thru	0	A	0	A	5	B
	N Right	7		9		59	
	W Left	9	C	29	E	39	D
	W Right	18		35		49	
Intersection Total – PM Peak		**18**	**C**	**35**	**E**	**13**	**B**

Table 6-12: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 2 / Carrington Road	**PM Peak**											
	7	--	0	7	42	--	7	8	54	--	63	38

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 18 seconds delay.

Worst approach: western arm – LOS C

Overall Intersection: LOS C with 18seconds delay

Queues: 7m (1 vehicle) on southern and western arms

Scenario A:

Worst Movement: western right turn – 35 seconds delay. An increase of 17 seconds compared to the Base.

Worst approach: western arm – LOS E

Overall Intersection: LOS E with 35 seconds delay. An increase of 17 seconds compared to the base.

Queues: 42m (8 vehicles) on southern arm. An increase of 35m (7 vehicles) compared to the base.

Scenario B:

Worst Movement: northern right turn – 59 seconds delay. An increase of 52 seconds compared to the Base.

Worst approach: western arm – LOS D

Overall Intersection: LOS B with 13 seconds delay. An increase of 22 seconds compared to the base.

Queues: 63m (13 vehicles) on northern arm. An increase of 63m (13 vehicles) compared to the base.

The intersection of Gate 2 and Carrington Road in Scenario A and Scenario B generally is shown to have good to moderate performance, with similar delays to the base model. The signalisation of Gate 2 in Scenario B slightly improves overall performance and delay at the intersection compared to the base.

It is noted that the increase in queue lengths is largely attributable to the signalisation of the intersection (that results in the through flows having to stop, where previously they were able to proceed directly). Importantly, the queues within the Precinct (thus the distances needed for potential multi-lane approach cross-sections within the site) is limited to less than 50m in both scenarios.

6.1.4 Unitec Gate 3 / Carrington Road

Table 6-13: Unitec Gate 3 / Carrington Road - AM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 3 / Carrington Road	**AM Peak**						
	S Left	2	A	2	A	14	B
	S Thru	1		2		19	
	N Thru	1	A	1	B	3	B
	N Right	8		13		54	
	W Left	5	C	12	D	48	D
	W Right	17		32		56	
Intersection Total – AM Peak		**17**	**C**	**32**	**D**	**19**	**B**

Table 6-14: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 3 / Carrington Road	**AM Peak**											
	53	--	7	0	54	--	17	26	105	--	28	25

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 17 seconds delay.

Worst approach: western arm – LOS C

Overall Intersection: LOS C with 17 seconds delay

Queues: 53m (11 vehicles) on southern arm

Scenario A:

Worst Movement: western right turn – 32 seconds delay. An increase of 15 seconds compared to the Base.

Worst approach: western arm – LOS D

Overall Intersection: LOS D with 32 seconds delay. An increase of 15 seconds compared to the base.

Queues: 54m (11 vehicles) on southern arm. No increase compared to the base.

Scenario B:

Worst Movement: western right turn – 56 seconds delay. An increase of 39 seconds compared to the Base.

Worst approach: western arm – LOS D

Overall Intersection: LOS B with 19 seconds delay. An increase of 2 seconds compared to the base.

Queues: 105m (21 vehicles) on southern arm. An increase of 52m (10 vehicles) compared to the base.

Table 6-15: Unitec Gate 3 / Carrington Road - PM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 3 / Carrington Road	**PM Peak**						
	S Left	1	A	5	A	15	B
	S Thru	1		5		15	
	N Thru	1	A	5	B	15	C
	N Right	5		10		64	
	W Left	3	B	28	F	31	D
	W Right	12		56		53	
Intersection Total – PM Peak		**12**	**B**	**56**	**F**	**22**	**C**

Table 6-16: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 3 / Carrington Road	**PM Peak**											
	32	--	7	7	65	--	54	87	91	--	89	46

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 12 seconds delay.

Worst approach: western arm – LOS B

Overall Intersection: LOS B with 12 seconds delay

Queues: 32m (6 vehicles) on southern arm

Scenario A:

Worst Movement: western right turn – 56 seconds delay. An increase of 44 seconds compared to the base.

Worst approach: western arm – LOS F

Overall Intersection: LOS F with 56 seconds delay. An increase of 44 seconds compared to the base.

Queues: 87m (18 vehicles) on western arm. An increase of 80m (16 vehicles) compared to the base.

Scenario B:

Worst Movement: northern right turn – 64 seconds delay. An increase of 59 seconds compared to the base.

Worst approach: western arm – LOS D

Overall Intersection: LOS C with 22 seconds delay. An increase of 10 seconds compared to the base.

Queues: 91m (18 vehicles) on southern arm. An increase of 59m (12 vehicles) compared to the base.

The intersection of Gate 3 and Carrington Road in Scenario A and Scenario B generally is shown to have good to moderate performance, with similar delays to the base model. While there is a decline in the overall performance of the intersection in Scenario A, the extent of additional delays is considered acceptable, particular for an interim layout. The later signalisation of Gate 3 in Scenario B results in the overall performance and delay at the intersection in the long term improving again.

Importantly, the queues within the Precinct (and thus the distances needed for potential multi-lane approach cross-sections within the site) is limited to less than 50m in Scenario B (once signals are installed).

6.1.5 Unitec Gate 4 / Carrington Road

Table 6-17: Unitec Gate 4 / Carrington Road - AM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 4 / Carrington Road	**AM Peak**						
	S Left	15	B	13	B	18	C
	S Thru	13		13		28	
	N Thru	20	C	29	D	10	C
	N Right	36		76		51	
	W Left	2	B	3	C	2	C
	W Right	33		54		51	
Intersection Total – AM Peak		**18**	**B**	**25**	**C**	**24**	**C**

Table 6-18: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 4 / Carrington Road	**AM Peak**											
	64	--	105	18	72	--	146	36	64	--	33	68

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: northern right turn – 36 seconds delay.

Worst approach: northern arm – LOS C

Overall Intersection: LOS B with 18 seconds delay

Queues: 105m (21 vehicles) on northern arm

Scenario A:

Worst Movement : northern right turn – 76 seconds delay. An increase of 40 seconds compared to the base.

Worst approach: northern arm – LOS D

Overall Intersection: LOS C with 25 seconds delay. An increase of 7 seconds compared to the base.

Queues: 146m (30 vehicles) on northern arm. An increase of 41m (8 vehicles) compared to the base.

Scenario B:

Worst Movement: northern right turn and western right turn – 51 seconds delay. An increase of 15 seconds and 18 seconds, respectively, compared to the Base.

Worst approach: All arms – LOS C

Overall Intersection: LOS C with 24 seconds delay. An increase of 6 seconds compared to the base.

Queues: 68m (14 vehicles) on western arm. An increase of 50m (10 vehicles) compared to the base.

Table 6-19: Unitec Gate 4 / Carrington Road - PM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Unitec Gate 4 / Carrington Road	**AM Peak**						
	S Left	13	B	13	B	12	B
	S Thru	14		13		18	
	N Thru	29	C	28	D	16	B
	N Right	42		78		35	
	W Left	2	B	4	D	1	C
	W Right	27		65		39	
Intersection Total – PM Peak		**21**	**C**	**28**	**C**	**19**	**B**

Table 6-20: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Unitec Gate 4 / Carrington Road	**PM Peak**											
	39	--	78	49	57	--	144	124	45	--	83	59

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: northern right turn – 42 seconds delay.

Worst approach: northern arm – LOS C

Overall Intersection: LOS C with 21 seconds delay

Queues: 78m (16 vehicles) on northern arm

Scenario A:

Worst Movement : northern right turn – 78 seconds delay. An increase of 36 seconds compared to the base.

Worst approach: northern and western arms – LOS D

Overall Intersection: LOS C with 28 seconds delay. An increase of 7 seconds compared to the base.

Queues: 144m (29 vehicles) on northern arm. An increase of 66m (13 vehicles) compared to the base.

Scenario B:

Worst Movement: western right turn – 39 seconds delay. An increase of 12 seconds compared to the base.

Worst approach: western arm – LOS C

Overall Intersection: LOS B with 19 seconds delay. A decrease of 2 seconds compared to the base.

Queues: 83m (17 vehicles) on northern arm. An increase of 5m (1 vehicle) compared to the base.

The intersection of Gate 4 and Carrington Road in Scenario A and Scenario B generally is shown to have a good to moderate performance, with very similar LOS and delays compared to the base model. This is expected, given that in Scenario B, a more evenly distributed turning traffic is anticipated between the signalised Gate 2, Gate 3, and Gate 4 accesses, therefore reducing potential further pressure on Gate 4.

Generally, queue lengths are fairly consistent across the base model, Scenario A and Scenario B. It is noted that queue length increases are predicted on the north and west approaches in Scenario A in the PM peak, however a similar level of reduction at these approaches are predicted in Scenario B. This may be a temporary result of some vehicles from the centre of the Precinct redirecting to Gate 4 in Scenario A, when Gate 4 remains the only signalised access.

6.1.6 Woodward Road / Carrington Road

Table 6-21: Woodward Road / Carrington Road - AM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / Carrington Road	**AM Peak**						
	S Left	2	A	1	A	21	C
	S Thru	1		1		26	
	N Thru	2	B	2	B	4	A
	N Right	10		14		23	
	W Left	15	C	23	D	36	D
	W Right	23		35		47	
Intersection Total – AM Peak		**23**	**C**	**35**	**D**	**25**	**C**

Table 6-22: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / Carrington Road	**AM Peak**											
	45	--	34	100	45	--	19	102	98	--	31	200

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 23 seconds delay

Worst approach: western arm – LOS C

Overall Intersection: LOS C with 23 seconds delay

Queues: 100m (20 vehicles) on northern arm

Scenario A:

Worst Movement: western right turn – 35 seconds delay. An increase of 12 seconds compared to the base.

Worst approach: western arm – LOS D

Overall Intersection: LOS D with 35 seconds delay. An increase of 12 seconds compared to the base.

Queues: 102m (20 vehicles) on western arm. No increase from the base.

Scenario B:

Worst Movement: western right turn – 47 seconds delay. An increase of 24 seconds compared to the base.

Worst approach: western arm – LOS D

Overall Intersection: LOS C with 25 seconds delay. An increase of 2 seconds compared to the base.

Queues: 200m (40 vehicles) on western arm. An increase of 100m (20 vehicles) compared to the base.

Table 6-23: Woodward Road / Carrington Road - PM Peak Results

Intersection	Approach	Base - Priority		Scenario A - Priority		Scenario B – Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / Carrington Road	**PM Peak**						
	S Left	1	A	1	A	13	B
	S Thru	1		1		14	
	N Thru	1	A	3	B	3	A
	N Right	8		13		14	
	W Left	5	B	11	D	11	B
	W Right	13		27		25	
Intersection Total – PM Peak		**13**	**B**	**27**	**D**	**11**	**B**

Table 6-24: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Priority				Scenario A - Priority				Scenario B – Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / Carrington Road	**PM Peak**											
	40	--	28	25	43	--	64	54	53	--	47	31

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 13 seconds delay.

Worst approach: western arm – LOS B

Overall Intersection: LOS B with 13 seconds delay

Queues: 40m (8 vehicles) on southern arm

Scenario A:

Worst Movement: western right turn – 27 seconds delay. An increase of 14 seconds compared to the Base.

Worst approach: western arm – LOS D

Overall Intersection: LOS D with 27 seconds delay. An increase of 14 seconds compared to the base.

Queues: 64m (13 vehicles) on northern arm. An increase of 36m (7 vehicles) compared to the base.

Scenario B:

Worst Movement: western right turn – 25 seconds delay. An increase of 12 seconds compared to the base.

Worst approach: southern and western arms – LOS B

Overall Intersection: LOS B with 11 seconds delay. A decrease of 2 seconds compared to the base.

Queues: 53m (11 vehicles) on southern arm. An increase of 13m (2 vehicles) compared to the base.

The Woodward Road / Carrington Road intersection in Scenario has a moderate to good performance, with delays increasing compared to the base model, but not to a degree considered problematic for a major intersection like this. This supports the assessment that signalisation is not yet required in Scenario A. Signalisation in Scenario B provides modelled results better than the base delays, despite higher volumes.

Queue lengths comparison between the base model and the future scenarios generally show no real difference, apart for the west approach in Scenario B in the AM peak as highlighted above. This increase in queue length corresponds to the higher volumes expected at the intersection.

6.1.7 Carrington Road / New North Road / Mt Albert Road

Table 6-25: Carrington Road / New North Road / Mt Albert Road - AM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B - Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Carrington Road / New North Road / Mt Albert Road	**AM Peak**						
	S Left	182	F	44	D	44	E
	S Thru	184		46		49	
	S Right	180		78		85	
	E Left	50	F	5	D	7	D
	E Thru	35		40		41	
	E Right	279		113		113	
	N Left	125	F	46	D	49	E
	N Thru	136		47		50	
	N Right	67		89		89	
	W Left	141	F	69	E	79	E
	W Thru	128		62		62	
	W Right	168		67		63	
Intersection Total – AM Peak		**122**	**F**	**52**	**D**	**53**	**D**

Table 6-26: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B - Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Carrington Road / New North Road / Mt Albert Road	**AM Peak**											
	188	80	187	302	116	31	138	107	140	33	193	144

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: eastern right turn – 279 seconds delay.

Worst approach: All arms – LOS F

Overall Intersection: LOS F with 122 seconds delay

Queues: 302m (62 vehicles) on western arm

Scenario A:

Worst Movement: eastern right turn – 113 seconds delay. A decrease of 116 seconds compared to the Base.

Worst approach: western arm – LOS E

Overall Intersection: LOS D with 52 seconds delay. A decrease of 70 seconds compared to the base.

Queues: 138m (28 vehicles) on northern arm. A decrease of 49m (10 vehicles) compared to the base.

Scenario B:

Worst Movement: western right turn – 113 seconds delay. A decrease of 116 seconds compared to the Base.

Worst approach: southern, northern, and western arms – LOS E

Overall Intersection: LOS D with 53 seconds delay. A decrease of 69 seconds compared to the base.

Queues: 193m (39 vehicles) on northern arm. An increase of 6m (1 vehicle) compared to the base.

Table 6-27: Carrington Road / New North Road / Mt Albert Road – PM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B - Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Carrington Road / New North Road / Mt Albert Road	**PM Peak**						
	S Left	104	F	44	D	44	D
	S Thru	115		45		46	
	S Right	111		59		61	
	E Left	50	E	29	D	44	E
	E Thru	94		79		98	
	E Right	90		85		102	
	N Left	139	F	46	E	48	E
	N Thru	144		47		49	
	N Right	91		84		89	
	W Left	56	E	78	F	72	F
	W Thru	65		89		78	
	W Right	71		112		111	
Intersection Total – PM Peak		**80**	**F**	**57**	**E**	**66**	**E**

Table 6-28: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B - Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Carrington Road / New North Road / Mt Albert Road	**PM Peak**											
	86	115	165	89	94	100	165	72	88	108	160	64

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: northern through – 144 seconds delay.

Worst approach: southern and northern arms – LOS F

Overall Intersection: LOS F with 80 seconds delay

Queues: 165m (33 vehicles) on northern arm

Scenario A:

Worst Movement: western right turn – 112 seconds delay. An increase of 41 seconds compared to the base.

Worst approach: western arm – LOS F

Overall Intersection: LOS E with 57 seconds delay. A decrease of 23 seconds compared to the base.

Queues: 165m (33 vehicles) on northern arm. No change compared to the base.

Scenario B:

Worst Movement: western right turn – 111 seconds delay. A decrease of 40 seconds compared to the base.

Worst approach: western arm – LOS F

Overall Intersection: LOS E with 66 seconds delay. A decrease of 14 seconds compared to the base.

Queues: 160m (32 vehicles) on northern arm. A decrease of 5m (1 vehicle) compared to the base.

The Carrington Road / New North Road / Mount Albert Road intersection consistently shows a moderate to poor performance on most approaches in the base and future scenarios. However, a notable improvement in delays is predicted on the Carrington Road and Mount Albert Road approaches (north and south, respectively), and generally in the AM peak. The queue lengths are also predicted to reduce on the majority of approaches in Scenario A and Scenario B.

This improvement from the AM base case can be attributed largely to the future change in demand along the wider network (i.e. this change is considered largely driven by non-development flow reduction assumptions on the basis of other network change assumptions provided by AT).

Under these assumptions, it can be clearly shown that the intersection does not degrade in performance due to the Precinct development.

6.1.8 Woodward Road / New North Road / Richardson Road

Table 6-29: Woodward Road / New North Road / Richardson Road - AM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B - Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / New North Road / Richardson Road	**AM Peak**						
	S Left	44	D	24	C	30	C
	S Thru	56		32		35	
	S Right	35		24		25	
	E Left	32	C	26	C	28	C
	E Thru	31		23		25	
	E Right	58		46		52	
	N Left	45	D	12	C	15	D
	N Thru	55		32		35	
	N Right	54		33		37	
	W Left	30	C	22	C	26	C
	W Thru	27		21		23	
	W Right	48		39		38	
Intersection Total – AM Peak		**35**	**C**	**25**	**C**	**28**	**C**

Table 6-30: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B - Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / New North Road / Richardson Road	**AM Peak**											
	122	25	117	83	56	21	26	46	77	20	37	56

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: eastern right turn – 58 seconds delay.

Worst approach: southern and northern arms – LOS D

Overall Intersection: LOS C with 35 seconds delay

Queues: 122m (25 vehicles) on southern arm

Scenario A:

Worst Movement: eastern right turn – 46 seconds delay. A decrease of 12 seconds compared to the base.

Worst approach: All arms – LOS C

Overall Intersection: LOS C with 25 seconds delay. A decrease of 10 seconds compared to the base.

Queues: 56m (11 vehicles) on southern arm. A decrease of 66m (13 vehicles) compared to the base.

Scenario B:

Worst Movement: eastern right turn - 52 seconds delay. A decrease of 6 seconds compared to the base.

Worst approach: Northern arm – LOS D

Overall Intersection: LOS C with 28 seconds delay. A decrease of 7 seconds compared to the base.

Queues: 77m (16 vehicles) on southern arm. A decrease of 45m (9 vehicle) compared to the base.

Table 6-31: Woodward Road / New North Road / Richardson Road - PM Peak Results

Intersection	Approach	Base - Signal		Scenario A - Signal		Scenario B - Signal	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / New North Road / Richardson Road	**PM Peak**						
	S Left	31	D	30	C	36	D
	S Thru	43		38		44	
	S Right	35		29		33	
	E Left	39	D	35	C	36	D
	E Thru	37		34		35	
	E Right	96		77		87	
	N Left	40	D	29	D	22	D
	N Thru	52		42		46	
	N Right	51		43		44	
	W Left	19	B	21	C	23	C
	W Thru	20		20		21	
	W Right	45		42		43	
Intersection Total – PM Peak		**35**	**D**	**32**	**C**	**35**	**C**

Table 6-32: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - Signal				Scenario A - Signal				Scenario B - Signal			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / New North Road / Richardson Road	**PM Peak**											
	71	74	123	36	73	60	111	29	92	62	124	32

Base Scenario :

Worst Movement : eastern right turn – 96 seconds delay.

Worst approach: southern, eastern, and northern arms – LOS D

Overall Intersection: LOS D with 35 seconds delay

Queues : 123m (25 vehicles) on northern arm

Scenario A:

Worst Movement: eastern right turn – 77 seconds delay. A decrease of 19 seconds compared to the base.

Worst approach: northern arm – LOS D

Overall Intersection: LOS C with 32 seconds delay. A decrease of 3 seconds compared to the base.

Queues: 111m (23 vehicles) on northern arm. A decrease of 12m (2 vehicles) compared to the base.

Scenario B:

Worst Movement: eastern right turn - 87 seconds delay. A decrease of 9 seconds compared to the base.

Worst approach: southern, eastern, and northern arms – LOS D

Overall Intersection: LOS C with 35 seconds delay. No change from the base.

Queues: 124m (25 vehicles) on northern arm. No change from the base.

The Woodward Road / New North Road / Richardson Road intersection consistently has an overall moderate performance in all scenarios modelled. It is noted that in the AM peak, the performance and delays at the south approach have improved in Scenario A and Scenario B, compared to the base model, that can be largely attributed to the reduction in the overall demand forecasted for the intersection by AT, even with the development traffic.

Consequently, reduction in queue lengths are also apparent in Scenario A and Scenario B, compared to the base model.

6.2 Car Journey Travel Time

6.2.1 Travel Time Route Overview

Journey Travel time analysis for cars has been undertaken along the sections between Point Chevalier Road / Great North Road / Carrington Road and New North Road / Carrington Road, in a clockwise and anti-clockwise direction between Woodward Road / Carrington Road, and New North Road / Carrington Road intersections.

Existing travel times along these sections were surveyed on 17 October 2019, between 6:00 – 9:00am and 3:00 – 6:00pm. The length of each segment of the routes surveyed, and corresponding average morning / afternoon peak hour travel speeds observed during the time of the survey are shown in Figure 6-1 and Figure 6-2.

The two routes, referred to as 'Route 1' and 'Route 2' are detailed below, along with the corresponding survey segments shown in Figure 6-1 and Figure 6-2.

Route 1 - Comprises the following sections:

a) Point Chevalier Road / Great North Road / Carrington Road to Carrington Road / Unitec Gate 4 (segment 1 and 2)

b) Carrington Road / Unitec Gate 4 to Carrington Road / Woodward Road (segment 3)

c) Carrington Road / Woodward Road to Carrington Road / New North Road (segment 4)

d) Carrington Road / New North Road to New North Road / Woodward Road (segment 5)

e) New North Road / Woodward Road to Woodward Road / Rail Crossing (segment 6)

f) Woodward Road / Rail Crossing to Woodward Road / Carrington Road (segment 7)

g) Woodward Road / Carrington Road to Carrington Road / Unitec Gate 4 (segment 8)

h) Carrington Road / Unitec Gate 4 to Carrington Road / Great North Road / Point Chevalier Road (segment 9 and 10)

Route 2 - Comprises the following sections:

a) Point Chevalier Road / Great North Road / Carrington Road to Carrington Road / Unitec Gate 4 (segment 1 and 2)

b) Carrington Road / Unitec Gate 4 to Carrington Road / Woodward Road (segment 3)

c) Carrington Road / Woodward Road to Woodward Road / Rail Crossing (segment 4)

d) Woodward Road / Rail Crossing to Woodward Road / New North Road (segment 5)

e) Woodward Road / New North Road to New North Road / Carrington Road (segment 6)

f) New North Road / Carrington Road to Carrington Road / Woodward Road (segment 7)

g) Carrington Road / Woodward Road to Carrington Road / Unitec Gate 4 (segment 8)

h) Carrington Road / Unitec Gate 4 to Carrington Road / Great North Road (segment 9 and 10)

The travel time analysis for Route A and B during the AM and PM peak hours are shown in Table 6-33 to Table 6-36. Journey Travel times from the 2019 surveys are also included (referred to as 'Observed Travel Time') to provide a reference to the existing situation.

The results are presented as cumulative travel time from origin point of the first segment (segment 1), to the destination point of the last segment (segment 8). For each route, the sections are referred to as Sections 1a-1h and Sections 2a-2h for Route 1 and Route 2 respectively, corresponding to the alphabetic point formatting above. The difference between the observed travel time and the modelled travel time for each scenario are also included, with negative values indicating faster travel time associated with Scenario A or Scenario B, relative to the observed travel time.

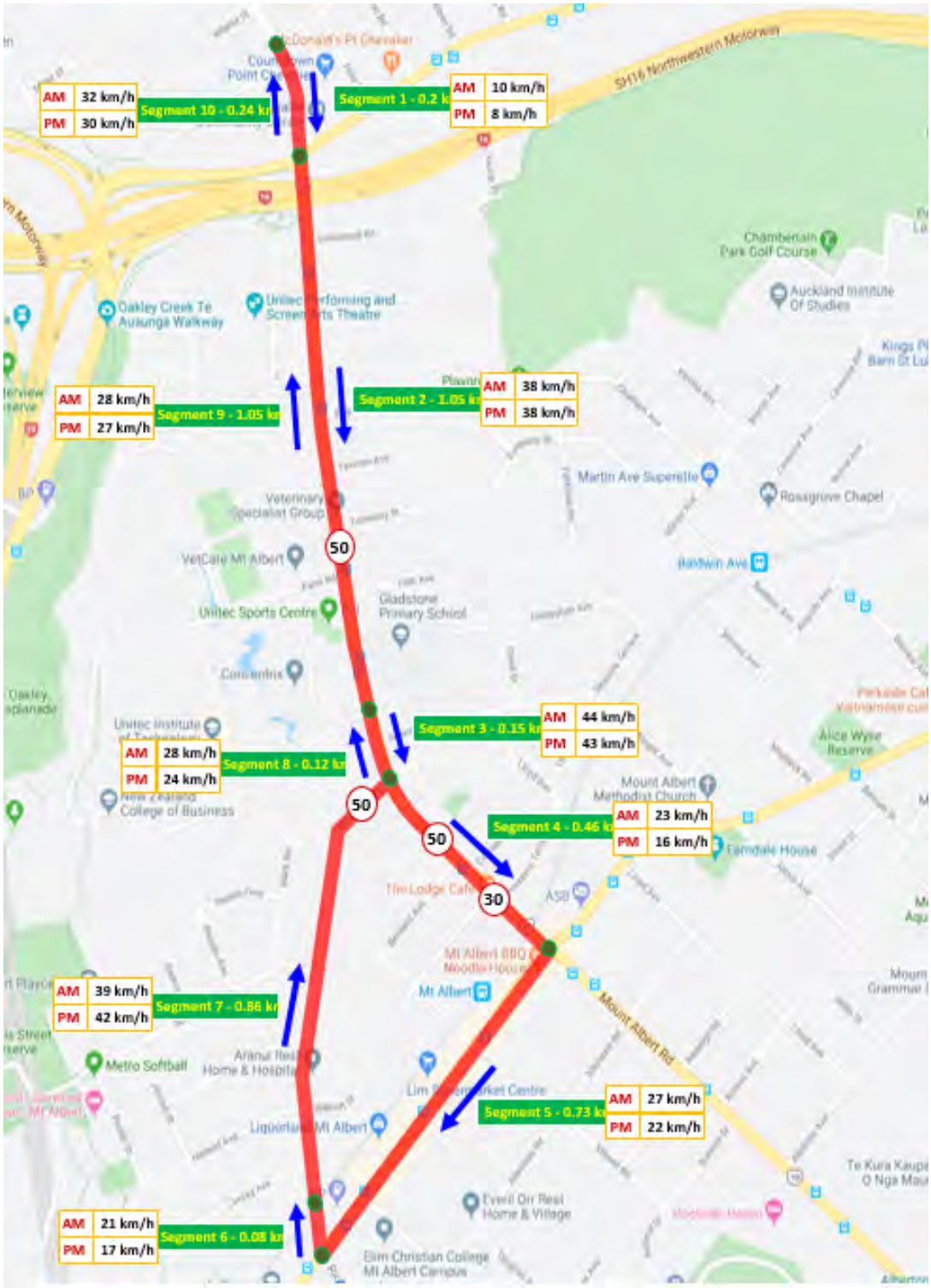


Figure 6-1: Route 1 (clockwise direction), source: Matrix.

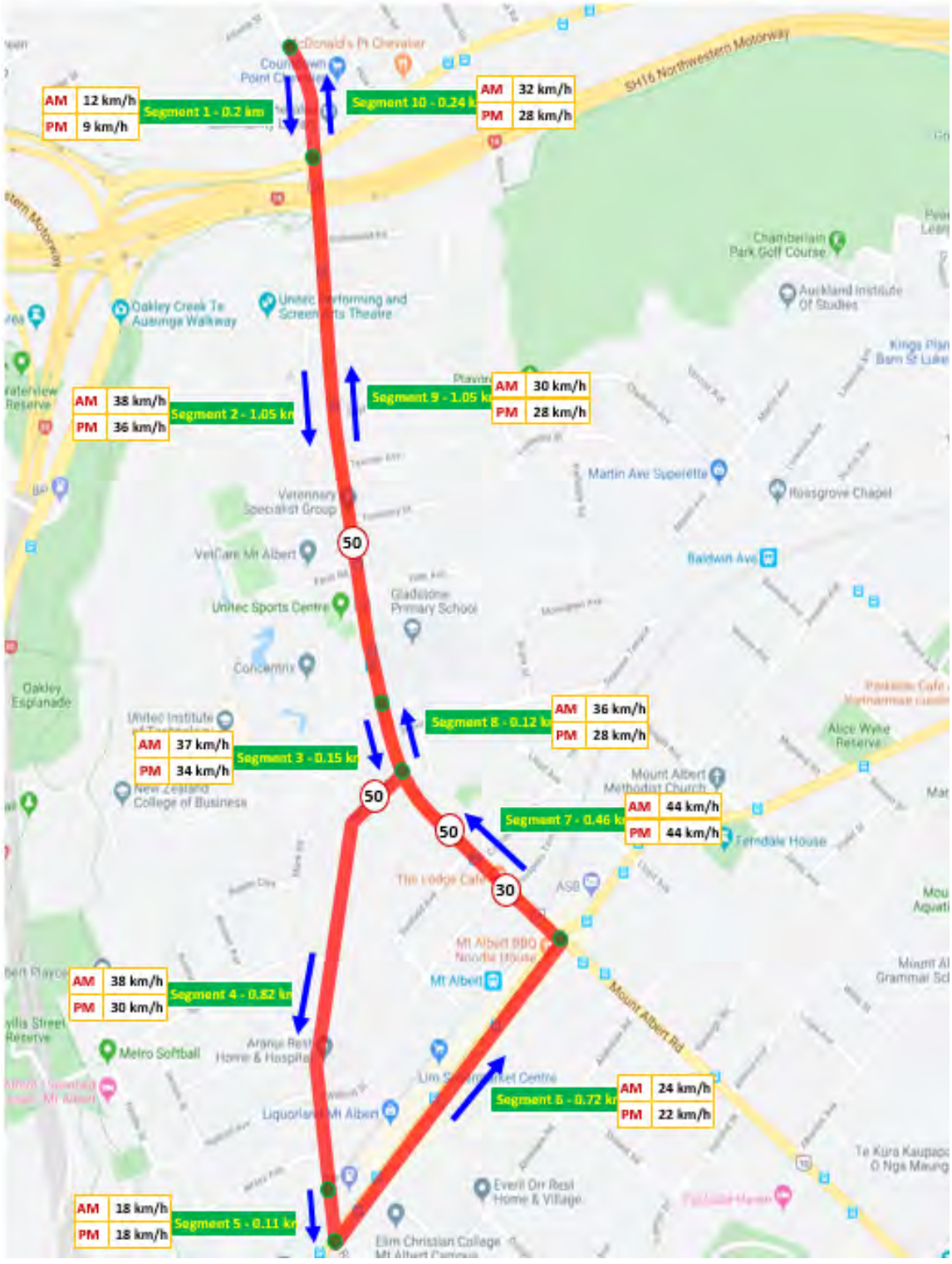


Figure 6-2: Route 2 (anti-clockwise), source: Matrix

6.2.2 Car Travel Time Route 1

Table 6-33: Cumulative Travel Time along Route 1 – AM Peak

Route 1	Cumulative Travel Time (in seconds)				
	Observed	Scenario A (Modelled)	Difference between Scenario A and Observed	Scenario B (Modelled)	Difference between Scenario B and Observed
AM Peak					
Section 1a	104	108	4	93	-11
Section 1b	118	117	-1	104	-14
Section 1c	205	233	28	221	16
Section 1d	313	323	10	318	5
Section 1e	341	349	8	344	2
Section 1f	426	426	0	431	5
Section 1g	444	445	1	461	17
Section 1h	590	653	64	747	157
%Difference (Observed vs Scenario)		**11%**		**27%**	

Table 6-34: Cumulative Travel Time along Route 1 – PM Peak

Route 1	Cumulative Travel Time (in seconds)				
	Observed	Scenario A (Modelled)	Difference between Scenario A and Observed	Scenario B (Modelled)	Difference between Scenario B and Observed
PM Peak					
Section 1a	104	122	19	118	14
Section 1b	119	133	14	128	10
Section 1c	249	254	5	243	-6
Section 1d	383	380	-3	375	-8
Section 1e	417	406	-11	401	-16
Section 1f	492	473	-19	470	-22
Section 1g	515	493	-23	494	-21
Section 1h	659	719	59	715	56
%Difference (Observed vs Scenario)		**9%**		**8%**	

The tables above demonstrate that Scenario A sees a minor increase in travel time in AM peak and PM peak, at 11% and 9% respectively, compared to the observed level.

Scenario B also sees an overall increase in travel time, that is more prominent during the AM peak. The increase is considered moderate to medium during the AM (27%) and minor in the PM (8%)

Generally, the increase in travel times projected for the Carrington Road section are balanced by travel time reductions on other segments. The movement contributing to the increase in travel time is primarily the segments between Carrington Road / Unitec Gate 4 to Carrington Road / Great North Road.

6.2.3 Car Travel Time Route 2

Table 6-35: Cumulative Travel Time along Route 2 - AM Peak

Route 2	Cumulative Travel Time (in seconds)				
	Observed	Scenario A (Modelled)	Difference between Scenario A and Observed	Scenario B (Modelled)	Difference between Scenario B and Observed
AM Peak					
Section 2a	104	108	4	93	-11
Section 2b	118	117	-1	120	3
Section 2c	200	194	-7	199	-1
Section 2d	241	207	-34	217	-25
Section 2e	374	321	-53	336	-38
Section 2f	411	352	-59	392	-20
Section 2g	430	370	-60	423	-7
Section 2h	575	578	3	709	134
%Difference (Observed vs Scenario)		**0%**		**23%**	

Table 6-36: Cumulative Travel Time along Route 2 - PM Peak

Route 2	Cumulative Travel Time (in seconds)				
	Observed	Scenario A (Modelled)	Difference between Scenario A and Observed	Scenario B (Modelled)	Difference between Scenario B and Observed
PM Peak					
Section 2a	104	122	19	118	14
Section 2b	119	133	14	139	20
Section 2c	217	218	0	227	9
Section 2d	256	237	-19	254	-2
Section 2e	374	360	-14	370	-4
Section 2f	411	391	-20	414	2
Section 2g	435	411	-24	437	2
Section 2h	579	637	59	658	80
%Difference (Observed vs Scenario)		**10%**		**14%**	

The tables above demonstrate that in Scenario A, an overall increase of 10% is predicted during the PM peak relative to the observed travel times, whilst no increase is predicted in the AM peak.

During the AM and PM peak periods, Scenario B is predicted to see an increase in travel times of 23% and 14%, respectively. Again, the movement contributing to the increase in travel time is primarily the segments between Carrington Road / Unitec Gate 4 to Carrington Road / Great North Road.

Overall, it can be concluded that the travel times for general traffic on the network surrounding the Precinct in both future scenarios are generally comparable to the observed travel time, using the wider-area assumptions provided.

6.3 Bus Journey Travel Time

The journey travel times for the buses along Carrington Road, between Point Chevalier Road / Great North Road / Carrington Road and New North Road / Carrington Road / Mount Albert Road have been modelled separately. The comparison between bus travel times in the base and future models for the sections of Carrington Road between the Great North Road / Pt Chevalier Road / Carrington Road and Carrington Road/Woodward Road, in both directions are provided in Table 6-37.

The comparisons are presented separately for AM and PM peak periods.

Table 6-37: Comparison of Bus and Car Travel Time on Carrington Road

Section	Bus Travel Times (seconds)		
	Base Model (no bus lanes)	Scenario A (no bus lanes)	Scenario B (with bus lanes)
AM Peak			
Southbound -Carrington Road (Pt Chevalier/Great North Road to Woodward Road)	199	210 (11 seconds longer than the base)	190 (9 seconds faster than the base)
Northbound – Carrington Road (Woodward Road to Pt Chevalier/Great North Road)	284	328 (44 seconds longer than the base)	285 (no change from the base)
PM Peak			
Southbound -Carrington Road (Pt Chevalier/Great North Road to Woodward Road)	207	231 (24 seconds longer than the base)	203 (4 seconds faster than the base)
Northbound – Carrington Road (Woodward Road to Pt Chevalier/Great North Road)	267	339 (72 seconds longer than the base)	318 (51 seconds longer than the base)

Bus travel times in Scenario A are longer than the bus travel times in the base model, with the differences ranging from 11 seconds (southbound, AM peak) to 72 seconds (northbound, PM peak). With the new bus lanes in Scenario B, the bus travel times are generally predicted to return to the base scenario levels.

An exception to this is the bus travel time in the northbound direction in the PM peak, where an increase of 51 seconds persists relative to the base model. This can be attributed to the higher delay on the southern approach of the Great North Road / Pt Chevalier Road / Carrington Road intersection in the PM peak (as discussed in Section 6.1.1), and as buses are required to merge with general traffic at the end of the northbound bus lane prior to the SH16 overbridge.

It is noted that the traffic model assumes that buses will stop for approximately 20 seconds at each bus stop along the corridor, for boarding and alighting passengers. These additional seconds are included in the bus travel times reported above. Given that there are three bus stops in each direction along Carrington Road in the future scenarios, this equates to approximately 60 seconds of additional time. This is

considered conservative as there will be instances where no passengers need to board and alight at one or more stops along Carrington Road. Service times could potentially be improved by consolidating stops.

The traffic model currently does not include full bus priority measures at intersections i.e. left turn general traffic competes at these locations with bus through traffic (left turners turn from within the bus lane). This delays buses, particularly where left turns are held (delayed) to first allow through pedestrian or bike movements across the side roads. It is likely that the design of the future Carrington Road Upgrade may include added bus priority measures at key intersections to reduce or avoid intersection specific delays.

Similarly, the model assumes that the bus lanes do not extend across the SH16 motorway overbridge all the way to Great North Road but stop in the general vicinity of Sutherland Road. Extending at least some bus priority across the bridge would result in significant delay improvement for services. However, this would require either a full rebuild of the overbridge (for bus lanes each way), or the relocation of some walk/cycle facilities onto a clip-on structure (which could then allow enough space for an added narrow bus lane in at least one direction on the existing bridge). However, the scope of the ITA currently do not provide certainty for such changes, and as such they were not included.

Overall, the above demonstrates that the future Carrington Road Upgrade is beneficial and will sufficiently sustain the public transport operation along the corridor. Without it, buses would perform at general traffic flow delays plus stop delays and delays to re-enter traffic streams, while also further holding up general traffic while sitting in stops. Particularly if combined with further intersection bus priority measures, the greater accessibility and reliability for buses will compensate for the longer travel times for general traffic (as previously discussed) and support the vision for a more balanced mode share on the transport network surrounding the Precinct.

6.4 Carrington Road Flows

The peak hour traffic volumes on Carrington Road, between Unitec Gate 3 and Gate 4, recorded by the 7-day tube count surveys (2014 and 2019) and modelled in Scenario A and Scenario B are presented in Table 6-38 shows

Table 6-38: Carrington Road Peak Hour Traffic Flow

Time	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
	Northbound	Southbound	Combined	Northbound	Southbound	Combined
2014 (survey)	1031	702	1733	583	647	1230
2019 (survey)	664	549	1213	555	577	1132
Scenario A (model)	842	699	1541	735	870	1605
Scenario B (model)	994	714	1708	741	947	1688

The table above shows lower peak hour traffic flows on Carrington Road in 2019 compared to 2014, which can be attributed largely to the opening of the Waterview motorway in 2017).

The table also shows a general increasing trend in traffic flows in both directions and peak periods, between 2019 and Scenario B. It is noted that the level of traffic flows predicted in Scenario B are comparable with the AM morning peak flows observed in 2014, which provides some indication that the corridor will have sufficient capacity to cater for the future flows.

6.5 Sensitivity Tests (SIDRA)

6.5.1 Background

The modelling within this ITA has been undertaken on 82% of the potential residential build out in the Precinct, as agreed with Auckland Transport and their consultants, Flow Ltd, in February 2020.

During the meeting between HUD / AT / Stantec on 16 February 2020 an agreement was reached that sensitivity testing of the key intersections along Carrington Road will be undertaken using SIDRA software, to better understand whether the Scenario B Aimsun modelling results has identified appropriate long-term footprints and forms of these key intersections.

The sensitivity testing has been undertaken by adding a further 10% to the Precinct-related traffic to the intersection flows created by Scenario B. This includes traffic generated by all activities and land uses within the Precinct (including Unitec), and not just the residential traffic only. The use of an additional 10% of all Precinct traffic is considered to represent a robust analysis.

Trip distribution applied to the additional 10% traffic is assumed as the same as in the standard scenarios, as the new development will not form new access routes or have any likelihood of being different in origin-destination patterns than immediately adjacent residential development.

A detailed breakdown of the Scenario B directional demands for AM and PM peak at each intersection along Carrington Road are included at Appendix F. The demands are further split into the following vehicle types; Car (general non-precinct related traffic), CarU (precinct-related traffic), Bus, and HCV (heavy vehicles). These demands have been input directly into SIDRA Intersection for the sensitivity testing.

The intersections that have been subject to sensitivity testing are:

1. **Great North Road / Pt Chevalier Road / Carrington Road.**

   The Aimsun modelling results of the intersection indicate that it will be operating close to capacity, and at LOS F in Scenario B. As such, this intersection is already under significant pressure.

2. **Gate 3 / Carrington Road**

   The performance of Gate 3 in its signalised form is in general satisfactory, whether with its existing priority intersection layout under the base scenario and Scenario A, as well as when it is signalised under Scenario B. However, this intersection is the one most likely to see added trip demand should further development eventuate in the areas excluded in the ITA assumptions (in particular the F Lots and B Lots), and therefore has also been subjected to sensitivity testing.

3. **Woodward Road / Carrington Road**

   Similar to the Gate 3 / Carrington Road intersection, the Woodward Road / Carrington Road intersection has been included in the sensitivity testing to account for the potential development of several Precinct areas in proximity that have not been included in the ITA timeframe.

A summary of the sensitivity results in terms of the delay (in seconds), 95th percentile queue length (in metres), and the level of service (LOS) are shown in Table 6-39 to Table 6-41. The tables compare the aforementioned performance indicators between Scenario B (as modelled in Aimsun) and the Scenario B + 10% Precinct Traffic.

It is noted that the SIDRA results for Scenario B have been compared with the corresponding Aimsun results and generally found to be in alignment in terms of delay and LOS. Therefore, no further calibration has been applied to the SIDRA files for each intersection.

6.5.2 Great North Road / Pt Chevalier Road / Carrington Road SIDRA

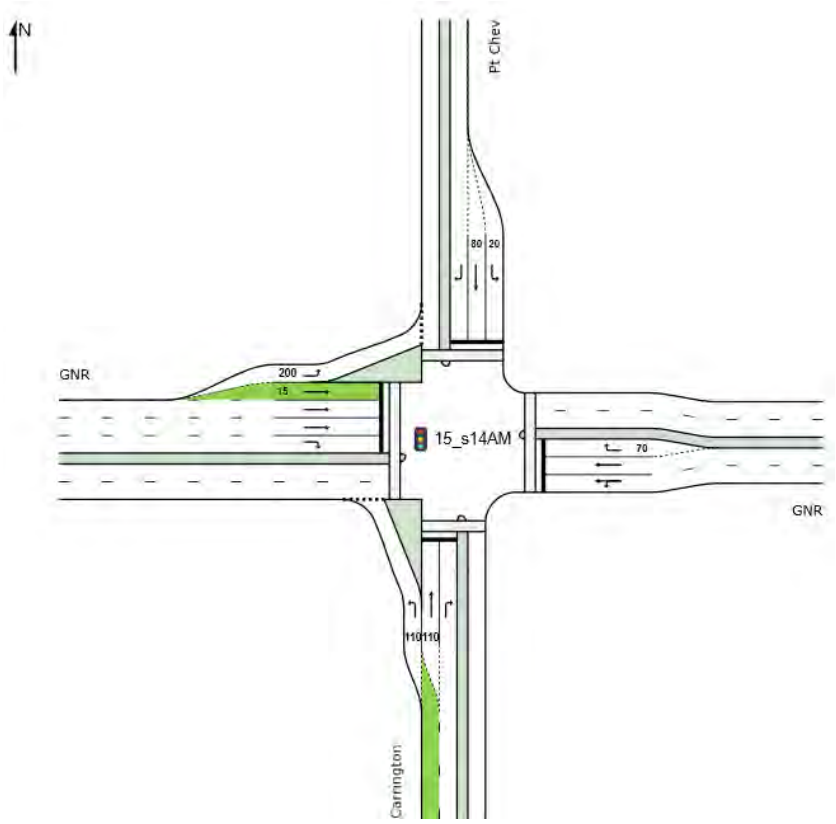


Figure 6-3: SIDRA layout for Great North Road / Point Chevalier Road / Carrington Road (green sections represent bus lanes).

Table 6-39: Sensitivity Test Results for Great North Road / Point Chevalier Road / Carrington Road intersection

Intersection Approach	Scenario B						Scenario B Sensitivity Test (+10% Precinct Traffic)					
	Approach			Intersection			Approach			Intersection		
	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS
	AM Peak											
South (Carrington Rd)	85	275	F	89	420	F	117	372	F	109	471	F
East (Great North Rd)	58	98	E				58	97	E			
North (Pt Chev Rd)	81	242	F				96	287	F			
West (Great North Rd)	101	420	F				123	471	F			
	PM Peak											
South (Carrington Rd)	58	107	E	65	257	E	65	108	E	76	300	E
East (Great North Rd)	86	257	F				108	300	F			
North (Pt Chev Rd)	68	219	E				76	249	E			
West (Great North Rd)	49	205	D				54	233	D			

The results of the sensitivity analysis undertaken on Great North Road / Point Chevalier Road / Carrington Road show further, substantial increases in delay on various approaches. This identifies that as already indicated, the northern end of the network is unlikely to be able to accommodate further traffic flows.

However, it has to be considered that:

- This extra traffic is expected to occur at least 10-20 years from now, and only if development proceeds at the fast pace assumed in this ITA and then continues in further areas;
- The intersection has limited realistic potential to improve capacity – in combination with the adjacent motorway the vicinity has already one of the widest traffic environments across Auckland (16 lanes), and further added lanes will not be feasible without severe impacts on both the town centre, and on downstream intersections (moving the queues); and
- The model adds this extra 10% traffic but does not include any assumptions for traffic reductions in the background volumes associated with a further mode shift in Auckland.

As such, it is considered that the results indicate more towards even stronger long-term actions towards reducing single-occupancy car trips, via projects such as the proposed SH16 Rapid Transit (Light Rail) service, that will reduce through traffic currently using the motorway parallel-routes.

It could also indicate that any Precinct development beyond that assumed within this ITA will need to be even more stringently restricted in terms of car use, that shall be progressively feasible with improved mode choice options likely to be available two decades from now.

6.5.3 Unitec Gate 3 / Carrington Road SIDRA

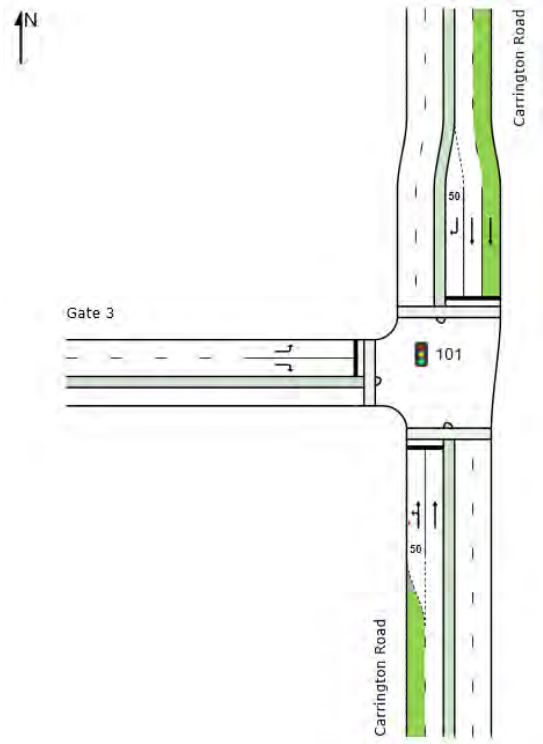


Figure 6-4: SIDRA layout for Gate 3 / Carrington Road (green sections represent bus lanes)

Table 6-40: Sensitivity Test Results for the Gate 3 / Carrington Road intersection

Intersection Approach	Scenario B						Scenario B Sensitivity Test (+10% Precinct Traffic)					
	Approach			Intersection			Approach			Intersection		
	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS
	AM Peak											
South (Carrington Rd)	29	312	C	27	312	C	32	358	C	30	358	C
North (Carrington Road)	20	163	B				21	178	C			
West (Gate 3)	53	35	D				58	42	E			
	PM Peak											
South (Carrington Rd)	34	210	C	29	215	C	29	214	C	27	232	C
North (Carrington Road)	23	215	C				23	232	C			
West (Gate 3)	33	40	C				38	50	D			

The table above shows that there will small differences between the results for Scenario B and Scenario B plus 10% additional Precinct-related traffic. The intersection will operate at acceptable LOS with the additional 10% Precinct-related traffic.

