I hereby give notice that a hearing by commissioners will be held on:

Date:	**Monday, 15 May 2023**
Time:	**9.30am**
Meeting Room:	**Uxbridge Theatre**
Venue:	**35 Uxbridge Road, Howick, Auckland 2014**

APPLICATION MATERIAL

SECTION 92 DOCUMENTS – VOLUME 2

5 REEVES ROAD, PAKURANGA HEIGHTS (EB2); 207 TI RAKAU DRIVE, PAKURANGA HEIGHTS (EB3R)

AUCKLAND TRANSPORT IN CONJUCTION WITH EASTERN BUSWAY ALLIANCE

COMMISSIONERS

Chairperson	**Sarah Shaw**
Commissioners	**Ian Munro**
	Nigel Mark-Brown

Patrice Baillargeon, Senior Hearings Advisor
KAITOHUTOHU MATAAMUA WHAKAWĀ/
SENIOR HEARINGS ADVISOR

Telephone: 09 890 4692 or 027 338 5383
Email: patrice.baillargeon@aucklandcouncil.govt.nz
Website: www.aucklandcouncil.govt.nz

Note: The reports contained within this document are for consideration and should not be construed as a decision of Council. Should commissioners require further information relating to any reports, please contact the hearings advisor.

Eastern Busway Alliance
20 Viaduct Harbour Avenue, Auckland 1010
Private Bag 92250, Auckland 1142, New Zealand
Email info@easternbusway.nz

Eastern Busway

3 March 2023

Auckland Council
Private Bag 92300
Victoria Street West
Auckland 1142

Attention: Warwick Pascoe - Principal Project Lead, Auckland Council

Dear Warwick

Re. Response to Council further information requests for the EB2 and EB3R Application Packages

I am writing in regard to Auckland Council's (the Council) further information request letter of 9 September 2022 for the Eastern Busway 2 (EB2) and Eastern Busway 3 Residential (EB3R) application packages, as well as further correspondence received in regard to Industrial Trade Activities.

Firstly, we wish to address Auckland Council's email of 22 February 2023[1] and its interpretation that the works being undertaken by EBA fall within the ambit of E33 as an Industrial Trade Activity. In particular, the e-mail stated:

"I am still in the opinion that assessment under E33 of the AUP O-P for the whole developed site is required (categorising the activities as unlisted activity)."

Respectfully we set below the reasons that we do not believe any general authorization for the construction yards associated with the busway is needed under Chapter E33 of the Auckland Unitary Plan (Operative in Part) (AUP(OP)). The temporary construction yards will serve as laydown areas of preconstructed structural elements, equipment (as noted previously such as gantry crane prior to erection), a satellite site office and staff facilities (including portable toilets). Some storage of inert materials, such as gravel, will be undertaken at these sites, but primarily at the established construction yard at Pakuranga Road.

The construction yard that was consented under LUC60403744 is operational. Any concerns with respect to compliance will be raised with the Auckland Council compliance monitoring officer, Ada Wang, during the regular site investigations. However, we can confirm that the only activity on site where potential discharges may require consent, are bunded and a sucker truck removes any potentially contaminated water (including from the wheel wash). No contaminants generated by

[1] The e-mail was sent directly by Arsini Hanna (Senior Specialist Advisor - Stormwater and Industrial and Trade Activities)

activities that would qualify under Chapter E33 of the AUP(OP) are discharged to the stormwater network.

In regard to the Bentonite/Polymer plant, we can advise that EBA is currently securing the supplier for this activity. The contract with that supplier will require a hazard assessment, and a clear methodology for ensuring that potential contaminants cannot and will not be discharged to the stormwater network.

We note the Ms. Hanna is relying on the “unlisted category” as a consent trigger. Our reading of the AUP(OP) provisions provides for unlisted activities (i.e. those not listed in Table E33.4.3 as permitted by Rule E33.4.1 (A3)). Additionally, we note that discharges of contaminants from unlisted activities are permitted by Rule E33.4.1 (A11). EBA have reviewed the relevant permitted activity standards of this Chapter E33 and considers that these standards will be complied with (i.e., a resource consent will not be required).

Please note that we have made this assessment with the inputs from the Project’s own environmental and construction specialists. We will not be seeking any land use consents under section 9(2) in relation Chapter E33 of the AUP(OP) given the permitted activity status of the Project’s construction under that chapter.

Furthermore, we draw attention to the Construction Environmental Management Plan (CEMP), which was supplied with the applications for both EB2 and EB3R. This draft management plan covers the broad range of construction activities for the Project, including spill plans and refueling of construction equipment. The proposed condition set for both application packages provides a mechanism for recertification of the CEMP in the event that further detail is needed to address the operation of the bentonite/polymer plant. We also note Auckland Council is the decision maker as to whether an altered management plan can be recertified, which provides surety to stakeholders that all appropriate AUP(OP) standards and controls will be employed during construction.

Lastly, EBA has reviewed the Council’s letter and has addressed the transport related queries raised by Council’s specialists, set out below. Following further analysis of both applications’ transport effects and refinement of their operational designs, the Integrated Traffic Assessment (ITA) has been updated (**Attachment 1 to this letter**) to reflect the Eastern Busway Project’s traffic related effects. This has included updates to the following key sections of the ITA:

- Updated crash environment assessment – Section 3.8.1
- Updated proposed design and construction methodology – Section 4.2
- Updated temporary effects to general traffic – Section 5.2
- Updated temporary effects to bus travel times – Section 5.3.5
- Updated permanent effects to general traffic – Section 6.3
- Updated permanent effects to bus travel times – Section 6.4.7.

During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as fine tuning construction staging so as to minimise adverse effects to road traffic.

Regardless of the above-mentioned updates, the quantum of any adverse environmental effects on parking, access and other transport matters has not increased above those detailed in the submitted ITA. Given this, AT considers that the updated ITA does not affect the Project's resource management process to-date and can be addressed through the Council's own section 42A hearing report and associated technical reporting.

Similarly, the mitigation for these effects is addressed through AT's proposed conditions and updated design. We are not proposing any changes to the draft conditions provided at lodgment of EB2 and EB3R consent packages. This mitigation is primarily achieved through the use of a Construction Traffic Management Plan (CTMP). CTMP's are commonly employed on major infrastructure projects within Tāmaki Makaurau and constructors are familiar with their implementation.

On this basis, AT has provided the updated ITA for Council's consideration, as well as transport specific responses listed below[2].

56. *It is noted that the ITA does not appear to include vehicle tracking plans as part of its appendices. This information is required to provide confirmation of the proposed design layout meets the vehicle manoeuvring requirement and aligns with the Transport Design Manual standards. Please provide the vehicle tracking curve analysis for all intersections to demonstrate the feasibility and practicality of the proposed intersection layouts, with greater focus being placed on those with multiple turning lanes and overlapped movements according to the intended phasing operations.*

    A copy of these tracking curves is provided as **Attachment 2** and show that the Project's intersection designs are compliant with the Transport Design Manual standards. Furthermore, it is noted that the Project's design has been subject to Road Safety Audits (RSAs).

57. *Section 3.8.1 of the ITA states that the crash data only covers the period from 2015 to 2019. Although it is acknowledged that the rationale may consider this data most relevant due to Covid effects from 2020 onwards, it is still important to identify any new crash trends derived from possible changes in new traffic patterns. Please provide an updated crash record to include all available data in 2022 to ensure all the latest safety risks can be identified.*

    An updated assessment of the Crash Environment is provided in Section 3.8.1 of the ITA which includes crash data for the five-year period from 2017 to 2022.

[2] The numbering for these responses matches those from Council's own section 92 letter. This numbering has been retained to assist the reader.

58. *It is noted that the ITA includes relevant appendices to demonstrate phasing diagrams at different project stages. However, the 3-staged mid-block pedestrian crossing across Ti Rakau Drive between Marriott Road and Edgewater Drive has not been elaborated on. Please confirm how the intersections and associated phasing are expected to be operated, i.e., three standalone signalised crossings or staggered pairs?*

A mid-block signalised pedestrian crossing will be provided across Ti Rakau Drive between Marriott Road and Edgewater Drive west, in proximity to the Edgewater bus station. The crossing will be a three-stage staggered signalised crossing, which will run across the two Ti Rakau Drive eastbound general traffic lanes, the two central dedicated bus lanes and the two Ti Rakau Drive westbound general traffic lanes.

Due to the limitations of the SIDRA traffic modelling software, which can only model at maximum a two-stage signalised crossing, the three-stage crossing was modelled as two separate intersections alongside each other.

The SIDRA model of the signalised crossing is shown in Figure 1, for the geometric layout of the signalised crossing refer to Appendix C in the ITA.

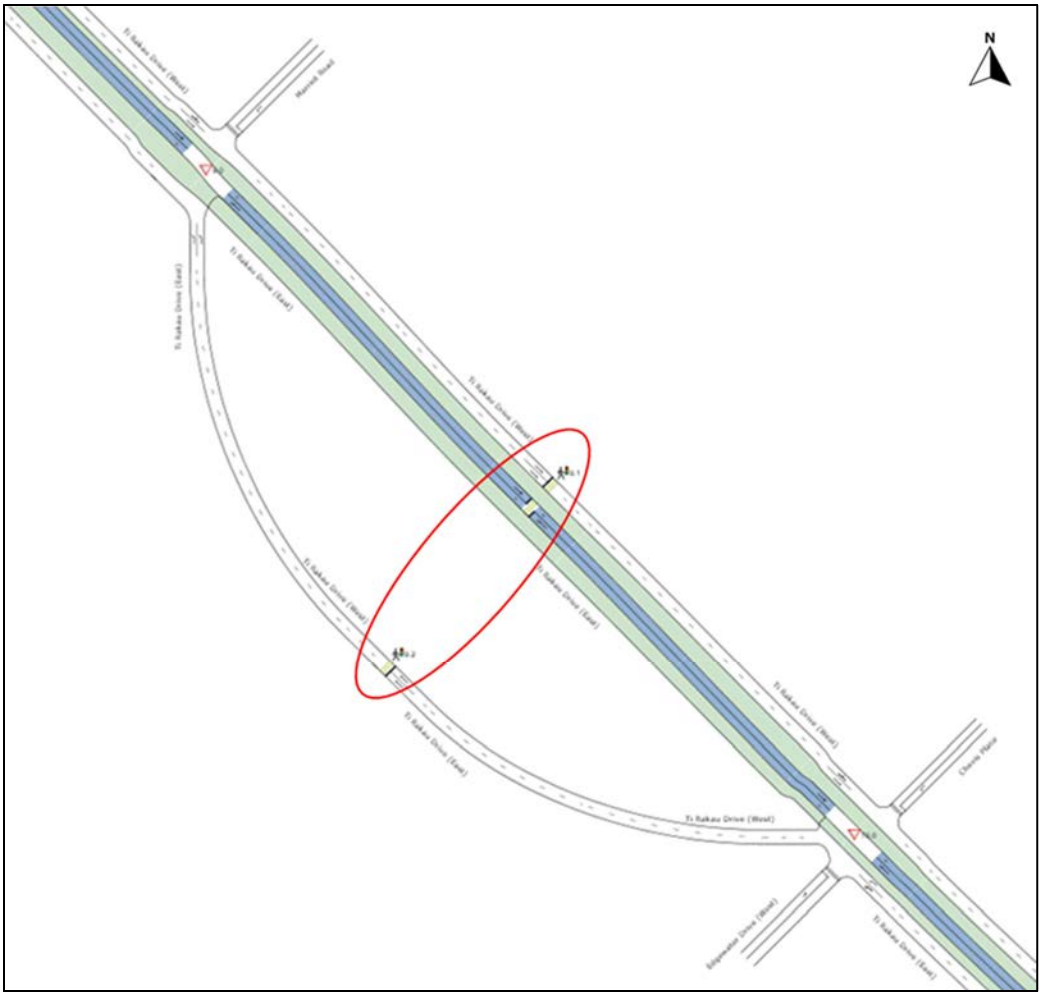


Figure 1: SIDRA model layout - Edgewater bus station midblock pedestrian crossing

59. *Section 5.3.2 describes the temporary rerouting of Bus 711, which will result in bus patronage to use Bus Stop 6127 on the western side of Ti Rakau Drive from the current Bus Stop 6060 inside the mall. Although there may not be a significant difference in travel distance, it will be problematic (if not dangerous) for pedestrians crossing Ti Rakau Drive without crossing facilities in the vicinity of Aylesbury Street/Ti Rakau Drive intersection. Please provide further consideration and assessment of temporary crossing facilities to assist pedestrians in continuing to use bus services in a safe and efficient manner.*

    Temporary bus rerouting, as well as the pedestrian connections to these buses, will be managed through the CTMP as required by the proposed conditions sets. The draft CTMP also details the bus service rerouted and notes that existing bus stops will be used for the 711 service. Please refer to the CTMP for further detail.

    The proposed Ti Rakau Drive / Aylesbury Street / Palm Avenue intersection will now be completed much earlier in the construction programme and will provide additional pedestrian crossing facilities across Ti Rakau Drive, refer to Section 4.2.1.5 of the ITA. The temporary Ti Rakau Drive bus stop for westbound 711 services is well-serviced by existing signalized pedestrian crossings at the Ti Rakau Drive/Pakuranga Road and Ti Rakau Drive/SEART/Reeves Road intersections. These existing crossings and the change to the construction staging are considered adequate to address pedestrian movements across Ti Rakau Drive during EB2’s construction.

60. *It is evident that bus travel time through all parts of the overall project is expected to experience substantial increases during Construction Stage (CS) 1. Figure 1 (below) shows approximately 40% delay on Bus 70, which is one of the busiest routes in Auckland and likely to have a significantly negative impact on bus patronage and travel experience during this CS1 period (with potential effects longer term). Please provide identification, consideration and assessment of potential mitigation measures to reduce bus travel times during CS 1.*

    During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as to produce construction staging with fewer adverse effects on road traffic (see Section 4.2 of the ITA).

    This process has also led to a more refined construction staging. The temporary effects were modelled in five separate construction stages (previously three stages) to simulate the expected traffic distribution that could occur due to changes in the road network (see Section 5.2.2, 5.2.3 and 5.3.5 of the ITA). These stages will be managed through the CTMP and SSTMPs.

61. *Similarly, it is noted that there will be an increase in bus travel time upon project completion as shown in Figure 2. It is expected that a flagship public transport improvement project such as the Eastern Busway will provide better travel or at least not worse travel times than currently. Please clarify the main reasons for longer travel times for various bus routes as demonstrated within the following tables, some of which are at least 10% longer than the travel time in the Do Minimum Scenario.*

    An updated design is proposed, with an updated description for both EB2 and EB3R being provided in Section 4.2 of the ITA. Consequently, an updated assessment of the new proposed design and expected permanent effects to bus travel times has also been undertaken, as detailed in Section 6.4.7 of the ITA.

    The new 72 route is predicted to have marginally longer travel times, in both directions during both the AM and PM peaks, compared to the 72C and 72M services it is replacing. This is due to a longer route distance (approximately +2.17km), and an expected increase in traffic volumes on Pakuranga Road to the east of the Flyover. However, the new 72 service will be running at higher frequencies in both directions.

    Travels times for the 72X, 711 and 712 services are predicted to increase in the outbound (eastbound) direction during the PM peak. This is likely due to the route changes of these services, particularly the additional number of intersections these services have to pass through as well as the expected increase in traffic volumes on Pakuranga Road, east of the Flyover. Again, while service frequencies for the 72X are expected to remain the same, service headways for the 711 and 712 services will be significantly improved.

    Furthermore, the integration off all services at the Pakuranga Town Centre station will provide for an improved transfer experience between services. Passengers will not be required to walk across the Pakuranga Plaza to transfer between services on Pakuranga Road and Ti Rakau Drive.

    In line with the Project objectives, significant public transport capacity and travel time improvements are expected for bus services travelling on Ti Rakau Drive between Botany and Panmure, particularly in the peak directions of travel (westbound in the AM peak and eastbound in the PM peak). The expected travel time results do however indicate the potential need for future investment in public transport infrastructure on Pakuranga Road between the Pakuranga Town Centre and Howick.

62. *Section 5.3.6 of the ITA discusses the continuation and potential changes in school bus services during various construction stages. Please describe and confirm that safe crossing points will be provided for school students where required.*

    AT will provide safe crossing points from temporary school bus stops and this will be governed through the CTMP. AT and EBA will continue to work with the affected schools to communicate school bus stop changes and the importance of students correctly using temporary pedestrian routes/crossings.

63. *It is not clear in the ITA if or where any bus priority techniques will be implemented along the corridor apart from dedicated bus lanes and associated phasing. The modelling results seem to favour reduction of private vehicle delays but no improvement of bus travel times. Please advise if bus priority operations will be included such as bus pre-emption or other techniques.*

    In order to provide buses with a level of service (LOS) of C or better, as per the Project Minimum Requirements, the following measures were included in the traffic signal design:

    - Some form of priority is provided for buses, to balance the delays to vehicles and pedestrians
    - Extending the current bus phase to enable an approaching bus to pass through the intersection
    - Allowing the bus phase to interrupt once per cycle when a bus is on approach to the intersection
    - Bus priority added in the form of approach and departure loops following review of traffic modelling
    - Managing bus priority through SCATS using advance calls and departure loop inputs at each site
    - Queue detection loops are provided on an as-needed basis only and in collaboration with AT.

    The above measures have been designed to adjust bus priority to suit traffic conditions and flow patterns, and to avoid blockage to busway movements and operate intersections efficiently. The bus priority operations at each of the specific intersections are detailed in EB-2-D-2-IT-RP-100001 (EB2 area) and EB-2-D-3-IT-RP-100001 (EB3R area). In terms of traffic modelling undertaken to simulate these above measures, see Section 2.4.4.3 of the ITA.

64. *The project may achieve a better overall outcome to allow integrated transport options. Please confirm your consideration and assessment of bicycle parking provisions at each bus station to provide convenient (and safe) transfer between travel modes.*

    Bicycle parking is provided at Pakuranga Station, Edgewater Station and Gossamer Station. The type and amount of bicycle parking is dictated, in part, by the function and location of each station.

    The functional requirements, as per the Project Minimum Requirements, for the major interchange station at the Pakuranga Town Centre, is at least 20 cycle parking spaces and at least five cycle parking spaces at each of the intermediate bus stations at Edgewater Drive and Gossamer Drive, respectively.

    Pakuranga Station, as a key destination for busway users and cyclists, has also been provided with a bicycle storage shelter. This shelter is located in close proximity to the bus station's platforms and will provide bicycle storage for both bus users and visitors to Pakuranga Town Centre itself.

    In comparison, both Gossamer Station and Edgewater Station are intermediate stations, and it is not anticipated that either of these stations will experience the same volume of patrons as Pakuranga Station. Both of these intermediate stations are space limited (when compared to Pakuranga Station) and it is not possible to provide a storage shelter or the same volume of bicycle parking. However, the Project will provide bicycle stands for busway users who wish to leave their bicycles at either station.

65. *Ti Rakau Drive/Pakuranga Road Intersection - The tightness of the turn through the south-eastern quadrant of this intersection is likely to accommodate waiting pedestrians at the crossings and create potential conflict with the adjoining two-way bicycle path. Please confirm consideration of this issue and provide possible design solutions to address this identified safety risk.*

    This intersection has been subject to redesign as noted in Appendix B of the ITA**.**

    It is also noted that the design has been subject to a Road Safety Audit (RSA), which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. In addition, these works will be subject to an Engineering Plan Approval (EPA) from AT which provides a further opportunity to refine the safety aspects of the design.

66. *There is a lack of cycling provision to connect with the Pakuranga Plaza area (also referred to as Pakuranga Town Centre), which is the main destination of the cycleway. Please confirm your design consideration of this matter and assessment of the cycling provision and connection on the eastern side of the intersection.*

    As per detailed in Section 4.2.1.5 of the ITA, a bidirectional cycleway will be provided on the northern side of Ti Rakau Drive, fronting the Pakuranga Town Centre, between Pakuranga Road and Reeves Road as part of the EB2 works. This bidirectional cycleway will connect to the cycleways along Pakuranga Road to the west, as part of EB1 and EB2 works and will connect to the unidirectional cycleways along Ti Rakau Drive further east, as part of the EB3R works.

    It is considered that these cycleways are a significant improvement on current active transport connectivity between the town centre and surrounding area.

67. *Cortina Place/Aylesbury Street Intersection: It is understood that the intersection footprint will need to accommodate large trucks. As a consequence, these large radii within the intersection will likely result in higher speeds being adopted by smaller vehicles and potentially create a hazardous environment for active road users (e.g., pedestrians). Please consider the combination of traffic calming and traversable aprons, as well as safe provisions for pedestrians and cyclists to obtain access to the Pakuranga Plaza area.*

    Please note that this intersection will be located in a low-speed environment with a posted 20 km/h speed limit that has been proposed to protect active road users. In addition, with the construction of the Reeves Road Flyover and alterations of Reeves Road, the use of Aylesbury Street as a 'rat run' for vehicle traffic is expected to decrease, further reducing the potential for conflicts between motor vehicles and active road users.

    Furthermore, this intersection has been subject to an RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment for all users. In addition, these works will be subject to an Engineering Plan Approval from AT which provides a further opportunity to refine the safety aspects of the design if needed.

68. *Cortina Place/Reeves Road Intersection: The raised features at this intersection are likely driven by the stormwater design consideration but they will result in problematic access experienced by mobility users and cyclists due to creating low points at both kerb edges. Please explore and consider design alternatives to provide better provisions for active user groups.*

    This intersection has been subject to an RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. In addition, these works will be subject to an EPA from AT which provides a further opportunity to refine the safety aspects of the design if needed.

69. *Ti Rakau Drive/Ti Rakau Drive Off-Ramp Intersection: Please confirm your design consideration to integrate the existing shared path with Seven Oaks Drive with the cycle path features of the project.*

    AT can confirm that this cycle path connection is provided for beside the SEART off-ramp and is shown on the submitted landscape plans.

70. *Pakuranga Road/Reeves Road Intersection: It is identified that the road user provision at the immediate proximity of the intersection appears to be diminished including an unprotected cycle lane at the Pakuranga Road approach and unclear routes to connect southbound cyclists to the Pakuranga Road exit. Please consider optimising the cycling provision for all directions through this location.*

    It is noted that there is no Pakuranga Road/Reeves Road intersection. However, it is assumed that this query relates to the proposed Pakuranga Road/William Roberts Road/Reeves Road Flyover intersection. With regard to that intersection, it is noted that the proposed design is an improvement over the current cycling infrastructure given the proposed signalization of this intersection (the current Pakuranga Road/William Roberts Road intersection only features a give way sign), as well as tie ins to improved footpaths on Pakuranga Road and William Roberts Road.

    Furthermore, as with other proposed intersections, this intersection has been subject to an RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. Lastly, these works will be subject to an EPA from AT which provides a further opportunity to refine the safety aspects of the design if needed.

71. *Reeves Road/Aylesbury Street Intersection: The eastern crossing path at this intersection is constrained in its accommodation of safe crossing movements for either/both pedestrians and cyclists. Please confirm if sufficient space is available to allow for the proposed infrastructure while ensuring safe movements for active road users.*

    It is noted that the Project will signalize this intersection, whereas currently traffic movements are only controlled by give way markings/signage. In addition, the function of Aylesbury Street as a 'rat run' will decrease given the introduction of the Reeves Road Flyover and the altered function of Reeves Road itself (i.e. for local traffic and buses only).

    Furthermore, as with other proposed intersections, this intersection has been subject to a RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. Lastly, these works will be subject to an EPA from AT which provides a further opportunity to refine the safety aspects of the design if needed.

72. *Reeves Road/SEART On Ramp: It is recommended that the Applicant consider reducing the substantial median island to allocate more space to cycle lane protectors and separations between pedestrian and cyclist paths on both sides of Ti Rakau Drive, to achieve the desired safety and provision of cyclists through this area.*

    An updated design is proposed, refer to Appendix B in the ITA. The median island widths have been reduced, allowing for a greater separation between the cycleway and the general traffic lanes.

73. *Marriott Road/Edgewater Drive (West) /Chevs Avenue/Ti Rakau Drive intersections: It is noted that the proposal includes a raised platform at the Edgewater Drive approach to Ti Rakau Drive, but they are not present at the Marriot Road and Chevs Avenue approaches. Please elaborate on the reasoning for this and consideration as to why this preferred traffic calming feature is not implemented at all side road approaches as a means of providing safety and convenience for active mode users in a consistent manner across the project area.*

    As with other proposed intersections, this intersection has been subject to an RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. Furthermore, these works will be subject to an EPA from AT, which provides a further opportunity to refine the safety aspects of the design if needed.

74. *Pedestrian Jaywalking: In addition, the mid-block signalised pedestrian crossings are located centrally to bus stops on both directions. The inconvenient location will result in pedestrian jaywalking across the bus corridor, which can lead to potential safety risks and ineffective utilisation of the signalised crossings. Please discuss its design philosophy in relation to this matter and give consideration of other potential locations/alignments for these crossings.*

    As with other proposed intersections, this intersection has been subject to an RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. Furthermore, these works will be subject to an EPA from AT, which provides a further opportunity to refine the safety aspects of the design if needed.

    Furthermore, fencing is proposed in the median along the busway in EB3R, between Roseburn Place and Edgewater Drive east, to encourage pedestrians to cross Ti Rakau Drive at the provided crossing points.

75. *Wheatley Avenue/Edgewater Drive (East)/Ti Rakau Drive intersections: It is recommended that consideration be given to reallocating the road space to provide enhanced safety by way of protectors for cyclists from the carriageway by reducing the width of median islands.*

    As with other proposed intersections, this intersection has been subject to an RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. Furthermore, these works will be subject to an EPA from AT, which provides a further opportunity to refine the safety aspects of the design if needed.

76. *Gossamer Drive/Ti Rakau Drive Intersection: The links to the central median two-way cycleway in both directions on either side of Ti Rakau Drive is provided with insufficient crossing and median widths to safely and conveniently accommodate both pedestrian and cyclist user groups. In addition, the lack of cycling provision from Gossamer Drive northwards seems to miss a large catchment of possible users. Please optimise the cycling provision and connection in the vicinity of the intersection.*

    As with other proposed intersections, this intersection has been subject to an RSA, which has confirmed that the amended design meets AT's roading standards and provides a safe roading environment. Furthermore, these works will be subject to an EPA from AT, which provides a further opportunity to refine the safety aspects of the design if needed.

    Regarding cycling provision from Gossamer Drive northwards, further works northwards along Gossamer Drive would be located outside the Project's identified footprint and are out of scope for the consenting matters associated with EB3R's resource consent application.

77. *Ti Rakau Bridge: It is understood that the current extent of works will end at the western side of the Ti Rakau Bridge. Please confirm how the bi-directional cycleway will be terminated safely to ensure a smooth transition to future works, especially during interim phases of the project between the completion of EB3R and EB3C/EB4.*

    For the purpose of this assessment, it is proposed that the cycleway terminate on the western side of the Ti Rakau Drive / Gossamer Drive intersection, as shown in Section 4.2.2.3 of the ITA. Cyclists would continue to use the road carriageway to the east of the intersection as per the current arrangement.

    However, as will be shown in a future assessment which will include the proposed design for EB2, EB3R, EB3C and EB4, the proposed cycleway will continue along an offline alignment across a new bridge that will support both the new bus lanes and the cycleway towards the Burswood area.

78. *U-turn movements: It is noted that U-turn movements and associated phasing arrangements are provided at the intersections west of Marriot Road and east of Chevis Place, respectively. Please confirm if U-turn movements at other intersections will be prohibited along the corridor to rationalise safe and efficient movements.*

    U-turns are provided for by the EB3R design along Ti Rakau Drive at each signalized intersection. This will be provided by lane markings, signage and signal phasing under the AUP(OP)'s permitted activity provisions for road network activities.

79. *Construction Traffic Management Plan (CTMP): The CTMP highlights the important arrangement of temporary footpaths for pedestrians during construction works but it is not clear if a similar facility for cyclists will be provided either on-road or off-road. Please confirm if and how temporary cycling provisions will be provided for during the construction.*

    No temporary cycle routes have been identified at present. Instead, cyclists will continue to use existing road lanes, footpaths and shared paths to move through the Project area. In addition, cyclists will be directed to dismount and travel along temporary footpaths where required (e.g. works at the SEART/Reeves Road/Ti Rakau Drive intersection).

80. *Road Safety Audit (RSA) Response and Decisions: It is understood that previous RSAs have been undertaken and it will be useful for these to be included in the supporting documents to assist with understanding the design rationale and decisions made on relevant matters. Therefore, please provide the complete RSA document set with associated responses and agreed decisions on identified issues.*

    The RSAs are an internal AT reporting mechanism to confirm engineering design detail, rather than an assessment of an environmental effect per se and will not be provided at this time.

Based on the above, EBA considers that the Council's transport related queries have been sufficiently addressed. This includes the provision of an updated ITA, direct responses to Council's earlier transport queries and confirmation that the proposed condition set (namely the use of a CTMP) addresses the potential transport effects of both application packages. Lastly, we consider that any issues regarding Industrial Trade Activities have been suitably addressed.

As such, EBA considers that these matters have been resolved.
Yours sincerely

Matt Zame
Alliance Project Director

Attachment 1 – Updated ITA and associated Appendices

Eastern Busway
EB2 and EB3 Residential

Integrated Transport Assessment

Document Number: EB234-1-PL-RP-Z2-000032-A3

Eastern Busway

Quality Information

Document Number: EB234-1-PL-RP-Z2-000032-A3

Document History and Status			
Rev	**Date**	**Author**	**Status**
A1	12 Nov 2021	Josie Ackroyd, Takeshi Nakamura, Christine Lee, Nathan Lowe, XiaoFan Lin, Jacques Van den Heever	Draft for internal review
A2	12 Jul 2022	Josie Ackroyd, Takeshi Nakamura, Christine Lee, Nathan Lowe, XiaoFan Lin, Jacques Van den Heever	Draft for Consent
A3	17 Feb 2023	XiaoFan Lin, Ellen, Chang, Tadios Masrsha, Jacques Van den Heever	For Consent

Document Approval				
Action	**Name**	**Position**	**Date**	**Signature**
Prepared by	XiaoFan Lin, Tadios Masrsha, Ellen Chang Jacques Van den Heever	Transport Modeller Transport Modeller Transport Engineer Transport Engineer	3 Mar 2023	On file
Reviewed by	Jack Wan Shane Doran	Transport Engineer Transportation Manager	3 Mar 2023	On file
Approved by	Dean Coutts	Design Lead	3 Mar 2023	On file

Terms and Definitions

Table 1: Terms and definitions

Abbreviation and Definitions	Description
AADT	Average Annual Daily Traffic
ATOC	Auckland Transport Operations Centre
AEE	Assessment of Environmental Effects
AFC	Auckland Forecasting Centre
AMETI	Auckland-Manukau Eastern Transport Initiative
AC	Auckland Council
AT	Auckland Transport
A2B	Airport to Botany
AUP(OP)	Auckland Unitary Plan (Operative in part) 2016
BPO	Best practicable option
CAR	Corridor Access Request
CAS	Crash Analysis System
CEMP	Construction Environmental Management Plan
CMA	Coastal Marine Area
CoPTTM	Code of Practice for Temporary Traffic Management
CTMP	Construction Traffic Management Plan
DOS	Degree of Saturation
EB1	Eastern Busway 1 (Panmure to Pakuranga)
EB2	Eastern Busway 2 (Pakuranga Town Centre)
EB3 Commercial/ EB3C	Eastern Busway 3 (Pakuranga Creek to Botany)
EB3 Residential/ EB3R	Eastern Busway 3 (SEART to Pakuranga Creek)
EB4	Eastern Busway 4 (Botany Town Centre Station)
EBA	Eastern Busway Alliance
HNZPT	Heritage New Zealand Pouhere Taonga
HNZPTA	Heritage New Zealand Pouhere Taonga Act 2014
ITA	Integrated Transport Assessment
km	Kilometre(s)
km/h	Kilometres per hour
KPI	Key Performance Indicator
LILO	Left-in/left-out
LOS	Level of Service
m	Metre(s)
m^2	Square Metre(s)
m^3	Cubic Metre(s)

MCA	Multi Criteria Analysis
MSM	Macro Strategic Model
NES - CS	Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011
NES - FW	Resource Management (National Environmental Standards for Freshwater) Regulations 2020
NPS - FM	National Policy Statement for Freshwater Management 2020
NPS - UD	National Policy Statement for Urban Development 2020
NoR	Notice of Requirement
NSAAT	No Stopping at All Time
NZCPS	New Zealand Coastal Policy Statement 2010
NZGTTM	New Zealand Guide to Temporary Traffic Management
OD and OW	Over-Dimension and Over-Weight
PWA	Public Works Act 1981
RAMM	Road Assessment and Maintenance Management
RASF	Roads and Street Framework
RTN	Rapid Transit Network
RRF	Reeves Road Flyover
RMA	Resource Management Act 1991
SSA	Safe System Assessment
SSTMP	Site Specific Traffic Management Plan
STMS	Site Traffic Management Supervisors
TCQSM	Transit Capacity and Quality Service Manual
tcu	Through car equivalent units or passenger car units
TTM	Temporary Traffic Management
v/c	Volume over capacity ratio
WRRE	William Roberts Road Extension
WTMP	Workforce Travel Management Plan

Table of Contents

Figures

Tables

Executive Summary

It should be noted that this version of the EB2 and EB3 Residential (EB3R) Integrated Transport Assessment (ITA) has been prepared to reflect an updated proposed design, an updated construction methodology and further technical information to support the Notice of Requirement (NoR) and resource consent applications of EB2 and EB3R.

During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as to produce construction staging so as to minimise adverse effects to road traffic. This process has led to a more refined construction staging.

To aid the reader in identifying these amendments, updated text has been highlighted in *yellow*. **Table 2** provides a summary of the key sections within the report that have been updated as well as a short description of the changes.

Table 2: Key updated sections and description of changes

Updated Section	Description
Section 2.4.4.3	SIDRA model adjustments to simulate the effects of raised tables and raised intersections.
Section 3.8.1	Updated assessment of the existing crash environment in response to council's S92 Request for Further Information. Analysis period included data from 2017 - 2022.
Section 4.2	Updated proposed design and construction methodology in EB2 and EB3R. The updates to the proposed design were largely in response to Road Safety Audit comments. The updates to the construction methodology were in response to the updated design as well as an attempt to shorten the overall construction programme.
Section 5.2	Updated assessment of temporary effects to intersection performance and general traffic travel times as a result of the updated construction methodology, including a more refined construction staging.
Section 5.3.5	Updated assessment of temporary effects to bus travel times as a result of the updated construction methodology.
Section 6.3	Updated assessment of permanent effects to intersection performance and general traffic travel times as a result of the updated proposed design.
Section 6.4.7	Updated assessment of permanent effects to bus travel times as a result of the updated proposed design.

Purpose

The purpose of this ITA is to evaluate the temporary and permanent transport effects of the EB2 and EB3R components of the overall Eastern Busway Project (the Project) and to recommend mitigation measures as appropriate. This report will form part of the Assessment of Environmental Effects (AEE) supporting the NoR and resource consent applications of EB2 and EB3R.

The Need for the Project

Auckland's eastern suburbs have one of the highest levels of journey to work trips by car and lowest use of public transport in Auckland[1]. This is due to a combination of lower density land uses and relatively unattractive bus services, lack of cycle facilities and low urban amenity on main roads.

With regard to transport issues in EB2 and EB3R, it has been identified that the area experiences heavy congestion. Recent population growth and a heavy dependence on private vehicles has put significant strain on the existing road network. Furthermore, projected population growth from both established and new suburbs is expected to exacerbate this issue.

Lastly, congestion due to the growth in commercial activity is also anticipated. Ti Rakau Drive and SEART are important for the efficient movement of freight and goods vehicles, connecting the commercial areas of East Tāmaki, Highbrook, Botany, Pakuranga and Highland Park to the wider region.

Without intervention, demand for public transport, walking and cycling will remain low, the heavy reliance on car travel will continue and the road network will experience significantly increased congestion. This will further impede the efficient movement of people and goods within the area, lead to detrimental environmental outcomes and exacerbate the area's limited access to opportunities compared to the rest of the region both in terms of the quality of life for residents and the economic wellbeing of businesses. It will also limit the area's potential to sustainably accommodate further residential and employment growth.

Benefits of the Project

The Eastern Busway programme presents an opportunity to address these problems by extending the rapid transit, high frequency busway between Panmure and Pakuranga, through to Botany Town Centre. The Project will include new walking and cycling connections, placemaking, urban renewal initiatives and improvements for general traffic. The end result will see customers being able to travel between Botany and Britomart by bus and train in less than 40 minutes, which is 20 minutes quicker than the current journey times.

EB2 and EB3R will help alleviate congestion, principally through the diversion of traffic from the Ti Rakau Drive / Pakuranga Road intersection and onto the Reeves Road Flyover (RRF). This diversion will reduce the volumes of through-traffic within the Pakuranga Town Centre and local roads. As such, EB2 and EB3R's contribution to congestion reductions will improve travel times, supporting the rapid movement of freight and people.

The Project will also provide increased transport choices for residents and visitors. The dedicated bus lanes and stations will improve the public transport experience for passengers and make it more attractive to current private vehicle users. Increased uptake of public transport will also ease congestion and reduce greenhouse gas emissions. Similarly, the Project's walking and cycling investments make those transport modes safer and more attractive to users. Lastly, an additional positive effect associated with EB2/EB3R, and the wider Project, is improved accessibility.

[1] SNZ Census 2018

Therefore, reduced congestion, better public transport, safer walking and new cycling infrastructure will improve the ability for both local residents and visitors to access jobs, education, recreation, housing and healthcare. Given the above, EB2 and EB3R will have significant positive effects for Auckland.

Assessment of Effects

Overall, through AIMSUN and SIDRA modelling assessments, EB2 and EB3R are expected to lead to acceptable intersection operations across the network. Importantly, bus movements are predicted to operate at LOS C and with spare capacity. The RRF is expected to relieve congestion around the Pakuranga Town Centre, and significant improvements in travel times are expected overall, especially between Botany in the east and Pakuranga and SEART in the west.

EB2 and EB3R are predicted to significantly increase public transport patronage in the future. As such, bus station platforms and loading areas have been designed to provide appropriate levels of service and capacity to support this uptake. Furthermore, bus service headways will be improved, and travel times are predicted to decrease overall, leading to faster and more reliable public transport trips. The combination of these public transport upgrades and improvements is expected to significantly increase public transport mode share, which in turn will reduce congestion and greenhouse gas emissions.

Dedicated footpaths and cycleways will improve pedestrian and cyclist amenity and safety which will provide users with a more attractive mode of travel and supports the uptake of cycling. Furthermore, the cycleways will improve accessibility to the bus stations, resulting in increased catchment and mode shift to public transport.

Lastly, through a Safe System Assessment (SSA), EB2 and EB3R are expected to provide an overall safer transport system for all modes of transport through the project areas with the aim to reduce fatal and serious injury crashes.

Mitigation

Overall, the temporary effects of construction in the project areas will be mitigated appropriately and are considered to be negligible to low. A Workforce Travel Management Plan (WTMP) will be developed to reduce private vehicle trips and to increase worksite accessibility through more travel options. Construction Traffic Management Plans (CTMPs) will be developed to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable, along with measures to manage travel demand through the provisions of the Site Specific Traffic Management Plans (SSTMPs). The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this. Hours of operation will be controlled in part by the Project's consent conditions and management plans, including the Construction Noise and Vibration Management Plan (CNVMP).

Conclusions

With the proposed mitigation measures in place, the potential adverse effects during construction and upon completion of EB2 and EB3R are considered to be negligible to low overall. Furthermore, the proposed design is predicted to result in significant improvements and a range of benefits overall.

1 Introduction

1.1 Project Background

The Auckland Manukau Eastern Transport Initiative (AMETI) programme was initiated in 2006 and has become the responsibility of Auckland Transport (AT) following the amalgamation of Auckland's previous local authorities in October 2010. The Eastern Busway Project (the Project)[2] is a flagship project for Auckland and will form a key part of the region's Rapid Transport Network (RTN). It will create dedicated bus lanes to connect people from Botany, Pakuranga, and the surrounding suburbs, to the rail network in Panmure. The Project includes cycling and walking paths, roading and safety improvements and a new RRF to ensure better journey reliability for all modes.

The Panmure to Pakuranga section of the busway (EB1) opened in late 2021. The Eastern Busway Alliance (EBA) has been formed to design and consent the Pakuranga to Botany sections of the Project (EB2,3,4), progressing towards construction, which is expected to start in 2022. The Project will provide a busway from Pakuranga Town Centre in the west to Botany Town Centre in the east. The busway will be approximately 5km long and will be running at grade primarily on Ti Rakau Drive. A median busway (Online Busway) is proposed along Ti Rakau Drive from Pakuranga Road to Gossamer Drive, while a separated busway (Offline Busway) is proposed between Gossamer Drive and Botany Station.

There will be one major interchange station at Pakuranga Town Centre, one major interchange station at Botany Town Centre, and three intermediate stations along Ti Rakau Drive. A separate cycleway and pedestrian footpath are also proposed along the length of Ti Rakau Drive. The proposed busway will serve the major employment areas of East Tāmaki, Botany and Panmure, as well as Botany and Pakuranga Town Centres. The proposed busway will also connect with major interchanges at Botany, including local bus services and Airport to Botany (A2B) RTN services, and at Panmure for suburban rail services.

1.1.1 Strategic Context

Auckland's eastern suburbs have one of the highest levels of journey to work trips by car and lowest use of public transport in Auckland[3]. This is due to a combination of lower density land uses and relatively unattractive bus services, lack of cycle facilities and low urban amenity on main roads. Without intervention, demand for public transport, walking and cycling will remain low and the heavy reliance on car travel will continue. This will further impede the efficient movement of people and goods within the area, lead to detrimental environmental outcomes and exacerbate the area's limited access to opportunities compared to the rest of the region. It will also limit the area's potential to sustainably accommodate further residential and employment growth.

The Eastern Busway programme presents an opportunity to address these problems by extending the rapid transit, high frequency busway between Panmure and Pakuranga, through to Botany Town Centre. The Project will include new walking and cycling connections, placemaking, urban renewal initiatives and improvements for general traffic. The end result will see customers being able to travel between Botany and Britomart by bus and train in less than 40 minutes, which is 20 minutes quicker than the current journey times.

[2] Formally known as AMETI.
[3] SNZ Census 2018

1.1.2 Project Objectives

The Project has a set of clear objectives and are outlined below:

1. Provide transport infrastructure that improves linkages, journey time and reliability of the public transport network

2. Provide a multimodal transport corridor that connects Pakuranga and Botany to the wider network and increases choice of transport options

3. Safeguard future transport infrastructure required at (or in vicinity of) Botany Town Centre to support the development of a strategic public transport connection to South Auckland

4. Provide transport infrastructure that integrates with existing land use and supports a quality, compact urban form

5. Contribute to accessibility and place shaping by providing better transport connections between, within and to the town centres

6. Provide transport infrastructure that is safe for everyone

1.1.3 Benefits of the Project as a Whole

With the Panmure to Pakuranga (EB1) section of the Project completed, once delivered the next stage between Pakuranga and Botany (EB2, 3 and 4) will provide:

- Better connections and sustainable travel options for pedestrians, cyclists, motorists, bus and train customers
- A reliable 40-minute bus and train trip between Botany Town Centre and Britomart (saving 20-minutes)
- Increase in public transport trips from 3,700 to 18,000 per day by 2028
- Increase in public transport mode share from 7% to 25% by 2028
- Reduce carbon emissions by 9,292 kg per day by 2028
- 24,000 more people with access to a rapid transit bus station within 1 km from home
- 5 km of busway between Pakuranga and Botany fully separated from other traffic
- 5 new bus stations with quality facilities
- 12 km of safe and separated walking and cycling infrastructure
- Reeves Road flyover to reduce vehicle congestion around Pakuranga Town Centre
- Encourage and support development of a more sustainable urban form and improve urban amenity
- Accommodates electric buses, a key part of AT’s low-emission vehicle fleet by 2040

1.1.4 EB2 and EB3R Project Benefits

The Project will deliver significant benefits to the communities of southeast Auckland and the wider Auckland Region. The Project has been developed in response to transport issues within southeast Auckland, to meet projected population growth, reduce regional greenhouse gas emissions and to achieve modal shift goals.

With regard to the Project area's transport issues, it was previously identified that the Howick Local Board area experiences heavy congestion, with 90,000 vpd using the Panmure and Waipuna Bridges. Recent rapid population growth and a heavy dependence on private vehicles has put significant strain on the existing road network. EB2 and EB3R will help alleviate this congestion. This will principally be achieved through the diversion of traffic from the Ti Rakau Drive / Pakuranga Road intersection and onto the RRF. This diversion will reduce the volumes of through-traffic within Pakuranga Town Centre and local roads. As such, EB2 and EB3R's contribution to congestion reductions will improve travel times, supporting the rapid movement of freight and people.

In addition, the development of the Project has been driven by both previous and projected population growth within southeast Auckland. Pakuranga Town Centre is a major transport hub for southeast Auckland, with traffic flows coming from both established and new suburbs. Ti Rakau Drive and SEART are also important for the efficient movement of freight and goods vehicles, connecting the commercial areas of East Tāmaki, Highbrook, Botany, Pakuranga and Highland Park to the wider region.

The established suburbs, such as Howick and Highland Park are experiencing high levels of redevelopment, through both infill housing and wholesale redevelopment of sites. This redevelopment will only grow in intensity through the new medium density residential standards introduced in late 2021 by the New Zealand Government. Traffic flows from the Auckland Isthmus are also expected to increase given population growth from brownfield developments like the Tāmaki regeneration programme[4]. Large growth is also being generated by greenfield developments like Flat Bush, where 1700 ha of land is being urbanised for a population of 40,000 people. Lastly, congestion due to the growth in commercial activity is also anticipated.

Without the construction of the Project and the provision of improved transport choices (i.e., public and active transport modes), southeast Auckland's road network would experience significantly increased congestion. This would in-turn, impact both the quality of life for residents and the economic wellbeing of Auckland's businesses. The Project will alleviate, in part, increases in road congestion.

The Project will also provide increased transport choices for residents and visitors. The dedicated bus lanes and stations will improve the public transport experience for passengers and make it more attractive to current private vehicle users. Increased uptake of public transport will also ease congestion and reduce greenhouse gas emissions. Similarly, the Project's walking and cycling investments make those transport modes safer and more attractive to users. Lastly, an additional positive effect associated with EB2/EB3R, and the wider Project is improved accessibility.

Therefore, reduced congestion, better public transport, safer walking and new cycling infrastructure will improve the ability for both local residents and visitors to access jobs, education, recreation, housing and healthcare. Given the above, EB2 and EB3R will have significant positive effects for Auckland.

[4] Tāmaki regeneration programme will deliver 10,500 new homes over the next 20 years.

1.2 Scope and Purpose of Report

The assessment and consenting phases of the proposed alignment of the Project has been divided into three 'packages'. The rationale is to aid in obtaining relevant RMA approvals for sections of the Project without potential undue delay to the Project as a whole.

This Integrated Transport Assessment (ITA) assesses the traffic and transportation effects during construction and upon completion of the EB2 and EB3 Residential (EB3R) sections of the Project.

Assessment of the William Roberts Road Extension (WRRE), which will precede EB2 and EB3R, has been provided for in the Early Works resource consent package, but has been taken into account in this assessment as part of the existing environment. Assessment of the EB3 Commercial (EB3C) and EB4 sections of the Project, which will follow after this ITA, will be addressed in a separate report.

The full extent and location of the Project is shown in **Figure 1** below.

Figure 1: Full project extent and location[5]

The main elements of EB2 and EB3R include the construction of the RRF, the busway along Ti Rakau Drive from Pakuranga Road to Reeves Road (EB2) and Reeves Road to Gossamer Drive (EB3R) as well as three new bus stations. The general extent and location of these sections of the Project are shown in **Figure 2** below.

[5] https://at.govt.nz/projects-roadworks/eastern-busway/

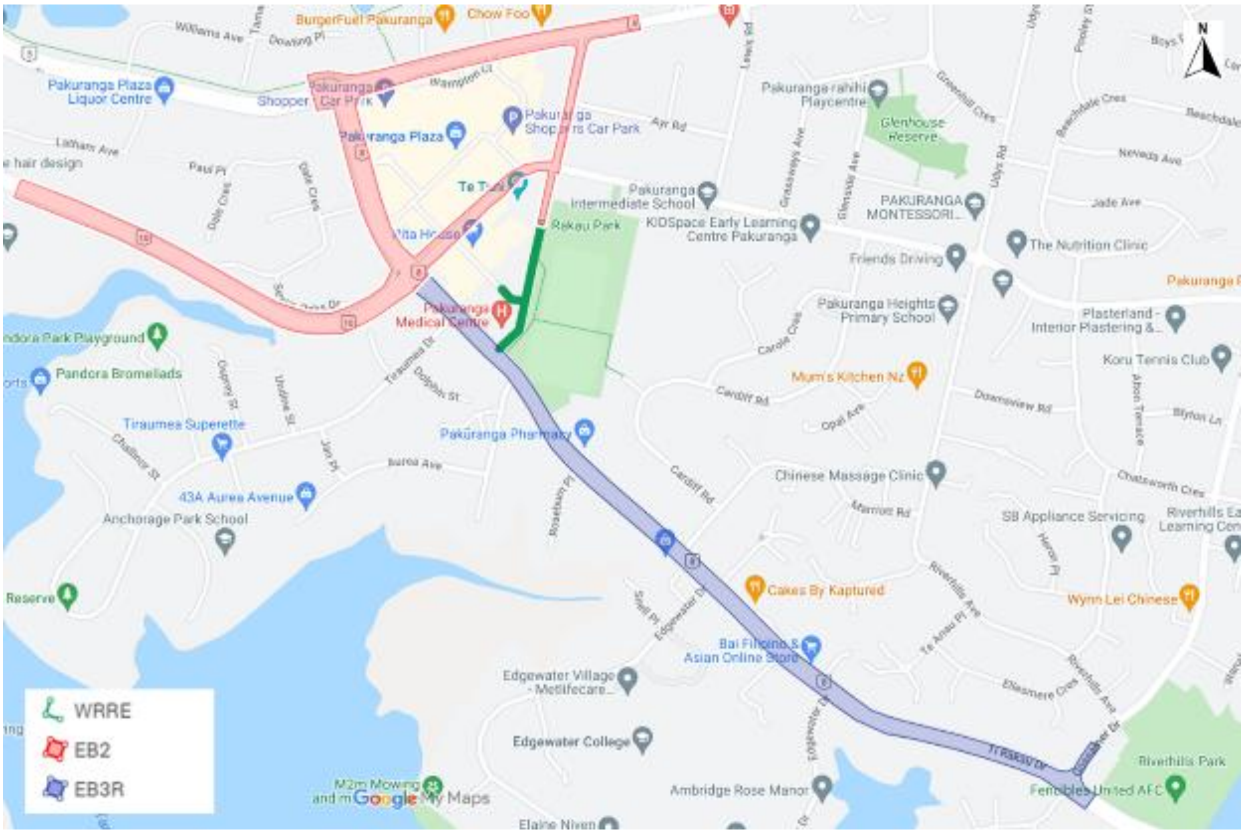


Figure 2: EB2 and EB3R general extent and location

The purpose of this report is to:

1. Identify and describe the existing transport environment, including the key issues that the environment faces
2. Describe the potential positive and adverse transport effects of EB2 and EB3R during its construction, in order to highlight the benefits of the Project and to develop mitigation measures as needed
3. Recommend measures (including any conditions/ management plans required); as appropriate to avoid, remedy or mitigate potential traffic and transportation effects including as these relate to effects from construction traffic
4. Present an overall conclusion of the level of potential transport effects of EB2 and EB3R after the recommended measures are implemented

1.3 Report Structure

This ITA has been structured as follows:

Section 2 describes the methodology used to assess the effects of EB2 and EB3R on the transport environment. This includes EB1, WRRE and other enabling works that will form part of the baseline traffic environment, traffic modelling methodology, public transport, walking and cycling, property access and parking, safety performance and freight traffic.

Section 3 provides a description of the existing transport environment including land use zoning, the transport network, traffic volumes, travel times, road characteristics, bus services and facilities, walking and cycling facilities, parking, crash environment, over-dimension and over-weight (OD and OW) routes, and changes to the baseline traffic environment for modelling.

Section 4 provides an overview of the proposed design and construction of EB2 and EB3R.

Section 5 provides an assessment of the temporary effects of EB2 and EB3R during construction, including construction effects, general traffic, bus services and facilities, pedestrians and cyclists, property access and parking, and safety performance.

Section 6 provides an assessment of the permanent effects of EB2 and EB3R upon completion, including a description of the future transport network, general traffic, bus services and facilities, pedestrians and cyclists, property access and parking, and safety performance.

Section 7 provides a summary of the mitigation measures proposed in this ITA.

Section 8 provides the conclusions from this ITA.

2 Assessment Methodology

2.1 Introduction

This section describes the methodology used to assess the effects of EB2 and EB3R on the transport environment including:

- A description of the transport environment for assessment (which includes EB1 (Panmure to Pakuranga), WRRE works, and other enabling works)
- Traffic modelling methodology
- Public transport
- Walking and cycling
- Property access and parking
- Safety performance
- Freight traffic

2.2 Guidance and Scope

The preparation of this ITA has taken into account the guidance set out in the Auckland Transport (AT) document "*Integrated Transport Assessment Guidelines*" (January 2015) and the Waka Kotahi NZ Transport Agency (Waka Kotahi) document "*Integrated Transport Assessment Guidelines*" (November 2010). This assessment has considered the operational effects of the following areas in the system:

- Road network – general traffic flows and travel time
- Public transport network
- Walking and cycling network
- Property access
- Parking
- Safety performance
- Heavy vehicle routes

2.3 Transport Environment for Traffic Modelling Assessment

Auckland's transport networks are constantly changing, undergoing improvements from new initiatives and being optimised. Furthermore, the global COVID-19 pandemic dramatically effected travel patterns and behaviours, and uncertainty remains that these effects would continue into the future. Assessment of the Project against the existing environment was therefore not considered appropriate.

Instead, a more conservative approach was followed whereby a future year scenario was used to compare a 'without Project' and a 'with Project' scenario. Throughout this assessment, the 'without Project' scenario is also referred to as the 'Do-Minimum' scenario, whilst the 'with Project' scenario is also referred to as the 'EB2/EB3R' scenario. The transport models used to simulate the effects of the future year scenarios are listed below:

- Do-Minimum – 2028
- EB2 and EB3R – 2028

Notable major changes to the existing transport network, that were included in the modelling assessments, are detailed below.

2.3.1 Eastern Busway 1 (EB1)

EB1 is a key component of the overall Project. It is the segregated busway connection from Panmure train station to Pakuranga Town Centre. EB1 was completed near the end of 2021 and was included in all 'future year' scenarios.

2.3.2 WRRE Works

This assessment has considered the effects of the WRRE to be undertaken prior to EB2 and EB3R construction. The WRRE includes the extension of William Roberts Road south to Ti Rakau Drive and the completion of the Cortina Place link between William Roberts Road and Reeves Road. WRRE was included in all future year scenarios.

2.3.3 Other EB2 and EB3R Enabling Works

This assessment has also considered the effects of other enabling works to be undertaken during the initial phases of the EB2 and EB3R construction programme, to enable the temporary closure of Reeves Road. The enabling works include geometric and traffic signal timing plan amendments at the Ti Rakau Drive / Reeves Road and Ti Rakau Drive / Gossamer Drive intersections. These enabling works will form part of the EB2 and EB3R consent packages.

2.4 Traffic Modelling Methodology

Traffic modelling undertaken of the proposed design of the Project used data cascaded from a number of higher-order, more strategic models provided by the Auckland Forecasting Centre (AFC).

Macro Strategic Model (MSM) Auckland Regional Transport Models (EMME) – These models forecast demands based on Auckland Council's Scenario I Modified Version 11.5 demographic and land use data. The outputs of these models include general traffic demand and public transport demand.

AMETI Regional Traffic Models (EMME) – The outputs of the MSM models were used as inputs into the Regional Traffic Models to generate traffic demands across the region. The outputs of the regional models were then fed into project specific AIMSUN models to allow for a more detailed assessment of traffic effects.

Operational Microsimulation Models (AIMSUN) – These models provide information regarding travel times along different routes within the project area as well as turn movements and traffic demand along roads within the project area. The turning movement outputs from these models were used as inputs into the SIDRA models.

Intersection Models (SIDRA) – These models were used to determine the performance of intersections using traffic movement data from the AIMSUN models. The key outputs include Degree of Saturation (DOS or v/c ratio), delay in seconds, Level of Service (LOS) and queue lengths in metres.

2.4.1 Supplied Models

The AIMSUN 2018 Base Model was subjected to various calibration and validation checks to assess the accuracy and suitability of the model. These checks were undertaken with reference to criteria for Category C: Urban Area NZTA Model Development Guidelines (Criteria) on individual link flows, turn flows and travel time for each hour between 07:00 – 09:00 and 16:00-18:00 and is considered acceptably calibrated and validated for the purposes of Eastern Busway design work[6] (see **Appendix J**).

Turning movement volumes from the AIMSUN models were used in the SIDRA models to assess intersection performance.

2.4.2 Model Outputs

As above, traffic flow outputs (in vehicles per hour) from the AIMSUN models were used as inputs in the SIDRA models to assess intersection performance. AIMSUN models simulate several hours of the network operation during the AM and PM peak periods. However, in order to account for residual demand and queues within the network and to maintain consistency across the various model runs, the AM peak hour adopted was 08:00 – 09:00 while the PM peak hour was 17:00 – 18:00. Traffic flows from these peak hours, produced by AIMSUN, were used to assess intersection performance in SIDRA.

Another key AIMSUN model output considered during this ITA was travel time. Route travel times were determined along various routes through the Project areas for the Do-Minimum and EB2/EB3R scenarios. The effects of EB2 and EB3R were determined by comparing these scenarios in each direction, for the AM and PM peak periods.

Key SIDRA outputs considered during this ITA included Level of Service (LOS), Degree of Saturation (DOS) or v/c ratio, and delay in seconds.

2.4.3 Traffic Demand

The traffic demand data, cascaded down from the various models as detailed above and used in the SIDRA models, represent an average weekday's traffic demand in the AM and PM peak hours. Interpeak periods and weekends were determined to generally have lower traffic activity and congestion compared to weekdays, so explicitly modelling these periods was not considered necessary to understand the effects and outcomes of the Project.

[6] Eastern Busway – Base 2018 Model Update Report, BECA, February 2019

2.4.4 Assumptions

Below are the key assumptions used in the modelled transport environments.

2.4.4.1 MSM Assumptions

- Auckland Council's Scenario I Modified Version 11.5
- All relevant projects that have been identified in the ATAP plan delivery 2021 – 2031 were included in the MSM version 11.5. Notable projects that may influence the demand of the movement of people around the Project include:
    - Airport to Botany interim bus improvements
    - Sylvia Park bus improvements
    - Connected Communities (Pakuranga Road)
    - City Rail Link
- Eastern Busway 1 Panmure to Pakuranga was included in the future Do-Minimum, 2028 and 2048 scenarios

2.4.4.2 AIMSUN Assumptions

- Similarly, relevant and notable projects were included in the AIMSUN models

2.4.4.3 SIDRA Assumptions

- Where turning movement volumes were <10 veh/h, a minimum of 10 veh/h was adopted
- Rather than being random, bus arrivals at intersections were set to Arrival Type 6 on all busway lanes. This means a high percentage of arrivals occur during the green phases, which was used to simulate Traffic Signal Priority for buses
- Free flow speeds along Ti Rakau Drive were assumed from the free-flow speeds provided by the MSM modelling. The following speeds were assumed for the various other streets:
    - Side streets – 50 km/h
    - William Roberts Road - 30km/h
    - Entrances (i.e., to the mall) – 20 km/h
    - Along busways – 50 km/h
- Saturation flow rate was left at the SIDRA default Basic Saturation Flow of 1950 tcu/h per lane
- Where the approach/ intersection was modified, lanes widths for general vehicle lanes and bus lanes were taken as 3.2 m and 3.5 m, respectively

The following model adjustments were added to simulate the effects of a raised table or raised intersection as per the updated proposed design (see **Appendix B** and **Appendix C**):

- Saturation flow rate of 1860tcu/h per lane, calculated from a jam spacing assumption of 6.5m which is between 6m (standard queue space value) and 7m (default SIDRA light vehicle jam spacing value)
- Saturation speed of 25km/h (MOTSAM guidelines for raised tables/humps)
- Negotiation speed of 25km/h

2.5 Public Transport, Walking and Cycling

2.5.1 Public Transport

The effects on the public transport network focused on the following aspects:

- Direct effects on bus routes and bus stops
- Effects on travel times of buses through the Project area

2.5.2 Walking and Cycling

The assessment considered the potential effects of EB2 and EB3R on pedestrians and cyclists. This was primarily via a qualitative assessment of changes in the type and quality of connections and facilities provided.

2.6 Property Access and Parking

2.6.1 Property Access

The assessment considered the potential effects of changes in property access. Local access effects were assessed in terms of extra travel time and distance as well as safety.

2.6.2 Parking

This included assessment of the potential physical effect of reducing properties' on-site parking spaces, as well as any on-street parking that may be affected by the proposed design.

2.7 Safety Performance

A Safe System Assessment (SSA) was undertaken for the Project, which provides a comprehensive assessment of the existing crash environment and the potential future environment.

The safety performance assessment considered the effects of the proposed design on existing roads, new roads and vulnerable users.

2.8 Freight Traffic

It is recognised that cars and trucks generally have the same travel times in congested urban networks and therefore the same methodology described in **Section 2.4.2** was used to assess the effect of the Project on freight traffic and direct effects to heavy vehicle routes.

3 Existing Transport Environment

This section provides a description of the existing transport environment, including the following:

- A description of the existing problems and challenges
- Land use zoning
- Existing transport network
- Traffic volumes
- Travel times
- Road characteristics
- Bus services and facilities
- Walking and cycling facilities
- Parking
- Crash environment
- Over-dimension and over-weight (OD and OW) routes
- Changes to the baseline traffic environment

3.1 Description of the Existing Problems and Challenges

In 2016, AT, Waka Kotahi and Auckland Council agreed the following key problems in the AMETI Project area for the AMETI programme, including the Eastern Busway, to address:

- **Problem 1** – Lack of connections in the transport network creates congestion and unreliable travel times for people accessing employment and other destinations

- **Problem 2** – Lack of travel choices and reliance on private cars is resulting in congestion, lack of access to opportunities and poor environmental outcomes

- **Problem 3** – Provision of transport capacity and options has not kept pace with land use development resulting in congestion and inefficient use of transport corridors

- **Problem 4** – Poorly integrated land use and transport design is limiting accessibility, creating poor places and discouraging economic development

- **Problem 5** – Development and operation of the road network has prioritised the efficient movement of vehicles ahead of safety resulting in too many people dying or being seriously injures, especially vulnerable users

The Project will seek to address these problems through a range of improvements to existing infrastructure as well as new infrastructure.

3.2 Land Use Zoning

The Project area is located in East Auckland and bordered by Pakuranga Town Centre in the northwest and Botany Town Centre in the southeast. Major industrial and commercial areas in East Tāmaki are situated to the west and south which play an important role in providing employment opportunities to the residents in the vicinity of the Project. These employment zones include Panmure, Mt Wellington, Penrose/ Onehunga and Highbrook/ East Tāmaki.

The local land uses comprise of medium density/ single dwelling residential lots with retail-based town centres, local shops, commercial activities and industrial blocks. These areas are currently connected to the Project area by either direct property access or near-direct access via side roads. The Project will also have a through-function and will serve movements between and beyond the fringes of the project area, including links to Panmure, Mt Wellington, Flat Bush and Manukau.

Notable features of the existing land use and environment include:

Business Land Uses of Interest:

- Pakuranga Plaza
- GAS Pakuranga Road service station
- Gull Reeves Road service station
- Tai Ping Supermarket
- Eastside Pups Dog Grooming and Daycare
- Edgewater Shops

Residential and Community Land Uses of Interest:

- Pakuranga Library and Citizens Advice Bureau
- Te Tuhi Art Gallery
- Pakuranga Mosque
- Ti Rakau Park
- Pakuranga Leisure Centre
- Dementia Auckland
- Pakuranga Medical Centre
- Pakuranga Counselling Centre
- Pakuranga Baptist Church
- River Hills Park (Fencibles United Football Club)

Schools and Education Land Uses of Interest:

- Saint Kentigern College
- Barnardos Early Learning Centre
- Pakuranga Intermediate School
- KIDSpace Early Learning Centre Pakuranga
- Pakuranga Kindergarten
- Edgewater College
- Pakuranga Baptist Church and Kindergarten

Figure 3 shows the surrounding area zoning of EB2 and EB3R in the Auckland Unitary Plan (Operative in Part) (AUP(OP)), in the existing environment.

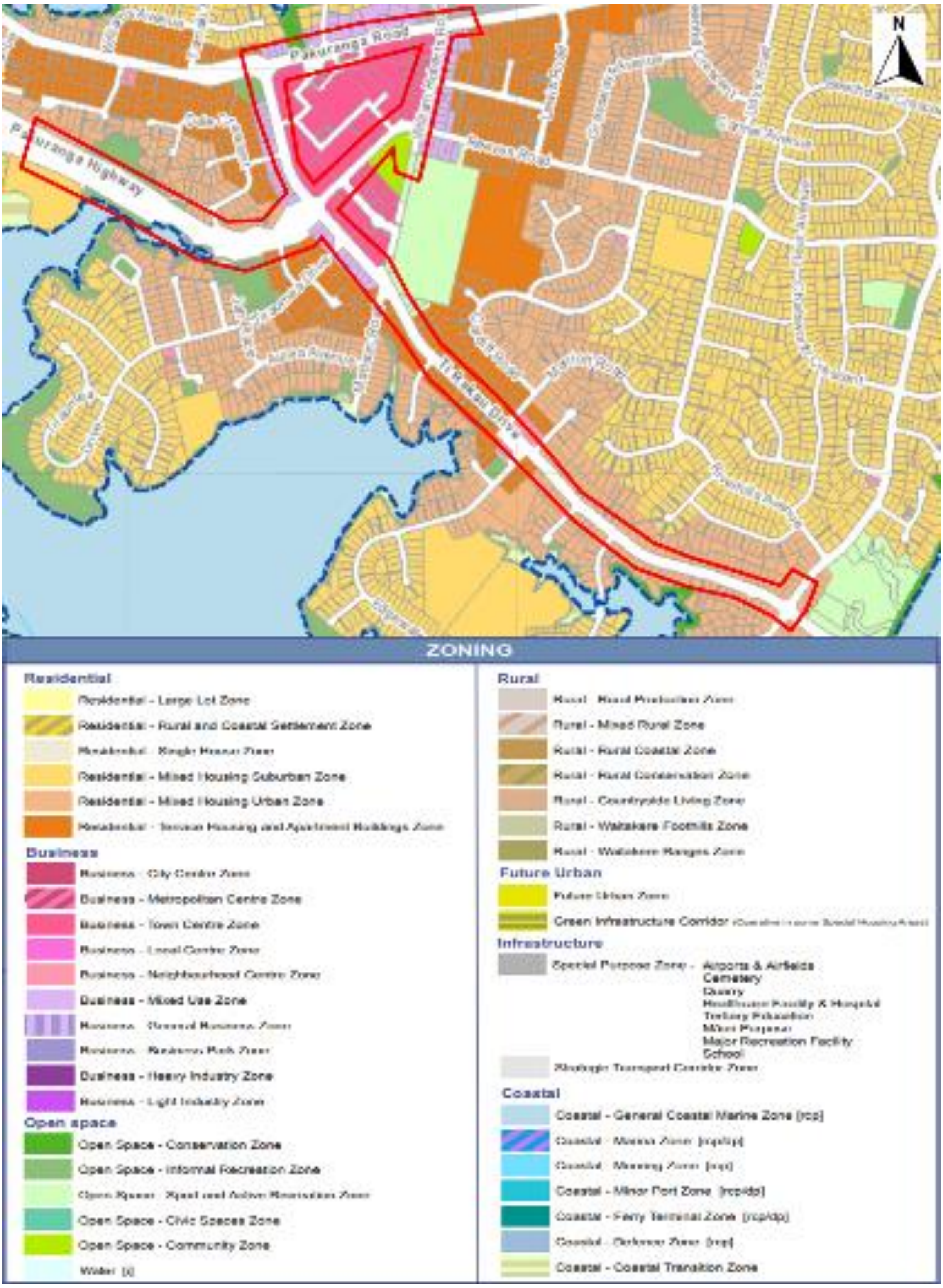


Figure 3: Existing EB2 and EB3R zoning (source: Auckland Council GIS)

3.3 Existing Transport Network

In order to align with AT's and Auckland Council's desire to consistently identify the different functions of roads and streets in Auckland, the EBA has adopted the Roads and Streets Framework (RASF) by using concepts of 'Place' and 'Movement' to reflect the strategic role of streets.

The RASF provides a systematic and consistent methodology for identifying the Place and Movement functions of roads and streets. In doing this, it reflects the needs and catchment of the adjoining land use as well as the movement of people, goods and services. A full RASF assessment was completed for the Project[7] and the section below summarises the key aspects of the existing transport network and modal priority in the EB2 and EB3R project areas.

Figure 4 shows the RASF typology matrix as a function of Movement and Place significance.

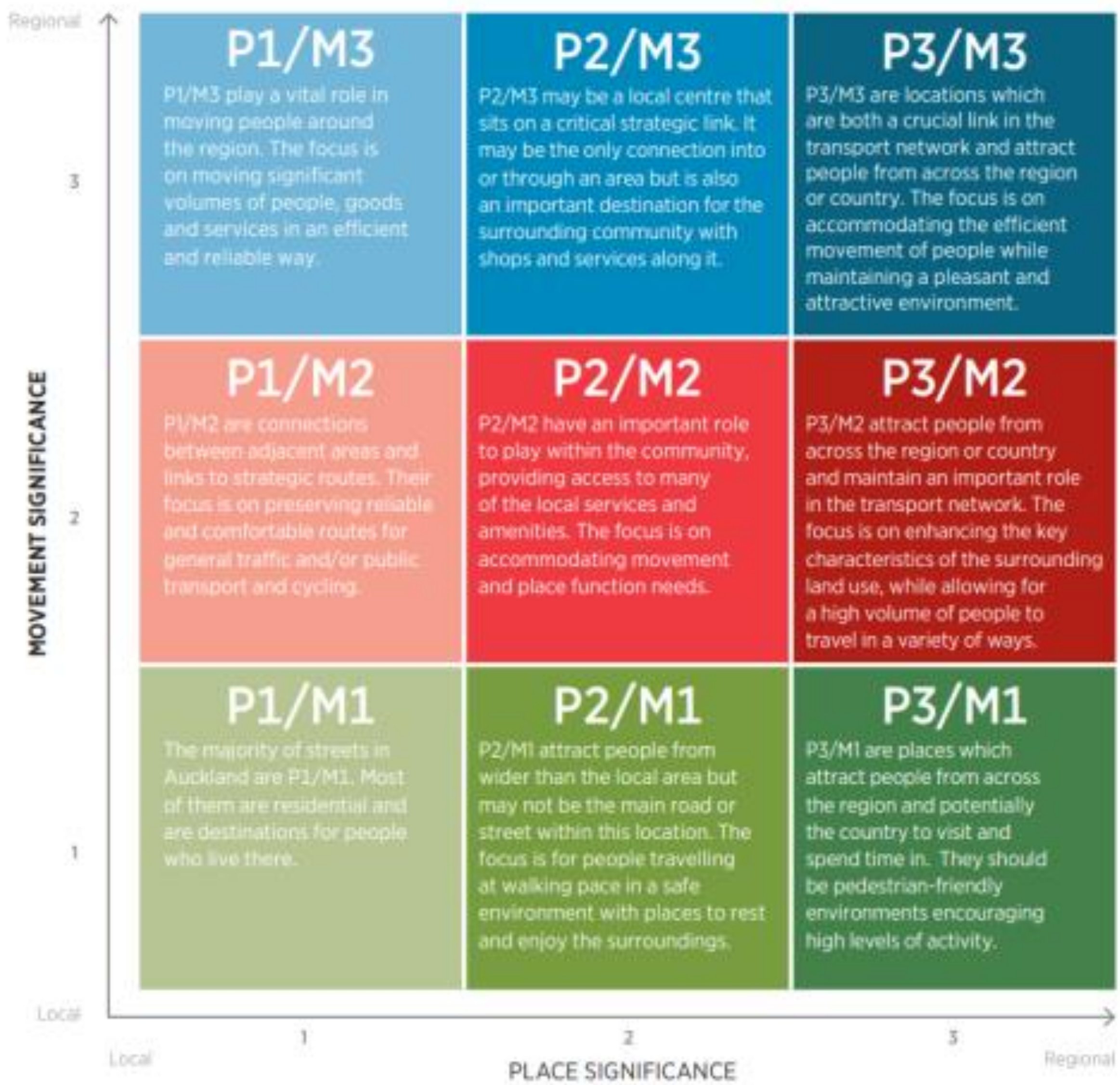


Figure 4: RASF typology matrix

[7] EB234-1-TE-RP-Z0-A2-Roads and Street Framework

Figure 5 outlines the current typology of the EB2 and EB3R project areas.

Figure 5: Existing EB2 and EB3R typology

Pakuranga Road is an east-west primary/ regional arterial, which connects Howick/Highland Park with Panmure via Pakuranga. It also intersects with Ti Rakau Drive, providing an arterial route towards Botany Town Centre and East Tāmaki. Pakuranga Road carries approximately 40,000 vehicles a day, as well as frequent bus services. The objective of this corridor is to move significant volumes of people, goods and services and as such, it has a typology of 'M3' classification.

The majority of land use along Pakuranga Road, west of the town centre, is residential. East of the town centre there are some retail properties along Pakuranga Road. However, these properties generally have a large setback between the footpath and the properties due to car parking spaces. As a result, the primary function of this corridor is Movement.

Ti Rakau Drive is a regionally significant corridor connecting Pakuranga with Botany. Along Ti Rakau Drive there are major employment sites such as Pakuranga Town Centre, Botany Town Centre, and East Tāmaki industrial zones. The section of Ti Rakau Drive east of SEART is a level 1B freight route. Frequent bus services also operate along this section. Given these factors, the primary function of this corridor is also Movement, and it also has a typology of 'M3' classification.

A trend is observed whereby Movement is largely prioritised over Place, especially along Ti Rakau Drive. The Project seeks to improve this, particularly at the proposed locations of the new bus stations.

3.4 Traffic Volumes, Travel Time and Road Characteristics

3.4.1 Traffic Volumes

The existing environment traffic volumes were determined predominantly using traffic data from 2017. In 2020/2021, COVID-19 dramatically affected the way people travelled and so these years would not accurately reflect the volumes of traffic expected on the road network. It was anticipated that data from 2019 would be the most accurate, however, it was determined that this data set was incomplete and would likely produce inaccurate results.

Data from 2017 was the most complete data set available from the previous life cycle of the AMETI EB2&3 specimen design. Although traffic volumes are expected to have grown marginally between 2017 and 2019, it is not expected that this growth would be significant, and the 2017 data is still considered relevant.

Table 3 shows the Average Annual Daily Traffic (AADT) volumes in the existing environment in the EB2 and EB3R project areas as well as the anticipated daily volumes for the 2028 and 2048 future years, without the Project. A conservative approach was followed to produce the 2028 and 2048 future year AADTs, by not including the effects of COVID-19. The purpose of this table is to provide context for a more detailed comparison of the future years.

Table 3: Existing[8] and future[9] AADT (without project)

Road Section	Direction	Existing AADT	2028 without project	2048 without project
Ti Rakau Drive				
Pakuranga Rd – Reeves Rd	Westbound	19,400	20,700	20,700
	Eastbound	14,800	17,400	17,400
Reeves Rd – Tiraumea Dr	Westbound	19,500	18,000	18,700
	Eastbound	17,300	16,600	18,200
Tiraumea Dr – Mattson Rd	Westbound	21,300	17,300	18,000
	Eastbound	18,800	16,600	18,200
Mattson Rd – Marriot Rd	Westbound	21,100	17,400	18,100
	Eastbound	17,900	16,100	17,700
Marriot Rd – Edgewater Dr West	Westbound	20,000	17,800	18,400
	Eastbound	17,900	16,400	17,800
Edgewater Dr West – Edgewater Dr East	Westbound	19,800	16,900	17,600
	Eastbound	17,500	15,600	17,200
	Westbound	19,700	16,600	17,400

[8] The majority of the existing volumes were sourced from 2017 SCATS data, however where this data was not available a mixture of RAMM, ONRC, and the most recent AT traffic counts have been reported.

[9] 2028 and 2048 future year demand was determined from the EMME models

Road Section	Direction	Existing AADT	2028 without project	2048 without project
Edgewater Dr East – Gossamer Dr	Eastbound	18,000	15,300	17,200
Side Roads				
Pakuranga Rd	Westbound	17,900	18,500	17,600
	Eastbound	16,000	20,000	19,400
SEART	Off-Ramp	27,400	26,200	27,900
	On-Ramp	27,000	29,900	30,600
Tiraumea Dr[10]	Exit	1,230	2,800	2,830
	Enter	410	2,600	2,620
William Roberts Rd[11]	Northbound	380	550	540
	Southbound	2,410	5,700	5,700
Reeves Rd	Exit	6,700	9,500	10,000
	Enter	6,600	4,100	4,400
Mattson Rd[12]	Exit	1,000	1,700	1,600
	Enter	1,600	2,300	2,300
Marriot Rd[13]	Exit	1,160	840	840
	Enter	1,090	950	1,000
Edgewater Dr West	Exit	1,500	1,800	1,900
	Enter	1,200	1,900	2,000
Fremantle Pl	Exit	400	520	530
	Enter	400	480	480
Gossamer Dr	Exit	7,200	1,2200	12,800
	Enter	5,800	8,800	10,000

It should be noted that no data was available for Cortina Place. This table provides useful context, however a more detailed comparison of future years 'without and with the Project' is discussed in **Section 5** and **Section 6** of this report.

[10] 2018 RAMM data used.
[11] Assumed 50/50 Split of volumes enter and exit.
[12] 2018 RAMM data used.
[13] 2028 design volume ratios used to determine volumes in each direction.

Large increases in traffic demand are predicted on Ti Rakau Drive between Pakuranga Road and Reeves Road in the 2028 future year, with no increases by 2048. With this section of the corridor near or at full capacity, especially at the Ti Rakau Drive / Reeves Road / SEART intersection, a trend is observed where traffic demand on Ti Rakau Drive to the east of the intersection is expected to remain roughly unchanged or in some cases decrease. This is likely due to large increases in queues and delays, acting as a bottle neck for the rest of the corridor, forcing vehicles to reroute to less congested links.

This trend is also observed on Pakuranga Road. An increase in traffic demand is predicted by 2028, with a decrease by 2048. In the existing environment, motorists travel along Pakuranga Road and turn left onto Ti Rakau Drive to head towards SEART. With this section of Ti Rakau Drive at capacity, large increases in queues and delays are likely. This in turn is expected to lead to rerouting to occur to less congested links.

Figure 6 shows the AADT volumes in the existing environment in a network context.

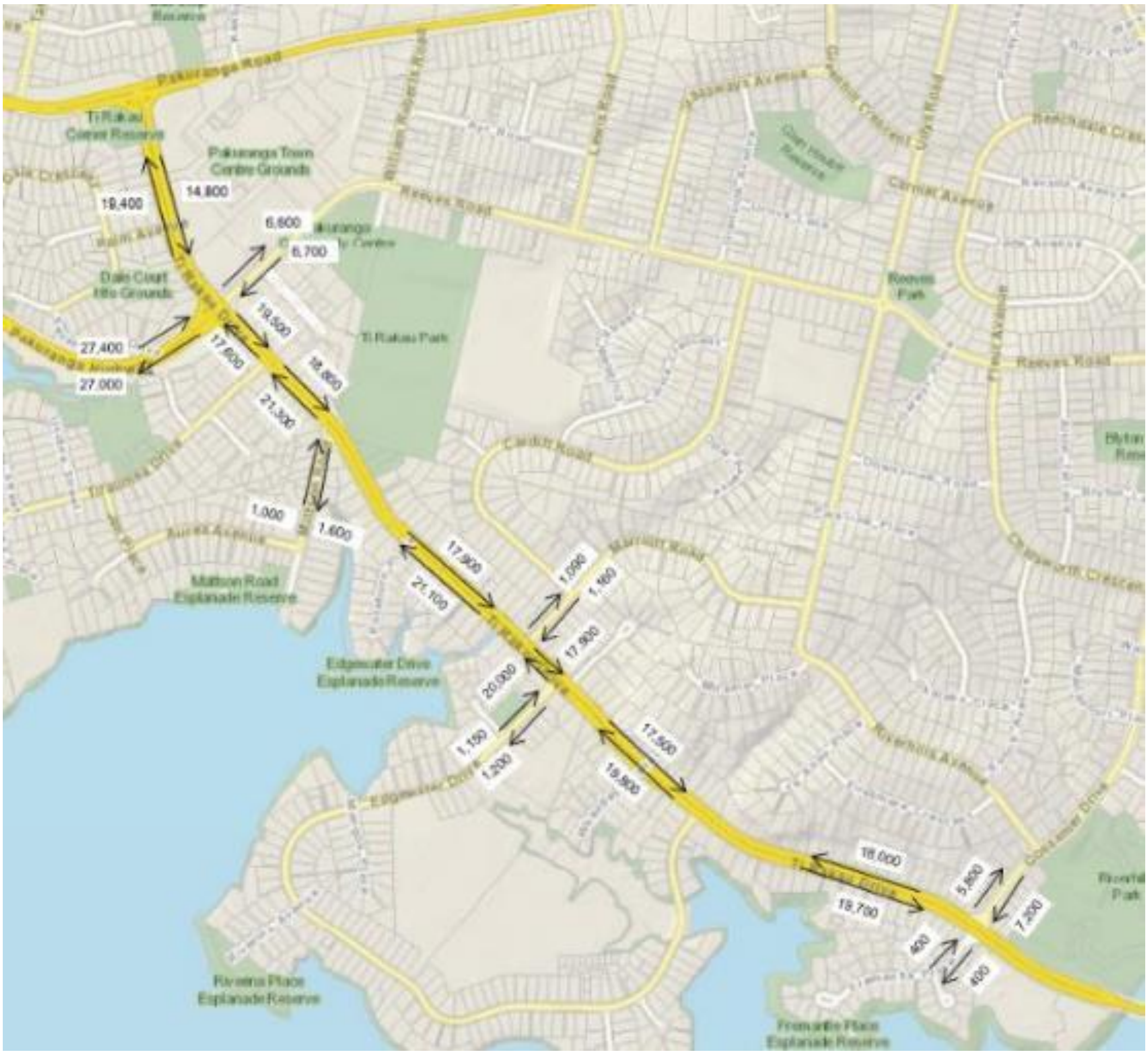


Figure 6: Existing environment AADT

3.4.2 Travel Time and Variability

Route travel times and variability in the existing environment were determined from the AIMSUN 2018 Base Model. The AM peak hour was recorded between 07:30-08:30 and the PM peak hour between 16:30-17:30. To maintain consistency across the different assessments already conducted and future ITAs, four routes were selected to determine the travel time of general traffic in the existing environment. These routes are outlined below, and the results are shown in **Table 4**:

- Botany to Pakuranga (Ti Rakau Drive / Chapel Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Botany to SEART (Ti Rakau Drive / Te Irirangi Drive intersection to the western abutment on Waipuna Bridge) – both directions
- Howick to Pakuranga (Pakuranga Road / Glenmore Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Howick to SEART (Pakuranga Road / Glenmore Road intersection to the western abutment on Waipuna Bridge) – both directions

Table 4: Base model (2018) general traffic travel times

AM Peak						
	Westbound			Eastbound		
Route	Base Model 2018 [min]	Variability + [min]	Variability – [min]	Base Model 2018 [min]	Variability + [min]	Variability – [min]
Botany - Pakuranga	17.4	2.0	-1.7	11.7	0.3	-0.4
Botany - SEART	10.7	1.6	-0.9	9.4	0.9	-0.7
Howick - Pakuranga	3.1	0.1	-0.1	3.3	0.2	-0.1
Howick - SEART	12.0	0.4	-0.5	6.9	0.5	-0.4
PM Peak						
	Westbound			Eastbound		
Route	Base Model 2018 [min]	Variability + [min]	Variability – [min]	Base Model 2018 [min]	Variability + [min]	Variability – [min]
Botany – Pakuranga	26.1	0.8	-1.1	16.0	0.8	-1.2
Botany - SEART	18.5	0.6	-0.9	9.3	0.6	-0.6
Howick - Pakuranga	2.9	0.1	-0.1	5.6	0.6	-0.5
Howick - SEART	4.5	0.1	-0.2	9.2	0.2	-0.1

In the AIMSUN model, the routes from Botany to Pakuranga and Botany to SEART travel along the same section of Ti Rakau Drive, up to Reeves Road. Therefore, these routes have the same travel time along this section of the corridor.

However, from the Ti Rakau Drive / Reeves Road / SEART intersection, the Botany to Pakuranga route heads towards the Williams Avenue intersection, a distance of roughly 780 m. Meanwhile, the Botany to SEART route extends up to the western abutment of the Waipuna Bridge, a distance of roughly 1.4km.

Although the Botany to Pakuranga Road route passes through three more intersections compared to the Botany to SEART route, its travel time is significantly longer. This is particular evident in the peak directions, westbound in the AM peak period and eastbound in the PM peak period. This is likely due to congestion on Ti Rakau Drive between Pakuranga Road and Reeves Road, leading to large queues and delays.

This trend is also observed in the Howick to Pakuranga and Howick to SEART routes. The two routes from Howick travel along the same section of Pakuranga Road, from Glenmore Road up to Ti Rakau Drive and will have the same travel times along this section. However, a significant increase in travel time is expected in the Howick to SEART route. Although the distance from the Pakuranga Road / Ti Rakau Drive intersection to the Waipuna Bridge is further than the distance to the Williams Avenue intersection, it is likely that congestion on Ti Rakau Drive is contributing to the large travel times.

3.4.3 Road Characteristics

The traffic data for Ti Rakau Drive demonstrated a tidal flow characteristic where westbound traffic movements (citybound) are dominant in the morning period and eastbound traffic volumes (outbound) are dominant in the evening period.

Figure 7 shows the existing directional signage on Ti Rakau Drive, upstream of Reeves Road / SEART intersection, westbound and eastbound, respectively.

Figure 7: Existing directional signage on Ti Rakau Dr westbound and eastbound, respectively

A raised median on Ti Rakau Drive between Pakuranga Road and Reeves Road prevents right-turn movements, except at Palm Avenue. Aylesbury Street has two accesses points onto Ti Rakau Drive with varying movement restrictions. A U-turn facility is provided on Ti Rakau Drive approximately 50 m south of the intersection with Pakuranga Road. This section of Ti Rakau Drive consists of three lanes in each direction.

A similar restriction currently exists on Ti Rakau Drive between Reeves Road and Mattson Road, preventing right-turn movements out of Tiraumea Drive and all properties fronting this section of Ti Rakau Drive. Three lanes westbound and two lanes eastbound are provided for the majority of this section.

The raised median continues from Mattson Road to Gossamer Drive, preventing right-turns out of properties fronting Ti Rakau Drive. However, full turning movements are provided at all intersections along this section of the corridor. Ti Rakau Drive has a 60 km/h posted speed limit in the existing environment.

3.5 Bus Services and Facilities

In December 2017, AT launched a new bus network for East Auckland. This launch included a new bus network, bus routes, route numbers, timetables and buses. The new East Auckland Bus Network philosophy was improved integration with other public transport networks for Auckland, such as buses connecting with trains at the Panmure and Otahuhu interchanges, as well as at the Middlemore, Papatoetoe and Manukau train stations. **Figure 8** outlines the existing bus routes operating in the EB2 and EB3R project areas.

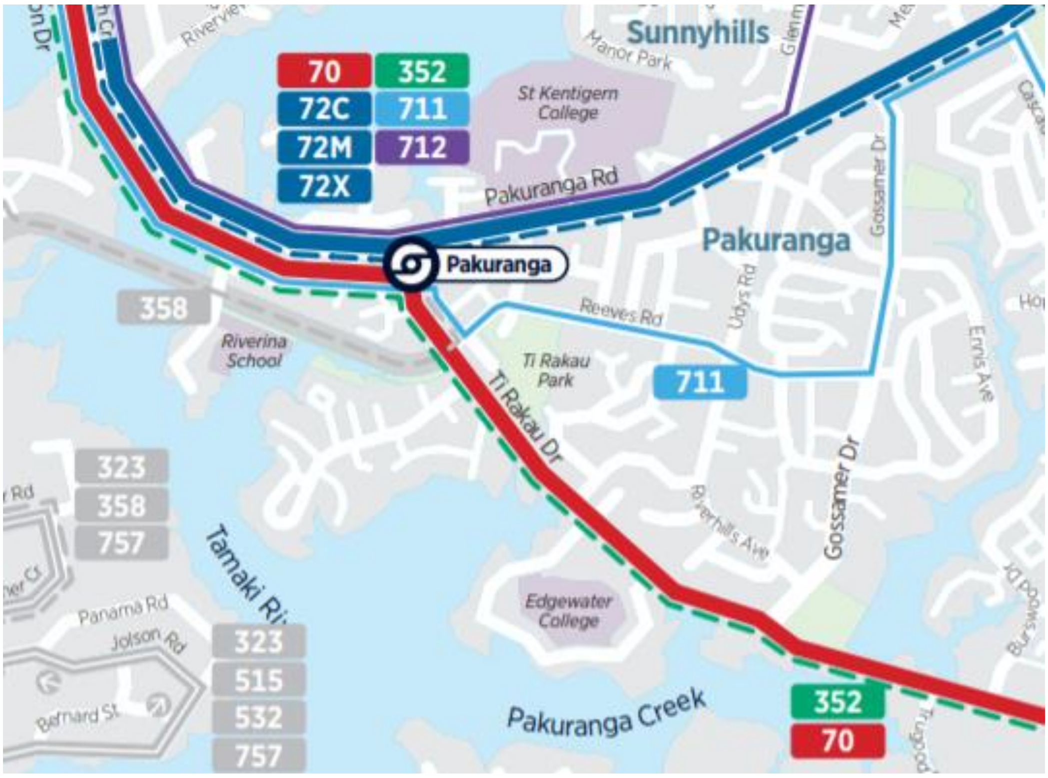


Figure 8: Existing bus network through EB2 and EB3R project areas[14]

[14] https://at.govt.nz/media/1974487/east-new-network-get-ready-poster-aug17-v30.pdf

There are a number of routes within the EB2 and EB3R project areas that currently operate on the proposed Eastern Busway corridor. These routes are the 70, 72C, 72M, 72X, 352, 711, 712. School bus services operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

Details of the general routes are outlined in **Table 5** below.

Table 5: Existing bus services through EB2 and EB3R project areas

Route Type	Route No	Frequency	Description
Frequent Services	70	Every 15 minutes	Botany, Pakuranga, Panmure, Ellerslie, Newmarket, City
	72C/M	Every 15 minutes	Howick, Pakuranga Rd, Pakuranga, Panmure
Connector Services	711	Varying	Howick, Cook St, Union Rd, Bradbury Rd, Cascades Rd, Reeves Rd, Panmure
	712	Varying	Bucklands Beach, Casuarina Rd, Glenmore Rd, Panmure
Peak Period Services	72X	Services operate weekdays only, during morning and afternoon peaks	Botany, Howick, Pakuranga, Panmure, Southern Motorway, City
	352	Services operate weekdays only, during morning and afternoon peaks	Panmure, Highbrook, East Tāmaki, Manukau

In the existing environment, the 70, 352 and 711 services travel along Ti Rakau Drive and the 72C, 72M, 72X and 712 services travel along Pakuranga Road in the kerbside lanes with general traffic. As such, buses have roughly the same travel times as general vehicles along these sections (excluding dwelling time at bus stops) and experience the same delays at intersections. Furthermore, without the Project, buses are expected to experience the same increases in delays in the future as a result of congestion and queueing on Ti Rakau Drive and Pakuranga Road.

There are approximately 18 bus stops within the EB2 and EB3R project areas, which include 10 on Ti Rakau Drive. **Figure 9** below shows the existing bus stop locations, the stops are mainly for public bus services.

Figure 9: Existing bus stops within the EB2 and EB3R project areas

The spacing between bus stops varies between 200m and 1.5km with the average distance between stops being 500m. The walking catchments for these bus stops show that there are some significant gaps in the walking network over large areas, particularly along Ti Rakau Drive, based on a nominal 400m radius isochrone walking catchment.

There are also locations of considerable overlap in the bus stop catchments suggesting that stop locations may not be optimised. All existing bus stops are on-street, with the exception of off-street stops at Pakuranga Town Centre. The majority of the existing bus stops on Ti Rakau Drive and Pakuranga Road do not provide seating and sheltered cover. No bicycle parking is provided in the existing environment.

3.6 Walking and Cycling Facilities

3.6.1 Walking Facilities

Overall, pedestrian footpaths are provided along both sides of the majority of roads within the Project area in the existing environment. However, there is an absence of pedestrian facilities particularly along William Roberts Road south, and some slip lanes do not provide signalised pedestrian crossings. Various side roads intersecting Ti Rakau Drive do not have crossings facilities currently.

3.6.1.1 EB2 – Ti Rakau Drive (Pakuranga Road to Reeves Road)

- A pedestrian footpath is available on both sides of the road, approximately 1.5 m wide and separated from the live lane by a 1.0 m grass berm
- The only crossing facilities are at the two signalised intersections of Pakuranga Road / Ti Rakau Drive and Ti Rakau Drive / Reeves Road
- No mid-block crossing is available between the two intersections. The road is also separated by a median grass berm. From observation, pedestrians are finding gaps in traffic and utilise the median as a refuge area, waiting for a gap to cross to Pakuranga Plaza

3.6.1.2 EB2 – Pakuranga Road (Ti Rakau Drive to William Roberts Road)

- A pedestrian footpath is provided on both sides of the corridor, approximately 1.2 m wide on the northern side with a 1.5 m grass berm (no grass berm to the east of the Brampton Court access to the Pakuranga Plaza). The footpath is approximately 1.7 m wide on the southern side with a 0.6 m grass berm
- Crossing facilities are only provided at the Pakuranga Road / Ti Rakau Drive intersection and the signalised mid-block crossing near the Pepler Street exit at the Pakuranga Plaza. The westbound and eastbound carriageways are separated by a 3.0 m flush median
- A pedestrian refuge island is provided across William Roberts Road at its intersection with Pakuranga Road, however, no crossing facility is provided across Pakuranga Road at this location

3.6.1.3 EB2 – Reeves Road

- Footpaths are currently provided along both sides of Reeves Road, approximately 1.5m in width and separated from the live lanes by a 1.2 m grass berm
- Crossing facilities are provided at the Ti Rakau Drive / Reeves Road / SEART intersection and at the mid-block pedestrian crossing. A pedestrian refuge island is provided across William Roberts Road north at its intersection with Reeves Road, however, no crossing facility across Reeves Road is provided at this intersection

3.6.1.4 EB2 – William Roberts Road

- Currently, footpaths are available on both sides of William Roberts Road north (approximately 1.5 m wide), however, a grass berm of approximately 1.2 m width is only provided on the eastern side

- Pedestrian refuge islands are provided at the north end at Pakuranga Road and at the southern end at Reeves Road

- William Roberts Road south currently has no pedestrian footpaths on either side of the carriageway, except for a short section on the western side near the Pakuranga Community Centre

- No pedestrian facilities are currently provided to cross William Roberts Road south

3.6.1.5 Cortina Place

- Footpaths are currently provided on both sides of Cortina Place, approximately 1.7 m wide and no grass berm

- A pedestrian refuge island is provided near the intersection with Reeves Road, and 2.9 m grass median is provided along the majority of the road

3.6.1.6 EB3R – Ti Rakau Drive (Reeves Road to Gossamer Drive)

- On average, the footpath width is 1.5 m and is separated from the road carriageway and high volumes of fast-moving traffic by a 1.0 m grass berm
- Patches of the pedestrian path is encroached with tree branches, leaves and shrubs from the property side of the footpath reducing the width of the footpath, but generally the path itself is in good physical condition
- The Ti Rakau Drive residential area supports low to medium density housing with a number of cul-de-sacs, as well as local schools and parks. Footpath facilities enable pedestrian movements along Ti Rakau Drive, but there are no additional links between cul-de-sacs
- There is one access into Ti Rakau Park from Ti Rakau Drive itself, near the intersection with Mattson Road. Limited links and connections indicate poor pedestrian connectivity and access to the parks and schools in the surrounding area
- There are four crossing facilities to accommodate crossing the corridor in the residential section, located at the four signalised intersections:
    - Ti Rakau Drive / Reeves Road
    - Ti Rakau Drive / Mattson Road
    - Ti Rakau Drive / Edgewater Drive
    - Ti Rakau Drive / Gossamer Drive
- The intersections are of similar design along the route, which consist of left-turn slip lanes for vehicle efficiency and crossing facilities provided across the side street and one leg of the corridor. Pedestrians must cross the slip lanes, unprotected, to the refuge island before arriving at the push button to cross the road. Additionally, pedestrians can only cross at one side of the intersections on Ti Rakau Drive, reducing the pedestrian amenity and efficiency

3.6.2 Cycling Facilities

There is an absence of cycle facilities along the vast majority of Ti Rakau Drive. Neither on-road nor off-road cycle facilities are provided to encourage movement along Ti Rakau Drive, except at the Ti Rakau Drive / Gossamer Drive intersection.

Cyclists within the EB2 and EB3R project areas must currently share an on-road lane with high-volume, high-speed traffic, as well as with heavy vehicles (e.g., buses). Crossing facilities are limited to those at signalised intersections. More experienced and confident cyclists who mix with general traffic have the choice to cross at intersections from right turning bays, but must still cross multiple lanes of traffic to do so. Furthermore, cyclists must navigate numerous driveways along the corridor.

In the wider Pakuranga area, there are sections of short cycle routes, outlined in **Figure 10**. Reeves Road is suggested as a road with space for cyclists, albeit with high traffic demand. AT recently developed recreational cycle facilities in the eastern cycle network, such as the Cascades shared path that connects Pakuranga College, Burswood Drive and Meadowlands. AT has also developed the Pakuranga Rotary shared path that tracks the coastline of the Tāmaki River. Additional recreational cycle routes provide connection to and from Half Moon Bay Ferry Terminal, Farm Cove, Sunny Hills, and Pakuranga Plaza. With the completion of EB1, a bi-directional cycleway and shared path is located on the northern side of Pakuranga Road from Ireland Road to Ti Rakau Drive.

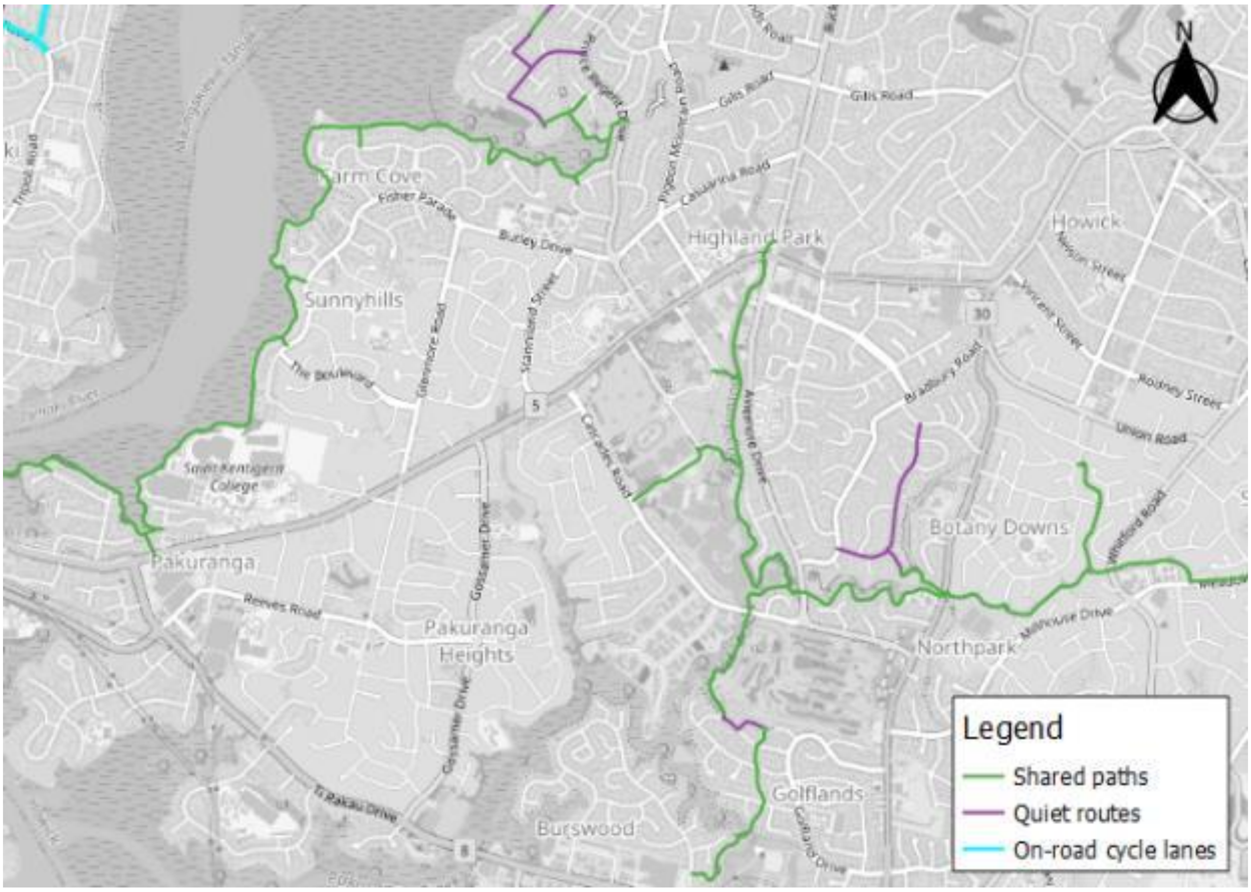


Figure 10: Existing cycle routes and facilities in the wider Pakuranga area

3.7 Parking

Within the EB2 and EB3R project areas there are a number of locations that offer parking, both on-street and off-street. The key locations in the EB2 and EB3R project areas are:

- Pakuranga Plaza
- Te Tuhi
- Ti Rakau Park
- Cortina Place
- William Roberts Road
- Ti Rakau Drive
- Edgewater shops
- Side roads

Currently, Pakuranga Plaza is classified as a Business Town Centre Zone. Under the AUP(OP), there are generally no upper limits on the amount of parking retail, office, education facilities, hospitals and commercial services can provide.

Parking surveys were conducted to determine the utilisation of the existing on-street and off-street parking demand and utilisation in the EB2 and EB3R project areas. **Figure 11** shows the surveyed areas, which were surveyed on Thursday 5 July 2018 and Saturday 7 July 2018. At the time of data collection, these survey dates were selected to represent typical weekday and weekend periods of parking utilisation at the selected sites. These data sets exclude the effects of COVID-19 on travel behaviour and are considered to represent the existing environment before EB2 and EB3R construction.

Figure 11: Parking survey locations

3.7.1 Pakuranga Plaza

Pakuranga Plaza currently supports 1,355 parking spaces on site. The utilisation of 840 of these parks was captured in the parking survey in the areas outlined in **Figure 12**.

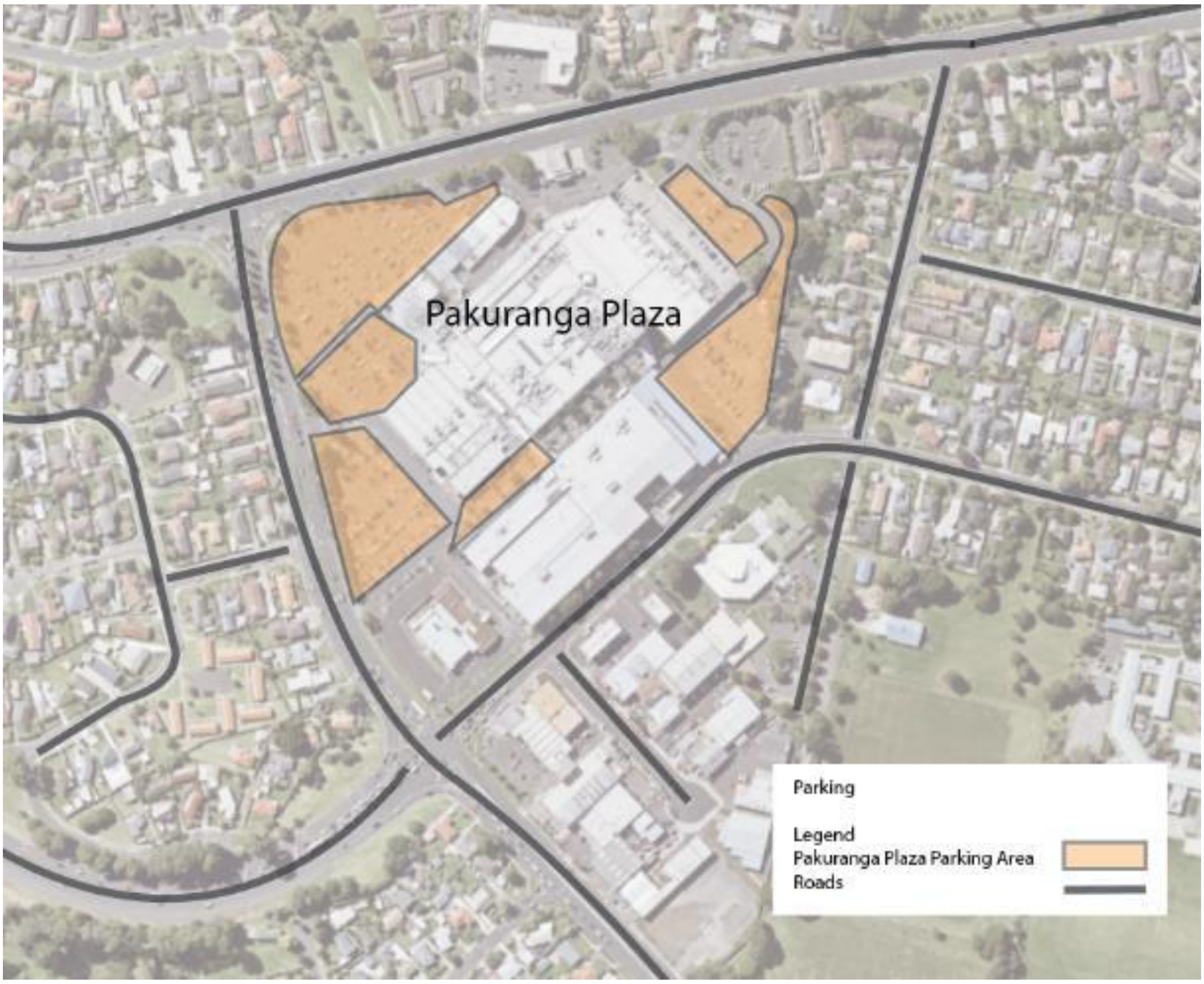


Figure 12: Surveyed parking areas of Pakuranga Plaza

Table 6 outlines the findings of the surveys and **Figure 13** below illustrates the daily utilisation profile. The table and the graph indicate the Pakuranga Plaza parking is underutilized and does not exceed 60% capacity on a typical weekday or weekend.

Table 6: Pakuranga Plaza parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	1
Average Stay [hours]	2.4	1.5
Maximum Parking (Utilisation)	418 (51%)	471 (57%)
Minimum Parking (Utilisation)	52 (6%)	306 (37%)
Average Parking (Utilisation)	301 (37%)	392 (48%)

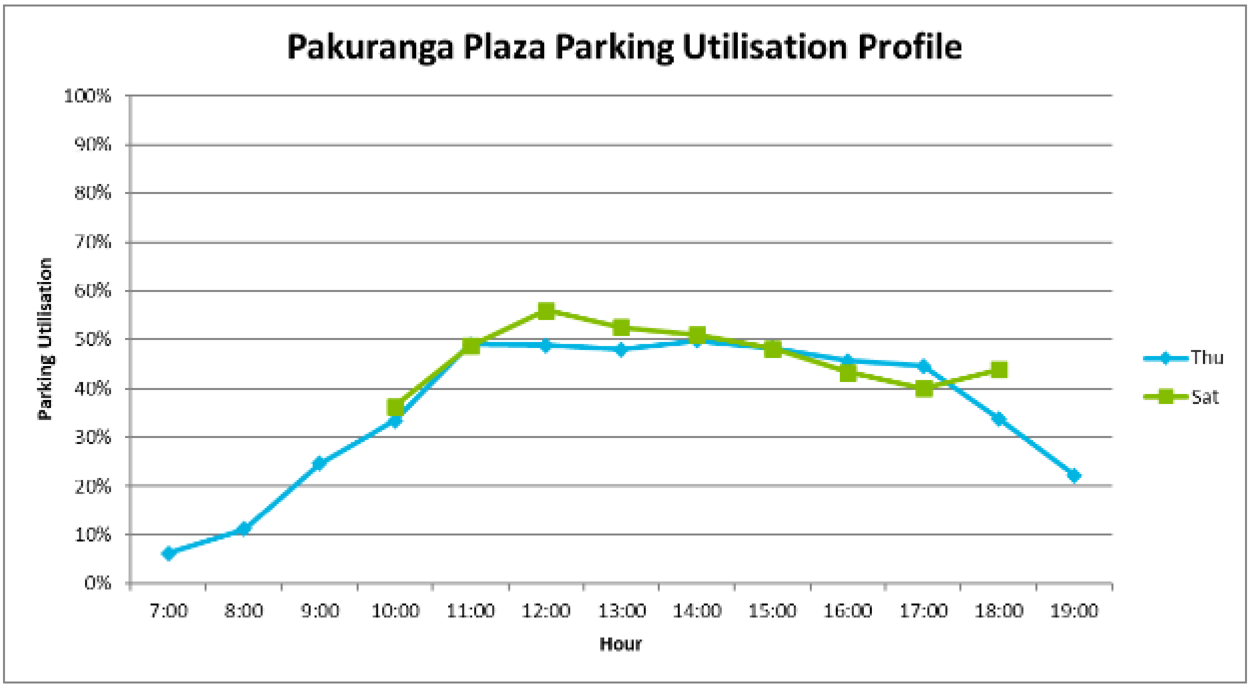


Figure 13: Pakuranga Plaza parking utilisation profile

3.7.2 Cortina Place

Cortina Place is a local cul-de-sac intersecting Reeves Road and provides access to a small commercial area. Overall, there are 25 on-street spaces available, with an average utilisation of 64% during weekdays and 71% during weekends. Full utilisation of the parking spaces occurs on weekend mornings for a short duration. The long duration of the average stay indicate that shop-owners and staff are likely using the spaces. **Table 7** outlines the findings of the survey and **Figure 14** below illustrates the parking utilisation profile across the days.

Table 7: Cortina Pl parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	2
Average Stay [hours]	5.7	5.5
Maximum Parking (Utilisation)	21 (84%)	25 (100%)
Minimum Parking (Utilisation)	8 (32%)	15 (60%)
Average Parking (Utilisation)	16 (64%)	18 (71%)

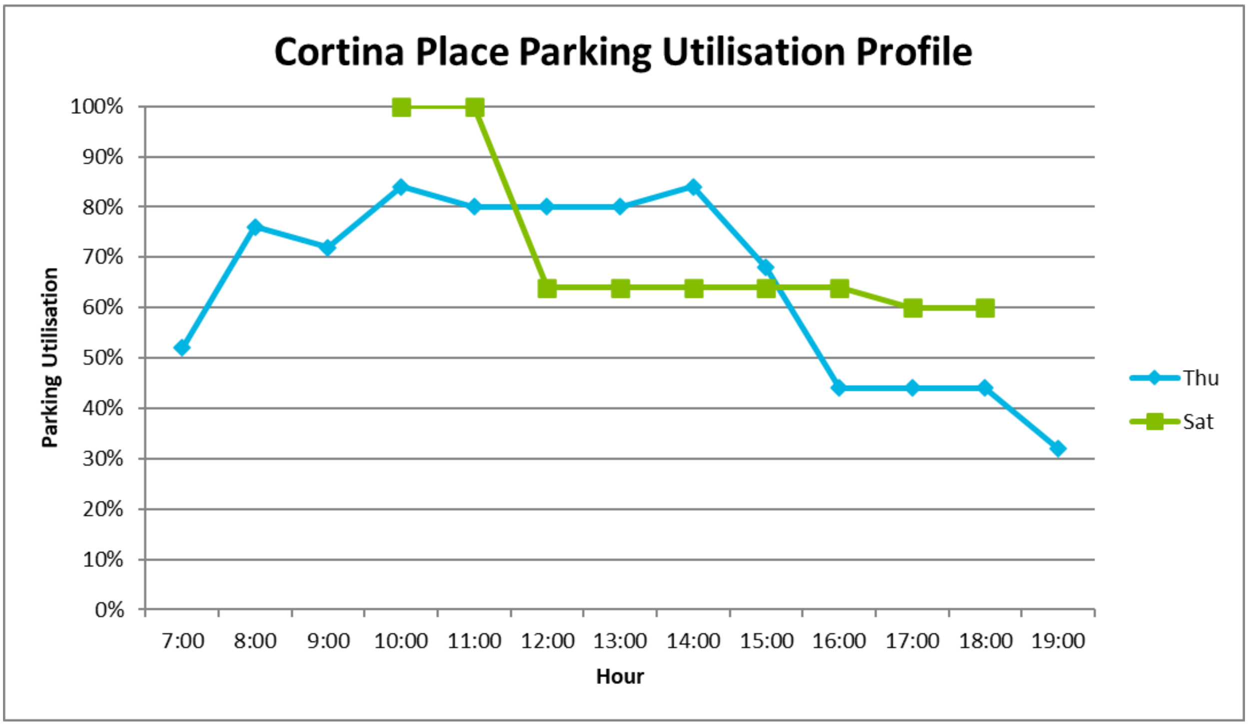


Figure 14: Cortina Pl parking utilisation profile

3.7.3 William Roberts Road

William Roberts Road connects Pakuranga Road to Reeves Road at its northern end and provides access to the Pakuranga Leisure Centre and Ti Rakau Park at its southern end. Overall, there are 127 parking spaces available, with an average utilisation of 49% on weekdays and 33% on weekends. There are 40 additional parks for the Ti Rakau Park which were considered off-street parking and were not surveyed. **Figure 15** outlines the area included in the parking survey of William Roberts Road.

Figure 15: Surveyed area of William Roberts Rd

Table 8 outlines the findings of the survey and **Figure 16** illustrates the parking utilisation profile across the days.

Table 8: William Roberts Rd parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay (hours)	13	9
Minimum Stay (hours)	1	1
Average Stay (hours)	3.7	2.8
Maximum Parking (Utilisation)	105 (83%)	113 (89%)
Minimum Parking (Utilisation)	25 (20%)	35 (28%)
Average Parking (Utilisation)	62 (49%)	42 (33%)

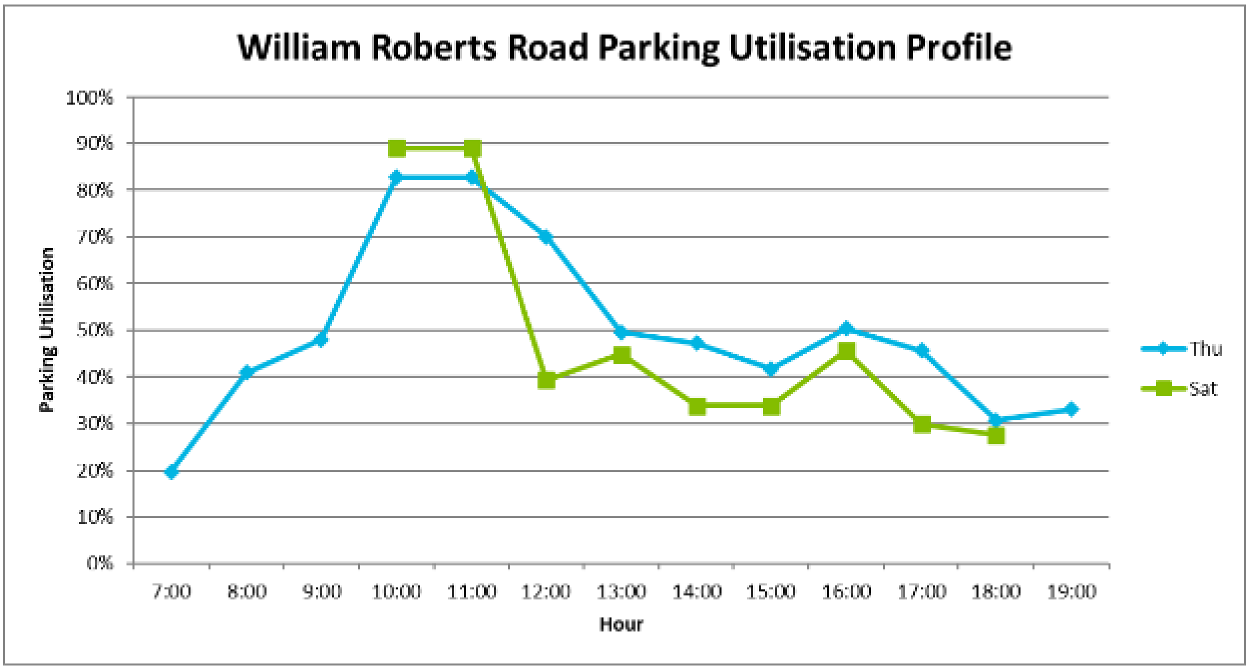


Figure 16: William Roberts Rd parking utilisation profile

Where the utilisation is around 90% for William Roberts Road and Cortina Place it is likely due to activities at the Pakuranga Leisure Centre or the Ti Rakau Park, such as Saturday morning sports. Additionally, the maximum stay for both Cortina Place and William Roberts Road was 13 hours, which is equivalent to the length of the parking survey. This indicates that a number of these parks are likely to be occupied by owners/ staff of the surrounding properties.

3.7.4 Ti Rakau Drive

Ti Rakau Drive is a major corridor connecting Pakuranga to East Tāmaki and Botany Town Centre in the southeast. The survey was conducted from the Roseburn Place intersection down to the Gossamer Drive intersection. Overall, there are 180 on-street parking spaces provided along Ti Rakau Drive, which are currently poorly utilised. **Table 9** below outlines the findings of the survey and **Figure 17** below illustrates the parking utilisation profile across the days.

Table 9: Ti Rakau Dr parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	1
Average Stay [hours]	3.0	2.7
Maximum Parking (Utilisation)	10 (5%)	28 (15%)
Minimum Parking (Utilisation)	3 (2%)	9 (5%)
Average Parking (Utilisation)	5 (3%)	15 (8%)

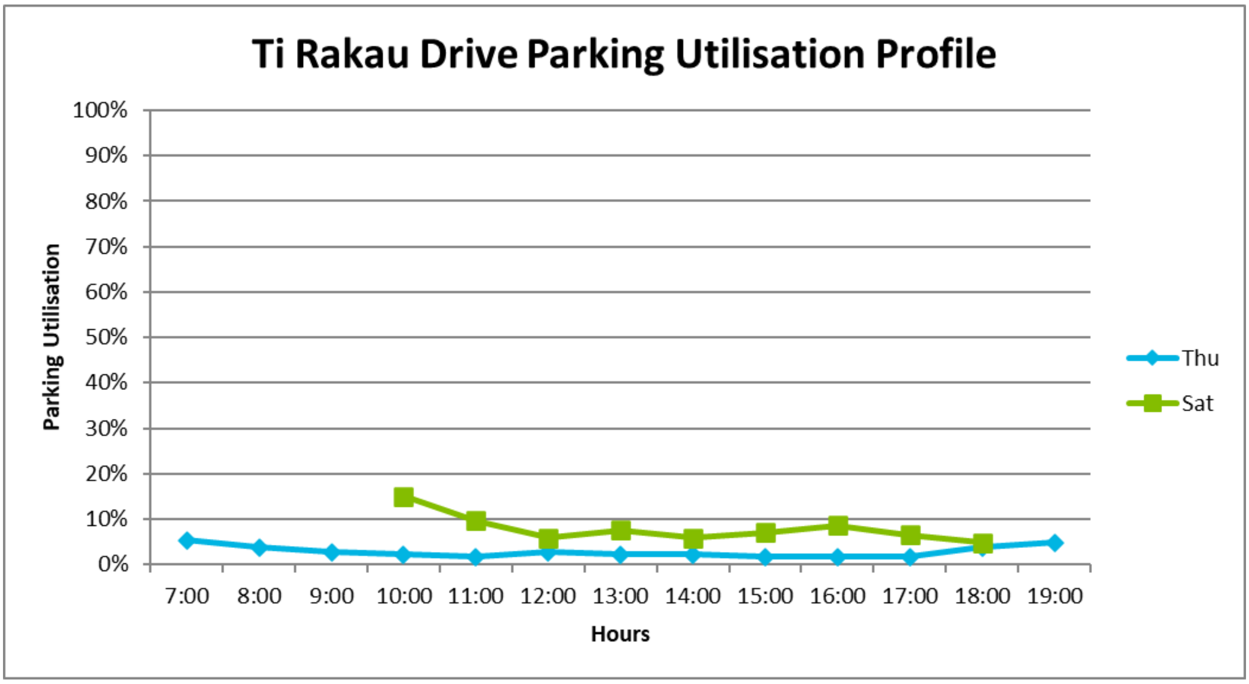


Figure 17: Ti Rakau Dr parking utilisation profile

The results shown are not unexpected. It is likely that the high traffic volume environment on Ti Rakau Drive does not create an appealing location to park vehicles given a perceived risk of accidents. Furthermore, this section of Ti Rakau Drive is surrounded by residential properties, and it would not be unreasonable to assume that properties have ample individual off-street parking due to the general size of these free-standing properties.

3.7.5 Edgewater Shops

The Edgewater Shops is a block of local shops located at the Ti Rakau Drive / Edgewater Drive intersection. Currently there are 30 parking spaces provided within an off-street parking area that serves the various commercial properties. The survey determined that the carpark is not fully utilised. **Table 10** outlines the findings of the survey and **Figure 18** illustrates the parking utilisation profile across the days.

Table 10: Edgewater Shops parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	11	9
Minimum Stay [hours]	1	1
Average Stay [hours]	2.5	1.8
Maximum Parking (Utilisation)	18 (60%)	12 (40%)
Minimum Parking (Utilisation)	1 (4%)	3 (10%)
Average Parking (Utilisation)	11 (37%)	8 (27%)

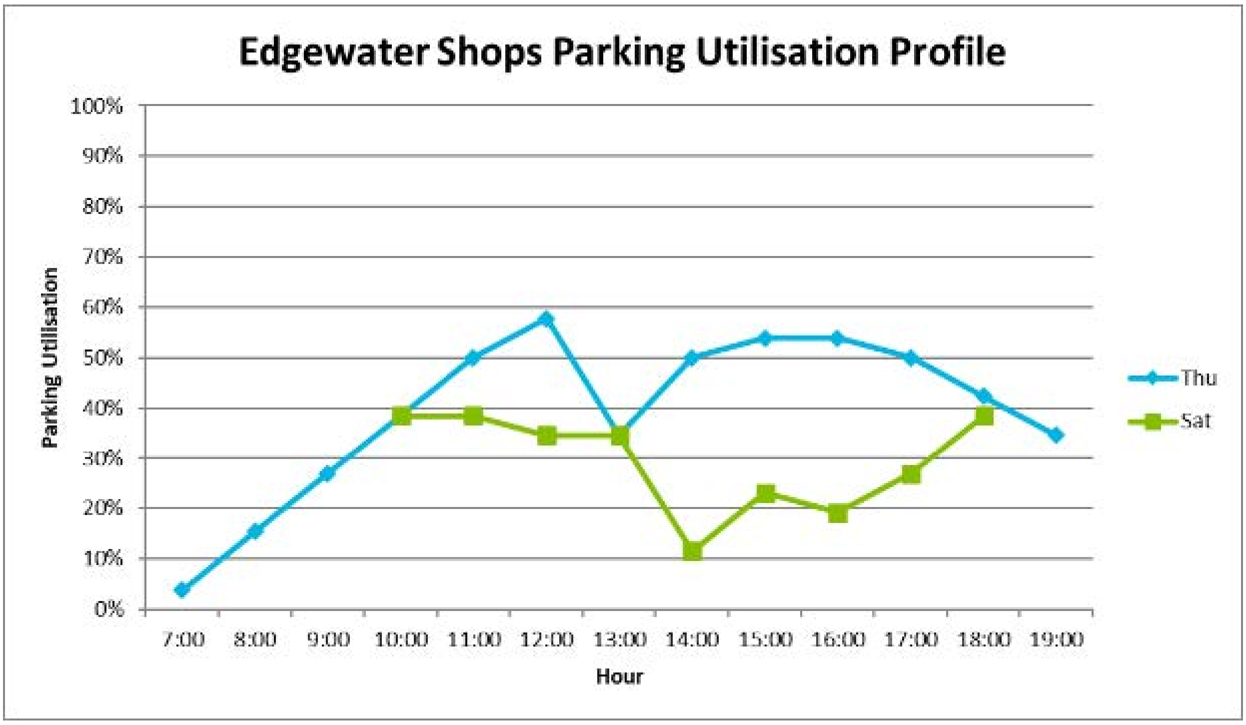


Figure 18: Edgewater Shops parking utilisation profile

Further analysis of the parking survey data shows that generally most vehicles are parked for short periods (one-hour survey intervals), with a minority of vehicles parked for longer periods (likely staff and shop owners). This is in line with what would be expected at these commercial properties. Parking utilisation is not expected to exceed 60% on a typical weekday or weekend.

3.7.6 Side roads

Due to the low utilisation of on-street parking along the side roads of Ti Rakau Drive, no further detailed analysis is presented. **Table 11** provides a summary of the parking surveys conducted on the side roads in EB2 and EB3R project areas.

Table 11: EB2 and EB3R side roads parking utilisation summary

Side Road	Parking Utilisation Comments
Ayr Rd	Ayr Road is a local road providing access to residential houses with 70 on-street spaces available. However, it is a poorly utilised road, with the maximum utilisation on Thursday being 12% and 6% on Saturday.
Roseburn Pl	Roseburn Place is a cul-de-sac joining to Ti Rakau Drive, providing access to residential properties. There are 45 on-street spaces available. However, it is poorly utilised with the maximum utilisation on Thursday being 9% and 10% on Saturday. The low utilisation could be attributed to residents having ample parking within their properties and visitors parking on the street.
Mattson Rd	Similar to Roseburn Place, Mattson Road is a cul-de-sac off Ti Rakau Drive with 80 on-street spaces. Again, it is poorly utilised with the maximum utilisation on Thursday being 4% and 8% on Saturday.
Marriott Rd	Marriott Road connects Ti Rakau Drive to Udys Road with 175 on-street parking spaces available. It is a poorly utilised road with a maximum of six parked vehicles.
Chevis Pl	Chevis Place is a cul-de-sac off Ti Rakau Drive providing access to residential properties to the east. There are 45 on-street parking spaces available. However, these spaces are poorly utilised with a maximum utilisation of 4% on Thursday and 16% on Saturday. The low utilisation could be attributed to most residents having ample parking within their properties.
Edgewater Dr	Edgewater Drive is a collector with a crescent shape that connects to Ti Rakau Drive at two locations. It provides access to residential properties, Edgewater College and Pakuranga Retirement Village. There are 500 on-street parking spaces available along the length of the road. It would be expected to see high utilisation of on-street parking during school peak periods; however, this is not the case, with a maximum weekday utilisation of five parked vehicles. A similar trend was observed on Saturday with a maximum of six vehicles parked within an hour.
Wheatley Ave	Wheatley Avenue is a small cul-de-sac off Ti Rakau Drive between the two sections of Edgewater Drive. It serves a small residential community and provides 30 on-street parking spaces. It is poorly utilised during weekdays with the maximum utilisation being 10%. This was observed to increase to 20% during the weekend.

3.8 Crash Environment

3.8.1 Crash Analysis System Data

All reported crashes within the EB2 and EB3R project area were extracted from the Crash Analysis System (CAS) for a five-year period from 2017 to 2022. For this assessment, the focus on the extracted data was in the area shown in **Figure 19**.

Figure 19: Extent of extracted CAS data for EB2 and EB3R project areas

There were 2 fatal crashes and 17 serious injury crashes in the 2017 – 2022 time period as described and analysed below:

- **Fatal crash 1 (2021/02/14)**: An eastbound vehicle on Pakuranga Road travelling in a through lane had turned right at the Pakuranga Road / Ti Rakau Drive intersection. A motorcycle travelling westbound on Pakuranga Road attempted to stop, lost control and collided with the right turning vehicle.
    - There were road works in the area at the time of the crash. A combination of traffic signals and road signage for all motorists in the eastbound lanes may have been confusing if they were unfamiliar with the road changes or area. Various road changes, layout changes, traffic cones, and signage were in effect (see **Figure 20**).

Figure 20: Pakuranga Rd / Ti Rakau Dr intersection, looking eastbound on Pakuranga Rd (source: Google Street View, Feb 2021)

- **Fatal crash 2 (2021/06/10)**: A vehicle was traveling in the south-west direction on Reeves Road while a pedestrian was crossing Reeves Road in the south-east direction. The pedestrian was hit by the vehicle while crossing the road.
    - There are two controlled pedestrian crossings within 90m of the crash scene.
    - A number of environmental factors were identified, but not limited to;
        - The change in speed zone from 60-50km/hr for eastbound traffic just before the driveway access to Pakuranga Plaza.
        - The merging of two lanes to one lane for eastbound traffic just before the driveway access to Pakuranga Plaza.
        - The amount of vehicle and pedestrian usage for the driveway to Pakuranga Plaza.
        - The width of Cortina Place and the amount of foot/vehicle traffic.
        - The increase in speed from 50-60km/hr just west of Cortina Place.
        - The widening of the westbound lane from one lane to three lanes just west of Cortina Place.
        - When Reeves Road traffic queues at the intersection with Ti Rakau Drive the tail can extend past Cortina Place obscuring visibility to pedestrians that cross from Cortina Place.
        - The average street lighting from nearby overhead lamp posts (if it was fully dark).

The majority of the serious injury crashes have occurred along Ti Rakau Drive. The data does not suggest commonality between the location and type of crashes. In total, of the 17 serious injuries, 47% was a result of vehicle collision with pedestrians, and 30% were attributed to loss of control from drivers. A further 18% of crashes were as a result of right turning collision between two motor vehicles, predominantly at intersections and a total of one serious injury attributed to a rear end crash were observed. The major factors influencing crashes are poor observation (42%), pedestrian factors (42%), alcohol (26%) and travel speed (16%). A further 11% were due to road factors. Time of day did not appear to be a significant factor in the crashes with 68% of crashes occurring during light/overcast conditions.

3.8.2 Safe System Assessment

A Safe System Assessment (SSA) was undertaken for the entire Project area[15]. The SSA was conducted in accordance with the Auckland Transport Safe System Assessment Guidelines which are based on the Austroads 2016, Research Report AP-R509-16, Safe System Assessment Framework. A summary of the SSA is provided below.

The SSA assessed a total of ten crash types as described below:

1. Run-off-road (R-O-R): Involving one or more vehicle(s) losing control on a curve or straight
2. Head-on (H-O): Crashes involving two or more vehicles travelling in opposite directions
3. Intersection (INT): Crashes involving two or more vehicles travelling in adjacent directions
4. Other: Includes manoeuvring, overtaking, parking and miscellaneous crashes
5. Motorcycle (M/C): Any crash type above involving a motorcycle
6. P1: Any crash involving a pedestrian and a vehicle turning at an intersection
7. P2: Any crash involving a pedestrian and vehicle travelling straight (midblock crossing)
8. P3: Any crash involving a pedestrian and vehicle travelling straight through an intersection
9. C1: Any crash involving a cyclist being struck by a vehicle travelling in the same direction
10. C2: Any Crash involving a cyclist being struck by a vehicle at an intersection (turning or straight)

Each crash type is scored based on exposure, likelihood and severity with a value between 0 and 4. A lower score corresponds with a safer system. A score of 0 for exposure, likelihood or severity means that a particular crash type is not applicable to the location being considered and will result in a product score of 0. **Table 12** and **Table 13** outline the safe system score of the existing environment in the EB2 and EB3R project areas. Location C in EB2 and locations F and H in EB3R indicate station locations on completion of the full Eastern Busway Project.

Table 12: EB2 existing environment safe systems assessment

ZONE EB2 ASSESSMENT SUMMARY											
EXISTING LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
B) TI RAKAU DR - INT	16	16	32	16	48	24	0	48	36	36	272
C) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
D) TI RAKAU DR - INT	16	16	24	16	48	18	0	24	36	27	225
E) TI RAKAU DR - MB	8	16	16	24	48	24	48	0	31.5	27	243
F) TI RAKAU DR - INT	16	16	24	24	48	18	48	36	31.5	27	289
G) TI RAKAU DR - MB	16	16	0	24	48	0	48	0	36	0	188
H) PAKURANGA RD - INT	16	16	24	16	48	12	0	24	36	36	228
I) PAKURANGA RD - MB	16	24	24	24	48	18	36	0	36	36	262
J) PAKURANGA RD - INT	16	24	32	16	64	18	0	48	36	36	290
K) REEVES RD - MB	9	13.5	15.75	13.5	36	18	36	0	31.5	36	209
L) REEVES RD - INT	15.75	13.5	18	13.5	36	21	0	48	36	36	238
M) WILLIAM ROBERTS RD - MB	NOT APPLICABLE										
N) CORTINA PL - MB	3	3	0	5.25	28	0	24	0	24	0	87
O) CORTINA PL - INT	9	13.5	18	15.75	42	21	0	48	27	36	230
P) PAKURANGA HWY - MB	24	0	0	24	32	0	0	0	0	0	80

[15] EB234-1-TE-RP-Z0_000003

Table 13: EB3R existing environment safe systems assessment

ZONE EB3R ASSESSMENT SUMMARY											
EXISTING LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) ROSEBURN PL	8	16	32	24	64	24	48	0	27	36	279
B) MARRIOTT RD	8	16	32	24	64	24	48	0	27	36	279
C) EDGEWATER DR / CHEVIS PL	8	16	16	24	48	24	48	24	27	27	262
D) WHEATLY AVE	8	16	32	24	64	24	36	0	27	36	267
E) EDGEWATER DR	8	0	32	24	64	24	0	0	27	36	215
F) GOSSAMER STATION WB	8	0	0	24	32	0	0	0	27	18	109
G) GOSSAMER DR INTERSECTION	24	24	24	24	48	18	0	36	36	18	252
H) GOSSAMER STASTION EB	8	16	0	8	16	0	32	0	36	0	116

Motorcycle crashes were identified as the highest risk in the existing layout due to a maximum score of 4 for both exposure and severity.

3.9 Over-Dimension and Over-Weight (OD and OW) Routes

Within the Project area there are a number of roads that have been defined by Waka Kotahi as strategic Over-Dimensional (OD) routes[16]. These support the large commercial and industrial areas in and around Burswood and East Tāmaki which are the key generators of freight and OD loads. The OD routes relevant to the EB2 and EB3R project areas are listed below and shown in **Figure 21**:

- Pakuranga Road – Ti Rakau Drive to Howick
- Pakuranga Highway – Ti Rakau Drive to Waipuna Road
- Ti Rakau Drive – Pakuranga Road to Te Irirangi Drive

[16] http://nzta1.cwp.govt.nz/assets/resources/overdimen-veh-route-maps/4-auckland/docs/OD_4-35%20Auckland

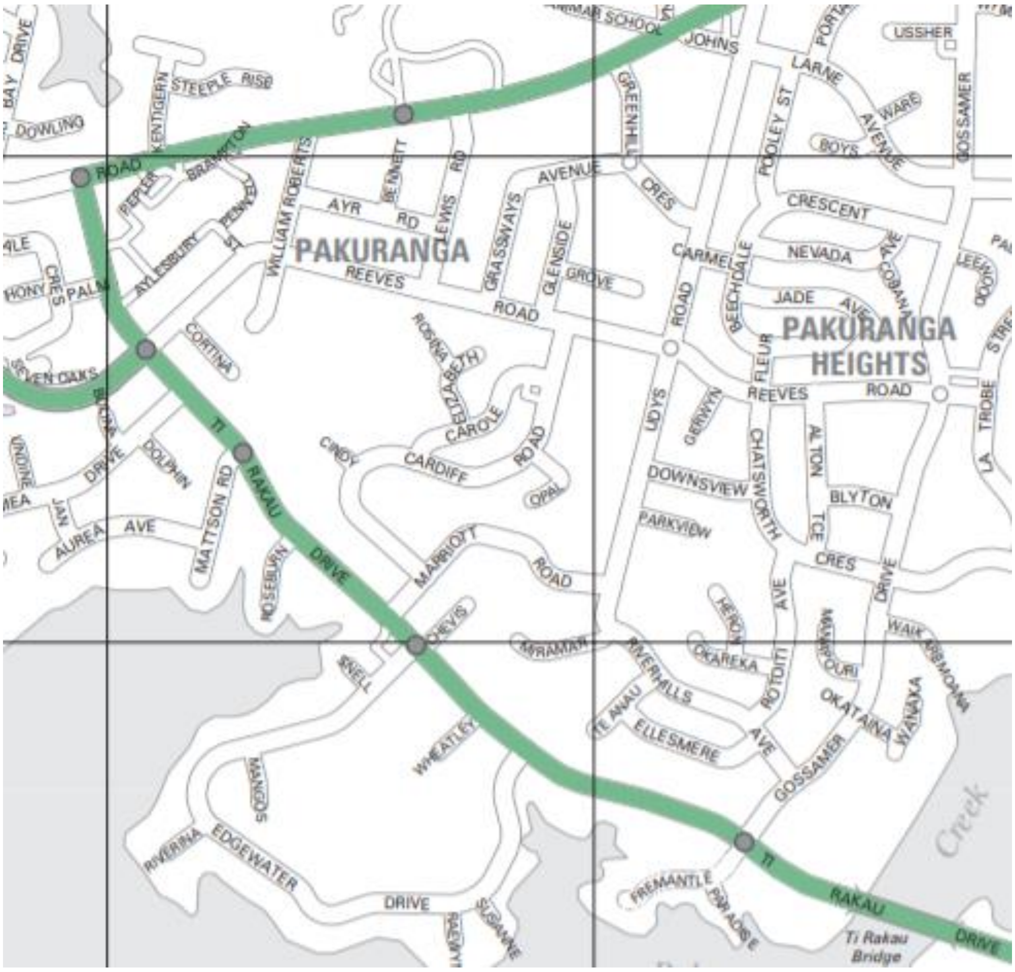


Figure 21: Over-dimensional vehicle routes

It is worth noting that no roads within the EB2 and EB3R project areas are designated as Over-Weight (OW) routes. The nearest OW route is Te Irirangi Drive further southeast, from State Highway 1 up to Botany Town Centre.

Table 14 below shows the current heavy commercial vehicle (HCV) percentage of traffic that travel through the EB2 and EB3R project areas. HCV data were sourced through a combination of AT traffic counts and RAMM data.

Table 14: Existing HCV percentage

Roads	HCV Percentage
Pakuranga Rd (east of Ti Rakau Dr)	6%
Pakuranga Rd (west of Ti Rakau Dr)	7%
Ti Rakau Dr (Pakuranga Rd – SEART)	7% westbound, 8% eastbound
Ti Rakau Dr (SEART – Edgewater Dr (west))	8%
Ti Rakau Dr (Edgewater Dr, west to east)	9% westbound, 8% eastbound
SEART	3%
William Roberts Rd	4%
Edgewater Dr	3%

3.10 Changes to the Baseline Traffic Environment

This section provides an overview of the changes to the baseline traffic environment that were included in the traffic modelling assessments conducted in this ITA.

3.10.1 EB1

Included in the modelling scenarios was EB1, which is a key component of the overall Project. It is the segregated busway connection from Panmure train station to Pakuranga Town Centre. The eastern terminus of EB1 is located beside the western boundary of the EB2 project area, at the Pakuranga Road / Ti Rakau Drive intersection and is shown in **Figure 22**.

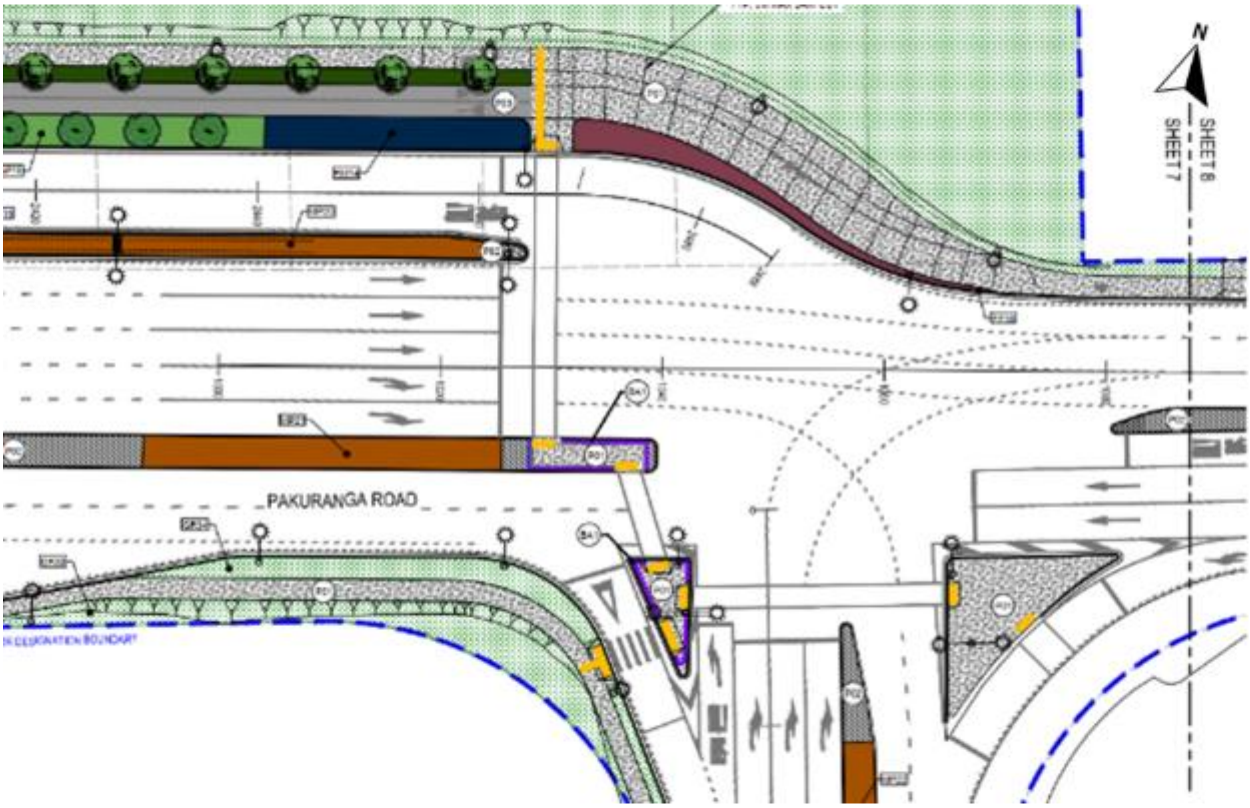


Figure 22: EB1 tie-in at Pakuranga Rd / Ti Rakau Dr intersection

3.10.2 WRRE Works

The WRRE construction will precede EB2 and EB3R, and is anticipated to have a duration of approximately eight months, from November 2022 to June 2023. The WRRE[17] will consist of:

- The extension of William Roberts Road further south to Ti Rakau Drive
- A new priority-controlled, left-in left-out (LILO) only intersection with Ti Rakau Drive at the southern end of William Roberts Road. The kerbside lane of Ti Rakau Drive eastbound will be a shared through and left-turn lane. It should be noted that a second lane at the northern approach will also be constructed during the WRRE but will not be operational until later stages of the overall construction of the Project (EB2)
- The extension of Cortina Place further east to connect to William Roberts Road. A new raised priority-controlled intersection with William Roberts Road at the eastern end of Cortina Place. All approaches to the intersection will provide one approach lane and one exit lane
- Five parallel on-street parking spaces will be provided on the eastern side of William Roberts Road and 11 angled parking spaces on the western side. A new raised pedestrian crossing will also be provided on William Roberts Road at Ti Rakau Park. The posted speed limit of this section of William Roberts Road will be 30 km/h

Figure 23 shows the layout of the William Roberts Road and Cortina Place extensions upon completion.

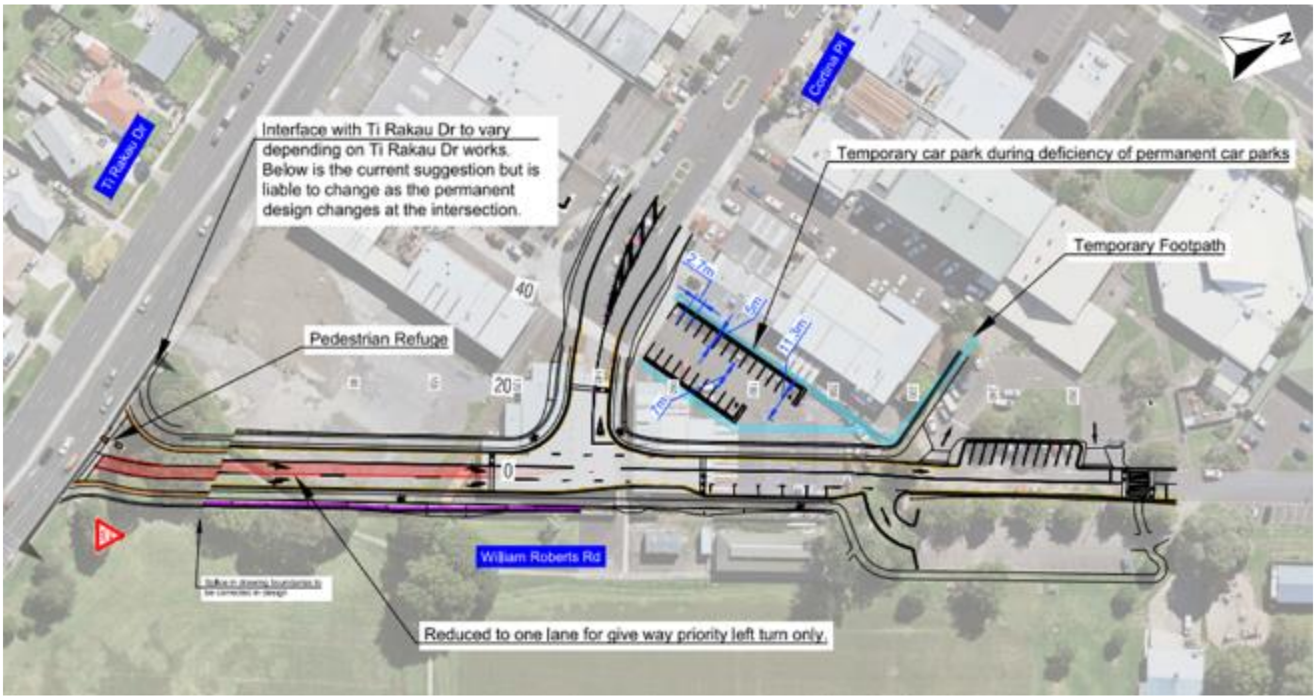


Figure 23: WRRE layout

[17] EB234-1-TE-RP-Z2-0001-A1-William Roberts Rd Extension ITA

3.10.3 Other EB2 and EB3R Enabling Works

An assessment was undertaken to understand the potential traffic redistribution that could occur on the network due to the closure of Reeves Road, which is required for the construction of the RRF during EB2. Furthermore, the assessment was aimed at identifying other potential enabling works that may be required to mitigate the effects of the resulting traffic redistribution. These enabling works will form part of the EB2 and EB3R consent package. Considering the construction programme, these enabling works will follow the WRRE and will precede the closure of Reeves Road during EB2 and EB3R construction.

The full results of the assessment are presented in the Technical Advice Memorandum provided in **Appendix A**, hereafter referred to as the 'Reeves Road Detour Assessment'. A summary of the results, and the enabling works required before the closure of Reeves Road, is presented below. **Figure 24** shows the proposed detour route during the Reeves Road closure.

Figure 24: Proposed detour route during Reeves Rd closure

The detour route along William Roberts Road north, westbound along Pakuranga Road and eastbound along Ti Rakau Drive towards SEART was determined to be less attractive than expected. Overall, only a small percentage of traffic could be expected to route along the proposed detour, likely due to the already congested nature of the Pakuranga Road / William Roberts Road intersection.

It was determined that inbound (citybound) traffic, during the AM peak, could be expected to detour via Gossamer Road to Ti Rakau Drive. Traffic in the outbound direction, during the PM peak, could be expected to return via Pakuranga Road and via SEART turning right onto Ti Rakau Drive.

It should be noted that the Reeves Road Detour Assessment followed a similar methodology as the WRRE ITA of assessing a 'future Do-Minimum' scenario in comparison to a 'future with detour' scenario. This approach allowed for the inclusion of known changes to the network that are expected to be completed before the Reeves Road closure and the associated traffic distribution on the network, such as the WRRE.

This assessment indicated that mitigation works would be required at the Ti Rakau Drive / Reeves Road and Ti Rakau Drive/ Gossamer Drive intersections.

3.10.3.1 Ti Rakau Drive / Reeves Road Intersection

Intersection performance is expected to be poor (LOS F) during both the AM and PM peaks in the Do-Minimum scenario. The Reeves Road Detour AM peak intersection performance could be expected to be slightly improved (LOS E), however the PM peak would still be LOS F.

The SEART off-ramp right-turn lanes into Ti Rakau Drive are expected to operate at LOS F during the PM peak. The increase in traffic volumes, due to Reeves Road closure, would result in delay increasing from around 50 sec to 215 sec (3.6 min), which would require mitigation.

Various mitigation measures were tested, however only the preferred option (Mitigation 2) is presented below. Mitigation 2 consists of the temporary removal of the pedestrian crossing on the eastern arm of the intersection, reducing the number of signal phases to three and redistributing the green time. **Table 15** provides a summary of the Ti Rakau Drive / Reeves Road intersection performance.

Table 15: Reeves Rd Detour Assessment – Ti Rakau Dr / Reeves Rd intersection performance summary[18]

Scenario	Level-of-Service (LOS)		Degree of Saturation (DOS)		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	F	F	0.90	1.13	178	83
Reeves Rd Detour	E	E	0.91	1.02	60	75
Mitigation 2	D	D	0.87	0.90	41	38

Mitigation 2 is expected to lead to improved intersection performance during both the AM and PM peaks compared to the Do-Minimum and the Reeves Road Detour scenarios.

[18] SIDRA analysis carried out based on traffic volumes for a 2028 horizon year.

3.10.3.2 Ti Rakau Drive / Gossamer Drive Intersection

The right-turn traffic volume from Gossamer Drive into Ti Rakau Drive is expected to increase by 160 veh/h in the AM peak during the Reeves Road closure. The resultant intersection performance is expected to be poor (LOS F), compared to the LOS E of the Do-Minimum scenario. This would require mitigation. The intersection is expected to experience little change during the Reeves Road closure in the PM peak and will remain at LOS D.

Again, various mitigation measures were tested, however only the preferred option (Mitigation 2) is presented below. Mitigation 2 consists of the following changes to the northern Gossamer Drive approach to the intersection; converting the short left-turn slip lane to pass through the intersection, converting the centre lane to a full length left-turn lane, providing an additional short lane for the shared through and right-turn movements, and increasing the length of the short kerbside exit lane (see **Figure 25**).

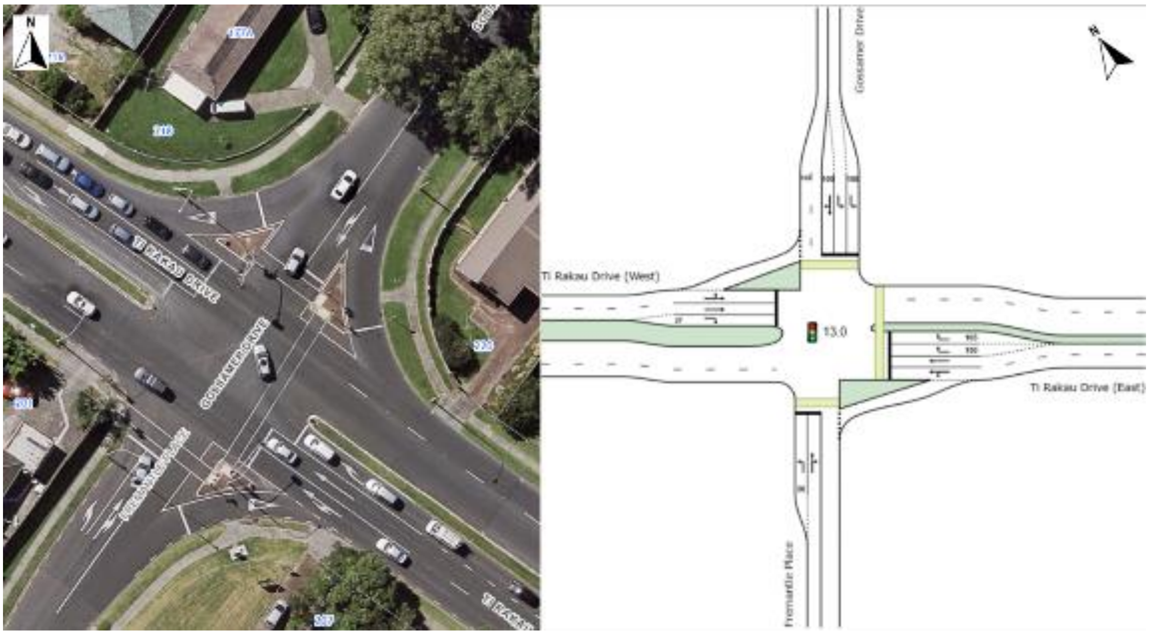


Figure 25: Ti Rakau Dr / Gossamer Dr intersection layout (left = current, right = enabling works)

Table 16 provides a summary of the Ti Rakau Drive / Gossamer Drive intersection performance.

Table 16: Reeves Rd Detour Assessment – Ti Rakau Dr / Gossamer Dr intersection performance summary[19]

Scenario	Level-of-Service (LOS)		Degree of Saturation (DOS)		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	D	D	1.02	0.90	48	45
Reeves Rd Detour	F	D	1.25	0.88	168	43
Mitigation 2	D	D	0.89	0.86	37	37

Mitigation 2 is expected to lead to improved intersection performance during both the AM and PM peaks compared to the Do-Minimum and the Reeves Road Detour scenarios.

[19] SIDRA analysis carried out based on traffic volumes for a 2028 horizon year.

4 EB2 and EB3R Design and Construction

4.1 EB2 and EB3R Overview

As stated in **Section 3.4.1**, without the Project, traffic volumes are predicted to increase on Pakuranga Road and Ti Rakau Drive (between Pakuranga Road and Reeves Road), reaching the capacity of the corridors by 2028. It is likely that large queues and delays on these sections will act as a bottle neck for the rest of the network. This issue is also highlighted in **Section 3.4.2**, with large travel times on these specific sections of the network in the existing environment.

The Project seeks to improve congestion and travel times across the transport network, and particularly in the area around the Pakuranga Town Centre. This will be achieved through the construction of the RRF, which will provide a direct and faster link between Pakuranga Road and SEART, as well as dedicated bus lanes for bus services.

Bus travel times will be improved primarily through the construction of dedicated bus lanes. Buses will also have priority at intersections by way of 'call-ahead' features and advance loops to extend the traffic signal green time when a bus is within approach distance of an intersection. Furthermore, the buses will in future laydown at new bus stations with improved efficiency and merge back into dedicated bus lanes, instead of general traffic lanes, further improving travel times as well as safety.

The Project will also seek to improve the catchment areas of public transport via improved bus stations and improved walking and cycling infrastructure. In the future, all bus stations in the EB2 and EB3R project area will provide seating and sheltered cover as well as bicycle and scooter parking for passengers. Separated walkways and cycleways will improve safety, amenity and travel time for an all-around improved trip to/from the bus stations.

Pedestrian and cyclist safety and amenity will be improved through the construction of separated footpaths and cycleways. Raised tables will be provided across all approaches on the southern side of Ti Rakau Drive as well as both intersections along Cortina Place. Additional signalised pedestrian crossings will be provided across Pakuranga Road, Ti Rakau Drive, Reeves Road, Aylesbury Street and William Roberts Road. A raised pedestrian crossing will also be provided on William Roberts Road near the Ti Rakau Park.

Lastly, the Project will seek an all-around improvement in safety to all users through the use of relevant TDM design standards. Improved pedestrian crossing facilities will be provided to discourage jaywalking and to improve amenity.

4.2 EB2 and EB3R Design and Construction Works

The sections below provide details, split between the EB2 and EB3R project areas, of the proposed design and construction works. Details are also provided to highlight when in the construction programme these works will occur as this is important to understand the development of the modelling scenarios presented in **Section 5.2.2**.

During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as to produce construction staging with less adverse effects to road traffic. This process has led to a more refined construction staging.

4.2.1 EB2 – Design and Construction Works

The general extent of the EB2 project area encompasses the following roads (see **Figure 26**, dark purple):

- Ti Rakau Drive from Pakuranga Road to Reeves Road
- SEART from the eastern Waipuna Bridge abutment to Ti Rakau Drive
- Reeves Road from Ti Rakau Drive to William Roberts Road
- Pakuranga Road from Ti Rakau Drive to William Roberts Road
- Specific sections of Palm Avenue, Aylesbury Street, Seven Oaks Drive, Cortina Place, and William Roberts Road

Figure 26: EB2 general extent (dark purple)

EB2 will be a complex area with multiple work zones occurring simultaneously against different time scales. Below are sections of geographical works roughly in sequential order, however significant overlap will occur between some of these sections of work. A full set of EB2 layout drawings is provided in **Appendix B**. The EB2 construction works are anticipated to occur over a period of approximately four years.

4.2.1.1 Reeves Road and the Flyover

Reeves Road between Ti Rakau Drive and William Roberts Road will consist of one lane per direction, similar to the existing environment. However, unlike the existing environment, Reeves Road will not serve as a through route from SEART to Pakuranga Heights. In the future, it will serve buses between Ti Rakau Drive and Pakuranga Road, and will provide access to the Pakuranga Plaza and businesses on Cortina Place.

The lower section of Reeves Road between Ti Rakau Drive and Cortina Place as well the new Reeves Road 'ramps' connecting to the RRF tie-in at Pakuranga Road will be bus only lanes to improve bus travel times between Ti Rakau Drive and Pakuranga Road. Reeves Road between Cortina Place and William Roberts Road will be mixed traffic with access to Pakuranga Plaza at Aylesbury Street and the private access road. The intersections with Aylesbury Street and William Roberts Road will be signalised upon completion of the RRF to avoid midblock queues blocking the bus lane ramps.

The RRF will in future provide a direct and faster link between Pakuranga Road and SEART, by eliminating the need to travel along Ti Rakau Drive. The RRF will consist of four lanes, two lanes per direction. Adjacent to the Pakuranga Plaza, the alignment of the RRF will be directly above Reeves Road.

A raised intersection will be provided at the Reeves Road / Cortina Place intersection, with uncontrolled courtesy crossings on the western, northern and eastern approaches. Signalised crossings will be provided across the southern and western approaches at the Reeves Road / Aylesbury Street intersection and all approaches at the William Roberts Road / Reeves Road intersection. The southern crossing at the Reeves Road / Aylesbury Street intersection and the western crossing at the William Roberts Road / Reeves Road intersection will be shared crossings. The existing midblock pedestrian crossing on Reeves Road will be removed to avoid potential sightline issues. As the columns of the RRF will be located along the centre of Reeves Road, the view of pedestrians may be obstructed to vehicles.

Unidirectional cycleways will be provided on both sides of Reeves from Ti Rakau Drive to Aylesbury Street, with a bidirectional cycleway on the eastern side between Aylesbury Street and William Roberts Road.

Figure 27 shows the proposed layout of Reeves Road underneath the RRF.

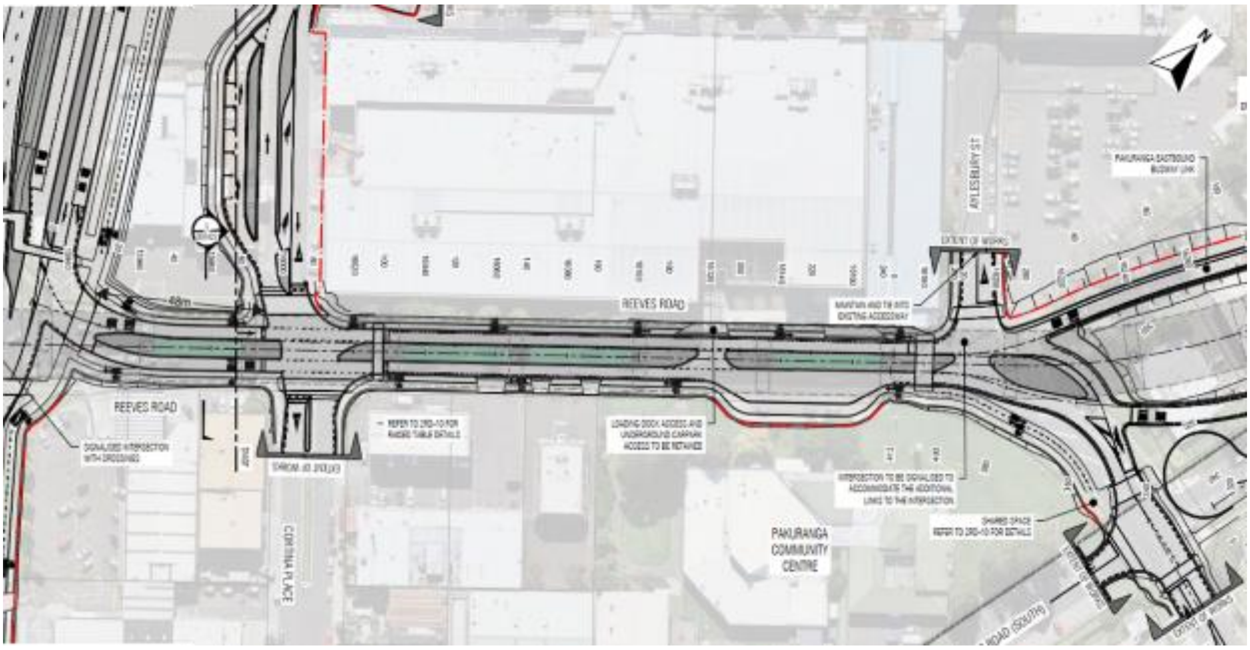


Figure 27: Reeves Rd (underneath RRF)

Figure 28 shows the proposed layout of the RRF itself.

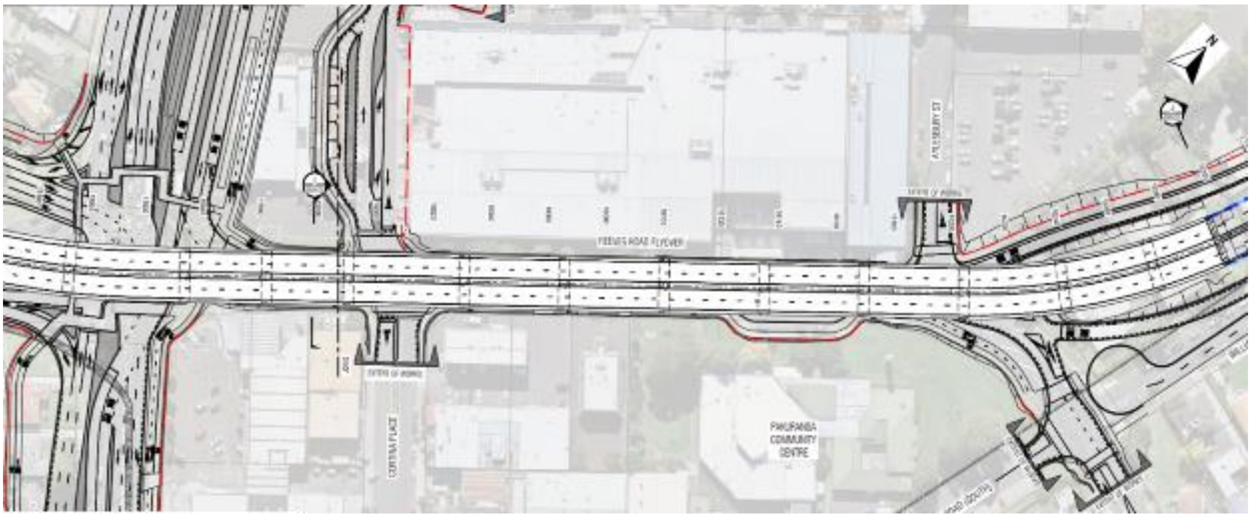


Figure 28: RRF

The works on Reeves Road will be extensive and will encompass offline works heading north along William Roberts Road. Reeves Road will be closed to enable these works and will not fully reopen until all works associated with the RRF and the remaining environment below the RRF have been completed.