There are some minor increases in queue lengths on Carrington Road, however, these are 95%ile queue lengths, therefore not representative of a typical peak hour situation at this intersection. These increases are also expected to be able to be readily accommodated on Carrington Road. Accordingly, the results do not indicate any need for a wider intersection footprint.

The results, however, provide valuable information regarding the length of dual-lane approach width that future site-internal design should provide (or at least future-proof) within the site on Farm Road. With or without the additional 10% of Precinct-related traffic, queue length on Farm Road is expected to be in the order of 40 – 50m. For comparison, the length of Farm Road between Carrington Road and the internal north-south road along the west of the sports fields is approximately 250m, and therefore can readily accommodate the expected queues.

6.5.4 Woodward Road / Carrington Road

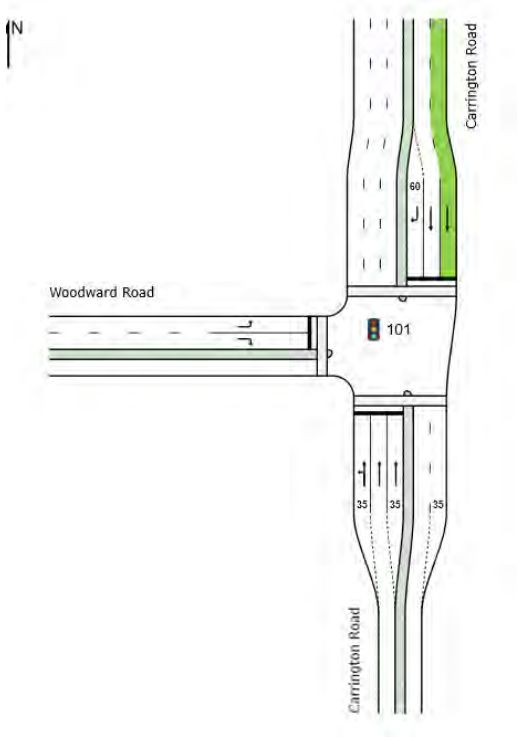


Figure 6-5: SIDRA layout for Woodward Road / Carrington Road (green sections represents bus lanes)

Table 6-41: Sensitivity Test Results for the Woodward Road / Carrington Road Intersection

Intersection Approach	Scenario B						Scenario B Sensitivity Test (+10% Precinct Traffic)					
	Approach			Intersection			Approach			Intersection		
	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS	Delay (s)	95%ile Queue (m)	LOS
	AM Peak											
South (Carrington Rd)	27	56	C	19	84	B	28	61	C	19	94	B
North (Carrington Road)	17	81	B				17	86	B			
West (Woodward Rd)	15	84	B				16	94	B			
	PM Peak											
South (Carrington Rd)	31	39	C	19	110	B	32	41	C	23	154	C
North (Carrington Road)	18	110	B				25	154	C			
West (Woodward Rd)	12	45	B				12	48	B			

The table above shows that there are small differences between results for Scenario B and Scenario B plus 10% additional Precinct related traffic, and intersection will continue operating at acceptable LOS with the additional 10% Precinct-related traffic.

As with the other two intersections above, some minor increases are predicted in terms of the 95%ile queue lengths on the approaches, however are not considered significant and are expected to be able to be readily accommodated on Carrington Road and Woodward Road accordingly.

6.6 Overall Modelling Result Summary

As can be seen within this section, the addition of development traffic onto the network leads to a general reduction in Level of Service, particularly at the northern end of the network. At the southern end, the performance results are much better, and in some cases even see improvement, in part due to AT assumptions of wider-area traffic reducing due to network changes.

General vehicle journey times similarly see no degradation overall, though mid-block travel along Carrington Road sees increases compared to the lower base traffic volume situation. This is again balanced by improvements in the southern part of the network.as per the 2028 MSM data provided by AT as a base for the traffic model.

Additionally, bus journey time analysis shows that Carrington Road bus routes will see clear benefits from the new bus lanes proposed as part of the Carrington Road Upgrade, albeit to ensure consistent advantage of public transport over single-occupancy cars, more intersection-specific bus priority would be required at key locations in addition to the mid-block bus lanes.

General vehicle capacity increases (such as much larger arterial road intersections at the network edges or added general lanes on Carrington Road) are not considered feasible without prohibitive impacts on surrounding town centres in particular. This is also borne out by the additional sensitivity testing, which identifies the key issue as being congested existing arterial/arterial intersections such as Great North Road / Carrington Road, rather than intersections into or closer to the Precinct.

Therefore, it is considered that the model results indicate that the future Carrington Road Upgrade project, and projects such as the Connected Communities project for New North Road, should consider the impacts of the Precinct's expected development into their assumptions [22] to ensure that the impacts are properly considered in the wider network as well as the short and medium distances assessed in this ITA.

However, the added development in the Precinct is already zoned, and creates much less impact on Auckland's overall transport network – including on motorways like SH16 and streets like Great North Road - in this location than if it were located at the end of a motorway further outside the city.

Therefore it is considered that the conclusion to be taken from these modelling results should be an even greater focus on ensuring both the Precinct and Auckland's transport network progress on mode shift, which needs to continue and accelerate in the longer term beyond the current ITA timeframe. This is likely to include further public transport infrastructure, active mode improvements and further restricting car parking rates per dwellings.

[22] As agreed with Auckland Transport and their consultants, Flow Ltd, during February 2020.

7. Policy and Precinct Rules

The following sections compare the transport provisions assumed in this ITA against the objectives of the transport section in the Auckland Unitary Plan Operative in Part. It also compares the ITA assumptions against the directly relevant provisions contained in the objectives, policies and rules of the Wairaka Precinct Plan within the Unitary Plan.

7.1 Auckland Unitary Plan, Section E27 Transport

The Auckland Unitary Plan Operative in Part (AUP-OP) outlines the following objectives in Section E27 – Transport:
Land use and all modes of transport are integrated in a manner that enables:

i) the benefits of an integrated transport network to be realised.

ii) the adverse effects of traffic generation on the transport network to be managed.

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

iv) Parking and loading supports urban growth and the quality compact urban form.

v) The provision of safe and efficient parking, loading and access is commensurate with the character, scale and intensity of the zone.

vi) Pedestrian safety and amenity along public footpaths is prioritised.

vii) Road/rail crossings operate safely with neighbouring land use and development.

The Precinct development aligns well with the above objectives. In particular Objective I II and III are supported by both the internal provision of active mode links, and the connecting to public transport links that are planned for in and around the Precinct, which will be significantly enhanced once the Carrington Road Upgrade occurs.

Objective II also aligns with the proposed reduction of parking provision for the residential and education land uses, as well as the strong focus of road safety in the design, which reduces adverse impacts.

Objective IV is supported by the proposed reduction of parking provision as well. Albeit for both Objective IV as with Objective V, the specific design to support these objectives will be covered in later design stages, which will be underpinned by the design philosophies – particularly those related to road safety – covered in the ITA and expected for any development proposals within it.

Objective VI is a key of the ITA and the Precinct, as high-quality pedestrian provisions and related road safety are necessary not just for this objective in itself, but also to support many of the other objectives of the development

Objective VII also aligns well with the intention design of internal roads ensure slow-speeds and pedestrian prioritisation, as well as provision of new safe crossing facilities along Carrington Road. This ensures that connectivity and safety are maintained for all transport modes between land uses inside and outside of the Precinct.

7.2 Wairaka Precinct Rules

The following rules have been excerpted from the Precinct Rules (Auckland Unitary Plan, Operative in Part, Section I334) for their traffic and transport relevance:

Table 7-1: Precinct Rules Compliance Table

Numbering	Description	Compliance
Objectives		
I334.2(1)	The provision for a high quality of tertiary education institution and accessory activities in the precinct is continued, while also providing for growth, change and diversification of activities	Complies
I334.2(2)	Comprehensive planning and integrated development of all sites within the precinct is achieved	Complies
I334.2(3)	A mix of residential, business, tertiary education and community activities is provided, which maximises the efficient and effective use of land	Complies
I334.2(4)	The healthcare/hospital facility, accessory activities and associated buildings, structures and infrastructure in Sub-precinct A (Mason Clinic) are provided for	Complies – access is provided effectively as is during Scenario A, and improved (traffic signals at Gate 2) in Scenario B
I334.2(5)	The commercial laundry service and accessory activities and associated buildings, structures and infrastructure in Sub-precinct B are provided for	Complies – access is provided effectively as is during Scenario A, and improved (traffic signals at Gate 2) in Scenario B
I334.2(6)	Identified heritage values are retained through the adaptation of the scheduled buildings and retention of identified trees, together with the management of the historic heritage, and Māori sites of significance on Oakley Creek land, and the contribution they make to the precinct's character and landscape, are recognised, protected and enhanced in the precinct	Not directly related to the ITA
I334.2(7)	Open spaces, cycling and pedestrian linkages from the Precinct to the wider area and neighbouring suburbs, including linkages between activities and open space nodes, are provided for and enhanced	Complies – key focus area of the ITA and requirement for individual development area design
I334.2(8)	Development and/or subdivision within the precinct facilitates a transport network that: (a) Integrates with, and avoids, remedies or mitigates adverse effects on the safety and efficiency of, the transport network within the precinct and the surrounding area, including providing any upgrades to the surrounding network; and (b) Facilitates transport choices by providing for pedestrians, cyclists, public transport facilities, and vehicles	(a) Complies – key focus of the ITA and requirement for development area design (b) Complies – key focus of the ITA and requirement for development area design

Numbering	Description	Compliance
I334.2(9)	Development of any roads connecting to the existing roading network to the south of the Precinct must be subject to specific resource consent processes to ensure that any private or public road connections must: (a) Avoid these southern connections becoming a direct vehicle entrance for the Special Purpose - Tertiary Education Zone; and (b) Be designed to minimise the amenity effects on existing residents	(a) Complies – no such vehicular link proposed (b) Complies – traffic volume assumptions using the links are limited in the model to the "Southern" development area uses, and design will prioritise residential amenity via reduced speeds, and active mode priority within the Precinct, and ancillary design in the adjacent streets being developed as part of the Southern development area
I334.2(10)	An integrated urban environment is created, which: (a) Incorporates high quality built form and urban design (b) Recognises, protects and enhances the environmental attributes of Wairaka in planning and development of the Precinct; (c) Avoids, mitigates and remedies adverse effects on the environment and existing stormwater, wastewater and road/s infrastructure, recognising that the precinct stormwater system services areas beyond Wairaka; (d) Is developed in a comprehensive manner, which complements and fits within the landscape and character of the surrounding environment, and (e) Contributes positively to the Mt Albert, Waterview and Point Chevalier communities	Not directly related to the ITA
I334.2(11)	Provide for retail, food and beverage and commercial services in identified locations to serve local demand within the Wairaka Precinct and at a scale and configuration which does not adversely affect the role, function and amenity of the Point Chevalier and Mt Albert town centres	Not directly related to the ITA
Policies		
I334.3(1)	Enable and provide for a wide range of activities, including education, business, office, research, health, recreation, residential accommodation, community facilities and appropriate accessory activities	Not directly related to the ITA
I334.3(2)	Respond to future demand and changes in the manner of learning and the desire to integrate business and education within the Special Purpose - Tertiary Education Zone	Not directly related to the ITA

Numbering	Description	Compliance
I334.3(3)	Recognise the benefits of allocating a high quality tertiary education institution within a diverse urban environment.	Not directly related to the ITA
I334.3(4)	Promote comprehensive planning by enabling integrated development in accordance with the precinct plan that provides for any of the following: (a) Tertiary education and associated research, and community activities; (b) Provision for the ongoing operation of the Mason Clinic; (c) Provision for the operation of the commercial laundry service; (d) Residential accommodation; (e) Economic development and employment; (f) Public infrastructure that is integrated with existing infrastructure, recognising that Wairaka receives stormwater from an upstream sub-catchment; (g) Integrated transport and land use planning through the development of the precinct; (h) Traffic management, including provision of pedestrian and cycle facilities, integration with public transport, parking provision and management; (i) Identification and protection of significant landscape features, the adaptation of the scheduled historic buildings, identified trees and open space network; (j) Public road and open space access to the Oakley Creek reserve; or (k) Pedestrian and cycle connections to Point Chevalier, Waterview and Mt Albert	This section includes numerous key foci of the ITA (a) Complies (b) Complies (c) Complies (d) Complies (e) Complies (f) Not directly related to the ITA (g) Complies – key focus of the ITA (h) Complies – key focus of the ITA (i) Not directly related to the ITA (j) Complies – a network of main internal roads is to be vested as public roads as part of the development process, securing this access - in addition to existing access easements such as the Waterview Shared Path (k) Complies – key focus of the ITA
I334.3(5)	Promote economic activity and provide for employment growth that will create opportunities for students, graduates and residents of the precinct and Auckland.	Not directly related to the ITA
I334.3(6)	Encourage a mix of residential lifestyles and housing typologies to cater for a diverse residential community at Wairaka	Not directly related to the ITA
I334.3(7)	Provide for a mix of residential and business activities which will enable development of a residential core to the Wairaka Precinct	Not directly related to the ITA
I334.3(8)	Enable a broad range of educational, research, laboratory, office and business uses which meet the needs and respond to future changes in teaching, learning, and research requirements for a modern campus environment	Not directly related to the ITA

Numbering	Description	Compliance
I334.3(9)	Provide for a broad range of business, office, innovation and research activities which will encourage employment and economic development to locate in Wairaka, including those which benefit from the co-location with a tertiary education institution	Not directly related to the ITA
I334.3(10)	Enable subdivision and development that is compatible with and sensitive to the ecological qualities of the Oakley Creek and the Motu Manawa Marine Reserve.	Not directly related to the ITA
I334.3(11)	Encourage the retention and adaptation of the heritage and character buildings, and elements identified within the precinct	Not directly related to the ITA
I334.3(12)	Provide for the adaptation of the scheduled part of the heritage building for economically viable activities which ensure ongoing economic sustainability for this building and its integration into the Wairaka Precinct	Not directly related to the ITA
I334.3(13)	Require new buildings to be designed in a manner that provides for a high standard of amenity, recognises landscape values and, where appropriate, enhances the streetscape and gateway locations of the precinct	Not directly related to the ITA
I334.3(14)	Require proposals for new buildings, structures and infrastructure or additions to existing buildings, structures and infrastructure adjoining or adjacent to the scheduled historic heritage buildings, and/or the significant ecological area of Oakley Creek to be sympathetic and provide contemporary and high-quality design, which enhances the precinct's built form and natural landscape	Not directly related to the ITA
I334.3(15)	Provide for public open space, including a neighbourhood park in the northern portion of the precinct	Not directly related to the ITA
I334.3(16)	Provide public connections to Oakley Creek from Carrington Road through public roads and open space, giving quality public access to this ecological area	Complies – a network of main internal roads is to be vested as public roads as part of the development process, securing this access - in addition to existing access easements such as the Waterview Shared Path
I334.3(17)	Require development to maintain and provide a varied and integrated network of pedestrian and cycle linkages, open space and plazas within the precinct	Complies – key focus of the ITA
I334.3(18)	Require the key pedestrian and cycle linkages through the precinct to be direct and convenient, well designed, safe and improve connectivity for all users	Complies – key focus of the ITA
I334.3(19)	Establish a network of roads which give public access through the precinct and a pedestrian and cycling connections to the Oakley Creek and Waterview pedestrian/cycle bridge	Complies – key focus of the ITA

Numbering	Description	Compliance
I334.3(20)	Require subdivision and development to be integrated with transport planning and infrastructure in a way that: (a) Avoids, remedies or mitigates the adverse effects of the development on the transport network; (b) Integrates with rail, bus, pedestrian and cycle connections; (c) Implements as a minimum the transport elements within the Precinct Plan; (d) Supports the provision of passenger transport services, linking to key public transport nodes such as the Mount Albert train station and Point Chevalier public transport services; (e) Minimises traffic effects on pedestrian and residents' safety and amenity; (f) Minimises overflow parking on roads occurring in the vicinity of the precinct; and (g) Stages subdivision and development with necessary surrounding transport network infrastructure and upgrades where adverse effects on the transport network cannot be avoided, remedied and mitigated.	This section includes numerous key foci of the ITA (a) Complies – key focus of the ITA (b) Complies – key focus of the ITA (c) Complies – key focus of the ITA (d) Complies – key focus of the ITA (e) Complies – key focus of the ITA (f) Will comply (g) Will comply
I334.3(21)	Enable parking areas to service the scheduled heritage building	Will comply – future development area design matter
I334.3(22)	Manage the expected traffic generated by activities in the precinct to avoid, remedy and mitigate adverse effects on the safety and efficiency of the surrounding transport network, particularly at peak times. For the purpose of this precinct, the surrounding transport network comprises Carrington Road, the Precinct's existing and proposed access points to Carrington Road, the Carrington Road/Woodward Road intersection, the Woodward Road/New North Road intersection, the Carrington Road/New North Road and Carrington Road/Great North Road intersections, Laurel Street, Renton Road, Rhodes Avenue and the other local roads bounded by Carrington Road, New North Road, and Oakley Creek	Complies – key focus of the ITA (including by having the traffic model area extend beyond the named areas)
I334.3(23)	Require an integrated transport assessment for the precinct for any new development greater than 2,500m² gross floor area in the Business - Mixed Use Zone or greater than 1,000m2 gross floor area in the residential zones, unless that additional development was assessed as part of an earlier assessment of transportation effects that is no more than two years old	Will comply – future development area design matter

Numbering	Description	Compliance
I334.3(24)	Require an integrated transport assessment for the precinct as part of any southern road connection (public or private), the first subdivision in the Business - Mixed Use and residential zones (other than for controlled activities) or for any new development greater than 2,500m2 gross floor area in the Business - Mixed Use Zone or greater than 1,000m2 gross floor area in the residential zones	Will comply – future development area design matter
I334.3(25)	Avoid parking buildings within the Special Purpose - Tertiary Education Zone having direct access from Laurel Street, Renton Road, Rhodes Avenue (or any extension of those roads) or the western road shown on the precinct plan	Will comply & link not assumed in traffic model
I334.3(26)	Avoid direct vehicle access between the Special Purpose - Tertiary Education Zone and Laurel Street, Renton Road, Rhodes Avenue (or any extension of those roads)	Will comply & link not assumed in traffic model
I334.3(27)	Manage potential adverse amenity effects from buildings at the precinct boundary by: (a) Establishing a 5m yard and graduated building heights to the southern residential interface (b) Establishing a 10m setback from the boundary of land that fronts Oakley Creek (c) Require graduated building heights and locate higher buildings away from the precinct boundary	Not directly related to the ITA
I334.3(28)	Encourage built form, activities, public open spaces and infrastructure to be planned and designed on a comprehensive land area basis, rather than on an individual site basis.	Not directly related to the ITA
I334.3(29)	Provide for the retail (including food and beverage) activities in identified locations of the precinct which: (a) meets the needs of the campus; (b) serves local demand within the precinct; and (c) creates the opportunity for retail (including food and beverage) activities in the Historic Heritage overlay	Not directly related to the ITA
I334.3(30)	Limit retail activities (including food and beverage) fronting or accessed directly from Carrington Road, restricting the number and size of supermarkets, preventing the concentration of retail activities at a single location, and placing caps on the size of retail tenancies and the overall gross floor area of retail in order to not adversely affect the role, function and amenity of the Point Chevalier and Mount Albert town centres	Not directly related to the ITA
I334.3(31)	Apply the subdivision controls of the zoning to the subsequent subdivision of the precinct or sub-precinct, subject to that subdivision also meeting the requirements of the precinct plan.	Not directly related to the ITA

Numbering	Description	Compliance
I334.3(32)	Provide for the range of healthcare and related accessory activities of the Mason Clinic in sub-precinct A	Not directly related to the ITA
I334.3(33)	Enable detailed site-specific planning of the Mason Clinic to reflect how the healthcare/hospital facility will be used and developed in sub-precinct A	Not directly related to the ITA
I334.3(34)	Limit the scale of accessory activities so they do not undermine the role of the precinct or result in adverse traffic effects, but still meet the requirements of those who work, live or use services and activities in this sub-precinct A	Not directly related to the ITA
I334.3(35)	Provide for the range of light manufacturing and servicing activities associated with the commercial laundry service for sub-precinct B	Not directly related to the ITA
I334.3(36)	Enable detailed site-specific planning of the commercial laundry service to reflect how the facility will be used and developed in sub-precinct B	Not directly related to the ITA
I334.3(37)	Limit the scale of accessory activities so they do not undermine the role of the sub-precinct B or result in adverse traffic effects, but still meet the requirements of those who work or use services and activities in this sub-precinct	Not directly related to the ITA
I334.3(38)	Recognise that should the commercial laundry service and associated activities on this sub-precinct B relocate from Wairaka, then the activities and controls of the Wairaka Precinct would apply	Will comply
I334.3(39)	Provide a broad range of residential activities adjacent to the Oakley Creek and residential neighbourhoods to the south of the sub-precinct C	Not directly related to the ITA
I334.3(40)	Provide quality dwellings which face west across Oakley Creek, providing passive surveillance of the public lands within Oakley Creek Valley and sub-precinct C	Not directly related to the ITA
Standards		
I334.6.1(1)	Where floodlights are located adjacent to a residential zone, the hours of operation must not extend beyond: (a) 10pm Monday to Saturday; and (b) 7.30pm Sunday and Public Holidays.	Not directly related to the ITA
I334.6.1(2)	Floodlights must comply with the lighting standards in E24.6 Auckland-wide Standards – Lighting.	Not directly related to the ITA
I334.6.2(1)	The following thresholds apply in this precinct: (a) The total gross floor area of retail (including food and beverage and supermarket) must not exceed 6500m2 for the whole precinct: (b) The total gross floor area of retail (including food and beverage) within the Business - Mixed Use Zone must not exceed 4500m2; and (c) The total gross floor area of retail (including food and beverage) within the Special Purpose - Tertiary Education Zone must not exceed 3000m2.	(a) Complies – no (or no threshold-exceeding) development of this type assumed in this ITA. Assumptions include existing uses of this type only (b) See a) above (c) See a) above

Numbering	Description	Compliance
I334.6.2(2)	The total gross floor area of retail (including food and beverage) in the Historic Heritage Place must not exceed 1000 m2 subject to Standard I334.6.2(1)(a) above	No such retail assumed in the ITA / in the ITA timeframes
I334.6.2(3)	All retail activities adjacent within 100m of to the supermarket must not exceed 1200m2	No such activity assumed in the ITA
I334.6.2(4)	Any supermarket, adjacent to and accessed from Farm Road, must not have vehicle access or parking directly off Carrington Road	No such activity assumed in the ITA
I334.6.3(1)	All subdivision and development of the land in the precinct must be consistent with the approved stormwater management plan.	Not directly related to the ITA
I334.6.4(1)	Standards in the table below apply rather than underlying zone heights unless specified. Buildings must not exceed the heights as set out below: *[TABLE OMITTED IN ITA]*	Not directly related to the ITA
I334.6.5(1)	At least 20 per cent of a site within the precinct must be landscaped, provided that the area of landscaping may be proportionately reduced by any required common areas of landscaping within the zone approved by the Council and protected by consent conditions.	Not directly related to the ITA
I334.6.6(1)	Buildings on land within Sub-precinct C adjoining residential zoned land outside the precinct and to the south must be set back a minimum width of 5m from the external precinct boundary. Planting requirements of Standards H13.6.5 and H13.6.6 Business - Mixed Use Zone apply	Not directly related to the ITA
I334.6.6(2)	Buildings on land adjoining Open Space - Conversation zoned land outside the precinct must be set back a minimum width of 10m from the external precinct boundary. Planting requirements of Standards H13.6.5 and H13.6.6 Business - Mixed Use Zone apply	Not directly related to the ITA
I334.6.6(3)	Buildings on land fronting Carrington Road must be set back a minimum width of 28.2m when measured from the eastern edge of the Carrington Road reserve as at 1 November 2015. This setback area may be used for walkways, cycleways, public transport facilities, site access, street furniture, outdoor dining and cafes. Other areas within the 28.2m not used for these activities must be landscaped. This setback does not apply once the road widening affecting the Wairaka Precinct Carrington Road frontage has been vested in the Auckland Council	Not directly related to the ITA
I334.6.7(1)	In addition to any notable tree, Subject to Standard I334.6.7(2) below, the following trees identified in I334.11.2 Precinct plan 2 – protected trees and in Table I334.6.7.1 below must not be altered, removed or have works undertaken within the dripline except as set out in I334.6.7(2) below. Trees located within an existing or future road-widening area along Carrington Road frontage are not subject to this control.	Not directly related to the ITA

Numbering	Description	Compliance
I334.6.7(2)	Tree works to the trees identified below must be carried out in accordance with all of the provisions applying to Notable Trees in D13 Notable Tree Overlay, with the exception that up to 20 per cent of live growth may be removed in any one year. *[TABLE OMITTED IN ITA]*	Not directly related to the ITA
I334.6.8(1)	The primary traffic access to the precinct must be from Carrington Road at locations shown on the Precinct Plan	Complies
I334.6.8(2)	Any retail (including food and beverage) fronting the southern bus node, must not have vehicle access directly off Carrington Road	No such activity assumed in the ITA
I334.6.9(1)	No parking is required for activities located within the scheduled heritage building other than for the provision of loading requirements	Will comply. No development plans within the heritage building (Unitec Hospital) are assumed within the ITA / ITA timeframes
I334.6.9(2)	There must be no parking provided at the bus node for retail activities	No such activity assumed in the ITA

8. Conclusions

In summary, and as described in this assessment, the proposed development of the Precinct will comply with the Precinct objectives, policies and rules as set out in the Unitary Plan.

Furthermore, it will form a best practice example of integrating transport and land use in a suburban setting, and support Auckland's need for more residential development with reduced region-wide transport demands via shorter average trip distances and greater ability to use non-car modes than in comparable developments further away from the centre of the city. This allows more development to be supported by putting less demand on the mutually used transport infrastructure.

The future Precinct is envisioned and committed to providing a transport environment within it, and a network integration to the outside, which support walking, cycling, public transport use and micro-mobility modes, provide a high level of road safety, and discourage reliance on private cars.

Traffic modelling undertaken as part of this assessment shows that, even with reduced private vehicle trip generation, it is not feasible to provide a large new residential development without added private vehicle congestion on the surrounding transport network. However, the proposed upgrades will significantly reduce external impacts compared to a "classic" car-centric suburban development model. At the same time, assumed changes will significantly increase people transport capacity on key corridors such as Carrington Road, by improving safety and convenience for active modes, and improving public transport reliability and journey times. Further upgrades in this regard above and beyond the ITA assumptions are considered the most realistic way of improving transport conditions.

To maximise the transport and land use-integration, the proposed Carrington Road Upgrade has been identified as the key external project on which the landowners and developers of the Precinct and authorities should cooperate on, and where landowners can ensure, by allowing AT to acquire the required land for widening, that the project is much more readily deliverable than in typical suburban environments.

In regards to longer-term further development in the Precinct (beyond the timeframes of this ITA), it is likely that further strategic change would be the most suitable way to enable this, such as significant public transport improvements along State Highway 16 and arterial roads such as Great North Road and New North Road, as well as an even stronger focus on reducing car parking rates per dwelling.

Appendices

Appendix A CAS List

NZ TRANSPORT AGENCY WAKA KOTAHI CAS

Mt Albert

Saved sites

Mt Albert

Crash severity

Fatal Crash, Serious Crash, Minor Crash, Non-Injury Crash

Crash year

2015 — 2020

Plain English report

189 results from your query.

Showing 20 100 1000 results at once.

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Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON RD	162m	S	FIFTH AVENUE	201968284	22/05/2019	Wed	18:23	Ute1 NDB on Carrington Rd lost control but did not leave the road, Ute1 hit bus at bus stop	UTE1, alcohol test above limit or test refused, other inattentive	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON RD		I	GREAT NORTH ROAD	201976182	01/08/2019	Thu	12:45	Car/Wagon1 DIRN on CARRINGTON RD hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, other inattentive	Null	Overcast	Light rain	Crossroads	Traffic Signals	0	0	0
CARRINGTON RD		I	NEW NORTH ROAD	201897728	08/08/2018	Wed	07:10	Car/Wagon1 DIRN on CARRINGTON RD changing lanes to left hit Car/Wagon2	CAR/WAGON1, too far left	Null	Unknown	Null	Nil (Default)	Unknown	0	0	0
CARRINGTON RD		I	NEW NORTH ROAD	201895886	28/11/2018	Wed	15:20	Truck1 NDB on NEW NORTH ROAD overtaking Car/Wagon2	TRUCK1, too far left	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON RD		I	PROSPERO TERRACE	201977706	13/08/2019	Tue	17:18	Bus1 SDB on CARRINGTON ROAD, MOUNT ALBERT, AUCKLAND hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON2, alcohol test below limit BUS1, other inattentive, wrong pedal/foot slipped	Wet	Dark	Light rain	Nil (Default)	Unknown	0	0	0
CARRINGTON RD	60m	N	SEAVIEW TERRACE	201967987	15/09/2019	Sun	13:19	Car/Wagon1 NDB on Carrington road hit Car/Wagon2 merging from the left	CAR/WAGON1, drugs suspected, speed on straight CAR/WAGON2, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Bright sun	Fine	T Junction	Give way	0	0	1