Figure 29 shows the indicative work zones associated with Reeves Road and the RRF. The works associated with the RRF, and Reeves Road underneath are anticipated to have a duration of approximately three years.

Figure 29: Indicative work zones – Reeves Rd and RRF

The existing alternate routes, during the Reeves Road closure, are at capacity and additional traffic loading will result in increased delays. This means that to enable the closure of Reeves Road without significant effects, three works must be completed prior to the closure to accommodate the displaced traffic volumes:

1. William Roberts Road extension. Effects of these works have been assessed in the WRRE ITA, see **Section 3.10.2**.
2. Ti Rakau Drive enabling works. To close Reeves Road will require the temporary removal of the pedestrian crossing on the eastern arm of the Ti Rakau Drive / Reeves Road intersection, reducing the required signal phases to three and redistributing the green time. The pedestrian crossing on the western approach will be maintained.
3. Gossamer Drive enabling works. During the Reeves Road closure, citybound traffic is expected to find an alternate route, via Gossamer Drive then proceeding along Ti Rakau Drive. As stated in **Section 3.10.3.2**, the enabling works at Gossamer Drive will include converting the short left-turn slip lane to pass through the intersection, converting the centre lane to a full left-turn lane, providing an additional short lane for the shared through and right-turn movements, and increasing the length of the kerbside exit lane.

The traffic modelling undertaken for EB2 and EB3R assumes that these three works have been completed and so form part of the baseline traffic environment discussed in **Section 3.10**.

4.2.1.2 William Roberts Road North

In the future, William Roberts Road north will no longer function as a through route between Reeves Road and Pakuranga Road, but rather as a local road to the surrounding residential properties. William Roberts Road north will be closed off once works are completed at the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection further south.

During this phase of construction, each end of William Roberts Road will be converted to a cul-de-sac with access off Ayr Road only. This in turn will remove the southern approach at the Pakuranga Road / William Roberts Road intersection, resulting in a no stop intersection until the RRF is built. The northern approach at the William Roberts Road / Reeves Road intersection will also be removed, resulting in a T-junction arrangement.

The majority of the existing footpath on the eastern side of William Roberts Road will be retained. **Figure 30** below shows the proposed layout of William Roberts Road north.

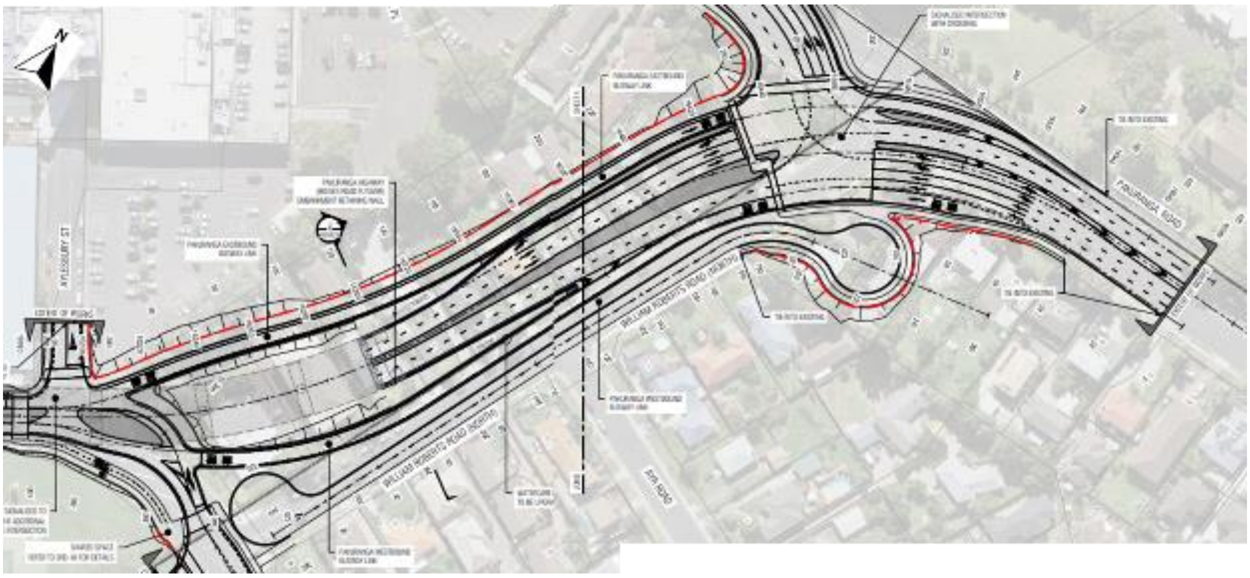


Figure 30: William Roberts Rd north

Figure 31 shows the indicative work zone of William Roberts Road north. The construction of William Roberts Road north is anticipated to have a duration of approximately six months.

Figure 31: Indicative work zones – William Roberts Rd north

4.2.1.3 Pakuranga Road Tie-In

The RRF will tie into Pakuranga Road with two through lanes per direction in addition to the dedicated bus lanes from Reeves Road. The Pakuranga Road western approach will tie into the intersection in a T-arrangement, providing two full length left-turn lanes for this minor approach and one short right-turn lane onto the RRF.

The eastern approach will consist of a short bus lane, two full length through lanes, one full length right-turn lane and an additional short right-turn lane. The southern RRF approach will consist of a bus lane from Reeves Road, a short left-turn lane, and two full length through lanes. Signalised pedestrian crossings will be provided across the southern and western approaches. **Figure 32** shows the proposed layout of the Pakuranga Road / RRF tie-in.

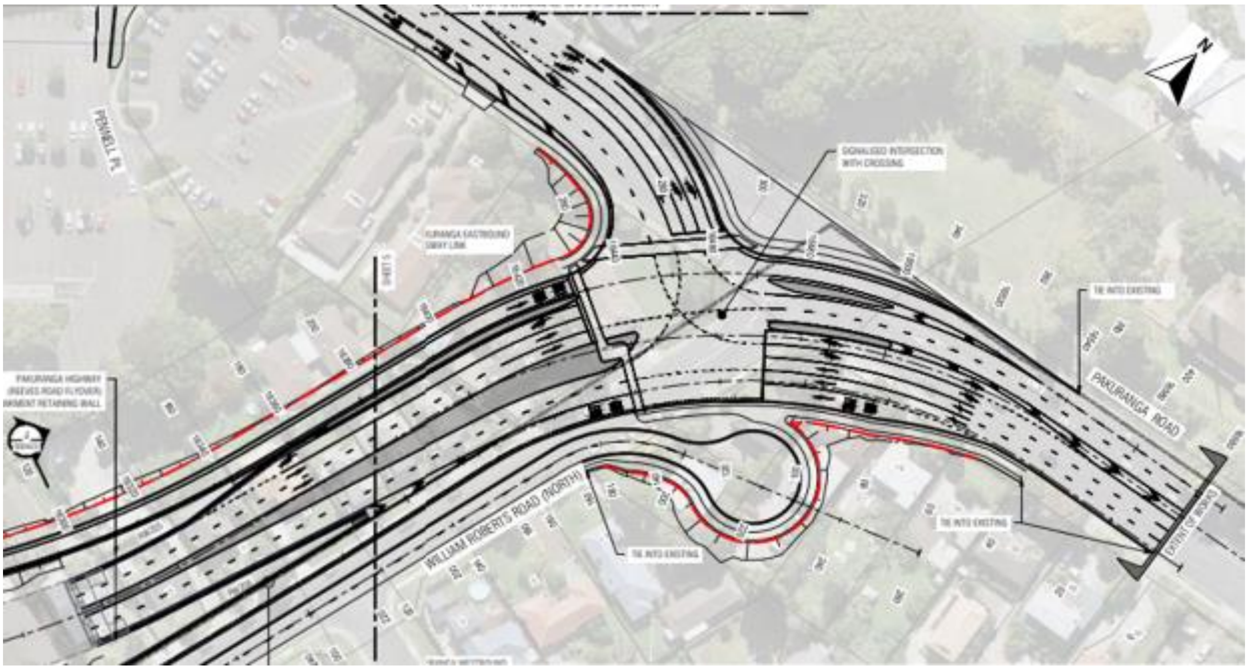


Figure 32: Pakuranga Rd / RRF tie-in

The tie-in of the RRF with Pakuranga Road will occur over four phases, generally maintaining five lanes of the Pakuranga Road carriageway. Three lanes will be provided for the westbound traffic and two lanes for the eastbound traffic. These works will be undertaken as soon as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection has been constructed.

Figure 33 shows the indicative work zone of the Pakuranga Road tie-in works. The construction of the tie-in is anticipated to have a duration of approximately six months.

Figure 33: Indicative work zone – Pakuranga Rd tie-in

4.2.1.4 SEART

In the future, the SEART off-ramp will consist of one short left-turn lane onto Ti Rakau Drive westbound, one short right-turn lane and two full length right-turn lanes onto Ti Rakau Drive eastbound. The SEART on-ramp will consist of two lanes to cater for the single left-turn from Ti Rakau Drive westbound and the single right-turn from Ti Rakau Drive eastbound.

Figure 34 below shows the proposed layout of the SEART on-ramp and off-ramp at Ti Rakau Drive. The works along SEART will be divided into three phases.

Figure 34: SEART on-ramp and off-ramp at Ti Rakau Dr

Phase 1 – Eastbound Carriageway:

The work associated with the eastbound carriageway will be offline between Ti Rakau Drive and Dale Crescent, on the northern side of SEART. Barrier protection will be installed along the existing shoulder up to the intersection with Ti Rakau Drive. To maintain the two left-turn lanes on the off-ramp, removal of the traffic island and temporary pavement will be required. Seven Oaks Drive will be reinstated further north of its current alignment.

Phase 2 – Westbound Carriageway:

During this phase the eastbound traffic will be moved to the new off-ramp. Westbound traffic will be transitioned to the existing eastbound lanes at the Ti Rakau Drive / Reeves Road intersection. This will allow for drainage works, permanent barrier removal and pavement construction on the existing westbound lanes. This phase of works will also consist of drainage works further west on SEART, which will be completed over night works with discrete closures.

Phase 3 – Centre of Carriageway:

Eastbound traffic will remain on the new off-ramp lanes from the preceding phases. Westbound traffic will be pushed to the southern edge of seal, maintaining the number of lanes as per the existing environment. A mixture of permanent and temporary barriers will protect the workspace.

A key component of this phase is construction of the falsework for the pier head above the Ti Rakau Drive right-turn lanes into SEART. Removal of the existing traffic island, including a streetlight and traffic signal pole, and construction of temporary pavement will be required to maintain the number of lanes as per the existing environment.

Figure 35 below shows the indicative work zones for SEART. The works along SEART are anticipated to have a duration of approximately three years.

Figure 35: Indicative work zones – SEART

4.2.1.5 Ti Rakau Drive

The works along Ti Rakau Drive in the EB2 project area have been divided into two sections to provide a clear and concise description of the proposed design and construction methodology.

Pakuranga Road to Reeves Road Section:

Ti Rakau Drive between Pakuranga Road and Reeves Road will in future consist of two through lanes per direction and offline bus lanes on the northern side of the carriageway. The eastern approach of Ti Rakau Drive at the intersection with Pakuranga Road will consist of one full length left-turn slip lane and one full length right-turn lane.

The two intersections with Aylesbury Street will be combined into one crossroads intersection with Palm Avenue, providing for all movements in and out of the side roads and will be signalised. The western approach on Ti Rakau Drive will consist of a short left-turn lane, two full length through lanes and a short right-turn lane, while the eastern approach will consist of full length shared through and left-turn lane, a full length through lane and a short right-turn lane. The northern approach on Aylesbury Street will consist of left-turn lane and a shared through and right-turn lane. The southern Palm Avenue approach will remain as per the existing environment.

A bus station will be provided between Aylesbury Street and Reeves Road, while a 'Kiss-and-Ride' facility will be provided on the private access road off Aylesbury Street that will consist of five parking spaces. A bidirectional cycleway will also be provided on the northern side of Ti Rakau Drive which will tie into the existing bidirectional cycleway on Pakuranga Road west (part of EB1) and the new unidirectional cycleways on Pakuranga Road east.

A signalised shared crossing will be provided across the northern approach at the Pakuranga Road / Ti Rakau Drive intersection, with a raised zebra crossing on the left-turn slip lane and signalised pedestrian crossings on all other approaches.

A raised intersection will be provided at the Ti Rakau Drive / Aylesbury Street / Palm Avenue intersection, a signalised shared crossing on the Aylesbury Street approach and signalised pedestrian crossings on all other approaches.

At the Ti Rakau Drive / Reeves Road / SEART intersection, a signalised shared crossing will be provided on the northern and eastern approaches, and signalised pedestrian crossings on the southern and western approaches. **Figure 36** below shows the proposed layout of Ti Rakau Drive between Pakuranga Road and Reeves Road.

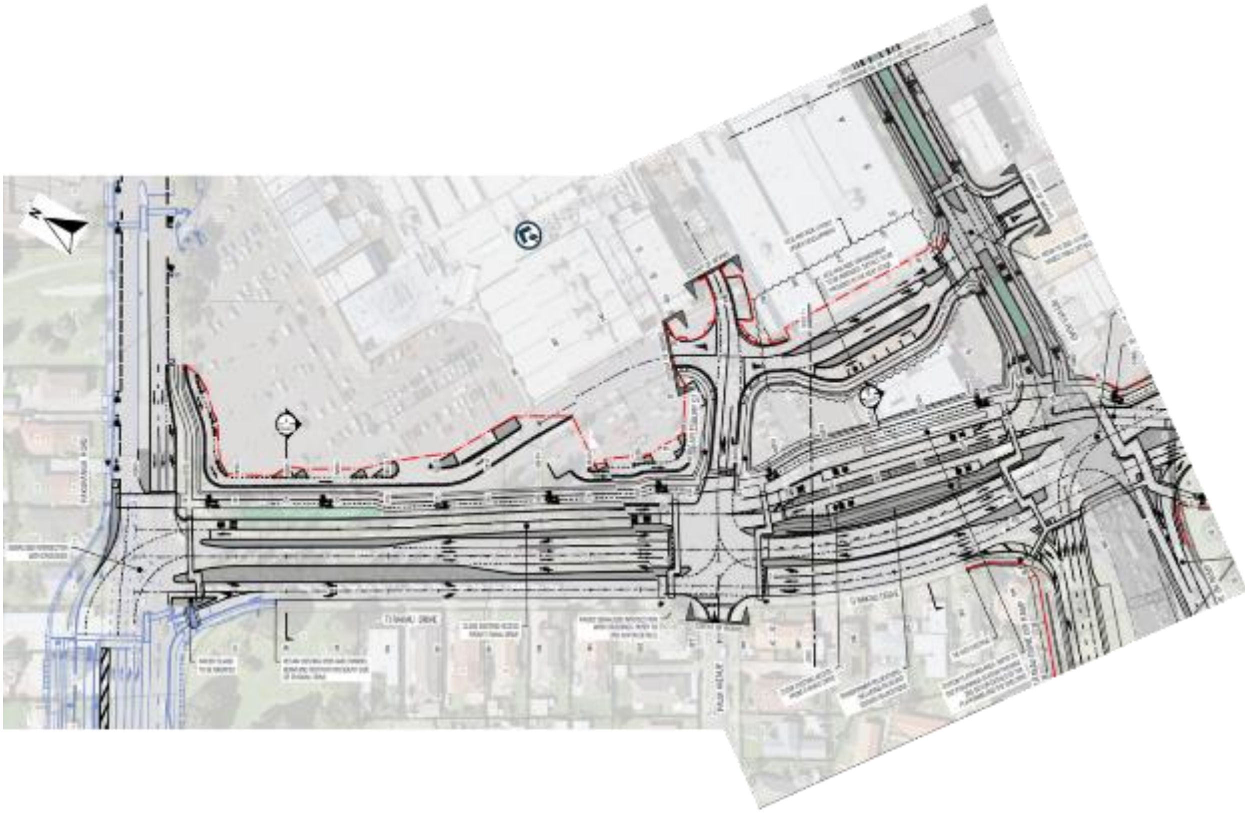


Figure 36: Ti Rakau Dr from Pakuranga Rd to Reeves Rd

The construction of Ti Rakau Drive between Pakuranga Road and Reeves Road will be divided into three sub-phases.

In Phase 1, the new bus lanes are to be built largely offline concurrent with the RRF abutment construction, and will include removal of the median island and shifting vehicle lanes. Construction of the new Ti Rakau Drive / Palm Avenue / Aylesbury Street crossroads intersection will be brought forward, and will be undertaken during this phase and is expected to have a duration of approximately eight months. The early completion of this intersection will provide improved access to the Pakuranga Plaza during the subsequent construction phases. It is anticipated that the intersection will be completed before the closure of Reeves Road.

Phase 2, which will consist of works in the centre of Ti Rakau Drive to construct the new eastbound lanes, will be undertaken after the completion of the RRF to maintain the capacity of this section of Ti Rakau Drive. In Phase 2, the eastbound traffic will be temporarily transferred to the new bus lanes, reducing the available eastbound lanes to two lanes.

Once the centre lane work is completed, Phase 3 will be able to commence and will consist of less extensive works in the westbound kerbside lane. The westbound carriageway will also be reduced to two lanes in this phase.

Figure 37 below shows the indicative work zones for Ti Rakau Drive from Pakuranga Road to Reeves Road. Construction of this section of Ti Rakau Drive is anticipated to have a duration of approximately three years.

Figure 37: Indicative work zones – Ti Rakau Dr from Pakuranga Rd to Reeves Rd

Ti Rakau Drive / Reeves Road Intersection:

The Ti Rakau Drive / Reeves Road intersection will provide for the transition of offline bus lanes from the west to online or central running bus lanes to the east. The northern Reeves Road approach to the intersection will serve bus movements only up to Cortina Place, and will connect to the bus lanes to the west of the intersection. The western approach will provide two full length through lanes and one short right-turn lane. The eastern approach will provide one full length left-turn lane and two full length through lanes.

As stated in **Section 4.2.1.4**, the SEART off-ramp will consist of one left-turn lane and three right-turn lanes. The intersection will also provide for the transition of the bidirectional cycleway to unidirectional cycleways on both sides of Ti Rakau Drive to the east of the intersection. Again, a signalised shared crossing will be provided on the northern and eastern approaches, and signalised pedestrian crossings on the remaining approaches. **Figure 38** below shows the proposed layout of the Ti Rakau Drive / Reeves Road intersection underneath the RRF.

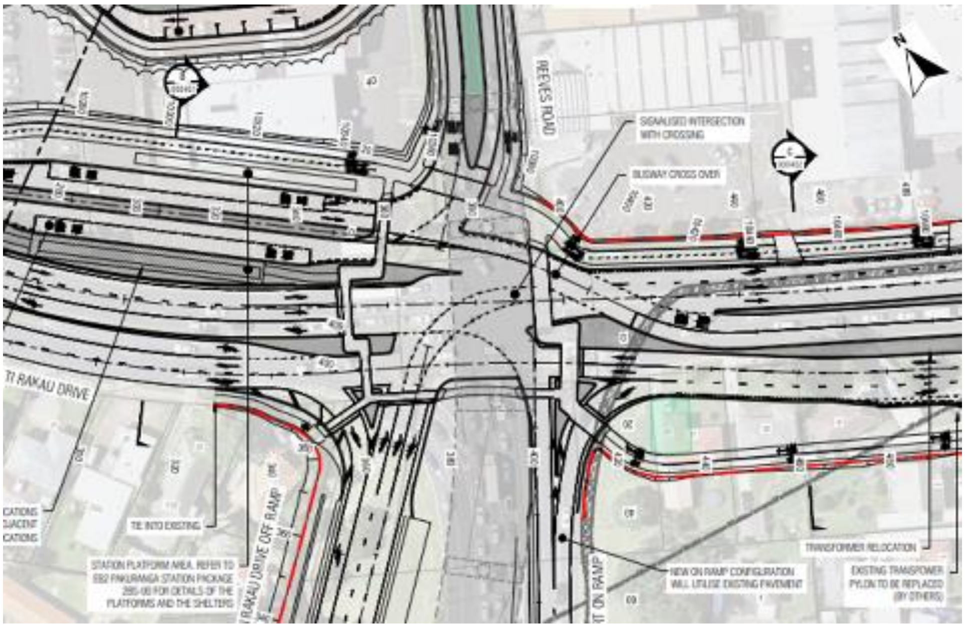


Figure 38: Ti Rakau Dr / Reeves Rd intersection

To minimise the adverse effects to traffic, temporary pavement will be constructed on the southern side of the intersection as part of the enabling works for the closure of Reeves Road. This will allow lanes to be shifted over while works are undertaken within the intersection footprint, as well as maintaining the majority of the existing number of lanes. The temporary realignment will be constructed and ready for use upon completion of the new Ti Rakau Drive / Palm Avenue / Aylesbury Street crossroads intersection further west, early in the construction programme.

Figure 39 shows the indicative work zone of the Ti Rakau Drive / Reeves Road intersection.

Figure 39: Indicative work zone – Ti Rakau Dr / Reeves Rd intersection

4.2.1.6 Pakuranga Road

Pakuranga Road between Ti Rakau Drive and the RRF will consist of four lanes (two lanes per direction) with unidirectional cycleways on each side. The eastern approach of Pakuranga Road at the intersection with Ti Rakau Drive will consist of a short left-turn lane and two full length through lanes. As stated in **Section 4.2.1.3**, the western Pakuranga Road approach at the intersection with the RRF will consist of two full length left-turn lanes and one short right-turn lane.

The works associated with Pakuranga Road will involve converting the existing kerbside lanes to cycleways while retaining the existing footpaths along both sides. The existing signalised midblock pedestrian crossing on Pakuranga Road, constructed as part of EB1, will remain. The Pakuranga Road / Brampton Court priority-controlled access to the Pakuranga Plaza will be realigned to improve access safety for right turners. **Figure 40** below shows the proposed layout of Pakuranga Road from Ti Rakau Drive to the RRF tie-in.

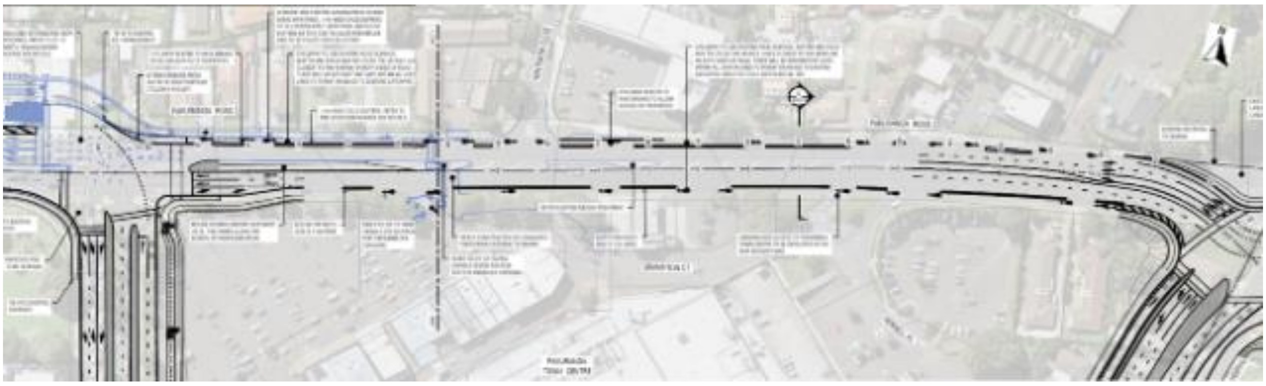


Figure 40: Pakuranga Rd from Ti Rakau Dr to the RRF

The initial stages of the Pakuranga Road construction will also include longitudinal drainage works between Kentigern Close and St Kentigern College, and will be undertaken concurrently with the enabling works, early in the construction programme. The new longitudinal drainage will tie into the existing drainage infrastructure crossing Pakuranga Road. Works to complete the tie-in of the drainage works between Kentigern Close and the signalised pedestrian crossing will be undertaken after the RRF is completed. **Figure 41** shows the indicative work zone for Pakuranga Road. Construction works along Pakuranga Road are anticipated to have a duration of approximately six months.

Figure 41: Indicative work zone – Pakuranga Rd

4.2.2 EB3R – Design and Construction Works

The general extent of the EB3R project area encompasses the following roads (see **Figure 42**, yellow):

- Ti Rakau Drive from Reeves Road to the western Ti Rakau Bridge abutment
- Short sections of Tiraumea Drive, Mattson Road, Roseburn Place, Edgewater Drive west, Wheatley Avenue, Edgewater Drive east, Gossamer Drive and Freemantle Place

Figure 42: EB3R general extent (yellow)

Ti Rakau Drive in the EB3R section of the Project will largely consist of two lanes per direction, similar to the existing environment. Online bus lanes will be provided along the entire length of the corridor from Reeves Road to Gossamer Drive. For the purposes of this ITA the online bus lanes will terminate at the western approach of the Ti Rakau Drive / Gossamer Drive intersection. An intermediate bus station will be provided in the centre of the carriageway between Roseburn Place and Wheatley Avenue, and another intermediate bus station near the intersection with Gossamer Drive. A full set of EB3R layout drawings is provided in **Appendix C**.

4.2.2.1 Ti Rakau Drive – Reeves Road to Mattson Road

This section of Ti Rakau Drive, between Reeves Road and Mattson Road, will consist of three lanes per direction. Bus lanes will also be provided along the centre of the carriageway.

The Tiraumea Drive intersection will remain left-in left-out only, as per the existing environment.

The intersections with William Roberts Road and Mattson Road will be combined into one signalised crossroads intersection. Both the William Roberts Road and Mattson Road approaches will consist of two lanes, a short left-turn lane and a full length shared through and right-turn lane. The Ti Rakau Drive eastern approach will consist of one full length shared through and left-turn lane, two full length through lanes and one short shared right-turn and U-turn lane. The western approach will consist of one full length left-turn lane, two full length through lanes and one short right-turn lane.

A bidirectional cycleway will be provided on the northern side of Ti Rakau Drive between Reeves Road and William Roberts Road, while a unidirectional cycleway (westbound) will be provided on the southern side as well.

Signalised shared crossings will be provided on all approaches at the Ti Rakau Drive / William Roberts Road / Mattson Road intersection. -A raised table will be provided across Tiraumea Drive. **Figure 43** shows the proposed layout of Ti Rakau Drive from Reeves Road to Mattson Road.

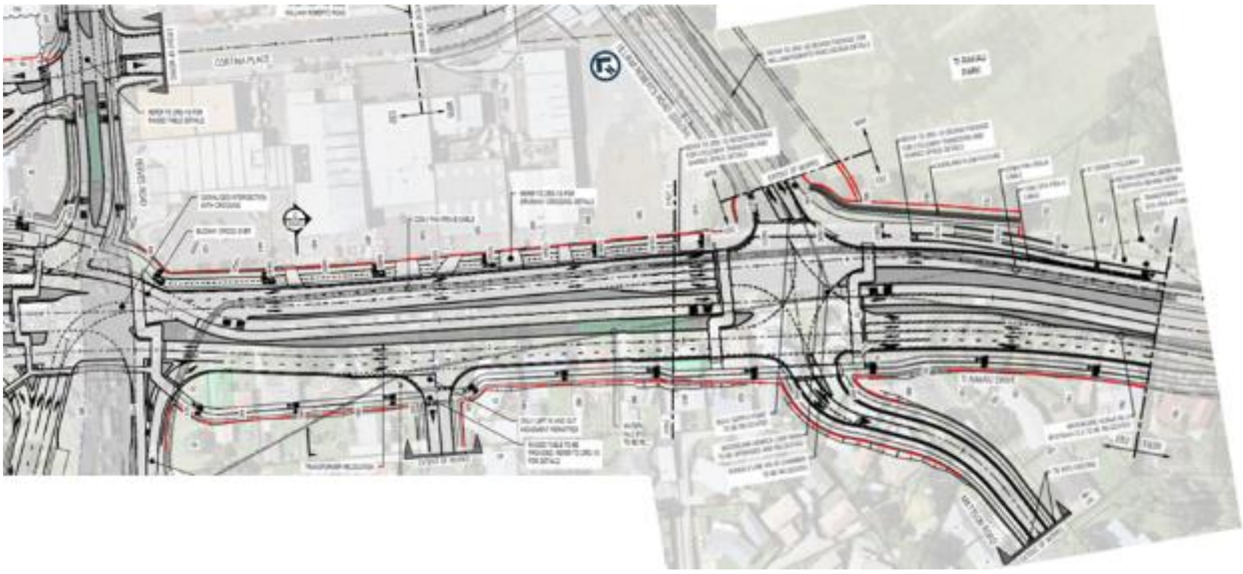


Figure 43: Ti Rakau Dr from Reeves Rd to Mattson Rd

The construction of this section of Ti Rakau Drive will be divided into six phases and will for the majority of its duration occur during the Reeves Road closure.

The first four phases will largely consist of offline works to construct the new westbound lanes on the acquired properties on the southern side of the carriageway. In addition, these phases will include the construction of the Mattson Road approach to the new crossroads intersection and will also include the construction of the Tiraumea Drive intersection.

The next phase will consist of works in the centre of the carriageway to construct the new bus lanes, after the completion of the RRF. During Phase 5, the new signalised Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection will be operational as well as all lanes on the William Roberts Road approach.

Finally, Phase 6 will include works in the existing eastbound lanes while traffic is diverted onto the newly constructed bus lanes. **Figure 44** shows the indicative works zones for Ti Rakau Drive from Reeves Road to Mattson Road. Construction of this section of Ti Rakau Drive is anticipated to have a duration of approximately one and a half years.

Figure 44: Indicative work zones – Ti Rakau Dr from Reeves Rd to Mattson Rd

4.2.2.2 Ti Rakau Drive – Mattson Road to Gossamer Drive

The intersections with Roseburn Place, Marriott Road, Edgewater Drive west and Chevis Place, Wheatley Avenue and Edgewater Drive east which currently provide for all movements in/out of the side roads, will be converted to LILO intersections. Two U-turn facilities will be provided along Ti Rakau Drive, one between Roseburn Place and Marriott Road for the westbound traffic and one between Edgewater Drive west and Wheatley Avenue for the eastbound traffic (see **Figure 45**).

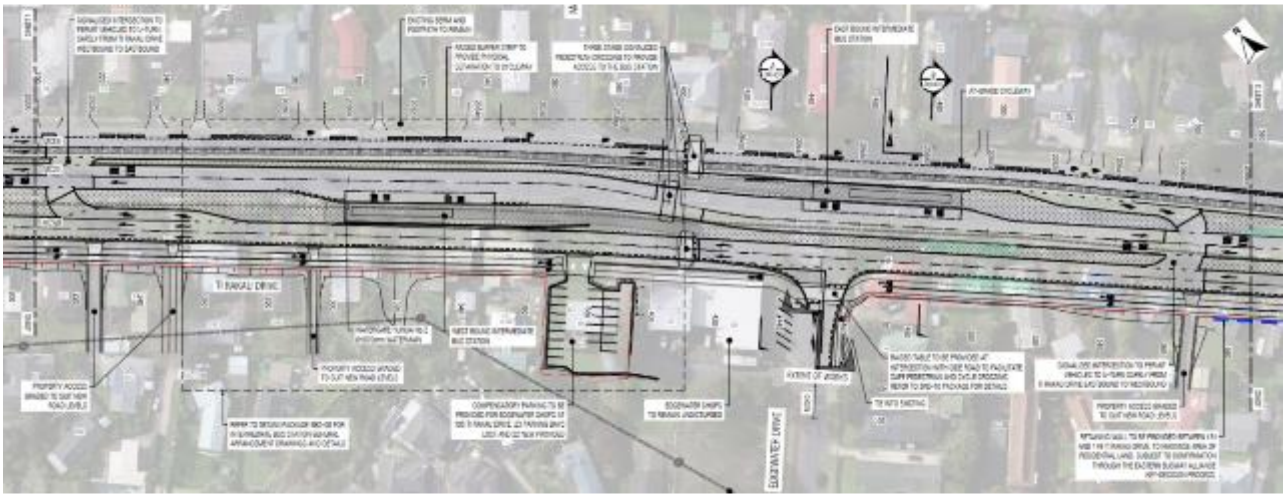


Figure 45: Ti Rakau Dr between Roseburn Pl and Wheatley Ave

Additionally, a U-turn manoeuvre will also be provided on the western approach at the Ti Rakau Drive / Gossamer Drive intersection. This is to provide access from Ti Rakau Drive eastbound into Edgewater Drive east, Wheatley Avenue and the properties on the southern side of Ti Rakau Drive between Edgewater Drive east and Freemantle Place. A U-turn manoeuvre will also be provided on the eastern approach of the Ti Rakau Drive / William Roberts Road / Mattson Road intersection to provide access onto Ti Rakau Drive eastbound from Roseburn Place.

A three-stage raised signalised pedestrian crossing will be provided, between Marriot Road and Edgewater Drive, to facilitate pedestrian access to the bus station from both sides of Ti Rakau Drive. Raised tables will be provided across Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east.

Figure 46 below shows the proposed layout of the Ti Rakau Drive / Gossamer Drive intersection. The western approach will consist of a short left-turn lane, two full length through lanes and one shared right-turn and U-turn short lane. The eastern approach will consist of one full length shared through and left-turn lane, one full length through lane, one short bus queue-jump lane and two short right-turn lanes.

The eastbound bus lane will transition to the northern side of Ti Rakau Drive to the proposed bus stop, and taper back into Ti Rakau Drive before the Ti Rakau Bridge. The southern Freemantle Place approach will consist of a short left-turn lane and a full length shared through and right-turn lane. The northern Gossamer Drive approach will consist of one short and one full length left-turn lane, and a shared through and right-turn short lane.

Signalised shared pedestrian and cyclist crossings will be provided on the northern and western approaches at the Ti Rakau Drive / Gossamer Drive intersection, with signalised pedestrian crossings on all other approaches. The Ti Rakau Drive / Gossamer Drive intersection will also be a raised intersection.

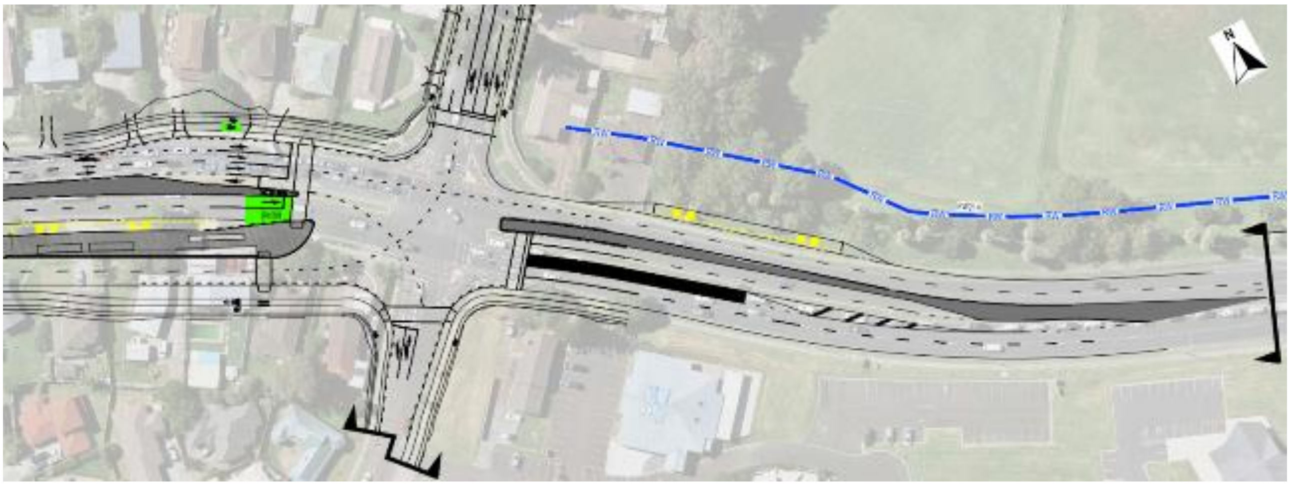


Figure 46: Ti Rakau Dr at Gossamer Dr

Throughout the construction of EB3R, the preferred methodology is to complete works offline to allow space to be provided for future lateral shifts of running lanes. The EB3R construction works between Mattson Road and Gossamer Drive are anticipated to occur over a period of approximately three years, and will be split into three main phases.

4.2.2.3 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 1)

Phase 1 will involve constructing the new westbound lanes offline in the acquired properties along the southern side of Ti Rakau Drive and rebuilding pavement at intersections where the new busway intersects. This phase will be divided into six sub-phases, a summary of which is provided in **Table 17** and will occur during the closure of Reeves Road.

Table 17: EB3R Phase 1 construction summary

Sub-Phase	Summary of Activities
1a-b	Construction of Roseburn Place in two sub-phases.
1c	Edgewater Drive west in one sub-phase.
1d-e	Wheatley Avenue in two sub-phases.
1f	Edgewater Drive east in one sub-phase.

The new westbound carriageway will consist of two lanes, similar to the existing environment. Establishing works will also be able to commence on the north-east quadrant of the Ti Rakau Drive / Gossamer Drive intersection to enable construction of the eastbound Gossamer Drive bus station to commence at any time.

Figure 47 below shows the indicative work zones for Phase 1 of EB3R, and is anticipated to have a duration of approximately one year and three months.

Figure 47: Indicative work zones – EB3R Phase 1

The pavement type specified for design requires closures of specific roadway sections for periods of at least one week before being opened to general traffic. These roadway sections have been divided into two categories with varying Temporary Traffic Management (TTM) approaches.

Category 1 (Detour Loops) – Edgewater Drive west and east:

The preferred approach to construct pavement through these intersections is to close one intersection at a time. As Edgewater Drive is a loop with two accesses to Ti Rakau Drive, traffic will be detoured to one end of the loop enabling the other end to be closed and rebuilt. The full closures are anticipated to reduce the overall time TTM will be required.

As above, Phase 1c will consist of the construction of the Edgewater Drive west intersection. All traffic along Edgewater Drive will be diverted to the Ti Rakau Drive / Edgewater Drive east intersection. A temporary traffic signal will be provided at this intersection to aid vehicles turning right into and out of Edgewater Drive. Phase 1f will include the construction of the Edgewater Drive east intersection, and all traffic along this side road will be diverted to the existing traffic signal at Edgewater Drive west.

Category 2 (Cul-de-sac Roads) – Wheatley Avenue and Roseburn Place:

Two cul-de-sac roads are located along Ti Rakau Drive that enable residential property access. To maintain access through Wheatley Avenue and Roseburn Place intersections, the approaches will be constructed in halves with temporary traffic signals installed and set back from the works, creating a one-way system on the side roads. As above, these intersections will be constructed during sub-phases 1a-b and 1d-e, respectively.

To minimise disruption to the main road, vehicles entering the cul-de-sac will have right-of-way. Green phases for vehicles leaving the cul-de-sac roads will only be triggered on the basis of demand. Traffic volumes on the side roads are predicted to be low during both peak periods (see **Table 18**).

Table 18: Ti Rakau Dr side road traffic volumes (2028)[20]

Side Road	Movement Out	AM Peak	PM Peak
Roseburn Pl	Left	20	7
	Right	10	8
	Total	**30**	**15**
Wheatley Ave	Left	31	22
	Right	0	0
	Total	**31**	**22**

Approximately one vehicle every two minutes would require access onto Ti Rakau Drive from Roseburn Place and Wheatley Avenue during the peak periods. Improved performance is expected on the side roads as the temporary traffic signal control would improve the delay currently being experienced at the priority-controlled intersections.

An alternative approach is also being considered whereby traffic to/from these side roads will be diverted to Edgewater Drive west and east, respectively, via temporary access tracks along the back of the acquired properties. This approach would support a more efficient construction programme. As above, the traffic volumes on these side roads are expected to be low during the peak periods, and the effects of this additional traffic at the Edgewater Drive intersections is expected to be low.

Freemantle Place:

The construction of the Freemantle Place approach will be brought forward in the programme, and will be undertaken during Phase 1 in EB3R (Mattson Road to Gossamer Drive). This will involve temporarily closing the kerbside left-turn short lane to construct the new kerbline.

Ti Rakau Drive / Gossamer Drive Intersection:

The Gossamer Drive approach enabling works will also be undertaken during Phase 1 of EB3R (Mattson Road to Gossamer Drive), see **Section 3.10.3.2** for a detailed description. These works will be undertaken before the closure of Reeves Road.

Lastly, during Phase 1 of EB3R (Mattson Road to Gossamer Drive), the Ti Rakau Drive eastbound and westbound left-turn slip lanes at this intersection will be converted to a signalised left-turn once the necessary stacking space has been constructed.

[20] Traffic volumes sourced from the WRRE AIMSUN model, with a 2028 horizon year.

4.2.2.4 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 2)

Phase 2 will consist of the construction of the bus lanes in the centre of Ti Rakau Drive and is expected to be undertaken during the closure of Reeves Road. The new bus lanes will tie into the EB2 bus lanes to the west and will terminate at Gossamer Drive to the east. The new Edgewater Drive bus station, the new westbound Gossamer Drive bus station and new U-turn facilities will also be constructed during this phase.

During Phase 2 of EB3R (Mattson Road to Gossamer Drive), the right-turn movements from all side roads will require removal, resulting in the intersections supporting LILO movements only. To mitigate these adverse effects to traffic, two new U-turn facilities will be constructed near Roseburn Place and Wheatley Avenue, respectively. The works in the median along Ti Rakau Drive, to enable the operation of the U-turn facilities, will be minimal and will be undertaken during night works. In the interim, while the bus lanes along the centre of Ti Rakau Drive are under construction, these U-turn facilities are expected to be unsignalised.

To provide access into Wheatley Avenue and Edgewater Drive east, while travelling eastbound on Ti Rakau Drive, a U-turn movement will also be provided on the western approach of the Ti Rakau Drive / Gossamer Drive intersection. Efforts will be made to complete this piece of work as early as possible during Phase 2 of EB3R (Mattson Road to Gossamer Drive).

Figure 48 below shows the indicative work zone for Phase 2 of EB3R (dark grey), and is expected to have a duration of approximately 11 months.

Figure 48: Indicative work zone – EB3R Phase 2

4.2.2.5 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 3)

Phase 3 will consist of works in the existing eastbound lanes and will have some temporal overlap with Phase 2 as some sections are completed. This is due to some Phase 3 works being completed under night works with discrete closures. However, the majority of the works under Phase 3 are expected to be completed after the completion of the RRF.

There is a large number of properties with driveways on the northern side of Ti Rakau Drive, meaning long term access will be required to allow vehicles to traverse through the site. As the pavement only requires resurfacing and not major reconstruction, this work will be completed in sections, with the road being trafficable during the daytime.

Figure 49 shows the indicative work zones for Phase 3 of EB3R, and is anticipated to have a duration of approximately six months.

Figure 49: Indicative work zones – EB3R Phase 3

During Phase 3 of EB3R (Mattson Road to Gossamer Drive), eastbound traffic along Ti Rakau Drive will be diverted onto the new bus lanes. Furthermore, all side roads on the southern side of Ti Rakau Drive will be temporarily converted back to full movement priority-controlled intersections during this phase. This will be enabled by not fully constructing the entire median under the previous phase of work, and by providing short right-turn pockets at Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east.

Phase 3 construction will also consist of works at the Ti Rakau Drive / Gossamer Drive intersection. Works during Phase 3 of EB3R (Mattson Road to Gossamer Drive) on the western and eastern approaches of the intersection have been brought forward in the construction programme and will occur during the Reeves Road closure, but after the RRF is open. These works will consist of the construction of the approach lanes of the western arm and the departure lanes as well as the medians on the eastern arm. This construction methodology, coupled with the updated construction methodology of Phases 1 and 2 above, will allow for more general traffic lanes to remain open during construction.

5 Assessment of Temporary Effects during Construction

The sections below provide an assessment of the temporary effects during construction of EB2 and EB3R including:

- Construction effects
- General traffic effects
- Effects to bus services and facilities
- Effects to pedestrians and cyclists
- Effects to property access and parking
- Effects to safety performance

5.1 Construction Effects

5.1.1 Construction Support Areas and Site Access Points

Construction Support Areas (CSAs) and Site Access Points (SAPs) are anticipated to vary throughout the construction phases, shifting as sections of the roadway are completed. The sections below provide details of notable CSAs and SAPs within the EB2 and EB3R project areas as advised by the construction team as well as an assessment of their temporary effects.

5.1.1.1 EB2 – 2 Cortina Place and 5 Reeves Road Site Offices

The properties at 2 Cortina Place and 5 Reeves Road have been acquired by AT and will serve as site offices for the EB2 project area. Therefore, the current use of these properties will no longer exist in the future. It is envisaged that Site Office 1 at 5 Reeves Road will accommodate approximately 120 workstations and Site Office 2 at 2 Cortina Place will accommodate approximately 30 workstations at the peak of construction. Office hours for the site offices will be from 07:00 to 19:00. **Figure 50** shows the location of Site Office 1 and 2 in the EB2 project area.

Figure 50: Site Office 1 and 2 locations

During the closure of Reeves Road, vehicle access to Site Office 1 from Reeves Road will not be maintained, although the property will still be accessible via Cortina Place. Pedestrian access to the property will be maintained at all times. Approximately 11 off-street parking spaces will be maintained on the eastern side of the property for visitors and deliveries.

The closure of Reeves Road will result in the loss of the access to Site Office 2 from the western frontage, however the property will still be accessible from Cortina Place. Pedestrian access to the property will be maintained at all times. The building in the centre of the property will be used as site office space, while the building along the eastern frontage of the property (red outline) will be demolished. Approximately five off-street parking spaces will be maintained on site and accessed from Cortina Place for material deliveries.

It is envisaged that, at least for the initial year of construction, site office staff will use public transport for commuter trips and will access the site offices on foot. A WTMP will be developed to achieve this. The aim of the WTMP will be to reduce the number of private vehicles travelling to the worksites and to increase the accessibility of the worksites through more travel options. Therefore, the temporary traffic effects from the site offices in the first year are expected to be very low. Following the initial year and as construction activities ramp up, a staff carpark will be provided at 26 Ti Rakau Drive.

5.1.1.2 EB2 – 26 Ti Rakau Drive Staff Carpark

It is envisaged that the property at 26 Ti Rakau Drive will be acquired by AT and will serve partially as a site office staff parking area and partially as a work zone for the new Pakuranga Town Centre bus station during construction. The existing building and parking area on the property are not in use and therefore the Project will have no effects on the property from a transport perspective.

Once the existing infrastructure has been demolished and the work zone has been established, a temporary staff carpark will be established until the construction of the Kiss-and-Ride facility. For the purposes of this ITA it was assumed the staff carpark will provide 150 parking spaces, one parking space per workstation in Site Office 1 and 2. The property currently has no direct access from Ti Rakau Drive, and is accessed via Reeves Road and the internal road network inside the Pakuranga Plaza.

Figure 51 below shows the location of the CSA to be located at 26 Ti Rakau Drive.

Figure 51: 26 Ti Rakau Dr CSA location

In the existing environment, the Pakuranga Plaza has six access points allowing for both in and out movements, with a seventh at Pepler Street allowing for movements out onto Pakuranga Road only. Throughout the construction programme of EB2, the accesses to Pakuranga Plaza will undergo several changes, some of which will be closed temporarily. Further details of effects to property access at the Pakuranga Plaza are provided in **Section 5.5.5.3**.

For the purposes of assessing the effects of the staff carpark, the 'worst-case' has been considered here, which will be during the Reeves Road closure. During this closure, access to this carpark will be gained via the three remaining accesses at Aylesbury Street north and south and at Brampton Court. It should be noted that the Pepler Street exit will also be open during this time.

As stated in **Section 5.1.1.1**, office hours for the site offices will be from 07:00 to 19:00, meaning a large proportion of site office staff is expected to travel on the road network outside of the AM and PM peaks. For the purpose of this ITA, assumptions were made to consider the staff carpark fully utilised and 50% of staff would be arriving/departing during the AM and PM peak hours, respectively.

Therefore, 150 parked vehicles, which would translate to 75 veh/h added to the traffic network and these vehicles would be accessing the Pakuranga Plaza from three access points during the peak hours. **Figure 52** below shows the background traffic volumes for both the AM and PM peak hours at these access points (PM traffic volumes in brackets).

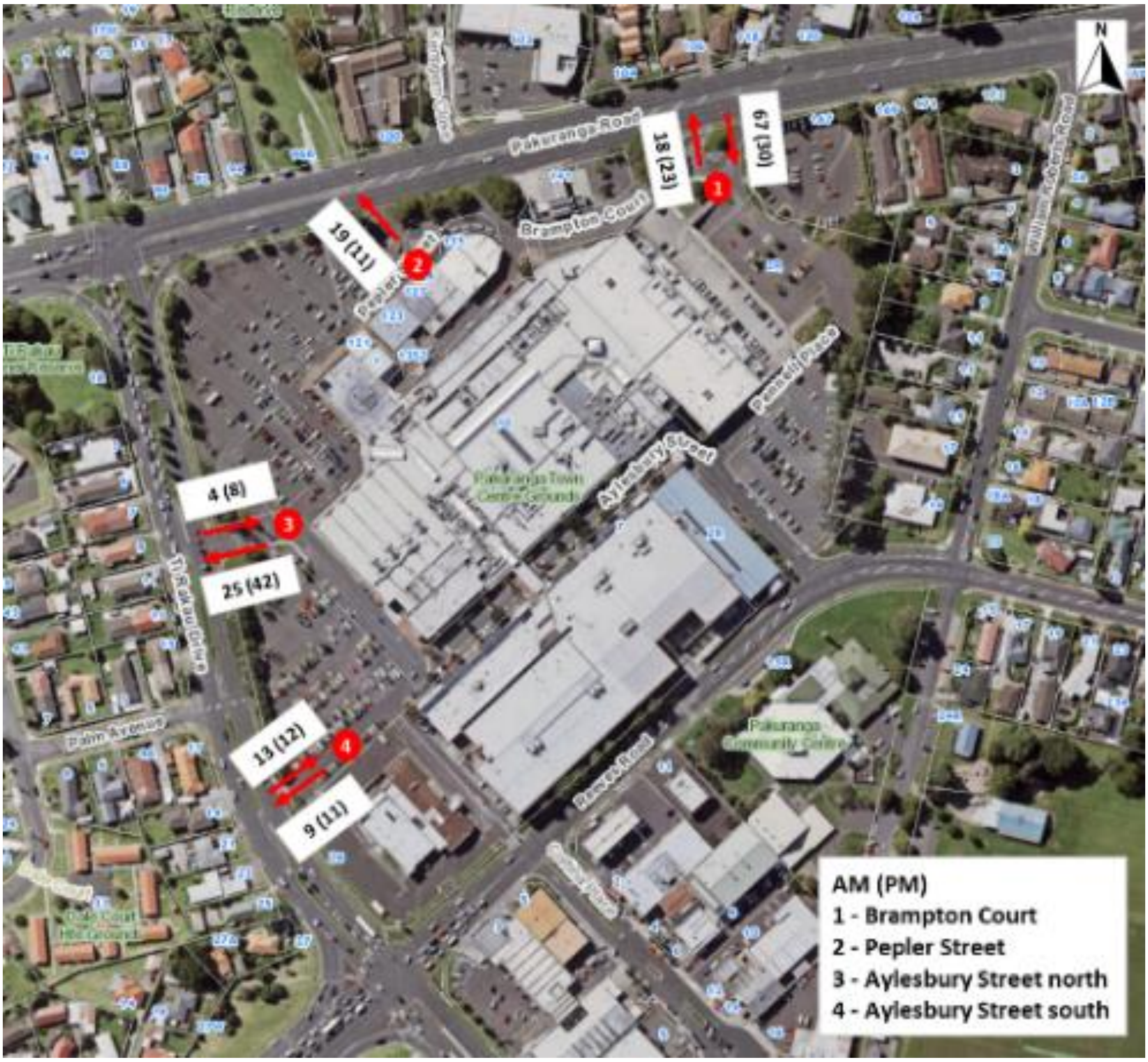


Figure 52: Pakuranga Plaza background traffic volumes[21]

[21] Traffic volumes sourced from the Do-Minimum AIMSUN model, with a 2028 horizon year.

The background traffic volumes on these access points are expected to be low during both the AM and PM peak hours. Furthermore, it would not be unreasonable to assume that the additional 75 veh/h would be distributed roughly evenly across these access points or to where the highest capacity is available. Therefore, the temporary effects of the staff carpark are expected to be very low.

5.1.1.3 EB2 – 2R Ti Rakau Drive Pennell Place CSA

During construction, the parking area off Pennell Place in the Pakuranga Plaza will be temporarily occupied and established as a CSA. **Figure 53** shows the location of the CSA.

Figure 53: Pennell Pl CSA location

The CSA will be used to support the construction of the RRF. In particular, it will be used to receive and pre-assemble the special Gantry (bespoke crane) to be used to lift and position the 'Super-T' beams. The CSA will also provide parking on site for specialist personnel and deliveries. The Pennell Place parking area will be occupied for approximately two years and two months.

Given the nature and operation of the CSA, general vehicle traffic volumes entering/exiting from the site are considered negligible. The operation and movement of the Gantry will be under strict construction traffic management control. Advance notice and appropriate public communication of such infrequent activities will be undertaken prior to these being initiated. This will be achieved through the Construction Traffic Management Plan (CTMP).

Therefore, the effects of the CSA on the transport network are expected to be very low. Effects to property access and parking at the Pakuranga Plaza due to the occupation are discussed in further detail in **Section 5.5.5.3**.

5.1.1.4 EB2 – William Roberts Road North Construction Yard

A CSA will be located on the south-western quadrant of the Pakuranga Road / William Roberts Road intersection and will serve as a laydown area of materials and aggregates. This construction yard is subject to a separate resource consent application[22], but is mentioned here for completeness.

It is proposed that the Pakuranga Road / William Roberts Road intersection will be signalised temporarily. This will improve the capacity of the right-turn movements into and out of William Roberts Road and improve safety of turning across three lanes of through traffic. Further details on intersection performance are provided in **Section 5.2.2.3** to **Section 5.2.2.5**.

5.1.1.5 EB2 – 14 Seven Oaks Drive Site Office / Laydown Area

A site office / laydown area will be established at 14 Seven Oaks Drive for the construction of EB2. The property has been acquired by AT. As such, the current residential use of this property will no longer exist during construction or at completion, therefore the CSA will have no effects on this property.

Figure 54 shows the location of the CSA to be located at 14 Seven Oaks Drive.

Figure 54: 14 Seven Oaks Dr CSA location

Access will be maintained off Seven Oaks Drive, utilizing the existing driveway. The existing house will be utilised as the office until de-construction of the structure is required. The site will be relatively small, and all parking requirements will be accommodated on site. The temporary effects of this contained site on the road network are expected to be negligible.

[22] LUC60403744

5.1.1.6 EB3R – 12 Bolina Cr, 143 Ti Rakau Dr and 178 Gossamer Dr Site Offices / Laydown Areas

Site offices / laydown areas will be established at 12 Bolina Crescent, 143 Ti Rakau Drive and 178 Gossamer Drive for the construction of EB3R. The properties have been acquired by AT. As such, the use of these properties will no longer exist during construction or at completion, therefore the CSAs will have no effects on these properties.

Figure 55 shows the location of the CSA to be located at 12 Bolina Crescent.

Figure 55: 12 Bolina Cr CSA location

Figure 56 shows the location of the CSA to be located at 143 Ti Rakau Drive.

Figure 56: 143 Ti Rakau Dr CSA location

Figure 57 shows the location of the CSA to be located at 220-222 Ti Rakau Drive and 178 Gossamer Drive.

Figure 57: 178 Gossamer Dr CSA location

Access will be maintained off Bolina Crescent, Ti Rakau Drive and Gossamer Drive, utilizing the existing driveways. The existing houses will be utilised as offices until de-construction of the structures is required. The sites will be relatively small, and all parking requirements will be accommodated on site. The temporary effects of these contained sites on the road network are expected to be negligible.

5.1.2 Construction Vehicle Effects

The sections below provide details on the construction routes, construction traffic volumes, hours of operation and vehicle types as advised by the construction team. Thereafter, an assessment of construction vehicle effects is provided, split into sections of the EB2 and EB3R project areas.

5.1.2.1 Construction Routes and Construction Traffic

The construction routes in and around the EB2 and EB3R project areas are shown in **Figure 58.** At the time of writing, suppliers of construction materials had not been confirmed. Therefore, the most likely routes for construction vehicle movements to the project area from plant and material sites not in the immediate vicinity will be the main corridors of Ti Rakau Drive, Pakuranga Road and SEART (main external routes below). The figure also shows the construction yard at 169-173 Pakuranga Road and the 'internal material transfer routes' to be used by construction vehicles.

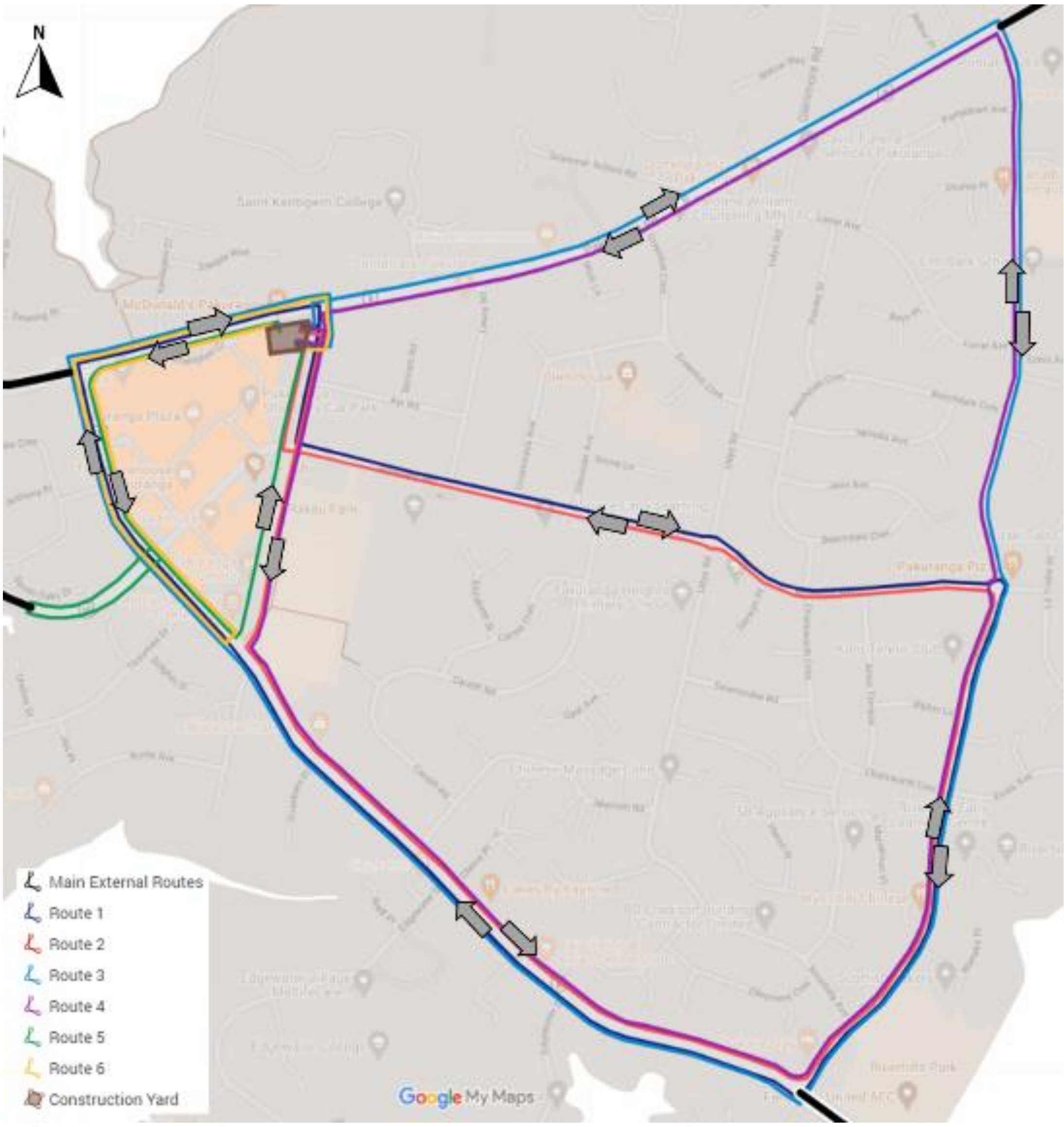


Figure 58: Construction vehicle routes

During EB2 and EB3R construction, roughly 50% of materials will be transported directly to the work zones from external supply yards as needed. The remaining 50% will be transported to the construction yard for storage until required. Construction material will be transported from the construction yard to the various work zones via six routes. **Table 19** below provides a description of each route as well as the anticipated number of vehicle movements. The number of vehicle movements also include the carting of demolition materials and excess spoil.

Table 19: Construction route description and movements

Route	Construction Activity	Description	Vehicle Movements [veh/h]
Route 1	EB3R Ti Rakau Dr westbound lanes (primary route)	Egress from the construction yard onto William Roberts Rd southbound, then Reeves Rd eastbound, Gossamer Dr southbound, Ti Rakau Drive westbound, Pakuranga Rd eastbound, William Roberts Rd southbound, return to construction yard.	9
Route 2	EB3R Ti Rakau Dr eastbound lanes (primary route)	Egress from construction yard onto William Roberts Rd southbound, then Ti Rakau Dr eastbound, Gossamer Drive northbound, Reeves Rd westbound, William Roberts Road northbound, return to construction yard.	10
Route 3	EB3R Ti Rakau Dr westbound lanes (secondary route)	Egress from construction yard onto William Roberts Rd northbound, then Pakuranga Rd eastbound, Gossamer Dr southbound, Ti Rakau Dr westbound, Pakuranga Rd eastbound, William Roberts Rd southbound, return to construction yard.	8
Route 4	EB3R Ti Rakau Dr eastbound lanes (secondary route)	Egress from construction yard onto William Roberts Rd southbound, then Ti Rakau Dr eastbound, Gossamer Dr northbound, Pakuranga Rd westbound, William Roberts Road southbound, return to construction yard.	9
Route 5	EB2 SEART	Egress from construction yard onto Pakuranga Rd westbound, then Ti Rakau Dr eastbound, SEART southbound, U-turn within work zone, SEART northbound, Ti Rakau Dr eastbound, William Roberts Rd northbound, return to construction yard.	10
Route 6	EB2 Ti Rakau Dr	Egress from construction yard onto Pakuranga Rd westbound, then Ti Rakau Dr eastbound, U-turn within work zone, Ti Rakau Drive westbound, Pakuranga Road eastbound, William Roberts Rd southbound, return to construction yard.	8

Route 1 will be the primary route for the construction of the Ti Rakau Drive westbound lanes with Route 3 as a secondary route in case of congestion or emergencies on Reeves Road. Similarly, Route 2 will be the primary route during the construction of the Ti Rakau Drive eastbound lanes, with Route 4 as a secondary route.

It should be noted that Route 1 and Route 3 will not be operating simultaneously with Route 2 and Route 4. This is due to the construction staging of Ti Rakau Drive in the EB3R project area. The new westbound lanes will be constructed first followed by the bus lanes in the centre and lastly the eastbound lanes.

5.1.2.2 Vehicle Types

It is anticipated that a range of vehicle sizes and types will be used for the construction activities within the EB2 and EB3R project areas. As stated above, roughly 50% of materials will be transported directly to the work zones as needed along the main external routes of Ti Rakau Drive, Pakuranga Road and SEART. The remaining 50% will be transported to the construction yard for storage until required. It is anticipated that 19m truck and trailers will be used for these activities. Materials from the construction yard will be transported to the various work zones via the six internal routes with smaller vehicles units such as 6-wheeler trucks.

Over-dimensional and over-weight deliveries are also expected; however, these will be infrequent, during low traffic periods such as night deliveries and will travel along appropriate routes such as arterial roads. The Ti Rakau Drive, Pakuranga Road and SEART corridors are well-suited to larger vehicles. Overall, the effects of these types of construction vehicles to the road network are expected to be negligible.

5.1.2.3 Hours of Operation

The vast majority of construction activities will be undertaken during 'typical weekdays' throughout the construction programme, as well as some weekends. Some construction activities will also be undertaken during lower traffic periods such as Easter and December holiday periods.

The general hours of operation for the construction activities and the construction routes will be from 07:00 to 18:00 on weekdays and 07:00 to 15:00 on Saturdays[23]. As such, construction vehicle movements will be balanced throughout the day, avoiding concentrations of construction traffic during the AM and PM peak hours. Therefore, the effects are expected to be very low.

It is anticipated that some night works will be undertaken to minimise the disruption to the public, businesses and traffic. Night works will be intermittent, and will not be continuous in a single location or activity for more than one month. These works will be controlled in part by the Project's consent conditions and management plans[24].

The sections below provide an assessment of construction vehicle effects on specific sections of the road network within the EB2 and EB3R project areas.

---

[23] It should be noted that staff will begin arriving at site prior to construction start times and leave after construction end times.

[24] These management plans include the Construction Noise and Vibration Management Plan (CNVMP).

5.1.2.4 EB2 – William Roberts Road North

This section provides an assessment of construction vehicle effects on William Roberts Road north, from Pakuranga Road to Reeves Road (see **Figure 59**).

Figure 59: William Roberts Rd north construction vehicle effects

The construction yard will be located on this section of roadway and will support the highest concentration of construction vehicles in the EB2 and EB3R project areas. At the peak of construction, William Roberts Road north is expected to carry an additional 20 veh/h northbound and 19 veh/h southbound. It should be noted that if Reeves Road is experiencing congestion or in case of an emergency, construction vehicles would be rerouted through Pakuranga Road, thereby reducing the construction vehicle traffic volumes on William Roberts Road.

In addition to the properties used by AT for the construction yard, all of the remaining properties on the western side of William Roberts Road north as well as 2 and 2A William Roberts Road on the eastern side have also been acquired and are flagged for demolition. Therefore, the demand for on-street parking along this section of road will be significantly reduced.

Pedestrian refuge islands are currently provided at both ends of William Roberts Road north to provide pedestrians with safe crossing opportunities.

Overall, the addition of the construction vehicles to William Roberts Road north will be roughly one vehicle every three minutes in each direction, on-street parking demand will be significantly reduced, and safe pedestrian crossing points are provided. Therefore, the effects are considered to be very low.

5.1.2.5 EB2 – William Roberts Road South

This section includes William Roberts Road south, from Reeves Road to Ti Rakau Drive, once the WRRE is completed (see **Figure 60**).

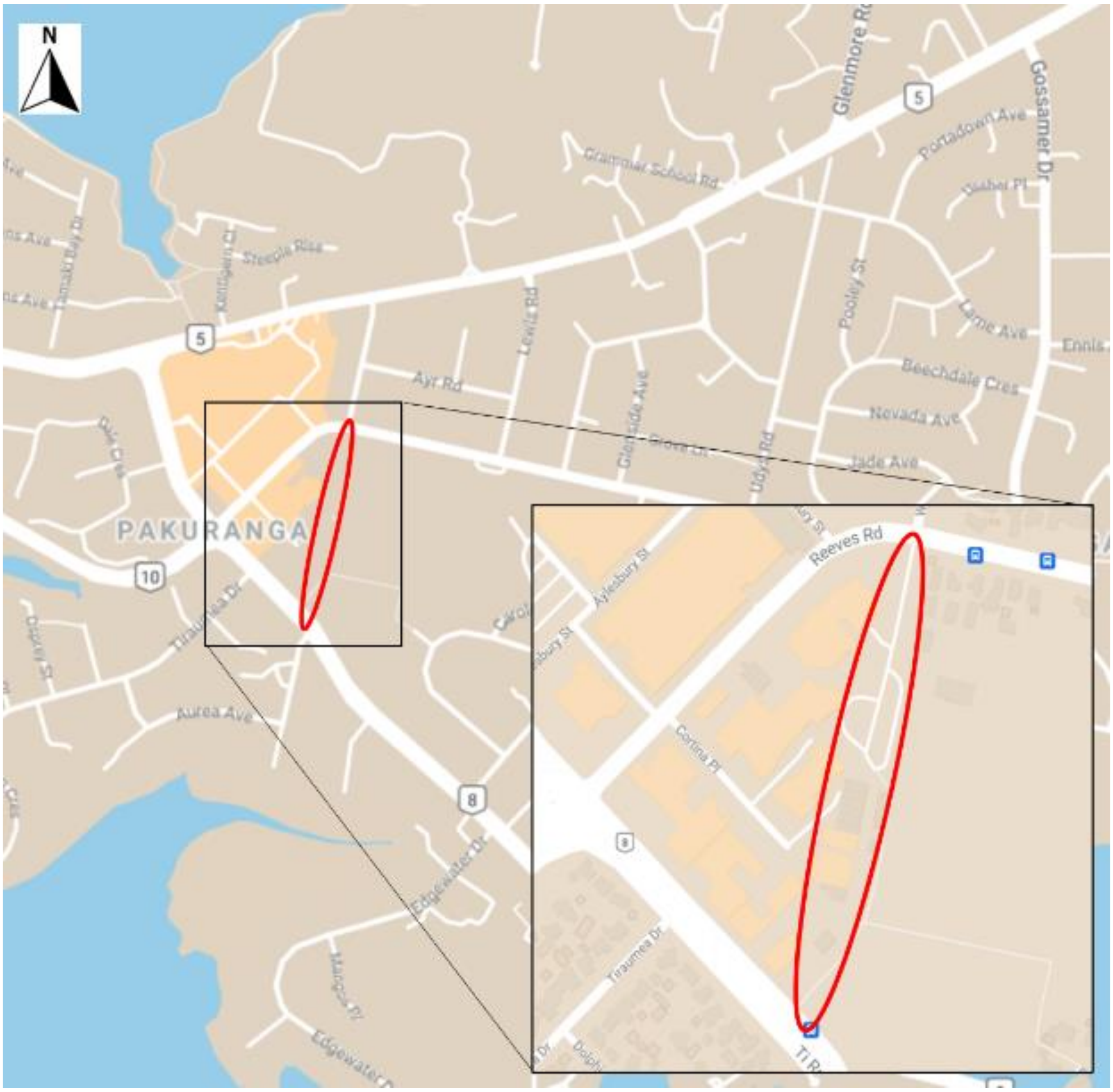


Figure 60: William Roberts Rd south construction vehicle effects

At the peak of construction, William Roberts Road south is expected to carry an additional 10 veh/h northbound and 10 veh/h southbound.

Some properties with vulnerable users such as the Pakuranga Leisure Centre, Barnardo's Early Learning Centre, Ti Rakau Park, and Dementia Auckland are located along this section of road. **Figure 61** below shows the location of these community and educational facilities.

Figure 61: William Roberts Rd south community and education facilities

However, once the William Roberts Road extension is completed, a low-speed environment will be created through a combination of the raised tables at the William Roberts Road / Cortina Place intersection, the raised pedestrian crossing near Ti Rakau Park and a 30 km/h posted speed limit. Furthermore, pedestrians will also be provided with safe crossing points at the Ti Rakau Drive / William Roberts Road and the William Roberts Road / Cortina Place intersections.

Nevertheless, appropriate community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through the area. This will be achieved through the CTMP.

Overall, William Roberts Road is expected to carry roughly one construction vehicle every six minutes northbound and southbound, and a combination of speed calming features will create a low-speed environment. Therefore, the effects are considered to be very low.

5.1.2.6 EB2 – Reeves Road

This section includes Reeves Road from William Roberts Road in the west to Gossamer Drive in the east (see **Figure 62**).

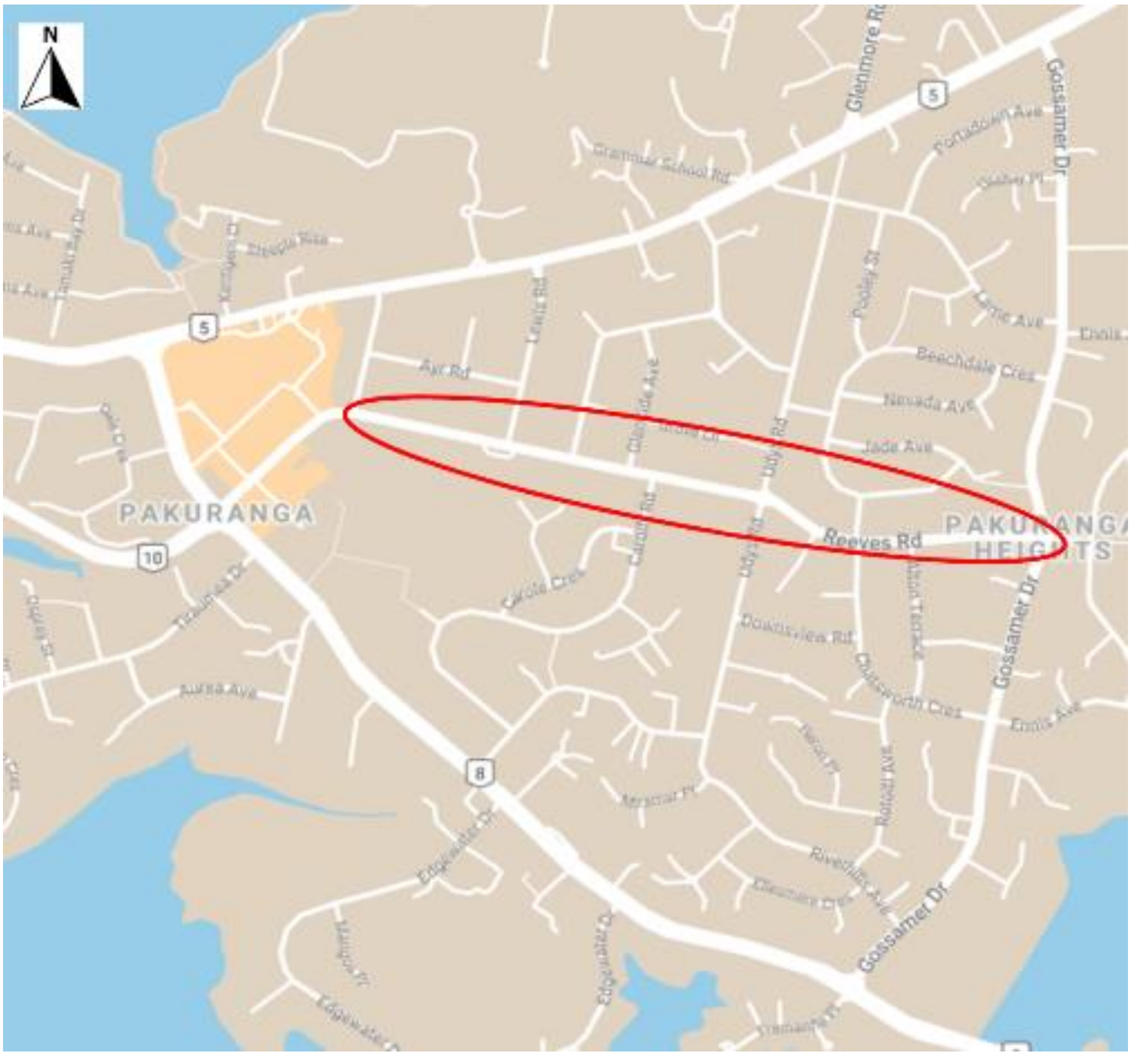


Figure 62: Reeves Rd construction vehicle effects

During construction of the Ti Rakau Drive westbound and eastbound lanes, Reeves Road will support an additional 9 veh/h in the eastbound direction and 10 veh/h in the westbound direction, respectively. It should be noted that these two construction phases will not occur simultaneously.

Reeves Road, in the existing environment, serves as a through route between Pakuranga Town Centre and Pakuranga Heights. As such, the carriageway consists of 4.4 m wide lanes and a 1.8 m flush median along the entire length. It also serves as a bus route for the 711 service.

In the existing environment there are three educational facilities that front Reeves Road, which will experience an increase in heavy vehicle traffic volumes. The Pakuranga Intermediate School, KIDSpace Early Learning Centre Pakuranga, and the Pakuranga Kindergarten are educational facilities with vulnerable users, and all have direct access off Reeves Road in the existing environment. The locations of these facilities are shown in **Figure 63** below.

Figure 63: Reeves Rd education facilities

The users of the facilities are, however, currently provided with ample and safe crossing facilities. Pedestrians are provided with a signalised pedestrian crossing outside the Pakuranga Intermediate School, and a pedestrian crossing near Cardiff Road for users of the KIDSpace Early Learning Centre. An uncontrolled pedestrian crossing is located near Gerwyn Place outside the Pakuranga Kindergarten; however, a pedestrian refuge island is provided here to facilitate a staged crossing if required.

Nevertheless, appropriate community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through the area. This will be achieved through the CTMP.

Overall, Reeves Road will carry roughly one construction vehicle every six minutes either in the westbound or eastbound directions at the peak of construction. Furthermore, Reeves Road consists of a wide carriageway which supports larger sized vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be very low.

5.1.2.7 EB2 – Pakuranga Road

This section includes Pakuranga Road from Ti Rakau Drive in the west to William Roberts Road in the east (see **Figure 64**).

Figure 64: Pakuranga Rd construction vehicle effects

At the peak of construction Pakuranga Road is expected to carry an additional 17 veh/h eastbound and 18 veh/h westbound.

Pakuranga Road is an arterial road, and will for the majority of the construction period consist of three lanes per direction. Multiple bus services run along this road and as such Pakuranga Road is well-suited to larger sized vehicles. Signalised pedestrian crossings are also provided at the Ti Rakau Drive / Pakuranga Road intersection and the Pepler Street exit from Pakuranga Plaza.

Overall, Pakuranga Road will carry roughly one construction vehicle every three minutes eastbound and westbound at the peak of construction. Furthermore, Pakuranga Road is an arterial route supporting large vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.2.8 EB2 – SEART

This section includes SEART from Ti Rakau Drive to the southern abutment of the RRF, see **Figure 65**.

Figure 65: SEART construction vehicle effects

During construction of the RRF southern abutment, construction vehicles will enter onto SEART turning right from the western Ti Rakau Drive approach and will gain access to the work zone from the on-ramp. A 180˚ turn will be executed within the work zone, allowing construction vehicles to exit back onto the SEART off-ramp. Construction vehicles will head back to the construction yard by turning right onto Ti Rakau Drive.

At the peak of construction, the SEART on-ramp and off-ramp are expected to carry an additional 10 veh/h each, which translates to one construction vehicle every six minutes. Therefore, the effects are considered to be negligible.

5.1.2.9 EB2 and EB3R – Ti Rakau Drive

This section includes Ti Rakau Drive between Pakuranga Road to SEART (Section 1) and SEART to Gossamer Drive (Section 2), see **Figure 66**.

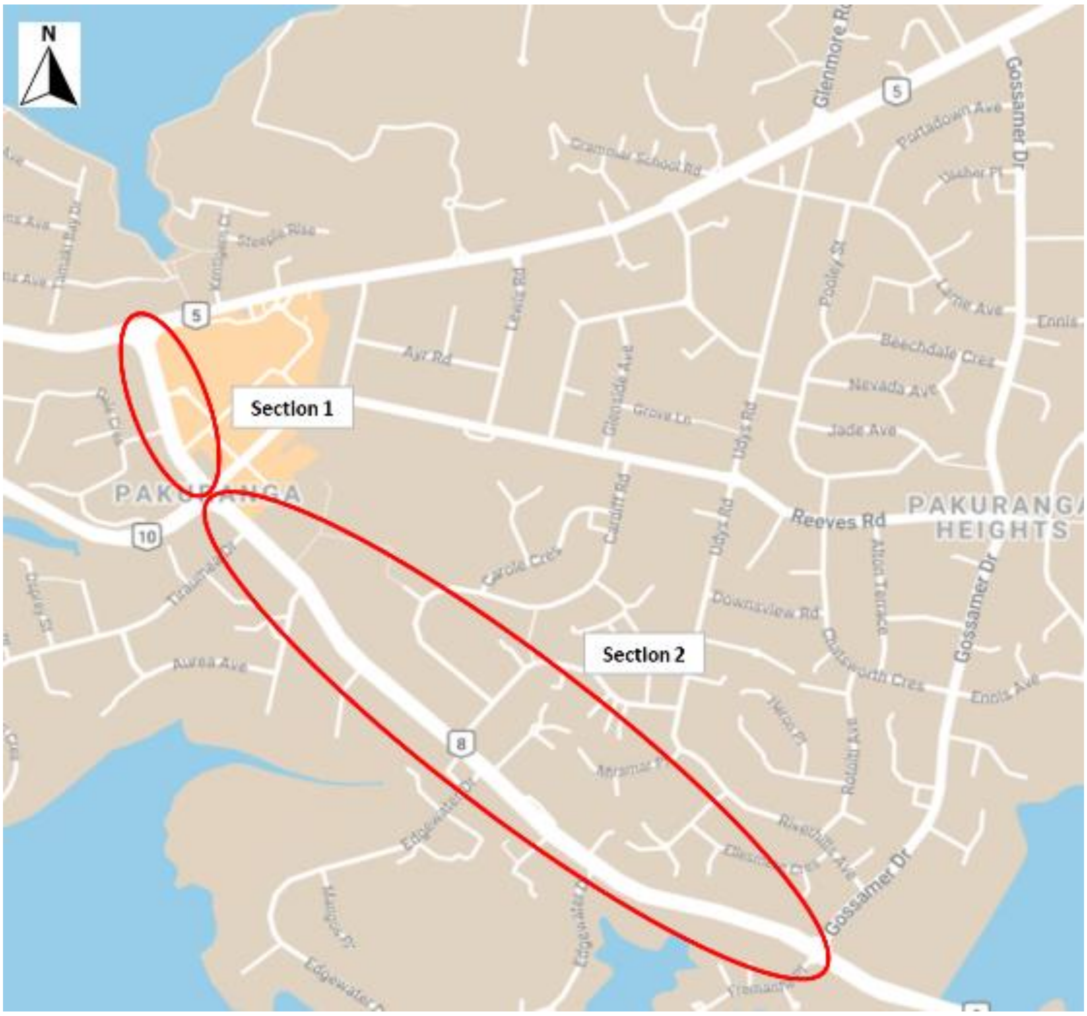


Figure 66: Ti Rakau Dr construction vehicle effects

Section 1 is expected to carry an additional 17 veh/h westbound and 18 veh/h eastbound at the peak of construction, while Section 2 is expected to carry an additional 9 veh/h westbound and 10 veh/h eastbound, respectively. It should be noted that the westbound and eastbound directions of Section 2 will not be loaded simultaneously as described above.

Ti Rakau Drive is an arterial road, and will for the majority of the construction period consist of two lanes per direction. Multiple bus services currently run along this road and as such is well-suited to larger sized vehicles. Signalised pedestrian crossings are provided at Pakuranga Road, Reeves Road, Mattson Road, Edgewater Drive west and Gossamer Drive.

Overall, Ti Rakau Drive will carry roughly one construction vehicle every three minutes westbound and eastbound at the peak of construction. Furthermore, Ti Rakau Drive is an arterial route supporting large vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.2.10 EB3R – Gossamer Drive

This section includes Gossamer Drive from Ti Rakau Drive in the south to Reeves Road in the north (see **Figure 67**).

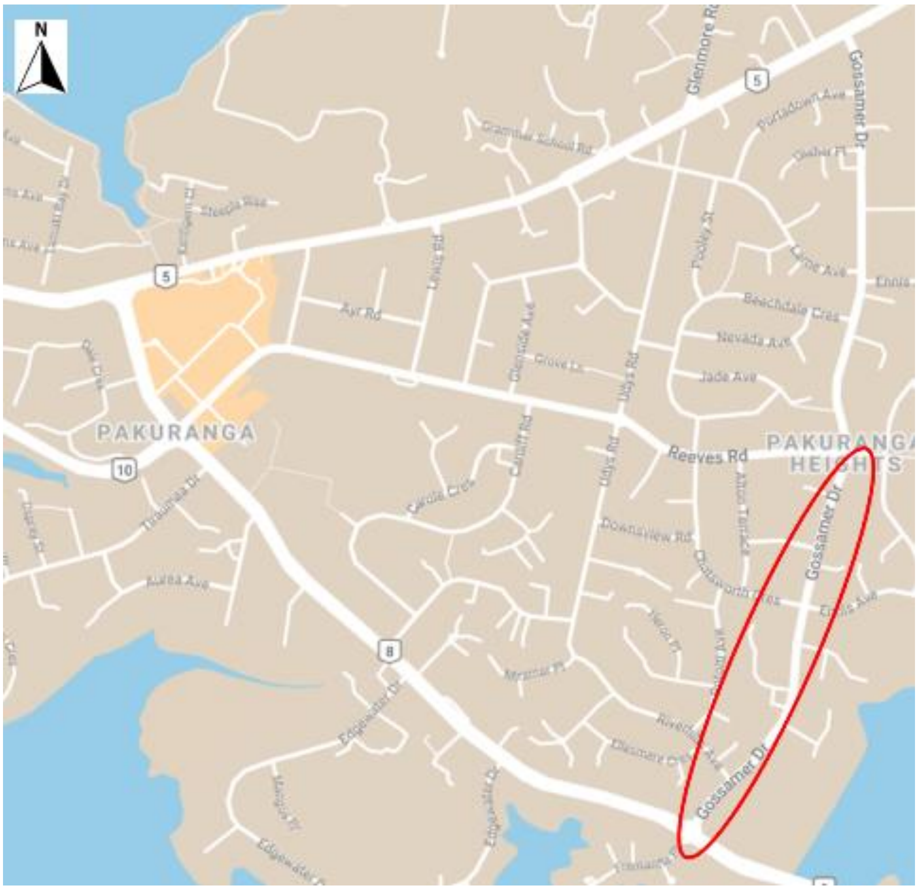


Figure 67: Gossamer Dr construction vehicle effects

During the construction of the Ti Rakau Drive westbound and eastbound lanes, Gossamer Drive will support an additional 9 veh/h southbound and 10 veh/h northbound, respectively. It should be noted that these two construction phases will not occur simultaneously.

Gossamer Drive, in the existing environment, serves as a through route between Ti Rakau Drive and Pakuranga Road. As such, the carriageway consists of 4.0 m wide lanes. Gossamer Drive is also a school bus route.

In the current environment, pedestrians are provided with a signalised pedestrian crossing at the Ti Rakau Drive / Gossamer Drive intersection and a pedestrian crossing near Chatsworth Crescent. In addition, all approaches to the Gossamer Drive / Reeves Road roundabout are provided with pedestrian refuge islands to facilitate a staged crossing if required.

Overall, Gossamer Drive will carry roughly one construction vehicle every six minutes either in the northbound or southbound directions at the peak of construction. Furthermore, Gossamer Drive consists of a wide carriageway which supports larger sized vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.3 Summary of Temporary Construction Effects

Overall, the temporary effects of the various CSAs that will be established as well as the construction traffic in the EB2 and EB3R project areas will be mitigated appropriately and are considered to be negligible or very low.

A WTMP will be developed to reduce the number of private vehicles travelling to the worksites and to increase accessibility of the worksites through more travel options.

CTMPs will be developed for the Project to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this.

Hours of operation, especially night works, will be controlled in part by the Project's consent conditions and management plans, including the CNVMP.

5.2 General Traffic Effects

The sections below provide an assessment of effects to general traffic during construction. General traffic effects refer to the movement of traffic across the road network as a whole. An assessment at a network-wide level, provides a better understanding as to the wider traffic effects of the Project and is based on the results from various AIMSUN and SIDRA traffic modelling assessments[25].

As stated in **Section 2.3**, Auckland's transport networks are constantly changing, undergoing improvements from new initiatives and being optimised. Furthermore, the global COVID-19 pandemic dramatically affected travel patterns and behaviours, and uncertainty remains that these effects would continue into the future. Given these factors, careful consideration was given to determine what formed the "existing environment".

For the purposes of the scenarios employed by the traffic modelling and this assessment, the existing environment was based on pre COVID-19 travel behaviours and a number of committed transport projects (including EB1 and WRRE Works) as well as the EB2/EB3R enabling works. Furthermore, a conservative approach was followed, whereby a 2028 future year was used to compare a Do-Minimum (without project) scenario and the EB2/EB3R scenarios. This approach allowed for the direct comparison between scenarios.

5.2.1 Construction Traffic

As stated in **Section 5.1.2**, the effects of the estimated construction traffic volumes are expected to be negligible or very low and will be catered for within the existing road network. Therefore, a separate modelling assessment of the 'Do-Minimum' and 'Do-Minimum + Construction Traffic' scenarios on the entire network was not considered necessary.

5.2.2 Intersection Performance during Construction

5.2.2.1 Overview of Performance Criteria and Modelling Scenario Development

Intersection performance analyses were undertaken, using SIDRA, of the transport network comprised of selected intersections in the EB2 and EB3R project areas. The analyses consisted of a comparison between the Do-Minimum and EB2/EB3R scenarios for both the AM and PM peak hours. The performance criteria for the assessment were based on the Level of Service (LOS), degree of Saturation (DOS) or v/c ratio and delay in seconds. The LOS is a measure of the average delay at an intersection and is a function of the intersection control (see **Table 20** below).

Table 20: Level of Service for intersections

Level of Service	Control Delay (d) for Buses, Freight and General Traffic
	Signalised intersections
A	d < 10 sec
B	10 < d <= 20 sec
C	20 < d <= 35 sec
D	35 < d <= 55 sec
E	55 < d <= 80 sec
F	d > 80 sec

[25] These assessments were undertaken in accordance with the methodology set out in **Section 2.4**.

It should be noted that SIDRA cannot produce an overall intersection performance LOS for priority-controlled intersections. This is due to some approaches at priority-controlled intersections being uncontrolled, i.e., free flow, hence no control delay. As per the Transport Minimum Requirements guiding the design of the Project, overall intersection performance of LOS E or better for signalised intersections, with regards to general traffic, was considered acceptable throughout this ITA.

The DOS is a measure of utilisation of the capacity of the intersection between 0 and 1, based on the traffic load forecast for the intersection. In SIDRA, the DOS is reported by turn movements based on the traffic load divided by the calculated capacity. At signalised intersections, the calculated capacity considers the signal phase times and the effective green time for any particular turn movement. The overall intersection DOS metric is based on the maximum reported DOS for any movement within the intersection.

The traffic modelling undertaken in this ITA considered the 'worst-case' scenarios to determine the temporary effects during construction. During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as to produce construction staging with less adverse effects to road traffic. This process has led to a more refined construction staging. The temporary effects were modelled in five separate construction scenarios to simulate the expected traffic distribution that could occur due to changes in the road network.

Figure 68 provides a simplified schematic of the construction activities that informed the development of the construction scenarios assessed in this ITA. It should be noted that activity duration should not be interpreted from this schematic.

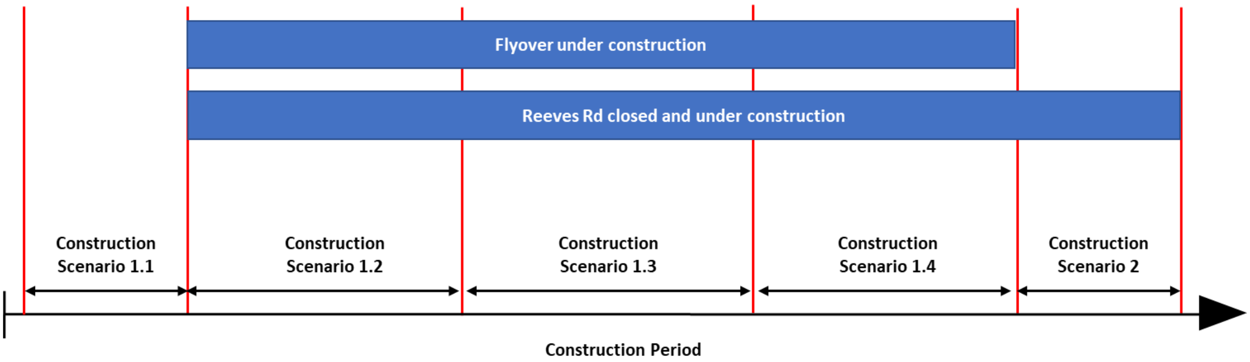


Figure 68: Construction modelling scenarios

Considering the construction programme from a transport perspective, the closure of Reeves Road and the ongoing construction of the RRF are considered as major changes to the transport network in the EB2 and EB3R project areas. Construction Scenario 1.1 to 1.4 simulate these activities.

The next major change to the transport network is the completion of the RRF, while Reeves Road underneath the RRF remains closed. These changes are simulated in Construction Scenario 2.

The sections below provide a description of each individual scenario, analysis of the scenario, followed by an assessment.

5.2.2.2 Construction Scenario 1.1

Construction Scenario 1.1 simulates various enabling works being undertaken, drainage works and offline works with some resultant lane closures as safety barriers are installed (see **Appendix K** for indicative construction staging diagrams in EB2 and **Appendix L** for EB3R). These include:

- WRRE works are not expected to be completed by this stage and therefore Reeves Road in EB2 will remain open.
- Construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive, between Pakuranga Road and Reeves Road, as well as the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection, see **Section 4.2.1.5** (Phase 1). This will reduce the eastbound carriageway to two lanes.
- Longitudinal drainage works in the kerbside lane of the westbound carriageway along Pakuranga Road in EB2, between Kentigern Close and St Kentigern College, see **Section 4.2.1.6**. The flush median will be utilised to maintain three traffic lanes in the westbound direction, while temporarily reducing the eastbound direction to two lanes and removing the right-turn into William Roberts Road.
- Construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive, between Reeves Road and Gossamer Drive, as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection, see **Section 4.2.2.1** (Phases 1-4) and **Section 4.2.2.3** (Phase 1). This will reduce one through lane on the eastern approach at the Ti Rakau Drive / Reeves Road / SEART intersection to a short lane and the westbound carriageway to two lanes between Tiraumea Drive and Mattson Road.
- Temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R, see **Section 4.2.2.3** (Phase 1).

Intersection Performance:

Demand flows from the 2028 AIMSUN Do-Minimum Scenario were used to test Construction Scenario 1.1. Traffic signal phasing diagrams per intersection are provided in **Appendix D** and lane performance summaries per intersection are provided in **Appendix E**.

Table 21 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1 during the AM peak, with a 2028 horizon year.

Table 21: Intersection performance – Do-Minimum vs Construction Scenario 1.1 (AM peak)

Intersection	Do-Minimum			Construction Scenario *1.1*		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	32	C	0.89	32
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	1.69	7
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	N/A	7.23	228
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.87	27
Reeves Rd / Aylesbury St	N/A	0.24	1	N/A	0.26	1
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.89	14
Ti Rakau Dr / Aylesbury St north	N/A	1.46	5	N/A	1.12	4
Ti Rakau Dr / Aylesbury St south	N/A	0.24	1	N/A	0.34	1
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	D	0.89	50
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.89	21
Ti Rakau Dr / Edgewater Drive west	C	0.85	27	C	0.86	28
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.06	84

SIDRA analysis indicates that in the AM peak, overall Construction Scenario 1.1 is expected to result in minimal adverse effects to intersection performance along the network. Compared to the Do-Minimum scenario, similar intersection performance is expected at all intersections, except the William Roberts Road / Reeves Road and Ti Rakau Drive / Mattson Road intersections. However, these intersections are still expected to operate with spare capacity.

Table 22 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1 during the PM peak, with a 2028 horizon year.

Table 22: Intersection performance – Do-Minimum vs Construction Scenario 1.1 (PM Peak)

Intersection	Do-Minimum			Construction Scenario *1.1*		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	D	0.89	46
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.86	10
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	N/A	48.04	3108
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.72	14
Reeves Rd / Aylesbury St	N/A	1.03	42	N/A	0.37	1
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	1.00	22
Ti Rakau Dr / Aylesbury St north	N/A	5.50	49	N/A	4.67	35
Ti Rakau Dr / Aylesbury St south	N/A	0.38	1	N/A	0.38	1
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	1.02	69
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.88	20
Ti Rakau Dr / Edgewater Drive west	C	0.89	31	C	0.85	26
Ti Rakau Dr / Gossamer Dr	D	0.91	45	D	0.89	44

SIDRA analysis indicates that in the PM peak, Construction Scenario 1.1 is expected to result in acceptable intersection performance along the network overall, with minor mitigation measures in place.

In order to manage the heavy demand on Pakuranga Road eastbound during the drainage works, it is recommended that Signal Phase D, at the Pakuranga Road / St Kentigern College intersection, be modified to a variable phase in the PM peak, only to be called when necessary. Through SIDRA analysis, it is expected that overall, more green time would be available to the major eastbound movement and queues would be manageable (see **Appendix D**). Consultation with the Auckland Transport Operations Centre (ATOC) will be undertaken to with regards to this mitigation measure.

Compared to the Do-Minimum scenario, similar or better intersection performance is expected at all intersections, except the Ti Rakau Drive / Reeves Road / SEART intersection. However, this intersection is still expected to operate at an acceptable LOS E.

5.2.2.3 Construction Scenario 1.2

Construction Scenario 1.2 simulates various completed enabling works, the initial closure of Reeves Road and ongoing offline works (see **Appendix K** and **Appendix L**). These include:

- Closure of Reeves Road between Ti Rakau Drive and Cortina Place in EB2.
- Ongoing construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive and the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Safety barriers will be installed on the existing kerbline of the eastbound carriageway to maintain three lanes.
- Completion of the temporary pavement on the southern side of the Ti Rakau Drive / Reeves Road / SEART intersection in EB2 (see **Section 4.2.1.5**), undertaken as part of the previous stage. In addition, a 3rd right-turn lane will be provided on the SEART offramp for vehicles turning onto Ti Rakau Drive eastbound. All slip lanes will be temporarily converted to pass through the intersection during this stage. As such, a double left-turn onto SEART will be provided. The pedestrian crossing on the eastern approach will be removed temporarily.
- Completion of the WRRE (see **Section 3.10.2**).
- Temporary signalisation of the Pakuranga Road / William Roberts Road intersection in EB2, see **Section 5.1.1.4.**
- Ongoing construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection. This will reduce the westbound carriageway to two lanes between Tiraumea Drive and Mattson Road.
- Temporary closure and construction of the Ti Rakau Drive / Edgewater Drive west intersection in EB3R, see **Section 4.2.2.3** (Phase 1c). During this closure, all traffic along Edgewater Drive will be diverted to the eastern intersection, which will be signalised temporarily.
- Completion of the enabling works at the Ti Rakau Drive / Gossamer Drive intersection in EB3R (see **Section 3.10.3.2**) as well as converting the left-turn slip lane on the western and eastern approaches to pass through the intersection, see **Section 4.2.2.3** (Phase 1). These works will be undertaken in the preceding stage, will be offline works, and will partly be undertaken during night works if necessary.
- Ongoing temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix M** and lane performance summaries per intersection are provided in **Appendix N**. Demand flows from the 2028 AIMSUN Construction Scenario 1.3 were used to test Construction Scenario 1.2 as Construction Scenario 1.3 was determined to be the most critical.

Table 23 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.2 during the AM peak, with a 2028 horizon year.

Table 23: Intersection performance – Do-Minimum vs Construction Scenario 1.2 (AM Peak)

Intersection	Do-Minimum			Construction Scenario 1.2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	C	0.89	29
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	4.75	52
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	C	0.89	22
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.85	22
Reeves Rd / Aylesbury St	N/A	0.24	1	N/A	0.02	2
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.25	5
William Roberts Road / Cortina Pl	Built during WRRE			N/A	0.17	3
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			D	0.84	38
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	C	0.92	33
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.50	1
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.89	22
Ti Rakau Dr / Edgewater Dr west	C	0.85	27	C	0.86	21
Ti Rakau Dr / Edgewater Dr east	N/A	1.99	17	C	0.89	23
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.21	113

The analysis indicates that overall in the AM peak, Construction Scenario 1.2 is expected to result in minimal adverse effects at the majority of intersections.

Average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the increased demand on Pakuranga Road as a section of Reeves Road will be closed during this stage. However, all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

The temporary signalisation of the Pakuranga Road / William Roberts Road intersection is expected to significantly reduce the average delay, particularly for vehicles turning right into/out of William Roberts Road.

The Ti Rakau Drive / Gossamer Drive intersection is also expected to experience an increase in delay. However, the intersection is already at capacity in the Do-Minimum Scenario and average delay is still expected to be less than the traffic signal cycle length.

Table 24 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.2 during the PM peak, with a 2028 horizon year.

Table 24: Intersection performance – Do-Minimum vs Construction Scenario 1.2 (PM Peak)

Intersection	Do-Minimum			Construction Scenario 1.2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	C	0.92	34
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.88	26
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	E	1.91	67
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.85	16
Reeves Rd / Aylesbury St	N/A	1.03	42	N/A	0.04	2
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	0.14	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.20	3
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			C	0.85	24
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	0.99	72
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.44	1
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.88	19
Ti Rakau Dr / Edgewater Dr west	C	0.89	31	C	0.88	22
Ti Rakau Dr / Edgewater Drive east	N/A	3.41	28	C	0.89	23
Ti Rakau Dr / Gossamer Dr	D	0.91	45	E	1.08	76

Construction Scenario 1.2 is expected to have acceptable intersection performance overall during the PM peak with some mitigation measures in place.

In order to manage the heavy demand on Pakuranga Road eastbound, it is recommended that fixed time cycles and offsets be implemented at the following intersections:

- Pakuranga Road / William Roberts Road (temporary traffic signal)
- Pakuranga Road / St Kentigern College

Through SIDRA analysis, a cycle length of 150 seconds and an offset of 13 seconds to St Kentigern College using the William Roberts Road intersection as reference, is expected to lead to manageable queues and delays (see **Appendix M**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Similar to the AM peak, average delay at the Pakuranga Road / Brampton Court intersection is expected to increase. However, all other access points to the Plaza are expected to have spare capacity should some diversions occur.

Although moderate increases in average delay are expected at the Ti Rakau Drive / Reeves Road / SEART and Ti Rakau Drive / Gossamer Drive intersections, these intersections are still expected to operate an acceptable LOS E.

5.2.2.4 Construction Scenario 1.3

Construction Scenario 1.3 simulates the full closure of Reeves Road, completion of the new SEART offramp and ongoing offline works (see **Appendix K** and **Appendix L**). These include:

- Closure of Reeves Road from Ti Rakau Drive to William Roberts Road in EB2.
- Ongoing construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive and the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Three lanes on the eastbound carriageway will be maintained.
- Completion of the new SEART offramp in EB2, providing two left-turn lanes (one of which will be temporary) and two right-turn lanes, see **Section 4.2.1.4** (Phase 1). The 3rd right-turn lane will have been constructed by this stage, but will not be operational until the Ti Rakau Drive eastbound carriageway has been widened.
- Ongoing construction of the new SEART onramp in EB2 by shifting traffic over to the existing offramp pavement, see **Section 4.2.1.4** (Phase 2). These works are not expected to lead to a reduction in general traffic lanes.
- Completion of the WRRE.
- Temporary signalisation of the Pakuranga Road / William Roberts Road intersection in EB2**.**
- Ongoing construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection. The left-turn onto SEART will be converted back to a slip lane and the westbound carriageway to two lanes between Tiraumea Drive and Mattson Road. The pedestrian crossing on the eastern approach will be removed temporarily.
- Completion of the enabling works at the Ti Rakau Drive / Gossamer Drive intersection in EB3R, including converting the left-turn slip lane on the western and eastern approaches to pass through the intersection.
- Ongoing temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix O** and lane performance summaries per intersection are provided in **Appendix P**.

Table 25 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.3 during the AM peak, with a 2028 horizon year.

Table 25: Intersection performance – Do-Minimum vs Construction Scenario 1.3 (AM Peak)

Intersection	Do-Minimum			Construction Scenario 1.3		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	C	0.91	34
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	4.12	45
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	B	0.89	22
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.85	22
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.26	5
William Roberts Road / Cortina Pl	Built during WRRE			N/A	0.17	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			E	1.01	69
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	D	0.89	54
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.50	1
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.89	21
Ti Rakau Dr / Edgewater Dr west	C	0.85	27	C	0.89	30
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.27	83

The analysis indicates that in the AM peak, Construction Scenario 1.3 is expected to result in minimal adverse effects at the majority of intersections.

Again, average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the full closure of Reeves Road and resultant increased demand on Pakuranga Road. However, all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

As above, the temporary signalisation of the Pakuranga Road / William Roberts Road intersection is expected to improve the average delay significantly.

Table 26 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.3 during the PM peak, with a 2028 horizon year.

Table 26: Intersection performance – Do-Minimum vs Construction Scenario 1.3 (PM Peak)

Intersection	Do-Minimum			Construction Scenario 1.3		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	C	0.93	35
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.93	27
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	B	0.92	28
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.86	13
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	0.28	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.15	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			B	0.85	20
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	0.96	64
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.43	1
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.88	20
Ti Rakau Dr / Edgewater Drive west	C	0.89	31	C	0.89	30
Ti Rakau Dr / Gossamer Dr	D	0.91	45	E	1.08	72

Construction Scenario 1.3 is expected to have acceptable intersection performance during the PM peak with some mitigation measures in place, similar to Construction Scenario 1.2.

The heavy demand on Pakuranga Road eastbound is expected to be manageable through implementing fixed time cycles and offsets at the following intersections:

- Pakuranga Road / William Roberts Road (temporary traffic signal)
- Pakuranga Road / St Kentigern College

A cycle length of 150 seconds and an offset of 13 seconds to St Kentigern College using the William Roberts Road intersection as reference, is expected to lead to manageable queues and delays (see **Appendix O**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Similar to Construction Scenario 1.2, moderate increases in average delay are expected at the Ti Rakau Drive / Reeves Road /SEART and Ti Rakau Drive / Gossamer Drive intersections. However, these intersections are still expected to operate at an acceptable LOS E.

5.2.2.5 Construction Scenario 1.4

Construction Scenario 1.4 simulates the full closure of Reeves Road, completion of the new SEART onramp and ongoing offline works (see **Appendix K** and **Appendix L**). These include:

- Closure of Reeves Road from Ti Rakau Drive to William Roberts Road in EB2.
- Completion of the new SEART offramp in EB2, providing two left-turn lanes and two right-turn lanes.
- Completion of the new SEART onramp in EB2, see **Section 4.2.1.4**. Offline construction of the southern RRF abutment will then commence (Phase 3).
- Ongoing construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive and the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Three lanes on the eastbound carriageway will be maintained.
- Completion of the WRRE.
- Temporary signalisation of the Pakuranga Road / William Roberts Road intersection in EB2.
- Ongoing construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection. The left-turn slip lane onto SEART will be maintained while the westbound carriageway is reduced to two lanes between Tiraumea Drive and Mattson Road. The pedestrian crossing on the eastern approach will be removed temporarily.
- Temporary closure and construction of the Ti Rakau Drive / Edgewater Drive east intersection in EB3R, see **Section 4.2.2.3** (Phase 1f). During this closure, all traffic along Edgewater Drive will be diverted to the western intersection.
- Completion of the enabling works at the Ti Rakau Drive / Gossamer Drive intersection in EB3R, including converting the left-turn slip lane on the western and eastern approaches to pass through the intersection.
- Ongoing temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix Q** and lane performance summaries per intersection are provided in **Appendix R**. Demand flows from the 2028 AIMSUN Construction Scenario 1.3 were used to test Construction Scenario 1.4 as Construction Scenario 1.3 was determined to be the most critical.

Table 27 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.4 during the AM peak, with a 2028 horizon year.

Table 27: Intersection performance – Do-Minimum vs Construction Scenario 1.4 (AM Peak)

Intersection	Do-Minimum			Construction Scenario 1.4		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	C	0.92	30
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	4.75	52
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	C	0.89	22
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.85	23
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.27	5
William Roberts Road / Cortina Pl	Built during WRRE			N/A	0.17	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			C	0.86	35
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	E	0.90	60
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.50	1
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.88	21
Ti Rakau Dr / Edgewater Dr west	C	0.85	27	C	0.89	28
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.27	83

The analysis indicates that in the AM peak, Construction Scenario 1.4 is expected to result in minimal adverse effects overall.

Similar to Construction Scenario 1.3, average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the full closure of Reeves Road. However, all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

Also similar to the previous scenarios, average delay at the Pakuranga Road / William Roberts Road intersection is expected to improve significantly.

Table 28 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.4 during the PM peak, with a 2028 horizon year.

Table 28: Intersection performance – Do-Minimum vs Construction Scenario 1.4 (PM Peak)

Intersection	Do-Minimum			Construction Scenario 1.4		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	C	0.91	35
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.12	8
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	C	0.89	27
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.86	12
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	0.27	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.15	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			B	0.85	20
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	0.99	68
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.43	1
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.89	20
Ti Rakau Dr / Edgewater Drive west	C	0.89	31	C	0.89	31
Ti Rakau Dr / Gossamer Dr	D	0.91	45	E	1.08	72

Construction Scenario 1.4 is also expected to have acceptable intersection performance during the PM peak with some mitigation measures in place.

Similar to Construction Scenario 1.3, the heavy demand on Pakuranga Road eastbound is expected to be manageable through implementing fixed time cycles and offsets at the following intersections:

- Pakuranga Road / William Roberts Road (temporary traffic signal)
- Pakuranga Road / St Kentigern College

A cycle length of 150 seconds and an offset of 13 seconds to St Kentigern College using the William Roberts Road intersection as reference, is expected to lead to manageable queues and delays (see **Appendix Q**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Low to moderate increases in average delay are expected at the Ti Rakau Drive / Reeves Road /SEART and Ti Rakau Drive / Gossamer Drive intersections. However, these intersections are still expected to operate at an acceptable LOS E.

Following Construction Scenario 1.4, before the RRF is operational, Phase 2 works are expected to commence in the centre of Ti Rakau Drive in EB3R between Mattson Road and Gossamer Drive (see **Section 4.2.2.4**). During these works the existing number of lanes on Ti Rakau Drive will be maintained in addition to the two new U-turn facilities and the U-turn manoeuvres as Mattson Road and Gossamer Drive. As such, the temporary effects are expected to similar to Construction Scenario 1.4.

5.2.2.6 Construction Scenario 2

Construction Scenario 2 simulates the completion of the RRF, while Reeves Road underneath remains closed. Various other ongoing construction activities, with lesser expected effects, as well as sections of work already completed were also included under Construction Scenario 2. These include:

- Completion of the William Roberts Road north closure works, see **Section 4.2.1.2**.
- Completion of the Pakuranga Road / RRF tie-in works, see **Section 4.2.1.3**.
- Completion of the SEART off-ramp and on-ramp works, during which the off-ramp left-turn lanes will be reduced to one lane, see **Section 4.2.1.4**.
- Completion of the new bus lanes on Ti Rakau Drive between Pakuranga Road and Reeves Road as well as the crossroads intersection with Palm Avenue and Aylesbury Street. This will allow for construction to commence in the centre of Ti Rakau Drive, between Pakuranga Road and Reeves Road, requiring eastbound traffic to be temporarily diverted onto the new bus lanes, see **Section 4.2.1.5** (Phase 2). This will reduce both the eastbound and westbound carriageways to two lanes.
- The western approach to the Ti Rakau Drive / Reeves Road intersection will provide two through lanes and a right-turn lane. The eastern approach will provide one left-turn lane onto SEART and two through lanes. The pedestrian crossing on the eastern approach of the Ti Rakau Drive / Reeves Road / SEART will not be operational yet.
- Completion of the Pakuranga Road works between Ti Rakau Drive and the RRF, see **Section 4.2.1.6**.
- Completion of the Ti Rakau Drive / William Roberts Road / Mattson Road intersection works, see **Section 4.2.2.1**.
- Completion of Phases 1 and 2 of the Ti Rakau Drive works between Mattson Road and Gossamer Drive, see **Section 4.2.2.3** and **Section 4.2.2.4**. This will allow for Phase 3 works to commence in EB3R (see **Section 4.2.2.5**). All side roads on the southern side of Ti Rakau Drive in EB3R will be temporarily converted back to full movement intersections. The western U-turn facility and the U-turn manoeuvres at the Ti Rakau Drive / William Roberts Road / Mattson Road and Ti Rakau Drive / Gossamer Drive intersections will be operational.
- Ongoing construction on the western and eastern approaches of the Ti Rakau Drive / Gossamer Drive intersection.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix F** and lane performance summaries per intersection are provided in **Appendix G**.

Table 29 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 2 during the AM peak, with a 2028 horizon year.

Table 29: Intersection performance – Do-Minimum vs Construction Scenario 2 (AM peak)

Intersection	Do-Minimum			Construction Scenario 2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	D	0.90	50
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	0.34	1
Pakuranga Rd / RRF	Built during EB2			C	0.90	35
Reeves Rd / Aylesbury St	N/A	0.24	1	N/A	0.03	3
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.19	5
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.15	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			D	0.88	37
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	C	0.89	24
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.87	27
Ti Rakau Dr / Mattson Rd	B	0.78	15			
Ti Rakau Dr western U-turn facility	Built during EB3R			N/A	0.53	2
Ti Rakau Dr / Edgewater Drive west	C	0.85	27	N/A	2.00	66
Ti Rakau Dr / Gossamer Dr	F	1.07	91	D	0.97	50

SIDRA analysis indicates that overall, in the AM peak, Construction Scenario 2 is expected to result in minimal adverse effects to intersection performance along the network. Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Reeves Road / Aylesbury Street
- William Roberts Road / Reeves Road

Once constructed, the following new intersections are expected to operate with spare capacity during the AM peak under Construction Scenario 2, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / William Roberts Road
- Ti Rakau Drive western U-turn facility

Increases in delay are expected at the Pakuranga Road / Ti Rakau Drive intersection during the AM peak hour, however the intersection is expected to operate at an acceptable LOS D.

Significant improvements in DOS and delay are predicted at the Ti Rakau Drive / Reeves Road / SEART intersection, and is expected to operate with spare capacity (LOS C). Improvements in performance are also expected at the Pakuranga Road / Brampton Court and Ti Rakau Drive / Gossamer Drive intersections.

Table 30 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 2 during the PM peak, with a 2028 horizon year.

Table 30: Intersection performance – Do-Minimum vs Construction Scenario 2 (PM Peak)

<table>
<tr><th rowspan="2">Intersection</th><th colspan="3">Do-Minimum</th><th colspan="3">Construction Scenario 2</th></tr>
<tr><th>LOS</th><th>DOS (v/c)</th><th>Delay [s]</th><th>LOS</th><th>DOS (v/c)</th><th>Delay [s]</th></tr>
<tr><td>Pakuranga Rd / Ti Rakau Dr</td><td>D</td><td>0.92</td><td>53</td><td>D</td><td>0.94</td><td>53</td></tr>
<tr><td>Pakuranga Rd / Brampton Ct</td><td>N/A</td><td>1.81</td><td>9</td><td>N/A</td><td>0.38</td><td>1</td></tr>
<tr><td>Pakuranga Rd / RRF</td><td colspan="3">Built during EB2</td><td>E</td><td>0.94</td><td>57</td></tr>
<tr><td>Reeves Rd / Aylesbury St</td><td>N/A</td><td>1.03</td><td>42</td><td>N/A</td><td>0.04</td><td>4</td></tr>
<tr><td>William Roberts Rd / Reeves Rd</td><td>N/A</td><td>1.05</td><td>26</td><td>N/A</td><td>0.41</td><td>6</td></tr>
<tr><td>William Roberts Rd / Cortina Pl</td><td colspan="3">Built during WRRE</td><td>N/A</td><td>0.14</td><td>1</td></tr>
<tr><td>Ti Rakau Dr / Aylesbury St / Palm Ave</td><td colspan="3">Built during EB2</td><td>C</td><td>0.86</td><td>21</td></tr>
<tr><td>Ti Rakau Dr/ Reeves Rd / SEART</td><td>E</td><td>0.98</td><td>56</td><td>E</td><td>1.00</td><td>77</td></tr>
<tr><td>Ti Rakau Dr / William Roberts Rd</td><td colspan="3">Built during WRRE</td><td rowspan="2">D</td><td rowspan="2">0.95</td><td rowspan="2">50</td></tr>
<tr><td>Ti Rakau Dr / Mattson Rd</td><td>B</td><td>0.68</td><td>13</td></tr>
<tr><td>Ti Rakau Dr western U-turn facility</td><td colspan="3">Built during EB3R</td><td>N/A</td><td>0.56</td><td>2</td></tr>
<tr><td>Ti Rakau Dr / Edgewater Drive west</td><td>C</td><td>0.89</td><td>31</td><td>N/A</td><td>1.93</td><td>63</td></tr>
<tr><td>Ti Rakau Dr / Gossamer Dr</td><td>D</td><td>0.91</td><td>45</td><td>E</td><td>1.02</td><td>74</td></tr>
</table>

SIDRA analysis indicates that in the PM peak, Construction Scenario 2 is also expected to result in acceptable intersection performance along the network overall, with some mitigation measures in place.

The demand on Ti Rakau Drive westbound, between Pakuranga Road and SEART, is expected to be manageable through implementing fixed time cycles and offsets at the following intersections:

- Pakuranga Road / Ti Rakau Drive
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / Reeves Road / SEART

A cycle length of 150 seconds, offsets of 11 seconds to Palm Avenue and 28 seconds to Pakuranga Road using the SEART intersection as reference, is expected to lead to manageable queues and delays (see **Appendix F**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Pakuranga Road / Brampton Court
- Reeves Road/ Aylesbury Street

SIDRA analysis indicates that the following new intersections are expected to operate with spare capacity during the PM peak under Construction Scenario 2, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / William Roberts Road / Mattson Road
- Ti Rakau Drive western U-turn facility

Improvements in DOS and delay are predicted at the William Roberts Road / Reeves Road intersection during the PM peak hour under Construction Scenario 2.

An increase in DOS and delay is predicted at the Ti Rakau Drive / Gossamer Drive intersection under Construction Scenario 2. Regardless, the intersection is expected to operate at an acceptable LOS E.

5.2.2.7 Construction Scenario 3

The various pieces of work originally proposed under Construction Scenario 3 will now be undertaken earlier in the construction programme. Therefore, this modelling scenario is no longer relevant to this assessment.

5.2.2.8 EB2 – Pakuranga Road / William Roberts Road Temporary Signalisation

The assessment of the temporary signalisation of the Pakuranga Road / William Roberts Road intersection is now incorporated into Construction Scenario 1.2 to 1.4, see **Section 5.2.2.3** to **Section 5.2.2.5**.

5.2.2.9 EB2 – Pakuranga Road Drainage Works

As stated in **Section 4.2.1.6**, the Pakuranga Road drainage works will be undertaken concurrently with the enabling works, early in the construction programme. Therefore, these works are now incorporated into Construction Scenario 1.1, see **Section 5.2.2.2**.

5.2.2.10 EB3R – Ti Rakau Drive / Edgewater Drive East Temporary Signalisation

The assessment of the temporary closures of the Edgewater Drive intersections is now incorporated into Construction Scenario 1.2 and 1.4, see **Section 5.2.2.3** and **Section 5.2.2.5**, respectively.

5.2.3 General Traffic Travel Times

Route travel times were determined using the AIMSUN model, with a 2028 horizon year. Four routes were selected to compare route travel times between the Do-minimum and EB2/EB3R scenarios for general traffic. This is similar to the assessment of travel times in the existing environment (see **Section 3.4.2**) and to maintain consistency across the different assessments already conducted as well as future ITAs. These routes are outlined below:

- Botany to Pakuranga (Ti Rakau Drive / Chapel Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Botany to SEART (Ti Rakau Drive / Te Irirangi Drive intersection to the western abutment on Waipuna Bridge) – both directions
- Howick to Pakuranga (Pakuranga Road / Glenmore Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Howick to SEART (Pakuranga Road / Glenmore Road intersection to the western abutment on Waipuna Bridge) – both directions

The sections below assess the temporary effects to travel times during the construction scenarios.

5.2.3.1 Construction Scenario 1.1

As the vast majority of the proposed works under Construction Scenario 1.1 are offline (see **Section 5.2.2.2**), a limited impact on general traffic travel time is expected. Therefore, route travel times under Construction Scenario 1.1 have not been remodelled in AIMSUN and are expected to be comparable to the travel times in the Do-Minimum scenario.

5.2.3.2 Construction Scenario 1.2 to 1.4

The transport network under Construction Scenario 1.2, 1.3 and 1.4 is roughly similar in terms of route options, ongoing works and lane configuration. As such, route travel times have only been remodelled in AIMSUN for Construction Scenario 1.3, which is expected to be the most conservative. Route travel times under Construction Scenario 1.2 and 1.4 are expected to perform similar or better.

Table 31 provides a comparison of the route travel times between the Do-Minimum and Construction Scenario 1.3, with a 2028 horizon year.

Table 31: General traffic travel times – Do-Minimum vs Construction Scenario 1.3

AM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	CS 1.3 [min]	Difference [min]	Do Minimum [min]	CS 1.3 [min]]	Difference [min]
Botany - Pakuranga	24.7	32.2	7.5	13.9	20.9	7.0
Botany - SEART	20.9	29.3	8.4	13.7	12.3	-1.4
Howick - Pakuranga	5.3	5.7	0.4	4.7	4.3	-0.3
Howick - SEART	11.6	26.9	15.3	8.0	6.6	-1.4

PM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	CS 1.3 [min]	Difference [min]	Do Minimum [min]	CS 1.3 [min]	Difference [min]
Botany - Pakuranga	18.4	15.2	-3.2	24.6	27.0	2.4
Botany - SEART	11.6	10.0	-1.6	24.5	32.7	8.2
Howick - Pakuranga	4.7	4.4	-0.4	3.4	3.3	-0.1
Howick - SEART	5.0	5.5	0.5	7.5	11.7	4.2

Travels times from Botany towards SEART (westbound) and Botany to Pakuranga (both directions) as well as from Howick to SEART (westbound) are predicted to experience moderate to relatively large increases during the AM peak period compared to the Do-Minimum. This is not unexpected given the following factors:

- The addition of the new Ti Rakau Drive / William Roberts Road and Ti Rakau Drive / Aylesbury Street / Palm Avenue intersections to the network
- The closure of Reeves Road, whereby more vehicles are likely to divert to Ti Rakau Drive and Pakuranga Road
- Ongoing construction on the northern side Ti Rakau Drive, between Pakuranga Road and Reeves Road as well as on the southern side between Reeves Road and Gossamer Drive.

Ti Rakau Drive is a congested corridor in the existing environment; therefore, it is likely that a redistribution of traffic or reduction in capacity due to road works will lead to increased queues and delays. It should also be noted that these increases in travel times are temporary, and are inherent in the majority of transport projects of this scale.

Consequently, changes in travel behaviour are also inherent in the majority of transport projects which the AIMSUN models do not account for. These include:

- The AIMSUN models do not account for peak spreading, i.e., motorists choosing to travel earlier or later on the network for their daily commute. 'As the capacity of the corridors is reached, especially during the peak period, travel behaviour changes. One of these changes may involve travelling to work earlier or later to avoid congestion'[26]. This change in behaviour is expected to occur at least to some degree with sufficient community engagement and on-road messaging such as Variable Message Signs (VMS).

- Another change in travel behaviour not included in the modelling assessment is flexible working options, i.e., to work from home. During and following the Covid-19 pandemic, many motorists with the option to do so changed their travel patterns in this manner. During construction it is expected that some motorists may choose to not travel on the network in order to avoid the temporary disruption.

[26] Research into Traffic Peak Spreading, Transfund New Zealand Research Report No. 241, 2003

- Multiple route choices are also an inherent limitation of the AIMSUN model being assessed. East-West route options within the model are limited to Ti Rakau Drive and Pakuranga Road. **Figure 69** shows the route options for motorists in Howick (red outline) and Botany (blue outline) to/from Panmure and the CBD.

Figure 69: Howick (red outline) and Botany (blue outline) route options

- Route options for motorists in the Howick area are geographically limited to Pakuranga Road and Ti Rakau Drive. As such, it is expected that no significant diversion of traffic will occur during construction from this area. However, Highbrook Drive, which is not within the extent of the model, may be an alternative route option over Ti Rakau Drive for some motorists in the Botany area for east-west movement to avoid the temporary disruption.

Therefore, a combination of the above factors could be expected to lead to a reduction in traffic volumes during construction, leading to more manageable queues and delays overall.

Mode shift is another travel behaviour change that the AIMSUN model does not take into account. However, realistically it is not expected that significant mode shift to public transport will occur during construction in the EB2 and EB3R areas with the existing public transport provision. Therefore, this travel behaviour change was excluded.

Various mitigation options were tested, ranging from traffic signal phasing amendments to delaying specific pieces of the proposed works, in an attempt improve travel times. However, this testing indicated that the only alternative to improve general traffic travel times would be to temporarily add more lanes, which would add significant construction cost and potentially delay the construction programme even further.

Once constructed the RRF will, in part, alleviate the congestion around the Pakuranga Town Centre and improve travel times for general traffic (see **Section 5.2.3.3**). Also, the completion of EB2 and EB3R is expected to further improve travel times, by means of the new RRF and dedicated bus lanes (see **Section 6.3.3**).

Nevertheless, to mitigate these effects, appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which would lead to changes in travel behaviour such as travelling outside the peak periods or using alternative routes. This will be achieved through the CTMP.

During the AM peak period, travel times of the majority of eastbound routes are predicted to experience small improvements.

The majority of route travel times during the PM peak, in all directions, are expected to experience small improvements, or is some cases manageable increases under Construction Scenario 1.3.

Based on the above, the potential adverse effects are considered to mitigated as far as is reasonably practicable.

5.2.3.3 Construction Scenario 2

Table 32 provides a comparison of the route travel times between the Do-Minimum and Construction Scenario 2, with a 2028 horizon year.

Table 32: General traffic travel times – Do-Minimum vs Construction Scenario 2

AM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	Construction 2 [min]	Difference [min]	Do Minimum [min]	Construction 2 [min]	Difference [min]
Botany - Pakuranga	24.7	33.5	8.8	13.9	15.2	1.3
Botany - SEART	20.9	30.5	9.6	13.7	12.7	-1.0
Howick - Pakuranga	5.3	9.6	4.3	4.7	4.5	-0.2
Howick - SEART	11.6	7.3	-4.3	8.0	5.3	-2.7
PM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	Construction 2 [min]	Difference [min]	Do Minimum [min]	Construction 2 [min]	Difference [min]
Botany - Pakuranga	18.4	13.4	-5.0	24.6	26.8	2.2
Botany - SEART	11.6	8.6	-3.0	24.5	26.1	1.6
Howick - Pakuranga	4.7	6.6	1.9	3.4	3.8	0.4
Howick - SEART	5.0	3.0	-2.0	7.5	9.6	2.1

Similar to Construction Scenario 1.3 during the AM peak, the westbound routes from Botany towards Pakuranga and SEART are predicted to experience moderate increases in travel times under Construction Scenario 2. This is likely due to the addition of a new intersection, additional traffic as a result of the Reeves Road and William Roberts Road north closures and capacity reduction due to the construction in the centre of Ti Rakau Drive.

The westbound route from Howick to Pakuranga is predicted to experience an increase in travel time during the AM peak period. This is likely due to the operation of the newly completed Pakuranga Road / RRF intersection. The right turn from Pakuranga Road east towards Pakuranga Road west is treated as the minor movement, and the majority of the traffic signal green time is allocated to the through movements between Pakuranga Road east and the RRF.

As the operation of this intersection as well as the wider network is a balance of not only the various movements of traffic flows, but also the competing modes of transport, the trade-off is the improvement of travel times of the other routes. Particularly the improvement in travel times for the major route from Howick towards SEART. It should also be noted that this increase in travel time is temporary. Upon completion of EB2 and EB3R, travel time for this route is expected to be improved (see **Section 6.3.3**), compared to Construction Scenario 2. As above, travel time increases are generally inherent in construction projects of this scale, and in context of the improvements that will be experienced once completed, this level of delay is considered to be acceptable.

The eastbound routes are predicted to experience small improvements or in some cases negligible increases in travel time during the AM peak period.

During the PM peak period, route travel times under Construction Scenario 2 are predicted to experience negligible increases or small improvements, in all directions.

Again, public communication and advance warning of the planned works will be undertaken prior to the works as well as during construction, along with appropriate signage of expected travel times and possible alternative routes. This will be achieved through the CTMP.

5.2.3.4 Construction Scenario 3

As stated in **Section 5.2.2.7**, the various pieces of work originally proposed under Construction Scenario 3 will now be undertaken earlier in the construction programme. Therefore, this modelling scenario is no longer relevant to this assessment.

5.2.4 Summary of Temporary General Traffic Effects

During the development of the updated construction methodology, based on an updated design, efforts have been made to create efficiencies in construction delivery and produce construction staging that would minimise adverse transport effects. Overall, the temporary effects on intersection performance during most construction scenarios across the EB2 and EB3R network are considered to be negligible or low as indicated by the SIDRA analysis, with some mitigation measures in place.

It is expected that the effects of the Pakuranga Road drainage works and the RRF tie-in works can be managed by utilising the flush median as a running lane in order to maintain three lanes westbound and two lanes eastbound during these works. Mitigation measures in the form of phasing adjustments and fixed-time cycles to facilitate better coordination between closely spaced intersection have been recommended in the PM peak during the majority of the construction scenarios. Consultation with ATOC will be undertaken to implement these measures.

The pedestrian crossing on the eastern arm of the Ti Rakau Drive / Reeves Road / SEART intersection will require removal for the majority of the construction programme to allow for more efficient traffic signal phasing, which will assist in managing the increased demand on Ti Rakau Drive. The pedestrian crossing on the western arm will be maintained.

Analysis indicated that the temporary signalisation of the Pakuranga Road / William Roberts Road intersection, to support the operation of the construction yard, is expected to lead to improved intersection performance. A temporary traffic signal will be provided at the Ti Rakau Drive / Edgewater Drive east intersection during the construction of the Ti Rakau Drive / Edgewater Drive west intersection. This will ensure that signalised movements for vehicles turning into and out of Edgewater Drive are maintained.

Although the temporary effects to intersection performance during construction are predicted to be negligible to low overall, some adverse effects to general traffic travel times are expected, particularly during Construction Scenario 1.3. These effects are not unexpected due to the additional intersections along the network and the number of ongoing construction activities.

A number of mitigation options were tested; however, it is expected that the only alternative to maintain existing travel times would be to add more lanes. This was not considered practicable as it would be expected to have significant implications on construction cost and programme.

Increases in travel times through the project area are inherent in the majority of transport projects of this scale as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur. This in turn could lead to more manageable queues, reduced delays and improved travel times on the network. These will be managed through the CTMP.

It should be noted that these effects are temporary, and once constructed, the RRF and EB2/EB3R as a whole will alleviate congestion, particularly around the Pakuranga Town Centre. In light of the improvements that will be experienced once completed, this level of delay is considered to be acceptable. Based on the above, the potential adverse effects are considered to be mitigated as far as is reasonably practicable.

5.3 Effects to Bus Services and Facilities

The sections below provide details and assessment of the temporary effects during construction to bus services and facilities in the EB2 and EB3R project areas. **Figure 70** shows the existing bus services operating through the project areas. These include the 70, 72C, 72M, 72X, 352, 711 and 712 services.

School bus service operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

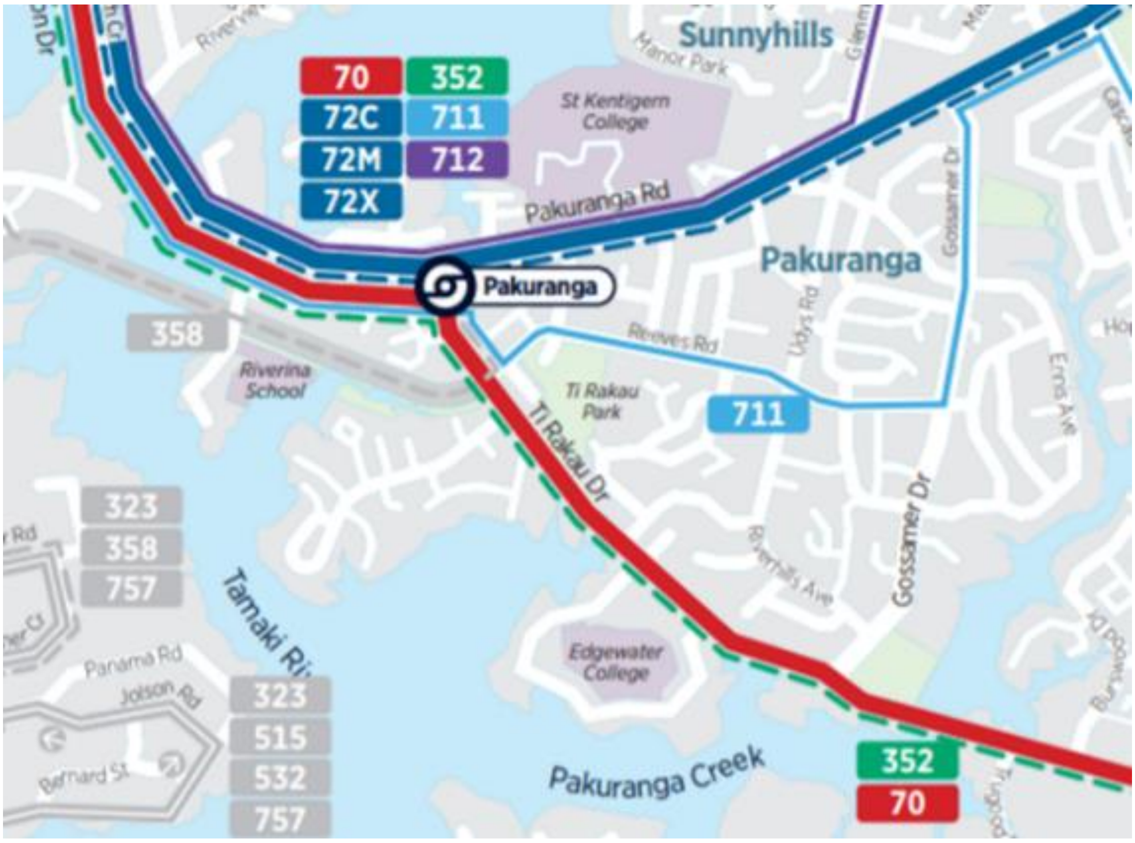


Figure 70: Existing bus services in the EB2 and EB3R project areas

5.3.1 EB2 – Reeves Road

At present, the 711 service travels partly along Reeves Road as a connector service between Howick and Panmure. During the Reeves Road closure, the 711 outbound (eastbound) service will be diverted temporarily to the newly completed WRRE (see **Figure 71**).

Figure 71: 711 outbound service, existing and proposed routes

The increase in distance of approximately 270 m and the resultant increase in travel time (20s) are considered negligible. It is noted that currently there are no bus stops located along Reeves Road between Ti Rakau Drive and William Roberts Road utilised by the 711 outbound service.

5.3.2 EB2 – William Roberts Road North

Currently, the 711 inbound (westbound) service travels partly along William Roberts Road north. Once William Roberts Road north is closed, the 711 inbound service will be diverted temporarily to William Roberts Road south and along Ti Rakau Drive (see **Figure 72**).

Figure 72: 711 inbound service, existing and proposed routes

The increase in distance of approximately 290 m and the resultant increase in travel time (21s) are considered to be negligible.

At present, the 711 inbound service utilises bus stop (ID 6060) to pick-up / drop-off passengers at the Pakuranga Plaza. Once William Roberts Road north is closed and until Reeves Road reopens, the 711 inbound service will utilise bus stop (ID 6127) instead.

The Pakuranga Road / Ti Rakau Drive intersection is located approximately 160 m north and the Ti Rakau Drive / Reeves Road intersection is located approximately 188 m south from the bus stop (ID 6127). Therefore, the increase in pedestrian walking distance to the Pakuranga Plaza is considered to be negligible.

Lewis Road was an alternative route considered during this assessment. However, Lewis Road is not well suited to buses given its narrow carriageway and on-street parking on both sides. Therefore, this alternative was discounted.

5.3.3 EB2 – Ti Rakau Drive and Pakuranga Road

Figure 73 shows the existing bus stops near the Pakuranga Town Centre, located on Ti Rakau Drive and Pakuranga Road in the EB2 project area.

Figure 73: Pakuranga Plaza bus stops

During construction of the new bus lanes on the northern side of Ti Rakau Drive, as well as the new bus station (Phase 1 of Ti Rakau Drive in EB2, see **Section 4.2.1.5**), it is anticipated that bus stop (ID 6132) will be maintained as existing. Once this phase of work has been completed, the bus stop will be removed permanently, and the new bus station will be utilised.

Currently, this bus stop is located in-lane on Ti Rakau Drive eastbound, whereas in the future the bus station will provide indented bus bays for improved operation and safety. The remaining bus stops will remain at their current locations following this phase of work. This is due to the ongoing Reeves Road works at this stage. Bus services that will benefit from this initial improvement include the 70 outbound, 352 outbound and the 711 outbound.

Following the completion of the RRF and Reeves Road modifications, it is anticipated that the bus stops (ID 6062, 6060 and 6127) will also be removed with bus services utilising the new bus station. The bus services that will benefit from the new bus station include the 70, 72C, 72M, 72X, 352, 711 and 712.

5.3.4 EB3R – Ti Rakau Drive

Figure 74 shows the existing bus stops on Ti Rakau Drive in the EB3R project area.

Figure 74: EB3R Ti Rakau Dr bus stops

During construction of Phase 1 of Ti Rakau Drive (between Mattson Road and Gossamer Drive) in EB3R (see **Section 4.2.2.3**), which will consist of the new westbound lanes on Ti Rakau Drive, bus stops (ID 6129, 6131 and 6133) will largely be kept in accordance with the current arrangement. It is expected that the bus stops will need to shift longitudinally as the works progress. However, the effects to bus services and passengers are expected to be negligible. The eastbound bus station at Gossamer Drive will also be constructed during Phase 1, however, it will not be operational until the completion of Phase 3 of EB3R.

Once Phase 1 is completed, these bus stops will be temporarily relocated to the new westbound lanes, in close proximity to their current locations and will operate until the completion of Phase 2 of EB3R.

Phase 2 of Ti Rakau Drive in EB3R (see **Section 4.2.2.4**) will consist of the central running bus lanes, as well as the new bus station at Edgewater Drive and the westbound bus station at Gossamer Drive. As above, the Gossamer Drive bus station will not be operational until completion of Phase 3 of EB3R.

Upon completion of Phase 2, it is anticipated that the bus stops (ID 6134, 6129, 6131, 6136, 6138 and 6133) will be removed permanently. The new Edgewater Drive bus station will provide improved bus services and facilities, as well as greater pedestrian safety and amenity.

In Phase 3 of Ti Rakau Drive in EB3R (see **Section 4.2.2.5**), the Ti Rakau Drive / Gossamer Drive intersection will be constructed, which will provide a link between the western and eastern bus stations at Gossamer Drive. It is expected that following Phase 3, bus stops (ID 6140 and 6135) will be removed permanently. The new bus station will provide improved bus services and facilities, as well as greater pedestrian safety and amenity.

5.3.5 Bus Travel Times

Bus route travel times were determined using the AIMSUN model, with a 2028 horizon year. Travel times were determined in both directions during AM and PM peak periods for the following routes:

- 70 – Botany Town Centre bus station to Ellerslie Panmure Highway / Clare Place intersection
- 72C – Pakuranga Road / Stanniland Street intersection to Ellerslie Panmure Highway / Clare Place intersection
- 72M – Panmure Pakuranga Road / Stanniland Street intersection to Ellerslie Panmure Highway / Clare Place intersection
- 72X – Pakuranga Road / Stanniland Street intersection to Ellerslie Panmure Highway / Clare Place intersection
- 352 – Ti Rakau Drive / Harris Road intersection to Panmure bus station
- 711 – Pakuranga Road / Stanniland Street intersection to Panmure bus station
- 712 – Glenmore Road / Meadway intersection to Panmure bus station

Note: The route descriptions refer to the extent of the routes in the AIMSUN model, not the total extent of the services from start to end on the wider network.

The sections below assess the temporary effects on bus travel times during the construction scenarios.

5.3.5.1 Construction Scenario 1.1

As stated in **Section 5.2.3.1**, the vast majority of the proposed works under Construction Scenario 1.1 are offline and as such a limited impact on bus travel time is expected. Therefore, bus travel times under Construction Scenario 1.1 have not been remodelled in AIMSUN and are expected to be comparable to the travel times in the Do-Minimum scenario.

5.3.5.2 Construction Scenario 1.2 to 1.4

Similar to the general traffic travel time assessment in **Section 5.2.3.2**, the transport network under Construction Scenario 1.2, 1.3 and 1.4 is roughly similar in terms of route options, ongoing works and lane configuration. As such, bus travel times have only been remodelled in AIMSUN for Construction Scenario 1.3, which is expected to be the most conservative. Bus travel times under Construction Scenario 1.2 and 1.4 are expected to perform similar or better.

Table 33 below provides a comparison of the bus route travel times between the Do-Minimum and Construction Scenario 1, with a 2028 horizon year.

Table 33: Bus travel times – Do-Minimum vs Construction Scenario 1.3

AM Peak						
Route Description	Westbound			Eastbound		
	Do-Minimum [min]	CS 1.3 [min]	Difference [min]	Do-Minimum [min]	CS 1.3 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	42.3	49.5	7.2	26.9	33.0	6.1
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	20.6	41.0	20.4	16.0	15.9	-0.1
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	15.8	17.2	1.4
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	24.6	47.8	23.2	-	-	-
352 – Ti Rakau Dr / Harris Rd to Panmure bus station	36.8	41.8	5.0	29.1	32.3	3.1
711 – Pakuranga Rd / Stanniland St to Panmure bus station	29.1	39.3	10.2	22.7	27.2	4.5
712 – Glenmore Rd / Meadway to Panmure bus station	22.6	34.9	12.3	16.6	15.8	-0.8

Route Description	PM Peak					
	Westbound			Eastbound		
	Do-Minimum [min]	CS 1.3 [min]	Difference [min]	Do-Minimum [min]	CS 1.3 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	35.7	33.8	-1.9	38.1	41.4	3.3
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	14.6	14.4	-0.2	14.8	14.7	-0.1
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	15.0	14.4	-0.6	-	-	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	16.8	20.3	3.5
352 – Ti Rakau Dr / Harris Rd to Panmure bus station	33.4	30.2	-3.2	27.9	32.7	4.8
711 – Pakuranga Rd / Stanniland St to Panmure bus station	23.8	25.6	1.8	24.5	24.3	-0.2
712 – Glenmore Rd / Meadway to Panmure bus station	19.7	19.6	-0.1	18.1	19.5	1.4

Bus travel times of the 72C, 72X, 711 and 712 services westbound along Pakuranga Road, as well as the 70 and 352 services (westbound) along Ti Rakau Drive, are predicted to experience moderate to relatively large increases during the AM peak period under Construction Scenario 1.3. This is not unexpected given the following factors:

- The addition of the new Ti Rakau Drive / William Roberts Road and Ti Rakau Drive / Aylesbury Street / Palm Avenue intersections to the network
- The closure of Reeves Road, whereby more vehicles are likely to divert to Ti Rakau Drive and Pakuranga Road
- Ongoing construction on the northern side of Ti Rakau Drive, between Pakuranga Road and Reeves Road as well as on the southern side between Reeves Road and Gossamer Drive.

With the closure of Reeves Road and with the RRF not completed at this stage, large queues are predicted in the westbound kerbside lane on Ti Rakau Drive as vehicles attempt to turn onto SEART. As the existing bus stops along Ti Rakau Drive are located along the kerbside lane, buses are likely to travel in this congested lane, resulting in increased travel times.

As stated in **Section 5.2.3.2**, a number of mitigation options were tested. However, it is expected that the only alternative to improve bus travel times travel times would be to add temporary bus lanes. For example, converting a westbound general traffic lane on Pakuranga Road into a bus lane. This would be expected to have significant impacts on general traffic travel times.

However, Ti Rakau Drive is a congested corridor in the existing environment; therefore, it is expected that a redistribution of traffic or reduction in capacity due to road works will lead to increased queues and delays. Furthermore, increases in travel times through the project area are inherent in the majority of transport projects of this scale as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur. This in turn could lead to more manageable queues, reduced delays and improved travel times on the network. This will be managed through the CTMP.

It should also be noted that these increases in travel times are temporary. Once constructed the RRF will, in part, alleviate the congestion around the Pakuranga Town and improve travel times (see **Section 5.3.5.3**). Furthermore, the completion of EB2 and EB3R is expected to further improve travel times, by means of the new dedicated bus lanes (see **Section 6.4.7**).

Opportunities to improve bus travel times will be explored in the development of the CTMPs, such as the provision of temporary bus priority where feasible, along with measures to manage travel demand through the provisions of the SSTMPs. Appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which could lead to changes in travel behaviour.

It should be noted that the 72M (westbound) and 72X (eastbound) services do not operate during the AM peak period.

All services in both directions are predicted to experience manageable increases, or in some cases small improvements, in travel time during the PM peak period under Construction Scenario 1.3.

Based on the above, the potential adverse effects are considered to mitigated as far as is reasonably practicable.

5.3.5.3 Construction Scenario 2

Table 34 provides a comparison of the bus route travel times between the Do-Minimum and Construction Scenario 2, with a 2028 horizon year.

Table 34: Bus travel times – Do-Minimum vs Construction Scenario 2

AM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	Construction 2 [min]	Difference [min]	Do Minimum [min]	Construction 2 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	42.3	47.3	5.0	26.9	26.6	-0.3
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	20.6	23.5	2.9	16.0	15.0	-1.0
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	15.8	16.0	0.2
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	24.6	28.4	3.8	-	-	-
352 – Ti Rakau Dr / Harris Rd to Panmure bus station	36.8	39.1	2.3	29.1	27.0	-2.1
711 – Pakuranga Rd / Stanniland St to Panmure bus station	29.1	32.7	3.6	22.7	26.9	4.2
712 – Glenmore Rd / Meadway to Panmure bus station	22.6	27.3	4.7	16.6	15.5	-1.1

PM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	Construction 2 [min]	Difference [min]	Do Minimum [min]	Construction 2 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	35.7	29.8	-5.9	38.1	36.7	-1.4
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	14.6	17.8	3.2	14.8	14.8	0.0
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	15.0	20.9	5.9	-	-	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	16.8	17.2	0.4
352 – Ti Rakau Dr / Harris Rd to Panmure bus station	33.4	28.2	-5.2	27.9	26.7	-1.2
711 – Pakuranga Rd / Stanniland St to Panmure bus station	23.8	26.4	2.6	24.5	24.1	-0.4
712 – Glenmore Rd / Meadway to Panmure bus station	19.7	25.2	5.5	18.1	19.8	1.7

The completion of the RRF is predicted to result in improved travel times of bus routes under Construction Scenario 2, compared to Construction Scenario 1.3. This is due to a significant redistribution of general traffic from Pakuranga Road and Ti Rakau Drive to the RRF.

Acceptable increases in bus travel times of the 70 and 352 (westbound) services are predicted during the AM peak. The 70 and 352 (eastbound) services are predicted to experience small travel time improvements.

The remaining westbound and eastbound services are predicted to experience manageable increases, or in some cases small improvements, in travel times during the AM peak under Construction Scenario 2.

Similar to the AM peak, travel times of the 70 and 352 services along Ti Rakau Drive are expected to experience improvements, in both directions, during the PM peak.

Again, travel times of the remaining westbound and eastbound services are expected to experience manageable increases or small improvements during the PM peak under Construction Scenario 2.

5.3.5.4 Construction Scenario 3

The various pieces of work originally proposed under Construction Scenario 3 will now be undertaken earlier in the construction programme. Therefore, this modelling scenario is no longer relevant to this assessment.

5.3.6 School Bus Services

The S415 school bus service between Pakuranga and Sacred Heart College will continue to depart from bus stop (ID 6060) outside Farmers in the AM peak and will continue to terminate at bus stop (ID 6062) on the return journey in the afternoon during construction. Furthermore, the service will also continue to travel in the general traffic lanes on Pakuranga Road during construction. As stated in **Section 5.3.3**, it is anticipated that the bus stops (ID 6062 and 6060) will only be removed following the completion of the RRF and Reeves Road underneath.

The S416 school bus service between Botany and Sacred Heart College will continue to use the general traffic lanes along Ti Rakau Drive as well as the existing bus stops in the EB2 and EB3R projects areas during construction. As stated in **Section 5.3.3**, it is anticipated that the bus stop (ID 6127) in the Pakuranga Town Centre will only be removed after the RRF, and Reeves Road have been completed. Also, as stated in **Section 5.3.4**, it is anticipated that bus stops (ID 6134, 6129, 6131, 6136, 6138 and 6133) along Ti Rakau Drive will only be removed following Phase 2 of Ti Rakau Drive in EB3R (Mattson Road to Gossamer Drive) and bus stops (ID 6140 and 6135) following Phase 3 of EB3R.

During construction, the S440 school bus services between Bucklands Beach and Sancta Maria College and Primary will remain on its current route and students will board and alight at the existing bus stops.

Edgewater College is located near the Ti Rakau Drive / Edgewater Drive west intersection. In the existing environment, the S013 school bus service proceeds down Edgewater Drive east and the S073 proceeds down Edgewater Drive west. Currently, both of these school bus services enter through the western access to pick-up/drop-off students at the off-street bus stop inside the parking area (see **Figure 75**).

Figure 75: Edgewater College existing school bus services and bus stop

As stated in **Section 4.2.2.3**, Phase 1 of Ti Rakau Drive in EB3R (Mattson Road to Gossamer Drive) will include the construction of the Edgewater Drive east and west intersections. This will require the closure of one intersection while diverting all traffic along Edgewater Drive to the other in an alternating fashion. As such, during each of these closures, both services will access the bus stop from the same direction along Edgewater Drive. During the Edgewater Drive west closure, the S073 is expected to experience an increased travel time of approximately 1.5min, while the S013 is expected to experience a decreased travel time of approximately 40sec during the Edgewater Drive east closure. Therefore, the temporary effects to these school bus services are considered to be very low.

5.3.7 Summary of Temporary Effects to Bus Services and Facilities

Overall, the temporary effects during construction to bus services and facilities in the EB2 and EB3R project areas are considered to be negligible during Construction Scenario 1.1, moderate to relatively large during Construction Scenario 1.3, and low during Construction Scenario 2. Again, these effects are not unexpected due to the additional intersections along the network and the number of ongoing construction activities.

A number of mitigation options were tested. However, it is expected that the only alternative to improve bus travel times would be to add temporary bus lanes. This is expected to have additional impacts on general traffic travel times.

Ti Rakau Drive is a congested corridor in the existing environment; therefore, it is expected that a redistribution of traffic or reduction in capacity due to road works will lead to increased queues and delays. Furthermore, increases in travel times through the project area are inherent in the majority of transport projects of this scale as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur This in turn could lead to more manageable queues, lower delays and improved travel times on the network. These will be managed through the CTMP.

It should also be noted that these increases in travel times are temporary. Once constructed the RRF will, in part, alleviate the congestion around the Pakuranga Town and improve travel times. Furthermore, the completion of EB2 and EB3R is expected to further improve travel times, by means of the new dedicated bus lanes.

Opportunities to improve bus travel times will be explored in the development of the CTMPs, such as the provision of temporary bus priority or temporary bus lanes where feasible, along with measures to manage travel demand through the provisions of the SSTMPs. Appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which could lead to changes in travel behaviour.

Lastly, the 711 service will undergo minor route changes as construction progresses through the closure of Reeves Road and William Roberts Road north. Existing bus stops along Pakuranga Road and Ti Rakau Drive will also experience minor changes during construction, undergoing minor relocation as the works progress. Based on the above, the potential adverse effects are considered to be mitigated as far as is reasonably practicable.

5.4 Effects to Pedestrians and Cyclists

Currently, pedestrian footpaths are provided along both sides of Ti Rakau Drive, between Pakuranga Road and Gossamer Drive. Signalised pedestrian facilities for crossing Ti Rakau Drive are provided at the following intersections:

- Ti Rakau Drive / Pakuranga Road southern and eastern approaches
- Ti Rakau Drive / Reeves Road all approaches
- Ti Rakau Drive / Mattson Road Western and southern approaches
- Ti Rakau Drive / Edgewater Drive west / Chevis Place western and southern approaches
- Ti Rakau Drive / Gossamer Drive northern, eastern and southern approaches

Pedestrian footpaths are also provided along both sides of Pakuranga Road, between Ti Rakau Drive and William Roberts Road. A midblock signalised pedestrian crossing is provided near the Pepler Street exit.

In the residential area to the north of SEART, pedestrian footpaths are provided along both sides of Dale Crescent. At the southern end of the street, the footpath continues along the northern side of Seven Oaks Drive.

In the commercial area south of the Pakuranga Plaza, pedestrian footpaths are provided along both sides of Reeves Road and Cortina Place. A midblock pedestrian crossing is also provided on Reeves Road. Footpaths are provided along both sides of William Roberts Road north, to the east of the Pakuranga Plaza. Once the WRRE is completed, footpaths will be provided along both sides of William Roberts Road south, from Ti Rakau Drive up to Ti Rakau Park.

Footpaths with the same width as existing footpaths will be provided during construction.

As stated in **Section 3.6.2**, no cycle facilities are provided in the existing environment, except at the Ti Rakau Drive / Gossamer Drive intersection.

Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities will be provided to ensure pedestrian connectivity. This will be ensured through the CTMPs.

5.4.1 EB2 – Reeves Road

Footpaths along both sides of Reeves Road as well as the midblock pedestrian crossing will be maintained during construction. When beam-landing activities are required for construction of the RRF, pedestrians may need to be diverted around these areas for safety purposes. CTMPs will be employed to achieve this.

5.4.2 EB2 – William Roberts Road North

Although construction is required to form the cul-de-sacs at each end, the existing footpaths along both sides of William Roberts Road north will be maintained. Once the RRF northern abutment is under construction, it is anticipated that the pedestrian footpath on the western side of William Roberts Road north will be closed. The effects of this closure are considered to be negligible as the footpath on the opposite side of the road will be maintained.

5.4.3 EB2 – Pakuranga Road Tie-In

The footpath along the northern side of the Pakuranga Road / RRF intersection will be maintained at all times. While the Pakuranga Road tie-in is under construction, pedestrians will be unable to utilise the existing refuge island on the southern side of the intersection. A temporary pedestrian crossing will be provided in a similar location to limit the effects to pedestrian walking time and distance.

5.4.4 EB2 – SEART

There are no footpaths along SEART provided at present.

Once the new SEART off-ramp has been completed and Seven Oaks Drive has been reinstated further north, it is anticipated that the footpath along the northern side of the Seven Oaks Drive will also be reinstated, similar to the existing environment.

5.4.5 EB2 – Ti Rakau Drive from Pakuranga Road to Reeves Road

Footpaths along both sides of the carriageway will be maintained. During the construction of the bus lanes on this section of Ti Rakau Drive as well as the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection, pedestrians may need to be diverted around these areas for safety purposes. CTMPs will be employed to achieve this.

During construction of the Ti Rakau Drive / Reeves Road intersection, pedestrian crossings will be maintained, except for the crossing on the eastern arm of the intersection. Temporary crossings will be provided as necessary to avoid the construction areas.

5.4.6 EB2 – Pakuranga Road

The existing footpaths along both sides of Pakuranga Road will be maintained during construction. The existing signalised midblock pedestrian crossing on Pakuranga Road, constructed as part of EB1, is also expected to be maintained.

5.4.7 EB2 – Side Roads

The existing footpaths along both sides of Palm Avenue, Aylesbury Street north, Cortina Place and William Roberts Road will be maintained. In the case of Aylesbury Street, the footpaths will be maintained until the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Following which the existing footpaths will be removed. CTMPs will be employed to divert pedestrians around work zones as necessary.

5.4.8 EB3R – Ti Rakau Drive from Reeves Road to Mattson Road

Footpaths along both sides of the carriageway will be maintained. During construction of the Ti Rakau Drive / William Roberts Road / Mattson Road intersection, temporary crossing facilities will be provided as per the CTMPs to avoid the work zones.

5.4.9 EB3R – Ti Rakau Drive from Mattson Road to Gossamer Drive (Phase 1)

Pedestrian footpaths on both sides of Ti Rakau Drive will be maintained. A new raised three-stage pedestrian crossing will be constructed, between Marriot Road and Edgewater Drive west, during the construction of the new westbound lanes. However, this crossing will not be in use until the completion of the bus lanes and the Edgewater bus station in the centre of Ti Rakau Drive. Pedestrians will continue to use the existing pedestrian crossing at the Ti Rakau Drive / Edgewater Drive west intersection.

5.4.10 EB3R – Ti Rakau Drive from Mattson Road to Gossamer Drive (Phase 2)

The footpath along the northern side of Ti Rakau Drive will be maintained, and pedestrians will be able to utilise the new footpath along the southern side during Phase 2. As above, the new staged pedestrian crossing towards the Edgewater bus station will not be in use until completion of the bus lanes and the bus station. A temporary signalised pedestrian crossing will be provided at the Ti Rakau Drive / Edgewater Drive west intersection.

5.4.11 EB3R – Ti Rakau Drive from Mattson Road to Gossamer Drive (Phase 3)

During Phase 3, the staged pedestrian crossing at the Edgewater Drive bus station will be completed and will be opened for use. During construction of Ti Rakau Drive / Gossamer Drive intersection, pedestrian crossings will be maintained. Temporary crossings will be provided as necessary to avoid the construction areas, and will form part of the CTMP.

5.4.12 EB3R – Side Roads

The existing footpaths along both sides of Tiraumea Drive, Mattson Road, Roseburn Place, Edgewater Drive west, Chevis Place, Wheatley Avenue, Edgewater Drive east, Freemantle Place and Gossamer Drive will be maintained during construction. CTMPs will be employed to divert pedestrians around work zones as necessary.

5.4.13 Summary of Temporary Effects to Pedestrians and Cyclists

Temporary effects to pedestrians and cyclists during construction are considered to be negligible overall. Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities and diversions will be provided to ensure pedestrian connectivity. Furthermore, pedestrian access to properties will be maintained at all times. This will be ensured through the CTMPs.

5.5 Effects to Property Access and Parking

The sections below provide assessment of the temporary effects of EB2 and EB3R on property access, as well as on-street and off-street parking during construction, split between the EB2 and EB3R project areas.

5.5.1 EB2 – Reeves Road

The construction of Reeves Road will have no effect on on-street parking along this section of road as none is provided currently.

An assessment of temporary effects to property access and off-street parking at specific properties along Reeves Road in the EB2 project area is provided below.

5.5.1.1 3 Reeves Road – Gull Service Station

Figure 76 shows the location and property boundary of 3 Reeves Road, as well as the Gull service station (red outline) developed on the site. Access to the property from Reeves Road will not be maintained during the Reeves Road closure. Discussions are ongoing with the owner regarding loss of direct road access onto Reeves Road.

Figure 76: 3 Reeves Rd and Gull service station (red outline)

5.5.1.2 11 Reeves Road – Eastside Pups Dog Grooming and Daycare

Access to the property at 11 Reeves Road will not be maintained during the closure of Reeves Road. A temporary two-way access will be provided from Cortina Place via the property at 2 Cortina Place (see **Figure 77**), which is owned by AT. The manoeuvring width between parking spaces to the rear of the property is approximately 8.4m and will be sufficient to accommodate a two-way temporary access, while having no effect on on-site parking. Therefore, the temporary effects to property access and parking are considered to be negligible.

Figure 77: 11 Reeves Rd temporary access during construction

5.5.1.3 7 Aylesbury Street and 2R Ti Rakau Drive – The Warehouse and Pakuranga Library

Currently, access from Reeves Road is provided to The Warehouse's goods access and the associated undercover carpark at 7 Aylesbury Street (orange outline). Similarly, the service entrance of the Pakuranga Library and Citizens Advice Bureau at 2R Ti Rakau Drive (blue outline) is also accessed from Reeves Road.

During the initial stages of the Reeves Road closure, from approximately mid-2023 to mid-2024[27], access will be maintained through the work site to the goods access. Access to the undercover carpark from Reeves Road as well as the library service entrance from Reeves Road will not be maintained during this period. However, the existing secondary access to the undercover carpark off the private access road in the Pakuranga Plaza will remain open (see **Figure 78**). The main access to the Library on Aylesbury Street east will also remain open. Therefore, effects to property access during this period at these properties, as well as during events such as the Pakuranga Night Market, are expected to be very low.

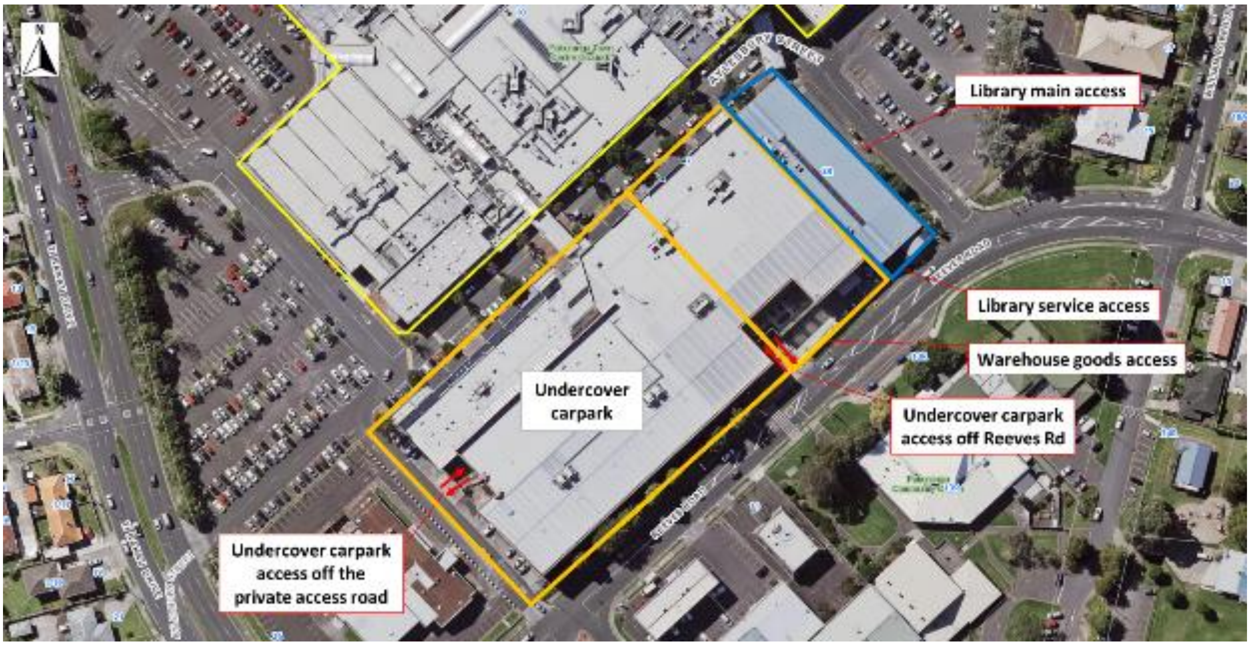


Figure 78: Pakuranga Plaza undercover carpark accesses

It should be noted that during this period, access to the Pakuranga Plaza at the Reeves Road / Aylesbury Street east intersection will also not be maintained. A full assessment of effects to property access at the Pakuranga Plaza is presented in **Section 5.5.5.3**.

Following this initial period, and in addition to the access being maintained to The Warehouse, access will also be reinstated to the undercover carpark and the Library service access. These access arrangements are shown in **Figure 79** below.

[27] These periods are indicative, and the EBA is reviewing the design and construction methodology to accelerate construction.

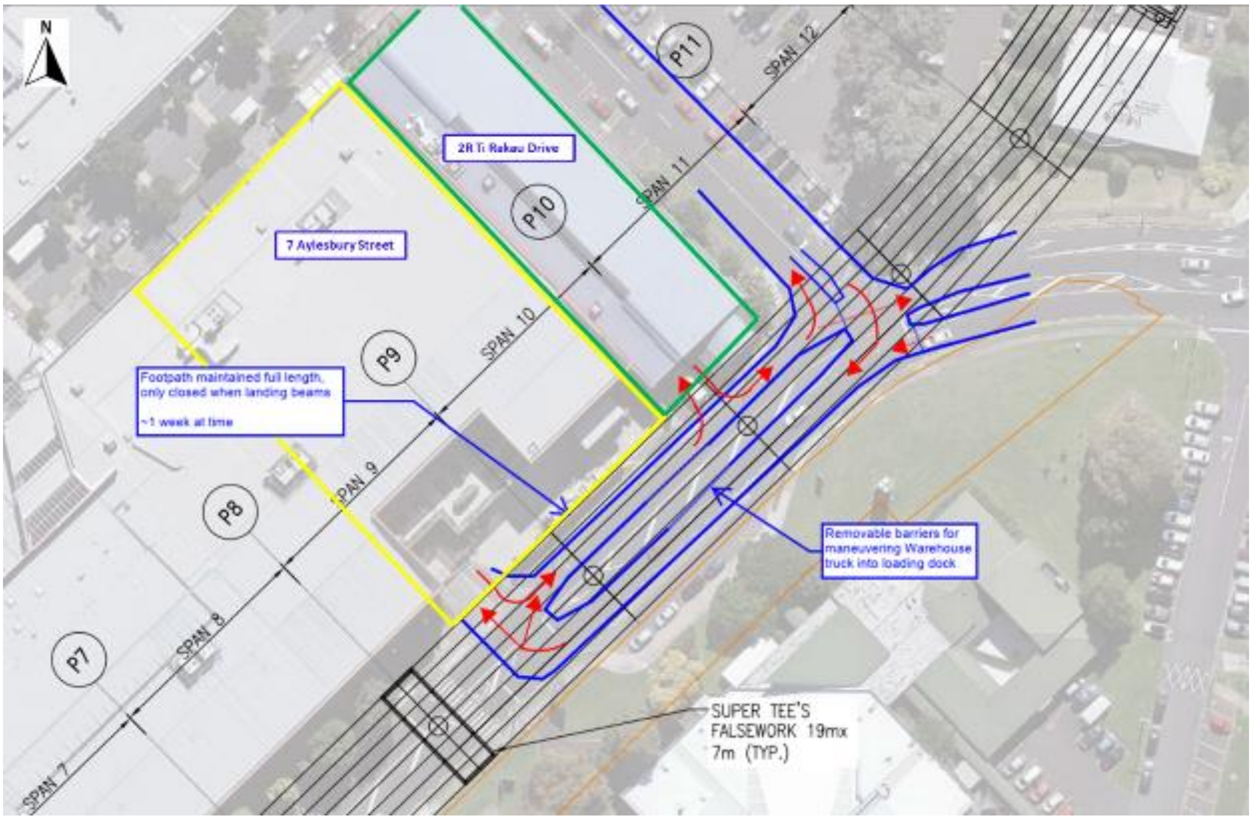


Figure 79: 7 Aylesbury St and 2R Ti Rakau Dr temporary access during construction

At present, The Warehouse's goods access is left-in left-out only, with trucks accessing the site via Reeves Road from the south and exiting to the north. Trucks will access the site from the north on Reeves Road, execute a U-turn and return northbound on Reeves Road towards William Roberts Road during construction.

Removeable barriers will be installed in the median and the existing masonry wall on the property boundary will be removed, if required, to accommodate this manoeuvre. The wall will be reinstated after construction of Reeves Road. Deliveries to the property are currently limited to one semi-trailer per day (as per the terms of the existing resource consent for the property) and background traffic volumes on Reeves Road will be significantly reduced.

Access to the undercover carpark will also be from the north on Reeves Road, turning right into the carpark. Left-out only movements will be provided at this access for vehicles exiting from the carpark.

Access to the service entrance of the Library will be from the north on Reeves Road, executing a U-turn manoeuvre at the undercover carpark access. During construction, this access will provide for left-in left-out movements only. Given the nature of the service access and its size, it is expected that a low number of vehicles would require access to this entrance during construction. Effects to property access are expected to be negligible as the existing background traffic on the road will be redistributed elsewhere during the Reeves Road closure.

5.5.1.4 13R Reeves Road – Te Tuhi

The main access to the property off Reeves Road will not be maintained during the Reeves Road closure. A temporary indented drop-off area will be provided on the western side of William Roberts Road, with a temporary walkway leading around the property to the main entrance (see **Figure 80**).

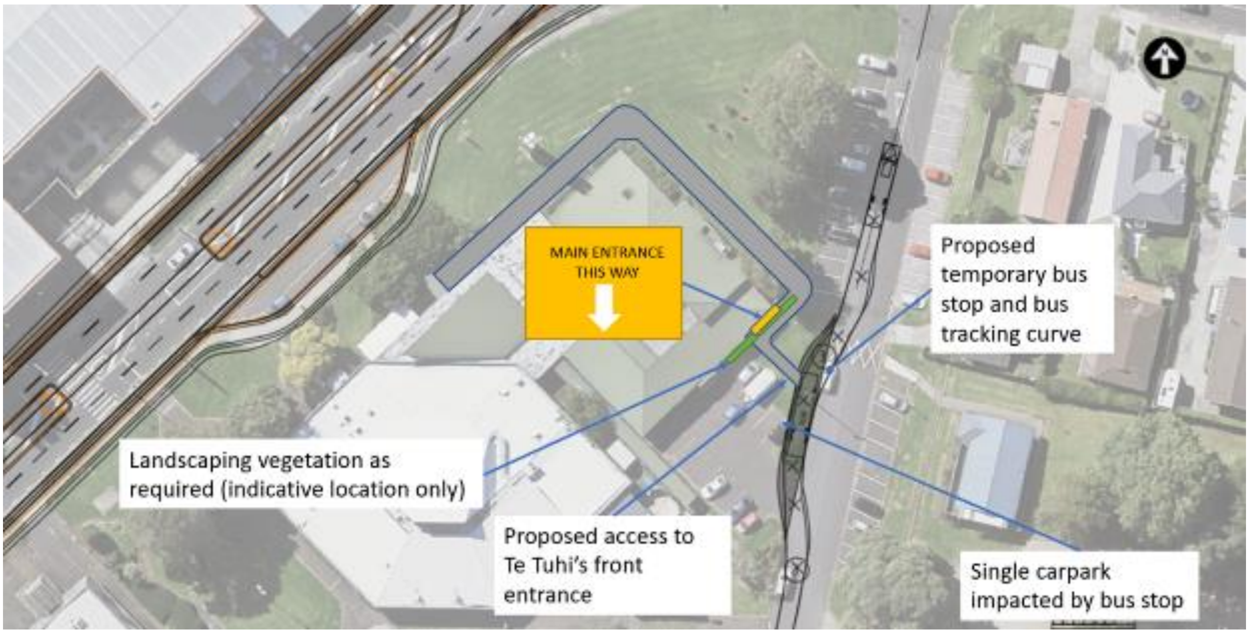


Figure 80: 13R Reeves Rd temporary access during construction

The drop-off will result in the temporary loss of one off-street parking space to the rear of the property. It is expected that the remaining 12 off-street parking spaces on the property would be sufficient during construction. Temporary effects on property access and off-street parking during construction are expected to be very low.

Once the WRRE is completed, on-street parking fronting this property will be removed via No Stopping at All Time (NSAAT) line markings. Therefore, the proposed temporary drop-off will have no additional effects on on-street parking along William Roberts Road.

5.5.2 EB2 – William Roberts Road North

As stated in **Section 5.1.1.4**, the construction yard will be located on the south-western quadrant of the Pakuranga Road / William Roberts Road intersection. The properties at 169, 171, 173 Pakuranga Road and 3 William Roberts Road have been acquired by AT and will provide the necessary space for this CSA. Again, it should be noted that this CSA is subject to a separate resource consent application and associated transport assessment. As such, no further comment on the construction yard is provided in this ITA.

AT have also acquired the remaining properties on the western side of William Roberts Road north, including 5, 7, 9,11, 13, 15, 17 and 19 William Roberts Road. These properties will provide the necessary space for the northern RRF abutment. The removal of these residential properties will further reduce the need for on-street parking along William Roberts Road north.

Lastly, AT have also acquired the properties at 177, 179, 181, 187 Pakuranga Road and 2 William Roberts Road on the southern side of the carriageway to allow for the Pakuranga Road / RRF tie-in.

Accesses to the remaining properties on the eastern side of the road will be maintained as per the existing environment.

Overall, the need for on-street parking along William Roberts Road north will be significantly reduced during construction. Therefore, the temporary effects to property access and parking are considered to be negligible.

5.5.3 EB2 – SEART

To enable the proposed design of the new SEART off-ramp and the southern RRF abutment, AT have acquired the following properties on the northern side of SEART:

- 25 and 27 Ti Rakau Drive
- 2, 4, 6, 8, 10, 12, 14, and 18 Seven Oaks Drive
- 1R and 19 Dale Crescent

The properties have been earmarked for demolition, thereby removing the current use of these properties.

5.5.4 EB2 – Pakuranga Road

In the existing environment, clearways are provided in the kerbside lanes on Pakuranga Road in the EB2 project area. The westbound clearway is enforced during the AM peak period (07:00 – 09:00) and the eastbound clearway during the PM peak period (16:00 – 18:00). In the off-peak periods, on-street parking is permitted along these sections of Pakuranga Road. **Figure 81** shows the location and extent of the clearways (blue outline) along Pakuranga Road in the EB2 project area.

Figure 81: Pakuranga Rd clearways and on-street parking (blue outline)

During construction of the Pakuranga Road / RRF tie-in, these clearways and on-street parking sections will be removed to provide the necessary workspace. As Pakuranga Road is largely similar to Ti Rakau Drive in the EB3R project area, in terms of traffic volumes and operating speeds, it is not unreasonable to assume that Pakuranga Road experiences the same low level of parking utilisation in the existing environment during weekdays and weekends. Based on this assumption, the temporary effects on on-street parking are expected to be negligible.

As per the existing environment, left-in/left-out access to the residential and commercial properties on the frontage of Pakuranga Road in EB2 will be maintained throughout the construction programme. This will be achieved through the CTMP. During the Reeves Road closure and before the RRF is open, vehicles exiting properties fronting this arterial road are expected to experience a minor increase in delay and queueing, and will still rely on driver behaviour for gaps within the opposing traffic streams. Once the RRF is completed, this section of Pakuranga Road is expected to experience a significant decrease in traffic volumes. The result is expected to be significantly less delay for vehicles attempting to enter the corridor. Therefore, the effects to these properties are considered to be very low.

As stated in **Section 4.2.1.6**, the initial stages of the Pakuranga Road construction will also include longitudinal drainage works and will be undertaken concurrently with the enabling works, early in the construction programme. A full assessment of effects to general traffic is presented in **Section 5.2.2.2**.

5.5.4.1 141 Pakuranga Road – GAS Service Station

Figure 82 shows the general location of the proposed longitudinal drainage works along Pakuranga Road and the property boundary of the GAS service station located at 141 Pakuranga Road.

Figure 82: Pakuranga Rd longitudinal drainage works and GAS service station (blue outline)

Longitudinal drainage construction will consist of the temporary closure of a section of the westbound kerbside lane on Pakuranga Road between William Roberts Road and Ti Rakau Drive. During this phase of work, access to the Pakuranga Plaza via Brampton Court, access to the GAS service station and the Pepler Street exit will be maintained.

The drainage works will be completed in sections to ensure this. It is envisaged that lateral shifts of the access points may be required. The construction team will also liaise with the operators of the GAS service station to ensure sufficient access widths are provided, as and when required, for fuel delivery tankers. Therefore, the effects to property access are expected to be negligible.

5.5.5 EB2 – Ti Rakau Drive, Side Roads and Pakuranga Plaza

5.5.5.1 Ti Rakau Drive

Ti Rakau Drive in the EB2 project area, between Pakuranga Road and Reeves Road, provides no on-street parking in the existing environment. Therefore, the construction phase will have no effects on on-street parking.

As per the existing environment, left-in/left-out access to the residential and commercial properties on the western side of the carriageway will be maintained throughout the construction programme. These properties include 3-27 Ti Rakau Drive. This will be achieved through the CTMP. Similar to **Section 5.5.4**, during the Reeves Road closure and before the RRF is open, vehicles exiting from these properties are expected to experience a minor increase in delay, and will still rely on driver behaviour for gaps within the opposing traffic stream. Once the RRF is completed, this section of Ti Rakau Drive is expected to experience a significant decrease in traffic volumes and delay. Therefore, the effects to these properties are considered to be very low.

Effects on property access with regards to the Pakuranga Plaza are discussed below.

5.5.5.2 Side Roads

Construction works on Palm Avenue will be limited to the approach of the intersection with Ti Rakau Drive. Works on Aylesbury Street will be more extensive; however, no on-street parking is provided in the existing environment and property access will be maintained during these works. Therefore, the construction phase will have no effects on on-street parking or property access along these side roads.

5.5.5.3 Pakuranga Plaza

The works in the EB2 project area around Pakuranga Plaza will be constantly evolving as works transition from one phase to the next. This in turn will require multiple changes to the accesses and parking currently serving the Pakuranga Plaza until the completion of the Project. The sections below provide an assessment of the temporary effects, in chronological order, to property access and parking.

It should be noted that for the purposes of this ITA, the term 'Pakuranga Plaza' is used here to refer to the entire area encompassed in the yellow outline in **Figure 83** below and includes the following properties:

- 7 and 10 Aylesbury Street
- 2R Ti Rakau Drive
- 1 Pepler Street
- 121, 123, 125, 127, 129, 131, 135, 141 and 167 Pakuranga Road

The assessment presented here excludes the property located at 26 Ti Rakau Drive (red outline).

Figure 83: Pakuranga Plaza

Property Access:

The Pakuranga Plaza currently has six access points allowing for both in and out movements, with a seventh allowing for movements out onto Pakuranga Road only. All accesses are currently priority-controlled. **Figure 84** below shows the traffic volumes for both the AM and PM peak hours at these access points (PM traffic volumes in brackets).

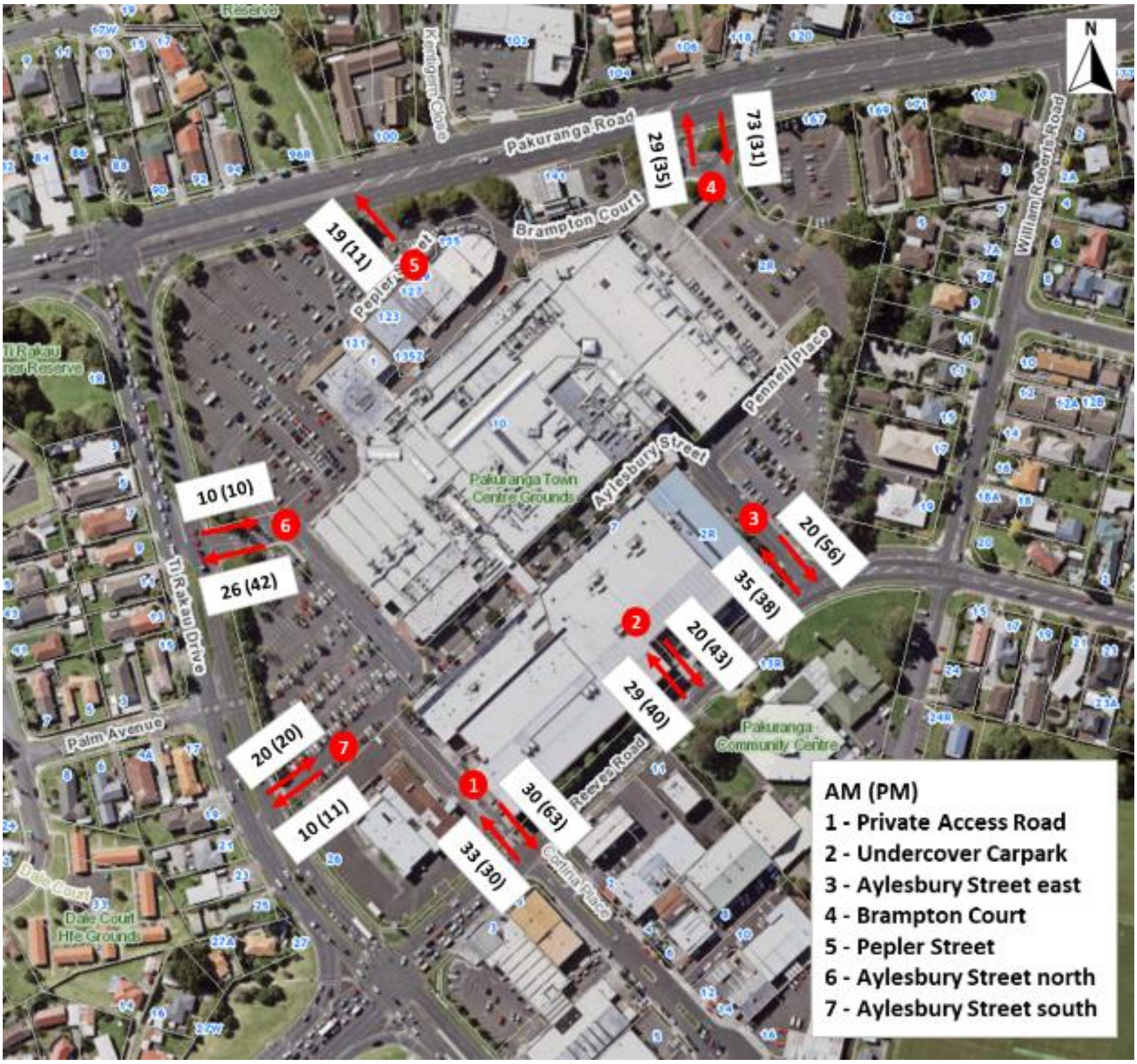


Figure 84: Pakuranga Plaza access volumes[28]

The initial stages of the Pakuranga Road construction will also include longitudinal drainage works and will be undertaken concurrently with the enabling works, early in the construction programme. However, as stated in **Section 5.5.4.1**, access to the Plaza via Brampton Court (Access 4) and the Pepler Street exit (Access 5) will be maintained. The drainage works will be completed in sections to ensure this. It is envisaged that lateral shifts of the access points may be required. The temporary effects to property access are expected to be negligible.

Construction of the new Ti Rakau Drive / Palm Avenue / Aylesbury Street crossroads intersection will be brought forward, and will be undertaken during Phase 1 of Ti Rakau Drive in EB2. The early completion of this intersection will provide improved access to the Pakuranga Plaza, with increased capacity and will allow for all movements. It is anticipated that the intersection will be completed before the closure of Reeves Road. During this phase of work, the existing priority-controlled Aylesbury Street accesses

[28] Traffic volumes sourced from the AIMSUN Do-Minimum model, with a 2028 horizon year.

(Access 6 and 7) will be maintained until completion of the new signalised crossroads intersection. Once completed, the accesses will be removed.

As stated in **Section 5.5.1.3**, Reeves Road will be closed during the initial stages of the construction programme, from approximately mid-2023 to mid-2024[29]. Access to the Plaza via the private access road (Access 1), the undercover carpark (Access 2), and Aylesbury Street east (Access 3) will not be maintained.

However, access will be maintained through the work site to The Warehouse's goods access. Furthermore, the existing secondary access to the undercover carpark off the private access road in the Pakuranga Plaza will remain open. The main access to the Library on Aylesbury Street east will also remain open.

It is expected that vehicles would divert to the three remaining accesses on Ti Rakau Drive and Pakuranga Road, which would have sufficient spare capacity due to the low background traffic volumes at those accesses. Therefore, the effects of the temporary closure of these accesses are expected to be very low.

Lastly, the Pakuranga Road / Brampton Court priority-controlled access to the Pakuranga Plaza will be realigned to allow for easier access for right turners.

Parking:

As stated in **Section 3.7.1**, the Pakuranga Plaza currently supports 1,355 parking spaces on site. The utilisation of 840 of these parks was captured during the parking survey, shown in **Figure 85**. The utilisation of the surveyed parking spaces was determined to not exceed 60% capacity on a typical weekday or weekend.

It is not unreasonable to assume that the remaining 495 un-surveyed parking spaces experience a similar utilisation profile. Therefore, based on this assumption, it is expected that the Pakuranga Plaza has at least 542 unoccupied parking spaces on an average weekday and weekend. It should be noted that AT owns all of parking areas shown in **Figure 85**, except for those parking spaces located on Aylesbury Street.

[29] These periods are indicative, and the Alliance is reviewing the design and construction methodology to accelerate construction.

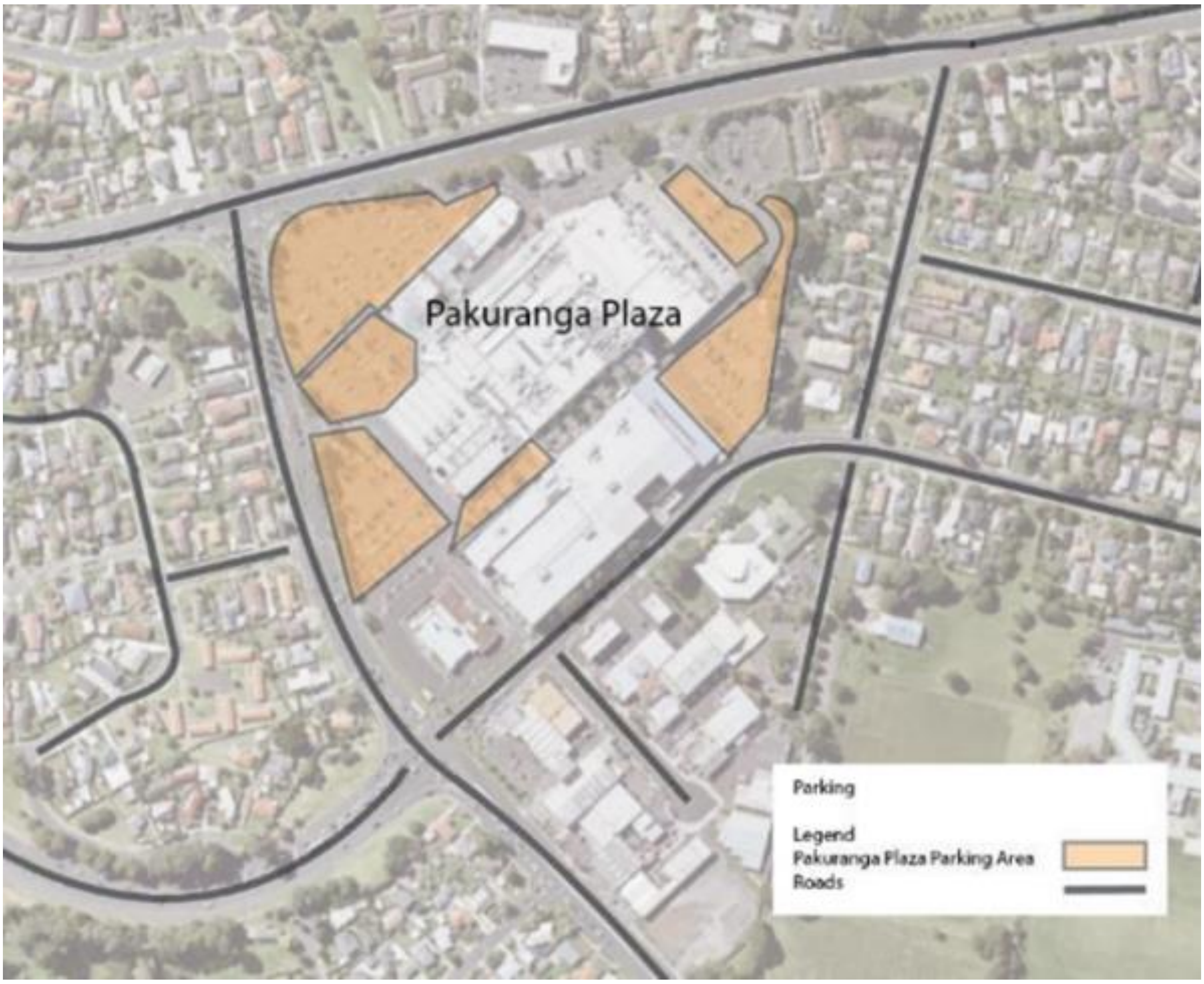


Figure 85: Pakuranga Plaza surveyed parking areas

As stated in **Section 5.1.1.3**, the parking area off Pennell Place in the Pakuranga Plaza will be temporarily occupied and established as a CSA. This carpark in its current form provides 108 parking spaces and will be occupied for approximately two years and two months. Taking the spare capacity of parking spaces at the Plaza into account, it is expected that there would still be 434 unoccupied parking spaces on site during the period where this parking area is occupied by the CSA. Therefore, in light of the existing spare capacity, the temporary effects of the use of the carpark as a CSA on parking at the Plaza are expected to be negligible.

During the Reeves Road closure and the RRF construction, works will commence on the new offline bus lanes on the northern side of Ti Rakau Drive between Pakuranga Road and Reeves Road. These works will also include the new bus station, the Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection and the ‘Kiss-and-Ride’ facility (see **Section 4.2.1.5**). **Figure 86** shows the layout of the proposed works and the effects on parking at the Plaza.

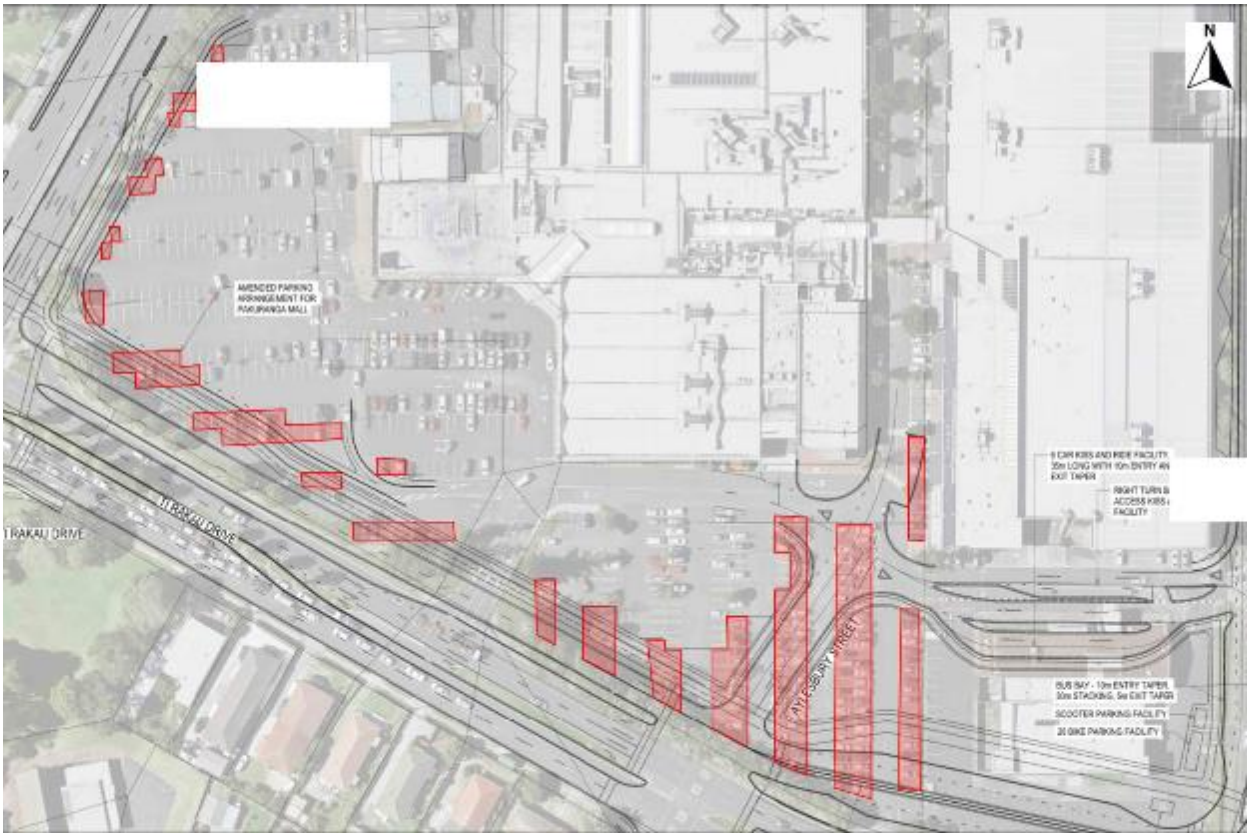


Figure 86: EB2 Ti Rakau Drive effects on parking at Pakuranga Plaza

For the purposes of this ITA it was assumed that all of the required land area will be under construction simultaneously, in other words the full effects of the proposed works on parking. Based on this assumption, the works will result in the permanent loss of 245 parking spaces at Pakuranga Plaza. Taking the spare capacity of parking at the Plaza into account, it is expected that there would still be 189 unoccupied parking spaces on site. Therefore, the effects of these works on parking at the Plaza are expected to be negligible.

Following construction of the RRF, late in the construction programme, the Reeves Road / Aylesbury Street and the Reeves Road / William Roberts Road intersections will be signalised. This will include the realignment of Reeves Road and Aylesbury Street east. **Figure 87** shows the proposed alignment of Reeves Road and Aylesbury Street east, as well as the effects on parking at the Plaza.

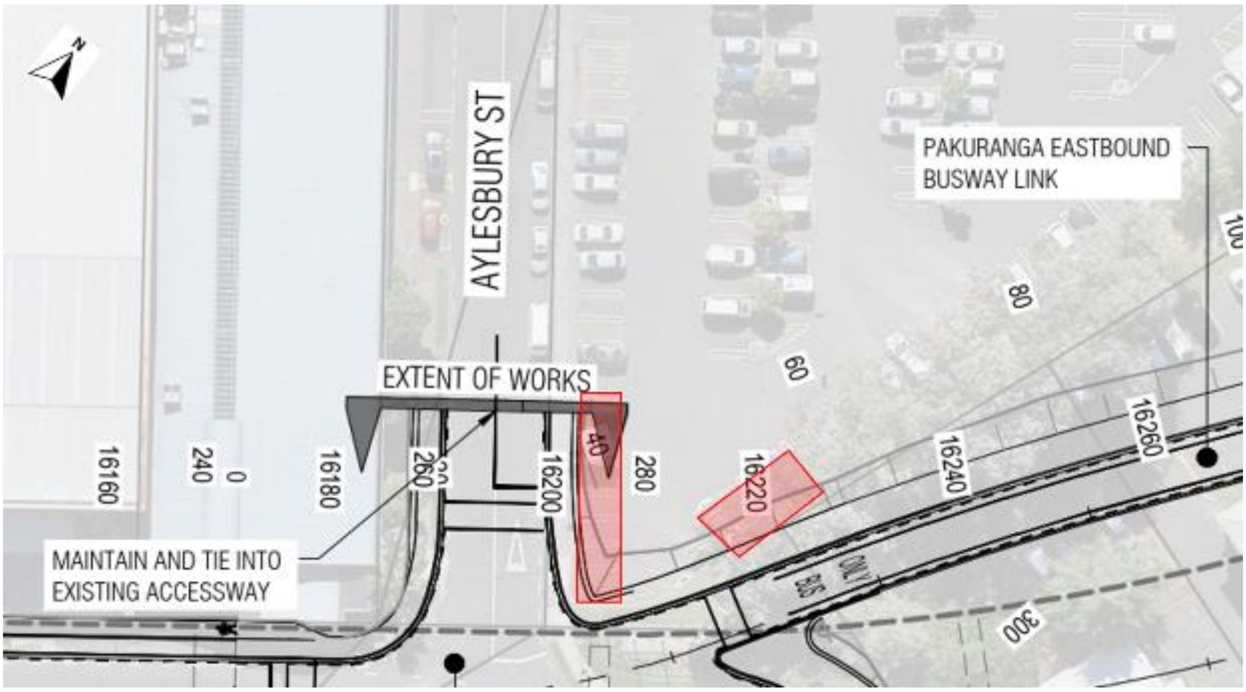


Figure 87: Reeves Rd / Aylesbury St signalisation effects on parking at Pakuranga Plaza

The proposed works will result in an additional and permanent loss of 12 parking spaces at the Pakuranga Plaza. However, these proposed works will occur after the CSA at Pennell Place has been disestablished and the parking area re-established. Taking the spare capacity of the remaining 297 parking spaces into account, it is expected that there would still be 285 unoccupied parking spaces on site. Therefore, the effects of this signalisation on parking at the Plaza are expected to be negligible.

5.5.6 EB3R – Ti Rakau Drive, Side Roads and Properties

The sections below provide assessment of the temporary effects during construction on property access and parking in the EB3R project area.

To enable the EB3R construction, AT have acquired the vast majority of properties along the southern frontage of Ti Rakau Drive including:

- 37 – 69, 73-105, 121-143, 147-207 Ti Rakau Drive
- 3 Tiraumea Drive
- 1, 3, 4 and 5 Mattson Road as well as small parcels of 7 and 9 Mattson Road
- 1 Roseburn Place
- 1 Snell Place
- 2 and 167 Edgewater Drive
- 1-2 Wheatley Avenue

Properties acquired on the northern side of the carriageway include:

- 216-222 Ti Rakau Drive
- 170, 174 and 178 Gossamer Drive
- A parcel of 168R Gossamer Drive

The majority of these properties are scheduled for demolition to facilitate the busway, thereby removing the current use of these properties.

5.5.6.1 Ti Rakau Drive

Ti Rakau Drive in the EB3R project area, between Reeves Road and Gossamer Drive, provides on-street parking along both sides for the majority of the corridor in the existing environment. The on-street parking will be removed during construction to provide the necessary space for the work zones. However, as stated in **Section 3.7.4**, the average utilization is poor with only 3% occupancy on weekdays and 8% on Saturdays. This is not unexpected as this high-volume road does not create an appealing location to park vehicles and is likely leading to a high perceived risk of crashes. It is also not unreasonable to assume that the surrounding residential properties have sufficient off-street parking.

Furthermore, the acquisition of the majority of the residential properties on the southern frontage of Ti Rakau Drive will remove the need for on-street parking along this section. Lastly, the current left-in/left-out access arrangements to the properties on the northern side of Ti Rakau Drive will be maintained during construction. Therefore, the temporary effects on on-street parking and property access along Ti Rakau Drive are considered to be negligible.

5.5.6.2 Side Roads

Tiraumea Drive, Roseburn Place, Edgewater Drive and Wheatley Avenue:

Construction works along the side roads of Tiraumea Drive, Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east will be limited to the approaches of the intersections with Ti Rakau Drive. Therefore, the construction phase will have negligible effects on on-street parking and property access along these side roads.

Marriot Road and Chevis Place:

No works are planned along Marriott Road and Chevis Place. Therefore, construction will have no temporary effects on on-street parking and property access along these side roads.

Mattson Road:

Construction works along Mattson Road will be relatively more extensive. The Mattson Road approach will be set back approximately 27m south and 36m west of its current location where it intersects Ti Rakau Drive. This will provide space for the new westbound lanes on Ti Rakau Drive.

However, the properties on the southern side of Ti Rakau Drive have been acquired, removing the need for on-street parking. Accesses to properties along Mattson Road not acquired by AT will be maintained and will interface with the new alignment of Mattson Road similar to the existing environment. Therefore, the temporary effects on on-street parking and property access along Mattson Road are considered to be negligible.

Gossamer Drive:

The Gossamer Drive approach limit line will be set back approximately 15 m from its current location and the kerbside exit lane will be extended to 100 m. NSAAT line markings are currently provided on the eastern side of the road up to the bus stop near the intersection with Riverhills Avenue. These markings will be replicated on the western side of the road. This will result in the loss of on-street parking in front of 169, 171, 173 and 175 Gossamer Drive. It is likely that these properties have sufficient off-street parking, and that on-street parking is not occupied on a regular basis. Accesses to properties along Gossamer Drive not acquired by AT will be maintained and will interface with the roadway similar to the existing environment. Therefore, the effects on on-street parking and property access along Gossamer Drive are considered to be negligible.

Freemantle Place:

The Freemantle Place approach will be set back approximately 11 m. NSAAT line markings are provided on the western side of the road for approximately 31 m from the limit line. The line markings will be reinstated upon completion and will result in the loss of one parking space in front of 3 Freemantle Place. It is expected that the remaining on-street parking space in front of the property will be sufficient. The existing line markings on the eastern side of the road will be retained. Property access along Freemantle Place will be maintained as per the existing environment. Therefore, the effects on on-street parking and property access along Freemantle Place are considered to be negligible.

5.5.6.3 Residential Properties on Southern Frontage of Ti Rakau Drive

During Phase 1 of EB3R, there will be 10 long driveways or 'strip accessways' to residential properties not being acquired by AT on the southern side of Ti Rakau Drive. As the new westbound lanes are constructed, access via Ti Rakau Drive will not be possible. Access to these properties will be provided via temporary residential access tracks along the back of the acquired properties as mitigation.

The temporary access tracks will run alongside a haul road to be used by site traffic, meaning construction and residential traffic will be separated. The tracks will be constructed with Chip Seal as the surface and in cases where the access tracks are greater than 50 m in length, these tracks will be wide enough for two-way traffic flow. The effect on each individual property is assessed below, however, overall the effects to property access are considered to be very low or negligible. As stated in **Section 4.2.2.3**, Phase 1 of EB3R is anticipated to have a duration of approximately one year and three months.

75A Ti Rakau Drive:

A temporary access point will be provided for 75A Ti Rakau Drive on the eastern side of Roseburn Place. The driveway will effectively line up with the existing access of 73 Ti Rakau Drive and will be separated from the haul road. Therefore, the effects to property access are considered to be negligible. **Figure 88** shows the location of the proposed temporary access.

Figure 88: 75A Ti Rakau Dr temporary access

83, 83A-C, 87, 89, 91, 97 and 103A Ti Rakau Drive:

A temporary access road will be provided for 83, 83A-C, 87, 89, 91 and 97 Ti Rakau Drive at the back of the acquired properties. The temporary access road will head east towards Edgewater Drive. **Figure 89** shows the location of the proposed temporary access road.

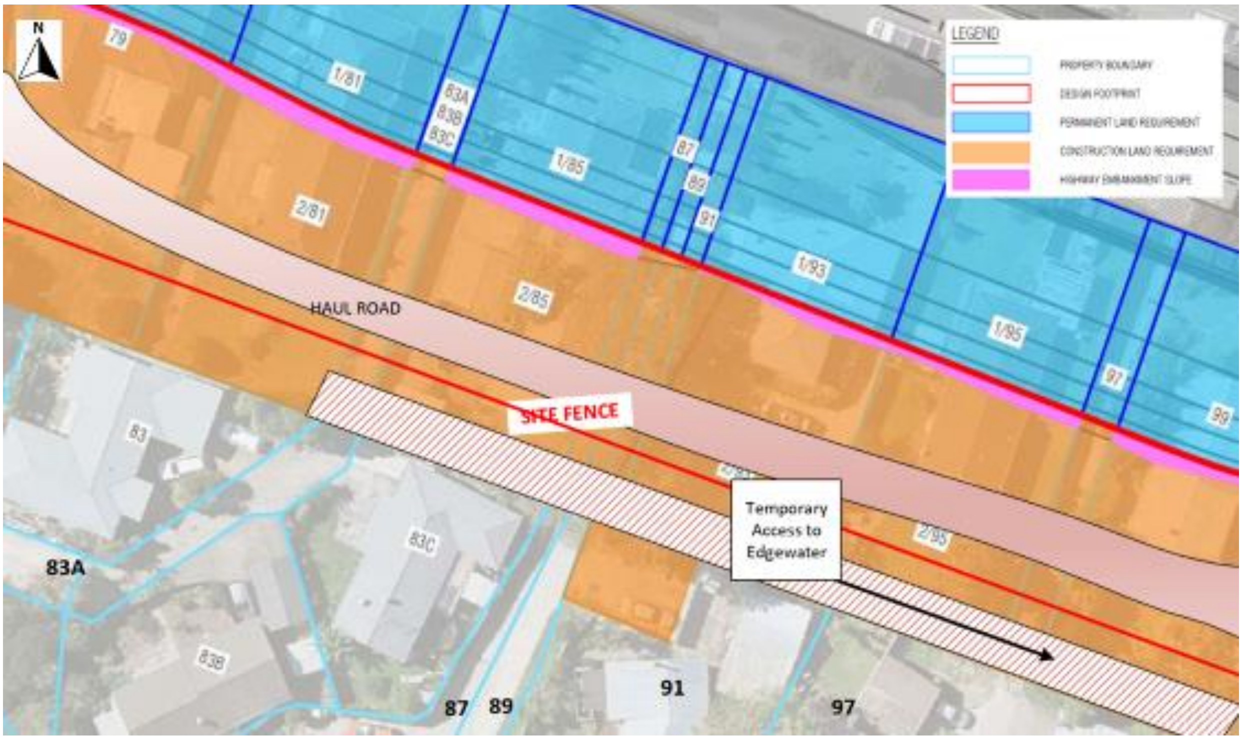


Figure 89: 83, 83A-C, 87, 89, 91 and 97 Ti Rakau Dr temporary access road

At the eastern end, the proposed temporary access road will terminate in the temporary parking area to be provided for the Edgewater Shops, located at 105 Ti Rakau Drive. A temporary access point for 103A Ti Rakau will also be provided here. **Figure 90** below shows the location of the proposed temporary accesses.

Figure 90: 103A Ti Rakau Dr temporary access

Residents will access the temporary access roads via Edgewater Drive west and the access road to the rear of the Edgewater Shops. The site haul road will also intersect the temporary parking area, but will be accessed by site traffic via Ti Rakau Drive. Therefore, the temporary effects to property access are considered to be very low.

129 Ti Rakau Drive:

A temporary access point will be provided for 129 Ti Rakau Drive on the western side of Wheatley Avenue. The driveway will intersect with Wheatley Avenue close to the existing access of 1 Wheatley Avenue and will be separated from the haul road. Therefore, the effects to property access are considered to be negligible. **Figure 91** shows the location of the proposed temporary access.

Figure 91: 129 Ti Rakau Dr temporary access

145 Ti Rakau Drive:

A temporary access point will be provided for 145 Ti Rakau Drive on the western side of Edgewater Drive east. The access road will intersect with Edgewater Drive at the existing access of 149 Ti Rakau Drive. A haul road is not proposed between Wheatley Avenue and Edgewater Drive east. Therefore, the effects to property access are considered to be negligible. **Figure 92** below shows the location of the proposed temporary access.

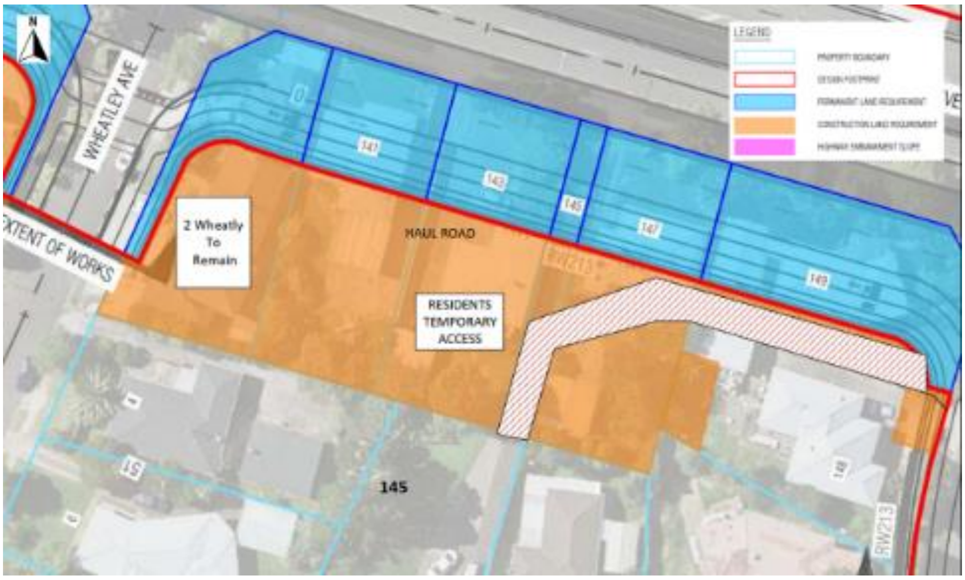


Figure 92: 145 Ti Rakau Dr temporary access

175A, 177, 183, 185 and 191 Ti Rakau Drive:

A temporary access road will be provided for 175A, 177, 183 and 185 Ti Rakau Drive at the back of the acquired properties. The temporary access road will head east towards Freemantle Place. **Figure 93** shows the location of the proposed temporary access road.

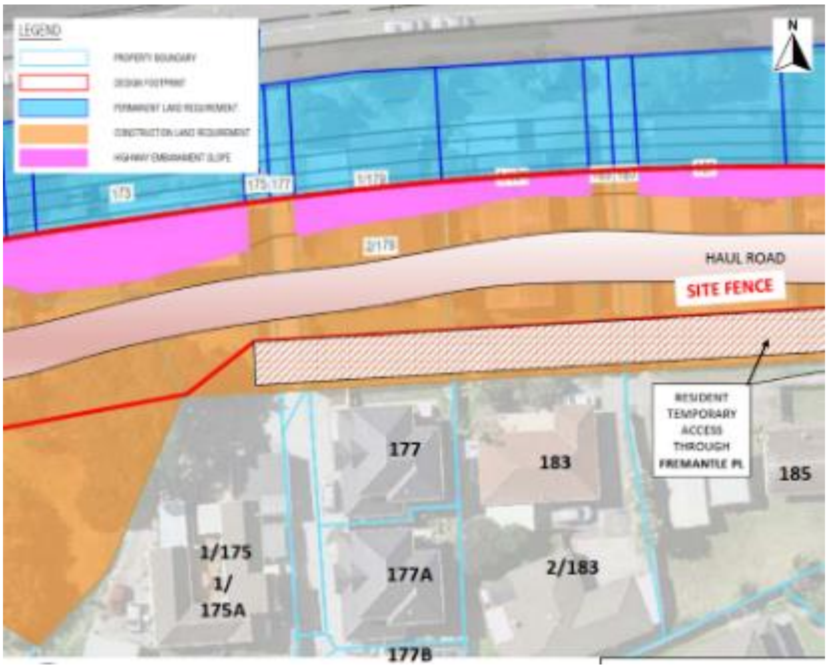


Figure 93: 175, 177, 183 and 185 Ti Rakau Dr temporary access

Near the eastern edge of 185 Ti Rakau Drive, the proposed haul road and temporary access road will curve northward, which will allow for access to also be provided to 191 Ti Rakau Drive. The temporary access road will continue eastwards and intersect Freemantle Place at the existing access to 201 Freemantle Place. Therefore, the effects to property access are considered to be negligible. **Figure 94** shows the location of the proposed temporary access road.

Figure 94: 191 Ti Rakau Dr temporary access

5.5.6.4 107 and 109 Ti Rakau Drive – Edgewater Shops

The Edgewater Shops, located at 107 and 109 Ti Rakau Drive, is a block of local shops. The parking area currently provides 26 parking spaces on the northern side of the property and an additional four parking spaces on the eastern side, for a total of 30 parking spaces (see **Figure 95**). It should be noted that these parking spaces are within the road reserve.

Figure 95: Edgewater Shops parking area

During construction, the new westbound lanes on Ti Rakau Drive as well as the redesigned Edgewater Drive west approach will result in the loss of all of the parking spaces at the shops.

As stated in **Section 5.5.6.3** above, the property at 105 Ti Rakau Drive (immediately west of the Edgewater Shops) has been acquired by AT and will provide a temporary parking area for customers of the shops (see **Figure 96**).

Figure 96: Edgewater Shops temporary parking area during construction

As stated in **Section 3.7.5**, utilization of the existing carpark is not expected to exceed 60% or 18 occupied spaces during a typical weekday or weekend. The temporary carpark will provide 18 parking spaces and access to the parking area will be from Edgewater Drive west via the access road at the back of the commercial properties. Access to the refuse collection area to the rear of the property will be maintained. Temporary signage will be provided to direct customers to the temporary parking area during construction. Therefore, temporary effects to property access and parking at the Edgewater Shops are considered to be very low.

As stated in **Section 5.5.6.3**, the temporary site haul road (blue polygon) will intersect the temporary carpark, but will be accessed by site traffic from Ti Rakau Drive. The proposed temporary access roads to 83, 83A-C, 87, 89, 91, 97 Ti Rakau Drive (green polygon) and 103A Ti Rakau Drive (yellow polygon) will also intersect the temporary carpark and will be accessed via Edgewater Drive west.

5.5.6.5 32 Edgewater Drive – Edgewater College

As stated in **Section 5.3.6**, the existing school bus services operating to and from the school will experience small route changes during the proposed Edgewater Drive intersection closures (Phase 1 of EB3R between Mattson Road and Gossamer Drive). However, these school bus services will still be able to access the existing off-street bus stop similar to the existing environment. Therefore, the temporary effects to property access and parking are considered to be negligible.

5.5.6.6 207, 219 and 229 Ti Rakau Drive – Pakuranga Baptist Church

Figure 97 shows the location of the Pakuranga Counselling Centre located at 207 Ti Rakau Drive (blue outline. The figure also shows the location of the Pakuranga Chinese Baptist Church, Pakuranga Baptist Kindergarten and the Pakuranga Baptist Church located at 219 Ti Rakau Drive (yellow outline) and the Congregational Church of Samoa located at 229 Ti Rakau Drive (purple outline). Lastly, the figure also shows the areas that will be occupied temporarily for drainage works (orange polygons), and the indicative drainage works segments (red outline).

It should be noted there is no intention to occupy the building at 207 Ti Rakau Drive and no demolition is planned.

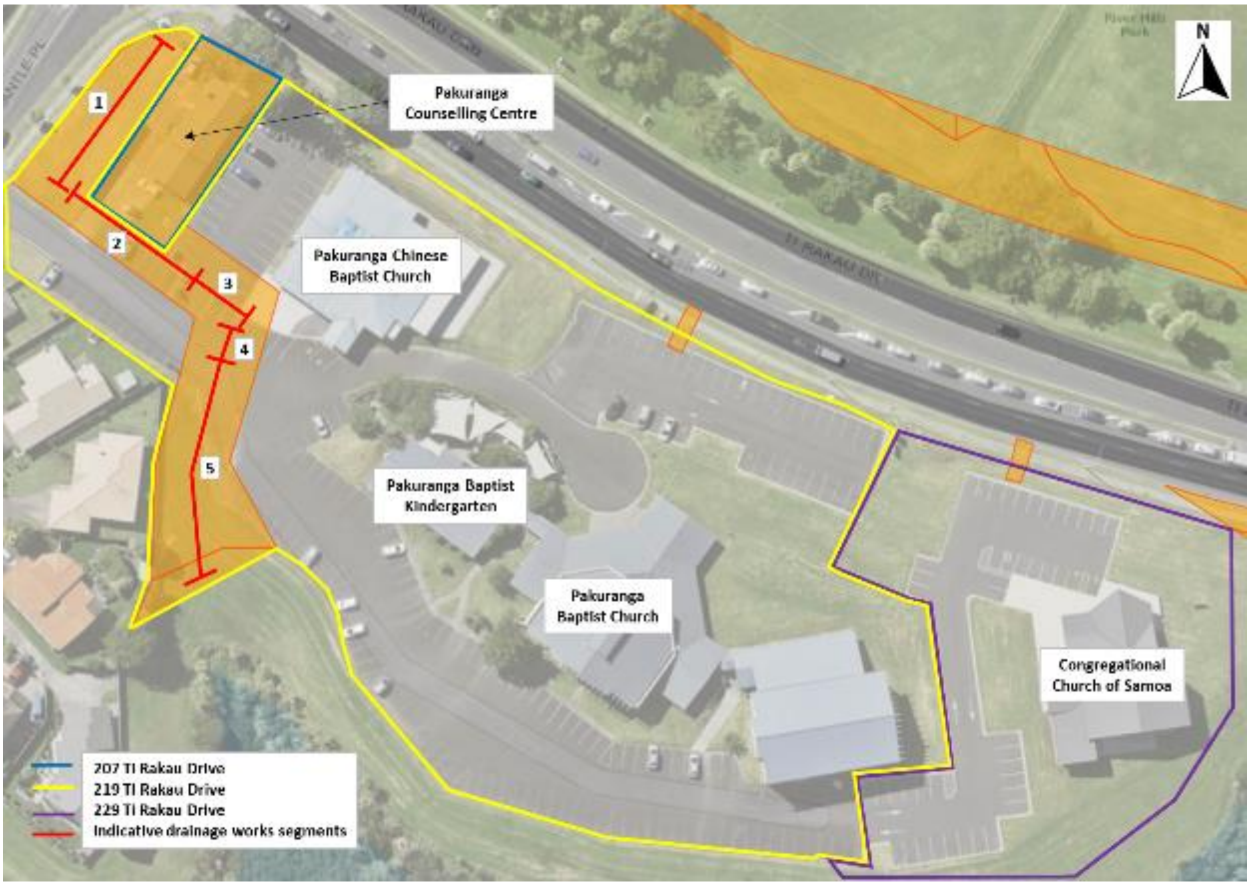


Figure 97: 207, 219 and 229 Ti Rakau Dr drainage works

Drainage works will be undertaken on these properties over a period of approximately one month. It is envisaged that the works will be completed in sections to maintain vehicle access to all the properties at all times. Furthermore, the drainage works will be undertaken during weekdays, with the possibility of works being undertaken on Saturdays as well.

At the end of each work week, the work zone will be reduced in size, while maintaining the safety of the work zone, to free up as many occupied parking spaces as possible. The Pakuranga Chinese Baptist Church currently offer one Saturday evening service, one Sunday morning service and one Sunday evening service. The Pakuranga Baptist Church currently offer one Sunday morning service.

Property Access:

In the existing environment, the Pakuranga Counselling Centre has one access off Ti Rakau Drive and one access off the private internal road to the off-street parking on the property. At least one of these accesses will be maintained at all times. Pedestrian access will be maintained at all times, and CTMPs will be employed to ensure this. Therefore, temporary effects to property access at 207 Ti Rakau Drive are considered negligible.

To avoid lateral shifts of the access and loss of parking as a result, the internal access to the Pakuranga Chinese Baptist Church will be reduced to a one-way system for a short period and will be managed through the CTMP. Appropriate liaison and advanced notice will be provided of the planned works.

Two-way access will be maintained for circulation on the internal roads of the property at 219 Ti Rakau Drive by using steel plating across trenches where necessary. Therefore, the temporary effects to property access at 207, 219 and 229 Ti Rakau Drive are considered to be very low.

Parking:

In the existing environment, the Counselling Centre at 207 Ti Rakau Drive has five parking spaces on site. The proposed drainage works will not have any effect on these parking spaces.

In the existing environment, 219 Ti Rakau Drive has a total of 220 parking spaces on site. The proposed drainage works in front of the Pakuranga Chinese Baptist Church are expected to affect 19 of these parking spaces. However, as stated above, the planned works will be staggered and is not expected to result in the loss of more than 10 parking spaces at any one time. Each segment of works will require roughly one week to complete.

To maintain two-way circulation on the internal roads, parking spaces will be removed temporarily. The planned works will result in the temporary loss of 15 parking spaces on the southern side of 219 Ti Rakau Drive during the work week. However, as stated above, the work zone size will be reduced at the end of the work week to free up as many parking spaces as possible. Therefore, it is expected that the temporary effects on parking will be very low.

5.5.6.7 168R Gossamer Drive – River Hills Park

A parcel of land along the southern boundary of 168R Ti Rakau Drive River Hills Park has been acquired by AT to allow for the eastbound Gossamer Drive bus station. Discussions are ongoing with the River Hills Park as well as the Fencibles United Football Club on the rearrangement of the fields on the property as a result of the Project.

However, from a transport perspective, the Project will have no temporary effects to property access and parking on-site.

5.5.7 Summary of Temporary Effects to Property Access and Parking

Overall, the temporary effects during construction on property access and parking will be mitigated appropriately and are considered to be negligible or very low. Where existing vehicle access arrangements and parking provisions cannot be maintained, appropriate mitigation measures have been proposed to provide levels of access and parking commensurate with the existing environment as far as is reasonably practicable.

Engagement with property owners or operators will be undertaken during construction to communicate the planned works and duration, the potential disruption and proposed mitigation measures as well as to develop additional measures or improve upon proposed measures if required. This will be a requirement of the CTMP.

Lastly, pedestrian access to properties will be maintained at all times. This will be ensured through the CTMPs.

5.6 Effects to Safety Performance

Safety measures will be in place during construction, ensured by the CTMPs. The safety and protection of the public, traffic and construction team is paramount, and all site operations will be focused on zero harm to all involved, associated and traveling through the project areas. This will be achieved through the following:

- Traffic management that separates the public / traffic operations as well as managing and maintaining public and traffic flow entering and exiting the construction operations within the project areas.
- Active communications with the local community and public travelling through the construction work zones to ensure they will be regularly updated on temporary traffic management operations.
- Before each work zone is ready to be opened following construction, an independent safety audit will be completed, and public notifications of the opening and new layouts will be made available.

5.7 Construction Traffic Management Plan

Construction Traffic Management Plans (CTMPs) will be employed for both EB2 and EB3R. The purpose of the CTMPs will be to avoid, remedy or mitigate the adverse effects of construction of the Project on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of the Notice of Requirement (NoR) / resource consent associated with the Project and will include management methods, controls and reporting to manage the potential effects on transport, parking and property access associated with the Project.

The CTMPs will be informed by practical experience with traffic management during construction and will reflect best practice through drawing on:

- The Code of Practice for Temporary Traffic Management prepared by the New Zealand Transport Agency, 4th Edition 2018 (CoPTTM)
- NZ Guide to Temporary Traffic Management (NZGTTM) which is currently in pre-consultation draft and will supersede the CoPTTM in due course

The CTMPs will set out the traffic management strategies that will be employed to manage the temporary effects during construction, including, but not limited to:

- Design standards
- Hours of operation
- Public transport
- Property access and parking
- Pedestrian and cyclists
- Emergency services
- Impacts on heavy haulage
- Impacts on taxi users
- Construction access and laydown
- Staff parking
- Site offices and satellite compounds
- Construction vehicle movements
- Transport network management
- Communicating traffic management impacts
- Temporary traffic management auditing
- Monitoring and reporting

The Project will be acting in and impacting on the network over the whole length of the construction period and over that time the construction's impacts will be monitored. The EBA will agree upon certain Key Performance Indicators (KPIs) to assess how well the EBA is performing at minimising community disruption. These KPIs will be reported to AT at an agreed interval.

The EBA will use the monitoring system SMATS iNode to track travel time through defined routes and compare these travel times to the normal travel time for that road at that time of day. This allows impacts of works to be identified without false-triggering of the system which may arise through normal congestion on busy routes. Additionally, Site Traffic Management Supervisors (STMSs) will monitor as part of their regular site checks and take action where possible to address the congestion.

Where disruption is identified as exceeding the trigger levels agreed with AT, the STMS will take action to reduce the impact of the works. This may include uplifting the closure or re-opening traffic lanes if this can be achieved quickly and safely.

Where disruption is occurring as a result of long-term Temporary Traffic Management (TTM), the Traffic Manager or Traffic Engineer will review the TTM measures and consider options to reduce the impact. The specific review process will depend on the nature and magnitude of each issue but will typically involve consultation with Auckland Transport Operations Centre (ATOC) and the Corridor Access Request (CAR) team from AT, and AT within the EBA to determine the acceptable level of disruption.

The review process may include reviewing staging of the construction activities, ability to provide further bus prioritisation at the expense of the general traffic, providing additional bus services as focus will be directed to provide prioritisation to bus service, or revised bus servicing. It is acknowledged that the retention of current public transport users is important for the busway utilisation after the project is completed.

6 Assessment of Permanent Effects upon Completion

The sections below provide an assessment of the permanent effects of EB2 and EB3R including:

- Future transport network
- General traffic effects
- Effects to bus services and facilities
- Effects to pedestrians and cyclists
- Effects to property access and parking
- Effects to safety performance

6.1 Project Benefits

In order to provide context to the benefits of the EB2 and EB3R sections of the Project and to reaffirm the benefits of the Project as a whole, the main elements of **Section 1.1.3** are reiterated here. Once delivered, the Project (EB2, 3 and 4) will provide:

- Better connections and sustainable travel options for pedestrians, cyclists, motorists, bus and train customers
- A reliable 40-minute bus and train trip between Botany Town Centre and Britomart (saving 20-minutes)
- Increase in public transport trips from 3,700 to 18,000 per day by 2028
- Increase in public transport mode share from 7% to 25% by 2028
- Reduce carbon emissions by 9,292 kg per day by 2028
- 24,000 more people with access to a rapid transit bus station within 1 km from home
- 5 km of busway between Pakuranga and Botany fully separated from other traffic
- 5 new bus stations with quality facilities
- 12 km of safe and separated walking and cycling infrastructure
- Reeves Road flyover to reduce vehicle congestion around Pakuranga Town Centre
- Encourage and support development of a more sustainable urban form and improve urban amenity
- Accommodates electric buses, a key part of AT's low-emission vehicle fleet by 2040

Although EB2 and EB3R are only two components of the Project as a whole, these sections will nevertheless provide:

- Significantly improved travel options for all modes of transport
- Increased public transport patronage and mode share through increased catchment and dedicated bus lanes
- Reduced carbon emissions
- Improved walking and cycling amenity and safety through dedicated infrastructure
- Reduced congestion, particularly around the Pakuranga Town Centre, through the new Reeves Road flyover

6.2 Future Transport Network

As stated in **Section 3.3**, a full RASF assessment was completed for the Project[30] and the section below summarises the key aspects of the future transport network and modal priority in the EB2 and EB3R project areas. Again, the RASF provides a systematic and consistent methodology for identifying the Place and Movement functions of roads and streets. In so doing, it reflects the needs and catchment of the adjoining land use as well as the movement of people, goods and services. Refer to **Figure 4** in **Section 3.3** which shows the RASF typology matrix, which is a function of Movement and Place significance.

In the future, the primary function of the Ti Rakau Drive and Pakuranga Road corridors will remain as Movement, but with more strategic functions. The Pakuranga Town Centre Masterplan promotes mixed-use retail zones along Ti Rakau Drive between Pakuranga Road and William Roberts Road. The primary function of the RRF will be Movement between Pakuranga Road and SEART. The proposed Eastern Busway bus stations will also attract more people within the area as the activities served by these bus stations will become local attractions.

Figure 98 outlines the future typology of the EB2 area.

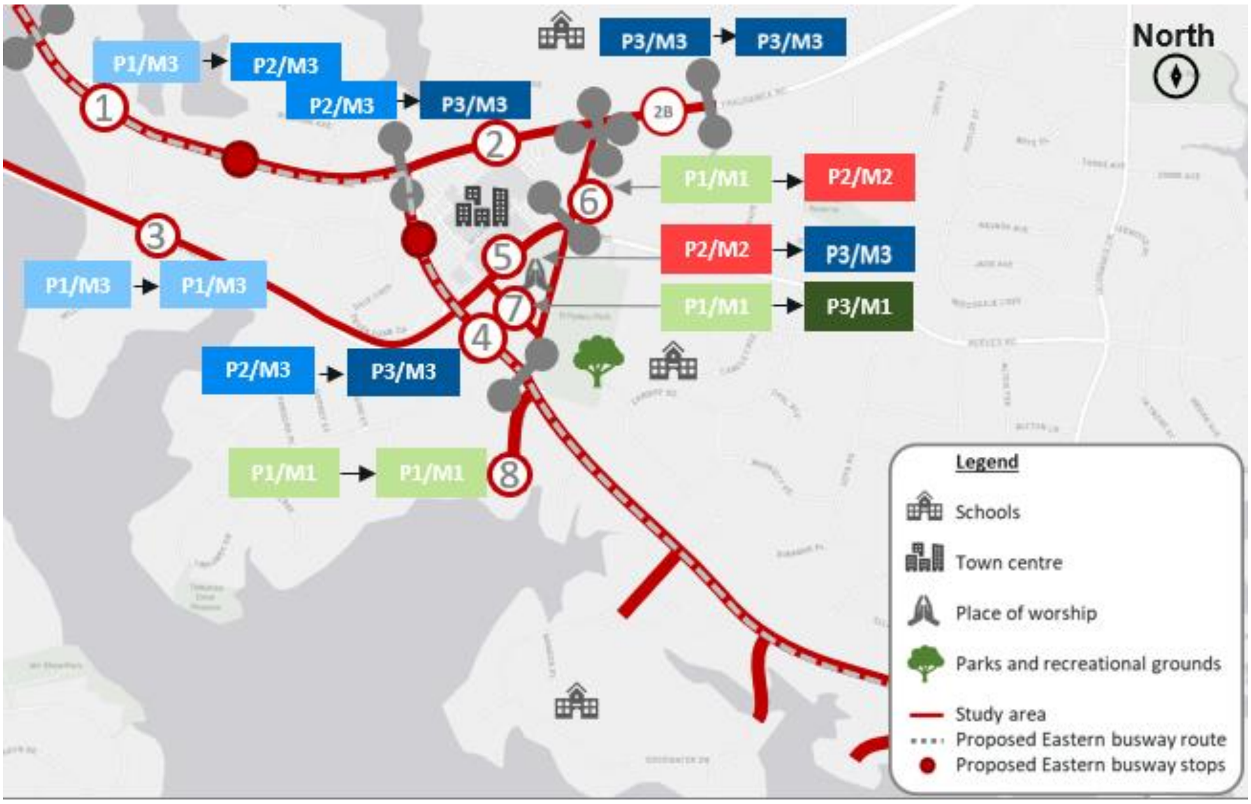


Figure 98: EB2 future typology

Figure 99 below outlines the future model priorities of the EB2 area.

30 EB234-1-TE-RP-Z0-A2-Roads and Street Framework

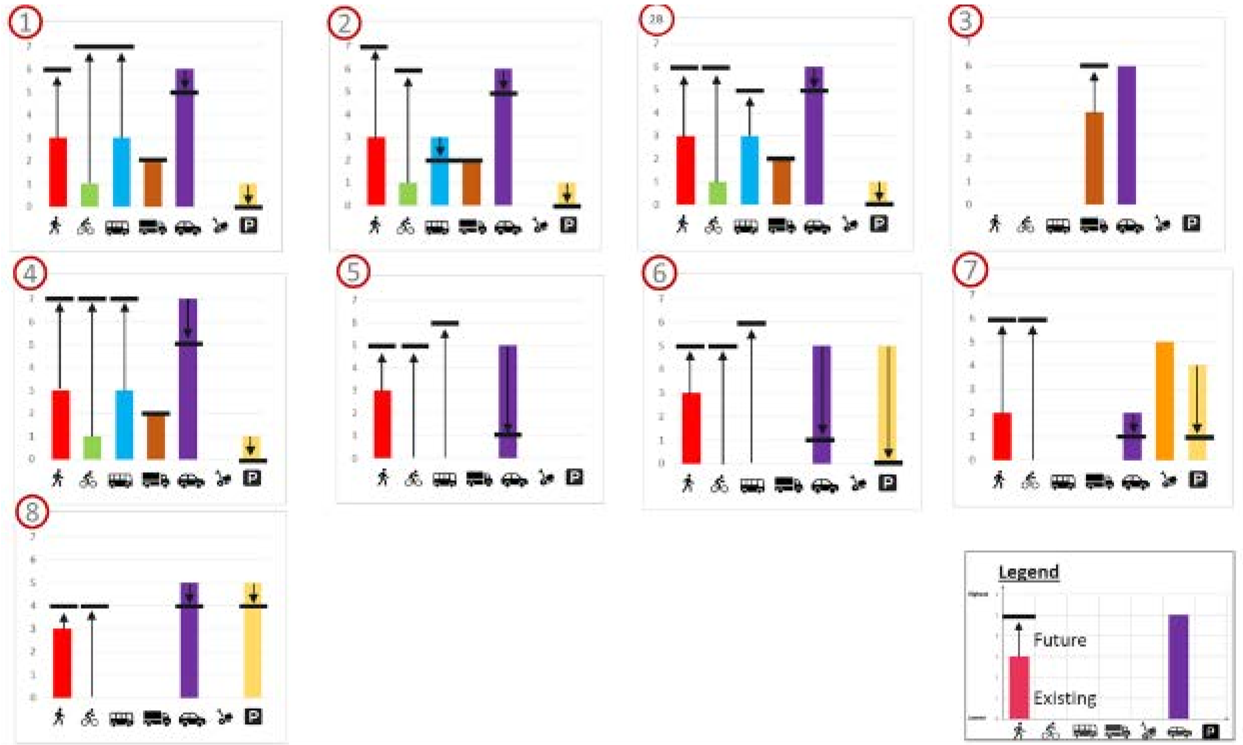


Figure 99: EB2 future modal priorities

While the corridors of Pakuranga Road and Ti Rakau Drive will carry more movements in future, Place function around the proposed bus stations in EB2 will become more important as these will attract more people. For this reason, the future Place typologies around the bus stations are marked as P2' as the stations will become more accessible with increased catchment and footfall.

The RRF will accommodate traffic from SEART and will largely prioritise active modes and public transport movements on the ground level. Reeves Road and William Roberts Road, which are currently town centre adjacent streets, will also be better integrated with the wider Town Centre. As a result, Place function on these streets will increase to 'P3'.

A general trend of improved pedestrian, cycling and bus modal priority is observed throughout the EB2 project area, as shown in **Figure 99**. As a result, the modal priority of general traffic as well as parking will decrease.

Figure 100 below outlines the future typology of the EB3R area.

Figure 100: EB3R future typology

Similar to EB2, the Place function around the proposed bus stations in EB3R are also marked as 'P2' (compared to the existing 'P1') as the stations will become more accessible, have increased catchments and higher footfall. The Movement and Place functions of the surrounding side roads will remain as per the existing environment.

Figure 101 outlines the future modal priorities of the EB3R area.

Figure 101: EB3R future modal priorities

Again, the modal priority of pedestrians, cyclists and buses will be improved throughout the EB3R project area, with a resultant decrease in modal priority of general traffic and parking.

6.3 General Traffic Effects

The sections below provide an assessment of permanent effects to general traffic upon completion of EB2 and EB3R. As stated in **Section 5.2.2**, general traffic effects refer to the movement of traffic across the road network as a whole. Similar to the assessments of the traffic environment during construction, the AIMSUN and SIDRA traffic modelling assessments were undertaken as per the methodology set out in **Section 2.4**.

6.3.1 Traffic Volumes

Table 35 outlines the expected AM and PM peak hour traffic volumes of the Do-Minimum and EB2/EB3R scenarios upon completion along key sections of the network, with a 2028 horizon year.

Table 35: Do-Minimum and EB2/EB3R (post construction) traffic volumes (2028)

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3R [veh/h]	Do-Minimum [veh/h]	EB2/EB3R [veh/h]
Pakuranga Rd (West of the RRF)[31]	Westbound	2,246	1,065	1,337	656
	Eastbound	1,548	982	2,725	1,192
Pakuranga Rd (East of the RRF)[32]	Westbound	2,304	3,014	1,331	1,541
	Eastbound	1,491	1,538	2,794	2,659
William Roberts Rd (Ti Rakau Dr – Reeves Rd)[33]	Northbound	35	419	42	415
	Southbound	35	220	75	235
Reeves Rd (West of William Roberts Rd)	Westbound	526	200	256	71
	Eastbound	240	83	791	200
Reeves Rd (East of William Roberts Rd)	Westbound	348	370	175	131
	Eastbound	310	369	607	573
RRF	Northbound	-	971	-	1,664
	Southbound	-	2,336	-	1,054
SEART (West of ramps)	Westbound	2,934	3,263	1,622	1,945
	Eastbound	1,387	1,848	3,135	3,081
Ti Rakau Dr (Pakuranga Rd – Reeves Rd)	Westbound	1,261	1,134	2,094	1,223
	Eastbound	1,319	706	958	853
Ti Rakau Dr (Reeves Rd – William Roberts Rd)	Westbound	2,062	1,751	1,524	1,694
	Eastbound	738	1,285	1,447	1,640
Ti Rakau Dr (William Roberts Rd – Edgewater Dr west)	Westbound	1,962	1,652	1,582	1,902
	Eastbound	740	996	1,446	1,469

[31] Relates to the section of Pakuranga Road west of William Roberts Road in the Do-Minimum scenario.
[32] The section of Pakuranga Road east of William Roberts Road in the Do-Minimum scenario.
[33] The section of William Roberts Road south of Reeves Road, prior to the completion of the extension, in the Do-Minimum scenario.

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3R [veh/h]	Do-Minimum [veh/h]	EB2/EB3R [veh/h]
Ti Rakau Dr (Edgewater Dr west – Gossamer Dr)	Westbound	1,600	1,671	1,652	2,009
	Eastbound	920	1,126	1,178	1,516
Gossamer Dr (At Ti Rakau Drive)	Northbound	359	426	697	603
	Southbound	1,224	719	499	503

A benefit of the RRF upon completion will be that less traffic is expected to travel on Pakuranga Road west, between Ti Rakau Drive and the RRF, as this is treated as the minor movement at the intersection. Instead, this traffic will travel along the RRF directly towards SEART. This trend is expected to occur in both the AM and PM peaks. Conversely, more traffic is expected to travel on Pakuranga Road east, to and from Howick, as this is treated as the major movement at the intersection.

The RRF is expected to experience somewhat cyclical traffic volumes with the majority of traffic heading southbound during the AM peak and returning northbound during the PM peak. A further benefit of the RRF is that Ti Rakau Drive in EB2, between Pakuranga Road and Reeves Road, is also expected to experience less traffic volumes in both directions during the AM and PM peaks.

The majority of the sections of Ti Rakau Drive in EB3R are predicted to experience increased traffic volumes in both directions during the AM and PM peaks. This likely due to the RRF diverting demand from Pakuranga Road directly to SEART, thus allowing more green time to be allocated at the Ti Rakau Drive / Reeves Road / SEART intersection to vehicles on Ti Rakau Drive.

As expected with the completion of the William Roberts Road extension, more traffic is predicted to travel along William Roberts Road between Ti Rakau Drive and Reeves Road in both directions during the AM and PM peaks.

Since general traffic will not be able to access Reeves Road from Ti Rakau Drive in the future and with the William Roberts Road link completed, traffic volumes are expected to be lower on Reeves Road west between William Roberts Road and Cortina Place. This section of Reeves Road will provide access to the Pakuranga Plaza. Reeves Road east, from William Roberts Road towards Pakuranga Heights, is expected to carry roughly the same traffic volumes westbound and eastbound in the future.

SEART is also expected to experience cyclical traffic volumes (similar to the existing environment), with the majority of traffic heading westbound during the AM peak and returning eastbound during the PM peak.

Gossamer Drive is expected to experience lower traffic volumes in the southbound direction during both AM and PM peaks. This is likely due to the removal of the left-turn slip lane on the northern approach at the intersection. However, Gossamer Drive is expected to experience marginally higher traffic volumes in the northbound direction in the AM peak. This is likely due to the increased length of the northbound kerbside exit lane.

6.3.2 Intersection Performance upon Completion

Intersection performance analyses of the transport network comprised of selected intersections in the EB2 and EB3R project areas was undertaken using SIDRA. Again, the analyses consisted of a comparison between the Do-Minimum and EB2/EB3R scenarios, with a 2028 horizon year, for both the AM and PM peak hours. The performance criteria for the assessment were based on the Level of Service (LOS), degree of Saturation (DOS) or v/c ratio and delay in seconds.

Permanent effects upon completion of EB2 and EB3R were assessed in a final scenario. The EB2/EB3R Final scenario simulates the completion of all EB2 works (see **Section 4.2.1**) and all EB3R works (see **Section 4.2.2**).

Traffic signal phasing diagrams per intersection are provided in **Appendix H** and lane performance summaries per intersection are provided in **Appendix I**.

Table 36 below provides a comparison of the intersection performance between the Do-Minimum and EB2/EB3R Final scenarios during the AM peak, with a 2028 horizon year.

Table 36: Intersection performance – Do-Minimum vs EB2/EB3R Final (AM peak, 2028)

Intersection	Do-Minimum			EB2/EB3R Final		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	32	D	0.94	39
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	1.23	11
Pakuranga Rd / RRF	Built during EB2			D	0.95	47
Reeves Rd / Aylesbury St	N/A	0.24	1	D	0.94	42
William Roberts Rd / Reeves Rd	N/A	0.69	8	E	0.89	71
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.34	2
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			D	0.99	51
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	D	0.82	40
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.82	33
Ti Rakau Dr / Mattson Rd	B	0.78	15			
Ti Rakau Dr western U-turn facility	Built during EB3R			A	0.68	4
Edgewater 3-Stage Pedestrian Crossing	Built during EB3R			C	0.88	25
Ti Rakau Dr eastern U-turn facility	Built during EB3R			B	0.86	11
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.14	86

SIDRA analysis indicates that, overall, in the AM peak the EB2/EB3R Final scenario is expected to result in minimal adverse effects on intersection performance at the majority of intersections along the network.

Minor increases in delay are expected at the Pakuranga Road / Ti Rakau Drive intersection, however the intersection is still expected to operate at an acceptable LOS D.

Compared to the Do-Minimum scenario, similar intersection performance is expected at the Pakuranga Road / Brampton Court intersection overall during the AM peak. The high v/c ratio is governed by the right-turn out from the Pakuranga Plaza, but is still expected to be lower than the Do-Minimum scenario.

The Pakuranga Road / RRF intersection is expected to operate at an acceptable LOS D during the AM peak under the EB2/EB3R Final scenario.

The signalisation of the Reeves Road / Aylesbury Street and William Roberts Road / Reeves Road intersections is expected to result in acceptable levels of service and midblock queues blocking the bus lanes are predicted to be unlikely.

Once constructed, the following new intersections are expected to operate with spare capacity during the AM peak under the EB2/EB3R Final scenario, all with acceptable LOS and DOS:

- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Edgewater 3-stage pedestrian crossing
- Ti Rakau Drive western U-turn facility
- Ti Rakau Drive eastern U-turn facility

Improved intersection performance is expected at the Ti Rakau Drive / Reeves Road / SEART intersection under the EB2/EB3R Final scenario during the AM peak. The intersection is predicted to operate at an acceptable LOS D.

The Ti Rakau Drive / Gossamer Drive intersection is expected to operate at capacity. The movements operating at capacity are the southern Freemantle Place approach, one right-turn lane on the eastern Ti Rakau Drive approach, the Gossamer Drive approach and the through lanes on the western Ti Rakau Drive approach. The trade-off is that all bus movements are expected to operate at LOS C and significant travel time improvements are predicted for the Botany to Pakuranga and SEART routes (see **Section 6.3.3**). Furthermore, the expected average delay at the intersection is less than the traffic signal cycle length.

The performance of this intersection is a balance between all the competing modes in a constrained corridor. Different intersection layouts, phasing and cycle times have been investigated and assessed to balance the competing modes. The intersection DOS < 1.2 is within the TMRs for the overall intersection performance guiding the design of the Project. The only alternative to improve LOS would be to provide additional lanes.

Lastly, it should be noted that the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is not identical to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout, and as a result would also have a more efficient traffic signal phasing.

Overall, the proposed design of EB2/EB3R is expected to lead to improved operations and reduced congestion for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. Furthermore, despite the poor performance at some of the intersections, significant improvements in travel time are expected overall. Lastly, further improvements are expected to be achieved once the full Project (EB2, 3, and 4) has been implemented.

Table 37 below provides a comparison of the intersection performance between the Do-Minimum and EB2/EB3R Final scenarios during the PM peak, with a 2028 horizon year.

Table 37: Intersection performance – Do-Minimum vs EB2/EB3R Final (PM Peak, 2028)

Intersection	Do-Minimum			EB2/EB3R Final		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	D	0.92	41
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	2.20	47
Pakuranga Rd / RRF	Built during EB2			C	0.83	34
Reeves Rd / Aylesbury St	N/A	1.03	42	E	0.93	62
William Roberts Rd / Reeves Rd	N/A	1.05	26	E	0.92	57
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.31	2
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			E	1.01	71
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	D	0.94	53
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.75	32
Ti Rakau Dr / Mattson Rd	B	0.68	13			
Ti Rakau Dr western U-turn facility	Built during EB3R			A	0.71	5
Edgewater 3-Stage Pedestrian Crossing	Built during EB3R			B	0.82	17
Ti Rakau Dr eastern U-turn facility	Built during EB3R			B	0.88	12
Ti Rakau Dr / Gossamer Dr	D	0.91	45	F	1.43	145

Similar to the AM peak, SIDRA analysis indicates that, overall, in the PM peak the EB2/EB3R Final scenario is expected to result in minimal adverse effects on intersection performance at the majority of intersections along the network.

Minor improvements in DOS and delay are expected at the Pakuranga Road / Ti Rakau Drive intersection, and the intersection is expected to operate at an acceptable LOS D.

Average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the increased demand on the right-turn out from the Pakuranga Plaza. These vehicles will become more reliant on driver behaviour to be given an opportunity to turn. However, on average, the intersection is still expected to with an acceptable level of delay and all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

Once constructed, the following new intersections are expected to operate with spare capacity during the PM peak under the EB2/EB3R Final Scenario, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Edgewater 3-stage pedestrian crossing
- Ti Rakau Drive western U-turn facility
- Ti Rakau Drive eastern U-turn facility

Similar to the AM peak hour, the signalisation of the Reeves Road / Aylesbury Street and William Roberts Road / Reeves Road intersections is expected to result in acceptable levels of service during the PM peak hour. Midblock queues blocking the bus lanes are predicted to be unlikely.

Improved intersection performance is expected at the Ti Rakau Drive / Reeves Road / SEART intersection under the EB2/EB3R Final Scenario in the PM peak. The intersection is predicted to operate at an acceptable LOS D.

The Ti Rakau Drive / Gossamer Drive intersection is expected to operate at LOS F during the PM peak. The failing movements are the through lanes on the western Ti Rakau Drive approach, eastern Ti Rakau Drive approach, the shared through and right-turn lane on the Gossamer Drive approach and the Freemantle Place approach. Similar to the AM peak hour, the trade-off is that all bus movements are expected to operate at LOS C and significant travel time improvements are predicted for the Pakuranga and SEART to Botany routes (see **Section 6.3.3**).

As discussed above, the performance of the intersection is a balance between all the competing modes in a constrained corridor. The only alternative to improve LOS would be to provide additional lanes. Different intersection layouts, phasing and cycle times have been investigated to balance the competing modes. Also, the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is different to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout and traffic signal phasing.

Again, the proposed design of EB2/EB3R is expected to lead to overall improved operations for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. Furthermore, despite the poor performance at some of the intersections, significant improvements in travel time are expected overall as a result of EB2 and EB3R, and will further improve once the full Project has been implemented.

6.3.3 General Traffic Travel Times

Route travel times were determined using the AIMSUN model, with a 2028 horizon year. The same four routes presented in **Section 5.2.3** are assessed here for permanent effects to general traffic travel times in the EB2/EB3R Final Scenario.

Table 38 provides a comparison of the route travel times between the Do-Minimum and EB2/EB3R Final scenarios, with a 2028 horizon year.

Table 38: General traffic travel times – Do-Minimum vs EB2/EB3R Final (2028)

AM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
Botany - Pakuranga	24.7	14.8	-9.9	13.9	22.1	8.1
Botany - SEART	20.9	14.9	-6.0	13.7	21.6	7.9
Howick - Pakuranga	5.3	6.6	1.3	4.7	6.4	1.7
Howick - SEART	11.6	5.7	-5.9	8.0	6.8	-1.2
PM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
Botany - Pakuranga	18.4	12.5	-5.9	24.6	18.6	-6.0
Botany - SEART	11.6	9.5	-2.1	24.5	19.8	-4.7
Howick - Pakuranga	4.7	3.9	-0.8	3.4	4.4	1.0
Howick - SEART	5.0	2.8	-2.2	7.5	8.6	1.1

During the AM peak period, westbound (citybound) movements are prioritised along the transport network upon completion of EB2 and EB3R. Along with the completion of the RRF, this is predicted to lead to significant improvements in travel times from Botany to SEART and Pakuranga as well as from Howick to SEART. The route from Howick to Pakuranga is predicted to experience a negligible increase, as it is treated as a minor movement at the Pakuranga Road / RRF intersection. The prioritisation of westbound movements is however predicted to lead to manageable increases in travel times of some of the eastbound routes. However, this is expected to improve once the remaining sections of the Project are constructed.

Similarly, in the PM peak eastbound movements are prioritised. This is predicted to lead to significant improvements in travel times from Pakuranga and SEART towards Botany. The eastbound routes from Pakuranga and SEART towards Howick are predicted to experience negligible increases in travel time. Westbound routes are predicted to experience small improvements, or in some cases negligible increases in travel time during the PM peak period upon completion of EB2 and EB3R.

6.4 Effects to Bus Services and Facilities

The sections below provide details and assessment of the permanent effects upon completion to bus services and facilities in the EB2 and EB3R project areas. **Figure 102** shows the existing bus services operating through project areas. These include the 70, 72C, 72M, 72X, 352, 711 and 712 services.

As noted above, school bus service operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

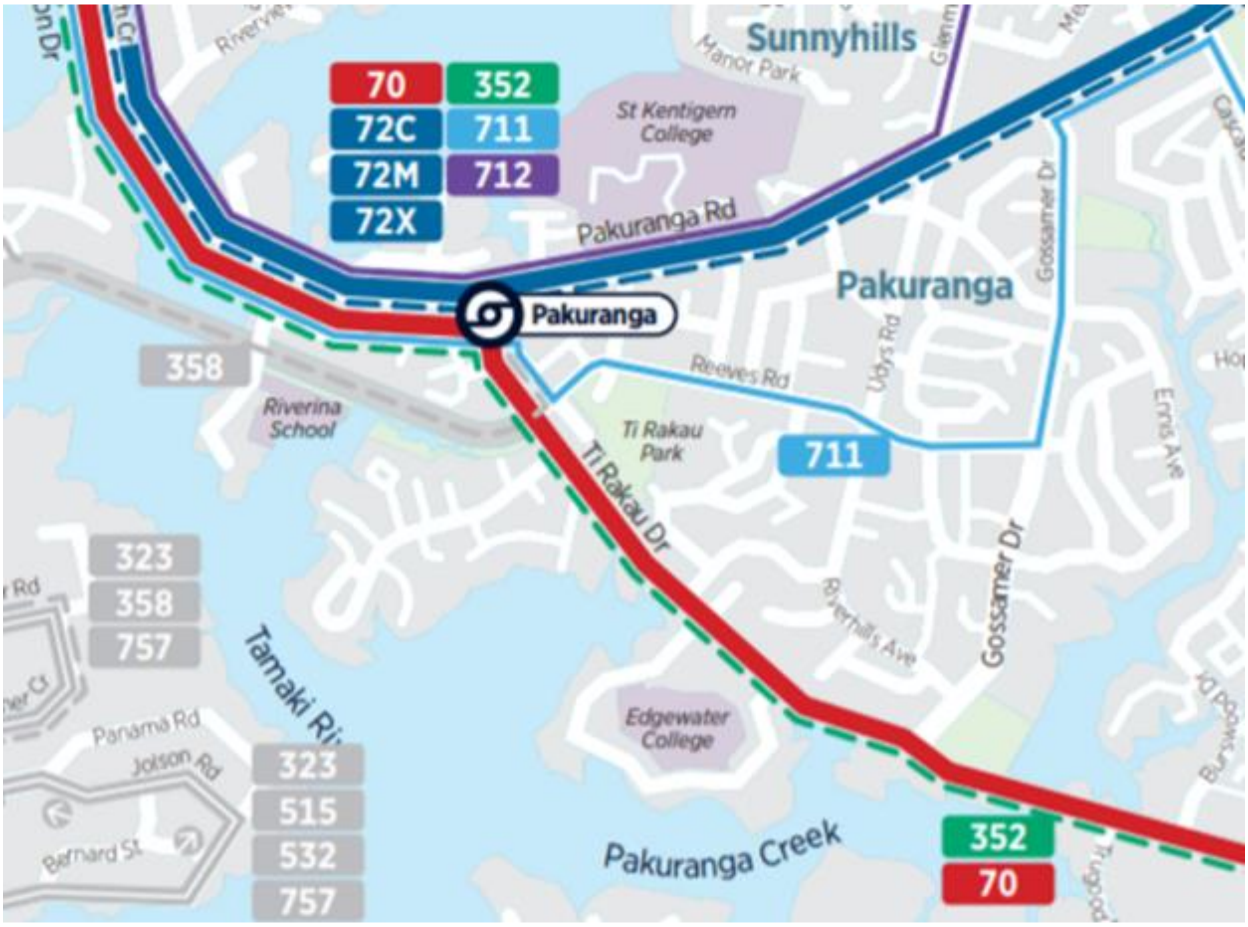


Figure 102: Existing bus services in the EB2 and EB3R project areas

6.4.1 Bus Station Overview

The sections below provide an overview of the bus stations that will be provided upon completion of EB2 and EB3R.

The benefits of the new stations will be the ability to support significantly higher public transport patronage through increased catchment and higher service frequencies through increased capacity. These benefits, in combination with improved customer accessibility, amenity and safety, will lead to an increase in mode share of public transport. A particular benefit of the Pakuranga Town Centre bus station will be the integration of all bus services in the EB2 and EB3R project areas, which will provide an improved transfer experience for passengers. Another benefit of the stations will be improved safety for buses.

6.4.1.1 Pakuranga Town Centre

A major interchange station will be provided in the Pakuranga Town Centre, on the northern side of Ti Rakau Drive, between Aylesbury Street and Reeves Road. The bus station will provide seating and sheltered cover for passengers boarding and alighting here. Furthermore, real-time information on service's estimated arrival times will be displayed on variable message boards along the platforms. Bicycle, scooter and e-bike storage will also be provided at this station. The bus station will be accessible to pedestrians and cyclists from all directions along all of the surrounding roads via separated footpaths, cycleways and signalised crossings. General vehicle access will be provided through a Kiss-and-Ride facility providing six drop-off spaces. **Figure 103** shows the layout of the proposed bus station in the Pakuranga Town Centre.

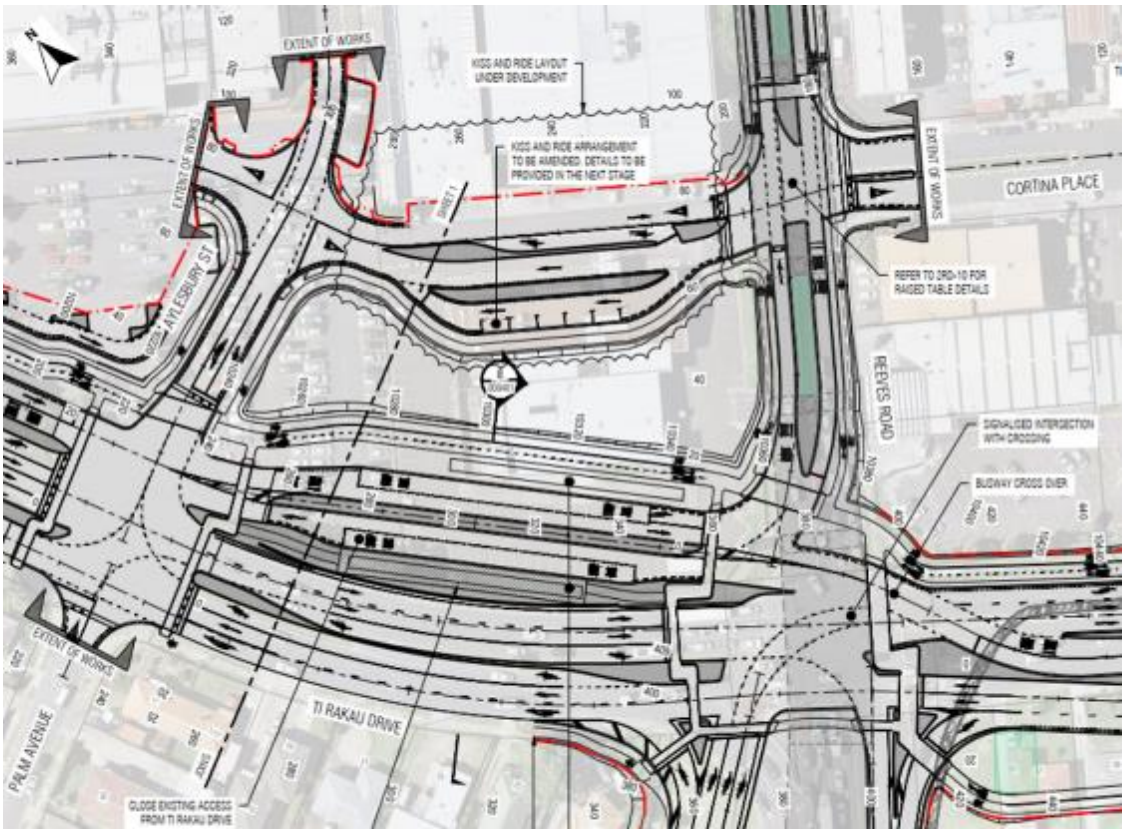


Figure 103: Proposed Pakuranga Town Centre major interchange station layout

6.4.1.2 Edgewater Drive

An intermediate station will be provided in the centre of Ti Rakau Drive, near Edgewater Drive west. As above, the bus station will provide seating and sheltered cover for passengers as well as real-time service information. Bicycle and scooter storage will also be provided. The bus station will be accessible to pedestrians and cyclists from both sides of Ti Rakau Drive via separated footpaths, cycleways and signalised crossings. **Figure 104** shows the layout of the proposed bus station at Edgewater Drive.

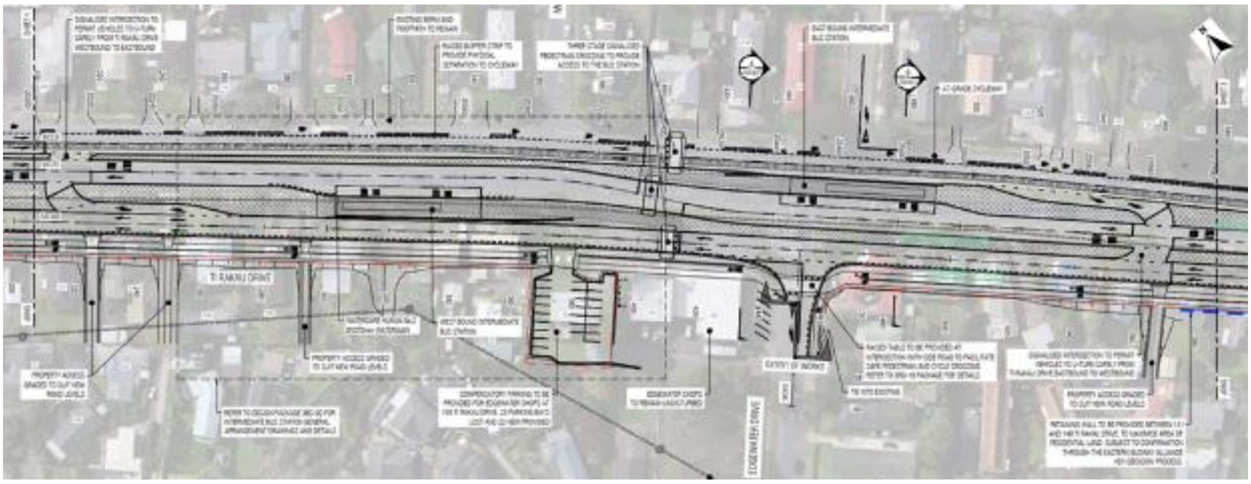


Figure 104: Proposed Edgewater Dr intermediate station layout

6.4.1.3 Gossamer Drive

An intermediate station will also be provided along Ti Rakau Drive, near Gossamer Drive. The westbound station will be provided along the centre of Ti Rakau Drive, while the eastbound station will be provided on the northern side of the Ti Rakau Drive carriageway.

With the full Project in place (EB2, 3 and 4), the bus lanes will continue on the northern side of Ti Rakau Drive and across the Pakuranga Creek towards Burswood (subject to a separate resource consent process). However, for the purposes of this ITA, the central running bus lanes will terminate at the western approach of the Ti Rakau Drive / Gossamer Drive intersection. Buses departing from the eastbound station will merge back into general traffic before the Ti Rakau Bridge. Similar to the Edgewater Drive station, this station will also provide seating, sheltered cover, real-time service information, and bicycle and scooter storage. The bus station will be accessible to pedestrians and cyclists from both sides of Ti Rakau Drive via separated footpaths, cycleways and signalised crossings.

Figure 105 below shows the layout of the proposed bus station at Gossamer Drive.

Figure 105: Proposed Gossamer Dr intermediate station layout

6.4.2 Future Patronage

Future patronage of bus services in the EB2 and EB3R project areas were determined from the MSM Auckland Regional Transport Models (EMME). These models forecast demands based on Auckland Council's Scenario I Modified Version 11.5 demographic and land use data. The outputs of these models include public transport demand and are based on a 2-hour period during the AM and PM Peaks.

Table 39 provides a comparison of bus patronage, predicted by the 2018 Base Model and the 2028 EB2/EB3R Model, at each of the proposed bus station locations during the AM peak period. It should be noted that the public transport demand shown below is a combination of both inbound and outbound services at these locations.

Table 39: AM peak period bus patronage – 2018 Base Model vs 2028 EB2/EB3R Model

Station	2018 Base Model			2028 EB2/EB3R Model		
	Boarding	Alighting	Total	Boarding	Alighting	Total
Pakuranga Town Centre	37	8	**45**	407	413	**820**
Edgewater Dr	72	0	**72**	208	60	**268**
Gossamer Dr	7	2	**9**	69	20	**89**

Table 40 provides a comparison of bus patronage, between the 2018 Base Model and the 2028 EB2/EB3R Model, during the PM peak period.

Table 40: PM peak period bus patronage – 2018 Base Model vs 2028 EB2/EB3R Model

Station	2018 Base Model			2028 EB2/EB3R Model		
	Boarding	Alighting	Total	Boarding	Alighting	Total
Pakuranga Town Centre	13	4	**17**	380	317	**697**
Edgewater Dr	50	0	**50**	69	143	**212**
Gossamer Dr	5	5	**10**	23	48	**71**

The proposed bus stations in the EB2 and EB3R project areas, as well as the proposed busway, are predicted to significantly increase public transport patronage during both the AM and PM peak periods. This trend is expected to continue throughout the day, leading to significant increases in daily public transport uptake.

As expected, the largest increase in bus patronage is predicted to occur at the major interchange station in the Pakuranga Town Centre. Nevertheless, the intermediate stations are also predicted to experience large increases in patronage, compared to the existing environment.

The benefit of increased public transport patronage is that it will lead to increased public transport mode share on the network. This will not only reduce congestion on the network, but will also reduce greenhouse gas emissions via a more sustainable movement of passengers through the network.

6.4.3 Platform Pedestrian Circulation

The level of service for customer circulation at the bus stations was determined based on the peak patronage at each location[34], with a target of LOS C (minimum 1.4 m^2 per person), for the peak 5-minute demand for boarding and peak 1-minute demand for alighting passengers. **Table 41** outlines the forecasted peak patronage by 2048, the resultant platform area required and the platform footprint of the design at each of the stations.

Table 41: Station patronage and platform area

Station	Direction	AM Peak period		PM Peak Period		Design Platform Footprint [m^2]
		Peak Patronage	Area Required [m^2]	Peak Patronage	Area Required [m^2]	
Pakuranga Town Centre	Inbound	73	102	60	84	**165**
	Outbound	41	57	45	63	
Edgewater Dr	Inbound	18	25	24	34	**105**
	Outbound	18	25	9	13	
Gossamer Dr	Inbound	18	25	24	34	**105**
	Outbound	18	25	9	13	

All station platform areas are being well provided for, with all stations requiring less area compared to provided platform footprint in the proposed design.

[34] EB234-2-TE-RP-Z0-0001_A1_Traffic Modelling and Analysis Report

6.4.4 Bus Station Loading Areas

An assessment was undertaken to determine the number of bus bays or loading areas at each of the bus stations, based on forecast patronage (EMME model) and bus numbers (provided by AT Metro) by 2048[35]. The assessment methodology to determine the number of bus bays and therefore the number of platforms required was determined using guidance from the Transit Capacity and Quality of Service Manual – Part 2 Transit Capacity (TCQSM). This included employing a given set of operating conditions and probability of acceptance of a bus entering a bus bay without delay.

Table 42 summarises the number of platforms and bus bays at each of the bus stations.

Table 42: Platform and bus bay requirements

Station	No. of Buses per Peak Hour	No. of Platforms (Inbound)	No. of Bus Bays (inbound)	No. of Platforms (Outbound)	No. of Bus Bays (Outbound)
Pakuranga Town Centre	74	1	3	1	3
Edgewater Dr	38	1	2	1	2
Gossamer Dr	38	1	2	1	2

The major interchange station in the Pakuranga Town Centre will consist of one platform per direction with three bus bays upon completion. The intermediate bus stations at Edgewater Drive and Gossamer Drive will consist of one platform per direction, each providing two bus bays upon completion, with the capability of providing a third bus bay in the future. Appropriate platforms and number of bus bays have been provided in the proposed design to cater for the predicted patronage and bus services by 2048.

6.4.5 Future Bus Services and Routes

The majority of bus services currently serving the EB2 and EB3R project areas will continue to do so by 2028, once EB2 and Eb3R are operational. These include the 70, 72X, 352, 711 and 712 services. It is anticipated by AT that the 72C and the 72M services will be combined into one new 72 service. In addition, two new services will be added to the network; the 705 service between Meadowlands and Panmure, and the 706 service between Flatbush and Panmure.

The new 705 service will travel along Picton Street, Selwyn Road, Granger Road, Litten Road, Sandspit Road, Meadowland Drive, Millhouse Drive, Botany Road, along Ti Rakau Drive through the EB2 and EB3R project areas, on Pakuranga Road and will terminate at the Panmure Train Station.

The new 706 service will travel along Ormiston Road, Murphys Road, Stancombe Road, Chapel Road, along Ti Rakau Drive through the EB2 and EB3R project areas, on Pakuranga Road and will terminate at the Panmure Train Station.

The route of the 35 service will be extended northwards from Botany Town Centre, along Chapel Road, Whitford Road, Cook Street, and Picton Street to replace the 72C service along these roads. The new 72 service will cover the same route as the 72M service from Botany to Howick, but with higher

[35] EB234-2-TE-RP-Z0-0001_A1_Traffic Modelling and Analysis Report

frequencies. From Picton Street, the new 72 service will replace both the 72C and 72M services as it heads along Ridge Road and Pakuranga Road towards Panmure.

Services currently operating along Ti Rakau Drive, such as the 70 and 352 services, will continue to do so with no changes to their routes. The 711 service will experience a minor route change, specifically the 711 inbound service. The route of the 711 inbound service will in future proceed along Reeves Road towards Ti Rakau Drive and the new bus station in the Pakuranga Town Centre.

The services operating along Pakuranga Road will also experience a minor route change. The 72X, 712 and the new 72 services will turn off Pakuranga Road, at the intersection with the RRF, and onto the new bus lanes towards Reeves Road. These services will continue along Reeves Road towards Ti Rakau Drive and the new Pakuranga Town Centre bus station. **Figure 106** below shows the future bus services and routes that will be operating in the EB2 and EB3R project areas upon completion.

Figure 106: Future bus services and routes in the EB2 and EB3R project areas

In future, all bus services along Ti Rakau Drive will travel in dedicated bus lanes through the EB2 and EB3R project areas, as opposed to the general traffic lanes in the existing environment. All bus services travelling along Pakuranga Road will turn onto the new dedicated bus lanes alongside the RRF towards Reeves Road and Ti Rakau Drive. Overall, the new routes and the bus lanes are predicted to lead to significant improvements in bus travel times and patronage levels. The sections below discuss the improvements in bus service headways as well as the expected improvements in bus travel times.

6.4.6 Service Headways

Table 43 below provides a comparison of the bus service headways, between the existing environment and EB2/EB3R upon completion by 2028, during the AM, IP and PM peak periods. These include the 70, 72C, 72M, 72, 72X, 352, 705, 706, 711 and 712 services.

Table 43: Service headways – Existing Environment vs EB2/EB3R (2028)

Service Description	Direction	Existing Environment			EB2/EB3R 2028		
		AM Headway [min]	IP Headway [min]	PM Headway [min]	AM Headway [min]	IP Headway [min]	PM Headway [min]
70 – Botany to Auckland CBD	Inbound	8	10	10	5	7	7
	Outbound	10	7	7	7	7	5
72C – Botany and Howick to Panmure	Inbound	20	30	30	-	-	-
	Outbound	30	30	20	-	-	-
72M – Botany and Howick to Panmure	Inbound	-	30	30	-	-	-
	Outbound	30	30	-	-	-	-
72 – Botany and Howick to Panmure (replacement for 72C and 72M)	Inbound	-	-	-	5	12	15
	Outbound	-	-	-	15	12	5
72X – Botany and Howick to Auckland CBD	Inbound	10	-	-	10	-	-
	Outbound	-	-	10	-	-	10
352 – Manukau to Panmure	Inbound	20	20	20	12	12	12
	Outbound	20	20	20	12	12	12
705 – Meadowlands to Panmure (new route)	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15
706 – Flatbush to Panmure (new route)	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15
711 – Howick to Panmure	Inbound	20	60	60	15	30	30
	Outbound	60	60	20	30	30	15
712 – Bucklands Beach to Panmure	Inbound	23	30	30	10	20	20
	Outbound	30	30	20	20	20	10

Service headways will improve for the 70 service during all periods of the day. The benefit of this will be an increase in public transport patronage, especially during the peak periods.

Again, it is anticipated that the 72C and 72M services will be combined into one new 72 service. The new 72 service will provide improved headways compared to the services it is replacing. The 72 service headways will be 5 mins in the peak direction (AM = inbound, PM = outbound), 12 mins during the IP periods, and 15 mins in the off-peak direction.

It is expected that the service headways for the 72X service will remain the same upon completion of EB2 and EB3R. The frequencies are expected to be sufficient to service the predicted patronage by 2028 along this route.

Service headways of the 352 service will improve significantly, compared to the existing environment. It is expected that 12 min headways will be provided for this service across all of the periods.

Initially, the new 705 and 706 services are expected to run at 15 min headways in the peak directions only (AM = inbound, PM = outbound), with the capacity to expand the timetable if required in the future.

The 711 service headways will improve to 15 min in the peak directions, while service headways will be halved during the IP periods and the off-peak directions.

The 712 service headways will be halved for the peak directions, to 10 minutes, while the IP period and off-peak service headways will be improved to 20 minutes.

As above, these improved service headways will significantly increase public transport patronage and as a result lead to increased public transport mode share on the network. This will not only reduce congestion, but will also reduce greenhouse gas emissions by way of a more sustainable movement of passengers through the network.

6.4.7 Bus Travel Time

Bus route travel times were determined using the AIMSUN model, with a 2028 horizon year. The same bus routes presented in **Section 5.3.5**, with the addition of the new 72, 705 and 706 services, are assessed here for permanent effects to bus travel times in the EB2/EB3R Final Scenario. **Table 44** below provides a comparison of the bus route travel times between the Do-Minimum and EB2/EB3R Final scenarios, with a 2028 horizon year.

Table 44: Bus travel times – Do-Minimum vs EB2/EB3R Final (2028)

AM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	42.3	29.8	-12.4	26.9	28.3	1.4
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	20.6	-	-	16.0	-	-
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	15.8	-	-
72 – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	21.8	-	-	20.0	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	24.6	25.5	0.9	-	-	-
352 – Ti Rakau Dr / Harris Rd to Panmure bus station	36.8	24.0	-12.8	29.1	29.6	0.5
705 – Cryers Rd / Stonedon Dr to Ellerslie Panmure Hwy Clare Pl	-	26.3	-	-	-	-
706 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	-	26.7	-	-	-	-
711 – Pakuranga Rd / Stanniland St to Panmure bus station	29.1	26.9	-2.2	22.7	27.9	5.2
712 – Glenmore Rd / Meadway to Panmure bus station	22.6	24.2	1.6	16.6	20.0	3.4

PM Peak						
Route Description	**Westbound**			**Eastbound**		
	Do Minimum [min]	**EB2/EB3R Final [min]**	**Difference [min]**	**Do Minimum [min]**	**EB2/EB3R Final [min]**	**Difference [min]**
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	35.7	28.5	-7.2	38.1	32.5	-5.6
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	14.6	-	-	14.8	-	-
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	15.0	-	-	-	-	-
72 – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	16.8	-	-	19.5	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	16.8	24.0	7.2
352 – Ti Rakau Dr / Harris Rd to Panmure bus station	33.4	28.9	-4.5	27.9	25.4	7.5
705 – Cryers Rd / Stonedon Dr to Ellerslie Panmure Hwy Clare Pl	-		-	-	28.7	-
706 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	-		-	-	32.0	-
711 – Pakuranga Rd / Stanniland St to Panmure bus station	23.8	24.6	0.8	24.5	32.5	8.0
712 – Glenmore Rd / Meadway to Panmure bus station	19.7	21.9	2.2	18.1	27.0	8.9

The 70 and 352 services, which travel along Ti Rakau Drive in the EB2 and EB3R project areas, are predicted to experience significant improvements in travel times during the AM peak in the westbound (inbound) direction. In the eastbound (outbound) direction, the 70 and 352 services are predicted to experience negligible increases in travel times. Both of these services will be running at higher frequencies during all periods of the day.

The new 72 route is predicted to have marginally longer travel times, in both directions during the AM peak, compared to the 72C and 72M routes it is replacing. Firstly, due to a longer route distance (+2.17km). Secondly, due to the expected increase in traffic volumes on Pakuranga Road, to the east of the RRF (see **Section 6.3.1**). However, the new 72 service will be running at higher frequencies in both directions.

The 711 and 712 routes are predicted to experience small to moderate increases, or in some cases small improvements, in both directions during the AM peak. Again, headways for the 711 and 712 service will be significantly improved in the future.

The 70 service is predicted to experience improvements in travel times during the PM peak in both directions upon completion of EB2 and EB3R. The combination of improved travel times and higher service frequencies will lead to a faster and more reliable public transport trip between Botany and the Auckland CBD.

Similar to the AM peak, the new 72 service is predicted to have marginally longer travel times, in both directions, during the PM peak compared to the routes it is replacing. This is likely due to the longer route distance and expected increase in traffic volumes on Pakuranga Road, east of the RRF. However, the new 72 will be running at higher frequencies.

Travels times for the 72X, 711 and 712 services are predicted to increase in the outbound (eastbound) direction during the PM peak. This is likely due to the route changes of these services, particularly the additional number of intersections these services have to pass through as well as the expected increase in traffic volumes on Pakuranga Road, east of the RRF. Again, while service frequencies for the 72X are expected to remain the same, service headways for the 711 and 712 services however will be significantly improved. Furthermore, the integration off all services at the Pakuranga Town Centre station will provide for an improved transfer experience between services. Passengers will not be required to walk across the Pakuranga Plaza to transfer between services on Pakuranga Road and Ti Rakau Drive.

The 352 service is predicted to experience an increase in travel times in the outbound (eastbound) direction during the PM peak. This is likely due to the operation of the Ti Rakau Drive / Gossamer Drive intersection. As stated in **Section 6.3.2,** the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is not identical to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout, and as a result would also have a more efficient traffic signal phasing. Therefore, additional travel time savings would be likely upon completion of the whole Project.

In line with the Project objectives, significant public transport capacity and travel time improvements are expected for bus services travelling on Ti Rakau Drive between Botany and Panmure, particularly in the peak directions of travel (westbound in the AM peak and eastbound in the PM peak). The expected travel time results do however indicate the potential need for future investment in public transport infrastructure on Pakuranga Road between the Pakuranga Town Centre and Howick.

In order to provide buses with a LOS of C or better, as per the TMRs, the following measures were included in the traffic signal design of EB2 and EB3R:

- Some form of priority is provided for buses, to balance the delays to vehicles and pedestrians
- Extending the current bus phase to enable an approaching bus to pass through the intersection
- Allowing the bus phase to interrupt once per cycle when a bus is on approach to the intersection
- Bus priority added in the form of approach and departure loops following review of traffic modelling
- Managing bus priority through SCATS using advance calls and departure loop inputs at each site
- Queue detection loops are provided on an as-needed basis only and in collaboration with AT

The above measures have been designed to adjust bus priority to suit traffic conditions and flow patterns, and to avoid blockage to busway movements and operate intersections efficiently. Therefore, the modelled average delay to buses at intersections within the project areas could potentially be reduced, further improving bus travel times.

Overall, bus travel times are predicted to improve across the network during the AM and PM peaks. The combination of improved travel times and higher service frequencies will lead to faster and more reliable public transport trips. In some cases where bus services are not expected to experience improvements in travel times, these services will still be improved in the form of the new bus stations, improved reliability and efficiency, and increased service frequencies.

6.4.8 School Bus Services

The S415 school bus service between Pakuranga and Sacred Heart College will in future also benefit from EB2. The S415 will depart from the Pakuranga Town Centre bus station, in the AM peak, and head westbound along the new Ti Rakau Drive bus lanes. At the intersection with Pakuranga Road, the S415 will join onto the EB1 bus lanes. In the afternoon, the S415 will return down Pakuranga Road, turning right onto the new Ti Rakau Drive bus lanes and terminate at the Pakuranga Town Centre bus station.

The S416 school bus service between Botany and Sacred Heart College will in future also benefit from EB2 as well as EB3R. In the AM peak, students will be able to board the S416 at the Gossamer Drive, Edgewater Drive and Pakuranga Town Centre bus stations as the service travels westbound along the new bus lanes on Ti Rakau Drive. As above, the S416 will turn left onto the EB1 Pakuranga Road bus lanes. In the afternoon, the S416 will return down the new Ti Rakau Drive bus lanes and students will be able to alight at the new EB2 and EB3R bus stations.

In the future, the S440 school bus service between Bucklands Beach and Sancta Maria College and Primary will remain on its current route and students will board and alight at the existing bus stops. The S440 will continue to proceed southbound on Gossamer Drive and turn left at the Ti Rakau Drive / Gossamer Drive intersection into the general traffic lanes and will not stop at the new Gossamer eastbound station in the AM peak. In the afternoon, the S440 will continue to turn right from Ti Rakau Drive onto Gossamer Drive from the general traffic lanes, and will not be able to stop at the Gossamer Drive westbound station.

The S013 school bus service between Otara and Edgewater College will in future continue to travel westbound along Ti Rakau Drive in the general traffic lanes during the AM peak, and will turn left into Edgewater Drive east. It will not stop on Ti Rakau Drive in the EB3R project area. In the afternoon, the S013 will experience a small change to its route. As the S013 departs from Edgewater College, the service will turn left at the Ti Rakau Drive / Edgewater Drive west intersection into the westbound general traffic lanes. The service will execute a U-turn manoeuvre at the western U-turn facility on Ti Rakau Drive and proceed as normal along the eastbound general traffic lanes. Again, the S013 will not stop along Ti Rakau Drive. The permanent effects to this school bus service are considered to be negligible.

In the future, the S073 school bus service between Otahuhu and Edgewater College will continue to turn right from SEART onto the eastbound general traffic lanes on Ti Rakau Drive, during the AM peak. The service will not be able to use the EB2 and EB3R bus lanes nor the Pakuranga Town Centre and Edgewater bus stations. The service will not stop along Ti Rakau Drive. As the Edgewater Drive west intersection is left-in left-out only in the proposed design, the S073 will experience a small change to its route. The service will proceed eastbound along Ti Rakau Drive and execute a U-turn manoeuvre at the eastern U-turn facility, to be able to turn left into Edgewater Drive west. In the afternoon, the S073 will continue to turn left onto the westbound Ti Rakau Drive general traffic lanes at Edgewater Drive west and head towards SEART. Again, the service will not be able to use the new bus lanes nor the new bus stations and will not stop along Ti Rakau Drive. The permanent effects to this school bus service are considered to be negligible.

Overall, school bus services travelling in the bus lanes are expected to experience similar travel time improvements as presented in **Section 6.4.7** and services travelling in the general traffic lanes are expected to experience similar travel time improvements as presented in **Section 6.3.3**.

6.5 Effects to Pedestrians and Cyclists

The Project will provide dedicated footpaths and cycleways to improve pedestrian and cyclist amenity and safety. Further benefits of this infrastructure will be greater connectivity and accessibility not only across the network, but especially in proximity to the bus stations, resulting in increased catchment as well as the potential for mode shift to occur.

In the EB2 and EB3R project areas, a combination of bidirectional and unidirectional cycleways will be provided along Ti Rakau Drive between Pakuranga Road and Gossamer Drive. Unidirectional cycleways will also be provided on Pakuranga Road between Ti Rakau Drive and the RRF. The majority of the existing footpaths will be retained while new footpaths will be provided along sections of Ti Rakau Drive, William Roberts Road, Cortina Place and Mattson Road.

In the future, raised tables (raised pedestrian platforms) will be implemented across all priority-controlled side streets along the southern side of Ti Rakau Drive in the EB2 and EB3R project areas. These include:

- Palm Avenue and Aylesbury Street (raised intersection)
- Tiraumea Drive
- Roseburn Place
- Edgewater Drive west
- Wheatley Avenue
- Edgewater Drive east
- Freemantle Place and Gossamer Drive (raised intersection)

Raised tables will also be implemented in the Pakuranga Town Centre area, the Reeves Road / Cortina Place intersection will be a raised intersection. **Figure 107** shows an example of a raised table in the proposed design at the Ti Rakau Drive / Edgewater west intersection.

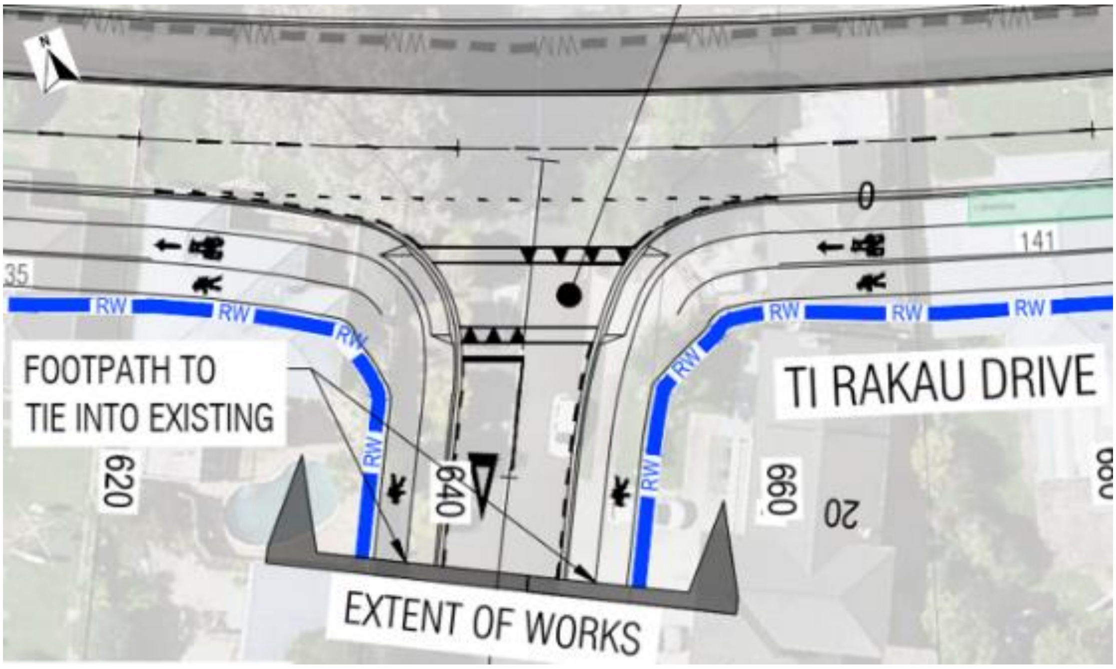


Figure 107: Example of raised tables in the proposed design

The presence of these crossing facilities will aid pedestrians and cyclists by simplifying the crossing task, increasing visibility by creating a visual cue for drivers to reduce their speed as they approach the intersections, and encourage courtesy between drivers and pedestrians. This will reduce the risk of potential conflict between vehicles and pedestrians. It should be noted that these raised tables will not be marked as formal pedestrian crossings. Compared to the existing environment, signalised pedestrian and/or cycle crossings will be provided more frequently along Ti Rakau Drive. Users will have safe and more direct travel routes, which will provide a connected network that encourages active modes. Signalised pedestrian crossings will be provided across all approaches of the following intersections:

- Pakuranga Road / Ti Rakau Drive (with a raised zebra crossing on the left-turn slip lane)
- Pakuranga Road / RRF (except northern approach)
- Reeves Road / Aylesbury Street (except eastern approach)
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / Reeves Road / SEART
- William Roberts Road / Reeves Road
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Ti Rakau Drive / Gossamer Drive

Additionally, a pedestrian crossing will also be provided at the Edgewater bus station. Lastly, the existing signalised pedestrian crossing on Pakuranga Road, constructed as part of EB1, will remain. The existing midblock pedestrian crossing on Reeves Road will be removed to avoid potential sightline issues. This is because the columns of the RRF will be located along the centre of Reeves Road, which may obstruct the view of pedestrians to vehicles.

Bidirectional cycleways will be provided along the northern side of Ti Rakau Drive, between Pakuranga Road and William Roberts Road. An eastbound unidirectional cycleway will be provided along the northern side of Ti Rakau Drive between William Roberts Road and Gossamer Drive, while a westbound unidirectional cycleway will be provided on the southern side of Ti Rakau Drive between Gossamer Drive and Reeves Road. Unidirectional cycleways will also be provided on both sides of Pakuranga Road between Ti Rakau Drive and the RRF. Together, these cycleways will tie into the existing cycleways provided on Pakuranga Road west of Ti Rakau Drive, as part of EB1.

Providing dedicated cycleways creates a physically separated and safe space that facilitates cycle movements through the network. This provides users with a more attractive mode of travel and supports the uptake of cycling. Furthermore, the cycleways will facilitate improved accessibility to the bus stations, increasing uptake of public transport across the network. Signalised shared pedestrian and cyclist crossings will be provided at the following intersections:

- Northern approach of Pakuranga Road / Ti Rakau Drive
- Northern approach of Ti Rakau Drive / Aylesbury Street / Pam Avenue
- Northern and Eastern approach of Ti Rakau Drive / Reeves Road / SEART
- All approaches of Ti Rakau Drive / William Roberts Road / Mattson Road
- Northern and western approaches of Ti Rakau Drive / Gossamer Drive

Overall, pedestrian and cyclist amenity and safety will be improved. The Project will also provide greater accessibility and connectivity to public transport, increasing catchment and mode shift.

6.6 Effects to Property Access and Parking

6.6.1 EB2 – Reeves Road

The proposed design of Reeves Road in the EB2 project area does not provide any on-street parking. However, no on-street parking is provided in the existing environment. Therefore, the proposed design will have no effects on on-street parking.

6.6.1.1 3 Reeves Road (Gull Service Station)

Figure 108 shows the location and property boundary of 3 Reeves Road, as well as the Gull service station (red outline) developed on the site. Access to the property from Reeves Road will not be maintained in the proposed design as the section of Reeves Road between TI Rakau Drive and Cortina Place will be bus only. Discussions are ongoing with the owner regarding loss of direct road access onto Reeves Road.

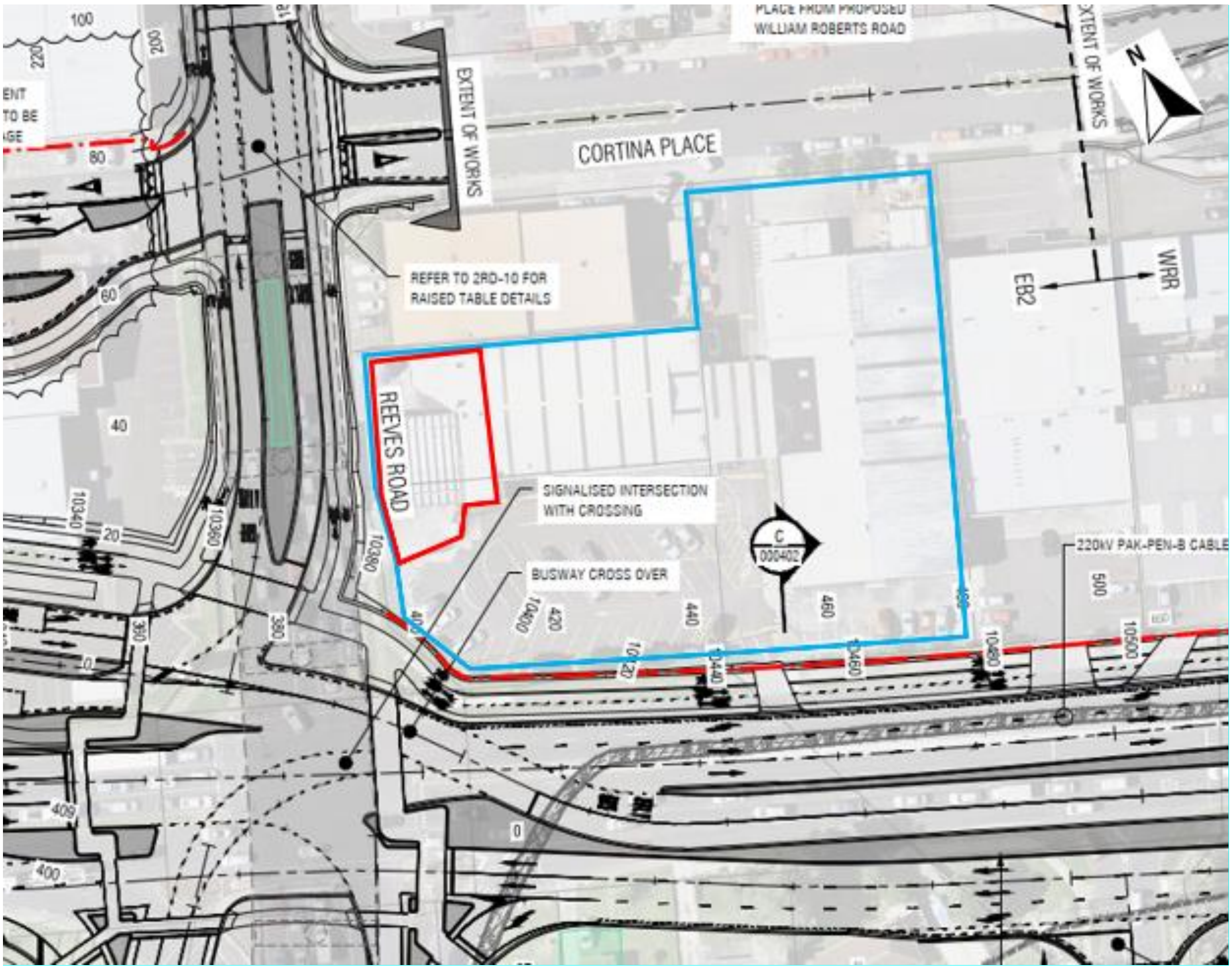


Figure 108: 3 Reeves Rd and Gull service station (red outline) upon completion

6.6.1.2 2 Cortina Place and 5 Reeves Road

As stated in **Section 5.1.1.1**, the properties at 2 Cortina Place and 5 Reeves Road have been acquired by AT and will be used as site offices during construction. Upon completion, these properties will be handed back or will be demolished for redevelopment in the future. **Figure 109** shows the location of 2 Cortina Place (yellow outline), 5 Reeves Road (blue outline) and the proposed design of the adjacent roads.

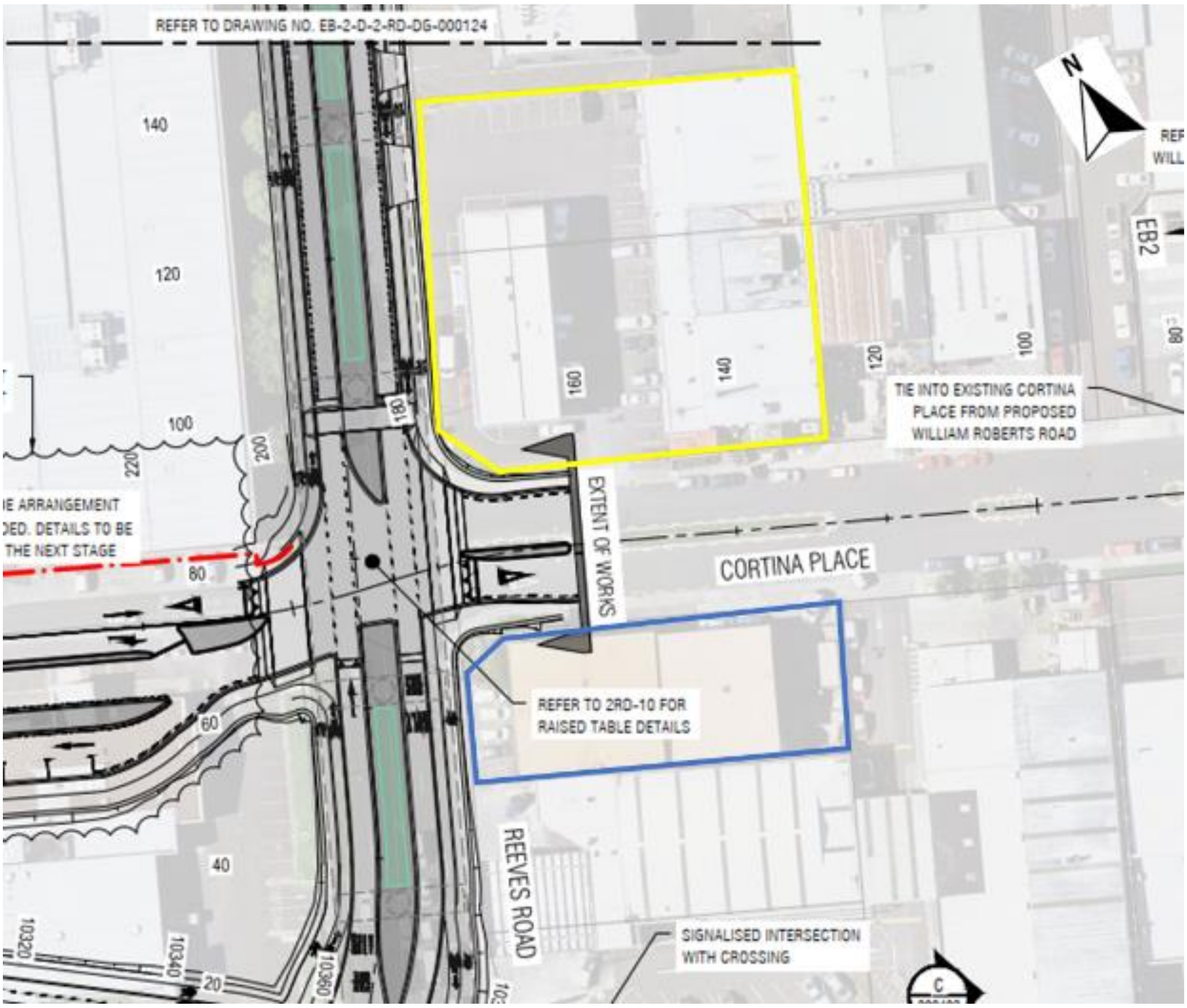


Figure 109: 2 Cortina Pl (yellow outline) and 5 Reeves Rd (blue outline) upon completion

The property at 5 Reeves Road will in future have no vehicle access from Reeves Road as the section of Reeves Road between Ti Rakau Drive and Cortina Place will be bus only. The property will however still be accessible via Cortina Place.

Upon completion, vehicle access from Reeves Road to the property at 2 Cortina Place will be reinstated. In future, the access from Reeves Road will be left-in/left-out only. However, this access will be in addition to the existing access off Cortina Place. Permanent effects to property access and parking at these properties are considered to be negligible.

6.6.1.3 11 Reeves Road (Eastside Pups Dog Grooming and Daycare)

Vehicle access from Reeves Road to the property at 11 Reeves Road will be reinstated once construction of the RRF and ground level works have been completed. The access will be left-in/left-out only due to the location of the columns of the RRF and potential sightline issues of opposing traffic. Although the access will be somewhat different compared to the existing environment, the permanent effects to property access are expected to be very low. **Figure 110** shows the location of 11 Reeves Road (blue outline) and the proposed design of Reeves Road.

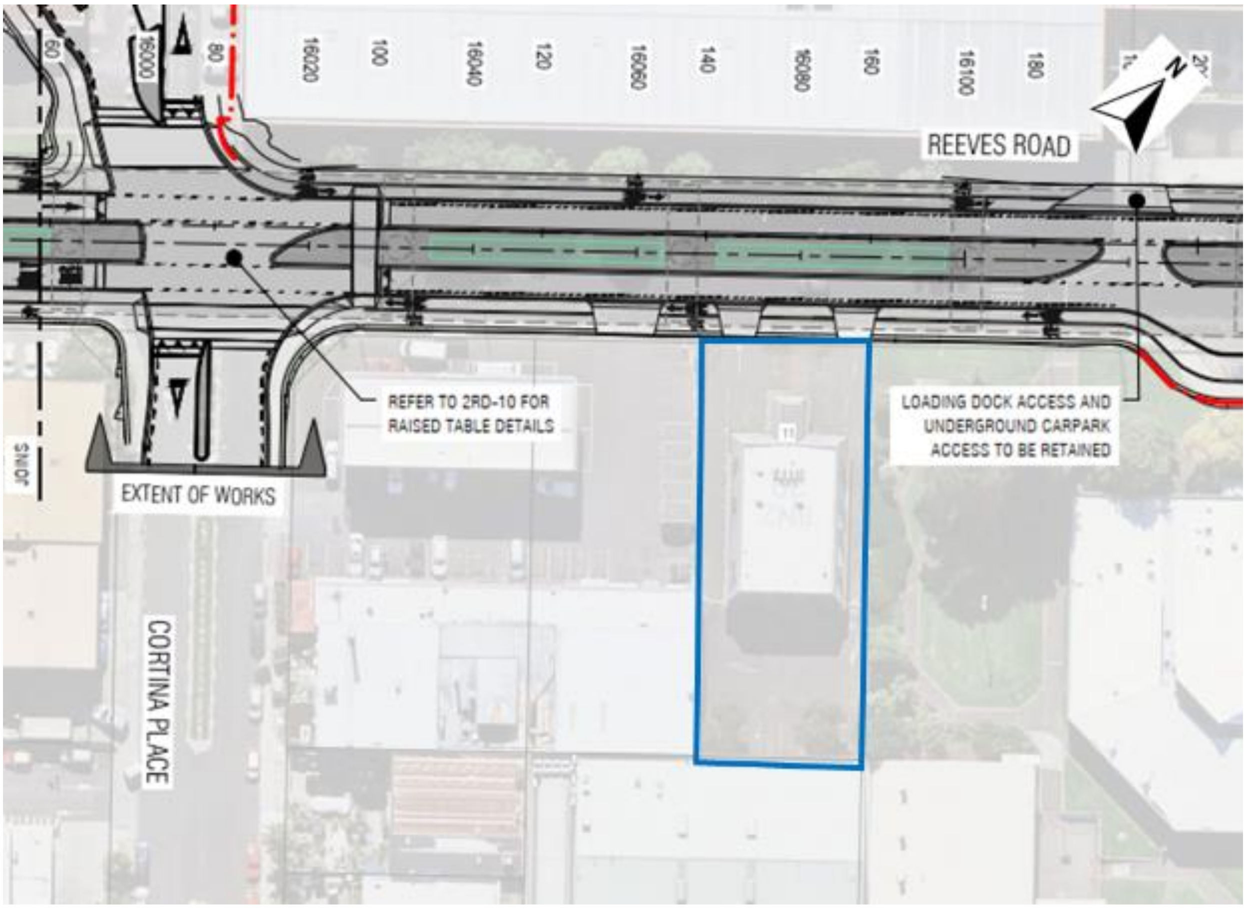


Figure 110: 11 Reeves Rd (blue outline) upon completion

6.6.1.4 13R Reeves Road (Te Tuhi)

Upon completion of the Reeves Road, access to the property at 13R Reeves Road (Pakuranga Community Centre) will be reinstated largely similar to the existing environment, and the temporary drop-off along William Roberts Road will be removed. Permanent effects to property access are expected to be negligible. **Figure 111** shows the location of the Te Tuhi development on 13R Reeves Road (blue outline) and the permanent access arrangement at the property.

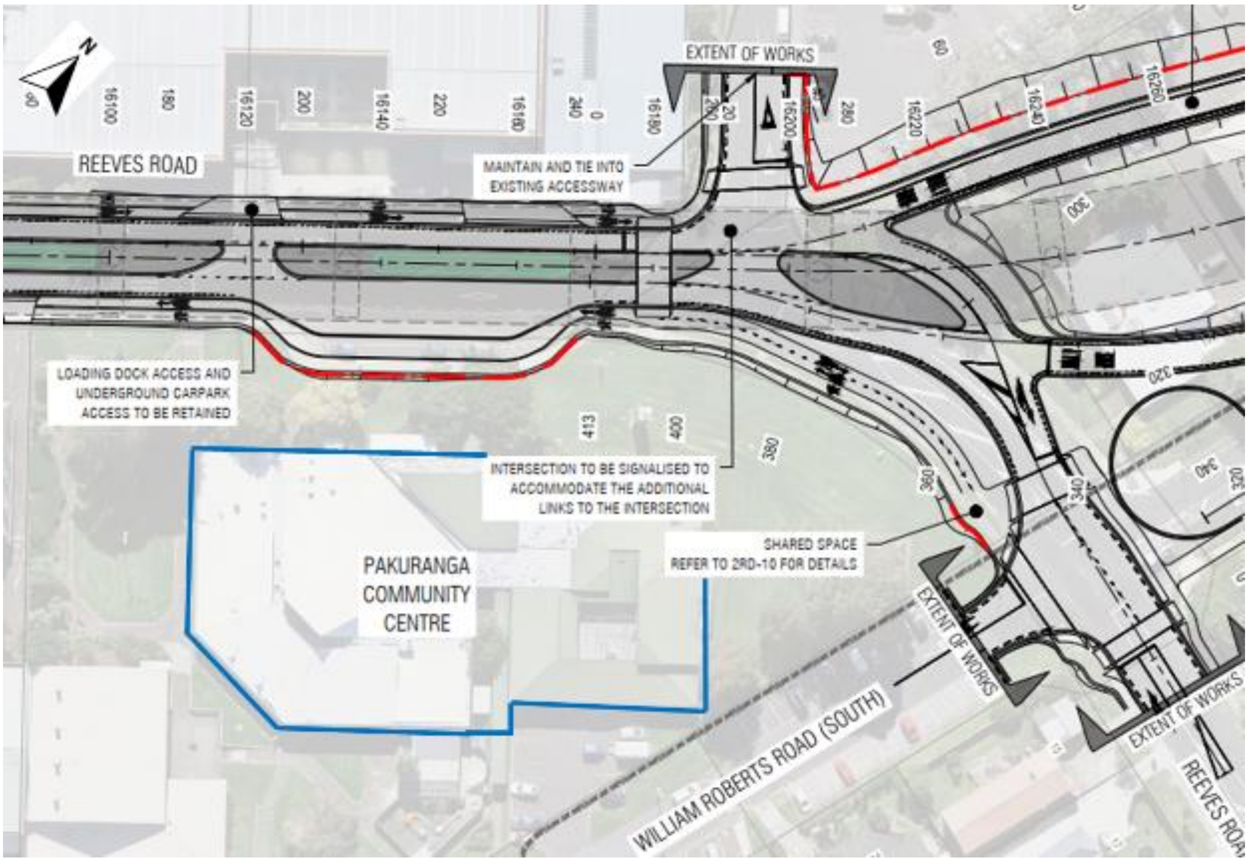


Figure 111: 13R Reeves Rd upon completion

6.6.1.5 7 Aylesbury Street and 2R Ti Rakau Drive (The Warehouse and Pakuranga Library)

Upon completion of Reeves Road, access to The Warehouse's goods access will be reinstated as per the existing environment (left-in left-out) with delivery vehicles approaching from the south via Cortina Place and exiting to the north on Reeves Road. A similar access arrangement will be provided to the Library service entrance. Access to the undercover carpark will be provided via Cortina Place to the south and Reeves Road to the north. **Figure 112** shows the permanent access arrangements at 7 Aylesbury Street (blue outline) and 2R Ti Rakau Drive (yellow outline) upon completion.

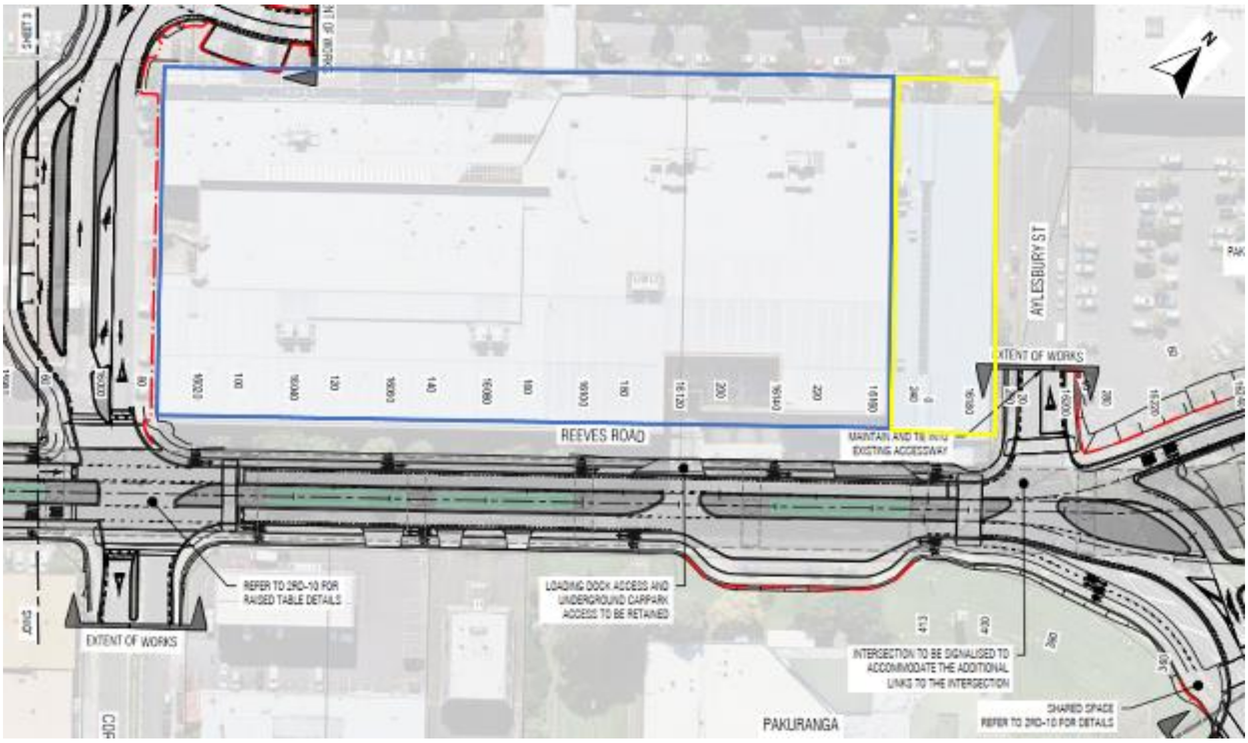


Figure 112: 7 Aylesbury St (blue outline) and 2R Ti Rakau Dr (yellow outline) upon completion

Permanent effects to property access, upon the completion of construction, are expected to be negligible as these access arrangements are largely similar to the existing environment and background traffic volumes on Reeves Road will be significantly reduced.

6.6.2 EB2 – William Roberts Road

6.6.2.1 William Roberts Road North

Upon completion, William Roberts Road north will no longer function as a through route between Reeves Road and Pakuranga Road, but rather as a local road to the surrounding residential properties. Each end of William Roberts Road north will be converted to a cul-de-sac with access off Ayr Road, and will provide ample on-street parking to the surrounding properties. Accesses to the remaining properties on the eastern side of the road will be maintained as per the existing environment. Overall, less through traffic will travel on William Roberts Road north, improving safety and the increased travel distance via Ayr Road to Lewis Road of roughly 300 m is considered to be negligible. Therefore, permanent effects to property access and parking are considered to be negligible.

6.6.2.2 William Roberts Road South

As stated in the WRRE ITA, the proposed WRRE design will result in the permanent loss of 12 parking spaces on William Roberts Road south, near the Pakuranga Leisure Centre and Ti Rakau Park.

Further north on William Roberts Road south, a total of 42 on-street parking spaces are provided at a 90˚ angle to the carriageway. To improve the safety of vehicles turning out from these parking spaces, and to avoid tracking curves passing over the road centre line, it is recommended that the angle of these parking spaces be adjusted (see **Figure 113**). The proposed design will provide 20 fewer on-street parking spaces.

Figure 113: William Roberts Rd south parking adjustments

Therefore, the combined loss of on-street parking along William Roberts Road south due to the proposed design of WRRE and EB2, is 32 parking spaces.

Of the 32 parking spaces lost along William Roberts Road south, 16 parking spaces are located within Open Space zoned land (blue outline, see **Figure 114** below) and will require mitigation which is outlined below. The remaining 16 parking spaces are located within the road reserve (red outline below). As stated in **Section 3.7.3**, the average parking utilisation on William Roberts Road is not expected to exceed 49% on weekdays and 33% on weekends based on observations of current utilisation. Therefore, the permanent effects of the loss of these 16 parking spaces are considered to be very low.

Figure 114: William Roberts Rd south zoning and on-street parking

Nevertheless, it is proposed that a new off-street parking area will be constructed in Ti Rakau Park with access off William Roberts Road. The parking area will provide 21 additional parking spaces (24 in total, however three spaces are displaced). The proposed layout is shown in **Figure 115**.

Figure 115: William Roberts Rd south parking loss mitigation

The proposed parking area will be located near the new raised pedestrian crossing on William Roberts Road, connecting the proposed parking area with the existing footpaths on the western side of the carriageway. The proposed parking area will mitigate the effects on parking in Open Spaced zoned land along William Roberts Road south.

Stakeholder engagement is ongoing with Auckland Council to develop this option as well as relocating the existing playground to provide the necessary space for the proposed carpark.

6.6.3 EB2 – Pakuranga Road

In the proposed design, the kerbside lanes along Pakuranga Road between Ti Rakau Drive and the RRF will be converted to unidirectional cycleways. As such, no on-street parking will be provided along this section of Pakuranga Road in the future. Intermittent gaps will be provided in the buffer islands to allow for drainage to catchpits, but also to allow vehicular access to all properties with access off Pakuranga Road, similar to the existing environment (see **Figure 116** below).

As noted above, Pakuranga Road is largely similar to Ti Rakau Drive in the EB3R project area, in terms of traffic volumes and operating speeds, and so it is not unreasonable to assume that Pakuranga Road experiences the same low level of parking utilisation in the existing environment during weekdays and weekends. Based on this assumption, the permanent effects on on-street parking are expected to be negligible.

The majority of the clearway sections along Pakuranga Road, east of the existing William Roberts Road intersection (see **Section 5.5.4**), will be retained upon completion of the Pakuranga Road / RRF tie-in.

6.6.3.1 141 Pakuranga Road (GAS Service Station)

In the future, access from Pakuranga Road to the property at 141 Pakuranga Road will be largely similar to the existing environment. The proposed design will provide unidirectional cycleways in the kerbside lanes on Pakuranga Road, as well as buffer islands to separate the cycleways and the general traffic running lanes.

As above, intermittent gaps will be provided in the buffer islands to allow for drainage to catchpits, but also to allow vehicular access to this property, similar to the existing environment. **Figure 116** below shows the location of 141 Pakuranga Road (blue outline) and the proposed design along Pakuranga Road.

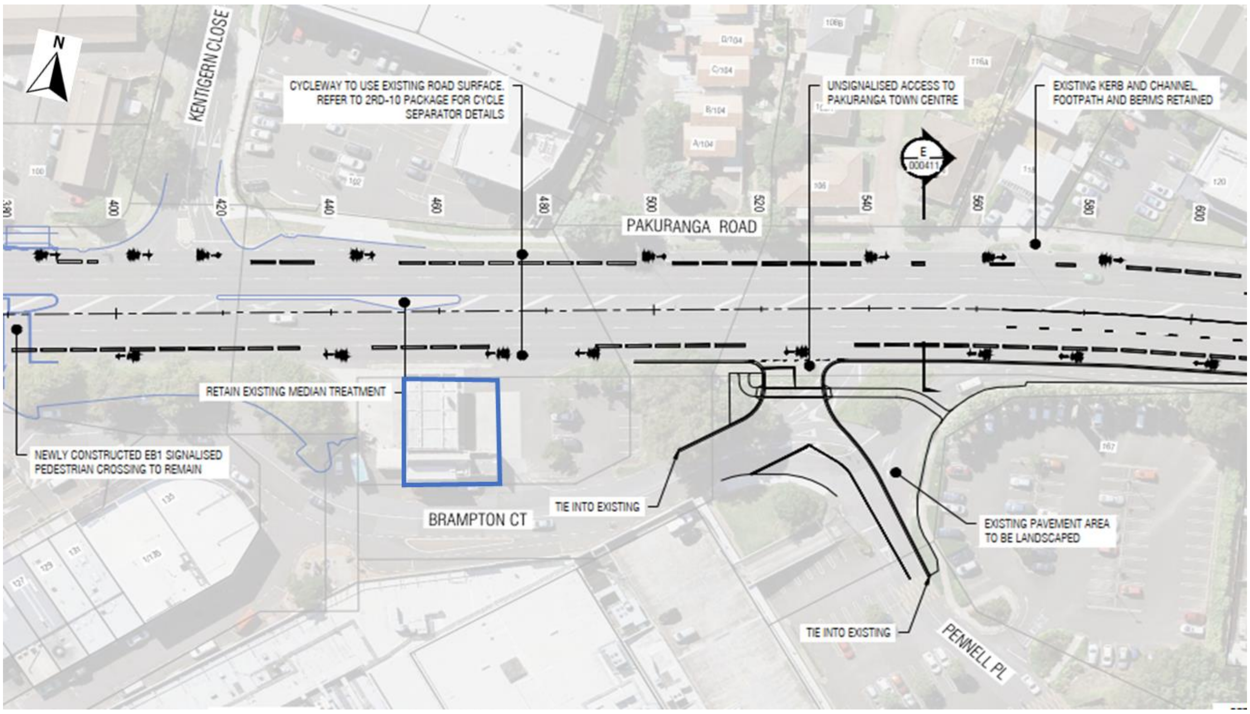


Figure 116: 141 Pakuranga Road (blue outline) upon completion

6.6.4 EB2 – Ti Rakau Drive, Side Roads and Properties

6.6.4.1 Ti Rakau Drive

The proposed design of Ti Rakau Drive in the EB2 project area, between Pakuranga Road and Reeves Road does not provide any on-street parking. However, no on-street parking is provided in the existing environment. Therefore, the proposed design will have no effects on on-street parking.

As per the existing environment, left-in/left-out access to the residential properties (3-27 Ti Rakau Drive) on the western side of the carriageway will be maintained. Upon completion, residents of these properties will no longer be able to use the existing U-turn facility on Ti Rakau Drive to head east. However, vehicles will still be able to turn right into Pakuranga Road and Brampton Court to execute a U-turn manoeuvre if required to head east along Ti Rakau Drive. Therefore, the permanent effects to these residential properties are considered to be very low.

6.6.4.2 Side Roads

Upon completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection, a raised intersection will be provided, with no effect on property access. No on-street parking is allowed on this section of Palm Avenue in the existing environment. Therefore, the final design will have no effects on on-street parking and property access along Palm Avenue.

6.6.4.3 Pakuranga Plaza

Property Access:

Upon completion of construction, the Plaza will be served by six access points in total including:

- Reeves Road / Cortina Place / Private Access Road intersection (unsignalised)
- The undercover carpark access off Reeves Road
- Reeves Road / Aylesbury Street intersection (signalised)
- Ti Rakau Drive / Aylesbury Street / Palm Avenue intersection (signalised)
- Pakuranga Road / Brampton Court intersection (unsignalised)
- The Pepler Street exit onto Pakuranga Road

The two existing Aylesbury Street accesses off Ti Rakau Drive will be combined into one crossroads intersection with Palm Avenue, the intersection will be raised and will be signalised. Furthermore, the Pakuranga Road / Brampton Court access will be realigned to provide improved access to vehicles turning right from Pakuranga Road eastbound. Although the total number of access points to the Plaza will be reduced by one compared to the existing environment, it is expected that the signalisation of two accesses will lead to an overall improvement in capacity and vehicle access to Pakuranga Plaza.

Parking:

Overall, the proposed design will result in the permanent loss of 257 of the 1,355 parking spaces at the Pakuranga Plaza. However, parking survey data showed that utilisation does not exceed 60% on an average weekday or weekend. As such, it is expected that the Plaza would still have 285 unoccupied parking spaces upon completion of construction. Therefore, the permanent effects of the proposed design on parking at the Pakuranga Plaza are considered to be negligible.

Figure 117 below shows the Pakuranga Plaza and the proposed design of the surrounding roads.

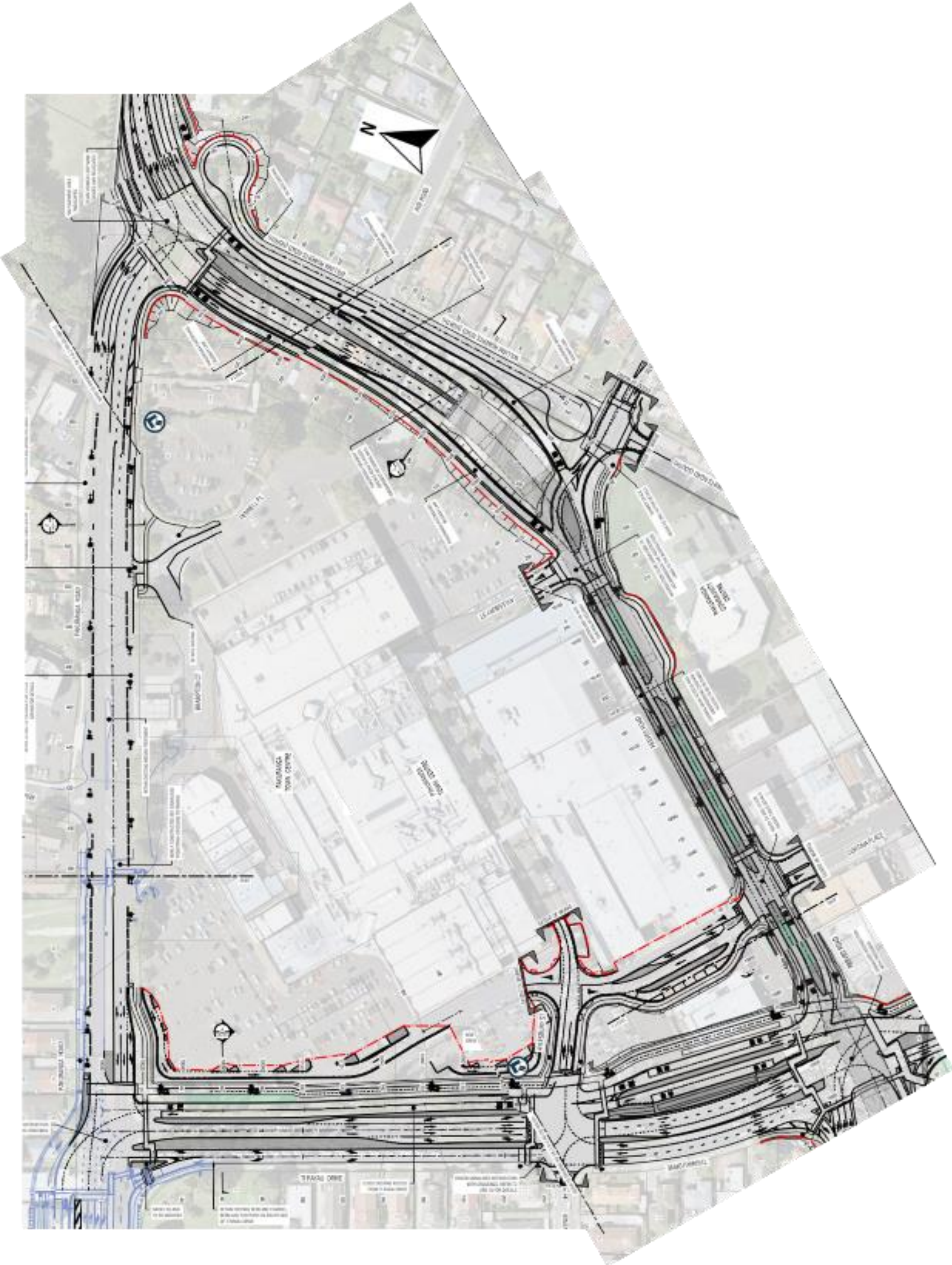


Figure 117: Pakuranga Plaza upon completion

6.6.4.4 26 Ti Rakau Drive

Upon completion of construction, 26 Ti Rakau Drive will be significantly redeveloped. A bus station will be provided between Aylesbury Street and Reeves Road, and a 'Kiss-and-Ride' facility will be provided on the private access road off Aylesbury Street that will consist of six parking spaces. Scooter and bike parking facilities will also be provided near the bus station. The remainder of 26 Ti Rakau Drive will be developed into open space, to improve amenity around the bus station (see **Figure 118**).

Figure 118: 26 Ti Rakau Dr artistic representation upon completion

6.6.5 EB3R – Ti Rakau Drive, Side Roads and Properties

6.6.5.1 Ti Rakau Drive

The proposed design of Ti Rakau Drive in the EB3R project area will provide online bus lanes along the centre of the carriageway, from Reeves Road to Gossamer Drive. In addition, unidirectional cycleways will be provided on both sides of Ti Rakau Drive. The cycleway on the northern side of the carriageway will be provided in the existing eastbound kerbside / parking lane and will be separated from the adjacent general traffic lanes by a buffer island. The cycleway on the southern side of Ti Rakau Drive will be separated from the general traffic running lanes by a grass berm. The proposed EB3R design of Ti Rakau Drive will provide no on-street parking between Reeves Road and Gossamer Drive.

However, as stated in **Section 3.7.4**, the average utilization of the existing on-street parking is poor with only 3% occupancy on weekdays and 8% on Saturdays. This is not unexpected as this high-volume road does not create an appealing location to park vehicles and is likely leading to a high perceived risk of crashes. Furthermore, the acquisition of the majority of the residential properties on the southern frontage of Ti Rakau Drive will remove the need for on-street parking along this section.

The current left-in/left-out access arrangements to the remaining properties on both sides of Ti Rakau Drive will be maintained upon completion. Access to these properties from the opposite side of Ti Rakau Drive will be facilitated by the new U-turn facilities along the corridor as well as the U-turn manoeuvres provided at the Ti Rakau Drive / Gossamer Drive intersection and the Ti Rakau Drive / William Roberts Road / Mattson Road intersection. Therefore, the permanent effects on property access and on-street parking are considered to be negligible.

6.6.5.2 Side Roads

Tiraumea Drive, Roseburn Place, Edgewater Drive and Wheatley Avenue:

Changes along the side roads of Tiraumea Drive, Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east as a result of the proposed design will be limited to the approaches of the intersections with Ti Rakau Drive. As such, permanent effects on on-street parking and property access along these side roads are considered to be negligible.

Marriott Road and Chevis Place:

No changes are proposed along Marriott Road and Chevis Place. Therefore, the proposed design will have no permanent effects on on-street parking and property access along these side roads.

Mattson Road:

The proposed design along Mattson Road is relatively more extensive. The Mattson Road approach will be set back approximately 27m south and 36m west of its current location where it intersects Ti Rakau Drive. This will provide space for the new westbound lanes on Ti Rakau Drive. However, the properties on the southern side of Ti Rakau Drive have been acquired, removing the need for on-street parking. Accesses to properties along Mattson Road not acquired by AT will be maintained and will interface with the new alignment of Mattson Road similar to the existing environment. Therefore, the permanent effects on on-street parking and property access along Mattson Road are considered to be negligible.

Gossamer Drive:

In the proposed design, the Gossamer Drive approach limit line will be set back approximately 15 m from its current location and the kerbside exit lane will be extended to 100 m. NSAAT line markings are currently provided on the eastern side of the road up to the bus stop near the intersection with Riverhills Avenue. These markings will be replicated on the western side of the road. This will result in the loss of on-street parking in front of 169, 171, 173 and 175 Gossamer Drive. It is likely that these properties have sufficient off-street parking, and that on-street parking is not occupied on a regular basis. Accesses to properties along Gossamer Drive not acquired by AT will be maintained and will interface with the roadway similar to the existing environment. Therefore, the permanent effects on on-street parking and property access along Gossamer Drive are considered to be negligible.

Freemantle Place:

The Freemantle Place approach will be set back approximately 11 m. NSAAT line markings are provided on the western side of the road for approximately 31 m from the limit line. The line markings will be reinstated upon completion and will result in the loss of one parking space in front of 3 Freemantle Place. The existing line markings on the eastern side of the road will be retained. Property access along Freemantle Place will be maintained as per the existing environment. Therefore, the permanent effects on on-street parking and property access along Freemantle Place are considered to be negligible.

6.6.5.3 Residential Properties on Southern Frontage of Ti Rakau Drive

Upon completion of the new westbound lanes on Ti Rakau Drive in EB3R, the temporary residential access tracks at 75A, 83, 83A-C, 87-91, 97, 103A, 129, 145, 175A, 177, 183-185 and 191 Ti Rakau Drive will be disestablished. Residents will be able to use their existing driveways off the new Ti Rakau Drive westbound lanes. The accesses will be left-in/left-out only, similar to the existing environment. Therefore, permanent effects to property access at these properties are considered to be negligible.

6.6.5.4 107 and 109 Ti Rakau Drive – Edgewater Shops

Upon completion, the temporary carpark at 105 Ti Rakau Drive will be made permanent. The carpark will provide 22 parking spaces. Access to and from the proposed carpark will be via Ti Rakau Drive, similar to the existing environment (see **Figure 119** below). Access to the refuse collection area to the rear of the property will be largely similar to the existing environment. Therefore, the effects of the proposed carpark on property access and parking are considered to be negligible.

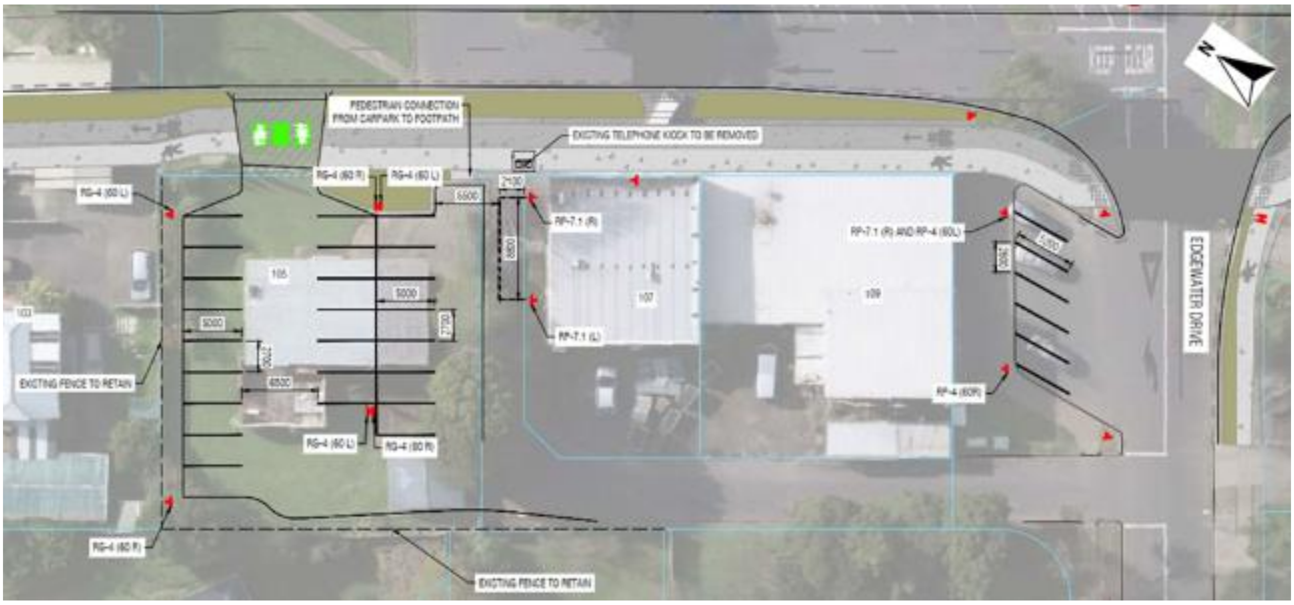


Figure 119: Edgewater Shops proposed parking area upon completion

6.6.5.5 32 Edgewater Drive – Edgewater College

In the existing environment, Edgewater College is accessed from both the Edgewater Drive west and east intersections with Ti Rakau Drive, which provide for all movements in and out. The proposed design of the Ti Rakau Drive / Edgewater Drive west and east intersections is left-in left-out only.

As stated in **Section 4.2.2.2**, a U-turn facility will be provided between Edgewater Drive west and Wheatley Avenue which will enable eastbound traffic on Ti Rakau Drive to execute a U-turn manoeuvre and turn into Edgewater Drive west. Furthermore, a U-turn manoeuvre will also be provided on the western approach at the Ti Rakau Drive / Gossamer Drive intersection. This will enable eastbound traffic on Ti Rakau Drive to execute a U-turn and turn into Edgewater Drive east.

Overall, permanent effects to property access at Edgewater College are considered to be negligible. Permanent effects to school bus services to and from Edgewater College are assessed in **Section 6.4.8**.

6.6.5.6 207, 219 and 229 Ti Rakau Drive – Pakuranga Baptist Church

Access from Ti Rakau to the property at 207 Ti Rakau Drive (Pakuranga Counselling Centre) will be maintained in the future. Therefore, permanent effects to property access are considered to be very low. **Figure 120** below shows the location of 207 Ti Rakau Drive (blue outline) and the proposed design of the adjacent roads.