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON RD		I	STUDHOLME ST	2018100346	26/11/2018	Mon	12:45	Car/Wagon1 NDB on Carrington Road turning right hit Car/Wagon2 turning right into AXROAD	CAR/WAGON2, failed to give way at priority traffic control CAR/WAGON1, turned right from incorrect lane	Dry	Overcast	Fine	T Junction	Stop	0	0	0
CARRINGTON RD	36m	S	SUTHERLAND ROAD	201951487	12/03/2019	Tue	08:20	SUV1 NDB on Carrington rd hit Cyclist2 (Age 42) turning right against	SUV1, alcohol test below limit, did not check/notice another party from other dirn, failed to notice signs	Dry	Overcast	Fine	Nil (Default)	Unknown	0	1	0
CARRINGTON RD	30m	N	SUTHERLAND ROAD	201963292	07/08/2019	Wed	08:45	Car/Wagon1 SDB on CARRINGTON ROAD, POINT CHEVALIER, AUCKLAND hit Cyclist2 (Age 32) turning right against	CAR/WAGON1, did not check/notice another party from other dirn CYCLE2, driving or riding in pedestrian space	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	1	0
CARRINGTON RD		I	WILLCOTT STREET	201970104	07/06/2019	Fri	16:30	Car/Wagon1 SDB on CARRINGTON ROAD hit Car/Wagon2 turning right onto AXROAD from the left, Car/Wagon1 hit retaining wall	CAR/WAGON1, alcohol test below limit CAR/WAGON2, alcohol test below limit, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Overcast	Fine	T Junction	Give way	0	0	0
CARRINGTON ROAD	0m			201517038	16/09/2015	Wed	16:35	Motorcycle1 NDB on CARRINGTON ROAD hit Car/Wagon2 turning right onto AXROAD from the left	MOTORCYCLE1, other inattentive, travelled straight ahead from turning lane or flus CAR/WAGON2, failed to give way turning to non-turning traffic, ENV: entering or leaving other commercial	Dry	Overcast	Fine	Driveway	Stop	0	1	0
CARRINGTON ROAD	0m			201544924	26/08/2015	Wed	08:30	Cycle1 SDB on CARRINGTON ROAD sideswiped by Car/Wagon2 SDB on CARRINGTON ROAD turning left	CAR/WAGON2, did not check/notice another party behind, new driver/under instruction	Dry	Bright sun	Fine	T Junction	Traffic Signals	0	0	0
CARRINGTON ROAD	0m			201736682	19/04/2017	Wed	18:40	Car/Wagon1 SDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, following too closely	Dry	Dark	Fine	T Junction	Traffic Signals	0	0	0
CARRINGTON ROAD	0m			201743156	15/06/2017	Thu	22:00	Car/Wagon1 NDB on Carrington Rd hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON1, did not stop at steady red light	Dry	Dark	Fine	T Junction	Traffic Signals	0	0	0
CARRINGTON ROAD	100m	N		201545288	24/08/2015	Mon	08:45	Moped1 NDB on CARRINGTON ROAD sideswiped by Car/Wagon2 NDB on CARRINGTON ROAD turning left	MOPED1, other wrong lane or position CAR/WAGON2, did not check/notice another party behind, other inattentive, ENV: entering or leaving car parking building/area	Dry	Bright sun	Fine	Driveway	Unknown	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON ROAD	0m			201541410	04/05/2015	Mon	12:40	Car/Wagon1 NDB on CARRINGTON ROAD hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, did not stop at steady red light CAR/WAGON1, did not stop at steady red light, ENV: entering or leaving other commercial	Dry	Bright sun	Fine	Driveway	Traffic Signals	0	0	0
CARRINGTON ROAD	110m	N		201611954	18/04/2016	Mon	16:08	Car/Wagon1 SDB on CARRINGTON ROAD hit rear end of Truck2 stop/slow for queue	CAR/WAGON1, wrong pedal/foot slipped	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
CARRINGTON ROAD	20m	S		201611965	05/04/2016	Tue	19:10	Car/Wagon2 turning right hit by oncoming Cycle1 NDB on CARRINGTON ROAD	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way turning to non-turning traffic	Dry	Dark	Fine	Driveway	Nil	0	0	1
CARRINGTON ROAD	0m			201750144	19/09/2017	Tue	13:15	Car/Wagon1 NDB on CARRINGTON ROAD hit PEDESTRIAN crossing road from right side	PEDESTRIAN2, pedestrian running across, heedless of traffic	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD	100m	N	BENFIELD AVENUE	201715129	28/06/2017	Wed	09:30	Car/Wagon1 NDB on CARRINGTON ROAD hit SUV2 U-turning from same direction of travel	SUV2, failed to give way turning to non-turning traffic, windws/helmet/glsses misted\dirty, wipers useless	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
CARRINGTON ROAD		I	COUNSEL TERRACE	201655240	25/11/2016	Fri	17:30	Car/Wagon2 turning right hit by oncoming Motorcycle1 SDB on CARRINGTON ROAD	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way when waved through by other dri MOTORCYCLE1, motor vehicle in cycle lane	Null	Overcast	Null	T Junction	Give way	0	0	0
CARRINGTON ROAD		I	FARM ROAD	201547529	22/09/2015	Tue	16:00	Car/Wagon1 SDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Overcast	Fine	T Junction	Traffic Signals	0	0	0
CARRINGTON ROAD	15m	S	FARM ROAD	201644364	28/07/2016	Thu	09:00	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, following too closely	Dry	Bright sun	Mist or Fog	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD	110m	S	FIFTH AVENUE	201742518	28/06/2017	Wed	18:00	Car/Wagon1 NDB on Carrington Road hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, failed to notice car slowing, stopping/stationary, following too closely	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD		I	FIFTH AVENUE	201745528	26/07/2017	Wed	18:30	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Dark	Null	T Junction	Give way	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON ROAD	10m	N	FONTENOY ST	201510067	06/01/2015	Tue	12:50	Car/Wagon1 NDB on CARRINGTON ROAD hit Car/Wagon2 crossing at right angle from right	CAR/WAGON1, swerved to avoid vehicle CAR/WAGON2, failed to give way entering roadway from driveway, misjudged another vehicle, new driver/under instruction, ENV: entering or leaving other commercial	Dry	Bright sun	Fine	Driveway	Unknown	0	0	2
CARRINGTON ROAD		I	FONTENOY ST	201649523	24/09/2016	Sat	23:45	Van1 NDB on CARRINGTON ROAD hit Car/Wagon2 merging from the right	CAR/WAGON2, failed to give way at priority traffic control	Wet	Dark	Light rain	T Junction	Give way	0	0	0
CARRINGTON ROAD		I	FONTENOY ST	201734040	07/03/2017	Tue	15:35	Cycle1 SDB on CARRINGTON ROAD sideswiped by Truck2 SDB on CARRINGTON ROAD turning left	TRUCK2, did not check/notice another party behind, failed to give way turning to non-turning traffic	Wet	Overcast	Fine	T Junction	Give way	0	0	0
CARRINGTON ROAD	300m	S	GREAT NORTH ROAD	201545026	21/08/2015	Fri	12:20	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, following too closely CAR/WAGON2, suddenly braked	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD		I	GREAT NORTH ROAD	201736762	30/04/2017	Sun	09:15	Car/Wagon1 NDB on CARRINGTON ROAD hit rear of left turning Car/Wagon2 NDB on CARRINGTON ROAD	CAR/WAGON1, following too closely	Wet	Overcast	Light rain	Crossroads	Give way	0	0	0
CARRINGTON ROAD		I	GREAT NORTH ROAD	201547598	05/10/2015	Mon	13:30	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
CARRINGTON ROAD	30m	S	GREAT NORTH ROAD	201738754	13/05/2017	Sat	23:54	Van1 NDB on Carrington road hit rear end of Car/Wagon2 stop/slow for queue	VAN1, alcohol test above limit or test refused	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD	30m	S	GREAT NORTH ROAD	201644535	28/07/2016	Thu	17:50	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stopped/moving slowly	CAR/WAGON1, following too closely, new driver/under instruction	Wet	Dark	Light rain	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD		I	GREAT NORTH ROAD	201535421	05/06/2015	Fri	18:45	Car/Wagon1 SDB on CARRINGTON ROAD changing lanes to left hit Car/Wagon2	CAR/WAGON2, did not check/notice another party behind	Wet	Dark	Light rain	Crossroads	Traffic Signals	0	0	0
CARRINGTON ROAD	5m	S	GREAT NORTH ROAD	201538965	02/06/2015	Tue	18:30	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary, ENV: heavy rain	Wet	Dark	Heavy rain	Crossroads	Traffic Signals	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON ROAD		I	NEW NORTH ROAD	201713411	07/03/2017	Tue	07:30	Car/Wagon1 EDB on Carrington Rd / Mt Albert Rd intersection hit rear of Cyclist2 (Age 42) EDB on Carrington Rd / Mt Albert Rd intersection turning right from centre line	CAR/WAGON1, misjudged another vehicle	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	1
CARRINGTON ROAD	15m	S	PARR ROAD NORTH	201640803	03/06/2016	Fri	14:00	Car/Wagon1 NDB on CARRINGTON ROAD changing lanes to left hit Truck2	CAR/WAGON1, cut in after overtaking	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD		I	PROSPERO TERRACE	201952041	19/03/2019	Tue	09:00	SUV1 NDB on Carrington Road hit rear of Car/Wagon2 NDB on Carrington Road turning right from centre line	SUV1, alcohol test below limit, failed to notice car slowing, stopping/stationary, other attention diverted CAR/WAGON2, alcohol test below limit	Dry	Overcast	Fine	T Junction	Stop	0	0	1
CARRINGTON ROAD	5m	N	PROSPERO TERRACE	201534536	23/03/2015	Mon	13:10	Van1 NDB on CARRINGTON ROAD lost control turning left, Van1 hit non specific kerb, non specific other	VAN1, lost control when turning, new driver/under instruction, wrong pedal/foot slipped, ENV: entering or leaving other commercial	Dry	Bright sun	Fine	Driveway	Nil	0	0	0
CARRINGTON ROAD		I	PROSPERO TERRACE	201634288	15/03/2016	Tue	07:40	Car/Wagon1 NDB on CARRINGTON ROAD changing lanes to left hit Truck2	CAR/WAGON1, did not check/notice another party behind, suddenly turned	Dry	Bright sun	Fine	T Junction	Nil	0	0	0
CARRINGTON ROAD		I	PROSPERO TERRACE	201612151	19/04/2016	Tue	17:44	Car/Wagon2 turning right hit by oncoming Cycle1 SDB on CARRINGTON ROAD	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Overcast	Fine	T Junction	Nil	0	0	1
CARRINGTON ROAD	50m	N	SEAVIEW TERRACE	201647218	07/09/2016	Wed	14:20	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for PEDESTRIAN	CAR/WAGON1, other inattentive	Dry	Overcast	Fine	Driveway	Unknown	0	0	0
CARRINGTON ROAD	60m	S	SEAVIEW TERRACE	201641922	22/06/2016	Wed	12:45	Car/Wagon1 SDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, following too closely	Wet	Overcast	Heavy rain	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD	40m	N	SEAVIEW TERRACE	201636521	09/04/2016	Sat	21:15	Car/Wagon1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, alcohol test below limit, following too closely	Dry	Dark	Fine	T Junction	Traffic Signals	0	0	0
CARRINGTON ROAD	20m	N	SEAVIEW TERRACE	201840450	23/05/2018	Wed	16:45	Van1 SDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stopped/moving slowly	VAN1, following too closely	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON ROAD		I	SEAVIEW TERRACE	201516949	02/07/2015	Thu	08:40	Car/Wagon1 NDB on CARRINGTON ROAD turning right hit Pedestrian2 (Age 30) crossing SIDEROAD from left	CAR/WAGON1, new driver/under instruction, other did not see or look for other party, PEDESTRIAN2, other pedestrian crossing road	Dry	Bright sun	Fine	T Junction	Give way	0	0	1
CARRINGTON ROAD		I	SEAVIEW TERRACE	201519586	22/12/2015	Tue	15:43	Cycle1 EDB on CARRINGTON ROAD hit Car/Wagon2 crossing at right angle from right	CYCLE1, driving or riding in pedestrian space CAR/WAGON2, other visibility limited, speed approaching a traffic control	Dry	Bright sun	Fine	T Junction	Stop	0	0	1
CARRINGTON ROAD	50m	N	SEAVIEW TERRACE	201642496	26/06/2016	Sun	00:48	Car/Wagon1 NDB on CARRINGTON ROAD lost control; went off road to left, Car/Wagon1 hit non specific guard rail, non specific tree	CAR/WAGON1, lost control - road conditions, ENV: slippery road due to rain	Wet	Dark	Light rain	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD	150m	N	SEGAR AVENUE	201616312	23/09/2016	Fri	22:30	Car/Wagon1 SDB on Carrington Rd lost control; went off road to left, Car/Wagon1 hit non specific pole	CAR/WAGON1, alcohol test above limit or test refused, too far left	Dry	Dark	Fine	Nil (Default)	Unknown	0	1	0
CARRINGTON ROAD		I	SEGAR AVENUE	201844796	20/07/2018	Fri	12:09	Car/Wagon1 SDB on SAGER ROAD, MOUNT ALBERT, AUCKLAND hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON1, alcohol test below limit CAR/WAGON2, alcohol test below limit, failed to give way at priority traffic control	Dry	Bright sun	Fine	T Junction	Give way	0	0	0
CARRINGTON ROAD	150m	S	SUTHERLAND ROAD	201615480	25/08/2016	Thu	10:00	Car/Wagon1 SDB on Carrington rd hit rear end of Motorcycle2 stopped/moving slowly	CAR/WAGON1, following too closely	Wet	Overcast	Heavy rain	Nil (Default)	Unknown	0	0	1
CARRINGTON ROAD	40m	S	SUTHERLAND ROAD	201619641	28/10/2016	Fri	07:30	Car/Wagon1 NDB on Carrington Road hit Cyclist2 (Age 34) crossing	CAR/WAGON1, did not stop, other failed to give way	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
CARRINGTON ROAD	20m	S	SUTHERLAND ROAD	201515087	26/05/2015	Tue	16:30	SUV1 NDB on CARRINGTON ROAD hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, failed to give way entering roadway from driveway, ENV: other non-commercial	Wet	Overcast	Light rain	Driveway	Unknown	0	0	1
CARRINGTON ROAD	40m	S	SUTHERLAND ROAD	201712859	14/04/2017	Fri	14:45	Car/Wagon1 SDB on Carrington road hit Pedestrian2 (Age 54) crossing road from right side	CAR/WAGON1, did not check/notice another party from other dirn, failed to give way to a pedestrian, PEDESTRIAN2, suddenly stepped onto pedestrian crossing	Wet	Overcast	Light rain	Nil (Default)	Unknown	0	0	1
CARRINGTON ROAD	40m	S	SUTHERLAND ROAD	201741262	29/05/2017	Mon	15:12	Car/Wagon1 SDB on CARRINGTON ROAD hit rear end of VEHB stop/slow for PEDESTRIAN	CYCLE2, driving or riding in pedestrian space	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON ROAD		I	SUTHERLAND ROAD	201833922	27/02/2018	Tue	11:38	Car/Wagon1 WDB on CARRINGTON ROAD and/or Car/Wagon2 cut corner/swung wide and collided head on	CAR/WAGON1, swung wide at intersection CAR/WAGON2, cutting corner at intersection	Dry	Bright sun	Null	T Junction	Give way	0	0	0
CARRINGTON ROAD	40m	S	SUTHERLAND ROAD	201614530	17/06/2016	Fri	12:45	Car/Wagon1 NDB on CARRINGTON ROAD hit Pedestrian2 (Age 21) crossing road from left side	CAR/WAGON1, failed to give way to a pedestrian, failed to see another party wearing dark clothing	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
CARRINGTON ROAD	50m	S	SUTHERLAND ROAD	201639294	28/05/2016	Sat	11:00	Van1 NDB on CARRINGTON ROAD hit rear end of Car/Wagon2 stop/slow for PEDESTRIAN	VAN1, following too closely	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD	80m	S	SUTHERLAND ROAD	201714630	25/05/2017	Thu	09:15	Car/Wagon1 SDB on Carrington Rd hit Cyclist2 (Age 34) turning right against	CYCLE2, other misjudged speed, distance or position CAR/WAGON1, did not check/notice another party from other dirn	Wet	Overcast	Mist or Fog	Nil (Default)	Unknown	0	1	0
CARRINGTON ROAD	60m	S	TASMAN AVENUE	201649118	02/10/2016	Sun	15:30	Car/Wagon1 SDB on Carrington Road hit VEHB manoeuvring, Car/Wagon1 hit non specific pole	CAR/WAGON1, new driver/under instruction, too far left	Wet	Overcast	Light rain	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD		I	WOODWARD ROAD	201617624	17/11/2016	Thu	11:25	SUV1 NDB on Carrington road hit Car/Wagon2 turning right onto AXROAD from the left	SUV1, did not stop at steady red light, other attention diverted	Wet	Bright sun	Null	T Junction	Traffic Signals	0	0	1
CARRINGTON ROAD		I	WOODWARD ROAD	201541274	05/07/2015	Sun	22:17	Car/Wagon1 SDB on CARRINGTON ROAD hit rear of Car/Wagon2 SDB on CARRINGTON ROAD turning right from centre line	CAR/WAGON1, alcohol test above limit or test refused, failed to notice indication of vehicle in front	Dry	Dark	Fine	T Junction	Give way	0	0	0
CARRINGTON ROAD		I	WOODWARD ROAD	201518867	19/11/2015	Thu	13:40	Truck2 turning right hit by oncoming Car/Wagon1 NDB on CARRINGTON ROAD	TRUCK2, did not check/notice another party from other dirn, failed to give way turning to non-turning traffic	Dry	Overcast	Fine	T Junction	Give way	0	0	1
CARRINGTON ROAD	40m	N	WOODWARD ROAD	201539369	27/05/2015	Wed	22:00	Car/Wagon1 NDB on CARRINGTON ROAD lost control; went off road to right, Car/Wagon1 hit non specific fence	CAR/WAGON1, alcohol suspected, other lost control, speed on straight, stolen vehicle	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
CARRINGTON ROAD		I	WOODWARD ROAD	201740804	24/05/2017	Wed	18:15	Car/Wagon1 SDB on CARRINGTON ROAD hit rear of Car/Wagon2 SDB on CARRINGTON ROAD turning right from centre line	CAR/WAGON1, wrong way in one way street, motorway or roundabou	Wet	Dark	Heavy rain	T Junction	Give way	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
CARRINGTON ROAD		I	WOODWARD ROAD	201512160	27/02/2015	Fri	10:30	Bus2 turning right hit by oncoming Cycle1 NDB on CARRINGTON ROAD	BUS2, did not check/notice another party from other dirn, failed to give way turning to non-turning traffic	Wet	Overcast	Fine	T Junction	Give way	0	0	1
CARRINGTON ROAD		I	WOODWARD ROAD	201657444	07/07/2016	Thu	15:23	SUV2 turning right hit by oncoming Cycle1 NDB on Carrington Road	SUV2, failed to give way turning to non-turning traffic	Wet	Overcast	Light rain	T Junction	Give way	0	0	0
FAIRLEIGH AVENUE	100m	E	JERRAM ST	201617698	07/11/2016	Mon	14:57	Car/Wagon1 EDB on Fairleigh avenue, Mt Albert hit parked veh, Car/Wagon1 hit non specific parked	CAR/WAGON1, alcohol suspected, drugs suspected	Dry	Overcast	Fine	Nil (Default)	Unknown	0	1	0
FARM ROAD	50m	W	CARRINGTON ROAD	201543802	04/08/2015	Tue	13:15	Car/Wagon1 WDB on FARM ROAD hit Car/Wagon2 merging from the right	CAR/WAGON2, failed to give way entering roadway from driveway, ENV: other non-commercial	Dry	Bright sun	Fine	Driveway	Unknown	0	0	0
FIFTH AVENUE	40m	E	CARRINGTON ROAD	201518216	23/08/2015	Sun	14:00	Car/Wagon1 EDB on FIFTH AVENUE hit rear of Car/Wagon2 EDB on FIFTH AVENUE turning right from left side	CAR/WAGON1, failed to notice indication of vehicle in front, overtaking at a junction, ENV: entering or leaving private house / farm	Dry	Bright sun	Fine	Driveway	Nil	0	0	2
GREAT NORTH RD	42m	N	CARRINGTON ROAD	201961443	11/03/2019	Mon	15:45	Truck1 SDB on GREAT NORTH RD overtaking Car/Wagon2	CAR/WAGON2, alcohol test below limit TRUCK1, alcohol test below limit, too far left	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH RD (CWC)		I	CARRINGTON RD	201897789	14/08/2018	Tue	13:55	Car/Wagon1 DIRN on GREAT NORTH RD (CWC) hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, following too closely	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH RD (CWC)		I	CARRINGTON RD	201954413	18/01/2019	Fri	07:34	Ute1 EDB on Great North Road hit rear end of Car/Wagon2 stop/slow for signals	UTE1, failed to notice car slowing, stopping/stationary	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH RD (CWC)	25m	E	POINT CHEVALIER ROAD	201961625	13/03/2019	Wed	14:47	SUV1 WDB on GREAT NORTH ROAD hit SUV2 manoeuvring	SUV1, misjudged own vehicle	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
GREAT NORTH ROAD		I	CARRINGTON ROAD	201833973	08/03/2018	Thu	10:38	load or trailer from Truck1 EDB on Carrington Road hit VEHB	TRUCK1, alcohol test below limit, load, speed entering corner/curve	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH ROAD		I	CARRINGTON ROAD	201834810	03/03/2018	Sat	21:10	Car/Wagon1 WDB on Great north road hit Car/Wagon2 crossing at right angle from right	CAR/WAGON1, alcohol test below limit, did not stop at steady red light CAR/WAGON2, alcohol test below limit	Dry	Dark	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH ROAD	30m	E	CARRINGTON ROAD	201533425	07/02/2015	Sat	02:06	Car/Wagon1 EDB on GREAT NORTH ROAD lost control; went off road to left, Car/Wagon1 hit non specific building, non specific street furniture, non specific traffic sign,	CAR/WAGON1, other lost control, speed on straight	Dry	Dark	Fine	Nil (Default)	Nil	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
GREAT NORTH ROAD		I	CARRINGTON ROAD	201551946	28/11/2015	Sat	17:00	Car/Wagon1 EDB on GREAT NORTH ROAD lost control turning right, Car/Wagon1 hit non specific pole	CAR/WAGON1, lost control when turning, speed entering corner/curve	Wet	Overcast	Fine	Crossroads	Give way	0	0	0
GREAT NORTH ROAD		I	CARRINGTON ROAD	201545023	15/08/2015	Sat	15:00	Car/Wagon1 NDB on GREAT NORTH ROAD hit Car/Wagon2 crossing at right angle from right	CAR/WAGON1, did not stop at steady red light	Wet	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH ROAD		I	CARRINGTON ROAD	201742810	19/06/2017	Mon	11:17	Car/Wagon1 WDB on Great North Road changing lanes/overtaking to right hit Car/Wagon2	CAR/WAGON1, did not check/notice another party from other dirn	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH ROAD	10m	W	CARRINGTON ROAD	201646043	16/08/2016	Tue	18:15	Car/Wagon1 EDB on Great North Road hit rear end of Car/Wagon2 stop/slow for obstruction	CAR/WAGON2, alcohol test below limit CAR/WAGON1, other inattentive, other mechanical, parking brake failed/defective	Dry	Twilight	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH ROAD		I	CARRINGTON ROAD	201712052	25/03/2017	Sat	16:24	Car/Wagon1 WDB on Great north road hit SUV2 turning right onto AXROAD from the left	CAR/WAGON1, failed to give way at priority traffic control, failed to notice control	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	2
GREAT NORTH ROAD	5m	W	POINT CHEVALIER ROAD	201545418	11/08/2015	Tue	08:50	Car/Wagon1 EDB on GREAT NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Null	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
GREAT NORTH ROAD		I	POINT CHEVALIER ROAD	201843230	22/06/2018	Fri	18:00	Car/Wagon2 turning right hit by oncoming SUV1 EDB on GREAT NORTH ROAD	SUV1, did not stop at steady red light	Dry	Overcast	Null	Crossroads	Traffic Signals	0	0	0
MOUNT ALBERT ROAD		I	NEW NORTH ROAD	201533096	17/03/2015	Tue	14:31	Car/Wagon1 NDB on MOUNT ALBERT ROAD hit rear end of Truck2 stop/slow for signals	CAR/WAGON1, following too closely, speed on straight	Dry	Bright sun	Fine	Multileg	Traffic Signals	0	0	0
MOUNT ALBERT ROAD	100m	S	NEW NORTH ROAD	201544917	01/09/2015	Tue	12:00	Car/Wagon1 NDB on MOUNT ALBERT ROAD hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, didnt look/notice other party - visibility obstruc, failed to give way entering roadway from driveway, ENV: entering or leaving private house / farm, visibility limited by parked vehicle	Dry	Bright sun	Fine	Driveway	Unknown	0	0	0
MOUNT ALBERT ROAD	30m	S	NEW NORTH ROAD	201814036	19/05/2018	Sat	09:40	Car/Wagon1 SDB on Mt Albert Rd hit Pedestrian2 (Age 13) crossing road from right side	CAR/WAGON1, alcohol test below limit, PEDESTRIAN2, pedestrian looking the wrong way, stepping out from behind vehicle	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
MOUNT ALBERT ROAD		I	NEW NORTH ROAD	201817167	22/08/2018	Wed	08:54	Car/Wagon1 SDB on NEW NORTH ROAD, MOUNT ALBERT, AUCKLAND hit Pedestrian2 (Age 52) crossing road	CAR/WAGON1, alcohol test below limit, did not check/notice another party from other dirn, PEDESTRIAN2, failed to see another party wearing dark clothing, pedestrian working on road	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	1	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
MOUNT ALBERT ROAD	30m	S	NEW NORTH ROAD	201976993	08/08/2019	Thu	11:35	Car/Wagon1 NDB on Mount Albert Road hit rear end of Van2 stop/slow for queue	VAN2, alcohol test below limit CAR/WAGON1, alcohol suspected, drugs suspected, failed to notice car slowing, stopping/stationary VAN3, alcohol test below limit	Wet	Overcast	Light rain	Nil (Default)	Nil	0	0	0
MT ALBERT RD	73m	S	NEW NORTH ROAD	201895918	02/12/2018	Sun	15:45	Car/Wagon1 NDB on MOUNT ALBERT ROAD hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, failed to give way entering roadway from driveway	Dry	Bright sun	Fine	Driveway	Nil	0	0	0
MT ALBERT RD (SANDRINGHAM)		I	NEW NORTH ROAD	201898719	16/10/2018	Tue	11:35	Truck1 DIRN on MT ALBERT RD (SANDRINGHAM) changing lanes to left hit Car/Wagon2	TRUCK1, too far left	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
NEW NORTH RD		I	CARRINGTON ROAD	201899839	19/11/2018	Mon	15:10	Bus1 SDB on NEW NORTH ROAD changing lanes/overtaking to right hit Car/Wagon2	BUS1, alcohol test below limit, incorrect merging/diverging manoeuvre, other failed to give way CAR/WAGON2, alcohol test below limit	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH RD		I	RICHARDSON ROAD	201971233	18/06/2019	Tue	07:00	Car/Wagon1 NDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Dark	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH RD	84m	S	WOODWARD ROAD	201959114	15/02/2019	Fri	22:48	Left scene1 DIRN on NEW NORTH RD changing lanes to left hit Car/Wagon2	LEFT SCENE1, cut in after overtaking, speed on straight CAR/WAGON2, alcohol test below limit	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
NEW NORTH ROAD		I	CARRINGTON ROAD	201655055	12/12/2016	Mon	13:53	Car/Wagon1 NDB on new north rd overtaking Car/Wagon2	CAR/WAGON1, too far left	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	40m	E	CARRINGTON ROAD	201816329	19/07/2018	Thu	17:40	Car/Wagon1 WDB on NEW NORTH ROAD, MOUNT ALBERT, AUCKLAND hit Pedestrian2 (Age 21) crossing road from left side	PEDESTRIAN2, miscellaneous pedestrian, pedestrian walking across heedless of traffic	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	1
NEW NORTH ROAD	20m	E	CARRINGTON ROAD	201553837	08/11/2015	Sun	15:45	Car/Wagon1 EDB on NEW NORTH ROAD hit Car/Wagon2 parking/unparking	CAR/WAGON1, did not check/notice another party from other dirn	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	0
NEW NORTH ROAD	20m	N	CARRINGTON ROAD	201844294	20/06/2018	Wed	17:18	Car/Wagon1 NDB on NEW NORTH ROAD hit rear end of Van2 stop/slow for queue	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Wet	Dark	Null	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD		I	CARRINGTON ROAD	201512784	18/05/2015	Mon	21:14	Car/Wagon1 WDB on NEW NORTH ROAD hit Car/Wagon2 crossing at right angle from right	CAR/WAGON1, alcohol test below limit, did not stop at steady red light	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	2
NEW NORTH ROAD	15m	S	CARRINGTON ROAD	201654331	24/11/2016	Thu	17:15	Car/Wagon1 NDB on NEW NORTH ROAD hit rear end of Van2 stop/slow for queue	CAR/WAGON1, attention diverted by navigation device, failed to notice car slowing, stopping/stationary	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
NEW NORTH ROAD	30m	N	CARRINGTON ROAD	201741948	02/06/2017	Fri	07:15	Car/Wagon1 SDB on NEW NORTH ROAD changing lanes/overtaking to right hit Car/Wagon2	CAR/WAGON1, did not check/notice another party from other dirn	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	30m	S	CARRINGTON ROAD	201534596	25/04/2015	Sat	15:05	Car/Wagon1 EDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, following too closely, other inattentive	Dry	Bright sun	Fine	Nil (Default)	Nil	0	0	0
NEW NORTH ROAD		I	MOUNT ALBERT ROAD	201730672	04/01/2017	Wed	17:45	Car/Wagon2 turning right hit by oncoming Car/Wagon1 SDB on New North Road	CAR/WAGON2, did not stop at steady red light	Dry	Overcast	Fine	Multileg	Traffic Signals	0	0	0
NEW NORTH ROAD		I	MOUNT ALBERT ROAD	201848754	26/09/2018	Wed	06:20	Car/Wagon1 NDB on NEW NORTH ROAD, MOUNT ALBERT, AUCKLAND hit Car/Wagon2 crossing at right angle from right	CAR/WAGON2, alcohol test below limit, did not stop at steady red light CAR/WAGON1, alcohol test below limit	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD		I	MOUNT ALBERT ROAD	201911047	01/01/2019	Tue	00:18	Car/Wagon1 NDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, following too closely, other inappropriate speed	Wet	Dark	Light rain	Crossroads	Traffic Signals	0	0	1
NEW NORTH ROAD	30m	S	MOUNT ALBERT ROAD	201743583	30/06/2017	Fri	14:15	Bus1 NDB on NEW NORTH ROAD changing lanes to left hit Car/Wagon2	BUS1, misjudged own vehicle	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	25m	S	MOUNT ALBERT ROAD	201647856	18/08/2016	Thu	06:15	Car/Wagon1 SDB on NEW NORTH ROAD hit Car/Wagon2 parking/unparking	CAR/WAGON2, did not check/notice another party behind	Dry	Dark	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD		I	RICHARDSON ROAD	201518090	13/11/2015	Fri	08:30	Car/Wagon1 EDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for cross traffic	CAR/WAGON1, following too closely, other inattentive	Dry	Bright sun	Null	T Junction	Give way	0	0	1
NEW NORTH ROAD		I	RICHARDSON ROAD	201511840	15/03/2015	Sun	09:15	passenger fell while boarding Truck1	TRUCK1, intentionally leaving/boarding moving vehicle	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	1	0
NEW NORTH ROAD	110m	W	RICHARDSON ROAD	201655128	13/12/2016	Tue	22:30	Car/Wagon1 EDB on New North Rd hit Car/Wagon2 merging from the left , Car/Wagon2 hit non specific parked	CAR/WAGON2, failed to signal in time, misjudged own vehicle	Dry	Dark	Fine	Driveway	Nil	0	0	0
NEW NORTH ROAD		I	RICHARDSON ROAD	201737585	21/04/2017	Fri	17:20	Car/Wagon1 NDB on New North Road changing lanes to left hit Car/Wagon2	CAR/WAGON1, other vehicle controls	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	10m	S	RICHARDSON ROAD	201536679	24/05/2015	Sun	10:00	Car/Wagon1 NDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, following too closely	Wet	Overcast	Light rain	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	70m	W	RICHARDSON ROAD	201635269	04/04/2016	Mon	09:20	Truck1 NDB on NEW NORTH ROAD hit rear of left turning SUV2 NDB on NEW NORTH ROAD	SUV2, failed to signal in time TRUCK1, swerved to avoid vehicle	Dry	Bright sun	Fine	Driveway	Nil	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
NEW NORTH ROAD		I	RICHARDSON ROAD	201755263	27/11/2017	Mon	09:15	Car/Wagon1 NDB on New north road overtaking SUV2	SUV2, too far right CAR/WAGON1, too far left	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	60m	E	RICHARDSON ROAD	201834374	10/03/2018	Sat	10:45	Car/Wagon1 NDB on Nnr hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, following too closely, new driver/under instruction	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
NEW NORTH ROAD		I	RICHARDSON ROAD	201533406	18/02/2015	Wed	16:45	Truck1 NDB on NEW NORTH ROAD overtaking Car/Wagon2	TRUCK1, blind spot, misjudged another vehicle	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	20m	N	RICHARDSON ROAD	201531955	17/01/2015	Sat	13:36	Car/Wagon1 SDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, following too closely	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	30m	N	RICHARDSON ROAD	201534681	28/02/2015	Sat	20:30	Car/Wagon2 turning right hit by oncoming Car/Wagon1 SDB on NEW NORTH ROAD	CAR/WAGON2, didnt look/notice other party - visibility obstruc, failed to give way when waved through by other dri, ENV: other non-commercial	Dry	Bright sun	Fine	Driveway	Nil	0	0	0
NEW NORTH ROAD	15m	N	RICHARDSON ROAD	201539660	16/06/2015	Tue	07:15	Car/Wagon1 SDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Dark	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD		I	WOODWARD ROAD	201531027	02/01/2015	Fri	13:35	Car/Wagon1 SDB on NEW NORTH ROAD hit Car/Wagon2 crossing at right angle from right	CAR/WAGON2, did not stop at steady red light	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD		I	WOODWARD ROAD	201730150	01/01/2017	Sun	13:45	Van1 NDB on New North Rd hit rear end of SUV2 stop/slow for signals	VAN1, failed to notice control	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD	140m	W	WOODWARD ROAD	201742273	17/06/2017	Sat	13:30	Car/Wagon1 EDB on NEW NORTH ROAD changing lanes/overtaking to right hit Car/Wagon2	CAR/WAGON1, did not check/notice another party from other dirn, weaving or cut in on multi-lane roads	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
NEW NORTH ROAD	70m	S	WOODWARD ROAD	201738114	21/02/2017	Tue	09:39	Car/Wagon2 turning right hit by oncoming Car/Wagon1 SDB on New North Road	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way when waved through by other dri	Dry	Bright sun	Fine	Driveway	Nil	0	0	0
NEW NORTH ROAD	15m	W	WOODWARD ROAD	201511277	26/01/2015	Mon	14:40	Car/Wagon1 NDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	1
NEW NORTH ROAD		I	WOODWARD ROAD	201550100	30/11/2015	Mon	09:50	Car/Wagon1 EDB on NEW NORTH ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, following too closely	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
NEW NORTH ROAD		I	WOODWARD ROAD	201713805	20/05/2017	Sat	11:30	Van1 SDB on Woodward Rd hit SUV2 crossing at right angle from right	SUV2, did not stop at steady red light, failed to notice control	Wet	Overcast	Fine	Crossroads	Traffic Signals	0	0	1

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
NEWCASTLE TERRACE	150m	S	JERSEY AVENUE	201720863	25/12/2017	Mon	15:00	Car/Wagon1 SDB on NEWCASTLE TERRACE hit Pedestrian2 (Age 51)	CAR/WAGON1, other postion on road	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
POINT CHEVALIER ROAD		I	GREAT NORTH ROAD	201735249	16/03/2017	Thu	17:50	Car/Wagon1 SDB on POINT CHEVALIER ROAD hit rear end of VEHB stopped/moving slowly	CAR/WAGON1, too far left	Dry	Bright sun	Fine	Crossroads	Traffic Signals	0	0	0
POINT CHEVALIER ROAD		I	GREAT NORTH ROAD	201837554	13/04/2018	Fri	10:15	Van1 SDB on POINT CHEVALIER ROAD hit rear end of Car/Wagon2 stop/slow for cross traffic	VAN1, following too closely	Dry	Overcast	Fine	T Junction	Give way	0	0	0
POINT CHEVALIER ROAD	10m	W	SH 16	201516682	03/08/2015	Mon	06:43	Motorcycle1 EDB on POINT CHEVALIER ROAD lost control; went off road to left	MOTORCYCLE1, lost control under braking, speed on straight, suddenly braked, ENV: slippery road due to rain	Wet	Dark	Fine	T Junction	Nil	0	0	1
RICHARDSON RD (OWAIRAKA)		I	NEW NORTH RD	201899288	09/11/2018	Fri	16:38	Car/Wagon1 NDB on RICHARDSON ROAD, MOUNT ALBERT, AUCKLAND hit rear end of Ute2 stop/slow for signals	CAR/WAGON1, attention diverted by passengers, failed to notice car slowing, stopping/stationary	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
RICHARDSON RD (OWAIRAKA)		I	NEW NORTH ROAD	201963877	08/04/2019	Mon	22:15	Car/Wagon1 NDB on RICHARDSON ROAD hit rear end of SUV2 stop/slow for signals	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Dark	Null	Crossroads	Traffic Signals	0	0	0
RICHARDSON RD (OWAIRAKA)	35m	S	NEW NORTH ROAD	201963958	09/04/2019	Tue	22:45	Car/Wagon1 NDB on RICHARDSON ROAD, MOUNT ALBERT, AUCKLAND lost control; went off road to left, Car/Wagon1 hit power pole	CAR/WAGON1, alcohol test below limit, fatige due to long day (working/recreation), too far left	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
RICHARDSON RD (OWAIRAKA)		I	NEW NORTH ROAD	201967134	03/09/2019	Tue	10:00	Truck1 NDB on Richardson Road hit Ute2 crossing at right angle from right	TRUCK1, alcohol test below limit UTE2, alcohol test below limit, did not stop at steady red light	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	2
RICHARDSON ROAD	60m	S	NEW NORTH ROAD	201750221	02/09/2017	Sat	11:00	Car/Wagon1 SDB on RICHARDSON ROAD hit parked veh, Car/Wagon1 hit non specific parked	CAR/WAGON1, too far left	Dry	Bright sun	Null	Nil (Default)	Unknown	0	0	0
RICHARDSON ROAD		I	NEW NORTH ROAD	201850162	18/06/2018	Mon	20:20	Car/Wagon1 NDB on WOODWARD ROAD, MOUNT ALBERT, AUCKLAND hit Car/Wagon2 merging from the left	CAR/WAGON1, alcohol test above limit or test refused, evading enforcement, speed entering corner/curve	Wet	Dark	Fine	Crossroads	Traffic Signals	0	0	0
RICHARDSON ROAD	50m	S	NEW NORTH ROAD	201839264	13/05/2018	Sun	14:28	Car/Wagon1 SDB on RICHARDSON ROAD, MOUNT ALBERT, AUCKLAND hit parked veh, Car/Wagon1 hit non specific parked	CAR/WAGON1, alcohol test below limit, attention diverted by food, cigarettes, beverages, too far left	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
RICHARDSON ROAD		I	NEW NORTH ROAD	201848023	06/09/2018	Thu	19:00	Car/Wagon1 SDB on New north road hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON1, alcohol test below limit, following too closely CAR/WAGON2, alcohol test below limit	Wet	Dark	Light rain	Crossroads	Traffic Signals	0	0	0
RICHARDSON ROAD	30m	S	NEW NORTH ROAD	201550107	11/12/2015	Fri	17:30	Car/Wagon1 NDB on RICHARDSON ROAD hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, following too closely, other inattentive	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
RICHARDSON ROAD	70m	S	NEW NORTH ROAD	201642124	08/07/2016	Fri	00:41	Car/Wagon1 NDB on Richardson road hit Car/Wagon2 headon on straight, Car/Wagon1 hit non specific parked	CAR/WAGON1, alcohol test above limit or test refused, too far right, ENV: heavy rain, slippery road due to rain	Wet	Dark	Heavy rain	Nil (Default)	Unknown	0	0	0
RICHARDSON ROAD		I	NEW NORTH ROAD	201841620	06/06/2018	Wed	14:56	Truck1 NDB on Richardson Road, Mount Albert hit rear end of Car/Wagon2 stop/slow for signals	TRUCK1, failed to notice car slowing, stopping/stationary	Wet	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
RICHARDSON ROAD		I	WOODWARD ROAD	201646413	23/08/2016	Tue	16:30	SUV1 NDB on RICHARDSON ROAD hit rear end of Car/Wagon2 stop/slow for signals	CAR/WAGON2, emotionally upset/road rage SUV1, failed to notice car slowing, stopping/stationary, impaired ability due to old age	Dry	Overcast	Fine	Crossroads	Traffic Signals	0	0	0
SH 16	0m			201513775	04/06/2015	Thu	17:30	Car/Wagon1 WDB on SH 16 changing lanes to left hit Motorcycle2	CAR/WAGON1, did not check/notice another party behind, other inattentive MOTORCYCLE2, following too closely, misjudged own vehicle, ENV: slippery road due to rain	Wet	Dark	Light rain	Nil (Default)	Unknown	0	0	1
SH 16	0m			201649134	01/09/2016	Thu	07:10	Car/Wagon1 EDB on Shwy 16 hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, failed to notice car slowing, stopping/stationary, following too closely	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	0
SH 16	15m	E		201737666	28/03/2017	Tue	10:45	Car/Wagon1 EDB on Sh16 hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, failed to notice car slowing, stopping/stationary, following too closely	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	0
SH 16	0m			201630453	03/01/2016	Sun	18:37	Van1 WDB on SH 16 lost control; went off road to left, Van1 hit non specific guard rail	VAN1, alcohol test below limit, fatige due to long day (working/recreation)	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
SH 16		I	WATERVIEW OFF WBD	201817081	23/06/2018	Sat	16:50	Car/Wagon1 WDB on SH 16 hit rear end of Motorcycle2 stop/slow for queue	CAR/WAGON1, alcohol test below limit, attention diverted by food, cigarettes, beverages, failed to notice car slowing, stopping/stationary MOTORCYCLE2, alcohol test below limit	Dry	Bright sun	Fine	T Junction	Nil	0	0	1

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
SH 16		I	WATERVIEW OFF WBD	201645525	12/08/2016	Fri	17:51	Car/Wagon1 WDB on Sh16 hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, attention diverted by navigation device, following too closely	Dry	Twilight	Fine	T Junction	Nil	0	0	0
SH 16		I	WATERVIEW OFF WBD	201516059	08/08/2015	Sat	02:27	Car/Wagon1 WDB on SH 16 lost control but did not leave the road, Car/Wagon1 hit non specific guard rail	CAR/WAGON1, alcohol test above limit or test refused, other lost control, ENV: slippery road due to rain	Wet	Dark	Light rain	T Junction	Nil	0	0	1
SH 16		I	WATERVIEW OFF WBD	201637733	26/03/2016	Sat	17:35	Car/Wagon1 WDB on SH 16 changing lanes to left hit SUV2	CAR/WAGON1, did not check/notice another party from other dirn	Dry	Bright sun	Fine	T Junction	Nil	0	0	0
SH 16		I	WATERVIEW OFF WBD	201748737	15/08/2017	Tue	14:50	Car/Wagon1 WDB on SH 16 hit rear end of Motorcycle2 stop/slow for queue	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Dry	Overcast	Fine	T Junction	Give way	0	0	0
SH 16		I	WATERVIEW OFF WBD	201618056	21/11/2016	Mon	08:33	Car/Wagon1 EDB on State highway 16 changing lanes/overtaking to right hit Motorcycle2	CAR/WAGON1, did not check/notice another party from other dirn, other inattentive	Dry	Bright sun	Fine	T Junction	Nil	0	0	1
SPRINGLEIGH AVE	20m	E	Renton Road	201895555	03/11/2018	Sat	22:00	Car/Wagon1 DIRN on SPRINGLEIGH AVENUE hit parked veh, Car/Wagon1 hit parked (unattended) vehicle, roadwork cone, Car/Wagon2 hit kerb	CAR/WAGON1, too far left	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
SPRINGLEIGH AVENUE	50m	E	LAUREL ST	201846980	10/08/2018	Fri	08:10	Car/Wagon1 EDB on SPRINGLEIGH AVENUE hit SUV2 reversing along road	SUV2, did not check/notice another party behind	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
SPRINGLEIGH AVENUE	20m	E	RENTON ROAD	201633716	29/02/2016	Mon	11:45	Truck1 EDB on SPRINGLEIGH AVENUE hit parked veh, Truck1 hit non specific parked	CAR/WAGON2, sudden illness	Wet	Overcast	Light rain	Nil (Default)	Unknown	0	0	0
SUTHERLAND ROAD	30m	E	CARRINGTON ROAD	201732076	20/01/2017	Fri	09:35	Cycle1 WDB on SUTHERLAND ROAD hit turning VEHB	CYCLE2, failed to give way entering roadway from driveway	Dry	Overcast	Fine	Driveway	Nil	0	0	0
WATERVIEW OFF WBD	30m	W	SH 16	201653591	10/11/2016	Thu	18:15	Car/Wagon1 WDB on Great north road off ramp hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, following too closely	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
WATERVIEW OFF WBD	40m	W	SH 16	201553089	19/12/2015	Sat	18:09	Car/Wagon1 WDB on WATERVIEW OFF WBD hit rear end of SUV2 stop/slow for queue	CAR/WAGON1, following too closely CAR/WAGON3, following too closely VAN4, attention diverted fiding intersection, house, etc, other mechanical	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
WATERVIEW OFF WBD	30m	W	SH 16	201720502	14/12/2017	Thu	18:52	Car/Wagon1 WDB on Northwestern motorway hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON2, alcohol test below limit CAR/WAGON1, alcohol test above limit or test refused, failed to notice car slowing, stopping/stationary, following too closely SUV3, alcohol test below limit	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
WILLCOTT ST	70m	S	CARRINGTON ROAD	201840551	19/05/2018	Sat	12:30	Car/Wagon1 SDB on WILLCOTT ST hit parked veh, Car/Wagon1 hit non specific parked	CAR/WAGON1, too far left	Wet	Overcast	Null	Nil (Default)	Unknown	0	0	0
WILLCOTT ST	170m	E	WOODWARD ROAD	201536292	11/04/2015	Sat	13:57	Car/Wagon1 WDB on WILLCOTT ST overtaking hit Car/Wagon2 WDB on WILLCOTT ST turning right, Car/Wagon1 hit non specific parked	CAR/WAGON1, other inattentive, overtaking vehicle signalling right turn, ENV: entering or leaving private house / farm	Dry	Bright sun	Fine	Driveway	Unknown	0	0	0
WOODWARD RD	15m	S	FAIRLEIGH AVE	201898528	29/09/2018	Sat	06:55	Car/Wagon1 SDB on WOODWARD ROAD, MOUNT ALBERT, AUCKLAND hit Car/Wagon2 headon on straight , Car/Wagon2 hit parked (unattended) vehicle	CAR/WAGON1, too far right CAR/WAGON2, alcohol test above limit or test refused	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
WOODWARD RD	33m	S	SPRINGLEIGH AVE	201898283	13/09/2018	Thu	09:00	Car/Wagon1 DIRN on WOODWARD RD hit parked veh, Car/Wagon1 hit parked (unattended) vehicle	CAR/WAGON1, too far left	Dry	Bright sun	Null	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD		I	CARRINGTON ROAD	201612314	13/04/2016	Wed	21:47	Car/Wagon1 SDB on WOODWARD ROAD lost control turning right, Car/Wagon1 hit non specific tree	CAR/WAGON1, alcohol test below limit, lost control under acceleration, lost control when turning	Dry	Dark	Fine	T Junction	Give way	0	0	3
WOODWARD ROAD	170m	W	CARRINGTON ROAD	201758369	26/11/2017	Sun	05:45	SUV1 NDB on Woodward Rd lost control; went off road to right, SUV1 hit non specific tree	SUV1, alcohol suspected, fatigue due to lack of sleep	Dry	Twilight	Fine	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD	100m	S	CARRINGTON ROAD	201517335	11/10/2015	Sun	00:26	Motorcycle1 SDB on WOODWARD ROAD hit parked veh, Motorcycle1 hit non specific parked	MOTORCYCLE1, fatige due to long day (working/recreation), too far left, ENV: street lighting inadequate	Dry	Dark	Fine	Nil (Default)	Nil	0	0	1
WOODWARD ROAD		I	CARRINGTON ROAD	201818132	16/09/2018	Sun	17:30	Car/Wagon1 SDB on Woodward Road lost control turning right, Car/Wagon1 hit non specific kerb, non specific tree	CAR/WAGON1, alcohol suspected, lost control when turning	Dry	Overcast	Fine	T Junction	Give way	0	0	1
WOODWARD ROAD	60m	N	HARBUTT AVENUE	201616346	21/09/2016	Wed	08:15	Car/Wagon1 NDB on Woodward Rd lost control turning right, Car/Wagon1 hit non specific pole	CAR/WAGON1, lost control when turning, speed entering corner/curve	Wet	Overcast	Light rain	Nil (Default)	Unknown	0	0	1

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
WOODWARD ROAD		I	HARBUTT AVENUE	201644161	22/07/2016	Fri	18:53	Van1 NDB on Woodward rd hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way at priority traffic control VAN1, other lost control	Wet	Dark	Heavy rain	Crossroads	Stop	0	0	0
WOODWARD ROAD	40m	S	HARBUTT AVENUE	201820314	22/11/2018	Thu	21:15	Car/Wagon1 NDB on Woodward Rd, Mt Albert hit Car/Wagon2 headon on straight	CAR/WAGON1, alcohol test above limit or test refused, speed on straight, too far right	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	1
WOODWARD ROAD	15m	N	JERSEY AVENUE	201538925	12/05/2015	Tue	13:50	Car/Wagon1 NDB on WOODWARD ROAD hit Car/Wagon2 U-turning from same direction of travel	CAR/WAGON2, did not check/notice another party behind, ENV: slippery road due to rain	Wet	Overcast	Light rain	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD	60m	N	NEW NORTH ROAD	201740895	22/05/2017	Mon	20:15	SUV1 SDB on WOODWARD ROAD hit rear end of Car/Wagon2 stopped/moving slowly	SUV1, failed to notice car slowing, stopping/stationary	Dry	Dark	Fine	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD	20m	N	RICHARDSON ROAD	201545192	09/08/2015	Sun	03:10	Car/Wagon1 SDB on WOODWARD ROAD hit Car/Wagon2 manoeuvring, Car/Wagon1 hit non specific parked	CAR/WAGON1, did not check/notice another party behind, ENV: entering or leaving service station	Dry	Dark	Fine	Driveway	Nil	0	0	0
WOODWARD ROAD	100m	N	SPRINGLEIGH AVENUE	201711807	06/03/2017	Mon	20:10	Car/Wagon1 SDB on Woodward Road hit Pedestrian2 (Age 7) crossing road from left side	PEDESTRIAN2, pedestrian running across, heedless of traffic, ENV: visibility limited by parked vehicle	Dry	Dark	Fine	Nil (Default)	Unknown	0	1	0
WOODWARD ROAD	40m	S	SPRINGLEIGH AVENUE	201711474	07/03/2017	Tue	07:12	Car/Wagon1 SDB on Woodward hit parked veh, Car/Wagon1 hit non specific parked, Car/Wagon2 hit non specific parked	CAR/WAGON1, attention diverted by food, cigarettes, beverages, too far left	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	1
WOODWARD ROAD	100m	N	SPRINGLEIGH AVENUE	201842441	16/06/2018	Sat	10:08	Car/Wagon1 NDB on WOODWARD ROAD, MOUNT ALBERT, AUCKLAND hit parked veh, Car/Wagon1 hit non specific parked, Car/Wagon2 hit non specific tree	CAR/WAGON1, alcohol test below limit, too far left	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD	160m	N	SPRINGLEIGH AVENUE	201736219	11/04/2017	Tue	17:30	Truck1 NDB on WOODWARD ROAD hit parked veh, Truck1 hit non specific parked	TRUCK1, too far left	Dry	Twilight	Fine	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD	190m	N	SPRINGLEIGH AVENUE	201755573	26/11/2017	Sun	12:20	SUV1 NDB on Woodward road lost control; went off road to right, SUV1 hit non specific tree	SUV1, other postion on road	Dry	Overcast	Fine	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD	30m	S	SPRINGLEIGH AVENUE	201550061	24/11/2015	Tue	09:18	Car/Wagon1 SDB on WOODWARD ROAD hit parked veh, Car/Wagon1 hit non specific parked	CAR/WAGON1, other attention diverted, too far left	Dry	Bright sun	Fine	T Junction	Stop	0	0	0

Crash road	Distance	Direction	Side road	ID	Date	Day of week	Time	Description of events	Crash factors	Surface condition	Natural light	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor
WOODWARD ROAD		I	SPRINGLEIGH AVENUE	201814097	17/03/2018	Sat	07:56	Van2 turning right hit by oncoming Car/Wagon1 NDB on Woodward Road, Mt Albert	CAR/WAGON1, alcohol test below limit VAN2, alcohol test below limit, did not check/notice another party from other dirn, failed to give way turning to non-turning traffic	Dry	Overcast	Fine	T Junction	Stop	0	0	1
WOODWARD ROAD	50m	N	WILLCOTT ST	201647018	29/08/2016	Mon	15:55	Car/Wagon1 SDB on WOODWARD ROAD hit parked veh, Car/Wagon1 hit non specific parked	CAR/WAGON1, too far left	Dry	Bright sun	Null	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD	50m	S	WILLCOTT ST	201738092	28/03/2017	Tue	17:10	Car/Wagon1 SDB on Woodward Rd hit rear end of Car/Wagon2 stopped/moving slowly	CAR/WAGON1, alcohol test above limit or test refused, failed to notice car slowing, stopping/stationary	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	0
WOODWARD ROAD		I	WILLCOTT ST	201510983	20/04/2015	Mon	17:35	Moped1 SDB on WOODWARD ROAD hit Car/Wagon2 crossing at right angle from right	MOPED1, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Bright sun	Fine	Crossroads	Stop	0	0	1
WOODWARD ROAD		I	WILLCOTT ST	201638430	10/05/2016	Tue	20:28	Car/Wagon1 SDB on WOODWARD ROAD lost control; went off road to left , Car/Wagon2 hit non specific traffic island	CAR/WAGON1, swerved to avoid vehicle CAR/WAGON2, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Dark	Fine	Crossroads	Stop	0	0	0
Z	120m	W	CARRINGTON ROAD	201614799	28/07/2016	Thu	08:40	Car/Wagon1 NDB on Unnamed Road hit Pedestrian2 (Age 26) crossing road from left side	CAR/WAGON1, attention diverted fiding intersection, house, etc, failed to give way to a pedestrian, PEDESTRIAN2, other pedestrian crossing road	Dry	Overcast	Null	Nil (Default)	Unknown	0	0	1
Z ACCESSWAY	450m	N	FARM ROAD	201720686	14/12/2017	Thu	07:15	Cycle1 SDB on Carrington rd hit Car/Wagon2 merging from the right	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Bright sun	Fine	Crossroads	Stop	0	0	1
Z BP STATION	50m	E	WOODWARD ROAD	201614239	20/03/2016	Sun	12:45	SUV1 NDB on Z BP STATION hit Pedestrian2 (Age 82)	SUV1, did not check/notice another party behind, ENV: other visibility limited	Wet	Overcast	Heavy rain	Nil (Default)	Unknown	0	1	0
Z CPK	100m	N	SEAVIEW TERRACE	201613754	23/06/2016	Thu	15:35	Car/Wagon1 SDB on Z CPK hit Car/Wagon2 manoeuvring	CAR/WAGON1, did not check/notice another party behind	Dry	Bright sun	Fine	Nil (Default)	Unknown	0	0	1
Z MASON CLINIC DWY	330m	W	CARRINGTON ROAD	201714180	09/05/2017	Tue	07:35	Car/Wagon1 SDB on Unnamed road, Unitec complex overtaking hit Car/Wagon2 SDB on Unnamed road, Unitec complex turning right , Car/Wagon2 hit non specific fence	CAR/WAGON1, other overtaking	Dry	Bright sun	Fine	Driveway	Nil	0	0	1

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Appendix B Memo: Wairaka Precinct Primary School - Transport Assumptions and Vehicle Trip Generation

Stantec

Memo

To:	Hannah McGregor	From:	Gabriela Surja, Max Robitzsch, Mark Moslin-Thomas
	Ministry of Housing and Urban Development		Stantec
File:	310203609	Date:	December 16, 2019

Reference: **Wairaka Precinct Primary School - Transport Assumptions and Vehicle Trip Generation**

INTRODUCTION

Stantec, as part of the work for the Ministry of Housing and Urban Development (HUD) on the Wairaka Precinct Integrated Transport Assessment (ITA), has produced this memorandum setting out our understanding, and proposed assumptions, for a future primary school within the Wairaka Precinct that is expected to be established by the Ministry of Education (MoE).

This memo documents the assessment and the general transport assumptions associated with it, for review and consideration by the MoE and its transport consultants Jacobs.

This memorandum has been updated based on provision of the initial draft, with corrections provided by MoE's consultants, received by email on 11 December 2019 from Terri Bell (Jacobs). The changes relate to correcting total students numbers (to 750 general primary school students at full build-out, and 62 FTE staff for the school, the early childhood education and the special needs facility together), as well as clarifying that any traffic model in the 2026 or earlier timeframe will not include the school, and any 2028-2030 timeframe traffic model will include the school, at half final capacity.

BACKGROUND

Based on discussions with MoE at a meeting on 13 November 2019 and in subsequent email conversations, it is understood that a primary school (but no secondary school) is intended to be established in the Wairaka Precinct at some (yet to be determined) time. The following are understood to be the general assumptions that the MoE has already identified (without prejudice) to assist Stantec and HUD:

- long-term capacity of the primary school will be approximately 750 students, with approximately 62 full time equivalent staff (this includes staff for the other associated facilities discussed below);
- The school is expected to also provide for and be co-located with a further 50 early childhood education places and 18 special needs student places;
- The location of the school is likely to be in the centre of the Precinct, in the general vicinity of the Farm Road / Carrington Road intersection (old Unitec Gate 3) access, and
- While the exact timeframes for establishment of the school are unknown, and will be at least in part dependent on the speed of residential development within the Precinct, the MoE has indicated that any traffic model of the 2026 or earlier should not include a school, whereas by around 2028 to 2030, the ITA should assume that approximately half the student and staff numbers cited above will be in place (as well as half the early childhood and special needs student numbers).

Discussions were also held with MoE regarding the transport assumptions for the new school. A number of general assumptions are made below based on these discussions:

- As the school is explicitly intended for the Precinct residents, and is bracketed by two other nearby primary schools (Waterview Primary to the west, and Gladstone Primary to the east), and as the school is expected to be located in the centre of the Precinct, no part of the school catchment is expected to be more than 500-700m away. Much of the catchment will be in mid-density blocks even closer.

- The school will be at the heart of an already traffic-calmed, walking and cycling friendly existing environment - the Precinct is, for example, already a 30 kph speed limit zone today. The future transport vision for Wairaka Precinct is identified by HUD as being highly active mode (walking and cycling) focused, with emphasis of these modes on priority over cars, and with a high-quality road safety environment.

- In combination, it is expected that a very high proportion of the school roll will walk, bike or scooter to school. This is intended to be encouraged by the operational model of the school, and by detailed design of the transport features around the school and in the Precinct in general.

- MoE noted that there is likely to be a high incidence of students being driven to the school among the special needs students (both due to impairments, and due to these students potentially living in a wider catchment than the general primary school students), and that similarly, the early childhood education centre may see higher driving rates compared to the general student rates.

- However, it is accepted that even if these uses are catered for to allow practical car pick-up and drop-off, the overall population of students will be encouraged not to be driven to school. This includes for example, ensuring that any pick-up-and-drop-off facilities are prioritised for (or potentially exclusive to) users that are dependent on them, rather than encouraging their use by general roll students and their parents – which would risk replicating classical "school gate [vehicle] chaos".

Overall, it is considered that the school is extremely well placed to be an exemplar for a walk- and cycle-friendly environment with very high levels of safe and convenient active mode travel to school. This has informed the subsequent (vehicle) trip generation assumptions of this memorandum.

TRIP GENERATION SOURCES AND ASSUMPTIONS

Information about mode share and vehicle trip generation from the following sources has been taken into account in the assessment of the proposed trip generation:

Mode share

- HD011 Mode share of journeys to school, aged 5-12 (%) (2010/14), Ministry of Transport, NZ

  55% of journeys by children of primary school age in New Zealand between 2010 and 2014 were as car passengers. The average mode shares for walking, public transport, and cycling were 29%, 12%, and 2%, respectively.

- HD013 Mode share of journeys to school by region, aged 5-12 (2010/14), Ministry of Transport, NZ

  In the Auckland region, 54% of journeys by children of primary school age between 2010 and 2014 were car passengers on the school journey. The second highest mode share was walking at 38%, followed by public transport at around 5%. This indicate that the car mode share for primary students in Auckland is similar to the average for New Zealand.

- StatsNZ News: Car streets ahead for travel to work and education (2019)[1] , NZ

  According to the 2018 Census, 39.1% of all New Zealand students got to their place of education as a passenger in a car, truck or van. 'Student' includes people from preschoolers up to adult learners. There is an indication that it is "typical for many working parents to drop their children at school or preschool on their way to work, as 87.7 percent of passengers were aged less than 15 years".

Vehicle trip generation

- Trip Generation Manual (2017), ITE (Institute of Transportation Engineers), USA

  Based on 35 elementary schools surveyed across the United States between 1980s and 2010s, the vehicle trip generation per student in the AM and PM peak hour of adjacent street traffic is 0.67 and 0.17 respectively.

- Trip Generation Surveys, Schools, Analysis Report (2014), Roads and Maritime Services, NSW Australia

  The Sydney metropolitan primary schools demonstrated average peak vehicle trip rates of 0.67 and 0.53 in the school AM and PM peak periods respectively.

  It should be noted that the peak periods referred to in this document correspond to the schools' peak periods as opposed to the general adjacent road network peak periods. As this assessment refer to the adjacent road network peak periods instead, it is noted that particularly for the PM peak, the school trip generation will be significantly lower as the majority of school trips have occurred prior to the adjacent network's PM peak period. Compare the ITE trip rate differences cited above regarding AM and PM differences during the network peak.

To assess the likelihood (and realistic maximum) of non-car travel mode share to primary schools, Stantec also contacted Auckland Transport (Community Transport team) and received 2019 travel survey data from 12 of the best-performing primary schools across Auckland (results averaged between AM and PM results). These results are shown below in Table 1.

[1] https://www.stats.govt.nz/news/car-streets-ahead-for-travel-to-work-and-education

Table 1: Predicted Travel survey results for a selection of Auckland primary schools, 2019

School Name	Walk	Walking School Bus	Cycle	Bus	Family Car	Friends Car	Scooter	Train	Ferry	Other	Car / Walk 400m	2019 Average - Total	Non-car %
Browns Bay School	42%	4%	0%	0%	19%	1%	1%	0%	0%	0%	32%	100%	47%
Chaucer School	44%	1%	5%	1%	34%	2%	2%	0%	0%	1%	9%	100%	54%
Churchill Park School	40%	2%	1%	0%	30%	2%	3%	0%	0%	0%	22%	100%	46%
Clendon Park School	52%	0%	0%	0%	38%	1%	0%	0%	0%	0%	9%	100%	53%
Colwill School	57%	0%	0%	0%	27%	0%	1%	0%	0%	7%	7%	100%	65%
Devonport School	56%	1%	5%	0%	25%	1%	4%	0%	1%	0%	7%	100%	68%
Flat Bush School	57%	0%	0%	0%	30%	1%	0%	0%	0%	1%	12%	100%	57%
Glenavon School	58%	3%	2%	0%	17%	2%	2%	0%	0%	1%	14%	100%	67%
Glenfield Primary School	57%	3%	0%	0%	33%	0%	0%	0%	0%	3%	4%	100%	63%
St Thomas School (Auckland)	46%	2%	2%	3%	37%	1%	0%	0%	0%	1%	7%	100%	55%
Sunnyvale School	43%	2%	0%	0%	40%	0%	0%	0%	0%	0%	15%	100%	45%
Waikowhai School	69%	0%	4%	2%	26%	0%	0%	0%	0%	0%	0%	100%	74%

The non-car percentage excludes the "family car", "friends car" and "car/walk" results.

As can be seen, the three best-performing schools achieve a non-car mode share of 74%, 68% and 67%.

Student vehicle trip assumptions

Based on the above, it is considered that a non-car mode share of 70% is realistic. This is considering the short distances between dwellings and the school and the intention to specifically design the school operation and the surrounding Precinct for active mode safety and convenience. There would appear to be no reason why the new school at Wairaka would not be able to be among the top performers in the future.

Inverting the 70% non-car total, a 30% "car passenger" share is therefore assumed, leading to 0.6 trips / student (in and out) in the AM network peak hour.

The pick-up period in the afternoon will largely occur much earlier than the general road network PM peak. Therefore, it is assumed that the students' PM network peak hour trip generation is 25% of that of the AM network peak hour (this correlates with the results in the US study cited earlier).

Staff vehicle trip assumptions

Staff driving rates tend to be included in surveyed trip generation rates for schools but need to be discussed separately in a first principles assessment. Separate staff trip rates are conservatively estimated to be 0.5 trips / staff member in AM network peak hour and 0.33 trips / staff member in the PM peak network peak hour (two thirds of the AM peak value). This implies overall driving rates (during the overall day) of significantly over 50%, thus being conservative.

Considering the low number of staff (31 in the 2028/2030 model timeframe) compared to overall future resident and student numbers in the Precinct, separating out staff trips does not lead to a likelihood of any significant change in traffic modelled network impacts even if the staff have significantly higher or lower driving rates at this school than assumed above. Therefore, no in-depth further assessment of comparative staff driving rates has occurred,

FURTHER ASSUMPTIONS

Early childhood education vehicle trip assumptions

The vehicle trip generation of the early childhood centre will be affected by similar factors as those discussed earlier in relation to the primary school trip generation - but is likely to see much higher incidences of being driven to the care facility. However, the overall impact is likely to be limited, as there will be only 25 such children assumed in the traffic model by 2028-2030, and many will be transported as part of linked trips (see later below).

For simplicity, it is proposed that these (25) children have twice the trip rate of primary school children. This represents a 60% "being driven" rate. The remainder are assumed to be brought to the facility by caregivers on foot or by bicycle, noting the close proximity to the residences.

Special needs students' vehicle trip assumptions

It has been assumed that most or nearly all of the nine (9) special needs students have three times the trip rate of primary school children. This represents a 90% "being driven" rate, in part because they come from a wider catchment, and in part due to their higher likelihood of dependence on mobility aids and assistance. From a traffic generation perspective this is a minimal demand, and also conservatively ignores that some of these students may arrive in the same vehicle picking them up from different residences.

Special needs student demands are more likely to affect the design of the pickup and drop-off zone (suitability for vans and wheelchair access etc.) rather than have any significant impact on the trip generation

Mode share over time

It is considered unlikely at this stage that the traffic model for the Wairaka Precinct ITA will model a time horizon far enough away to assume that the full 700 student roll will be in place. This will be a matter of revisiting the traffic model and the Precinct ITA at a future stage, as already envisaged in the Precinct rules.

As such, while mode share will change further in the future, this assessment only discusses projected mode share and trip generation at a point in time approximately 8 to 10 years from now (late 2020s).

Wider network assumptions

The traffic model will include a number of wider network assumptions. These are likely to include matters such as the Carrington Road Upgrade (currently funded in the 10-year programme for the second half of the 2020s). However, since (as discussed earlier) effectively all students are assumed to come from within the Precinct, and the primary wider network changes affect the external interface instead of the internal network, no specific sensitivity scenarios for the presence or absence of infrastructure are deemed required for the school. If, closer to the time of the school's establishment, factors come to light that would materially affect trip generation or catchment, this can be covered in a school-specific assessment if required.

Vehicle occupancy

Conservatively, it is assumed that among cars being used to drive children to the primary school, each has an average occupancy of 1.2 children (i.e. every fifth car brings two children to the primary school / child care).

Linked trip commentary (for later traffic model assignment)

Given the background of the proposed school, it is considered that there will be a high portion of walking and cycling trips. However, it is acknowledged that it is common for 'linked-trips' to occur where a parent or caregiver drops off a student on their way to work, particularly in the AM peak period.

The later traffic models will assume that approximately half of all car trips to and from the school are linked trips (originating in the Precinct, travelling to the school, and then travelling onwards to another external destination – and reverse for the PM peak), while the other half are entirely new trips (very short car trips both originating and finishing within the Precinct after pick-up or drop-off at the school). Considering that none of the car trips would be more than some 800m, this is considered a conservatively high assumption.

For staff, it is conservatively assumed that all staff live outside the Precinct.

TRIP GENERATION

Based on the above information and assumptions, the proportions of students that will travel to school by car (as a passenger) in each enrollment scenario has been estimated.

Table 2 and 3 outlines the summary trip generation assumed for the student and staff numbers.

Table 2: Predicted car mode share for students / children

Scenario 2028/2030 incl. allowances for childcare and special needs	**Estimated Percentage as car passenger:**	**AM peak hour trip rate** (first principles)	**AM peak hour Trip rate** (including 1.2 children car occupancy)	**PM peak hour Trip rate** (incl 1.2 children car occupancy, 0.25 PM peak factor)	**AM peak trips** (in and out 50/50)	**PM peak trips** (in and out 50/50)
375 general roll students	30%	0.6 trips / child	0.5 trips / child	0.13 trips / child	188	49
25 early childhood centre children	60%	1.2 trips / child	1 trip / child	0.25 trips / child	25	6
9 special needs students	90%	1.8 trips / child	1.8 tips / child	0.45 trips / child	16	4
Total					229	59

Table 3: Predicted car mode share for staff

Scenario 2028/2030			**AM peak hour Trip rate**	**PM peak hour Trip rate**	**AM peak trips** (in 100%)	**PM peak trips** (out 100%)
31 staff (total, all facilities)			0.5 trips / staff	0.33 trips / staff	16	10

Stantec

Memo

SUMMARY

This memorandum sets out the core transport-related assumptions for a potential future primary school in the Wairaka Precinct, as based on discussions with the Ministry of Education and their consultants, and research undertaken by Stantec. It is prepared to document these assumptions for inclusion in a precinct wide ITA (Integrated Transport Assessment) for the Wairaka Precinct.

The assumptions include a primary school that has a school roll of approximately 375 children by around 2028-2030, with 25 early childhood education students and 9 special needs students also provided for in the collocated facilities, with a total of 31 staff. In the longer run (outside of the traffic model timeframe of the ITA), it is expected that these numbers are likely to double.

The location of the school expected to be in or near the centre of the Precinct, will allow very high non-car mode share to be realized among primary school students, with a 70% mode share of walking cycling and public transport, in line with other high-performing primary schools already existing in Auckland.

To assess the remaining impact of vehicle trips created by the remaining car mode share, a first principles assessment (underpinned by existing research) has been undertaken, which indicates that the trip generation to be included in the traffic model is 245 vehicle trips (student and staff) in the morning peak, and 69 vehicle trips (student and staff) during the afternoon (general network) peak.

Appendix C Traffic Counts and Calibration Results

Observed vs Modelled Turn Counts (Cars Only)

AM Peak (07:45-08:45)

	Count	%	Target
<5	143	93%	85%
<7.5	150	98%	90%
<10	151	99%	95%
All	153		

Intersection	Approach	Turn	Observed	Modelled	Difference	Difference (%)	GEH
Carrington Rd / New North Rd / Mount Albert Rd	S	Right	107	102	-5	-4	0.5
	S	Thru	192	173	-19	-10	1.4
	S	Left	19	25	6	33	1.3
	E	Right	120	118	-2	-2	0.2
	E	Thru	199	204	5	3	0.4
	N	Right	59	85	26	45	3.1
	N	Thru	147	145	-2	-1	0.2
	N	Left	108	130	22	20	2.0
	W	Left	48	71	23	49	3.0
	W	Right	15	38	23	155	4.5
	W	Thru	792	907	115	14	3.9
Carrington Rd / Prospero Tce	E	Right	1	8	7	660	3.2
	E	Left	31	21	-10	-32	1.9
	N	Left	8	10	2	30	0.8
	S	Right	21	14	-7	-33	1.6
Carrington Rd / Willcott St	W	Left	234	83	-151	-65	12.0
	N	Right	35	18	-18	-50	3.4
	S	Left	20	14	-6	-30	1.5
Carrington Rd / Counsel Tce	E	Right	2	14	12	615	4.3
	E	Left	51	33	-18	-35	2.8
	N	Left	9	7	-2	-23	0.7
	S	Right	70	55	-15	-22	1.9
Carrington Rd / Benfield Ave	W	Right	5	5	-1	-10	0.2
	W	Left	107	17	-90	-84	11.5
	N	Right	2	12	10	480	3.7
Woodward Rd / Carrington Rd	N	Right	191	221	30	16	2.1
	N	Thru	233	312	79	34	4.8
	W	Left	654	617	-37	-6	1.5
	S	Thru	399	395	-4	-1	0.2
	S	Left	22	7	-15	-68	3.9
Seaview Tce / Carrington Rd	E	Right	20	25	5	27	1.1
	E	Left	80	73	-7	-9	0.8
	N	Left	22	22	0	1	0.0
	S	Right	94	77	-17	-18	1.8
Unitec Gate 4 / Carrington Rd	N	Right	200	167	-33	-16	2.4
	N	Thru	336	444	108	32	5.4
	W	Right	39	39	0	-1	0.1
	S	Thru	633	653	20	3	0.8
	S	Left	267	305	38	14	2.2
	W	Left	25	27	2	8	0.4
Fifth Av / Carrington Rd	E	Right	33	38	5	15	0.9
	E	Left	19	14	-5	-24	1.1
	N	Left	12	10	-2	-15	0.5
	S	Right	9	10	1	8	0.2
Unitec Gate 3 / Carrington Rd	N	Right	92	103	11	12	1.1
	N	Thru	573	610	37	7	1.5
	S	Thru	584	665	81	14	3.3
	S	Left	57	43	-14	-24	1.9
Fontenoy St / Carrington Rd	E	Right	21	26	5	24	1.1
	E	Left	65	58	-7	-11	0.9
	N	Left	11	14	3	29	0.9
	S	Right	10	6	-4	-37	1.3
Segar Ave / Carrington Rd	E	Right	48	51	3	6	0.4
	E	Left	12	7	-5	-43	1.7
	N	Left	9	12	3	33	0.9
	S	Right	4	3	-1	-20	0.4
Unitec Gate 2 / Carrington Rd	N	Right	36	65	29	81	4.1
	N	Thru	645	673	28	4	1.1
	W	Right	14	4	-10	-69	3.2
	W	Left	9	51	42	466	7.7
	S	Thru	629	708	79	12	3.0
	S	Left	27	39	12	45	2.1
Great North Rd / Point Chevalier Rd / Carrington Rd	S	Thru	188	221	33	17	2.3
Carrington Rd / New North Rd / Mount Albert Rd	E	Left	38	39	1	2	0.1
Great North Rd / Point Chevalier Rd / Carrington Rd	S	Right	209	302	93	44	5.8
	N	Right	271	265	-6	-2	0.4
	N	Thru	129	146	17	13	1.4
	E	Right	44	47	3	8	0.5
	E	Thru	100	88	-12	-12	1.2
	W	Right	499	540	41	8	1.8
	W	Thru	1050	1045	-5	0	0.1
	S	Left	185	242	57	31	3.9
	W	Left	637	640	3	1	0.1
	N	Left	52	49	-3	-5	0.4
Unitec Gate 1 / Carrington Rd	N	Right	101	128	27	27	2.5
	N	Thru	706	733	27	4	1.0
	W	Left	30	58	28	94	4.2
	W	Right	4	7	3	63	1.1
	S	Thru	580	725	145	25	5.7
	S	Left	36	31	-5	-14	0.9

Observed vs Modelled Turn Counts (Cars Only)

AM Peak (07:45-08:45)

	Count	%	Target
<5	143	93%	85%
<7.5	150	98%	90%
<10	151	99%	95%
All	153		

Intersection	Approach	Turn	Observed	Modelled	Difference	Difference (%)	GEH
Woodward Rd / New North Rd / Richardson Rd	N	Thru	133	119	-14	-11	1.3
	N	Right	81	85	4	5	0.5
	E	Right	34	20	-14	-40	2.6
	E	Left	63	69	6	9	0.7
	E	Thru	234	226	-8	-3	0.5
	S	Right	57	67	10	17	1.3
	S	Left	39	48	9	22	1.3
	W	Left	353	410	57	16	2.9
	W	Thru	894	893	-1	0	0.0
	W	Right	158	145	-13	-8	1.1
	N	Left	28	52	24	85	3.8
Woodward Rd / Jersey Ave	W	Left	4	8	4	93	1.5
	W	Right	6	9	3	43	1.0
	S	Left	1	21	20	1980	6.0
Woodward Rd / Harbutt Ave / Willcott St	S	Left	8	15	7	84	2.0
	S	Thru	548	608	60	11	2.5
	S	Right	85	31	-54	-63	7.1
	W	Right	13	31	18	135	3.8
	W	Left	52	10	-42	-80	7.4
	W	Thru	23	10	-13	-55	3.1
	N	Thru	214	219	5	2	0.4
	N	Right	10	10	0	-3	0.1
	N	Left	33	16	-17	-51	3.4
	E	Left	35	12	-23	-65	4.7
	E	Thru	6	0	-6	-98	3.4
	E	Right	5	5	-1	-10	0.2
Harbutt Ave / Jerram St	E	Right	2	13	11	560	4.1
	E	Thru	4	11	7	183	2.6
	N	Left	7	17	10	147	3.0
	N	Right	4	0	-4	-100	2.8
	W	Thru	16	12	-4	-24	1.0
	W	Left	1	0	-1	-100	1.4
Woodward Rd / Fairleigh Ave	S	Left	3	7	4	123	1.7
	N	Right	1	5	4	430	2.4
	W	Right	18	26	8	43	1.6
	W	Left	5	9	4	80	1.5
Fairleigh Ave / Jerram St	E	Right	0	1	1	--	1.6
	E	Left	0	9	9	--	4.2
	N	Left	4	6	2	60	1.1
	N	Thru	8	9	1	6	0.2
	S	Right	1	9	8	760	3.5
	S	Thru	2	5	3	130	1.4
Springleigh Ave / Jerram St	S	Left	1	5	4	360	2.2
	S	Right	9	1	-8	-86	3.4
	W	Right	0	8	8	--	3.9
	W	Thru	15	6	-9	-59	2.7
	E	Left	8	7	-1	-11	0.3
	E	Thru	7	4	-3	-49	1.5
Springleigh Ave / Laurel St	W	Left	1	0	-1	-100	1.4
	W	Thru	23	8	-16	-67	4.0
	N	Right	5	7	2	42	0.9
	N	Left	16	6	-10	-63	3.1
	E	Thru	10	4	-6	-63	2.4
	E	Right	8	0	-8	-100	4.0
Springleigh Ave / Renton Rd	N	Left	9	11	2	23	0.7
	E	Right	2	11	9	445	3.5
Springleigh Ave / Rhodes Ave	E	Right	1	0	-1	-100	1.4
	N	Left	8	18	10	123	2.7
	N	Right	1	0	-1	-100	1.4
Woodward Rd / Springleigh Ave	N	Right	27	29	2	8	0.4
	W	Left	42	37	-5	-11	0.7
	W	Right	55	31	-24	-43	3.6
	S	Left	39	28	-11	-29	2.0
Springleigh Ave / Mark Rd	N	Left	31	26	-5	-17	1.0
	N	Right	1	0	-1	-100	1.4
	E	Right	44	42	-2	-5	0.3
	W	Left	4	0	-4	-100	2.8
Unitec Gate 3 / Carrington Rd	W	Right	12	4	-8	-69	3.0
	W	Left	12	21	9	78	2.3
Carrington Rd / Willcott St	W	Right	87	37	-50	-57	6.3
Woodward Rd / Carrington Rd	W	Right	14	14	0	1	0.1
Great North Rd / Point Chevalier Rd / Carrington Rd	E	Left	149	178	29	20	2.3
Woodward Rd / New North Rd / Richardson Rd	S	Thru	250	240	-10	-4	0.7

Observed vs Modelled Turn Counts (Cars Only)

PM Peak (16:45-17:45)

	Count	%	Target
<5	147	94%	85%
<7.5	153	98%	90%
<10	156	100%	95%
All	156		

Intersection	Approach	Turn	Observed	Modelled	Difference	Difference (%)	GEH
Carrington Rd / New North Rd / Mount Albert Rd	S	Right	53	60	7	14	1.0
	S	Thru	153	156	3	2	0.2
	S	Left	37	40	3	8	0.5
	E	Right	126	123	-3	-3	0.3
	E	Thru	763	734	-29	-4	1.1
	N	Right	115	181	66	57	5.4
	N	Thru	138	141	3	2	0.2
	N	Left	77	71	-6	-8	0.7
	W	Left	51	96	45	88	5.2
	W	Right	42	57	15	36	2.2
	W	Thru	310	334	24	8	1.4
Carrington Rd / Prospero Tce	E	Right	6	5	-1	-15	0.4
	E	Left	30	28	-2	-8	0.4
	N	Left	4	5	1	23	0.4
	S	Right	11	10	-1	-10	0.3
Carrington Rd / Willcott St	W	Left	35	13	-22	-63	4.5
	N	Right	34	26	-8	-25	1.5
	S	Left	66	74	8	12	0.9
Carrington Rd / Counsel Tce	E	Right	7	14	7	103	2.2
	E	Left	59	41	-18	-31	2.6
	N	Left	6	6	0	0	0.0
	S	Right	39	43	4	11	0.7
Carrington Rd / Benfield Ave	W	Right	2	1	-1	-30	0.5
	W	Left	8	2	-6	-79	2.9
	N	Right	10	12	2	22	0.7
	S	Left	13	0	-13	-99	5.0
Woodward Rd / Carrington Rd	N	Right	437	363	-74	-17	3.7
	N	Thru	323	333	10	3	0.5
	W	Left	278	276	-2	-1	0.1
	S	Thru	259	266	7	3	0.4
	S	Left	39	14	-25	-63	4.8
Seaview Tce / Carrington Rd	E	Right	10	19	9	91	2.4
	E	Left	87	74	-14	-16	1.5
	N	Left	46	38	-8	-17	1.2
	S	Right	84	88	4	4	0.4
Unitec Gate 4 / Carrington Rd	N	Right	72	50	-22	-31	2.8
	N	Thru	516	477	-39	-8	1.8
	W	Right	197	183	-14	-7	1.0
	S	Thru	375	363	-12	-3	0.6
	S	Left	107	114	7	7	0.7
	W	Left	121	142	21	17	1.8
Fifth Av / Carrington Rd	E	Right	19	21	2	9	0.4
	E	Left	10	10	0	-4	0.1
	N	Left	22	15	-7	-31	1.6
	S	Right	14	18	4	29	1.0
Unitec Gate 3 / Carrington Rd	N	Right	92	95	3	3	0.3
	N	Thru	553	512	-41	-7	1.8
	S	Thru	434	470	36	8	1.7
	S	Left	50	36	-14	-27	2.1
Fontenoy St / Carrington Rd	E	Right	5	9	4	82	1.5
	E	Left	28	23	-5	-19	1.0
	N	Left	32	34	2	7	0.4
	S	Right	28	34	6	21	1.1
Segar Ave / Carrington Rd	E	Right	41	40	-2	-4	0.2
	E	Left	6	5	-1	-15	0.4
	N	Left	29	34	5	19	1.0
	S	Right	7	3	-4	-51	1.6
Unitec Gate 2 / Carrington Rd	N	Right	6	25	19	317	4.8
	N	Thru	656	631	-25	-4	1.0
	W	Right	19	18	-1	-6	0.3
	W	Left	31	48	17	53	2.6
	S	Thru	569	577	8	1	0.3
	S	Left	7	5	-2	-23	0.6
Great North Rd / Point Chevalier Rd / Carrington Rd	S	Thru	208	196	-12	-6	0.8
Carrington Rd / New North Rd / Mount Albert Rd	E	Left	50	58	8	17	1.1
Great North Rd / Point Chevalier Rd / Carrington Rd	S	Right	210	201	-9	-4	0.6
	N	Right	554	522	-33	-6	1.4
	N	Thru	186	183	-3	-1	0.2
	E	Right	78	97	19	24	2.0
	E	Thru	586	553	-33	-6	1.4
	W	Right	235	281	46	20	2.9
	W	Thru	275	273	-2	-1	0.1
	S	Left	301	320	19	6	1.1
	W	Left	386	383	-3	-1	0.2
	N	Left	37	43	6	15	0.9
Unitec Gate 1 / Carrington Rd	N	Right	24	41	17	69	2.9
	N	Thru	612	590	-22	-4	0.9
	W	Left	77	92	15	19	1.6
	W	Right	29	27	-3	-9	0.5
	S	Thru	614	617	3	1	0.1
	S	Left	8	5	-3	-41	1.3

Observed vs Modelled Turn Counts (Cars Only)

PM Peak (16:45-17:45)

	Count	%	Target
<5	147	94%	85%
<7.5	153	98%	90%
<10	156	100%	95%
All	156		

Intersection	Approach	Turn	Observed	Modelled	Difference	Difference (%)	GEH
Woodward Rd / New North Rd / Richardson Rd	N	Thru	221	166	-55	-25	4.0
	N	Right	201	181	-21	-10	1.5
	E	Right	23	5	-18	-77	4.7
	E	Left	94	109	15	16	1.5
	E	Thru	834	828	-6	-1	0.2
	S	Right	86	127	41	47	3.9
	S	Left	103	109	6	6	0.6
	W	Left	123	211	88	71	6.8
	W	Thru	354	330	-24	-7	1.3
	W	Right	108	97	-11	-10	1.0
	N	Left	31	32	1	4	0.2
Woodward Rd / Jersey Ave	N	Right	0	14	14	--	5.4
	W	Left	0	7	7	--	3.6
	W	Right	14	7	-8	-54	2.3
	S	Left	12	13	1	12	0.4
Woodward Rd / Harbutt Ave / Willcott St	S	Left	30	45	15	51	2.5
	S	Thru	308	277	-31	-10	1.8
	S	Right	39	28	-11	-28	1.9
	W	Right	16	19	3	20	0.8
	W	Left	29	16	-14	-47	2.9
	W	Thru	8	4	-4	-55	1.8
	N	Thru	381	325	-56	-15	3.0
	N	Right	6	20	14	233	3.9
	N	Left	38	1	-37	-98	8.4
	E	Left	48	43	-6	-11	0.8
	E	Thru	19	1	-18	-97	5.9
	E	Right	9	0	-9	-100	4.2
Harbutt Ave / Jerram St	E	Right	11	23	12	105	2.8
	E	Thru	24	31	7	29	1.3
	N	Left	6	11	5	80	1.7
	N	Right	13	0	-13	-97	4.9
	W	Thru	11	17	6	58	1.7
	W	Left	1	1	-1	-50	0.6
Woodward Rd / Fairleigh Ave	S	Left	9	12	3	33	0.9
	N	Right	10	9	-1	-9	0.3
	W	Right	5	10	5	98	1.8
	W	Left	3	9	6	187	2.3
Fairleigh Ave / Jerram St	E	Right	5	4	-2	-30	0.7
	E	Left	4	6	2	45	0.8
	N	Left	3	4	1	23	0.4
	N	Thru	11	5	-6	-51	2.0
	S	Right	2	5	3	135	1.5
	S	Thru	11	19	8	70	2.0
Springleigh Ave / Jerram St	S	Left	5	20	15	306	4.3
	S	Right	9	2	-7	-77	2.9
	W	Right	1	7	6	600	3.0
	W	Thru	15	9	-7	-43	1.9
	E	Left	37	2	-35	-94	7.9
	E	Thru	40	17	-23	-59	4.4
Springleigh Ave / Laurel St	W	Left	3	0	-3	-100	2.4
	W	Thru	21	11	-10	-50	2.6
	N	Right	1	2	1	120	0.9
	N	Left	10	4	-7	-65	2.5
	E	Thru	76	17	-59	-78	8.7
	E	Right	11	0	-11	-100	4.7
Springleigh Ave / Renton Rd	N	Left	3	6	3	83	1.2
	E	Right	5	22	17	334	4.6
Springleigh Ave / Rhodes Ave	E	Right	10	0	-10	-100	4.5
	W	Left	1	0	-1	-70	0.9
	N	Left	3	6	3	113	1.6
	N	Right	2	0	-2	-100	2.0
Woodward Rd / Springleigh Ave	N	Right	69	42	-27	-39	3.6
	W	Left	22	26	4	16	0.7
	W	Right	16	10	-6	-35	1.5
	S	Left	19	30	11	57	2.2
Springleigh Ave / Mark Rd	N	Left	14	10	-4	-29	1.2
	N	Right	2	0	-2	-100	2.0
	E	Right	25	33	8	33	1.5
	W	Left	-1	0	1	100	0.0
Unitec Gate 3 / Carrington Rd	W	Right	18	19	1	3	0.1
	W	Left	103	100	-4	-3	0.3
Carrington Rd / Willcott St	W	Right	37	27	-11	-28	1.9
Woodward Rd / Carrington Rd	W	Right	9	10	1	7	0.2
Great North Rd / Point Chevalier Rd / Carrington Rd	E	Left	108	138	30	28	2.7
Woodward Rd / New North Rd / Richardson Rd	S	Thru	181	144	-38	-21	2.9

Appendix D Meeting Minutes - Stantec / HUD / AT, 16 February 2020

Meeting note: Wairaka Precinct ITA

9.30 – 10.45am, 13 February 2020, Stantec Offices, 111 Carlton Gore, Auckland

Attendees

Terry Church, Flow (TC), Mitra Prasad (AT), Max Robitzsch, Stantec (MR), Hannah Mcgregor, HUD (HM), Trevor Lee Joe, Stantec (TLJ), Gabriela Surja, Stantec (GS), Tony Wicker, Stantec (TW)

Discussion

1) Development and trip generation scenarios

Terry Church (TC) noted:

- Agree in principle with the approach where there will be two scenarios of A @ roughly 40 percent HUD land buildout in 2024 and B @ roughly 80 percent in 2028 (acknowledging the years are indicative only and mainly intended for estimating background traffic)

- Considers there is some risk in not anticipating the 100% build out and potential further third-party development (NWO etc), and thus potentially underestimate the required long-term footprint of some internal roads and intersections with Carrington. Considers that full AIMSUN modelling of such greater build-out / other development not required - but suggests sensitivity testing of the key intersections onto Carrington with SIDRA.

Max Robitzsch (MR) responded that:

- Once 2028 modelling is nearing completion, Stantec will look at intersections which are close to capacity and test them with SIDRA for potential additional load, maybe in the order of 10-20% extra, and assess whether they are likely to "tip" and require consideration of added setbacks around intersections or key internal roads for potential extra capacity in the future.

2) Trip generation assumptions

- TC noted it is acceptable to have leaned on what was agreed between AT and Fletchers Living (FRL) for residential trip rates in the southwest, but with lower car ownership there is the potential for replacement vehicle trips – ubers, taxis etc. So TC raised whether it was appropriate to reduce trips by as much as 20% in B scenario, despite mode change trends.

- MR considered that these uber-style vehicle trips aren't primarily commuter-style trips from suburban locations, and that the proposed reductions would apply to zones located in a medium-density development close to a major PT spine. The resulting reduced rate also aligned well with literary research for similar medium-density development in suburban areas (relevant background research being provided as part of ITA).

- MR also clarified that the "rear" (western) residential areas are not proposed to be reduced in the same way even in B scenario, accounting for their greater walking distances to PT.

- With these clarifications, it was agreed that:

- Scenario A (~2024): all residential areas within the Precinct to adopt the same trip generation as the FRL rates for the Southern Precinct, and TC noted that this was, if anything, a conservative approach and some partial reductions might in fact occur (Note: Scenario A assumptions will stay unreduced unless further tweaks agreed).

- Scenario B (~2028): there will be 20% trip generation reduction from FRL residential rates for the zones with better walking and cycling access to Carrington Road and PT, i.e. the North-west, Northern, and Carrington zones as per the map of the first tab of the assumptions spreadsheet.

- It was noted that the Te Auaunga North zone has good access to main PT routes on Great North Road (short walking distance across Oakley Creek pedestrian bridge), however a trip generation reduction is not currently proposed for this zone.

    - Post-meeting note from Stantec: On further consideration, while the Te Auaunga North zone's approximate centre is just under 500m away from Carrington Road, it is much closer to this PT route than Fletchers southwestern zone. It is also less than 400m walking distance away from the bus stops of further frequent bus services on Great North Road (at Alford St intersection), providing extra accessibility.

    - As such, it is considered that not reducing this zone at all even in the longer-term scenario is too conservative. It is proposed to stay un-reduced in Scenario A, but that by Scenario B, it receive a 10% trip reduction, half that of the zones closer to Carrington Road.

WDHB's Mason Clinic

- Stantec confirmed incorporated based on a slightly slowed-down development approach i.e. that there is no increase in traffic until later on in their development timeframe, as the initial works are only replacement beds, but will check

- Stantec confirmed understanding that for the next couple of years, Mason Clinic is set to replace existing facilities/beds. Stantec to confirm the approach that has been taken for determining the future trip generation for Mason Clinic.

    - Post meeting note from Stantec: The trip generation for the future years have been determined by comparing the number of beds in 2016 with the future number of beds according to the Mason Clinic's latest masterplan, and adjusting the trip generation proportionally based on the 2016 Mason Clinic traffic survey. This is considered conservative as it does not consider any potential travel mode shift that is likely to happen in the future.

Ministry of Education Primary School site

- TC noted although based on Ministry of Education information that the school (primary, ECE and special education) will be operating at 50% capacity by 2028/2030, it is likely that an ECE will only begin operation at the intended full capacity of 50 children not 25, due to commercial reasons. Traffic modelling for Scenario B (2028) is to assume 50 ECE students.

- For the primary school, TC suggested a sensitivity test on the capacity of Gate 3 for a 100% primary school enrolment to test long-term impacts. Similarly, TC noted that modelling for school drop off/ pick up (pass by and link diverted trips) needed to include traffic from throughout the site, coming from different directions, going to different exits, etc, rather than just being applied on one link.

- TC noted that the assumption of the PM peak hour trip rate being 25% of the AM peak hour trip rate seems a bit too high for the primary, ECE and special needs students. However, fine to leave it as is at the present time (partly as this assumption has been agreed with MOE).

- Although the assumption of 70% active mode and 30% car proportions for the primary school appear reasonable under appropriate transport conditions, and while acknowledging the very local school roll catchment, TC noted there is no way to influence infrastructure provision outside the school at NOR stage (i.e. MOE will not be contributing to the transport network itself). Therefore, provision for this level of walking / cycling needs to be anticipated by HUD at the design stage.

- MR noted, and HM agreed, that high-quality provision of walk/cycle infrastructure was key for the development's success overall and would be "baked in" as much as the ITA step reasonably allowed, for example via standard cross-sections and related space allowances for active modes. The Precinct rules and AT's requirements for vested new roads (key routes within the Precinct are to be vested) also require good active mode provision.

- Agreed between participants that detailed design of the internal street layout can be dealt through future consents/EPAs. For the Precinct ITA and the model itself, Stantec will produce a 'skeleton road network' that will show the main connections within the Precinct indicatively only, without finer-grain links, or claiming to show exact road alignments.

- However, as noted above, cross-sections will be provided for typical internal roads, with separate cross-sections for added capacity (if/where required) closer to Carrington Road and/or the school (depending on location, "added capacity" could mean more provision for active modes on key routes within the Precinct, rather than vehicle capacity).

- Similarly, concept layouts are also going to be prepared for the Carrington Road intersection accesses to/from the Precinct (the "gates" in the old Unitec parlance). These concepts will serve primarily to establish minimum intersection footprints required, rather than to set a fixed design for AT or HUD. This will also consider PT priority and active mode space needs.

Residential typology assumptions

- TC noted that he had some reservations regarding the blanket use of 1.5 bedroom with parking (1 car park) assumption for ALL of the HUD assumption development units (except for those in the FLR zone) in the trip generation assumptions.

- In this regard, MR and HM explained that the masterplanning of the site had not gone substantially above massing exercises and some typical block / building level layouts. As such, unlike the FRL southwestern development, no proposed typology split exists yet.

- The masterplan in its proposed examples focused strongly on 1 bedroom and 2 bedroom apartments, with very few 3 bedroom and no 4 bedroom units envisaged. Additionally, the site-wide HUD average for car parking is proposed to be under 1 per unit.

- As such, it is considered that a 1.5 bedroom assumption, with 1 car park each, is a good default value in the absence of future design. The inclusion of a number of larger apartments in the actual build-out will, in a vehicle trip generation sense, be balanced by the presence of studios and 1 bedroom apartments, some of which will have zero car parks.

3) Modelling (Methodology and Assumptions)

- Discussion occurred related to volume comparisons between the 2028 MSM plots and the 2019 survey. There is some difference in the level of traffic generated by the Precinct between the 2028 MSM and Stantec's Scenario B (~2028), roughly 300-400 extra vehicles in the AM peak, and a slightly more tidal (residential, leaving the area) pattern.

- However, in the larger scale of things, the 2028 MSM already includes significant development in the Precinct, which will which help with validity of the wider background data of the 2028 model being used in the ITA.

- The localised New North Road future vehicle traffic reductions, as observed from a comparison between the 2028 MSM data and 2019 survey data, are considered to be due to the ATAP Connected Community assumptions (provision for greater PT priority etc)

- Stantec has requested (currently awaiting) the 2018 MSM uncalibrated model data from the Auckland Forecasting Centre (AFC).

- Post-meeting note from Stantec: For the background traffic assumptions of the A scenario (no MSM model available for 2024), an interpolation between current and future (2028 MSM) traffic flows will be undertaken

- TC noted that it would not be necessary to re-run the MSM model but MSM data will be useful to help predict trip patterns in the area for the modelling. Noted that MSM is not a congestion model (i.e. it is a regional model) so it won't be as accurate in predicting mid-block traffic, or defined intersection layouts.

- TC suggested that the AFC be requested to undertake a Select Link Analysis (SLA) of links north and south of Gate 3, to understand where the traffic on Carrington Road is travelling from and to. This will help understanding the % of through traffic and how much background traffic could potentially be displaced by added local traffic.

- Stantec to request from AFC a cordon around the Precinct (including the main intersections of Pt Chev/Great North Road/Carrington Road and New North Road/) to assist in creating an O/D matrix and understand trip patterns related to these external junctions, and which flows would likely be affected by through traffic reduction assumptions – as well as identify the likely levels of such reductions.

4) Carrington Road (General)

- Discussed the impact of the Connected Communities project, which is likely to displace traffic off New North Road and Great North Road. Further discussion about the likely geographic constraints of the Carrington Road Upgrade, i.e. whether AT's eventual project would include the SH16 overbridge (maybe, but potentially not beyond measures such as walk/cycle clip-ons to free up road space as envisaged in the 2017 unfinished ITA) or extend further south past Woodward as far as Mt Albert Town Centre intersection (likely not, as the rail overbridge is a major constraint, and even if it was replaced, any gains there would then immediately be constrained again by the town centre itself).

- Regarding PT, TC noted that AT focus is generally targeting LOS C for PT corridors (ambitious) but with reliability the overriding key goal where this is not feasible. The modelling / ITA can assume that the future cross-sections of Carrington Road comprises two bus lanes (one in each direction), two general traffic lanes and walking / cycling facilities (fully protected cycleway etc). Intersection upgrades should provide reasonable level of PT priority.

- Post-meeting note by Stantec: Stantec will seek information from AFC regarding the high-level assumptions for Carrington Road and the modelled parts of GNR and NNR within the 2028 MSM model to ensure that there is no "double counting" of assumptions/upgrades.

- TC noted that AT (Gavin Smith) is only in the early stages of considering what might be required for a Business Case for the upgrade of Carrington Road. As such, the ITA will assist all stakeholders by identifying both demands and constraints better, which can then assist with future discussions.

Appendix E Trip Generation per Land Use - Scenario A and Scenario B

Colour code
- Agreed with AT
- Agreed with developer / organisation
- Existing data/ Based on historical survey /2015 TA
- To be confirmed

Zones	Notes
Southern	Current FRL/NWO landholding
Northern	Current Crown landholding
Carrington	Current Crown landholding
North-West	Current Crown landholding
Te Auaunga North	Current Crown landholding
Unitec Core	Area owned by Unitec, including F blocks and B blocks
Taylor's	Area owned by Taylor's Laundry

Future trip generation factor	
Tertiary	0.9
Residential (North-We	1
Residential (Te Auaung	1
Residential (Southern a	1

SCENARIO A

Land Use / Activity	Developers / organisation	Development (Year 4 since development)	Zone	Unit	Total development per activity	Notes re. development assumption	AM Trip rate	AM Source	AM Trips	PM Trip rate	PM Source	PM Trips	Total trips AM (vehicles/hour)	Total trips PM (vehicles/hour)
Education				FTE	9,899								1065	1065
Tertiary Education	Unitec				9,899								1065	1065
Students		8820	Unitec Core	FTE		Based on the future target enrolment of 9800 (as per the Unitec Annual Report 2018), factored by 90% to consider the proportion of the number of students at the Mt Albert campus to the overall Unitec student numbers at both campuses.	0.10	The base rate of 0.11 is based on Trip Generation Manual (2017) Trip rate for Junior/Community College in general urban/suburban area, and cross-checks with past trip surveys. A reduction of 10% has been applied to the base rate to account for a growing multi-modal accessibility.	873	0.10	The base rate of 0.11 is based on Trip Generation Manual (2017) Trip rate for Junior/Community College in general urban/suburban area, and cross-checks with past trip surveys. A reduction of 10% has been applied to the base rate to account for a growing multi-modal accessibility.	873		
Staff		1079	Unitec Core	FTE		Estimated based on the 2018 (latest) proportion of staff to students, factored to account for the projected future student FTE.	0.18	Based on the 2014, 2016, and 2018 Tertiary Student Travel Surveys, the average share of car travel (all types) for the Unitec Mt Albert students is 47%. In comparison, the 2016 staff travel survey indicates that 83% of Unitec Mt Albert staff travelled by car (including carpool). The proportion of the %car mode share for students and staff is assumed to be 47% to 83%, (i.e. 1 : 1.8) and as a result, the staff trip rate is assumed to be 1.8x higher than the student base rate. Similar to the student trip rate, the staff trip rate has been reduced by 10% to account for growing multi-modal accessibility.	192	0.18	Based on the 2014, 2016, and 2018 Tertiary Student Travel Surveys, the average share of car travel (all types) for the Unitec Mt Albert students is 47%. In comparison, the 2016 staff travel survey indicates that 83% of Unitec Mt Albert staff travelled by car (including carpool). The proportion of the %car mode share for students and staff is assumed to be 47% to 83%, (i.e. 1 : 1.8) and as a result, the staff trip rate is assumed to be 1.8x higher than the student base rate. Similar to the student trip rate, the staff trip rate has been reduced by 10% to account for growing multi-modal accessibility.	192		
Residential				Dwelling units / beds (	1023								483	483
Studio and 1 / 1.5 bedroom without parking					98								34	34
	Fletchers / NWO	98	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019	0.35	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	34	0.35	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	34		
	HUD	0	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.35	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	0	0.35	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	0		
		0	Carrington	Dwelling units		as above	0.35	as above	0	0.35	as above	0		
		0	North-West	Dwelling units		as above	0.35	as above	0	0.35	as above	0		
		0	Te Auaunga North	Dwelling units		as above	0.35	as above	0	0.35	as above	0		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.35	as above	0	0.35	as above	0		
1.5 Bedroom with parking					565								226	226
	Fletchers / NWO	11	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019	0.4	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	4	0.4	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	4		
	HUD	282	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.4	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	113	0.4	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	113		
		208	Carrington	Dwelling units		as above	0.4	as above	83	0.4	as above	83		
		64	North-West	Dwelling units		as above	0.4	as above	26	0.4	as above	26		
		0	Te Auaunga North	Dwelling units		as above	0.4	as above	0	0.4	as above	0		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.4	as above	0	0.4	as above	0		
2 Bedroom					183								92	92
	Fletchers / NWO	183	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019	0.5	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	92	0.5	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	92		
	HUD	0	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.5	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	0	0.5	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	0		
		0	Carrington	Dwelling units		as above	0.5	as above	0	0.5	as above	0		
		0	North-West	Dwelling units		as above	0.5	as above	0	0.5	as above	0		
		0	Te Auaunga North	Dwelling units		as above	0.5	as above	0	0.5	as above	0		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.5	as above	0	0.5	as above	0		
2.5 Bedroom					95								62	62
	Fletchers / NWO	95	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019	0.65	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	62	0.65	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019	62		
	HUD	0	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.65	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	0	0.65	As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the Precinct above (conservative)	0		
		0	Carrington	Dwelling units		as above	0.65	as above	0	0.65	as above	0		
		0	North-West	Dwelling units		as above	0.65	as above	0	0.65	as above	0		

Colour code

Agreed with AT
Agreed with developer / organisation
Existing data/ Based on historical survey /2015 TA
To be confirmed

Zones	Notes
Southern	Current FRL/NWO landholding
Northern	Current Crown landholding
Carrington	Current Crown landholding
North-West	Current Crown landholding
Te Auaunga North	Current Crown landholding
Unitec Core	Area owned by Unitec, including F blocks and B blocks
Taylor's	Area owned by Taylor's Laundry

Future trip generation factor	
Tertiary	0.9
Residential (North-We	1
Residential (Te Auaung	1
Residential (Southern	1

SCENARIO A

							AM			PM				
Land Use / Activity	**Developers / organisation**	**Development (Year 4 since development)**	**Zone**	**Unit**	**Total development per activity**	**Notes re. development assumption**	**Trip rate**	**Source**	**Trips**	**Trip rate**	**Source**	**Trips**	**Total trips AM (vehicles/hour)**	**Total trips PM (vehicles/hour)**
		0	Te Auaunga North	Dwelling units		as above	0.65	as above	0	0.65	as above	0		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.65	as above	0	0.65	as above	0		
3 and 4 Bedroom					82								70	70
	Fletchers / NWO	82	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019 all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions	0.85	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019 As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the	70	0.85	Trip generation based on Transport Assessment Report for Unitec Masterplan Stage 1 by Commute, dated 4 July 2019. Number of units based on the Masterplan Draft 03 dated 10/9/2019 As per the trip rates agreed between Fletchers/NWO and AT for the southwest of the	70		
	HUD	0	Northern	Dwelling units		indicated in the HUD Masterplan (Feb 2019).	0.85	Precinct above (conservative)	0	0.85	Precinct above (conservative)	0		
		0	Carrington	Dwelling units		as above	0.85	as above	0	0.85	as above	0		
		0	North-West	Dwelling units		as above	0.85	as above	0	0.85	as above	0		
		0	Te Auaunga North	Dwelling units		as above	0.85	as above	0	0.85	as above	0		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.85	as above	0	0.85	as above	0		
Student Housing					0								0	0
	Unitec	0	Unitec Core	Beds		Assumed none as the existing student housing in Southern zone will be replaced by housing, and no information is available on new development.	0.08	Assumes 1 car park per 6 student beds, and 50% of carpark owners driving	0	0.08	Assumes 1 car park per 6 student beds, and 50% of carpark owners driving	0		
Commercial					65								21	35
Services	Taylors Laundry	65	Taylor's	100 sqm	65	As per existing area of Taylor's Laundry.	n/a	Survey 2014 and existing land use	21	n/a	Survey 2014 and existing land use	35	21	35
Business Partnerships / Offices		0	Unitec Core	100 sqm	0	Assumed none as no information available.	1.92	0.2 higher than the RTA Guide's updated study of 10 PT friendly office developments in Sydney (located outside CBD), NSW, 2013 - Sydney rate is 1.6 per 100m2 GFA in morning peak hour.	0	1.44	0.2 higher than the RTA Guide's updated study of 10 PT friendly office developments in Sydney (located outside CBD), NSW, 2013 - Sydney rate is 1.2 per 100m2 GFA in evening peak hour.	0	0	0
Other land uses					121								100	39
Health	Mason Clinic	121	Northern	beds	121	Based on the 2019 Mason Clinic Masterplan, as provided to Stantec by Flow.	n/a	Based on the comparison between the expected number of beds by 2024 and the actual number of beds in 2016, and accordingly factoring the actual trips generated by Masons Clinic as surveyed in 2016. Note numbers are as provided by Flow on 23/01/2020 via email.	100	n/a	Based on the comparison between the expected number of beds by 2024 and the actual number of beds in 2016, and accordingly factoring the actual trips generated by Masons Clinic as surveyed in 2016. Note numbers are as provided by Flow on 23/01/2020 via email.	39	100	39
Grand total trips													1670	1623

Colour code
- Agreed with AT
- Agreed with developer / organisation
- Existing data/ Based on historical survey /2015 TA
- To be confirmed

Zones	Notes
Southern	Current FRL/NWO landholding
Northern	Current Crown landholding
Carrington	Current Crown landholding
North-West	Current Crown landholding
Te Auaunga North	Current Crown landholding
Unitec Core	Area owned by Unitec, including F blocks and B blocks
Taylor's	Area owned by Taylor's Laundry

Future trip generation factor	
Tertiary	0.7
Residential (North-West, Northern, C	0.75
Residential (Te Auaunga North)	0.9
Residential (Southern and Unitec Co	0.95

SCENARIO B

							AM			PM				
Land Use / Activity	**Developers / organisation**	**Development (Year 8 since development)**	**Zone**	**Unit**	**Total development per activity**	**Notes re. development assumption**	**Trip rate**	**Source**	**Trips**	**Trip rate**	**Source**	**Trips**	**Total trips AM (vehicles/hour)**	**Total trips PM (vehicles/hour)**
Education				FTE	11,354								1181	985
Tertiary Education	Unitec				10,889								912	912
Students		9702	Unitec Core	FTE		Assuming 10% increase from the Scenario A student numbers.	0.08	Assuming 30% reduction in trip rate compared to Scenario A (student base trip rate of 0.11), based on the network congestion pushing more people onto PT and active modes, particularly since PT and active modes have been increased in quality too with Carrington. The reduction also takes into account that there is a higher likelihood for remote learning to become more common at this stage of the future.	747	0.08	Assuming 30% reduction in trip rate compared to Scenario A (student base trip rate of 0.11), based on the network congestion pushing more people onto PT and active modes, particularly since PT and active modes have been increased in quality too with Carrington. The reduction also takes into account that there is a higher likelihood for remote learning to become more common at this stage of the future.	747		
Staff		1187	Unitec Core	FTE		Assuming 10% increase from the Scenario A staff numbers.	0.14	Assuming 30% reduction in trip rate compared to Scenario A (staff base trip rate of 0.20), based on the network congestion pushing more people onto PT and active modes, particularly since PT and active modes have been increased in quality too with Carrington. The reduction also takes into account that there is a higher likelihood for remote working to become more common at this stage of the future.	165	0.14	Assuming 30% reduction in trip rate compared to Scenario A (staff base trip rate of 0.20), based on the network congestion pushing more people onto PT and active modes, particularly since PT and active modes have been increased in quality too with Carrington. The reduction also takes into account that there is a higher likelihood for remote working to become more common at this stage of the future.	165		
Primary School	MoE				406								203	57
Students		375	Carrington	FTE		Based on information provided from MoE and their consultants, as documented in Wairaka Precinct Primary School - Transport Assumption and Vehicle Trip Generation memo dated 16/12/2019 by Stantec	0.5	Assumes 30% of all children being driven (0.3 trips per FTE), then doubled as creates in and out trip (0.6 trips per FTE), then factored assuming 1.2 children/car occupancy (0.5 trips per FTE)	188	0.13	Assumed as 25% of AM peak hour trips, as school finishes before network peak	47		
Staff		31	Carrington	FTE		Based on information provided from MoE and their consultants, as documented in Wairaka Precinct Primary School - Transport Assumption and Vehicle Trip Generation memo dated 16/12/2019 by Stantec	0.5	Assumes 50% of staff travel to work by car (0.5 trips per FTE), but unlike students, this is a one-way trip only, so no doubling. Assumes 1 person / car occupancy	16	0.33	Assumed as two thirds of AM volume, i.e. most teachers stay longer than students and more likely to drive in PM network peak	10		
Early Childhood Education	MoE				50								50	13
Students		50	Carrington	FTE		Updated to 100% of target full roll capacity of 50 as per AT's direction due to commerciality reasons. Previously set as 25 (50% capacity) based on information provided from MoE and their consultants, as documented in Wairaka Precinct Primary School - Transport Assumption and Vehicle Trip Generation memo dated 16/12/2019 by Stantec.	1	Assumes 60% of all children being driven (0.6 trips per FTE), then doubled as creates in and out trip (1.2 trips per FTE), then factored assuming 1.2 children/car occupancy (1 trip per FTE).	50	0.25	Assumed as 25% of AM peak hour trips, as school finishes before network peak	13		
Special Needs Education	MoE				9								16	4
Students		9	Carrington	FTE		Based on information provided from MoE and their consultants, as documented in Wairaka Precinct Primary School - Transport Assumption and Vehicle Trip Generation memo dated	1.8	Assumes 90% of all children being driven (0.9 trips per FTE), then doubled as creates in and out trips (1.8 trips per FTE)	16	0.45	Assumed as 25% of AM peak hour trips, as school finishes before network peak	4		
Residential				Dwelling units / beds (l	2049								732	732
Studio and 1 / 1.5 bedroom without parking					98								33	33
	Fletchers / NWO	98	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019	0.3325	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	33	0.3325	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	33		
	HUD	0	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.2625	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active modes upgrades, and the expected mode shift across Auckland.	0	0.2625	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active modes upgrades, and the expected mode shift across Auckland.	0		
		0	Carrington	Dwelling units		as above	0.2625	as above	0	0.2625	as above	0		
		0	North-West	Dwelling units		as above	0.2625	as above	0	0.2625	as above	0		
		0	Te Auaunga North	Dwelling units		as above	0.315	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and therefore does not enjoy the same level of PT acessibility as the Northern, North-west, and Carrington sub-precicnts, the Te Auaunga North sub-precinct is still considered better than the Southern (Fletcher) sub-precicnt in terms of PT accessibility.	0	0.315	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and therefore does not enjoy the same level of PT acessibility as the Northern, North-west, and Carrington sub-precicnts, the Te Auaunga North sub-precinct is still considered better than the Southern (Fletcher) sub-precicnt in terms of PT accessibility.	0		