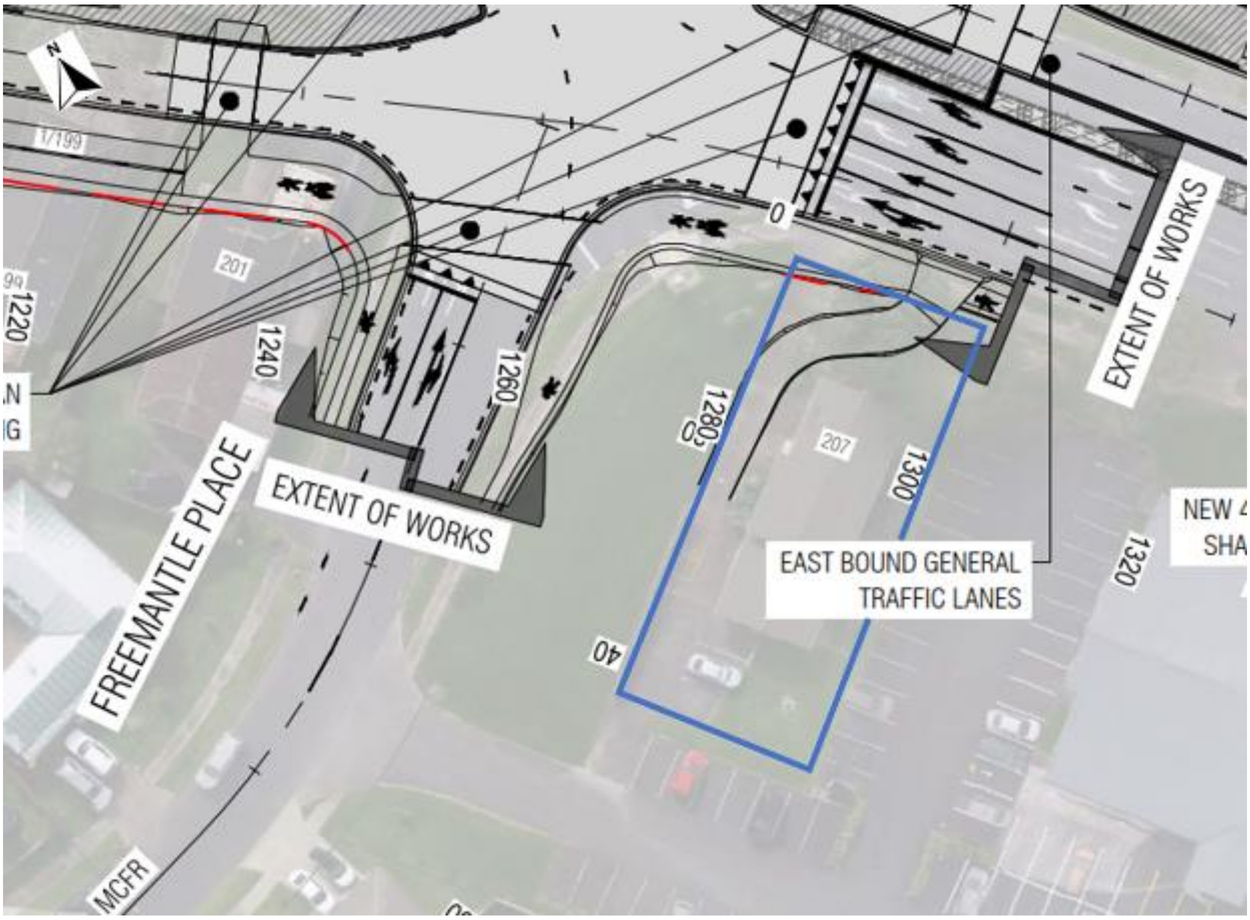


Figure 120: 207 Ti Rakau Drive (blue outline) upon completion

No changes to property access or parking are proposed at 209 and 229 Ti Rakau Drive in the proposed design. Access to these properties will be maintained as per the existing environment.

6.6.5.7 168R Gossamer Drive – River Hills Park

As stated in **Section 5.5.6.7**, a parcel of land along the southern boundary of 168R Ti Rakau Drive River Hills Park has been acquired to allow for the eastbound Gossamer Drive bus station. Discussions are ongoing with the Council as well as the Fencibles United Football Club on the rearrangement of the fields on the property as a result of the Project. **Figure 121** below shows the proposed field rearrangements at the River Hills Park.

Figure 121: 168R Gossamer Drive upon completion

However, from a transport perspective, the Project will have no permanent effects to property access and parking on-site.

6.7 Effects to Safety Performance

The sections below discuss the potential effects on safety performance in the context of EB2 and EB3R upon completion.

A Safe Systems Assessment (SSA) was undertaken of the proposed EB2 and EB3R design layouts. As stated in **Section 3.8.2**, the SSA was conducted in accordance with the Auckland Transport Safe System Assessment Guidelines which are based on the Austroads 2016, Research Report AP-R509-16, Safe System Assessment Framework. The above-mentioned report section also provides details on the types of crashes assessed as well as the SSA framework. A summary of the findings is presented below.

6.7.1 EB2

Table 45 provides an assessment summary and comparison of the SSA of the existing environment and the proposed design of EB2. Again, each crash type is scored based on exposure, likelihood and severity and a lower score corresponds with a safer system. It should be noted that Location C in EB2 indicates the location of the bus station upon completion of the Project.

Table 45: EB2 SSA – existing vs future environment

ZONE EB2 ASSESSMENT SUMMARY											
EXISTING LAYOUT	**R-O-R**	**H-O**	**INT**	**OTHER**	**M/C**	**P1**	**P2**	**P3**	**C1**	**C2**	**TOTAL**
A) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
B) TI RAKAU DR - INT	16	16	32	16	48	24	0	48	36	36	272
C) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
D) TI RAKAU DR - INT	16	16	24	16	48	18	0	24	36	27	225
E) TI RAKAU DR - MB	8	16	16	24	48	24	48	0	31.5	27	243
F) TI RAKAU DR - INT	16	16	24	24	48	18	48	36	31.5	27	289
G) TI RAKAU DR - MB	16	16	0	24	48	0	48	0	36	0	188
H) PAKURANGA RD - INT	16	16	24	16	48	12	0	24	36	36	228
I) PAKURANGA RD - MB	16	24	24	24	48	18	36	0	36	36	262
J) PAKURANGA RD - INT	16	24	32	16	64	18	0	48	36	36	290
K) REEVES RD - MB	9	13.5	15.75	13.5	36	18	36	0	31.5	36	209
L) REEVES RD - INT	15.75	13.5	18	13.5	36	21	0	48	36	36	238
M) WILLIAM ROBERTS RD - MB	NOT APPLICABLE										
N) CORTINA PL - MB	3	3	0	5.25	28	0	24	0	24	0	87
O) CORTINA PL - INT	9	13.5	18	15.75	42	21	0	48	27	36	230
P) PAKURANGA HWY - MB	24	0	0	24	32	0	0	0	0	0	80
Q) REEVES RD FLYOVER - MB	NOT APPLICABLE										
CDD LAYOUT	**R-O-R**	**H-O**	**INT**	**OTHER**	**M/C**	**P1**	**P2**	**P3**	**C1**	**C2**	**TOTAL**
A) TI RAKAU DR - MB	12	12	0	12	32	0	48	0	22.5	0	139
B) TI RAKAU DR - INT	0	0	0	0	36	8	0	12	30	20	106
C) TI RAKAU DR - MB	12	12	0	12	32	0	64	0	30	0	162
D) TI RAKAU DR - INT	12	12	24	12	48	24	0	48	25	30	235
E) TI RAKAU DR - MB	6	6	12	21	40	12	48	0	15	22.5	183
F) TI RAKAU DR - INT	12	6	15	18	48	12	0	24	15	15	165
G) TI RAKAU DR - MB	12	6	0	12	32	0	48	0	15	0	125
H) PAKURANGA RD - INT	12	12	18	12	48	15	0	24	15	15	171
I) PAKURANGA RD - MB	12	18	18	15	40	18	36	0	15	26.25	198
J) PAKURANGA RD - INT	18	12	12	12	32	15	0	30	36	36	203
K) REEVES RD - MB	0	0	0	0	18	6	18	0	12	12	66
L) REEVES RD - INT	0	0	0	0	15	6	0	12	15	15	63
M) WILLIAM ROBERTS RD - MB	0	0	0	0	12	7.5	15	0	24	24	83
N) CORTINA PL - MB	0	0	0	0	21	0	18	0	24	0	63
O) CORTINA PL - INT	0	0	0	0	12	8	0	16	16	16	68
P) PAKURANGA HWY - MB	16	0	0	16	16	0	0	0	0	0	48
Q) REEVES RD FLYOVER - MB	12	0	0	12	32	0	0	0	0	0	56

Apart from the product score for P2 type crashes (midblock crossings) remaining unchanged, the total score of Location A is significantly reduced. Due to the removal of one uncontrolled intersection into the Pakuranga Plaza, a reduced likelihood score for intersection and motorcycle crashes is expected. The C2 crash type is eliminated due to the removal of the unsignalised access into the Pakuranga Plaza.

Due to the new design providing a greater physical separation between carriageways and by replacing an unsignalised intersection (Palm Avenue) with traffic signals on all approaches, the total score for all general traffic type crashes for Location C has reduced.

The SSA shows that the product score for general traffic type crashes across all locations and for motorcycle crashes at most locations, are slightly reduced. This is due to a reduction in the posted speed limit from 60km/h to 50km/h, reducing the severity score.

Overall, the proposed design of EB2 is a balance between the competing modes of travel. The proposed design will provide staged crossings at various locations to reduce pedestrian delay, improve safety and discourage jaywalking. Overall, the product score of the proposed design is lower throughout EB2 compared to the existing environment.

6.7.2 EB3R

Table 46 below provides an assessment summary and comparison of the SSA of the existing environment and the proposed design of EB3R. It should be noted that Location F and H in EB3R indicate the locations of the bus stations upon completion of the Project.

Table 46: EB3R SSA – existing vs future environment

ZONE EB3R ASSESSMENT SUMMARY											
EXISTING LAYOUT	**R-O-R**	**H-O**	**INT**	**OTHER**	**M/C**	**P1**	**P2**	**P3**	**C1**	**C2**	**TOTAL**
A) ROSEBURN PL	8	16	32	24	64	24	48	0	27	36	279
B) MARRIOTT RD	8	16	32	24	64	24	48	0	27	36	279
C) EDGEWATER DR / CHEVIS PL	8	16	16	24	48	24	48	24	27	27	262
D) WHEATLY AVE	8	16	32	24	64	24	36	0	27	36	267
E) EDGEWATER DR	8	0	32	24	64	24	0	0	27	36	215
F) GOSSAMER STATION WB	8	0	0	24	32	0	0	0	27	18	109
G) GOSSAMER DR INTERSECTION	24	24	24	24	48	18	0	36	36	18	252
H) GOSSAMER STATION EB	8	16	0	8	16	0	32	0	36	0	116
CDD LAYOUT	**R-O-R**	**H-O**	**INT**	**OTHER**	**M/C**	**P1**	**P2**	**P3**	**C1**	**C2**	**TOTAL**
A) ROSEBURN PL	6	6	12	18	48	8	64	0	10	20	192
B) MARRIOTT RD	6	6	12	24	48	8	64	0	20	30	218
C) EDGEWATER DR / CHEVIS PL	4	4	8	16	24	8	20	0	16	24	124
D) WHEATLY AVE	6	6	12	18	48	8	48	0	10	20	176
E) EDGEWATER DR	6	0	12	18	48	8	0	0	10	20	122
F) GOSSAMER STATION WB	6	6	0	18	32	0	32	0	20	20	134
G) GOSSAMER DR INTERSECTION	8	10	10	12	24	8	0	24	20	24	140
H) GOSSAMER STATION EB	6	12	0	6	16	0	48	0	10	0	98

Although the total scores for Locations A, B and C are significantly reduced, the product score for P2 type crashes is slightly increased. This is due to the expected increase in pedestrian movements and slight increase in likelihood of pedestrians rushing to the bus station.

The total score of Location F is slightly increased, compared to the existing environment. Similar to the above, this is due to the expected increase in pedestrian movements and slight increase in likelihood of pedestrians rushing to the bus station.

A large improvement is observed in the product score for location G in the proposed design. This is due to a reduced product score in general traffic type crashes, including motorcycle crashes. Through the provision of a raised intersection, approach speeds of vehicles will reduce, causing severity and likelihood of general traffic type crashes to reduce.

A reduced product score is also observed for both pedestrian and cyclist crashes. Due to the reduced approach speed, the severity of pedestrian crashes is expected to reduce. The provision of a separate cycling facility will also reduce exposure and likelihood of cycling crashes.

As above, the proposed design will provide staged crossings at various locations in order to reduce pedestrian delay, improve safety and discourage jaywalking. Overall, the product score of the proposed design is lower throughout EB3R compared to the existing environment.

7 Mitigation Summary

The sections below provide a summary of the mitigation measures proposed in this ITA to mitigate the potential adverse effects of the Project both during construction and upon completion.

7.1 Mitigation Measures during Construction

The mitigation measures to be employed during construction will form part of the conditions of the CTMP.

7.1.1 Construction Support Areas

- The properties at 2 Cortina Place and 5 Reeves Road will serve as site offices for the Project. It is envisaged that, at least for the initial year of construction, site office staff will use public transport for commuter trips and will access the site offices on foot. A WTMP will be developed to reduce the number of private vehicles travelling to the worksites and to increase the accessibility of the worksites through more travel options. Following the initial year and as construction activities ramp up, a staff carpark will be provided at 26 Ti Rakau Drive.

- The operation and movement of the Gantry at the Pennell Place CSA will be under strict construction traffic management control. Advance notice and appropriate public communication of such infrequent activities will be undertaken prior to these being initiated. This will be achieved through the Construction Traffic Management Plan (CTMP).

- During the operation of the William Roberts Road north construction yard, it is proposed that the Pakuranga Road / William Roberts Road intersection will be signalised temporarily. This will improve the capacity of the right-turn movements into and out of William Roberts Road and improve the safety of turning across three lanes of through traffic.

7.1.2 Hours of Operation

- It is anticipated that some night works will be undertaken to minimise the disruption to the public, businesses and traffic. Night works will be intermittent, and will not be continuous in a single location or activity. These works will be controlled in part by the Project's consent conditions and management plans, including the Construction Noise and Vibration Management Plan (CNVMP).

7.1.3 Construction Vehicles and Routes

- Community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through William Roberts Road south and Reeves Road due to the increase in exposure to some vulnerable users in the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through these areas. This will be achieved through the CTMP.

7.1.4 General Traffic

- To mitigate the potential adverse effects to travel times during all Construction Scenarios, appropriate public engagement will be undertaken, and on-road messaging will be provided. This is expected to lead to changes in travel behaviour, such as peak spreading, flexible working and alternative route selection, that could lead to decreased traffic volumes. This in turn could lead to more manageable queues, lower delays and improved travel times on the network. This will be managed through the CTMP.
- It is expected that the effects of the Pakuranga Road drainage works (Construction Scenario 1.1) can be managed by utilising the flush median as a running lane in order to maintain three lanes westbound and two lanes eastbound during these works.
- The pedestrian crossing on the eastern arm of the Ti Rakau Drive / Reeves Road / SEART intersection will require removal for the duration of Construction Scenario 1.2 to 2 to allow for more efficient traffic signal phasing, which will assist in managing the increased demand on Ti Rakau Drive.
- In the PM peak, during Construction Scenario 1.1, it is recommended that Signal Phase D at the Pakuranga Road / St Kentigern College intersection be modified to a variable phase, only to be called when necessary. This will assist in managing the Pakuranga Road eastbound demand during the drainage works.
- During Construction Scenario 1.2 to 1.4, in the PM peak, it is recommended that fixed time cycles of 150sec and offsets be implemented at the following intersections to facilitate better coordination between closely spaced intersections:
    - Pakuranga Road / William Roberts Road (temporary traffic signal) – reference
    - Pakuranga Road / St Kentigern College – offset = 13sec
- In the PM peak, during Construction Scenario 2, it is recommended that fixed time cycles of 150sec and offsets be implemented at the following intersections:
    - Ti Rakau Drive / Reeves Road / SEART – reference
    - Ti Rakau Drive / Aylesbury Street / Palm Avenue – offset = 11sec
    - Pakuranga Road / Ti Rakau Drive – offset = 28sec
- Consultation with ATOC will be undertaken to implement these traffic signal adjustment measures.
- A temporary traffic signal will be provided at the Ti Rakau Drive / Edgewater Drive east intersection during the construction of the Ti Rakau Drive / Edgewater Drive west intersection. This will ensure that signalised movements for vehicles turning into and out of Edgewater Drive are maintained.

7.1.5 Bus Services and Facilities

- During the closure of Reeves Road, the 711 outbound (eastbound) service will be diverted temporarily to the newly completed WRRE.
- Once William Roberts Road north is closed, the 711 inbound (westbound) service will also be diverted to the WRRE and will utilise bus stop (ID 6127) to pick-up/drop-off passengers at the Pakuranga Plaza.
- Opportunities will be explored during the development of the CTMP to improve bus travel times during all Construction Scenarios, such as the provision of temporary bus priority or temporary bus lanes where feasible, along with measures to manage travel demand through the provisions of the SSTMPs.
- Appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which could lead to changes in travel behaviour such as travelling outside the peak periods or using alternative routes.

7.1.6 Pedestrians and Cyclists

- Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities will be provided to ensure pedestrian connectivity. This will be ensured through the CTMP.

7.1.7 Property Access and Parking

- Access from Reeves Road to the Gull Service Station at 3 Reeves Road will not be maintained during the Reeves Road closure. Discussions are ongoing with the owner regarding loss of direct road access onto Reeves Road.
- During the Reeves Road closure, a temporary two-way access will be provided from Cortina Place to the Eastside Pups Dog Grooming and Daycare at 11 Reeves Road.
- Access to The Warehouse's goods entrance at 7 Aylesbury Street and the service entrance to the Pakuranga Library and Citizens Advice Bureau at 2R Ti Rakau Drive will be maintained through the work site. Removable barriers will be installed in the median and the existing masonry wall on the property boundary will be removed, if required, and will be re-installed following construction.
- During the Reeves Road closure, the main access to Te Tuhi at 13R Reeves Road will be closed and a temporary drop-off area with a temporary walkway leading to the main entrance will be provided on William Roberts Road.
- Access to the GAS Service Station at 141 Pakuranga Road and the Pakuranga Plaza via Brampton Court will be maintained during the longitudinal drainage works on Pakuranga Road by completing the works in sections and via steel plating across the trenches. The construction team will also liaise with the operators of the service station to ensure sufficient access widths are provided, as and when required, for fuel delivery tankers.

- During Phase 1 of Ti Rakau Drive in EB3R, the remaining properties on the southern frontage will not have access to Ti Rakau Drive while the westbound lanes are constructed. Temporary residential access will therefore be provided during this phase via chip seal access tracks along the back of the acquired properties accessed through side streets. Properties that would use these access tracks include 75, 83, 83A-C, 87, 98, 91, 97, 103A, 129, 145, 175A, 177, 183, 185 and 191 Ti Rakau Drive.

- A temporary parking area, with 18 parking spaces, will be provided at 105 Ti Rakau Drive for the Edgewater Shops located at 107 and 109 Ti Rakau Drive during construction. The temporary carpark will be accessed via Edgewater Drive west and the access road to the rear of the commercial buildings. Temporary signage will be provided to direct customers.

- Drainage works at 207, 219 and 229 Ti Rakau Drive will be undertaken in sections to maintain vehicle access to all properties at all times. Furthermore, at the end of the work week, the work zone will be reduced in size, while maintaining safety, to free up as many occupied parking spaces as possible.

7.2 Mitigation Measures upon Completion

- Access to the Gull Service Station at 3 Reeves Road will not be maintained from Reeves Road. Discussions are ongoing with the owner regarding the loss of direct road access from Reeves Road.
- To mitigate the loss of 16 parking spaces located within the Open Space zoned land along William Roberts Road south an off-street parking area will be provided in Ti Rakau Park providing 21 additional parking spaces. Stakeholder engagement is ongoing with Auckland Council to develop this option as well as relocating the existing playground to provide the necessary space for the proposed carpark.
- To mitigate the removal of the parking spaces at the Edgewater Shops (107 and 109 Ti Rakau Drive), the temporary carpark at 105 Ti Rakau Drive will be made permanent and will provide 22 parking spaces.

- Discussions are ongoing with Council and Fencibles United Football Club to rearrange the fields on River Hills Park as a result of the parcel of land that has been acquired along the southern boundary of 168R Ti Rakau Drive to facilitate the eastbound Gossamer Drive bus station.

8 Conclusions

During the development of the updated construction methodology, based on an updated design, efforts have been made to add efficiencies to the overall construction programme and produce construction staging so as to minimise the adverse transport effects. This process has led to a more refined construction staging.

Overall, the temporary effects of the various CSAs as well as the construction traffic in the project areas will be mitigated appropriately and are considered to be negligible or very low. A WTMP will be developed to reduce private vehicle trips and to increase worksite accessibility through more travel options. CTMPs will be developed to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this. Hours of operation, especially night works, will be controlled in part by the Project's consent conditions and management plans, including the CNVMP.

Overall, the temporary effects on intersection performance during all construction scenarios across the network are considered to be negligible to low, with some mitigation measures in place. Appropriate measures have been proposed to support the operation of the construction yard, as well as during drainage works on Pakuranga Road, the RRF tie-in and works on the Edgewater Drive loop.

Although the temporary effects to intersection performance during construction are predicted to be negligible to low, some adverse effects to general traffic and bus travel times are expected, particularly during Construction Scenario 1.3[36]. These effects are not unexpected due to the number of additional intersections and ongoing construction activities. Various mitigation options were tested; however, it is expected that the only alternative to improve travel times would be to add more lanes, which would be expected to have significant implications on construction cost and programme. Furthermore, increases in travel times through the project area are inherent in the majority of transport projects of this scale, as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur This in turn could lead to more manageable queues, lower delays and improved travel times on the network. These will be managed through the CTMP process.

It should be noted that these effects are temporary, and once constructed, the RRF and EB2/EB3R as a whole will alleviate congestion, particularly around the Pakuranga Town Centre. Nevertheless, to mitigate these effects, appropriate public communication and advanced warning of the planned works will be undertaken prior to the works being initiated. Also, opportunities to improve bus travel times will be explored in the development of the CTMPs along with measures to manage travel demand through the provisions of the SSTMPs. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which would lead to changes in travel behaviour. Based on the above, the potential adverse effects to general traffic and bus travel times are considered to be mitigated as far as is reasonably practicable.

[36] Construction Scenario 1.3 simulates the closure of Reeves Road as well as the ongoing construction of the RRF (i.e., not constructed yet).

Temporary effects to pedestrian and cyclists during construction are considered to be negligible overall. Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities and diversions will be provided to ensure pedestrian connectivity.

Overall, the temporary effects during construction on property access and parking will be mitigated appropriately and are considered to be negligible or very low. Where existing vehicle access arrangements and parking provisions cannot be maintained, appropriate mitigation measures have been proposed to provide levels of access and parking commensurate with the existing environment as far as is reasonably practicable.

Engagement with property owners or operators will be undertaken during construction to communicate the planned works and duration, the potential disruption and proposed mitigation measures as well as to develop additional measures or improve upon proposed measures if required. Lastly, pedestrian access to properties will be maintained at all times. This will be ensured through the CTMPs.

Safety measures will be in place during construction, ensured by the CTMPs. The safety and protection of the public, traffic and construction team is paramount, and all site operations will be focused on zero harm to all involved, associated with and traveling through the project areas.

In the existing environment, Auckland's eastern suburbs are experiencing a range of transport related problems and challenges. The completion of EB2 and EB3R will improve upon these shortcomings through the following:

- Significantly improved travel options for all modes of transport
- Increased public transport patronage and mode share through increased catchment and dedicated bus lanes
- Reduced carbon emissions
- Improved walking and cycling amenity and safety through dedicated infrastructure
- Reduced congestion, particularly around the Pakuranga Town Centre, through the new Reeves Road flyover

The main elements of the proposed design of EB2 and EB3R include dedicated bus lanes along Ti Rakau Drive, connecting to the EB1 bus lanes at Pakuranga Road and terminating at Gossamer Drive, as well as three new bus stations along the corridor. A new link between Pakuranga Road and SEART in the form of the Reeves Road Flyover (RRF). Dedicated cycleways on Pakuranga Road, between Ti Rakau Drive and the RRF, and along Ti Rakau Drive from Pakuranga Road to Gossamer Drive.

In the future, the Ti Rakau Drive and Pakuranga Road corridors will have more strategic Place functions, in addition to the Movement of people and goods. The proposed Eastern Busway bus stations will also attract more people within the area as the activities served by these bus stations will become local attractions. Modal priority of pedestrians, cyclists and buses will be improved, and as a result modal priority of general traffic and parking will decrease across the project areas.

Overall, the proposed design of EB2 and EB3R is expected to lead to acceptable operations for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. The RRF is expected to relieve congestion around the Pakuranga Town Centre by removing traffic from Ti Rakau Drive and providing a direct and faster link between Pakuranga Road and SEART. Furthermore, significant improvements in travel times are expected overall, especially from Botany towards Pakuranga and SEART.

Benefits of the new stations will be the ability to support significantly higher public transport patronage through increased catchment and higher service frequencies through increased capacity. These benefits, in combination with improved customer accessibility, amenity and safety, will lead to an increase in mode share of public transport. A particular benefit of the Pakuranga Town Centre bus station will be the integration of all bus services in the EB2 and EB3R project areas, which will provide an improved transfer experience for passengers. Another benefit of the stations will be improved safety for buses.

EB2 and EB3R are predicted to result in a significant increase in public transport patronage in the future. As such, bus station platforms and loading areas have been designed to provide appropriate levels of service and capacity to support this uptake in public transport. Along with this, bus service headways, reliability and efficiency will also be improved overall. The combination of these public transport upgrades is expected to significantly increase public transport mode share, which in turn will reduce congestion and reduce greenhouse gas emissions by way of a more sustainable movement of people through the network. Overall, the proposed design is predicted to improve bus travel times across the network. The combination of improved travel times and higher service frequencies will lead to faster and more reliable public transport trips.

The Project will provide dedicated footpaths and cycleways to improve pedestrian and cyclist amenity and safety. Providing dedicated cycleways will create a physically separated and safe space that facilitates cycle movements through the network, which will provide users with a more attractive mode of travel and supports the uptake of cycling. Furthermore, the cycleways will facilitate improved accessibility to the bus stations, resulting in increased catchment as well as the potential for mode shift to occur, increasing uptake of public transport across the network.

Lastly, the proposed design of EB2 and EB3R will provide an overall safer transport system for all modes of transport through the project areas with the aim to reduce fatal and serious injury crashes. The proposed design will provide staged crossings at various locations in order to reduce pedestrian delay, improve safety and discourage jaywalking. Raised pedestrian platforms will also be provided to create a low-speed environment, and to aid pedestrians and cyclists by simplifying the crossing task. Furthermore, these facilities will increase visibility by creating a visual cue for drivers to reduce their speed as they approach, and encourage courtesy between drivers and pedestrians.

In conclusion, with the proposed mitigation measures in place, the potential adverse effects during construction and upon completion of EB2 and EB3R are considered to be negligible to low overall. Furthermore, the proposed design is predicted to result in significant improvements and a range of benefits overall.

Appendix A

Reeves Road Closure Detour Assessment

Technical Advice Memorandum

To	Josie Jackson, Andy Gibbard, Julio Marti Herraiz, Ben Burrows	Page	1 of 27
CC	Jacques Van den Heever, Christine Lee, Josie Ackroyd		
Subject	AMETI Eastern Busway Stage 2 Reeves Road Closure & Detour Assessment - DRAFT		
From	Shane Doran		
File/Ref No. EBQ-TA-Z1-TM-0001-01		Date	03-Sep-2021

Summary

- Overall, it seems that only a small percentage of traffic is routing along the proposed detour route (probably due to the already congested nature of those intersections).
- As a result, in the **inbound** (citybound) direction during the AM demand seems to detour via Gossamer Road to Pakuranga Road in the north and Ti Rakau Drive in the south.
- In the PM in the **outbound** direction, demand seems to return via Pakuranga Road, and via SEART turning right onto Ti Rakau Drive.
- NOTE: Colour-coding of the tables below are in reference to the Do-Minimum scenario with green = improved, amber = similar and red = worse.

William Roberts Road / Reeves Road intersection:

- For the Stage 2 detour this intersection is expected to operate with good LOS in the AM and PM.

Scenario	LOS		DOS [v/c]		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	-	-	0.68	0.87	8	12
Stage 2 Detour	-	-	0.18	0.39	5	5

William Roberts Road / Pakuranga Road intersection:

- The assessment indicates that the Stage 2 detour results in overall intersection performance that is similar or worse than the Do-Minimum in the AM and PM, but in practical terms the intersection is already saturated, and the impact of the detour is considered negligible.

Scenario	LOS		DOS [v/c]		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	-	-	9.46	32.92	387	2260
Stage 2 Detour	-	-	10.96	19.93	443	1011

Pakuranga Road / Ti Rakau Drive intersection:

- Stage 2 intersection performance is LOS D during the AM peak, with the Ti Rakau Drive west left-turn lane expected to operate at LOS C.
- During the PM peak the intersection is expected to perform at LOS F during Stage 2, compared to the LOS E of the Do-Minimum scenario. Demand seems to have increased on Pakuranga Road west (and east), however the west approach is already saturated, causing delays to increase further.
- NOTE: The Ti Rakau Drive / SEART intersection below (**Section 3.4**) is also expected to experience poor LOS. It is expected that the mitigation measures discussed would remedy that intersection as well as this intersection by drawing demand away from Pakuranga Road eastbound to SEART, then turning right into Ti Rakau Drive. Therefore, mitigation measures are not recommended for the Pakuranga Road / Ti Rakau Drive intersection.

Scenario	LOS		DOS [v/c]		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	D	E	0.93	1.01	43	71
Stage 2 Detour	D	F	0.92	1.07	37	99

Ti Rakau Drive / SEART intersection:

- Intersection performance is poor (LOS F) during both the AM and PM peaks for the Do-Min scenario. The Stage 2 AM peak intersection performance is expected to be slightly improved (LOS E), however the PM peak is still poor (LOS F).
- The SEART right-turn lanes into Ti Rakau Drive are expected to operate at LOS F during the PM peak. The increase in demand (due to Reeves Road closure) results in delay increasing from around 50 sec to 215 sec (3.6 min), which would require mitigation.
- Mitigation 1 consists of an additional right-turn lane from SEART to Ti Rakau Drive eastbound and an additional exit lane on Ti Rakau Drive eastbound between SEART and William Roberts Road. Improved intersection performance is expected during both AM and PM peaks. <u>This option is recommended to be discussed with key stakeholders.</u>
- A further refinement of Mitigation 1 was also tested. It consisted of a 105 m short exit lane (AGRD04A (Austroads) – Table 5.5) on Ti Rakau Drive eastbound. Although intersection performance is expected to be similar to Mitigation 1 above, this geometric change would provide insufficient weave distance up to William Roberts Road and is not recommended.
- Mitigation 2 consists of the temporary removal of the pedestrian crossing on the eastern arm of the intersection, reducing phases to 3 and redistributing the greentime. Improved intersection performance is expected during both AM and PM peaks however, large queues are still expected in the SEART right-turn lanes.

Scenario	LOS		DOS [v/c]		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	F	F	0.89	1.15	178	98
Stage 2 Detour	E	F	0.91	1.13	60	120
Mitigation 1	D	E	0.89	1.06	53	41
Mitigation 2	D	E	0.87	0.97	41	77

Ti Rakau Drive / Gossamer Drive intersection:

- The right-turn traffic demand from Gossamer Drive into Ti Rakau Drive is expected to increase by around 160 veh/h. The resultant intersection performance is poor (LOS F) for the Stage 2 AM peak, compared to the LOS E of the Do-Min scenario. This would require mitigation.

- The intersection is expected to experience little change during the Stage 2 PM peak and will remain at LOS D.

- Mitigation 1 consists of the following changes to the northern Gossamer Drive approach: additional short right-turn lane (100 m), converting the short left-turn slip lane to pass through the intersection and providing 150 m stacking space and kerbside short exit lane length increased to 100 m. Intersection performance is expected to be slightly improved, compared to Stage 2 during the AM peak, however still LOS F. Furthermore, the additional control delay now imposed on the Gossamer Drive left-turn (previously a left-turn slip under the Do-Min and Stage 2 scenarios) has resulted in large delays (141 sec) and queues (478 m) in that lane. The PM peak is expected to experience improved performance.

- Mitigation 2 consists of the following changes to the northern Gossamer Drive approach: additional short lane (100 m) for the shared through and right-turn movements, converting the centre lane to a full left-turn lane, converting the short left-turn slip lane to pass through the intersection and providing 150 m stacking space and kerbside short exit lane length increased to 100 m. Improved intersection performance is expected during both the AM and PM peaks. <u>This option is recommended to be discussed with key stakeholders.</u>

Scenario	**LOS**		**DOS [v/c]**		**Average Delay [sec]**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
Do-Minimum	D	D	1.02	0.90	48	45
Stage 2 Detour	F	D	1.25	0.88	168	43
Mitigation 1	F	D	1.09	0.86	118	38
Mitigation 2	D	D	0.89	0.86	37	37

- The impacts to buses through the project area are expected to be low as the frequencies of the 711 route in the AM inbound and PM outbound directions are only 4 buses/h (1 every 15min).

1.0 Introduction

The proposed construction sequencing of the Eastern Busway, relevant to this Technical Advice Note, are as follows:

- Stage 1 – Extension of William Roberts Road south to Ti Rakau Drive as well as completing the Cortina Place link between William Roberts Road and Reeves Road. During this stage, Reeves Road will remain open, providing site access through Cortina Place and William Roberts Road. **Figure 1** provides an overview of Stage 1.

Figure 1: Stage 1 overview

- Stage 2 – Closure of Reeves Road between Ti Rakau Drive and William Roberts Road. At the completion of Stage 1, William Roberts Road is intended to be a left-in left-out (LILO) only at the intersection with Ti Rakau Drive. Therefore, due to the Reeves Road closure and the LILO arrangement at the William Roberts Road / Ti Rakau Drive intersection, an alternative detour route is proposed for traffic usually traveling along Reeves Road toward the SEART. **Figure 2** provides an overview of Stage 2.

Figure 2: Stage 2 overview

The proposed detour will route traffic north along William Roberts Road, west along Pakuranga Road, south along Ti Rakau Drive and finally west along SEART. The purpose of this Technical Advice Note is to assess the proposed detour route.

2.0 Assessment Methodology

AIMSUN:

- Operational Microsimulation Models – These models provide information about travel times along different routes within the project area as well as turn movements and traffic demand along roads within the project area.
- The proposed geometric changes of Stage 1 and Stage 2 were updated within the AIMSUN model to determine re-routed traffic demands along roads within the project area.
- The turning movement outputs at intersections from this model were used as inputs into SIDRA models.

SIDRA:

- Intersection models – These models are used to determine the performance of intersections using traffic movement data from AIMSUN models. The key outputs include degree of saturation (DOS), level of service (LOS), delays and queue lengths.
- The proposed geometric changes of Stage 1 and Stage 2 were updated within the SIDRA model and the AIMSUN turning movements were imported.
- The results of this 'Stage 2' scenario were compared to a 'Do Minimum' scenario in order to determine and assess the potential impact of the proposed Stage 2 and associated disruption.

3.0 Lane Performance Summaries

3.1 William Roberts Road / Reeves Road

3.1.1 AM Peak

- NOTE: The Reeves Road west approach to this intersection in the Stage 2 scenario has been closed. For the Stage 2 detour this intersection is expected to operate with good LOS in the AM, the removal of the Reeves Road west approach reduces much of the opposing flows.
- Total intersection demand decreased by around 300 veh/h and the Reeves Road east approach right-turn increased by around 30 veh/h.
- It is clear from the comparison below that Reeves Road westbound traffic demand has decreased and only a small percentage of traffic is routing along the proposed detour north on William Roberts Road. This is a general trend for all intersection assessed and will be detailed further in later sections of this Technical Advice Note.

Table 1: William Roberts Rd / Reeves Rd – Do-Min vs Stage 2 (AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Rd (South)															
Lane 1	39	2.6	39	2.6	337	0.116	100	10.9	LOS B	0.1	0.9	Full	170	-20.4[N7]	0.0
Approach	39	2.6	39	2.6		0.116		10.9	LOS B	0.1	0.9				
East: Reeves Rd (East)															
Lane 1	375	6.1	375	6.1	1831	0.205	100	0.2	LOS A	0.0	0.0	Full	266	0.0	0.0
Lane 2	103	11.7	103	11.7	562	0.183	100	5.5	LOS A	0.2	1.2	Short	13	-49.9[N7]	NA
Approach	478	7.3	478	7.3		0.205		1.3	NA	0.2	1.2				
North: William Roberts Rd (North)															
Lane 1	283	5.7	235	4.2	344	0.683	100	24.2	LOS C	2.0	14.6	Full	244	0.0	0.0
Approach	283	5.7	235[N1]	4.2		0.683		24.2	LOS C	2.0	14.6				
West: Reeves Rd (West)															
Lane 1	41	9.8	40	9.9	832	0.048	100	4.1	LOS A	0.0	0.0	Short	53	-49.9[N7]	NA
Lane 2	143	12.6	139	12.8	1803	0.077	100	0.0	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 3	11	0.0	11	0.0	1238	0.009	100	5.4	LOS A	0.0	0.1	Short	13	0.0	NA
Approach	195	11.3	190[N1]	11.4		0.077		1.2	NA	0.0	0.1				
Intersection	995	7.4	942[N1]	7.9		0.683		7.4	NA	2.0	14.6				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Rd (South)															
Lane 1	136	7.4	135	7.4	745	0.182	100	5.9	LOS A	0.6[N5]	4.5[N5]	Full	243	-19.0[N3]	11.8
Approach	136	7.4	135[N1]	7.4		0.182		5.9	LOS A	0.6	4.5				
East: Reeves Rd (East)															
Lane 1	215	5.6	215	5.6	1758	0.122	100	4.6	LOS A	0.0	0.0	Full	266	0.0	0.0
Lane 2	134	9.0	134	9.0	1718	0.078	100	4.7	LOS A	2.6[N5]	19.4[N5]	Short	13	0.0	NA
Approach	349	6.9	349	6.9		0.122		4.6	NA	2.6	19.4				
North: William Roberts Rd (North)															
Lane 1	212	12.3	89	7.7	1216	0.073	100	5.3	LOS A	0.1	0.9	Full	244	0.0	0.0
Approach	212	12.3	89[N1]	7.7		0.073		5.3	LOS A	0.1	0.9				
Intersection	697	8.6	573[N1]	10.5		0.182		5.0	NA	2.6	19.4				

3.1.2 PM Peak

- The intersection is expected to operate with good LOS in PM with the Stage 2 detour.
- Total intersection demand decreased by around 500 veh/h and the Reeves Road east approach right-turn increased by around 30 veh/h. The William Roberts Road south approach demand increased by around 230 veh/h, indicating an increase in vehicles routing from Ti Rakau Drive at the new LILO intersection further south.

Table 2: William Roberts Rd / Reeves Rd – Do-Min vs Stage 2 (PM)

Lane Use and Performance (Do-Min)

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Rd (South)															
Lane 1	46	4.3	46	4.3	270	0.170	100	13.3	LOS B	2.6 N5	19.2 N5	Full	170	-20.7 N3	16.8
Approach	46	4.3	46	4.3		0.170		13.3	LOS B	2.6	19.2				
East: Reeves Rd (East)															
Lane 1	140	8.6	140	8.6	1794	0.078	100	0.3	LOS A	0.0	0.0	Full	266	0.0	2.7 8
Lane 2	53	24.5	53	24.5	523	0.101	100	10.3	LOS B	11.7 N5	98.8 N5	Short	13	0.0	NA
Approach	193	13.0	193	13.0		0.101		3.1	NA	11.7	98.8				
North: William Roberts Rd (North)															
Lane 1	259	15.8	217	15.0	250	0.869	100	50.0	LOS F	3.3	25.9	Full	244	0.0	0.0
Approach	259	15.8	217 N1	15.0		0.869		50.0	LOS F	3.3	25.9				
West: Reeves Rd (West)															
Lane 1	259	9.7	256	9.7	1665	0.154	100	4.1	LOS A	7.3 N6	55.0 N6	Short	53	0.0	NA
Lane 2	427	9.8	423	9.9	1841	0.230	100	0.0	LOS A	0.0	0.0	Full	55	0.0	49.9 8
Lane 3	43	4.7	43	4.7	1542	0.028	100	4.5	LOS A	0.0	0.4	Short	13	0.0	NA
Approach	729	9.5	722 N1	9.5		0.230		1.7	NA	7.3	55.0				
Intersection	1227	11.2	1178 N1	11.6		0.869		11.3	NA	11.7	98.8				

Lane Use and Performance (Stage 2)

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Rd (South)															
Lane 1	274	9.2	273	9.2	698	0.391	100	5.0	LOS A	24.8 N5	187.3 N5	Full	243	-35.9 N3	29.9
Approach	274	9.2	273 N1	9.2		0.391		5.0	LOS A	24.8	187.3				
East: Reeves Rd (East)															
Lane 1	47	4.3	47	4.3	1774	0.026	100	4.6	LOS A	0.0	0.0	Full	266	0.0	5.6 8
Lane 2	81	22.2	81	22.2	1578	0.051	100	4.8	LOS A	13.1 N5	109.3 N5	Short	13	0.0	NA
Approach	128	15.6	128	15.6		0.051		4.7	NA	13.1	109.3				
North: William Roberts Rd (North)															
Lane 1	342	9.6	162	7.8	1510	0.107	100	4.9	LOS A	0.2	1.5	Full	244	0.0	0.0
Approach	342	9.6	162 N1	7.8		0.107		4.9	LOS A	0.2	1.5				
Intersection	744	10.5	563 N1	13.9		0.391		4.9	NA	24.8	187.3				

3.2 William Roberts Road / Pakuranga Road

3.2.1 AM Peak

- The Do-Min scenario performance is poor, specifically the shared left and right-turn lane out of William Roberts Road and the Pakuranga Road west right-turn during the AM.
- The results below indicate that the Stage 2 detour results in overall intersection performance that is worse than the Do-Min in the AM, but in practical terms the intersection is saturated, and the impact of the detour is considered negligible.

Table 3: William Roberts Rd / Pakuranga Rd – Do-Min vs Stage 2 (AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road															
Lane 1	147	9.5	146	9.6	15	9.462	100	7695.3	LOS F	32.2[N4]	243.9[N4]	Full	244	0.0	49.9
Approach	147	9.5	146[N1]	9.6		9.462		7695.3	LOS F	32.2	243.9				
East: Pakuranga Road (East)															
Lane 1	991	5.3	991	5.3	1824	0.543	100	1.4	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 2	825	5.7	825	5.7	1519	0.543	100	0.1	LOS A	0.0	0.0	Full	184	-17.0[N7]	0.0
Lane 3	866	5.7	866	5.7	1593	0.543	100	0.1	LOS A	0.0	0.0	Full	184	-13.9[N7]	0.0
Approach	2682	5.6	2682	5.6		0.543		0.6	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	526	6.8	509	6.9	1847	0.276	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 2	509	6.8	493	6.9	1788	0.276	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 3	11	6.8	11	6.9	39[15]	0.276	100	498.4	LOS F	1.6	11.5	Full	152	0.0	48.6[8]
Lane 4	54	13.0	52	13.2	6	8.723	100	7175.8	LOS F	19.3	150.2	Short	60	0.0	NA
Approach	1100	7.1	1065[N1]	7.2		8.723		357.6	NA	19.3	150.2				
Intersection	3929	6.2	3893[N1]	6.2		9.462		386.9	NA	32.2	243.9				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road															
Lane 1	159	8.2	159	8.2	32	4.904	100	3578.9	LOS F	32.6[N4]	243.9[N4]	Full	244	0.0	49.9
Approach	159	8.2	159	8.2		4.904		3578.9	LOS F	32.6	243.9				
East: Pakuranga Road (East)															
Lane 1	766	5.7	766	5.7	1832	0.418	100	0.6	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 2	765	5.9	765	5.9	1829	0.418	100	0.1	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 3	773	5.9	773	5.9	1849	0.418	100	0.1	LOS A	0.0	0.0	Full	184	0.0	0.0
Approach	2305	5.8	2305	5.8		0.418		0.2	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	724	7.2	710	7.3	1842	0.386	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 2	701	7.2	688	7.3	1784	0.386	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 3	20	7.2	20	7.3	51[15]	0.386	100	268.2	LOS F	1.5	11.5	Full	152	0.0	49.9[8]
Lane 4	135	15.6	133	15.7	12	10.962	100	9061.0	LOS F	19.1[N4]	151.9[N4]	Short	60	0.0	NA
Approach	1580	7.9	1550[N1]	8.0		10.962		778.4	NA	19.1	151.9				
Intersection	4044	6.7	4014[N1]	6.8		10.962		442.4	NA	32.6	243.9				

3.2.2 PM Peak

- Similar to the AM, the Do-Min scenario performance is poor, specifically the shared left and right-turn lane out of William Roberts Road and the Pakuranga Road west right-turn during the PM.
- In practical terms the intersection is already over-saturated in the Do-Min PM peak, and the impact of the detour is considered negligible.
- During the Stage 2 detour the Pakuranga Road west right-turn lane is expected to perform worse than the Do-Min during the PM, with high delay and LOS F.

Table 4: William Roberts Rd / Pakuranga Rd – Do-Min vs Stage 2 (PM)

Do-Min – Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road															
Lane 1	326	11.7	324	11.7	10	32.923	100	28787.8	LOS F	31.7[N4]	243.9[N4]	Full	244	0.0	49.9
Approach	326	11.7	324[N1]	11.7		32.923		28787.8	LOS F	31.7	243.9				
East: Pakuranga Road (East)															
Lane 1	469	8.0	469	8.0	1787	0.262	100	1.6	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 2	477	6.8	477	6.8	1818	0.262	100	0.0	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 3	482	6.8	482	6.8	1838	0.262	100	0.0	LOS A	0.0	0.0	Full	184	0.0	0.0
Approach	1427	7.2	1427	7.2		0.262		0.5	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	1177	4.8	1047	4.8	1871	0.559	100	0.1	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 2	1140	4.8	1014	4.8	1812	0.559	100	0.1	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 3	250	4.8	222	4.8	397[15]	0.559	100	63.4	LOS F	4.6	33.5	Full	152	0.0	10.8[8]
Lane 4	133	20.3	118	20.4	91	1.298	100	349.8	LOS F	9.0	73.7	Short	60	0.0	NA
Approach	2700	5.5	2401[N1]	5.6		1.298		23.2	NA	9.0	73.7				
Intersection	4453	6.5	4152[N1]	7.0		32.923		2259.1	NA	31.7	243.9				

Stage 2 – Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road															
Lane 1	235	12.3	234	12.4	12	18.936	100	16209.3	LOS F	31.5[N4]	243.9[N4]	Full	244	0.0	49.9
Approach	235	12.3	234[N1]	12.4		18.936		16209.3	LOS F	31.5	243.9				
East: Pakuranga Road (East)															
Lane 1	496	6.5	496	6.5	1820	0.272	100	0.8	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 2	495	7.0	495	7.0	1816	0.272	100	0.0	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 3	500	7.0	500	7.0	1836	0.272	100	0.0	LOS A	0.0	0.0	Full	184	0.0	0.0
Approach	1490	6.8	1490	6.8		0.272		0.3	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	1218	5.4	996	5.4	1864	0.534	100	0.1	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 2	1179	5.4	964	5.4	1805	0.534	100	0.1	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 3	178	5.4	145	5.4	272[15]	0.534	100	47.9	LOS E	2.1	15.4	Full	152	0.0	49.9[8]
Lane 4	273	11.4	223	11.4	93	2.390	100	1289.6	LOS F	19.8[N4]	151.9[N4]	Short	60	0.0	NA
Approach	2848	5.9	2328[N1]	6.0		2.390		126.6	NA	19.8	151.9				
Intersection	4573	6.6	4053[N1]	7.4		18.936		1010.3	NA	31.5	243.9				

Eastern Busway Alliance

Fletcher | acciona | AECOM | Jacobs

3.3 Pakuranga Road / Ti Rakau Drive

3.3.1 AM Peak

- The Stage 2 detour intersection performance is expected to be only slightly improved during the AM peak compared to the Do-Min scenario.
- The Pakuranga Road east left-turn is expected to operate at LOS C.
- Total intersection demand increased by around 300 veh/h, with increases on Ti Rakau Drive south approach and the Pakuranga Road west approach.

Table 5: Pakuranga Rd / Ti Rakau Dr – Do-Min vs Stage 2 (AM)

Lane Use and Performance (Do-Min)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	583	7.5	509	7.8	759[1]	0.671	100	29.8	LOS C	14.4	107.9	Full	130	0.0	32.6
Lane 2 (B)	14	100.0	14	100.0	326	0.043	100	48.0	LOS D	0.5	6.0	Short	16	0.0	NA
Lane 3	166	4.6	145	4.8	502	0.288	100	50.5	LOS D	5.1	37.4	Full	130	0.0	0.0
Lane 4	166	4.6	145	4.8	502	0.288	100	50.5	LOS D	5.1	37.4	Full	130	0.0	0.0
Lane 5	166	4.6	145	4.8	502	0.288	100	50.5	LOS D	5.1	37.4	Short	40	0.0	NA
Approach	1094	7.4	957[N1]	7.8		0.671		39.5	LOS D	14.4	107.9				
East: Pakuranga Road (East)															
Lane 1	1019	4.2	974	4.3	1113	0.875	100	20.0	LOS B	15.6[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 2	757	5.8	724	6.0	781	0.927	100	62.7	LOS E	15.4[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 3	740	5.8	707	6.0	763[1]	0.927	100	62.6	LOS E	15.4[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 4 (B)	19	100.0	19	100.0	47	0.406	100	85.2	LOS F	0.9	12.2	Short	101	0.0	NA
Approach	2535	5.9	2424[N1]	6.0		0.927		45.7	LOS D	15.6	113.0				
West: Pakuranga Road (West)															
Lane 1 (B)	24	100.0	24	100.0	44	0.541	100	90.8	LOS F	1.2	15.6	Full	388	0.0	0.0
Lane 2	201	7.8	201	7.8	893	0.225	100	24.1	LOS C	5.2	39.0	Short	141	0.0	NA
Lane 3	201	7.8	201	7.8	893	0.225	100	24.1	LOS C	5.2	39.0	Full	388	0.0	0.0
Lane 4	201	7.8	201	7.8	893	0.225	100	24.1	LOS C	5.2	39.0	Full	388	0.0	0.0
Lane 5	177	13.6	177	13.6	226	0.782	100	62.4	LOS E	6.0	47.2	Short	184	0.0	NA
Lane 6	177	13.6	177	13.6	226	0.782	100	62.4	LOS E	6.0	47.2	Short	109	0.0	NA
Approach	981	12.1	981	12.1		0.782		39.5	LOS D	6.0	47.2				
Intersection	4610	7.6	4361[N1]	8.0		0.927		42.9	LOS D	15.6	113.0				

Lane Use and Performance (Stage 2)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	701	9.1	635	9.3	841[1]	0.754	100	24.4	LOS C	17.2[N4]	130.0[N4]	Full	130	0.0	50.0
Lane 2 (B)	16	100.0	16	100.0	348	0.046	100	45.7	LOS D	0.5	6.7	Short	16	0.0	NA
Lane 3	225	4.4	203	4.5	538	0.378	100	49.6	LOS D	7.3	52.9	Full	130	0.0	0.0
Lane 4	203	4.4	184	4.5	487[1]	0.378	100	49.0	LOS D	6.5	47.2	Full	130	0.0	0.0
Lane 5	203	4.4	184	4.5	487[1]	0.378	100	49.0	LOS D	6.5	47.2	Short	40	0.0	NA
Approach	1348	8.0	1221[N1]	8.2		0.754		36.3	LOS D	17.2	130.0				
East: Pakuranga Road (East)															
Lane 1	1062	4.8	1004	4.9	1097	0.915	100	29.6	LOS C	15.5[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 2	592	5.3	559	5.4	735	0.761	100	42.8	LOS D	15.4[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 3	574	5.3	543	5.4	713[1]	0.761	100	42.3	LOS D	15.4[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 4 (B)	19	100.0	19	100.0	47	0.406	100	85.2	LOS F	0.9	12.2	Short	101	0.0	NA
Approach	2247	5.9	2125[N1]	6.0		0.915		36.8	LOS D	15.5	113.0				
West: Pakuranga Road (West)															
Lane 1 (B)	24	100.0	24	100.0	35	0.690	100	95.0	LOS F	1.3	16.3	Full	388	-21.6[N7]	0.0
Lane 2	319	9.4	319	9.4	848	0.376	100	28.1	LOS C	9.3	70.2	Short	141	0.0	NA
Lane 3	319	9.4	319	9.4	848	0.376	100	28.1	LOS C	9.3	70.2	Full	388	0.0	0.0
Lane 4	319	9.4	319	9.4	848	0.376	100	28.1	LOS C	9.3	70.2	Full	388	0.0	0.0
Lane 5	187	13.9	187	13.9	236	0.792	100	64.6	LOS E	6.6	51.4	Short	184	0.0	NA
Lane 6	130	13.9	130	13.9	164	0.792	100	67.5	LOS E	4.7	37.0	Short	109	-30.6[N7]	NA
Approach	1297	12.2	1297	12.2		0.792		38.6	LOS D	9.3	70.2				
Intersection	4892	8.1	4643[N1]	8.6		0.915		37.2	LOS D	17.2	130.0				

3.3.2 PM Peak

- During the PM peak the intersection is expected to perform at LOS F during Stage 2, compared to the LOS E of the Do-Min scenario.
- Demand seems to have increased on Pakuranga Road west (and east), however the west approach is already saturated, causing delays to increase further.
- NOTE: The Ti Rakau Drive / SEART intersection (**Section 3.4** below) is also expected to experience poor LOS. It is expected that the mitigation measures discussed in **Section 3.4.3** would remedy that intersection as well as this intersection by drawing demand away from Pakuranga Road eastbound to SEART, then turning right into Ti Rakau Drive. Therefore, mitigation measures are not recommended for the Pakuranga Road / Ti Rakau Drive intersection.

Table 6: Pakuranga Rd / Ti Rakau Dr – Do-Min vs Stage 2 (PM)

Lane Use and Performance (Do-Min)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	680	6.6	655	6.6	1109[1]	0.591	100	13.5	LOS B	12.3	90.6	Full	130	0.0	16.7
Lane 2 (B)	12	100.0	12	100.0	528	0.023	100	28.6	LOS C	0.3	3.8	Short	16	0.0	NA
Lane 3	654	3.1	630	3.1	657	0.960	100	83.7	LOS F	18.1[N4]	130.0[N4]	Full	130	-21.7[N3]	50.0
Lane 4	393	3.1	379	3.1	394[1]	0.960	100	86.6	LOS F	18.1[N4]	130.0[N4]	Full	130	-22.5[N3]	50.0[8]
Lane 5	389	3.1	375	3.1	390[1]	0.960	100	87.0	LOS F	18.1[N4]	130.0[N4]	Short	40	-24.0[N3]	NA
Approach	2128	4.8	2051[N1]	4.8		0.960		62.1	LOS E	18.1	130.0				
East: Pakuranga Road (East)															
Lane 1	575	2.3	514	2.4	1116	0.461	100	14.2	LOS B	6.6	47.1	Full	113	0.0	0.0
Lane 2	426	8.0	382	8.5	420	0.909	100	77.6	LOS E	15.0[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 3	421	8.0	378	8.5	416[1]	0.909	100	77.6	LOS E	15.0[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 4 (B)	11	100.0	11	100.0	47	0.235	100	83.9	LOS F	0.5	6.9	Short	101	0.0	NA
Approach	1433	6.4	1285[N1]	6.9		0.909		52.3	LOS D	15.0	113.0				
West: Pakuranga Road (West)															
Lane 1 (B)	40	100.0	40	100.0	40	1.008	100	135.2	LOS F	2.6	33.3	Full	388	-11.1[N7]	0.0
Lane 2	426	6.7	426	6.7	437	0.975	100	99.5	LOS F	26.1	192.9	Short	141	-21.7[N3]	NA
Lane 3	422	6.7	422	6.7	433	0.975	100	99.7	LOS F	25.8	191.2	Full	388	-22.5[N3]	0.0
Lane 4	414	6.7	414	6.7	424	0.975	100	100.1	LOS F	25.4	187.9	Full	388	-24.0[N3]	0.0
Lane 5	195	7.7	195	7.7	245	0.796	100	73.6	LOS E	7.0	52.1	Short	184	0.0	NA
Lane 6	195	7.7	195	7.7	245	0.796	100	73.6	LOS E	7.0	52.1	Short	109	0.0	NA
Approach	1692	9.2	1692	9.2		1.008		94.6	LOS F	26.1	192.9				
Intersection	5253	6.6	5028[N1]	6.9		1.008		70.5	LOS E	26.1	192.9				

Lane Use and Performance (Stage 2)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	725	6.5	696	6.4	1074[1]	0.648	100	14.4	LOS B	14.7	108.8	Full	130	0.0	33.4
Lane 2 (B)	12	100.0	12	100.0	492	0.024	100	31.6	LOS C	0.3	4.0	Short	16	0.0	NA
Lane 3	604	4.2	580	4.1	545	1.064	100	153.3	LOS F	17.9[N4]	130.0[N4]	Full	130	-29.6[N3]	50.0
Lane 4	378	4.2	363	4.1	341[1]	1.064	100	164.3	LOS F	17.9[N4]	130.0[N4]	Full	130	-30.4[N3]	50.0[8]
Lane 5	406	4.2	390	4.1	366[1]	1.064	100	162.4	LOS F	17.9[N4]	130.0[N4]	Short	40	-20.0[N7]	NA
Approach	2125	5.5	2040[N1]	5.5		1.064		108.9	LOS F	17.9	130.0				
East: Pakuranga Road (East)															
Lane 1	722	4.0	660	4.2	1126	0.587	100	14.7	LOS B	9.5	69.1	Full	113	0.0	4.8
Lane 2	420	8.3	385	8.6	504	0.764	100	55.6	LOS E	15.0[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 3	414	8.3	379	8.6	496[1]	0.764	100	55.4	LOS E	15.0[N4]	113.0[N4]	Full	113	0.0	50.0
Lane 4 (B)	11	100.0	11	100.0	47	0.235	100	83.9	LOS F	0.5	6.9	Short	101	0.0	NA
Approach	1567	7.0	1436[N1]	7.3		0.764		37.0	LOS D	15.0	113.0				
West: Pakuranga Road (West)															
Lane 1 (B)	40	100.0	40	100.0	38	1.066	100	169.5	LOS F	2.9	38.3	Full	388	-15.9[N7]	0.0
Lane 2	463	6.4	463	6.4	437	1.059	100	149.9	LOS F	35.0	258.6	Short	141	-29.6[N3]	NA
Lane 3	458	6.4	458	6.4	432	1.059	100	150.2	LOS F	34.7	256.0	Full	388	-30.4[N3]	12.6[8]
Lane 4	526	6.4	526	6.4	497	1.059	100	147.0	LOS F	39.3	290.4	Full	388	-20.0[N7]	23.2
Lane 5	180	7.5	180	7.5	222	0.807	100	72.2	LOS E	6.3	46.6	Short	184	0.0	NA
Lane 6	180	7.5	180	7.5	222	0.807	100	72.2	LOS E	6.3	46.6	Short	109	0.0	NA
Approach	1845	8.7	1845	8.7		1.066		134.5	LOS F	39.3	290.4				
Intersection	5537	7.0	5321[N1]	7.3		1.066		98.4	LOS F	39.3	290.4				

3.4 Ti Rakau Drive / SEART (Pakuranga HWY)

3.4.1 AM Peak

- Do-Min scenario performance is poor, LOS F in the AM peak.
- Stage 2 intersection performance is expected to be improved with lower delay but poorer DOS, LOS is E in the AM peak.
- The Ti Rakau Drive west approach right-turn into SEART is expected to operate at LOS E during the AM.

Table 7: Ti Rakau Dr / SEART – Do-Min vs Stage 2 (AM)

Lane Use and Performance (Do-Min)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	1735	9.7	1499	10.2	1677	0.894	100	464.6	LOS F	0.0	0.0	Full	91	0.0	0.0
Lane 2	238	11.1	206	11.9	273	0.757	100	60.5	LOS E	8.1	62.6	Full	91	0.0	15.5
Lane 3	240	11.1	208	11.9	276	0.757	100	60.4	LOS E	8.2	63.2	Full	91	0.0	16.4
Lane 4	54	5.6	47	5.9	270	0.172	100	56.7	LOS E	1.6	11.7	Full	91	0.0	0.0
Approach	2267	9.9	1961[N1]	10.5		0.894		369.5	LOS F	8.2	63.2				
NorthEast: Reeves Road															
Lane 1	240	6.8	228	6.5	255[1]	0.894	100	71.8	LOS E	9.7[N4]	72.0[N4]	Short	52	0.0	NA
Lane 2	253	5.8	240	5.5	268[1]	0.894	100	71.0	LOS E	9.8[N4]	72.0[N4]	Full	72	0.0	50.0[8]
Lane 3	26	3.8	25	3.7	83	0.299	100	73.6	LOS E	1.0	7.2	Short	16	0.0	NA
Approach	519	6.2	493[N1]	5.9		0.894		71.5	LOS E	9.8	72.0				
NorthWest: Ti Rakau Drive (West)															
Lane 1	251	20.7	235	21.4	605	0.389	45[5]	33.4	LOS C	6.8	56.0	Full	84	0.0	12.5
Lane 2	610	5.0	568	5.1	651	0.872	100	54.9	LOS D	11.5[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	594	5.0	553	5.1	634	0.872	100	55.3	LOS E	11.5[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1455	7.7	1356[N1]	7.9		0.872		51.3	LOS D	11.5	84.0				
SouthWest: Pakuranga HWY															
Lane 1	268	4.6	268	4.6	1189	0.226	100	16.8	LOS B	4.1	29.5	Short	308	0.0	NA
Lane 2	273	4.6	273	4.6	1208	0.226	100	16.8	LOS B	4.1	29.9	Short	132	0.0	NA
Lane 3	155	11.0	155	11.0	455	0.341	100	46.3	LOS D	4.9	37.7	Full	1650	0.0	0.0
Lane 4	217	7.3	217	7.3	257	0.847	100	74.3	LOS E	9.2	68.1	Full	1650	0.0	0.0
Lane 5	220	7.3	220	7.3	259	0.847	100	74.3	LOS E	9.2	68.7	Short	277	0.0	NA
Approach	1133	6.5	1133	6.5		0.847		43.0	LOS D	9.2	68.7				
Intersection	5374	8.2	4943[N1]	9.0		0.894		177.6	LOS F	11.5	84.0				

Lane Use and Performance (Stage 2)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	1662	9.2	1235	9.3	1688	0.732	100	53.1	LOS D	0.0	0.0	Full	91	0.0	0.0
Lane 2	308	11.3	229	11.6	260	0.882	100	86.0	LOS F	11.8[N4]	91.0[N4]	Full	91	0.0	50.0
Lane 3	311	11.3	232	11.6	263	0.882	100	85.9	LOS F	11.8[N4]	91.0[N4]	Full	91	0.0	50.0
Approach	2281	9.8	1696[N1]	9.9		0.882		62.0	LOS E	11.8	91.0				
NorthWest: Ti Rakau Drive (West)															
Lane 1	198	24.2	186	24.8	588	0.316	35[5]	41.0	LOS D	6.5	55.5	Full	84	0.0	11.8
Lane 2	620	5.0	577	5.1	637	0.905	100	71.9	LOS E	11.5[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	604	5.0	562	5.1	621	0.905	100	72.5	LOS E	11.5[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1422	7.7	1324[N1]	7.8		0.905		67.8	LOS E	11.5	84.0				
SouthWest: Pakuranga HWY															
Lane 1	354	5.2	354	5.2	1398	0.253	100	12.8	LOS B	4.6	33.6	Short	308	0.0	NA
Lane 2	359	5.2	359	5.2	1420	0.253	100	12.8	LOS B	4.7	34.1	Short	132	0.0	NA
Lane 3	385	8.4	385	8.4	431	0.893	100	84.5	LOS F	20.6	154.4	Full	1650	0.0	0.0
Lane 4	389	8.4	389	8.4	436	0.893	100	84.3	LOS F	20.8	155.8	Full	1650	0.0	0.0
Approach	1487	6.9	1487	6.9		0.893		50.1	LOS D	20.8	155.8				
Intersection	5190	8.4	4507[N1]	9.6		0.905		59.8	LOS E	20.8	155.8				

3.4.2 PM Peak

- Similar to the AM, the Do-Min intersection performance is poor (LOS F). The intersection performance is also expected to be poor during the Stage 2 detour.
- The SEART right-turn lanes into Ti Rakau Drive are expected to operate at LOS F during the PM. The increase in demand (due to Reeves Road closure) results in delay increasing from around 50 sec to 215 sec (3.6 min), which would require mitigation.

Table 8: Ti Rakau Dr / SEART – Do-Min vs Stage 2 (PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	862	8.9	821	8.6	1695	0.484	100	6.0	LOS A	0.0	0.0	Full	91	0.0	0.0
Lane 2	173	6.9	166	6.8	165	1.003	100	137.4	LOS F	11.8	87.7	Full	91	-50.0[N7]	46.5
Lane 3	351	6.9	335	6.8	334	1.003	100	123.3	LOS F	12.3[N4]	91.0[N4]	Full	91	0.0	50.0
Lane 4	192	3.1	183	3.0	162	1.132	100	226.2	LOS F	12.7[N4]	91.0[N4]	Full	91	-49.9[N7]	50.0
Approach	1578	7.5	1505[N1]	7.3		1.132		73.4	LOS E	12.7	91.0				
NorthEast: Reeves Road															
Lane 1	187	8.3	178	7.9	249[1]	0.718	100	75.4	LOS E	8.5	63.9	Short	52	0.0	NA
Lane 2	175	11.1	167	10.5	233[1]	0.718	100	75.3	LOS E	8.1	61.8	Full	72	0.0	38.8[8]
Lane 3	34	14.7	32	14.0	60	0.535	100	96.0	LOS F	1.7	13.4	Short	16	0.0	NA
Approach	396	10.1	378[N1]	9.6		0.718		77.1	LOS E	8.5	63.9				
NorthWest: Ti Rakau Drive (West)															
Lane 1	332	10.3	305	10.5	267	1.145	100	222.0	LOS F	11.0[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 2	341	5.0	313	5.3	273	1.145	100	225.0	LOS F	11.5[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	331	4.4	304	4.6	265	1.145	100	226.2	LOS F	11.5[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1004	6.6	922[N1]	6.8		1.145		224.4	LOS F	11.5	84.0				
SouthWest: Pakuranga HWY															
Lane 1	1029	4.0	1029	4.0	1218	0.844	100	29.1	LOS C	37.7	272.7	Short	308	0.0	NA
Lane 2	522	4.0	522	4.0	619	0.844	100	38.0	LOS D	21.8	158.1	Short	132	-50.0[N7]	NA
Lane 3	547	9.7	547	9.7	475[1]	1.152	100	227.4	LOS F	54.0	409.1	Full	1650	-33.3[N7]	0.0
Lane 4	476	6.9	476	6.9	679	0.700	100	53.1	LOS D	19.6	145.4	Full	1650	0.0	0.0
Lane 5	480	6.9	480	6.9	686	0.700	100	53.1	LOS D	19.8	146.9	Short	277	0.0	NA
Approach	3054	5.9	3054	5.9		1.152		73.6	LOS E	54.0	409.1				
Intersection	6032	6.7	5859[N1]	6.9		1.152		97.5	LOS F	54.0	409.1				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	961	8.3	885	8.1	1702	0.520	100	6.3	LOS A	0.0	0.0	Full	91	0.0	0.0
Lane 2	288	7.9	266	7.9	241	1.105	100	199.1	LOS F	12.2[N4]	91.0[N4]	Full	91	-50.0[N7]	50.0
Lane 3	319	7.9	294	7.9	266	1.105	100	197.0	LOS F	12.2[N4]	91.0[N4]	Full	91	-45.3[N7]	50.0
Approach	1568	8.2	1445[N1]	8.0		1.105		80.6	LOS F	12.2	91.0				
NorthWest: Ti Rakau Drive (West)															
Lane 1	406	8.7	378	8.5	341	1.106	100	190.1	LOS F	11.2[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 2	396	6.5	369	6.7	333	1.106	100	194.8	LOS F	11.3[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	385	6.4	359	6.7	324	1.106	100	195.4	LOS F	11.4[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1188	7.2	1105[N1]	7.3		1.106		193.4	LOS F	11.4	84.0				
SouthWest: Pakuranga HWY															
Lane 1	1031	4.7	1031	4.7	1191	0.866	100	30.9	LOS C	39.5	287.7	Short	308	0.0	NA
Lane 2	508	4.7	508	4.7	587	0.866	100	44.5	LOS D	22.7	165.1	Short	132	-50.0[N7]	NA
Lane 3	488	7.6	488	7.6	431[1]	1.132	100	216.1	LOS F	44.3	330.3	Full	1650	0.0	0.0
Lane 4	598	7.6	598	7.6	528	1.132	100	212.7	LOS F	53.8	400.7	Full	1650	0.0	0.0
Approach	2625	5.9	2625	5.9		1.132		109.4	LOS F	53.8	400.7				
Intersection	5381	6.8	5175[N1]	7.1		1.132		119.3	LOS F	53.8	400.7				

3.4.3 Mitigation 1

- Mitigation 1, to remedy the Ti Rakau Drive / SEART intersection during the PM peak, includes converting the through lane from SEART to Reeves Road to a right-turn lane (note Reeves Road is closed during Stage 2), thus providing a 3rd lane for this turning movement onto Ti Rakau Drive eastbound.
- In addition, a 3rd exit lane is proposed on Ti Rakau Drive eastbound between the SEART intersection and the newly completed William Roberts Road intersection. The proposed layout is shown below.
- As stated in **Section 3.3** above, it is expected that the Pakuranga Road / Ti Rakau Drive intersection performance during the PM peak would also be improved as demand would be drawn away from that intersection to the Ti Rakau Drive / SEART intersection, which could have more spare capacity.

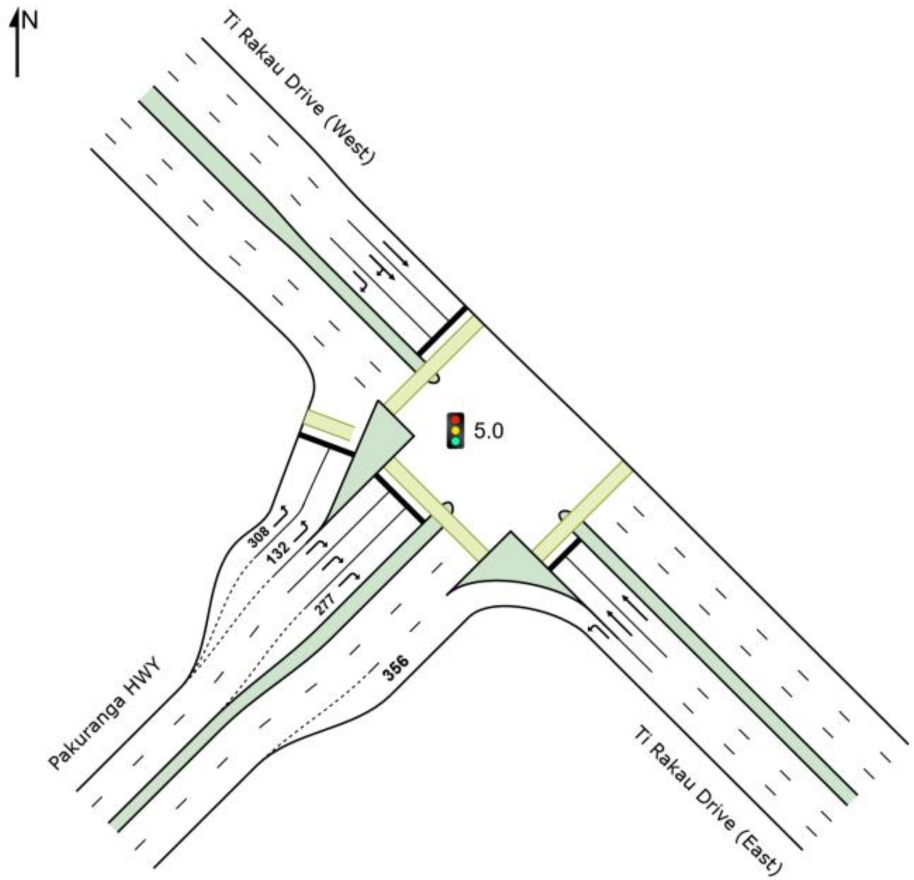


Figure 3: Ti Rakau Dr / SEART - Mitigation 1 proposed layout

- The Stage 2 intersection performance (without mitigation) is expected to be poor (LOS F), especially in the SEART right-turn lanes into Ti Rakau Drive where delay increases from around 50 sec in the Do-Min scenario, to 215 sec (3.6 min).
- With the measures in place proposed under Mitigation 1, intersection performance during the detour is expected to improve to LOS E, with an average delay of 70 sec. This is also an improvement compared to the Do-Min scenario (LOS F and delay of 98 sec)
- Delay and queue lengths in the SEART right-turn lanes are improved under Mitigation 1 (delay of 85 sec and average queue length of 145 m), compared to the Stage 2 detour.

Table 9: Ti Rakau Dr / SEART – Stage 2 vs Mitigation 1 (PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	961	8.3	885	8.1	1702	0.520	100	6.3	LOS A	0.0	0.0	Full	91	0.0	0.0
Lane 2	288	7.9	266	7.9	241	1.105	100	199.1	LOS F	12.2[N4]	91.0[N4]	Full	91	-50.0[N7]	50.0
Lane 3	319	7.9	294	7.9	266	1.105	100	197.0	LOS F	12.2[N4]	91.0[N4]	Full	91	-45.3[N7]	50.0
Approach	1568	8.2	1445[N1]	8.0		1.105		80.6	LOS F	12.2	91.0				
NorthWest: Ti Rakau Drive (West)															
Lane 1	406	8.7	378	8.5	341	1.106	100	190.1	LOS F	11.2[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 2	396	6.5	369	6.7	333	1.106	100	194.8	LOS F	11.3[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	385	6.4	359	6.7	324	1.106	100	195.4	LOS F	11.4[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1188	7.2	1105[N1]	7.3		1.106		193.4	LOS F	11.4	84.0				
SouthWest: Pakuranga HWY															
Lane 1	1031	4.7	1031	4.7	1191	0.866	100	30.9	LOS C	39.5	287.7	Short	308	0.0	NA
Lane 2	508	4.7	508	4.7	587	0.866	100	44.5	LOS D	22.7	165.1	Short	132	-50.0[N7]	NA
Lane 3	488	7.6	488	7.6	431	1.132	100	216.1	LOS F	44.3	330.3	Full	1650	0.0	0.0
Lane 4	598	7.6	598	7.6	528	1.132	100	212.7	LOS F	53.8	400.7	Full	1650	0.0	0.0
~~Approach~~	~~2625~~	~~5.9~~	~~2625~~	~~5.9~~		~~1.132~~		~~109.4~~	~~LOS F~~	~~53.8~~	~~400.7~~				
Intersection	5381	6.8	5175[N1]	7.1		1.132		119.3	LOS F	53.8	400.7				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	961	8.3	885	8.1	1702	0.520	100	6.6	LOS A	0.0	0.0	Full	91	0.0	0.0
Lane 2	288	7.9	266	7.9	252	1.057	100	165.1	LOS F	12.2[N4]	91.0[N4]	Full	91	-50.0[N7]	50.0
Lane 3	319	7.9	294	7.9	278	1.057	100	162.8	LOS F	12.2[N4]	91.0[N4]	Full	91	-45.3[N7]	50.0
Approach	1568	8.2	1445[N1]	8.0		1.057		67.6	LOS E	12.2	91.0				
NorthWest: Ti Rakau Drive (West)															
Lane 1	406	8.7	378	8.5	397	0.952	100	96.9	LOS F	11.2[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 2	396	6.5	369	6.7	387	0.952	100	101.6	LOS F	11.3[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	385	6.4	359	6.7	376	0.952	100	102.4	LOS F	11.4[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1188	7.2	1105[N1]	7.3		0.952		100.2	LOS F	11.4	84.0				
SouthWest: Pakuranga HWY															
Lane 1	1029	4.7	1029	4.7	1169	0.880	100	32.5	LOS C	40.7	296.6	Short	308	0.0	NA
Lane 2	510	4.7	510	4.7	580	0.880	100	50.0	LOS D	24.4	177.3	Short	132	-50.0[N7]	NA
Lane 3	359	7.6	359	7.6	408	0.882	100	84.8	LOS F	19.2	142.8	Full	1650	0.0	0.0
Lane 4	363	7.6	363	7.6	412	0.882	100	84.7	LOS F	19.3	144.1	Full	1650	0.0	0.0
Lane 5	363	7.6	363	7.6	412	0.882	100	84.7	LOS F	19.3	144.1	Short	277	0.0	NA
Approach	2625	5.9	2625	5.9		0.882		57.5	LOS E	40.7	296.6				
Intersection	5381	6.8	5175[N1]	7.1		1.057		69.4	LOS E	40.7	296.6				

- A further refinement of Mitigation 1 was also tested. It consisted of a 105 m short exit lane (AGRD04A (Austroads) – Table 5.5) on Ti Rakau Drive eastbound. Although intersection performance is expected to be similar to Mitigation 1 above, this geometric change would provide insufficient weave distance up to William Roberts Road and is not recommended.
- The construction costs of and effort to implement the measures proposed under Mitigation 1 are potentially considerable. Mitigation 1 could require the buildout of the southern side of Ti Rakau Drive and the relocation of the centreline in order to provide the additional exit lane along Ti Rakau Drive eastbound.
- Therefore, alternative measures are proposed under Mitigation 2.

3.4.4 Mitigation 2

- Mitigation 2 includes the temporary removal of the pedestrian crossing on the eastern arm of the Ti Rakau Drive / SEART intersection, thus reducing signal phasing down to 3 phases and allowing for more greentime to be allocated to the SEART right-turn movements into Ti Rakau Drive eastbound during the PM peak.
- It is noted that pedestrian amenity at this intersection would be temporarily reduced, however the intersection would still provide the ability to cross Ti Rakau Drive from all directions, albeit with some increase in travel time and distance. The pedestrian crossing would be reinstated in the final build-out of the intersection.
- The proposed layout is shown below.

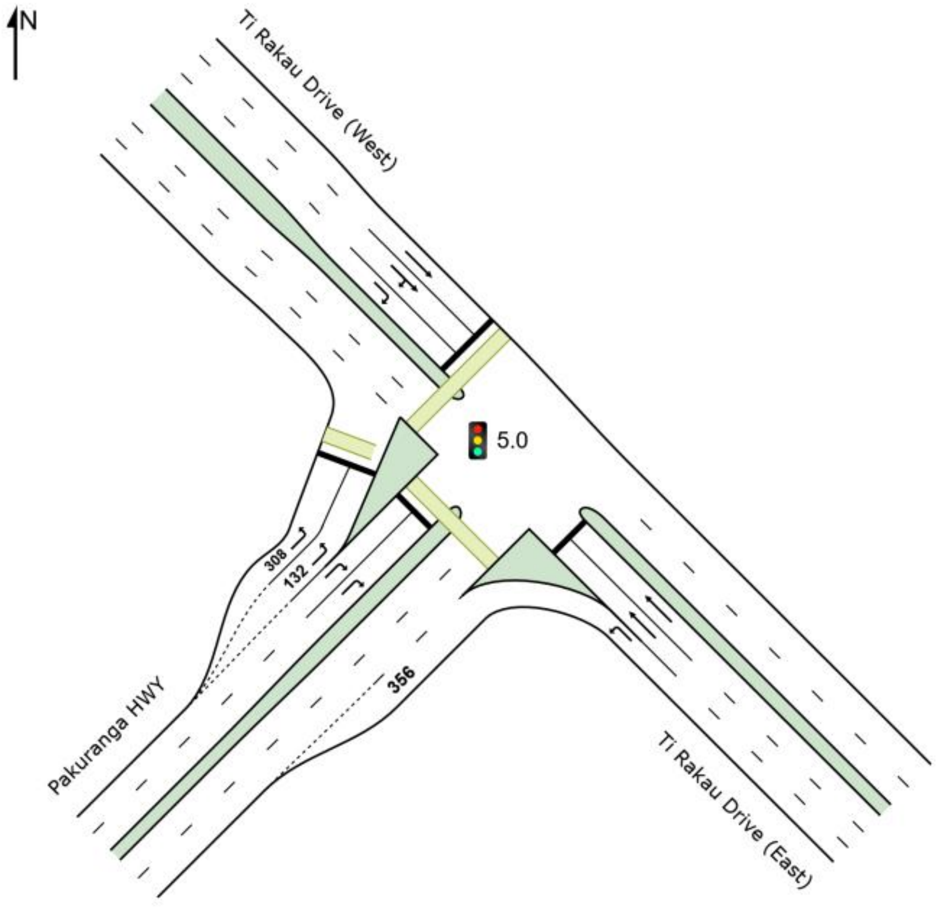


Figure 4: Ti Rakau Dr / SEART - Mitigation 2 proposed layout

- Again, the Stage 2 intersection performance (without mitigation) is expected to be poor (LOS F), especially in the SEART right-turn lanes into Ti Rakau Drive where delay increases from around 50 sec in the Do-Min scenario, to 215 sec (3.6 min).
- With the measures in place proposed under Mitigation 2, intersection performance during the detour is expected to improve to LOS E, with an average delay of 78 sec. This is also an improvement compared to the Do-Min scenario (LOS F and delay of 98 sec).
- Delay and queue lengths in the SEART right-turn lanes are improved under Mitigation 2 (delay of 92 sec and average queue length of 280 m), compared to the Stage 2 detour. However, these are still larger than the Do-Min scenario.

Table 10: Ti Rakau Dr / SEART – Stage 2 vs Mitigation 2 (PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	961	8.3	885	8.1	1702	0.520	100	6.3	LOS A	0.0	0.0	Full	91	0.0	0.0
Lane 2	288	7.9	266	7.9	241	1.105	100	199.1	LOS F	12.2[N4]	91.0[N4]	Full	91	-50.0[N7]	50.0
Lane 3	319	7.9	294	7.9	266	1.105	100	197.0	LOS F	12.2[N4]	91.0[N4]	Full	91	-45.3[N7]	50.0
Approach	1568	8.2	1445[N1]	8.0		1.105		80.6	LOS F	12.2	91.0				
NorthWest: Ti Rakau Drive (West)															
Lane 1	406	8.7	378	8.5	341	1.106	100	190.1	LOS F	11.2[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 2	396	6.5	369	6.7	333	1.106	100	194.8	LOS F	11.3[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	385	6.4	359	6.7	324	1.106	100	195.4	LOS F	11.4[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1188	7.2	1105[N1]	7.3		1.106		193.4	LOS F	11.4	84.0				
SouthWest: Pakuranga HWY															
Lane 1	1031	4.7	1031	4.7	1191	0.866	100	30.9	LOS C	39.5	287.7	Short	308	0.0	NA
Lane 2	508	4.7	508	4.7	587	0.866	100	44.5	LOS D	22.7	165.1	Short	132	-50.0[N7]	NA
Lane 3	488	7.6	488	7.6	431[1]	1.132	100	216.1	LOS F	44.3	330.3	Full	1650	0.0	0.0
Lane 4	598	7.6	598	7.6	528	1.132	100	212.7	LOS F	53.8	400.7	Full	1650	0.0	0.0
Approach	2625	5.9	2625	5.9		1.132		109.4	LOS F	53.8	400.7				
Intersection	5381	6.8	5175[N1]	7.1		1.132		119.3	LOS F	53.8	400.7				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	961	8.3	885	8.1	1702	0.520	100	6.6	LOS A	0.0	0.0	Full	91	0.0	0.0
Lane 2	289	7.9	266	7.9	274	0.973	100	115.0	LOS F	12.2[N4]	91.0[N4]	Full	91	-50.0[N7]	50.0
Lane 3	318	7.9	294	7.9	302	0.973	100	112.7	LOS F	12.2[N4]	91.0[N4]	Full	91	-45.4[N7]	50.0
Approach	1568	8.2	1445[N1]	8.0		0.973		48.1	LOS D	12.2	91.0				
NorthWest: Ti Rakau Drive (West)															
Lane 1	406	8.7	378	8.5	397	0.954	100	97.4	LOS F	11.2[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 2	396	6.5	369	6.7	387	0.954	100	102.2	LOS F	11.3[N4]	84.0[N4]	Full	84	0.0	50.0
Lane 3	385	6.4	359	6.7	376	0.954	100	102.9	LOS F	11.4[N4]	84.0[N4]	Full	84	0.0	50.0
Approach	1188	7.2	1106[N1]	7.3		0.954		100.8	LOS F	11.4	84.0				
SouthWest: Pakuranga HWY															
Lane 1	1040	4.7	1040	4.7	1067[1]	0.974	100	70.3	LOS E	59.0	429.6	Short	308	0.0	NA
Lane 2	499	4.7	499	4.7	513[1]	0.974	100	95.2	LOS F	31.6	230.2	Short	132	-50.0[N7]	NA
Lane 3	460	7.6	460	7.6	481[1]	0.956	100	91.8	LOS F	26.0	193.9	Full	1650	0.0	0.0
Lane 4	626	7.6	626	7.6	655	0.956	100	91.1	LOS F	37.6	280.4	Full	1650	0.0	0.0
Approach	2625	5.9	2625	5.9		0.974		83.7	LOS F	59.0	429.6				
Intersection	5381	6.8	5176[N1]	7.1		0.974		77.4	LOS E	59.0	429.6				

- The construction costs of and effort to implement the measures proposed under Mitigation 2 are considered more economically viable, compared to Mitigation 1. The measure would include minor road marking removal, signal head amendments and signal phasing adjustments. However, large queues are still expected in the SEART right-turn lanes. <u>Therefore, it is recommended that Mitigation 1 be discussed with key stakeholders.</u>

Eastern Busway Alliance

3.5 Ti Rakau Drive / Gossamer Drive

3.5.1 AM Peak

- The relatively low increase in traffic demand on the right-turn from Reeves Road to William Roberts (**Section 3.1**) indicated that traffic would be diverting to other links in the network. **Section 4.0** below provides further detail to this, but in summary, traffic demand is expected to detour from Gossamer Drive, north to Pakuranga Road and south Ti Rakau Drive.
- As a result, more demand would be experienced on the turning movements into Pakuranga Road and Ti Rakau Drive at these intersections. The Gossamer Drive left-turn into Pakuranga Road is expected to experience an increase of around 40 veh/h only, and was therefore not analysed.
- However, the right-turn from Gossamer Drive into Ti Rakau Drive is expected to increase by around 160 veh/h. The resultant intersection performance is poor (LOS F) for the Stage 2 AM peak, compared to the LOS E of the Do-Min scenario. This may require mitigation.

Table 11: Ti Rakau Dr / Gossamer Dr – Do-Min vs Stage 2 (AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	25	4.0	25	4.0	82	0.305	100	73.7	LOS E	1.0	7.3	Short	26	0.0	NA
Lane 2	31	3.2	31	3.2	85	0.363	100	71.9	LOS E	1.3	9.0	Full	285	0.0	0.0
Approach	56	3.6	56	3.6		0.363		72.7	LOS E	1.3	9.0				
East: Ti Rakau Drive (East)															
Lane 1	866	11.2	866	11.2	1010	0.857	100	29.3	LOS C	29.7	227.8	Full	636	0.0	0.0
Lane 2	827	11.3	827	11.3	964[1]	0.857	100	29.2	LOS C	28.1	215.6	Full	636	0.0	0.0
Lane 3	47	8.4	47	8.4	318	0.147	23[6]	30.2	LOS C	0.9	6.8	Short	150	0.0	NA
Lane 4	203	8.4	203	8.4	318	0.639	100	33.2	LOS C	4.4	33.2	Short	103	0.0	NA
Approach	1943	10.9	1943	10.9		0.857		29.7	LOS C	29.7	227.8				
North: Gossamer Drive															
Lane 1	1053	7.5	1053	7.5	1033[1]	1.020	100	87.5	LOS F	58.7	437.3	Short	30	0.0	NA
Lane 2	100	8.0	100	8.0	268	0.374	100	58.3	LOS E	3.6	26.6	Full	1010	0.0	0.0
Approach	1153	7.5	1153	7.5		1.020		85.0	LOS F	58.7	437.3				
West: Ti Rakau Drive (West)															
Lane 1	428	10.2	360	10.4	701	0.514	100	33.7	LOS C	10.5	80.0	Full	479	0.0	0.0
Lane 2	409	10.4	343	10.6	669[1]	0.514	100	32.6	LOS C	10.1	77.2	Full	479	0.0	0.0
Lane 3	10	10.0	8	9.9	90	0.093	100	70.7	LOS E	0.3	2.5	Short	27	0.0	NA
Approach	847	10.3	712[N1]	10.5		0.514		33.6	LOS C	10.5	80.0				
Intersection	3999	9.7	3864[N1]	10.0		1.020		47.5	LOS D	58.7	437.3				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	23	8.7	23	8.7	63	0.367	100	94.2	LOS F	1.2	8.9	Short	26	0.0	NA
Lane 2	28	7.1	28	7.1	65	0.429	100	92.7	LOS F	1.4	10.8	Full	285	0.0	0.0
Approach	51	7.8	51	7.8		0.429		93.4	LOS F	1.4	10.8				
East: Ti Rakau Drive (East)															
Lane 1	832	10.3	832	10.3	680	1.224	100	272.4	LOS F	85.1	648.8	Full	636	0.0	51.9
Lane 2	792	10.5	792	10.5	646[1]	1.224	100	277.1	LOS F	83.4	635.9	Full	636	0.0	50.0
Lane 3	65	7.8	65	7.8	262	0.247	23[6]	41.4	LOS D	1.8	13.7	Short	150	0.0	NA
Lane 4	282	7.8	282	7.8	262	1.075	100	137.8	LOS F	16.5	123.4	Short	103	0.0	NA
Approach	1971	9.9	1971	9.9		1.224		247.4	LOS F	85.1	648.8				
North: Gossamer Drive															
Lane 1	960	9.0	960	9.0	1066[1]	0.901	100	28.7	LOS C	30.7	231.8	Short	30	0.0	NA
Lane 2	264	6.4	264	6.4	212[1]	1.246	100	319.1	LOS F	29.7	219.6	Full	1010	0.0	0.0
Approach	1224	8.4	1224	8.4		1.246		91.3	LOS F	30.7	231.8				
West: Ti Rakau Drive (West)															
Lane 1	523	11.8	432	11.6	451	0.958	100	98.1	LOS F	26.1	200.6	Full	479	0.0	0.0
Lane 2	500	11.9	413	11.7	431[1]	0.958	100	96.7	LOS F	25.1	193.1	Full	479	0.0	0.0
Lane 3	10	10.0	8	9.6	102	0.081	100	85.7	LOS F	0.4	3.0	Short	27	0.0	NA
Approach	1033	11.8	854[N1]	11.7		0.958		97.3	LOS F	26.1	200.6				
Intersection	4279	9.9	4100[N1]	10.4		1.246		167.6	LOS F	85.1	648.8				

3.5.2 PM Peak

- The intersection is expected to experience little change during the Stage 2 PM peak and will remain at LOS D.
- It is noted that an equivalent in traffic demand returning to this intersection, compared to AM peak, does not occur as expected in the Ti Rakau Drive west left-turn. This could be due to the completion of the William Roberts Road link to Ti Rakau Drive.

Table 12: Ti Rakau Dr / Gossamer Dr – Do-Min vs Stage 2 (PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	12	0.0	12	0.0	64	0.187	100	95.8	LOS F	0.6	4.4	Short	26	0.0	NA
Lane 2	27	3.7	27	3.7	65	0.418	100	95.8	LOS F	1.4	10.4	Full	285	0.0	0.0
Approach	39	2.6	39	2.6		0.418		95.8	LOS F	1.4	10.4				
East: Ti Rakau Drive (East)															
Lane 1	863	6.9	863	6.9	1037	0.832	100	32.6	LOS C	35.4	262.7	Full	636	0.0	0.0
Lane 2	779	7.0	779	7.0	936 [1]	0.832	100	30.4	LOS C	30.0	223.0	Full	636	0.0	0.0
Lane 3	113	8.9	113	8.9	553	0.205	23 [6]	28.4	LOS C	2.5	18.9	Short	150	0.0	NA
Lane 4	494	8.9	494	8.9	553	0.893	100	48.2	LOS D	17.4	130.7	Short	103	0.0	NA
Approach	2249	7.5	2249	7.5		0.893		35.1	LOS D	35.4	262.7				
North: Gossamer Drive															
Lane 1	475	17.3	475	17.3	911 [1]	0.522	100	18.4	LOS B	11.3	91.1	Short	30	0.0	NA
Lane 2	41	4.9	41	4.9	241	0.170	100	74.3	LOS E	1.9	13.6	Full	1010	0.0	0.0
Approach	516	16.3	516	16.3		0.522		22.8	LOS C	11.3	91.1				
West: Ti Rakau Drive (West)															
Lane 1	587	5.2	563	5.2	629	0.895	100	73.2	LOS E	29.7	217.3	Full	479	0.0	0.0
Lane 2	554	5.5	532	5.5	594 [1]	0.895	100	68.8	LOS E	28.3	207.4	Full	479	0.0	0.0
Lane 3	18	0.0	17	0.0	231	0.075	100	75.1	LOS E	0.8	5.4	Short	27	0.0	NA
Approach	1159	5.3	1112 [N1]	5.3		0.895		71.2	LOS E	29.7	217.3				
Intersection	3963	7.9	3916 [N1]	8.0		0.895		44.3	LOS D	35.4	262.7				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	10	0.0	10	0.0	65	0.155	100	94.9	LOS F	0.5	3.6	Short	26	0.0	NA
Lane 2	27	3.7	27	3.7	65	0.416	100	95.2	LOS F	1.4	10.4	Full	285	0.0	0.0
Approach	37	2.7	37	2.7		0.416		95.1	LOS F	1.4	10.4				
East: Ti Rakau Drive (East)															
Lane 1	888	6.9	888	6.9	1032	0.860	100	33.7	LOS C	37.5	277.7	Full	636	0.0	0.0
Lane 2	806	7.0	806	7.0	937 [1]	0.860	100	32.3	LOS C	32.3	239.9	Full	636	0.0	0.0
Lane 3	110	8.5	110	8.5	548	0.201	23 [6]	28.5	LOS C	2.4	18.2	Short	150	0.0	NA
Lane 4	480	8.5	480	8.5	548	0.876	100	45.3	LOS D	16.1	121.1	Short	103	0.0	NA
Approach	2284	7.4	2284	7.4		0.876		35.4	LOS D	37.5	277.7				
North: Gossamer Drive															
Lane 1	455	16.0	455	16.0	909 [1]	0.501	100	17.2	LOS B	10.3	81.8	Short	30	0.0	NA
Lane 2	51	5.9	51	5.9	240	0.212	100	74.6	LOS E	2.3	17.1	Full	1010	0.0	0.0
Approach	506	15.0	506	15.0		0.501		23.0	LOS C	10.3	81.8				
West: Ti Rakau Drive (West)															
Lane 1	603	4.9	560	4.8	639	0.876	100	66.0	LOS E	28.0	203.8	Full	479	0.0	0.0
Lane 2	564	5.8	523	5.7	597 [1]	0.876	100	64.7	LOS E	26.8	196.6	Full	479	0.0	0.0
Lane 3	18	0.0	17	0.0	233	0.072	100	74.5	LOS E	0.7	5.2	Short	27	0.0	NA
Approach	1185	5.2	1100 [N1]	5.2		0.876		65.5	LOS E	28.0	203.8				
Intersection	4012	7.7	3927 [N1]	7.8		0.876		42.8	LOS D	37.5	277.7				

3.5.3 Mitigation 1

- Mitigation 1, to remedy the Ti Rakau Drive / Gossamer Drive intersection during the AM peak, includes the following on the northern Gossamer Drive approach (see figure below):
  - Adding an additional short right-turn lane (100 m).
  - Converting the short left-turn slip lane to pass through the intersection and providing 150 m stacking space.
  - The kerbside short exit lane length is increased from 24 m to 100 m.

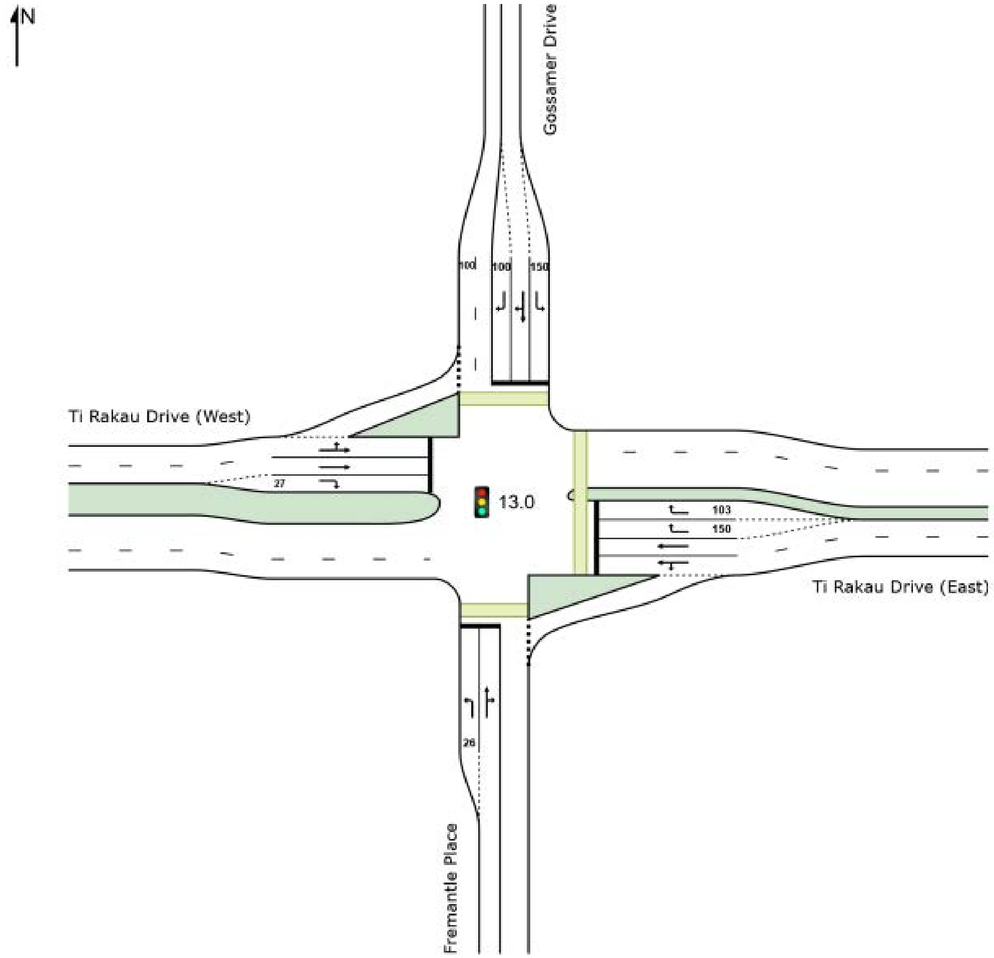


Figure 5: Ti Rakau Drive / Gossamer Drive – Mitigation 1 proposed layout

- The Stage 2 intersection performance (without mitigation) is expected to be poor (LOS F), especially in the Gossamer Drive right-turn lane into Ti Rakau Drive where delay increases from around 59 sec in the Do-Min scenario, to 320 sec (5.3 min).
- With the measures in place proposed under Mitigation 1, intersection performance during the detour is expected to be slightly improved, however still LOS F, with an average delay of 117 sec.
- Delay and queue lengths in the Gossamer Drive right-turn lanes are improved under Mitigation 1 (delay of 78 sec and average queue length of 46 m), compared to the Stage 2 detour.
- However, the additional control delay now imposed on the Gossamer Drive left-turn (previously a left-turn slip under the Do-Min and Stage 2 scenarios) has resulted in large delays (141 sec) and queues (478 m) in that lane. Traffic demand in this lane is around 960 veh/h.

Table 13: Ti Rakau Dr / Gossamer Dr – Stage 2 vs Mitigation 1 (AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	23	8.7	23	8.7	63	0.367	100	94.2	LOS F	1.2	8.9	Short	26	0.0	NA
Lane 2	28	7.1	28	7.1	65	0.429	100	92.7	LOS F	1.4	10.8	Full	285	0.0	0.0
Approach	51	7.8	51	7.8		0.429		93.4	LOS F	1.4	10.8				
East: Ti Rakau Drive (East)															
Lane 1	832	10.3	832	10.3	680	1.224	100	272.4	LOS F	85.1	648.8	Full	636	0.0	51.9
Lane 2	792	10.5	792	10.5	646 [1]	1.224	100	277.1	LOS F	83.4	635.9	Full	636	0.0	50.0
Lane 3	65	7.8	65	7.8	262	0.247	23 [6]	41.4	LOS D	1.8	13.7	Short	150	0.0	NA
Lane 4	282	7.8	282	7.8	262	1.075	100	137.8	LOS F	16.5	123.4	Short	103	0.0	NA
Approach	1971	9.9	1971	9.9		1.224		247.4	LOS F	85.1	648.8				
North: Gossamer Drive															
Lane 1	960	9.0	960	9.0	1066 [1]	0.901	100	28.7	LOS C	30.7	231.8	Short	30	0.0	NA
Lane 2	264	6.4	264	6.4	212 [1]	1.246	100	319.1	LOS F	29.7	219.6	Full	1010	0.0	0.0
Approach	1224	8.4	1224	8.4		1.246		91.3	LOS F	30.7	231.8				
West: Ti Rakau Drive (West)															
Lane 1	523	11.8	432	11.6	451	0.958	100	98.1	LOS F	26.1	200.6	Full	479	0.0	0.0
Lane 2	500	11.9	413	11.7	431 [1]	0.958	100	96.7	LOS F	25.1	193.1	Full	479	0.0	0.0
Lane 3	10	10.0	8	9.6	102	0.081	100	85.7	LOS F	0.4	3.0	Short	27	0.0	NA
Approach	1033	11.8	854 [N1]	11.7		0.958		97.3	LOS F	26.1	200.6				
Intersection	4279	9.9	4100 [N1]	10.4		1.246		167.6	LOS F	85.1	648.8				

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	23	8.7	23	8.7	63	0.367	100	94.2	LOS F	1.2	8.9	Short	26	0.0	NA
Lane 2	28	7.1	28	7.1	65	0.429	100	92.7	LOS F	1.4	10.8	Full	285	0.0	0.0
Approach	51	7.8	51	7.8		0.429		93.4	LOS F	1.4	10.8				
East: Ti Rakau Drive (East)															
Lane 1	847	10.4	847	10.4	778	1.088	100	158.3	LOS F	68.2	519.8	Full	636	0.0	31.2
Lane 2	777	10.5	777	10.5	714 [1]	1.088	100	163.8	LOS F	64.8	494.0	Full	636	0.0	26.6
Lane 3	126	7.8	126	7.8	598	0.210	57 [6]	26.0	LOS C	2.6	19.4	Short	150	0.0	NA
Lane 4	221	7.8	221	7.8	598	0.370	100	27.5	LOS C	4.9	36.6	Short	103	0.0	NA
Approach	1971	9.9	1971	9.9		1.088		137.3	LOS F	68.2	519.8				
North: Gossamer Drive															
Lane 1	960	9.0	960	9.0	884 [1]	1.086	100	141.0	LOS F	63.4	478.0	Short	150	0.0	NA
Lane 2	132	5.9	132	5.9	235	0.562	100	77.6	LOS E	6.2	45.6	Full	1010	0.0	0.0
Lane 3	131	6.3	131	6.3	233	0.562	100	77.9	LOS E	6.2	45.5	Short	100	0.0	NA
Approach	1223	8.3	1223	8.3		1.086		127.4	LOS F	63.4	478.0				
West: Ti Rakau Drive (West)															
Lane 1	522	11.8	431	11.6	549	0.786	100	57.6	LOS E	19.4	149.0	Full	479	0.0	0.0
Lane 2	501	11.9	413	11.8	526 [1]	0.786	100	57.3	LOS E	18.7	144.5	Full	479	0.0	0.0
Lane 3	10	10.0	8	9.6	429	0.019	100	53.1	LOS D	0.3	2.3	Short	27	0.0	NA
Approach	1033	11.8	853 [N1]	11.7		0.786		57.4	LOS E	19.4	149.0				
Intersection	4278	9.9	4098 [N1]	10.3		1.088		117.2	LOS F	68.2	519.8				

- Therefore, alternative measures are proposed under Mitigation 2.

3.5.4 Mitigation 2

- Mitigation 2, to remedy the Ti Rakau Drive / Gossamer Drive intersection during the AM peak, includes the following on the northern Gossamer Drive approach (see figure below):
    - Adding an additional short lane (100 m) for the shared through and right-turn movements.
    - Converting the centre lane to a full left-turn lane.
    - Converting the short left-turn slip lane to pass through the intersection and adding 150 m stacking space.
    - The kerbside short exit lane length is increased from 24 m to 100 m.

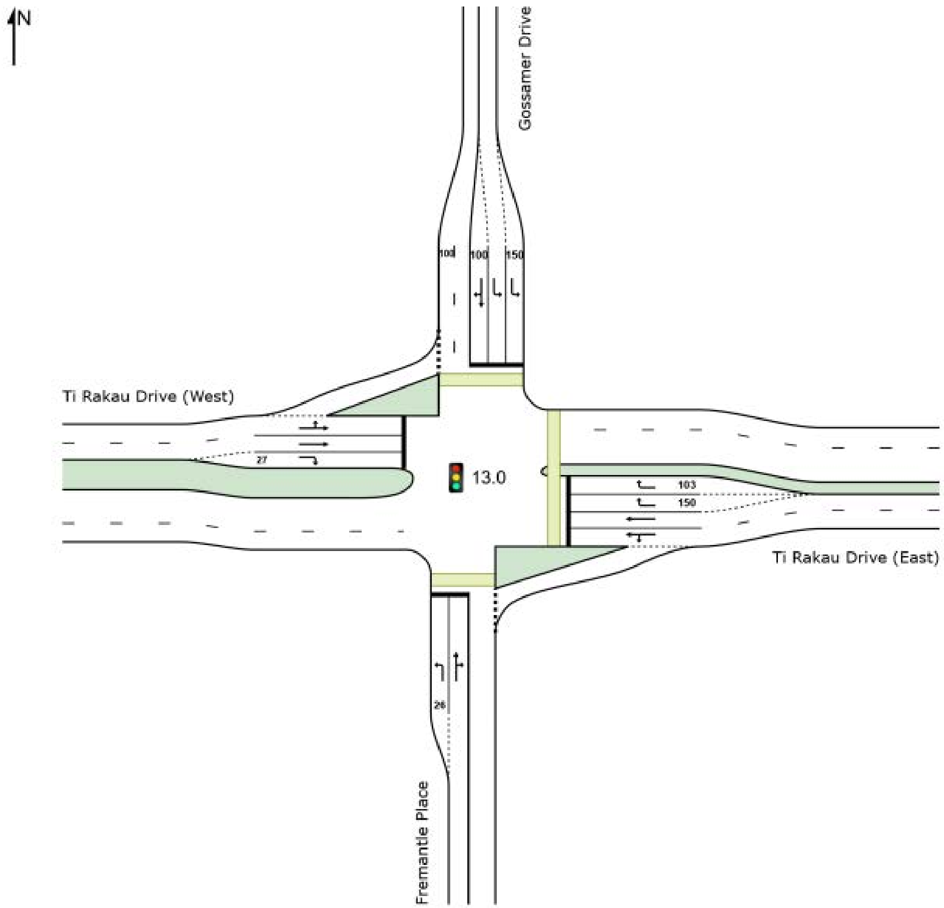


Figure 6: Ti Rakau Drive / Gossamer Drive – Mitigation 1 proposed layout

- The Stage 2 intersection performance (without mitigation) is expected to be poor (LOS F), especially in the Gossamer Drive right-turn lane into Ti Rakau Drive where delay increases from around 59 sec in the Do-Min scenario, to 320 sec (5.3 min).
- With the measures in place proposed under Mitigation 2, intersection performance during the detour is expected to be improved to LOS D and with an average delay of 37 sec. This is also an improvement compared to the Do-Min scenario (LOS D and delay of 48 sec).
- Delays and queue lengths in the Gossamer Drive right-turn lane are improved under Mitigation 2 (delay of 75 sec and average queue length of 86 m), compared to the Stage 2 detour.
- The Gossamer Drive left-turn lanes (previously a single left-turn slip under the Stage 2 scenario) are expected to experience improved performance (LOS C), with an average delay of 28 sec and average queue length of 91 m.

Table 14: Ti Rakau Dr / Gossamer Dr – Stage 2 vs Mitigation 2 (AM)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Fremantle Place															
Lane 1	23	8.7	23	8.7	63	0.367	100	94.2	LOS F	1.2	8.9	Short	26	0.0	NA
Lane 2	28	7.1	28	7.1	65	0.429	100	92.7	LOS F	1.4	10.8	Full	285	0.0	0.0
Approach	51	7.8	51	7.8		0.429		93.4	LOS F	1.4	10.8				
East: Ti Rakau Drive (East)															
Lane 1	832	10.3	832	10.3	680	1.224	100	272.4	LOS F	85.1	648.8	Full	636	0.0	51.9
Lane 2	792	10.5	792	10.5	646[1]	1.224	100	277.1	LOS F	83.4	635.9	Full	636	0.0	50.0
Lane 3	65	7.8	65	7.8	262	0.247	23[6]	41.4	LOS D	1.8	13.7	Short	150	0.0	NA
Lane 4	282	7.8	282	7.8	262	1.075	100	137.8	LOS F	16.5	123.4	Short	103	0.0	NA
Approach	1971	9.9	1971	9.9		1.224		247.4	LOS F	85.1	648.8				
North: Gossamer Drive															
Lane 1	960	9.0	960	9.0	1066[1]	0.901	100	28.7	LOS C	30.7	231.8	Short	30	0.0	NA
Lane 2	264	6.4	264	6.4	212[1]	1.246	100	319.1	LOS F	29.7	219.6	Full	1010	0.0	0.0
Approach	1224	8.4	1224	8.4		1.246		91.3	LOS F	30.7	231.8				
West: Ti Rakau Drive (West)															
Lane 1	523	11.8	432	11.6	451	0.958	100	98.1	LOS F	26.1	200.6	Full	479	0.0	0.0
Lane 2	500	11.9	413	11.7	431[1]	0.958	100	96.7	LOS F	25.1	193.1	Full	479	0.0	0.0
Lane 3	10	10.0	8	9.6	102	0.081	100	85.7	LOS F	0.4	3.0	Short	27	0.0	NA
Approach	1033	11.8	854[N1]	11.7		0.958		97.3	LOS F	26.1	200.6				
Intersection	4279	9.9	4100[N1]	10.4		1.246		167.6	LOS F	85.1	648.8				

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Fremantle Place															
Lane 1	23	8.7	23	8.7	79	0.289	100	73.8	LOS E	0.9	7.0	Short	26	0.0	NA
Lane 2	28	7.1	28	7.1	83	0.338	100	72.2	LOS E	1.1	8.4	Full	285	0.0	0.0
Approach	51	7.8	51	7.8		0.338		72.9	LOS E	1.1	8.4				
East: Ti Rakau Drive (East)															
Lane 1	846	10.4	846	10.4	960	0.881	100	36.2	LOS D	31.8	242.5	Full	636	0.0	0.0
Lane 2	778	10.5	778	10.5	883[1]	0.881	100	36.1	LOS D	28.5	217.7	Full	636	0.0	0.0
Lane 3	126	7.8	126	7.8	320	0.393	57[6]	31.4	LOS C	2.5	18.8	Short	150	0.0	NA
Lane 4	221	7.8	221	7.8	320	0.692	100	33.9	LOS C	4.8	36.0	Short	103	0.0	NA
Approach	1971	9.9	1971	9.9		0.881		35.6	LOS D	31.8	242.5				
North: Gossamer Drive															
Lane 1	480	9.0	480	9.0	687	0.698	100	27.4	LOS C	12.0	90.2	Short	150	0.0	NA
Lane 2	480	9.0	480	9.0	687	0.698	100	27.4	LOS C	12.0	90.2	Full	1010	0.0	0.0
Lane 3	264	6.4	264	6.4	296	0.891	100	74.7	LOS E	11.6	85.9	Short	100	0.0	NA
Approach	1224	8.4	1224	8.4		0.891		37.6	LOS D	12.0	90.2				
West: Ti Rakau Drive (West)															
Lane 1	523	11.8	431	11.6	669	0.645	100	37.1	LOS D	13.6	104.3	Full	479	0.0	0.0
Lane 2	500	11.9	413	11.8	640[1]	0.645	100	36.2	LOS D	13.1	101.3	Full	479	0.0	0.0
Lane 3	10	10.0	8	9.6	117	0.071	100	67.7	LOS E	0.3	2.3	Short	27	0.0	NA
Approach	1033	11.8	852[N1]	11.7		0.645		37.0	LOS D	13.6	104.3				
Intersection	4279	9.9	4098[N1]	10.4		0.891		36.9	LOS D	31.8	242.5				

- Mitigation 2 is expected to result in improved performance compared to Mitigation 1 and it is recommended that this mitigation measure be discussed with key stakeholders.

4.0 Traffic Volumes in the wider Project Area

- **Table 15** below shows an increase in demand in the Gossamer Drive left-turn at the intersection with Pakuranga Road, and in the Gossamer Drive right-turn lane at Ti Rakau Drive during the AM and PM.
- The table below also shows an increase in the Ti Rakau Drive west approach left-turn lane into Gossamer Drive during the PM.
- Overall, it seems that only a small percentage of traffic is routing along the proposed detour route (probably due to the already congested nature of those intersections).
- As a result, in the **inbound** (citybound) direction during the AM demand seems to detour via Gossamer Road to Pakuranga Road in the north and Ti Rakau Drive in the south.
- In the PM in the **outbound** direction, demand seems to return via Pakuranga Road, and via SEART turning right onto Ti Rakau Drive.

Table 15: Gossamer Road traffic volumes

			DM AM peak 0645-0745 Traffic Flow (Vehicles / hr)				Stage 2 AM peak 0800-0900 Traffic Flow (Vehicles / hr)			
			Car	Truck	Bus	**Total**	Car	Truck	Bus	**Total**
Pakuranga Road / Gossamer Drive	Pakuranga Road (West)	Through	503	28	6	**536**	613	40	6	**659**
		Right	143	13	0	**156**	139	19	0	**158**
	Pakuranga Road (East)	Left	847	20	3	**871**	839	32	3	**874**
		Through Bus-lane	0	0	12	**12**	0	0	10	**10**
		Through	1632	83	0	**1715**	1033	50	0	**1082**
	Gossamer Drive	Left	59	5	0	**63**	100	7	0	**107**
		Right	273	10	2	**285**	253	13	2	**268**
	Total (Maximum in Red)		3457	159	23	**3639**	2975	162	21	**3158**
Ti Rakau Drive / Gossamer Drive / Fremantle Place	Ti Rakau Drive (North)	Left	18	1	0	**19**	34	4	0	**37**
		Through	733	71	14	**817**	868	104	13	**985**
		Right	9	1	0	**10**	9	1	0	**10**
	Gossamer Drive	Left	974	79	0	**1053**	874	86	0	**960**
		Through	9	1	0	**10**	9	1	0	**10**
		Right	83	7	0	**90**	238	16	0	**255**
	Ti Rakau Drive (South)	Left	13	1	0	**14**	18	1	0	**18**
		Through	1490	173	16	**1679**	1437	152	16	**1605**
		Right	229	21	0	**250**	320	27	0	**347**
	Fremantle Place	Left	24	1	0	**25**	21	2	0	**23**
		Through	13	0	0	**13**	10	0	0	**10**
		Right	17	1	0	**18**	16	2	0	**18**
	Total (Maximum in Red)		3602	357	29	**3988**	3842	396	29	**4267**

			DM PM peak 1615-1715 Traffic Flow (Vehicles / hr)				Stage 2 PM peak 1615-1715 Traffic Flow (Vehicles / hr)			
			Car	Truck	Bus	**Total**	Car	Truck	Bus	**Total**
Pakuranga Road / Gossamer Drive	Pakuranga Road (West)	Through	1920	84	14	**2017**	1795	79	14	**1887**
		Right	44	2	0	**46**	47	5	0	**51**
	Pakuranga Road (East)	Left	248	7	2	**257**	232	7	2	**241**
		Through Bus-lane	0	0	6	**6**	0	0	6	**6**
		Through	1104	45	0	**1149**	1107	45	0	**1152**
	Gossamer Drive	Left	4	6	0	**10**	4	6	0	**10**
		Right	593	14	4	**611**	595	14	4	**614**
	Total (Maximum in Red)		3911	158	26	**4095**	3779	155	26	**3960**
Ti Rakau Drive / Gossamer Drive / Fremantle Place	Ti Rakau Drive (North)	Left	59	2	0	**61**	126	2	0	**128**
		Through	1021	42	17	**1079**	979	43	17	**1039**
		Right	18	0	0	**19**	18	0	0	**19**
	Gossamer Drive	Left	393	82	0	**475**	382	73	0	**456**
		Through	9	1	0	**10**	8	2	0	**10**
		Right	30	1	0	**31**	40	1	0	**41**
	Ti Rakau Drive (South)	Left	20	0	0	**20**	20	0	0	**21**
		Through	1508	101	13	**1622**	1556	105	13	**1674**
		Right	553	54	0	**606**	540	50	0	**590**
	Fremantle Place	Left	12	0	0	**12**	10	0	0	**10**
		Through	10	0	0	**10**	10	0	0	**10**
		Right	16	1	0	**18**	16	1	0	**18**
	Total (Maximum in Red)		3640	285	30	**3956**	3700	278	30	**4008**

5.0 Impacts to Buses

- The impacts to buses through the project area are expected to be low as the frequency of the 711 route in the AM inbound direction is only 4 buses/h (1 every 15min).
- As shown above, the William Roberts Road / Reeves Road intersection is expected to operate with good LOS in the AM.
- The William Roberts Road / Pakuranga Road intersection is already saturated in the Do-Min AM scenario and the impact of the detour is expected to be negligible.
- The Pakuranga Road / Ti Rakau Drive intersection is expected to operate at LOS D during the AM.

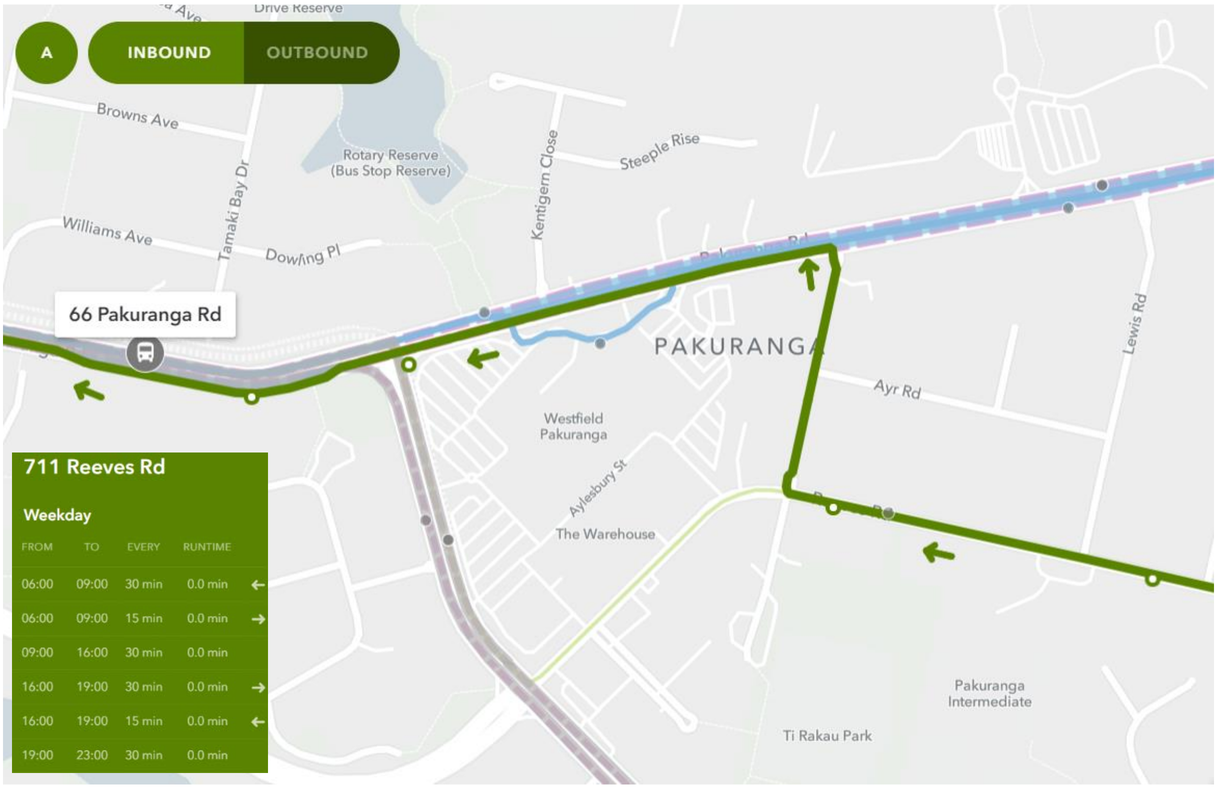


Figure 7: Inbound buses through project area

- NOTE: The 711 outbound route below is based on the Do-Min scenario. During Stage 2, with Reeves Road closed between Ti Rakau Drive and William Roberts Road, it is anticipated buses will continue along Ti Rakau Drive and turn left at the newly completed Ti Rakau Drive / William Roberts Road intersection.
- The impacts to buses through the project area are expected to be low as the frequency of the 711 route in the PM outbound direction is only 4 buses/h (1 every 15min).
- The Pakuranga Road / Ti Rakau Drive intersection is expected to perform at LOS F during the Stage 2 PM scenario, compared to the LOS E of the Do-Min scenario, however, the Pakuranga Road west approach is already at capacity (including the bus lanes).
  - However, performance is expected to improve at this intersection with the mitigation measures proposed under **Section 3.4**.
- The Ti Rakau Drive / SEART intersection is already saturated during the PM peak and the impact of the detour is expected to be negligible.
  - However, performance is expected to improve at this intersection with the mitigation measures proposed under **Section 3.4**.
- It is expected that the Ti Rakau Drive / William Roberts Road LILO intersection would operate with acceptable LOS and the impact of the detour would be negligible at this intersection.

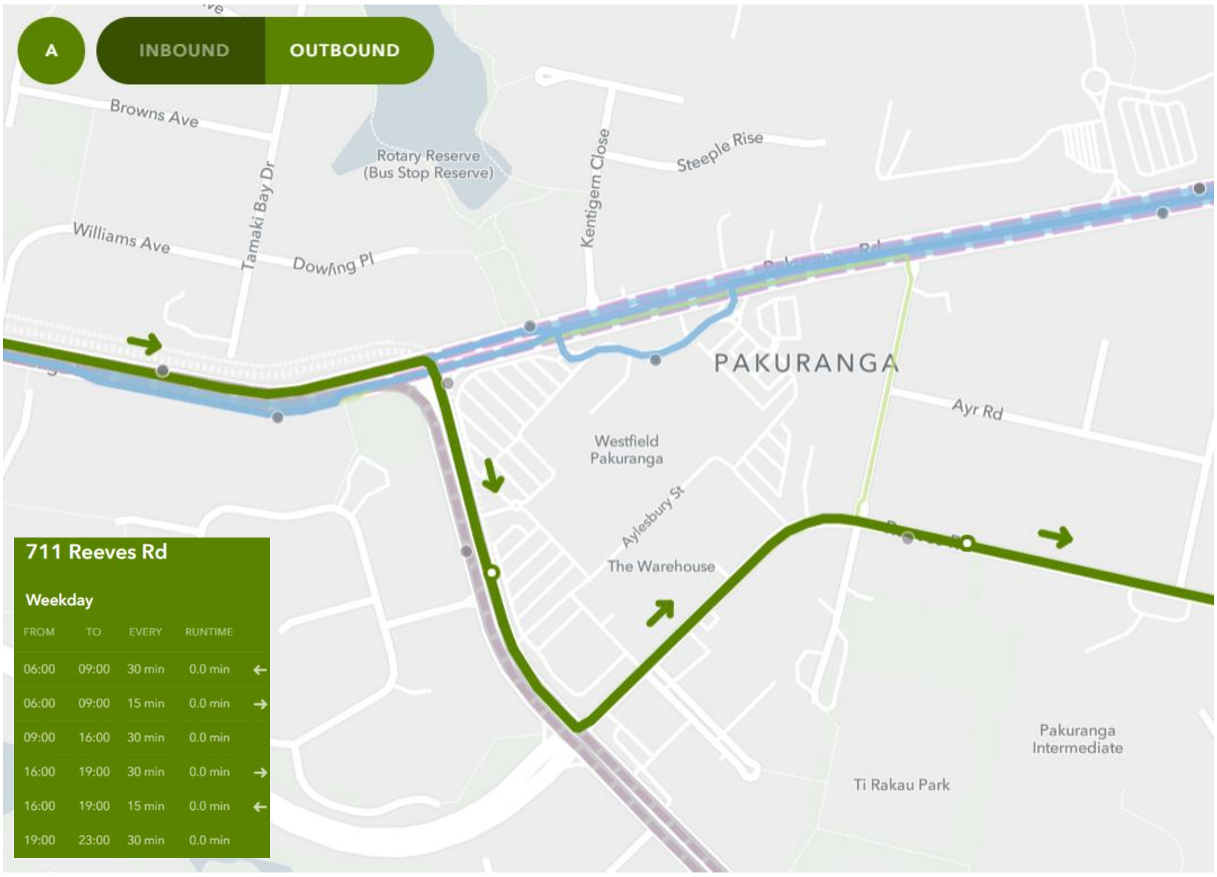
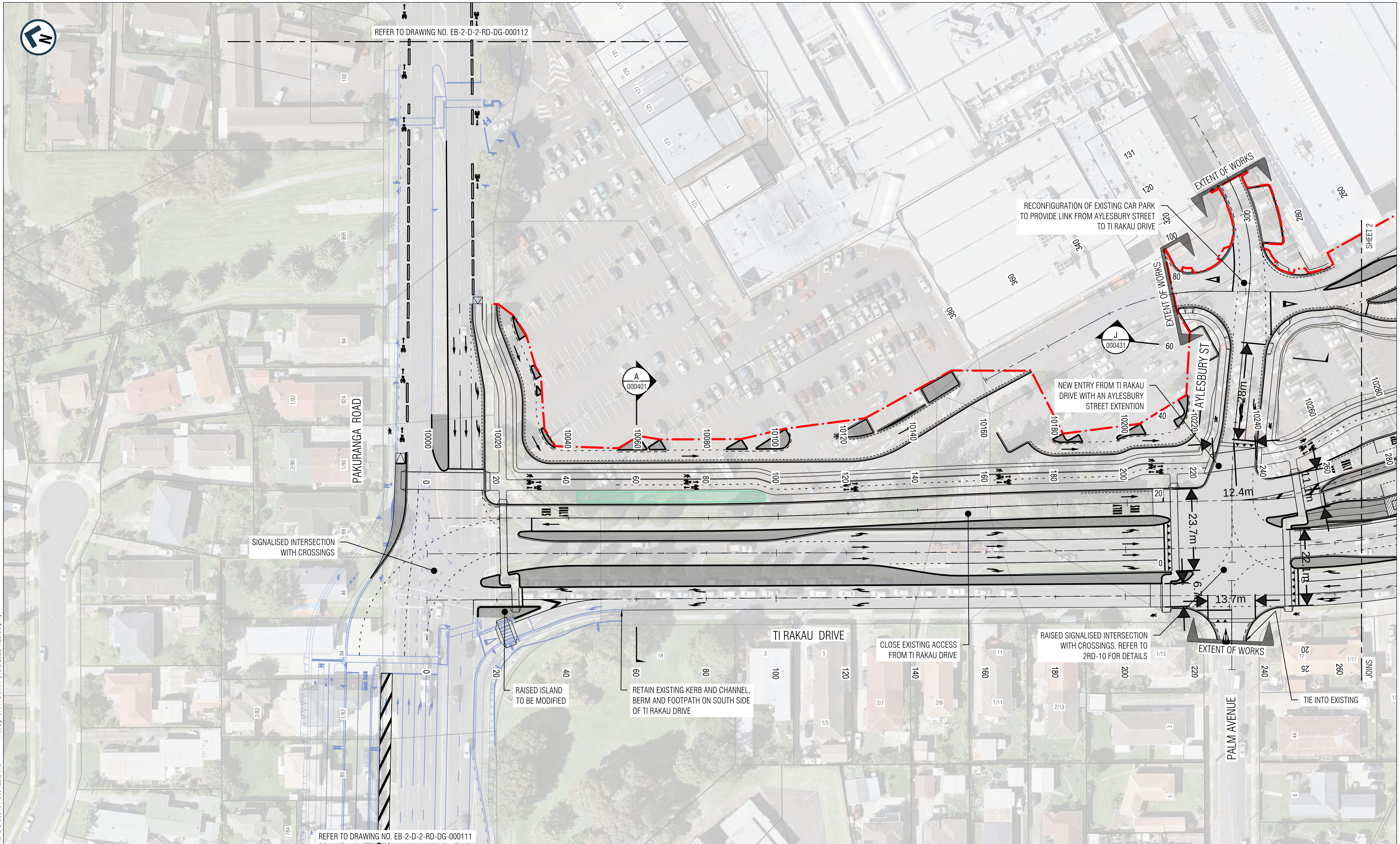


Figure 8: Outbound buses through project area

Appendix B

EB2 General Arrangement Plans



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

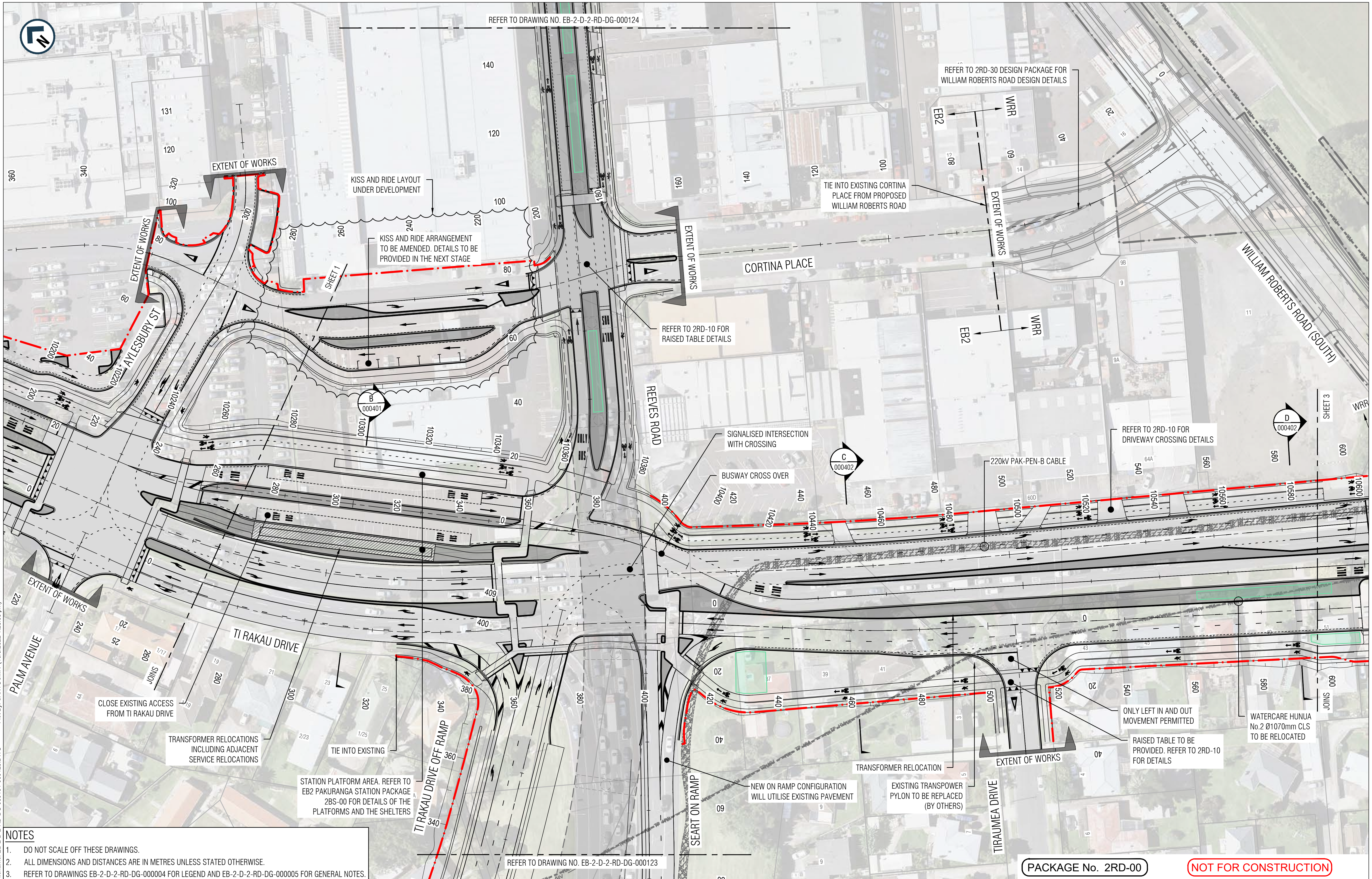
Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 1 OF 3
Drawing Number: EB-2-D-2-RD-DG-000101
Revision: B

A1 ORIGINAL SIZE

ORIGINAL IN COLOUR

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

A1 ORIGINAL SIZE

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

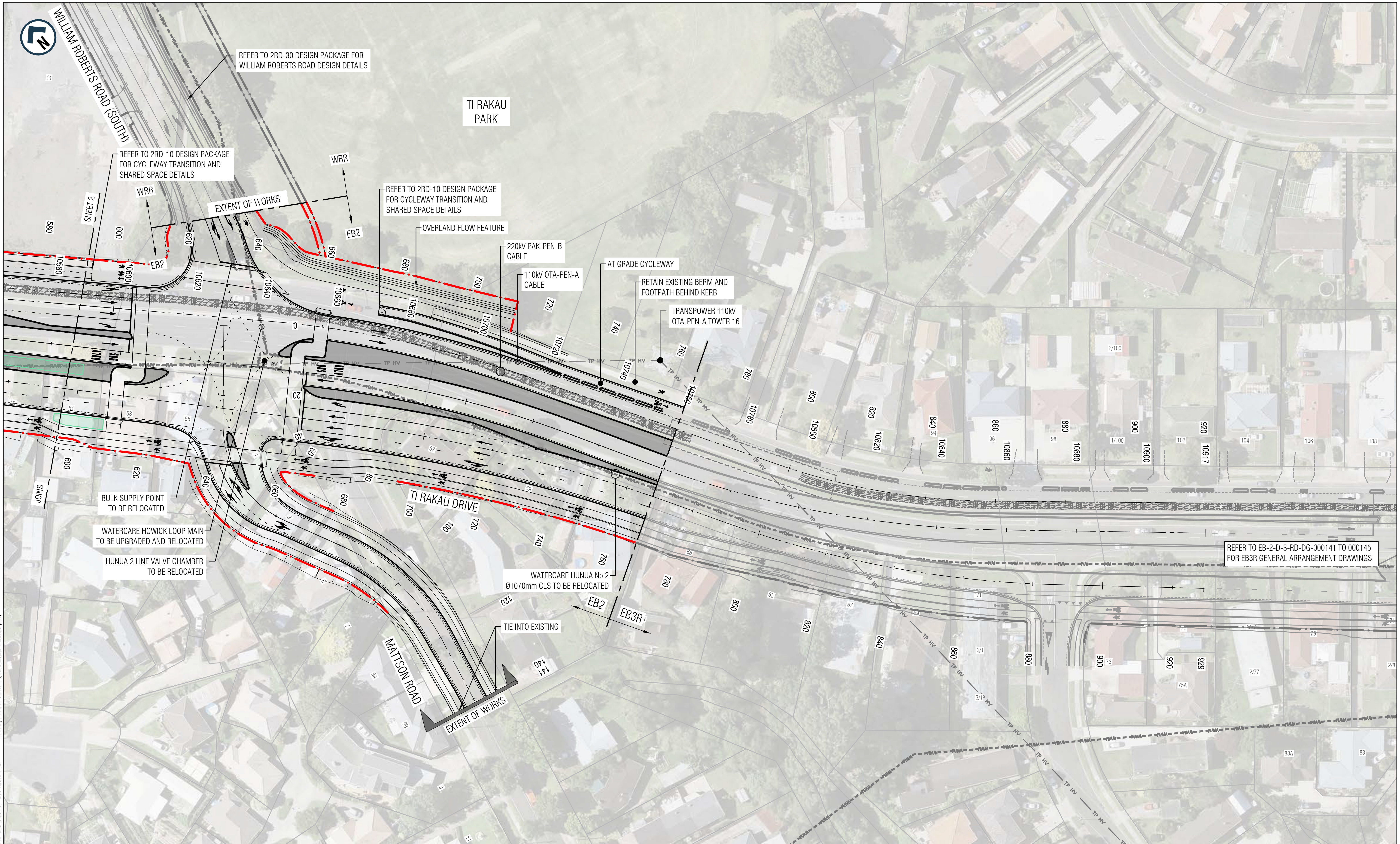
AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 2 OF 3
Drawing Number: EB-2-D-2-RD-DG-000102
Revision: B

700



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar 0 12.5 25 m — A1 1:500, A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

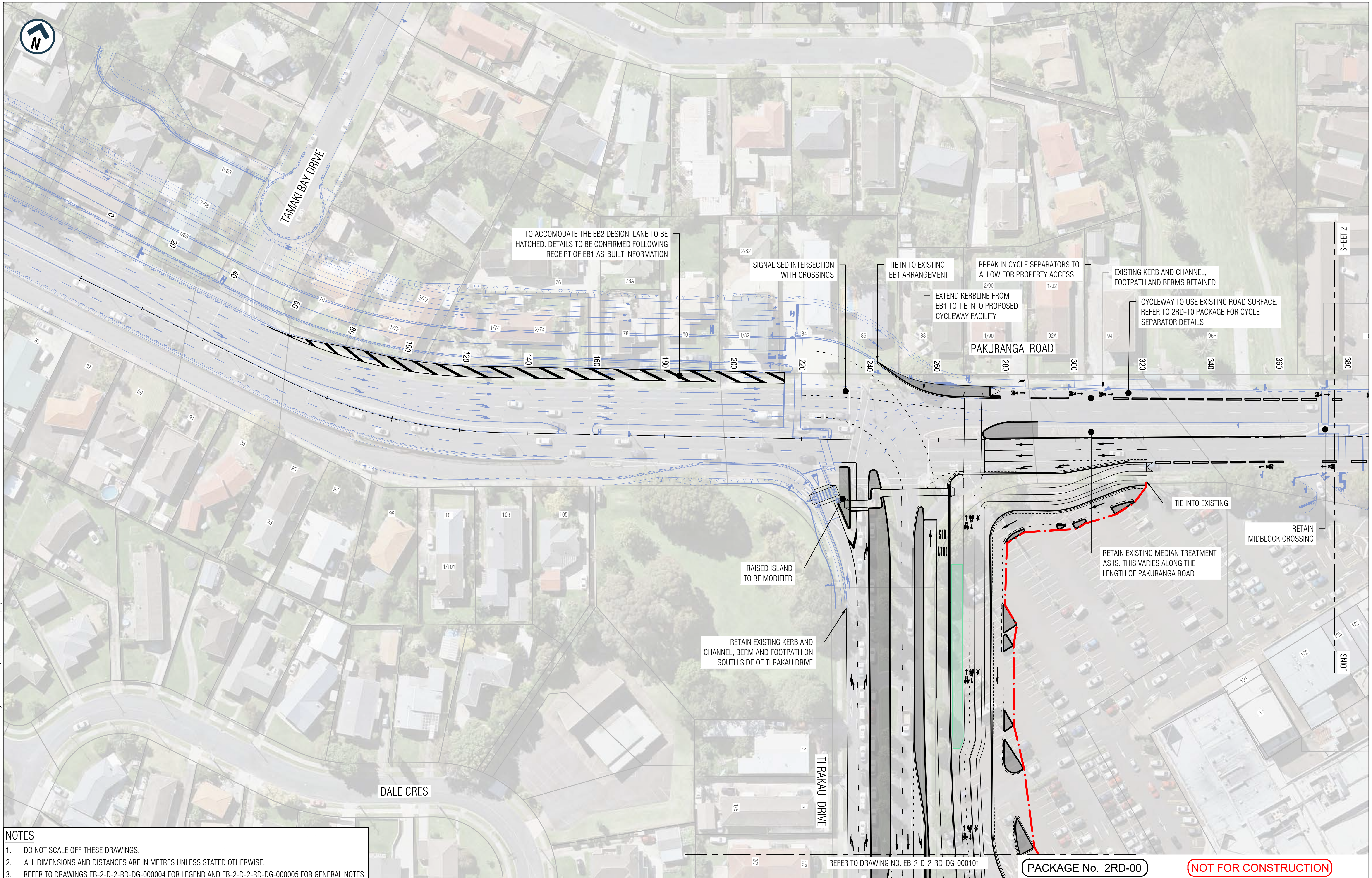
Drawing Status	STAGE 2
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
A1 SCALE 1:500	A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 3 OF 3

Drawing Number: EB-2-D-2-RD-DG-000103 | Revision: B

Filename: EB-2-D-2-RD-DG-000101-000125.DWG   Plot By: SANTOSMR (10/3/2022 1:28:08 pm)



PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar: 0 12.5 25 m — A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

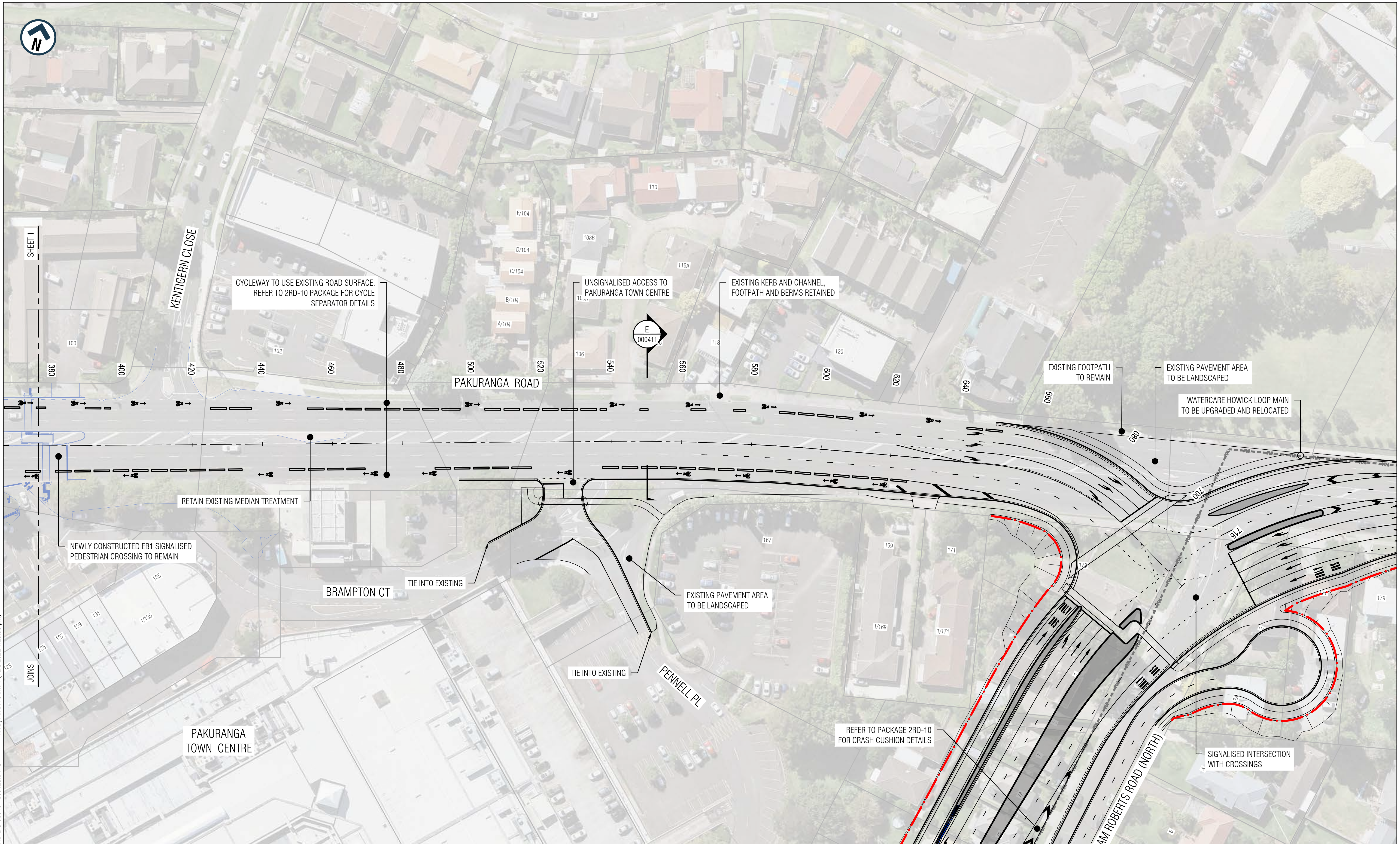
Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: PAKURANGA ROAD GENERAL ARRANGEMENT PLAN SHEET 1 OF 2
Drawing Number: EB-2-D-2-RD-DG-000111
Revision: B

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)

ORIGINAL IN COLOUR



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: PAKURANGA ROAD GENERAL ARRANGEMENT PLAN SHEET 2 OF 2
Drawing Number: EB-2-D-2-RD-DG-000112
Revision: B

A1 ORIGINAL SIZE

ORIGINAL IN COLOUR

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)

NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)

ORIGINAL SIZE A1

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

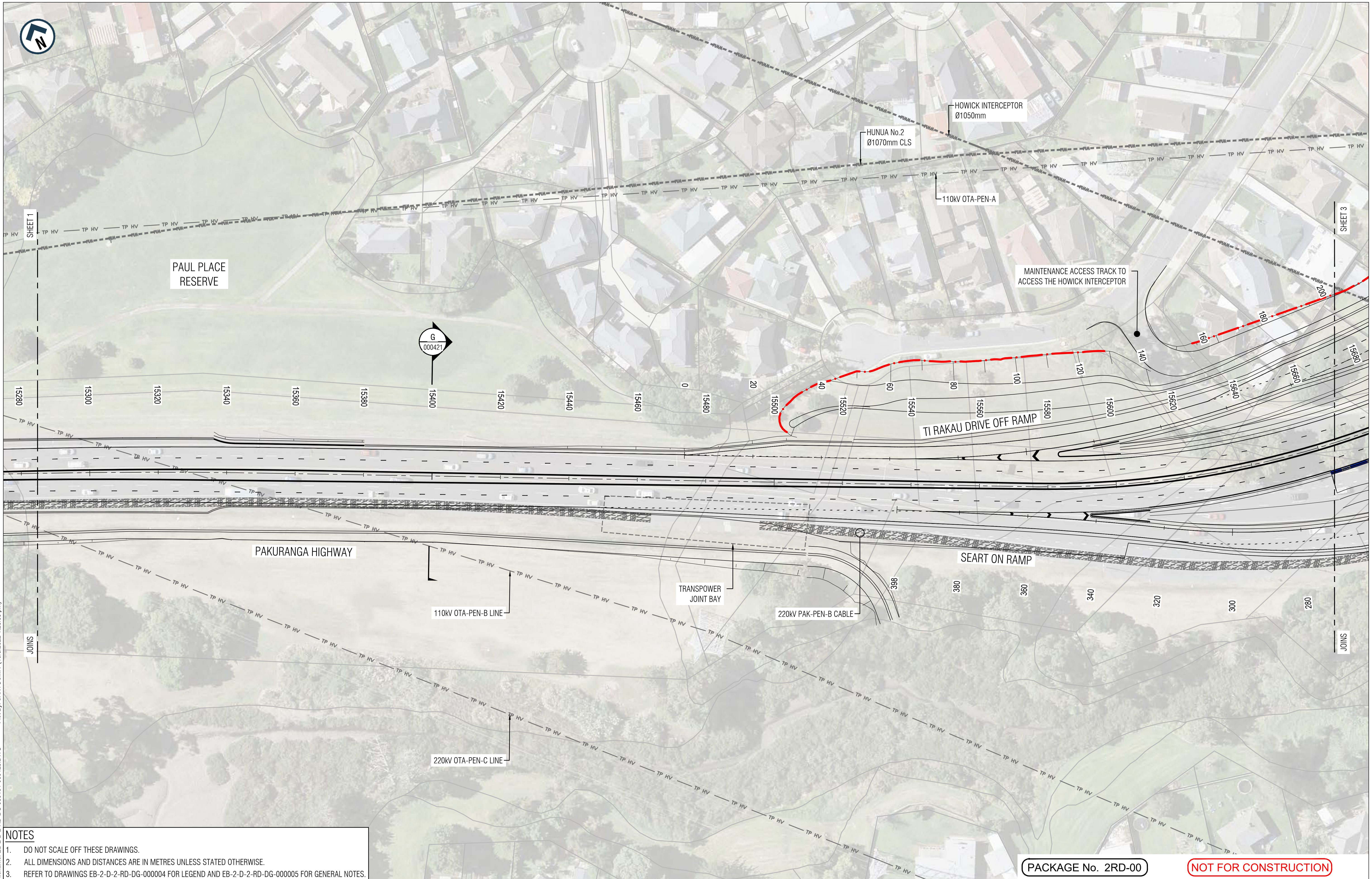
Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status	STAGE 2
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
Scale	A1 1:500 / A3 1:1000
Design Package	ROADWORK GEOMETRIC DESIGN
Drawing Title	PAKURANGA HIGHWAY / REEVES ROAD GENERAL ARRANGEMENT PLAN SHEET 1 OF 5
Drawing Number	EB-2-D-2-RD-DG-000121
Revision	B



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar: 0 12.5 25 m — A1 1:500, A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status	STAGE 2
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
A1 SCALE 1:500	A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: PAKURANGA HIGHWAY / REEVES ROAD
GENERAL ARRANGEMENT PLAN
SHEET 2 OF 5

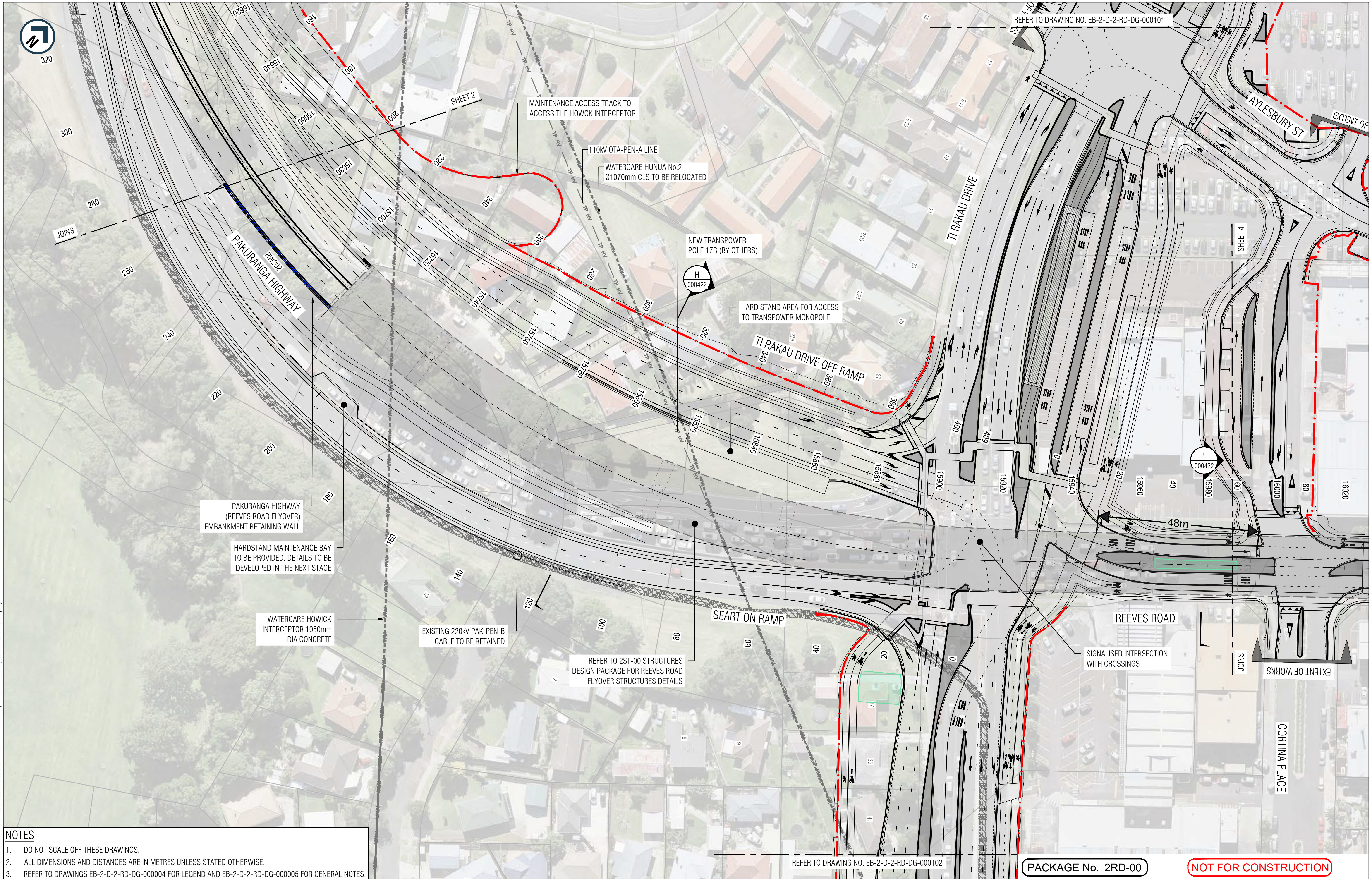
Drawing Number: EB-2-D-2-RD-DG-000122 — Revision: B

705

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

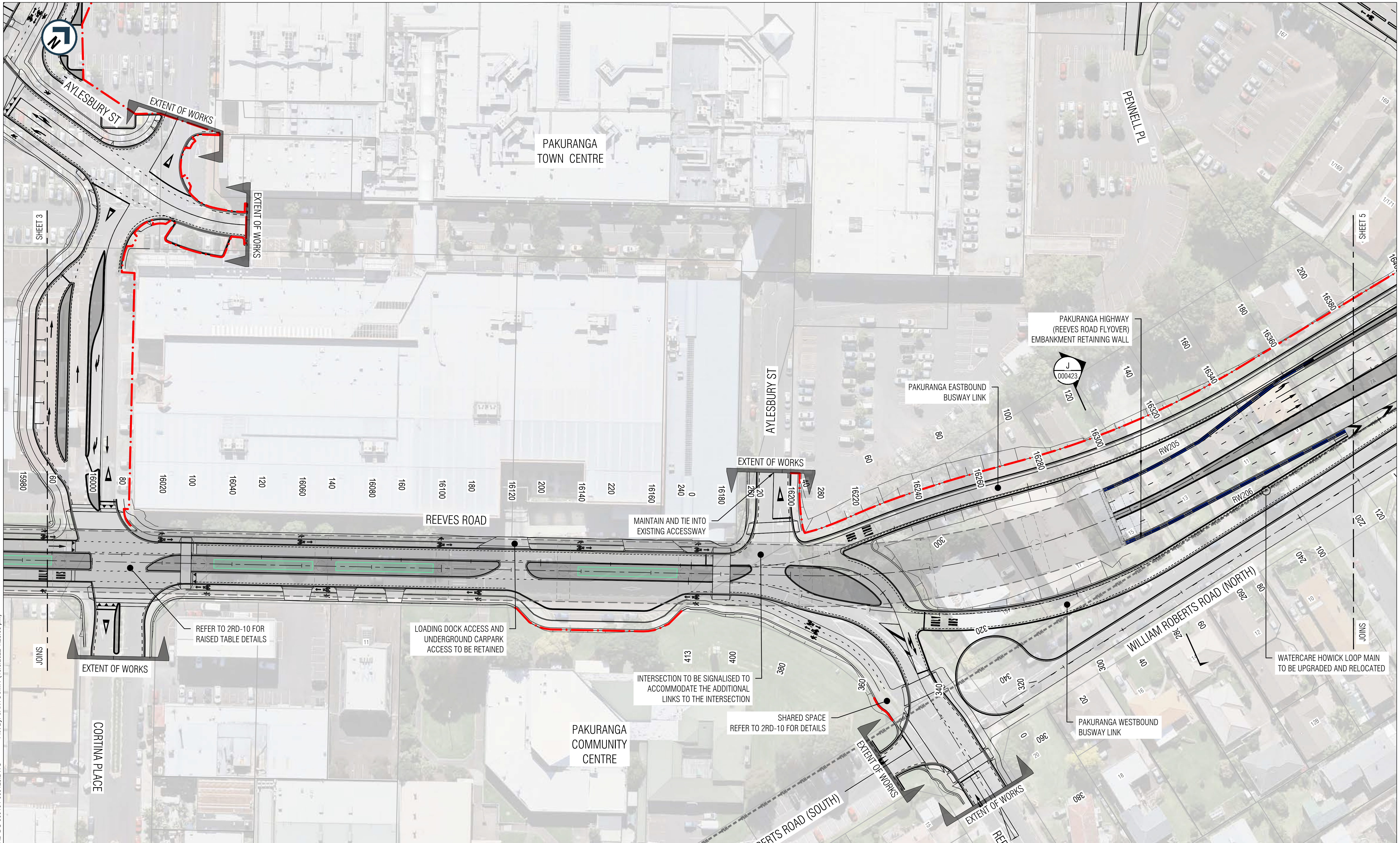
KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: PAKURANGA HIGHWAY / REEVES ROAD GENERAL ARRANGEMENT PLAN SHEET 3 OF 5
Drawing Number: EB-2-D-2-RD-DG-000123
Revision: B



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

Filename: EB-2-D-2-RD-DG-000101-000125.DWG

Plot By: SANTOSMR (10/3/2022 1:28:08 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

A1 ORIGINAL SIZE

ORIGINAL IN COLOUR

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar: 0 12.5 25 m — A1 1:500, A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status: STAGE 2

Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT

Vertical Datum: 2016 NEW ZEALAND

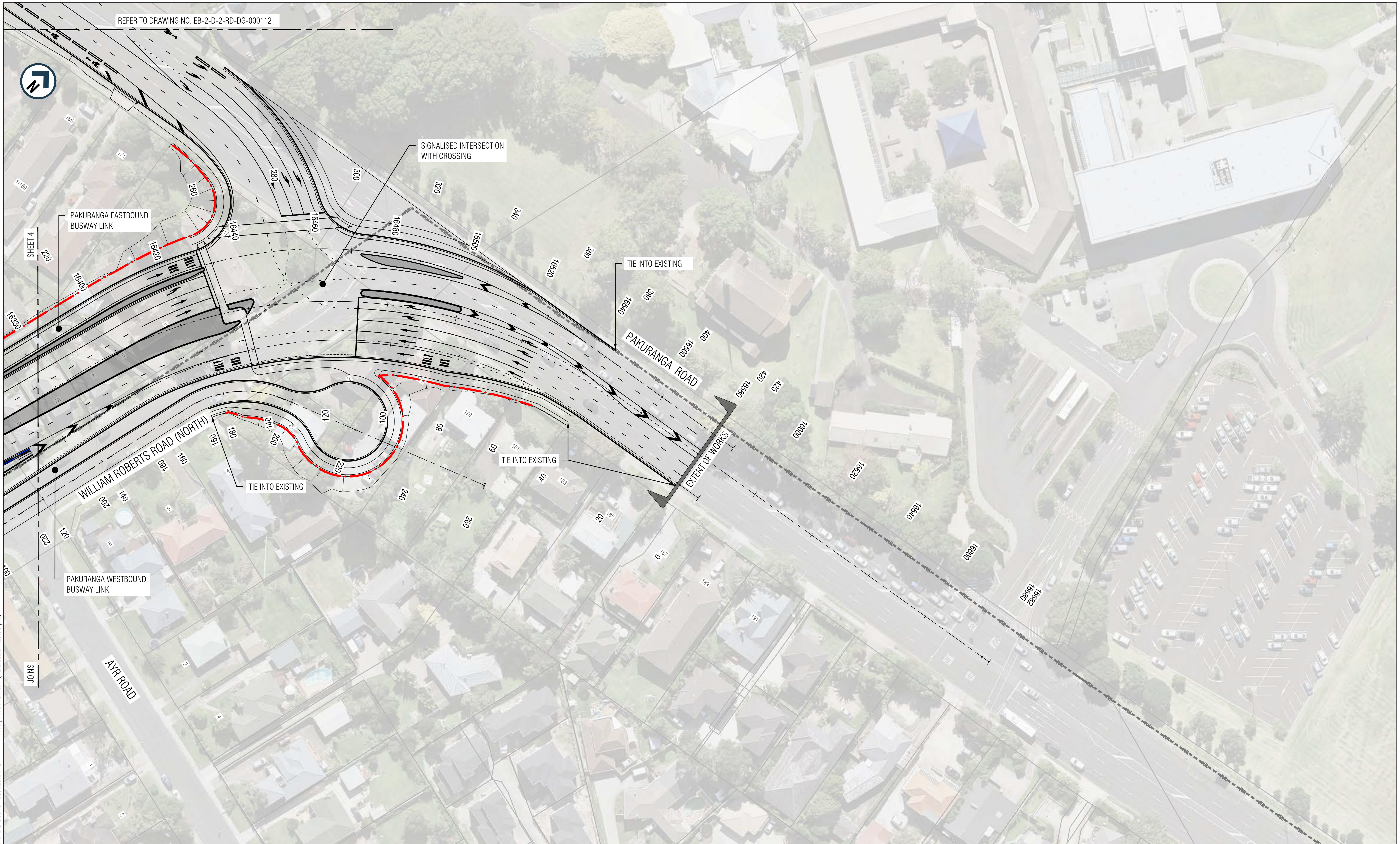
A1 SCALE 1:500 — A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: PAKURANGA HIGHWAY / REEVES ROAD GENERAL ARRANGEMENT PLAN SHEET 4 OF 5

Drawing Number: EB-2-D-2-RD-DG-000124

Revision: B



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

A1 ORIGINAL SIZE

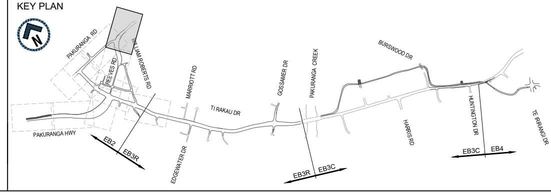
ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar
0 12.5 25 m
A1 1:500 A3 1:1000

KEY PLAN



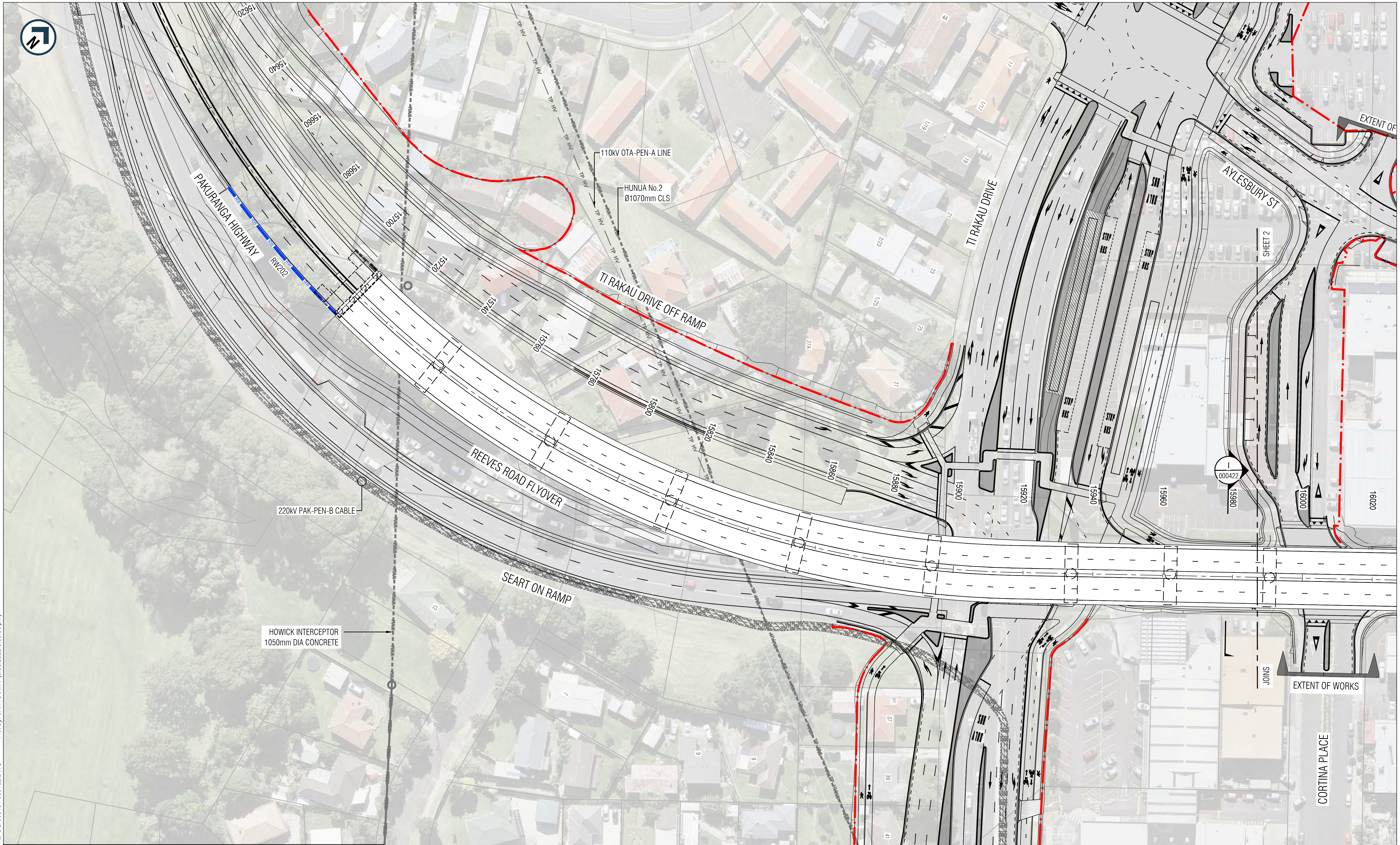
AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: PAKURANGA HIGHWAY / REEVES ROAD GENERAL ARRANGEMENT PLAN SHEET 5 OF 5
Drawing Number: EB-2-D-2-RD-DG-000125
Revision: B

Filename: EB-2-D-2-RD-DG-000101-000125.DWG Plot By: SANTOSMR (10/3/2022 1:28:08 pm)



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

Filename: EB-2-D-2-RD-DG-000131-000132.DWG Plot By: SANTOSMR (9/30/2022 6:06:50 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

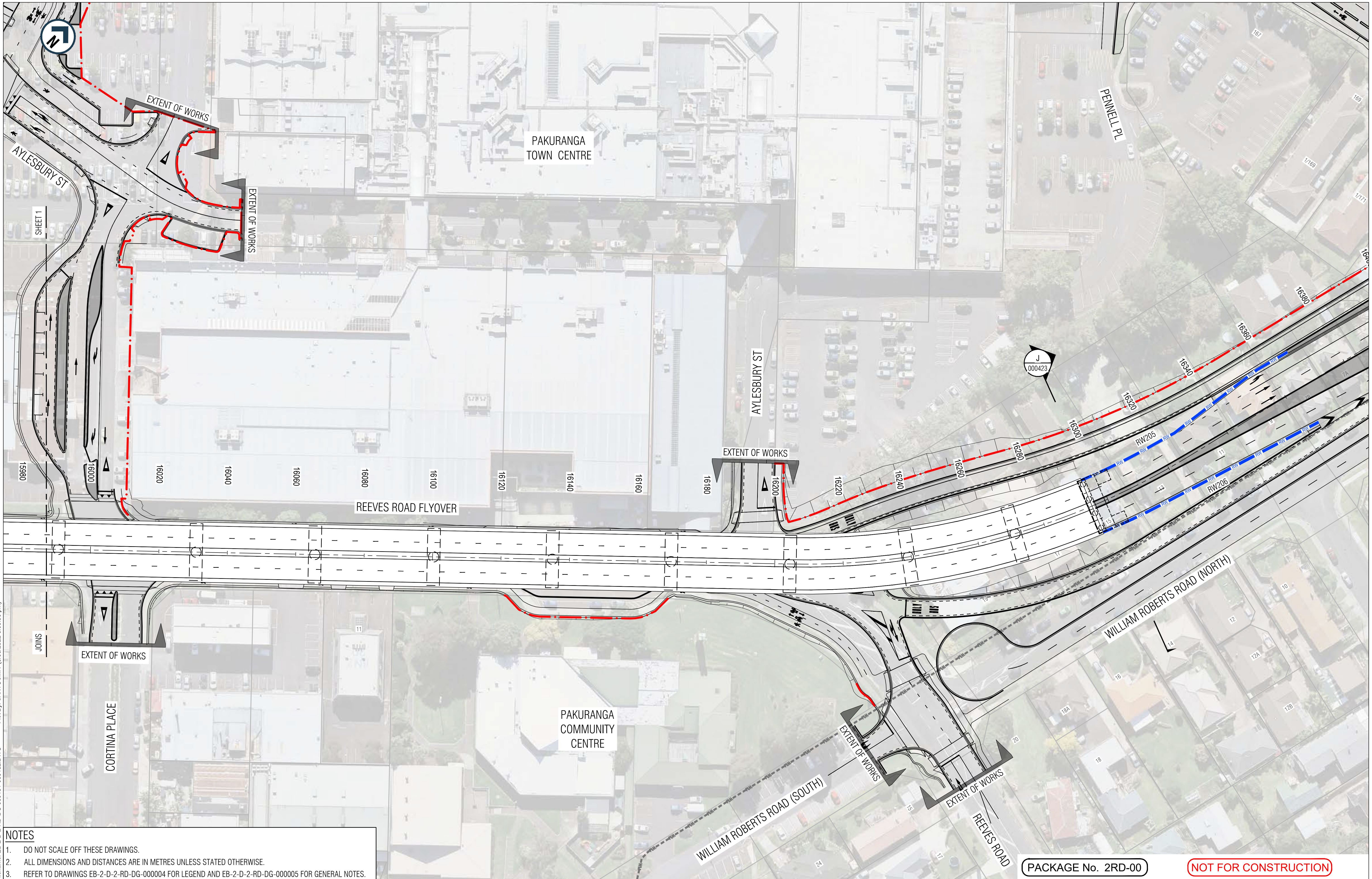
KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: REEVES ROAD FLYOVER GENERAL ARRANGEMENT PLAN SHEET 1 OF 2
Drawing Number: EB-2-D-2-RD-DG-000131
Revision: B



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-2-RD-DG-000004 FOR LEGEND AND EB-2-D-2-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 2RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	30/09/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	29/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

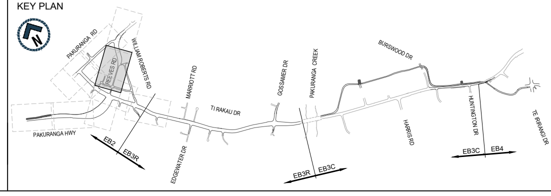
ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	D. deAbrew	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	30/09/2022	Approver Signature	

Scale Bar
0 12.5 25 m
A1 1:500 A3 1:1000

KEY PLAN



AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status	STAGE 2
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
A1 SCALE	1:500
A3 SCALE	1:1000
Design Package	**ROADWORK GEOMETRIC DESIGN**
Drawing Title	REEVES ROAD FLYOVER GENERAL ARRANGEMENT PLAN SHEET 2 OF 2
Drawing Number	EB-2-D-2-RD-DG-000132
Revision	B

Filename: EB-2-D-2-RD-DG-000131-000132.DWG

Plot By: SANTOSMR (9/30/2022 6:06:50 pm)

Appendix C

EB3R General Arrangement Plans

NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWING EB-2-D-3-RD-DG-000004 FOR GENERAL LEGEND AND EB-2-D-3-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 3RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	12/10/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	28/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

A1 ORIGINAL SIZE

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	A. Tavildar	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	12/10/2022	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 | A3 SCALE 1:1000

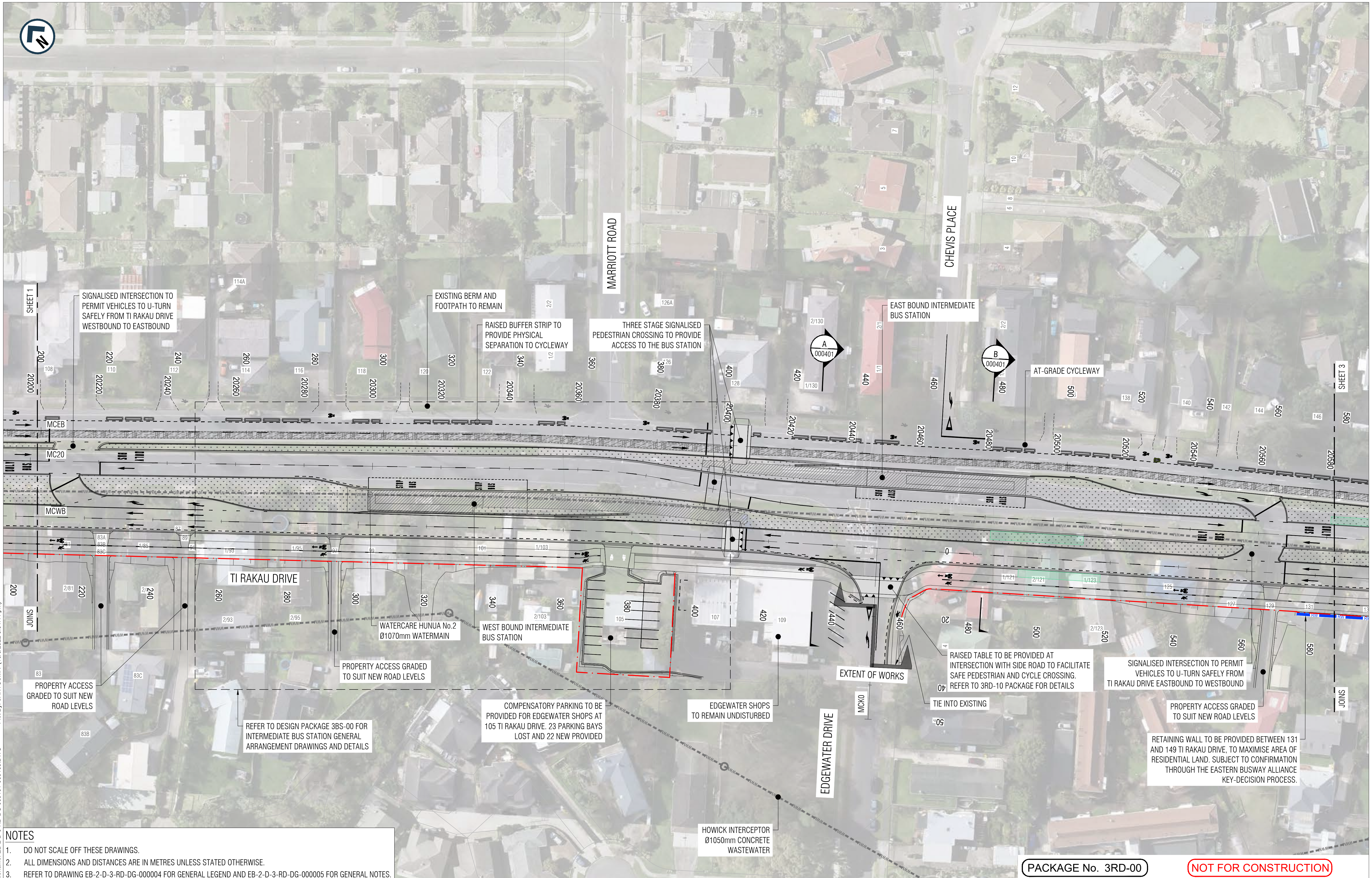
Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 1 OF 5

Drawing Number: EB-2-D-3-RD-DG-000101

Revision: B

Filename: EB-2-D-3-RD-DG-000101-000105.DWG Plot By: SANTOSMR (10/6/2022 5:54:41 pm)



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWING EB-2-D-3-RD-DG-000004 FOR GENERAL LEGEND AND EB-2-D-3-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 3RD-00

NOT FOR CONSTRUCTION

Filename: EB-2-D-3-RD-DG-000101-000105.DWG   Plot By: SANTOSMR (10/6/2022 5:54:41 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	12/10/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	28/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	A. Tavildar	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	12/10/2022	Approver Signature	

Scale Bar: 0 12.5 25 m — A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

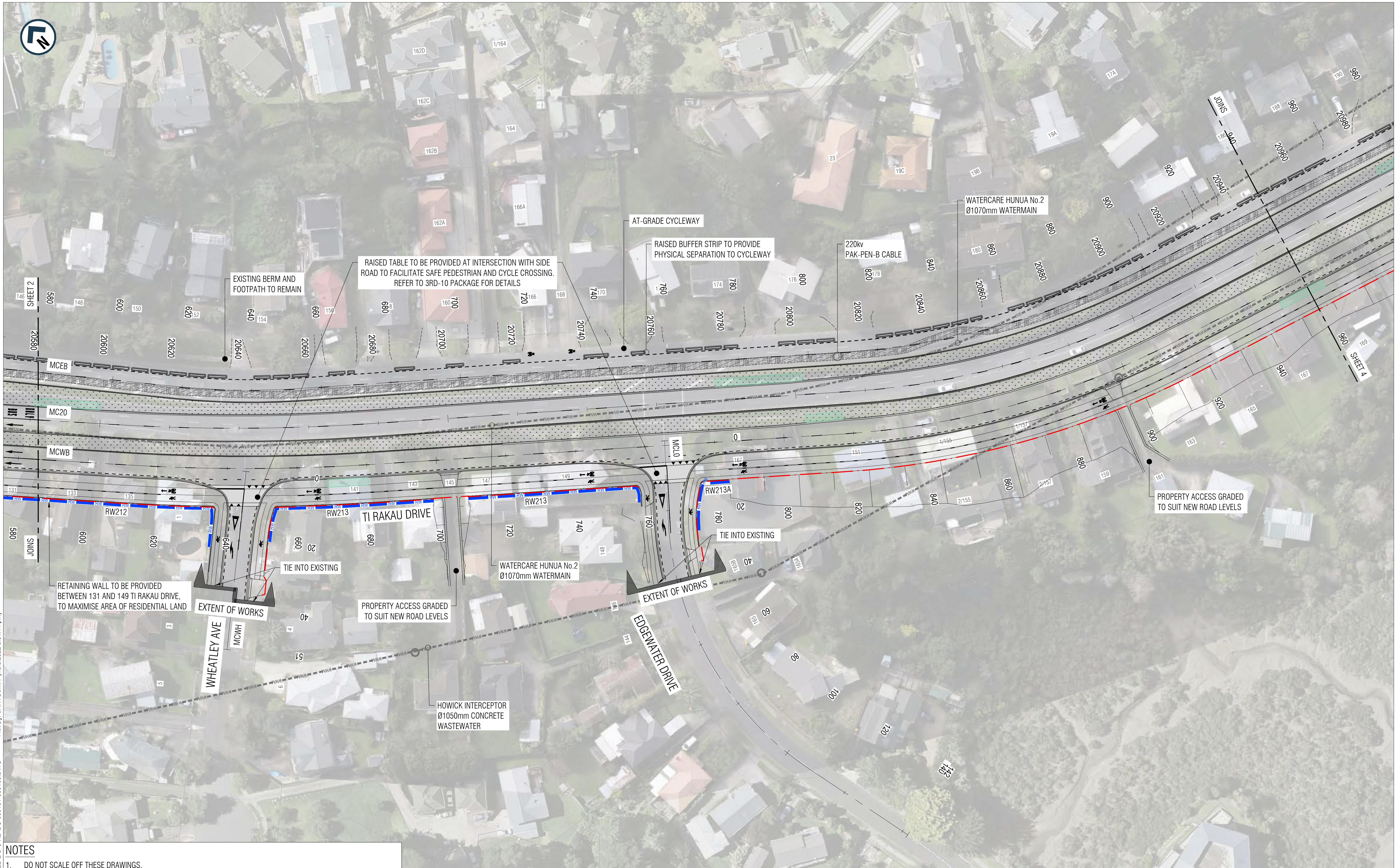
Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 2 OF 5

Drawing Number: EB-2-D-3-RD-DG-000102

Revision: B



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWING EB-2-D-3-RD-DG-000004 FOR GENERAL LEGEND AND EB-2-D-3-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 3RD-00

NOT FOR CONSTRUCTION

REV	DATE	DRAWN	REVISION DESCRIPTION
B	12/10/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	28/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

A1 ORIGINAL SIZE

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	A. Tavildar	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	12/10/2022	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

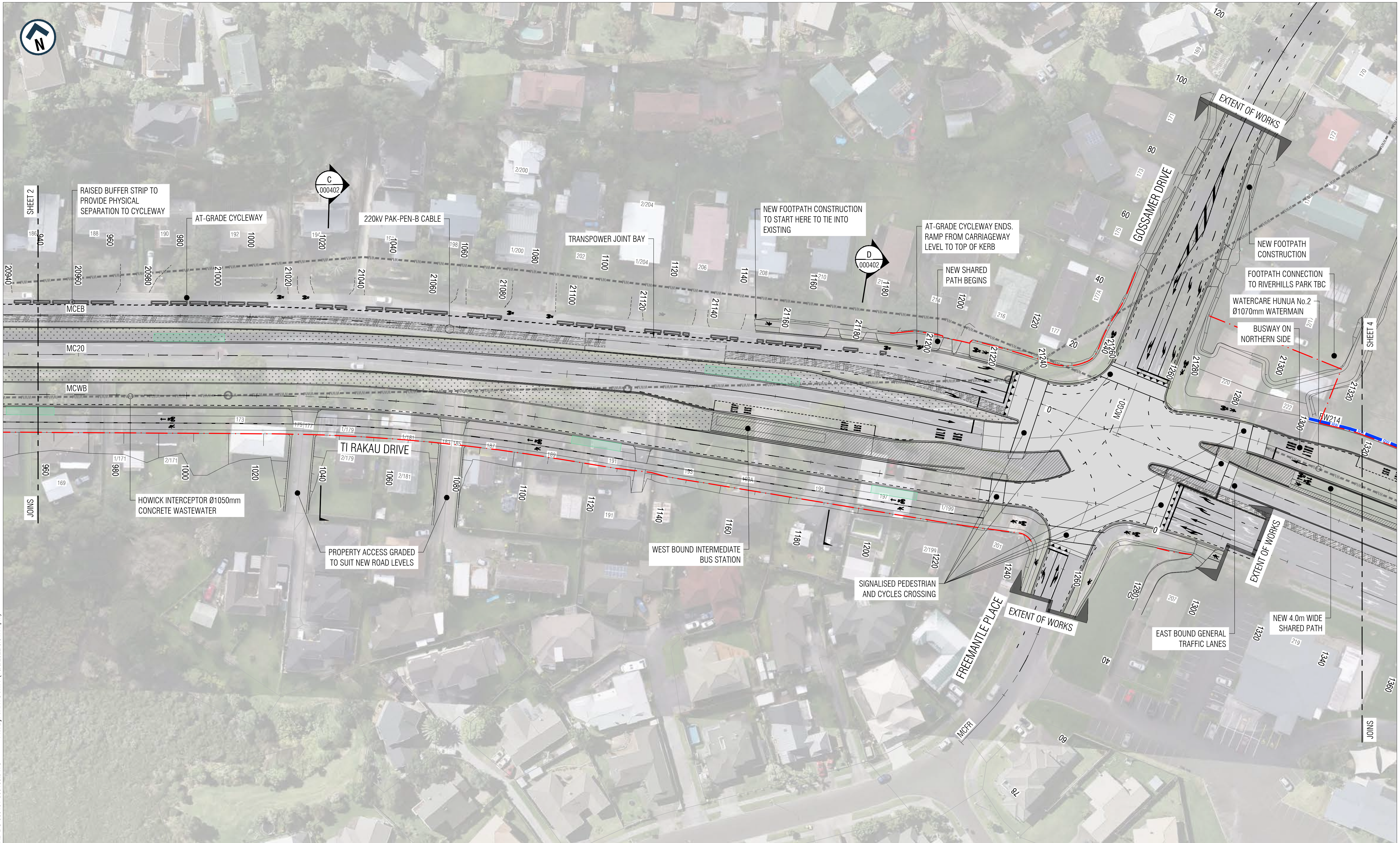
AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 3 OF 5
Drawing Number: EB-2-D-3-RD-DG-000103
Revision: B

Filename: EB-2-D-3-RD-DG-000101-000105.DWG Plot By: SANTOSMR (10/6/2022 5:54:41 pm)



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWING EB-2-D-3-RD-DG-000004 FOR GENERAL LEGEND AND EB-2-D-3-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 3RD-00

NOT FOR CONSTRUCTION

Filename: EB-2-D-3-RD-DG-000101-000105.DWG
Plot By: SANTOSMR (10/6/2022 5:54:41 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	12/10/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	28/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	A. Tavildar	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	12/10/2022	Approver Signature	

Scale Bar: 0 12.5 25 m — A1 1:500, A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

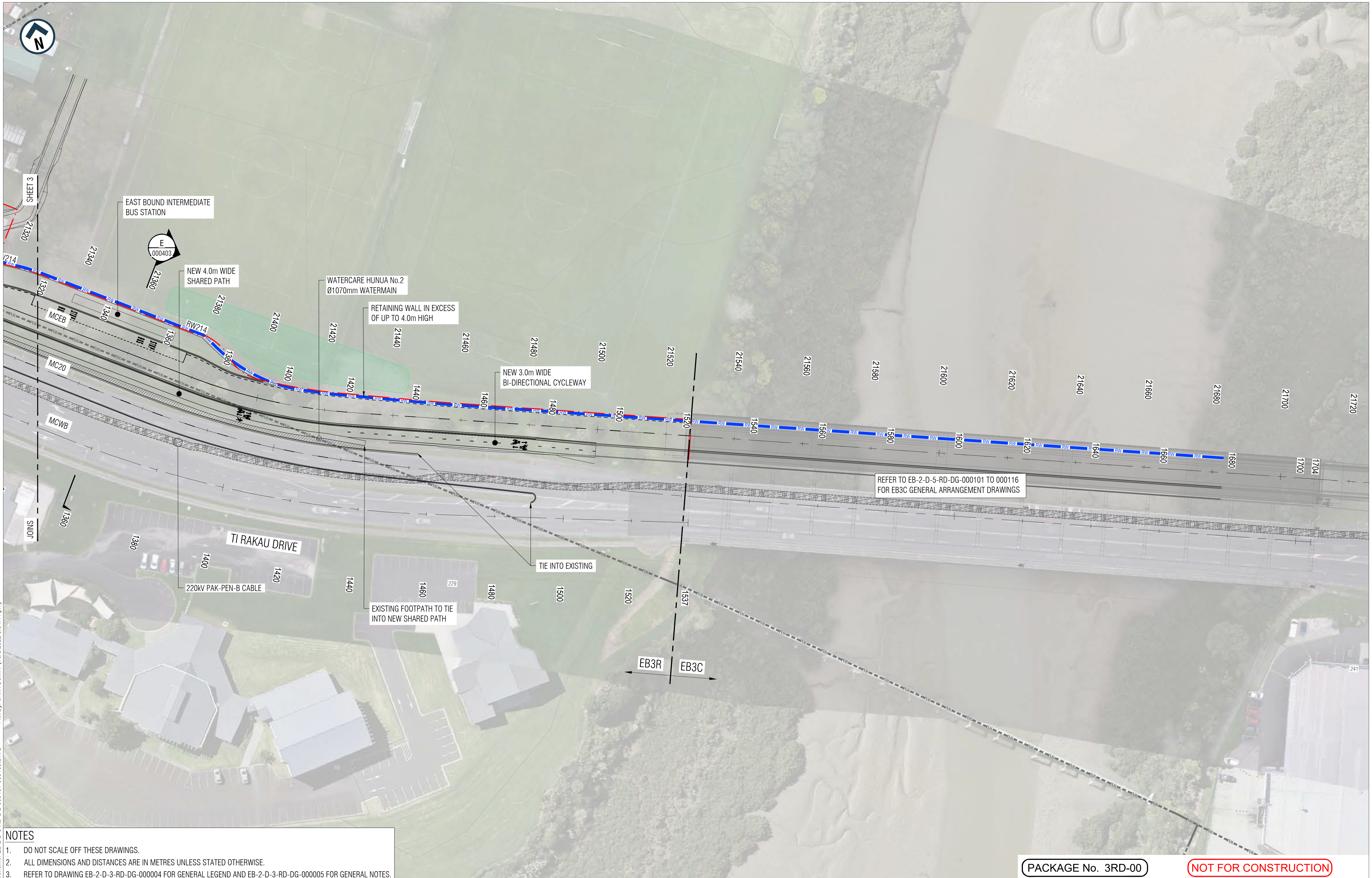
Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: TI RAKAU DRIVE
GENERAL ARRANGEMENT PLAN
SHEET 4 OF 5

Drawing Number: EB-2-D-3-RD-DG-000104

Revision: B



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWING EB-2-D-3-RD-DG-000004 FOR GENERAL LEGEND AND EB-2-D-3-RD-DG-000005 FOR GENERAL NOTES.