Colour code

Agreed with AT
Agreed with developer / organisation
Existing data/ Based on historical survey /2015 TA
To be confirmed

Zones	Notes
Southern	Current FRL/NWO landholding
Northern	Current Crown landholding
Carrington	Current Crown landholding
North-West	Current Crown landholding
Te Auaunga North	Current Crown landholding
Unitec Core	Area owned by Unitec, including F blocks and B blocks
Taylor's	Area owned by Taylor's Laundry

Future trip generation factor	
Tertiary	0.7
Residential (North-West, Northern, C	0.75
Residential (Te Auaunga North)	0.9
Residential (Southern and Unitec Co	0.95

SCENARIO B

							AM			PM				
Land Use / Activity	**Developers / organisation**	**Development (Year 8 since development)**	**Zone**	**Unit**	**Total development per activity**	**Notes re. development assumption**	**Trip rate**	**Source**	**Trips**	**Trip rate**	**Source**	**Trips**	**Total trips AM (vehicles/hour)**	**Total trips PM (vehicles/hour)**
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.3325	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0	0.3325	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0		
1.5 Bedroom with parking					1591								487	487
	Fletchers / NWO	11	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019	0.38	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	4	0.38	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	4		
	HUD	658	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.3	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active modes upgrades, and the expected mode shift across Auckland.	197	0.3	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active modes upgrades, and the expected mode shift across Auckland.	197		
		674	Carrington	Dwelling units		as above	0.3	as above	202	0.3	as above	202		
		96	North-West	Dwelling units		as above	0.3	as above	29	0.3	as above	29		
		152	Te Auaunga North	Dwelling units		as above	0.36	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and therefore does not enjoy the same level of PT acessibility as the Northern, North-west, and Carrington sub-precicnts, the Te Auaunga North sub-precinct is still considered better than the Southern (Fletcher) sub-precicnt in terms of PT accessibility.	55	0.36	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and therefore does not enjoy the same level of PT acessibility as the Northern, North-west, and Carrington sub-precicnts, the Te Auaunga North sub-precinct is still considered better than the Southern (Fletcher) sub-precicnt in terms of PT accessibility.	55		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.38	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0	0.38	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0		
2 Bedroom					183								87	87
	Fletchers / NWO	183	Southern	Dwelling units		Based on the information provided by HUD to Stant	0.475	Trip generation for the Southern and Unitec Core sub-precinct	87	0.475	Trip generation for the Southern and Unitec Core sub-precincts are a	87		
	HUD	0	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apa	0.375	Trip generation for the Northern, Carrington and North-West s	0	0.375	Trip generation for the Northern, Carrington and North-West sub-pr	0		
		0	Carrington	Dwelling units		as above	0.375	as above	0	0.375	as above	0		
		0	North-West	Dwelling units		as above	0.375	as above	0	0.375	as above	0		
		0	Te Auaunga North	Dwelling units		as above	0.45	Trip generation for the Te Auaunga North sub-precinct is assur	0	0.45	Trip generation for the Te Auaunga North sub-precinct is assumed a	0		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.475	Trip generation for the Southern and Unitec Core sub-precinct	0	0.475	Trip generation for the Southern and Unitec Core sub-precincts are a	0		
2.5 Bedroom					95								59	59
	Fletchers / NWO	95	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019	0.6175	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	59	0.6175	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	59		
	HUD	0	Northern	Dwelling units		all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.4875	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active modes upgrades, and the expected mode shift across Auckland.	0	0.4875	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active modes upgrades, and the expected mode shift across Auckland.	0		
		0	Carrington	Dwelling units		as above	0.4875	as above	0	0.4875	as above	0		
		0	North-West	Dwelling units		as above	0.4875	as above	0	0.4875	as above	0		
		0	Te Auaunga North	Dwelling units		as above	0.585	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and therefore does not enjoy the same level of PT acessibility as the Northern, North-west, and Carrington sub-precicnts, the Te Auaunga North sub-precinct is still considered better than the Southern (Fletcher) sub-precicnt in terms of PT accessibility.	0	0.585	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and therefore does not enjoy the same level of PT acessibility as the Northern, North-west, and Carrington sub-precicnts, the Te Auaunga North sub-precinct is still considered better than the Southern (Fletcher) sub-precicnt in terms of PT accessibility.	0		

Colour code
Agreed with AT
Agreed with developer / organisation
Existing data/ Based on historical survey /2015 TA
To be confirmed

Zones	Notes
Southern	Current FRL/NWO landholding
Northern	Current Crown landholding
Carrington	Current Crown landholding
North-West	Current Crown landholding
Te Auaunga North	Current Crown landholding
Unitec Core	Area owned by Unitec, including F blocks and B blocks
Taylor's	Area owned by Taylor's Laundry

Future trip generation factor	
Tertiary	0.7
Residential (North-West, Northern, C	0.75
Residential (Te Auaunga North)	0.9
Residential (Southern and Unitec Co	0.95

SCENARIO B

							AM			PM				
Land Use / Activity	**Developers / organisation**	**Development (Year 8 since development)**	**Zone**	**Unit**	**Total development per activity**	**Notes re. development assumption**	**Trip rate**	**Source**	**Trips**	**Trip rate**	**Source**	**Trips**	**Total trips AM (vehicles/hour)**	**Total trips PM (vehicles/hour)**
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.6175	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0	0.6175	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0		
3 and 4 Bedroom					82								66	66
	Fletchers / NWO	82	Southern	Dwelling units		Based on the information provided by HUD to Stantec in email dated 9/12/2019 and according to the FRL masterplan dated 10/9/2019 all HUD dwellings are assumed as "1.5 bedroom apartments with parking" due to the expected housing types and parking provisions indicated in the HUD Masterplan (Feb 2019).	0.8075	precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	66	0.8075	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	66		
	HUD	0	Northern	Dwelling units			0.6375	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active	0	0.6375	Trip generation for the Northern, Carrington and North-West sub-precincts are assumed as 25% lower than the corresponding base rates applied in Scenario A, due to their proximity and ease of access to PT provisions, PT and active modes upgrades, and the	0		
		0	Carrington	Dwelling units		as above	0.6375	as above	0	0.6375	as above	0		
		0	North-West	Dwelling units		as above	0.6375	as above	0	0.6375	as above	0		
		0	Te Auaunga North	Dwelling units		as above	0.765	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and	0	0.765	Trip generation for the Te Auaunga North sub-precinct is assumed as 10% lower than the base rate applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will encourage mode shift. The reduction considers that this sub-precinct has good access (less than 400m) to main PT routes on GNR (via the new Oakley Creek pedestrian bridge). Although it is located almost 500m away from Carrigton Road and therefore does not enjoy the same level of PT acessibility	0		
	Unitec	0	Unitec Core	Dwelling units		Assumed none as no information available	0.8075	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0	0.8075	Trip generation for the Southern and Unitec Core sub-precincts are assumed as 5% lower than the corresponding base rates applied in Scenario A, due to the likelihood of congestion in the surrouding network at this stage of the future which will strongly encourage mode shift or other changes in travel behaviour.	0		
Student Housing					0								0	0
	Unitec	0	Unitec Core	Beds		Assumed none as the existing student housing in Southern zone will be replaced by housing, and no information is available on new development.	0.08	Assumes 1 car park per 6 student beds, and 50% of carpark owners driving	0	0.08	Assumes 1 car park per 6 student beds, and 50% of carpark owners driving	0		

Colour code

Agreed with AT
Agreed with developer / organisation
Existing data/ Based on historical survey /2015 TA
To be confirmed

Zones	Notes
Southern	Current FRL/NWO landholding
Northern	Current Crown landholding
Carrington	Current Crown landholding
North-West	Current Crown landholding
Te Auaunga North	Current Crown landholding
Unitec Core	Area owned by Unitec, including F blocks and B blocks
Taylor's	Area owned by Taylor's Laundry

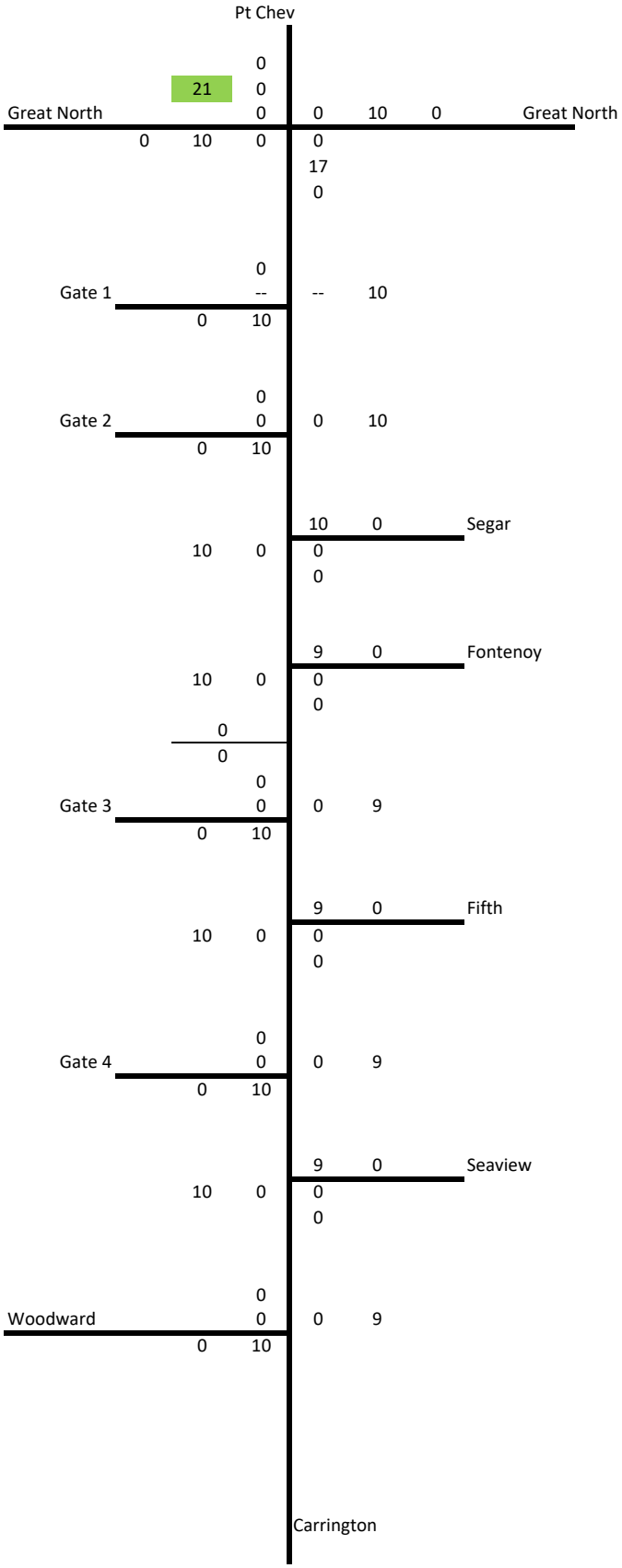
Future trip generation factor	
Tertiary	0.7
Residential (North-West, Northern, C	0.75
Residential (Te Auaunga North)	0.9
Residential (Southern and Unitec Co	0.95

SCENARIO B

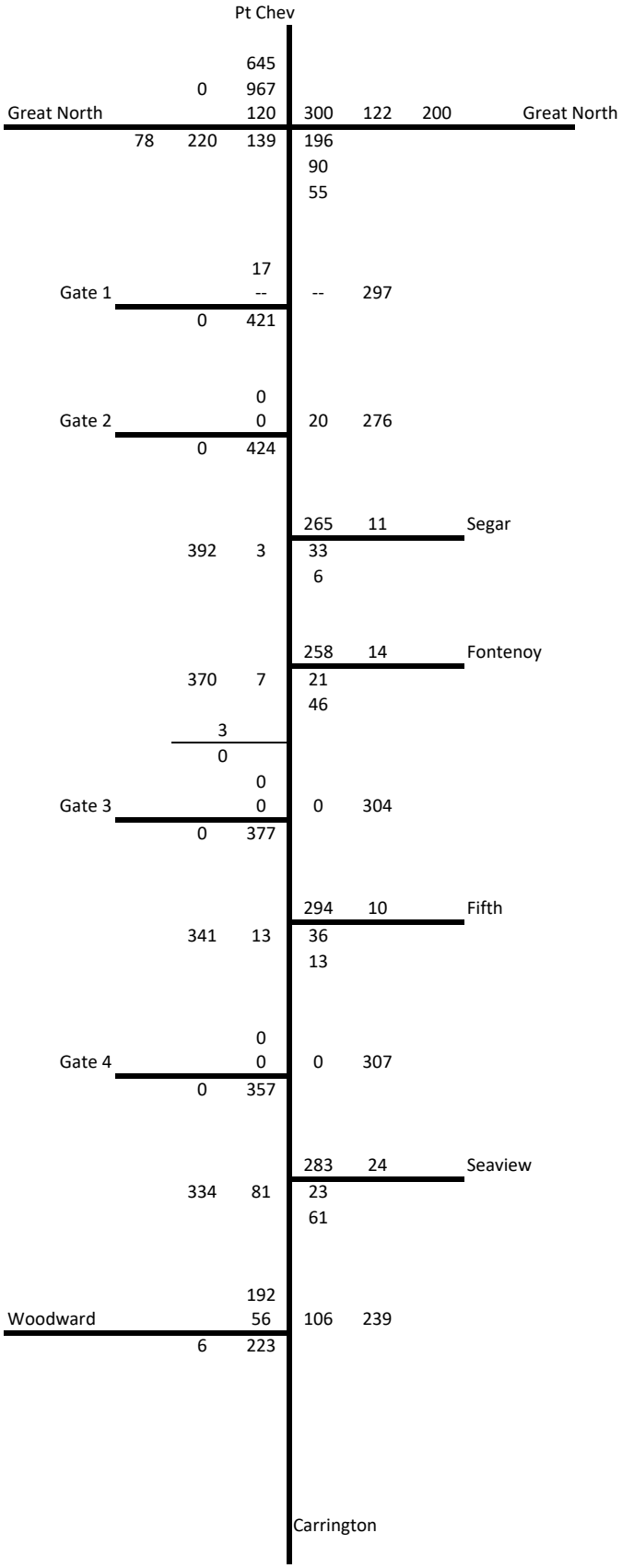
							AM			PM				
Land Use / Activity	Developers / organisation	Development (Year 8 since development)	Zone	Unit	Total development per activity	Notes re. development assumption	Trip rate	Source	Trips	Trip rate	Source	Trips	Total trips AM (vehicles/hour)	Total trips PM (vehicles/hour)
Commercial					65								21	35
Services	Taylors Laundry	65	Taylor's	100 sqm	65	As per existing area of Taylor's Laundry.	n/a	Assume no change from Scenario A. Based on survey 2014 and existing land use.	21	n/a	Assume no change from Scenario A. Based on survey 2014 and existing land use.	35	21	35
Business Partnerships / Offices		0	Unitec Core	100 sqm	0	Assumed none as no information available.	1.6	As per the RTA Guide's updated study of 10 PT friendly office developments in Sydney (located outside CBD), NSW, 2013 - Sydney rate is 1.6 per 100m2 GFA in morning peak hour.	0	1.2	As per the RTA Guide's updated study of 10 PT friendly office developments in Sydney (located outside CBD), NSW, 2013 - Sydney rate is 1.2 per 100m2 GFA in evening peak hour.	0	0	0
Other land uses					198								156	61
Health	Mason Clinic	198	Northern	beds	198	Based on the 2019 Mason Clinic Masterplan, as provided to Stantec by Flow.	n/a	Based on the comparison between the expected number of beds by 2027 and the actual number of beds in 2016, and accordingly factoring the actual trips generated by Masons Clinic as surveyed in 2016. Note numbers are as provided by Flow on 23/01/2020 via email.	156	n/a	Based on the comparison between the expected number of beds by 2027 and the actual number of beds in 2016, and accordingly factoring the actual trips generated by Masons Clinic as surveyed in 2016. Note numbers are as provided by Flow on 23/01/2020 via email.	61	156	61
Grand total trips													**2089**	**1813**

Appendix F Breakdown of Traffic Flows for Sensitivity Tests

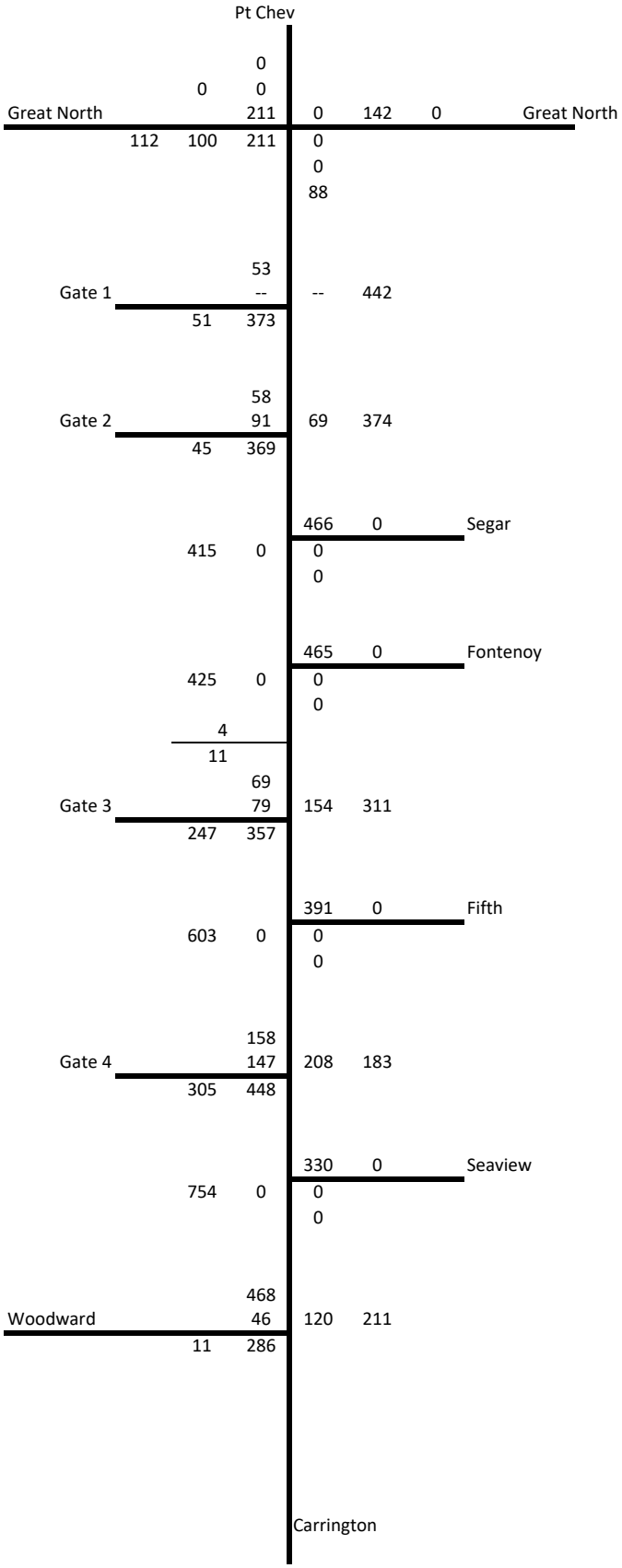
AM Peak
Buses



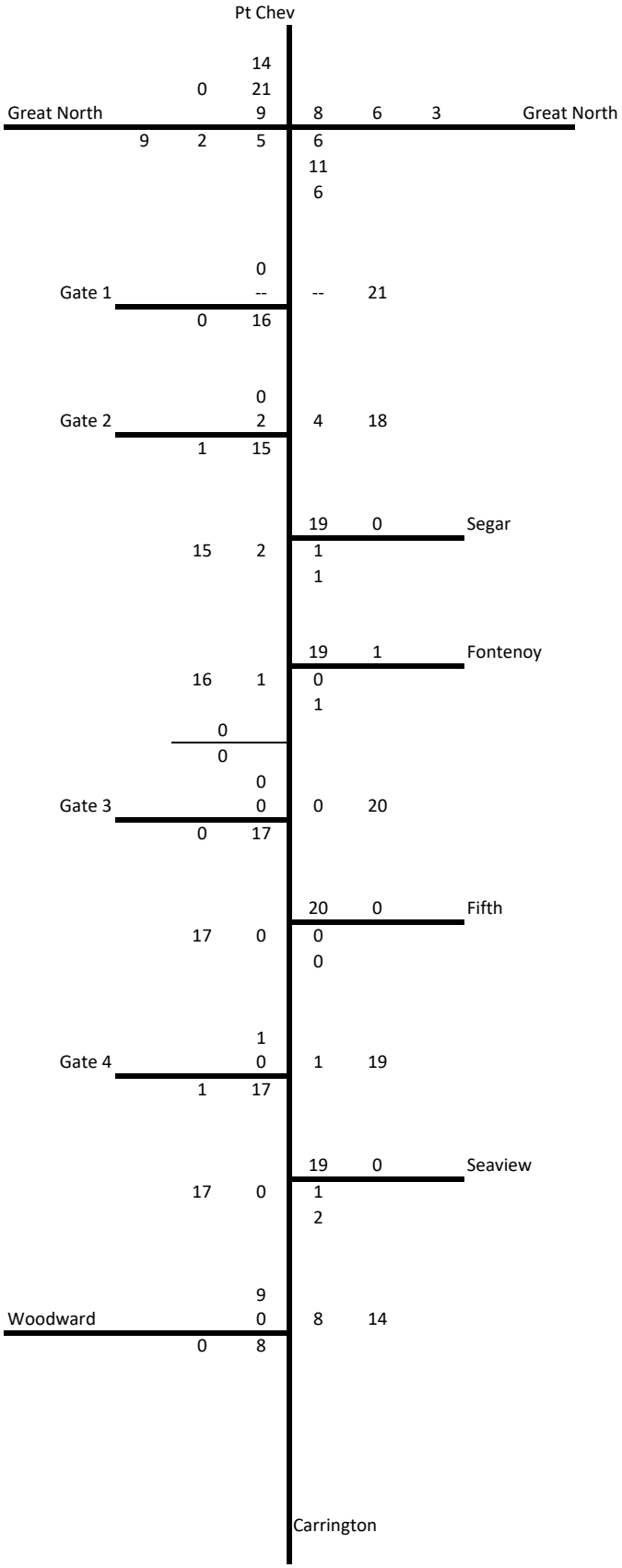
AM Peak
Cars (Non-Precinct Traffic)



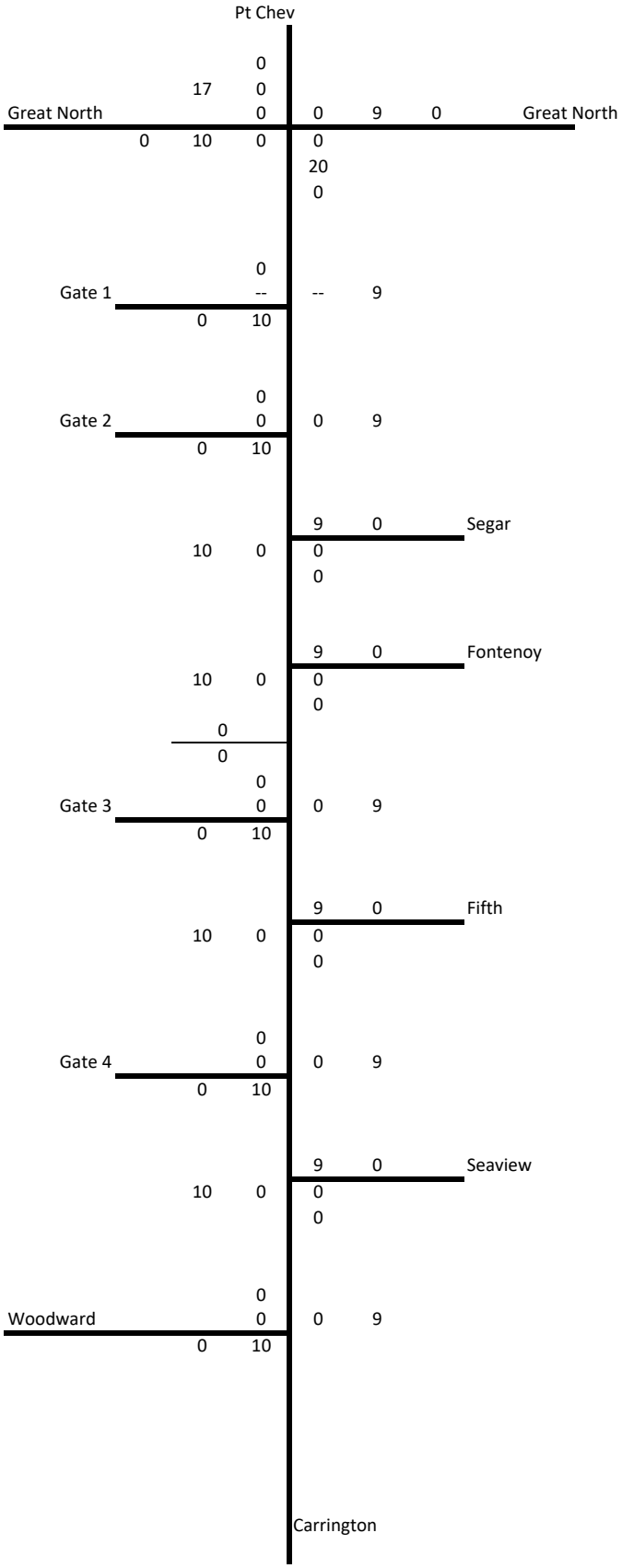
AM Peak
CarsU (Precinct-related Traffic)



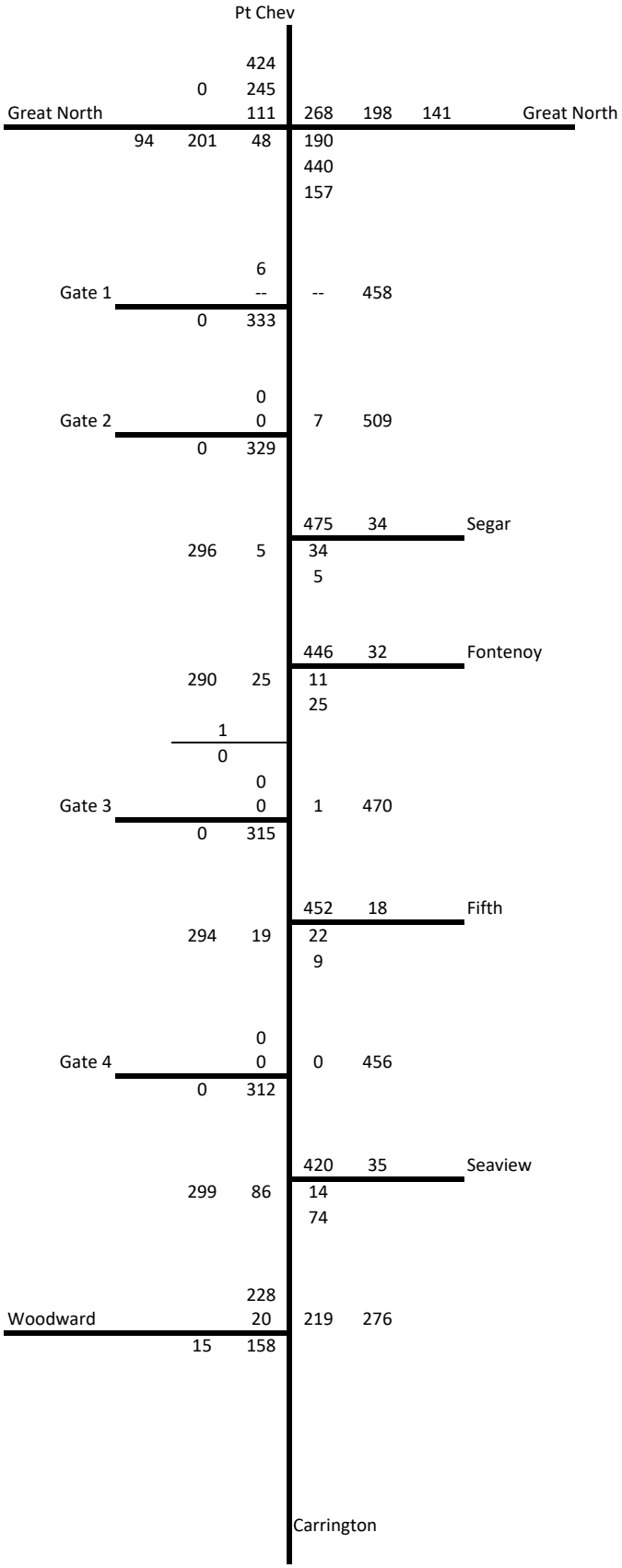
AM Peak
HCVs


Pt Chev
14
0 21
Great North 9 8 6 3 Great North
9 2 5 6
11
6
0
Gate 1 -- -- 21
0 16
0
Gate 2 2 4 18
1 15
19 0 Segar
15 2 1
1
19 1 Fontenoy
16 1 0
1
0
0
0
Gate 3 0 0 20
0 17
20 0 Fifth
17 0 0
0
1
Gate 4 0 1 19
1 17
19 0 Seaview
17 0 1
2
9
Woodward 0 8 14
0 8
Carrington

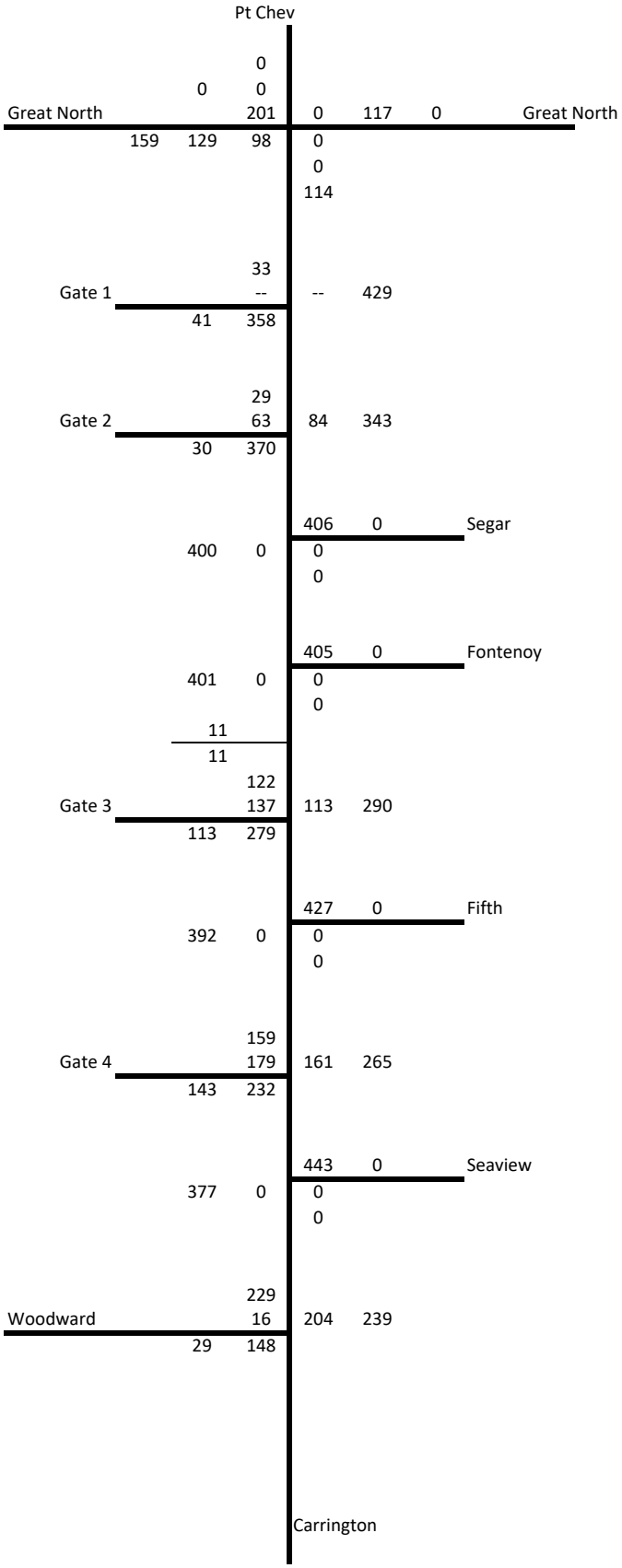
PM Peak
Buses



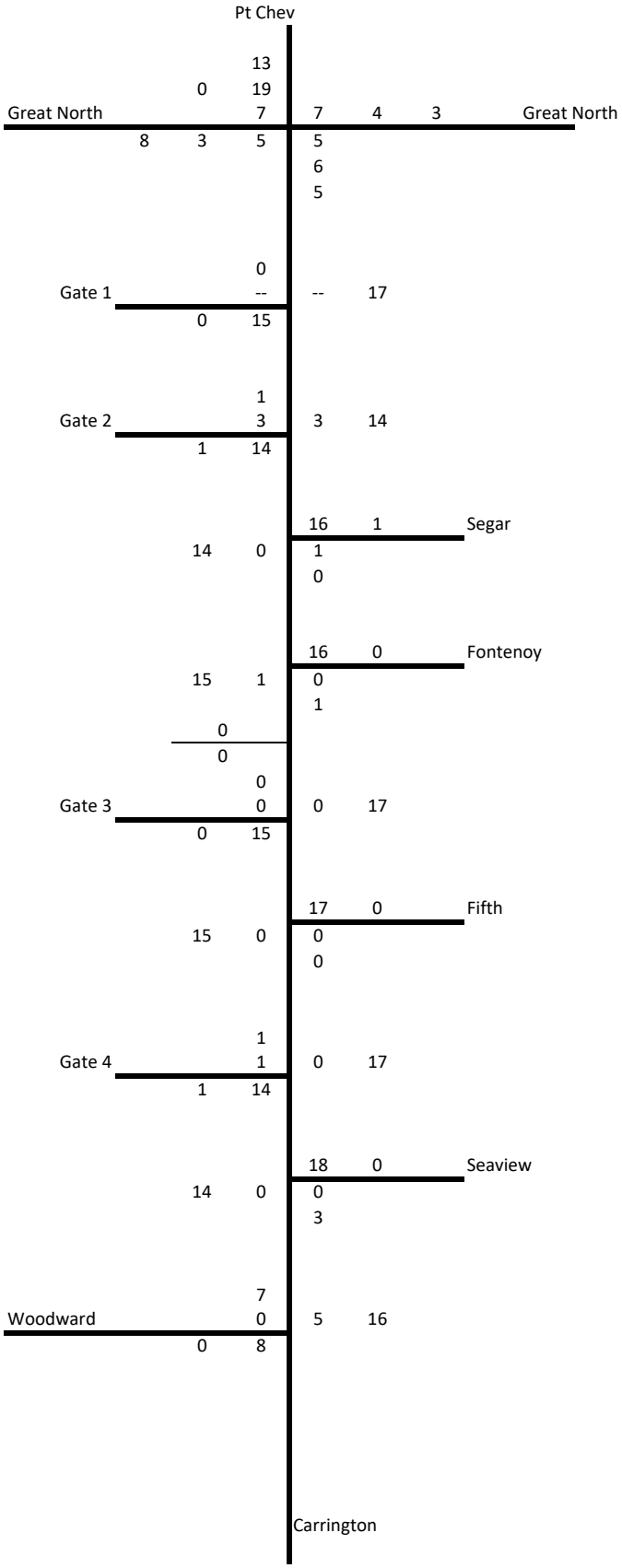
PM Peak
Cars (Non-Precinct Traffic)



PM Peak
CarsU (Precinct-related Traffic)



PM Peak
HCVs


Pt Chev
13
0 19
Great North 7 7 4 3 Great North
8 3 5 5
6
5
0
Gate 1 -- -- 17
0 15
1
Gate 2 3 3 14
1 14
16 1 Segar
14 0 1
0
16 0 Fontenoy
15 1 0
1
0
0
0
Gate 3 0 0 17
0 15
17 0 Fifth
15 0 0
0
1
Gate 4 1 0 17
1 14
18 0 Seaview
14 0 0
3
7
Woodward 0 5 16
0 8
Carrington

Auckland
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Newmarket, Auckland 1023
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Tel +64 9 580 4500

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Memorandum

Wairaka Precinct ITA

October 2020

Integrated Transport Assessment - Memorandum - Additional Sensitivity Modelling

Introduction

In June 2020, Stantec released an Integrated Transport Assessment ("ITA") on behalf of Ministry of Housing and Urban Development ("HUD") for their proposals associated with the Wairaka Precinct, and the Precinct overall.

As part of their review of the ITA, Auckland Transport ("AT") have requested further clarifications and sensitivity modelling analyses. This memorandum outlines the additional modelling undertaken that has been agreed in discussions between AT and HUD.

AT requested confirmation that future infrastructure, in particular at the Carrington Road entrances into the Precinct, will have sufficient capacity to accommodate vehicular traffic flows, should some assumptions made in the ITA do not eventuate. Specifically, this related to reductions in traffic reductions on Carrington Road, associated with traffic unrelated to the precinct development, that AT considers may not in reality occur. These reductions were included in the ITA assumptions due to network congestion discouraging such trips, thereby leading to a proportion of existing users diverting onto different routes, alternative modes or transport, or travelling during different times (Reference Section 5.6, Table 5-4 of the ITA).

Through discussions between AT and HUD agreement has been reached that a sensitivity analysis scenario excluding these reductions will be particularly important for the future implementation of traffic signals at the Gate 2 / Carrington Road intersection, that is anticipated to be the first upgraded site access.

This memorandum discusses the modelling undertaken to demonstrate the potential impact in this regard.

Modelling Scope

The ITA (June 2020) as well as assumptions associated with AT's future plans Carrington Road wider upgrades will be revisited during the medium to long-term. As such, the modelling agreed to be required is relatively limited.

Using SIDRA localised intersection model software, Gate 2 / Carrington Road has been modelled for a weekday AM and PM peak period. All other gates / intersections are excluded from this analysis scope, as per agreement between AT and HUD.

Modelling will cover one development stage / scenario, being a variant to Scenario B included in the ITA (June 2020). The same input and development assumptions will be included as outlined in Scenario B. However, the through-traffic reductions included in the ITA to account for potential congestion-caused redirection and reductions will be reversed on Carrington Road. This through traffic has been manually added back into the intersection flows to represent a worst-case scenario, and is considered a robust assessment for that reason. It covers a medium timeframe of around 8 years with a high development buildout level (around 80% of the HUD land development).

Other scenarios / staging have not been modelled, including no non-signalised baseline or earlier-stage (Scenario A of ITA) options with lower development assumptions. The wider-area models have also not been re-run for this local test.

Vehicle Turning Flow Adjustments

The turning vehicle flows and turning movements incorporated into the modelling are provided in the analysis result sheets attached at **Attachment A**.

As the SIDRA model has no peak factoring, input flows and flows used by SIDRA indicated on the Attachment A sheets are identical.

In comparing the input flows, the re-inclusion of through traffic movements leads to changes to traffic in the Gate 2 model, as summarised in the table below:

Table 1: Changes in Flows With (ITA) and Without through Traffic Reductions

	Northbound on Carrington Road [vehicles / hour]	Southbound on Carrington Road [vehicles / hour]
AM peak hour through flows with through traffic reduction	815	660
Total AM peak hour intersection flows with reduction (all turns)	**1,780**	
AM peak hour through flows without through traffic reduction	885 (+70)	714 (+54)
Total AM peak hour intersection flows without reduction (all turns)	**1,904 (+124)**	
PM peak hour through flows with through traffic reduction	730	894
Total PM peak hour intersection flows with reduction (all turns)	**1,855**	
PM peak hour through flows without through traffic reduction	803 (+73)	989 (+95)
Total PM peak hour intersection flows without reduction (all turns)	**2,023 (+168)**	

Intersection Layout – Carrington Road / Gate 2

The intersection layout (extracted from SIDRA) modelled for the Carrington Road / Gate 2 intersection is shown in Figure 1 below. This provides bus priority as additional lanes, as discussed between AT and HUD, to eventually tie into the anticipated future Carrington Road Upgrade bus facilities. Additionally, a dedicated left turn lane for northbound traffic into the Wairaka Precinct is included, rather than assuming left turning vehicles will queue in the bus lane, that will cause added delays. A dedicated left-turn lane also allows safer and more convenient pedestrian and cyclist crossing phasing on the Gate 2 side road, a key feature of encouraging active modes. Finally, the model assumes pedestrian crossings on all legs. **Note:** In reality these pedestrian crossings would operate as signalised walk/cycle crossings, but this is not considered to have notable impacts for a sensitivity test of this type.

The SIDRA model assumes this signal initially being only a local upgrade, in advance of the wider Carrington Road Upgrade. Therefore, the additional bus and left turn lanes will eventually merge back into the existing layout, until such a time as the adjacent corridor is upgraded. By modelling accordingly (with the resulting lane lengths), this correctly represents an interim period before a corridor upgrade.

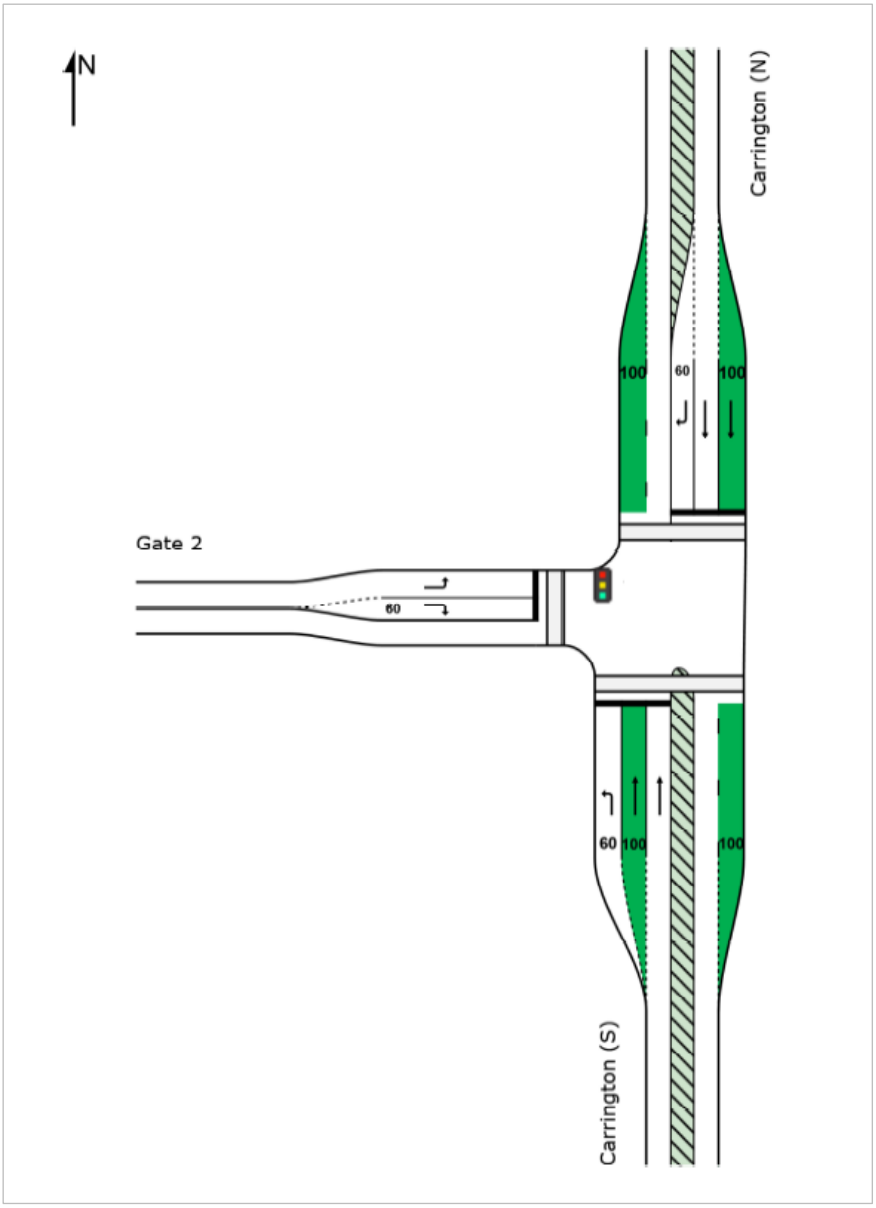

Figure 1: Intersection signal layout used in all scenarios (SIDRA Layout)

SIDRA Modelling Results

A copy of the SIDRA modelling results are provided at Attachment A. In undertaking this analysis, the "with through traffic reduction" modelling was run first, allowing SIDRA to set a cycle time for a signalised baseline using ITA flows. Then SIDRA modelling was re-run, using the "without through traffic reduction" flows. This resulted in some initially un-intuitive results, in particular, the PM peak having better average performance (delays) despite an increase in traffic flows.

Following a review of the modelling it was identified that this was due to SIDRA increasing the total cycle times (from 80s to 90s in the AM, and from 110 seconds to 140 seconds in the PM) to improve vehicular throughput.

It is considered, particularly for the PM peak period, that 140 second cycle times may be too high, considering the associated downsides for active modes of long waiting periods for pedestrians and cyclists, even though there will be a reduction in vehicular delays.

Therefore, in association with the "without through traffic reductions" (higher) flow scenarios, one scenario was run once with a SIDRA-optimised (longer) cycle time, and once based on the retained earlier cycle times SIDRA with the reduced flows. This allows a better comparison of impacts.

A summary of the analyses results are provided in the table below, whilst the SIDRA modelling results output is attached at Attachment A.

Table 2: Key performance indicators for three scenarios assessed (all scenarios are identical in representing a 2028 modelling year, and around 80% buildout development, as per ITA Scenario B)

	With through traffic reductions scenario (**lower flows**), cycle time set by SIDRA	Without through traffic reductions scenario (**higher flows**), cycle time set by SIDRA	Without through traffic reductions scenario (**higher flows**), cycle time forced to be same as set by SIDRA for lower flows (shorter)
AM peak hour, average delays [s]	23.3	24.3	33.4
AM peak hour, average delays, worst turn [s]	39.6 (RT from Gate 2)	44.5 (RT from Gate 2)	47.5 (northbound THRU)
AM peak hour, longest 95th percentile queue [m]	238.0 (northbound THRU)	289.0 (northbound THRU)	347.8 (northbound THRU)
PM peak hour, average delays [s]	21.2	18.7	33.8
PM peak hour, average delays, worst turn [s]	53.1 (RT from Gate 2)	67.7 (RT from Gate 2)	53.1 (RT from Gate 2)
PM peak hour, longest 95th percentile queue [m]	236.6 (southbound THRU)	233.9 (southbound THRU)	419.3 (southbound THRU)

As can be seen from the results above, the intersection is predicted to perform well overall, never falling below Level of Service (LOS) C during any of the six modelling scenarios. The anticipated highest delays are considered acceptable for a traffic signal-controlled intersection on a very busy arterial road, especially considering they tend to mostly affect development-traffic right turns, not through traffic movements.