PACKAGE No. 3RD-00

NOT FOR CONSTRUCTION

Filename: EB-2-D-3-RD-DG-000101-000105.DWG

Plot By: SANTOSMR (10/6/2022 5:54:41 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	12/10/2022	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	28/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	A. Tavildar	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	12/10/2022	Approver Signature	

Scale Bar: 0 12.5 25 m — A1 1:500 — A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status: STAGE 2

Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT

Vertical Datum: 2016 NEW ZEALAND

A1 SCALE 1:500 — A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: TI RAKAU DRIVE
GENERAL ARRANGEMENT PLAN
SHEET 5 OF 5

Drawing Number: EB-2-D-3-RD-DG-000105

Revision: B

Appendix D

Construction Scenario 1.1 – Phasing Diagrams

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Rd (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 90 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

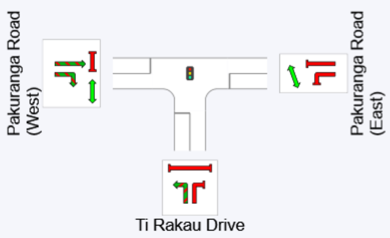
Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	17	29	52	64
Green Time (sec)	11	6	17	6	20
Phase Time (sec)	17	12	23	12	26
Phase Split	19%	13%	26%	13%	29%

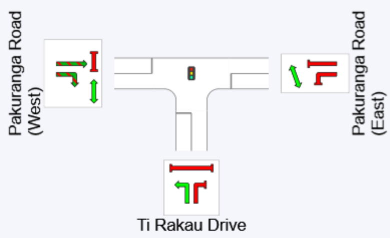
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

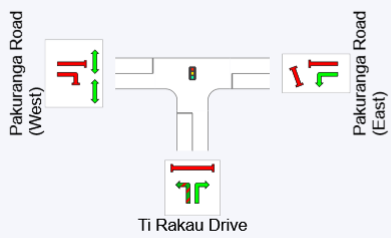
Phase A **REF**



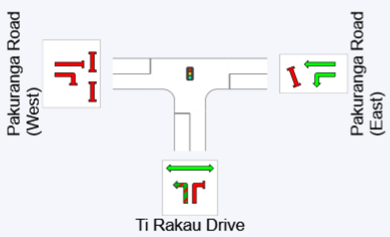
Phase B



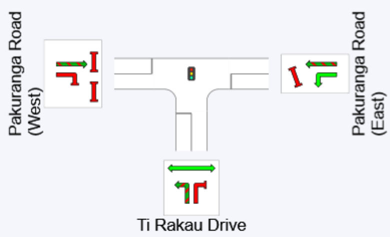
Phase C



Phase D



Phase E



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 AM.sip9

PHASING SUMMARY

Site: 1.5 [1.5 Saint Kentigern/ Pakuranga Rd - PD (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 67 seconds (Site Practical Cycle Time)

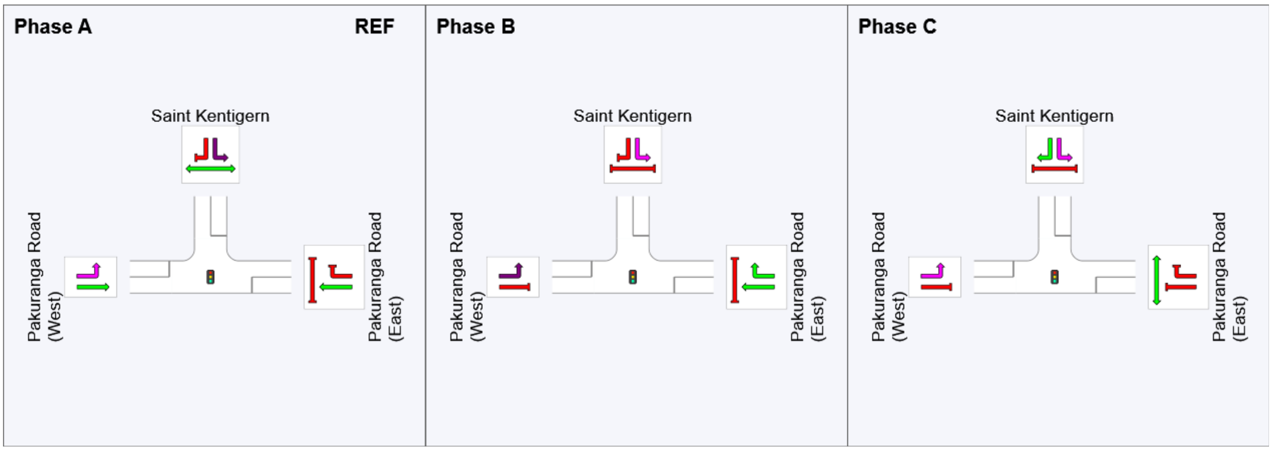
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D*
Output Phase Sequence: A, B, C
(* Variable Phase)

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	27	39
Green Time (sec)	21	6	22
Phase Time (sec)	27	12	28
Phase Split	40%	18%	42%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga HWY/ Reeves Rd (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 110 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

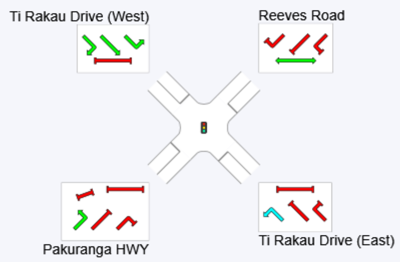
Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	42	67	79	89
Green Time (sec)	36	19	6	4	15
Phase Time (sec)	42	25	12	10	21
Phase Split	38%	23%	11%	9%	19%

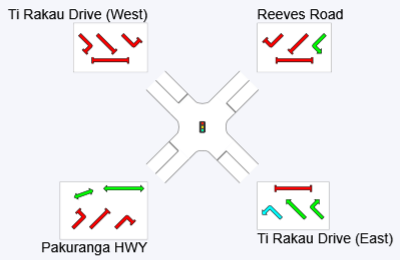
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

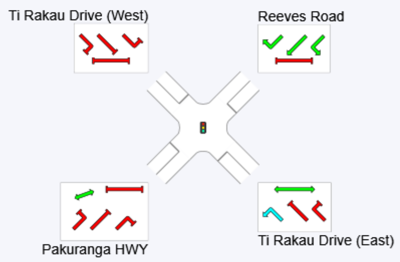
Phase A **REF**



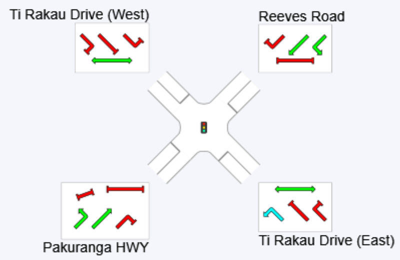
Phase B



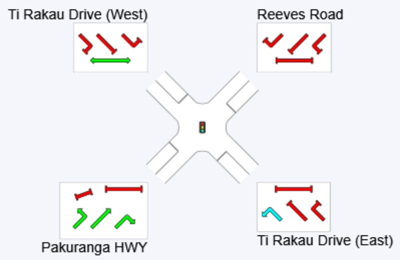
Phase C



Phase D



Phase E



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 15 February 2023 8:39:11 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 AM.sip9

PHASING SUMMARY

Site: 7.0 [7.0 Mattson Rd/ Ti Rakau Dr (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 64 seconds (Site Practical Cycle Time)

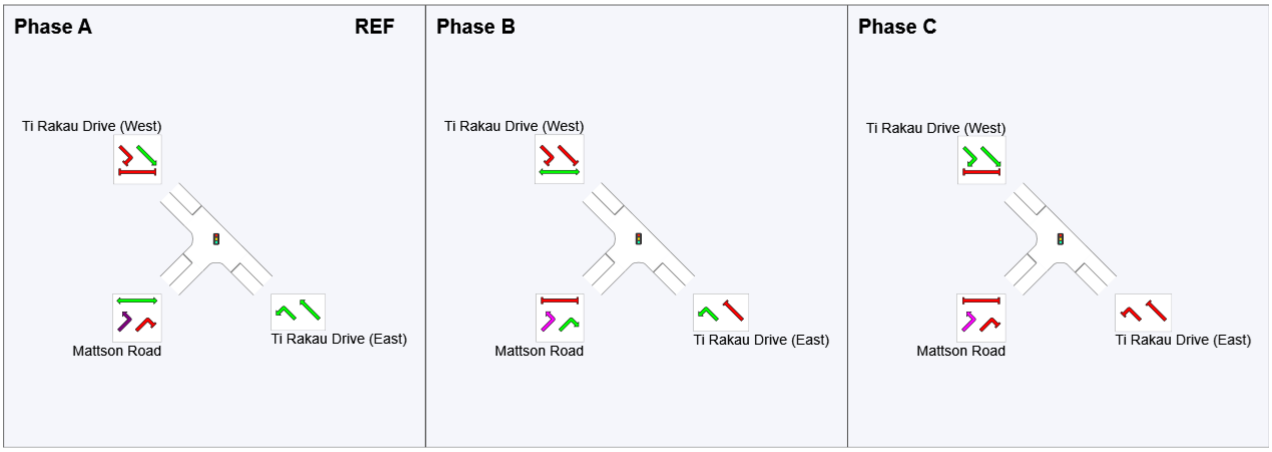
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	37	52
Green Time (sec)	31	9	6
Phase Time (sec)	37	15	12
Phase Split	58%	23%	19%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 10.0 [10.0 Edgewater Dr (West) / Chevis Pl (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

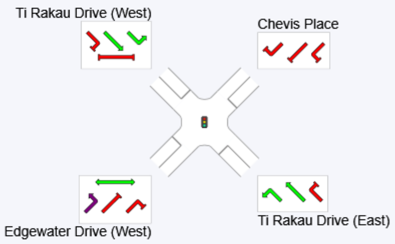
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	55	76	88
Green Time (sec)	49	15	6	6
Phase Time (sec)	55	21	12	12
Phase Split	55%	21%	12%	12%

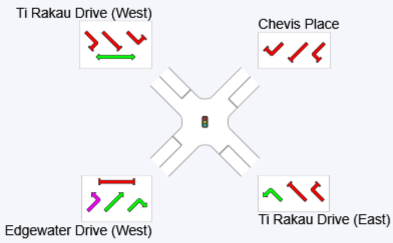
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

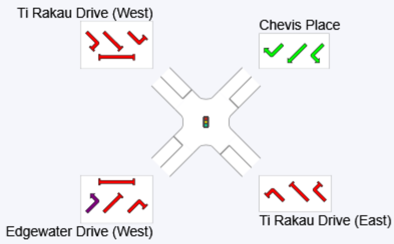
Phase A **REF**



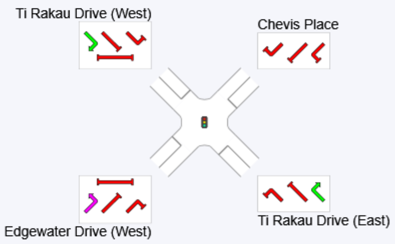
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 15 February 2023 8:39:11 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 AM.sip9

PHASING SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site Practical Cycle Time)

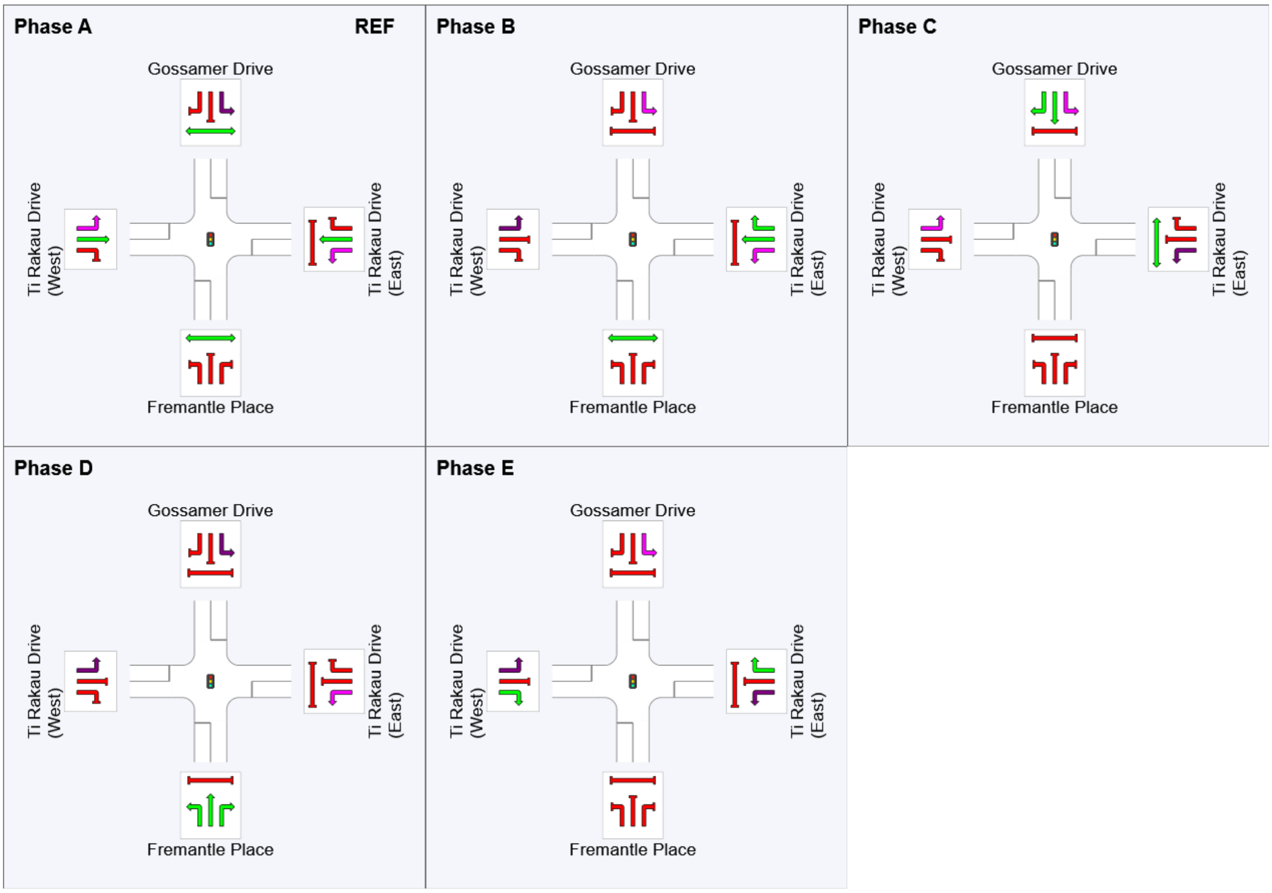
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	46	65	120	132
Green Time (sec)	40	13	49	6	12
Phase Time (sec)	46	19	55	12	18
Phase Split	31%	13%	37%	8%	12%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

	Normal Movement		Permitted/Opposed
	Slip/Bypass-Lane Movement		Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
	Other Movement Class (MC) Running		Undetected Movement
	Mixed Running & Stopped MCs		Continuous Movement
	Other Movement Class (MC) Stopped		Phase Transition Applied

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Rd (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 130 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

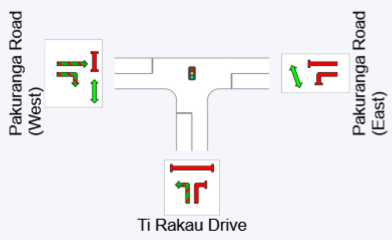
Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	23	35	94	106
Green Time (sec)	17	6	53	6	18
Phase Time (sec)	23	12	59	12	24
Phase Split	18%	9%	45%	9%	18%

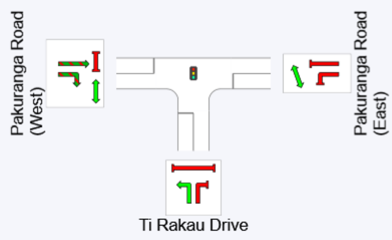
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

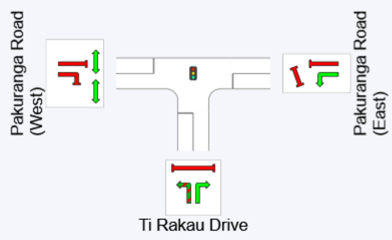
Phase A **REF**



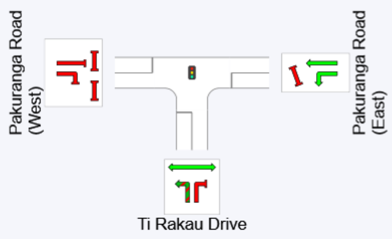
Phase B



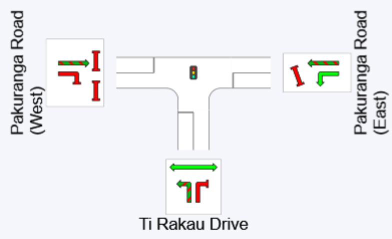
Phase C



Phase D



Phase E



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Friday, 20 January 2023 1:49:14 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 PM.sip9

PHASING SUMMARY

Site: 1.5 [1.5 Saint Kentigern/ Pakuranga Rd - Import (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site Practical Cycle Time)

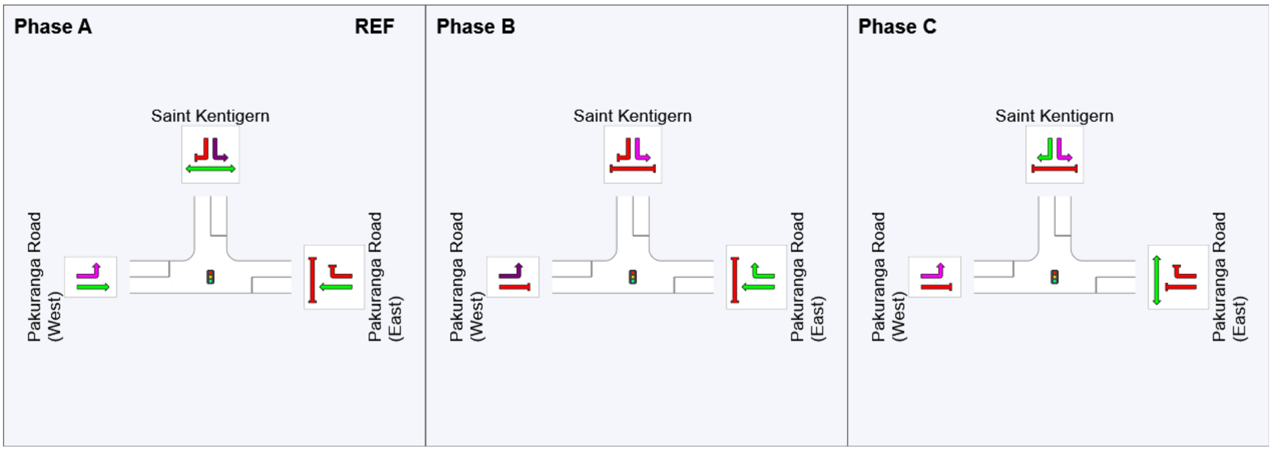
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D*
Output Phase Sequence: A, B, C
(* Variable Phase)

Phase Timing Summary

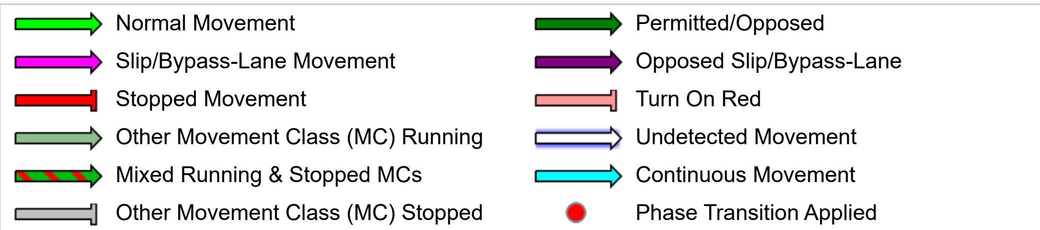
Phase	A	B	C
Phase Change Time (sec)	0	100	112
Green Time (sec)	94	6	22
Phase Time (sec)	100	12	28
Phase Split	71%	9%	20%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Friday, 20 January 2023 1:49:14 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 PM.sip9

PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga HWY/ Reeves Rd (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 166 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

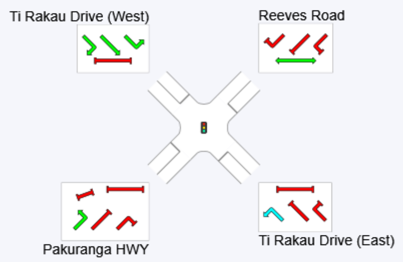
Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	40	79	91	107
Green Time (sec)	34	33	6	10	53
Phase Time (sec)	40	39	12	16	59
Phase Split	24%	23%	7%	10%	36%

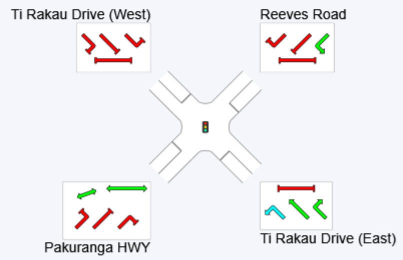
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

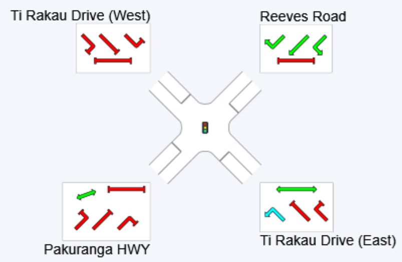
Phase A **REF**



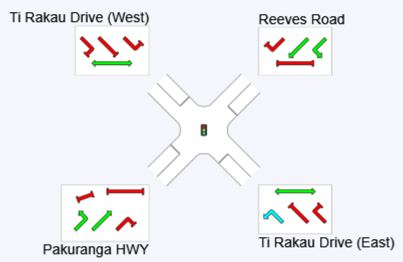
Phase B



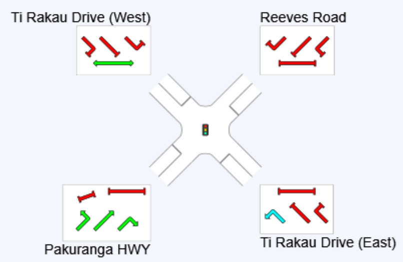
Phase C



Phase D



Phase E



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Friday, 20 January 2023 1:49:14 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 PM.sip9

PHASING SUMMARY

Site: 7.0 [7.0 Mattson Rd/ Ti Rakau Dr (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 70 seconds (Site Practical Cycle Time)

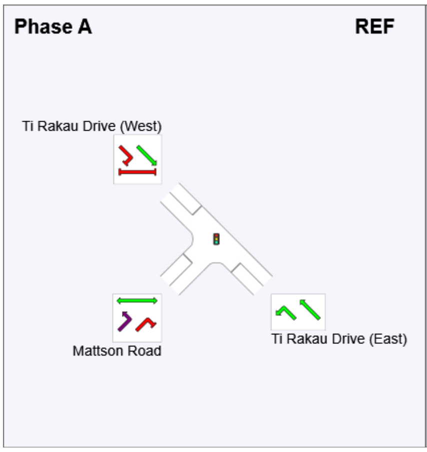
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

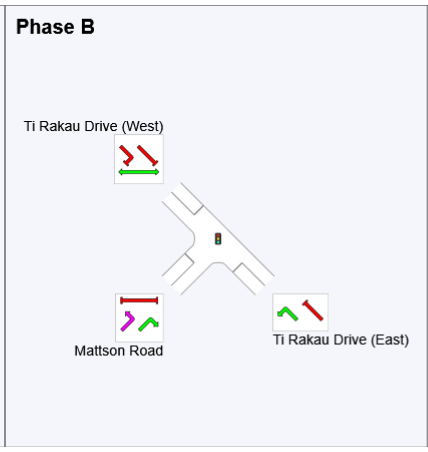
Phase Timing Summary

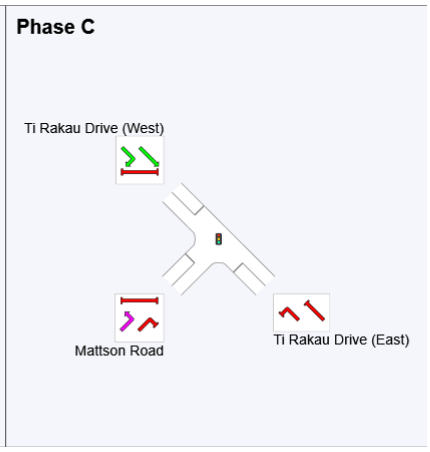
Phase	A	B	C
Phase Change Time (sec)	0	42	58
Green Time (sec)	36	10	6
Phase Time (sec)	42	16	12
Phase Split	60%	23%	17%

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

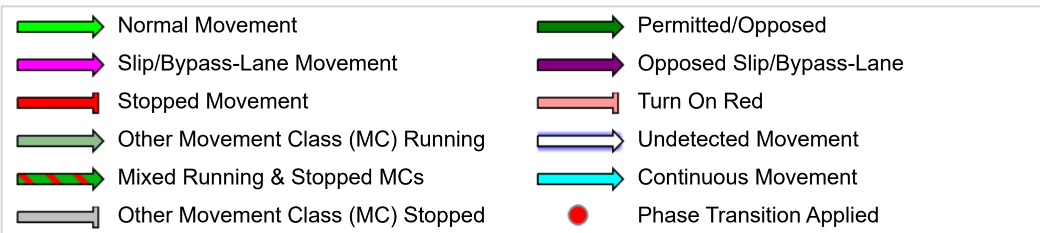
Output Phase Sequence







REF: Reference Phase
VAR: Variable Phase



PHASING SUMMARY

Site: 10.0 [10.0 Edgewater Dr (West) / Chevis Pl (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 110 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

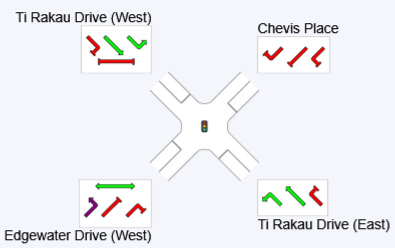
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	64	86	98
Green Time (sec)	58	16	6	6
Phase Time (sec)	64	22	12	12
Phase Split	58%	20%	11%	11%

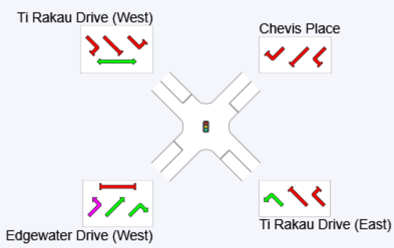
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

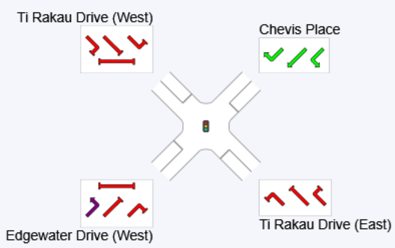
Phase A **REF**



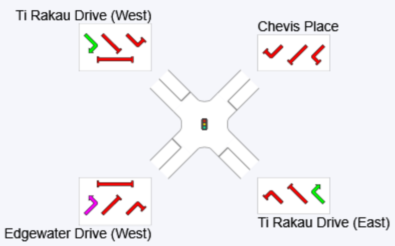
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 PM.sip9

PHASING SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 171 seconds (Site Practical Cycle Time)

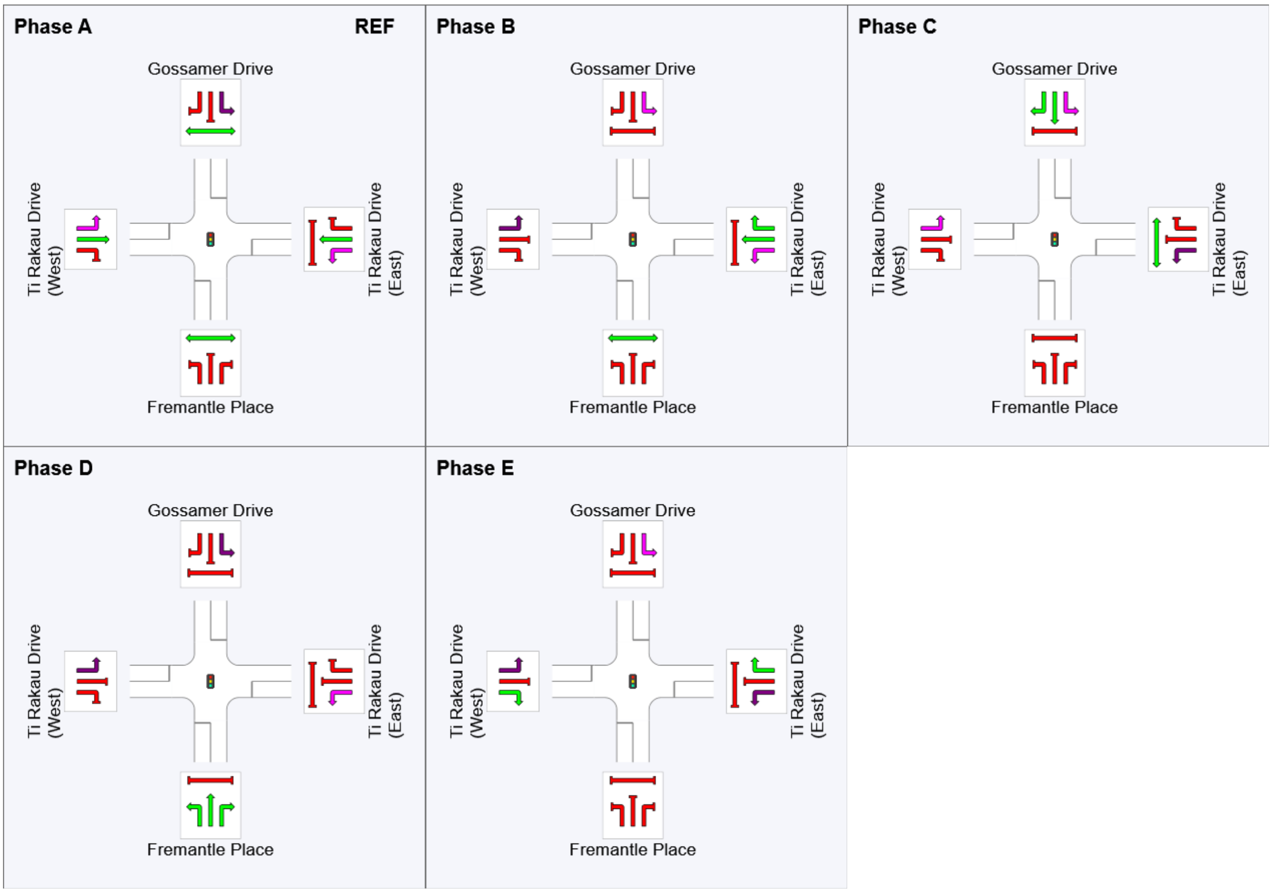
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	63	102	131	143
Green Time (sec)	57	33	23	6	22
Phase Time (sec)	63	39	29	12	28
Phase Split	37%	23%	17%	7%	16%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Friday, 20 January 2023 1:49:14 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 PM.sip9

Appendix E

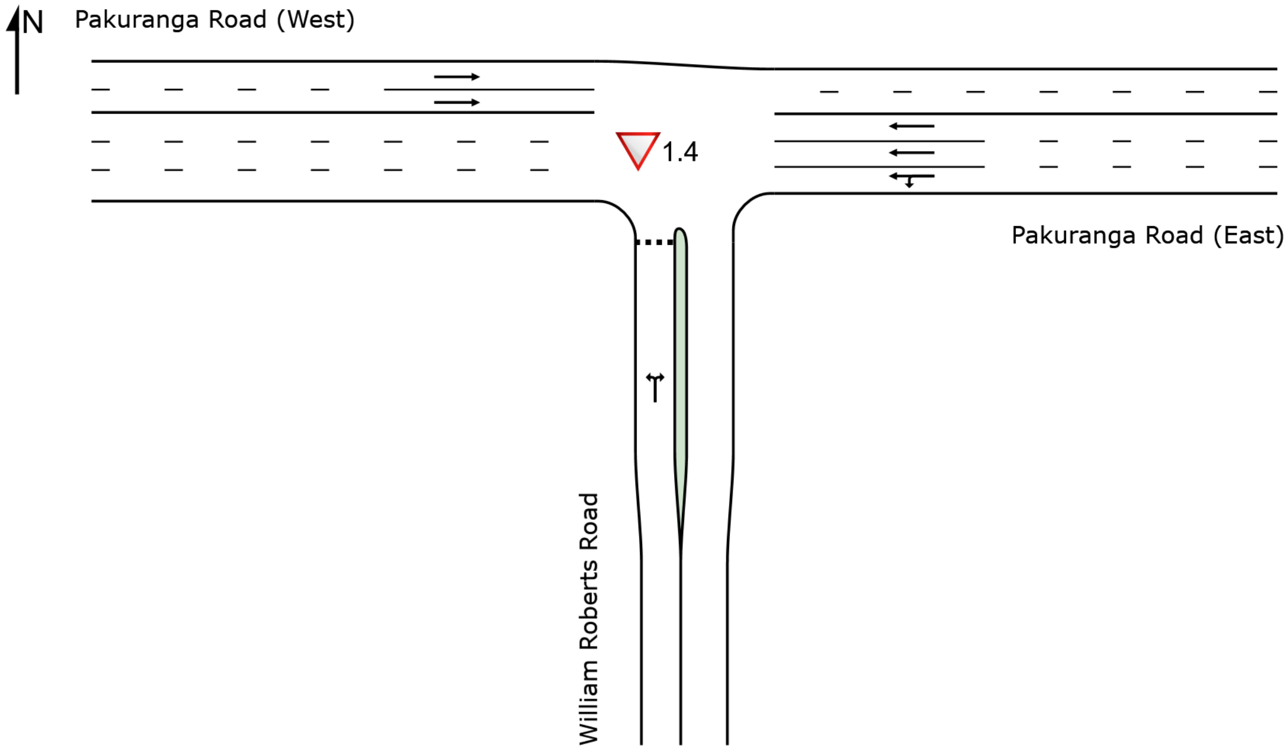
Construction Scenario 1.1 – Lane Performance Summaries

SITE LAYOUT

Site: 1.4 [1.4 William Roberts/ Pakuranga Rd - PD (Site Folder: General)]

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

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

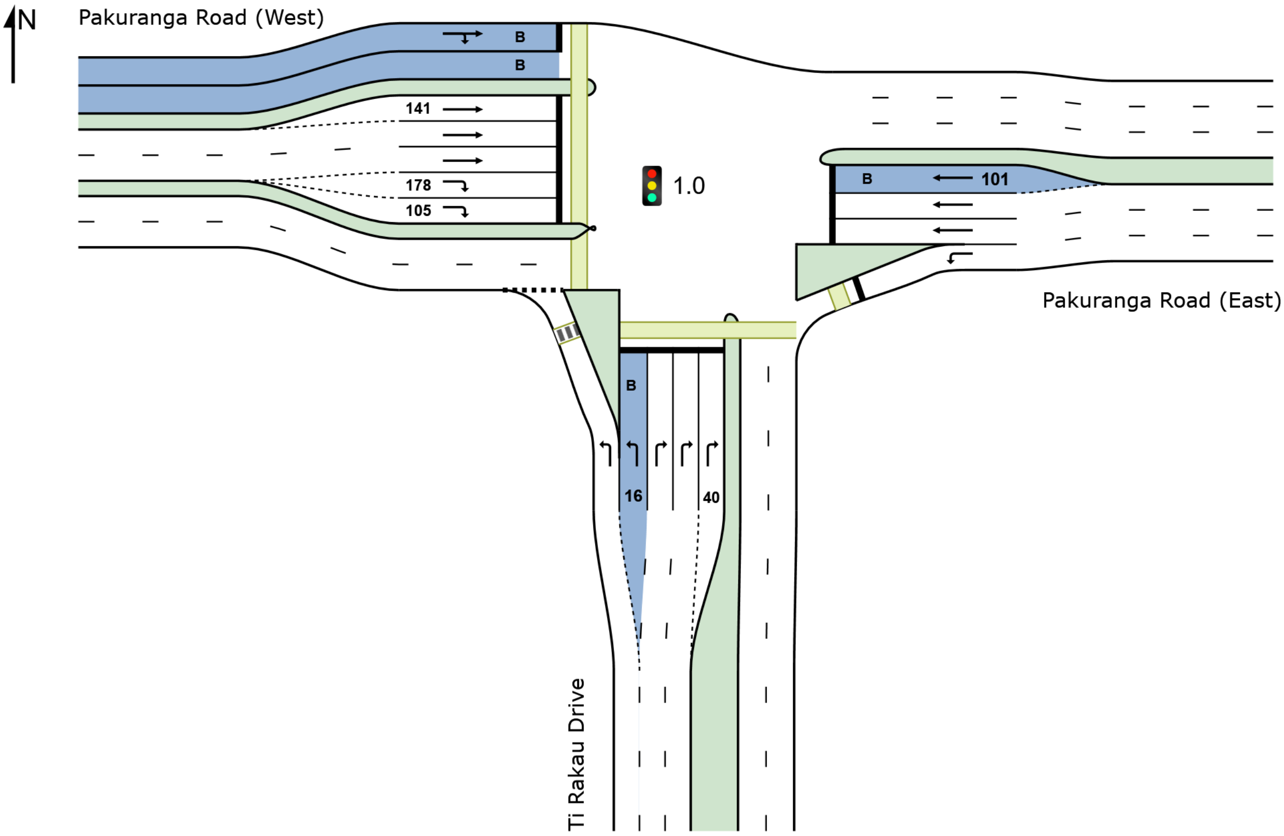


SITE LAYOUT

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Rd (Site Folder: General)]

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

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



LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Rd (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 90 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	575	8.7	519	8.7	916[1]	0.567	100	13.0	LOS B	12.1	91.1	Full	130	0.0	0.0
Lane 2 (B)	17	100.0	17	100.0	113	0.151	100	50.7	LOS D	0.8	9.8	Short	16	0.0	NA
Lane 3	210	4.6	190	4.6	338	0.561	100	41.3	LOS D	7.8	56.7	Full	130	0.0	0.0
Lane 4	210	4.6	190	4.6	338	0.561	100	41.3	LOS D	7.8	56.7	Full	130	0.0	0.0
Lane 5	210	4.6	190	4.6	338	0.561	100	41.3	LOS D	7.8	56.7	Short	40	0.0	NA
Approach	1223	7.8	1105[N1]	8.0		0.567		28.2	LOS C	12.1	91.1				
East: Pakuranga Road (East)															
Lane 1	914	4.5	861	4.6	1093	0.788	100	20.3	LOS C	25.4[N4]	184.4[N4]	Full	113	0.0	50.0
Lane 2	630	5.7	594	5.8	664	0.894	100	42.2	LOS D	25.1[N4]	184.4[N4]	Full	113	0.0	50.0
Lane 3	623	5.7	587	5.8	657[1]	0.894	100	42.2	LOS D	25.1[N4]	184.4[N4]	Full	113	0.0	50.0
Lane 4 (B)	25	100.0	25	100.0	80	0.314	100	49.2	LOS D	1.2	15.1	Short	101	0.0	NA
Approach	2192	6.3	2067[N1]	6.5		0.894		33.2	LOS C	25.4	184.4				
West: Pakuranga Road (West)															
Lane 1 (B)	24	100.0	24	100.0	75	0.318	100	47.8	LOS D	1.1	13.8	Full	388	0.0	0.0
Lane 2	306	8.8	306	8.8	754	0.406	100	20.2	LOS C	9.5	71.6	Short	141	0.0	NA
Lane 3	306	8.8	306	8.8	754	0.406	100	20.2	LOS C	9.5	71.6	Full	388	0.0	0.0
Lane 4	306	8.8	306	8.8	754	0.406	100	20.2	LOS C	9.5	71.6	Full	388	0.0	0.0
Lane 5	176	15.4	176	15.4	203	0.862	100	57.4	LOS E	8.9	70.3	Short	178	0.0	NA
Lane 6	176	15.4	176	15.4	203	0.862	100	57.4	LOS E	8.9	70.3	Short	105	0.0	NA
Approach	1293	12.3	1293	12.3		0.862		30.8	LOS C	9.5	71.6				
Intersection	4708	8.3	4465[N1]	8.8		0.894		31.2	LOS C	25.4	184.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	519	-	519	8.7	916[1]	0.567	100	NA	NA
Lane 2	17	-	17	100.0	113	0.151	100	0.0	1
Lane 3	-	190	190	4.6	338	0.561	100	NA	NA

Lane 4	-	190	190	4.6	338	0.561	100	NA	NA
Lane 5	-	190	190	4.6	338	0.561	100	36.9	4
Approach	536	569	1105	8.0		0.567			

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	861	-	861	4.6	1093	0.788	100	NA	NA
Lane 2	-	594	594	5.8	664	0.894	100	NA	NA
Lane 3	-	587	587	5.8	657 [1]	0.894	100	NA	NA
Lane 4	-	25	25	100.0	80	0.314	100	0.0	3
Approach	861	1206	2067	6.5		0.894			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	15	24	100.0	75	0.318	100	NA	NA
Lane 2	306	-	306	8.8	754	0.406	100	0.0	3
Lane 3	306	-	306	8.8	754	0.406	100	NA	NA
Lane 4	306	-	306	8.8	754	0.406	100	NA	NA
Lane 5	-	176	176	15.4	203	0.862	100	0.0	4
Lane 6	-	176	176	15.4	203	0.862	100	0.0	5
Approach	927	366	1293	12.3		0.862			

	Total	%HV	Deg.Satn (v/c)
Intersection	4465	8.8	0.894

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

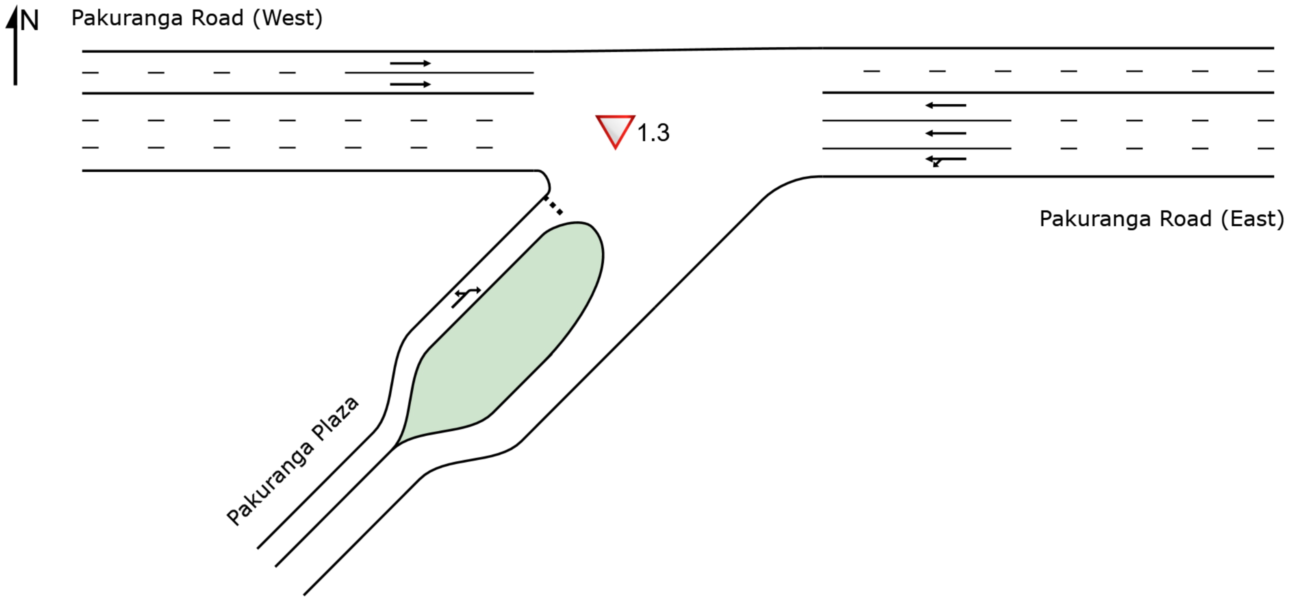
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

SITE LAYOUT

Site: 1.3 [1.3 Mall/ Pakuranga Rd - PD (Site Folder: General)]

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

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



LANE SUMMARY

Site: 1.3 [1.3 Mall/ Pakuranga Rd - PD (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	736	8.3	703	8.1	1855	0.379	100	0.7	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 2	752	5.2	718	5.3	1895	0.379	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 3	752	5.2	718	5.3	1895	0.379	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Approach	2239	6.2	2140 [N1]	6.2		0.379		0.2	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	775	7.6	762	7.7	1790	0.426	100	0.0	LOS A	0.0	0.0	Full	108	0.0	0.0
Lane 2	770	7.6	758	7.7	1780	0.426	100	0.0	LOS A	0.0	0.0	Full	108	0.0	0.0
Approach	1545	7.6	1519 [N1]	7.7		0.426		0.0	NA	0.0	0.0				
SouthWest: Pakuranga Plaza															
Lane 1	24	4.2	24	4.2	14	1.686	100	977.2	LOS F	9.8	71.1	Full	196	0.0	0.0
Approach	24	4.2	24	4.2		1.686		977.2	LOS F	9.8	71.1				
Intersection	3808	6.7	3683 [N1]	7.0		1.686		6.5	NA	9.8	71.1				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	80	623	703	8.1	1855	0.379	100	NA	NA
Lane 2	-	718	718	5.3	1895	0.379	100	NA	NA
Lane 3	-	718	718	5.3	1895	0.379	100	NA	NA
Approach	80	2060	2140	6.2		0.379			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	762	762	7.7	1790	0.426	100	NA	NA
Lane 2	758	758	7.7	1780	0.426	100	NA	NA
Approach	1519	1519	7.7		0.426			

SouthWest: Pakuranga Plaza

Mov. From SW To Exit:	L3 W	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	10	24	4.2	14	1.686	100	NA	NA
Approach	14	10	24	4.2		1.686			

	Total	%HV	Deg.Satn (v/c)
Intersection	3683	7.0	1.686

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 1.4 [1.4 William Roberts/ Pakuranga Rd - PD (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	ARRIVAL FLOWS [Total veh/h	ARRIVAL FLOWS HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	95% BACK OF QUEUE Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road															
Lane 1	158	9.5	156	9.6	22	7.229	100	5713.5	LOS F	80.1 N4	606.4 N4	Full	244	0.0	49.9
Approach	158	9.5	156 N1	9.6		7.229		5713.5	LOS F	80.1	606.4				
East: Pakuranga Road (East)															
Lane 1	773	6.2	773	6.2	1809	0.427	100	1.6	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 2	780	6.2	780	6.2	1825	0.427	100	0.1	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 3	788	6.2	788	6.2	1845	0.427	100	0.1	LOS A	0.0	0.0	Full	184	0.0	0.0
Approach	2340	6.2	2340	6.2		0.427		0.6	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	736	7.2	722	7.3	1843	0.392	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 2	712	7.2	699	7.3	1785	0.392	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Approach	1448	7.2	1421 N1	7.3		0.392		0.0	NA	0.0	0.0				
Intersection	3946	6.7	3917 N1	6.8		7.229		227.8	NA	80.1	606.4				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: William Roberts Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	113	42	156	9.6	22	7.229	100	NA	NA
Approach	113	42	156	9.6		7.229			

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	209	564	773	6.2	1809	0.427	100	NA	NA
Lane 2	-	780	780	6.2	1825	0.427	100	NA	NA
Lane 3	-	788	788	6.2	1845	0.427	100	NA	NA
Approach	209	2131	2340	6.2		0.427			

West: Pakuranga Road (West)

Mov.	T1	Total	%HV	Deg.	Lane	Prob.	Ov.

From W To Exit:	E			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	722	722	7.3	1843	0.392	100	NA	NA
Lane 2	699	699	7.3	1785	0.392	100	NA	NA
Approach	1421	1421	7.3		0.392			

	Total	%HV	Deg.Satn (v/c)
Intersection	3917	6.8	7.229

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

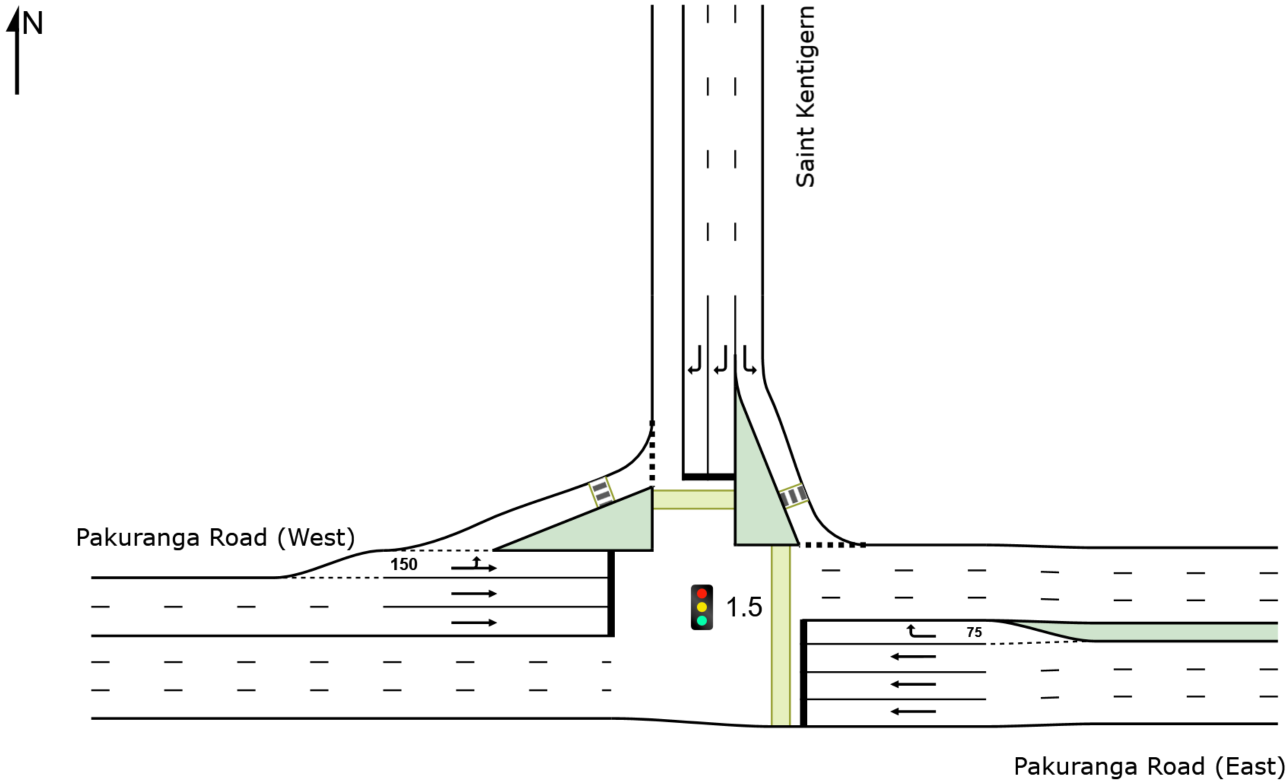
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: William Roberts Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SITE LAYOUT

Site: 1.5 [1.5 Saint Kentigern/ Pakuranga Rd - PD (Site Folder: General)]

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

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



LANE SUMMARY

Site: 1.5 [1.5 Saint Kentigern/ Pakuranga Rd - PD (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	791	6.3	791	6.3	908	0.870	100	25.7	LOS C	28.9	212.9	Full	87	0.0	89.1
Lane 2	791	6.3	791	6.3	908	0.870	100	25.7	LOS C	28.9	212.9	Full	87	0.0	89.1
Lane 3	757	6.3	757	6.3	870 [1]	0.870	100	25.5	LOS C	27.0	199.5	Full	87	0.0	82.7
Lane 4	95	5.3	95	5.3	154	0.615	100	40.8	LOS D	3.3	24.2	Short	75	0.0	NA
Approach	2433	6.2	2433	6.2		0.870		26.2	LOS C	28.9	212.9				
North: Saint Kentigern															
Lane 1	17	0.0	17	0.0	958	0.018	100	4.6	LOS A	0.2	1.3	Full	96	0.0	0.0
Lane 2	17	9.1	17	9.1	564	0.030	100	16.4	LOS B	0.4	2.8	Full	96	0.0	0.0
Lane 3	16	9.1	16	9.1	555	0.030	100	16.5	LOS B	0.4	2.7	Full	96	0.0	0.0
Approach	50	6.0	50	6.0		0.030		12.4	LOS B	0.4	2.8				
West: Pakuranga Road (West)															
Lane 1	482	7.0	461	6.8	556	0.828	100	25.5	LOS C	14.3	106.1	Short	150	0.0	NA
Lane 2	502	7.8	480	7.6	579	0.828	100	29.1	LOS C	17.0	126.7	Full	184	0.0	0.0
Lane 3	502	7.8	480	7.6	579	0.828	100	29.1	LOS C	17.0	126.7	Full	184	0.0	0.0
Approach	1485	7.5	1421 [N1]	7.4		0.828		27.9	LOS C	17.0	126.7				
Intersection	3968	6.7	3904 [N1]	6.8		0.870		26.6	LOS C	28.9	212.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	791	-	791	6.3	908	0.870	100	NA	NA
Lane 2	791	-	791	6.3	908	0.870	100	NA	NA
Lane 3	757	-	757	6.3	870 [1]	0.870	100	NA	NA
Lane 4	-	95	95	5.3	154	0.615	100	0.0	3
Approach	2338	95	2433	6.2		0.870			

North: Saint Kentigern

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	17	-	17	0.0	958	0.018	100	NA	NA
Lane 2	-	17	17	9.1	564	0.030	100	NA	NA
Lane 3	-	16	16	9.1	555	0.030	100	NA	NA
Approach	17	33	50	6.0		0.030			

West: Pakuranga Road (West)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	108	353	461	6.8	556	0.828	100	0.0	2
Lane 2	-	480	480	7.6	579	0.828	100	NA	NA
Lane 3	-	480	480	7.6	579	0.828	100	NA	NA
Approach	108	1313	1421	7.4		0.828			

	Total	%HV	Deg.Satn (v/c)
Intersection	3904	6.8	0.870

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

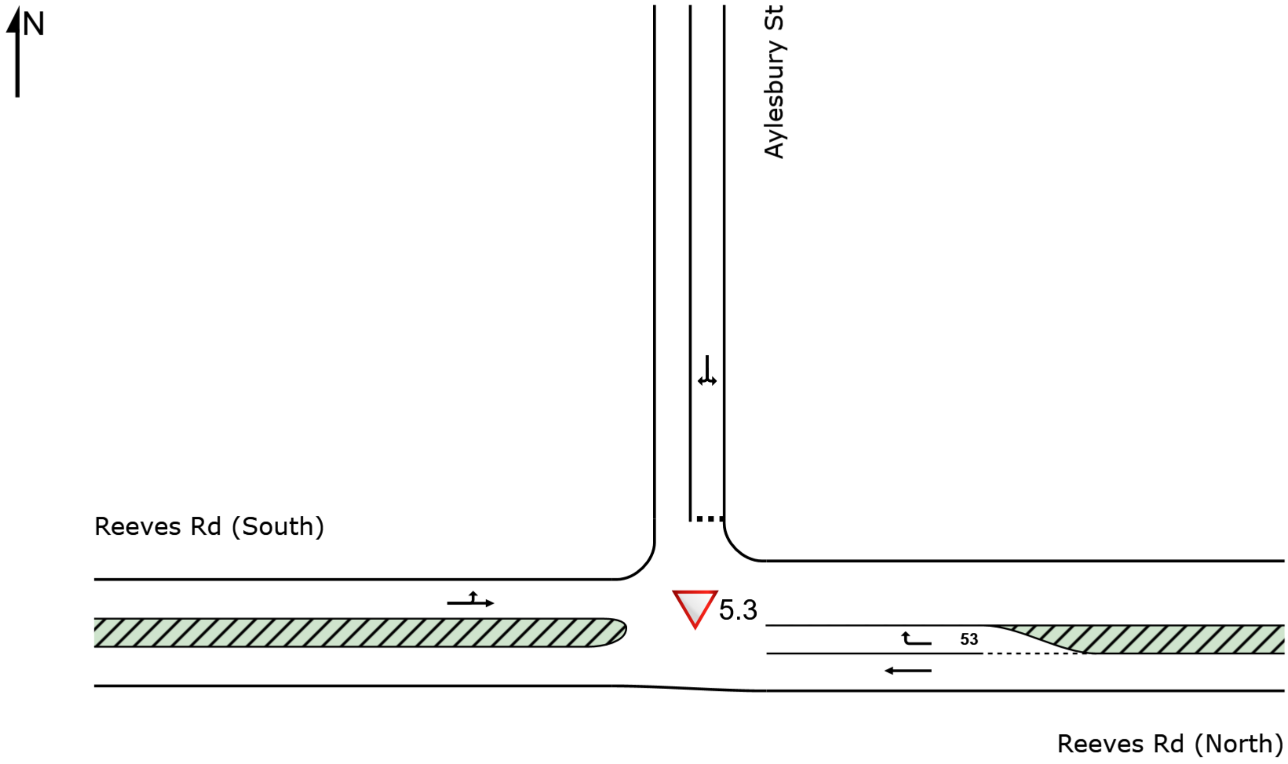
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
North Exit: Saint Kentigern Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

SITE LAYOUT

Site: 5.3 [5.3 Reeves Rd/ Aylesbury St (Site Folder: General)]

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

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



LANE SUMMARY

Site: 5.3 [5.3 Reeves Rd/ Aylesbury St (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Reeves Rd (North)															
Lane 1	497	7.4	497	7.4	1913	0.260	100	0.0	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 2	26	3.8	26	3.8	1391	0.019	100	5.1	LOS A	0.1	0.6	Short	53	0.0	NA
Approach	523	7.3	523	7.3		0.260		0.3	NA	0.1	0.6				
North: Aylesbury St															
Lane 1	20	0.0	20	0.0	646	0.031	100	3.9	LOS A	0.1	0.8	Full	193	0.0	0.0
Approach	20	0.0	20	0.0		0.031		3.9	LOS A	0.1	0.8				
West: Reeves Rd (South)															
Lane 1	258	10.1	242	10.3	1902	0.127	100	0.4	LOS A	0.0	0.0	Full	60	0.0	0.0
Approach	258	10.1	242 N1	10.3		0.127		0.4	NA	0.0	0.0				
Intersection	801	8.0	785 N1	8.1		0.260		0.4	NA	0.1	0.8				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

East: Reeves Rd (North)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	497	-	497	7.4	1913	0.260	100	NA	NA
Lane 2	-	26	26	3.8	1391	0.019	100	0.0	1
Approach	497	26	523	7.3		0.260			

North: Aylesbury St

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	10	20	0.0	646	0.031	100	NA	NA
Approach	10	10	20	0.0		0.031			

West: Reeves Rd (South)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	24	218	242	10.3	1902	0.127	100	NA	NA

Approach	24	218	242	10.3	0.127
	Total	%HV	Deg.Satn (v/c)		
Intersection	785	8.1	0.260		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

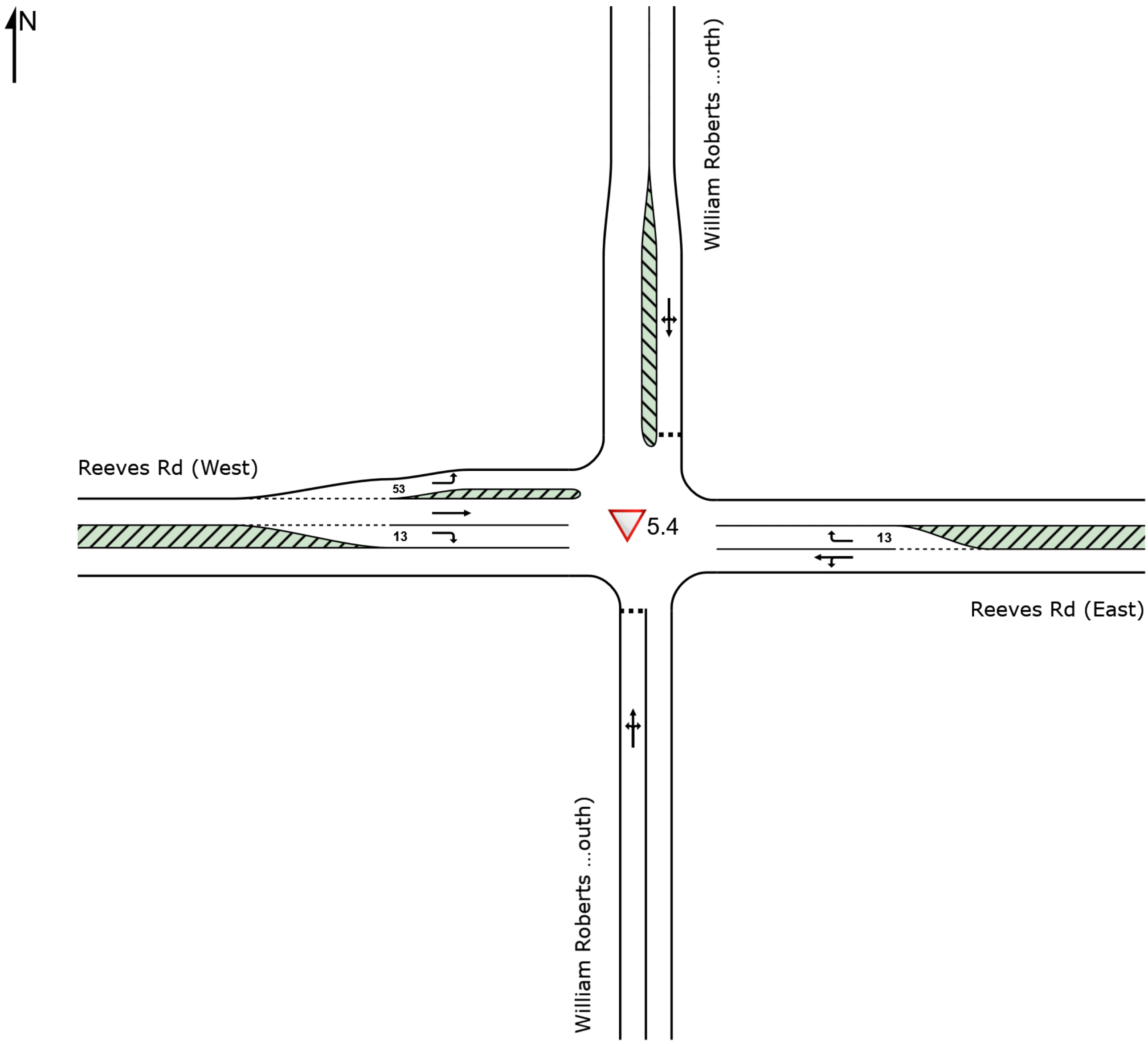
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Reeves Rd (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Aylesbury St Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Reeves Rd (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 5.4 [5.4 Reeves Rd / William Roberts Rd (Site Folder: General)]

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

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



LANE SUMMARY

Site: 5.4 [5.4 Reeves Rd / William Roberts Rd (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: William Roberts Rd (South)															
Lane 1	35	5.7	35	5.7	276	0.127	100	12.4	LOS B	1.4 N5	10.0 N5	Full	170	-23.9 N7	17.2
Approach	35	5.7	35	5.7		0.127		12.4	LOS B	1.4	10.0				
East: Reeves Rd (East)															
Lane 1	337	6.8	337	6.8	1818	0.185	100	0.2	LOS A	0.0	0.0	Full	266	0.0	0.0
Lane 2	113	12.4	113	12.4	1074	0.105	100	5.8	LOS A	14.0 N5	108.3 N5	Short	13	0.0	NA
Approach	450	8.2	450	8.2		0.185		1.6	NA	14.0	108.3				
North: William Roberts Rd (North)															
Lane 1	306	8.2	306	8.2	346	0.885	100	41.8	LOS E	11.6	86.9	Full	244	0.0	0.0
Approach	306	8.2	306	8.2		0.885		41.8	LOS E	11.6	86.9				
West: Reeves Rd (West)															
Lane 1	38	7.9	36	8.0	1683	0.021	100	4.1	LOS A	4.4 N5	33.2 N5	Short	53	0.0	NA
Lane 2	189	11.1	178	11.4	1819	0.098	100	0.0	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 3	13	0.0	12	0.0	1291	0.009	100	5.2	LOS A	0.0	0.3	Short	13	0.0	NA
Approach	240	10.0	226 N1	10.2		0.098		0.9	NA	4.4	33.2				
Intersection	1031	8.5	1017 N1	8.6		0.885		13.9	NA	14.0	108.3				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: William Roberts Rd (South)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	11	10	35	5.7	276	0.127	100	NA	NA
Approach	14	11	10	35	5.7		0.127			

East: Reeves Rd (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	327	-	337	6.8	1818	0.185	100	NA	NA

Mov. From N To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 2	-	-	113	113	12.4	1074	0.105	100	100.0	1
Approach	10	327	113	450	8.2		0.185			
North: William Roberts Rd (North)										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	111	10	185	306	8.2	346	0.885	100	NA	NA
Approach	111	10	185	306	8.2		0.885			
West: Reeves Rd (West)										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	36	-	-	36	8.0	1683	0.021	100	33.1	2
Lane 2	-	178	-	178	11.4	1819	0.098	100	NA	NA
Lane 3	-	-	12	12	0.0	1291	0.009	100	0.0	2
Approach	36	178	12	226	10.2		0.098			

	Total	%HV	Deg.Satn (v/c)
Intersection	1017	8.6	0.885

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

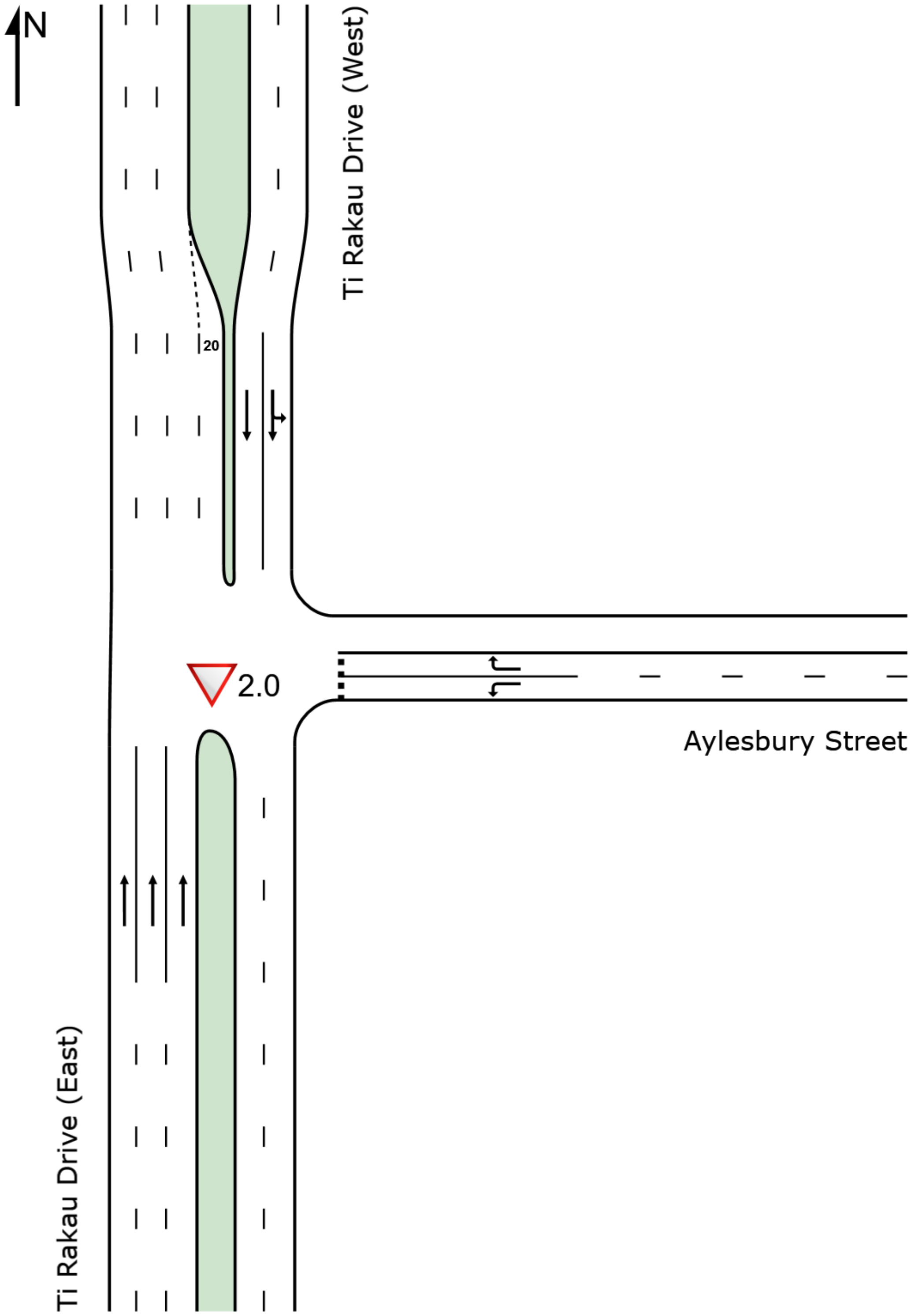
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: William Roberts Rd (South) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: Reeves Rd (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: William Roberts Rd (North) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Reeves Rd (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

▽ Site: 2.0 [2.0 Aylesbury St North/Ti Rakau Dr (Site Folder: General)]

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

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



LANE SUMMARY

Site: 2.0 [2.0 Aylesbury St North/Ti Rakau Dr (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive (East)															
Lane 1	409	7.9	369	8.1	1785	0.207	100	0.0	LOS A	0.0	0.0	Full	63	0.0	0.0
Lane 2	416	7.9	375	8.1	1814	0.207	100	0.0	LOS A	0.0	0.0	Full	63	0.0	0.0
Lane 3	418	7.9	377	8.1	1824	0.207	100	0.0	LOS A	0.0	0.0	Full	63	0.0	0.0
Approach	1243	7.9	1122 [N1]	8.1		0.207		0.0	NA	0.0	0.0				
East: Aylesbury Street															
Lane 1	10	0.0	10	0.0	723	0.014	100	3.2	LOS A	0.1	0.4	Full	28	0.0	0.0
Lane 2	11	9.1	11	9.1	9	1.166	100	823.7	LOS F	4.2	31.8	Full	28	0.0	8.8
Approach	21	4.8	21	4.8		1.166		433.0	LOS F	4.2	31.8				
North: Ti Rakau Drive (West)															
Lane 1	644	8.6	617	8.9	1794	0.344	100	0.1	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	644	8.6	618	8.8	1796	0.344	100	0.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	1288	8.6	1235 [N1]	8.8		0.344		0.1	NA	0.0	0.0				
Intersection	2552	8.2	2378 [N1]	8.8		1.166		3.9	NA	4.2	31.8				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	369	369	8.1	1785	0.207	100	NA	NA
Lane 2	375	375	8.1	1814	0.207	100	NA	NA
Lane 3	377	377	8.1	1824	0.207	100	NA	NA
Approach	1122	1122	8.1		0.207			

East: Aylesbury Street

Mov. From E To Exit:	L2 S	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	-	10	0.0	723	0.014	100	NA	NA
Lane 2	-	11	11	9.1	9	1.166	100	NA	NA
Approach	10	11	21	4.8		1.166			

North: Ti Rakau Drive (West)									
Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	607	617	8.9	1794	0.344	100	NA	NA
Lane 2	-	618	618	8.8	1796	0.344	100	NA	NA
Approach	11	1225	1235	8.8		0.344			

	Total	%HV	Deg.Satn (v/c)
Intersection	2378	8.8	1.166

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

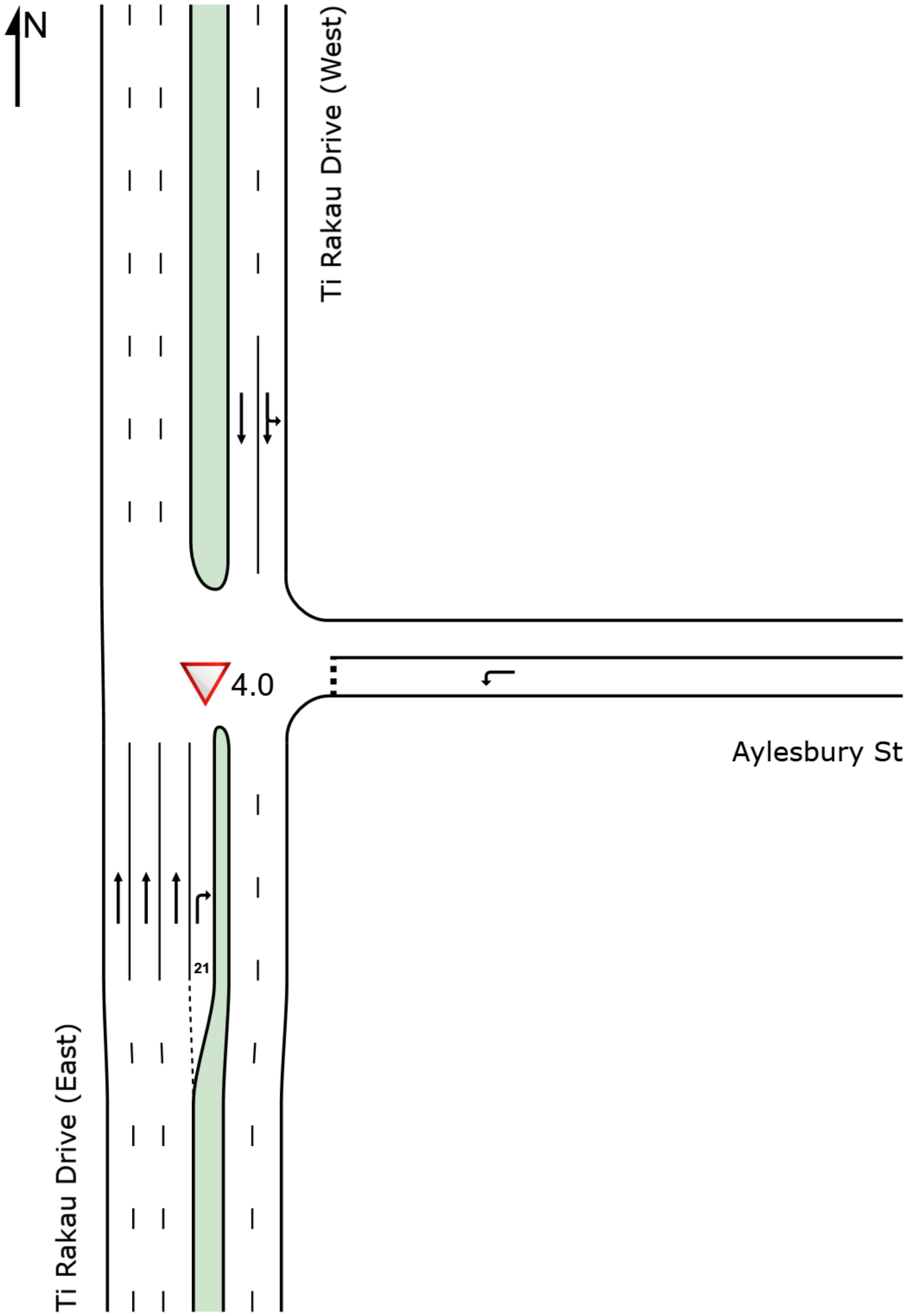
Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Aylesbury Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ti Rakau Drive (West) Merge Type: **Priority**												
Exit Short Lane	4	20	0.0	377	393	3.00	2.00	9	1399	0.007	0.6	0.7
Merge Lane	3	-	100.0	Merge Lane is not Opposed				377	1800	0.210	0.0	0.0

SITE LAYOUT

▽ Site: 4.0 [4.0 Aylesbury St South/ Ti Rakau Dr (Site Folder: General)]

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

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



LANE SUMMARY

▽ Site: 4.0 [4.0 Aylesbury St South/ Ti Rakau Dr (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Ti Rakau Drive (East)															
Lane 1	411	7.9	382	7.9	1778	0.215	100	0.0	LOS A	0.0	0.0	Full	84	0.0	0.0
Lane 2	420	7.9	391	7.9	1816	0.215	100	0.0	LOS A	0.0	0.0	Full	84	0.0	0.0
Lane 3	409	7.9	380	7.9	1768	0.215	100	0.0	LOS A	0.0	0.0	Full	84	0.0	0.0
Lane 4	14	7.1	13	7.1	255	0.051	100	18.0	LOS C	0.1	1.0	Short	21	0.0	NA
Approach	1253	7.9	1166[N1]	7.9		0.215		0.2	NA	0.1	1.0				
East: Aylesbury St															
Lane 1	10	0.0	10	0.0	327	0.031	100	3.4	LOS A	0.1[N5]	0.7[N5]	Full	93	-50.0[N3]	0.0
Approach	10	0.0	10	0.0		0.031		3.4	LOS A	0.1	0.7				
North: Ti Rakau Drive (West)															
Lane 1	655	8.5	608	8.8	1785	0.341	100	0.1	LOS A	6.1[N5]	46.0[N5]	Full	45	0.0	11.4
Lane 2	661	8.7	614	9.0	1804	0.341	100	0.0	LOS A	9.7[N6]	73.4[N6]	Full	45	0.0	50.0[N6]
Approach	1316	8.6	1222[N1]	8.9		0.341		0.0	NA	9.7	73.4				
Intersection	2579	8.2	2399[N1]	8.8		0.341		0.1	NA	9.7	73.4				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	382	-	382	7.9	1778	0.215	100	NA	NA
Lane 2	391	-	391	7.9	1816	0.215	100	NA	NA
Lane 3	380	-	380	7.9	1768	0.215	100	NA	NA
Lane 4	-	13	13	7.1	255	0.051	100	0.0	3
Approach	1153	13	1166	7.9		0.215			

East: Aylesbury St

Mov. From E	L2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S				veh/h	v/c	%	%	No.
Lane 1	10	10	0.0		327	0.031	100	NA	NA
Approach	10	10	0.0			0.031			
North: Ti Rakau Drive (West)									
Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	599	608	8.8	1785	0.341	100	NA	NA
Lane 2	-	614	614	9.0	1804	0.341	100	NA	NA
Approach	9	1213	1222	8.9		0.341			

	Total	%HV	Deg.Satn (v/c)
Intersection	2399	8.8	0.341

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

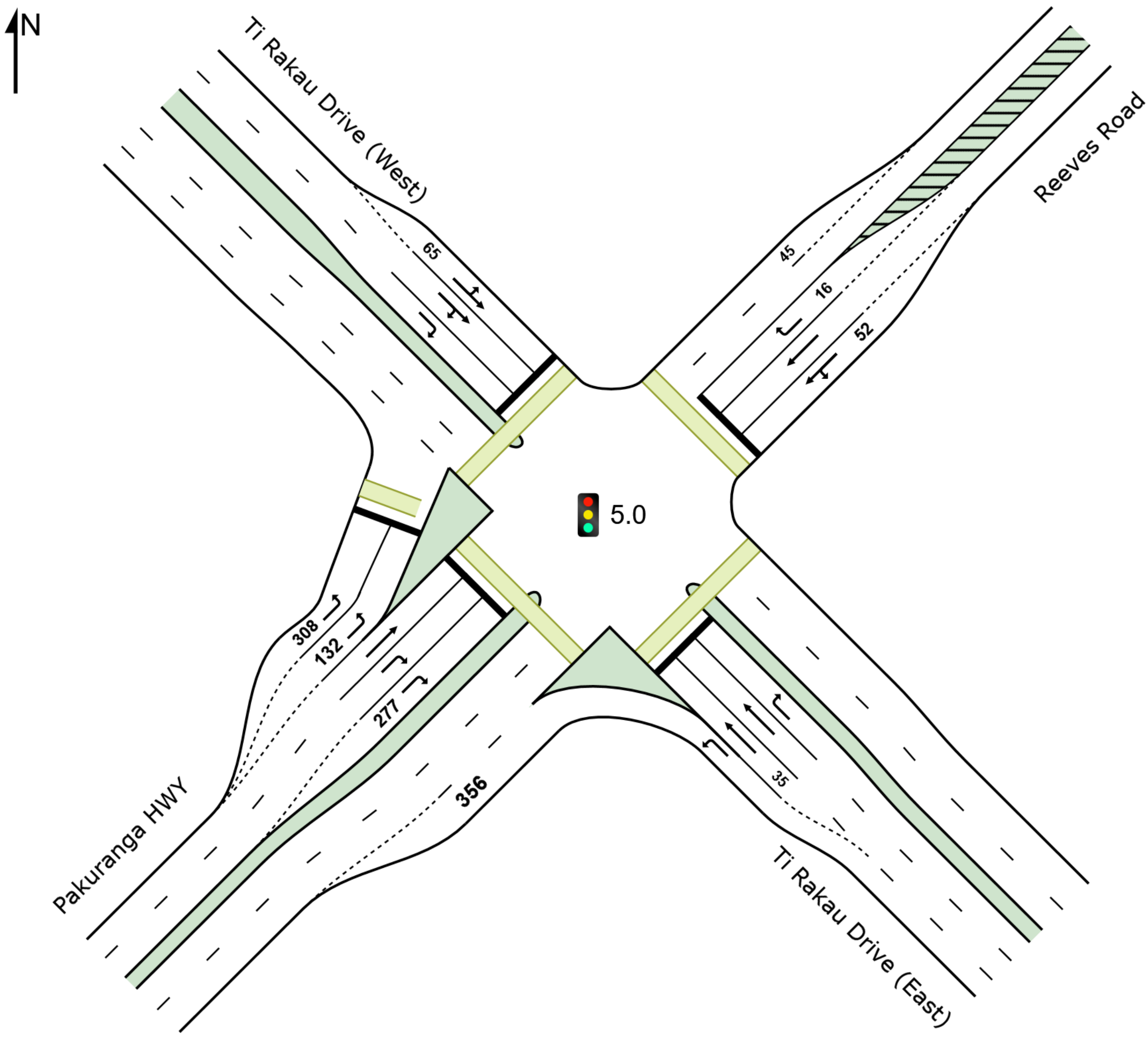
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Aylesbury St Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SITE LAYOUT

Site: 5.0 [5.0 Pakuranga HWY/ Reeves Rd (Site Folder: General)]

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

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



LANE SUMMARY

Site: 5.0 [5.0 Pakuranga HWY/ Reeves Rd (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 110 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	1533	9.3	1210	9.6	1684	0.718	100	63.1	LOS E	0.0	0.0	Full	91	0.0	0.0
Lane 2	176	12.6	140	13.8	214[1]	0.654	100	46.0	LOS D	7.0	55.0	Short	35	0.0	NA
Lane 3	251	12.6	200	13.8	306	0.654	100	47.2	LOS D	10.3	81.0	Full	91	0.0	0.0
Lane 4	102	5.9	80	6.1	303	0.266	100	47.9	LOS D	3.8	28.1	Full	91	0.0	0.0
Approach	2062	9.8	1630[N1]	10.3		0.718		58.9	LOS E	10.3	81.0				
NorthEast: Reeves Road															
Lane 1	233	8.8	233	8.8	272[1]	0.855	100	58.9	LOS E	13.8	104.1	Short	52	0.0	NA
Lane 2	209	7.0	209	7.0	245[1]	0.855	100	57.8	LOS E	12.3	91.0	Full	72	0.0	38.7[8]
Lane 3	31	9.7	31	9.7	94	0.331	100	62.6	LOS E	1.7	13.1	Short	16	0.0	NA
Approach	473	8.0	473	8.0		0.855		58.7	LOS E	13.8	104.1				
NorthWest: Ti Rakau Drive (West)															
Lane 1	305	20.7	285	21.3	543	0.525	59[5]	33.2	LOS C	12.5	103.5	Short	65	0.0	NA
Lane 2	466	4.9	433	5.1	489[1]	0.886	100	53.6	LOS D	18.8[N4]	137.1[N4]	Full	84	0.0	50.0
Lane 3	548	4.9	509	5.1	574	0.886	100	54.3	LOS D	18.8[N4]	137.1[N4]	Full	84	0.0	50.0
Approach	1319	8.6	1226[N1]	8.9		0.886		49.1	LOS D	18.8	137.1				
SouthWest: Pakuranga HWY															
Lane 1	398	5.2	398	5.2	1091	0.365	100	19.1	LOS B	10.6	77.4	Short	308	0.0	NA
Lane 2	405	5.2	405	5.2	1108	0.365	100	19.1	LOS B	10.7	78.6	Short	132	0.0	NA
Lane 3	165	10.3	165	10.3	409	0.404	100	43.0	LOS D	7.6	58.1	Full	1650	0.0	0.0
Lane 4	208	8.6	208	8.6	237	0.878	100	69.1	LOS E	12.8	95.9	Full	1650	0.0	0.0
Lane 5	211	8.6	211	8.6	240	0.878	100	69.0	LOS E	12.9	96.8	Short	277	0.0	NA
Approach	1387	6.8	1387	6.8		0.878		37.0	LOS D	12.9	96.8				
Intersection	5241	8.5	4716[N1]	9.5		0.886		49.9	LOS D	18.8	137.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
5 Lane under-utilisation found by the program
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.

From SE To Exit:	SW	NW	NE			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	1210	-	-	1210	9.6	1684	0.718	100	NA	NA
Lane 2	-	140	-	140	13.8	214[1]	0.654	100	46.4	1
Lane 3	-	200	-	200	13.8	306	0.654	100	NA	NA
Lane 4	-	-	80	80	6.1	303	0.266	100	NA	NA
Approach	1210	340	80	1630	10.3		0.718			

NorthEast: Reeves Road

Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	55	178	-	233	8.8	272[1]	0.855	100	69.4	2
Lane 2	-	209	-	209	7.0	245[1]	0.855	100	NA	NA
Lane 3	-	-	31	31	9.7	94	0.331	100	0.0	2
Approach	55	387	31	473	8.0		0.855			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	38	247	-	285	21.3	543	0.525	59[5]	47.7	2
Lane 2	-	-	433	433	5.1	489[1]	0.886	100	NA	NA
Lane 3	-	-	509	509	5.1	574	0.886	100	NA	NA
Approach	38	247	941	1226	8.9		0.886			

SouthWest: Pakuranga HWY

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	398	-	-	398	5.2	1091	0.365	100	0.0	3
Lane 2	405	-	-	405	5.2	1108	0.365	100	0.0	3
Lane 3	-	165	-	165	10.3	409	0.404	100	NA	NA
Lane 4	-	-	208	208	8.6	237	0.878	100	NA	NA
Lane 5	-	-	211	211	8.6	240	0.878	100	0.0	4
Approach	803	165	419	1387	6.8		0.878			

	Total	%HV	Deg.Satn (v/c)
Intersection	4716	9.5	0.886

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

5 Lane under-utilisation found by the program

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthEast Exit: Reeves Road Merge Type: **Priority**												
Exit Short Lane	1	45	0.0	163	170	3.00	2.00	121	1629	0.074	0.2	0.3
Merge Lane	2	-	100.0	Merge Lane is not Opposed				163	1800	0.090	0.0	0.0

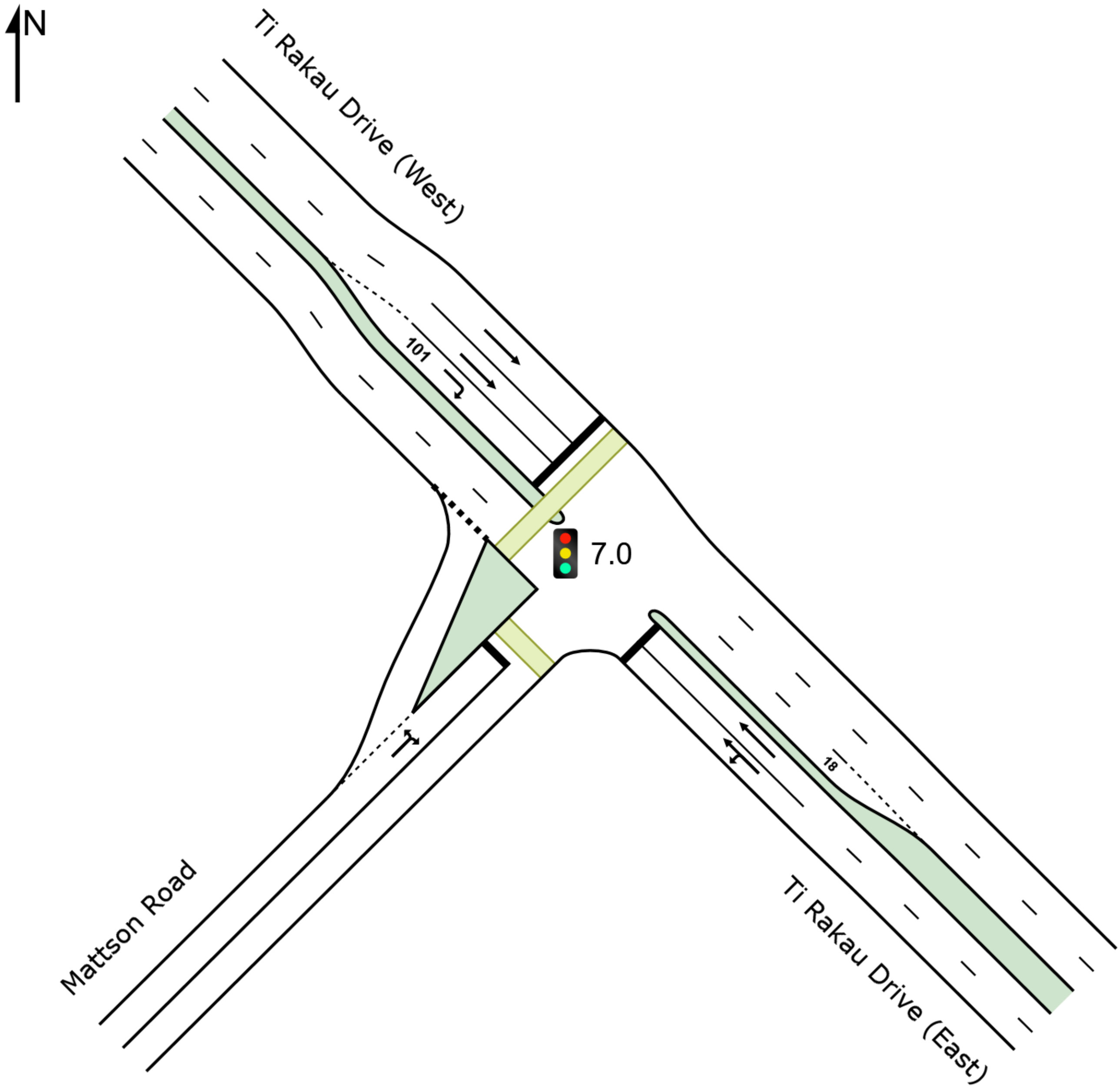
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Pakuranga HWY Merge Type: **Priority**												
Exit Short Lane	1	356	0.0	611	628	3.00	2.00	1210	1151	1.050	1.2	58.6
Merge Lane	2	-	100.0	Merge Lane is not Opposed				611	1800	0.339	0.0	0.0

SITE LAYOUT

Site: 7.0 [7.0 Mattson Rd/ Ti Rakau Dr (Site Folder: General)]

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

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



LANE SUMMARY

Site: 7.0 [7.0 Mattson Rd/ Ti Rakau Dr (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 64 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	972	10.1	748	10.8	845	0.885	100	28.0	LOS C	28.0	213.9	Full	187	0.0	17.2
Lane 2	978	10.2	752	10.9	850	0.885	100	28.0	LOS C	28.0	214.7	Full	187	0.0	17.5
Approach	1950	10.2	1500 [N1]	10.9		0.885		28.0	LOS C	28.0	214.7				
NorthWest: Ti Rakau Drive (West)															
Lane 1	364	14.0	356	14.1	1244	0.286	100	4.6	LOS A	4.5	35.3	Full	148	0.0	0.0
Lane 2	343	14.0	335	14.1	1169	0.286	100	4.6	LOS A	4.2	33.2	Full	148	0.0	0.0
Lane 3	33	9.1	32	9.1	160	0.201	100	35.7	LOS D	1.0	7.6	Short	101	0.0	NA
Approach	740	13.8	723 [N1]	13.8		0.286		6.0	LOS A	4.5	35.3				
SouthWest: Mattson Road															
Lane 1	97	5.2	97	5.2	452	0.215	100	21.2	LOS C	2.4	17.2	Full	282	0.0	0.0
Approach	97	5.2	97	5.2		0.215		21.2	LOS C	2.4	17.2				
Intersection	2787	10.9	2320 [N1]	13.1		0.885		20.8	LOS C	28.0	214.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	729	748	10.8	845	0.885	100	NA	NA
Lane 2	-	752	752	10.9	850	0.885	100	NA	NA
Approach	19	1481	1500	10.9		0.885			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	356	-	356	14.1	1244	0.286	100	NA	NA
Lane 2	335	-	335	14.1	1169	0.286	100	NA	NA
Lane 3	-	32	32	9.1	160	0.201	100	0.0	2
Approach	691	32	723	13.8		0.286			

SouthWest: Mattson Road

Mov. From SW	L2	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

To Exit:	NW	SE							
Lane 1	37	60	97	5.2	452	0.215	100	NA	NA
Approach	37	60	97	5.2		0.215			

	Total	%HV	Deg.Satn (v/c)
Intersection	2320	13.1	0.885

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

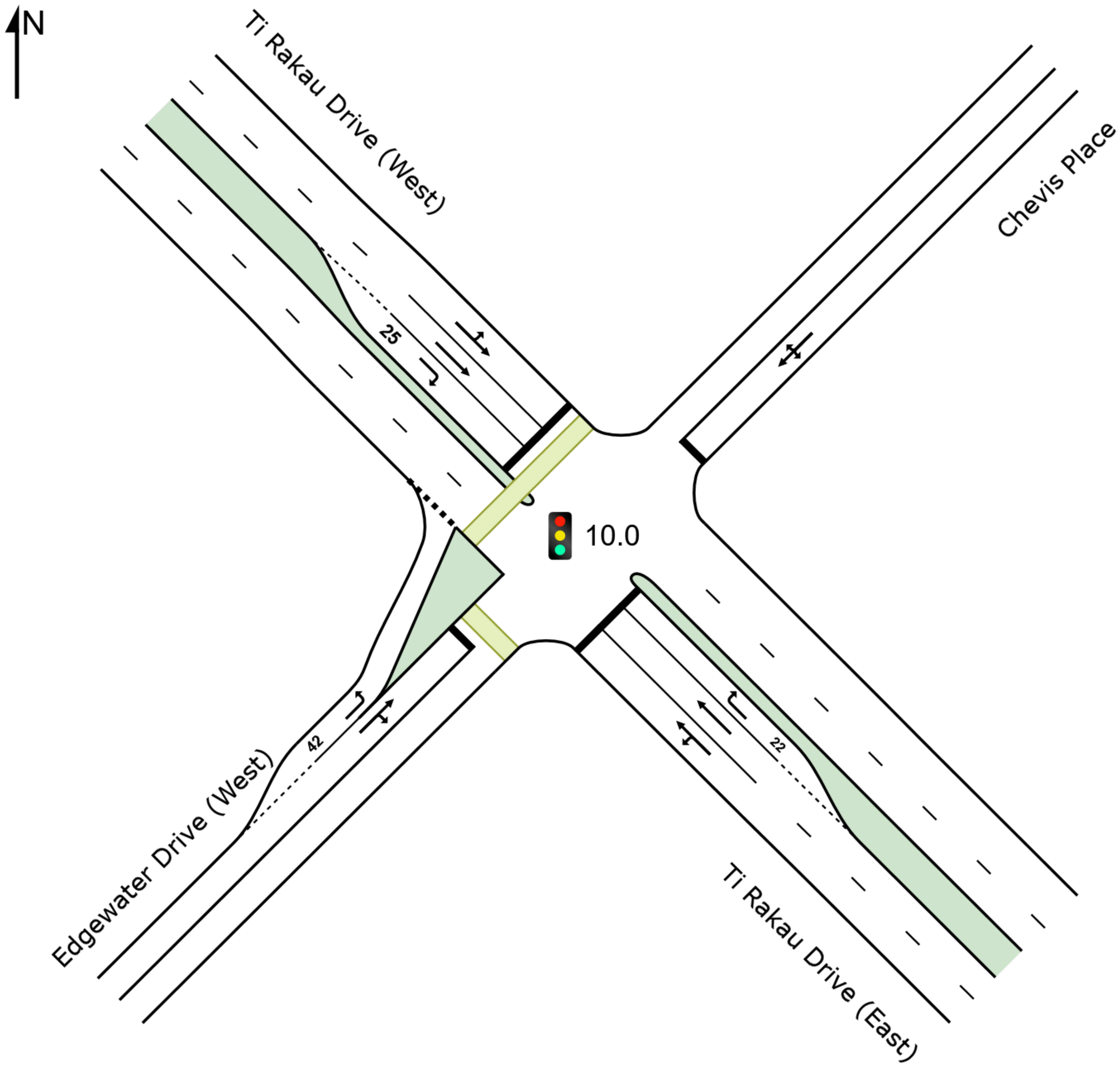
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Priority**												
Exit Short Lane	3	18	0.0	335	358	3.00	2.00	60	1435	0.042	0.5	0.6
Merge Lane	2	-	100.0	Merge Lane is not Opposed				335	1800	0.186	0.0	0.0
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Mattson Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 10.0 [10.0 Edgewater Dr (West) / Chevis Pl (Site Folder: General)]

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

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



LANE SUMMARY

Site: 10.0 [10.0 Edgewater Dr (West) / Chevis Pl (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	803	10.4	769	10.5	895	0.859	100	31.2	LOS C	34.7[N4]	264.4[N4]	Full	162	0.0	50.0
Lane 2	787	11.0	753	11.1	876[1]	0.859	100	31.1	LOS C	34.5[N4]	264.4[N4]	Full	162	0.0	50.0
Lane 3	10	0.0	10	0.0	107	0.090	100	55.1	LOS E	0.5	3.3	Short	22	0.0	NA
Approach	1600	10.6	1531[N][1]	10.7		0.859		31.3	LOS C	34.7	264.4				
NorthEast: Chevis Place															
Lane 1	30	0.0	30	0.0	113	0.265	100	54.6	LOS D	1.5	10.4	Full	138	0.0	0.0
Approach	30	0.0	30	0.0		0.265		54.6	LOS D	1.5	10.4				
NorthWest: Ti Rakau Drive (West)															
Lane 1	445	12.7	379	13.0	903	0.420	100	17.6	LOS B	11.8	91.8	Full	68	0.0	32.3
Lane 2	389	13.0	332	13.3	791[1]	0.420	100	17.2	LOS B	10.2	79.2	Full	68	0.0	18.8
Lane 3	34	14.7	29	14.8	100	0.289	100	56.7	LOS E	1.5	11.5	Short	25	0.0	NA
Approach	868	12.9	740[N1]	13.2		0.420		18.9	LOS B	11.8	91.8				
SouthWest: Edgewater Drive (West)															
Lane 1	114	8.8	114	8.8	679	0.168	100	15.5	LOS B	2.6	19.8	Short	42	0.0	NA
Lane 2	48	6.3	48	6.3	268	0.179	100	44.6	LOS D	2.1	15.4	Full	789	0.0	0.0
Approach	162	8.0	162	8.0		0.179		24.1	LOS C	2.6	19.8				
Intersection	2660	11.1	2464[N][1]	12.0		0.859		27.4	LOS C	34.7	264.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
SouthEast: Ti Rakau Drive (East)										
Lane 1	99	669	-	769	10.5	895	0.859	100	NA	NA
Lane 2	-	753	-	753	11.1	876[1]	0.859	100	NA	NA
Lane 3	-	-	10	10	0.0	107	0.090	100	0.0	2
Approach	99	1422	10	1531	10.7		0.859			

NorthEast: Chevis Place

Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From NE To Exit:	SE	SW	NW			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	10	10	10	30	0.0	113	0.265	100	NA	NA
Approach	10	10	10	30	0.0		0.265			
NorthWest: Ti Rakau Drive (West)										
Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	8	371	-	379	13.0	903	0.420	100	NA	NA
Lane 2	-	332	-	332	13.3	791 [1]	0.420	100	NA	NA
Lane 3	-	-	29	29	14.8	100	0.289	100	0.0	2
Approach	8	703	29	740	13.2		0.420			
SouthWest: Edgewater Drive (West)										
Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	114	-	-	114	8.8	679	0.168	100	0.0	2
Lane 2	-	10	38	48	6.3	268	0.179	100	NA	NA
Approach	114	10	38	162	8.0		0.179			

	Total	%HV	Deg.Satn (v/c)
Intersection	2464	12.0	0.859

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

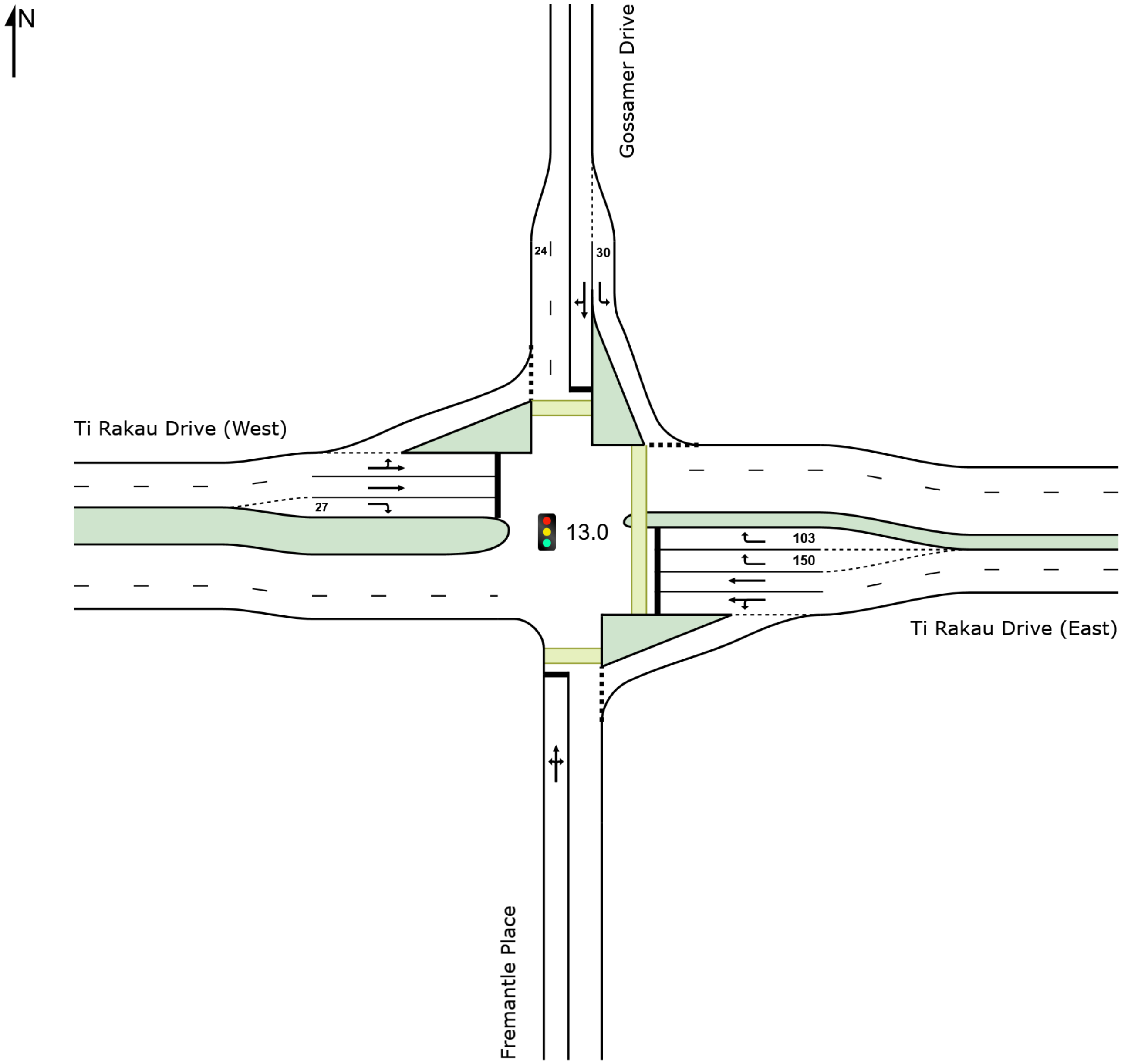
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
NorthEast Exit: Chevis Place Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Edgewater Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: General)]

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

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



Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Created: Wednesday, 15 February 2023 9:03:33 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 AM.sip9

LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: General)]

Network: N101 [AM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	48	6.3	48	6.3	72	0.669	100	87.0	LOS F	3.8	27.8	Full	285	0.0	0.0
Approach	48	6.3	48	6.3		0.669		87.0	LOS F	3.8	27.8				
East: Ti Rakau Drive (East)															
Lane 1	732	10.9	732	10.9	710	1.031	100	114.3	LOS F	78.0	596.7	Full	636	0.0	0.0
Lane 2	697	11.0	697	11.0	676[1]	1.031	100	120.2	LOS F	77.9	596.7	Full	636	0.0	0.0
Lane 3	61	0.3	61	0.3	304	0.201	23[6]	35.5	LOS D	2.3	16.4	Short	150	0.0	NA
Lane 4	266	0.3	266	0.3	304	0.875	100	51.1	LOS D	13.5	95.0	Short	103	0.0	NA
Approach	1756	8.9	1756	8.9		1.031		104.4	LOS F	78.0	596.7				
North: Gossamer Drive															
Lane 1	1052	8.2	1052	8.2	1088[1]	0.967	100	54.8	LOS D	73.2	548.6	Short	30	0.0	NA
Lane 2	172	7.0	172	7.0	163[1]	1.055	100	169.9	LOS F	21.9	162.3	Full	1010	0.0	0.0
Approach	1224	8.0	1224	8.0		1.055		71.0	LOS E	73.2	548.6				
West: Ti Rakau Drive (West)															
Lane 1	430	12.5	365	12.9	479	0.762	100	57.1	LOS E	24.7	192.1	Full	479	0.0	0.0
Lane 2	409	12.7	348	13.1	456[1]	0.762	100	55.6	LOS E	23.7	184.8	Full	479	0.0	0.0
Lane 3	11	9.1	9	9.2	135	0.069	100	74.9	LOS E	0.6	4.9	Short	27	0.0	NA
Approach	850	12.6	722[N1]	12.9		0.762		56.6	LOS E	24.7	192.1				
Intersection	3878	9.4	3750[N1]	9.7		1.055		84.0	LOS F	78.0	596.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	21	10	17	48	6.3	72	0.669	100	NA	NA
Approach	21	10	17	48	6.3		0.669			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	18	714	-	732	10.9	710	1.031	100	NA	NA
Lane 2	-	697	-	697	11.0	676[1]	1.031	100	NA	NA
Lane 3	-	-	61	61	0.3	304	0.201	23[6]	0.0	2
Lane 4	-	-	266	266	0.3	304	0.875	100	0.0	3
Approach	18	1411	327	1756	8.9		1.031			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1052	-	-	1052	8.2	1088[1]	0.967	100	100.0	2
Lane 2	-	11	161	172	7.0	163[1]	1.055	100	NA	NA
Approach	1052	11	161	1224	8.0		1.055			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	346	-	365	12.9	479	0.762	100	NA	NA
Lane 2	-	348	-	348	13.1	456[1]	0.762	100	NA	NA
Lane 3	-	-	9	9	9.2	135	0.069	100	0.0	2
Approach	19	694	9	722	12.9		0.762			

	Total	%HV	Deg.Satn (v/c)
Intersection	3750	9.7	1.055

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

Merge Analysis

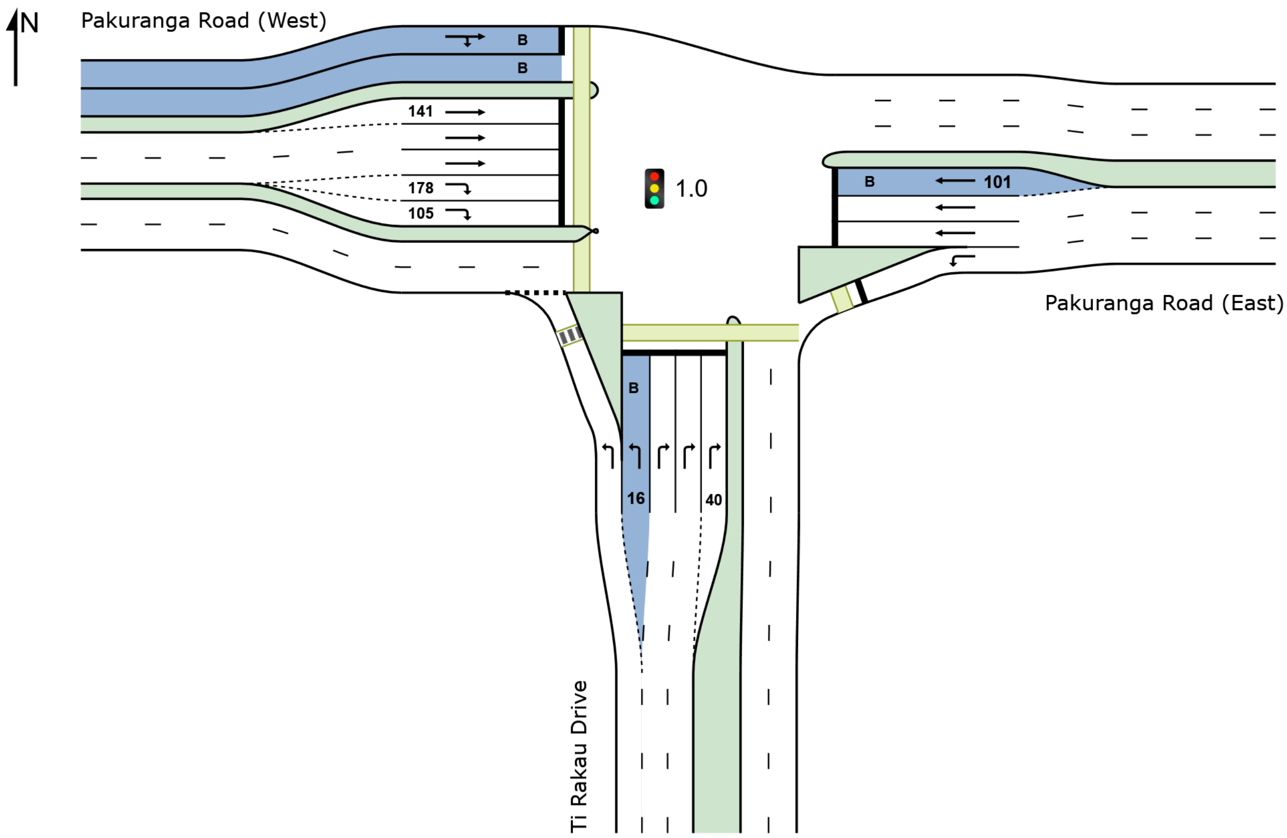
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	24	50.0	138	138	2.50	2.00	80	1640	0.049	0.0	0.1
Merge Lane	2	-	50.0	40	40	2.50	2.00	276	1755	0.157	0.0	0.0
West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

SITE LAYOUT

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Rd (Site Folder: General)]

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

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



LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Rd (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 130 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	680	6.6	651	6.6	1217[1]	0.535	100	10.3	LOS B	15.9	117.8	Full	130	0.0	0.0
Lane 2 (B)	13	100.0	13	100.0	78	0.162	100	73.5	LOS E	0.8	10.7	Short	16	0.0	NA
Lane 3	636	3.1	610	3.1	692	0.882	100	53.3	LOS D	29.5[N4]	212.2[N4]	Full	130	-6.1[N3]	50.0
Lane 4	402	3.1	385	3.1	436[1]	0.882	100	53.7	LOS D	23.6	169.3	Full	130	-6.9[N3]	29.0
Lane 5	398	3.1	382	3.1	433[1]	0.882	100	53.9	LOS D	23.4	168.5	Short	40	-8.4[N3]	NA
Approach	2129	4.8	2040[N1]	4.8		0.882		39.9	LOS D	29.5	212.2				
East: Pakuranga Road (East)															
Lane 1	575	2.3	509	2.4	1243	0.410	100	15.1	LOS B	13.8	98.9	Full	113	0.0	0.0
Lane 2	424	8.0	377	8.6	424	0.888	100	64.4	LOS E	24.5[N4]	184.4[N4]	Full	113	0.0	50.0
Lane 3	424	8.0	377	8.6	424	0.888	100	64.4	LOS E	24.5[N4]	184.4[N4]	Full	113	0.0	50.0
Lane 4 (B)	11	100.0	11	100.0	55	0.200	100	71.7	LOS E	0.7	9.6	Short	101	0.0	NA
Approach	1433	6.4	1274[N1]	6.9		0.888		44.7	LOS D	24.5	184.4				
West: Pakuranga Road (West)															
Lane 1 (B)	42	100.0	42	100.0	50	0.840	100	75.2	LOS E	3.0	38.9	Full	388	-5.2[N7]	0.0
Lane 2	425	6.7	425	6.7	550	0.773	100	45.1	LOS D	25.1	185.9	Short	141	-6.1[N3]	NA
Lane 3	422	6.7	422	6.7	546	0.773	100	45.1	LOS D	24.9	184.5	Full	388	-6.9[N3]	0.0
Lane 4	415	6.7	415	6.7	537	0.773	100	45.3	LOS D	24.6	181.9	Full	388	-8.4[N3]	0.0
Lane 5	199	7.7	199	7.7	229	0.870	100	76.2	LOS E	14.1	104.9	Short	178	0.0	NA
Lane 6	191	7.7	191	7.7	219	0.870	100	76.7	LOS E	13.5	100.7	Short	105	-4.3[N7]	NA
Approach	1694	9.3	1694	9.3		0.870		53.1	LOS D	25.1	185.9				
Intersection	5256	6.7	5008[N1]	7.0		0.888		45.6	LOS D	29.5	212.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	651	-	651	6.6	1217[1]	0.535	100	NA	NA
Lane 2	13	-	13	100.0	78	0.162	100	0.0	1
Lane 3	-	610	610	3.1	692	0.882	100	NA	NA
Lane 4	-	385	385	3.1	436[1]	0.882	100	NA	NA
Lane 5	-	382	382	3.1	433[1]	0.882	100	100.0	4
Approach	664	1376	2040	4.8		0.882			

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	509	-	509	2.4	1243	0.410	100	NA	NA
Lane 2	-	377	377	8.6	424	0.888	100	NA	NA
Lane 3	-	377	377	8.6	424	0.888	100	NA	NA
Lane 4	-	11	11	100.0	55	0.200	100	0.0	3
Approach	509	764	1274	6.9		0.888			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	21	21	42	100.0	50	0.840	100	NA	NA
Lane 2	425	-	425	6.7	550	0.773	100	30.1	3
Lane 3	422	-	422	6.7	546	0.773	100	NA	NA
Lane 4	415	-	415	6.7	537	0.773	100	NA	NA
Lane 5	-	199	199	7.7	229	0.870	100	0.0	4
Lane 6	-	191	191	7.7	219	0.870	100	1.3	5
Approach	1283	411	1694	9.3		0.870			

	Total	%HV	Deg.Satn (v/c)
Intersection	5008	7.0	0.888

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

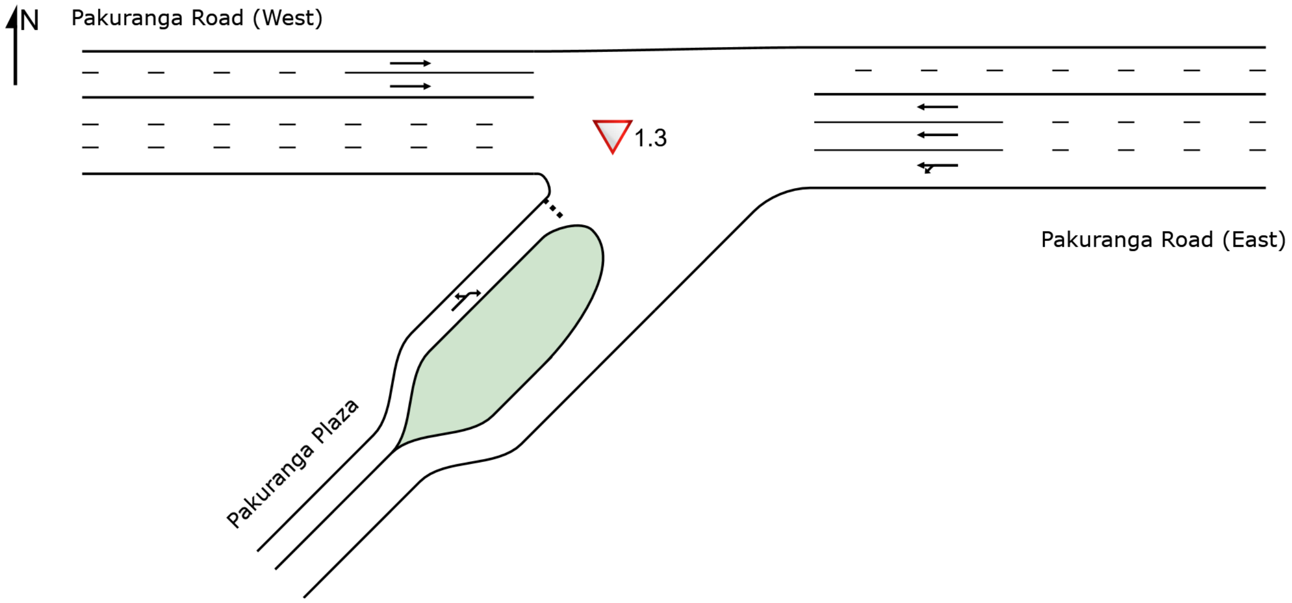
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 PM.sip9

SITE LAYOUT

▽ Site: 1.3 [1.3 Mall/ Pakuranga Rd - Import (Site Folder: General)]

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

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



LANE SUMMARY

Site: 1.3 [1.3 Mall/ Pakuranga Rd - Import (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Pakuranga Road (East)															
Lane 1	492	7.9	449	8.1	1973	0.228	100	0.4	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 2	470	5.9	429	6.3	1884	0.228	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Lane 3	470	5.9	429	6.3	1884	0.228	100	0.0	LOS A	0.0	0.0	Full	152	0.0	0.0
Approach	1432	6.6	1307 N1	6.9		0.228		0.1	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	1340	5.5	1318	5.6	1813	0.727	100	0.1	LOS A	0.0	0.0	Full	108	0.0	0.0
Lane 2	1368	5.5	1346	5.6	1852	0.727	100	0.1	LOS A	0.0	0.0	Full	108	0.0	0.0
Approach	2708	5.5	2664 N1	5.6		0.727		0.1	NA	0.0	0.0				
SouthWest: Pakuranga Plaza															
Lane 1	35	5.7	35	5.7	19	1.858	100	1038.1	LOS F	14.0	103.0	Full	196	0.0	0.0
Approach	35	5.7	35	5.7		1.858		1038.1	LOS F	14.0	103.0				
Intersection	4175	5.9	4006 N1	6.1		1.858		9.2	NA	14.0	103.0				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	422	449	8.1	1973	0.228	100	NA	NA
Lane 2	-	429	429	6.3	1884	0.228	100	NA	NA
Lane 3	-	429	429	6.3	1884	0.228	100	NA	NA
Approach	27	1279	1307	6.9		0.228			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1318	1318	5.6	1813	0.727	100	NA	NA
Lane 2	1346	1346	5.6	1852	0.727	100	NA	NA
Approach	2664	2664	5.6		0.727			

SouthWest: Pakuranga Plaza

Mov. From SW To Exit:	L3 W	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	24	11	35	5.7	19	1.858	100	NA	NA
Approach	24	11	35	5.7		1.858			

	Total	%HV	Deg.Satn (v/c)
Intersection	4006	6.1	1.858

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

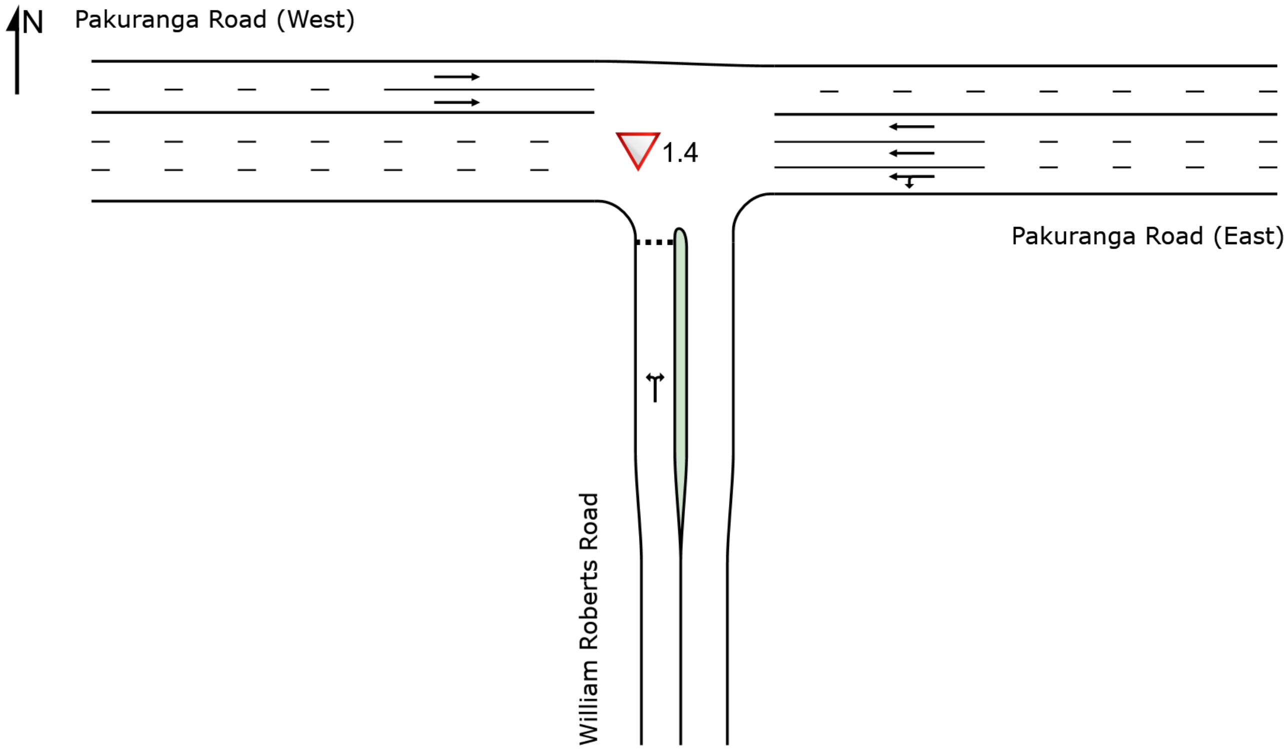
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 1.4 [1.4 William Roberts/ Pakuranga Rd - Import (Site Folder: General)]

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

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



LANE SUMMARY

Site: 1.4 [1.4 William Roberts/ Pakuranga Rd - Import (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road															
Lane 1	326	11.7	320	11.7	7	48.040	100	42392.7	LOS F	78.7[N4]	606.4[N4]	Full	244	-32.3[N7]	49.9
Approach	326	11.7	320[N1]	11.7		48.040		42392.7	LOS F	78.7	606.4				
East: Pakuranga Road (East)															
Lane 1	469	8.0	469	8.0	1787	0.262	100	1.6	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 2	477	6.8	477	6.8	1818	0.262	100	0.0	LOS A	0.0	0.0	Full	184	0.0	0.0
Lane 3	482	6.8	482	6.8	1838	0.262	100	0.0	LOS A	0.0	0.0	Full	184	0.0	0.0
Approach	1427	7.2	1427	7.2		0.262		0.5	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	1394	5.6	1369	5.6	1076	1.272	100	40.9	LOS E	0.0	0.0	Full	152	-42.2[N3]	0.0
Lane 2	1308	5.6	1285	5.6	1010	1.272	100	40.9	LOS E	0.0	0.0	Full	152	-44.0[N3]	0.0
Approach	2702	5.6	2653[N1]	5.6		1.272		40.9	NA	0.0	0.0				
Intersection	4455	6.6	4400[N1]	6.6		48.040		3107.6	NA	78.7	606.4				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: William Roberts Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	126	194	320	11.7	7	48.040	100	NA	NA
Approach	126	194	320	11.7		48.040			

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	126	343	469	8.0	1787	0.262	100	NA	NA
Lane 2	-	477	477	6.8	1818	0.262	100	NA	NA

Lane 3	-	482	482	6.8	1838	0.262	100	NA	NA
Approach	126	1301	1427	7.2		0.262			

West: Pakuranga Road (West)								
Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1369	1369	5.6	1076	1.272	100	NA	NA
Lane 2	1285	1285	5.6	1010	1.272	100	NA	NA
Approach	2653	2653	5.6		1.272			

	Total	%HV	Deg.Satn (v/c)
Intersection	4400	6.6	48.040

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

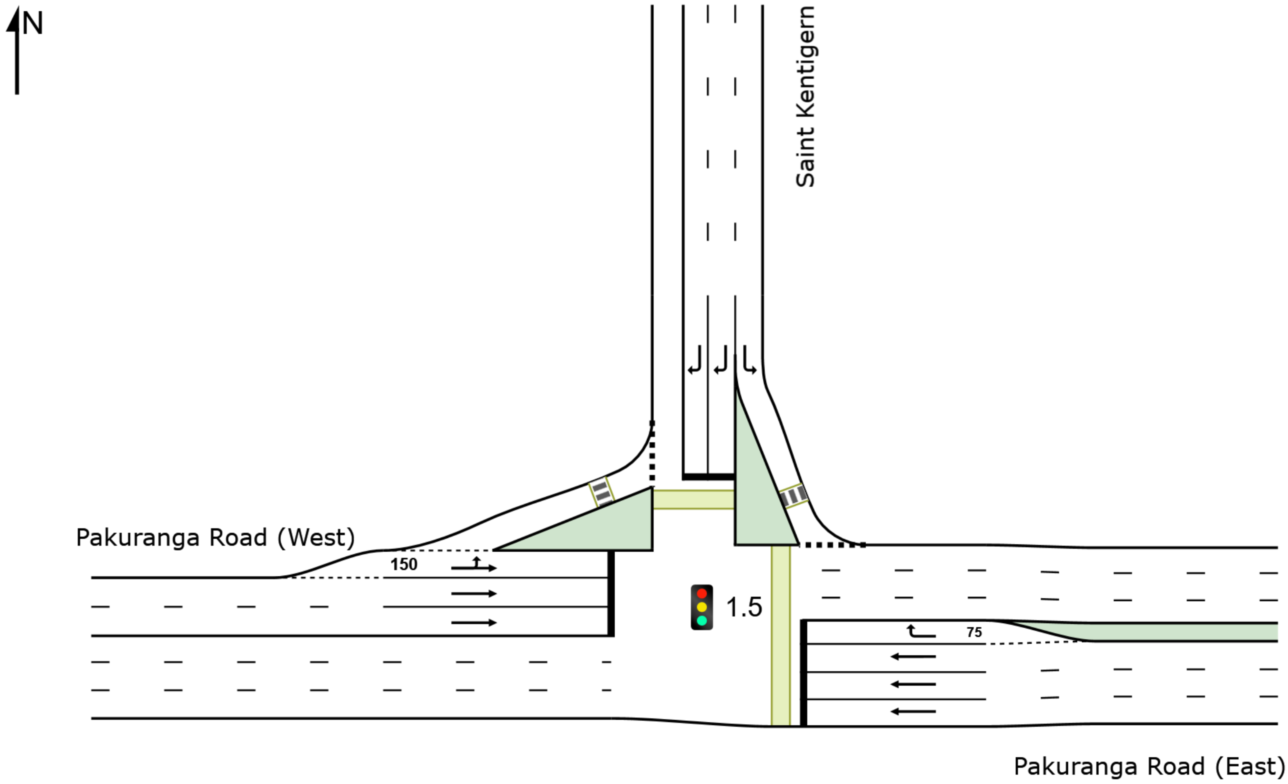
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: William Roberts Road Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

SITE LAYOUT

Site: 1.5 [1.5 Saint Kentigern/ Pakuranga Rd - Import (Site Folder: General)]

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

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



LANE SUMMARY

Site: 1.5 [1.5 Saint Kentigern/ Pakuranga Rd - Import (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	450	7.2	450	7.2	1388	0.324	100	5.7	LOS A	9.6	71.6	Full	87	0.0	0.0
Lane 2	450	7.2	450	7.2	1388	0.324	100	5.7	LOS A	9.6	71.6	Full	87	0.0	0.0
Lane 3	453	7.2	453	7.2	1395	0.324	100	5.7	LOS A	9.7	72.0	Full	87	0.0	0.0
Lane 4	36	5.6	36	5.6	74	0.488	100	81.8	LOS F	2.6	19.0	Short	75	0.0	NA
Approach	1389	7.2	1389	7.2		0.488		7.7	LOS A	9.7	72.0				
North: Saint Kentigern															
Lane 1	69	4.3	69	4.3	470	0.147	100	11.3	LOS B	2.0	14.3	Full	96	0.0	0.0
Lane 2	38	9.2	38	9.2	270	0.142	100	55.2	LOS E	2.3	17.2	Full	96	0.0	0.0
Lane 3	38	9.2	38	9.2	265	0.142	100	55.2	LOS E	2.2	16.9	Full	96	0.0	0.0
Approach	145	6.9	145	6.9		0.147		34.3	LOS C	2.3	17.2				
West: Pakuranga Road (West)															
Lane 1	980	6.3	895	5.6	1245	0.719	100	15.9	LOS B	37.7	276.3	Short	150	0.0	NA
Lane 2	932	6.4	852	5.7	1185[1]	0.719	100	14.6	LOS B	34.3	252.1	Full	184	0.0	42.2[8]
Lane 3	988	6.4	903	5.7	1256	0.719	100	15.4	LOS B	38.4	281.6	Full	184	0.0	44.0
Approach	2900	6.4	2650[N1]	5.7		0.719		15.3	LOS B	38.4	281.6				
Intersection	4434	6.7	4184[N1]	7.1		0.719		13.4	LOS B	38.4	281.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	450	-	450	7.2	1388	0.324	100	NA	NA
Lane 2	450	-	450	7.2	1388	0.324	100	NA	NA
Lane 3	453	-	453	7.2	1395	0.324	100	NA	NA
Lane 4	-	36	36	5.6	74	0.488	100	0.0	3
Approach	1353	36	1389	7.2		0.488			

North: Saint Kentigern

Mov. From N	L2	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	E	W			veh/h	v/c	%	%	No.
Lane 1	69	-	69	4.3	470	0.147	100	NA	NA
Lane 2	-	38	38	9.2	270	0.142	100	NA	NA
Lane 3	-	38	38	9.2	265	0.142	100	NA	NA
Approach	69	76	145	6.9		0.147			

West: Pakuranga Road (West)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	868	895	5.6	1245	0.719	100	61.4	2
Lane 2	-	852	852	5.7	1185[1]	0.719	100	NA	NA
Lane 3	-	903	903	5.7	1256	0.719	100	NA	NA
Approach	27	2623	2650	5.7		0.719			

	Total	%HV	Deg.Satn (v/c)
Intersection	4184	7.1	0.719

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

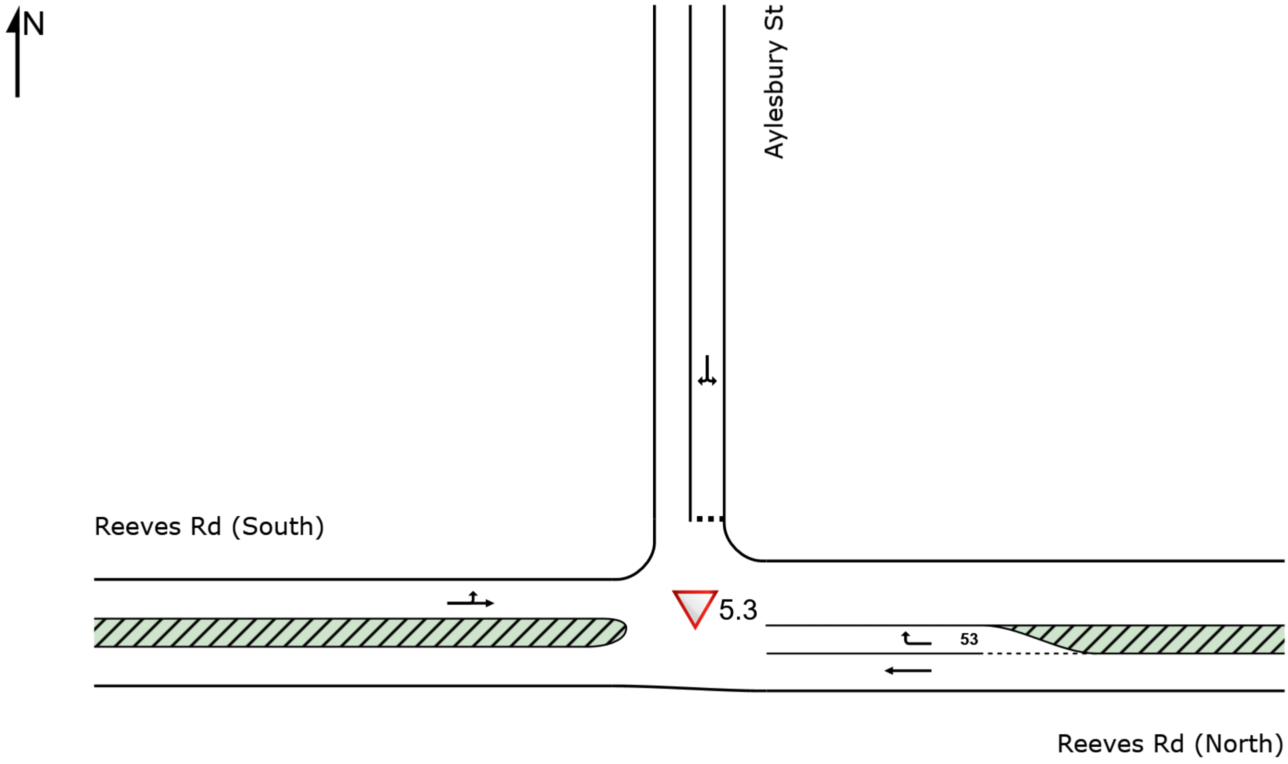
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
North Exit: Saint Kentigern Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

SITE LAYOUT

Site: 5.3 [5.3 Reeves Rd/ Aylesbury St (Site Folder: General)]

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

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



LANE SUMMARY

Site: 5.3 [5.3 Reeves Rd/ Aylesbury St (Site Folder: General)] Network: N101 [PM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Reeves Rd (North)															
Lane 1	277	11.9	274	11.9	1876	0.146	100	0.0	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 2	10	0.0	10	0.0	777	0.013	100	7.7	LOS A	0.0	0.3	Short	53	0.0	NA
Approach	287	11.5	284 [N1]	11.5		0.146		0.3	NA	0.0	0.3				
North: Aylesbury St															
Lane 1	56	5.4	56	5.4	246	0.227	100	9.9	LOS A	4.5 [N5]	32.7 [N5]	Full	193	-31.7 [N7]	100.0
Approach	56	5.4	56	5.4		0.227		9.9	LOS A	4.5	32.7				
West: Reeves Rd (South)															
Lane 1	730	9.2	702	9.2	1923	0.365	100	0.2	LOS A	19.8 [N6]	149.1 [N6]	Full	60	0.0	49.9 [N6]
Approach	730	9.2	702 [N1]	9.2		0.365		0.2	NA	19.8	149.1				
Intersection	1073	9.6	1043 [N1]	9.9		0.365		0.7	NA	19.8	149.1				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

East: Reeves Rd (North)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	-	274	11.9	1876	0.146	100	NA	NA
Lane 2	-	10	10	0.0	777	0.013	100	0.0	1
Approach	274	10	284	11.5		0.146			

North: Aylesbury St

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	26	30	56	5.4	246	0.227	100	NA	NA
Approach	26	30	56	5.4		0.227			

West: Reeves Rd (South)

Mov.	L2	T1	Total	%HV	Deg.	Lane	Prob.	Ov.