Increases in delays (with no through traffic reduction occurring) will depend to some degree on whether or not the signals are optimised for vehicle traffic. This applies even more so for queue lengths. Based on the SIDRA results all vehicle turning flow lengths i.e. excluding Carrington Road through traffic queue lengths have been shown to be less than the 60m used as indicative turn lane lengths. Queues on Carrington Road, as noted, are longer.

However, it is noted that these queue lengths are considered somewhat irrelevant anyway, as the localised model cannot include impacts from upstream and downstream intersections, that during peak hours are expected to “override” localised queueing effects.

More importantly, the results show that no matter whether the reduced or non-reduced flows are used, the proposed traffic signal controlled intersection will not represent a “weak link” in the future Carrington Road environment, performing well for a very busy intersection.

Attachment A

MOVEMENT SUMMARY

Site: 13_B1_am [Gate 2 - AM Peak - With Through Traffic Reduction - 80s Cycle - SIDRA Set]

AM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Carrington (S)												
1	L2	47	2.1	0.038	9.1	LOS A	0.6	4.3	0.35	0.61	0.35	44.0
2	T1	815	3.2	0.866	27.8	LOS C	33.4	238.0	0.95	0.99	1.11	36.2
Approach		862	3.1	0.866	26.7	LOS C	33.4	238.0	0.92	0.97	1.07	36.6
North: Carrington (N)												
8	T1	660	4.1	0.756	14.3	LOS B	16.9	121.5	0.69	0.63	0.71	41.8
9	R2	83	3.6	0.310	38.6	LOS D	3.0	21.7	0.93	0.76	0.93	32.5
Approach		743	4.0	0.756	17.0	LOS B	16.9	121.5	0.72	0.65	0.74	40.5
West: Gate 2												
10	L2	82	1.2	0.131	24.4	LOS C	2.2	15.7	0.73	0.72	0.73	37.2
12	R2	93	2.2	0.376	39.9	LOS D	3.5	24.6	0.95	0.77	0.95	32.2
Approach		175	1.7	0.376	32.6	LOS C	3.5	24.6	0.85	0.74	0.85	34.3
All Vehicles		1780	3.4	0.866	23.3	LOS C	33.4	238.0	0.83	0.81	0.91	37.9

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		150	34.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 13_B2_am [Gate 2 - AM Peak - Without Through Traffic Reduction - 80s Cycle - Forced]

AM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Carrington (S)												
1	L2	47	2.1	0.038	9.1	LOS A	0.6	4.3	0.35	0.61	0.35	44.0
2	T1	885	2.9	0.942	47.5	LOS D	48.9	347.8	1.00	1.25	1.43	30.3
Approach		932	2.9	0.942	45.6	LOS D	48.9	347.8	0.96	1.22	1.38	30.8
North: Carrington (N)												
8	T1	714	3.8	0.814	17.1	LOS B	21.0	150.1	0.74	0.72	0.81	40.5
9	R2	83	3.6	0.310	38.6	LOS D	3.0	21.7	0.93	0.76	0.93	32.5
Approach		797	3.8	0.814	19.3	LOS B	21.0	150.1	0.76	0.72	0.82	39.5
West: Gate 2												
10	L2	82	1.2	0.131	24.4	LOS C	2.2	15.7	0.73	0.72	0.73	37.2
12	R2	93	2.2	0.376	39.9	LOS D	3.5	24.6	0.95	0.77	0.95	32.2
Approach		175	1.7	0.376	32.6	LOS C	3.5	24.6	0.85	0.74	0.85	34.3
All Vehicles		1904	3.2	0.942	33.4	LOS C	48.9	347.8	0.87	0.97	1.10	34.3

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	50	34.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		150	34.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 13_B2_am [Gate 2 - AM Peak - Without Through Traffic Reduction - 90s Cycle - SIDRA Set]

AM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Carrington (S)												
1	L2	47	2.1	0.036	8.9	LOS A	0.6	4.4	0.32	0.61	0.32	44.1
2	T1	885	2.9	0.880	29.8	LOS C	40.7	289.3	0.95	0.99	1.10	35.5
Approach		932	2.9	0.880	28.7	LOS C	40.7	289.3	0.92	0.97	1.06	35.9
North: Carrington (N)												
8	T1	714	3.8	0.766	13.2	LOS B	18.9	135.1	0.64	0.59	0.65	42.3
9	R2	83	3.6	0.322	43.2	LOS D	3.4	24.5	0.94	0.76	0.94	31.2
Approach		797	3.8	0.766	16.3	LOS B	18.9	135.1	0.67	0.61	0.68	40.8
West: Gate 2												
10	L2	82	1.2	0.137	27.8	LOS C	2.6	18.0	0.74	0.72	0.74	36.0
12	R2	93	2.2	0.387	44.5	LOS D	3.9	27.7	0.96	0.77	0.96	30.9
Approach		175	1.7	0.387	36.7	LOS D	3.9	27.7	0.86	0.75	0.86	33.1
All Vehicles		1904	3.2	0.880	24.3	LOS C	40.7	289.3	0.81	0.80	0.88	37.5

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
P3	North Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	50	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		150	39.3	LOS D			0.94	0.94

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

MOVEMENT SUMMARY

Site: 13_B1_pm [Gate 2 - PM Peak - With Through Traffic Reduction - 110s Cycle - SIDRA Set]

PM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 110 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Carrington (S)												
1	L2	29	3.4	0.022	8.9	LOS A	0.4	3.0	0.29	0.59	0.29	44.1
2	T1	730	3.3	0.657	17.0	LOS B	26.1	185.9	0.74	0.67	0.74	40.5
Approach		759	3.3	0.657	16.7	LOS B	26.1	185.9	0.72	0.67	0.72	40.7
North: Carrington (N)												
8	T1	894	2.7	0.874	18.4	LOS B	33.3	236.6	0.66	0.66	0.73	39.9
9	R2	97	3.1	0.398	52.7	LOS D	4.9	35.2	0.96	0.78	0.96	28.9
Approach		991	2.7	0.874	21.8	LOS C	33.3	236.6	0.69	0.67	0.75	38.5
West: Gate 2												
10	L2	33	3.0	0.062	34.6	LOS C	1.3	9.1	0.75	0.69	0.75	33.7
12	R2	72	4.2	0.319	53.1	LOS D	3.6	26.3	0.95	0.76	0.95	28.8
Approach		105	3.8	0.319	47.3	LOS D	3.6	26.3	0.89	0.74	0.89	30.2
All Vehicles		1855	3.0	0.874	21.2	LOS C	33.3	236.6	0.71	0.67	0.75	38.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	50	49.3	LOS E	0.1	0.1	0.95	0.95
P3	North Full Crossing	50	49.3	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	50	49.3	LOS E	0.1	0.1	0.95	0.95
All Pedestrians		150	49.3	LOS E			0.95	0.95

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

MOVEMENT SUMMARY

Site: 13_B2_pm [Gate 2 - PM Peak - Without Through Traffic Reduction - 110s Cycle - Forced]

PM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Carrington (S)												
1	L2	29	3.4	0.022	8.9	LOS A	0.4	3.0	0.29	0.59	0.29	44.1
2	T1	803	3.0	0.725	18.1	LOS B	30.6	217.6	0.78	0.72	0.78	40.1
Approach		832	3.0	0.725	17.8	LOS B	30.6	217.6	0.77	0.71	0.77	40.2
North: Carrington (N)												
8	T1	989	2.4	0.960	43.9	LOS D	59.1	419.3	0.80	0.97	1.09	31.3
9	R2	97	3.1	0.398	52.7	LOS D	4.9	35.2	0.96	0.78	0.96	28.9
Approach		1086	2.5	0.960	44.7	LOS D	59.1	419.3	0.81	0.96	1.08	31.0
West: Gate 2												
10	L2	33	3.0	0.062	34.6	LOS C	1.3	9.1	0.75	0.69	0.75	33.7
12	R2	72	4.2	0.319	53.1	LOS D	3.6	26.3	0.95	0.76	0.95	28.8
Approach		105	3.8	0.319	47.3	LOS D	3.6	26.3	0.89	0.74	0.89	30.2
All Vehicles		2023	2.8	0.960	33.8	LOS C	59.1	419.3	0.80	0.84	0.94	34.2

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	50	49.3	LOS E	0.1	0.1	0.95	0.95
P3	North Full Crossing	50	49.3	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	50	49.3	LOS E	0.1	0.1	0.95	0.95
All Pedestrians		150	49.3	LOS E			0.95	0.95

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

MOVEMENT SUMMARY

Site: 13_B2_pm [Gate 2 - PM Peak - Without Through Traffic Reduction - 140s Cycle - SIDRA Set]

PM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Carrington (S)												
1	L2	29	3.4	0.021	8.4	LOS A	0.4	3.2	0.24	0.58	0.24	44.4
2	T1	803	3.0	0.654	16.6	LOS B	32.9	233.9	0.67	0.62	0.67	40.7
Approach		832	3.0	0.654	16.3	LOS B	32.9	233.9	0.66	0.62	0.66	40.9
North: Carrington (N)												
8	T1	989	2.4	0.871	11.5	LOS B	33.0	233.9	0.52	0.49	0.53	43.2
9	R2	97	3.1	0.447	67.6	LOS E	6.3	45.3	0.97	0.78	0.97	25.8
Approach		1086	2.5	0.871	16.5	LOS B	33.0	233.9	0.56	0.52	0.57	40.8
West: Gate 2												
10	L2	33	3.0	0.070	46.4	LOS D	1.7	12.1	0.79	0.70	0.79	30.4
12	R2	72	4.2	0.355	67.7	LOS E	4.7	33.7	0.97	0.77	0.97	25.8
Approach		105	3.8	0.355	61.0	LOS E	4.7	33.7	0.91	0.75	0.91	27.1
All Vehicles		2023	2.8	0.871	18.7	LOS B	33.0	233.9	0.62	0.57	0.62	39.8

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	50	64.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	50	64.3	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	50	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		150	64.3	LOS F			0.96	0.96

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

Te Auaunga Plan Change - Transport Assessment & Traffic Modelling Report

PREPARED FOR MINISTRY OF HOUSING AND URBAN DEVELOPMENT | DECEMBER 2022

We design with community in mind

Stantec

Revision Schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	**Checked by**	**Reviewed by**	**Approved by**
V1		First draft for client / planner review	TLJ/ZC	MR	DJM	DJM
V2		Second draft for review	TLJ/ZC	MR	DJM	
V3		Final Draft	TLJ/ZC	MR	DJM	DJM
V4	20/12/2022	Final	TLJ/ZC	MR	DJM	DJM

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Quality Statement

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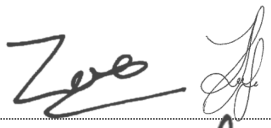
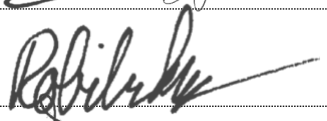
PREPARED BY Zoe Chen/ Trevor Lee-Joe		20 / 12 / 2022
CHECKED BY Max Robitzsch		20 / 12 / 2022
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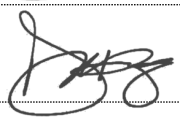
APPROVED FOR ISSUE BY Don McKenzie		20 / 12 / 2022

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Executive summary

This report summarises the traffic modelling and relevant other transport aspects of a plan change proposal for rezoning and residential intensification in the Wairaka Precinct (proposed to be renamed Te Auaunga) in Auckland, together with the establishment of a retail cluster already provided for in the zoning, but not previously assessed in traffic flow terms.

To enable effective integration of this significant level of development into the existing transport environment without inappropriate disruption, the development needs to progress beyond a number of "Status Quo" assumptions historically forming part of large new residential developments in Auckland.

As with the 2020 ITA, but in some cases strengthened in form, the reporting instead assumes a Te Auaunga Precinct planned from the outset to encourage transport alternatives. This is to incentivise use of public transport, walking and cycling, while disincentivising private car use among residents and visitors, via both design and operation. The assumptions and conditions necessary to achieve the required mode shift are available to the Te Auaunga Precinct both in terms of its location as well as its proposed design and infrastructure, as set out in this report to follow.

It is important to note that the increase in development intensity is not solely due to the proposed rezoning of some areas within the precinct. Instead, it is in large degree due to the traffic modelling extending the assessment horizon to include more of the development already signalled by the existing zoning and precinct provisions. The purpose of now including an extended time period in the model is to assess these impacts alongside those of the rezoning itself. This report's assumptions and conclusions, if approved through the plan change process, would be expected to sit alongside the previously approved 2020 ITA as a companion document.

As was identified in the work related to the new traffic modelling covered in this December 2022 Report, the additional residential and retail development requires an even stronger focus on non-car-based access. Key assumption changes going beyond those of the 2020 ITA include a more stringent (pro-rata) constraint on residential car parking, the assumption of resident's parking schemes being established to avoid creating added parking pressure (and added trip generation) via people parking in surrounding suburbs, and incorporation of a more extensive Carrington Road Upgrade (with bus lanes and protected cycle lanes) extending as far as New North Road.

The key zoning changes are the rezoning of 122,329m² of "Special purpose – Tertiary Education Zone" to "Business – Mixed Use" zoning intended for residential housing is accompanied by the rezoning of two smaller other areas from "Terrace Housing and Apartment Buildings" to "Business – Mixed Use" in the centre, and a "Special purpose – Tertiary Education Zone" area to "Residential Mixed Housing Urban" along the southern edge of the Unitec core area.

The Te Auaunga Plan Change traffic modelling also, above and beyond the impacts of the rezoning alone, incorporates recent changes in the masterplan assumptions. The most significant of these changes are:

- a modelling horizon year of 2031 rather than 2028;
- an inclusion of a small supermarket and supporting specialty retail,
- An increase of residential dwellings modelled from previously 2,049 to now 4,000, and an increase in average dwelling size from 1.5 bedrooms to 2.5 bedrooms, albeit without a commensurate increase of car parking.

At the same time, a primary school previously included at 50% of its long-term roll in year 2028 has been omitted at year 2031, as the actual year of it being developed currently remains uncertain.

Overall, compared to the results of the approved 2020 ITA, there are a variety of changes to traffic Levels of Service / delays. These vary widely and are not all decreases in performance, as individual intersections are affected differently by the changed layout assumptions and increased flows. At the southern end of the network, performance results are also somewhat dependent on longer-term flow reduction assumed in the wider Auckland traffic model in this area, and the added capacity on the approach to the Mt Albert intersection from a rebuild / widening of the rail overbridge.

Bus journey time analysis shows that the Carrington Road bus routes will see clear benefits from the new bus lanes proposed as part of the Carrington Road Upgrade, albeit to ensure consistent advantage of public transport over single-occupancy cars, more intersection-specific bus priority would be beneficial at key locations in addition to the mid-block bus lanes. This particularly applies at the "ends" of the model (Great North Road and New North Road).

In a wider sense, this report indicates that the transport impacts of the proposed intensification and the rezoning enabled by the plan change can be adequately integrated into the surrounding transport network. This conclusion is however predicated upon key constraints to trip generation rates (in particular the parking constraints) and improvements to active modes and public transport (in particular the extended Carrington Road Upgrade) both being in place.

If these assumptions are given effect to, then, combined with the good existing transport accessibility and the central location that the Te Auaunga Precinct enjoys, the transport effects of the new development are considered acceptable, and will place a much-reduced burden on Auckland's transport networks compared to a development of similar size further outside the Auckland Isthmus.

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1 Introduction

This report on the Te Auaunga Plan Change discusses the traffic aspects of a proposal to intensify residential development in the Wairaka Precinct (the "precinct") in Auckland, as it is currently defined in Section I334 of Auckland Council's Unitary Plan Operative in Part ("Unitary Plan") (the "December 2022 Report").

The primary change consists of 122,329m² of "Special Purpose - Tertiary Education Zone" proposed to be rezoned to "Business – Mixed Use" zoning. This land, in three blocks, is located in the southern part of the centre of the precinct, in the west and east of what is generally called the "Unitec Core", where the Unitec tertiary education institute is located after having progressively consolidating activities there from the wider precinct. There is a further small triangle of land adjacent to the Mason Clinic to the north that is to changes from "Special Purpose – Healthcare Facility and Hospital Zone" to "Business Mixed Use" as part of this plan change. However, it is intended to be vested as road, and does not affect the transport matters discussed in this report.

One further block of approximately 10,093m² in the northwest, currently zoned "Terrace Housing and Apartment Buildings" is also proposed to be rezoned as "Business – Mixed Use".

Finally, the Te Auaunga Plan Change proposes to rezone approximately 9,898m2 of "Special Purpose - Tertiary Education Zone" to "Residential Mixed Housing Urban", in the south of the area.

The areas proposed to be rezoned are identified in Figure 1 below:

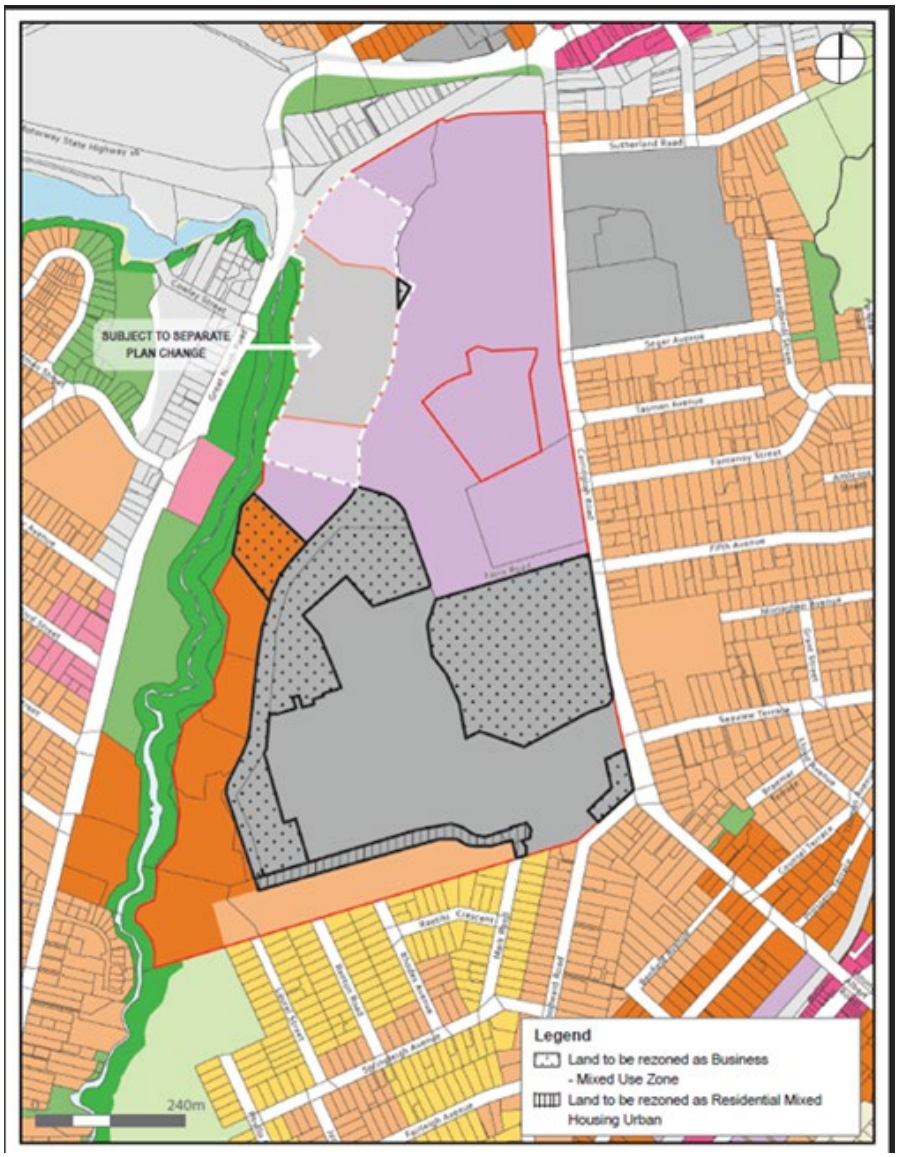

Figure 1: Areas to be rezoned

The purpose of the Te Auaunga Plan Change is to enable development of multi-storey, residential housing on the rezoned mixed-use land, similar to that envisaged in other parts of the precinct already zoned “Business – Mixed use”.

Stantec has previously prepared an Integrated Transport Assessment (“2020 ITA”) covering the entire precinct for the Ministry of Housing and Urban Development, “HUD”. That 2020 ITA discussed all transport aspects, from the overall transport philosophy of the proposed new community to how development would fulfil precinct rules and manage transport and traffic integration. The reporting included producing and assessing a wider-area traffic model – up to the assumptions for a Year 2028 scenario. On 30 March 2021, Auckland Council, after discussion with HUD and Auckland Transport (”AT”), approved the ITA. This document is referred to as the “2020 ITA” in this report.

While the 2020 ITA included the areas now proposed to be rezoned, the tertiary education areas were not assumed to have any traffic generation (at least not by Year 2028), beyond that assumed for the tertiary education institute itself. As such, a key traffic and transport matter for assessment during the Te Auaunga Plan Change process is the extent of additional traffic impacts resulting from development of these areas that will be enabled by the proposed rezoning to Business – Mixed Use.

At the same time, HUD has now instructed Stantec to also assess increased residential and commercial (retail) development in the other areas of the precinct not being rezoned. While this further residential development aligns with the zoning of the unchanged areas, the 2020 ITA did not yet include it for the Year 2028 horizon.

Overall, the Te Auaunga Plan Change is not considered to change the character of development proposed in the precinct, or the general transport approaches, only the intensity of development. In consequence therefore, this report largely concentrates on traffic modelling matters only. It does not represent a “new ITA” in and of itself, with the precinct rules / the 2020 ITA already having envisaged further intensified housing, and the overall appropriate transport environment to cater for it, but rather forms one of the three documents comprising the Te Auaunga Precinct 2022 ITA as set out in the 2022 Executive Summary provided with the Te Auaunga Plan Change application.

The relevant provision and assessments of the 2020 ITA are considered as remaining appropriate, except where this report states changed assumptions or mitigations that have been identified during the updated traffic modelling.

To assist with usability, both this December 2022 Report and the Te Auaunga Plan Change application will explicitly (and where appropriate, in tabulated form), discuss which assumptions remain the same and which would change if the Te Auaunga Plan Change is approved.

The Te Auaunga Plan Change’s assumptions will be covered in depth in the following report, however the most important assumptions compared to the 2020 ITA can be summarised as:

- The traffic modelling scenario is for the Year 2031, instead of Years 2024 and 2028. Background (wider-area) traffic data has also been updated to 2031 using Auckland-wide projected values.
- The model now covers 4,000 residential dwellings by Year 2031, compared to a total of 2,049 dwellings by Year 2028 considered within the 2020 ITA.
- The model somewhat modifies the distribution of dwellings (i.e. different spread for size of bedrooms)
- The model now includes retail development, including a supermarket (previously assumed to be developed only after the model scenario timeframe).
- The model now assumes a primary school (and associated early childhood education) will only be implemented at some stage after Year 2031 – where in the 2020 ITA by 2028 the school had reached 375 students, half the long-term roll.
- The model now assumes that the commercial operations of the Taylor’s Laundry site will have ceased by Year 2031, while they were still included in the Year 2028 scenario in the 2020 ITA.
- The model reduces the per-dwelling car parking rate. Instead of a previous rate of less than 1 car park per dwelling, a total of 1,000 dwellings are now proposed to have no car parking, while the remaining 3,000 dwellings will have an average of 0.7 or less parking spaces per dwelling (average across the precinct).
- The model adjusts a number of trip generation rates downwards (less motor vehicle traffic) based on various assumption changes since the 2020 ITA’s production.
- The model now assumes that Gate 1 will be an all-movements signal, with Gate 2 being a left-in / left-out give-way intersection by 2031 (reversing the functionality of the two northern-most gates switch compared to the 2020 ITA). Associated with this, the nearby North-Western Shared Path crossing over Carrington Road is now proposed to be integrated into the Gate 1 signals rather than assumed to be signalised as a separate mid-block crossing.
- The model now assumes that the Carrington Road Upgrade (provision of bus lanes, protected cycle lanes, improved footpaths and various intersection upgrades) extends along the entirety of Carrington Road, from the intersections with Great North Road in Point Chevalier to New North Road in Mt Albert, including additional lanes on upgraded / replaced motorway and rail overbridges – rather than the upgrade only covering the precinct frontage.

The following key elements remain the same, or essentially the same, as in the 2020 ITA and its supporting transport model:

- The geographic distribution and numbers of dwellings across the areas of the precinct that are not being rezoned.
- The student assumptions for Unitec (9,702 FTE), despite a reduction in size in the tertiary education-zoned area.
- The trip generation assumptions for the extended Mason Clinic currently undergoing its own Plan Change (Proposed Private Plan Change 75: Mason Clinic) - noting that the 2020 ITA model already allowed for the same increases since put forward in the transport documentation for Plan Change 75.
- The number and location of vehicle connections to the wider transport network.
- The assumptions for how much through traffic reductions on Carrington Road would occur due to displacement by the new site traffic.
- The focus on “less-car dominated” residential development via improving alternative transport options, including improving public transport.

2 Assumption Changes

As set out in the introduction, this December 2022 Report does not intend to replace the 2020 ITA, as the overall transport moves set out therein stay the same. At the same time, the work extends to more than simply adding some additional vehicle traffic to the traffic model and re-running it to assess intersection performance and journey times, and has therefore been packaged together to form the Te Auaunga Precinct 2022 ITA as described in the 2022 Executive Summary included in the Te Auaunga Plan Change application.

This is not only because some of the key activity area assumptions and the scenario year have changed, but also because a number of other "wider" assumption changes have occurred. These both cover changes in the assumed future network; for example, the extension of the "Carrington Road Upgrade", to other changes made after iterative work within the applicant team to identify optimisations and mitigation needed to ensure appropriate traffic performance.

This section of the report discusses the key assumption changes in more depth. In Table 9, the report later provides a table setting out a summary of all key assumption changes on the traffic model.

Where the below section does not discuss something – for example, the basic form of the AIMSUN model, or the calibration process – this can be reviewed in the 2020 ITA's modelling section.

2.1 Modelling Years / Scenarios

The 2020 ITA had a "Base" (2019 road layout and traffic) scenario, as well as a Scenario A (Year 2024) and a Scenario B (Year 2028). The December 2022 Report will discuss the "Base" and "Scenario B" scenarios again (albeit renamed "Base 2019" and "ITA 2028") as well as a new "Plan Change 2031" scenario. The first two are not new modelling – they are re-provided mainly to allow easier comparison with the previous work and the approved 2020 ITA.

The future year horizon adopted for the Te Auaunga Plan Change 2031 was adopted for a number of reasons:

- Several years have passed since the original modelling was developed in 2019-2020.
- The significant additional residential development proposed to be enabled is unlikely to happen immediately – it primarily extends the upper ceiling, rather than the development speed.
- The primary infrastructure upgrade to the wider roading network (the "Full Upgrade" along all of Carrington Road discussed later in this report) is unlikely to be (fully) in place by 2028, as it is more substantial than the upgrade discussed in the 2020 ITA.
- The 2031 timeframe aligns with the new wider-area Auckland traffic model data available from Auckland's Macro Strategic Model ("MSM") (available model data for periods after 2031 remains relatively unrefined and is thus much less useful for local-area traffic modelling such as the plan change model).

As in the 2020 ITA, no modelling for periods after the chosen longer-term scenario has been undertaken. If any future development above and beyond the activity area assumptions is proposed, a future ITA will update the corresponding assumptions and revise the traffic model as required.

2.2 Proposed Development Levels

The below sections align with the order of Section 3.5, Proposed Development Levels, in the 2020 ITA.

2.2.1 Education Land Uses

Despite the Te Auaunga Plan Change rezoning land currently zoned "tertiary education", the Te Auaunga Plan Change modelling assumes the same level of future student and staff at Unitec in the 2031 scenario as in the 2020 ITA for 2028, i.e. 9,702 students and 1,187 staff (all FTE equivalents). These forecast numbers are several years old and predate reorganisation that is currently ongoing in the tertiary education sector - however, in the absence of formalised updated forecasts, this was retained as per before.

Unlike tertiary education, the primary school and associated special needs students and early childhood education components, as well as the related staff, are assumed to not be present in the 2031 scenario. While the 2020 ITA assumed a 50% roll of students and staff for a new primary school in 2028, there is now understood to be insufficient certainty about the timing and location of the future primary school to enable the traffic modelling to incorporate it. At the point in time this information is available, the ITA and/or modelling work may need to be updated.

2.2.2 Residential Land Uses

One key outcome of the Te Auaunga Plan Change would be the increase in enabled residential development (assuming the Te Auaunga Plan Change is granted as set out in this report) from the 2,049 dwellings discussed in the 2020 ITA to 4,000 dwellings. This number of extra dwellings are expected to be developed in an iterative fashion considering the likely external traffic impacts and amount of rezoned land available.

The proposed additional 1,951 extra dwellings are proposed to be located in the west of the Unitec core, in the area sometimes referred to as the "F-Blocks" with approximately 155 dwellings, and 483 dwellings in the east of the Unitec site, along Carrington Road in the area sometimes referred to as the "B-Blocks". These areas are the primary proposed areas for rezoning as shown in Figure 1 earlier. Existing development in these zones (where present – some low-intensity development exists along the Carrington Road frontage between Gate 3 and 4 in particular) is assumed as removed prior to development for the purposes of this traffic model.

The residential development in the other areas of the precinct not being rezoned (i.e. the 2,049 dwellings) are located essentially in the same locations as in the previous model.

The 2020 ITA, while noting that there was some flexibility in the breakdown of different dwelling sizes from one to four bedrooms, largely assumed an "average" of an "1.5 bedrooms with parking" typology. Information on other sizes, where available, was largely based on masterplanning that had been completed at that time (now further advanced). It was acknowledged that the 1.5 bedrooms was a simplification, and in practice would be somewhat more varied - with the key traffic constraint allowing certainty despite this being the overall dwelling cap, and the site-wide parking constraint (1 or fewer spaces per dwelling average). This has been discussed in Appendix D of the original 2020 ITA.

Subsequent discussions between HUD and development partners identified that there were some concerns that the bedroom average was somewhat too small on average, i.e. that it was sensible to plan for larger average dwellings. After discussion, it was decided that a significant number of larger developments would be included. However – as will be discussed later – a significant number (one third) of all dwellings would now have zero car parking, and the car parking average for the remainder would be reduced further. This assists with limiting the vehicular impacts of not only increasing the overall dwelling numbers, but also increasing the average size of the dwellings.

Actual bedroom spreads may still vary somewhat. Again, the overall cap and the car parking average will provide the required transport certainty even if, for example, some 3-4 bedroom dwellings are built as well, despite these – and 2-bedroom dwellings – not being explicitly included in this current dwelling schedule.

The new and old distribution spread is shown in Table 1 below.

Table 1: Dwelling Size Distribution

Dwelling size	2028 ITA Number of dwellings	2031 Plan Change Number of dwellings
Studios / 1-bedrooms / 1.5-bedrooms (without parking)	98	1,000
1.5 bedrooms (with parking)	1,591	1,250
2 bedrooms (with parking)	183	0
2.5 bedrooms (with parking)	95	1,750
3 and 4 bedrooms (with parking)	82	0
Totals	2,049	4,000

The distribution is applied pro-rata (i.e. if an area has 400 dwellings, it is assumed to have 100 1.5-bedroom dwellings without parking, 125 1.5-bedrooms with parking, and 175 2.5-bedrooms with parking dwellings). In practice, this may vary somewhat across the precinct, however the variation is not expected to be so substantial, and the distances and access arrangements not so great that this would lead to any marked impacts to the traffic model if the weighting ends up slightly different.

It is important to note that the above distribution change has been applied for all residential development across the precinct, not just the areas proposed to be rezoned through the Te Auaunga Plan Change.

2.2.3 Commercial Land Uses

The 2020 ITA had only one "commercial" use by 2028, being Taylor's Laundry. This has a lease running until 2036.

Additionally, the 2031 scenario now assumes a new metro-sized supermarket with 1,500sqm retail floor space, with a surrounding specialty retail cluster of 1,200sqm retail floor space. These activities had not been included in the 2028 scenario of the HUD plans approved with the 2020 ITA. Now, with the modelling scenario moved out to 2031, and with further advanced masterplanning, these retail components are assumed to be operating by 2031.

Retail floor space represents a proportion of Gross Leasable Floor Area (GLFA), the standard assessment metric in retail transport assessments. For the purposes of the Te Auaunga Plan Change, an estimated conversion factor of 1.2 has been adopted for the supermarket to convert retail floor space to GLFA and 1.1 for the specialty retail. This results in 1,800sqm GLFA for the supermarket and 1,320sqm GLFA for the specialty retail. This is considered appropriate as specialty retail would likely have a smaller back-of-house areas than the supermarket.

The proposed supermarket / retail cluster is to be located off Farm Road (Gate 3), close to Carrington Road – as envisaged in the operative Wairaka Precinct provisions. This cluster is assumed to be primarily to serve the local catchment within the precinct, with size and store focus not intended to draw "destination traffic" – albeit it is accepted that some traffic passing on Carrington Road and some existing populations east of Carrington Road will shop here.

2.2.4 Other Land Uses

The only other land use discussed in the approved 2020 ITA is the Mason Clinic in the northwest of the precinct. Since the preparation of the 2020 ITA, the clinic has been the subject of its own Plan Change (Proposed Private Plan Change 75: Mason Clinic) to expand within the precinct.

However, the approved 2020 ITA had already allowed for this expansion of the Mason Clinic in the 2028 scenario in discussion with the then District Health Board's traffic consultants. The since-lodged Proposed Private Plan Change 75 retains the same assumptions (including the same trip generation). As such, there is no change required for the 2031 Te Auaunga Plan Change scenario compared to the 2020 ITA 2028 scenario, as both already allow for the plan change expansion of the clinic.

2.3 Car Parking

The below sections generally align with the order of Section 3.6, Future Car Parking, in the 2020 ITA (except where additional elements related to commercial and retail parking are addressed).

Car parking availability, especially for residential and retail uses, is a key determinant of external traffic impacts of the development. The Te Auaunga Plan Change modifies a number of car parking assumptions, both for the rezoned areas, and the overall precinct. Parking is, on average, being constrained more than was previously assumed in the 2020 ITA.

The following parking constraints are explicit assumptions underpinning the Te Auaunga Plan Change and the associated changes to the wider precinct, as providing significantly more parking would also create significantly more traffic than assumed within the traffic model. The impacts of the parking constraint on the chosen trip generation rates are discussed in more detail at the end of this section.

2.3.1 Residential Parking

In the 2020 ITA 2028 scenario, the key residential parking assumption was a provision of "less than 1 car park space per dwelling" across the average of the precinct. This has been constrained further. Out of the 4,000 dwellings, at least 1,000 are assumed to provide no car parking at all, while the remaining 2,000 will provide 0.7 or less car parking spaces average. In total, this means that the overall residential development component will have a maximum of 2,100 car parking spaces, as set out in Table 2 below:

Table 2: Car Parking Distribution

	Number of dwellings	Maximum parking rate per dwelling	Resulting maximum parking spaces
Studios/1 & 1.5-bedrooms (without parking)	1,000	0	0
1.5-bedrooms (with parking)	1,250	0.7	875
2.5-bedrooms (with parking)	1,750	0.7	1,225
Totals	4,000	N.A.	2,100

As before in the 2020 ITA, the assumption is also that residential car parking provided will generally be "unbundled", i.e. it will be offered for lease or purchase separately from the residential dwellings. This will assist with not only identifying the true level of demand, but also make purchasing or renting in the precinct more affordable and thus attractive to the type of residents who are happy to use alternative modes of transport.

2.3.2 Commercial / Retail Parking

To limit the potential for excessive trip generation, and acknowledging the focus on the nearby precinct, rather than a wider retail catchment, the supermarket and surrounding retail cluster will have a cap on car parking, with the supermarket being limited to 50 car parks or less (representing a rate of 1/36sqm GLFA or less), and the retail cluster being limited to 25 car parks or less (representing a rate of 1/52sqm GLFA or less). This limit of 75 spaces or less includes on-street parking in the precinct at or near the cluster, whether the streets are proposed to be public or private.

For clarity, the proposed rates above are provided mainly for context to how they were derived. As parking in a retail cluster is in practice somewhat or even mostly independent of what specific retail tenancy is visited, the allocated "split" between the supermarket and specialty retail parking can could change. This would not be expected to have any impact on the traffic modelling discussed in this report as long as the total of retail parking remains at approximately 75 spaces.

The limitation Is explicitly intended to ensure that retailers focus on serving the immediate surrounding neighbourhood, with local residents being able to walk or cycle to the shops or at least, when shopping by car, undertaking their shopping this via pass-by trip on the way home with minimal additional car traffic being generated. The limitation (already included in the precinct rules prior to the Te Auaunga Plan Change) on the size of the supermarket will also assist with ensuring the retail does not become an attractor for more distant catchments.

2.3.3 Education Parking

No changes to the education parking assumptions are made compared to the 2020 ITA (except for no new parking being provided for new primary school and any early childhood education activities – as these developments are now assumed to only occur after the assessment period).

It is noted that with the assumptions for the tertiary education area not changing, the "up to 2,500 car parks" assumed to be provided by Unitec represent more than 50% of the car parking expected across the precinct, even after the significant increase in residential activity proposed.

It may be beneficial for Unitec and the overall transport network in the area to consider a future car parking and overall transport approach that emphasises alternative modes more strongly, especially in light of the much-improved conditions expected along Carrington Road after the upgrade. However, considering the lack of confirmed updates for Unitec's future plans, this Te Auaunga Plan Change assessment does not assume any reduced car parking for Unitec.

Unitec has however confirmed to HUD that it will not be providing any of its potential surplus car parking for rent or purchase by residential tenants of the wider precinct - it intends to implement measures to reserve its parking for staff and students only. This is important to the assumptions in this report, because if Unitec provides any notable added residential parking this could significantly skew the trip generation of the precinct.

The only exception to the above would be the possibility of shared carparking, but if this occurs, any such parking provided by Unitec to the use of residents will be counted towards the maximum carparking discussed in Table 2.

2.3.4 On-Street Parking

No changes to the on-street parking philosophy within the precinct are proposed compared to the 2020 ITA. On-street parking, while provided, is intended to be relatively limited in scale.

2.3.5 Parking Controls

Two further parking assumptions are key for the Te Auaunga Plan Change, relating to the wider parking environment. Firstly, it is assumed that any on-street parking that may be provided within the precinct will generally be time-limited (i.e. targeted at short term visitors and similar uses, and not suitable for residential longer-term parking). This is identical to the 2020 ITA.

Secondly, it is assumed that once significant residential development occurs, AT should implement residential parking schemes in the surrounding neighbourhoods for existing residents, especially to the south and east of the precinct. This differs from the 2020 ITA where (for 2,049 dwellings) such schemes were seen as less important.

It is acknowledged that the latter (resident's parking schemes) cannot be agreed or conditioned as part of the current Te Auaunga Plan Change process, requiring separate legal and consultative processes by AT. However, it is explicitly noted that such schemes are assumed as an appropriate response to the residential intensification proposed, (nearly 2,000 additional dwellings with many having no, or low car parking numbers). Without residential parking schemes, vehicular traffic generation of the area could rise more than expected or modelled, despite parking constraints within the precinct, with some of the new residents parking additional cars in the surrounding neighbourhoods. With minimum parking no longer able to be prescribed through the Unitary Plan, the use of resident's parking schemes may now also find more application in Auckland in any case.

2.4 Transport Network Changes

The Te Auaunga Plan Change assumes a number of transport network (infrastructure) changes that were not fully assumed in the 2020 ITA. These flow into the network modelling but also in some cases, are factors in assuming modified trip generation rates. The key changes in network assumptions are given below.

2.4.1 Full Carrington Road Upgrade

Recent discussions between government, Auckland Transport and HUD have identified that to support the proposed residential intensification within the site, the upgrade of Carrington Road should ideally cover not only the precinct frontage (as assumed in the 2020 ITA) but should be extended along the full length of the corridor from Great North Road to New North Road, inclusive of the motorway and rail over-bridges. The extension primarily affects Carrington Road between Woodward Road and New North Road, which previously did not see significant change.

While exact design and timing of such a "Full Upgrade" (as it is being referred to within this Te Auaunga Plan Change report) are still being developed, it was agreed with HUD that the Full Upgrade should be included in the 2031 assumptions for the Te Auaunga Plan Change, with certain design assumptions being made for the future layout (essentially extending the geographic extent of the design assumed during the 2020 ITA).

As such, the 2031 traffic model scenario now includes bus lanes along the full length of Carrington Road on both sides of the carriageway and has the existing rail overbridge near New North Road replaced or widened to a total of five lanes from the current three lanes. This will effectively provide the ability to extend bus lanes to the New North Road / Carrington Road / Mt Albert Road intersection.

Assumptions at the SH16 motorway overbridge are more consistent with the previous 2020 ITA model, which already assumed moving walking and cycling facilities partly or fully onto clip-on bridges to avoid a full bridge rebuild.

While not directly affecting the traffic model, the assumptions also include the existing painted cycle lanes for the section from Woodward Road to New North Road being upgraded to protected cycle lanes. Together with more incremental pedestrian improvements, these assumptions assist in supporting the significant components of "low-car / no-car" development proposed in the precinct by making it safer and more convenient to walk, scooter, bike or bus to and from the precinct – which in turn supports the reduced trip generation rates applied in the model.

2.4.2 Intersection Upgrades

2.4.2.1 Great North Road / Pt Chevalier Road / Carrington Road

Within both the 2020 ITA 2028 scenario and Te Auaunga Plan Change 2031 scenarios, several changes to the northern approach and departure (Point Chevalier Road) have been included as set out already in the 2020 ITA. The changes modelled are based on information from the Point Chevalier Improvements project consultation material[1] (consultation by AT completed in December 2019). It is understood that only minor changes (which do not affect the Te Auaunga Plan Change traffic model) have occurred since, and this project is still intended to proceed in advance of the modelled timeframes as of this writing.

The 2031 scenario also includes the new northbound and southbound bus lanes on Carrington Road. At this intersection, they are incorporated as follows:

- The northbound bus lane is assumed to still finish just before the SH16 overbridge, similar to the 2028 scenario, splitting into three lanes, one for each turn option.
- The new southbound bus lane on Carrington Road away from Great North Road is added, starting just south of the intersection proper (i.e. including over the overbridge). This (and walk/cycle works on the east side) will require some physical realignment of the northbound lanes.

As set out in the 2020 ITA, no mandatory structural widening is assumed on the motorway overbridge (even with the "Full Upgrade" as discussed above). The added space for the bus lane is assumed to be gained from relocating at least some of the walk / cycle facilities off the current bridge onto clip-on facilities. If the final design for the Full Upgrade does include more substantial rebuilds and/or widening, this would result in greater potential bus and general traffic movement capacity than assumed – for example, by taking the northbound bus lane closer to Great North Road.

However, to avoid doubt, this assessment does not assume any such more extensive changes to the overbridge and is thus conservative in terms of assessing potential network and bus impacts, pending finalisation of the Full Upgrade

[1] https://at.govt.nz/projects-roadworks/point-chevalier-improvements/

design. The proposed intersection layout, as modelled in the Aimsun traffic modelling under the Te Auaunga Plan Change 2031 scenario, is shown in Figure 2.

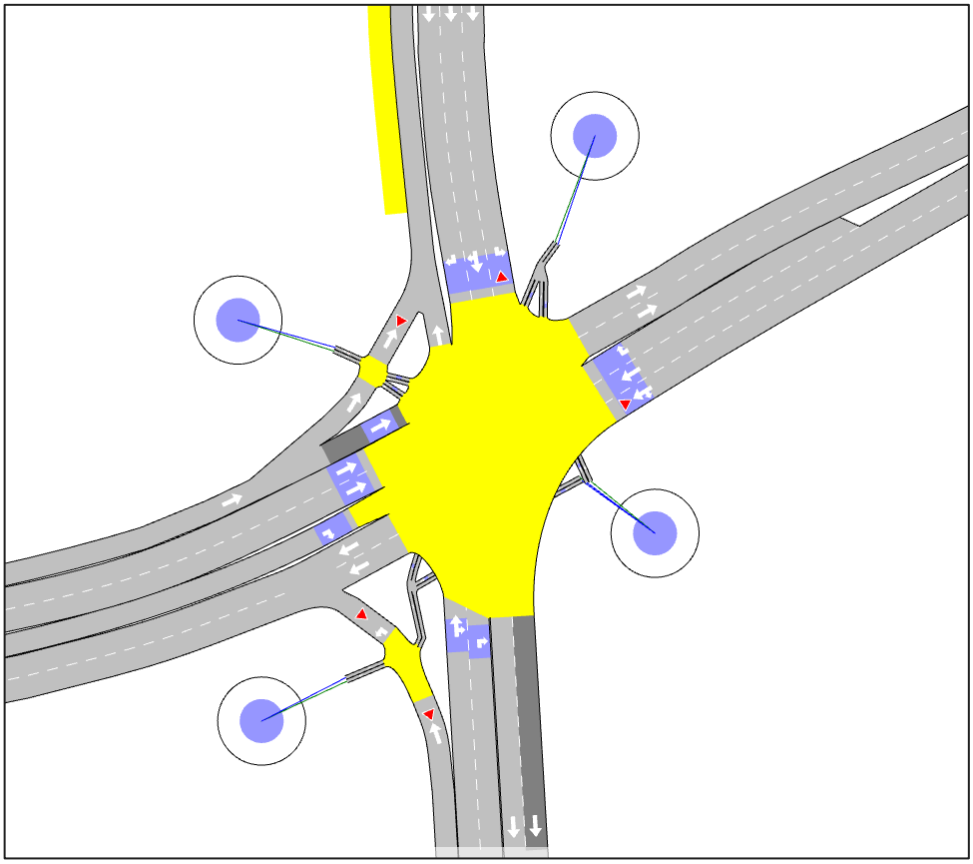

Figure 2: Proposed Great North Road / Pt Chevalier Road / Carrington Road Layout

It should be noted that the Te Auaunga Plan Change 2031 scenario includes shared through/right turn lanes on both the northern and southern approaches, which is a variation on the 2020 ITA 2028 scenario which only has dedicated lanes. The proposed signal phasing (diamond right phasing for the eastern and western approaches and split phasing for the northern and southern approaches) allow for the shared lane arrangements.

2.4.2.2 Gate 1 / 2 & NW Path Crossing

The primary change in terms of how motor vehicle traffic is proposed to enter and exit from the precinct is a proposed functional reversal between Gate 1 and Gate 2, which also affects the future layout of the crossing of the North-western Shared Path over Carrington Road.

Subsequent to discussions with and further investigation by HUD's development partners since the 2020 ITA, it was decided that Gate 1 would function more effectively as the primary northern vehicular access into the precinct, whereas previous iterations had this located at Gate 2 (closer to Segar Avenue).

The change was driven by a variety of reasons, but primarily is understood to be due to the difficulties of upgrading the internal road network connecting Gate 2 to the internal spine road to the higher standard expected for the main vehicular connection, particularly with a dedicated cycleway. While this link ("Road 2") will still be provided and upgraded, Gate 2 is now proposed to be (by the time of the 2031 Scenario) a left-in / left-out only connection to Carrington Road.

All-movements connectivity with Carrington Road to/from the northern part of the precinct is thus now planned to be provided via Gate 1, where the 2031 scenario now shows a signalised intersection.