From W To Exit:	N	E			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	27	675	702	9.2	1923	0.365	100	NA	NA
Approach	27	675	702	9.2		0.365			

	Total	%HV	Deg.Satn (v/c)
Intersection	1043	9.9	0.365

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

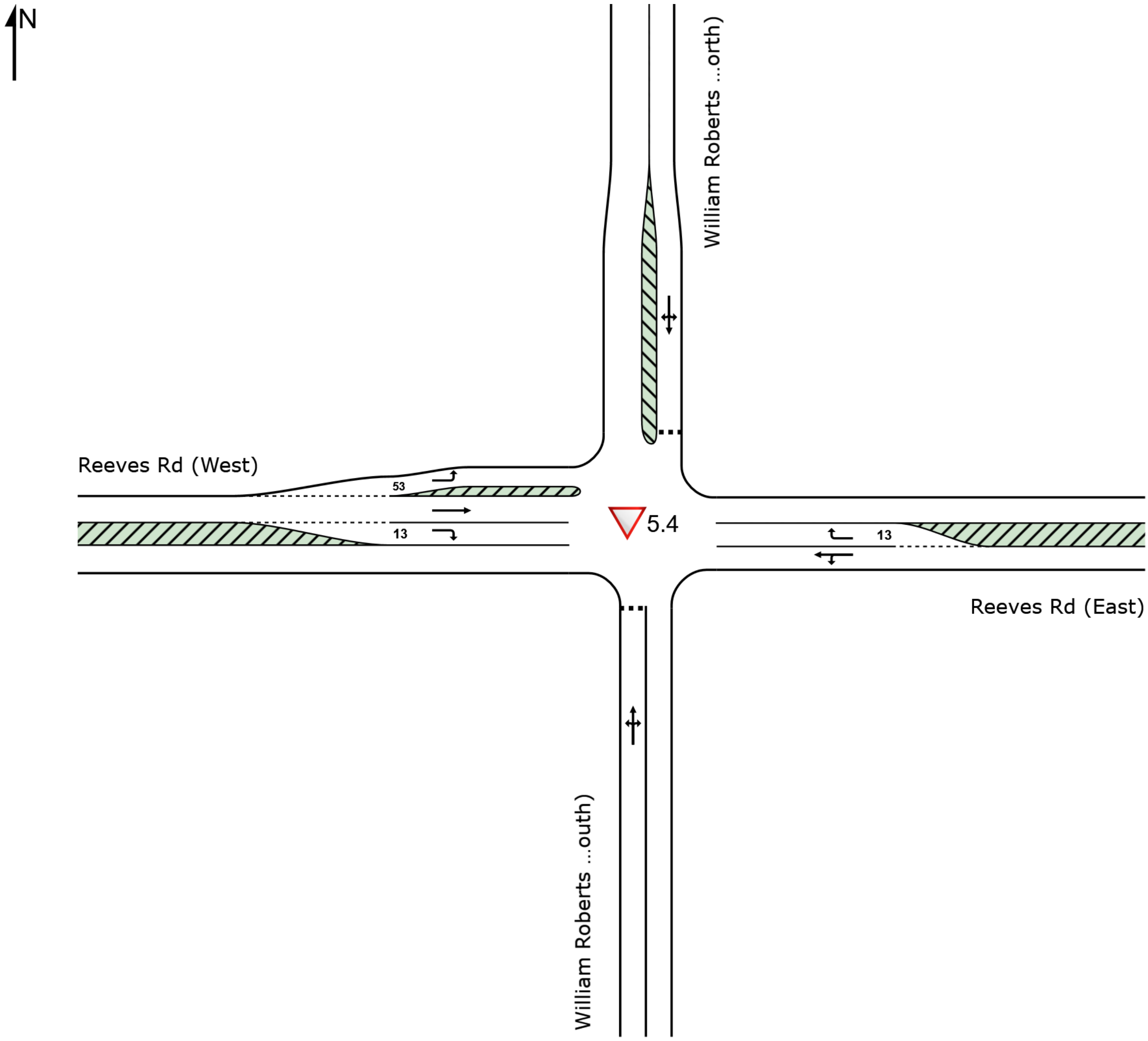
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Reeves Rd (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Aylesbury St Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Reeves Rd (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 5.4 [5.4 Reeves Rd / William Roberts Rd (Site Folder: General)]

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

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



LANE SUMMARY

Site: 5.4 [5.4 Reeves Rd / William Roberts Rd (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Rd (South)															
Lane 1	46	4.3	46	4.3	277	0.166	100	13.0	LOS B	6.7 [N5]	48.5 [N5]	Full	170	-20.7 [N7]	16.8
Approach	46	4.3	46	4.3		0.166		13.0	LOS B	6.7	48.5				
East: Reeves Rd (East)															
Lane 1	140	8.6	140	8.6	1795	0.078	100	0.3	LOS A	0.0	0.0	Full	266	0.0	3.2 [8]
Lane 2	53	24.5	53	24.5	542	0.098	100	10.0	LOS B	29.5 [N5]	249.9 [N5]	Short	13	0.0	NA
Approach	193	13.0	193	13.0		0.098		3.0	NA	29.5	249.9				
North: William Roberts Rd (North)															
Lane 1	259	15.8	259	15.8	259	0.999	100	88.8	LOS F	16.8	133.2	Full	244	0.0	0.0
Approach	259	15.8	259	15.8		0.999		88.8	LOS F	16.8	133.2				
West: Reeves Rd (West)															
Lane 1	259	9.7	249	9.6	1666	0.149	100	4.1	LOS A	18.0 [N6]	136.7 [N6]	Short	53	0.0	NA
Lane 2	426	9.6	409	9.6	1844	0.222	100	0.0	LOS A	0.0	0.0	Full	55	0.0	49.9 [8]
Lane 3	43	4.7	41	4.6	1543	0.027	100	4.5	LOS A	0.1	0.9	Short	13	0.0	NA
Approach	728	9.3	699 [N1]	9.3		0.222		1.7	NA	18.0	136.7				
Intersection	1226	11.1	1197 [N1]	11.4		0.999		21.2	NA	29.5	249.9				

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

8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: William Roberts Rd (South)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	24	12	10	46	4.3	277	0.166	100	NA	NA
Approach	24	12	10	46	4.3		0.166			

East: Reeves Rd (East)

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

Mov. From S To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	130	-	140	8.6	1795	0.078	100	NA	NA
Lane 2	-	-	53	53	24.5	542	0.098	100	100.0	1
Approach	10	130	53	193	13.0		0.098			
North: William Roberts Rd (North)										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	114	17	128	259	15.8	259	0.999	100	NA	NA
Approach	114	17	128	259	15.8		0.999			
West: Reeves Rd (West)										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	249	-	-	249	9.6	1666	0.149	100	54.8	2
Lane 2	-	409	-	409	9.6	1844	0.222	100	NA	NA
Lane 3	-	-	41	41	4.6	1543	0.027	100	0.0	2
Approach	249	409	41	699	9.3		0.222			

	Total	%HV	Deg.Satn (v/c)
Intersection	1197	11.4	0.999

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

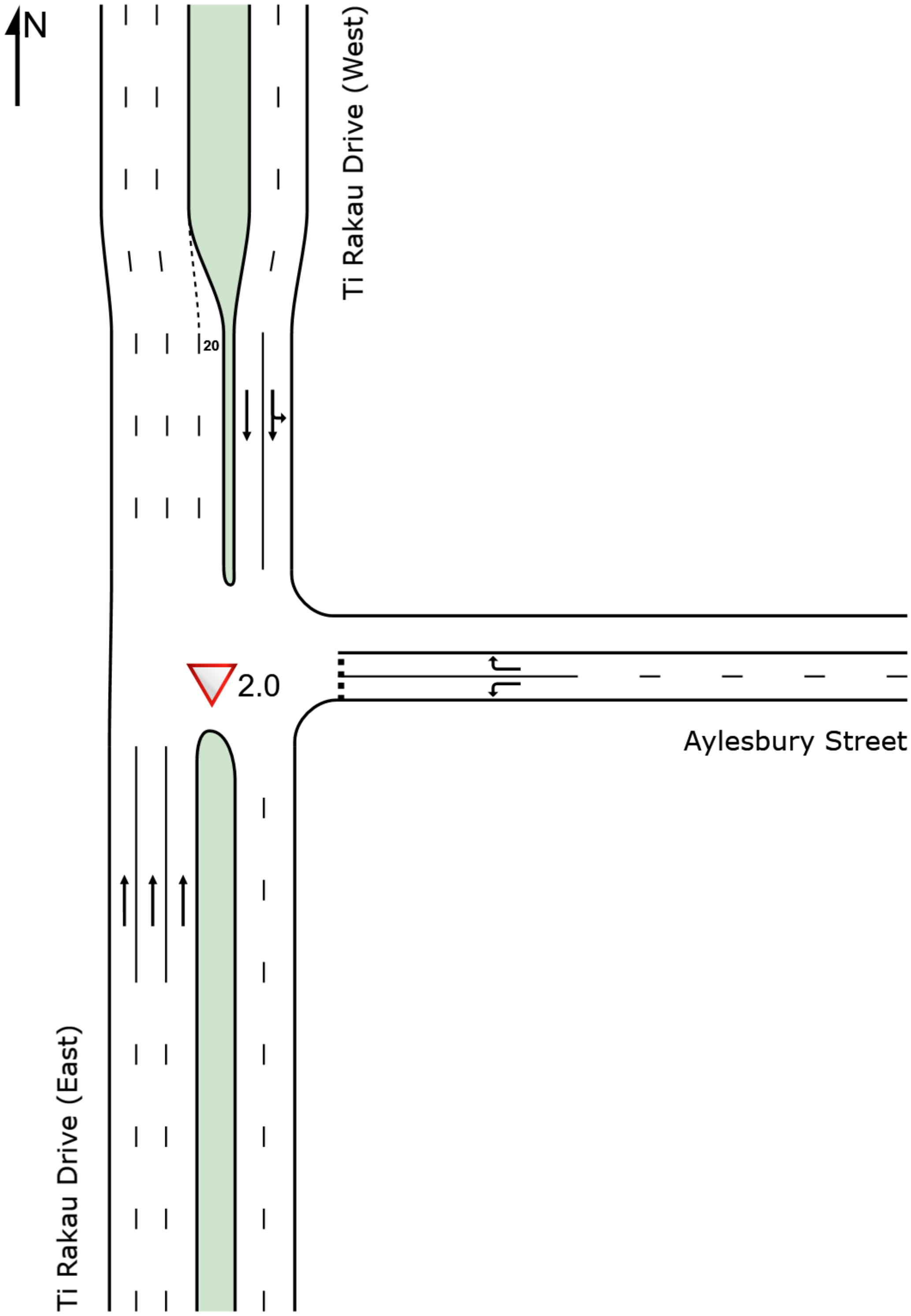
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: William Roberts Rd (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Reeves Rd (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: William Roberts Rd (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Reeves Rd (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 2.0 [2.0 Aylesbury St North/Ti Rakau Dr (Site Folder: General)]

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

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



LANE SUMMARY

Site: 2.0 [2.0 Aylesbury St North/Ti Rakau Dr (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive (East)															
Lane 1	767	5.0	742	4.9	1821	0.408	100	0.0	LOS A	0.0	0.0	Full	63	0.0	0.0
Lane 2	780	5.0	754	4.9	1850	0.408	100	0.0	LOS A	12.6 [N5]	91.6 [N5]	Full	63	0.0	39.2
Lane 3	533	5.0	516	4.9	1266	0.408	100	0.0	LOS A	0.0	0.0	Full	63	-31.9 [N3]	0.0
Approach	2080	5.0	2013 [N1]	4.9		0.408		0.0	NA	12.6	91.6				
East: Aylesbury Street															
Lane 1	14	7.1	14	7.1	752	0.019	100	1.8	LOS A	0.1	0.4	Full	28	-21.9 [N7]	0.0
Lane 2	28	0.0	28	0.0	6	4.667	100	3633.8	LOS F	23.9	167.6	Full	28	0.0	100.0
Approach	42	2.4	42	2.4		4.667		2423.1	LOS F	23.9	167.6				
North: Ti Rakau Drive (West)															
Lane 1	495	6.4	463	6.8	1817	0.255	100	0.1	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	496	6.5	463	6.9	1818	0.255	100	0.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	991	6.5	925 [N1]	6.8		0.255		0.1	NA	0.0	0.0				
Intersection	3113	5.4	2980 [N1]	5.6		4.667		34.2	NA	23.9	167.6				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	742	742	4.9	1821	0.408	100	NA	NA
Lane 2	754	754	4.9	1850	0.408	100	NA	NA
Lane 3	516	516	4.9	1266	0.408	100	NA	NA
Approach	2013	2013	4.9		0.408			

East: Aylesbury Street

Mov. From E To Exit:	L2 S	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	-	14	7.1	752	0.019	100	NA	NA

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 2	-	28	28	0.0	6	4.667	100	NA	NA
Approach	14	28	42	2.4		4.667			
North: Ti Rakau Drive (West)									
Lane 1	9	453	463	6.8	1817	0.255	100	NA	NA
Lane 2	-	463	463	6.9	1818	0.255	100	NA	NA
Approach	9	916	925	6.8		0.255			

	Total	%HV	Deg.Satn (v/c)
Intersection	2980	5.6	4.667

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

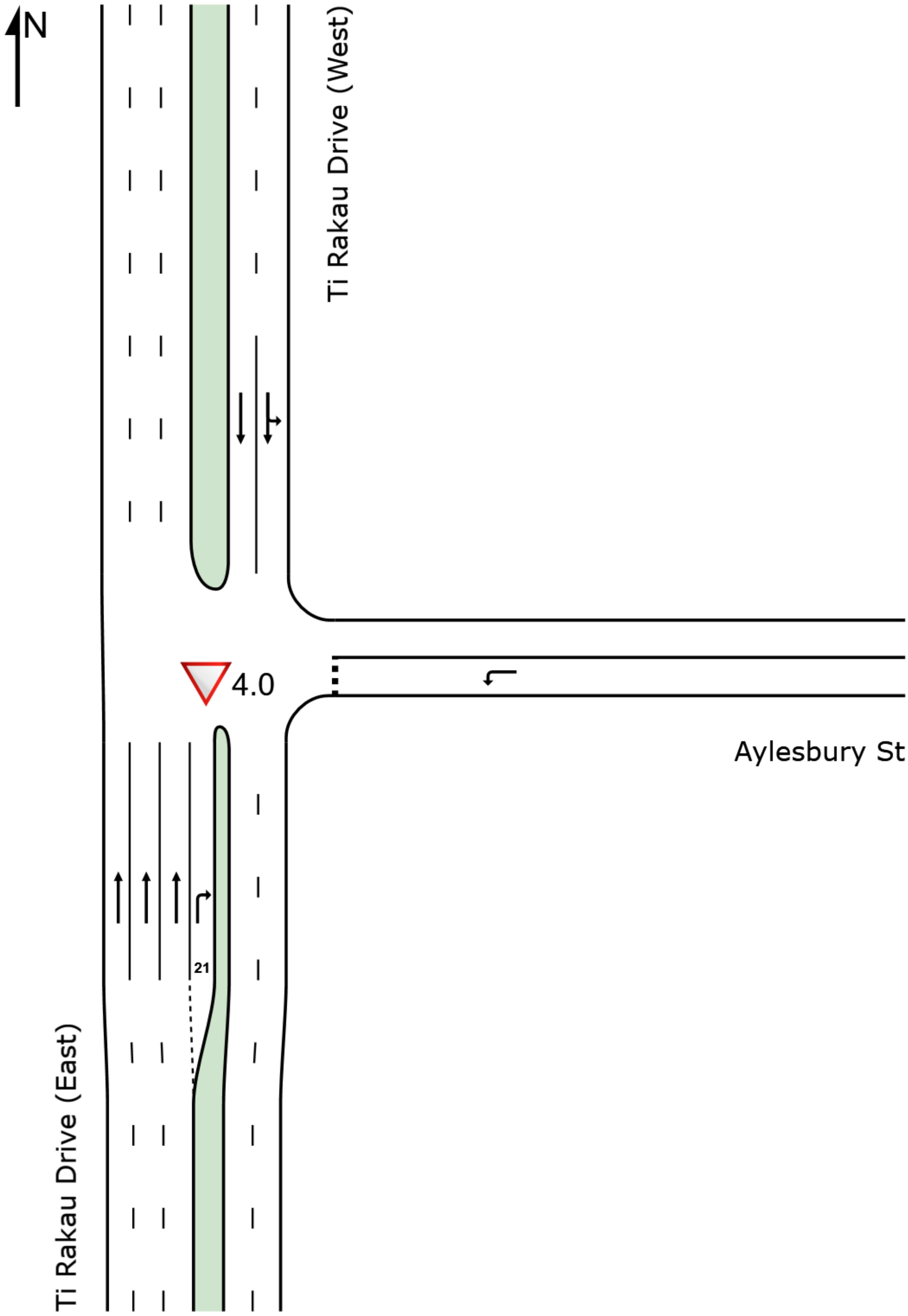
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Aylesbury Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ti Rakau Drive (West) Merge Type: **Priority**												
Exit Short Lane	4	20	0.0	516	529	3.00	2.00	6	1256	0.005	0.9	1.0
Merge Lane	3	-	100.0	Merge Lane is not Opposed				516	1800	0.287	0.0	0.0

SITE LAYOUT

▽ Site: 4.0 [4.0 Aylesbury St South/ Ti Rakau Dr (Site Folder: General)]

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

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



LANE SUMMARY

▽ Site: 4.0 [4.0 Aylesbury St South/ Ti Rakau Dr (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Ti Rakau Drive (East)															
Lane 1	694	4.9	683	4.9	1811	0.377	100	0.0	LOS A	0.0	0.0	Full	84	0.0	0.0
Lane 2	709	4.9	698	4.9	1851	0.377	100	0.0	LOS A	0.0	0.0	Full	84	0.0	0.0
Lane 3	700	4.9	689	4.9	1828	0.377	100	0.0	LOS A	0.0	0.0	Full	84	0.0	0.0
Lane 4	10	0.0	10	0.0	484	0.020	100	10.6	LOS B	0.1	0.4	Short	21	0.0	NA
Approach	2113	4.9	2080[N1]	4.9		0.377		0.1	NA	0.1	0.4				
East: Aylesbury St															
Lane 1	11	18.2	11	18.2	426	0.026	100	2.0	LOS A	0.3[N5]	2.5[N5]	Full	93	-50.0[N3]	0.0
Approach	11	18.2	11	18.2		0.026		2.0	LOS A	0.3	2.5				
North: Ti Rakau Drive (West)															
Lane 1	503	6.5	459	6.9	1845	0.249	100	0.1	LOS A	9.9[N6]	73.4[N6]	Full	45	0.0	50.0[N6]
Lane 2	493	6.6	450	7.1	1806	0.249	100	0.0	LOS A	9.9[N6]	73.4[N6]	Full	45	0.0	50.0[N6]
Approach	996	6.5	909[N1]	7.0		0.249		0.0	NA	9.9	73.4				
Intersection	3120	5.5	3000[N1]	5.7		0.377		0.1	NA	9.9	73.4				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	683	-	683	4.9	1811	0.377	100	NA	NA
Lane 2	698	-	698	4.9	1851	0.377	100	NA	NA
Lane 3	689	-	689	4.9	1828	0.377	100	NA	NA
Lane 4	-	10	10	0.0	484	0.020	100	0.0	3
Approach	2070	10	2080	4.9		0.377			

East: Aylesbury St

Mov. From E To Exit:	L2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

	S									
Lane 1	11	11	18.2		426	0.026	100	NA	NA	
Approach	11	11	18.2			0.026				
North: Ti Rakau Drive (West)										
Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	9	450	459	6.9	1845	0.249	100	NA	NA	
Lane 2	-	450	450	7.1	1806	0.249	100	NA	NA	
Approach	9	900	909	7.0		0.249				

	Total	%HV	Deg.Satn (v/c)
Intersection	3000	5.7	0.377

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Aylesbury St Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

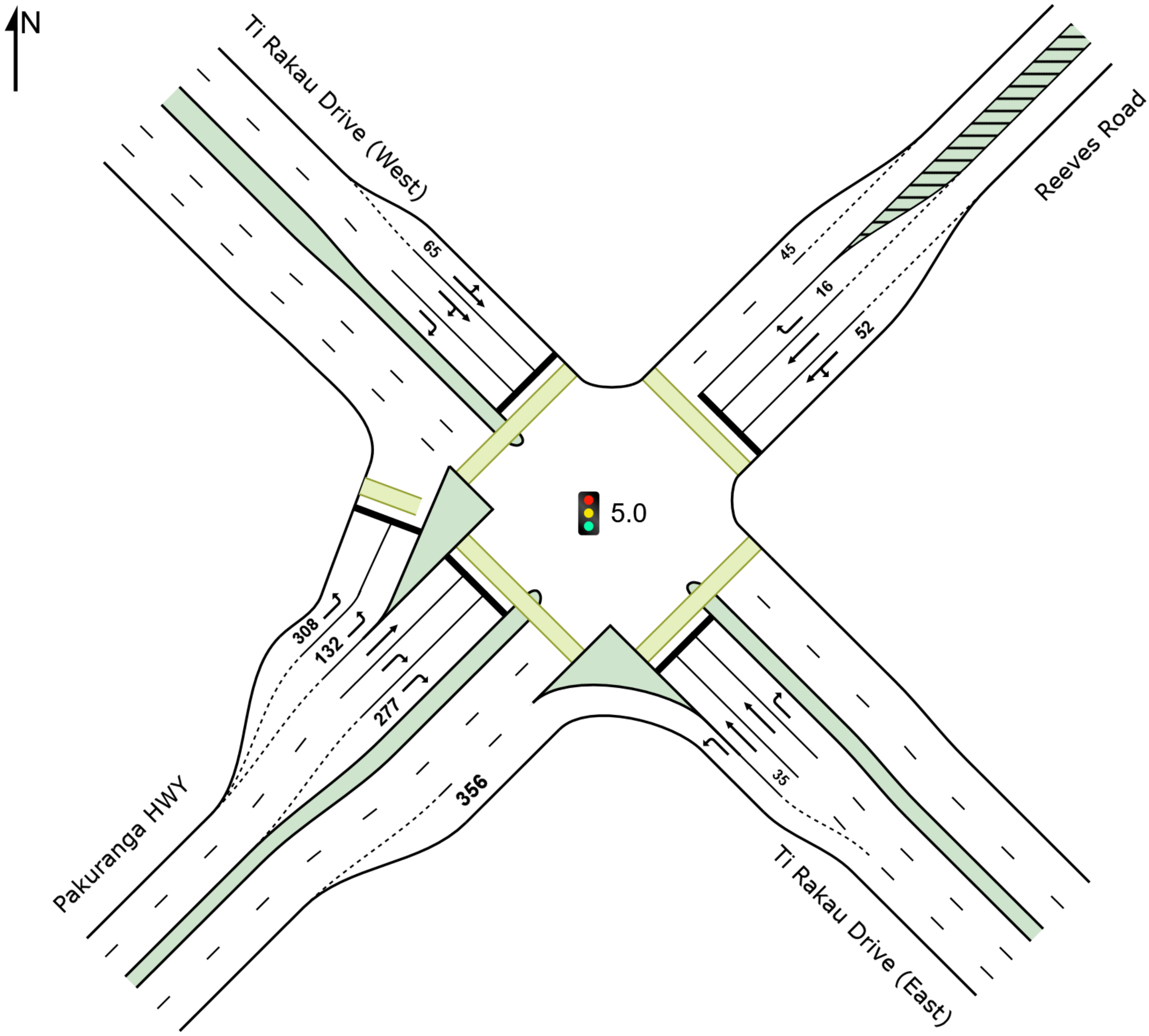
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Friday, 20 January 2023 1:49:14 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 1.1\CS 1.1 PM.sip9

SITE LAYOUT

Site: 5.0 [5.0 Pakuranga HWY/ Reeves Rd (Site Folder: General)]

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

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



LANE SUMMARY

Site: 5.0 [5.0 Pakuranga HWY/ Reeves Rd (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 166 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	862	8.9	821	8.6	1695	0.484	100	5.9	LOS A	0.0	0.0	Full	91	0.0	17.5 [8]
Lane 2	143	7.0	136	7.0	137 [1]	0.995	100	124.8	LOS F	14.1	104.4	Short	35	0.0	NA
Lane 3	382	7.0	365	7.0	367	0.995	100	117.8	LOS F	20.0 [N4]	148.5 [N4]	Full	91	0.0	50.0
Lane 4	192	3.1	183	3.0	356	0.515	100	68.6	LOS E	13.3	95.3	Full	91	0.0	9.2
Approach	1579	7.6	1506 [N1]	7.4		0.995		51.4	LOS D	20.0	148.5				
NorthEast: Reeves Road															
Lane 1	188	8.3	187	8.3	227 [1]	0.826	100	82.2	LOS F	15.6	116.7	Short	52	0.0	NA
Lane 2	174	11.1	173	11.1	210 [1]	0.826	100	81.7	LOS F	14.5	111.1	Full	72	0.0	49.4 [8]
Lane 3	34	14.7	34	14.7	60	0.563	100	96.3	LOS F	2.9	23.0	Short	16	0.0	NA
Approach	396	10.1	394 [N1]	10.1		0.826		83.2	LOS F	15.6	116.7				
NorthWest: Ti Rakau Drive (West)															
Lane 1	299	10.2	273	11.0	273 [1]	1.002	100	127.6	LOS F	17.9 [N4]	137.1 [N4]	Short	65	0.0	NA
Lane 2	309	5.5	283	5.9	282 [1]	1.002	100	129.6	LOS F	18.6 [N4]	137.1 [N4]	Full	84	0.0	50.0 [8]
Lane 3	395	4.4	361	4.6	361	1.002	100	126.8	LOS F	18.8 [N4]	137.1 [N4]	Full	84	0.0	50.0
Approach	1003	6.5	918 [N1]	6.9		1.002		127.9	LOS F	18.8	137.1				
SouthWest: Pakuranga HWY															
Lane 1	875	4.0	875	4.0	1186	0.738	100	27.6	LOS C	46.1	333.4	Short	308	0.0	NA
Lane 2	676	4.0	676	4.0	916 [1]	0.738	100	23.9	LOS C	29.0	210.1	Short	132	0.0	NA
Lane 3	547	9.7	547	9.7	538 [1]	1.017	100	125.7	LOS F	65.2	493.9	Full	1650	0.0	0.0
Lane 4	476	6.9	476	6.9	562	0.846	100	69.2	LOS E	37.9	280.7	Full	1650	0.0	0.0
Lane 5	480	6.9	480	6.9	568	0.846	100	69.0	LOS E	38.2	283.2	Short	277	0.0	NA
Approach	3054	5.9	3054	5.9		1.017		57.3	LOS E	65.2	493.9				
Intersection	6032	6.7	5871 [N1]	6.9		1.017		68.6	LOS E	65.2	493.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	821	-	-	821	8.6	1695	0.484	100	NA	NA
Lane 2	-	136	-	136	7.0	137 [1]	0.995	100	100.0	1
Lane 3	-	365	-	365	7.0	367	0.995	100	NA	NA
Lane 4	-	-	183	183	3.0	356	0.515	100	NA	NA
Approach	821	501	183	1506	7.4		0.995			

NorthEast: Reeves Road

Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	101	87	-	187	8.3	227 [1]	0.826	100	80.5	2
Lane 2	-	173	-	173	11.1	210 [1]	0.826	100	NA	NA
Lane 3	-	-	34	34	14.7	60	0.563	100	38.2	2
Approach	101	260	34	394	10.1		0.826			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	21	252	-	273	11.0	273 [1]	1.002	100	74.5	2
Lane 2	-	81	202	283	5.9	282 [1]	1.002	100	NA	NA
Lane 3	-	-	361	361	4.6	361	1.002	100	NA	NA
Approach	21	333	563	918	6.9		1.002			

SouthWest: Pakuranga HWY

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	875	-	-	875	4.0	1186	0.738	100	12.2	3
Lane 2	676	-	-	676	4.0	916 [1]	0.738	100	47.7	3
Lane 3	-	547	-	547	9.7	538 [1]	1.017	100	NA	NA
Lane 4	-	-	476	476	6.9	562	0.846	100	NA	NA
Lane 5	-	-	480	480	6.9	568	0.846	100	7.0	4
Approach	1551	547	956	3054	5.9		1.017			

	Total	%HV	Deg.Satn (v/c)
Intersection	5871	6.9	1.017

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthEast Exit: Reeves Road Merge Type: **Priority**												
Exit Short Lane	1	45	0.0	452	468	3.00	2.00	290	1320	0.220	0.8	1.1
Merge Lane	2	-	100.0	Merge Lane is not Opposed				452	1800	0.251	0.0	0.0
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

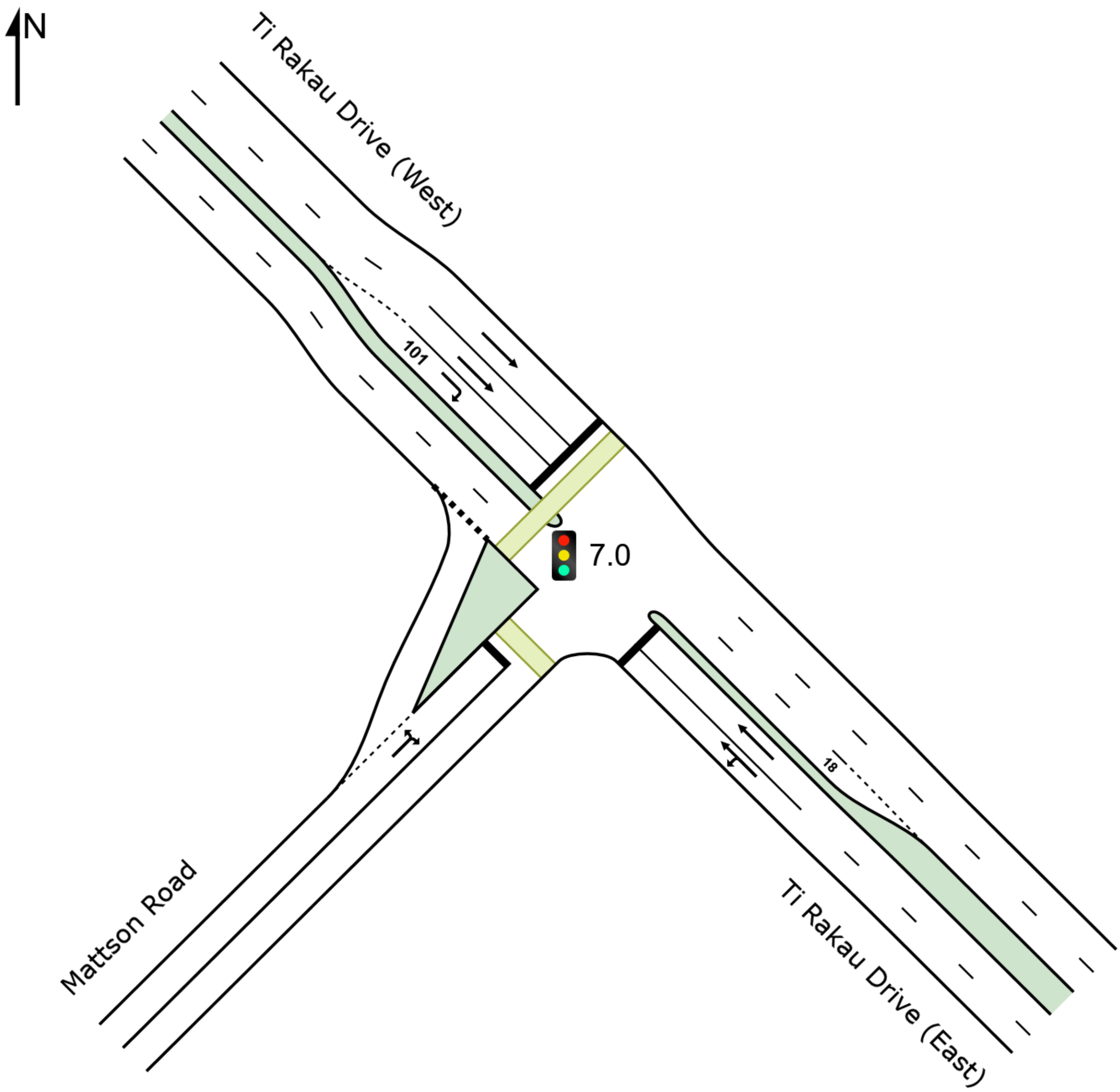
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Pakuranga HWY Merge Type: **Priority**												
Exit Short Lane	1	356	0.0	288	298	3.00	2.00	821	1497	0.548	0.4	1.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				288	1800	0.160	0.0	0.0

SITE LAYOUT

Site: 7.0 [7.0 Mattson Rd/ Ti Rakau Dr (Site Folder: General)]

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

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



LANE SUMMARY

Site: 7.0 [7.0 Mattson Rd/ Ti Rakau Dr (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 70 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	854	7.2	812	7.0	918	0.884	100	27.7	LOS C	32.0	237.1	Full	187	0.0	26.6
Lane 2	781	7.3	742	7.1	840	0.884	100	28.9	LOS C	29.8	221.0	Full	187	-10.5 [N7]	20.2
Approach	1635	7.3	1554 [N1]	7.1		0.884		28.3	LOS C	32.0	237.1				
NorthWest: Ti Rakau Drive (West)															
Lane 1	677	7.5	662	7.6	1321	0.501	100	5.6	LOS A	10.8	80.4	Full	148	0.0	0.0
Lane 2	636	7.5	622	7.6	1241	0.501	100	5.7	LOS A	10.1	75.7	Full	148	0.0	0.0
Lane 3	120	4.2	117	4.2	151	0.775	100	43.9	LOS D	4.5	32.6	Short	101	0.0	NA
Approach	1433	7.2	1402 [N1]	7.3		0.775		8.9	LOS A	10.8	80.4				
SouthWest: Mattson Road															
Lane 1	55	5.5	55	5.5	353	0.156	100	25.6	LOS C	1.6	11.5	Full	282	0.0	0.0
Approach	55	5.5	55	5.5		0.156		25.6	LOS C	1.6	11.5				
Intersection	3123	7.2	3011 [N1]	7.5		0.884		19.2	LOS B	32.0	237.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	24	788	812	7.0	918	0.884	100	NA	NA
Lane 2	-	742	742	7.1	840	0.884	100	NA	NA
Approach	24	1530	1554	7.1		0.884			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	662	-	662	7.6	1321	0.501	100	NA	NA
Lane 2	622	-	622	7.6	1241	0.501	100	NA	NA
Lane 3	-	117	117	4.2	151	0.775	100	0.0	2
Approach	1284	117	1402	7.3		0.775			

SouthWest: Mattson Road

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	41	55	5.5	353	0.156	100	NA	NA
Approach	14	41	55	5.5		0.156			

	Total	%HV	Deg.Satn (v/c)
Intersection	3011	7.5	0.884

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

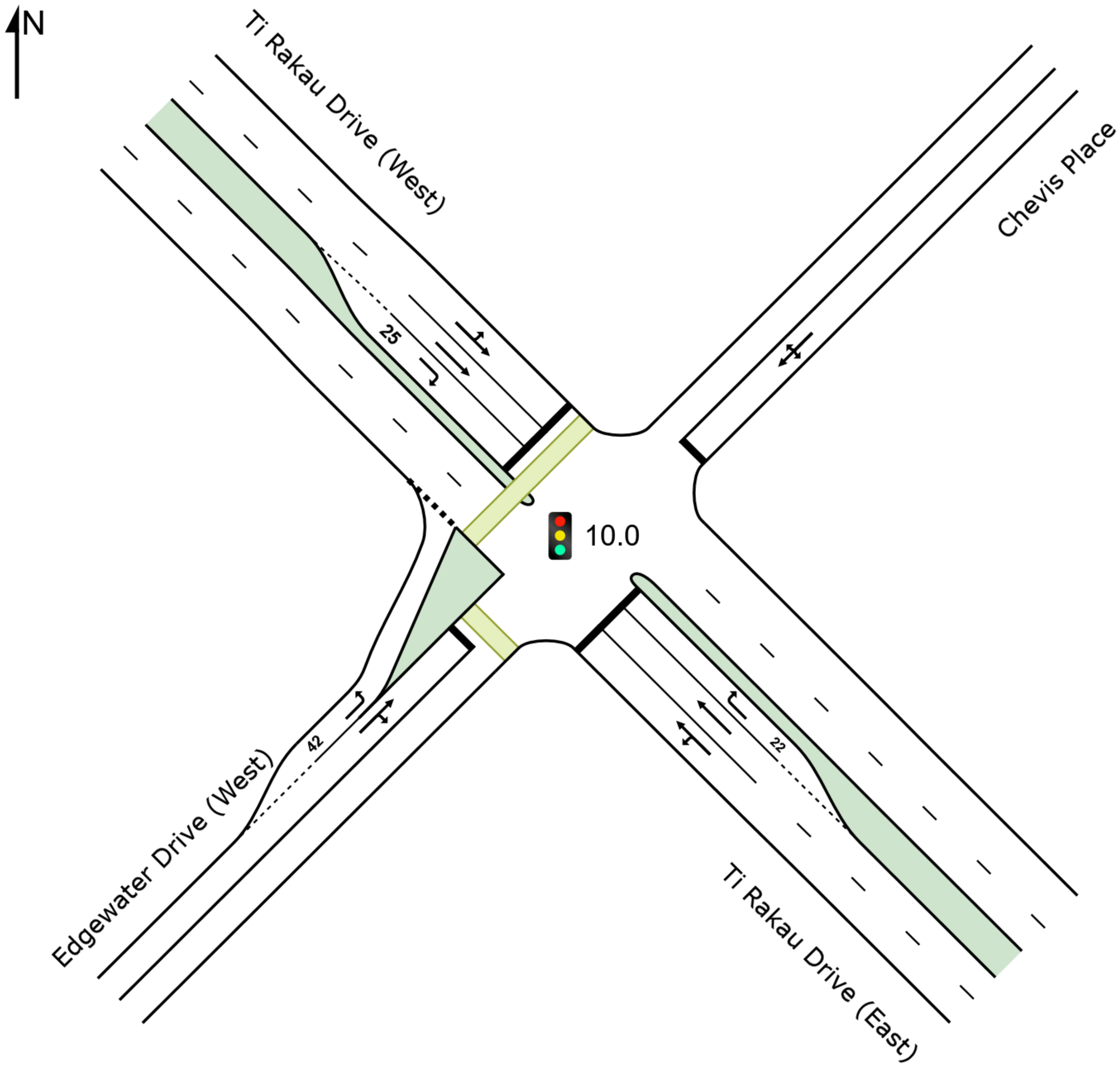
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Priority**												
Exit Short Lane	3	18	0.0	622	646	3.00	2.00	41	1132	0.036	1.2	1.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				622	1800	0.346	0.0	0.0
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Mattson Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 10.0 [10.0 Edgewater Dr (West) / Chevis Pl (Site Folder: General)]

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

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



LANE SUMMARY

Site: 10.0 [10.0 Edgewater Dr (West) / Chevis Pl (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	845	6.8	835	6.8	986	0.846	100	27.8	LOS C	35.7 [N4]	264.4 [N4]	Full	162	0.0	50.0
Lane 2	828	7.2	818	7.2	966 [1]	0.846	100	27.8	LOS C	35.6 [N4]	264.4 [N4]	Full	162	0.0	50.0
Lane 3	10	0.0	10	0.0	97	0.102	100	60.8	LOS E	0.5	3.7	Short	22	0.0	NA
Approach	1683	7.0	1662 [N1]	7.0		0.846		28.0	LOS C	35.7	264.4				
NorthEast: Chevis Place															
Lane 1	30	0.0	30	0.0	103	0.291	100	60.4	LOS E	1.7	11.6	Full	138	0.0	0.0
Approach	30	0.0	30	0.0		0.291		60.4	LOS E	1.7	11.6				
NorthWest: Ti Rakau Drive (West)															
Lane 1	623	5.2	603	5.2	1020	0.592	100	19.1	LOS B	15.2 [N4]	111.0 [N4]	Full	68	0.0	50.0
Lane 2	516	5.3	500	5.3	845 [1]	0.592	100	18.0	LOS B	15.2 [N4]	111.0 [N4]	Full	68	0.0	50.0
Lane 3	81	6.2	78	6.1	97	0.812	100	68.1	LOS E	4.7	34.6	Short	25	0.0	NA
Approach	1220	5.3	1181 [N1]	5.3		0.812		21.9	LOS C	15.2	111.0				
SouthWest: Edgewater Drive (West)															
Lane 1	94	5.3	94	5.3	649	0.145	100	16.7	LOS B	2.4	17.5	Short	42	0.0	NA
Lane 2	56	5.4	56	5.4	261	0.215	100	49.4	LOS D	2.7	19.8	Full	789	0.0	0.0
Approach	150	5.3	150	5.3		0.215		28.9	LOS C	2.7	19.8				
Intersection	3083	6.2	3024 [N1]	6.3		0.846		26.0	LOS C	35.7	264.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
SouthEast: Ti Rakau Drive (East)										
Lane 1	94	741	-	835	6.8	986	0.846	100	NA	NA
Lane 2	-	818	-	818	7.2	966 [1]	0.846	100	NA	NA
Lane 3	-	-	10	10	0.0	97	0.102	100	0.0	2
Approach	94	1559	10	1662	7.0		0.846			
NorthEast: Chevis Place										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From NE To Exit:	SE	SW	NW			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	10	10	10	30	0.0	103	0.291	100	NA	NA
Approach	10	10	10	30	0.0		0.291			
NorthWest: Ti Rakau Drive (West)										
Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	594	-	603	5.2	1020	0.592	100	NA	NA
Lane 2	-	500	-	500	5.3	845 [1]	0.592	100	NA	NA
Lane 3	-	-	78	78	6.1	97	0.812	100	34.6	2
Approach	10	1093	78	1181	5.3		0.812			
SouthWest: Edgewater Drive (West)										
Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	94	-	-	94	5.3	649	0.145	100	0.0	2
Lane 2	-	10	46	56	5.4	261	0.215	100	NA	NA
Approach	94	10	46	150	5.3		0.215			

	Total	%HV	Deg.Satn (v/c)
Intersection	3024	6.3	0.846

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

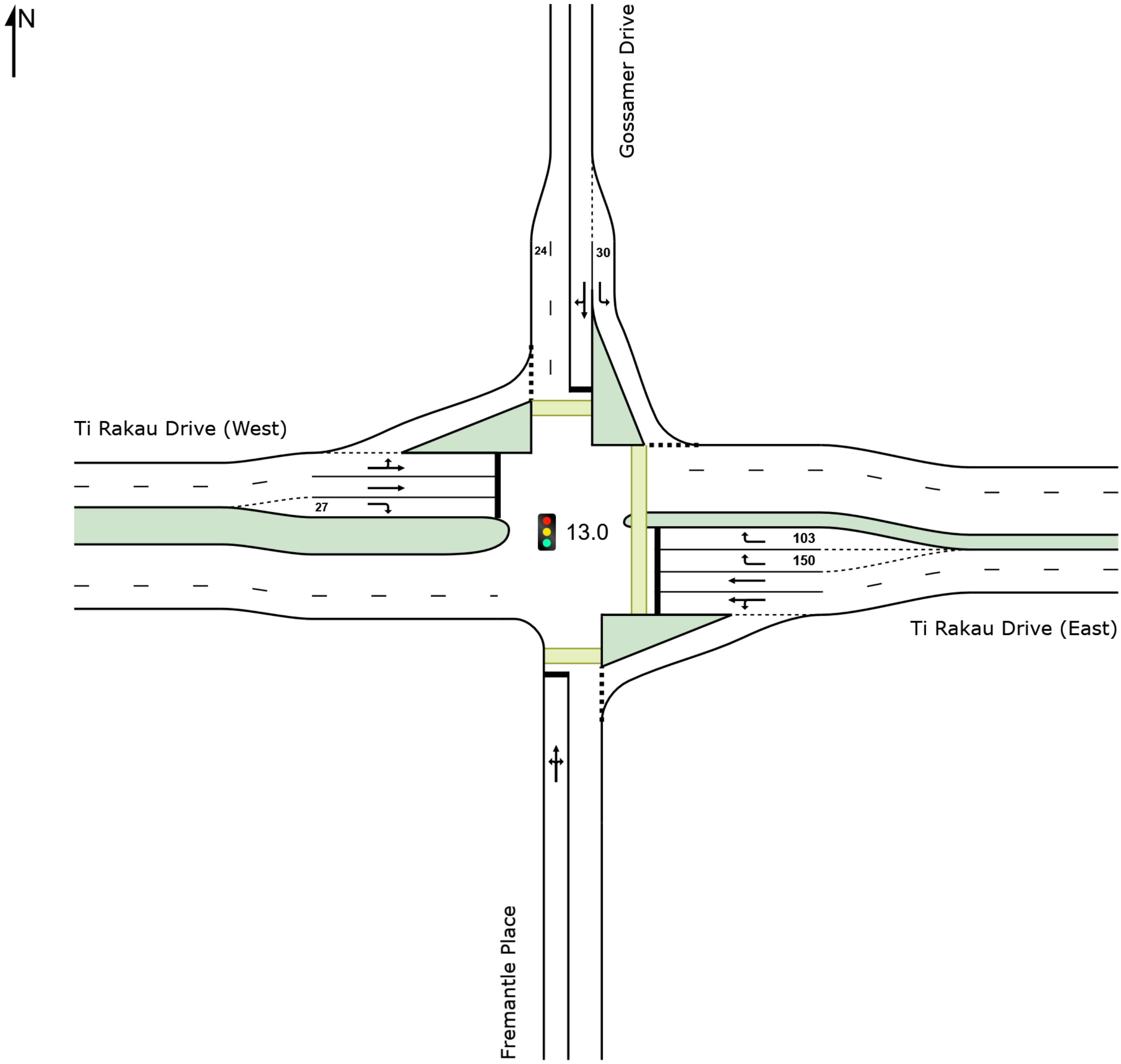
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
NorthEast Exit: Chevis Place Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Edgewater Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: General)]

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

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



LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: General)]

Network: N101 [PM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 171 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	ARRIVAL FLOWS [Total veh/h	ARRIVAL FLOWS HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	95% BACK OF QUEUE Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	39	2.6	39	2.6	65	0.602	100	97.7	LOS F	3.5	24.7	Full	285	0.0	0.0
Approach	39	2.6	39	2.6		0.602		97.7	LOS F	3.5	24.7				
East: Ti Rakau Drive (East)															
Lane 1	863	6.9	863	6.9	1037	0.832	100	32.6	LOS C	57.8	428.8	Full	636	0.0	0.0
Lane 2	779	7.0	779	7.0	936[1]	0.832	100	30.4	LOS C	49.0	363.9	Full	636	0.0	0.0
Lane 3	113	8.9	113	8.9	553	0.205	23[6]	28.4	LOS C	4.1	30.8	Short	150	0.0	NA
Lane 4	494	8.9	494	8.9	553	0.893	100	48.2	LOS D	28.3	213.3	Short	103	0.0	NA
Approach	2249	7.5	2249	7.5		0.893		35.1	LOS D	57.8	428.8				
North: Gossamer Drive															
Lane 1	475	17.3	475	17.3	912[1]	0.521	100	17.9	LOS B	18.2	146.6	Short	30	0.0	NA
Lane 2	41	4.9	41	4.9	241	0.170	100	74.3	LOS E	3.0	22.2	Full	1010	0.0	0.0
Approach	516	16.3	516	16.3		0.521		22.4	LOS C	18.2	146.6				
West: Ti Rakau Drive (West)															
Lane 1	587	5.2	560	5.2	629	0.890	100	72.3	LOS E	47.8	349.9	Full	479	0.0	0.0
Lane 2	554	5.5	529	5.4	594[1]	0.890	100	67.9	LOS E	45.6	333.9	Full	479	0.0	0.0
Lane 3	18	0.0	17	0.0	231	0.074	100	75.1	LOS E	1.3	8.8	Short	27	0.0	NA
Approach	1159	5.3	1106[N1]	5.2		0.890		70.2	LOS E	47.8	349.9				
Intersection	3963	7.9	3910[N1]	8.0		0.893		44.0	LOS D	57.8	428.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	12	10	17	39	2.6	65	0.602	100	NA	NA
Approach	12	10	17	39	2.6		0.602			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

	S	W	N							
Lane 1	20	843	-	863	6.9	1037	0.832	100	NA	NA
Lane 2	-	779	-	779	7.0	936[1]	0.832	100	NA	NA
Lane 3	-	-	113	113	8.9	553	0.205	23[6]	37.2	2
Lane 4	-	-	494	494	8.9	553	0.893	100	72.7	3
Approach	20	1622	607	2249	7.5		0.893			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	475	-	-	475	17.3	912[1]	0.521	100	100.0	2
Lane 2	-	10	31	41	4.9	241	0.170	100	NA	NA
Approach	475	10	31	516	16.3		0.521			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	58	502	-	560	5.2	629	0.890	100	NA	NA
Lane 2	-	529	-	529	5.4	594[1]	0.890	100	NA	NA
Lane 3	-	-	17	17	0.0	231	0.074	100	0.0	2
Approach	58	1031	17	1106	5.2		0.890			

	Total	%HV	Deg.Satn (v/c)
Intersection	3910	8.0	0.893

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	24	50.0	252	263	2.50	2.00	171	1481	0.116	0.0	0.1
Merge Lane	2	-	50.0	86	89	2.50	2.00	504	1699	0.296	0.0	0.0
West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

Appendix F

Construction Scenario 2 – Phasing Diagrams

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 128 seconds (Site Practical Cycle Time)

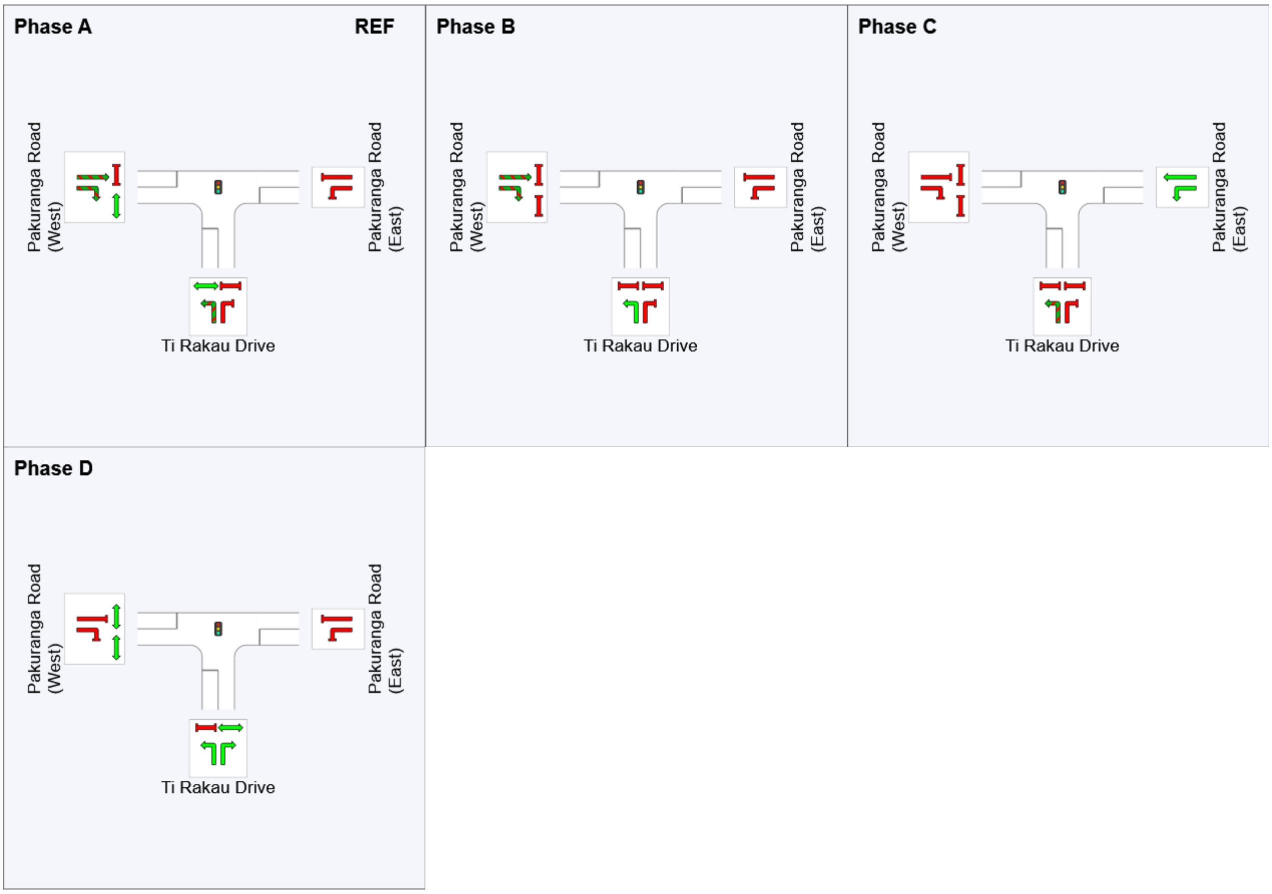
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	38	50	100
Green Time (sec)	32	6	44	22
Phase Time (sec)	38	12	50	28
Phase Split	30%	9%	39%	22%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 96 seconds (Site Practical Cycle Time)

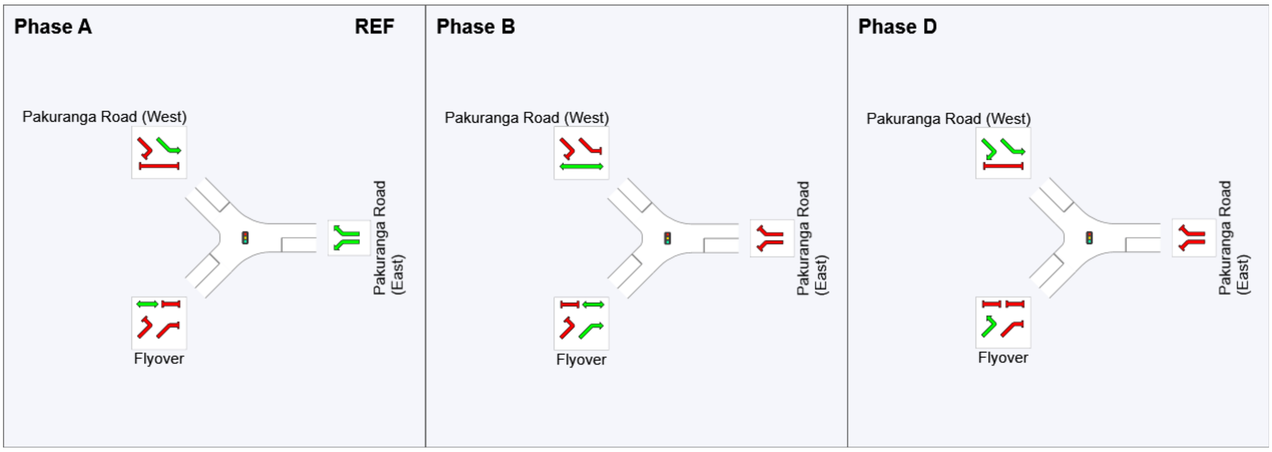
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, D
Output Phase Sequence: A, B, D

Phase Timing Summary

Phase	A	B	D
Phase Change Time (sec)	0	56	78
Green Time (sec)	50	16	12
Phase Time (sec)	56	22	18
Phase Split	58%	23%	19%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 64 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

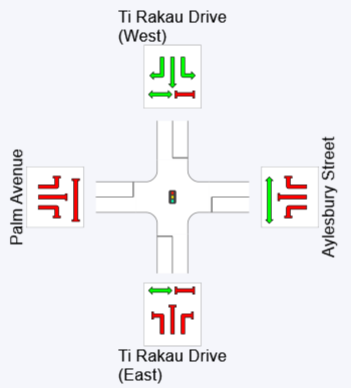
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	17	40	52
Green Time (sec)	11	17	6	6
Phase Time (sec)	17	23	12	12
Phase Split	27%	36%	19%	19%

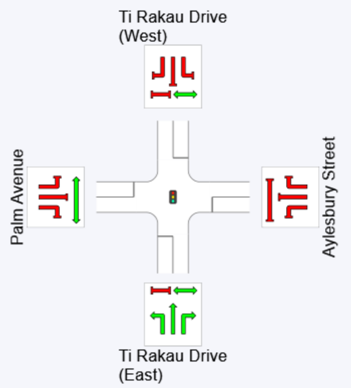
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

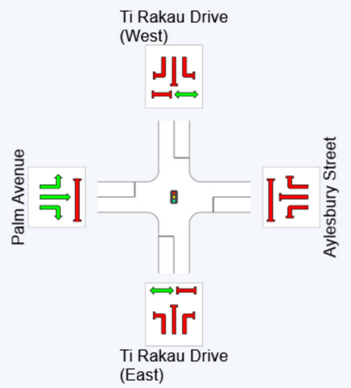
Phase A **REF**



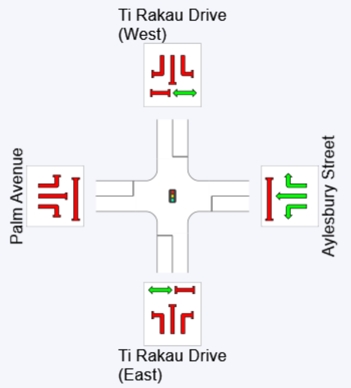
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Monday, 13 February 2023 1:51:32 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 AM - XL.sip9

PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga Highway/ Reeves Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 44 seconds (Site Practical Cycle Time)

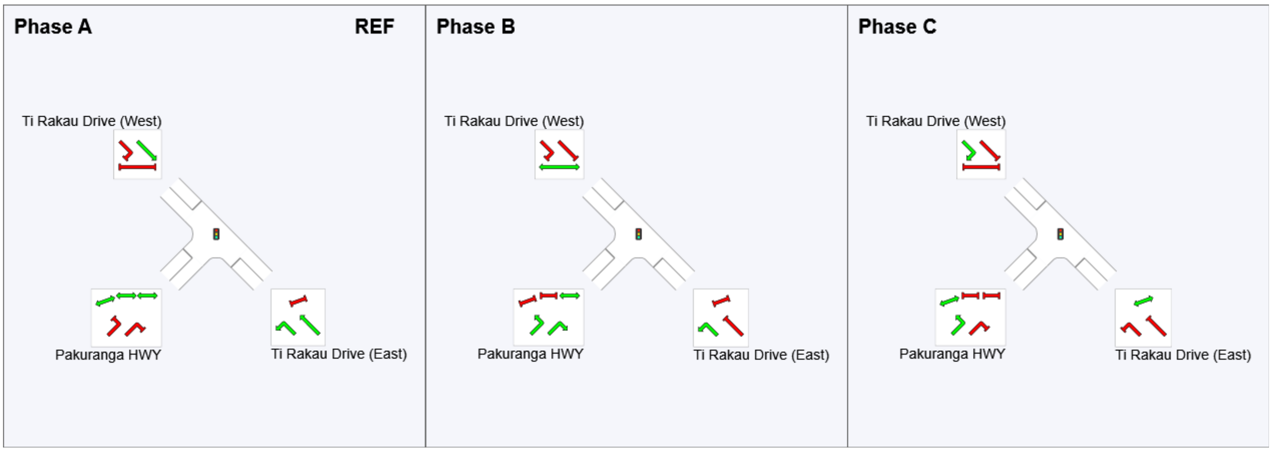
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

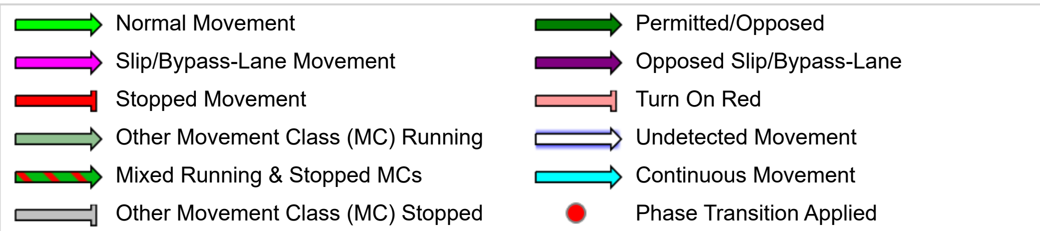
Phase	A	B	C
Phase Change Time (sec)	0	15	32
Green Time (sec)	9	11	6
Phase Time (sec)	15	17	12
Phase Split	34%	39%	27%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



PHASING SUMMARY

Site: 7.0 [7.0 William Roberts Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 65 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

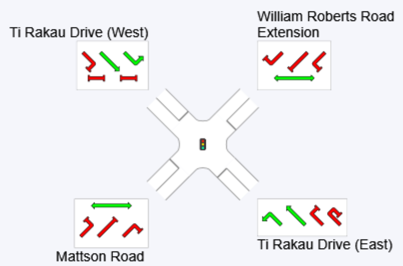
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	29	41	53
Green Time (sec)	23	6	6	6
Phase Time (sec)	29	12	12	12
Phase Split	45%	18%	18%	18%

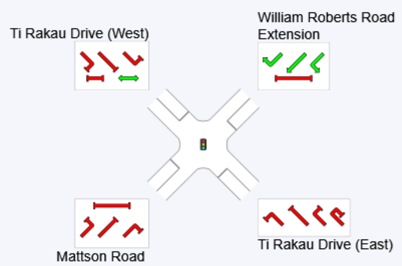
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

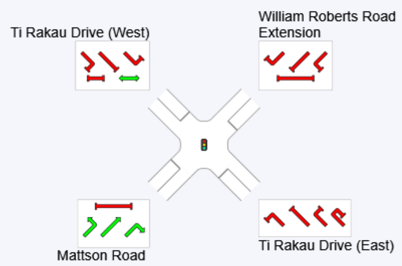
Phase A **REF**



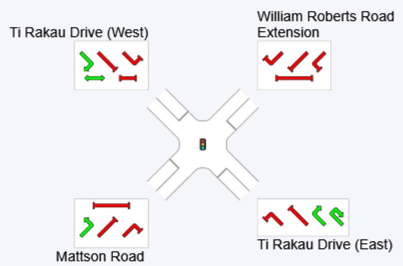
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

	Normal Movement		Permitted/Opposed
	Slip/Bypass-Lane Movement		Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
	Other Movement Class (MC) Running		Undetected Movement
	Mixed Running & Stopped MCs		Continuous Movement
	Other Movement Class (MC) Stopped		Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Monday, 13 February 2023 1:51:32 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 AM - XL.sip9

PHASING SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site Practical Cycle Time)

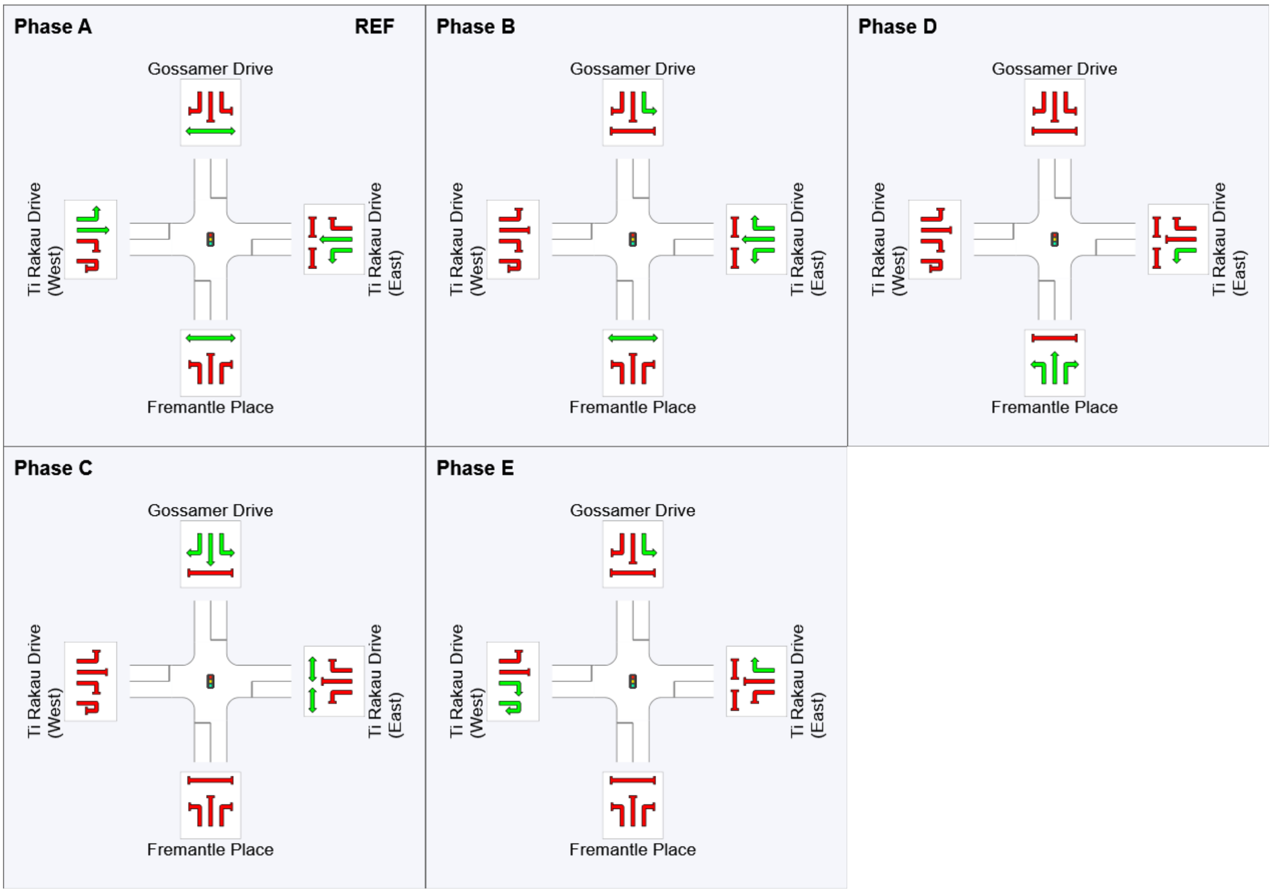
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, D, C, E
Output Phase Sequence: A, B, D, C, E

Phase Timing Summary

Phase	A	B	D	C	E
Phase Change Time (sec)	0	62	86	98	126
Green Time (sec)	56	18	6	22	18
Phase Time (sec)	62	24	12	28	24
Phase Split	41%	16%	8%	19%	16%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

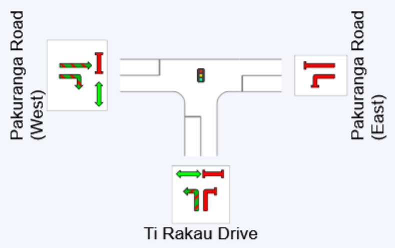
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	28	100	113	149
Green Time (sec)	66	7	30	23
Phase Time (sec)	72	13	36	29
Phase Split	48%	9%	24%	19%

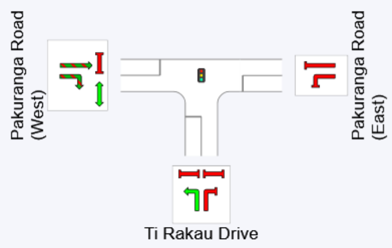
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

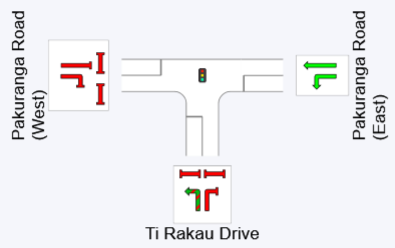
Phase A **REF**



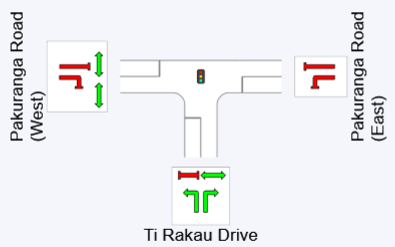
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)] **Network: N101 [AM (Network Folder: General)]**

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

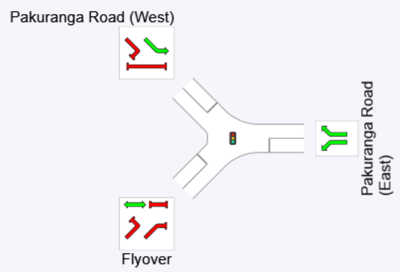
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	44	89	129
Green Time (sec)	38	39	34	15
Phase Time (sec)	44	45	40	21
Phase Split	29%	30%	27%	14%

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

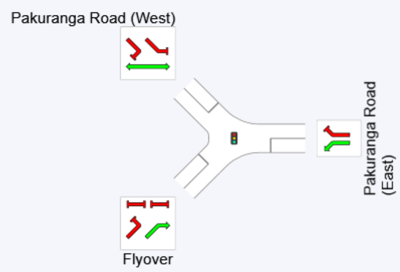
Output Phase Sequence

Phase A **REF**

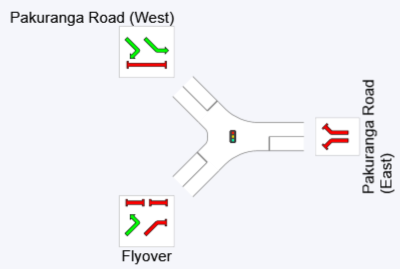


Phase B

Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

	Normal Movement		Permitted/Opposed
	Slip/Bypass-Lane Movement		Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
	Other Movement Class (MC) Running		Undetected Movement
	Mixed Running & Stopped MCs		Continuous Movement
	Other Movement Class (MC) Stopped		Phase Transition Applied

PHASING SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Green Split Priority has been specified
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

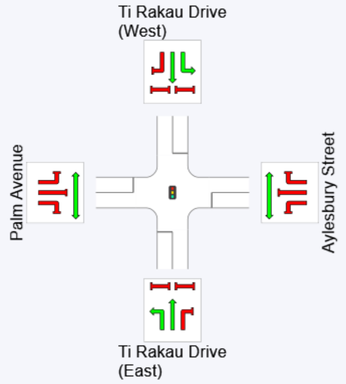
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	11	113	128	149
Green Time (sec)	96	9	15	6
Phase Time (sec)	102	15	21	12
Phase Split	68%	10%	14%	8%

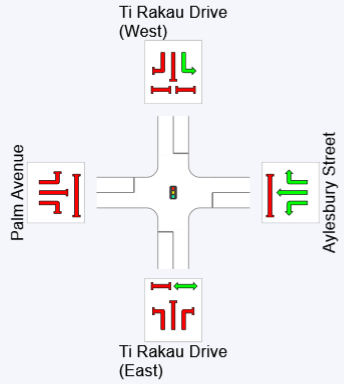
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

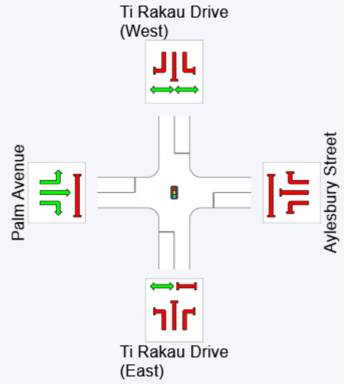
Phase A REF



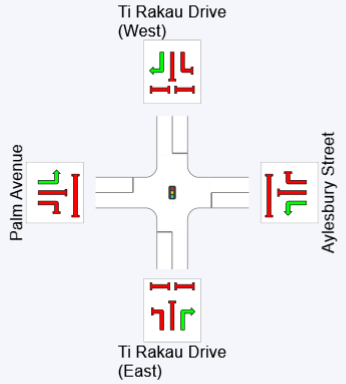
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 15 February 2023 9:19:03 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 PM - XL.sip9

PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga Highway/ Reeves Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Network User-Given Cycle Time)

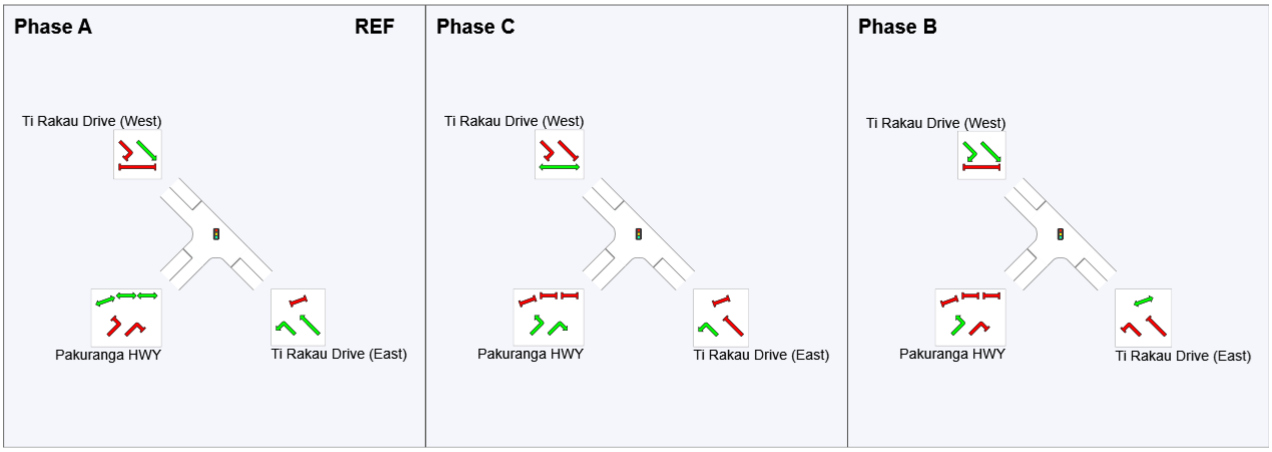
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Map Extract Default
Reference Phase: Phase A
Input Phase Sequence: A, C, B
Output Phase Sequence: A, C, B

Phase Timing Summary

Phase	A	C	B
Phase Change Time (sec)	0	43	135
Green Time (sec)	37	86	9
Phase Time (sec)	43	92	15
Phase Split	29%	61%	10%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 7.0 [7.0 William Roberts Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

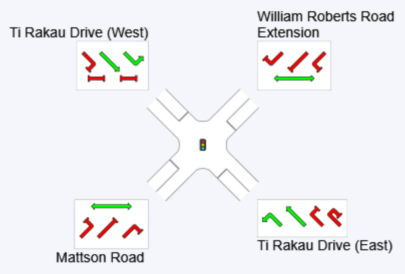
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	86	108	120
Green Time (sec)	80	16	6	24
Phase Time (sec)	86	22	12	30
Phase Split	57%	15%	8%	20%

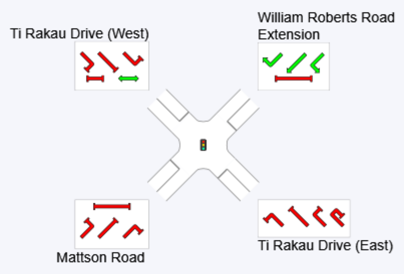
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

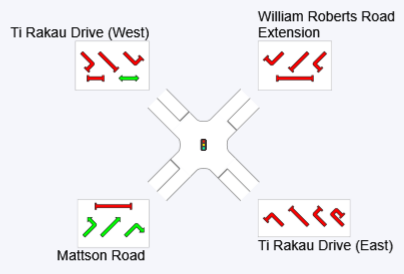
Phase A **REF**



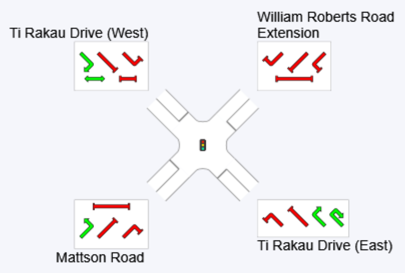
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site User-Given Phase Times)

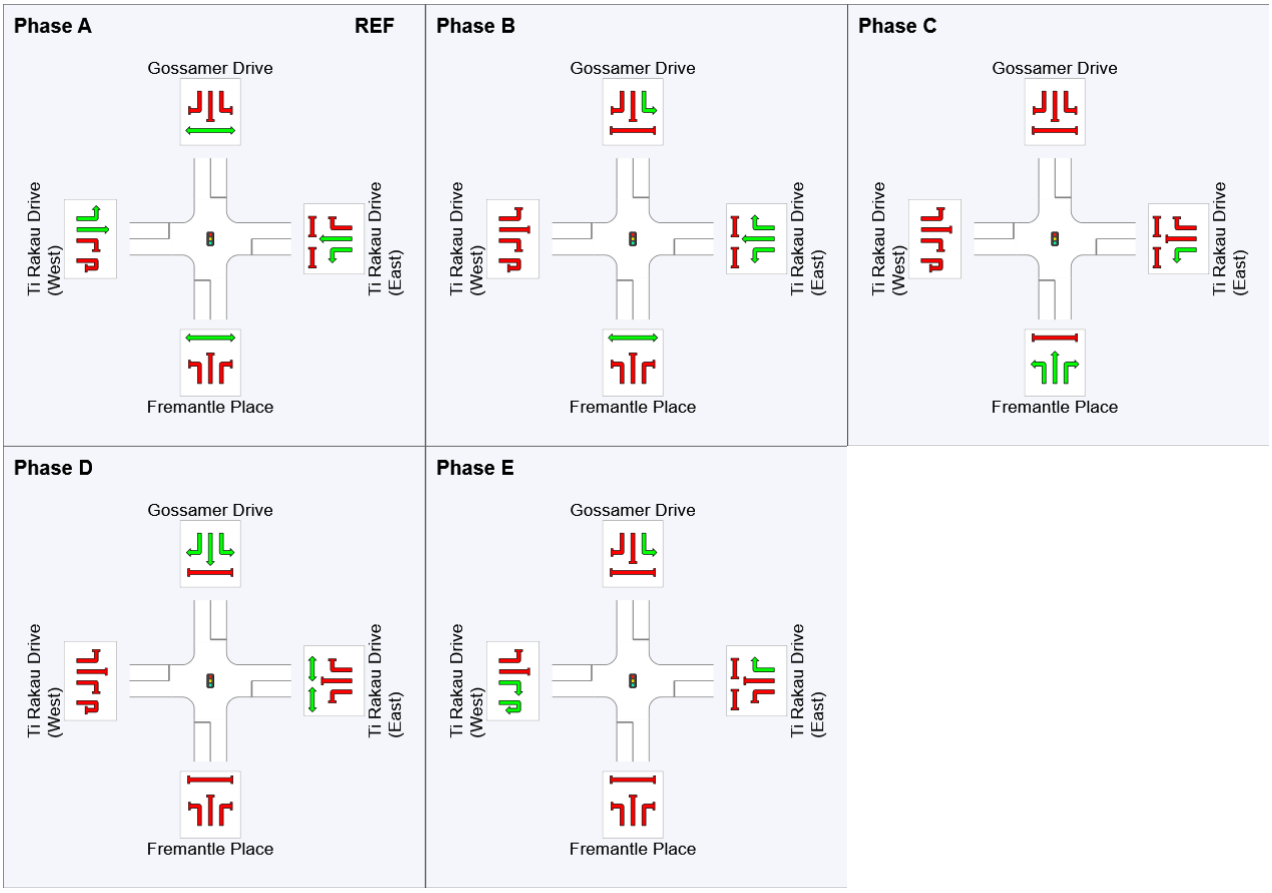
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	57	81	101	124
Green Time (sec)	51	18	14	17	20
Phase Time (sec)	57	24	20	23	26
Phase Split	38%	16%	13%	15%	17%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

TIME - DISTANCE DIAGRAM

Time – Distance Diagram for the Selected Route

Movement Class: Light Vehicles

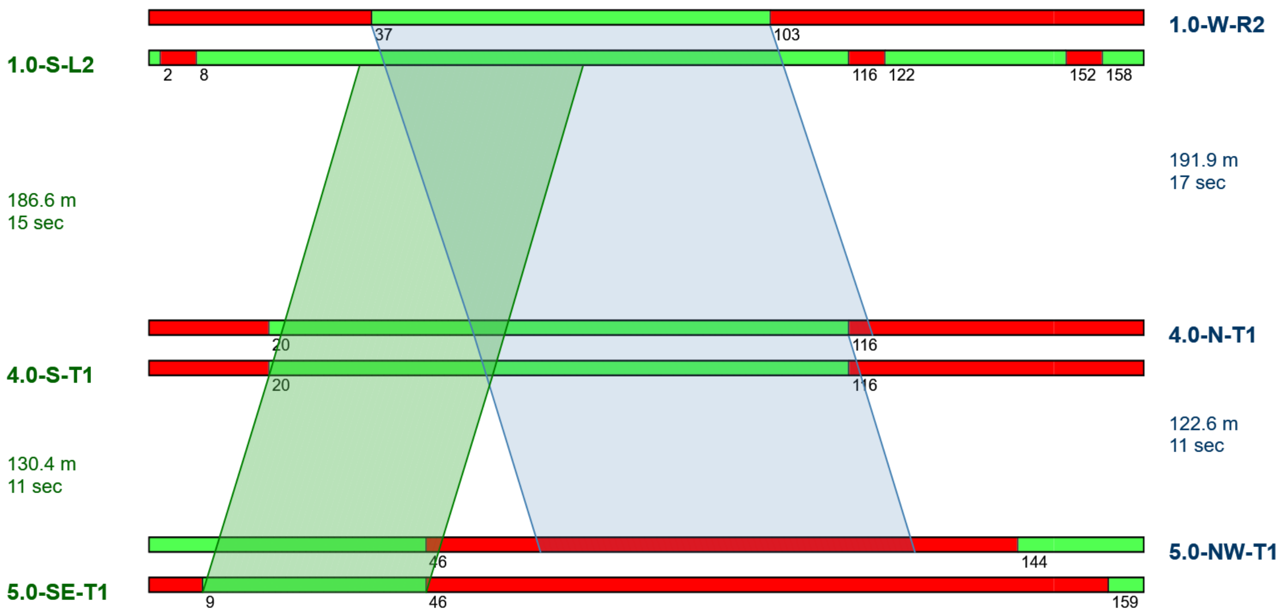
Route: R101 [Route1]

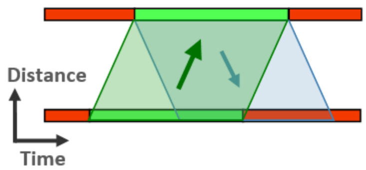
Network: N101 [AM (Network Folder: General)]

New Route
Network Category: (None)
Network Cycle Time = 150 seconds (Network User-Given Cycle Time)

Signal Offsets option used: User

Interactive Offsets





Main Route Direction: Up (Vertical)
Main Route
Reverse Route

Appendix G

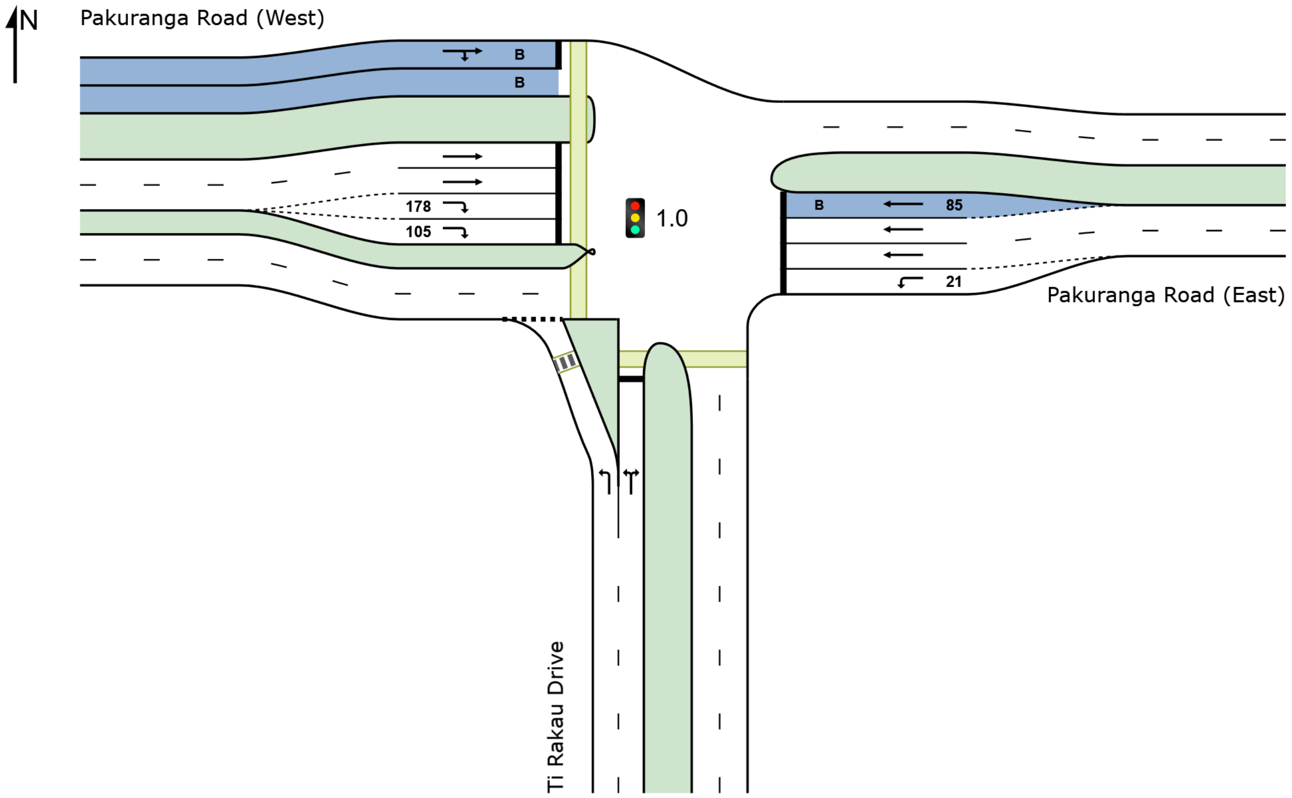
Construction Scenario 2 – Lane Performance Summaries

SITE LAYOUT

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 128 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Ti Rakau Drive															
Lane 1	676	9.9	659	10.0	921	0.716	100	22.8	LOS C	20.4	155.3	Full	174	0.0	4.7
Lane 2	118	22.0	116	22.4	278	0.415	58 [5]	55.3	LOS E	5.4	44.8	Full	174	0.0	0.0
Approach	794	11.7	774 [N1]	11.8		0.716		27.6	LOS C	20.4	155.3				
East: Pakuranga Road (East)															
Lane 1	55	3.6	55	3.6	619	0.089	100	34.7	LOS C	2.0	14.8	Short	21	0.0	NA
Lane 2	531	5.7	529	5.7	590 [1]	0.898	100	55.3	LOS E	19.5 [N4]	143.2 [N4]	Full	98	0.0	50.0
Lane 3	565	5.7	564	5.7	628 [1]	0.898	100	55.5	LOS E	19.5 [N4]	143.2 [N4]	Full	98	0.0	50.0
Lane 4 (B)	21	100.0	21	100.0	404	0.052	6 [5]	30.0	LOS C	0.8	10.1	Short	85	0.0	NA
Approach	1172	7.3	1169 [N1]	7.3		0.898		54.0	LOS D	19.5	143.2				
West: Pakuranga Road (West)															
Lane 1 (B)	24	100.0	24	100.0	53	0.453	100	72.3	LOS E	1.4	18.6	Full	380	0.0	0.0
Lane 2	413	7.9	413	7.9	461	0.894	100	63.0	LOS E	25.9	193.5	Full	380	0.0	0.0
Lane 3	413	7.9	413	7.9	461	0.894	100	63.0	LOS E	25.9	193.5	Full	380	0.0	0.0
Lane 4	237	15.4	237	15.4	416	0.569	100	50.2	LOS D	11.7	92.6	Short	178	0.0	NA
Lane 5	237	15.4	237	15.4	416	0.569	100	50.2	LOS D	11.7	92.6	Short	105	0.0	NA
Approach	1323	12.2	1323	12.2		0.894		58.6	LOS E	25.9	193.5				
Intersection	3289	10.4	3266 [N1]	10.4		0.898		49.6	LOS D	25.9	193.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
5 Lane under-utilisation found by the program
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	659	-	659	10.0	921	0.716	100	NA	NA
Lane 2	21	95	116	22.4	278	0.415	58 [5]	NA	NA
Approach	680	95	774	11.8		0.716			

East: Pakuranga Road (East)

Mov. From E	L2	T1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

To Exit:	S	W							
Lane 1	55	-	55	3.6	619	0.089	100	0.0	2
Lane 2	-	529	529	5.7	590 [1]	0.898	100	NA	NA
Lane 3	-	564	564	5.7	628 [1]	0.898	100	NA	NA
Lane 4	-	21	21	100.0	404	0.052	6 [5]	0.0	3
Approach	55	1114	1169	7.3		0.898			
West: Pakuranga Road (West)									
Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	15	24	100.0	53	0.453	100	NA	NA
Lane 2	413	-	413	7.9	461	0.894	100	NA	NA
Lane 3	413	-	413	7.9	461	0.894	100	NA	NA
Lane 4	-	237	237	15.4	416	0.569	100	0.0	3
Lane 5	-	237	237	15.4	416	0.569	100	3.7	4
Approach	834	489	1323	12.2		0.894			

	Total	%HV	Deg.Satn (v/c)
Intersection	3266	10.4	0.898

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

5 Lane under-utilisation found by the program

Merge Analysis

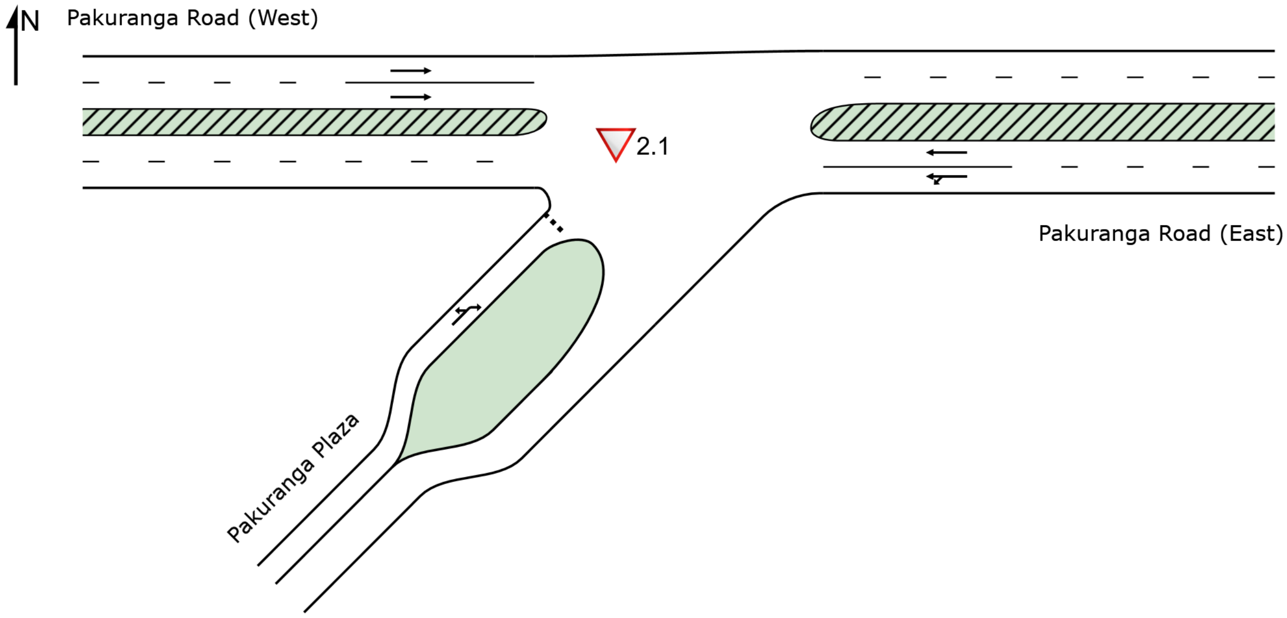
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Pakuranga Road (East)															
Lane 1	624	9.1	624	9.1	1819	0.343	100	1.0	LOS A	0.0	0.0	Full	121	0.0	0.0
Lane 2	643	5.6	643	5.6	1872	0.343	100	0.0	LOS A	0.0	0.0	Full	121	0.0	0.0
Approach	1267	7.3	1267	7.3		0.343		0.5	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	472	8.4	471	8.4	1840	0.256	100	0.0	LOS A	0.0	0.0	Full	108	0.0	0.0
Lane 2	472	8.4	471	8.4	1840	0.256	100	0.0	LOS A	0.0	0.0	Full	108	0.0	0.0
Approach	943	8.4	943	8.4		0.256		0.0	NA	0.0	0.0				
SouthWest: Pakuranga Plaza															
Lane 1	28	7.1	28	7.1	113	0.247	100	29.7	LOS D	0.5	3.6	Full	196	-12.5 [N7]	0.0
Approach	28	7.1	28	7.1		0.247		29.7	LOS D	0.5	3.6				
Intersection	2238	7.8	2238	7.8		0.343		0.7	NA	0.5	3.6				

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

N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	121	503	624	9.1	1819	0.343	100	NA	NA
Lane 2	-	643	643	5.6	1872	0.343	100	NA	NA
Approach	121	1146	1267	7.3		0.343			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	471	471	8.4	1840	0.256	100	NA	NA
Lane 2	471	471	8.4	1840	0.256	100	NA	NA
Approach	943	943	8.4		0.256			

SouthWest: Pakuranga Plaza

Mov. From SW To Exit:	L3	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

	W	E							
Lane 1	18	10	28	7.1	113	0.247	100	NA	NA
Approach	18	10	28	7.1		0.247			

	Total	%HV	Deg.Satn (v/c)
Intersection	2238	7.8	0.343

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

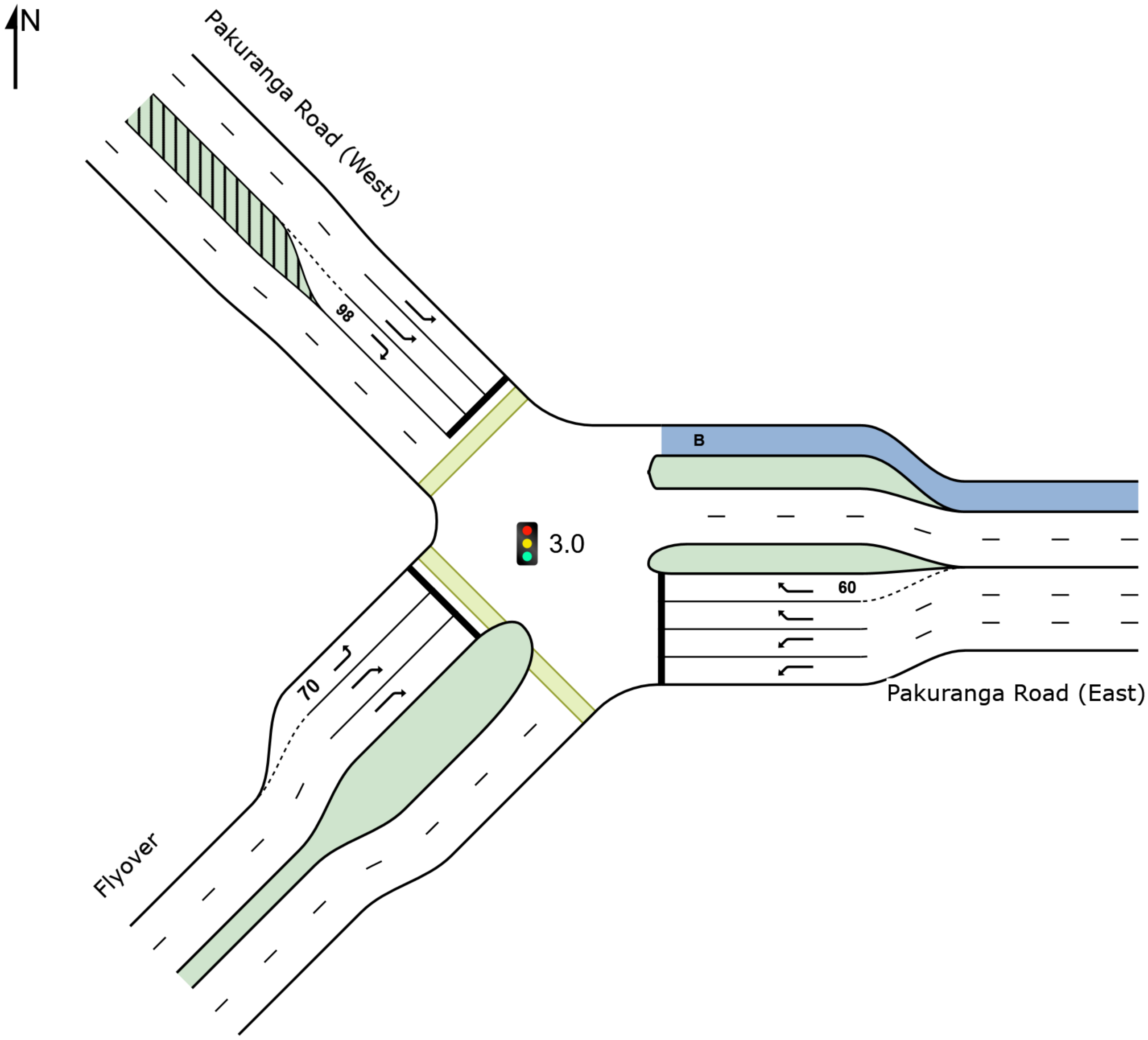
Merge Analysis												
	Exit Lane Number	Short Lane Length	Percent Opng in Lane	Opposing Flow Rate		Critical Gap	Follow-up Headway	Lane Flow Rate	Capacity	Deg. Satn	Min. Delay	Merge Delay
		m	%	veh/h	pcu/h	sec	sec	veh/h	veh/h	v/c	sec	sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 96 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Pakuranga Road (East)															
Lane 1	859	5.3	859	5.3	955	0.899	100	38.7	LOS D	40.0	292.9	Full	183	0.0	58.6
Lane 2	859	5.3	859	5.3	955	0.899	100	38.7	LOS D	40.0	292.9	Full	183	0.0	58.6
Lane 3	566	7.4	566	7.4	692[1]	0.819	100	26.7	LOS C	19.0	141.7	Full	183	0.0	0.0
Lane 4	567	7.4	567	7.4	692[1]	0.819	100	26.7	LOS C	19.0	141.7	Short	60	0.0	NA
Approach	2851	6.1	2851	6.1		0.899		33.9	LOS C	40.0	292.9				
NorthWest: Pakuranga Road (West)															
Lane 1	383	9.7	383	9.7	1262	0.303	100	8.9	LOS A	5.9	44.5	Full	121	0.0	0.0
Lane 2	388	7.5	388	7.5	1280	0.303	100	8.9	LOS A	5.9	44.3	Full	121	0.0	0.0
Lane 3	198	6.6	198	6.6	221	0.898	100	62.3	LOS E	9.8	72.8	Short	98	0.0	NA
Approach	969	8.2	969	8.2		0.898		19.8	LOS B	9.8	72.8				
SouthWest: Flyover															
Lane 1	144	6.9	144	6.9	227	0.635	100	51.0	LOS D	6.1	44.9	Short	70	0.0	NA
Lane 2	281	5.3	281	5.3	315	0.890	100	58.6	LOS E	13.7	100.3	Full	1162	0.0	0.0
Lane 3	281	5.3	281	5.3	315	0.890	100	58.6	LOS E	13.7	100.3	Full	1162	0.0	0.0
Approach	705	5.7	705	5.7		0.890		57.0	LOS E	13.7	100.3				
Intersection	4525	6.5	4525	6.5		0.899		34.5	LOS C	40.0	292.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	R1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	859	-	859	5.3	955	0.899	100	NA	NA
Lane 2	859	-	859	5.3	955	0.899	100	NA	NA
Lane 3	-	566	566	7.4	692[1]	0.819	100	NA	NA
Lane 4	-	567	567	7.4	692[1]	0.819	100	96.6	3
Approach	1718	1133	2851	6.1		0.899			

NorthWest: Pakuranga Road (West)

Mov. From NW To Exit:	L1 E	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	383	-	383	9.7	1262	0.303	100	NA	NA

Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 2	388	-	388	7.5	1280	0.303	100	NA	NA
Lane 3	-	198	198	6.6	221	0.898	100	0.0	2
Approach	771	198	969	8.2		0.898			

SouthWest: Flyover

Mov. From SW To Exit:	L2 NW	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	144	-	144	6.9	227	0.635	100	0.0	2
Lane 2	-	281	281	5.3	315	0.890	100	NA	NA
Lane 3	-	281	281	5.3	315	0.890	100	NA	NA
Approach	144	561	705	5.7		0.890			

	Total	%HV	Deg.Satn (v/c)
Intersection	4525	6.5	0.899

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

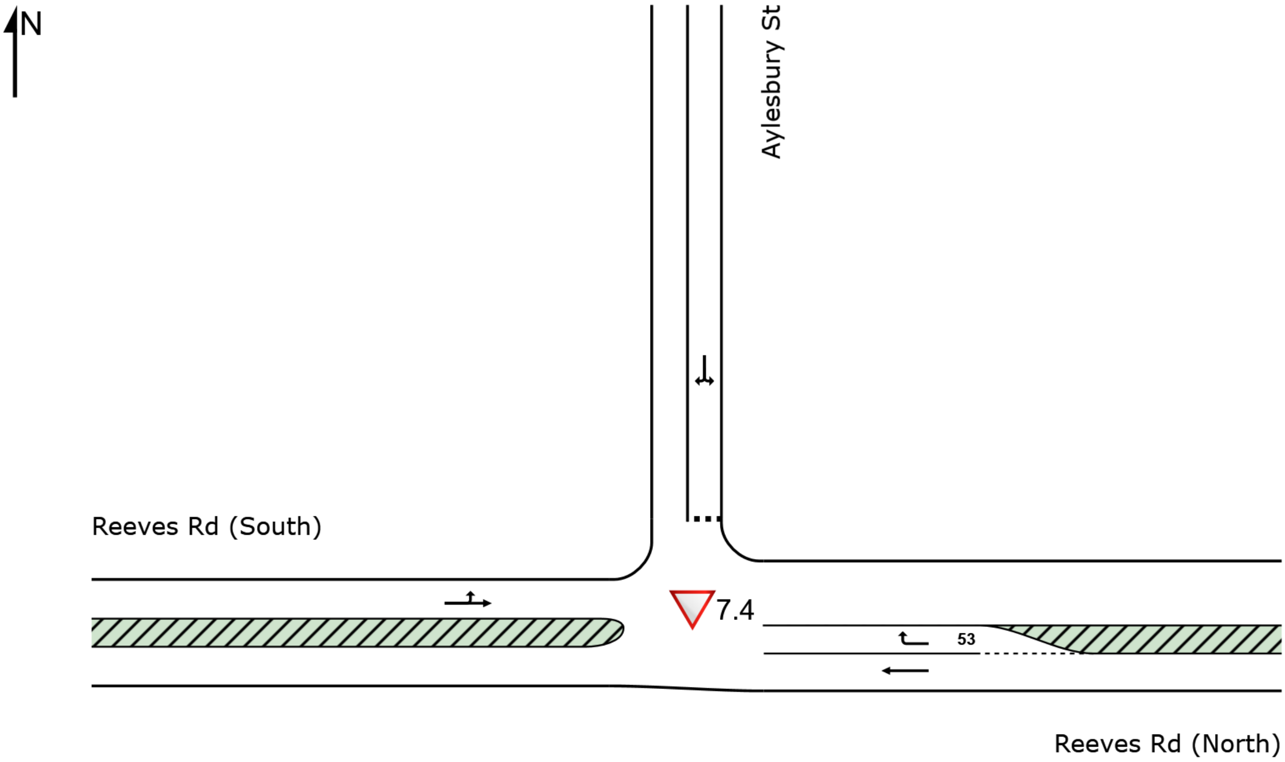
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Flyover Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

SITE LAYOUT

Site: 7.4 [7.4 Reeves Rd/ Aylesbury St - XL (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 7.4 [7.4 Reeves Rd/ Aylesbury St - XL (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Reeves Rd (North)															
Lane 1	33	3.2	33	3.2	1967	0.017	100	0.0	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 2	48	6.5	48	6.5	1712	0.028	100	4.1	LOS A	0.1	0.7	Short	53	0.0	NA
Approach	81	5.2	81	5.2		0.028		2.5	NA	0.1	0.7				
North: Aylesbury St															
Lane 1	21	0.0	21	0.0	1296	0.016	100	4.8	LOS A	0.0	0.3	Full	193	0.0	0.0
Approach	21	0.0	21	0.0		0.016		4.8	LOS A	0.0	0.3				
West: Reeves Rd (South)															
Lane 1	21	0.0	21	0.0	1991	0.011	100	2.1	LOS A	0.0	0.0	Full	60	0.0	0.0
Approach	21	0.0	21	0.0		0.011		2.1	NA	0.0	0.0				
Intersection	123	3.4	123	3.4		0.028		2.8	NA	0.1	0.7				

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

Approach Lane Flows (veh/h)

East: Reeves Rd (North)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	33	-	33	3.2	1967	0.017	100	NA	NA
Lane 2	-	48	48	6.5	1712	0.028	100	0.0	1
Approach	33	48	81	5.2		0.028			

North: Aylesbury St

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	11	21	0.0	1296	0.016	100	NA	NA
Approach	11	11	21	0.0		0.016			

West: Reeves Rd (South)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	11	21	0.0	1991	0.011	100	NA	NA
Approach	11	11	21	0.0		0.011			

	Total	%HV	Deg.Satn (v/c)
Intersection	123	3.4	0.028

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

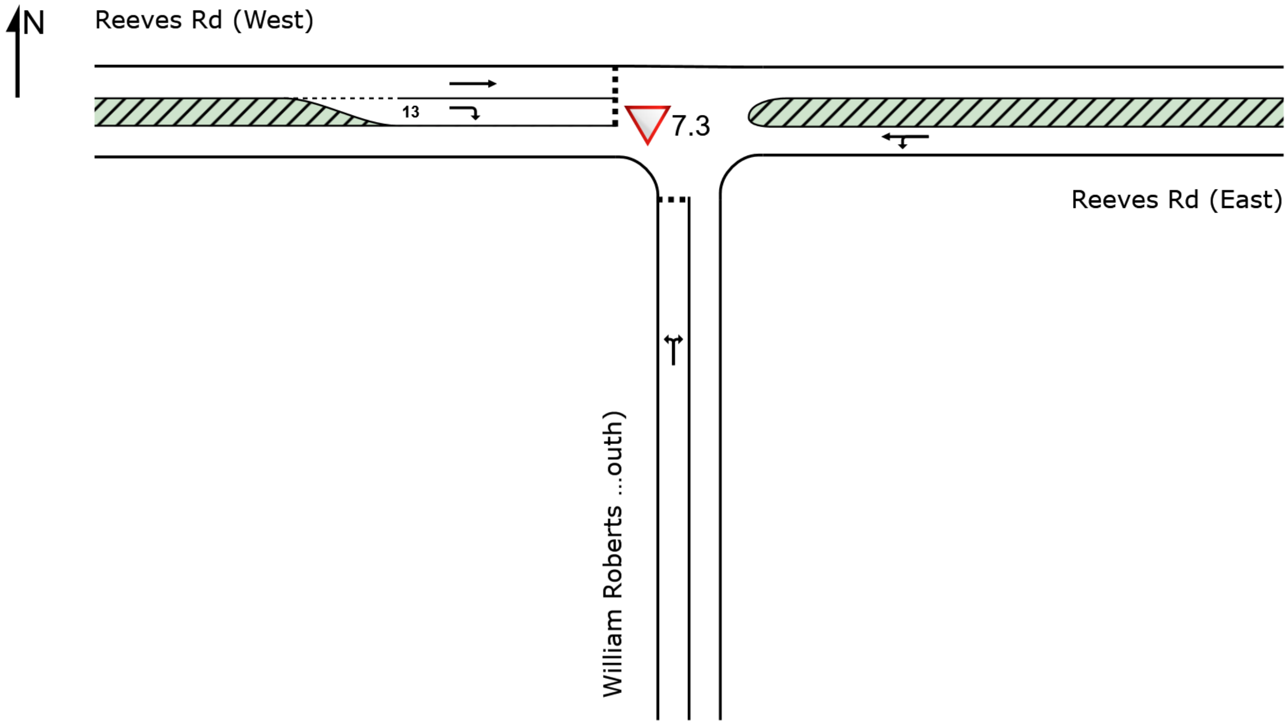
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Reeves Rd (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Aylesbury St Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Reeves Rd (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 7.3 [7.3 William Roberts Rd / Reeves Rd - XL (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 7.3 [7.3 William Roberts Rd / Reeves Rd - XL (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road (South)															
Lane 1	184	8.0	183	8.0	971	0.189	100	5.5	LOS A	0.5	3.9	Full	243	0.0	0.0
Approach	184	8.0	183 N1	8.0		0.189		5.5	LOS A	0.5	3.9				
East: Reeves Rd (East)															
Lane 1	208	9.6	208	9.6	1734	0.120	100	4.3	LOS A	0.0	0.0	Full	266	0.0	0.0
Approach	208	9.6	208	9.6		0.120		4.3	NA	0.0	0.0				
West: Reeves Rd (West)															
Lane 1	11	0.0	11	0.0	1960	0.005	100	2.7	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 2	11	0.0	11	0.0	737	0.014	100	6.2	LOS A	0.0	0.2	Short	13	0.0	NA
Approach	21	0.0	21	0.0		0.014		4.4	LOS A	0.0	0.2				
Intersection	414	8.4	413 N1	8.4		0.189		4.8	NA	0.5	3.9				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: William Roberts Road (South)

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	23	160	183	8.0	971	0.189	100	NA	NA
Approach	23	160	183	8.0		0.189			

East: Reeves Rd (East)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	151	58	208	9.6	1734	0.120	100	NA	NA
Approach	151	58	208	9.6		0.120			

West: Reeves Rd (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	-	11	0.0	1960	0.005	100	NA	NA
Lane 2	-	11	11	0.0	737	0.014	100	0.0	1

Approach	11	11	21	0.0	0.014

	Total	%HV	Deg.Satn (v/c)
Intersection	413	8.4	0.189

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Reeves Rd (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Reeves Rd (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

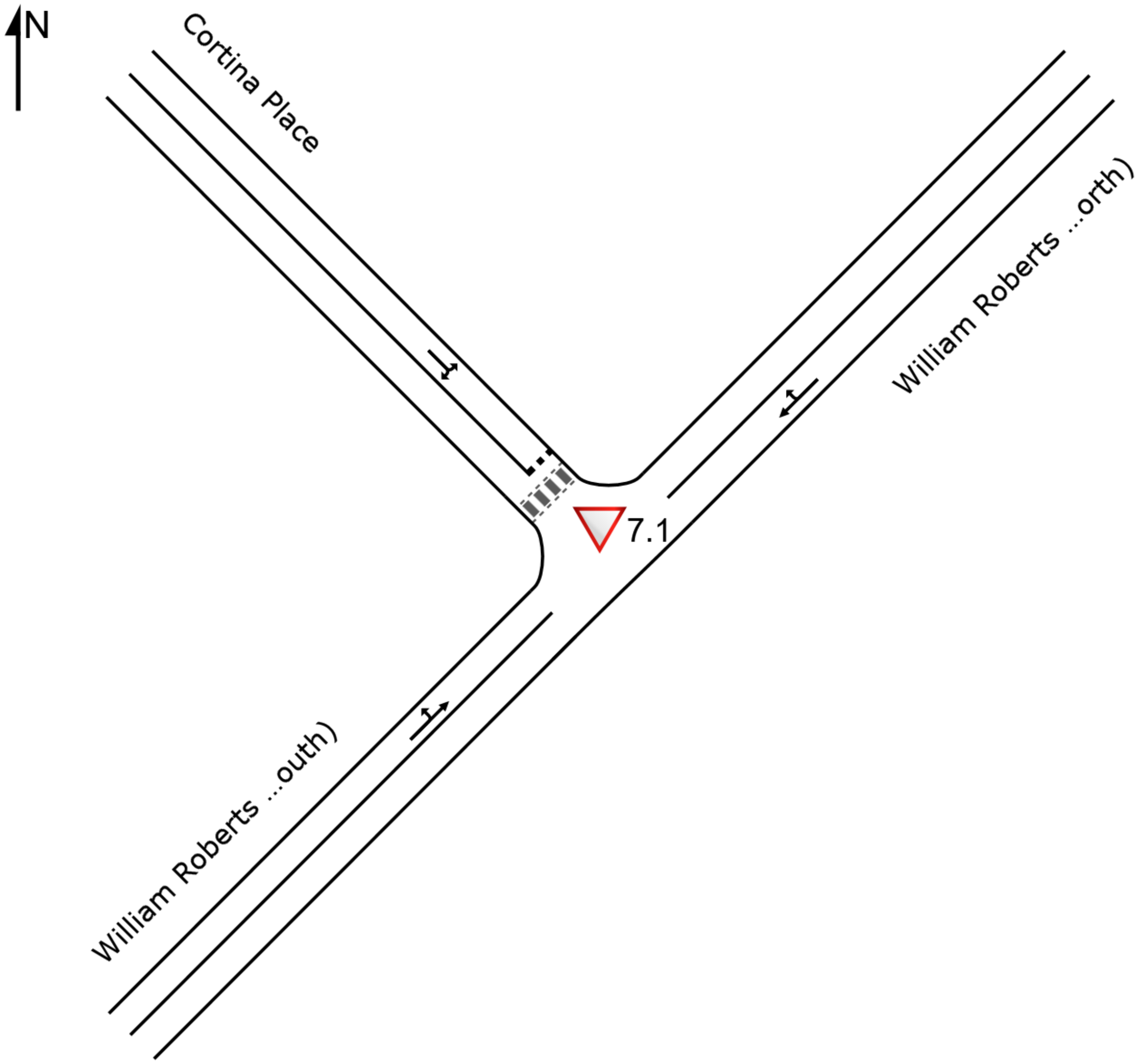
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Monday, 13 February 2023 1:51:32 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 AM - XL.sip9

SITE LAYOUT

▽ Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
NorthEast: William Roberts Road (North)															
Lane 1	267	8.3	267	8.3	1831	0.146	100	0.2	LOS A	0.1	0.5	Full	243	0.0	0.0
Approach	267	8.3	267	8.3		0.146		0.2	NA	0.1	0.5				
NorthWest: Cortina Place															
Lane 1	37	5.4	37	5.4	1137	0.033	100	3.0	LOS A	0.1	0.7	Full	177	0.0	0.0
Approach	37	5.4	37	5.4		0.033		3.0	LOS A	0.1	0.7				
SouthWest: William Roberts Road (South)															
Lane 1	97	7.2	96	7.3	1791	0.054	100	0.5	LOS A	0.0	0.0	Full	110	0.0	0.0
Approach	97	7.2	96 [N1]	7.3		0.054		0.5	NA	0.0	0.0				
Intersection	401	7.7	400 [N1]	7.8		0.146		0.5	NA	0.1	0.7				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

NorthEast: William Roberts Road (North)

Mov. From NE To Exit:	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	257	10	267	8.3	1831	0.146	100	NA	NA
Approach	257	10	267	8.3		0.146			

NorthWest: Cortina Place

Mov. From NW To Exit:	L2 NE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	18	37	5.4	1137	0.033	100	NA	NA
Approach	19	18	37	5.4		0.033			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	23	73	96	7.3	1791	0.054	100	NA	NA
Approach	23	73	96	7.3		0.054			

Total	%HV	Deg.Satn (v/c)

Intersection	400	7.8		0.146

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

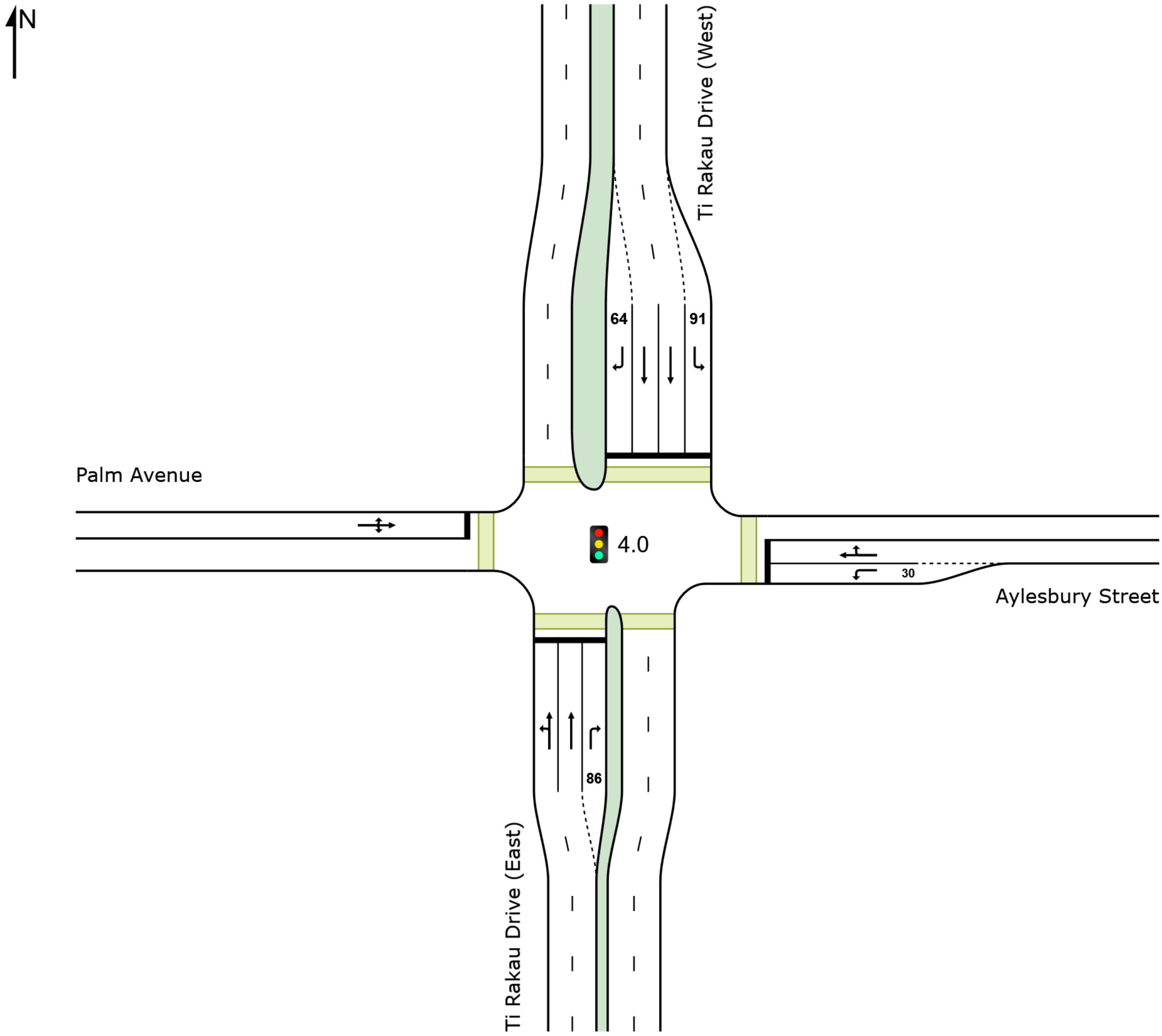
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
NorthEast Exit: William Roberts Road (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Cortina Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 64 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Ti Rakau Drive (East)															
Lane 1	368	11.7	356	11.9	430	0.826	100	34.1	LOS C	11.1	85.9	Full	110	-4.3 N3	0.0
Lane 2	388	12.6	375	12.8	454	0.826	100	33.8	LOS C	11.7	90.6	Full	110	0.0	0.0
Lane 3	11	9.1	11	9.2	439	0.024	100	22.5	LOS C	0.2	1.7	Short	86	0.0	NA
Approach	767	12.1	741 N1	12.3		0.826		33.8	LOS C	11.7	90.6				
East: Aylesbury Street															
Lane 1	12	8.3	12	8.3	152	0.079	100	31.3	LOS C	0.3	2.5	Short	30	0.0	NA
Lane 2	20	0.0	20	0.0	168	0.119	100	31.5	LOS C	0.5	3.8	Full	40	0.0	0.0
Approach	32	3.1	32	3.1		0.119		31.5	LOS C	0.5	3.8				
North: Ti Rakau Drive (West)															
Lane 1	14	7.1	14	7.1	240	0.058	100	30.3	LOS C	0.4	2.6	Short	91	0.0	NA
Lane 2	256	17.4	256	17.4	290	0.882	100	42.1	LOS D	8.8	70.5	Full	174	0.0	0.0
Lane 3	256	17.4	256	17.4	290	0.882	100	42.1	LOS D	8.8	70.5	Full	174	0.0	0.0
Lane 4	23	0.0	23	0.0	308	0.075	100	28.1	LOS C	0.6	3.9	Short	64	0.0	NA
Approach	549	16.4	549	16.4		0.882		41.2	LOS D	8.8	70.5				
West: Palm Avenue															
Lane 1	119	5.0	119	5.0	158	0.751	100	39.1	LOS D	3.7	27.1	Full	87	-2.5 N3	0.0
Approach	119	5.0	119	5.0		0.751		39.1	LOS D	3.7	27.1				
Intersection	1467	13.0	1441 N1	13.2		0.882		37.0	LOS D	11.7	90.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	31	325	-	356	11.9	430	0.826	100	NA	NA
Lane 2	-	375	-	375	12.8	454	0.826	100	NA	NA
Lane 3	-	-	11	11	9.2	439	0.024	100	0.0	2
Approach	31	700	11	741	12.3		0.826			

East: Aylesbury Street

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	12	-	-	12	8.3	152	0.079	100	0.0	2
Lane 2	-	10	10	20	0.0	168	0.119	100	NA	NA
Approach	12	10	10	32	3.1		0.119			

North: Ti Rakau Drive (West)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	-	-	14	7.1	240	0.058	100	0.0	2
Lane 2	-	256	-	256	17.4	290	0.882	100	NA	NA
Lane 3	-	256	-	256	17.4	290	0.882	100	NA	NA
Lane 4	-	-	23	23	0.0	308	0.075	100	0.0	3
Approach	14	512	23	549	16.4		0.882			

West: Palm Avenue

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	63	10	46	119	5.0	158	0.751	100	NA	NA
Approach	63	10	46	119	5.0		0.751			

	Total	%HV	Deg.Satn (v/c)
Intersection	1441	13.2	0.882

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

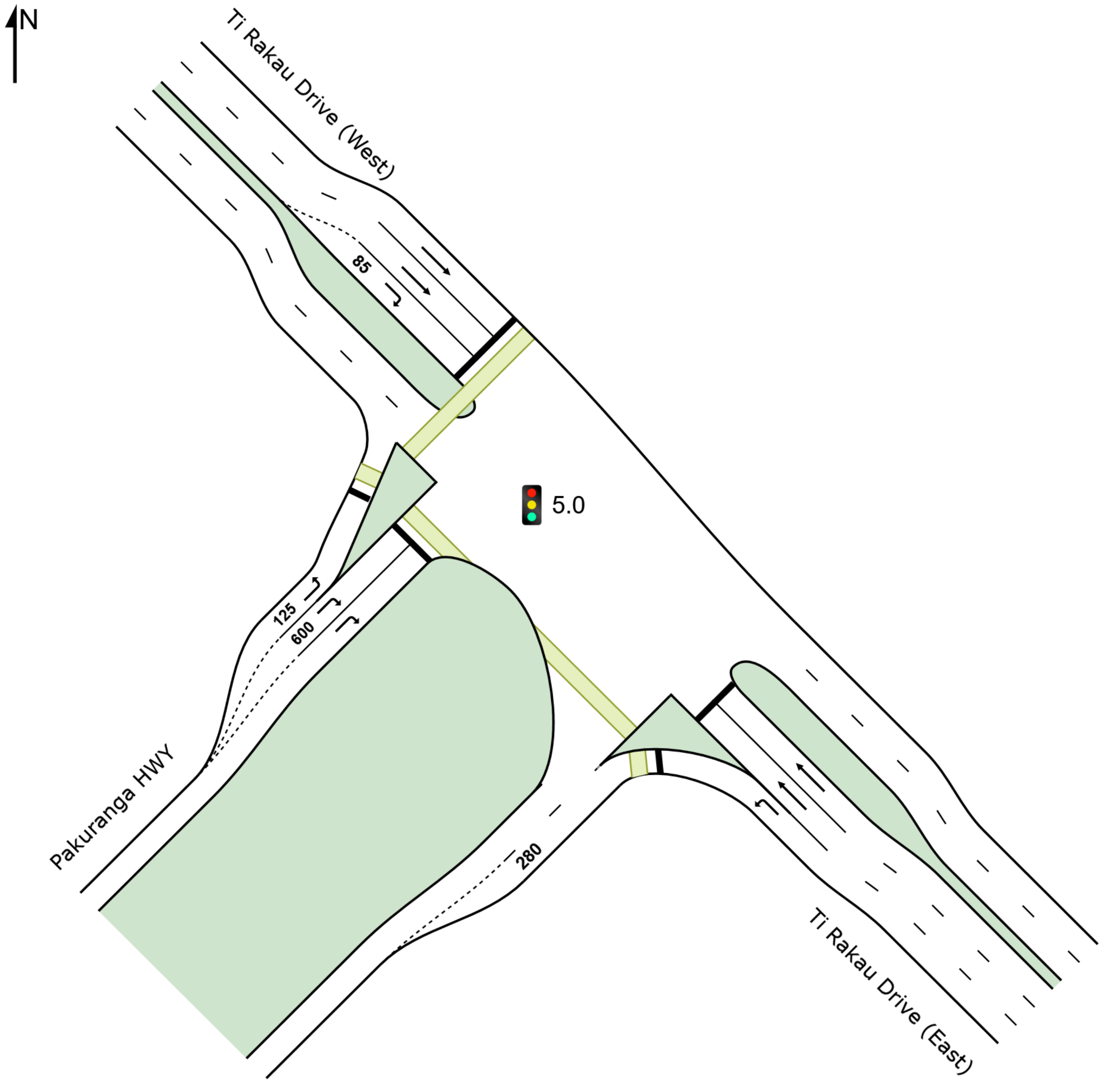
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Aylesbury Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Palm Avenue Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 5.0 [5.0 Pakuranga Highway/ Reeves Rd (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 5.0 [5.0 Pakuranga Highway/ Reeves Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 44 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	953	9.9	909	10.0	1019	0.892	100	26.3	LOS C	17.3 N4	131.5 N4	Full	90	0.0	50.0
Lane 2	296	13.2	283	13.5	365	0.775	100	21.9	LOS C	6.0	47.1	Full	90	0.0	0.0
Lane 3	295	13.2	282	13.5	364	0.775	100	21.9	LOS C	6.0	47.0	Full	90	-0.3 N3	0.0
Approach	1544	11.1	1474 N1	11.4		0.892		24.6	LOS C	17.3	131.5				
NorthWest: Ti Rakau Drive (West)															
Lane 1	222	19.4	222	19.4	358	0.619	100	18.9	LOS B	4.2	34.7	Full	110	0.0	0.0
Lane 2	222	19.4	222	19.4	358	0.619	100	18.9	LOS B	4.2	34.7	Full	110	0.0	0.0
Lane 3	129	6.2	129	6.2	245	0.526	100	25.5	LOS C	2.5	18.7	Short	85	0.0	NA
Approach	572	16.4	572	16.4		0.619		20.4	LOS C	4.2	34.7				
SouthWest: Pakuranga HWY															
Lane 1	185	7.6	185	7.6	916	0.202	100	13.6	LOS B	1.9	14.4	Short	125	0.0	NA
Lane 2	338	8.0	338	8.0	437	0.772	100	27.7	LOS C	7.1	52.9	Short	600	0.0	NA
Lane 3	338	8.0	338	8.0	437	0.772	100	27.7	LOS C	7.1	52.9	Full	623	0.0	0.0
Approach	860	7.9	860	7.9		0.772		24.6	LOS C	7.1	52.9				
Intersection	2976	11.2	2906 N1	11.5		0.892		23.8	LOS C	17.3	131.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	909	-	909	10.0	1019	0.892	100	NA	NA
Lane 2	-	283	283	13.5	365	0.775	100	NA	NA
Lane 3	-	282	282	13.5	364	0.775	100	NA	NA
Approach	909	565	1474	11.4		0.892			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	222	-	222	19.4	358	0.619	100	NA	NA
Lane 2	222	-	222	19.4	358	0.619	100	NA	NA

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 3	-	129	129	6.2	245	0.526	100	0.0	2
Approach	443	129	572	16.4		0.619			
SouthWest: Pakuranga HWY									
Lane 1	185	-	185	7.6	916	0.202	100	0.0	2
Lane 2	-	338	338	8.0	437	0.772	100	0.0	3
Lane 3	-	338	338	8.0	437	0.772	100	NA	NA
Approach	185	675	860	7.9		0.772			

	Total	%HV	Deg.Satn (v/c)
Intersection	2906	11.5	0.892

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

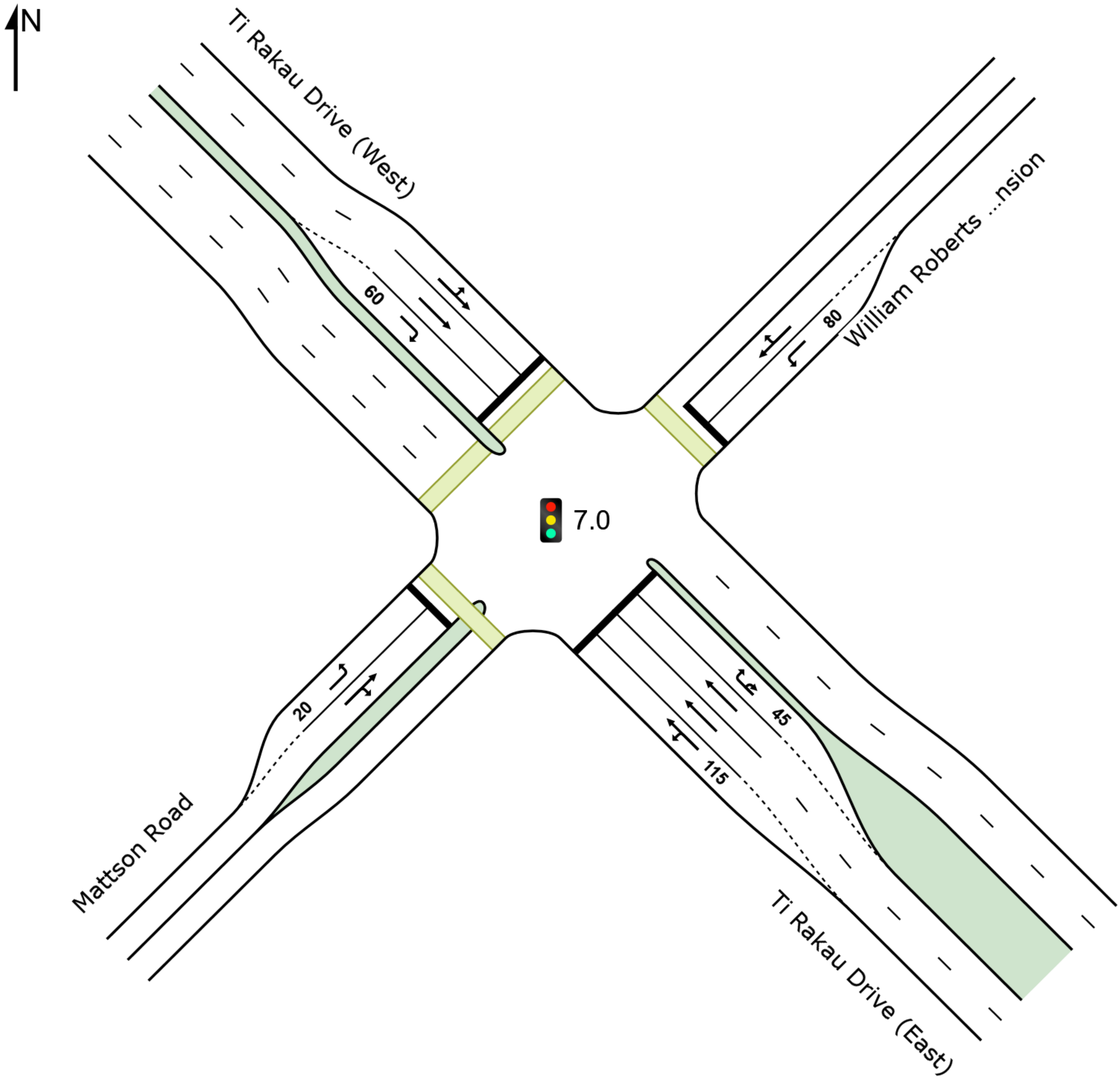
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Pakuranga HWY Merge Type: **Priority**												
Exit Short Lane	1	280	0.0	129	133	3.00	2.00	909	1666	0.546	0.2	0.5
Merge Lane	2	-	100.0	Merge Lane is not Opposed				129	1800	0.072	0.0	0.0

SITE LAYOUT

Site: 7.0 [7.0 William Roberts Rd / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 7.0 [7.0 William Roberts Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 65 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	ARRIVAL FLOWS [Total veh/h	ARRIVAL FLOWS HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	85% BACK OF QUEUE Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	436	11.0	412	11.3	637	0.646	100	19.6	LOS B	10.0	76.6	Short	115	0.0	NA
Lane 2	437	11.3	412	11.6	638	0.646	100	19.2	LOS B	10.0	76.9	Full	203	0.0	0.0
Lane 3	422	11.3	398	11.6	616[1]	0.646	100	19.0	LOS B	9.5	73.4	Full	203	0.0	0.0
Lane 4	87	6.1	82	6.2	136	0.601	100	40.2	LOS D	2.5	18.4	Short	45	0.0	NA
Approach	1382	10.9	1304[N1]	11.2		0.646		20.6	LOS C	10.0	76.9				
NorthEast: William Roberts Road Extension															
Lane 1	29	10.3	29	10.3	159	0.183	100	33.5	LOS C	0.8	6.2	Short	80	0.0	NA
Lane 2	133	13.7	133	13.7	156	0.852	100	41.5	LOS D	4.5	34.9	Full	110	0.0	0.0
Approach	162	13.1	162	13.1		0.852		40.0	LOS D	4.5	34.9				
NorthWest: Ti Rakau Drive (West)															
Lane 1	543	11.9	543	11.9	627	0.866	100	31.7	LOS C	17.9	137.9	Full	107	0.0	38.2
Lane 2	541	13.2	541	13.2	625[1]	0.866	100	30.0	LOS C	17.6	137.3	Full	107	0.0	37.9
Lane 3	43	12.2	43	12.2	159	0.271	100	37.6	LOS D	1.2	9.5	Short	60	0.0	NA
Approach	1127	12.5	1127	12.5		0.866		31.1	LOS C	17.9	137.9				
SouthWest: Mattson Road															
Lane 1	75	4.2	75	4.2	499	0.150	100	25.0	LOS C	1.6	11.8	Short	20	0.0	NA
Lane 2	71	6.0	71	6.0	166	0.425	100	37.2	LOS D	2.1	15.1	Full	282	0.0	0.0
Approach	145	5.1	145	5.1		0.425		31.0	LOS C	2.1	15.1				
Intersection	2816	11.4	2738[N1]	11.7		0.866		26.6	LOS C	17.9	137.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	30	382	-	-	412	11.3	637	0.646	100	0.0	2
Lane 2	-	412	-	-	412	11.6	638	0.646	100	NA	NA
Lane 3	-	398	-	-	398	11.6	616[1]	0.646	100	NA	NA
Lane 4	-	-	32	50	82	6.2	136	0.601	100	0.0	3
Approach	30	1193	32	50	1304	11.2		0.646			

NorthEast: William Roberts Road Extension											
Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	29	-	-	29	10.3	159	0.183	100	0.0	2
Lane 2	-	11	122	133	13.7	156	0.852	100	NA	NA
Approach	29	11	122	162	13.1		0.852			

NorthWest: Ti Rakau Drive (West)										
Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	161	382	-	543	11.9	627	0.866	100	NA	NA
Lane 2	-	541	-	541	13.2	625[1]	0.866	100	NA	NA
Lane 3	-	-	43	43	12.2	159	0.271	100	0.0	2
Approach	161	923	43	1127	12.5		0.866			

SouthWest: Mattson Road										
Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	75	-	-	75	4.2	499	0.150	100	0.0	2
Lane 2	-	12	59	71	6.0	166	0.425	100	NA	NA
Approach	75	12	59	145	5.1		0.425			

	Total	%HV	Deg.Satn (v/c)
Intersection	2738	11.7	0.866

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

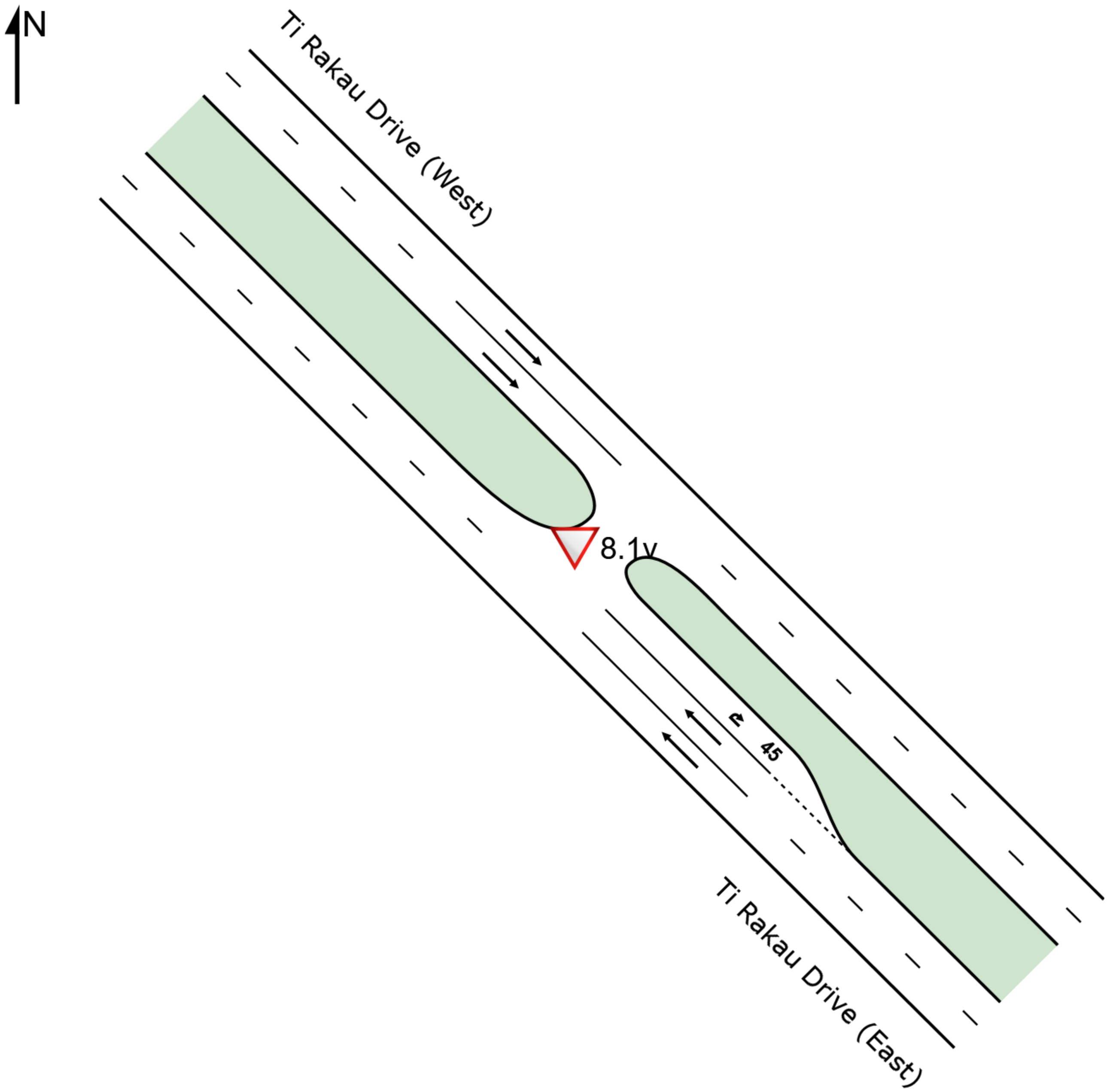
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
NorthEast Exit: William Roberts Road Extension Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
SouthWest Exit: Mattson Road Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

▽ Site: 8.1v [8.1 U-turn - West of Marriot Rd - Conversion (2) (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 8.1v [8.1 U-turn - West of Marriot Rd - Conversion (2) (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	ARRIVAL FLOWS [Total veh/h	ARRIVAL FLOWS HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	85% BACK OF QUEUE Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	684	10.9	644	11.2	1808	0.356	100	0.0	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 2	674	10.9	635	11.2	1784	0.356	100	0.0	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 3	94	5.3	88	5.5	167	0.528	100	37.9	LOS E	1.6	11.7	Short	45	0.0	NA
Approach	1452	10.5	1367 N1	10.8		0.528		2.5	NA	1.6	11.7				
NorthWest: Ti Rakau Drive (West)															
Lane 1	514	11.2	512	11.2	1808	0.283	100	0.0	LOS A	0.0	0.0	Full	73	0.0	0.0
Lane 2	506	13.5	505	13.5	1783	0.283	100	0.0	LOS A	0.0	0.0	Full	73	0.0	0.0
Approach	1020	12.4	1017 N1	12.4		0.283		0.0	NA	0.0	0.0				
Intersection	2472	11.3	2385 N1	11.7		0.528		1.4	NA	1.6	11.7				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	644	-	644	11.2	1808	0.356	100	NA	NA
Lane 2	635	-	635	11.2	1784	0.356	100	NA	NA
Lane 3	-	88	88	5.5	167	0.528	100	0.0	2
Approach	1279	88	1367	10.8		0.528			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	512	512	11.2	1808	0.283	100	NA	NA
Lane 2	505	505	13.5	1783	0.283	100	NA	NA
Approach	1017	1017	12.4		0.283			

	Total	%HV	Deg.Satn (v/c)
Intersection	2385	11.7	0.528

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

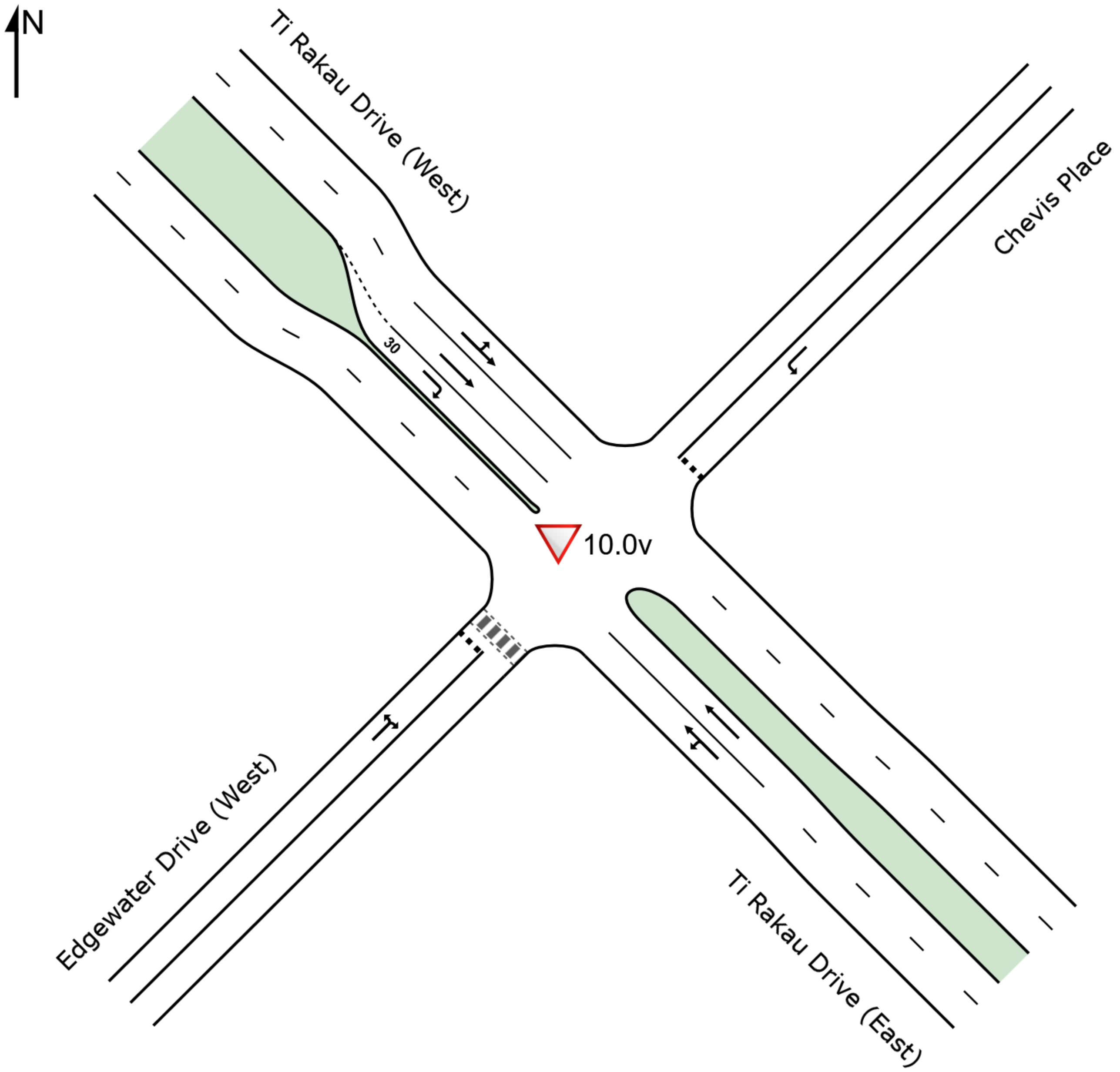
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 10.0v [10.0 Edgewater Dr (West) / Chevis Pl - Conversion - Import (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 10.0v [10.0 Edgewater Dr (West) / Chevis Pl - Conversion - Import (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	881	10.9	867	11.0	1699	0.510	100	0.4	LOS A	0.7	5.2	Full	81	0.0	0.0
Lane 2	937	11.3	921	11.4	1806	0.510	100	0.0	LOS A	0.0	0.0	Full	81	0.0	0.0
Approach	1818	11.1	1788 N1	11.2		0.510		0.2	NA	0.7	5.2				
NorthEast: Chevis Place															
Lane 1	10	0.0	10	0.0	859	0.012	100	6.4	LOS A	0.0	0.2	Full	138	0.0	0.0
Approach	10	0.0	10	0.0		0.012		6.4	LOS A	0.0	0.2				
NorthWest: Ti Rakau Drive (West)															
Lane 1	408	10.3	406	10.4	1844	0.220	100	0.1	LOS A	0.0	0.0	Full	68	0.0	0.0
Lane 2	405	10.6	404	10.6	1834	0.220	100	0.0	LOS A	0.0	0.0	Full	68	0.0	0.0
Lane 3	37	8.1	37	8.1	60	0.609	100	100.6	LOS F	1.4	10.6	Short	30	0.0	NA
Approach	850	10.4	846 N1	10.4		0.609		4.4	NA	1.4	10.6				
SouthWest: Edgewater Drive (West)															
Lane 1	192	6.3	192	6.3	96	1.995	100	949.0	LOS F	48.5	357.5	Full	789	0.0	0.0
Approach	192	6.3	192	6.3		1.995		949.0	LOS F	48.5	357.5				
Intersection	2870	10.5	2836 N1	10.6		1.995		65.7	NA	48.5	357.5				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	77	790	867	11.0	1699	0.510	100	NA	NA
Lane 2	-	921	921	11.4	1806	0.510	100	NA	NA
Approach	77	1711	1788	11.2		0.510			

NorthEast: Chevis Place

Mov. From NE To Exit:	L2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	10	0.0	859	0.012	100	NA	NA
Approach	10	10	0.0		0.012			

NorthWest: Ti Rakau Drive (West)										
Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	396	-	406	10.4	1844	0.220	100	NA	NA
Lane 2	-	404	-	404	10.6	1834	0.220	100	NA	NA
Lane 3	-	-	37	37	8.1	60	0.609	100	0.0	2
Approach	10	799	37	846	10.4		0.609			

SouthWest: Edgewater Drive (West)									
Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	182	10	192	6.3	96	1.995	100	NA	NA
Approach	182	10	192	6.3		1.995			

	Total	%HV	Deg.Satn (v/c)
Intersection	2836	10.6	1.995

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

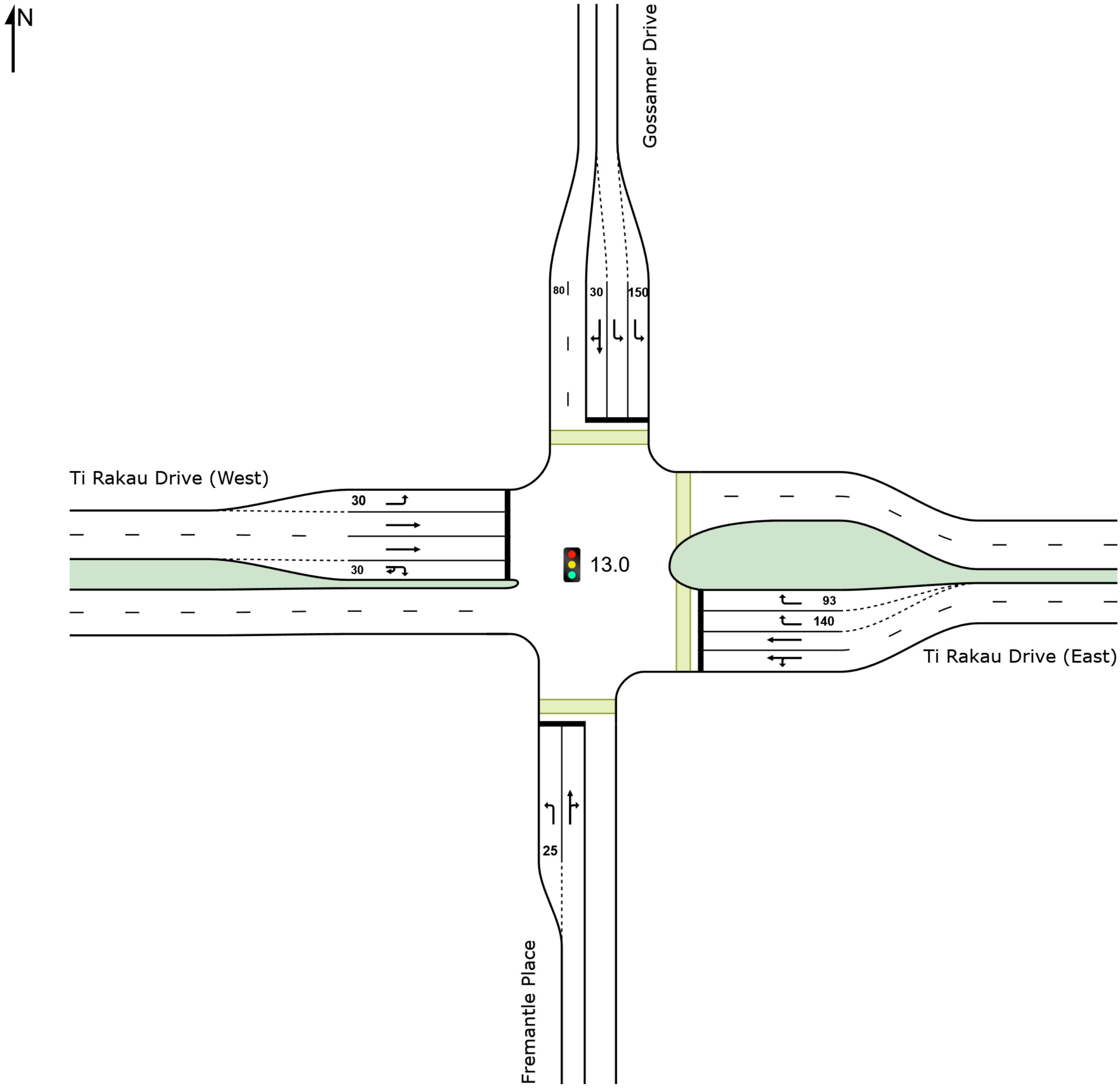
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthEast Exit: Chevis Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Edgewater Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

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

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



Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Created: Wednesday, 15 February 2023 9:16:19 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 AM - XL.sip9

LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	19	10.5	19	10.5	66	0.288	100	84.4	LOS F	1.3	9.9	Short	25	0.0	NA
Lane 2	28	7.1	28	7.1	69	0.409	100	85.3	LOS F	1.9	14.3	Full	285	0.0	0.0
Approach	47	8.5	47	8.5		0.409		84.9	LOS F	1.9	14.3				
East: Ti Rakau Drive (East)															
Lane 1	723	10.5	723	10.5	919	0.786	100	33.0	LOS C	37.3	284.5	Full	636	0.0	0.0
Lane 2	638	10.6	638	10.6	811[1]	0.786	100	31.6	LOS C	30.9	236.1	Full	636	0.0	0.0
Lane 3	146	9.1	146	9.1	393	0.372	46[6]	31.2	LOS C	4.9	37.1	Short	140	0.0	NA
Lane 4	315	9.1	315	9.1	393	0.802	100	38.9	LOS D	13.0	98.0	Short	93	0.0	NA
Approach	1822	10.2	1822	10.2		0.802		33.4	LOS C	37.3	284.5				
North: Gossamer Drive															
Lane 1	360	8.2	360	8.2	659	0.547	100	28.7	LOS C	14.1	105.5	Short	150	0.0	NA
Lane 2	345	8.2	345	8.2	631[1]	0.547	100	27.7	LOS C	13.5	100.9	Full	1010	0.0	0.0
Lane 3	133	9.0	133	9.0	139[1]	0.955	100	103.8	LOS F	10.6	79.9	Short	30	0.0	NA
Approach	838	8.4	838	8.4		0.955		40.2	LOS D	14.1	105.5				
West: Ti Rakau Drive (West)															
Lane 1	47	12.8	46	12.9	560	0.083	100	38.6	LOS D	2.0	15.6	Short	30	0.0	NA
Lane 2	578	11.4	570	11.5	608[1]	0.938	100	75.5	LOS E	43.3	333.3	Full	479	0.0	0.0
Lane 3	499	11.4	493	11.5	525[1]	0.938	100	75.6	LOS E	36.3	279.4	Full	479	0.0	0.0
Lane 4	103	14.1	101	14.3	104[1]	0.973	100	117.6	LOS F	8.6	67.8	Short	30	0.0	NA
Approach	1227	11.7	1211[N1]	11.8		0.973		77.6	LOS E	43.3	333.3				
Intersection	3934	10.3	3918[N1]	10.3		0.973		49.1	LOS D	43.3	333.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	-	-	19	10.5	66	0.288	100	0.0	2
Lane 2	-	10	18	28	7.1	69	0.409	100	NA	NA

Approach	19	10	18	47	8.5		0.409			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	18	705	-	723	10.5	919	0.786	100	NA	NA
Lane 2	-	638	-	638	10.6	811[1]	0.786	100	NA	NA
Lane 3	-	-	146	146	9.1	393	0.372	46[6]	0.0	2
Lane 4	-	-	315	315	9.1	393	0.802	100	19.8	3
Approach	18	1343	461	1822	10.2		0.802			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	360	-	-	360	8.2	659	0.547	100	0.0	2
Lane 2	345	-	-	345	8.2	631[1]	0.547	100	NA	NA
Lane 3	-	10	123	133	9.0	139[1]	0.955	100	100.0	2
Approach	705	10	123	838	8.4		0.955			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	U W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	46	-	-	-	46	12.9	560	0.083	100	0.0	2
Lane 2	-	570	-	-	570	11.5	608[1]	0.938	100	NA	NA
Lane 3	-	493	-	-	493	11.5	525[1]	0.938	100	NA	NA
Lane 4	-	-	12	89	101	14.3	104[1]	0.973	100	92.1	3
Approach	46	1063	12	89	1211	11.8		0.973			

	Total	%HV	Deg.Satn (v/c)
Intersection	3918	10.3	0.973

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	80	50.0	162	170	2.50	2.00	192	1602	0.120	0.0	0.1
Merge Lane	2	-	50.0	96	101	2.50	2.00	325	1685	0.193	0.0	0.0
West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

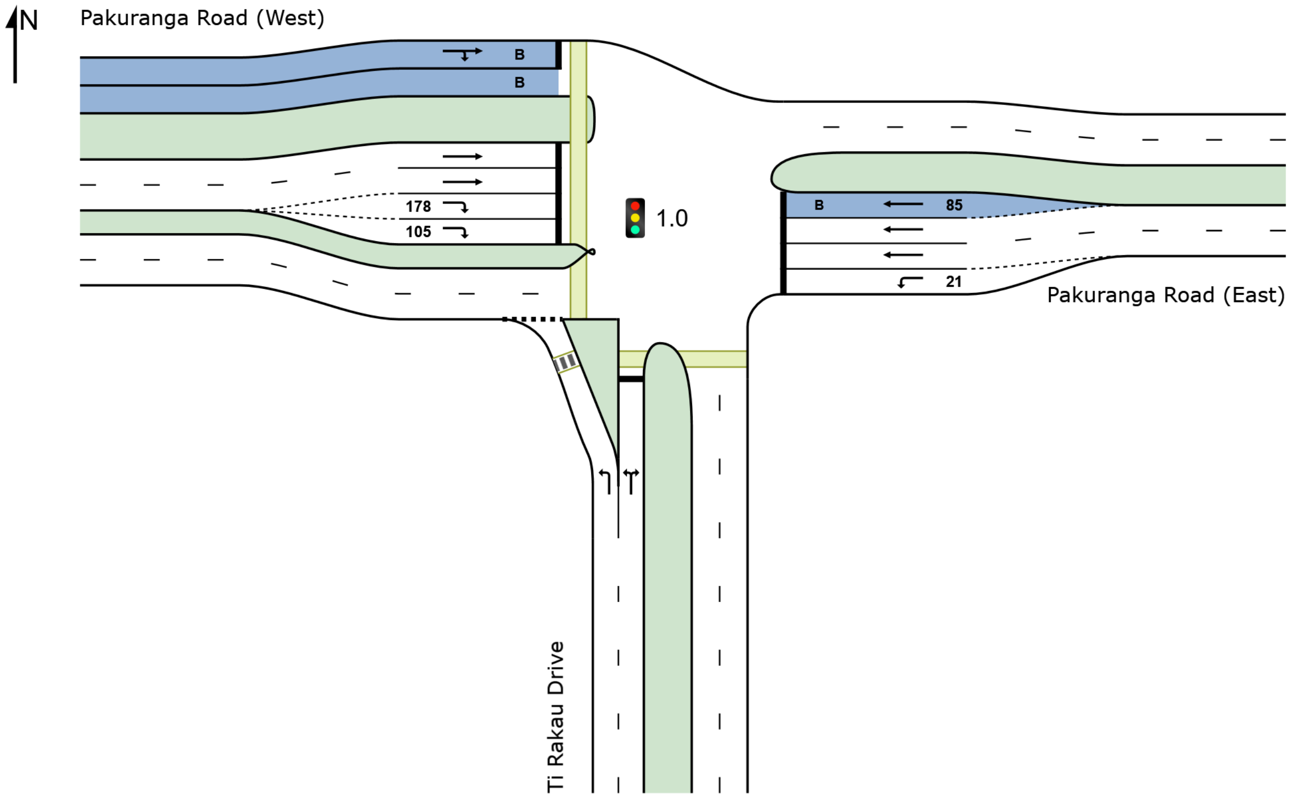
Full Length Lane	2	Merge Analysis not applied.