A related matter is the future functionality of the current priority crossing for walking and cycling over Carrington Road south of Sutherland Road. When the assumption was that Gate 2 would be the signal, not Gate 1, the crossing was assumed to be signalised as part of the Carrington Road Upgrade (i.e. once the road became four-laned). With Gate 1 now a new signal located much closer to the current crossing location, it has been assumed that the crossing is removed fully, and instead integrated into the northern side of the Gate 1 signals as a two-way bike signal crossing.

2.4.2.3 Carrington Road / Woodward Road Intersection

The Carrington Road / Woodward Road intersection is currently formed as a give-way priority-controlled intersection. The modelled signalised intersection layout is shown below in Figure 3.

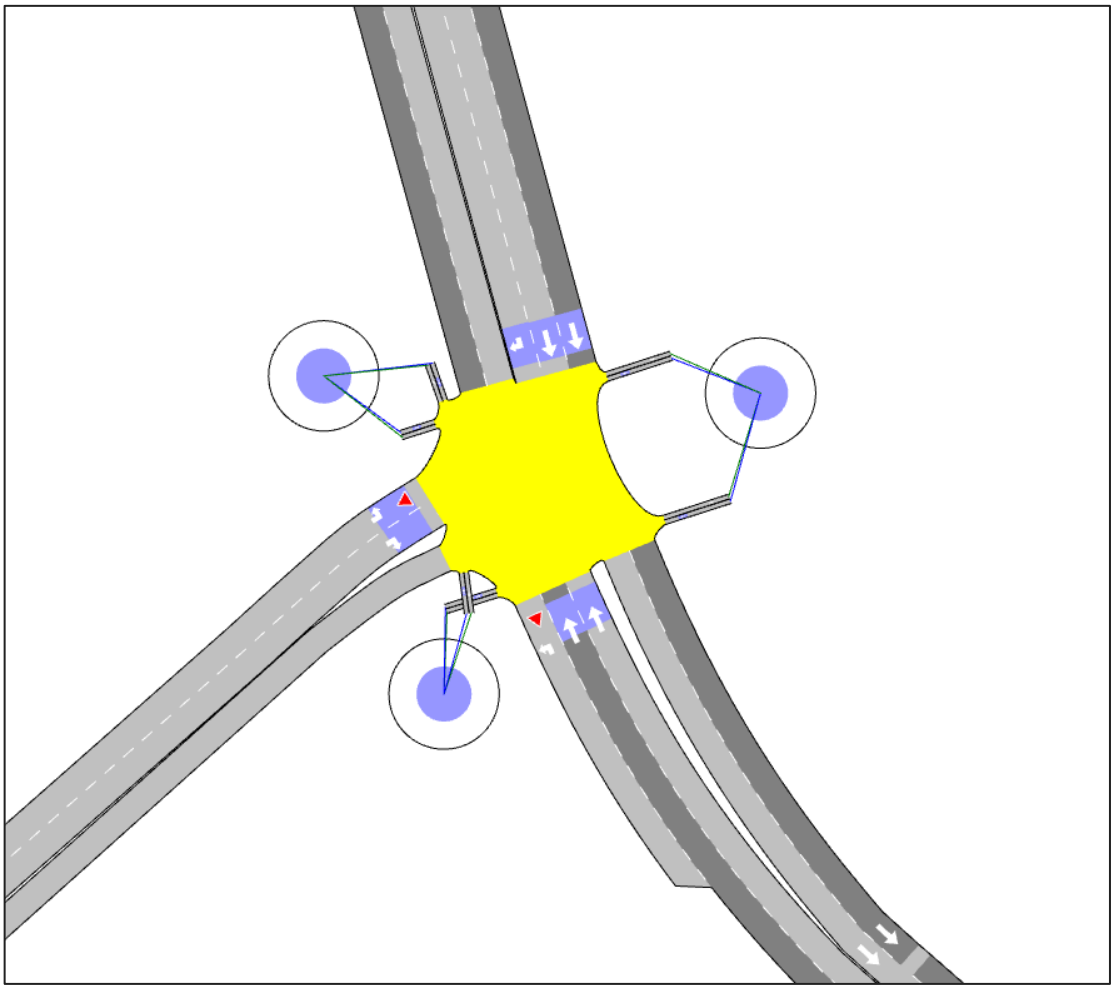

Figure 3: Proposed Woodward Road / Carrington Road layout

It should be noted that this layout differs from the 2020 ITA 2028 scenario in that it has the approaching and departing bus lanes on Carrington Road south of Woodward Road, but also has a separate northbound left turn lane into Woodward Road so that left turners will interfere less with northbound bus movements (see extended discussion below).

2.4.2.4 Intersection bus priority

To assist with ensuring bus priority even in a congested network, the updated design for Carrington Road in the 2031 traffic model now assumes certain added features.

For northbound intersections – at the four gates to the precinct, but also at Woodward Road – the left turn lane into the precinct / into Woodward Road is designed as a separate / additional lane from the northbound bus lane. In short, the design aims to ensure that left turners do not block the northbound bus function, unless in typical bus lane designs, where for the last 50m ahead of the limit line, left turners are allowed to drive in the bus lane.

While in theory it would have been possible to provide such priority southbound as well, the five affected intersections along the frontage all undertake their road widening to the west. Providing this “left turn separation” bus priority on southbound designs as well would result in the need for land take on third parties to the east and / or result in “bending out” the intersection further to the west for southbound through lanes (i.e. deviating from a direct southbound path) to fit in the lane. For these reasons, this kind of bus priority is assumed northbound only, with left-turners into the residential areas to the east of Carrington Road assumed to be sharing the bus lanes over the last 50m.

It is acknowledged that the width requirements of such an added bus priority lane may create some constraints at intersections along the route, within the previously agreed corridor width of 28.2m.

However, initial conceptual assessment indicates that such an approach (with five lanes) should be feasible with an acceptable level of Departures from Standards in the intersection area, albeit it could affect aspects such as street tree provision in the relevant area. This can be reviewed further in the design process for the Full Upgrade.

2.4.3 Other Network Changes

While the Full Upgrade has been modelled as providing two lanes each way between Woodward Road and New North Road, there is some uncertainty at this time as to what mid-block pedestrian crossing options would be provided in this long block without other signalised options, to reduce severance across the proposed four lanes. As such, the model, in the 2031 Scenario, now includes a mid-block pedestrian crossing west of Willcott Street. This would reduce the maximum length between signalised crossings from approximately 450m to 250m on one side and 200m on the other side. To avoid encouraging rat-running, and travel pattern changes in the adjacent residential suburbs, this crossing has not been co-located with any potential new intersection signals (i.e. none of the side roads between Woodward Road and New North Road are proposed to be signalised).

Conversely to the above crossing addition, the 2028 Scenario included a mid-block signalised pedestrian crossing between Gate 3 and 4, which has now been removed in the 2031 Scenario. This because the length between the signalised pedestrian crossings at the nearby gates will be only around 250m, and accordingly this block does not require the previously proposed mid-block crossing.

As one further change, the model now assumes bus lanes on New North Road between Carrington Road and Woodward Road, with the bus lanes ending around 100m before the intersection. This layout is based on the ADTA model provided by the Auckland Forecasting Centre.

2.4.4 Key Network Elements Unchanged

No significant changes from the 2028 scenario model (except for the addition of the bus lanes on Carrington Road) have been assumed at the various other intersections not specifically mentioned above.

For avoidance of doubt, as per the 2028 scenario, the 2031 scenario model also does not assume an internal north-south connection for motor vehicle traffic between the southern zone on one hand and the central and northern development areas of the precinct on the other hand. This is not assumed in the model to ensure appropriate (conservative) testing (particularly of the Carrington Road sections near Woodward Road), and to reduce future increases to traffic flows through the existing local roads south of the precinct, as per existing precinct rules.

For clarity, the traffic model assumes that Mark Road is also connected up to the future internal road network in the southern zone (without permitting motor vehicle connections to the Unitec Core or the central and northern areas). The current Precinct Plan 1 shows four southbound indicative internal roads, but only three are clearly linked up to their named existing southern road connections – Laurel Street, Renton Road and Rhodes Ave – with the fourth in the east unclear as to whether it is intended to connect to an existing road or not.

2.5 Trip generation

To retain the standard structure of the traffic modelling section, changes to trip generation assumptions (from the June 2020 ITA to the Te Auaunga Plan Change) are covered within later modelling sections.

Without prejudicing the discussion in those sections, the key changes covered some further reductions in trip generation for residential development, and a “new” section regarding retail trip generation.

3 Modelling

3.1 Methodology

A microsimulation traffic model of the precinct and the surrounding area was developed for the 2020 ITA of the precinct using the AIMSUN software package to assess the traffic impacts of the proposal on the surrounding road network. The effects of the future infrastructure upgrades (up to an assumed 2028 year) in the vicinity of the precinct were also included in the modelled road network.

In developing the model, Stantec used versions from 2014 - 2015, and 2017 that were prepared in association with previous studies undertaken on precinct developments and draft ITAs prepared. The model has now been adjusted to reflect the latest land-use assumptions and traffic data obtained through surveys undertaken in 2019 and using 2028/2031 forecast traffic volumes from the MSM strategic model provided by Auckland Forecasting Centre[2] (AFC).

The base model referred to within this assessment incorporates existing network and traffic data obtained from the October 2019 surveys. These are considered to remain relevant, as they represent pre-Covid numbers that are expected to remain conservative compared to current traffic patterns.

A future testing scenario, hereafter referred to as the Te Auaunga Plan Change 2031 scenario, has now been developed based on network assumptions described earlier in this report, MSM future traffic demands and the latest development proposals and impacts from the rezoning proposals described earlier in this report.

3.2 Existing Traffic Volumes

Traffic surveys for the base model were undertaken on 17 October 2019. These surveys remain unchanged, and as noted above are considered to remain relevant, as they represent pre-Covid numbers that are expected to remain conservative compared to current traffic patterns. The survey details can be reviewed in Section 5.2 of the 2020 ITA.

3.3 Model Form, Peak Profile and Calibration

The modelled area has not changed from the 2020 ITA, and includes the full extent of Carrington Road, Woodward Road, and the section of New North Road between Carrington Road and Woodward Road, all residential streets branching off Woodward Road and the precinct internal road network.

It is acknowledged that parts of the precinct-internal network – specific positions of roads etc – may by now slightly differ from recent plans by the development partners.

However, there are no fundamental (functional) changes in how different areas within the precinct connect to each other (or are intentionally disconnected) in terms of vehicle movements.

Also, key changes that could lead to substantial impacts have been incorporated – in particular changes to the four gate access intersections discussed in Section 2.4 earlier.

The extent of the model is shown in Figure 4.

[2] A partnership between Auckland Council, Waka Kotahi | NZ Transport Agency and Auckland Transport.

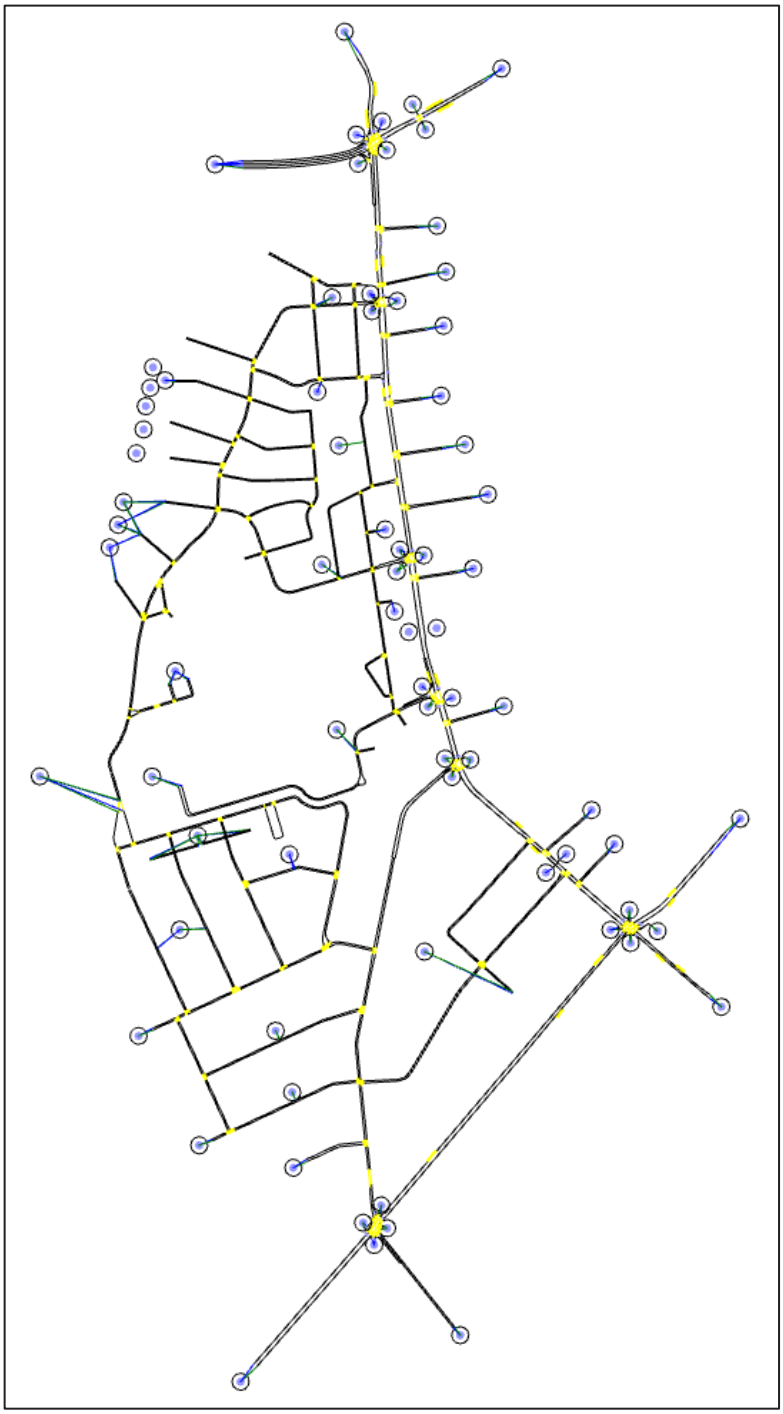

Figure 4: Extent of Modelled Area

The micro-simulation models have two-hour durations, corresponding to the typical lead-in and lead-out period for more accurate analysis of peak hour statistics. The modelled times are as follows:

- Weekday Morning Peak (“AM’) 7:00 - 9:00am.
- Weekday Evening Peak (“PM”) 4:00 - 6:00pm.

For discussion of peak profiles and model calibration, please refer to Section 5.3 and 5.4 of the 2020 ITA.

3.4 Scenario Compilation

The indicative development area and staging included within the modelling has been discussed in Section 2. The traffic modelling for the precinct has assessed the following scenarios for the AM and PM peak hour periods:

- **Base Scenario:** Existing network with traffic demand from the October 2019 survey. This represents the situation where the precinct is not developed (existing 2019 but being very similar to the current situation as of 2022) and remains operating and with the same land-use currently on the site.
- **ITA 2028**: This scenario was the longest-reach scenario assessed and reported in the 2020 ITA. In terms of development above existing, the 2028 scenario primarily represented adding 2,049 dwellings, and a primary school.
- **Plan Change 2031**: This scenario represents further residential intensification, including those stemming from the rezoning proposed in the Te Auaunga Plan Change, modelled at a slightly later date. In terms of development above existing, the scenario primarily represents adding 4,000 dwellings, plus a supermarket and retail cluster, and excludes the primary school components of the 2020 ITA 2028 scenario.

The in-depth scenario assumptions and development levels were discussed earlier, in Section 2.2 in particular.

3.5 Background Traffic

3.5.1 General Background Traffic

The background traffic incorporated for the 2020 ITA 2028 and Te Auaunga Plan Change 2031 scenarios have been sourced from the 2028 and 2031 MSM data.

Information from AFC, including Select Link Analysis for Carrington Road and traversal matrices for a cordon around the Unitec site have been considered and analysed in determining the appropriateness on the level of background traffic, as shown in the 2028 MSM data, as well as potential reduction in future scenario.

3.5.2 Through Traffic Reductions

In both the 2020 ITA 2028 and Te Auaunga Plan Change 2031 scenarios, a reduction of 25% has been applied to the through traffic on Carrington Road. This reduction is considered appropriate taking into consideration the level of off-network queues that will otherwise be present, whilst also taking account that it is commonly understood that through traffic will avoid a congested network when alternative routes are available i.e. as with the Waterview motorway. The through-traffic reduction assumes that the removed trips do not use any part of the modelled network, i.e. they do not become through traffic on Great North Road or New North Road in the immediate vicinity of Carrington Road.

Through-traffic is defined as traffic on the section of Carrington Road between the New North Road / Carrington Road / Mount Albert Road intersection and the Point Chevalier / Great North Road / Carrington Road intersection with destinations other than the precinct or local roads along the section.

3.5.3 Peak Hour Profile

A flattening of peak hour profile over the 2-hour period has also been assumed. That is to say, the proportion of peak hour traffic to the 2-hour traffic has been reduced from 0.56 to 0.52. This is considered typical within a congested network where some people choose to travel slightly earlier or later within the same 2-hour period than they would under more free-flowing conditions.

This remains unchanged from what was adopted within the 2028 scenario.

3.6 Trip Generation

3.6.1 Overview and Methodology

The vehicle trip generation rates for the various land uses in the precinct have been calculated through a number of methods. The methods consider existing traffic flows within and surrounding the precinct, the likely influence of the future transportation environment around the precinct, as well as literature research and historical values.

Careful consideration is required in estimating trip generation rates for the precinct, particularly as trip rates are estimated for approximately nine years into the future, and assume future infrastructure, behaviour change and congestion-assisted mode shift away from private motor cars. Over-optimistic calculations will underestimate the traffic impacts, while over-conservative calculations may lead to over-provision of capacity and subsequently induce demand.

Trip generation rates have been reduced – in some elements notably so – compared to the 2020 ITA – as the new development assumptions reduce pro-rata car parking (and for some dwellings provide no car parking at all), while at the same time, some enhanced infrastructure upgrades for active modes and public transport are assumed (see preceding Sections 2 and 3 of this Te Auaunga Plan Change report).

The following sections discuss the trip generation rates chosen for the various land uses and how they were sourced and derived. The full list of trip rates for the various land uses within the precinct and the total trip generated in the Te Auaunga Plan Change 2031 scenario are included in **Appendix A**.

3.6.2 Education Trip Rates

The 2020 ITA at Year 2028 assumed a peak trip generation rate of 0.08vph/ student for students and 0.14vph/FTE based on the assumed transport environment at the time of writing. The full Carrington Road Upgrade (provision of bus lanes, protected cycle lanes, improved footpaths and various intersection upgrades) is assumed to be in place by 2031 which provides much higher accessibility to Unitec through multi-modal transport than what was assumed in the 2020 ITA at Year 2028.

A trip generation rate of 0.07vph/ FTE for students and 0.12vph /FTE for staff has been adopted to reflect this. This represents an approximately 15% reduction to previous assumptions.

3.6.3 Residential Trip Rates

Trip rates for residential dwellings are largely affected by the much reduced (pro-rata) residential car parking in the development now assumed, coupled with residents parking schemes preventing residents from displacing some of the reduced demand in surrounding areas instead, and due to improved accessibility by alternative modes.

3.6.3.1 Studio and 1/1.5 bedroom without parking

The previous 2020 ITA assumed “zero car parking” dwellings to have trip rates of 0.33 vph / dwelling. It is considered that such a rate is very high, unrealistically high in fact - but it is acknowledged that the rate was not interrogated more robustly at the time.

Considering that “zero car parking” dwellings now represent a significant part of the overall development, this brings about more practical constraints on making private car trips “despite” the zero car parking, and by necessity will need to be marketed widely to residents who are in fact willing and able to live a low or no-car lifestyle. It is assumed that these residential dwellings will generate no vehicle trips. However, a trip rate of 0.05vph / dwelling has been adopted to account for some remnant vehicle trips associated with Ubers, taxis or private ride sharing.

3.6.3.2 1.5 bedroom and 2.5 bedroom with parking

As described earlier, the pro-rata parking for residential dwellings has been constrained further since the 2020 ITA and this and the other factors and constraints will result in a lower trip generation.

The Transport for New South Wales (formerly the Roads and Maritime Services’) published an updated technical direction to the Guide to Traffic Generation Development in 2013 (**2013 TfNSW Report**). The 2013 TfNSW Report provided updated residential trip generation rates for high density residential flat dwellings based on more recent traffic surveys undertaken in Sydney, Hunter and Illawarra. All surveyed developments were greater than six storeys, close to public transport and residential in nature. It is considered that of the three cities included in the 2013 TfNSW Report, Sydney is the most applicable to Auckland and has been used as a basis for the Te Auaunga Plan Change trip rates.

Of most relevance to the Te Auaunga Plan Change is the surveyed trip rate per parking space. Whilst the Te Auaunga Plan Change is planning 1.5-to-2.5-bedroom dwellings, a “0.7 parking space per dwelling or less” rate is assumed, compared to the previous “1 parking space per dwelling or less” rate. Therefore, the trip generation is likely to be less than traditional residential developments with one parking space per dwelling.

Table 3 below summarises the average Sydney trip rates and the equivalent trip rate for a 1.5- and 2.5-bedroom dwelling – particular emphasis should be placed on the “per car park” rates.

Table 3: 2013 TfNSW Trip Generation Rates

	Average Sydney Trip Rate		1.5 bedroom Trip Rate		2.5 bedroom Trip Rate	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
Vehicle trips per unit	0.19	0.15	0.19	0.15	0.19	0.15
Vehicle trips per car space	0.15	0.12	0.11	0.08	0.11	0.08
Vehicle trips per bedroom	0.09	0.07	0.14	0.11	0.23	0.18

These rates are considerably lower than the trip generation rates used in the June 2020 ITA.

To reflect that fact, but to also acknowledge that public transport in Auckland is not yet as extensive as in Sydney, even in a well-placed location such as the precinct, rates were chosen that represented a halfway average between the 2020 ITA trip generation rates for the 1.5-bedroom and the average surveyed Sydney trip rate per unit (the higher of trip rate per unit, per parking space and per bedroom). For the 2.5-bedroom dwellings, the 2020 ITA 2028 trip rates have therefore been reduced by an effective 30%.

The residential trip rates for the Te Auaunga Plan Change are summarised in the table below - noting that the differences within the zones are derived from the distance to the nearest PT stops. I.e. the southern zone has the longest walking or cycling distances to nearby PT services, while the central and north areas of the precinct are much closer to services on Carrington Road and Great North Road. Further discussion on this precinct-internal PT access factoring is provided in is Section 5.8.3 Residential Trip Rates of the 2020 ITA.

Table 4: Adopted residential trip generation rates

Zone(s)	AM	PM
Studio and 1-/1.5-bedroom without parking		
All Zones	0.05	0.05
1.5-bedroom with parking		
Southern	0.29	0.27
Northern, Carrington, North-West, B Lots	0.25	0.23
Te Auaunga North, F Lots	0.28	0.26
2.5-bedroom		
Southern (less PT accessibility)	0.43	0.43
Northern, Carrington, North-West, B Lots	0.34	0.34
Te Auaunga North, F Lots (less PT accessibility)	0.41	0.41

3.6.4 Commercial / Retail Trip Rates

3.6.4.1 Taylor's Laundry

As noted earlier in this report the Taylor's Laundry facilities are expected to remain on-site until 2036, unless an earlier end to the lease is negotiated. The 2031 traffic model has not included the small component of traffic associated with this use. In case the activity runs beyond 2031 in practice, actual trip generation from this area of the precinct would be expected to be minimally higher than modelled, up 21 trips in the AM peak hour and 35 trips in the PM peak hour (based on previous surveys specifically assessing the facility trip generation).

While not specifically assessed as a sensitivity scenario, the addition of 21 and 35 trips would represent barely 1% of all precinct trips in the AM peak, and 1.5% in the PM peak, and even less when compared to the overall traffic flows on Carrington Road. As such, the possibility of this added generation overlapping for a few years with the full 2031 scenario's residential development is not considered likely to cause any notable changes to results or conclusions.

3.6.4.2 Supermarket

The traffic generation behaviour of supermarket retail has a relatively significant body of literature associated with it, including New Zealand specific data. Conservative (i.e. car-dominated) PM peak rates range around 12-13 trips / 100 sqm GFA[3] and the Transport for New South Wales (TfNSW) guidelines indicate a rate of 15.5 trips / 100sqm Gross Leasable Floor Area (GLFA) which is the unit used in the TfNSW for calculating trip generation for retail activities. The use of such rates as the base rate is therefore considered conservatively high.

It is considered that for a small local supermarket (as opposed to a large "destination supermarket" such as the much larger Pak' N Save less than 2km away at Mt Albert), which is also co-located with substantial walkable residential activity nearby, a 25% traffic reduction from the TfNSW rate in the next decade is considered appropriate.

[3] New Zealand Trips and Parking Data Base, as well as TDG Surveys for Auckland stand-alone supermarkets from the 2000s

It is noted that there are already several supermarkets in Auckland that demonstrate such traffic generation rates. Additionally, it should also be noted that parking will be constrained to a maximum of 50 car parks for the supermarket, which also provides a further measure of restraint for generated traffic movements.

Based on the above, a supermarket trip generation rate of 11.6vph/100sqm has been adopted for the evening peak hour. This is still conservatively high considering it represents around 100 arriving trips / hour for a 50 car park store.

It is assumed that the morning trip rate will be approximately 20% of the generally much busier evening trip rate.

3.6.4.3 Other Retail

The type and location of the proposed small format retail is not able to be determined with sufficient accuracy at this stage. However, like the supermarket, it is expected to generally serve the local community, rather than be a destination.

To ensure a reasonable allowance is made for the traffic generated by it, the assessment assumes a trip rate of 3.5vph / 100 sqm GLFA. This appears generally appropriate considering standard literature[4] and the fact that much of this retail will serve local needs, as well as sitting in a very multi-modal environment. Similarly, to the supermarket itself, there will also be a parking constraint, with only a further 25 car parks additional above the 50 supermarket spaces.

As discussed earlier in the report, while rates discussed here assume a 50 spaces / 25 spaces split between supermarket and specialty retail, it is considered that in practice, trip generation rates are not expected to be affected by the on-site physical allocation between the uses, as long as the overall spaces are approximately 75 in the total area.

It is assumed that the morning trip rate will be 30% of the evening trip rate.

3.6.5 Mason Clinic

There is no change in the trip generation of the Mason Clinic for the 2031 Te Auaunga Plan Change scenario compared to the 2020 ITA 2028 scenario. As before, the trip generation rate is based upon surveyed flows scaled up – see 2020 ITA for discussion.

3.6.6 Trip Generation Summary

The table below summarises the rates applied to the model scenarios:

Table 5: Trip generation rates in 2020 ITA 2028 and Te Auaunga Plan Change 2031 scenarios

Activity	Zone	Units	2028 ITA Trip Rate	2031 Plan Change Trip Rate
Tertiary Education		Per Student	0.08	0.07
		Per FTE	0.14	0.12
Studio and 1/1.5 bedroom	All Zones	Per dwelling	0.33	0.05
1.5 Bedroom with parking	Southern	Per dwelling	0.38	0.27-0.29
	Northern	Per dwelling	0.3	0.25-0.23
	Carrington	Per dwelling	0.3	0.25-0.23
	North-West	Per dwelling	0.3	0.25-0.23
	Te Auaunga North	Per dwelling	0.36	0.26-0.28
	F Lots	Per dwelling	-	0.26-0.28
	B Lots	Per dwelling	-	0.23-0.25
2.5 Bedroom	Southern	Per dwelling	0.62	0.43
	Northern	Per dwelling	0.49	0.34
	Carrington	Per dwelling	0.49	0.34

[4] Specialty retail, secondary retail - Guide to Traffic Generating Developments, RTA New South Wales, 2002 Edition, and 2013 Update

	North-West	Per dwelling	0.49	0.34
	Te Auaunga North	Per dwelling	0.59	0.41
	F Lots	Per dwelling	-	0.41
	B Lots	Per dwelling	-	0.34
Supermarket	Carrington	Per 100sqm GLFA	-	11.6 in PM, 2.3 in AM
Retail	Carrington	Per 100sqm GLFA	-	3.5 in PM, 2.4 in AM
Mason Clinic	Northern	Per Bed	0.79 / bed in AM and 0.31 / bed in PM	0.71 / bed in AM, 0.28 / bed in PM

A summary of the resulting total vehicle trips in the 2020 ITA 2028 and Te Auaunga Plan Change 2031 scenarios is also provided in the following table.

Table 6: Summary of Precinct Trips

Overall Precinct Trips	AM Peak Hour	PM Peak Hour
2020 ITA 2028	2,089	1,813
Te Auaunga Plan Change 2031	2,042	2,103

3.7 Secondary Trip Generation

New development within an established urban area is likely to draw a percentage of traffic from the surrounding road network rather than directly adding to the existing traffic volumes on nearby streets.

Vehicle trips generated by a development can be separated into primary and secondary trips. Secondary trips can further be split into pass-by trips and diverted trips. **Figure 5** below illustrates the different trip types.

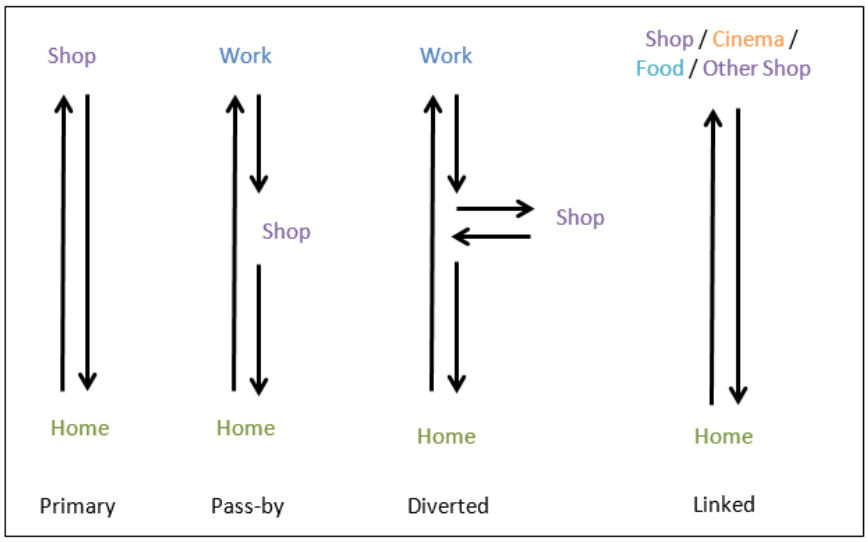

Figure 5: Trip Types

Currently the precinct only has road frontage onto Carrington Road. No secondary trips through any internal links between the two frontages are assumed (such through links would be designed to discourage through traffic – and are not present at all in the Te Auaunga Plan Change model in any case).

Any pass-by trips generated will therefore currently and in the future be using Carrington Road as part of their journey. Diverted trips will most likely be traffic that are currently using Great North Road or New North Road. The only secondary trips considered in this assessment are pass-by trips.

Of the activities proposed, the supermarket and Unitec are the only activities that are likely to result in secondary trips being generated. Secondary trip rates vary for different developments and are primarily dependent upon the passing traffic volumes and other similar developments in the surrounding area.

Compared to the 2020 ITA, the main added assessment for the Te Auaunga Plan Change is for appropriate retail pass-by trip rates. The ITE Trip Generation Manual has been used to determine the secondary trip rates for the supermarket. Other retail activities within the precinct are intended to cater primarily for other activities in the precinct and it is considered that secondary trips will not be generated by these activities.

Currently there are (often far larger) supermarkets located on the corner of Pt Chevalier Road and Great North Road, on New North Road approximately 500m south-west of New North Road / Mt Albert / Carrington Road, at St Lukes shopping mall and at Lynn Mall in New Lynn.

It is considered that the proposed smaller-scale supermarket will not generate any notable diverted trip types given the coverage and proximity of these well-established supermarkets. Only pass-by trips will be considered for the proposed supermarket.

As stated in the ITE Trip Generation Manual, secondary trip rates vary between 52% and 75% with pass-by trip rates varying between 19% and 57%. The average pass-by trip rate is 36%. For the purposes of this assessment, a conservative estimate of 20% has been adopted.

Unitec-related secondary trips would involve Unitec students carpooling with others who are travelling in a similar direction or attending the campus briefly for a single class or other purposes before continuing on with their journey along Carrington Road. Research data on the pass-by trip rates for tertiary education land uses are not readily available. Therefore, to remain conservative, a pass-by trip adjustment rate of 10% has been assumed for Unitec students. This rate has been incorporated in the morning and evening peak periods. Conservatively, no secondary trips rates are considered to occur for Unitec staff. This is consistent with the assumptions in the 2020 ITA.

No research data on the potential diverted trip rates for education activity is available, therefore diverted trips associated with the precinct have conservatively not been included in the assessment.

3.8 Trip Distribution

3.8.1 Inbound / Outbound Spit

The ITE Manual has been used to calculate the inbound and outbound trip distributions of the various activities within the precinct. The split of the existing activities within the precinct (Unitec and Mason Clinic) were determined using the previous site survey by Stantec (previously TDG) in 2014 that was undertaken for Unitec[5].

The distribution used in the modelling and data source for each activity is summarised in **Table 7.**

Table 7: Inbound / Outbound Trip Distribution Splits

Activity	AM PEAK		PM PEAK		Source
	In-bound	Out-bound	In-bound	Out-bound	
Unitec students	84%	16%	43%	57%	From Stantec Surveys (2014)
Unitec staff	84%	16%	43%	57%	From Stantec Surveys (2014)
Studios & 1/1.5 bed apartments	20%	80%	65%	35%	ITE Manual - Apartment
1.5 and 2.5 bed apartments	20%	80%	65%	35%	ITE Manual - Apartment
Mason Clinic	85%	15%	20%	80%	From Stantec Surveys (2014)
Supermarket	62%	38%	51%	49%	ITE Manual – Supermarket
Other Retail	48%	52%	44%	56%	ITE Manual – Specialty Retail Centre

[5] As per the transport assessment for the 2015 Campus Consolidation consent - Unitec, Wairaka Campus, Campus Consolidation Project, Transportation Assessment Report, TDG, August 2014

3.8.2 Wider Network Distribution

The trip distribution adopted in the future scenarios are based on observed 2019 surveys and the MSM data provided by the AFC. The network distribution is shown in **Table 8.**

Table 8: Network Distribution

	AM Peak		PM Peak	
	From Precinct	To Precinct	From Precinct	To Precinct
New North Road (West)	13%	25%	21%	15%
Richardson Road	8%	10%	8%	12%
Mt Albert Road	20%	24%	20%	15%
New North Road (East)	5%	2%	2%	5%
Great North Road (East)	28%	8%	12%	14%
Pt Chevalier Road	11%	11%	15%	14%
Great North Road (West)	15%	20%	22%	25%
North	54%	39%	49%	53%
South	46%	61%	51%	47%

3.8.3 Summary of Model Assumptions

The following table provides a high-level summary of key assumptions relevant to each modelling scenario.

Table 9: Summary of Modelling Assumptions

Modelling Assumptions	Base 2019	ITA 2028	Plan Change 2031
Residential dwellings	✗	✓ (2,049 dwellings)	✓ (4,000 dwellings)
Tertiary Education	✓ (varied)	✓ (9,702 FTE students)	✓ (9,702 FTE students)
Commercial / Retail development (supermarket / retail cluster)	✗	✗	✓ (1,200 sqm specialty retail, 1,500 sqm supermarket)
Primary school / early childhood education	✗	✓ (375 students)	✗
Mason-clinic (including allowance for growth)	✓ (121 beds or less)	✓ (198 beds)	✓ (198 beds)
Taylors Laundry	✓	✓	✗
Residential car-parking	✗	✓ (2,049 spaces or less)	✓ (2,100 spaces or less, with more dwellings)
Unitec car parking	✓ (varies, more than 2,500 spaces)	✓ (2,500 spaces or less)	✓ (2,500 spaces or less)
Commercial / Retail car parking	✗	✗	✓ (75 spaces or less)
Resident's parking sold / leased unbundled from dwellings	✗	✓	✓
Resident's Parking schemes (areas adjacent to but outside of precinct)	✗	✗	✓
Carrington Road Corridor Upgrade (precinct Frontage)	✗	✓	✓
Carrington Road Corridor Upgrade (Full length including Woodward New North Road)	✗	✗	✓
Carrington Road through traffic reductions, 25%	✗	✓	✓
Peak Hour Profile Adjustment	✗	✓	✓
Great North Rd / Pt Chevalier Rd / Carrington Rd intersection adjustments (slip lane removal into Great North Road, southbound Carrington Road bus lane)	✗	✓	✓

Modelling Assumptions	Base 2019	ITA 2028	Plan Change 2031
Mid-block North-western Path crossing south of Sutherland Road	✓ (priority)	✓ (signal)	✗ (integrated into Gate 1 signal)
Gate 1 signalised	✗	✗ (LILO)	✓
Gate 2 signalised	✗	✓	✗ (LILO)
Gate 3 signalised	✗	✓	✓
Signalised mid-block pedestrian crossing between Gate 3 and 4	✗	✓	✗
Gate 4 signalised	✓	✓ (added lanes)	✓ (added lanes
Carrington Road / Woodward Road intersection signalised	✗	✓	✓
Signalised mid-block pedestrian crossing between Benfield Avenue and Willcott St	✗	✗	✓
Vehicle connections between Southern precinct area and southern local roads	✗	✓	✓
Vehicle connections between the Southern precinct area and the central / northern Precinct areas	✓	✗	✗
Vehicle connections between the Southern precinct area and Unitec Core	✓	✗	✗

4 Model Results

The main intersections in the model have been analysed to assess the impact of the proposed Te Auaunga Plan Change development on the surrounding rod network. Comparisons of the results have been made between the base 2019, 2020 ITA 2028 and Te Auaunga Plan Change 2031 scenarios for the weekday AM and PM peak hours. The AM peak hour assessed is from 7:45 to 8:45am, and PM peak hour is from 4:45pm to 5:45pm.

This section also outlines the travel time for general traffic and buses along key routes through the network, as a further measure of network performance especially from a transport system use perspective.

4.1 Intersection Results

The key intersections modelled are as follows:

- Great North Road / Pt Chevalier Road / Carrington Road
- Unitec Gate 1 / Carrington Road
- Unitec Gate 2 / Carrington Road
- Unitec Gate 3 / Carrington Road
- Unitec Gate 4 / Carrington Road
- Woodward Road / Carrington Road
- Carrington Road / New North Road / Mount Albert Road; and
- Woodward Road / New North Road / Richardson Road.

These intersections represent the major intersections along the Carrington Road, and main access locations into the precinct.

The modelling results for each intersection are tabulated in **Table 10** to **Table 41** in terms of average delay per vehicle (in seconds) and Level of Service (LOS), and 95th percentile queue length per approach (in metres).

4.1.1 Great North Road / Point Chevalier Road / Carrington Road

Table 10: Great North Road / Point Chevalier Road / Carrington Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Great North Road / Pt Chevalier Road / Carrington Road	AM Peak						
	S Left	9	E	15	E	9	E
	S Thru	82		97		76	
	S Right	85		97		69	
	E Left	81	E	73	F	46	E
	E Thru	65		62		55	
	E Right	79		130		104	
	N Left	72	F	110	F	43	E
	N Thru	89		99		74	
	N Right	81		88		68	
	W Left	16	D	25	F	14	E
	W Thru	50		105		111	
	W Thru (Bus)	32		48		39	
	W Right	108		170		78	
Intersection Total – AM Peak		**61**	**E**	**89**	**F**	**69**	**E**

Table 11: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Great North Road / Pt Chevalier Road / Carrington Road	AM Peak											
	158	66	119	166	141	96	159	242	136	65	92	161

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: western right turn – 108 seconds delay
Worst approach: northern approach – LOS F
Overall Intersection: LOS E with 61 seconds delay
Queues: 166m on western approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 170 seconds delay. An increase of 62 seconds compared to the Base.
Worst approach: eastern, northern, and western approaches – LOS F
Overall Intersection: LOS F with 89 seconds delay. An increase of 28 seconds compared to the Base.
Queues: 242m on western approach. An increase of 76m compared to the Base.

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: western through movement – 111 seconds delay. An increase of 61 seconds compared to the Base and an increase of 6 seconds compared to the 2020 ITA 2028 scenario
Worst approach: all approaches – LOS E
Overall Intersection: LOS E with 69 seconds delay. An increase of eight seconds compared to the Base and a decrease of 20 seconds compared to the 2020 ITA 2028 scenario
Queues: 161m on western approach. A decrease of 5m compared to the Base and a decrease of 81m compared to the 2020 ITA 2028 scenario

Table 12: Great North Road / Pt Chevalier Road / Carrington Road - PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Great North Road / Pt Chevalier Road / Carrington Road	**PM Peak**						
	S Left	16	D	20	E	18	D
	S Thru	69		104		74	
	S Right	69		79		48	
	E Left	58	E	71	E	68	E
	E Thru	53		49		59	
	E Right	105		91		89	
	N Left	67	E	95	F	50	E
	N Thru	81		85		83	
	N Right	79		69		71	
	W Left	10	C	18	E	8	D
	W Thru	40		50		35	
	W Thru (Bus)	38		47		32	
	W Right	64		180		114	
Intersection Total – PM Peak		**54**	**D**	**72**	**E**	**59**	**E**

Table 13: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Great North Road / Pt Chevalier Road / Carrington Road	PM Peak											
	88	169	165	42	141	193	150	39	91	166	115	181

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: eastern right turn – 105 seconds delay
Worst approach: eastern and northern approaches – LOS E
Overall Intersection: LOS D with 54 seconds delay
Queues: 169m on eastern approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 180 seconds delay. An increase of 116 seconds compared to the Base
Worst approach: northern approach – LOS F
Overall Intersection: LOS E with 72 seconds delay. An increase of 18 seconds compared to the Base
Queues: 193m on eastern approach. An increase of 24m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: western right turn – 114 seconds delay. An increase of 50 seconds compared to the Base but a decrease of 66 seconds compared to the 2020 ITA 2028 scenario
Worst approach: eastern, northern and western approaches – LOS E
Overall Intersection: LOS E with 59 seconds delay. An increase of five seconds compared to the Base and a decrease of 13 seconds compared to the 200 ITA 2028 scenario
Queues: 181m on western approach. An increase of around 140m compared to the Base and ITA 2028 scenarios

The modelling indicates that there are likely to be increases in delay at this intersection during AM and PM peaks when comparing the Te Auaunga Plan Change 2031 scenario with the Base. However, in comparing the modelled Te Auaunga Plan Change 2031 with the previous 2020 ITA 2028 scenarios, there are improvements noted for both peak periods.

Overall, the modelling results for the AM and PM peak periods indicate that the intersection will perform at expected and appropriate levels for the Te Auaunga Plan Change 2031 scenario.

4.1.2 Gate 1 / Carrington Road

Table 14: Gate 1 / Carrington Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 1 / Carrington Road	AM Peak						
	S Left	6	A	12	D	25	C
	S Thru	5		29		27	
	S Right	0		0		-	
	E Left	0	A	0	A	-	-
	E Right	0		0		-	
	N Left	0	C	0	A	-	C
	N Thru	1		0		14	

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
	N Right	19		N/A		57	
	W Left	21	D	88	F	30	D
	W Right	31		N/A		55	
Intersection Total – AM Peak		**31**	**D**	**88**	**F**	**27**	**C**

Table 15: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 1 / Carrington Road	AM Peak											
	21	--	21	8	49	--	21	30	49	-	67	74

The above results need to be considered in light of the 2020 ITA 2028 Scenario having a private vehicle crossing included in the model on the opposite (eastern side) of the LILO Gate 1 access. In the "all movements" signal design now assumed for Gate 1, a fourth arm was not considered practical, and the eastern-side vehicle access function is assumed to be provided at a somewhat relocated position (north or south relative to Gate 1). As such, no eastern access is reported on for the Te Auaunga Plan Change 2031 scenario results.

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: western right turn – 31 seconds delay
Worst approach: western approach – LOS D
Overall Intersection: LOS D with 31 seconds delay
Queues: 21m on southern and northern approaches

2020 ITA 2028 Scenario:

Worst Movement: western left turn – 88 seconds delay. An increase of 67 seconds compared to the Base
Worst approach: western approach – LOS F
Overall Intersection: LOS F with 88 seconds delay. An increase of 57 seconds compared to the Base
Queues: 49m on southern approach. An increase of 28m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: northern right turn – 57 seconds delay. An increase of 38 seconds compared to the Base
Worst approach: western approach – LOS D
Overall Intersection: LOS C with 27 seconds delay. An improvement compared to the Base and 2020 ITA 2028 scenarios
Queues: 74m on northern approach. An increase of around 66m compared to the Base scenario and 44m compared to the 2020 ITA 2028 scenario

Table 16: Gate 1 / Carrington Road - PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 1 / Carrington Road	PM Peak						
	S Left	1	B	6	A	31	C
	S Thru	1		10		26	
	S Right	13		0		-	
	E Left	15	C	13	E	-	-
	E Right	22		41		-	
	N Left	2	B	4	A	-	C
	N Thru	1		1		18	
	N Right	14		N/A		72	
	W Left	15	C	32	D	39	D
	W Right	18		N/A		47	
Intersection Total – PM Peak		**22**	**C**	**41**	**E**	**27**	**C**

Table 17: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 1 / Carrington Road	PM Peak											
	0	--	16	11	21	--	16	7	51	--	123	33

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: eastern right turn – 22 seconds delay
Worst approach: eastern and western approaches – LOS C
Overall Intersection: LOS C with 22 seconds delay
Queues: 16m on northern approach

2020 ITA 2028 Scenario:

Worst Movement: eastern right turn – 41 seconds delay. An increase of 19 seconds compared to the Base
Worst approach: eastern approach – LOS E
Overall Intersection: LOS E with 41 seconds delay. An increase of 19 seconds compared to the Base
Queues: 42m on southern approach. An increase of 42m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement:	northern right turn – 72 seconds delay. An increase of around 60 seconds compared to the Base
Worst approach:	western approach – LOS D
Overall Intersection:	LOS C with 27 seconds delay. An increase of five seconds compared to the Base and a decrease of 14 seconds compared to the 2020 ITA 2028 scenario
Queues:	123m on northern approach. An increase of around 107m compared to the Base and 2020 ITA 2028 scenarios

The Gate 1 intersection is proposed to be signalised as part of the Te Auaunga Plan Change 2031 upgrade works. From a technical perspective, the overall LOS for a priority intersection is typically based on the delay for the worst movement (as the through movements are generally unimpeded) whilst for signalised intersections the overall LOS is based on all movements.

The results of the modelling indicate a general decline in performance between the Te Auaunga Plan Change 2031 scenario and the Base scenario. However, this is not considered surprising considering the switch from a priority intersection on a one-lane-each-way road to a traffic signal on a two-lanes-each-way road also catering for more traffic.

Improvements are anticipated for the vehicles exiting the precinct in the AM peak (particularly the left turn movement out) and the LOS for the exiting movements remains the same when comparing the Te Auaunga Plan Change 2031 and 2020 ITA 2028 scenarios in the PM peak.

An increase in queuing is observed in the Te Auaunga Plan Change 2031 scenario, particularly the northern and western approaches but this is to be expected given the signalisation of the intersection.

Overall, the modelling predicts that the intersection will perform well within acceptable tolerances for the busiest periods of the day.