SITE LAYOUT

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	898	8.7	871	8.8	1121	0.777	100	6.9	LOS A	9.0	67.4	Full	174	0.0	0.0
Lane 2	140	18.6	136	18.9	189	0.720	100	93.1	LOS F	9.0	72.9	Full	174	-24.6 N7	0.0
Approach	1038	10.0	1007 N1	10.2		0.777		18.6	LOS B	9.0	72.9				
East: Pakuranga Road (East)															
Lane 1	67	1.5	66	1.5	366	0.181	100	58.0	LOS E	3.6	25.5	Short	21	0.0	NA
Lane 2	301	4.4	298	4.4	321 1	0.927	100	83.0	LOS F	19.7 N4	143.2 N4	Full	98	0.0	50.0
Lane 3	352	4.4	347	4.4	374 1	0.927	100	83.1	LOS F	19.7 N4	143.2 N4	Full	98	0.0	50.0
Lane 4 (B)	9	100.0	9	100.0	235	0.038	100	52.2	LOS D	0.5	6.2	Short	85	0.0	NA
Approach	729	5.3	720 N1	5.3		0.927		80.4	LOS F	19.7	143.2				
West: Pakuranga Road (West)															
Lane 1 (B)	42	100.0	42	100.0	45	0.926	100	97.3	LOS F	3.3	42.8	Full	380	-14.9 N7	0.0
Lane 2	572	5.7	572	5.7	609	0.939	100	71.5	LOS E	45.7	335.2	Full	380	-26.0 N7	3.7
Lane 3	568	5.7	568	5.7	605	0.939	100	71.7	LOS E	45.4	333.4	Full	380	-26.5 N7	3.2
Lane 4	273	10.1	273	10.1	758	0.360	100	34.2	LOS C	11.7	89.1	Short	178	0.0	NA
Lane 5	273	10.1	273	10.1	758	0.360	100	34.2	LOS C	11.7	89.1	Short	105	0.0	NA
Approach	1728	9.4	1728	9.4		0.939		60.4	LOS E	45.7	335.2				
Intersection	3495	8.7	3455 N1	8.8		0.939		52.4	LOS D	45.7	335.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	871	-	871	8.8	1121	0.777	100	NA	NA
Lane 2	13	123	136	18.9	189	0.720	100	NA	NA
Approach	884	123	1007	10.2		0.777			

East: Pakuranga Road (East)

Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	66	-	66	1.5	366	0.181	100	32.6	2
Lane 2	-	298	298	4.4	321 [1]	0.927	100	NA	NA
Lane 3	-	347	347	4.4	374 [1]	0.927	100	NA	NA
Lane 4	-	9	9	100.0	235	0.038	100	0.0	3
Approach	66	654	720	5.3		0.927			
West: Pakuranga Road (West)									
Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	21	21	42	100.0	45	0.926	100	NA	NA
Lane 2	572	-	572	5.7	609	0.939	100	NA	NA
Lane 3	568	-	568	5.7	605	0.939	100	NA	NA
Lane 4	-	273	273	10.1	758	0.360	100	0.0	3
Lane 5	-	273	273	10.1	758	0.360	100	0.1	4
Approach	1161	567	1728	9.4		0.939			

	Total	%HV	Deg.Satn (v/c)
Intersection	3455	8.8	0.939

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

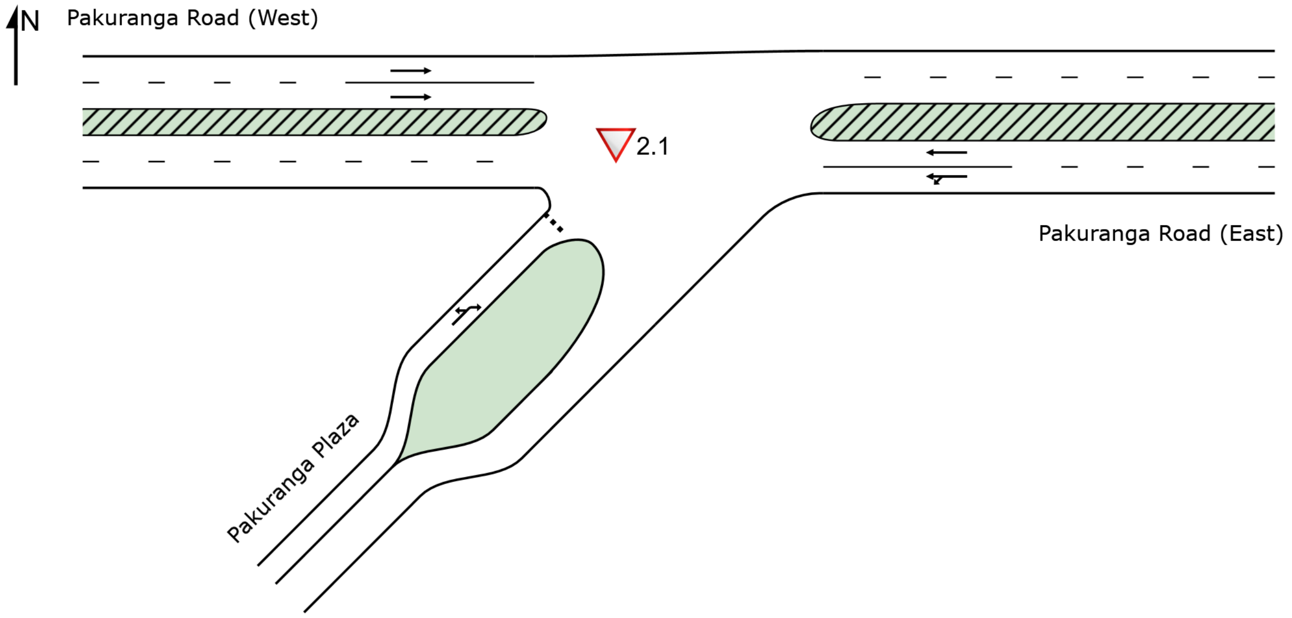
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	553	4.0	553	4.0	1883	0.294	100	0.8	LOS A	0.0	0.0	Full	121	0.0	0.0
Lane 2	561	2.6	561	2.6	1907	0.294	100	0.0	LOS A	0.0	0.0	Full	121	0.0	0.0
Approach	1114	3.3	1114	3.3		0.294		0.4	NA	0.0	0.0				
West: Pakuranga Road (West)															
Lane 1	640	7.7	640	7.7	1847	0.346	100	0.0	LOS A	21.1[N6]	157.8[N6]	Full	108	0.0	50.0[N6]
Lane 2	640	7.7	640	7.7	1847	0.346	100	0.0	LOS A	21.1[N6]	157.8[N6]	Full	108	0.0	50.0[N6]
Approach	1280	7.7	1280	7.7		0.346		0.0	NA	21.1	157.8				
SouthWest: Pakuranga Plaza															
Lane 1	49	2.0	49	2.0	130	0.377	100	31.8	LOS D	0.8	5.9	Full	196	-16.9[N7]	0.0
Approach	49	2.0	49	2.0		0.377		31.8	LOS D	0.8	5.9				
Intersection	2443	5.6	2443	5.6		0.377		0.8	NA	21.1	157.8				

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

N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	80	473	553	4.0	1883	0.294	100	NA	NA
Lane 2	-	561	561	2.6	1907	0.294	100	NA	NA
Approach	80	1034	1114	3.3		0.294			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	640	640	7.7	1847	0.346	100	NA	NA
Lane 2	640	640	7.7	1847	0.346	100	NA	NA
Approach	1280	1280	7.7		0.346			

SouthWest: Pakuranga Plaza

Mov. From SW To Exit:	L3 W	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	39	10	49	2.0	130	0.377	100	NA	NA
Approach	39	10	49	2.0		0.377			

	Total	%HV	Deg.Satn (v/c)
Intersection	2443	5.6	0.377

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

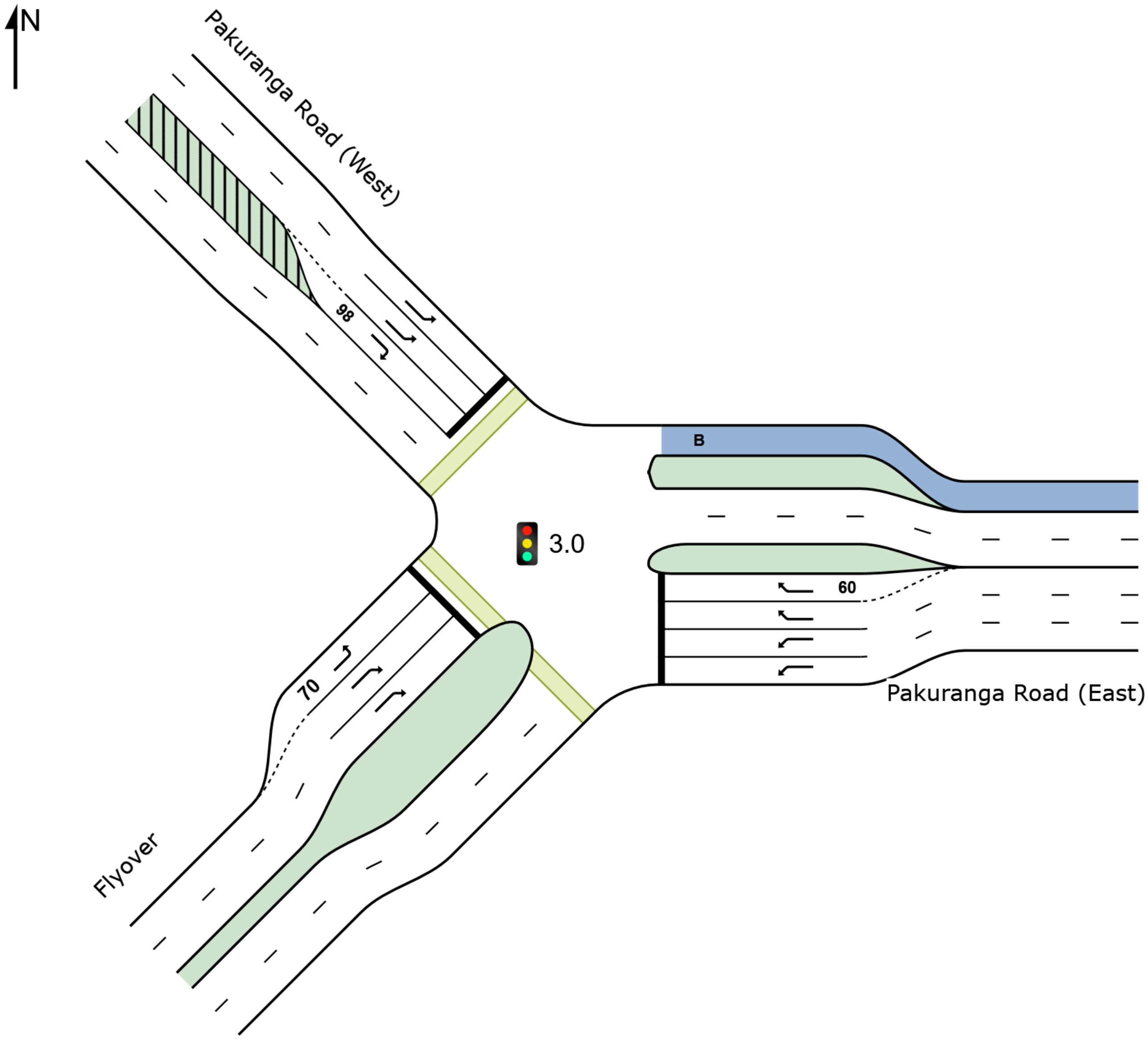
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Pakuranga Road (East)															
Lane 1	321	5.8	321	5.8	878	0.366	100	18.0	LOS B	8.7	64.0	Full	183	0.0	0.0
Lane 2	321	5.8	321	5.8	878	0.366	100	18.0	LOS B	8.7	64.0	Full	183	0.0	0.0
Lane 3	318	5.7	318	5.7	338[1]	0.940	100	87.0	LOS F	24.1	177.0	Full	183	0.0	12.0[8]
Lane 4	318	5.7	318	5.7	338[1]	0.940	100	87.0	LOS F	24.1	177.0	Short	60	0.0	NA
Approach	1278	5.7	1278	5.7		0.940		52.3	LOS D	24.1	177.0				
NorthWest: Pakuranga Road (West)															
Lane 1	662	8.7	662	8.7	705	0.938	100	73.0	LOS E	23.5[N4]	176.8[N4]	Full	121	0.0	50.0
Lane 2	644	5.7	644	5.7	686[1]	0.938	100	72.3	LOS E	24.1[N4]	176.8[N4]	Full	121	0.0	50.0
Lane 3	53	17.0	53	17.0	165	0.322	100	74.2	LOS E	3.3	26.7	Short	98	0.0	NA
Approach	1359	7.6	1359	7.6		0.938		72.7	LOS E	24.1	176.8				
SouthWest: Flyover															
Lane 1	473	0.2	473	0.2	685	0.691	100	28.4	LOS C	13.9	97.7	Short	70	0.0	NA
Lane 2	634	1.8	634	1.8	682[1]	0.930	100	57.0	LOS E	39.2	278.6	Full	1162	0.0	0.0
Lane 3	948	1.8	948	1.8	1020	0.930	100	54.3	LOS D	66.5	472.6	Full	1162	0.0	0.0
Approach	2055	1.5	2055	1.5		0.930		49.2	LOS D	66.5	472.6				
Intersection	4692	4.4	4692	4.4		0.940		56.8	LOS E	66.5	472.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	R1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	321	-	321	5.8	878	0.366	100	NA	NA
Lane 2	321	-	321	5.8	878	0.366	100	NA	NA
Lane 3	-	318	318	5.7	338[1]	0.940	100	NA	NA
Lane 4	-	318	318	5.7	338[1]	0.940	100	100.0	3
Approach	642	636	1278	5.7		0.940			

NorthWest: Pakuranga Road (West)

Mov. From NW To Exit:	L1 E	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	662	-	662	8.7		705	0.938	100	NA	NA
Lane 2	644	-	644	5.7		686[1]	0.938	100	NA	NA
Lane 3	-	53	53	17.0		165	0.322	100	0.0	2
Approach	1306	53	1359	7.6			0.938			

SouthWest: Flyover

Mov. From SW To Exit:	L2 NW	R1 E	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	473	-	473	0.2		685	0.691	100	45.7	2
Lane 2	-	634	634	1.8		682[1]	0.930	100	NA	NA
Lane 3	-	948	948	1.8		1020	0.930	100	NA	NA
Approach	473	1582	2055	1.5			0.930			

	Total	%HV	Deg.Satn (v/c)
Intersection	4692	4.4	0.940

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

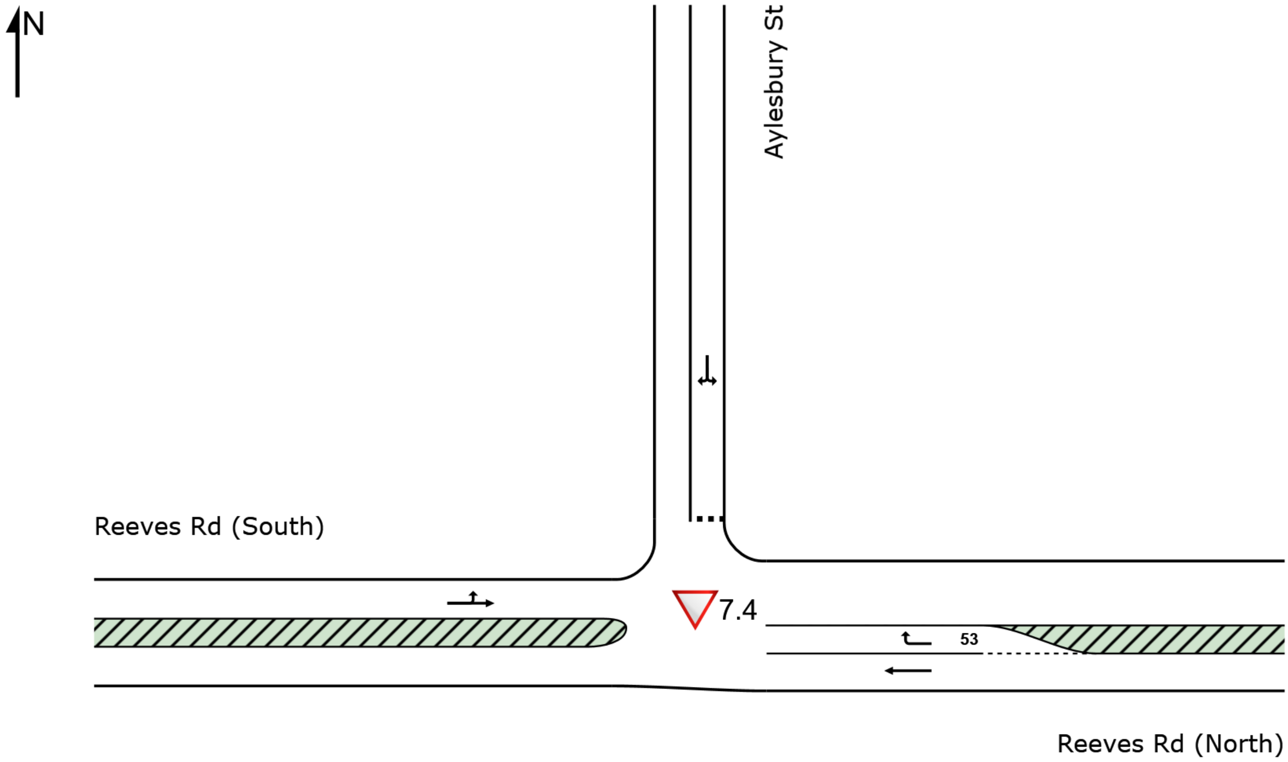
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Flyover Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

SITE LAYOUT

Site: 7.4 [7.4 Reeves Rd/ Aylesbury St - XL (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 7.4 [7.4 Reeves Rd/ Aylesbury St - XL (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Reeves Rd (North)															
Lane 1	14	7.7	14	7.7	1915	0.007	100	0.0	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 2	18	5.9	18	5.9	1696	0.011	100	4.2	LOS A	0.0	0.3	Short	53	0.0	NA
Approach	32	6.7	31	6.7		0.011		2.4	NA	0.0	0.3				
North: Aylesbury St															
Lane 1	57	5.6	57	5.6	1319	0.043	100	4.8	LOS A	0.1	0.9	Full	193	0.0	0.0
Approach	57	5.6	57	5.6		0.043		4.8	LOS A	0.1	0.9				
West: Reeves Rd (South)															
Lane 1	35	3.0	35	3.0	1973	0.018	100	1.3	LOS A	0.0	0.0	Full	60	0.0	0.0
Approach	35	3.0	35	3.0		0.018		1.3	NA	0.0	0.0				
Intersection	123	5.1	123	5.1		0.043		3.2	NA	0.1	0.9				

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

Approach Lane Flows (veh/h)

East: Reeves Rd (North)

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	-	14	7.7	1915	0.007	100	NA	NA
Lane 2	-	18	18	5.9	1696	0.011	100	0.0	1
Approach	14	18	31	6.7		0.011			

North: Aylesbury St

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	33	24	57	5.6	1319	0.043	100	NA	NA
Approach	33	24	57	5.6		0.043			

West: Reeves Rd (South)

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	24	35	3.0	1973	0.018	100	NA	NA
Approach	11	24	35	3.0		0.018			

	Total	%HV	Deg.Satn (v/c)
Intersection	123	5.1	0.043

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

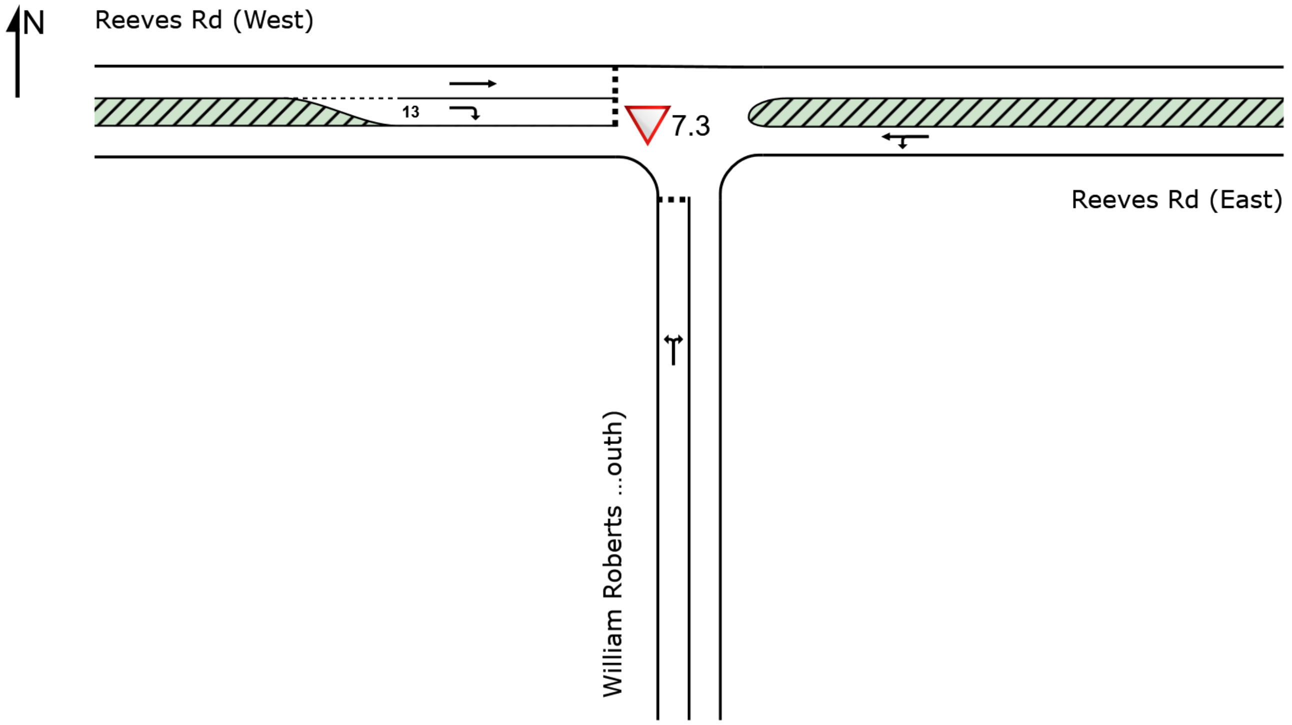
Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Reeves Rd (North) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Aylesbury St Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Reeves Rd (South) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

Site: 7.3 [7.3 William Roberts Rd / Reeves Rd - XL (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



SIDRA INTERSECTION 9.0 | Copyright © 2000-2020 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Created: Wednesday, 15 February 2023 9:20:06 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 PM - XL.sip9

LANE SUMMARY

Site: 7.3 [7.3 William Roberts Rd / Reeves Rd - XL (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: William Roberts Road (South)															
Lane 1	397	14.3	395	14.4	962	0.411	100	5.6	LOS A	1.5	11.6	Full	243	0.0	0.0
Approach	397	14.3	395 N1	14.4		0.411		5.6	LOS A	1.5	11.6				
East: Reeves Rd (East)															
Lane 1	159	8.6	159	8.6	1729	0.092	100	4.5	LOS A	0.0	0.0	Full	266	0.0	0.0
Approach	159	8.6	159	8.6		0.092		4.5	NA	0.0	0.0				
West: Reeves Rd (West)															
Lane 1	17	6.3	17	6.3	1884	0.009	100	2.7	LOS A	0.0	0.0	Full	55	0.0	0.0
Lane 2	40	5.3	40	5.3	554	0.072	100	8.2	LOS A	0.2	1.3	Short	13	0.0	NA
Approach	57	5.6	57	5.6		0.072		6.5	LOS A	0.2	1.3				
Intersection	613	12.0	611 N1	12.1		0.411		5.4	NA	1.5	11.6				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: William Roberts Road (South)

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	368	395	14.4	962	0.411	100	NA	NA
Approach	27	368	395	14.4		0.411			

East: Reeves Rd (East)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	147	12	159	8.6	1729	0.092	100	NA	NA
Approach	147	12	159	8.6		0.092			

West: Reeves Rd (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	17	-	17	6.3	1884	0.009	100	NA	NA
Lane 2	-	40	40	5.3	554	0.072	100	0.0	1

Approach	17	40	57	5.6	0.072

	Total	%HV	Deg.Satn (v/c)
Intersection	611	12.1	0.411

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Reeves Rd (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Reeves Rd (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

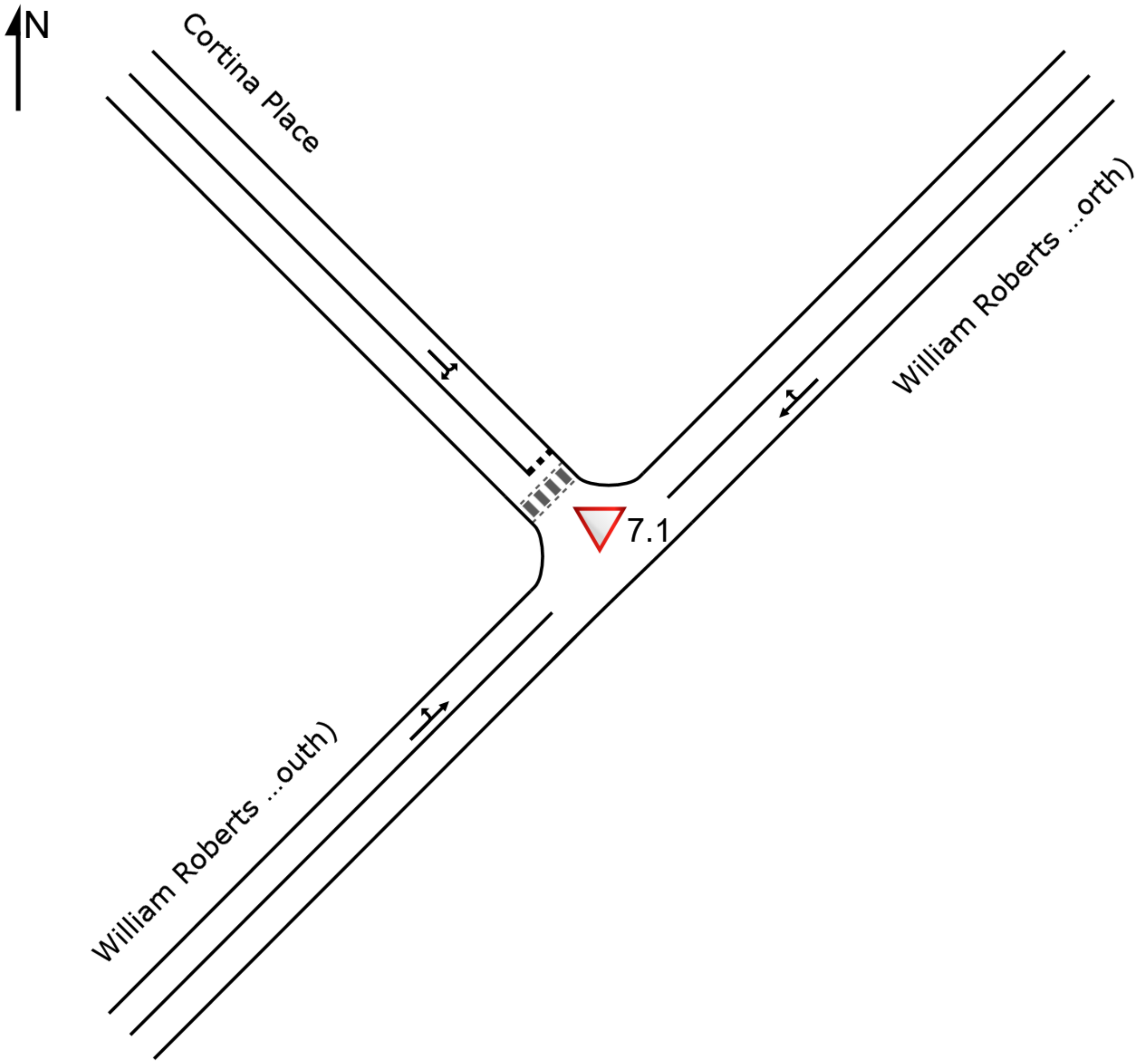
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 15 February 2023 9:19:03 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 PM - XL.sip9

SITE LAYOUT

Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
NorthEast: William Roberts Road (North)															
Lane 1	265	7.6	265	7.6	1838	0.144	100	0.1	LOS A	0.1	0.5	Full	243	0.0	0.0
Approach	265	7.6	265	7.6		0.144		0.1	NA	0.1	0.5				
NorthWest: Cortina Place															
Lane 1	37	5.4	37	5.4	1126	0.033	100	3.0	LOS A	0.1	0.7	Full	177	-1.0 [N7]	0.0
Approach	37	5.4	37	5.4		0.033		3.0	LOS A	0.1	0.7				
SouthWest: William Roberts Road (South)															
Lane 1	99	9.1	97	9.2	1771	0.055	100	0.5	LOS A	0.0	0.0	Full	110	0.0	0.0
Approach	99	9.1	97 [N1]	9.2		0.055		0.5	NA	0.0	0.0				
Intersection	401	7.7	399 [N1]	7.8		0.144		0.5	NA	0.1	0.7				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

NorthEast: William Roberts Road (North)

Mov. From NE To Exit:	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	255	10	265	7.6	1838	0.144	100	NA	NA
Approach	255	10	265	7.6		0.144			

NorthWest: Cortina Place

Mov. From NW To Exit:	L2 NE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	18	37	5.4	1126	0.033	100	NA	NA
Approach	19	18	37	5.4		0.033			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	23	75	97	9.2	1771	0.055	100	NA	NA
Approach	23	75	97	9.2		0.055			

	Total	%HV	Deg.Satn (v/c)
Intersection	399	7.8	0.144

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

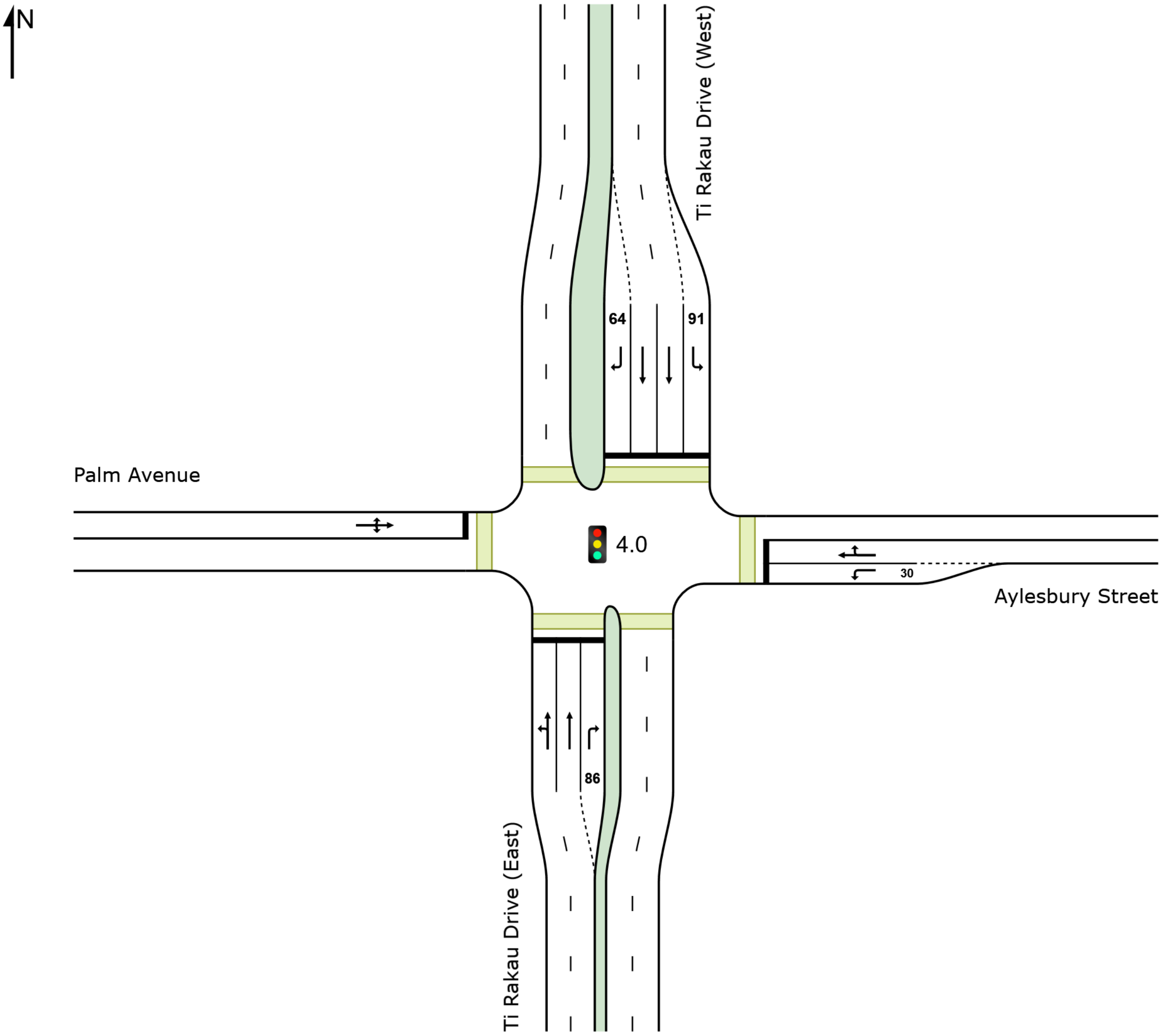
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
NorthEast Exit: William Roberts Road (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Cortina Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive (East)															
Lane 1	518	10.5	490	10.8	1093	0.448	100	8.2	LOS A	5.4	41.6	Full	110	0.0	0.0
Lane 2	525	10.5	496	10.9	1106	0.448	100	6.4	LOS A	3.5	27.0	Full	110	0.0	0.0
Lane 3	11	9.1	10	9.3	66	0.157	100	83.3	LOS F	0.7	5.4	Short	86	0.0	NA
Approach	1054	10.5	996[N1]	10.8		0.448		8.1	LOS A	5.4	41.6				
East: Aylesbury Street															
Lane 1	25	8.0	25	8.0	81	0.308	100	52.1	LOS D	1.4	10.1	Short	30	-50.0[N7]	NA
Lane 2	20	0.0	20	0.0	108	0.186	100	76.1	LOS E	1.3	9.1	Full	40	0.0	0.0
Approach	45	4.4	45	4.4		0.308		62.8	LOS E	1.4	10.1				
North: Ti Rakau Drive (West)															
Lane 1	10	0.0	10	0.0	1277	0.008	100	9.7	LOS A	0.1	1.0	Short	91	0.0	NA
Lane 2	453	8.2	453	8.2	571[1]	0.793	100	24.1	LOS C	19.9	148.9	Full	174	-50.0[N7]	1.0
Lane 3	449	8.2	449	8.2	566[1]	0.793	100	17.5	LOS B	15.0	112.5	Full	174	-49.2[N7]	0.0
Lane 4	61	1.6	61	1.6	71	0.861	100	92.4	LOS F	4.5	31.9	Short	64	0.0	NA
Approach	973	7.7	972[N1]	7.7		0.861		25.2	LOS C	19.9	148.9				
West: Palm Avenue															
Lane 1	96	4.2	96	4.2	119	0.806	100	84.7	LOS F	6.9	49.8	Full	87	-29.2[N7]	0.0
Approach	96	4.2	96	4.2		0.806		84.7	LOS F	6.9	49.8				
Intersection	2168	8.9	2109[N1]	9.1		0.861		20.6	LOS C	19.9	148.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	54	436	-	490	10.8	1093	0.448	100	NA	NA
Lane 2	-	496	-	496	10.9	1106	0.448	100	NA	NA
Lane 3	-	-	10	10	9.3	66	0.157	100	0.0	2
Approach	54	932	10	996	10.8		0.448			

East: Aylesbury Street

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	25	-	-	25	8.0	81	0.308	100	0.0	2
Lane 2	-	10	10	20	0.0	108	0.186	100	NA	NA
Approach	25	10	10	45	4.4		0.308			

North: Ti Rakau Drive (West)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	-	-	10	0.0	1277	0.008	100	0.0	2
Lane 2	-	453	-	453	8.2	571 [1]	0.793	100	NA	NA
Lane 3	-	449	-	449	8.2	566 [1]	0.793	100	NA	NA
Lane 4	-	-	61	61	1.6	71	0.861	100	0.0	3
Approach	10	901	61	972	7.7		0.861			

West: Palm Avenue

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	45	10	41	96	4.2	119	0.806	100	NA	NA
Approach	45	10	41	96	4.2		0.806			

	Total	%HV	Deg.Satn (v/c)
Intersection	2109	9.1	0.861

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

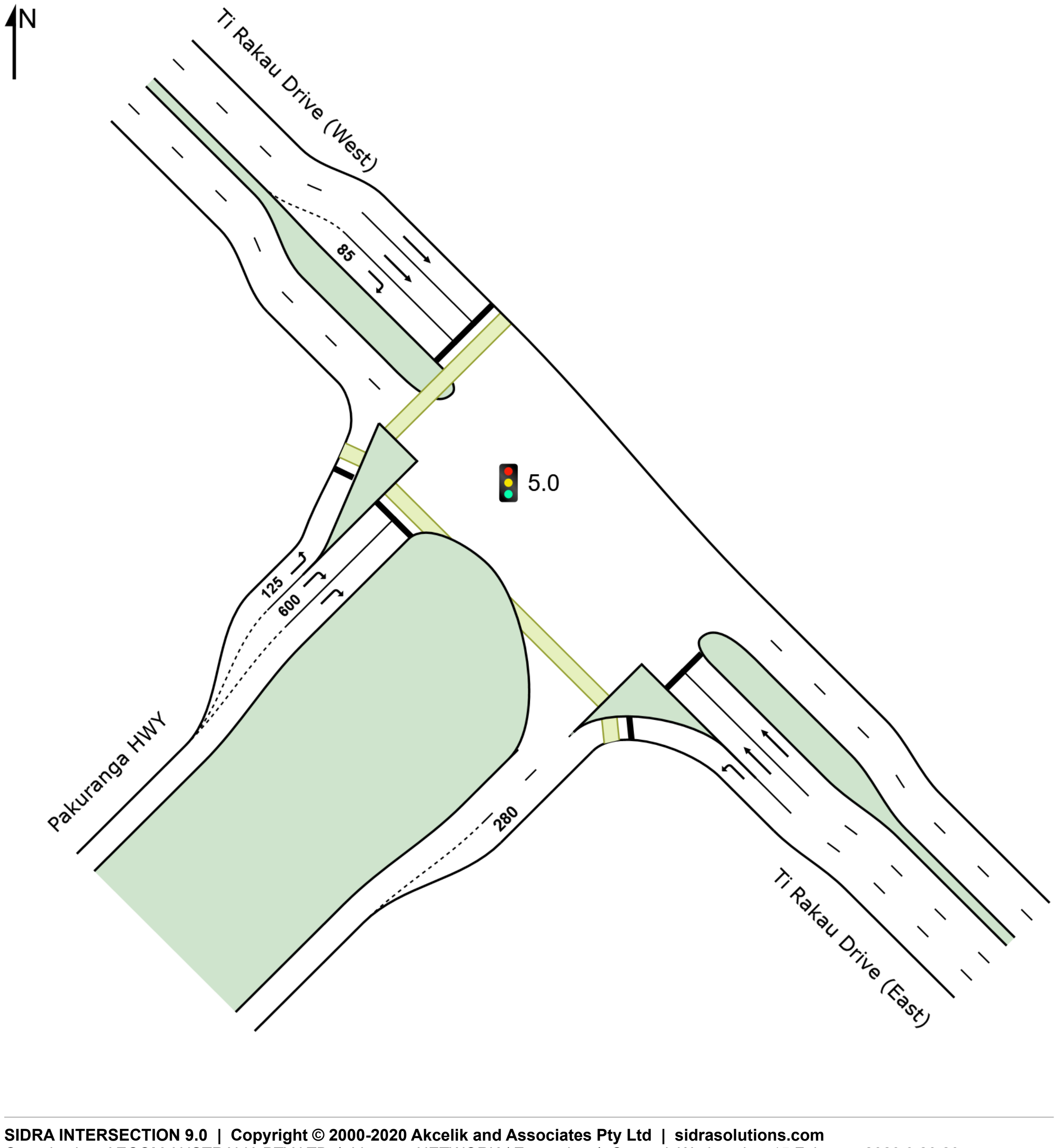
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
East Exit: Aylesbury Street Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
West Exit: Palm Avenue Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

Site: 5.0 [5.0 Pakuranga Highway/ Reeves Rd (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 5.0 [5.0 Pakuranga Highway/ Reeves Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	836	7.2	775	7.3	1510	0.513	100	7.4	LOS A	12.4	92.0	Full	90	0.0	17.0
Lane 2	449	8.9	416	9.1	452	0.922	100	78.0	LOS E	17.4 N4	131.5 N4	Full	90	0.0	50.0
Lane 3	449	8.9	416	9.1	452	0.922	100	78.0	LOS E	17.4 N4	131.5 N4	Full	90	0.0	50.0
Approach	1734	8.1	1608 N1	8.3		0.922		44.0	LOS D	17.4	131.5				
NorthWest: Ti Rakau Drive (West)															
Lane 1	320	9.9	320	9.9	321	0.997	100	110.4	LOS F	21.2 N4	160.7 N4	Full	110	-50.0 N7	50.0
Lane 2	314	9.9	314	9.9	315 1	0.997	100	109.2	LOS F	21.2 N4	160.7 N4	Full	110	-50.0 N7	50.0
Lane 3	69	23.2	69	23.2	97	0.714	100	85.7	LOS F	4.8	40.4	Short	85	0.0	NA
Approach	703	11.2	703	11.2		0.997		107.4	LOS F	21.2	160.7				
SouthWest: Pakuranga HWY															
Lane 1	147	21.1	147	21.1	1081	0.136	100	16.9	LOS B	3.4	27.8	Short	125	0.0	NA
Lane 2	473	12.8	473	12.8	471 1	1.004	100	119.1	LOS F	49.6	385.6	Short	600	-50.0 N7	NA
Lane 3	488	12.8	488	12.8	485	1.004	100	118.3	LOS F	50.9	395.7	Full	623	-50.0 N7	0.0
Approach	1108	13.9	1108	13.9		1.004		105.2	LOS F	50.9	395.7				
Intersection	3545	10.5	3418 N1	10.9		1.004		76.9	LOS E	50.9	395.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	775	-	775	7.3	1510	0.513	100	NA	NA
Lane 2	-	416	416	9.1	452	0.922	100	NA	NA
Lane 3	-	416	416	9.1	452	0.922	100	NA	NA
Approach	775	833	1608	8.3		0.922			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	320	-	320	9.9	321	0.997	100	NA	NA
Lane 2	314	-	314	9.9	315[1]	0.997	100	NA	NA
Lane 3	-	69	69	23.2	97	0.714	100	0.0	2
Approach	634	69	703	11.2		0.997			
SouthWest: Pakuranga HWY									
Lane 1	147	-	147	21.1	1081	0.136	100	0.0	2
Lane 2	-	473	473	12.8	471[1]	1.004	100	0.0	3
Lane 3	-	488	488	12.8	485	1.004	100	NA	NA
Approach	147	961	1108	13.9		1.004			

	Total	%HV	Deg.Satn (v/c)
Intersection	3418	10.9	1.004

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

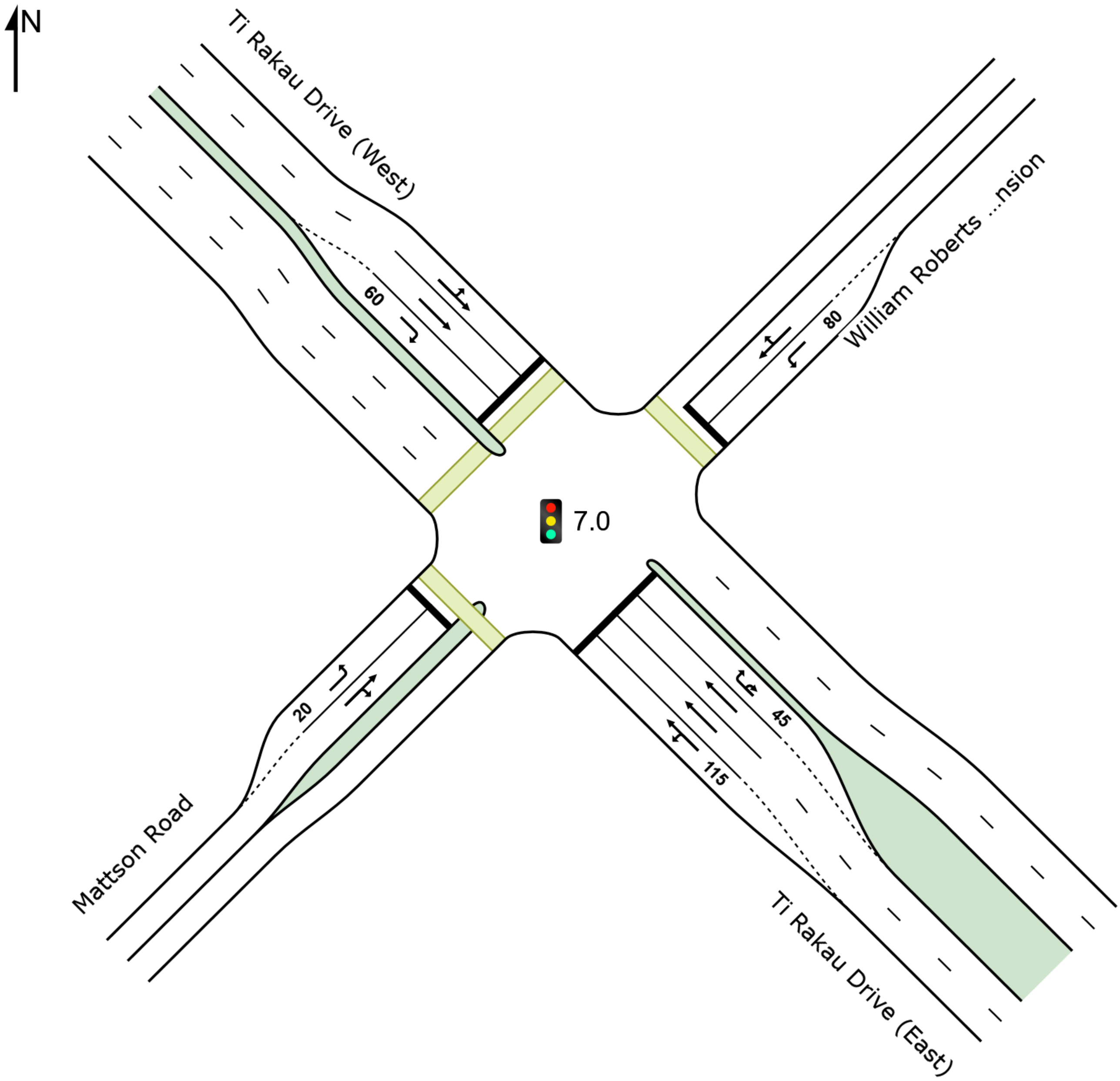
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Pakuranga HWY Merge Type: **Priority**												
Exit Short Lane	1	280	0.0	69	77	3.00	2.00	775	1723	0.450	0.1	0.2
Merge Lane	2	-	100.0	Merge Lane is not Opposed				69	1800	0.038	0.0	0.0

SITE LAYOUT

Site: 7.0 [7.0 William Roberts Rd / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 7.0 [7.0 William Roberts Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	603	7.8	552	8.1	980	0.563	100	24.8	LOS C	23.5	175.6	Short	115	0.0	NA
Lane 2	605	7.8	554	8.0	983	0.563	100	24.4	LOS C	23.5	176.1	Full	203	0.0	2.1
Lane 3	431	7.8	394	8.0	700 [1]	0.563	100	21.7	LOS C	14.9	111.4	Full	203	0.0	0.0
Lane 4	182	10.5	167	10.8	176 [1]	0.947	100	101.4	LOS F	13.2	101.3	Short	45	0.0	NA
Approach	1821	8.1	1667 [N1]	8.3		0.947		31.6	LOS C	23.5	176.1				
NorthEast: William Roberts Road Extension															
Lane 1	80	5.0	80	5.0	190	0.420	100	71.2	LOS E	5.0	36.7	Short	80	0.0	NA
Lane 2	169	9.0	169	9.0	186	0.908	100	89.3	LOS F	12.7	95.4	Full	110	0.0	2.1
Approach	249	7.7	249	7.7		0.908		83.5	LOS F	12.7	95.4				
NorthWest: Ti Rakau Drive (West)															
Lane 1	897	10.7	897	10.7	946	0.948	100	60.8	LOS E	20.5 [N4]	156.4 [N4]	Full	107	0.0	50.0
Lane 2	839	9.3	839	9.3	884 [1]	0.948	100	57.4	LOS E	20.7 [N4]	156.4 [N4]	Full	107	0.0	50.0
Lane 3	124	6.8	124	6.8	286	0.434	100	67.5	LOS E	7.4	55.0	Short	60	0.0	NA
Approach	1860	9.8	1860	9.8		0.948		59.7	LOS E	20.7	156.4				
SouthWest: Mattson Road															
Lane 1	16	0.0	16	0.0	446	0.035	100	51.8	LOS D	0.8	5.5	Short	20	0.0	NA
Lane 2	58	1.8	58	1.8	74	0.783	100	89.9	LOS F	4.1	29.5	Full	282	0.0	0.0
Approach	74	1.4	74	1.4		0.783		81.8	LOS F	4.1	29.5				
Intersection	4004	8.7	3849 [N1]	9.1		0.948		49.5	LOS D	23.5	176.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	35	517	-	-	552	8.1	980	0.563	100	54.1	2
Lane 2	-	554	-	-	554	8.0	983	0.563	100	NA	NA
Lane 3	-	394	-	-	394	8.0	700 [1]	0.563	100	NA	NA
Lane 4	-	-	104	63	167	10.8	176 [1]	0.947	100	91.7	3

Approach	35	1465	104	63	1667	8.3		0.947			

NorthEast: William Roberts Road Extension										
Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	80	-	-	80	5.0	190	0.420	100	0.0	2
Lane 2	-	11	158	169	9.0	186	0.908	100	NA	NA
Approach	80	11	158	249	7.7		0.908			

NorthWest: Ti Rakau Drive (West)										
Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	349	548	-	897	10.7	946	0.948	100	NA	NA
Lane 2	-	839	-	839	9.3	884[1]	0.948	100	NA	NA
Lane 3	-	-	124	124	6.8	286	0.434	100	7.2	2
Approach	349	1387	124	1860	9.8		0.948			

SouthWest: Mattson Road										
Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	-	-	16	0.0	446	0.035	100	0.0	2
Lane 2	-	11	47	58	1.8	74	0.783	100	NA	NA
Approach	16	11	47	74	1.4		0.783			

	Total	%HV	Deg.Satn (v/c)
Intersection	3849	9.1	0.948

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

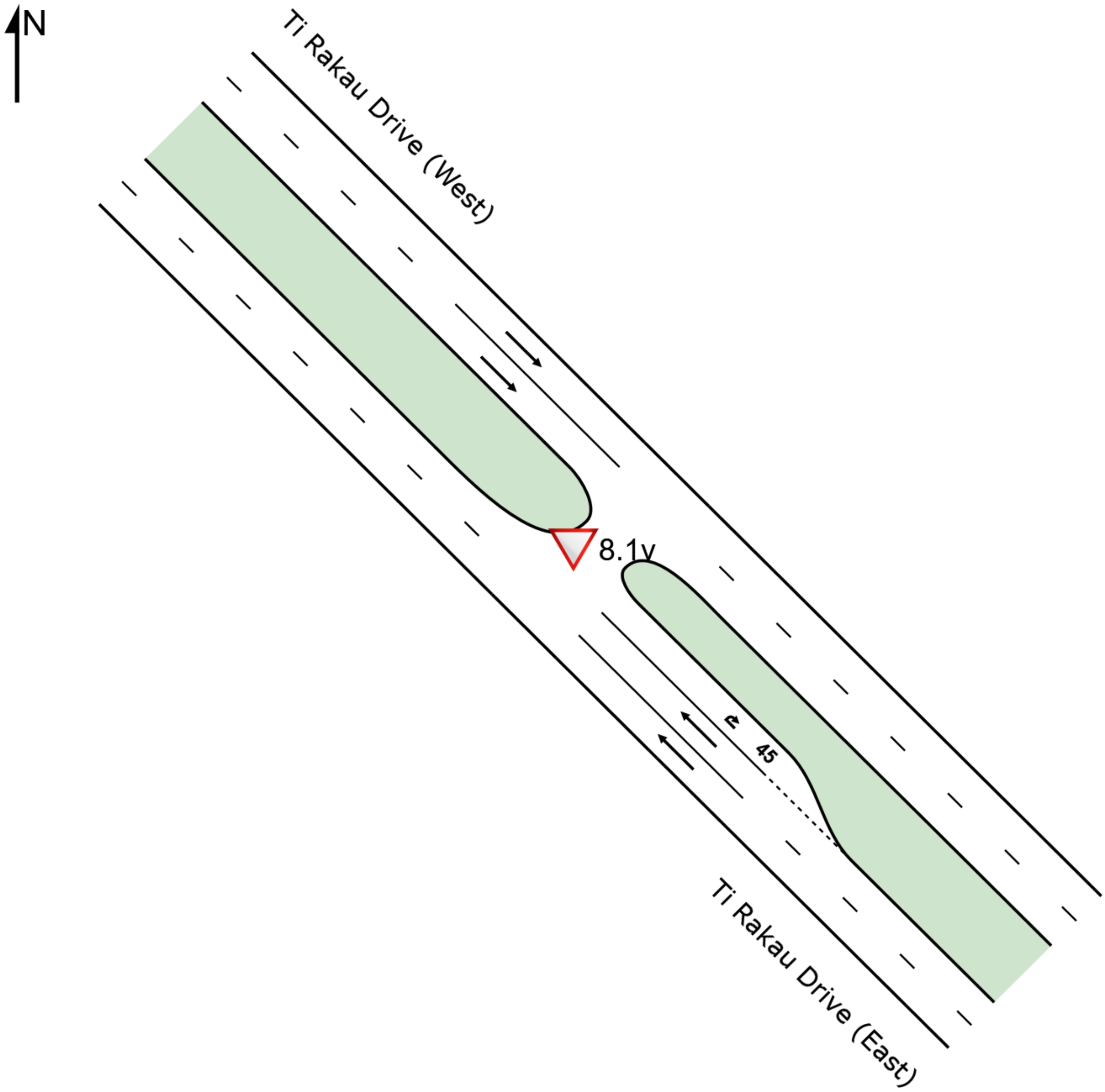
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthEast Exit: William Roberts Road Extension Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Mattson Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 8.1v [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 8.1v [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	766	12.4	689	12.9	1790	0.385	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 2	756	12.4	680	12.9	1766	0.385	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 3	91	5.5	81	5.7	147	0.555	100	43.7	LOS E	1.7	12.2	Short	45	0.0	NA
Approach	1613	12.0	1450 [N1]	12.5		0.555		2.5	NA	1.7	12.2				
NorthWest: Ti Rakau Drive (West)															
Lane 1	535	13.8	531	13.9	1807	0.294	100	0.0	LOS A	0.0	0.0	Full	73	0.0	0.0
Lane 2	535	13.8	531	13.9	1807	0.294	100	0.0	LOS A	0.0	0.0	Full	73	0.0	0.0
Approach	1069	13.8	1062 [N1]	13.9		0.294		0.0	NA	0.0	0.0				
Intersection	2682	12.7	2512 [N1]	13.6		0.555		1.5	NA	1.7	12.2				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	689	-	689	12.9	1790	0.385	100	NA	NA
Lane 2	680	-	680	12.9	1766	0.385	100	NA	NA
Lane 3	-	81	81	5.7	147	0.555	100	0.0	2
Approach	1368	81	1450	12.5		0.555			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	531	531	13.9	1807	0.294	100	NA	NA
Lane 2	531	531	13.9	1807	0.294	100	NA	NA
Approach	1062	1062	13.9		0.294			

	Total	%HV	Deg.Satn (v/c)
Intersection	2512	13.6	0.555

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

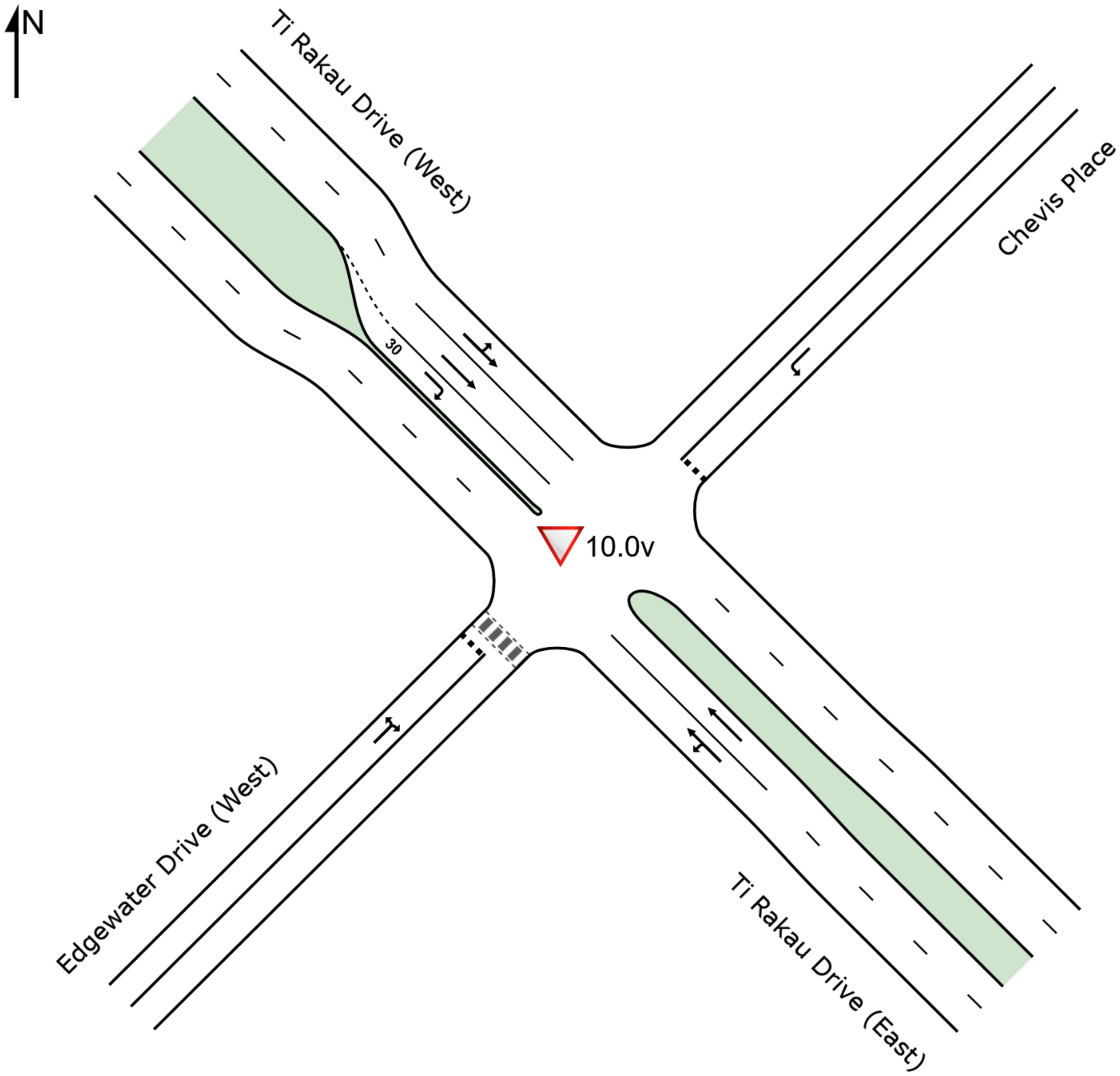
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 10.0v [10.0 Edgewater Dr (West) / Chevis Pl - Conversion - Import (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 10.0v [10.0 Edgewater Dr (West) / Chevis Pl - Conversion - Import (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	892	7.8	835	7.9	1648	0.506	100	1.0	LOS A	1.5	11.3	Full	81	0.0	0.0
Lane 2	995	8.4	931	8.5	1838	0.506	100	0.0	LOS A	0.0	0.0	Full	81	0.0	0.0
Approach	1887	8.1	1765 N1	8.2		0.506		0.5	NA	1.5	11.3				
NorthEast: Chevis Place															
Lane 1	10	0.0	10	0.0	858	0.012	100	6.4	LOS A	0.0	0.2	Full	138	0.0	0.0
Approach	10	0.0	10	0.0		0.012		6.4	LOS A	0.0	0.2				
NorthWest: Ti Rakau Drive (West)															
Lane 1	410	10.8	406	10.8	1839	0.221	100	0.1	LOS A	0.0	0.0	Full	68	0.0	0.0
Lane 2	407	11.0	404	11.1	1829	0.221	100	0.0	LOS A	0.0	0.0	Full	68	0.0	0.0
Lane 3	37	8.1	37	8.2	67	0.545	100	83.8	LOS F	1.3	9.4	Short	30	0.0	NA
Approach	854	10.8	846 N1	10.8		0.545		3.7	NA	1.3	9.4				
SouthWest: Edgewater Drive (West)															
Lane 1	192	6.3	192	6.3	100	1.925	100	894.4	LOS F	47.2	348.4	Full	789	0.0	0.0
Approach	192	6.3	192	6.3		1.925		894.4	LOS F	47.2	348.4				
Intersection	2943	8.7	2814 N1	9.1		1.925		62.5	NA	47.2	348.4				

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	185	650	835	7.9	1648	0.506	100	NA	NA
Lane 2	-	931	931	8.5	1838	0.506	100	NA	NA
Approach	185	1580	1765	8.2		0.506			

NorthEast: Chevis Place

Mov. From NE To Exit:	L2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	10	0.0	858	0.012	100	NA	NA
Approach	10	10	0.0		0.012			

NorthWest: Ti Rakau Drive (West)											
Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	396	-	406	10.8	1839	0.221	100	NA	NA
Lane 2	-	404	-	404	11.1	1829	0.221	100	NA	NA
Lane 3	-	-	37	37	8.2	67	0.545	100	0.0	2
Approach	10	800	37	846	10.8		0.545			

SouthWest: Edgewater Drive (West)									
Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	182	10	192	6.3	100	1.925	100	NA	NA
Approach	182	10	192	6.3		1.925			

	Total	%HV	Deg.Satn (v/c)
Intersection	2814	9.1	1.925

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

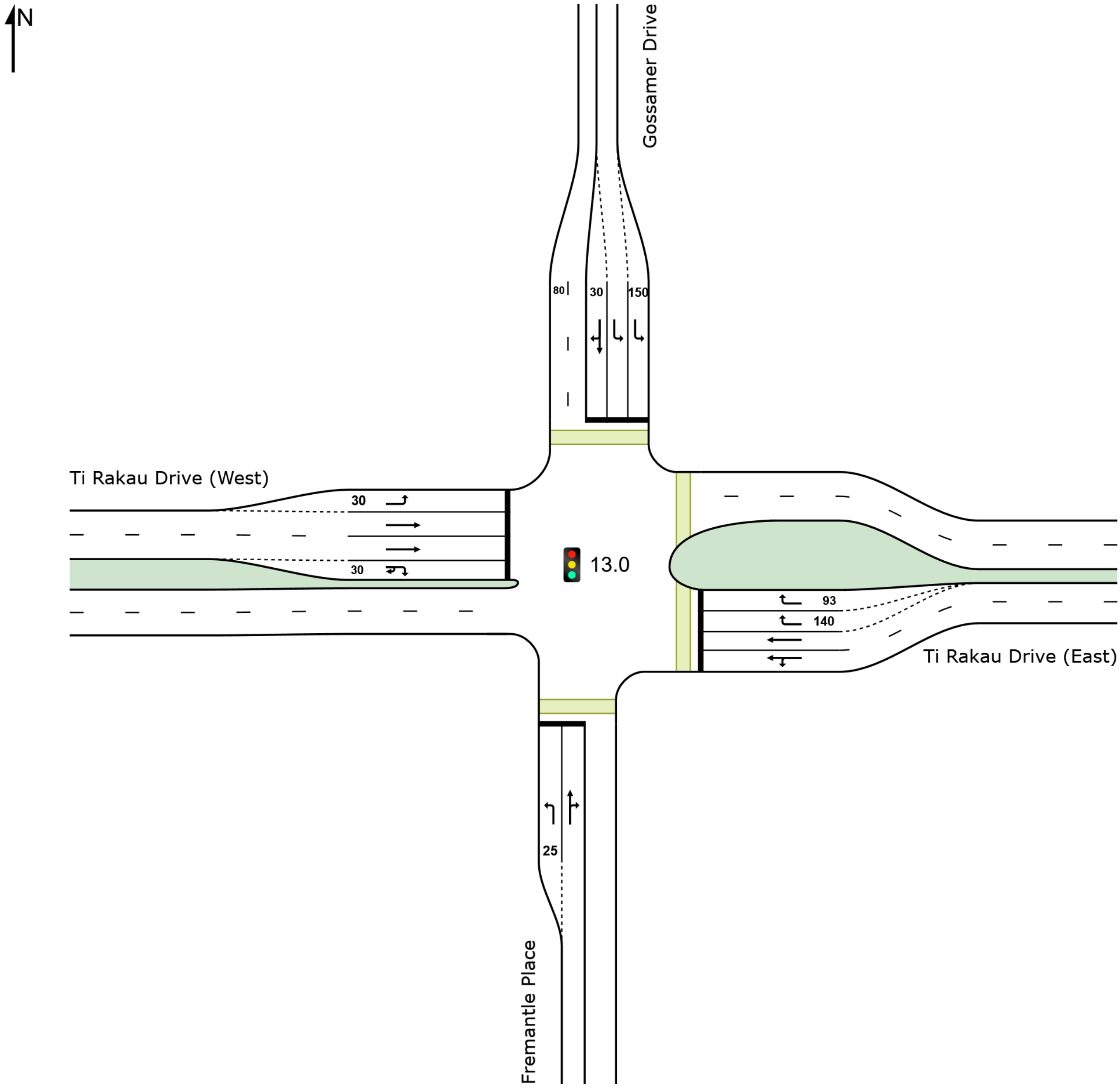
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
NorthEast Exit: Chevis Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Edgewater Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	25	4.0	25	4.0	161	0.156	100	72.5	LOS E	1.5	11.2	Short	25	0.0	NA
Lane 2	31	3.2	31	3.2	165	0.188	100	73.2	LOS E	1.9	13.8	Full	285	0.0	0.0
Approach	56	3.6	56	3.6		0.188		72.9	LOS E	1.9	13.8				
East: Ti Rakau Drive (East)															
Lane 1	873	11.0	873	11.0	859	1.016	100	105.9	LOS F	84.5	647.4	Full	636	0.0	16.6
Lane 2	817	11.1	817	11.1	804[1]	1.016	100	108.0	LOS F	79.7	610.7	Full	636	0.0	11.3
Lane 3	79	8.4	79	8.4	417	0.190	46[6]	28.4	LOS C	2.3	17.6	Short	140	0.0	NA
Lane 4	171	8.4	171	8.4	417	0.410	100	30.1	LOS C	5.4	40.6	Short	93	0.0	NA
Approach	1940	10.7	1940	10.7		1.016		96.9	LOS F	84.5	647.4				
North: Gossamer Drive															
Lane 1	559	7.5	559	7.5	629	0.889	100	51.9	LOS D	26.1	194.7	Short	150	0.0	NA
Lane 2	494	7.5	494	7.5	556[1]	0.889	100	49.7	LOS D	23.0	171.2	Full	1010	0.0	0.0
Lane 3	100	8.0	100	8.0	188	0.532	100	73.5	LOS E	6.4	47.6	Short	30	0.0	NA
Approach	1153	7.5	1153	7.5		0.889		52.9	LOS D	26.1	194.7				
West: Ti Rakau Drive (West)															
Lane 1	19	5.3	19	5.3	532	0.035	100	41.4	LOS D	0.8	6.1	Short	30	0.0	NA
Lane 2	429	10.7	420	10.8	577[1]	0.727	100	49.7	LOS D	23.7	181.4	Full	479	0.0	0.0
Lane 3	392	10.7	383	10.8	527[1]	0.727	100	48.5	LOS D	21.1	161.0	Full	479	0.0	0.0
Lane 4	48	6.5	46	6.5	175	0.266	100	70.0	LOS E	2.8	20.8	Short	30	0.0	NA
Approach	888	10.4	868[N1]	10.4		0.727		50.1	LOS D	23.7	181.4				
Intersection	4037	9.6	4017[N1]	9.7		1.016		73.8	LOS E	84.5	647.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	25	-	-	25	4.0	161	0.156	100	0.0	2
Lane 2	-	13	18	31	3.2	165	0.188	100	NA	NA
Approach	25	13	18	56	3.6		0.188			

East: Ti Rakau Drive (East)										
Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	859	-	873	11.0	859	1.016	100	NA	NA
Lane 2	-	817	-	817	11.1	804[1]	1.016	100	NA	NA
Lane 3	-	-	79	79	8.4	417	0.190	46[6]	0.0	2
Lane 4	-	-	171	171	8.4	417	0.410	100	0.0	3
Approach	14	1676	250	1940	10.7		1.016			

North: Gossamer Drive										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	559	-	-	559	7.5	629	0.889	100	38.9	2
Lane 2	494	-	-	494	7.5	556[1]	0.889	100	NA	NA
Lane 3	-	10	90	100	8.0	188	0.532	100	57.8	2
Approach	1053	10	90	1153	7.5		0.889			

West: Ti Rakau Drive (West)											
Mov. From W To Exit:	L2 N	T1 E	R2 S	U W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	-	-	-	19	5.3	532	0.035	100	0.0	2
Lane 2	-	420	-	-	420	10.8	577[1]	0.727	100	NA	NA
Lane 3	-	383	-	-	383	10.8	527[1]	0.727	100	NA	NA
Lane 4	-	-	10	37	46	6.5	175	0.266	100	0.0	3
Approach	19	803	10	37	868	10.4		0.727			

	Total	%HV	Deg.Satn (v/c)
Intersection	4017	9.7	1.016

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	80	50.0	92	95	2.50	2.00	98	1691	0.058	0.0	0.0
Merge Lane	2	-	50.0	49	51	2.50	2.00	184	1743	0.105	0.0	0.0
West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\CS 2.0\2028 Construction 2 PM - XL.sip9

Appendix H

EB2/EB3R Final Scenario – Phasing Diagrams

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 100 seconds (Site User-Given Phase Times)

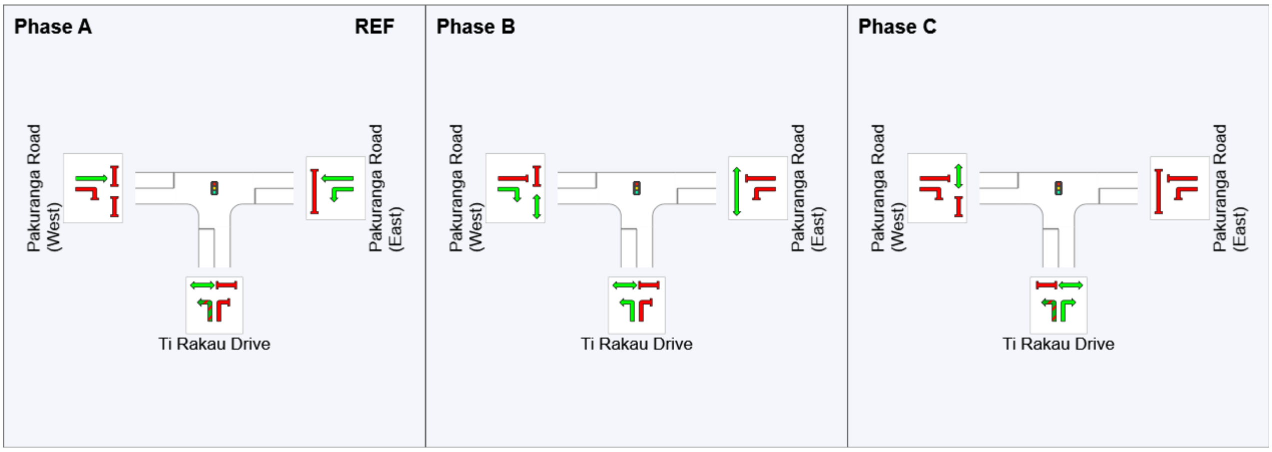
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	39	69
Green Time (sec)	34	24	25
Phase Time (sec)	40	30	30
Phase Split	40%	30%	30%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

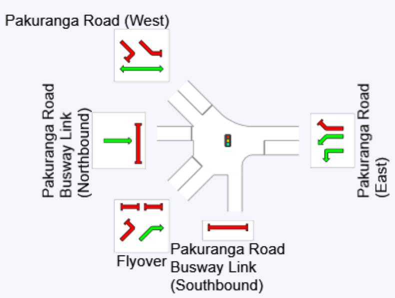
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	43	74	93
Green Time (sec)	37	25	13	51
Phase Time (sec)	43	31	19	57
Phase Split	29%	21%	13%	38%

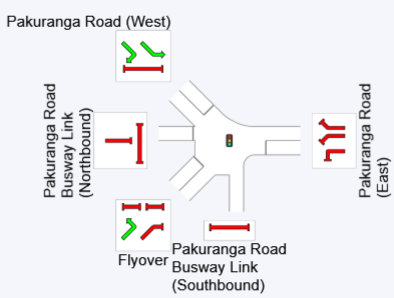
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

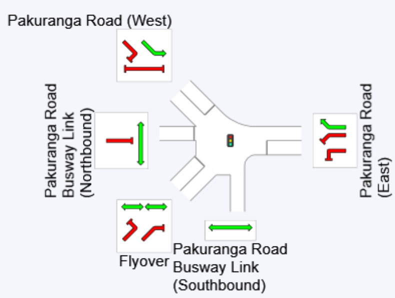
Phase A **REF**



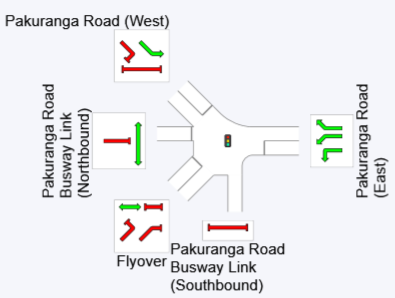
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 11:21:24 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

PHASING SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

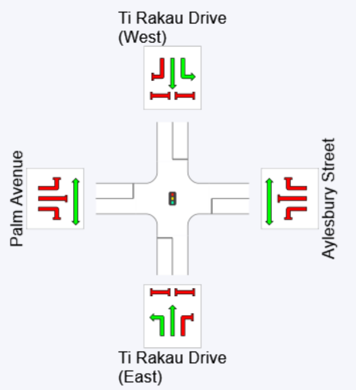
Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	73	97	114	139
Green Time (sec)	66	18	11	19	6
Phase Time (sec)	72	24	17	24	13
Phase Split	48%	16%	11%	16%	9%

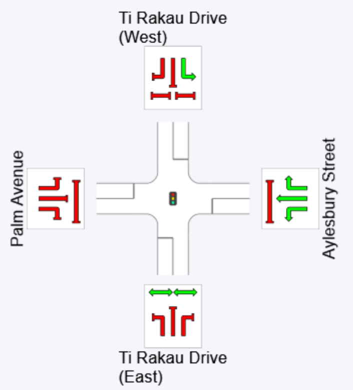
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

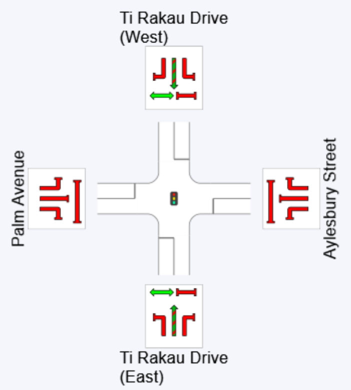
Phase A **REF**



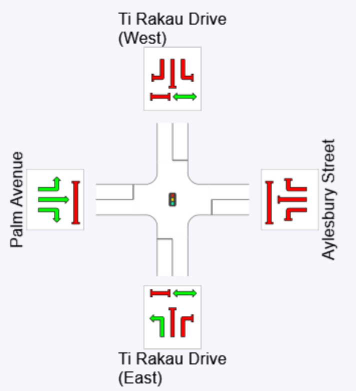
Phase B



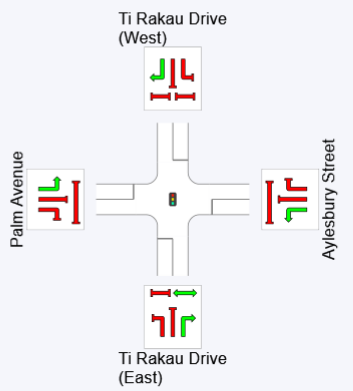
Phase C



Phase D



Phase E



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

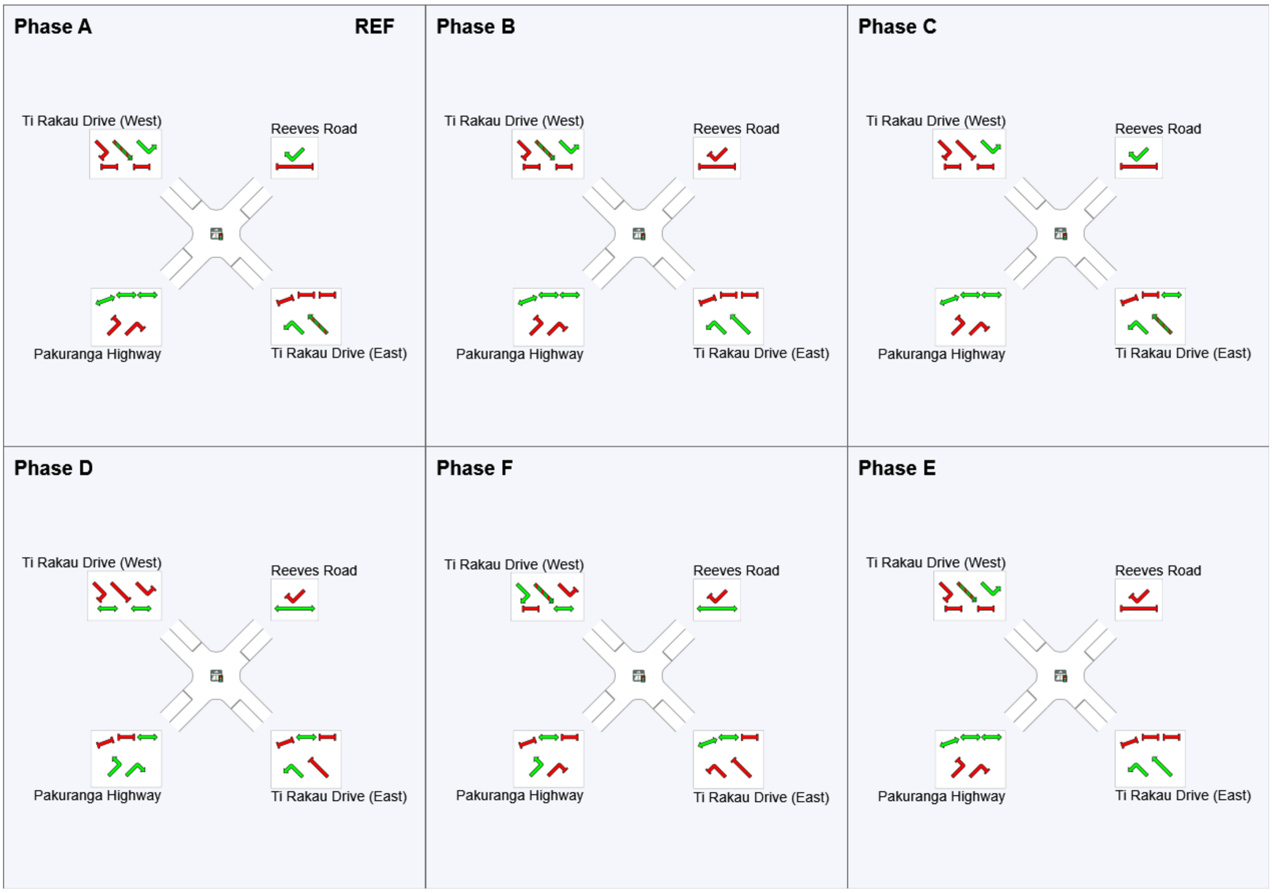
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, F, E
Output Phase Sequence: A, B, C, D, F, E

Phase Timing Summary

Phase	A	B	C	D	F	E
Phase Change Time (sec)	0	32	52	72	106	131
Green Time (sec)	26	14	14	29	17	11
Phase Time (sec)	32	20	19	37	25	17
Phase Split	21%	13%	13%	25%	17%	11%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 110 seconds (Network Practical Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, X, B, C, D
Output Phase Sequence: A, X, B, C, D

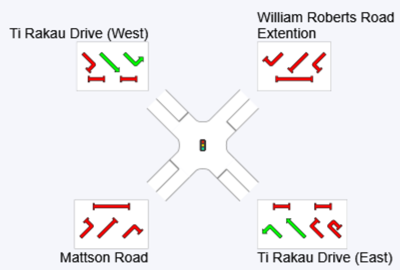
Phase Timing Summary

Phase	A	X	B	C	D
Phase Change Time (sec)	0	35	60	77	92
Green Time (sec)	27	19	11	7	12
Phase Time (sec)	33	25	19	13	20
Phase Split	30%	23%	17%	12%	18%

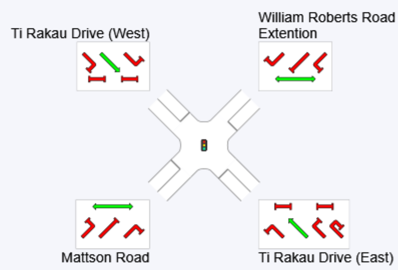
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

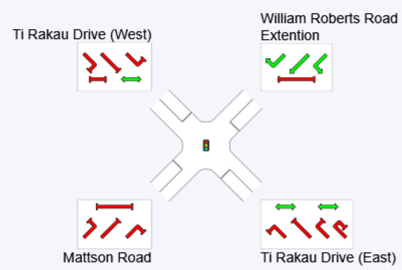
Phase A **REF**



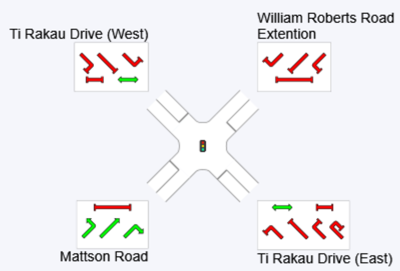
Phase X



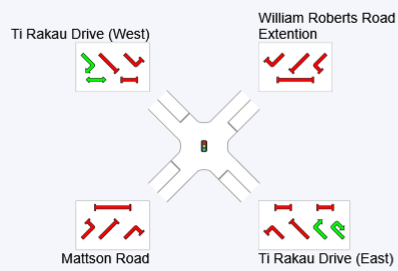
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 30 seconds (Site Practical Cycle Time)

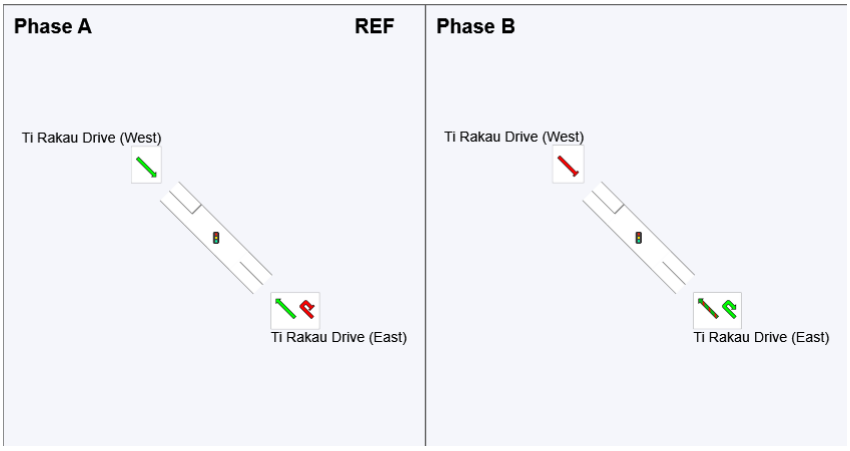
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Opposed Turns
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	18
Green Time (sec)	12	6
Phase Time (sec)	18	12
Phase Split	60%	40%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

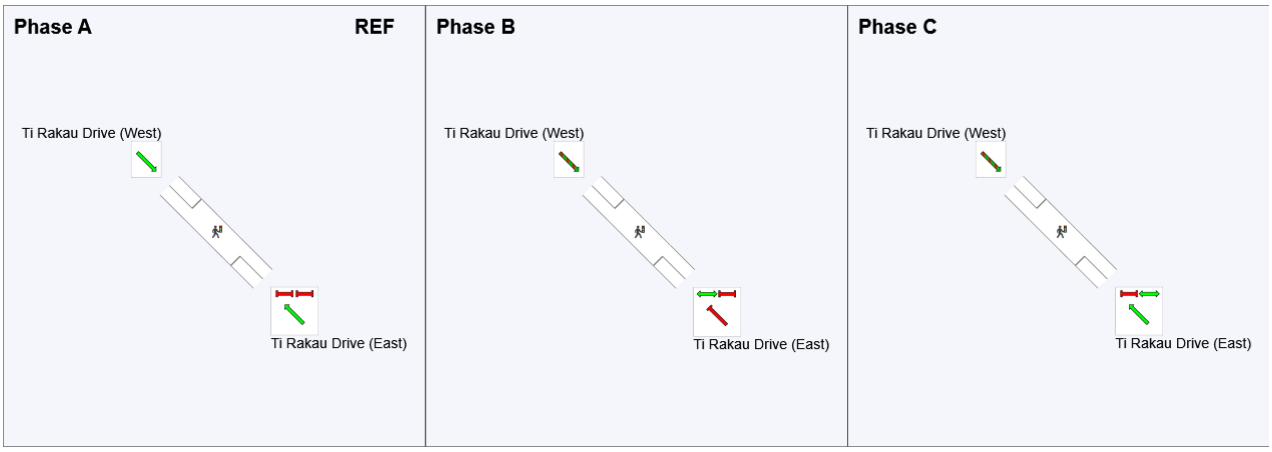
Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	2	23
Green Time (sec)	***	15	11
Phase Time (sec)	2	21	17
Phase Split	5%	53%	43%

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

*** No green time has been calculated for this phase because the next phase starts during its intergreen time.
This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

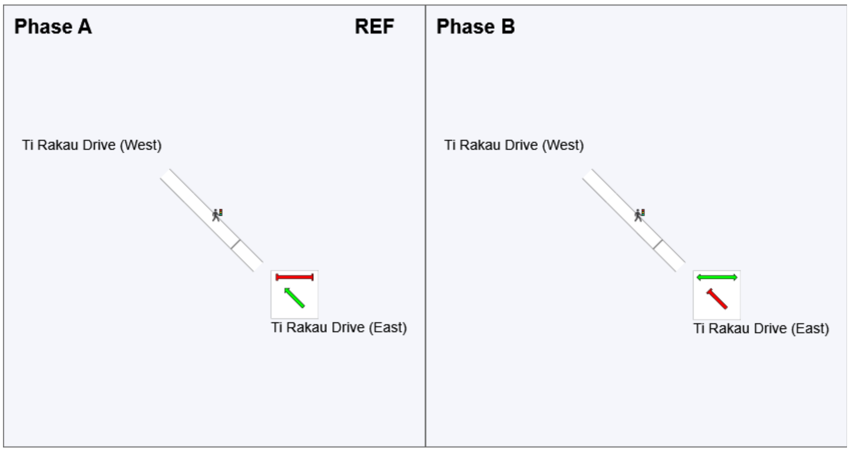
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	33
Green Time (sec)	27	11
Phase Time (sec)	33	17
Phase Split	66%	34%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 10.1 [10.1 U-turn - East of Edgewater Dr (West) (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 40 seconds (Site Practical Cycle Time)

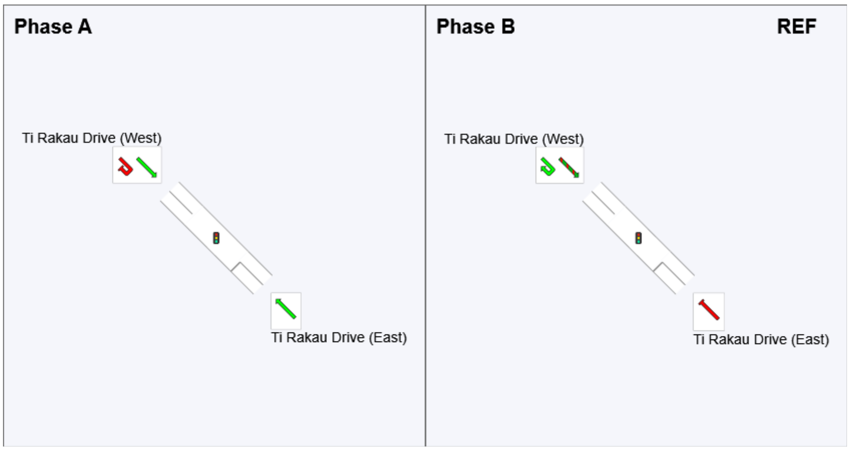
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	12	0
Green Time (sec)	22	6
Phase Time (sec)	28	12
Phase Split	70%	30%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

PHASING SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site User-Given Phase Times)

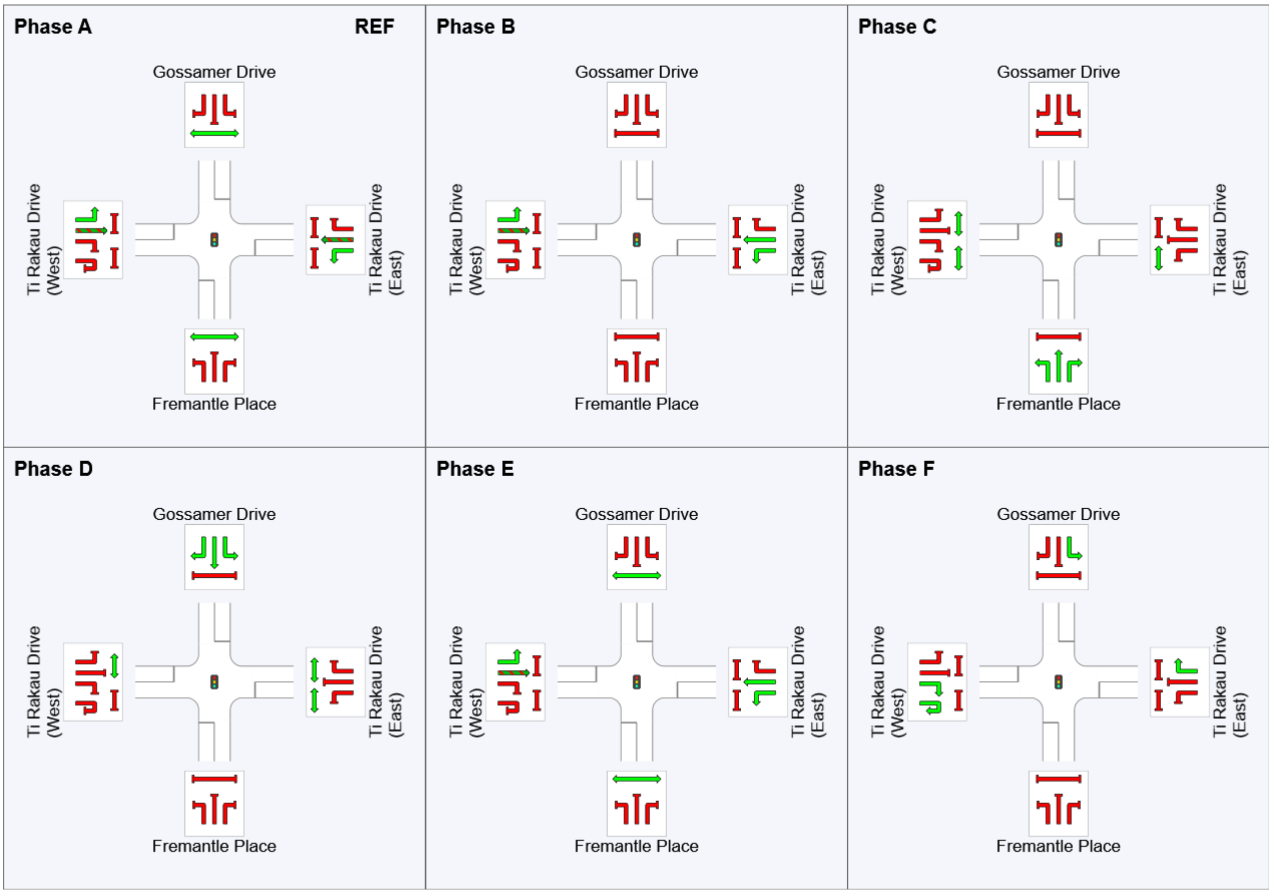
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E, F
Output Phase Sequence: A, B, C, D, E, F

Phase Timing Summary

Phase	A	B	C	D	E	F
Phase Change Time (sec)	0	50	73	85	100	123
Green Time (sec)	44	17	6	11	17	21
Phase Time (sec)	50	23	10	17	23	27
Phase Split	33%	15%	7%	11%	15%	18%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

	Normal Movement		Permitted/Opposed
	Slip/Bypass-Lane Movement		Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
	Other Movement Class (MC) Running		Undetected Movement
	Mixed Running & Stopped MCs		Continuous Movement
	Other Movement Class (MC) Stopped		Phase Transition Applied

CCG PHASING SUMMARY

Common Control Group: CCG3 [Aylesbury/ WR/ Reeves Rd]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 158 seconds (CCG Practical Cycle Time)

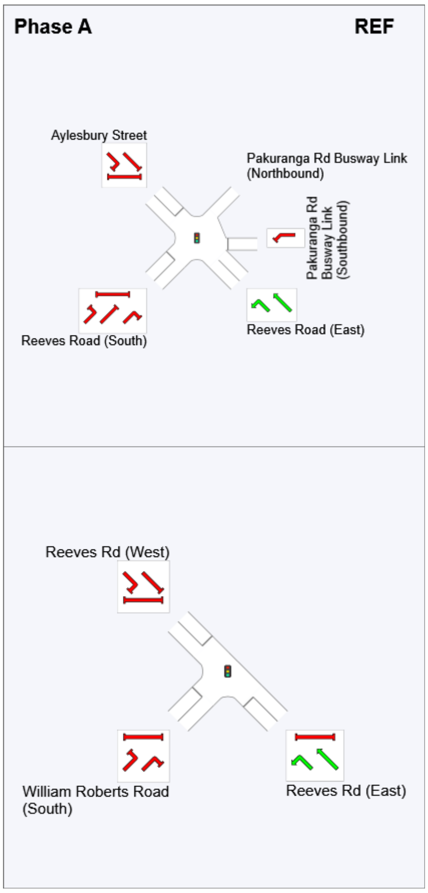
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: CCG Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, D2, E
Output Phase Sequence: A, B, C, D, D2, E

Phase Timing Summary (CCG)

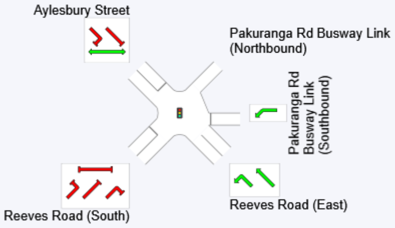
Phase	A	B	C	D	D2	E
Phase Change Time (sec)	2	45	66	79	95	113
Green Time (sec)	37	14	6	10	12	41
Phase Time (sec)	44	21	12	16	18	47
Phase Split	28%	13%	8%	10%	11%	30%

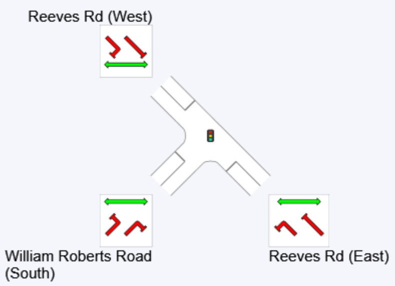
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence (CCG)

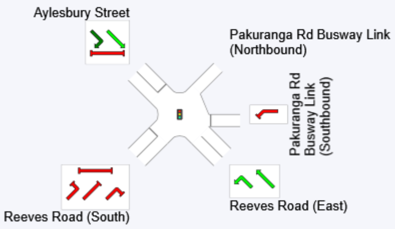


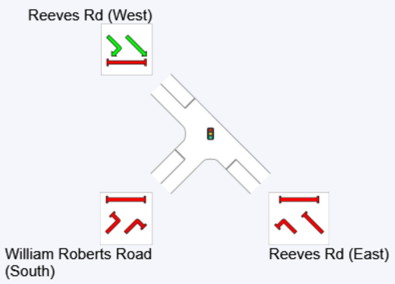
Phase B



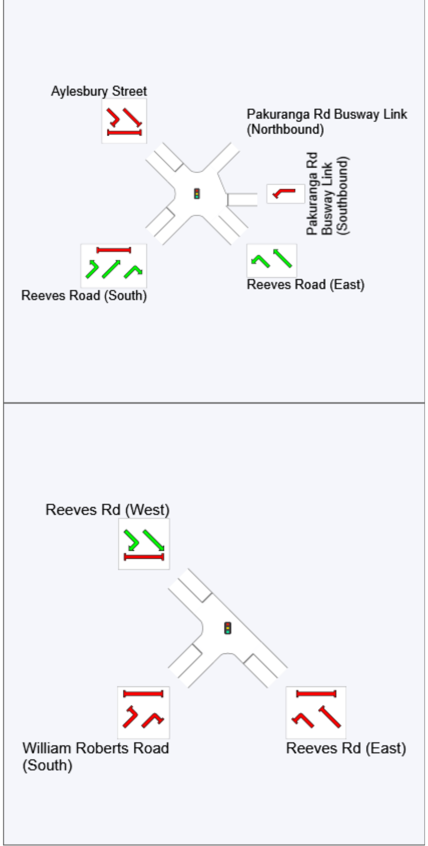


Phase C

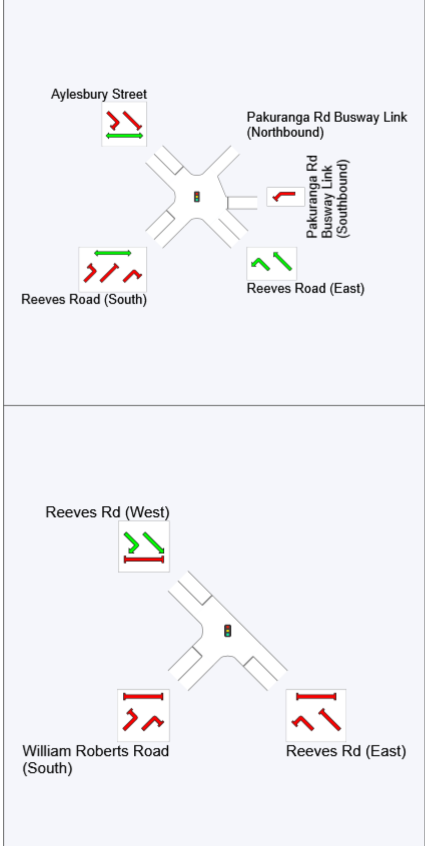


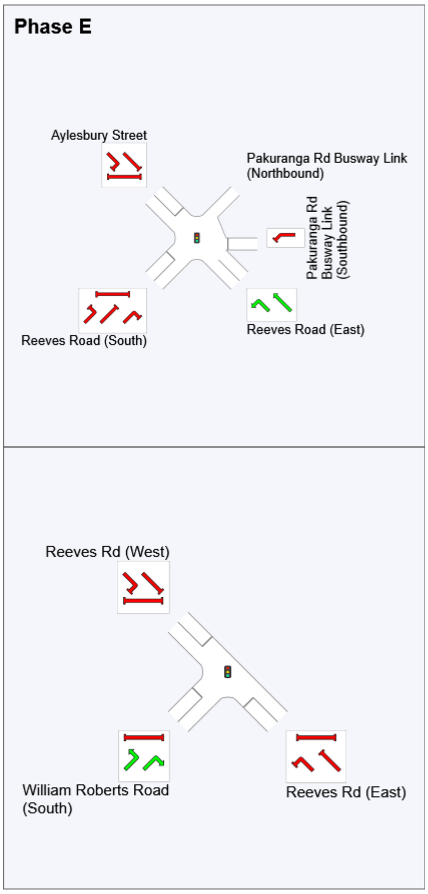


Phase D

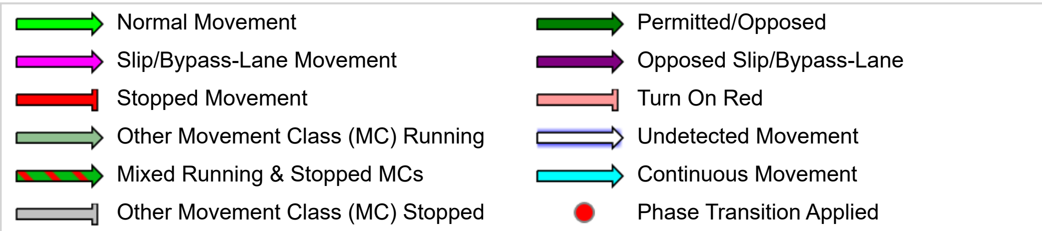


Phase D2





REF: Reference Phase
VAR: Variable Phase



Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 11:21:24 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 97 seconds (Site Practical Cycle Time)

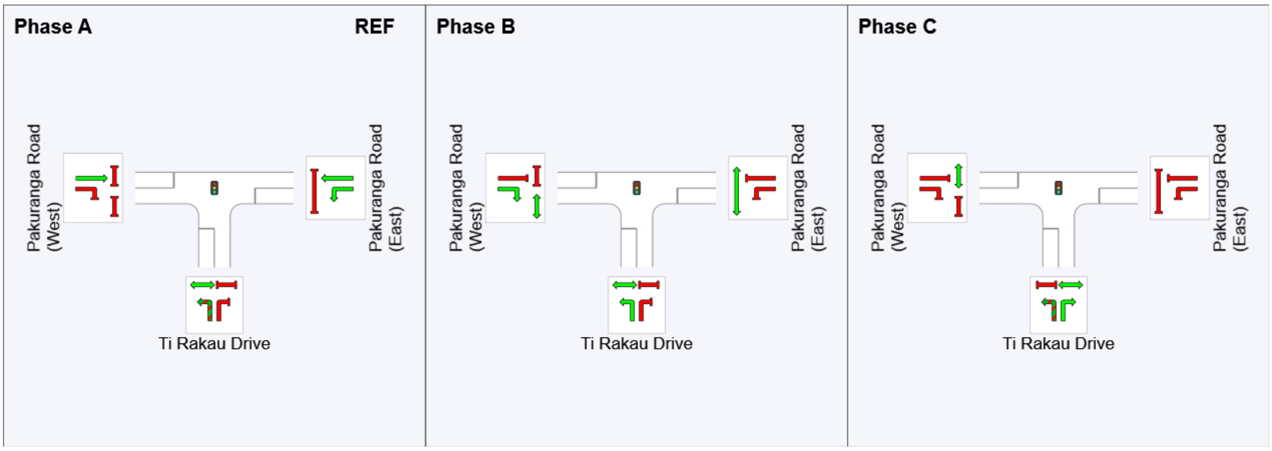
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	34	64
Green Time (sec)	28	24	27
Phase Time (sec)	34	30	33
Phase Split	35%	31%	34%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

PHASING SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

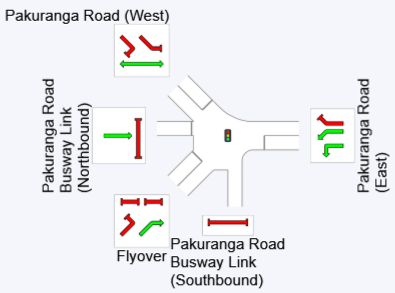
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	68	89	108
Green Time (sec)	62	15	13	6
Phase Time (sec)	68	21	19	12
Phase Split	57%	18%	16%	10%

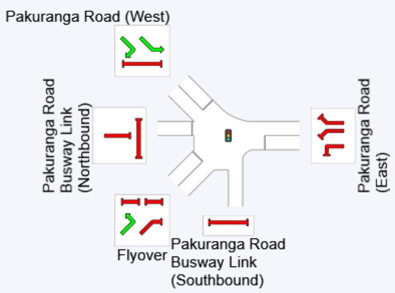
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

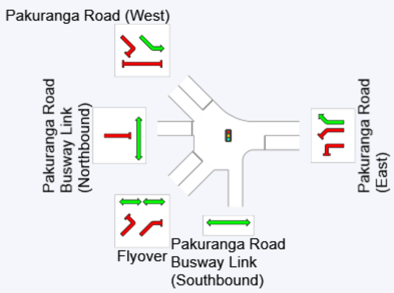
Phase A **REF**



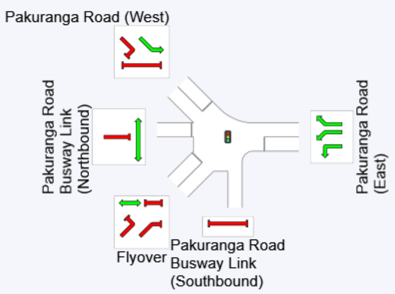
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	72	96	113	139
Green Time (sec)	66	18	11	20	6
Phase Time (sec)	72	24	17	25	12
Phase Split	48%	16%	11%	17%	8%

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

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 10:49:27 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site User-Given Phase Times)

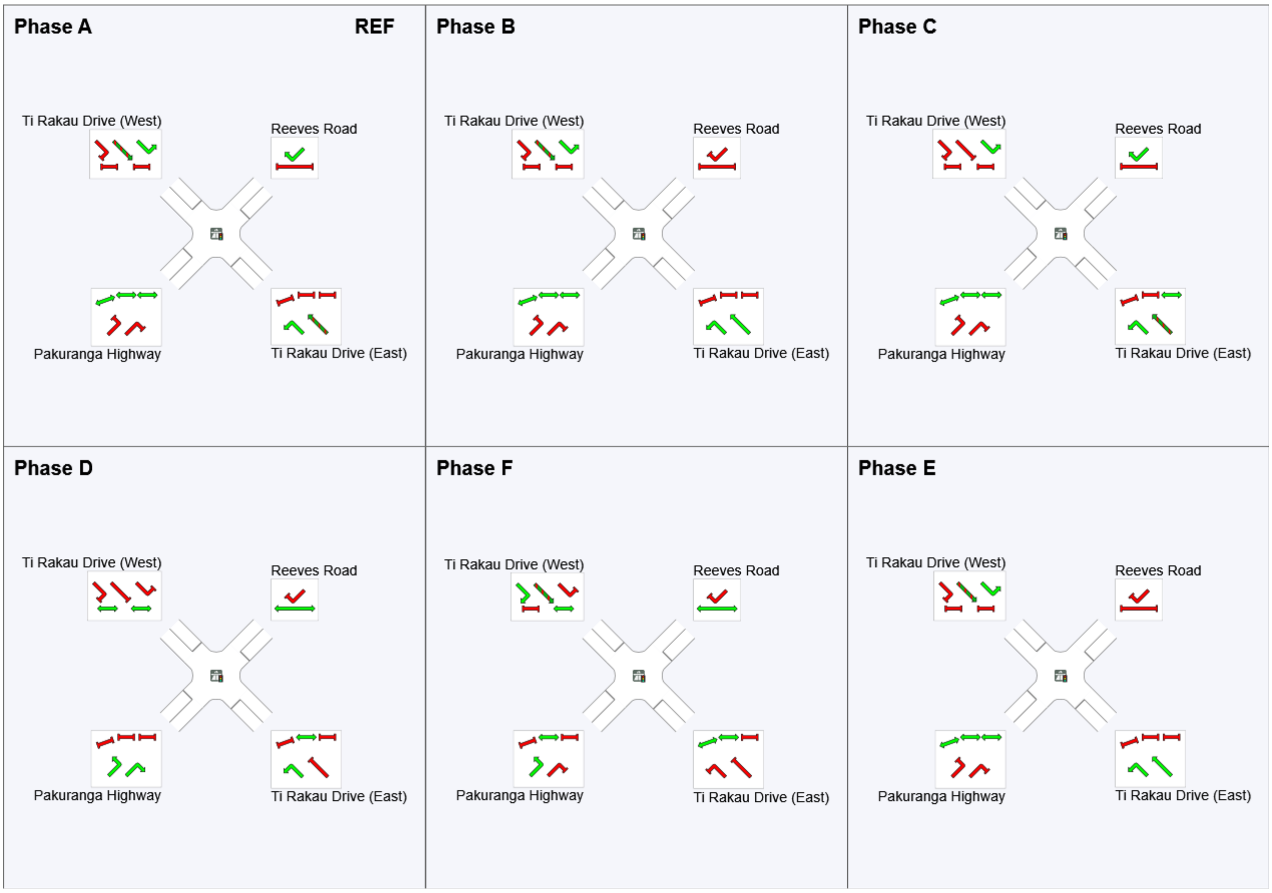
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, F, E
Output Phase Sequence: A, B, C, D, F, E

Phase Timing Summary

Phase	A	B	C	D	F	E
Phase Change Time (sec)	0	15	30	53	96	116
Green Time (sec)	9	9	17	38	12	26
Phase Time (sec)	15	15	22	46	20	32
Phase Split	10%	10%	15%	31%	13%	21%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Practical Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, X, B, C, D
Output Phase Sequence: A, X, B, C, D

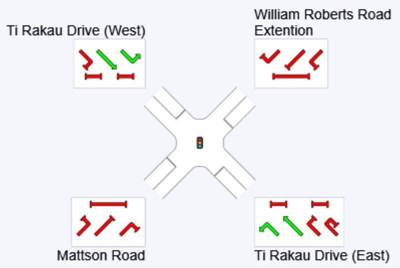
Phase Timing Summary

Phase	A	X	B	C	D
Phase Change Time (sec)	0	44	69	86	100
Green Time (sec)	36	19	11	6	14
Phase Time (sec)	42	25	19	12	22
Phase Split	35%	21%	16%	10%	18%

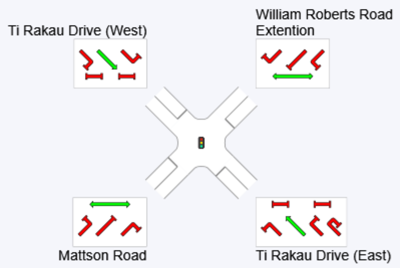
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

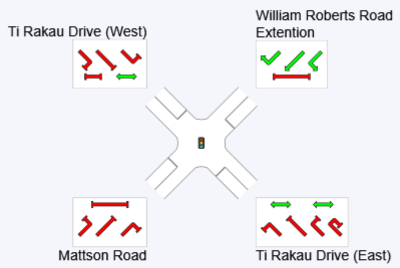
Phase A REF



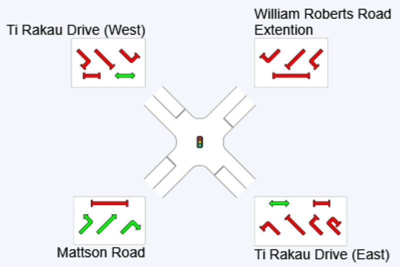
Phase X



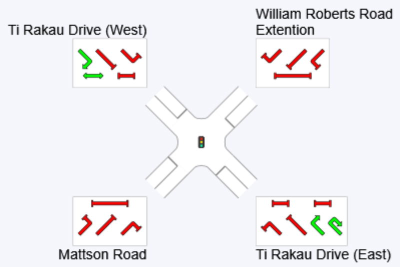
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 10:49:27 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

PHASING SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 40 seconds (Site Practical Cycle Time)

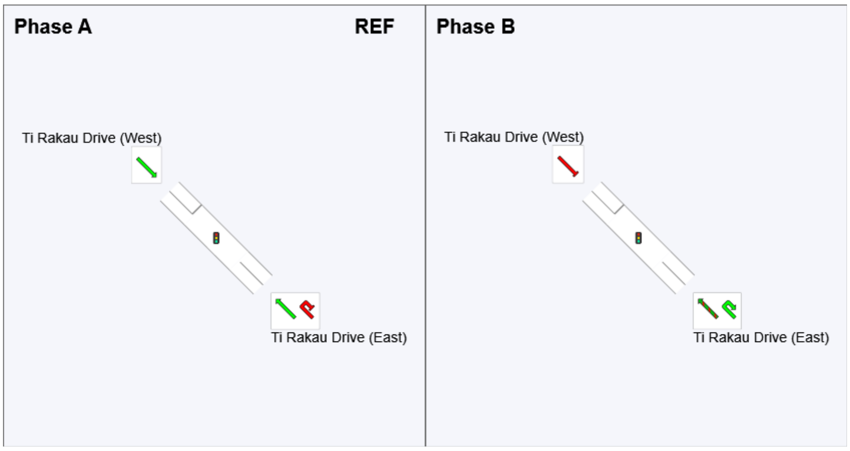
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Opposed Turns
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	28
Green Time (sec)	22	6
Phase Time (sec)	28	12
Phase Split	70%	30%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

PHASING SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 50 seconds (Site Practical Cycle Time)

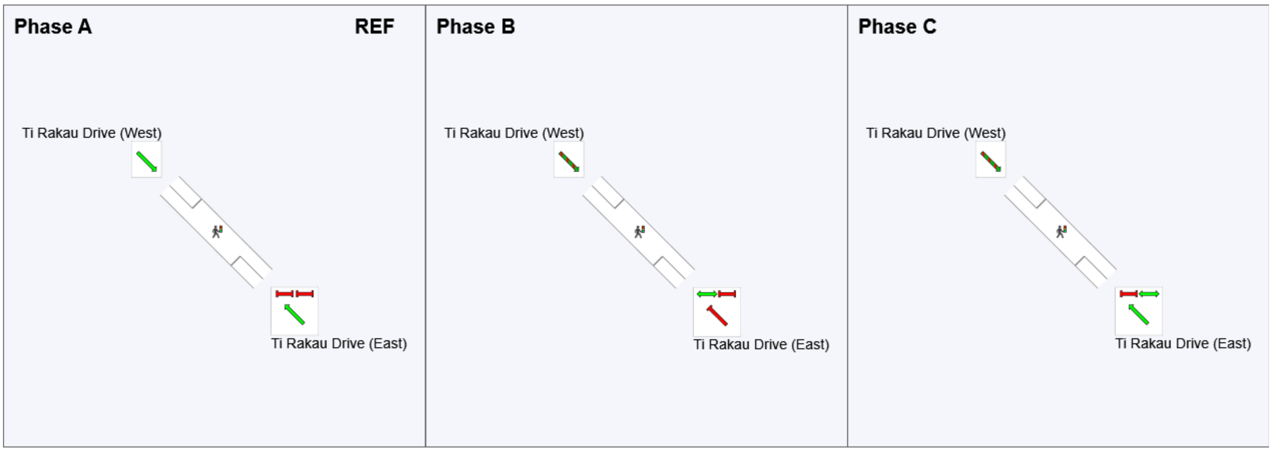
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

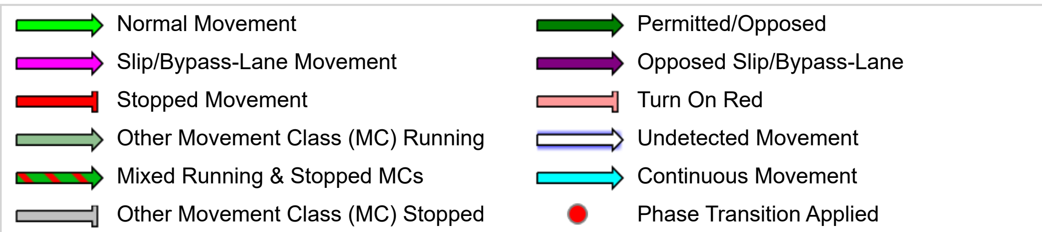
Phase	A	B	C
Phase Change Time (sec)	0	8	33
Green Time (sec)	2	19	11
Phase Time (sec)	8	25	17
Phase Split	16%	50%	34%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 60 seconds (Site Practical Cycle Time)

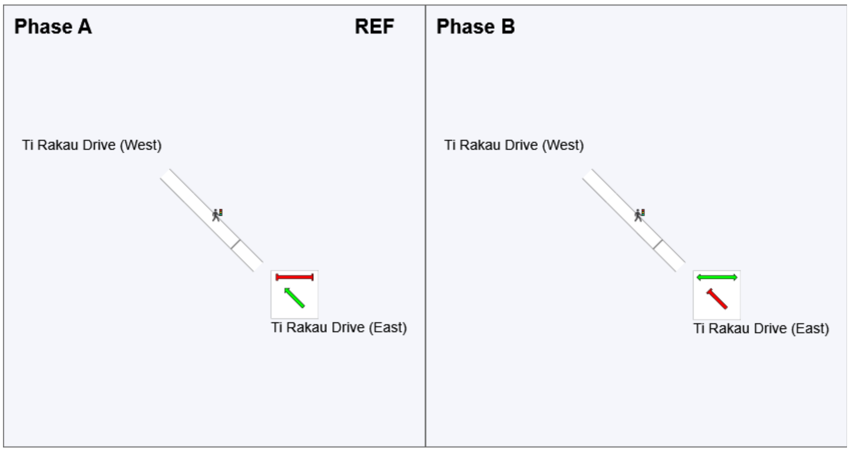
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

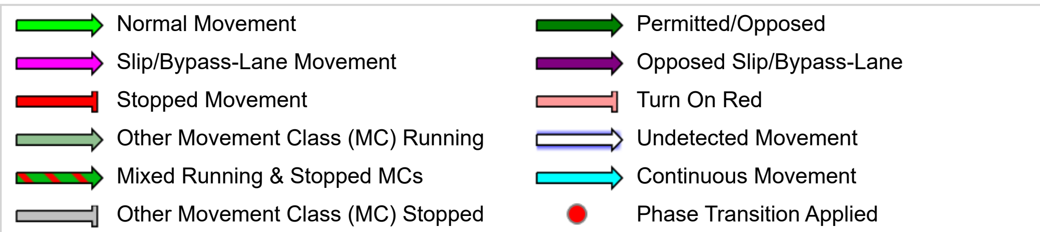
Phase	A	B
Phase Change Time (sec)	0	43
Green Time (sec)	37	11
Phase Time (sec)	43	17
Phase Split	72%	28%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 10:49:27 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

PHASING SUMMARY

Site: 10.1 [10.1 U-turn - East of Edgewater Dr (West) (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 50 seconds (Site Practical Cycle Time)

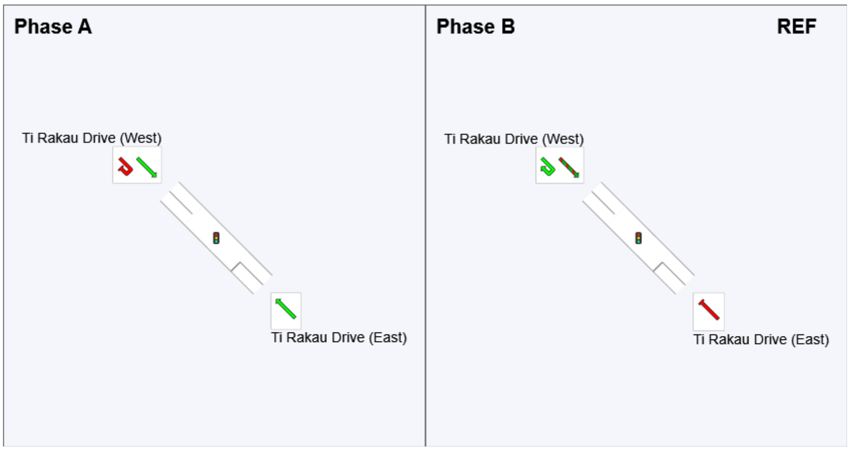
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

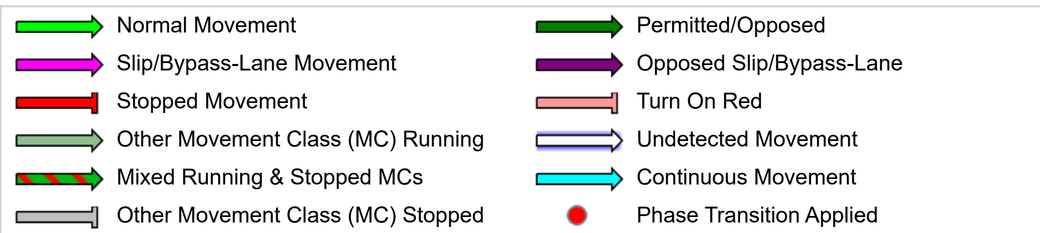
Phase	A	B
Phase Change Time (sec)	12	0
Green Time (sec)	32	6
Phase Time (sec)	38	12
Phase Split	76%	24%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

PHASING SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 160 seconds (Site User-Given Phase Times)

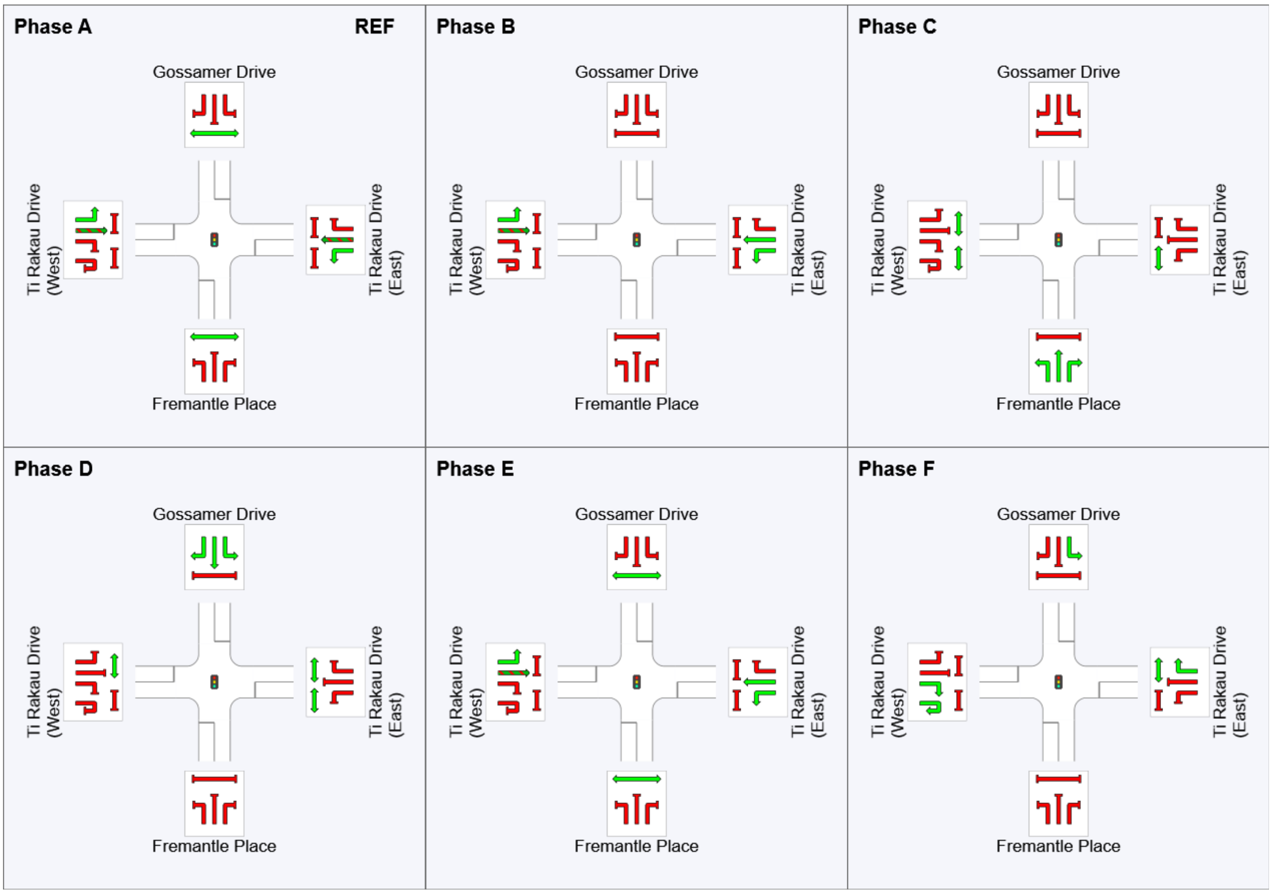
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E, F
Output Phase Sequence: A, B, C, D, E, F

Phase Timing Summary

Phase	A	B	C	D	E	F
Phase Change Time (sec)	0	63	87	101	113	136
Green Time (sec)	57	18	8	8	19	17
Phase Time (sec)	63	24	12	12	26	23
Phase Split	39%	15%	8%	8%	16%	14%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 10:49:27 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

CCG PHASING SUMMARY

Common Control Group: CCG3 [Aylesbury/ WR/ Reeves Rd]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 130 seconds (CCG Practical Cycle Time)

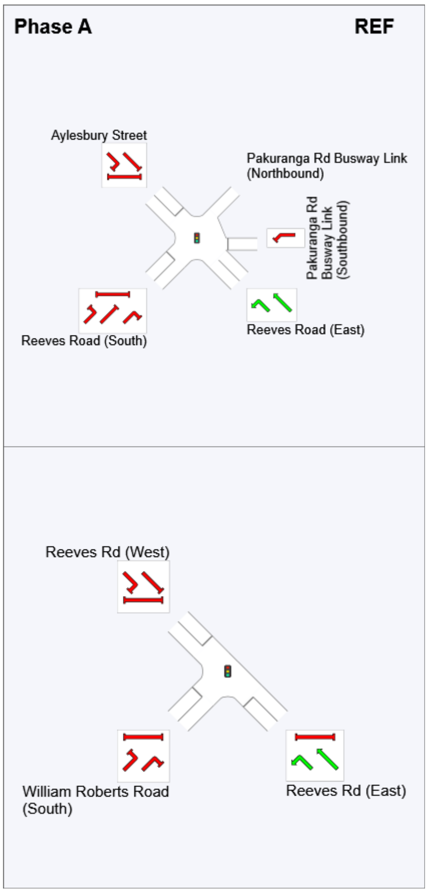
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: CCG Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, C2, D, E
Output Phase Sequence: A, B, C, C2, D, E

Phase Timing Summary (CCG)

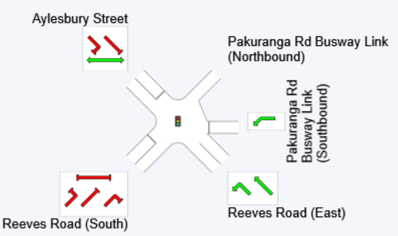
Phase	A	B	C	C2	D	E
Phase Change Time (sec)	2	19	39	56	74	91
Green Time (sec)	11	14	10	12	11	35
Phase Time (sec)	17	21	16	18	17	41
Phase Split	13%	16%	12%	14%	13%	32%

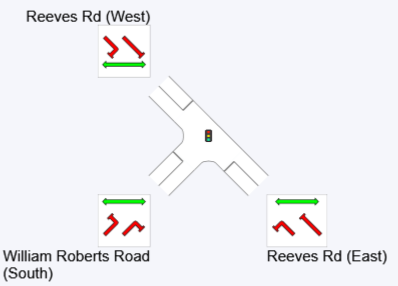
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence (CCG)

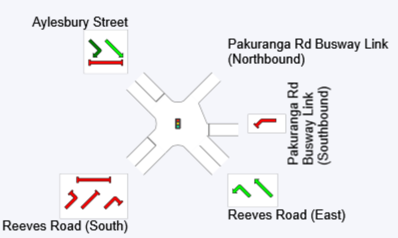


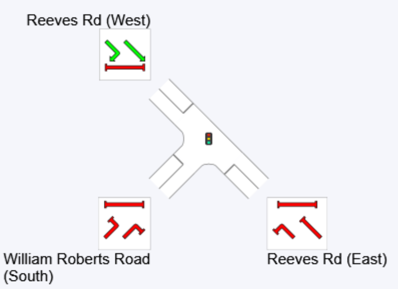
Phase B



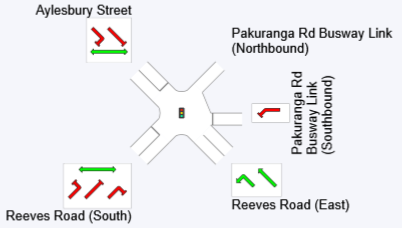


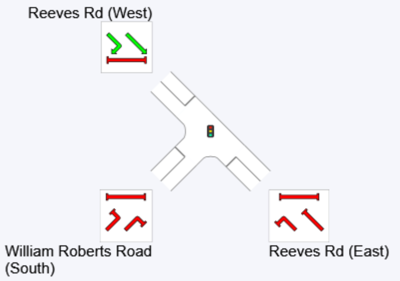
Phase C



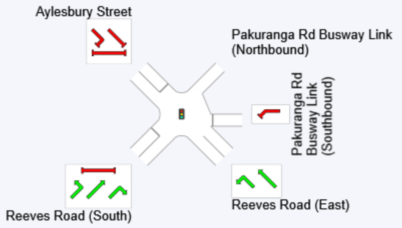


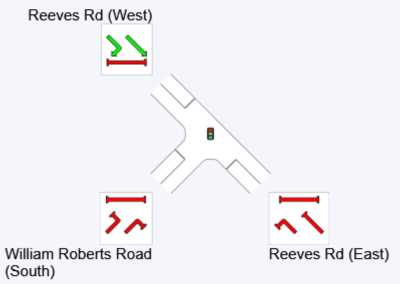
Phase C2

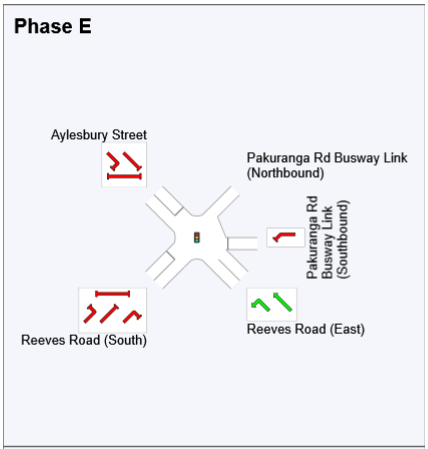


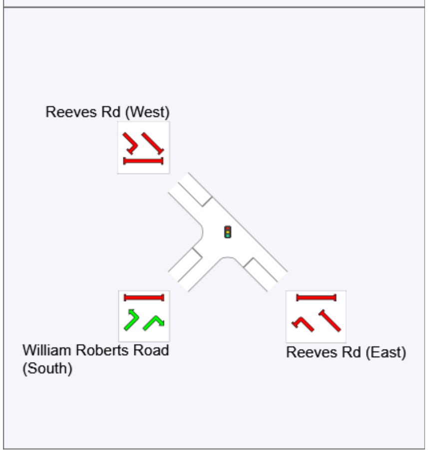


Phase D









REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Appendix I

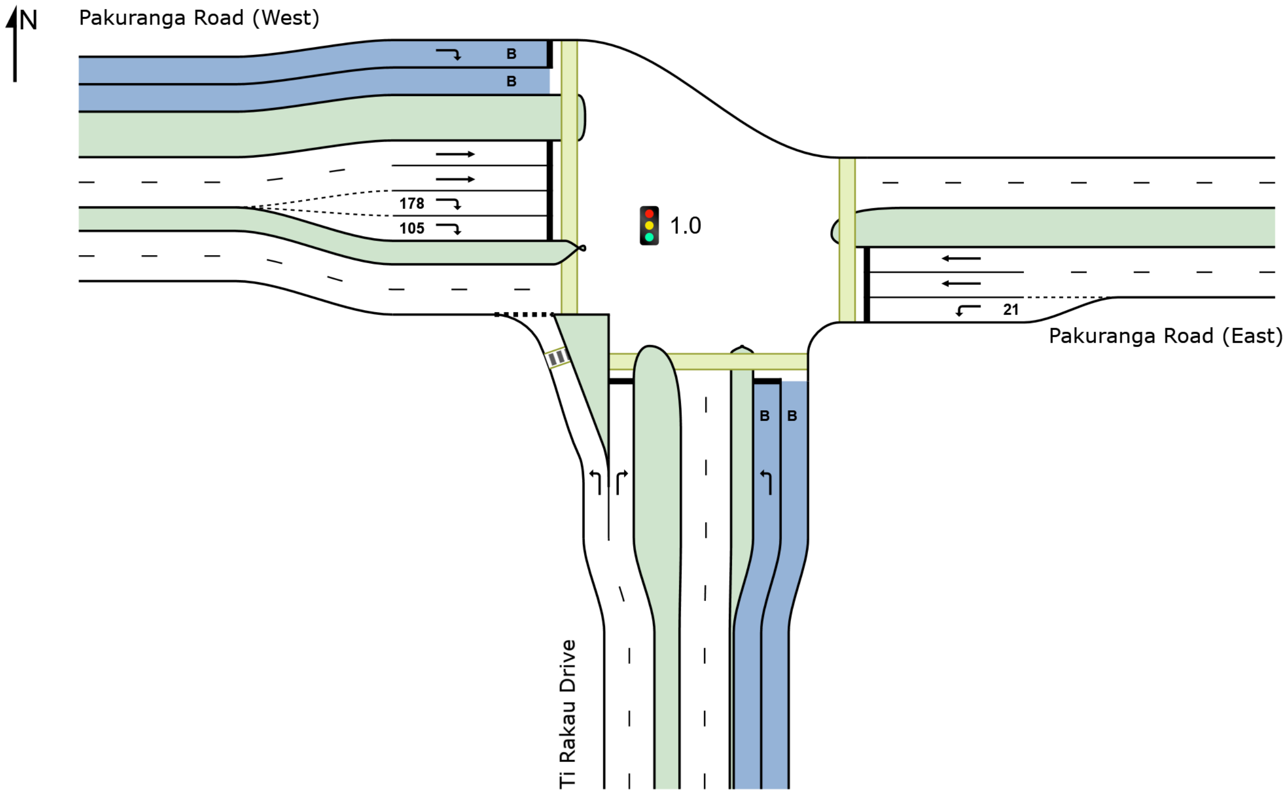
EB2/EB3R Final Scenario – Lane Performance Summaries

SITE LAYOUT

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	870	9.5	870	9.5	931	0.935	100	46.2	LOS D	33.6[N4]	254.3[N4]	Full	174	0.0	50.0
Lane 2	211	7.1	211	7.1	440	0.480	100	39.5	LOS D	8.0	59.2	Full	174	0.0	0.0
Lane 3 (B)	53	100.0	53	100.0	279	0.190	100	27.7	LOS C	1.4	17.7	Full	174	0.0	0.0
Approach	1134	13.3	1134	13.3		0.935		44.1	LOS D	33.6	254.3				
East: Pakuranga Road (East)															
Lane 1	93	1.1	93	1.1	623	0.149	100	29.1	LOS C	2.8	19.8	Short	21	0.0	NA
Lane 2	436	5.6	435	5.6	548[1]	0.794	100	34.5	LOS C	17.7	129.8	Full	98	0.0	40.8
Lane 3	507	5.6	505	5.6	636	0.794	100	35.2	LOS D	19.5[N4]	143.2[N4]	Full	98	0.0	50.0
Approach	1036	5.2	1034[N1]	5.2		0.794		34.4	LOS C	19.5	143.2				
West: Pakuranga Road (West)															
Lane 1 (B)	23	100.0	23	100.0	263	0.087	100	27.4	LOS C	0.6	7.3	Full	380	0.0	0.0
Lane 2	363	7.4	363	7.4	629	0.576	100	29.3	LOS C	13.1	97.2	Full	380	0.0	0.0
Lane 3	363	7.4	363	7.4	629	0.576	100	29.3	LOS C	13.1	97.2	Full	380	0.0	0.0
Lane 4	295	16.9	295	16.9	396	0.746	100	45.5	LOS D	12.7	101.7	Short	178	0.0	NA
Lane 5	295	16.9	295	16.9	396	0.746	100	45.5	LOS D	12.7	101.7	Short	105	0.0	NA
Approach	1338	13.2	1338	13.2		0.746		36.4	LOS D	13.1	101.7				
Intersection	3508	10.9	3506[N1]	10.9		0.935		38.3	LOS D	33.6	254.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	870	-	870	9.5	931	0.935	100	NA	NA
Lane 2	-	211	211	7.1	440	0.480	100	NA	NA
Lane 3	53	-	53	100.0	279	0.190	100	NA	NA
Approach	923	211	1134	13.3		0.935			

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	93	-	93	1.1	623	0.149	100	9.7	2
Lane 2	-	435	435	5.6	548[1]	0.794	100	NA	NA
Lane 3	-	505	505	5.6	636	0.794	100	NA	NA
Approach	93	941	1034	5.2		0.794			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	23	100.0	263	0.087	100	NA	NA
Lane 2	363	-	363	7.4	629	0.576	100	NA	NA
Lane 3	363	-	363	7.4	629	0.576	100	NA	NA
Lane 4	-	295	295	16.9	396	0.746	100	0.0	3
Lane 5	-	295	295	16.9	396	0.746	100	12.1	4
Approach	725	613	1338	13.2		0.746			

	Total	%HV	Deg.Satn (v/c)
Intersection	3506	10.9	0.935

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

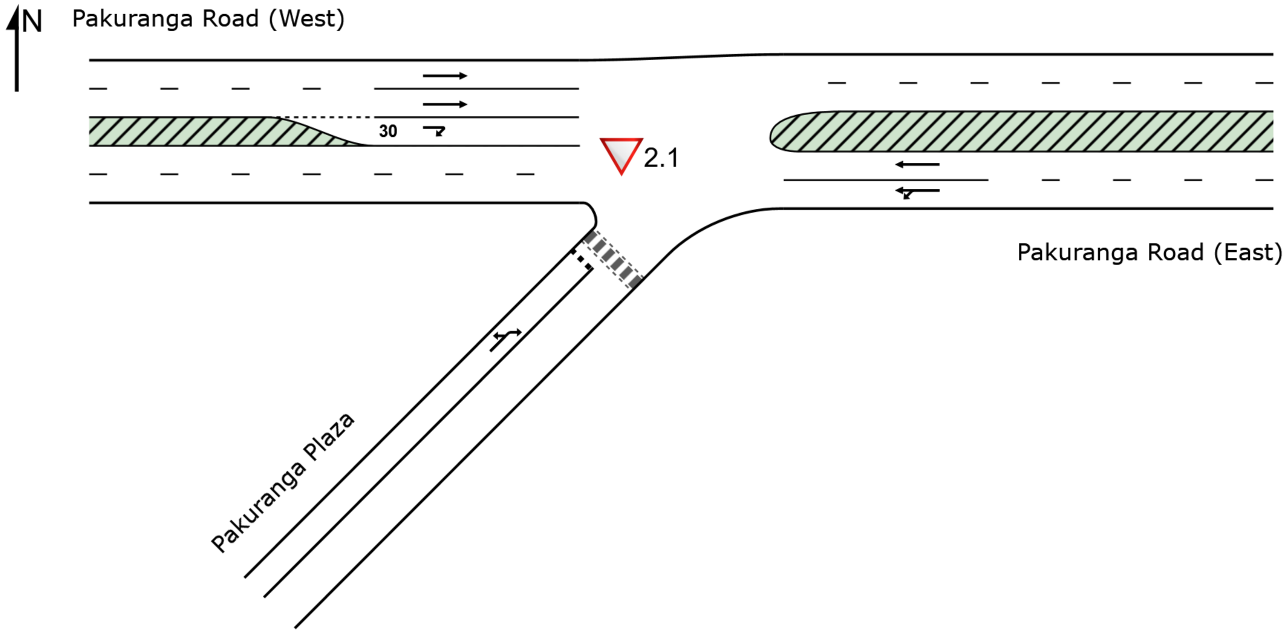
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 11:21:24 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

SITE LAYOUT

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Created: Wednesday, 15 February 2023 9:25:47 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

LANE SUMMARY

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	520	5.3	520	5.3	1779	0.292	100	0.7	LOS A	0.4	2.8	Full	121	0.0	0.0
Lane 2	547	5.4	547	5.4	1874	0.292	100	0.0	LOS A	0.0	0.0	Full	121	0.0	0.0
Approach	1067	5.3	1067	5.3		0.292		0.4	NA	0.4	2.8				
West: Pakuranga Road (West)															
Lane 1	521	7.4	521	7.4	1850	0.282	100	0.0	LOS A	0.0	0.0	Full	108	0.0	0.0
Lane 2	420	7.4	420	7.4	1491	0.282	100	0.0	LOS A	0.0	0.0	Full	108	-18.2 [N3]	0.0
Lane 3	34	3.1	34	3.1	489	0.069	100	13.4	LOS B	0.2	1.4	Short	30	0.0	NA
Approach	975	7.3	975	7.3		0.282		0.5	NA	0.2	1.4				
SouthWest: Pakuranga Plaza															
Lane 1	55	5.5	55	5.5	45	1.232	100	383.0	LOS F	7.8	57.1	Full	196	-14.2 [N7]	0.0
Approach	55	5.5	55	5.5		1.232		383.0	LOS F	7.8	57.1				
Intersection	2097	6.3	2097	6.3		1.232		10.5	NA	7.8	57.1				

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

N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	68	452	520	5.3	1779	0.292	100	NA	NA
Lane 2	-	547	547	5.4	1874	0.292	100	NA	NA
Approach	68	999	1067	5.3		0.292			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R3 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	521	-	521	7.4	1850	0.282	100	NA	NA
Lane 2	420	-	420	7.4	1491	0.282	100	NA	NA
Lane 3	-	34	34	3.1	489	0.069	100	0.0	2

Approach	941	34	975	7.3		0.282			
SouthWest: Pakuranga Plaza									
Mov. From SW To Exit:	L3 W	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	15	40	55	5.5	45	1.232	100	NA	NA
Approach	15	40	55	5.5		1.232			

	Total	%HV	Deg.Satn (v/c)
Intersection	2097	6.3	1.232

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

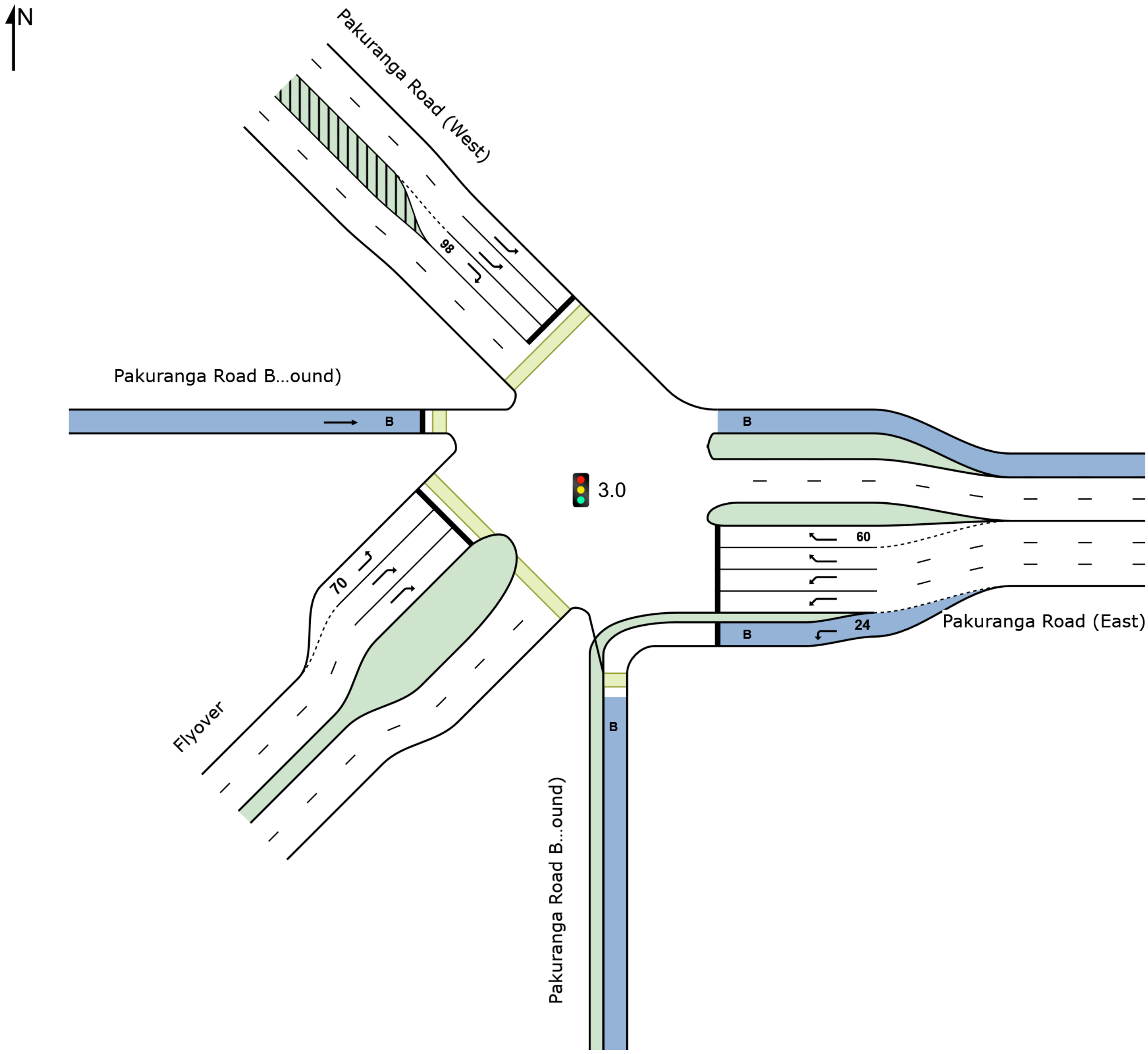
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1 (B)	28	100.0	28	100.0	687	0.041	100	16.6	LOS B	0.7	8.9	Short	24	0.0	NA
Lane 2	1026	5.1	1026	5.1	1105[1]	0.928	100	42.8	LOS D	66.0	482.1	Full	183	0.0	100.0
Lane 3	1068	5.1	1068	5.1	1151	0.928	100	42.8	LOS D	71.1	519.3	Full	183	0.0	100.0
Lane 4	446	4.7	446	4.7	587[1]	0.760	100	33.3	LOS C	20.2	147.5	Full	183	0.0	0.0
Lane 5	446	4.7	446	4.7	587[1]	0.760	100	33.3	LOS C	20.2	147.5	Short	60	0.0	NA
Approach	3014	5.9	3014	5.9		0.928		39.7	LOS D	71.1	519.3				
NorthWest: Pakuranga Road (West)															
Lane 1	370	6.8	367	6.8	1223	0.301	100	13.8	LOS B	9.6	71.1	Full	121	0.0	0.0
Lane 2	370	6.8	367	6.8	1223	0.301	100	13.8	LOS B	9.6	71.1	Full	121	0.0	18.2[8]
Lane 3	242	9.5	240	9.5	288	0.834	100	77.1	LOS E	16.5	125.3	Short	98	0.0	NA
Approach	982	7.4	975[N1]	7.5		0.834		29.4	LOS C	16.5	125.3				
West: Pakuranga Road Busway Link (Northbound)															
Lane 1 (B)	9	100.0	9	100.0	295	0.031	100	45.9	LOS D	0.4	5.8	Full	215	0.0	0.0
Approach	9	100.0	9	100.0		0.031		45.9	LOS D	0.4	5.8				
SouthWest: Flyover															
Lane 1	173	8.7	173	8.7	299	0.578	100	68.5	LOS E	10.6	79.6	Short	70	0.0	NA
Lane 2	362	7.0	362	7.0	383[1]	0.945	100	89.1	LOS F	28.0	208.0	Full	1162	0.0	0.0
Lane 3	436	7.0	436	7.0	461	0.945	100	89.1	LOS F	34.5	256.3	Full	1162	0.0	0.0
Approach	971	7.3	971	7.3		0.945		85.4	LOS F	34.5	256.3				
Intersection	4976	6.6	4969[N1]	6.6		0.945		46.6	LOS D	71.1	519.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	L1 SW	R1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	-	-	28	100.0	687	0.041	100	0.0	2
Lane 2	-	1026	-	1026	5.1	1105[1]	0.928	100	NA	NA

Lane 3	-	1068	-	1068	5.1	1151	0.928	100	NA	NA
Lane 4	-	-	446	446	4.7	587[1]	0.760	100	NA	NA
Lane 5	-	-	446	446	4.7	587[1]	0.760	100	100.0	4
Approach	28	2094	892	3014	5.9		0.928			

NorthWest: Pakuranga Road (West)

Mov. From NW To Exit:	L1 E	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	367	-	367	6.8	1223	0.301	100	NA	NA
Lane 2	367	-	367	6.8	1223	0.301	100	NA	NA
Lane 3	-	240	240	9.5	288	0.834	100	37.5	2
Approach	735	240	975	7.5		0.834			

West: Pakuranga Road Busway Link (Northbound)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	9	100.0	295	0.031	100	NA	NA
Approach	9	9	100.0		0.031			

SouthWest: Flyover

Mov. From SW To Exit:	L2 NW	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	173	-	173	8.7	299	0.578	100	26.7	2
Lane 2	-	362	362	7.0	383[1]	0.945	100	NA	NA
Lane 3	-	436	436	7.0	461	0.945	100	NA	NA
Approach	173	798	971	7.3		0.945			

	Total	%HV	Deg.Satn (v/c)
Intersection	4969	6.6	0.945

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

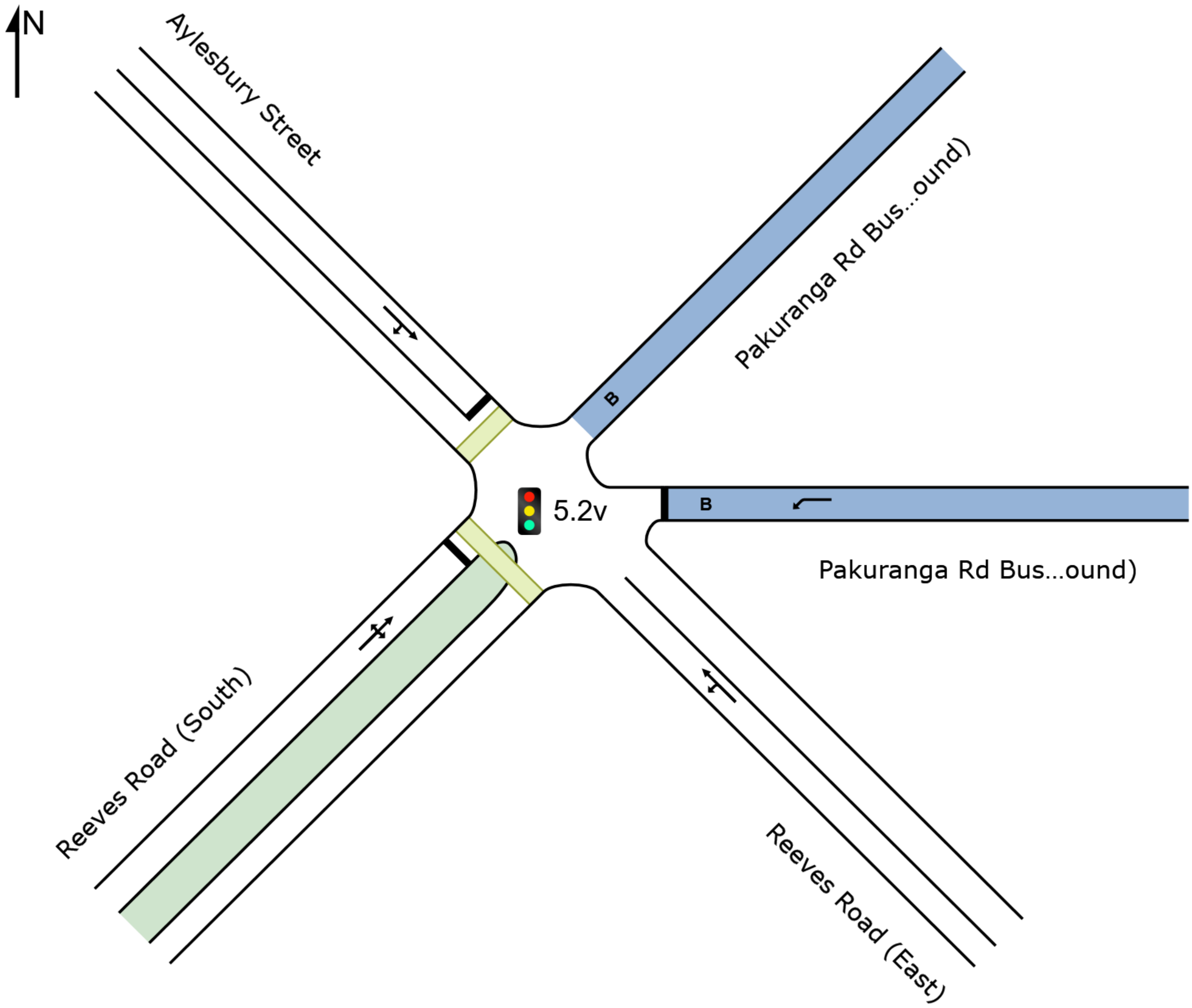
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Pakuranga Road Busway Link (Southbound) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Flyover Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

SITE LAYOUT

Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised (Site Folder: AM)]

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

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

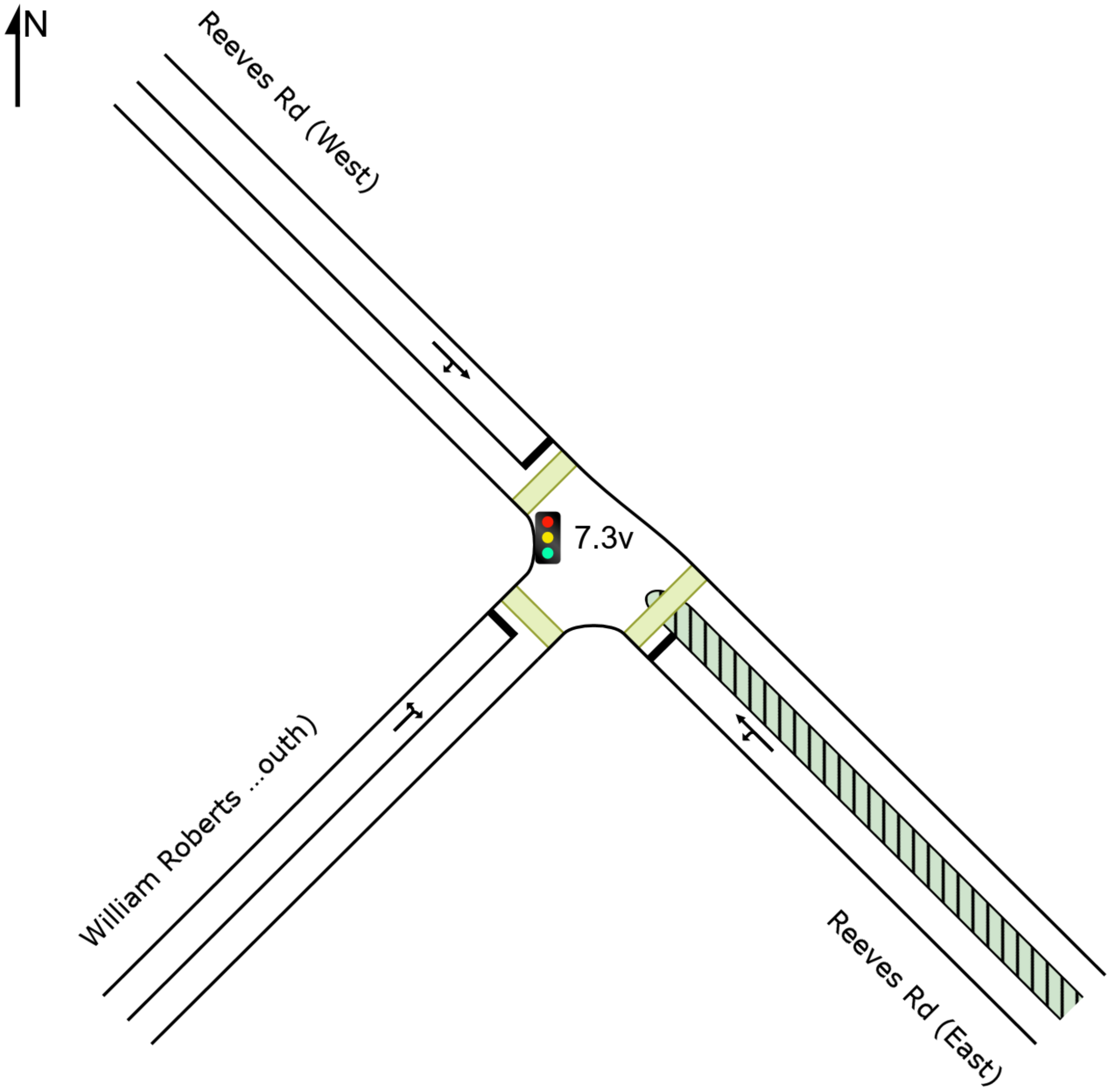


SITE LAYOUT

Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised (Site Folder: AM)]

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

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



CCG LANE SUMMARY

Common Control Group: CCG3 [Aylesbury/ WR/ Reeves Rd]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 158 seconds (CCG Practical Cycle Time)

Lane Use and Performance (CCG)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]															
SouthEast: Reeves Road (East)															
Lane 1	201	9.5	201	9.5	1739	0.116	100	1.9	LOS A	0.0	0.0	Full	27	0.0	0.0
Approach	201	9.5	201	9.5		0.116		1.9	LOS A	0.0	0.0				
East: Pakuranga Rd Busway Link (Southbound)															
Lane 1 (B)	28	100.0	28	100.0	101	0.278	100	80.5	LOS F	1.9	24.7	Full	203	0.0	0.0
Approach	28	100.0	28	100.0		0.278		80.5	LOS F	1.9	24.7				
NorthWest: Aylesbury Street															
Lane 1	22	9.1	22	9.1	65	0.338	100	85.7	LOS F	1.6	12.0	Full	284	0.0	0.0
Approach	22	9.1	22	9.1		0.338		85.7	LOS F	1.6	12.0				
SouthWest: Reeves Road (South)															
Lane 1	96	19.9	96	19.9	102	0.938	100	103.6	LOS F	7.8	64.2	Full	180	-3.6 [N7]	0.0
Approach	96	19.9	96	19.9		0.938		103.6	LOS F	7.8	64.2				
Intersection	347	19.6	347	19.6		0.938		41.6	LOS D	7.8	64.2				
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]															
SouthEast: Reeves Rd (East)															
Lane 1	370	9.5	370	9.5	417	0.888	100	78.9	LOS E	27.8	210.1	Full	810	0.0	0.0
Approach	370	9.5	370	9.5		0.888		78.9	LOS E	27.8	210.1				
NorthWest: Reeves Rd (West)															
Lane 1	83	10.8	83	10.8	463	0.179	100	2.0	LOS A	0.1	1.1	Full	27	0.0	0.0
Approach	83	10.8	83	10.8		0.179		2.0	LOS A	0.1	1.1				
SouthWest: William Roberts Road (South)															
Lane 1	395	12.2	395	12.2	443	0.891	100	76.7	LOS E	29.4	227.6	Full	223	0.0	16.8
Approach	395	12.2	395	12.2		0.891		76.7	LOS E	29.4	227.6				
Intersection	848	10.8	848	10.8		0.891		70.4	LOS E	29.4	227.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (CCG) (veh/h)

Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]

SouthEast: Reeves Road (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	162	39	201	9.5	1739	0.116	100	NA	NA
Approach	162	39	201	9.5		0.116			

East: Pakuranga Rd Busway Link (Southbound)

Mov. From E To Exit:	L1 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	28	100.0	101	0.278	100	NA	NA
Approach	28	28	100.0		0.278			

NorthWest: Aylesbury Street

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	11	22	9.1	65	0.338	100	NA	NA
Approach	11	11	22	9.1		0.338			

SouthWest: Reeves Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	12	9	75	96	19.9	102	0.938	100	NA	NA
Approach	12	9	75	96	19.9		0.938			

	Total	%HV	Deg.Satn (v/c)
Intersection	347	19.6	0.938

Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]

SouthEast: Reeves Rd (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	212	158	370	9.5	417	0.888	100	NA	NA
Approach	212	158	370	9.5		0.888			

NorthWest: Reeves Rd (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	59	24	83	10.8	463	0.179	100	NA	NA
Approach	59	24	83	10.8		0.179			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	353	395	12.2	443	0.891	100	NA	NA
Approach	42	353	395	12.2		0.891			

	Total	%HV	Deg.Satn (v/c)
Intersection	848	10.8	0.891

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis (CCG)

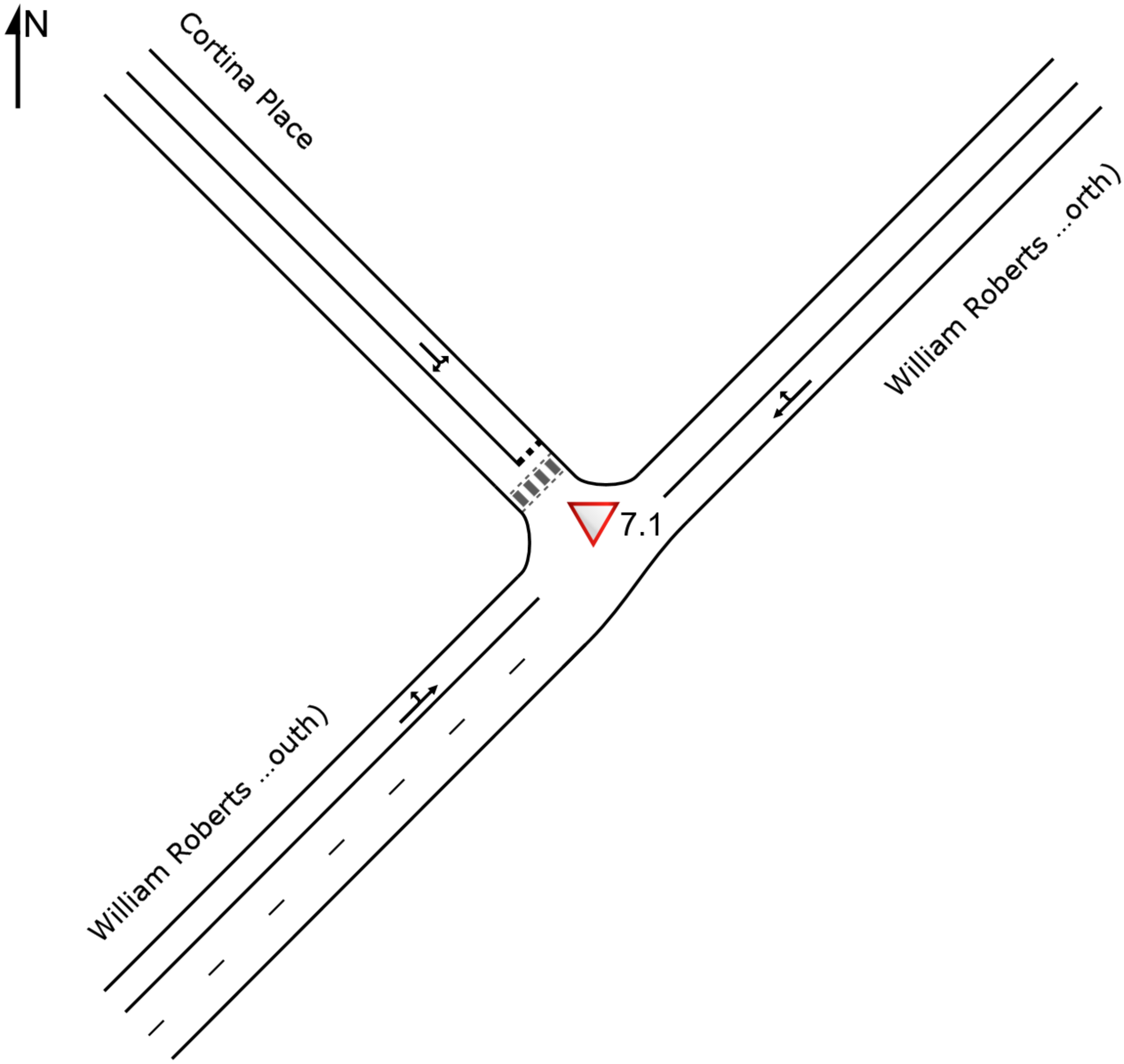
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]											
SouthEast Exit: Reeves Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Pakuranga Rd Busway Link (Northbound) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Aylesbury Street Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
SouthWest Exit: Reeves Road (South) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]											
SouthEast Exit: Reeves Rd (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Reeves Rd (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

▽ Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
NorthEast: William Roberts Road (North)															
Lane 1	249	10.0	249	10.0	1451	0.172	100	2.5	LOS A	0.6	4.6	Full	223	0.0	0.0
Approach	249	10.0	249	10.0		0.172		2.5	NA	0.6	4.6				
NorthWest: Cortina Place															
Lane 1	136	15.4	136	15.4	747	0.182	100	3.6	LOS A	0.5	4.1	Full	177	-10.3 N7	0.0
Approach	136	15.4	136	15.4		0.182		3.6	LOS A	0.5	4.1				
SouthWest: William Roberts Road (South)															
Lane 1	457	10.5	457	10.5	1355	0.337	100	1.0	LOS A	0.7	5.1	Full	110	-12.7 N7	0.0
Approach	457	10.5	457	10.5		0.337		1.0	NA	0.7	5.1				
Intersection	842	11.2	842	11.2		0.337		1.9	NA	0.7	5.1				

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

N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

NorthEast: William Roberts Road (North)

Mov. From NE To Exit:	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	161	88	249	10.0	1451	0.172	100	NA	NA
Approach	161	88	249	10.0		0.172			

NorthWest: Cortina Place

Mov. From NW To Exit:	L2 NE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	77	59	136	15.4	747	0.182	100	NA	NA
Approach	77	59	136	15.4		0.182			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	129	328	457	10.5	1355	0.337	100	NA	NA

Approach	129	328	457	10.5	0.337
	Total	%HV	Deg.Satn (v/c)		
Intersection	842	11.2	0.337		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

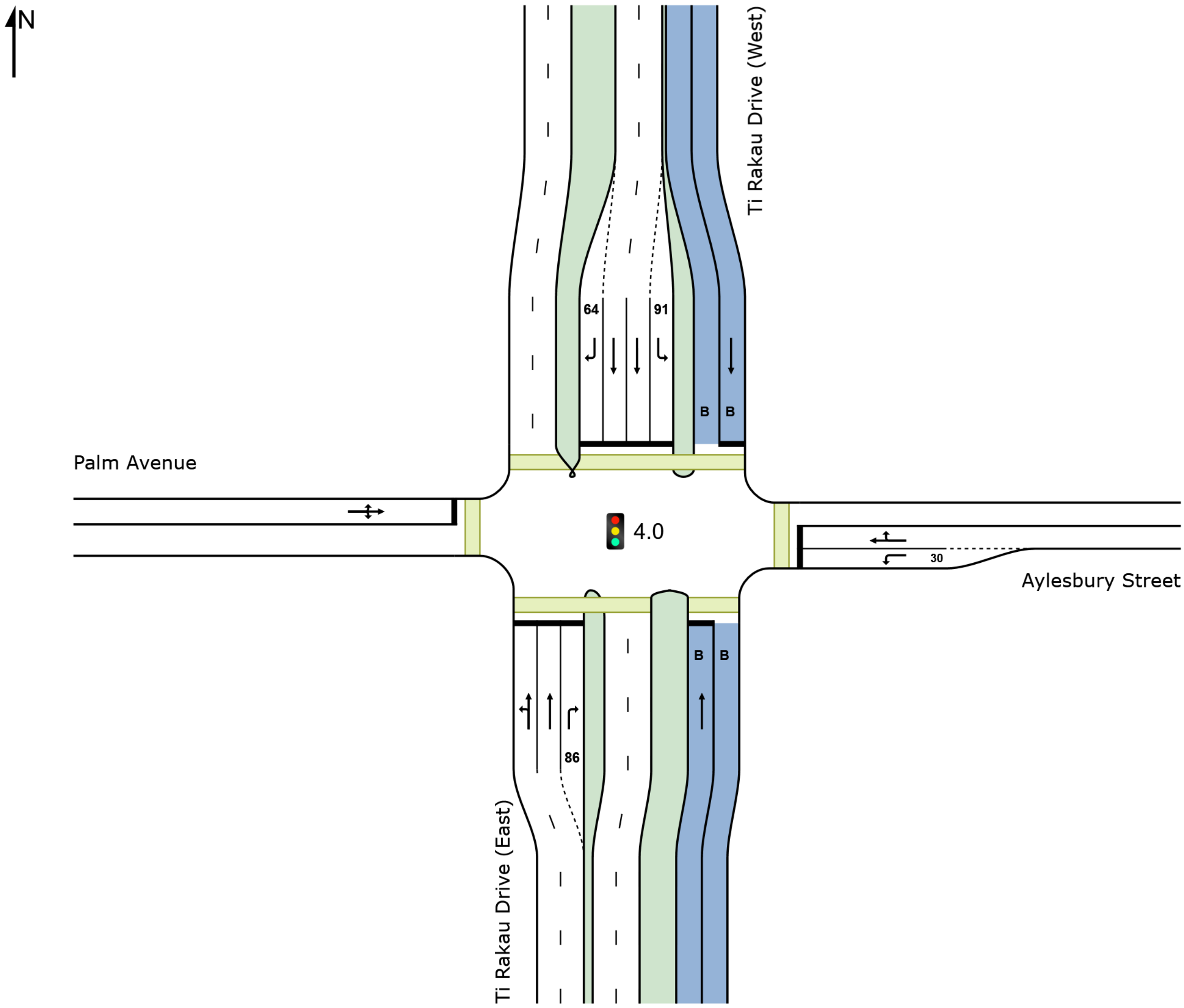
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
NorthEast Exit: William Roberts Road (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Cortina Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

SITE LAYOUT

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Ti Rakau Drive (East)															
Lane 1	333	9.8	333	9.8	393	0.848	100	65.2	LOS E	21.2[N4]	160.7[N4]	Full	110	-42.2[N3]	50.0
Lane 2	628	9.8	628	9.8	741[1]	0.848	100	47.0	LOS D	21.2[N4]	160.7[N4]	Full	110	0.0	50.0
Lane 3	33	3.0	33	3.0	69	0.478	100	85.4	LOS F	2.3	16.4	Short	86	0.0	NA
Lane 4 (B)	53	100.0	53	100.0	613	0.086	100	4.4	LOS A	0.0	0.6	Full	110	0.0	0.0
Approach	1047	14.1	1047	14.1		0.848		51.8	LOS D	21.2	160.7				
East: Aylesbury Street															
Lane 1	113	9.7	113	9.7	139	0.812	100	49.1	LOS D	5.6	42.1	Short	30	0.0	NA
Lane 2	154	6.5	154	6.5	156[1]	0.985	100	112.9	LOS F	7.9[N4]	58.4[N4]	Full	40	0.0	50.0
Approach	267	7.9	267	7.9		0.985		85.9	LOS F	7.9	58.4				
North: Ti Rakau Drive (West)															
Lane 1 (B)	23	100.0	23	100.0	613	0.038	100	4.4	LOS A	0.0	0.2	Full	174	0.0	0.0
Lane 2	106	14.2	106	14.2	960	0.110	100	17.2	LOS B	2.9	22.7	Short	91	0.0	NA
Lane 3	271	15.5	271	15.5	740	0.366	100	33.2	LOS C	11.7	92.6	Full	174	0.0	0.0
Lane 4	271	15.5	271	15.5	740	0.366	100	33.2	LOS C	11.7	92.6	Full	174	0.0	0.0
Lane 5	15	6.7	15	6.7	67	0.223	100	83.9	LOS F	1.0	7.5	Short	64	0.0	NA
Approach	686	17.9	686	17.9		0.366		30.8	LOS C	11.7	92.6				
West: Palm Avenue															
Lane 1	118	5.1	118	5.1	166	0.712	100	75.1	LOS E	7.9	57.6	Full	87	-31.0[N7]	0.0
Approach	118	5.1	118	5.1		0.712		75.1	LOS E	7.9	57.6				
Intersection	2118	14.1	2118	14.1		0.985		50.6	LOS D	21.2	160.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	90	243	-	333	9.8	393	0.848	100	NA	NA

Lane 2	-	628	-	628	9.8	741[1]	0.848	100	NA	NA
Lane 3	-	-	33	33	3.0	69	0.478	100	0.0	2
Lane 4	-	53	-	53	100.0	613	0.086	100	NA	NA
Approach	90	924	33	1047	14.1		0.848			

East: Aylesbury Street

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	113	-	-	113	9.7	139	0.812	100	46.3	2
Lane 2	-	8	146	154	6.5	156[1]	0.985	100	NA	NA
Approach	113	8	146	267	7.9		0.985			

North: Ti Rakau Drive (West)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	-	23	100.0	613	0.038	100	NA	NA
Lane 2	106	-	-	106	14.2	960	0.110	100	0.0	3
Lane 3	-	271	-	271	15.5	740	0.366	100	NA	NA
Lane 4	-	271	-	271	15.5	740	0.366	100	NA	NA
Lane 5	-	-	15	15	6.7	67	0.223	100	0.0	4
Approach	106	565	15	686	17.9		0.366			

West: Palm Avenue

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	53	20	45	118	5.1	166	0.712	100	NA	NA
Approach	53	20	45	118	5.1		0.712			

	Total	%HV	Deg.Satn (v/c)
Intersection	2118	14.1	0.985

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
East Exit: Aylesbury Street Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
West Exit: Palm Avenue Merge Type: **Not Applied**											

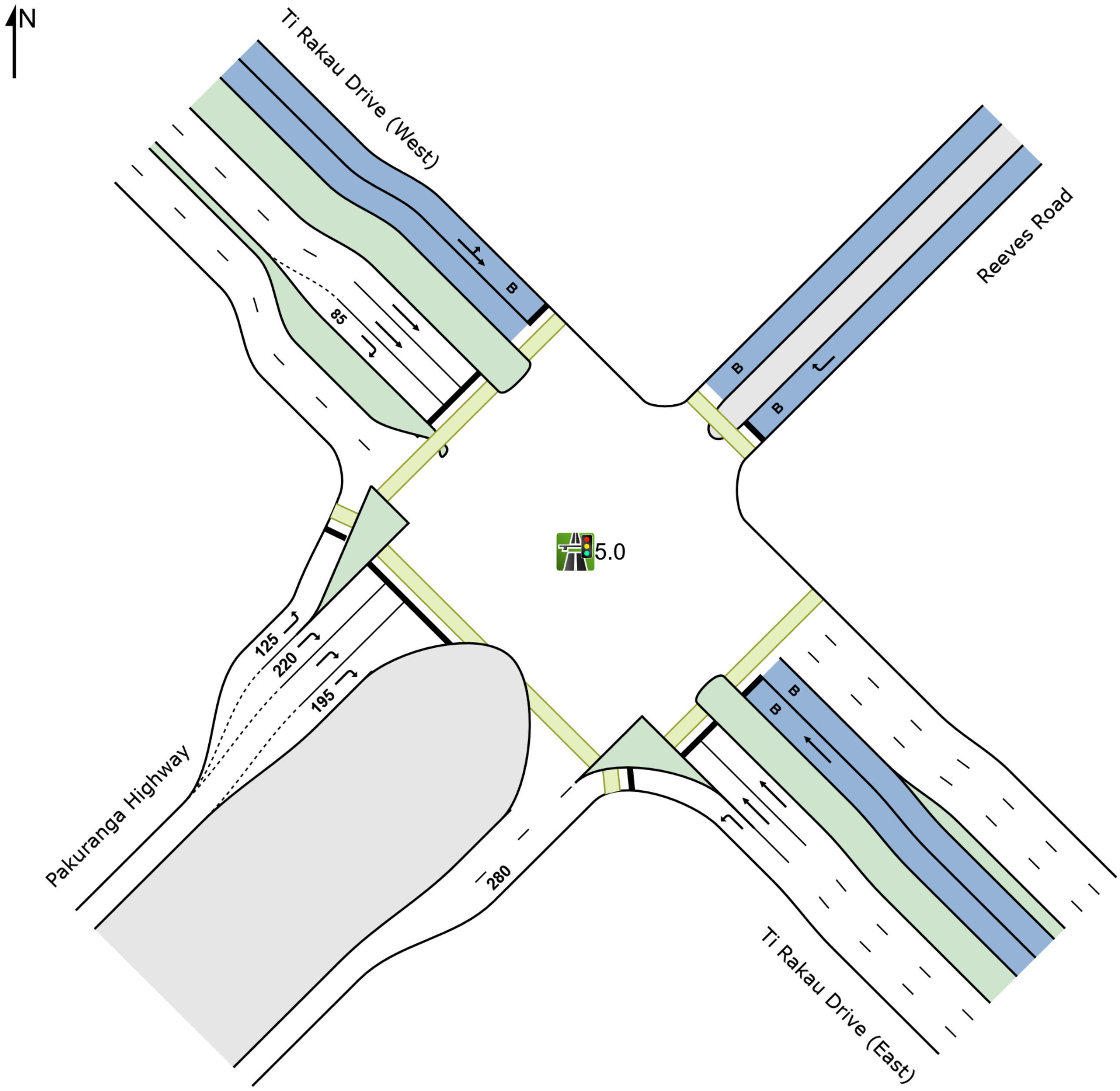
Full Length Lane	1	Merge Analysis not applied.