4.1.3 Gate 2 / Carrington Road

Table 18: Gate 2 / Carrington Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 2 / Carrington Road	AM Peak						
	S Left	-	-	-	-	10	B
	S Thru	5	A	36	E	14	
	N Thru	0	B	8	F	6	A
	N Right	11		53		-	
	W Left	14	D	33	E	37	E
	W Right	27		34		-	
Intersection Total – AM Peak		**27**	**D**	**53**	**F**	**37**	**E**

Table 19: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 2 / Carrington Road	AM Peak											
	82	--	8	8	123	--	57	44	87	-	0	74

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: western right turn – 27 seconds delay
Worst approach: western approach – LOS D
Overall Intersection: LOS D with 27 seconds delay
Queues: 82m on southern approach

2020 ITA 2028 Scenario:

Worst Movement: northern right turn – 53 seconds delay. An increase of 42 seconds compared to the Base
Worst approach: northern approach – LOS F
Overall Intersection**:** LOS F with 48 seconds delay. An increase of 26 seconds compared to the Base
Queues: 112m on southern approach. An increase of 30m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: western left turn – 37 seconds delay. An increase of 23 seconds compared to the Base but no significant difference compared to the ITA 2028 scenario
Worst approach: western approach – LOS E
Overall Intersection: LOS E with 37 seconds delay. A decline in performance of around 10 seconds compared to the Base but an improvement of around 16 seconds compared to the 2020 ITA 2028 scenario
Queues: 87m on southern approach. An increase of 5m compared to the Base scenario and an decrease of around 36m compared to the 2020 ITA 2028 scenario

Table 20: Gate 2 / Carrington Road - PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 2 / Carrington Road	PM Peak						
	S Left	-	-	-	-	4	A
	S Thru	1	A	11	B	6	
	N Thru	0	A	5	F	7	A
	N Right	7		59		-	
	W Left	9	C	39	E	19	C
	W Right	18		49		-	
Intersection Total – PM Peak		**18**	**C**	**59**	**F**	**19**	**C**

Table 21: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 2 / Carrington Road	PM Peak											
	7	--	0	7	54	--	63	38	46	-	25	29

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: western right turn – 18 seconds delay
Worst approach: western approach – LOS C
Overall Intersection: LOS C with 18 seconds delay
Queues: 7m on southern and western approaches

2020 ITA 2028 Scenario:

Worst Movement: northern right turn – 59 seconds delay. An increase of 52 seconds compared to the Base.
Worst approach: northern approach – LOS F
Overall Intersection: LOS F with 59 seconds delay. An increase of 41 seconds compared to the Base
Queues: 63m on northern approach. An increase of 63m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: western left turn – 19 seconds delay. An increase of 10 seconds compared to the Base and a decrease of 20 seconds compared to the 2020 ITA 2028 scenario
Worst approach: western approach – LOS C
Overall Intersection: LOS C with 19 seconds delay. Similar to the Base but a decrease of 40 seconds compared to the 2020 ITA 2028 scenario
Queues: 46m on the southern approach. An increase of 39m compared to the Base and a decrease of 8m compared to the 2020 ITA 2028 scenario

Under the Te Auaunga Plan Change 2031 scenario the Gate 2 / Carrington Road intersection is proposed to be converted to a left-in, left-out intersection (unsignalised).

Overall, the modelled intersection performance for the Te Auaunga Plan Change 2031 scenario shows a decline compared to the Base but an improvement compared to the 2020 ITA 2028 scenarios in both peak periods.

4.1.4 Gate 3 (Farm Road) / Carrington Road

Table 22: Gate 3 / Carrington Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 3 / Carrington Road	AM Peak						
	S Left	2	A	14	B	7	B
	S Thru	1		19		14	
	N Thru	1	A	3	B	13	C
	N Right	8		54		59	
	W Left	5	C	48	D	38	D
	W Right	17		56		48	
Intersection Total – AM Peak		**17**	**C**	**19**	**B**	**20**	**C**

Table 23: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 3 / Carrington Road	AM Peak											
	53	--	7	0	105	--	28	25	64	-	65	37

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 17 seconds delay

Worst approach: western approach – LOS C
Overall Intersection: LOS C with 17 seconds delay
Queues: 53m on southern approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 56 seconds delay. An increase of 39 seconds compared to the Base
Worst approach: western approach – LOS D
Overall Intersection: LOS B with 19 seconds delay. An increase of two seconds compared to the Base
Queues**:** 105m on southern approach. An increase of 52m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: northern right turn – 59 seconds delay. An increase of 51 and five seconds compared to the Base and 2020 ITA 2028 scenarios respectively
Worst approach: western approach – LOS D
Overall Intersection: LOS C with 20 seconds delay. Generally consistent with the Base and 2020 ITA 2028 scenarios
Queues**:** 65m on northern approach. An increase of 58m compared to the Base and 37m compared to the 2020 ITA 2028 scenario

Table 24: Gate 3 / Carrington Road - PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 3 / Carrington Road	PM Peak						
	S Left	1	A	15	B	30	C
	S Thru	1		15		26	
	N Thru	1	A	15	C	20	C
	N Right	5		64		77	
	W Left	3	B	31	D	35	D
	W Right	12		53		50	
Intersection Total – PM Peak		**12**	**B**	**22**	**C**	**32**	**C**

Table 25: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 3 / Carrington Road	PM Peak											
	32	--	7	7	91	--	89	46	94	-	149	65

This gate will see the majority of the retail cluster motor vehicle traffic (this being intended to be located close to Gate 3). It should be noted that in particular, some egress traffic at this access is expected to egress via a LILO access located between Gate 1 and 2. Should this not be provided, some pattern shift may occur, with more traffic exiting Gate 3.

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: western right turn – 12 seconds delay
Worst approach: western approach – LOS B
Overall Intersection: LOS B with 12 seconds delay
Queues: 32m on southern approach

2020 ITA 2028 Scenario:

Worst Movement: northern right turn – 64 seconds delay. An increase of 59 seconds compared to the Base
Worst approach: western approach – LOS D

Overall Intersection**:** LOS D with 22 seconds delay. An increase of 10 seconds compared to the Base
Queues: 91m on southern approach. An increase of 59m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: northern right turn – 77 seconds delay. An increase of 72 seconds compared to the Base and 13 seconds compared to the 2020 ITA 2028 scenario
Worst approach: western approach – LOS D
Overall Intersection**:** LOS C with 32 seconds delay. An increase of 20 seconds compared to the Base and 10 seconds compared to the 2020 ITA 2028 scenario
Queues: 149m on northern approach. An increase of 142m compared to the Base and 60m compared to the 2020 ITA 2028 scenario

The modelling indicates a gradual decline in performance from the Base scenario to the 2020 ITA 2028 scenario and subsequently the Te Auaunga Plan Change 2031 scenario. However, the overall intersection performance for the Te Auaunga Plan Change 2031 model (LOS C for the AM and PM peak hours) is considered to be acceptable for the future peak periods.

4.1.5 Gate 4 / Carrington Road

Table 26: Gate 4 / Carrington Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 4 / Carrington Road	AM Peak						
	S Left	15	B	18	C	10	B
	S Thru	13		28		13	
	N Thru	20	C	10	C	13	C
	N Right	36		51		68	
	W Left	2	B	2	C	8	D
	W Right	33		51		75	
Intersection Total – AM Peak		**18**	**B**	**24**	**C**	**20**	**C**

Table 27: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 4 / Carrington Road	AM Peak											
	64	--	105	18	64	--	33	68	40	-	41	95

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: northern right turn – 36 seconds delay
Worst approach: northern approach – LOS C
Overall Intersection: LOS B with 18 seconds delay
Queues: 105m on northern approach

2020 ITA 2028 Scenario:

Worst Movement: northern right turn and western right turn – 51 seconds delay. Increases of 15 seconds and 18 seconds, respectively, compared to the Base
Worst approach: All approaches – LOS C
Overall Intersection: LOS C with 24 seconds delay. An increase of six seconds compared to the Base

Queues: 68m on western approach. An increase of 50m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: northern right turn and western right turn – 68 and 75 seconds delay. Increases of 32 seconds and 42 seconds, respectively, compared to the Base. Compared to the 2020 ITA 2028 scenario the respective increases are 17 and 24 seconds for the same movements
Worst approach: western approach – LOS D
Overall Intersection: LOS C with 20 seconds delay. An increase of two seconds compared to the Base and a decrease of four seconds compared to the 2020 ITA 2028 scenario
Queues: 95m on western approach. An increase of 77m compared to the Base and an increase of 27 meters compared to the 2020 ITA 2028 scenario

Table 28: Gate 4 / Carrington Road - PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Gate 4 / Carrington Road	**AM Peak**						
	S Left	13	B	12	B	13	B
	S Thru	14		18		20	
	N Thru	29	C	16	B	23	C
	N Right	42		35		56	
	W Left	2	B	1	C	7	D
	W Right	27		39		68	
Intersection Total – PM Peak		**21**	**C**	**19**	**B**	**26**	**C**

Table 29: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Gate 4 / Carrington Road	**PM Peak**											
	39	--	78	49	45	--	83	59	38	-	102	177

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: northern right turn – 42 seconds delay
Worst approach: northern approach – LOS C
Overall Intersection: LOS C with 21 seconds delay
Queues: 78m on northern approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 39 seconds delay. An increase of 12 seconds compared to the Base.
Worst approach: western approach – LOS C
Overall Intersection: LOS B with 19 seconds delay. A decrease of two seconds compared to the Base
Queues: 83m on northern approach. An increase of 5m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: western right turn – 68 seconds delay. An increase of around 41 and 29 seconds compared to the Base and ITA 2028 scenarios respectively
Worst approach: western approach – LOS D
Overall Intersection: LOS C with 26 seconds delay. A marginal increase compared to the Base and ITA 2028 scenarios

Queues: 177m on western approach. Increases of 128m and 118m compared to the Base and ITA 2028 scenarios respectively

The modelling indicates Gate 4 and Carrington Road in both future scenarios generally show a good to moderate performance, with very similar overall LOS and delays compared to the Base scenario. This is expected, given that in the future scenarios, a more evenly distributed turning traffic pattern is anticipated between the signalised Gate 1, Gate 3, and Gate 4 accesses, therefore reducing potential further pressures on Gate 4.

Generally, the largest queue length increases are noted on the western approach in both peak periods. However, these queues are typically transitory in nature and tend to dissipate relatively quickly at the action of the signals.

4.1.6 Woodward Road / Carrington Road

Table 30: Woodward Road / Carrington Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / Carrington Road	AM Peak						
	S Left	2	A	21	C	20	C
	S Thru	1		26		32	
	N Thru	2	B	4	A	6	B
	N Right	10		23		52	
	W Left	15	C	36	D	73	E
	W Right	23		47		73	
Intersection Total – AM Peak		**23**	**C**	**25**	**C**	**36**	**D**

Table 31: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / Carrington Road	AM Peak											
	45	--	34	100	98	--	31	200	76	-	44	83

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 23 seconds delay
Worst approach: western approach – LOS C
Overall Intersection: LOS C with 23 seconds delay
Queues: 100m on northern approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 47 seconds delay. An increase of 24 seconds compared to the Base
Worst approach: western approach – LOS D
Overall Intersection: LOS C with 25 seconds delay. An increase of two seconds compared to the Base
Queues: 200m on western approach, an increase of 100m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: western left and right turn – 73 seconds delay. An increase of 50-60 seconds compared to the Base and an increase of 26-37 seconds compared to the 2020 ITA 2028 scenario
Worst approach: western approach – LOS E
Overall Intersection: LOS D with 36 seconds delay. Increase of 13 seconds compared to the Base and 11 seconds compared to the 2020 ITA 2028 scenario

Queues: 83m on western approach. Decreases of 17m compared to the Base and 117m compared to the 2020 ITA 2028 scenario

Table 32: Woodward Road / Carrington Road - PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / Carrington Road	PM Peak						
	S Left	1	A	13	B	35	C
	S Thru	1		14		31	
	N Thru	1	A	3	A	8	B
	N Right	8		14		27	
	W Left	5	B	11	B	32	C
	W Right	13		25		39	
Intersection Total – PM Peak		**13**	**B**	**11**	**B**	**23**	**C**

Table 33: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / Carrington Road	PM Peak											
	40	--	28	25	53	--	47	31	50	-	52	55

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: western right turn – 13 seconds delay
Worst approach: western approach – LOS B
Overall Intersection: LOS B with 13 seconds delay
Queues: 40m on southern approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 25 seconds delay. An increase of 12 seconds compared to the Base
Worst approach: southern and western approaches – LOS B
Overall Intersection: LOS B with 11 seconds delay. A decrease of two seconds compared to the Base
Queues: 53m on southern approach. An increase of 13m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: western right turn – 39 seconds delay. An increase of 26 seconds compared to the Base and an increase of 14 seconds compared to the 2020 ITA 2028 scenario
Worst approach: southern and western approaches – LOS C
Overall Intersection: LOS C with 23 seconds delay. An increase of around 10 to 12 seconds compared to the Base and 2020 ITA 2028 scenarios
Queues: 55m on western approach. An increase of 30m compared to the Base and an increase of 24m compared to the 2020 ITA 2028 scenario

The modelling indicates that a decline in performance is anticipated at the Woodward Road / Carrington Road intersection in comparing the Te Auaunga Plan Change 2031 scenario with the other two scenarios. However, an overall intersection LOS D and LOS C is considered generally acceptable for the AM and PM peak hours, respectively.

When comparing the queue lengths from the modelling, there is a noticeable improvement noted in the AM peak between the Te Auaunga Plan Change 2031 scenario and the 2020 ITA 2028 scenario. The PM peak hour queues are generally similar for all three scenarios.

4.1.7 Carrington Road / New North Road / Mt Albert Road

Table 34: Carrington Road / New North Road / Mt Albert Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Carrington Road / New North Road / Mt Albert Road	AM Peak						
	S Left	182	F	44	E	45	E
	S Thru	184		49		50	
	S Right	180		85		94	
	E Left	50	F	7	D	49	E
	E Thru	35		41		56	
	E Right	279		113		60	
	N Left	125	F	49	E	31	E
	N Thru	136		50		50	
	N Right	67		89		116	
	W Left	141	F	79	E	92	F
	W Thru	128		62		97	
	W Right	168		63		97	
Intersection Total – AM Peak		**122**	**F**	**53**	**D**	**71**	**E**

Table 35: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Carrington Road / New North Road / Mt Albert Road	AM Peak											
	188	80	187	302	140	33	193	144	125	29	93	191

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: eastern right turn – 279 seconds delay
Worst approach: All approaches – LOS F
Overall Intersection: LOS F with 122 seconds delay
Queues: 302m on western approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 113 seconds delay. A decrease of 116 seconds compared to the Base
Worst approach: southern, northern, and western approaches – LOS E
Overall Intersection: LOS D with 53 seconds delay. A decrease of 69 seconds compared to the Base
Queues: 193m on northern approach. An increase of 6m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: northern right turn – 116 seconds delay. Increase of 49 seconds compared to the Base and an increase of 27 seconds compared to the 2020 ITA 2028 scenario
Worst approach: western approach – LOS F
Overall Intersection: LOS E with 71 seconds delay. A decrease of 51 seconds compared to the Base and an increase of 18 seconds compared to the 2020 ITA 2028 scenario
Queues: 191m on western approach. A decrease of 111m compared to the Base and an increase of 47m compared to the 2020 ITA 2028 scenario

Table 36: Carrington Road / New North Road / Mt Albert Road – PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Carrington Road / New North Road / Mt Albert Road	**PM Peak**						
	S Left	104	F	44	D	83	F
	S Thru	115		46		88	
	S Right	111		61		135	
	E Left	50	E	44	E	62	E
	E Thru	94		98		65	
	E Right	90		102		60	
	N Left	139	F	48	E	24	E
	N Thru	144		49		52	
	N Right	91		89		90	
	W Left	56	E	72	F	110	F
	W Thru	65		78		118	
	W Right	71		111		119	
Intersection Total – PM Peak		**80**	**F**	**66**	**E**	**75**	**E**

Table 37: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Carrington Road / New North Road / Mt Albert Road	**PM Peak**											
	86	115	165	89	88	108	160	64	169	88	114	77

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: northern through – 144 seconds delay
Worst approach: southern and northern approaches – LOS F
Overall Intersection: LOS F with 80 seconds delay
Queues: 165m on northern approach

2020 ITA 2028 Scenario:

Worst Movement: western right turn – 111 seconds delay. A decrease of 40 seconds compared to the Base
Worst approach: western approach – LOS F
Overall Intersection: LOS E with 66 seconds delay. A decrease of 14 seconds compared to the Base
Queues**:** 160m on northern approach. A decrease of 5m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: southern right turn – 135 seconds delay. Increase of 24 seconds and 74 seconds compared to the Base and 2020 ITA 2028 scenarios respectively
Worst approach: southern and western approaches – LOS F
Overall Intersection: LOS E with 75 seconds delay. A decrease of five seconds compared to the Base but an increase of nine seconds compared to the 2020 ITA 2028 scenario
Queues**:** 169m on southern approach. An increase of around 80m compared to the Base and 2020 ITA 2028 scenarios

The Carrington Road / New North Road / Mount Albert Road intersection consistently shows a moderate to poor performance on most approaches in both the base and future scenarios. Whilst a decline in performance is noted between the Te Auaunga Plan Change 2031 and 2020 ITA 2028 scenarios, a marginal PM peak improvement is noted between the Plan Change 2031 and Base scenario, with a significant AM improvement largely driven by the wider-strategic modelled demands derived from the MSM model.

As indicated by the modelling, the intersection does not degrade in performance appreciably due to the further precinct development.

4.1.8 Woodward Road / New North Road / Richardson Road

Table 38: Woodward Road / New North Road / Richardson Road - AM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / New North Road / Richardson Road	**AM Peak**						
	S Left	44	D	30	C	23	C
	S Thru	56		35		28	
	S Right	35		25		23	
	E Left	32	C	28	C	31	C
	E Thru	31		25		27	
	E Right	58		52		47	
	N Left	45	D	15	D	11	C
	N Thru	55		35		32	
	N Right	54		37		31	
	W Left	30	C	26	C	21	B
	W Thru	27		23		19	
	W Right	48		38		35	
Intersection Total – AM Peak		**35**	**C**	**28**	**C**	**24**	**C**

Table 39: 95th Percentile Queue per Approach in AM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / New North Road / Richardson Road	AM Peak											
	122	25	117	83	77	20	37	56	44	27	41	42

Based on the results above the following can be summarised:

Base Scenario:

Worst Movement: eastern right turn – 58 seconds delay
Worst approach: southern and northern approaches – LOS D
Overall Intersection: LOS C with 35 seconds delay
Queues: 122m on southern approach

2020 ITA 2028 Scenario:

Worst Movement: eastern right turn - 52 seconds delay. A decrease of six seconds compared to the Base
Worst approach: Northern approach – LOS D
Overall Intersection: LOS C with 28 seconds delay. A decrease of seven seconds compared to the Base
Queues**:** 77m on southern approach. A decrease of 45m compared to the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: eastern right turn - 47 seconds delay. A decrease of 11 seconds compared to the Base and a decrease of five seconds compared to the 2020 ITA 2028 scenario.
Worst approach: Northern, eastern and southern approaches – LOS C
Overall Intersection: LOS C with 24 seconds delay. Decreases of 11 seconds and four seconds compared to the Base and 2020 ITA 2028 scenarios
Queues**:** 44m on southern approach. Decreases of 78m and 33m compared to the Base and 2020 ITA 2028 scenarios respectively

Table 40: Woodward Road / New North Road / Richardson Road - PM Peak Results

Intersection	Approach	Base - 2019		ITA - 2028		Plan Change - 2031	
		Delay (s)	LOS	Delay (s)	LOS	Delay(s)	LOS
Woodward Road / New North Road / Richardson Road	PM Peak						
	S Left	31	D	36	D	38	D
	S Thru	43		44		46	
	S Right	35		33		33	
	E Left	39	D	36	D	41	D
	E Thru	37		35		38	
	E Right	96		87		82	
	N Left	40	D	22	D	40	D
	N Thru	52		46		49	
	N Right	51		44		49	
	W Left	19	B	23	C	25	C
	W Thru	20		21		20	
	W Right	45		43		46	
Intersection Total – PM Peak		**35**	**D**	**35**	**C**	**37**	**D**

Table 41: 95th Percentile Queue per Approach in PM Peak

Intersection	95th Percentile Queue (m)											
	Base - 2019				ITA - 2028				Plan Change - 2031			
	S	E	N	W	S	E	N	W	S	E	N	W
Woodward Road / New North Road / Richardson Road	PM Peak											
	71	74	123	36	92	62	124	32	93	78	119	35

Based on the results above the following can be summarised:

Base Scenario :

Worst Movement: eastern right turn – 96 seconds delay
Worst approach: southern, eastern, and northern approaches – LOS D
Overall Intersection: LOS D with 35 seconds delay
Queues: 123m on northern approach

2020 ITA 2028 Scenario:

Worst Movement: eastern right turn - 87 seconds delay. A decrease of 9 seconds compared to the Base
Worst approach: southern, eastern, and northern approaches – LOS D
Overall Intersection: LOS C with 35 seconds delay. No change from the Base
Queues**:** 124m (25 vehicles) on northern arm. No change from the Base

Te Auaunga Plan Change 2031 Scenario:

Worst Movement: eastern right turn - 82 seconds delay. A decrease of 14 seconds compared to the Base and five seconds compared to the 2020 ITA 2028 scenario
Worst approach: all approaches – LOS D
Overall Intersection: LOS D with 37 seconds delay. Practically the same as the Base and 2020 ITA 2028 scenarios
Queues**:** 119m on northern approach. Practically the same as the Base and 2020 ITA 2028 scenarios

The Woodward Road / New North Road / Richardson Road intersection consistently demonstrates an overall moderate performance in all scenarios modelled. It is noted that in the AM peak, the performance of the intersection improves for both future scenarios compared to the base scenario. Once again, this can largely be attributed to the reduction in the overall demand forecast for the intersection by the wider regional model, even accounting for the development traffic.

4.2 Car Journey Travel Time

4.2.1 Travel Time Route Overview

Journey Travel time analysis for cars has been undertaken along the sections between Point Chevalier Road / Great North Road / Carrington Road and New North Road / Carrington Road, in a clockwise and anti-clockwise direction between Woodward Road / Carrington Road, and New North Road / Carrington Road intersections.

Existing travel times along these sections were surveyed on 17 October 2019, between 6:00 – 9:00am and 3:00 – 6:00pm. The length of each segment of the routes surveyed, and corresponding average morning / afternoon peak hour travel speeds observed during the time of the survey are shown in **Figure 6** and **Figure 7.**

The two routes, referred to as 'Route 1' and 'Route 2' are detailed below, along with the corresponding survey segments shown in **Figure 6** and **Figure 7.**

Route 1 - Comprises the following sections:

a) Point Chevalier Road / Great North Road / Carrington Road to Carrington Road / Gate 4 (segment 1 and 2)
b) Carrington Road / Gate 4 to Carrington Road / Woodward Road (segment 3)
c) Carrington Road / Woodward Road to Carrington Road / New North Road (segment 4)
d) Carrington Road / New North Road to New North Road / Woodward Road (segment 5)
e) New North Road / Woodward Road to Woodward Road / Rail Crossing (segment 6)
f) Woodward Road / Rail Crossing to Woodward Road / Carrington Road (segment 7)
g) Woodward Road / Carrington Road to Carrington Road / Gate 4 (segment 8)
h) Carrington Road / Gate 4 to Carrington Road / Great North Road / Point Chevalier Road (segment 9 and 10)

Route 2 - Comprises the following sections:

a) Point Chevalier Road / Great North Road / Carrington Road to Carrington Road / Gate 4 (segment 1 and 2)
b) Carrington Road / Gate 4 to Carrington Road / Woodward Road (segment 3)
c) Carrington Road / Woodward Road to Woodward Road / Rail Crossing (segment 4)
d) Woodward Road / Rail Crossing to Woodward Road / New North Road (segment 5)
e) Woodward Road / New North Road to New North Road / Carrington Road (segment 6)
f) New North Road / Carrington Road to Carrington Road / Woodward Road (segment 7)
g) Carrington Road / Woodward Road to Carrington Road / Gate 4 (segment 8)
h) Carrington Road / Gate 4 to Carrington Road / Great North Road (segment 9 and 10)

The travel time analysis for Route A and B during the AM and PM peak hours are shown in **Table 42** to **Table 45**. Journey Travel times from the 2019 surveys are also included (referred to as 'Observed Travel Time') to provide a reference to the existing situation.

The results are presented as cumulative travel time from origin point of the first segment (segment 1), to the destination point of the last segment (segment 8). For each route, the sections are referred to as Sections 1a-1h and Sections 2a-2h for Route 1 and Route 2 respectively, corresponding to the alphabetic point formatting described above. The difference between the observed travel time and the modelled travel time for each scenario are also included, with negative values indicating faster travel time associated with Scenario A or Scenario B, relative to the observed travel time.

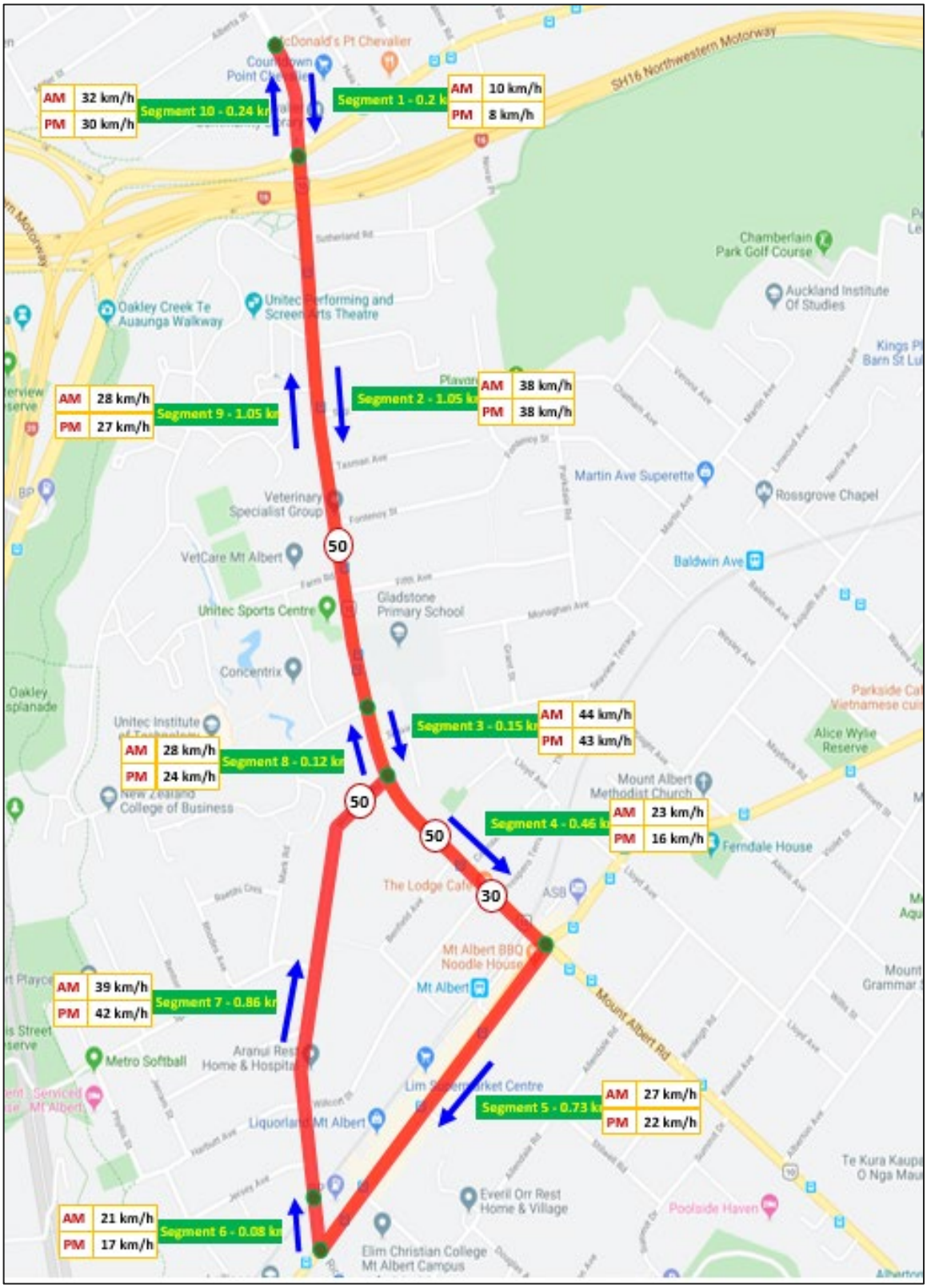

Figure 6: Route 1 (clockwise direction), source: Matrix.

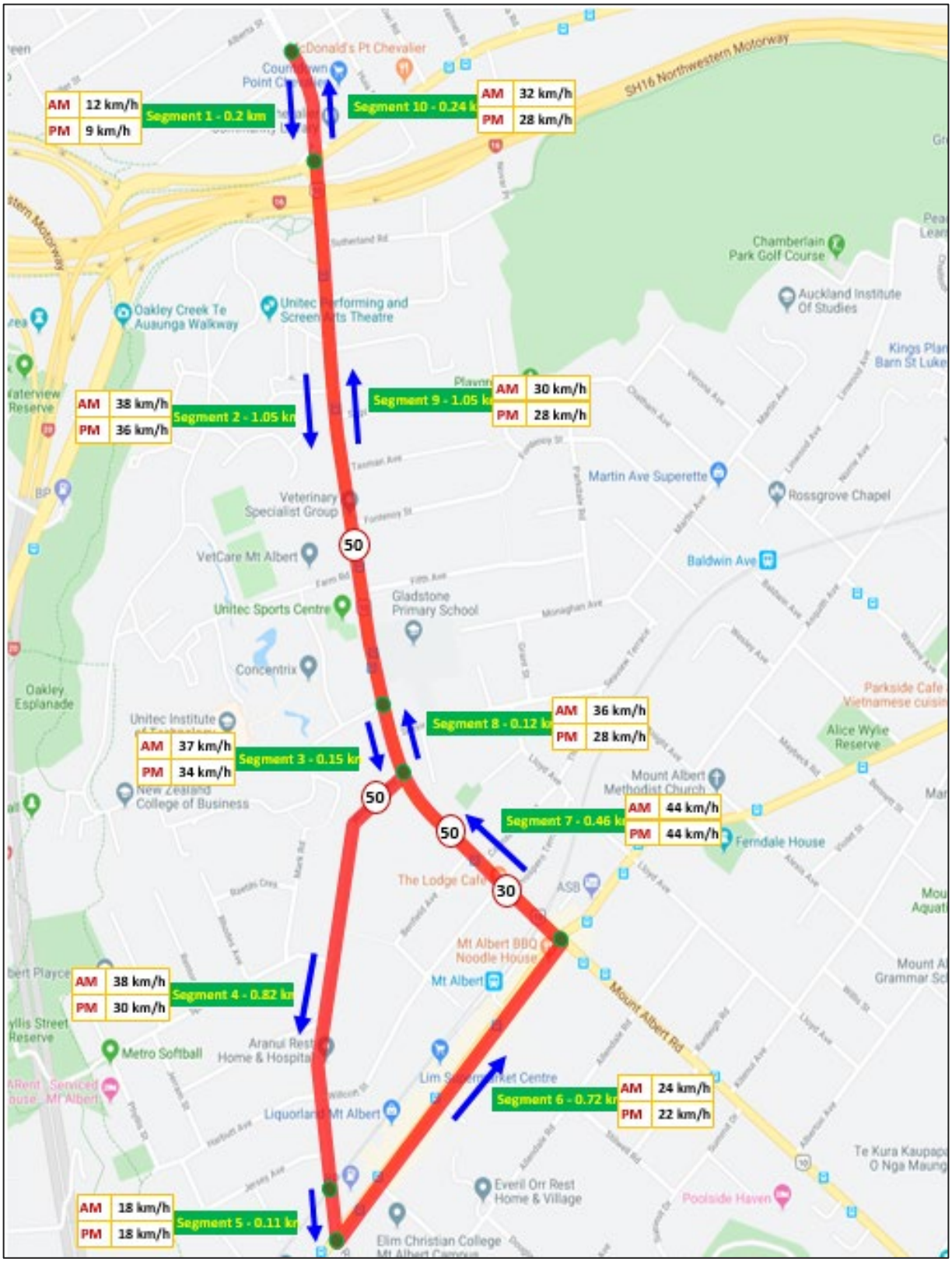

Figure 7: Route 1 (anti-clockwise direction), source: Matrix.

4.2.2 Car Travel Time Route 1

Table 42: Cumulative Travel Time along Route 1 – AM Peak

Route 1	Cumulative Travel Time (in seconds)				
	Observed	ITA 2028 (Modelled)	Difference compared to Observed	Plan Change 2031	Difference compared to Observed
AM Peak					
Section 1a	104	93	-11	104	0
Section 1b	118	104	-14	115	-3
Section 1c	205	221	+16	249	+49
Section 1d	313	318	+5	340	+27
Section 1e	341	344	+2	366	+25
Section 1f	426	431	+5	491	+66
Section 1g	444	461	+17	527	+83
Section 1h	590	747	+157	725	+136
%Difference (Observed vs Scenario)		**+27%**		**+23%**	

Table 43: Cumulative Travel Time along Route 1 – PM Peak

Route 1	Cumulative Travel Time (in seconds)				
	Observed	ITA 2028	Difference compared to Observed	Plan Change 2031	Difference compared to Observed
PM Peak					
Section 1a	104	118	+14	146	+43
Section 1b	119	128	+10	161	+42
Section 1c	249	243	-6	291	+42
Section 1d	383	375	-8	425	+42
Section 1e	417	401	-16	451	+34
Section 1f	492	470	-22	540	+48
Section 1g	515	494	-21	565	+50
Section 1h	659	715	+56	+768	+108
%Difference (Observed vs Scenario)		**+8%**		**+16%**	

The modelling indicates that in the AM peak hour, the overall travel time for Te Auaunga Plan Change 2031 scenario is around 23% higher than the Base. However, the Te Auaunga Plan Change 2031 travel time along Route 1 is lower than the 2020 ITA 2028 travel time by around 3%.

Increased travel times on Route 1 are also noted in the PM peak hour for both future scenarios (compared to the Base), with generally higher times anticipated in the Te Auaunga Plan Change 2031 scenario compared to the 2020 ITA 2028 scenario. However, the overall travel time increases are considered acceptable in light of the proposed intensification of uses, and new signalised intersections being provided.

4.2.3 Car Travel Time Route 2

Table 44: Cumulative Travel Time along Route 2 - AM Peak

Route 2	Cumulative Travel Time (in seconds)				
	Observed	ITA 2028	Difference compared to Observed	Plan Change 2031	Difference compared to Observed
AM Peak					
Section 2a	104	93	-11	104	+1
Section 2b	118	120	+3	172	+54
Section 2c	200	199	-1	251	+51
Section 2d	241	217	-25	264	+23
Section 2e	374	336	-38	386	+12
Section 2f	411	392	-20	447	+36
Section 2g	430	423	-7	459	+29
Section 2h	575	709	+134	658	+82
%Difference (Observed vs Scenario)		**+23%**		**+14%**	

Table 45: Cumulative Travel Time along Route 2 - PM Peak

Route 2	Cumulative Travel Time (in seconds)				
	Observed	ITA 2028	Difference compared to Observed	Plan Change 2031	Difference compared to Observed
PM Peak					
Section 2a	104	118	+14	146	+43
Section 2b	119	139	+20	180	+61
Section 2c	217	227	+9	279	+62
Section 2d	256	254	-2	298	+42
Section 2e	374	370	-4	439	+65
Section 2f	411	414	+2	501	+90
Section 2g	435	437	+2	529	+94
Section 2h	579	658	+80	731	+152
%Difference (Observed vs Scenario)		**+14%**		**+26%**	

For Route 2, the modelling indicates that travel times increase by just over 10% for the AM peak for the Te Auaunga Plan Change 2031 future scenario compared to the Base. However, an improvement in travel time of around 7% along Route 2 is observed between the Te Auaunga Plan Change 2031 scenario and the 2020 ITA 2028 scenario.

In the PM peak period, the Te Auaunga Plan Change 2031 scenario is predicted to see an increase in travel times of around 26% over the Base and around 11% over the 2020 ITA 2028 scenario.

Overall, it can be concluded that the travel times for general traffic on the network surrounding the precinct in both future scenarios are generally higher than the observed travel time, using the wider-area assumptions provided.

4.3 Bus Journey Travel Time

The journey travel times for the buses along Carrington Road, between Point Chevalier Road / Great North Road / Carrington Road and New North Road / Carrington Road / Mount Albert Road have been modelled separately.

The comparison between bus travel times in the base and future models for the sections of Carrington Road between the Great North Road / Pt Chevalier Road / Carrington Road and Carrington Road/Woodward Road, in both directions are provided in **Table 46.**

The comparisons are presented separately for AM and PM peak periods.

Table 46: Comparison of Bus Travel Time on Carrington Road

Section	Bus Travel Times (seconds)		
	Base Model (no bus lanes)	**ITA 2028**	**Plan Change 2031**
AM Peak			
Southbound -Carrington Road (Pt Chevalier/Great North Road to Woodward Road)	199	190 (9 seconds faster than the base)	200 (similar to the base)
Northbound – Carrington Road (Woodward Road to Pt Chevalier/Great North Road)	284	285 (no change from the base)	282 (2 seconds faster than the base)
PM Peak			
Southbound -Carrington Road (Pt Chevalier/Great North Road to Woodward Road)	207	203 (4 seconds faster than the base)	201 (6 seconds faster than the base)
Northbound – Carrington Road (Woodward Road to Pt Chevalier/Great North Road)	267	318 (51 seconds slower than the base)	295 (28 seconds slower than the base)

It is noted that the traffic model assumes that buses will stop for an average of 20 seconds at each bus stop along the corridor, for boarding and alighting passengers. These additional seconds are included in the bus travel times reported above. Given that there are three bus stops in each direction along Carrington Road in the future scenarios, this equates to approximately 60 seconds of additional time each direction.

Comparing the Te Auaunga Plan Change 2031 and Base scenarios, the model indicates improvements in bus travel times along the Carrington Road corridor in the northbound direction during the AM peak and in the southbound direction in the PM peak. These are the critical directions of travel in both peak hours. In the southbound direction during the AM peak the bus travel time essentially the same as the Base.

With respect to the bus travel time in the northbound direction in the PM peak, where an increase of 28 seconds persists relative to the Base scenario, this can generally be attributed to the higher delay on the southern approach of the Great North Road / Pt Chevalier Road / Carrington Road intersection in the PM peak as buses are required to merge with general traffic at the end of the northbound bus lane prior to the SH16 over-bridge.

In comparing the Te Auaunga Plan Change 2031 scenario with the 2020 ITA 2028 scenario, the bus travel time in the southbound direction is around 10 seconds slower during the AM peak. However, improvements are noted for the northbound AM peak and the PM peak in both directions, with the most noticeable improvement being 23 seconds in the northbound direction.

As noted earlier, the model assumes that the bus lanes do not extend across the SH16 motorway over-bridge all the way to Great North Road but stop in the general vicinity of Sutherland Road. Extending at least some bus priority across the bridge would result in significant delay improvement for services. However, this would require either the extension of the bus lane closer to the intersection at cost to performance of non-bus movements, or a full rebuild of the over-bridge (for bus lanes each way rather than just southbound, as achieved by relocating the cycle facility onto a clip-on).

Overall, the above demonstrates that the Full Upgrade of Carrington is beneficial and will sufficiently sustain the public transport operation along the corridor. Without it, buses would perform at general traffic flow delays plus stop delays and delays to re-enter traffic streams, while also further holding up general traffic while sitting in stops.

Particularly if combined with further intersection bus priority measures, the greater accessibility and reliability for buses will compensate for the longer travel times for general traffic (as previously discussed) and support the objective of encouraging greater public transport use to and from the precinct. It will also support the wider network, where the road serves several Frequent Network bus routes.

4.4 Carrington Road Flows

The peak hour traffic volumes on Carrington Road, between Gate 3 and Gate 4, recorded by the 7-day tube count surveys (2014 and 2019) and modelled in the future scenarios are presented in **Table 47.**

Table 47: Carrington Road Peak Hour Traffic Flow

Time	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
	Northbound	Southbound	Combined	Northbound	Southbound	Combined
2014 (survey)	1,031	702	1,733	583	647	1,230
2019 (survey)	664	549	1213	555	577	1,132
2028 ITA	994	714	1,708	741	947	1,688
2031 Plan Change	1,087	754	1,841	842	1,045	1,886

The table above shows lower peak hour traffic flows on Carrington Road in 2019 compared to 2014, which can be attributed largely to the opening of the Waterview motorway and tunnel in 2017.

The table also shows a general increasing trend in traffic flows in both directions and peak periods, between 2019 and 2031. It is noted that the level of traffic flows predicted in the Te Auaunga Plan Change 2031 scenario are comparable with the AM morning peak flows observed in 2014, which provides some indication that the corridor will have sufficient capacity to cater for the future flows.

5 Summary & Conclusions

As can be seen from the results of the modelling, the changes to development traffic leads to changes in Level of Service / delays compared to the 2020 ITA. These changes are not always negative, despite the additional traffic from an extended modelling horizon and added dwellings due to the rezoned areas. The varying patterns of change (rather than a simple decline in performance) are due to the model now also including modifications to previous trip generation assumptions (mainly based on reduction of pro-rata residential car parking provided) and due to network assumption changes, such as switching the signalisation of Gate 2 to Gate 1 instead.

At the southern end, performance results are also affected due to AT/AFC assumptions of the effect of wider-area traffic reductions due to network changes, and the new assumption of a “Full Upgrade” of all of Carrington Road’s length including a rail over-bridge replacement with added lanes.

General vehicle journey times see no or quite limited degradation overall, though mid-block travel along Carrington Road sees increases compared to the lower base traffic volume situation. This is again balanced by improvements in the southern part of the network as per the MSM projections provided by AT/AFC as a base for the traffic model.

Bus journey time analysis shows that the Carrington Road bus routes will see clear benefits from the new bus lanes proposed as part of the Carrington Road Upgrade, albeit to ensure consistent advantage of public transport over single-occupancy cars, more intersection-specific bus priority would be beneficial at key locations in addition to the mid-block bus lanes. This particularly applies at the “ends” of the model (Great North Road and New North Road).

Further, general vehicle capacity increases (such as much larger arterial road intersections at the network edges or added general lanes on Carrington Road) are not considered feasible without prohibitive impacts on surrounding town centres in particular and would not be in line with policy and objectives for the precinct.

The model results (and development impacts) should be considered as part of the assumptions of other projects in the wider vicinity (such as Connected Communities designs for New North Road) to ensure that the impacts are properly considered in the wider network, as well as the more local areas of the network assessed in this report.

In a wider sense, this report indicates that the transport impacts of the proposed rezoning being sought, as well as the added residential intensification modelled (the latter of which is already allowed by the existing zoning) can be adequately integrated. This conclusion is however predicated upon the assumption that some relatively substantial changes in the transport environment serving the Te Auaunga Plan Change area are in place. Without such changes, the assessed modelling results and overall transport network performance would risk being undermined by additional car-centric traffic.

Key assumptions that would need to occur in practice to achieve the projected outcomes would include a (more extensive) Carrington Road Upgrade focused on public transport and active modes, significant constraints on car parking for the proposed residential and retail activities, as well as implementing measures intended to prevent displacing potential parking demand into surrounding suburbs and streets.

If these assumptions are given effect to, then, combined with the good existing transport accessibility and the central location that the Te Auaunga Plan Change location enjoys, the transport effects of the rezoning and intensification sought by the Te Auaunga Plan Change are considered acceptable, and will place a much-reduced burden on Auckland’s transport networks compared to a development of similar size located further outside the Auckland Isthmus.

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Appendices

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Appendix A Trip General Table

						AM		PM			
Land Use / Activity	**Developers / organisation**	**Development (Year 8 since development)**	**Zone**	**Unit**	**Total development per activity**	**Trip rate**	**Trips**	**Trip rate**	**Trips**	**Total trips AM (vehicles/hour)**	**Total trips PM (vehicles/hour)**
Education				FTE	10,889					820	820
Tertiary Education	Unitec				10,889					820	820
Students		9,702	Unitec Core	FTE		0.07	672	0.07	672		
Staff		1,187	Unitec Core	FTE		0.12	148	0.12	148		
Primary School	MoE				0					0	0
Students		0	Carrington	FTE		0.42	0	0.105	0		
Staff		0	Carrington	FTE		0.45	0	0.3	0		
Early Childhood Education	MoE				0					0	0
Students			Carrington	FTE		1	0	0.25	0		
Special Needs Education	MoE				0					0	0
Students			Carrington	FTE		1.8	0	0.45	0		
Residential				Dwelling units / beds (Unitec h	4000					992	967
Studio and 1 / 1.5 bedroom without parking					1000					50	50
	Fletchers / NWO	109	Southern	Dwelling units		0.05	5	0.05	5		
		374	Northern	Dwelling units		0.05	19	0.05	19		
		254	Carrington	Dwelling units		0.05	13	0.05	13		
		43	North-West	Dwelling units		0.05	2	0.05	2		
		60	Te Auaunga North	Dwelling units		0.05	3	0.05	3		
		39	F Lots	Dwelling units		0.05	2	0.05	2		
	HUD	121	B Lots	Dwelling units		0.05	6	0.05	6		
	Unitec		Unitec Core	Dwelling units		0.05	0	0.05	0		
1.5 Bedroom with parking					1250					315	290
	Fletchers / NWO	136	Southern	Dwelling units		0.29	39	0.27	36		
		468	Northern	Dwelling units		0.25	115	0.23	105		
		317	Carrington	Dwelling units		0.25	78	0.23	71		
		54	North-West	Dwelling units		0.25	13	0.23	12		
		75	Te Auaunga North	Dwelling units		0.28	21	0.26	19		
		48	F Lots	Dwelling units		0.28	13	0.26	12		
	HUD	151	B Lots	Dwelling units		0.25	37	0.23	34		
	Unitec		Unitec Core	Dwelling units			0		0		
2 Bedroom					0					0	0
	Fletchers / NWO		Southern	Dwelling units			0		0		
			Northern	Dwelling units			0		0		
			Carrington	Dwelling units			0		0		
			North-West	Dwelling units			0		0		
	HUD		Te Auaunga North	Dwelling units			0		0		
	Unitec		Unitec Core	Dwelling units			0		0		
2.5 Bedroom					1750					626	626
	Fletchers / NWO	190	Southern	Dwelling units		0.43	82	0.43	82		
	HUD	655	Northern	Dwelling units		0.34	224	0.34	224		
		444	Carrington	Dwelling units		0.34	151	0.34	151		
		76	North-West	Dwelling units		0.34	26	0.34	26		
		106	Te Auaunga North	Dwelling units		0.41	43	0.41	43		
		68	F Lots	Dwelling units		0.41	28	0.41	28		
		211	B Lots	Dwelling units		0.34	72	0.34	72		
	Unitec		Unitec Core	Dwelling units			0		0		
3 and 4 Bedroom					0					0	0
	Fletchers / NWO		Southern	Dwelling units			0		0		
	HUD		Northern	Dwelling units			0		0		
			Carrington	Dwelling units			0		0		
			North-West	Dwelling units			0		0		
			Te Auaunga North	Dwelling units			0		0		
	Unitec		Unitec Core	Dwelling units			0		0		
Student Housing					0					0	0
	Unitec		Unitec Core	Beds			0	0.00	0		
Commercial					0					0	0
Services	Taylors Laundry		Taylor's	100 sqm	0	n/a		n/a		0	0
Business Partnerships / Offices		0	Unitec Core	100 sqm	0	1.6	0	1.2	0	0	0
Retail					3120					74	255
Supermarket		1800	Carrington Retail	100 sqm	1800	2.325	41.85	11.625	209.25	42	209
Other Retail (F&B)		1320	Carrington Retail	100 sqm	1320	2.415	31.878	3.45	45.54	32	46
Other land uses					198					156	61
Health	Mason Clinic	198	Northern	beds	198	n/a	156	n/a	61	156	61
Grand total trips										**2042**	**2103**

DESIGN WITH COMMUNITY IN MIND

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of place and of belonging. That's why at Stantec, we always design with community in mind.

We care about the communities we serve—because they're our communities too. This allows us to assess what's needed and connect our expertise, to appreciate nuances and envision what's never been considered, to bring together diverse perspectives so we can collaborate toward a shared success.

We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

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