SITE LAYOUT

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated

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



LANE SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	910	13.0	910	13.0	1319	0.690	100	12.9	LOS B	16.9[N4]	131.5[N4]	Full	90	0.0	50.0
Lane 2	408	9.9	408	9.9	498	0.819	100	38.0	LOS D	17.3[N4]	131.5[N4]	Full	90	-50.0[N7]	50.0
Lane 3	408	9.9	408	9.9	498	0.819	100	38.0	LOS D	14.2[N5]	108.1[N5]	Full	90	-50.0[N3]	31.8
Lane 4 (B)	25	100.0	25	100.0	199	0.126	100	35.0	LOS C	1.0	12.6	Full	90	0.0	0.0
Approach	1751	12.8	1751	12.8		0.819		24.9	LOS C	17.3	131.5				
NorthEast: Reeves Road															
Lane 1 (B)	28	100.0	28	100.0	292	0.096	100	31.0	LOS C	1.0	12.4	Full	50	0.0	0.0
Approach	28	100.0	28	100.0		0.096		31.0	LOS C	1.0	12.4				
NorthWest: Ti Rakau Drive (West)															
Lane 1 (B)	22	100.0	22	100.0	225	0.098	100	34.0	LOS C	0.8	10.4	Full	110	0.0	0.0
Lane 2	255	15.7	254	15.7	505	0.504	100	31.9	LOS C	11.0	87.6	Full	110	0.0	0.0
Lane 3	255	15.7	254	15.7	505	0.504	100	31.9	LOS C	11.0	87.6	Full	110	0.0	0.0
Lane 4	146	8.9	146	8.9	197	0.741	100	78.8	LOS E	9.8	73.6	Short	85	0.0	NA
Approach	677	17.0	677	17.0		0.741		42.1	LOS D	11.0	87.6				
SouthWest: Pakuranga Highway															
Lane 1	141	7.1	141	7.1	322	0.439	100	47.2	LOS D	7.1	52.8	Short	125	-50.0[N7]	NA
Lane 2	245	10.2	245	10.2	338	0.725	100	70.1	LOS E	15.4	117.6	Short	220	0.0	NA
Lane 3	245	10.2	245	10.2	338	0.725	100	70.1	LOS E	15.4	117.6	Full	623	0.0	0.0
Lane 4	245	10.2	245	10.2	338	0.725	100	70.1	LOS E	15.4	117.6	Short	195	0.0	NA
Approach	877	9.7	877	9.7		0.725		66.4	LOS E	15.4	117.6				
Intersection	3333	13.6	3333	13.6		0.819		39.4	LOS D	17.3	131.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	910	-	910	13.0	1319	0.690	100	NA	NA
Lane 2	-	408	408	9.9	498	0.819	100	NA	NA
Lane 3	-	408	408	9.9	498	0.819	100	NA	NA
Lane 4	-	25	25	100.0	199	0.126	100	NA	NA
Approach	910	841	1751	12.8		0.819			

NorthEast: Reeves Road

Mov. From NE To Exit:	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	28	100.0	292	0.096	100	NA	NA
Approach	28	28	100.0		0.096			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	13	-	22	100.0	225	0.098	100	NA	NA
Lane 2	-	254	-	254	15.7	505	0.504	100	NA	NA
Lane 3	-	254	-	254	15.7	505	0.504	100	NA	NA
Lane 4	-	-	146	146	8.9	197	0.741	100	2.0	3
Approach	9	522	146	677	17.0		0.741			

SouthWest: Pakuranga Highway

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	141	-	141	7.1	322	0.439	100	0.0	2
Lane 2	-	245	245	10.2	338	0.725	100	0.0	3
Lane 3	-	245	245	10.2	338	0.725	100	NA	NA
Lane 4	-	245	245	10.2	338	0.725	100	0.0	3
Approach	141	736	877	9.7		0.725			

	Total	%HV	Deg.Satn (v/c)
Intersection	3333	13.6	0.819

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
Full Length Lane	4	Merge Analysis not applied.										
NorthEast Exit: Reeves Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Highway												

Merge Type: **Zipper**												
Exit Short Lane	1	280	50.0	73	76	2.50	2.00	910	1714	0.531	0.0	0.1
Merge Lane	2	-	50.0	455	484	2.50	2.00	146	1155	0.126	0.6	0.8

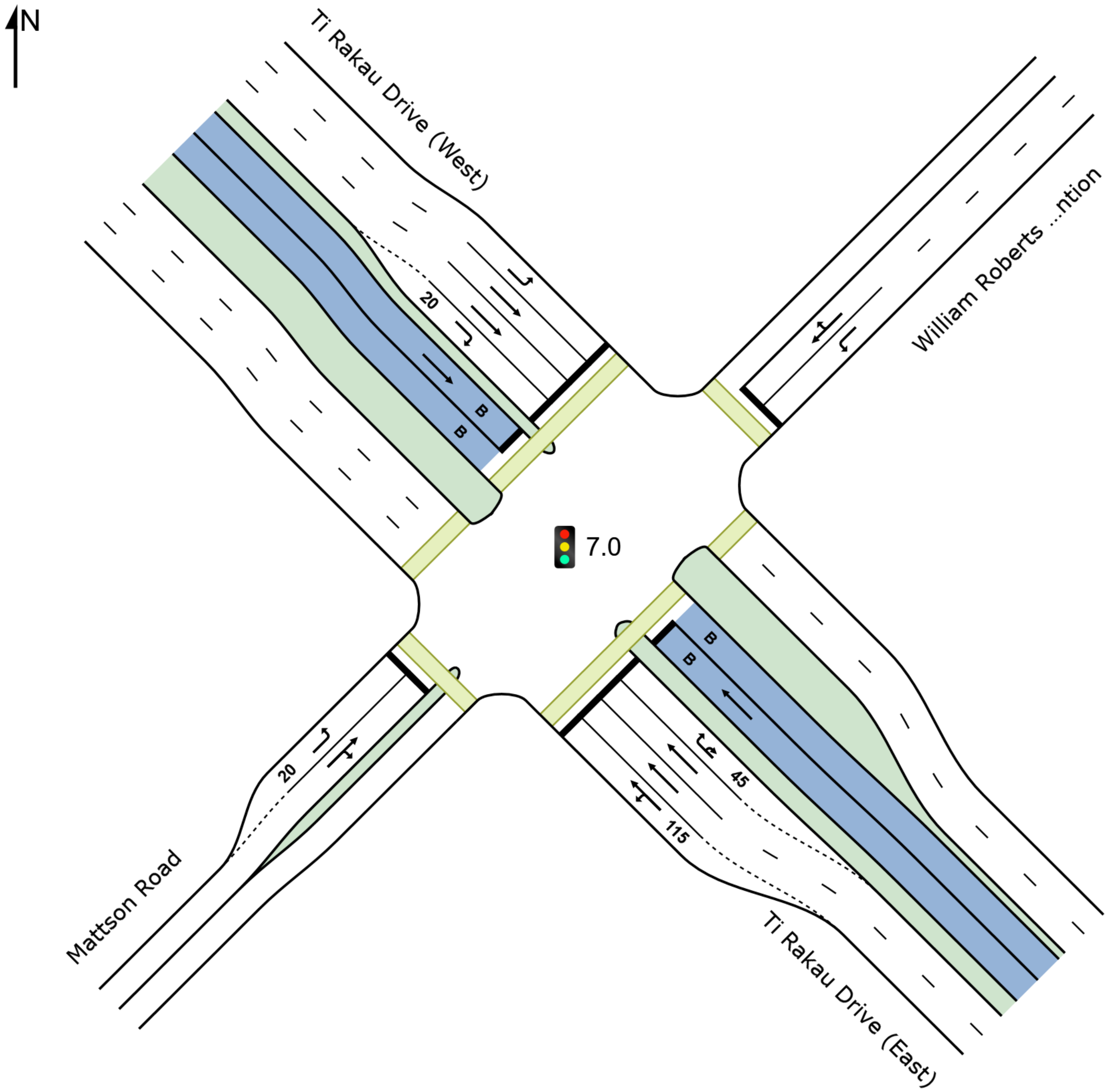
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 11:21:24 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

SITE LAYOUT

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

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



LANE SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 110 seconds (Network Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	462	11.3	462	11.3	682	0.677	100	30.9	LOS C	18.5	141.9	Short	115	0.0	NA
Lane 2	576	11.8	576	11.8	852	0.677	100	24.1	LOS C	21.3	164.5	Full	207	0.0	0.0
Lane 3	476	11.8	476	11.8	703 [1]	0.677	100	22.2	LOS C	16.3	125.4	Full	207	0.0	0.0
Lane 4	116	8.9	116	8.9	165	0.701	100	61.1	LOS E	5.8	43.7	Short	45	0.0	NA
Lane 5 (B)	25	100.0	25	100.0	564	0.044	100	1.7	LOS A	0.1	0.9	Full	207	0.0	0.0
Approach	1655	12.8	1655	12.8		0.701		27.7	LOS C	21.3	164.5				
NorthEast: William Roberts Road Extention															
Lane 1	83	14.5	83	14.5	167	0.496	100	55.0	LOS E	4.0	31.2	Full	112	0.0	0.0
Lane 2	137	11.7	137	11.7	171	0.800	100	60.2	LOS E	7.1	54.9	Full	110	0.0	0.0
Approach	220	12.7	220	12.7		0.800		58.2	LOS E	7.1	54.9				
NorthWest: Ti Rakau Drive (West)															
Lane 1	346	11.3	346	11.3	420	0.824	100	53.3	LOS D	17.4	133.4	Full	107	0.0	35.2
Lane 2	441	12.5	441	12.5	848	0.520	100	21.7	LOS C	14.7	114.1	Full	107	0.0	20.9
Lane 3	420	12.5	420	12.5	806 [1]	0.520	100	21.3	LOS C	13.8	106.8	Full	107	0.0	14.8
Lane 4	22	18.2	22	18.2	178	0.123	100	53.9	LOS D	1.0	8.0	Short	20	0.0	NA
Lane 5 (B)	13	100.0	13	100.0	564	0.023	100	1.7	LOS A	0.0	0.4	Full	107	0.0	0.0
Approach	1242	13.2	1242	13.2		0.824		30.7	LOS C	17.4	133.4				
SouthWest: Mattson Road															
Lane 1	25	0.0	25	0.0	118	0.212	100	60.1	LOS E	1.2	8.4	Short	20	0.0	NA
Lane 2	88	9.1	88	9.1	114	0.770	100	65.2	LOS E	4.6	34.8	Full	282	0.0	0.0
Approach	113	7.1	113	7.1		0.770		64.0	LOS E	4.6	34.8				
Intersection	3230	12.7	3230	12.7		0.824		32.2	LOS C	21.3	164.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)											
Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	38	424	-	-	462	11.3	682	0.677	100	34.3	2
Lane 2	-	576	-	-	576	11.8	852	0.677	100	NA	NA

Lane 3	-	476	-	-	476	11.8	703[1]	0.677	100	NA	NA
Lane 4	-	-	63	53	116	8.9	165	0.701	100	12.3	3
Lane 5	-	25	-	-	25	100.0	564	0.044	100	NA	NA
Approach	38	1501	63	53	1655	12.8		0.701			

NorthEast: William Roberts Road Extention

Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	83	-	-	83	14.5	167	0.496	100	NA	NA
Lane 2	-	11	126	137	11.7	171	0.800	100	NA	NA
Approach	83	11	126	220	12.7		0.800			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	346	-	-	346	11.3	420	0.824	100	NA	NA
Lane 2	-	441	-	441	12.5	848	0.520	100	NA	NA
Lane 3	-	420	-	420	12.5	806[1]	0.520	100	NA	NA
Lane 4	-	-	22	22	18.2	178	0.123	100	0.0	3
Lane 5	-	13	-	13	100.0	564	0.023	100	NA	NA
Approach	346	874	22	1242	13.2		0.824			

SouthWest: Mattson Road

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	25	-	-	25	0.0	118	0.212	100	0.0	2
Lane 2	-	49	39	88	9.1	114	0.770	100	NA	NA
Approach	25	49	39	113	7.1		0.770			

	Total	%HV	Deg.Satn (v/c)
Intersection	3230	12.7	0.824

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthEast Exit: William Roberts Road Extention Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
Full Length Lane	4	Merge Analysis not applied.									
SouthWest Exit: Mattson Road											

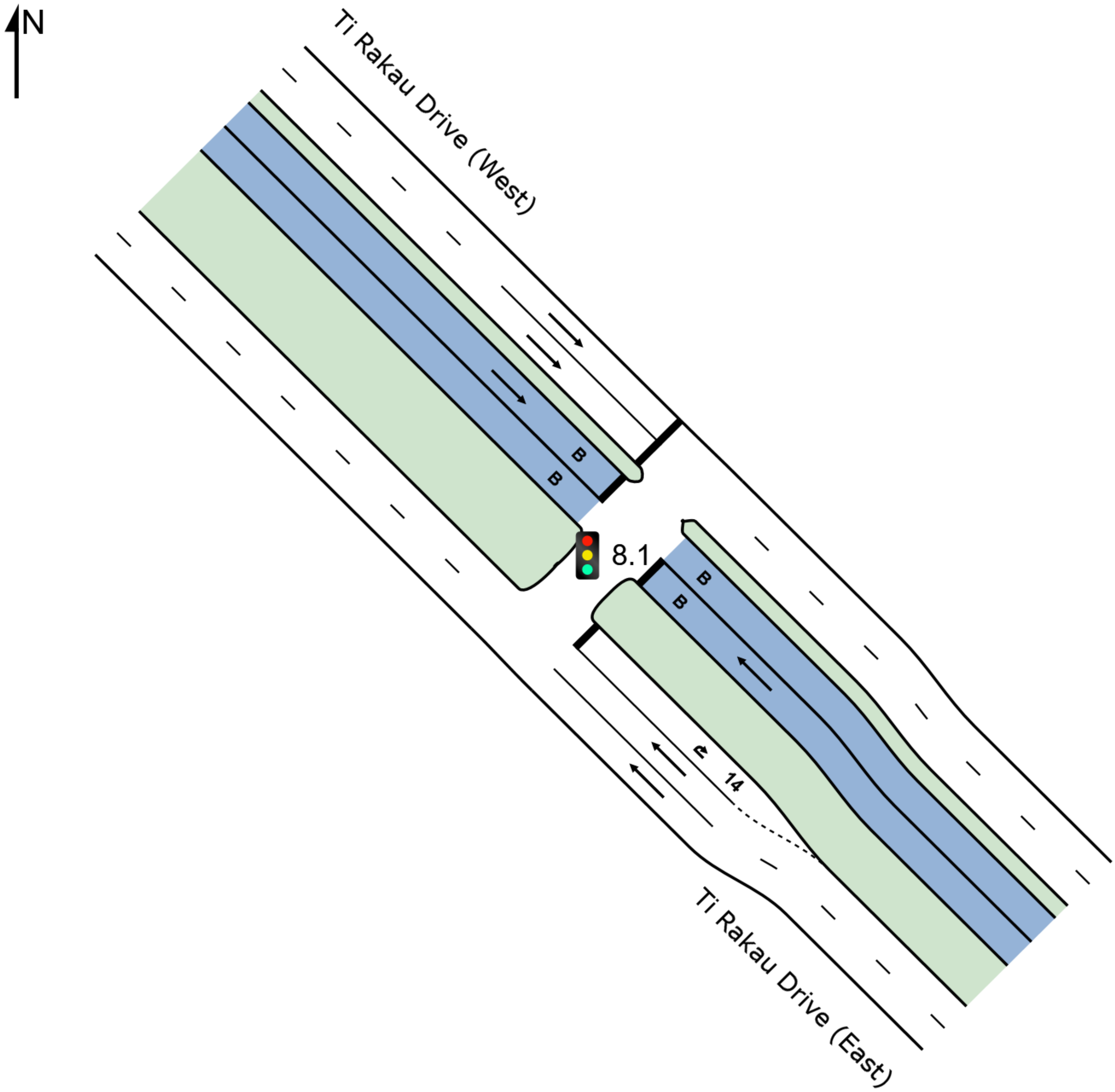
Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.

SITE LAYOUT

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

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

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



Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Created: Wednesday, 15 February 2023 9:26:53 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

LANE SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 30 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	787	11.4	787	11.4	1806	0.436	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 2	787	11.4	787	11.4	1806	0.436	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 3	65	4.6	65	4.6	269	0.242	100	18.1	LOS B	0.8	5.8	Short	14	0.0	NA
Lane 4 (B)	25	100.0	25	100.0	478	0.052	100	2.1	LOS A	0.1	0.9	Full	147	0.0	0.0
Approach	1664	12.5	1664	12.5		0.436		0.8	LOS A	0.8	5.8				
NorthWest: Ti Rakau Drive (West)															
Lane 1	490	12.6	489	12.6	717	0.682	100	9.5	LOS A	6.0	46.6	Full	73	0.0	0.0
Lane 2	490	12.6	489	12.6	717	0.682	100	9.5	LOS A	6.0	46.6	Full	73	0.0	0.0
Lane 3 (B)	13	100.0	13	100.0	478	0.027	100	2.1	LOS A	0.0	0.5	Full	73	0.0	0.0
Approach	992	13.7	992	13.7		0.682		9.4	LOS A	6.0	46.6				
Intersection	2656	13.0	2656	13.0		0.682		4.0	LOS A	6.0	46.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	787	-	787	11.4	1806	0.436	100	NA	NA
Lane 2	787	-	787	11.4	1806	0.436	100	NA	NA
Lane 3	-	65	65	4.6	269	0.242	100	0.0	2
Lane 4	25	-	25	100.0	478	0.052	100	NA	NA
Approach	1599	65	1664	12.5		0.436			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	489	489	12.6	717	0.682	100	NA	NA
Lane 2	489	489	12.6	717	0.682	100	NA	NA
Lane 3	13	13	100.0	478	0.027	100	NA	NA
Approach	992	992	13.7		0.682			

	Total	%HV	Deg.Satn (v/c)

Intersection	2656	13.0	0.682

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

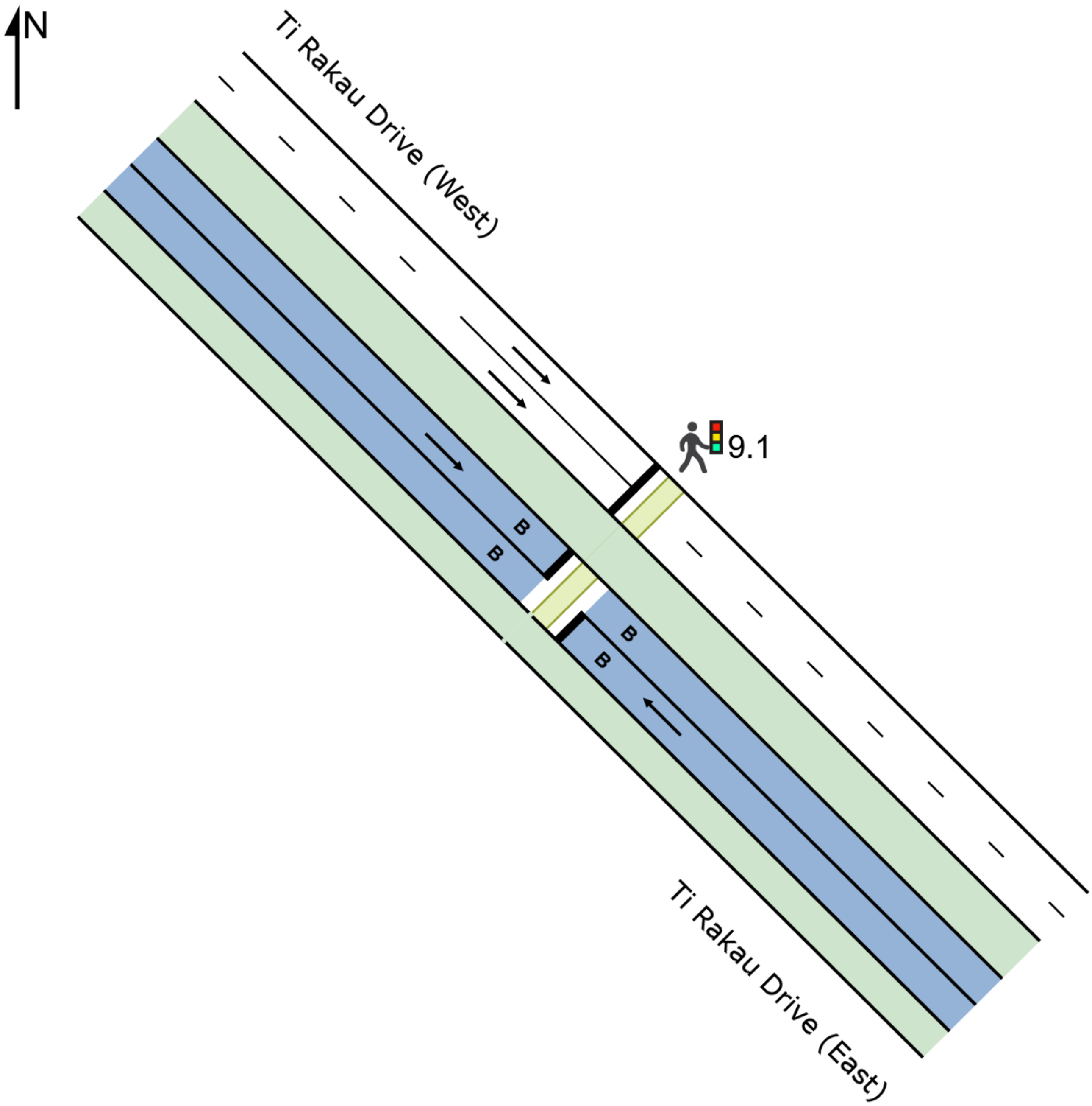
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SITE LAYOUT

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated

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



LANE SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1 (B)	25	100.0	25	100.0	370	0.068	100	5.5	LOS A	0.2	2.2	Full	45	0.0	0.0
Approach	25	100.0	25	100.0		0.068		5.5	LOS A	0.2	2.2				
NorthWest: Ti Rakau Drive (West)															
Lane 1	546	12.0	546	12.0	730	0.749	100	13.2	LOS B	2.3 N4	17.5 N4	Full	12	0.0	50.0
Lane 2	547	12.0	547	12.0	730	0.749	100	13.2	LOS B	2.3 N4	17.5 N4	Full	12	0.0	50.0
Lane 3 (B)	13	100.0	13	100.0	370	0.035	100	5.4	LOS A	0.1	1.1	Full	12	0.0	0.0
Approach	1106	13.0	1106	13.0		0.749		13.1	LOS B	2.3	17.5				
Intersection	1131	14.9	1131	14.9		0.749		13.0	LOS B	2.3	17.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	25	25	100.0	370	0.068	100	NA	NA
Approach	25	25	100.0		0.068			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	546	546	12.0	730	0.749	100	NA	NA
Lane 2	547	547	12.0	730	0.749	100	NA	NA
Lane 3	13	13	100.0	370	0.035	100	NA	NA
Approach	1106	1106	13.0		0.749			

	Total	%HV	Deg.Satn (v/c)
Intersection	1131	14.9	0.749

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

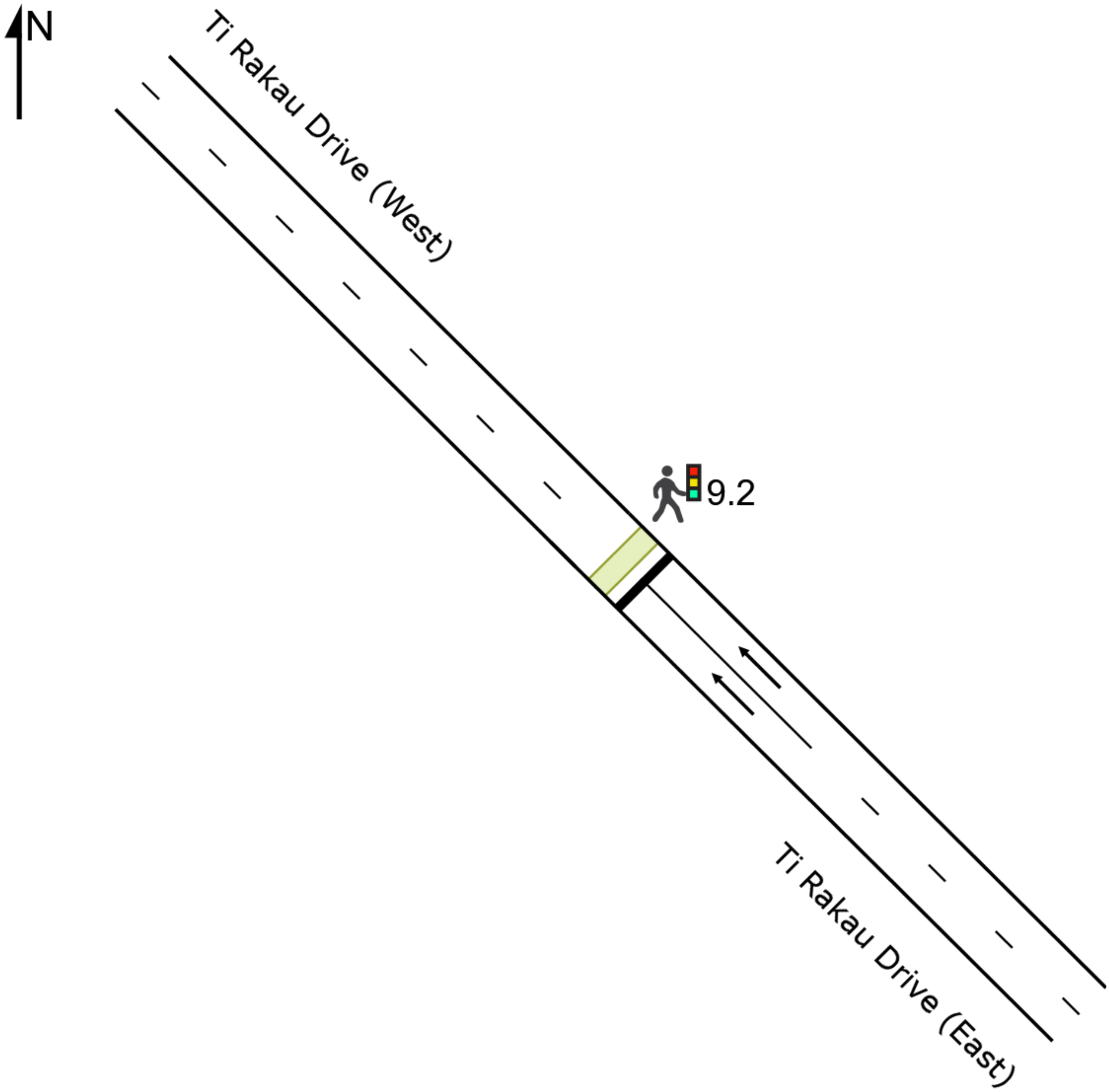
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

SITE LAYOUT

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated

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



LANE SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	820	11.2	820	11.2	931	0.880	100	24.5	LOS C	8.6 N4	65.8 N4	Full	45	0.0	50.0
Lane 2	820	11.2	820	11.2	931	0.880	100	24.5	LOS C	8.6 N4	65.8 N4	Full	45	0.0	50.0
Approach	1639	11.2	1639	11.2		0.880		24.5	LOS C	8.6	65.8				
Intersection	1639	11.2	1639	11.2		0.880		24.5	LOS C	8.6	65.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)								
Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	820	820	11.2	931	0.880	100	NA	NA
Lane 2	820	820	11.2	931	0.880	100	NA	NA
Approach	1639	1639	11.2		0.880			

	Total	%HV	Deg.Satn (v/c)
Intersection	1639	11.2	0.880

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length	Percent Opng in Lane	Opposing Flow Rate		Critical Gap	Follow-up Headway	Lane Flow Rate	Capacity	Deg. Satn	Min. Delay	Merge Delay
		m	%	veh/h	pcu/h	sec	sec	veh/h	veh/h	v/c	sec	sec
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

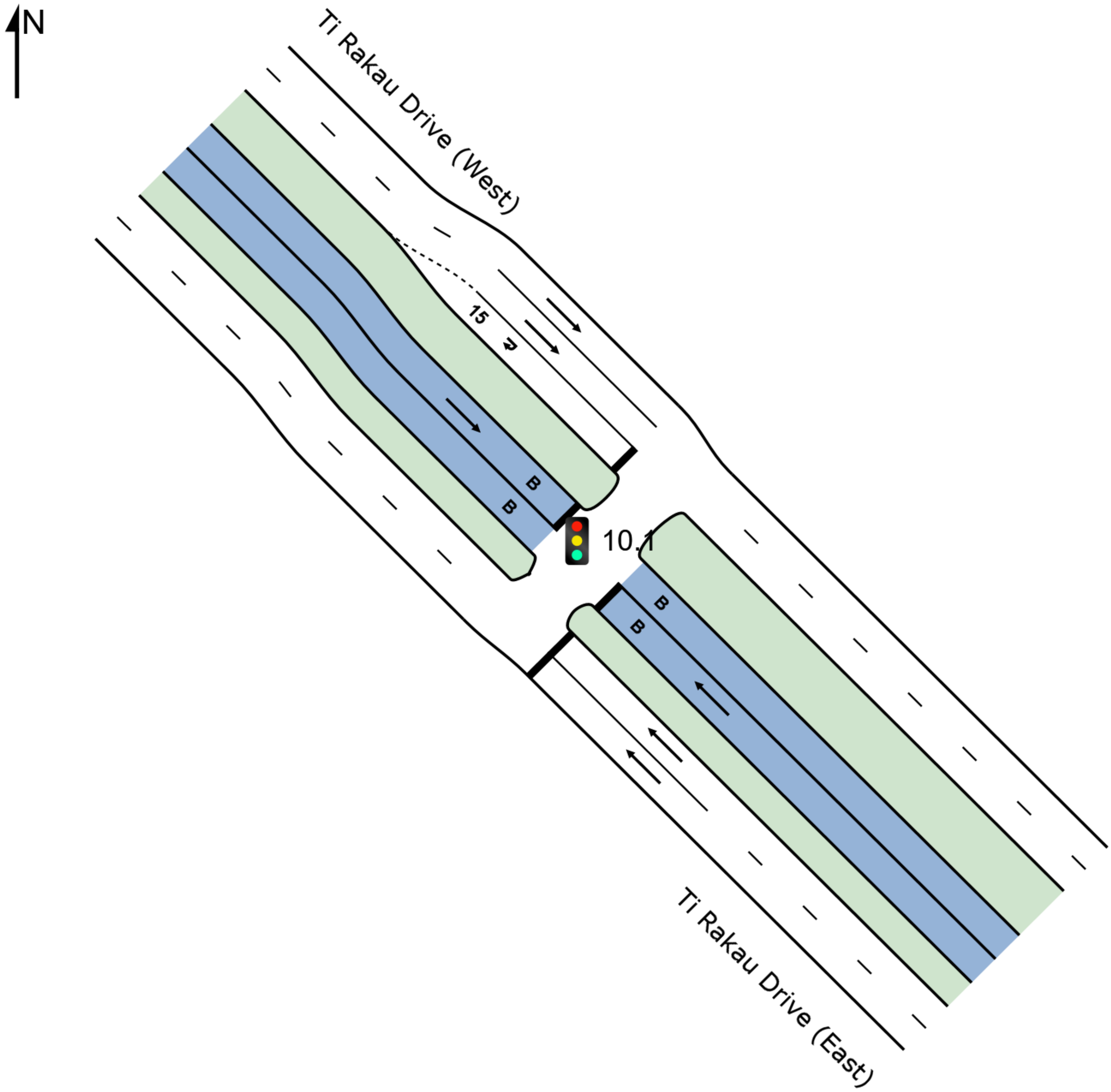
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

SITE LAYOUT

Site: 10.1 [10.1 U-turn - East of Edgewater Dr (West) (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 10.1 [10.1 U-turn - East of Edgewater Dr (West) (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 40 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	857	11.4	857	11.4	993	0.863	100	17.0	LOS B	12.2 [N4]	93.5 [N4]	Full	64	0.0	50.0
Lane 2	719	11.4	719	11.4	834	0.863	100	18.3	LOS B	12.2 [N4]	93.5 [N4]	Full	64	-16.0 [N7]	50.0
Lane 3 (B)	25	100.0	25	100.0	657	0.038	100	0.2	LOS A	0.0	0.1	Full	64	0.0	0.0
Approach	1601	12.8	1601	12.8		0.863		17.3	LOS B	12.2	93.5				
NorthWest: Ti Rakau Drive (West)															
Lane 1	503	12.7	503	12.7	1792	0.281	100	0.0	LOS A	0.0	0.0	Full	81	0.0	0.0
Lane 2	503	12.7	503	12.7	1792	0.281	100	0.0	LOS A	0.0	0.0	Full	81	0.0	0.0
Lane 3	76	3.9	76	3.9	170	0.447	100	24.9	LOS C	1.4	9.9	Short	15	-16.0 [N7]	NA
Lane 4 (B)	13	100.0	13	100.0	657	0.020	100	0.2	LOS A	0.0	0.1	Full	81	0.0	0.0
Approach	1095	13.2	1095	13.2		0.447		1.7	LOS A	1.4	9.9				
Intersection	2696	12.9	2696	12.9		0.863		11.0	LOS B	12.2	93.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	857	857	11.4	993	0.863	100	NA	NA
Lane 2	719	719	11.4	834	0.863	100	NA	NA
Lane 3	25	25	100.0	657	0.038	100	NA	NA
Approach	1601	1601	12.8		0.863			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	U NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	503	-	503	12.7	1792	0.281	100	NA	NA
Lane 2	503	-	503	12.7	1792	0.281	100	NA	NA
Lane 3	-	76	76	3.9	170	0.447	100	0.0	2
Lane 4	13	-	13	100.0	657	0.020	100	NA	NA
Approach	1019	76	1095	13.2		0.447			

	Total	%HV	Deg.Satn (v/c)
Intersection	2696	12.9	0.863

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

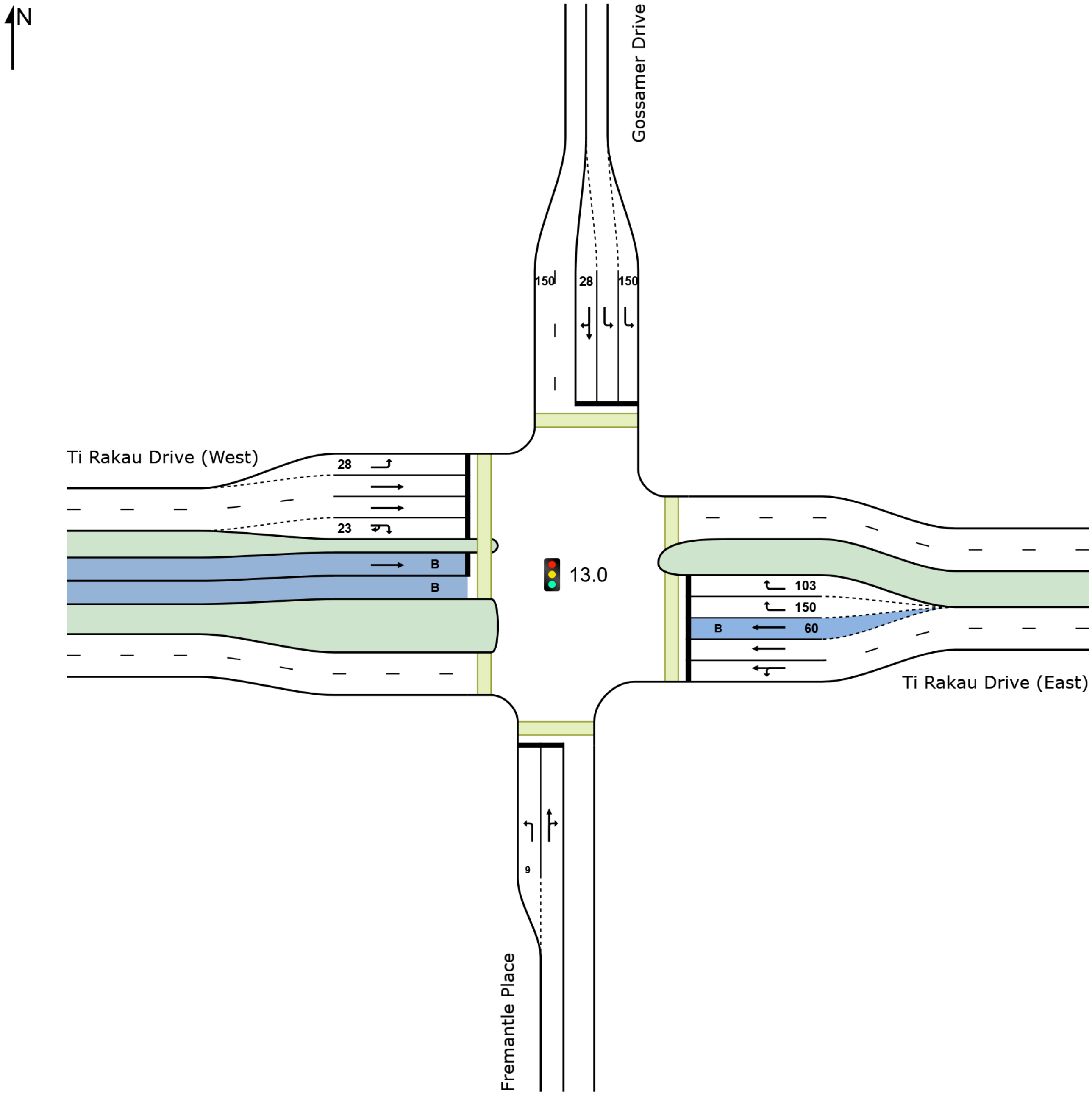
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 1 February 2023 11:21:24 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM.sip9

SITE LAYOUT

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	DEMAND FLOWS HV]	ARRIVAL FLOWS [Total	ARRIVAL FLOWS HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	85% BACK OF QUEUE Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Fremantle Place															
Lane 1	20	5.0	20	5.0	34	0.580	100	92.4	LOS F	1.5	10.7	Short	9	0.0	NA
Lane 2	23	13.0	23	13.0	67	0.344	100	85.5	LOS F	1.6	12.3	Full	285	0.0	0.0
Approach	43	9.3	43	9.3		0.580		88.7	LOS F	1.6	12.3				
East: Ti Rakau Drive (East)															
Lane 1	778	11.5	778	11.5	959	0.811	100	24.0	LOS C	28.2	216.8	Full	636	0.0	0.0
Lane 2	757	11.6	757	11.6	933 [1]	0.811	100	22.8	LOS C	25.9	199.4	Full	636	0.0	0.0
Lane 3 (B)	28	100.0	28	100.0	266	0.105	100	34.9	LOS C	1.1	14.0	Short	60	0.0	NA
Lane 4	164	6.9	164	6.9	235	0.695	82 [6]	72.4	LOS E	10.6	78.4	Short	150	0.0	NA
Lane 5	199	6.9	199	6.9	235	0.848	100	80.8	LOS F	14.1	104.3	Short	103	0.0	NA
Approach	1926	11.9	1926	11.9		0.848		33.7	LOS C	28.2	216.8				
North: Gossamer Drive															
Lane 1	334	10.6	334	10.6	292	1.143	100	180.0	LOS F	35.4	270.2	Short	150	0.0	NA
Lane 2	337	10.6	337	10.6	295	1.143	100	179.9	LOS F	35.7	272.8	Full	1010	0.0	0.0
Lane 3	48	8.3	48	8.3	123	0.390	100	78.8	LOS E	3.1	23.5	Short	28	0.0	NA
Approach	719	10.4	719	10.4		1.143		173.2	LOS F	35.7	272.8				
West: Ti Rakau Drive (West)															
Lane 1	53	9.4	53	9.4	815	0.065	100	14.5	LOS B	0.9	7.2	Short	28	0.0	NA
Lane 2	472	12.7	472	12.7	458 [1]	1.029	100	131.5	LOS F	46.9	364.2	Full	479	0.0	0.0
Lane 3	458	12.7	458	12.7	445 [1]	1.029	100	132.0	LOS F	45.7	354.7	Full	479	0.0	0.0
Lane 4	53	7.5	53	7.5	185	0.287	100	67.8	LOS E	3.2	23.8	Short	23	0.0	NA
Lane 5 (B)	27	100.0	27	100.0	271	0.100	100	34.8	LOS C	1.0	13.5	Full	479	0.0	0.0
Approach	1063	14.5	1063	14.5		1.029		120.3	LOS F	46.9	364.2				
Intersection	3751	12.3	3751	12.3		1.143		85.6	LOS F	46.9	364.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	20	-	-	20	5.0	34	0.580	100	31.1	2
Lane 2	-	11	12	23	13.0	67	0.344	100	NA	NA
Approach	20	11	12	43	9.3		0.580			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	762	-	778	11.5	959	0.811	100	NA	NA
Lane 2	-	757	-	757	11.6	933[1]	0.811	100	NA	NA
Lane 3	-	28	-	28	100.0	266	0.105	100	0.0	2
Lane 4	-	-	164	164	6.9	235	0.695	82[6]	0.0	2
Lane 5	-	-	199	199	6.9	235	0.848	100	16.1	4
Approach	16	1547	363	1926	11.9		0.848			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	334	-	-	334	10.6	292	1.143	100	69.9	2
Lane 2	337	-	-	337	10.6	295	1.143	100	NA	NA
Lane 3	-	10	38	48	8.3	123	0.390	100	0.0	2
Approach	671	10	38	719	10.4		1.143			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	U W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	53	-	-	-	53	9.4	815	0.065	100	0.0	2
Lane 2	-	472	-	-	472	12.7	458[1]	1.029	100	NA	NA
Lane 3	-	458	-	-	458	12.7	445[1]	1.029	100	NA	NA
Lane 4	-	-	10	43	53	7.5	185	0.287	100	18.1	3
Lane 5	-	27	-	-	27	100.0	271	0.100	100	NA	NA
Approach	53	957	10	43	1063	14.5		1.029			

	Total	%HV	Deg.Satn (v/c)
Intersection	3751	12.3	1.143

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	150	50.0	100	103	2.50	2.00	228	1682	0.135	0.0	0.0
Merge Lane	2	-	50.0	114	118	2.50	2.00	199	1665	0.120	0.0	0.1

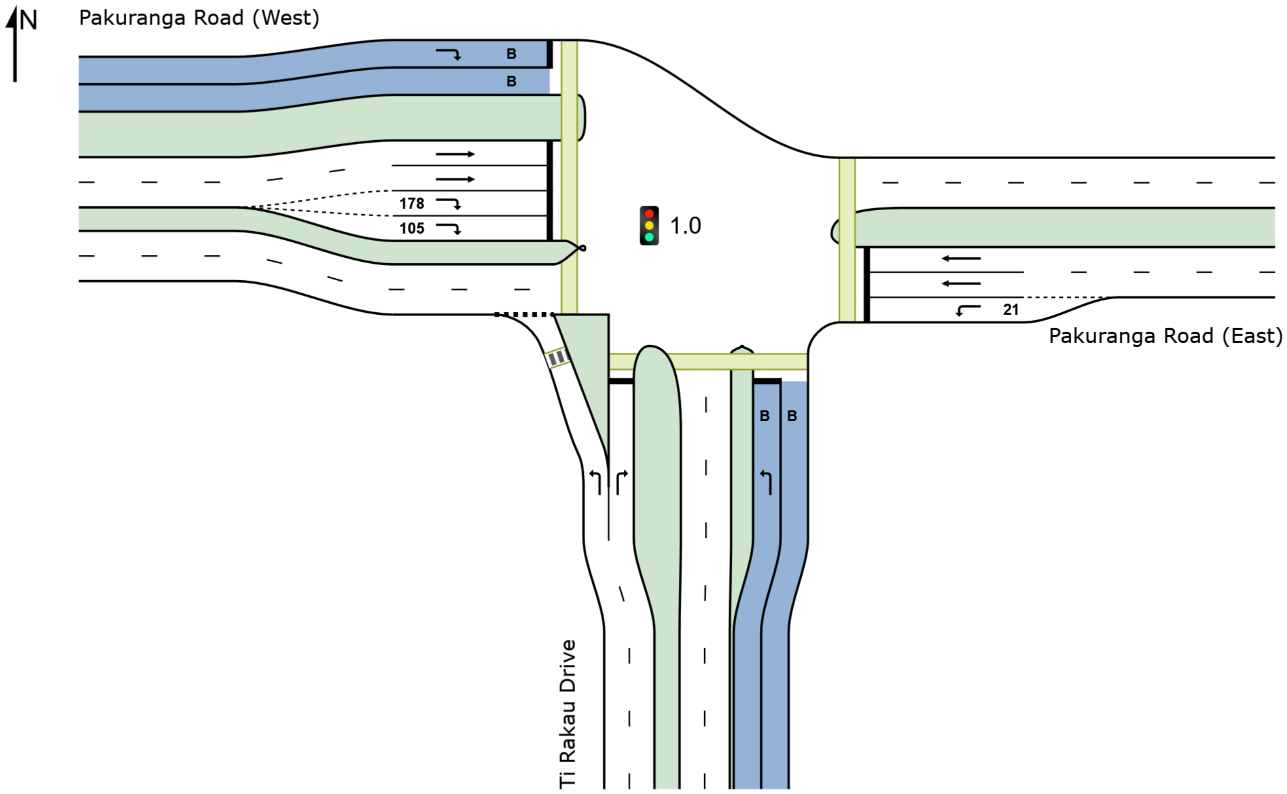
West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.
Full Length Lane	2	Merge Analysis not applied.
Full Length Lane	3	Merge Analysis not applied.

SITE LAYOUT

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 97 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	986	7.3	986	7.3	1078	0.915	100	32.4	LOS C	34.2[N4]	254.3[N4]	Full	174	0.0	50.0
Lane 2	184	6.0	184	6.0	493	0.373	100	35.2	LOS D	6.3	46.7	Full	174	0.0	0.0
Lane 3 (B)	53	100.0	53	100.0	287	0.184	100	26.1	LOS C	1.3	16.7	Full	174	0.0	0.0
Approach	1223	11.1	1223	11.1		0.915		32.5	LOS C	34.2	254.3				
East: Pakuranga Road (East)															
Lane 1	67	1.5	66	1.5	528	0.126	100	32.0	LOS C	2.1	14.7	Short	21	0.0	NA
Lane 2	265	4.8	262	4.8	479[1]	0.548	100	31.0	LOS C	9.3	67.6	Full	98	0.0	0.0
Lane 3	301	4.8	298	4.8	543	0.548	100	31.7	LOS C	10.8	78.5	Full	98	0.0	0.0
Approach	633	4.4	627[N1]	4.5		0.548		31.4	LOS C	10.8	78.5				
West: Pakuranga Road (West)															
Lane 1 (B)	23	100.0	23	100.0	271	0.085	100	26.0	LOS C	0.5	6.8	Full	380	0.0	0.0
Lane 2	479	5.3	479	5.3	541	0.884	100	46.9	LOS D	23.1	168.9	Full	380	0.0	0.0
Lane 3	479	5.3	479	5.3	541	0.884	100	46.9	LOS D	23.1	168.9	Full	380	0.0	0.0
Lane 4	382	8.1	382	8.1	432	0.883	100	54.5	LOS D	18.7	139.6	Short	178	0.0	NA
Lane 5	382	8.1	382	8.1	432	0.883	100	54.5	LOS D	18.7	139.6	Short	105	0.0	NA
Approach	1743	7.8	1743	7.8		0.884		49.9	LOS D	23.1	168.9				
Intersection	3599	8.3	3593[N1]	8.4		0.915		40.8	LOS D	34.2	254.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	986	-	986	7.3	1078	0.915	100	NA	NA
Lane 2	-	184	184	6.0	493	0.373	100	NA	NA
Lane 3	53	-	53	100.0	287	0.184	100	NA	NA
Approach	1039	184	1223	11.1		0.915			

East: Pakuranga Road (East)

Mov.	L2	T1	Total	%HV	Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	66	-	66	1.5	528	0.126	100	0.0	2
Lane 2	-	262	262	4.8	479[1]	0.548	100	NA	NA
Lane 3	-	298	298	4.8	543	0.548	100	NA	NA
Approach	66	560	627	4.5		0.548			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	23	100.0	271	0.085	100	NA	NA
Lane 2	479	-	479	5.3	541	0.884	100	NA	NA
Lane 3	479	-	479	5.3	541	0.884	100	NA	NA
Lane 4	-	382	382	8.1	432	0.883	100	0.0	3
Lane 5	-	382	382	8.1	432	0.883	100	41.2	4
Approach	957	786	1743	7.8		0.884			

	Total	%HV	Deg.Satn (v/c)
Intersection	3593	8.4	0.915

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

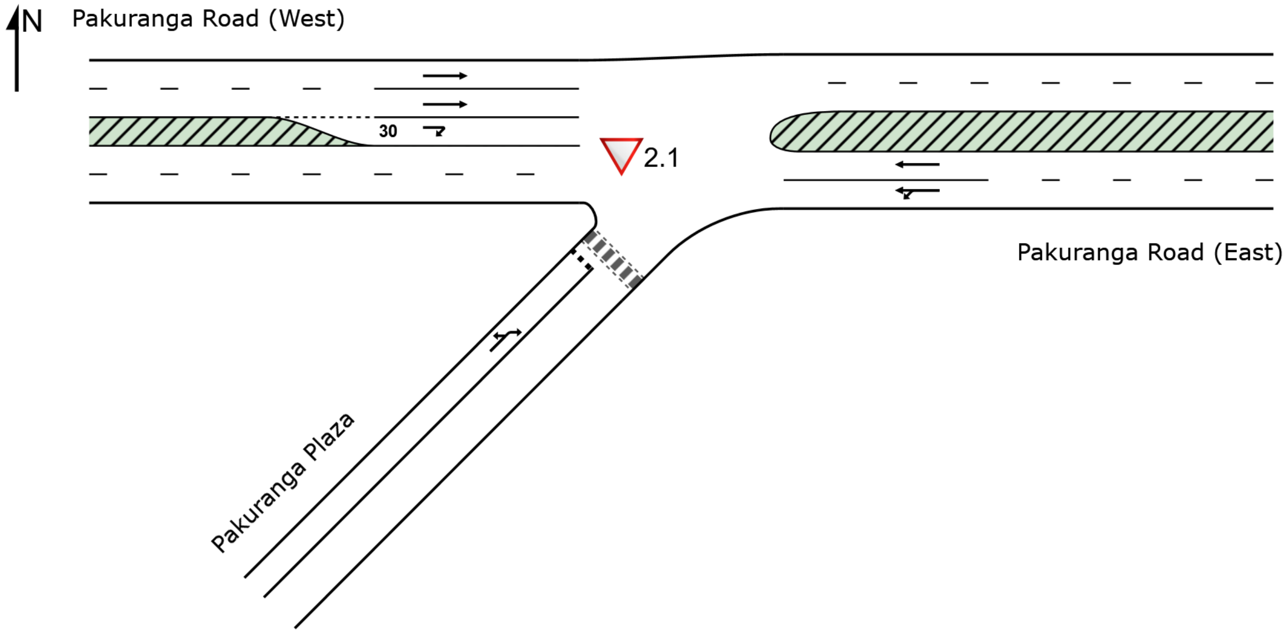
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

SITE LAYOUT

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	321	4.6	321	4.6	1801	0.178	100	0.6	LOS A	0.2	1.2	Full	121	0.0	0.0
Lane 2	336	4.5	336	4.5	1885	0.178	100	0.0	LOS A	0.0	0.0	Full	121	0.0	0.0
Approach	657	4.6	657	4.6		0.178		0.3	NA	0.2	1.2				
West: Pakuranga Road (West)															
Lane 1	571	5.4	571	5.4	1874	0.305	100	0.0	LOS A	2.6 N5	19.0 N5	Full	108	0.0	0.0
Lane 2	561	5.4	561	5.4	1843	0.305	100	0.0	LOS A	0.6 N5	4.3 N5	Full	108	0.0	0.0
Lane 3	24	0.0	24	0.0	839	0.029	100	9.5	LOS A	0.1	0.6	Short	30	0.0	NA
Approach	1156	5.3	1156	5.3		0.305		0.2	NA	2.6	19.0				
SouthWest: Pakuranga Plaza															
Lane 1	75	6.7	75	6.7	34	2.201	100	1156.4	LOS F	21.6	160.1	Full	196	-44.4 N3	8.2
Approach	75	6.7	75	6.7		2.201		1156.4	LOS F	21.6	160.1				
Intersection	1888	5.1	1888	5.1		2.201		46.2	NA	21.6	160.1				

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

N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	34	287	321	4.6	1801	0.178	100	NA	NA
Lane 2	-	336	336	4.5	1885	0.178	100	NA	NA
Approach	34	623	657	4.6		0.178			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R3 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	571	-	571	5.4	1874	0.305	100	NA	NA
Lane 2	561	-	561	5.4	1843	0.305	100	NA	NA
Lane 3	-	24	24	0.0	839	0.029	100	0.0	2

Approach	1132	24	1156	5.3		0.305			
SouthWest: Pakuranga Plaza									
Mov. From SW To Exit:	L3 W	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	15	60	75	6.7	34	2.201	100	NA	NA
Approach	15	60	75	6.7		2.201			

	Total	%HV	Deg.Satn (v/c)
Intersection	1888	5.1	2.201

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

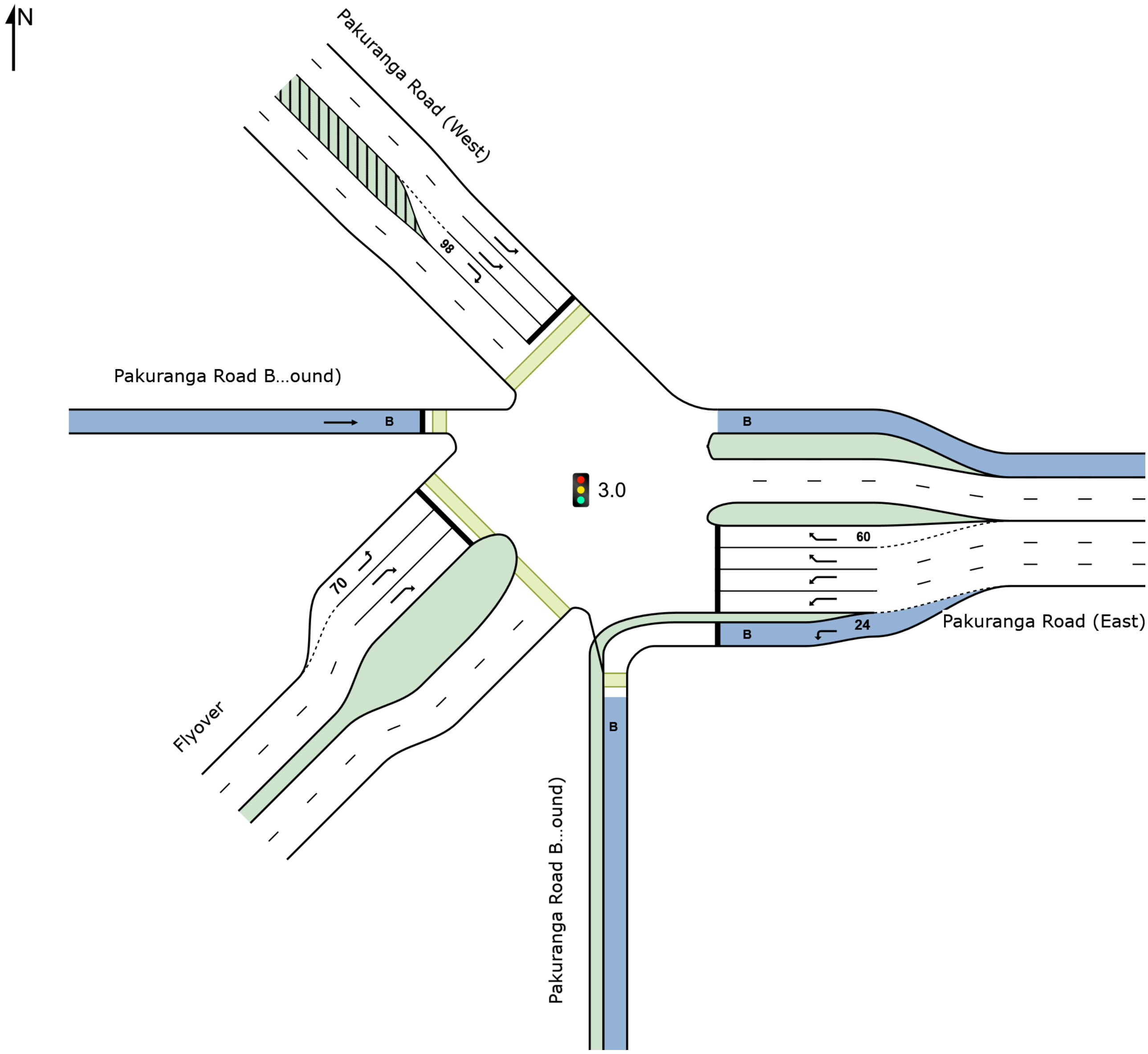
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 120 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1 (B)	28	100.0	28	100.0	676	0.041	100	14.9	LOS B	0.6	7.4	Short	24	0.0	NA
Lane 2	474	5.4	474	5.4	1066 [1]	0.444	100	16.0	LOS B	12.6	92.4	Full	183	0.0	0.0
Lane 3	502	5.4	502	5.4	1130	0.444	100	16.3	LOS B	13.7	100.1	Full	183	0.0	0.0
Lane 4	269	4.1	269	4.1	385 [1]	0.698	100	52.0	LOS D	13.3	96.7	Full	183	0.0	0.0
Lane 5	269	4.1	269	4.1	385 [1]	0.698	100	52.0	LOS D	13.3	96.7	Short	60	0.0	NA
Approach	1541	6.7	1541	6.7		0.698		28.6	LOS C	13.7	100.1				
NorthWest: Pakuranga Road (West)															
Lane 1	573	5.2	559	5.1	704	0.795	100	40.4	LOS D	24.2 [N4]	176.8 [N4]	Full	121	0.0	50.0
Lane 2	541	5.2	527	5.1	663 [1]	0.795	100	39.9	LOS D	24.2 [N4]	176.8 [N4]	Full	121	0.0	50.0
Lane 3	78	11.5	76	11.4	214	0.356	100	58.0	LOS E	3.8	28.9	Short	98	0.0	NA
Approach	1192	5.6	1162 [N1]	5.6		0.795		41.3	LOS D	24.2	176.8				
West: Pakuranga Road Busway Link (Northbound)															
Lane 1 (B)	9	100.0	9	100.0	617	0.015	100	14.9	LOS B	0.2	2.9	Full	215	0.0	0.0
Approach	9	100.0	9	100.0		0.015		14.9	LOS B	0.2	2.9				
SouthWest: Flyover															
Lane 1	119	6.7	119	6.7	227	0.524	100	60.2	LOS E	6.0	44.6	Short	70	0.0	NA
Lane 2	731	4.2	731	4.2	883 [1]	0.827	100	31.3	LOS C	31.3	227.0	Full	1162	0.0	0.0
Lane 3	814	4.2	814	4.2	984	0.827	100	32.0	LOS C	36.7	266.0	Full	1162	0.0	0.0
Approach	1664	4.4	1664	4.4		0.827		33.7	LOS C	36.7	266.0				
Intersection	4406	5.7	4376 [N1]	5.8		0.827		33.9	LOS C	36.7	266.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L2	L1	R1	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.
	S	SW	NW			veh/h	v/c	%	%	
Lane 1	28	-	-	28	100.0	676	0.041	100	0.0	2
Lane 2	-	474	-	474	5.4	1066 [1]	0.444	100	NA	NA

Lane 3	-	502	-	502	5.4	1130	0.444	100	NA	NA
Lane 4	-	-	269	269	4.1	385[1]	0.698	100	NA	NA
Lane 5	-	-	269	269	4.1	385[1]	0.698	100	59.3	4
Approach	28	976	537	1541	6.7		0.698			

NorthWest: Pakuranga Road (West)

Mov. From NW To Exit:	L1 E	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	559	-	559	5.1	704	0.795	100	NA	NA
Lane 2	527	-	527	5.1	663[1]	0.795	100	NA	NA
Lane 3	-	76	76	11.4	214	0.356	100	0.0	2
Approach	1086	76	1162	5.6		0.795			

West: Pakuranga Road Busway Link (Northbound)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	9	100.0	617	0.015	100	NA	NA
Approach	9	9	100.0		0.015			

SouthWest: Flyover

Mov. From SW To Exit:	L2 NW	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	119	-	119	6.7	227	0.524	100	0.0	2
Lane 2	-	731	731	4.2	883[1]	0.827	100	NA	NA
Lane 3	-	814	814	4.2	984	0.827	100	NA	NA
Approach	119	1545	1664	4.4		0.827			

	Total	%HV	Deg.Satn (v/c)
Intersection	4376	5.8	0.827

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

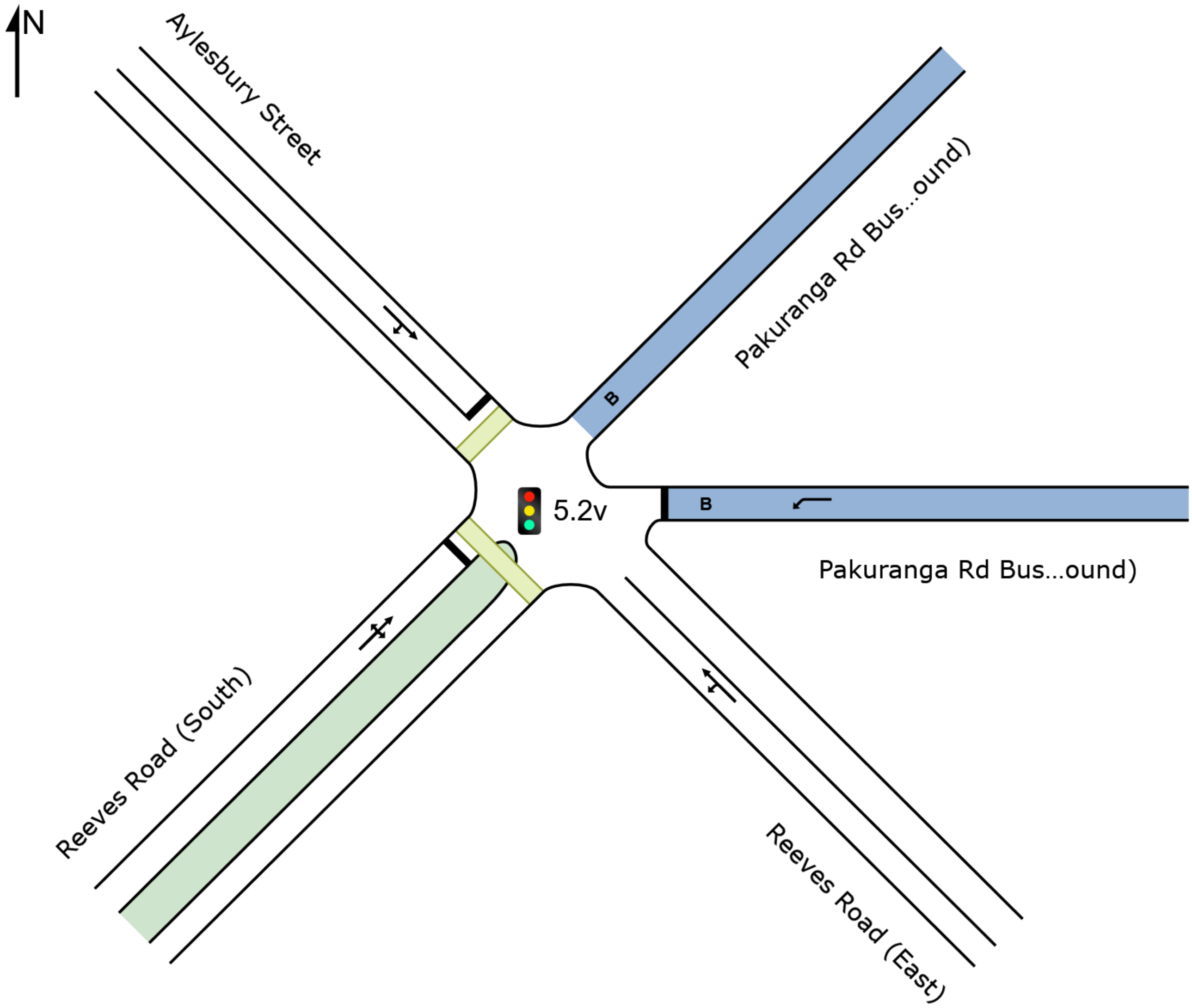
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Pakuranga Road Busway Link (Southbound) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Flyover Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

SITE LAYOUT

Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised (Site Folder: AM)]

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

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

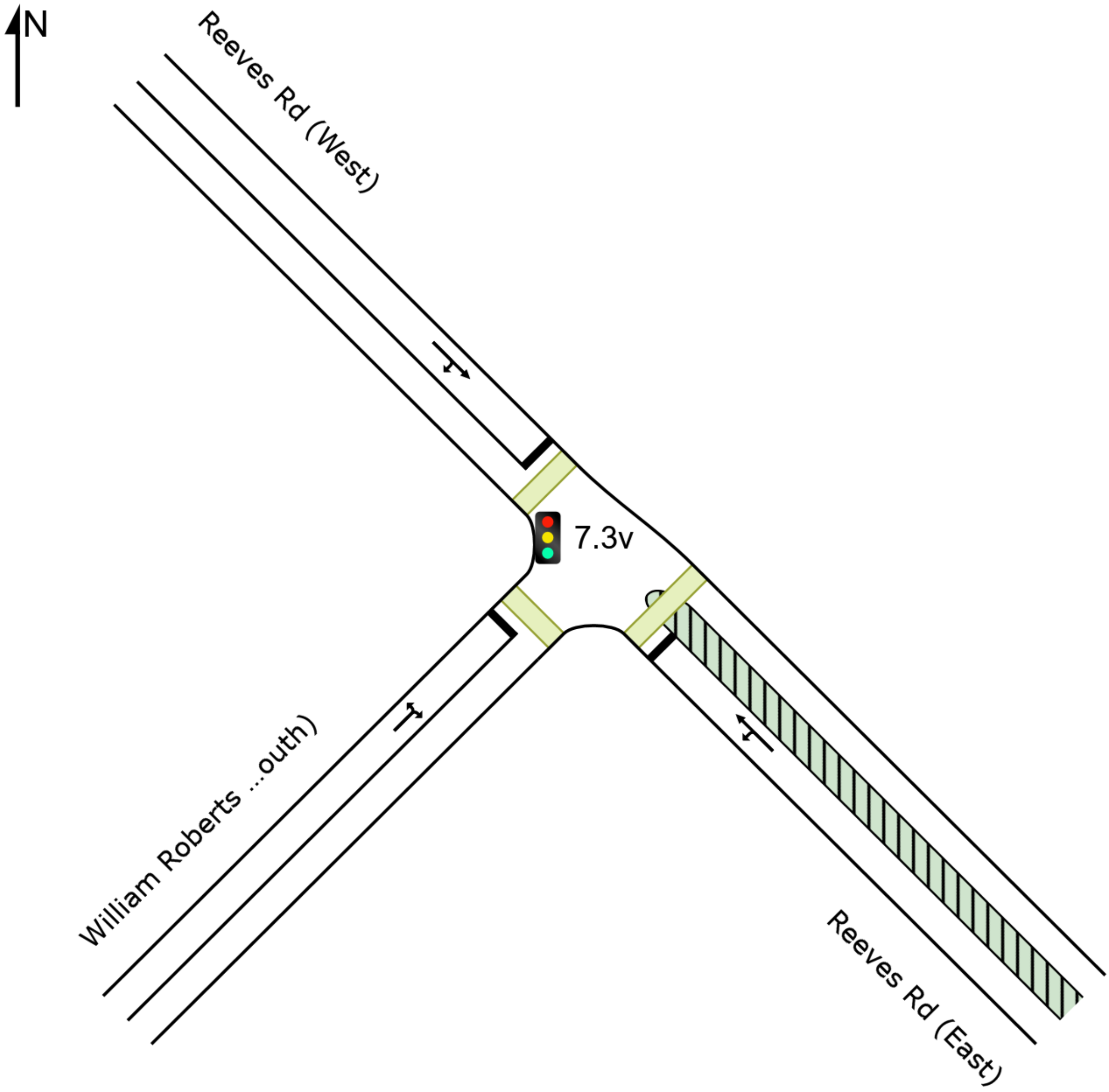


SITE LAYOUT

Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised (Site Folder: AM)]

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

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



CCG LANE SUMMARY

Common Control Group: CCG3 [Aylesbury/ WR/ Reeves Rd]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 130 seconds (CCG Practical Cycle Time)

Lane Use and Performance (CCG)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]															
SouthEast: Reeves Road (East)															
Lane 1	72	6.9	72	6.9	1772	0.041	100	1.9	LOS A	0.0	0.0	Full	27	0.0	0.0
Approach	72	6.9	72	6.9		0.041		1.9	LOS A	0.0	0.0				
East: Pakuranga Rd Busway Link (Southbound)															
Lane 1 (B)	28	100.0	28	100.0	122	0.229	100	64.4	LOS E	1.5	19.9	Full	203	0.0	0.0
Approach	28	100.0	28	100.0		0.229		64.4	LOS E	1.5	19.9				
NorthWest: Aylesbury Street															
Lane 1	118	5.1	118	5.1	127	0.927	100	83.2	LOS F	8.0	58.5	Full	284	-9.1 N7	0.0
Approach	118	5.1	118	5.1		0.927		83.2	LOS F	8.0	58.5				
SouthWest: Reeves Road (South)															
Lane 1	114	14.1	113	14.1	134	0.845	100	75.3	LOS E	7.2	56.2	Full	180	-8.4 N7	0.0
Approach	114	14.1	113	14.1		0.845		75.3	LOS E	7.2	56.2				
Intersection	332	16.6	331	16.6		0.927		61.2	LOS E	8.0	58.5				
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]															
SouthEast: Reeves Rd (East)															
Lane 1	131	5.3	131	5.3	154	0.851	100	76.4	LOS E	8.2	60.0	Full	810	0.0	0.0
Approach	131	5.3	131	5.3		0.851		76.4	LOS E	8.2	60.0				
NorthWest: Reeves Rd (West)															
Lane 1	200	6.5	200	6.5	654	0.306	100	22.1	LOS C	5.3 N4	39.5 N4	Full	27	0.0	50.0
Approach	200	6.5	200	6.5		0.306		22.1	LOS C	5.3	39.5				
SouthWest: William Roberts Road (South)															
Lane 1	437	6.9	437	6.9	477	0.917	100	66.1	LOS E	27.9	206.7	Full	223	0.0	8.1
Approach	437	6.9	437	6.9		0.917		66.1	LOS E	27.9	206.7				
Intersection	768	6.5	768	6.5		0.917		56.4	LOS E	27.9	206.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (CCG) (veh/h)

Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]

SouthEast: Reeves Road (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	55	17	72	6.9	1772	0.041	100	NA	NA
Approach	55	17	72	6.9		0.041			

East: Pakuranga Rd Busway Link (Southbound)

Mov. From E To Exit:	L1 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	28	100.0	122	0.229	100	NA	NA
Approach	28	28	100.0		0.229			

NorthWest: Aylesbury Street

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	107	11	118	5.1	127	0.927	100	NA	NA
Approach	107	11	118	5.1		0.927			

SouthWest: Reeves Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	9	94	113	14.1	134	0.845	100	NA	NA
Approach	11	9	94	113	14.1		0.845			

	Total	%HV	Deg.Satn (v/c)
Intersection	331	16.6	0.927

Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]

SouthEast: Reeves Rd (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	86	45	131	5.3	154	0.851	100	NA	NA
Approach	86	45	131	5.3		0.851			

NorthWest: Reeves Rd (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	162	38	200	6.5	654	0.306	100	NA	NA
Approach	162	38	200	6.5		0.306			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	26	411	437	6.9	477	0.917	100	NA	NA

Approach	26	411	437	6.9		0.917

	Total	%HV	Deg.Satn (v/c)
Intersection	768	6.5	0.917

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

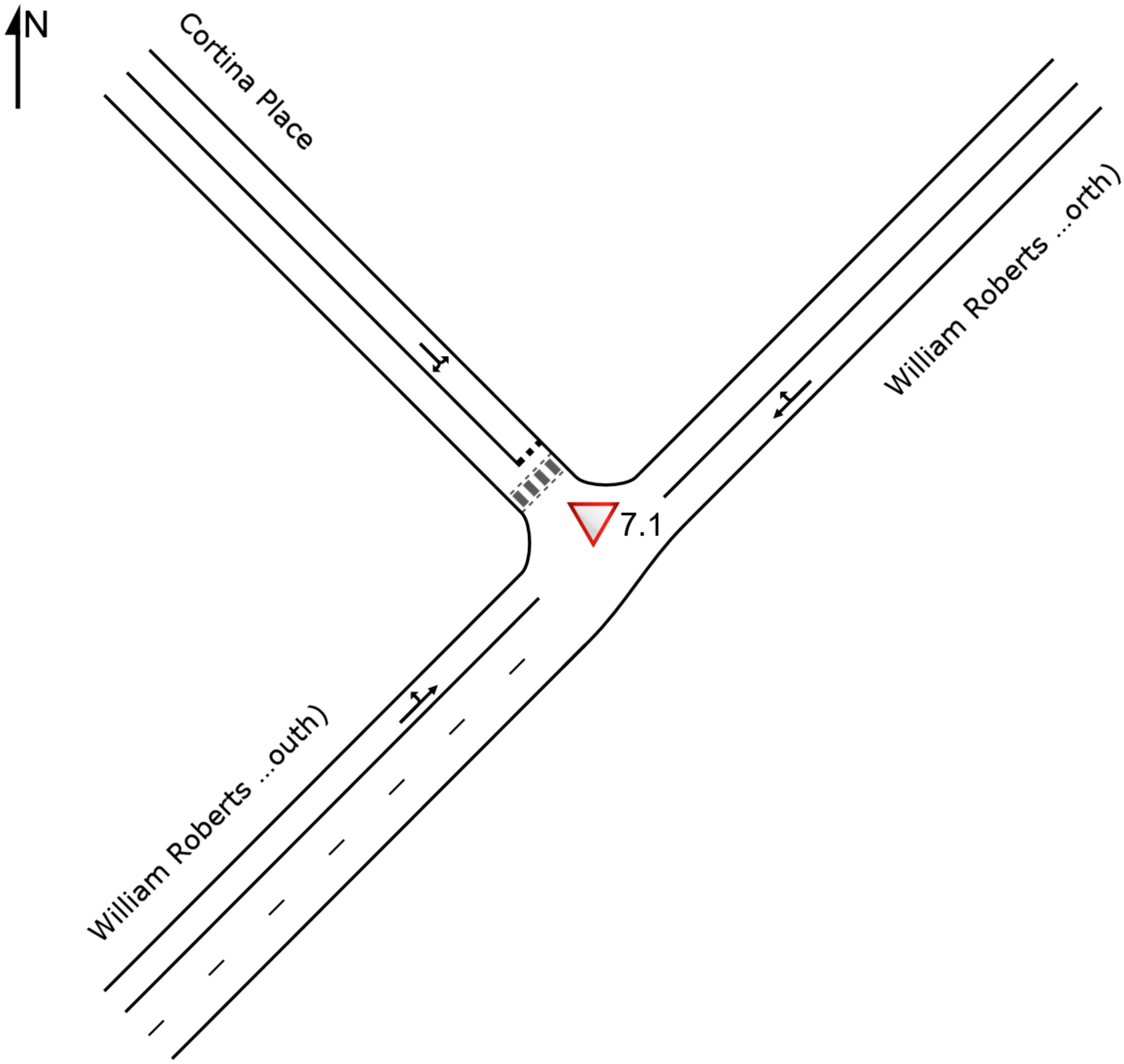
Merge Analysis (CCG)	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]												
SouthEast Exit: Reeves Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthEast Exit: Pakuranga Rd Busway Link (Northbound) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Aylesbury Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: Reeves Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]												
SouthEast Exit: Reeves Rd (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Reeves Rd (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

▽ Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Site Category: (None)
Give-Way (Two-Way)

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



LANE SUMMARY

Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
NorthEast: William Roberts Road (North)															
Lane 1	139	6.5	139	6.5	1580	0.088	100	1.8	LOS A	0.2	1.6	Full	223	0.0	0.0
Approach	139	6.5	139	6.5		0.088		1.8	NA	0.2	1.6				
NorthWest: Cortina Place															
Lane 1	276	8.3	276	8.3	899	0.307	100	3.3	LOS A	1.1	7.9	Full	177	-3.0 [N7]	0.0
Approach	276	8.3	276	8.3		0.307		3.3	LOS A	1.1	7.9				
SouthWest: William Roberts Road (South)															
Lane 1	416	7.7	416	7.7	1510	0.275	100	0.9	LOS A	0.5	4.0	Full	110	-4.3 [N7]	0.0
Approach	416	7.7	416	7.7		0.275		0.9	NA	0.5	4.0				
Intersection	831	7.7	831	7.7		0.307		1.9	NA	1.1	7.9				

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

N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

NorthEast: William Roberts Road (North)

Mov. From NE To Exit:	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	106	33	139	6.5	1580	0.088	100	NA	NA
Approach	106	33	139	6.5		0.088			

NorthWest: Cortina Place

Mov. From NW To Exit:	L2 NE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	144	132	276	8.3	899	0.307	100	NA	NA
Approach	144	132	276	8.3		0.307			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	101	315	416	7.7	1510	0.275	100	NA	NA

Approach	101	315	416	7.7	0.275

	Total	%HV	Deg.Satn (v/c)
Intersection	831	7.7	0.307

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

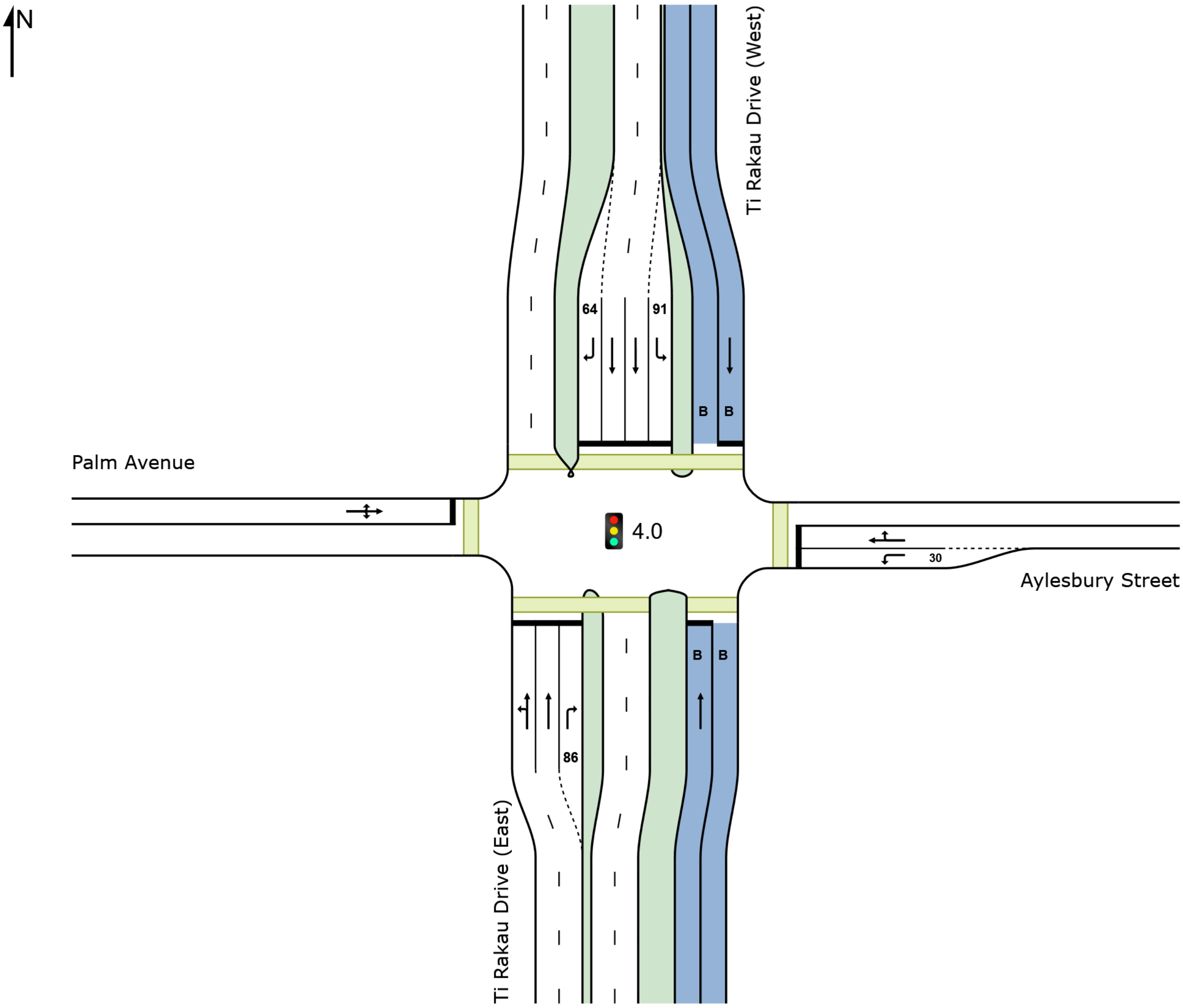
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
NorthEast Exit: William Roberts Road (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Cortina Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

SITE LAYOUT

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Ti Rakau Drive (East)															
Lane 1	393	8.0	393	8.0	390	1.007	100	97.9	LOS F	21.5 [N4]	160.7 [N4]	Full	110	-44.3 [N3]	50.0
Lane 2	742	7.1	742	7.1	737 [1]	1.007	100	105.7	LOS F	21.6 [N4]	160.7 [N4]	Full	110	0.0	50.0
Lane 3	65	4.6	65	4.6	68	0.952	100	104.7	LOS F	5.2	37.5	Short	86	0.0	NA
Lane 4 (B)	53	100.0	53	100.0	613	0.086	100	4.4	LOS A	0.0	0.6	Full	110	0.0	0.0
Approach	1253	11.2	1253	11.2		1.007		98.9	LOS F	21.6	160.7				
East: Aylesbury Street															
Lane 1	49	8.2	49	8.2	125	0.393	100	42.3	LOS D	2.1	16.1	Short	30	-11.3 [N7]	NA
Lane 2	102	8.8	102	8.8	199 [1]	0.512	100	69.5	LOS E	6.4	48.4	Full	40	0.0	32.5
Approach	151	8.6	151	8.6		0.512		60.7	LOS E	6.4	48.4				
North: Ti Rakau Drive (West)															
Lane 1 (B)	23	100.0	23	100.0	613	0.038	100	4.4	LOS A	0.0	0.2	Full	174	0.0	0.0
Lane 2	256	7.4	256	7.4	1004	0.255	100	18.5	LOS B	7.7	57.6	Short	91	0.0	NA
Lane 3	268	7.8	268	7.8	687	0.390	100	33.6	LOS C	11.7	87.5	Full	174	-11.3 [N7]	0.0
Lane 4	268	7.8	268	7.8	687	0.390	100	33.6	LOS C	11.7	87.5	Full	174	-11.3 [N7]	0.0
Lane 5	31	3.2	31	3.2	69	0.450	100	85.2	LOS F	2.1	15.4	Short	64	0.0	NA
Approach	846	10.0	845 [N1]	10.1		0.450		30.1	LOS C	11.7	87.5				
West: Palm Avenue															
Lane 1	90	4.4	90	4.4	173	0.521	100	69.9	LOS E	5.6	41.0	Full	87	-30.9 [N7]	0.0
Approach	90	4.4	90	4.4		0.521		69.9	LOS E	5.6	41.0				
Intersection	2340	10.3	2339 [N1]	10.3		1.007		70.5	LOS E	21.6	160.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)										
Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	80	313	-	393	8.0	390	1.007	100	NA	NA
Lane 2	-	742	-	742	7.1	737 [1]	1.007	100	NA	NA
Lane 3	-	-	65	65	4.6	68	0.952	100	0.0	2
Lane 4	-	53	-	53	100.0	613	0.086	100	NA	NA
Approach	80	1108	65	1253	11.2		1.007			

East: Aylesbury Street

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	49	-	-	49	8.2	125	0.393	100	0.0	2
Lane 2	-	15	87	102	8.8	199 [1]	0.512	100	NA	NA
Approach	49	15	87	151	8.6		0.512			

North: Ti Rakau Drive (West)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	-	23	100.0	613	0.038	100	NA	NA
Lane 2	256	-	-	256	7.4	1004	0.255	100	0.0	3
Lane 3	-	268	-	268	7.8	687	0.390	100	NA	NA
Lane 4	-	268	-	268	7.8	687	0.390	100	NA	NA
Lane 5	-	-	31	31	3.2	69	0.450	100	0.0	4
Approach	256	559	31	845	10.1		0.450			

West: Palm Avenue

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	36	21	33	90	4.4	173	0.521	100	NA	NA
Approach	36	21	33	90	4.4		0.521			

	Total	%HV	Deg.Satn (v/c)
Intersection	2339	10.3	1.007

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
East Exit: Aylesbury Street Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
West Exit: Palm Avenue Merge Type: **Not Applied**											

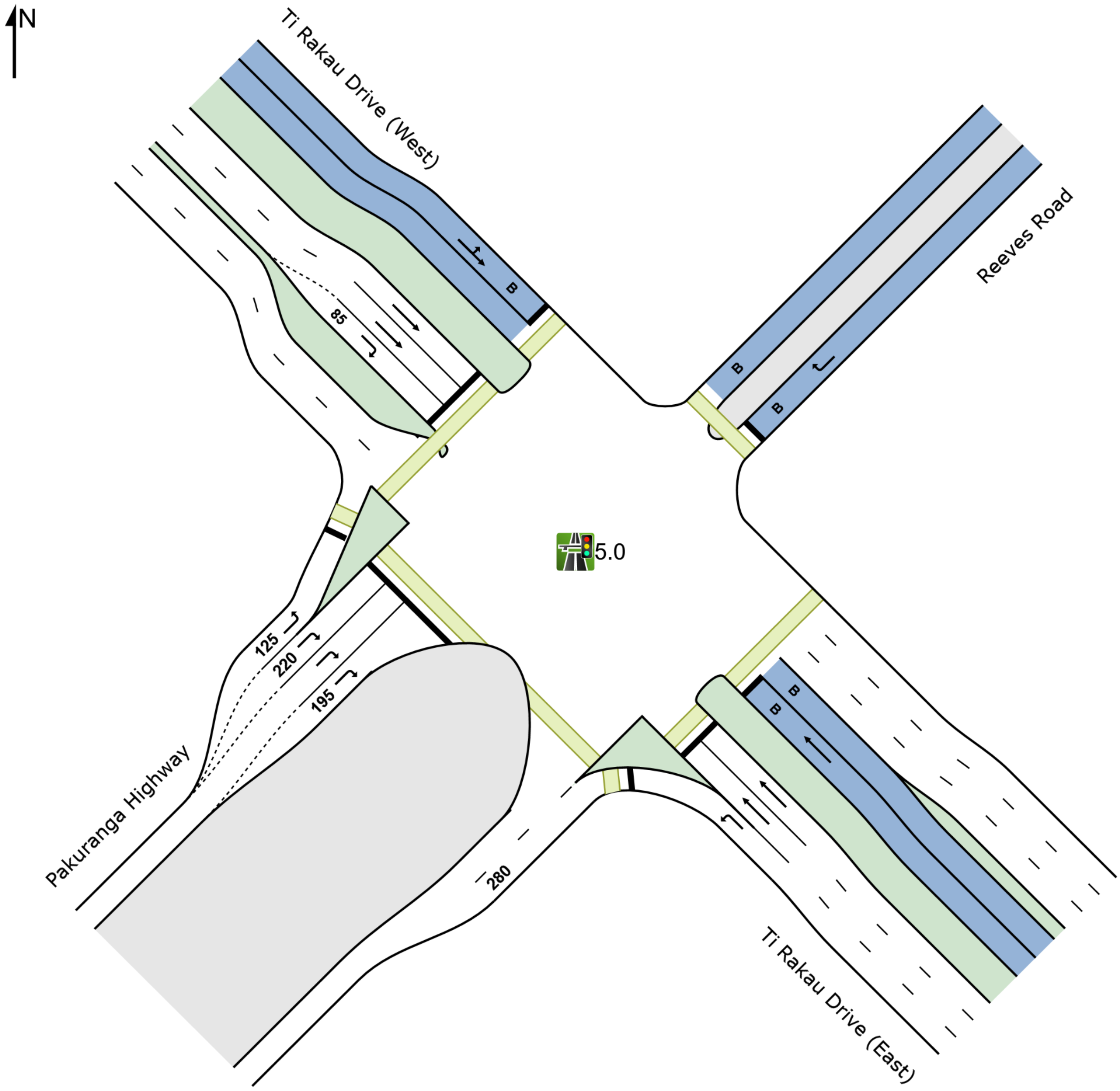
Full Length Lane	1	Merge Analysis not applied.

SITE LAYOUT

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated

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



LANE SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	817	8.2	817	8.2	1420	0.575	100	9.7	LOS A	17.6 N4	131.5 N4	Full	90	0.0	50.0
Lane 2	432	7.2	432	7.2	482	0.896	100	58.5	LOS E	17.7 N4	131.5 N4	Full	90	-50.0 N7	50.0
Lane 3	432	7.2	432	7.2	482	0.896	100	58.5	LOS E	17.7 N6	131.5 N6	Full	90	-50.0 N3	50.0
Lane 4 (B)	13	100.0	13	100.0	279	0.047	100	34.1	LOS C	0.5	6.4	Full	90	0.0	0.0
Approach	1694	8.4	1694	8.4		0.896		34.8	LOS C	17.7	131.5				
NorthEast: Reeves Road															
Lane 1 (B)	9	100.0	9	100.0	190	0.047	100	44.5	LOS D	0.4	5.3	Full	50	0.0	0.0
Approach	9	100.0	9	100.0		0.047		44.5	LOS D	0.4	5.3				
NorthWest: Ti Rakau Drive (West)															
Lane 1 (B)	53	100.0	53	100.0	319	0.166	100	34.9	LOS C	2.0	25.5	Full	110	0.0	0.0
Lane 2	244	7.4	243	7.4	259	0.939	100	65.9	LOS E	14.2	105.6	Full	110	0.0	11.3
Lane 3	244	7.4	243	7.4	259	0.939	100	65.9	LOS E	14.2	105.6	Full	110	0.0	11.3
Lane 4	75	12.0	75	12.0	136	0.551	100	79.7	LOS E	4.9	38.1	Short	85	0.0	NA
Approach	615	15.9	615	15.9		0.939		64.9	LOS E	14.2	105.6				
SouthWest: Pakuranga Highway															
Lane 1	289	7.6	289	7.6	344	0.840	100	65.7	LOS E	20.0	149.2	Short	125	-50.0 N7	NA
Lane 2	376	7.5	376	7.5	451	0.833	100	70.1	LOS E	24.9	185.7	Short	220	0.0	NA
Lane 3	376	7.5	376	7.5	451	0.833	100	70.1	LOS E	24.9	185.7	Full	623	0.0	0.0
Lane 4	376	7.5	376	7.5	451	0.833	100	70.1	LOS E	24.9	185.7	Short	195	0.0	NA
Approach	1417	7.6	1417	7.6		0.840		69.2	LOS E	24.9	185.7				
Intersection	3735	9.5	3735	9.5		0.939		52.8	LOS D	24.9	185.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE	L2	T1	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	SW	NW				veh/h	v/c	%	%	No.
Lane 1	817	-	817	8.2		1420	0.575	100	NA	NA
Lane 2	-	432	432	7.2		482	0.896	100	NA	NA
Lane 3	-	432	432	7.2		482	0.896	100	NA	NA
Lane 4	-	13	13	100.0		279	0.047	100	NA	NA
Approach	817	877	1694	8.4			0.896			

NorthEast: Reeves Road

Mov. From NE To Exit:	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	9	100.0	190	0.047	100	NA	NA
Approach	9	9	100.0		0.047			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	25	-	53	100.0	319	0.166	100	NA	NA
Lane 2	-	243	-	243	7.4	259	0.939	100	NA	NA
Lane 3	-	243	-	243	7.4	259	0.939	100	NA	NA
Lane 4	-	-	75	75	12.0	136	0.551	100	0.0	3
Approach	28	512	75	615	15.9		0.939			

SouthWest: Pakuranga Highway

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	289	-	289	7.6	344	0.840	100	31.2	2
Lane 2	-	376	376	7.5	451	0.833	100	0.0	3
Lane 3	-	376	376	7.5	451	0.833	100	NA	NA
Lane 4	-	376	376	7.5	451	0.833	100	10.6	3
Approach	289	1128	1417	7.6		0.840			

	Total	%HV	Deg.Satn (v/c)
Intersection	3735	9.5	0.939

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
Full Length Lane	4	Merge Analysis not applied.										
NorthEast Exit: Reeves Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

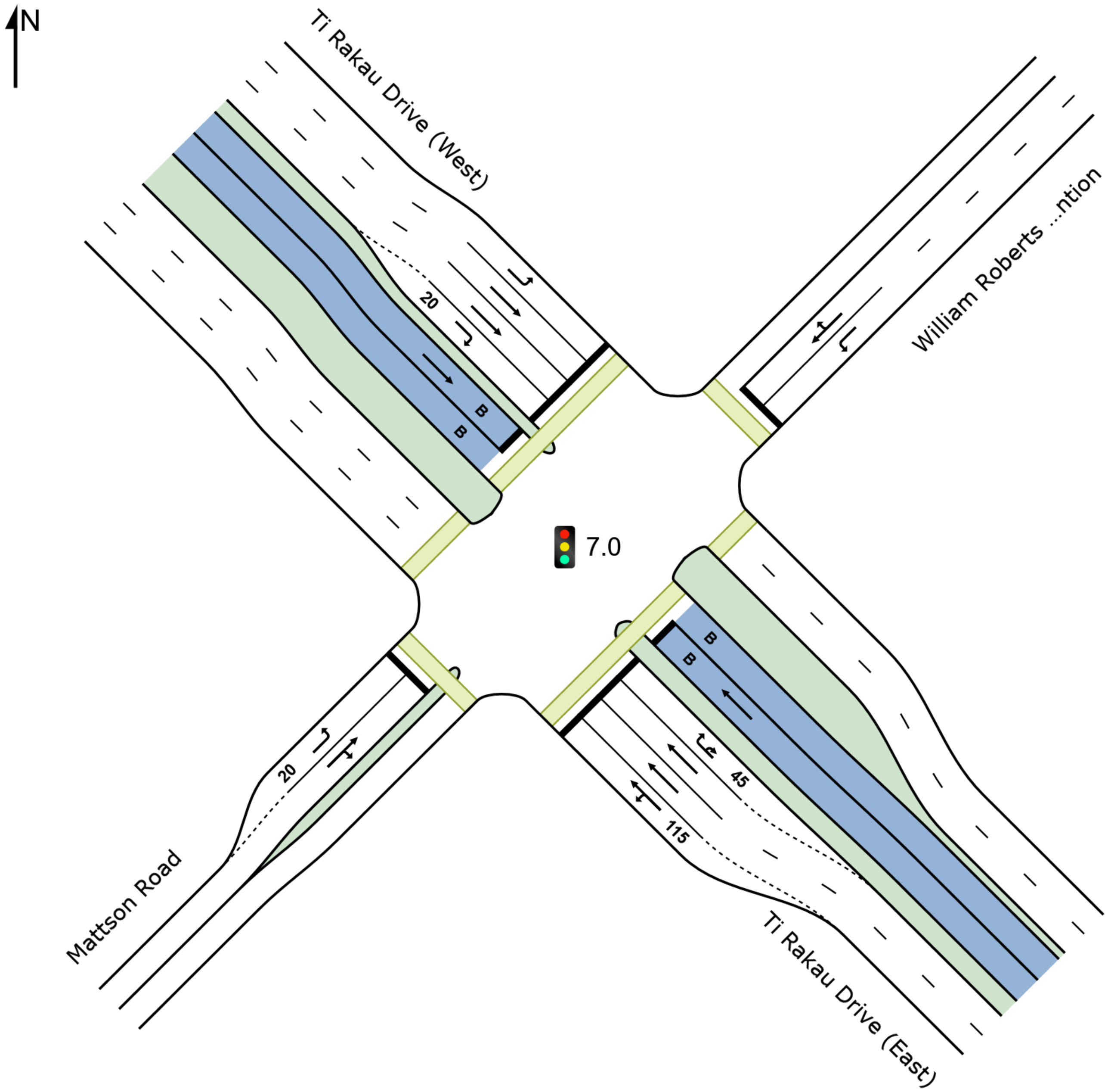
SouthWest Exit: Pakuranga Highway Merge Type: **Zipper**												
Exit Short Lane	1	280	50.0	37	40	2.50	2.00	817	1756	0.465	0.0	0.0
Merge Lane	2	-	50.0	408	425	2.50	2.00	75	1248	0.060	0.4	0.5

SITE LAYOUT

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

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



LANE SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	529	7.3	527	7.3	699	0.753	100	35.1	LOS D	23.8	177.3	Short	115	0.0	NA
Lane 2	646	7.6	643	7.6	854[1]	0.753	100	23.7	LOS C	25.1	187.5	Full	207	0.0	6.0
Lane 3	593	7.6	590	7.6	784[1]	0.753	100	22.7	LOS C	22.1	164.7	Full	207	0.0	0.0
Lane 4	123	7.5	123	7.5	173	0.708	100	65.3	LOS E	6.7	49.6	Short	45	0.0	NA
Lane 5 (B)	13	100.0	13	100.0	607	0.021	100	0.6	LOS A	0.0	0.2	Full	207	0.0	0.0
Approach	1905	8.1	1895[N1]	8.2		0.753		29.1	LOS C	25.1	187.5				
NorthEast: William Roberts Road Extention															
Lane 1	115	7.8	115	7.8	160	0.717	100	63.5	LOS E	6.3	47.0	Full	112	0.0	0.0
Lane 2	120	7.5	120	7.5	163	0.735	100	63.0	LOS E	6.6	49.1	Full	110	0.0	0.0
Approach	235	7.7	235	7.7		0.735		63.2	LOS E	6.6	49.1				
NorthWest: Ti Rakau Drive (West)															
Lane 1	330	7.9	330	7.9	525	0.629	100	43.8	LOS D	15.0	112.0	Full	107	0.0	19.2
Lane 2	665	7.4	665	7.4	941	0.707	100	24.1	LOS C	21.0[N4]	156.4[N4]	Full	107	0.0	50.0
Lane 3	638	7.4	638	7.4	903[1]	0.707	100	23.6	LOS C	21.0[N4]	156.4[N4]	Full	107	0.0	50.0
Lane 4	28	7.1	28	7.1	205	0.136	100	57.0	LOS E	1.3	10.0	Short	20	0.0	NA
Lane 5 (B)	25	100.0	25	100.0	607	0.041	100	0.6	LOS A	0.0	0.3	Full	107	0.0	0.0
Approach	1686	8.9	1686	8.9		0.707		27.9	LOS C	21.0	156.4				
SouthWest: Mattson Road															
Lane 1	10	0.0	10	0.0	93	0.108	100	66.3	LOS E	0.5	3.7	Short	20	0.0	NA
Lane 2	56	3.6	56	3.6	93	0.602	100	69.2	LOS E	3.1	22.5	Full	282	0.0	0.0
Approach	66	3.0	66	3.0		0.602		68.7	LOS E	3.1	22.5				
Intersection	3892	8.4	3882[N1]	8.4		0.753		31.3	LOS C	25.1	187.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	78	449	-	-	527	7.3	699	0.753	100	55.0	2
Lane 2	-	643	-	-	643	7.6	854 [1]	0.753	100	NA	NA
Lane 3	-	590	-	-	590	7.6	784 [1]	0.753	100	NA	NA
Lane 4	-	-	55	68	123	7.5	173	0.708	100	23.9	3
Lane 5	-	13	-	-	13	100.0	607	0.021	100	NA	NA
Approach	78	1695	55	68	1895	8.2		0.753			

NorthEast: William Roberts Road Extention

Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	115	-	-	115	7.8	160	0.717	100	NA	NA
Lane 2	-	36	84	120	7.5	163	0.735	100	NA	NA
Approach	115	36	84	235	7.7		0.735			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	330	-	-	330	7.9	525	0.629	100	NA	NA
Lane 2	-	665	-	665	7.4	941	0.707	100	NA	NA
Lane 3	-	638	-	638	7.4	903 [1]	0.707	100	NA	NA
Lane 4	-	-	28	28	7.1	205	0.136	100	0.0	3
Lane 5	-	25	-	25	100.0	607	0.041	100	NA	NA
Approach	330	1328	28	1686	8.9		0.707			

SouthWest: Mattson Road

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	-	-	10	0.0	93	0.108	100	0.0	2
Lane 2	-	30	26	56	3.6	93	0.602	100	NA	NA
Approach	10	30	26	66	3.0		0.602			

	Total	%HV	Deg.Satn (v/c)
Intersection	3882	8.4	0.753

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthEast Exit: William Roberts Road Extention Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									

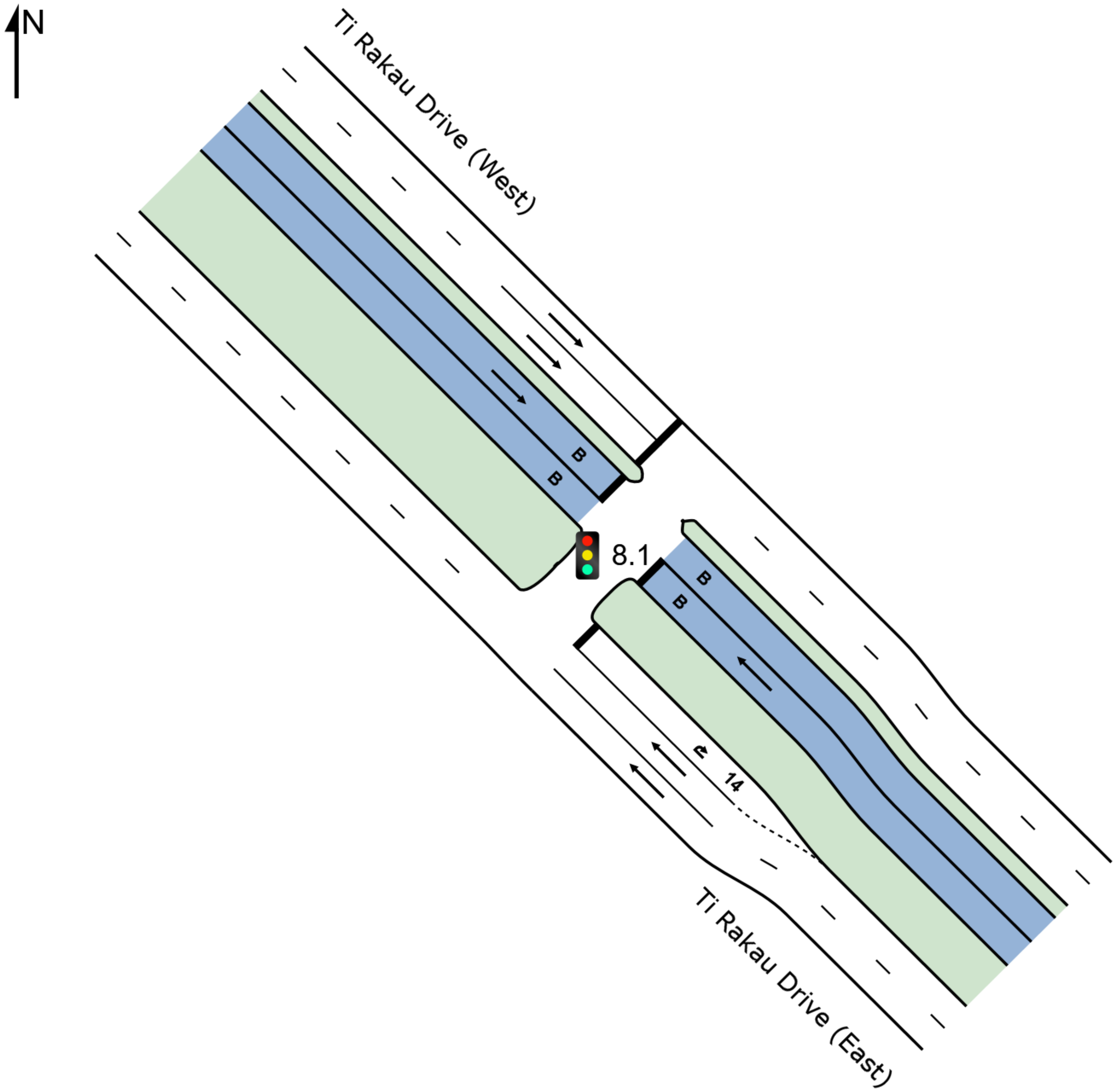
Full Length Lane	4	Merge Analysis not applied.
SouthWest Exit: Mattson Road Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.

SITE LAYOUT

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

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

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



SIDRA INTERSECTION 9.0 | Copyright © 2000-2020 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Created: Wednesday, 15 February 2023 9:30:38 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

LANE SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 40 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	926	7.6	899	7.6	1848	0.486	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 2	926	7.6	899	7.6	1848	0.486	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 3	75	6.7	73	6.7	199	0.365	100	24.4	LOS C	1.3	9.4	Short	14	0.0	NA
Lane 4 (B)	13	100.0	13	100.0	657	0.020	100	0.2	LOS A	0.0	0.1	Full	147	0.0	0.0
Approach	1940	8.2	1884 N1	8.2		0.486		1.0	LOS A	1.3	9.4				
NorthWest: Ti Rakau Drive (West)															
Lane 1	726	7.4	726	7.4	1018	0.713	100	8.4	LOS A	10.3	76.6	Full	73	0.0	19.4
Lane 2	726	7.4	726	7.4	1018	0.713	100	8.4	LOS A	10.3	76.6	Full	73	0.0	19.4
Lane 3 (B)	25	100.0	25	100.0	657	0.038	100	0.2	LOS A	0.0	0.1	Full	73	0.0	0.0
Approach	1477	9.0	1477	9.0		0.713		8.3	LOS A	10.3	76.6				
Intersection	3417	8.5	3360 N1	8.7		0.713		4.2	LOS A	10.3	76.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	899	-	899	7.6	1848	0.486	100	NA	NA
Lane 2	899	-	899	7.6	1848	0.486	100	NA	NA
Lane 3	-	73	73	6.7	199	0.365	100	0.0	2
Lane 4	13	-	13	100.0	657	0.020	100	NA	NA
Approach	1811	73	1884	8.2		0.486			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	726	726	7.4	1018	0.713	100	NA	NA
Lane 2	726	726	7.4	1018	0.713	100	NA	NA
Lane 3	25	25	100.0	657	0.038	100	NA	NA
Approach	1477	1477	9.0		0.713			

	Total	%HV	Deg.Satn (v/c)
Intersection	3360	8.7	0.713

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

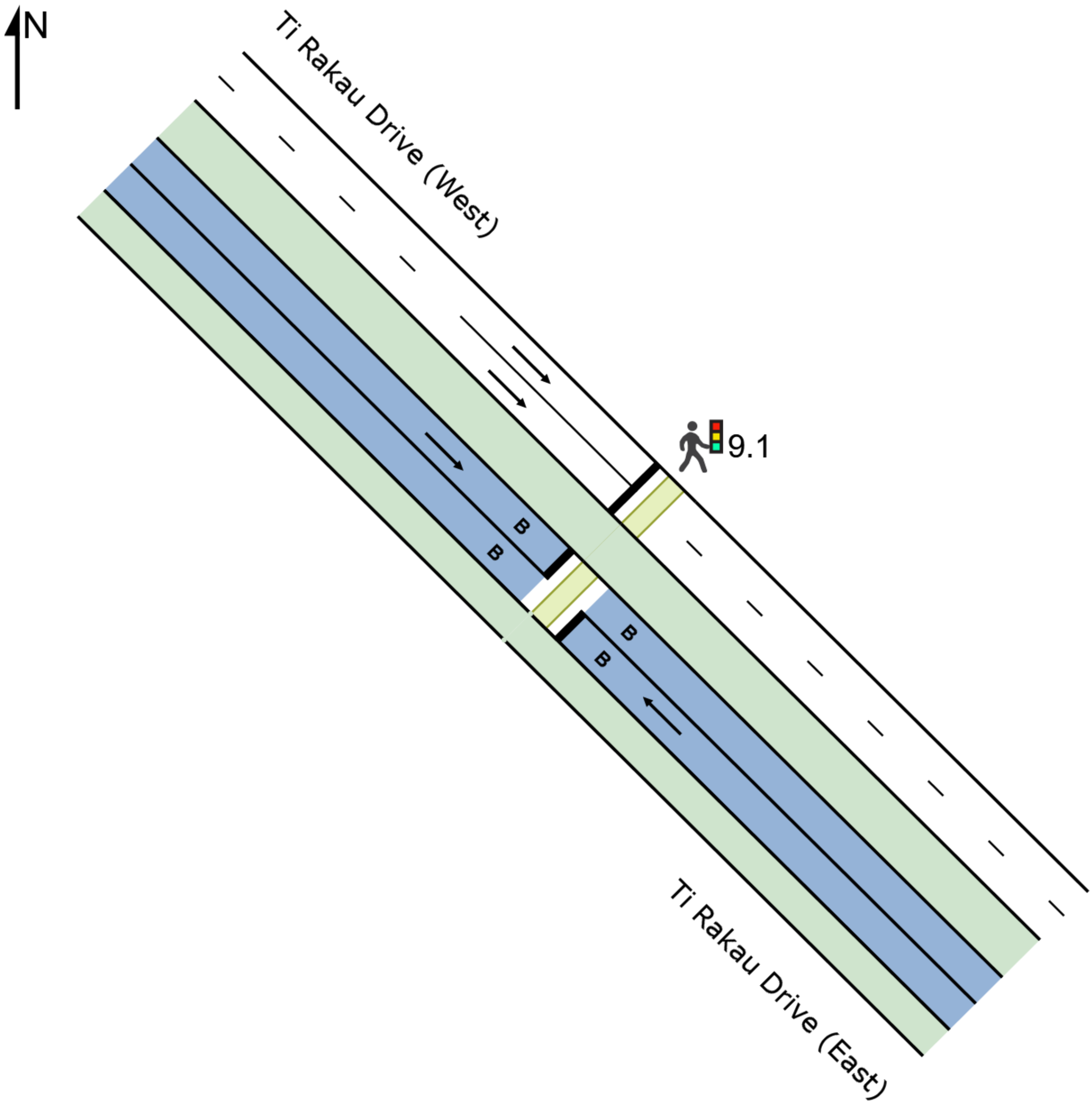
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SITE LAYOUT

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated

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



LANE SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 50 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1 (B)	13	100.0	13	100.0	433	0.030	100	4.2	LOS A	0.1	0.9	Full	45	0.0	0.0
Approach	13	100.0	13	100.0		0.030		4.2	LOS A	0.1	0.9				
NorthWest: Ti Rakau Drive (West)															
Lane 1	741	7.6	740	7.6	952	0.777	100	12.9	LOS B	2.4[N4]	17.5[N4]	Full	12	0.0	50.0
Lane 2	741	7.6	740	7.6	952	0.777	100	12.9	LOS B	2.4[N4]	17.5[N4]	Full	12	0.0	50.0
Lane 3 (B)	25	100.0	25	100.0	433	0.058	100	4.2	LOS A	0.1	1.8	Full	12	0.0	0.0
Approach	1506	9.1	1506	9.1		0.777		12.8	LOS B	2.4	17.5				
Intersection	1519	9.9	1519	9.9		0.777		12.7	LOS B	2.4	17.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	13	13	100.0	433	0.030	100	NA	NA
Approach	13	13	100.0		0.030			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	740	740	7.6	952	0.777	100	NA	NA
Lane 2	740	740	7.6	952	0.777	100	NA	NA
Lane 3	25	25	100.0	433	0.058	100	NA	NA
Approach	1506	1506	9.1		0.777			

	Total	%HV	Deg.Satn (v/c)
Intersection	1519	9.9	0.777

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

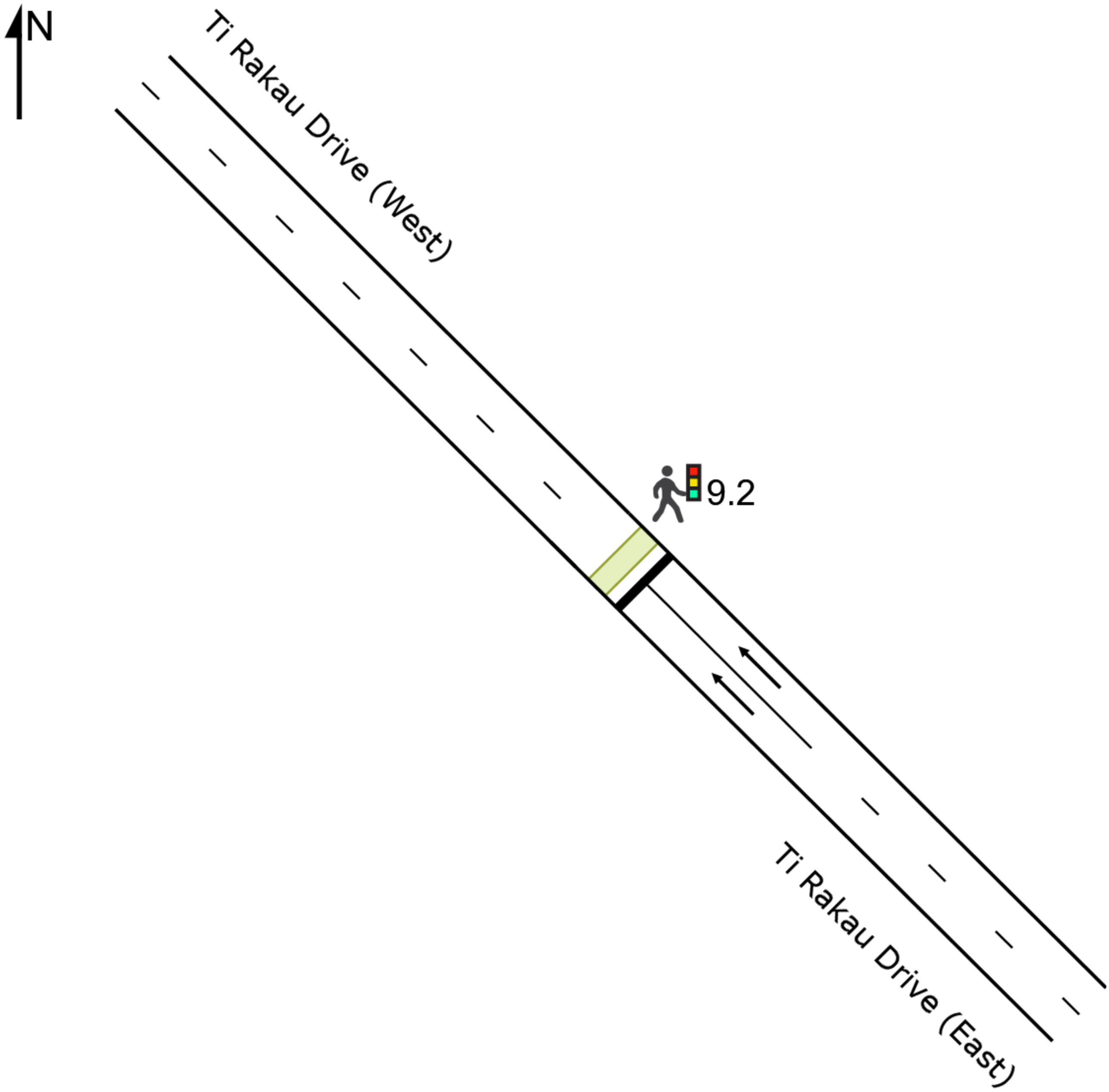
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated

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



LANE SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	957	7.6	890	7.6	1087	0.819	100	16.6	LOS B	8.8 N4	65.8 N4	Full	45	0.0	50.0
Lane 2	957	7.6	890	7.6	1087	0.819	100	16.6	LOS B	8.8 N4	65.8 N4	Full	45	0.0	50.0
Approach	1914	7.6	1780 N1	7.6		0.819		16.6	LOS B	8.8	65.8				
Intersection	1914	7.6	1780 N1	8.1		0.819		16.6	LOS B	8.8	65.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	890	890	7.6	1087	0.819	100	NA	NA
Lane 2	890	890	7.6	1087	0.819	100	NA	NA
Approach	1780	1780	7.6		0.819			

	Total	%HV	Deg.Satn (v/c)
Intersection	1780	8.1	0.819

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

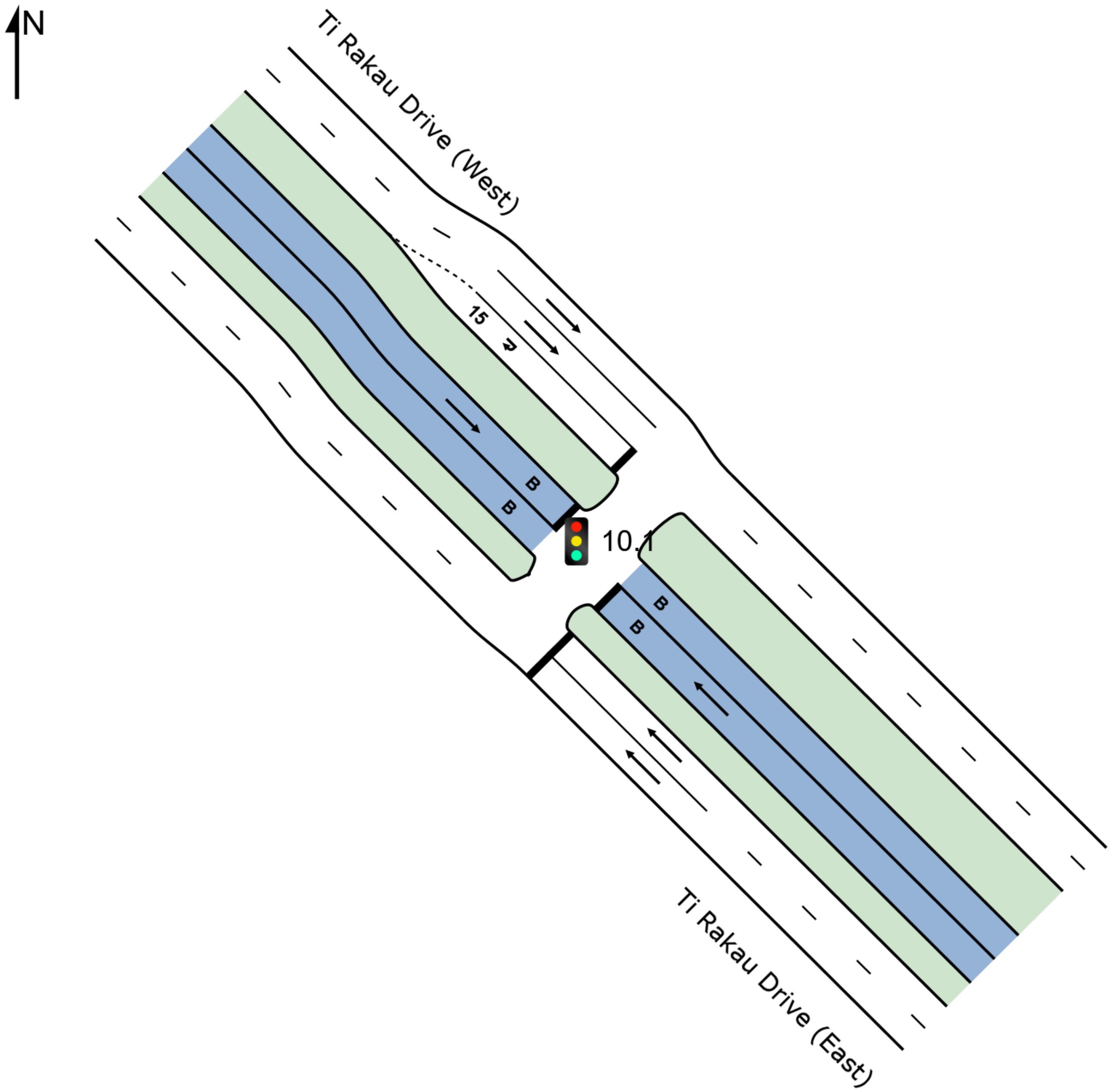
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

SITE LAYOUT

Site: 10.1 [10.1 U-turn - East of Edgewater Dr (West) (Site Folder: AM)]

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

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



LANE SUMMARY

Site: 10.1 [10.1 U-turn - East of Edgewater Dr (West) (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 50 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1	1023	7.6	1016	7.6	1161	0.875	100	18.1	LOS B	12.5 N4	93.5 N4	Full	64	-1.9 N7	50.0
Lane 2	868	7.6	863	7.6	986	0.875	100	19.8	LOS B	12.5 N4	93.5 N4	Full	64	-16.7 N7	50.0
Lane 3 (B)	13	100.0	13	100.0	764	0.017	100	0.2	LOS A	0.0	0.1	Full	64	0.0	0.0
Approach	1904	8.2	1892 N1	8.2		0.875		18.8	LOS B	12.5	93.5				
NorthWest: Ti Rakau Drive (West)															
Lane 1	694	7.9	694	7.9	1846	0.376	100	0.0	LOS A	0.0	0.0	Full	81	0.0	0.0
Lane 2	694	7.9	694	7.9	1846	0.376	100	0.0	LOS A	0.0	0.0	Full	81	0.0	0.0
Lane 3	97	3.1	97	3.1	136	0.714	100	33.8	LOS C	2.4	17.5	Short	15	-16.7 N7	NA
Lane 4 (B)	25	100.0	25	100.0	764	0.033	100	0.2	LOS A	0.0	0.1	Full	81	0.0	0.0
Approach	1509	9.1	1509	9.1		0.714		2.2	LOS A	2.4	17.5				
Intersection	3413	8.6	3401 N1	8.6		0.875		11.4	LOS B	12.5	93.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1016	1016	7.6	1161	0.875	100	NA	NA
Lane 2	863	863	7.6	986	0.875	100	NA	NA
Lane 3	13	13	100.0	764	0.017	100	NA	NA
Approach	1892	1892	8.2		0.875			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	U NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	694	-	694	7.9	1846	0.376	100	NA	NA
Lane 2	694	-	694	7.9	1846	0.376	100	NA	NA
Lane 3	-	97	97	3.1	136	0.714	100	29.1	2
Lane 4	25	-	25	100.0	764	0.033	100	NA	NA

Approach	1412	97	1509	9.1	0.714

	Total	%HV	Deg.Satn (v/c)
Intersection	3401	8.6	0.875

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

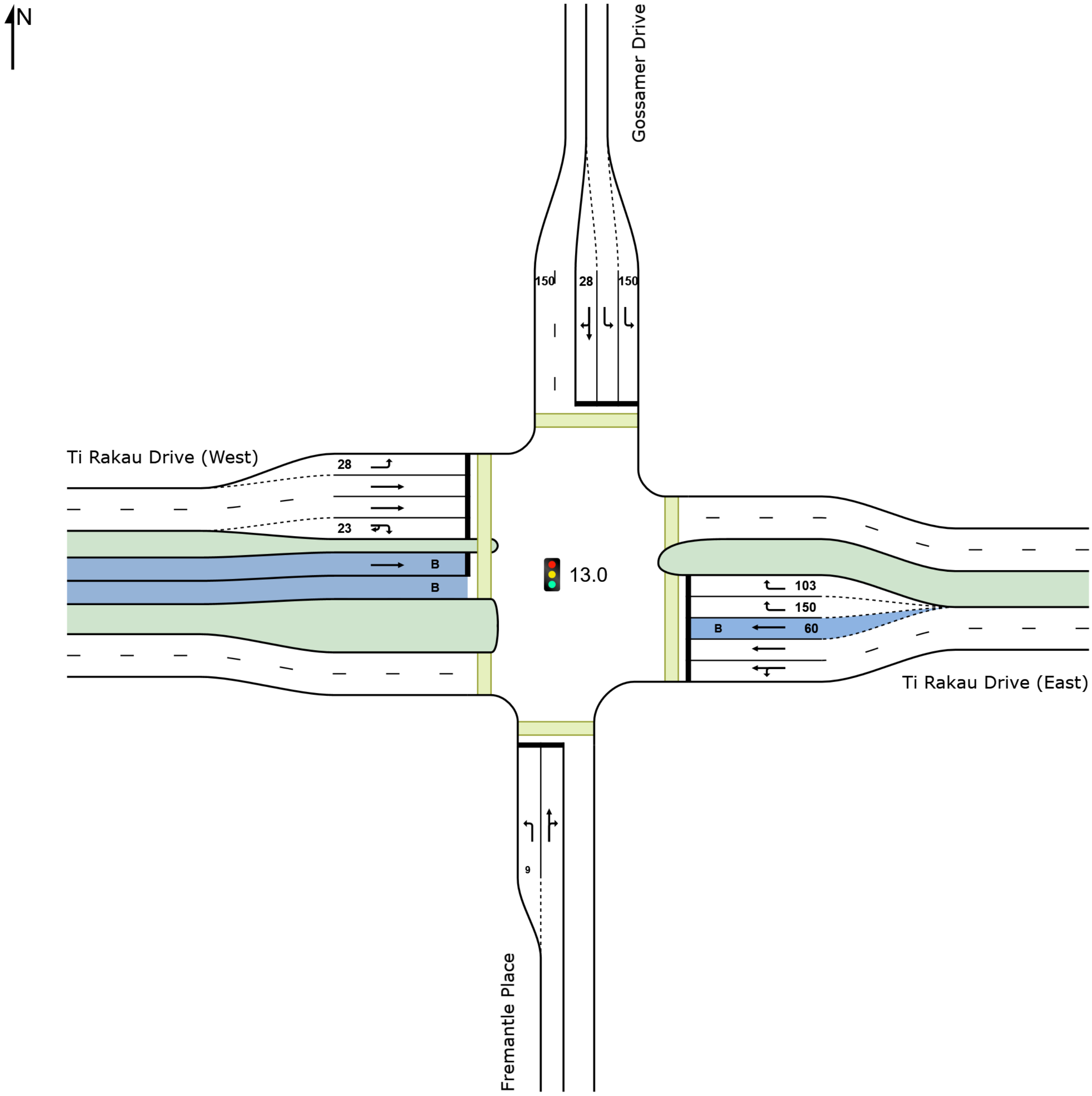
Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SITE LAYOUT

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

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

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



SIDRA INTERSECTION 9.0 | Copyright © 2000-2020 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Created: Wednesday, 15 February 2023 9:30:58 am
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM.sip9

LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 160 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Fremantle Place															
Lane 1	10	0.0	10	0.0	27	0.369	100	98.3	LOS F	0.8	5.5	Short	9	-19.1[N7]	NA
Lane 2	24	4.2	24	4.2	88	0.272	100	87.2	LOS F	1.7	12.3	Full	285	0.0	0.0
Approach	34	2.9	34	2.9		0.369		90.5	LOS F	1.7	12.3				
East: Ti Rakau Drive (East)															
Lane 1	874	7.6	874	7.6	892	0.980	100	74.1	LOS E	69.3	516.7	Full	636	-18.7[N7]	0.0
Lane 2	955	7.6	955	7.6	974[1]	0.980	100	70.0	LOS E	72.6	541.8	Full	636	-10.6[N7]	0.5
Lane 3 (B)	13	100.0	13	100.0	272	0.048	100	37.8	LOS D	0.5	7.1	Short	60	0.0	NA
Lane 4	210	5.6	210	5.6	180	1.168	82[6]	242.5	LOS F	28.1	206.3	Short	150	0.0	NA
Lane 5	257	5.6	257	5.6	180	1.425	100	456.9	LOS F	48.0	351.7	Short	103	0.0	NA
Approach	2309	7.7	2309	7.7		1.425		130.1	LOS F	72.6	541.8				
North: Gossamer Drive															
Lane 1	200	8.7	200	8.7	257	0.779	100	67.7	LOS E	11.2	84.4	Short	150	0.0	NA
Lane 2	202	8.7	202	8.7	259	0.779	100	67.6	LOS E	11.3	85.2	Full	1010	0.0	0.0
Lane 3	101	5.0	101	5.0	78	1.292	100	346.1	LOS F	16.4	119.3	Short	28	-9.0[N7]	NA
Approach	503	8.0	503	8.0		1.292		123.6	LOS F	16.4	119.3				
West: Ti Rakau Drive (West)															
Lane 1	126	4.8	126	4.8	959	0.131	100	12.6	LOS B	2.2	15.8	Short	28	0.0	NA
Lane 2	594	8.1	594	8.1	529[1]	1.123	100	199.7	LOS F	76.2	570.3	Full	479	0.0	30.9
Lane 3	641	8.1	641	8.1	571[1]	1.123	100	198.3	LOS F	81.9	613.1	Full	479	0.0	37.6
Lane 4	53	7.5	53	7.5	140	0.378	100	78.3	LOS E	3.6	26.7	Short	23	0.0	NA
Lane 5 (B)	25	100.0	25	100.0	276	0.091	100	38.3	LOS D	1.1	13.9	Full	479	0.0	0.0
Approach	1439	9.4	1439	9.4		1.123		175.4	LOS F	81.9	613.1				
Intersection	4285	8.3	4285	8.3		1.425		144.2	LOS F	81.9	613.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.

From S To Exit:	W	N	E			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	10	-	-	10	0.0	27	0.369	100	0.0	2
Lane 2	-	10	14	24	4.2	88	0.272	100	NA	NA
Approach	10	10	14	34	2.9		0.369			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	23	851	-	874	7.6	892	0.980	100	NA	NA
Lane 2	-	955	-	955	7.6	974[1]	0.980	100	NA	NA
Lane 3	-	13	-	13	100.0	272	0.048	100	0.0	2
Lane 4	-	-	210	210	5.6	180	1.168	82[6]	95.8	2
Lane 5	-	-	257	257	5.6	180	1.425	100	100.0	4
Approach	23	1819	467	2309	7.7		1.425			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	200	-	-	200	8.7	257	0.779	100	0.0	2
Lane 2	202	-	-	202	8.7	259	0.779	100	NA	NA
Lane 3	-	17	84	101	5.0	78	1.292	100	100.0	2
Approach	402	17	84	503	8.0		1.292			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	U W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	126	-	-	-	126	4.8	959	0.131	100	0.0	2
Lane 2	-	594	-	-	594	8.1	529[1]	1.123	100	NA	NA
Lane 3	-	641	-	-	641	8.1	571[1]	1.123	100	NA	NA
Lane 4	-	-	10	43	53	7.5	140	0.378	100	28.5	3
Lane 5	-	25	-	-	25	100.0	276	0.091	100	NA	NA
Approach	126	1260	10	43	1439	9.4		1.123			

	Total	%HV	Deg.Satn (v/c)
Intersection	4285	8.3	1.425

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
North Exit: Gossamer Drive											

Merge Type: **Zipper**												
Exit Short Lane	1	150	50.0	90	93	2.50	2.00	316	1695	0.186	0.0	0.0
Merge Lane	2	-	50.0	158	162	2.50	2.00	180	1611	0.112	0.0	0.1
West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

Appendix J

Base 2018 Model Update Report

Eastern Busway - Base 2018 Model Update Report

Prepared for Auckland Transport (AT)
Prepared by Beca Limited

28 February 2019

Contents

Appendices

List of Abbreviations

Abbreviation	
ADTA	Auckland Dynamic Traffic Assignment (model)
AFC	Auckland Forecasting Centre
AMETI	Auckland-Manuka Eastern Transport Initiative
AT	Auckland Transport
GEH	Gesellschaft zur Erhaltung alter und gefährdeter Haustierrassen (statistic)
JDF	Junction Delay Function
MSM	Macro Strategic Model
NZTA	New Zealand Transport Agency
QLD	Queensland model (Aimsun model in Australia)
SCATS	Sydney Coordinated Adaptive Traffic System
TPF	Turn Delay Function
VDF	Volume Delay Function
EB	Eastern Busway

Table of Figures

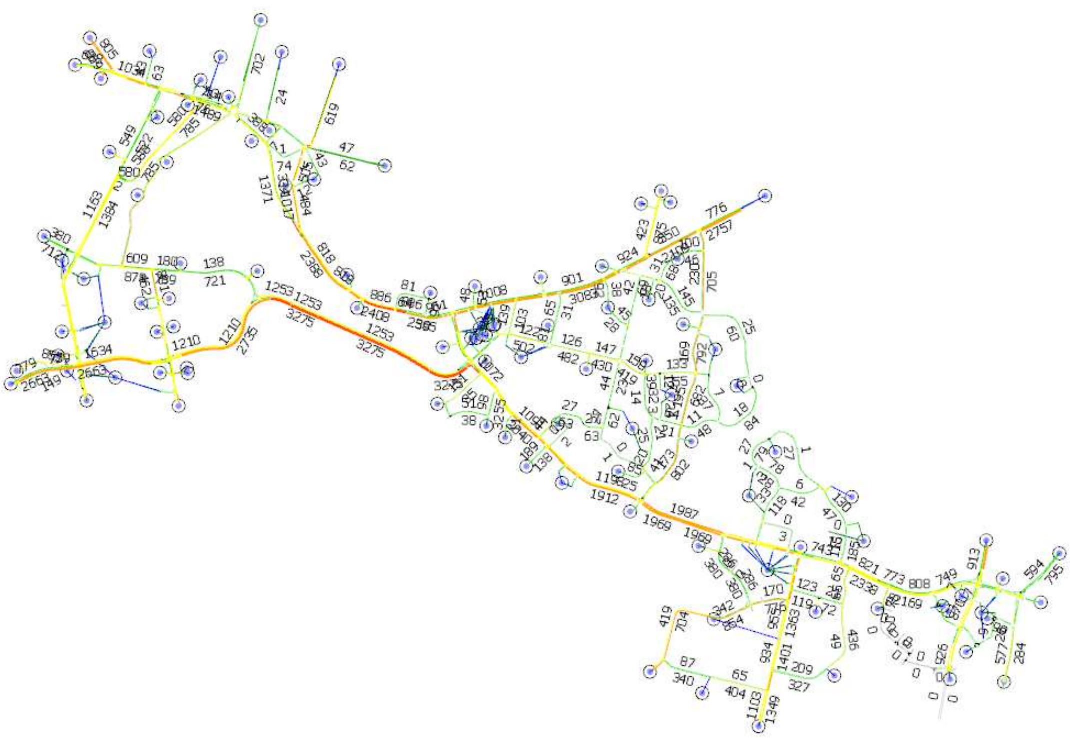


Table of Tables

Revision History

Revision Nº	Prepared By	Description	Date
1.0	**Ling Hoong**	Draft for client comments	1 March 2019

Document Acceptance

Action	Name	Signed	Date
Prepared by	Ling Hoong	Lingzi	1 March 2019
Reviewed by	Caleb Deverell / Nyan Aung Lin	Deverell	1 March 2019
Approved by	Andrew Murray	AMurray	1 March 2019
on behalf of	Beca Limited		

Executive Summary

This report details the update and calibration/validation of the Aimsun model for the Eastern Busway Project. The purpose of this model is to provide a consistent and common base for project developments in the East Auckland Area, primarily along Ti Rakau Drive for the EB 2 and EB3 detailed design work.

The model covers two three-hour peak periods (6.30 am – 9.30 am, and 3.30 pm – 6.30 pm). The modelled periods were chosen to capture the congestion typically experienced in the modelled area.

The model consists of macro and micro tiers with the respective assignment methods: static assignment and microscopic dynamic assignment (DTA). The macro tier provides an interim stage to calibrate the demand through demand adjustment and to generate 80% of paths for the micro DTA. Based on previous modelling of the area, an 80-to-20 split in static versus dynamic path assignment was considered appropriate. This gave better control of modelling route choice in the area and sense-checks during the model development process showed that route distribution in the model is reasonable.

Various observed data were provided by Auckland Transport (AT) for the model development. These included traffic counts, travel time, public transport timing, and signal timing.

The traffic demands come from the AMETI EMME traffic model and were processed before assigning to the Aimsun model. This demand interface process includes a minor refinement of AMETI traffic model zones and application of 2-to-3 hour expansion factors to fit the Aimsun model period. Demand adjustment as part of the validation process was done manually.

The model network was developed in line with the Auckland Dynamic Traffic Assignment Model (ADTA) network coding guideline, which sets out the recommended network coding methodology for Aimsun models in Auckland. This included a standard system of classification and labelling of different turn movement types which were important function variables in the ADTA-developed cost functions also adopted in this model for calculating junction and turn delays.

Model validation showed that the model meets the validation target criteria for Category C: Urban Area in NZTA Model Development Guidelines on individual link flows and turn flows for each hour between 7am – 9am, and 4pm – 6pm. Travel times in the model fit reasonably well with the observed.

Overall, the base year model is considered acceptably calibrated and validated for the purposes of the EB2/3 design work.

1 Introduction

1.1 Background

This report documents the calibration and validation of the Aimsun model to the year 2018.

The Eastern Busway project is focused on developing an integrated multi-modal transport system that supports population and economic growth in East Auckland and Manukau. This involves providing more and better transport choices and aims to significantly enhance the safety, quality and attractiveness of passenger transport, walking and cycling environments.

Beca Ltd (Beca) was commissioned by the Auckland Transport (AT) to update the existing microsimulation model in Aimsun software for testing scenarios relating to the Eastern Busway project. Figure 1 shows the extent of the model. The model was calibrated to 2018 observations and will be used to forecast operational performance for various future scenarios in 2026.

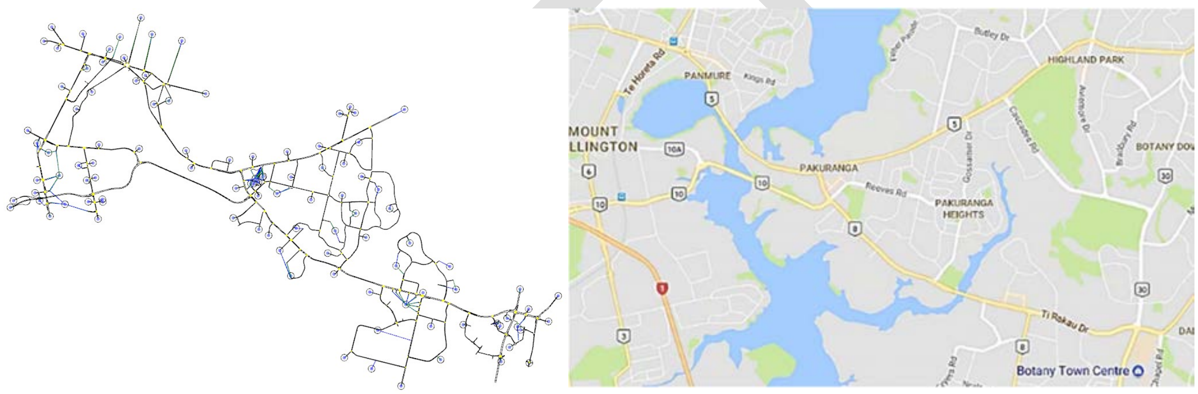


Figure 1 - Snapshot of Aimsun model network and zone structure

1.2 Report Structure

The remainder of this report is structured as follows:

Chapter 2 Describes the model's background and structure;

Chapter 3 Details the model's data inputs;

Chapter 4 Details the model's parameter inputs;

Chapter 5 Presents the calibration and validation results;

Chapter 6 Presents conclusions of this report;

2 Model Background and Structure

2.1 Background and Focus

Previously, an update of the Base model had been undertaken in 2017, focusing on the area around the Panmure Town Centre, including the Panmure roundabout, King's Roundabout and Lagoon Drive, which were of interest for the EB1 project. SCATS and manual traffic counts and observed travel time data were used to validate the model to a 2016 base year for EB1 option-testing.

This update focuses on the EB2/3 corridor which is along Ti Rakau Drive from Pakuranga Highway to Botany (Figure 2). This base year for this model update is 2018 where 2018 input demand were sourced from the AMETI traffic model and calibration/validation process used 2018 counts and travel time information.

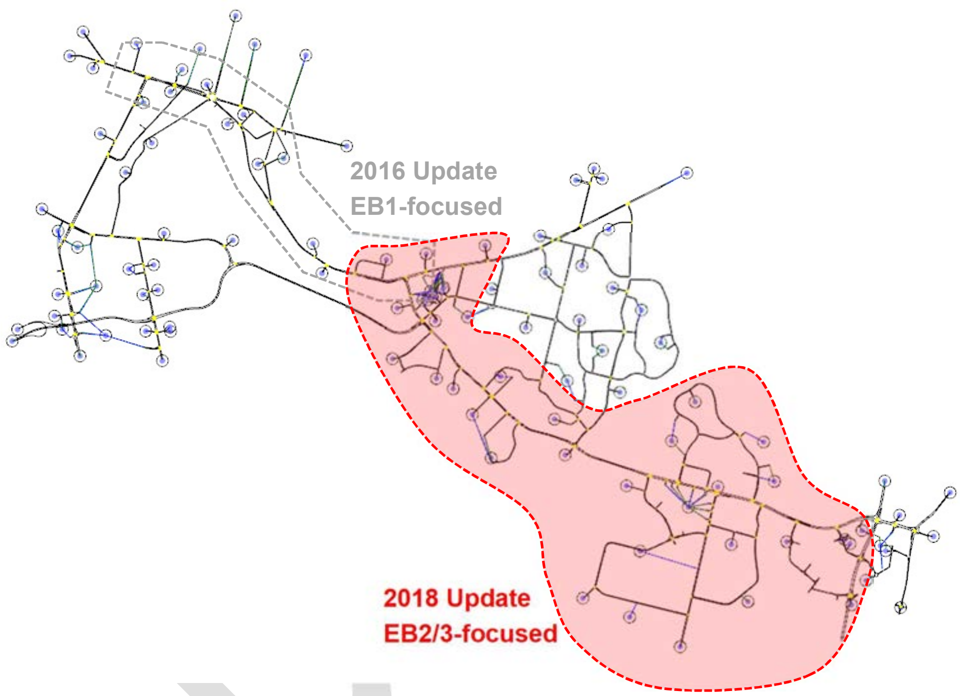


Figure 2 - Aimsun model focus areas: 2016/ EB1-focused (grey) and 2018/ EB2/3-focused (red)

2.2 Model Structure

The Aimsun model follows the hierarchical modelling structure that has been used successfully on other major projects in Auckland since the early 1990's. This involves the following three components:

- A strategic multi-modal **Demand (Macro Strategic Model, MSM)** model (an EMME model developed by AFC) that relates forecast land use (such as population and employment), to travel patterns at a strategic, region-wide level;
- A **Traffic Assignment** model (an EMME model developed by Arup) that has a more refined network representation for the wider study area. It takes the demand matrices from the Demand model and is calibrated to match traffic conditions particularly in the study area of interest. This model provides the cordon matrices for the Project Operational model.
- A **Project Operational** model (an Aimsun model and the focus of this report) that has a more refined network in a smaller project area. This model loads the vehicle trip patterns predicted by the assignment model onto the road network to test various options and investigate the traffic effects at a more detailed level.

It is the **project operational** model, developed in Aimsun that is detailed in this report.
The **demand** model was developed in EMME and is the Macro Strategic Model (MSM) developed by AFC. Also AMETI traffic assignment model was developed in EMME software.

The overall model structure is shown schematically in Figure 3 which comprises a hierarchical structure with the MSM model providing the multi-modal demand forecasts, and the EMME traffic assignment model and the Aimsun project model used for assignment and network performance modelling.

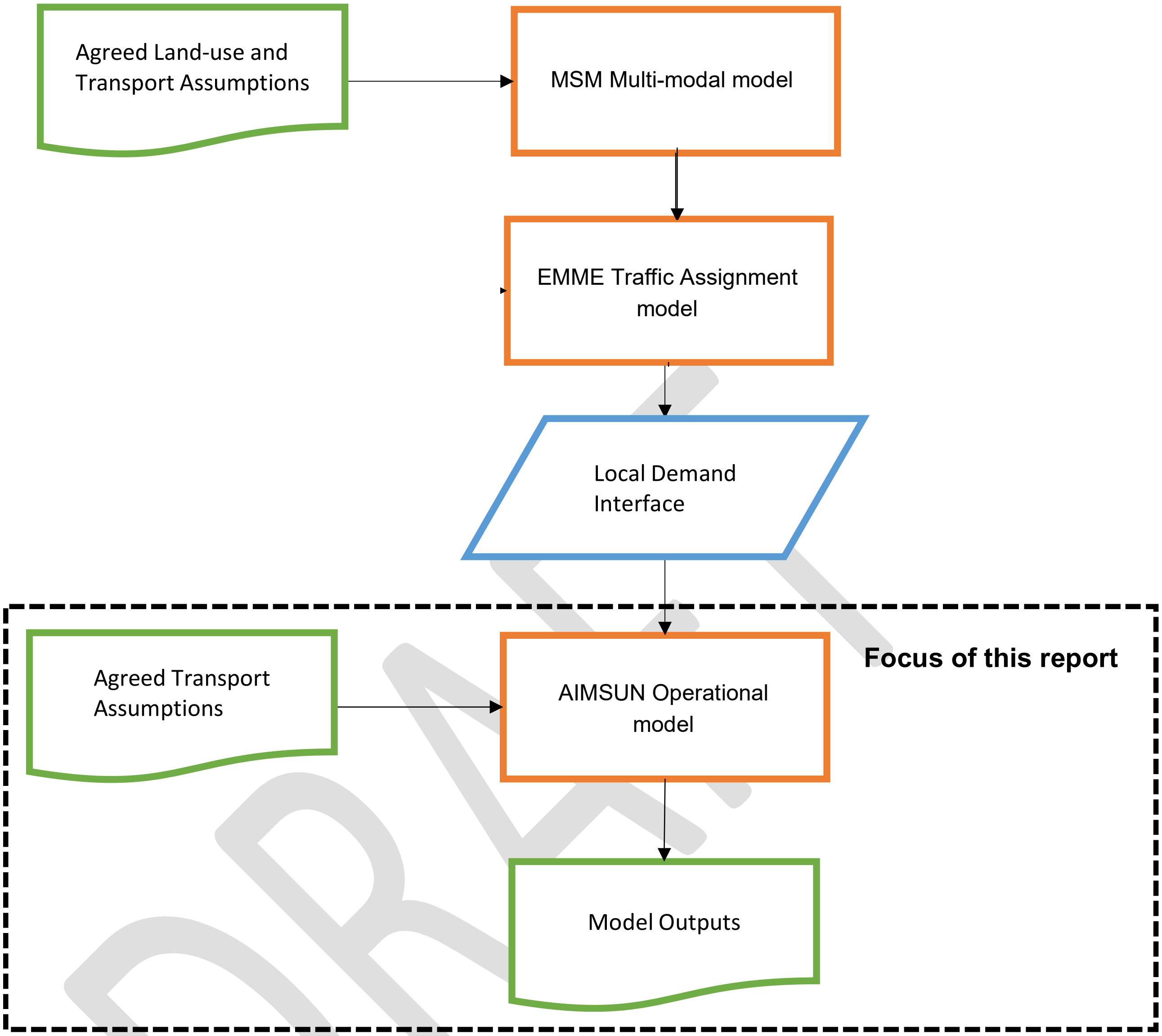


Figure 3 - Model Structure

2.2.1 MSM Demand Model

The MSM model is a traditional 4-step multi-modal model. The original model was developed for the year 2006, using the 2006 Census data and observed travel data. The model was updated in 2017/ 2018 using Census data from 2013, and validated to 2016 conditions. Separate models exist for the morning and evening commuter peaks and weekday inter-peak periods.

The model itself comprises the following key modules:

- **Trip Generation**. This is where the number of person-trips are estimated as a function of the land use data (population, employment, school roll etc.);
- **Mode Choice.** This is where the choice of preferred travel mode is determined, based on the relative attractiveness of the various modes. The key modes are car-driver, car passenger, bus passenger, train passenger and ferry passenger. A process is used to also consider 'slow' modes, such as walking and cycling;

- **Trip Distribution.** This is where the trips produced in each zone (generally by the households), are matched to a preferred destination. This distribution is predicted as a function of the relative attractiveness of each destination zone (generally related to employment), and the travel costs to reach each destination;
- **Time of Day.** This is where the proportion of daily trips occur in each peak. The proportion occurring in each peak changes in future-year models in response to the changes in travel time and costs; and
- **Trip Assignment**. This is where the resulting travel demands, in the form of origin to destination trip tables, are loaded to the road and public transport networks. An iterative process is used to firstly identify the lowest-cost route between each origin and destination, followed by an estimation of the speeds and delays on each route associated with the predicted traffic flows on the route.

The MSM model is operated by AFC and is implemented in the EMME software, which is a well-used and proven platform for this kind of analysis.

It is therefore the MSM model that predicts the overall regional traffic patterns, based on the inputs and forecasts of population and employment growth, together with the assumed level of road and public transport infrastructure.

The MSM standard model years are 2016, 2026 and so on. To get the 2018 regional demand, a demand interpolation process was undertaken between 2016 and 2026 scenarios. The 2016 scenario is the validated MSM base year scenario. As part of this project, a 2026 scenario was developed using the today network layout and bus service patterns.

2.2.2 EMME Traffic Assignment Model

This model was originally developed by Arup in 2010 and was peer-reviewed. This peer-reviewed model was used as the traffic assignment model for the previous AMETI project. The model takes its traffic demands from the MSM model and has the same model extent as MSM but has a more refined network representation in the wider study area of interest (Manukau and Auckland City areas). A zone refinement process was undertaken as an interface between the MSM and traffic assignment models.

2.2.3 Aimsun Operational Model

The Aimsun model is only a traffic operational model in that it takes the localised traffic demands from the EMME traffic assignment model, assigns them to the road network and tests the operation of the network. Land use data is not directly used in this part of the model, and it only considers vehicle traffic i.e. it represents bus vehicles but not passengers.

2.3 Model Time Period

The Aimsun model models two peak periods:

- AM: 6.30am – 9.30am
- PM: 3.30pm – 6.30pm

The traffic counts and typical traffic conditions were evaluated to determine that these time periods are suitable to capture the peak traffic on the network and ending at a time when traffic cooldown is typically observed. Each peak consists of a 15 minute warm-up prior to the peak start time in order to generate an appropriate level of demand inside the network before the official start of the peak.

3 Model Data Inputs

3.1 Network

Most of the road network was formed from the previous version of the Aimsun model (updated for 2016 base year). Additional road network was added in around Cryers Road and Burswood Road in the South East area of the model. Further refinements or error-checking over the whole model were conducted based on ADTA network coding conventions (Ref. 160520_DTA_Template_JMAC_v2.1.3). Network parameters are detailed in Chapter 4.1.

3.2 Demand

The initial demand was from the AMETI assignment model (refer to Chapter 2.2.2) and restructured to match the zone structure in the Aimsun model.

3.2.1 Demand Expansion

The two-hour to three-hour demand expansion factor for each peak was 1.38. This has been applied to the two-hour EMME demands to create a three-hour demand as a starting point for model calibration/validation.

3.2.2 Zone Disaggregation

As discussed earlier, most of the zone refinement was undertaken between the MSM and AMETI traffic assignment models. Only a very limited zone was further refined in the demand interface process between the AMETI traffic and Aimsun models. This process was retained from the previous base model 2016. A zone to zone correlation table is provided in Appendix A.

3.2.3 Demand Release Profiles

For developing traffic release profiles, the zones in the Aimsun model were grouped into six sectors: Panmure, West, Internal, North, East and South (Figure 4). Within the Internal sector, a subset of zones was created to separately represent the region nearest the Panmure Bridge and assigned its own demand profile.

Figure 5 and Figure 6 show the sector-to-sector profiles applied in the Aimsun model. Traffic count profiles at key locations on the network were used as a guideline to develop these demand profiles.

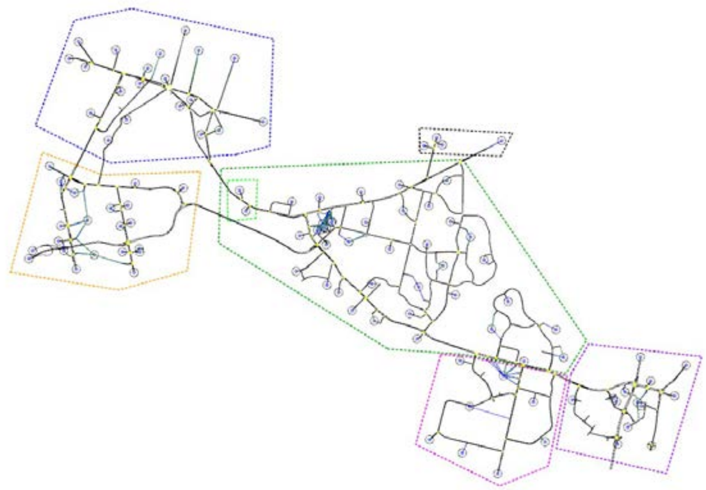


Figure 4 - Aimsun model sectors: Panmure (blue), West (yellow), Internal (dark green) with Panmure Bridge subset (light green), North (black), South (Pink), and East (purple)

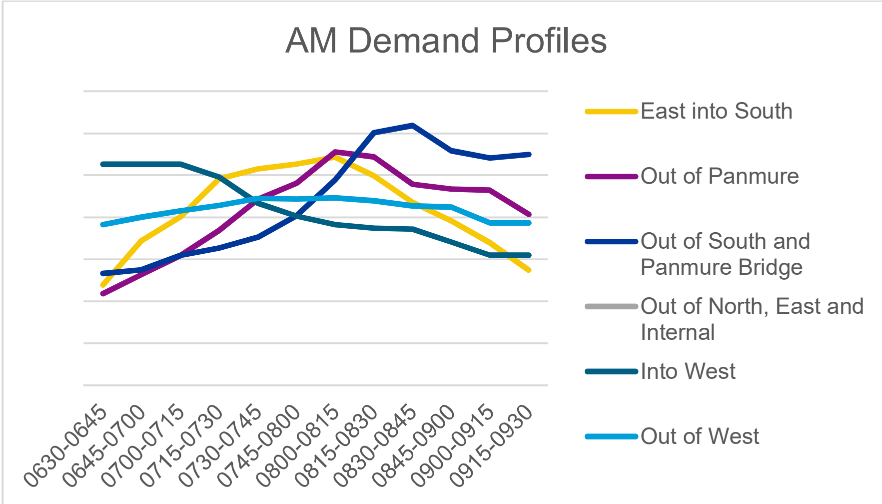


Figure 5 - AM Demand Profiles

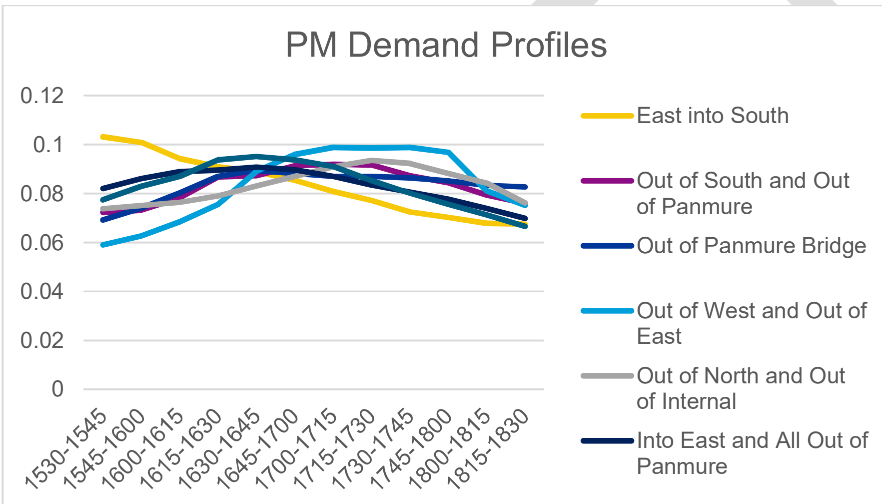


Figure 6 - PM Demand Profiles

3.3 Count Data

All count data for 2018 were provided by AFC, including SCATS detector counts and some manual counts. The locations of these counts used for link validation and turn validation (refer to Chapter 5) are shown in Figure 7 and Figure 8 respectively.

Link validation data was based on the average SCATS data of Tuesdays to Thursdays in March 2018. Turn validation data was based on the average of manual counts taken between Tuesday 12 June 2018 to Thursday 14 June 2018.

A sense-check of count continuity across the network was carried out and only counts that were consistent with adjacent counts were retained. This consisted of the majority of counts. All manual turn counts were checked for continuity with adjacent relevant SCATS counts and all were retained regardless of continuity since manual counts are considered more robust in general and these had been specifically provided by AFC for turn validation in the focus area. All counts used in validation were used as-is, without any further smoothing or processing.

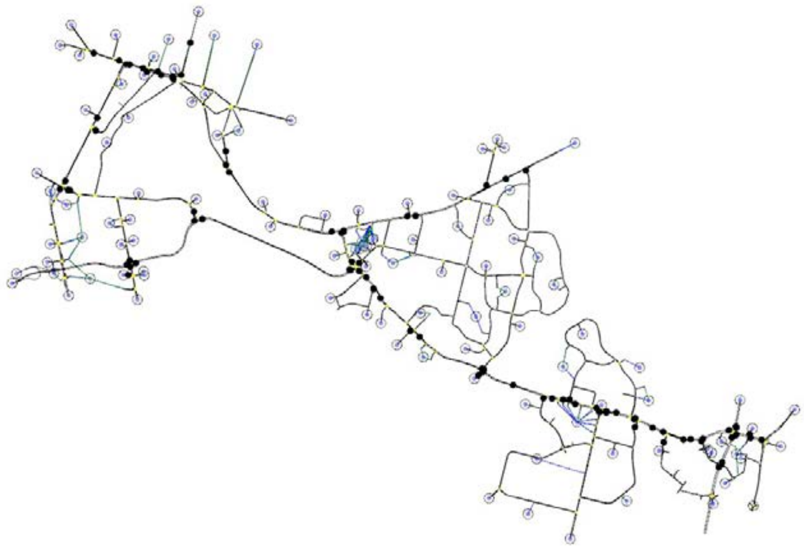


Figure 7 - Count locations used for link validation

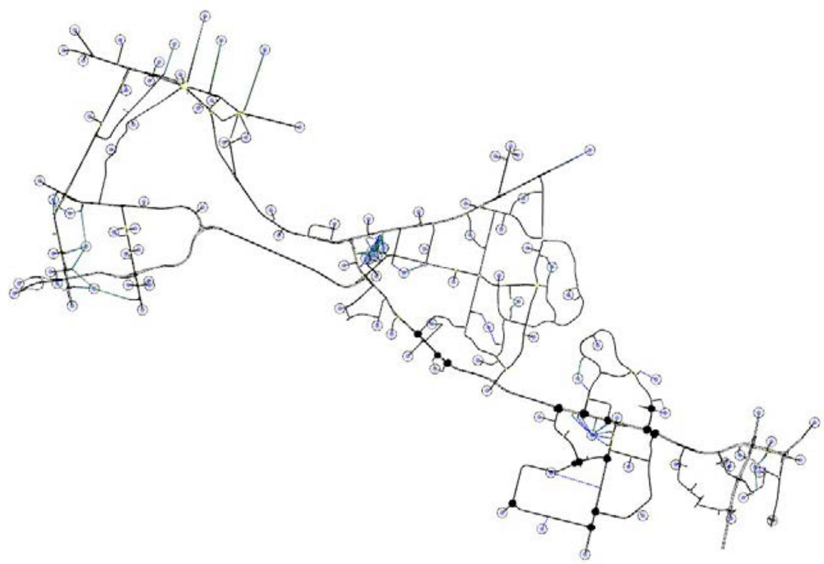


Figure 8 - Count locations used for turn validation, specifically for the model's focus area

3.4 Travel Time Data

The general traffic travel time data for key routes on the network (Figure 9) of Tuesdays to Thursdays in June 2018 was provided by AFC as summarised by Snitch GPS data. The full routes were provided in segments in order to understand the travel time and condition along the route. Following a sense-check of the travel times on Google, only the mean travel time on Ti Rakau Drive between Pakuranga Road and Pakuranga Highway was adjusted. All other travel times were accepted and retained for use in the validation.

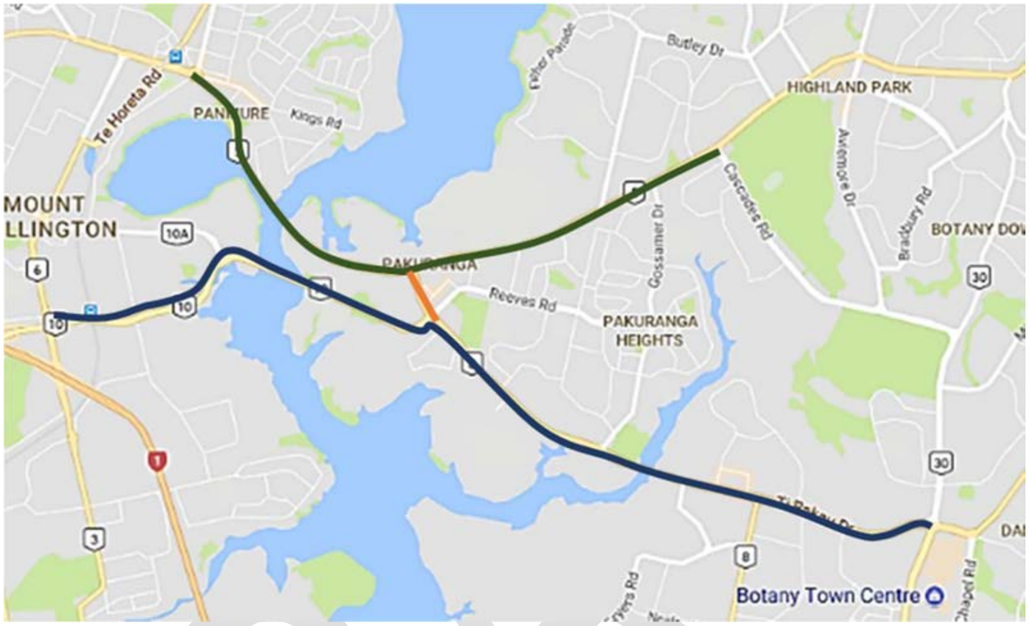


Figure 9 - Travel time routes from Snitch GPS data for reporting travel time validation in Chapter 5

3.5 Public Transport Data

All bus schedules and bus routes were obtained from the Auckland Transport (AT) website. Bus dwell time at bus stops were fixed at 30 sec mean stop time and deviation of 5. Bus travel time data was provided by AFC for March 2018 which included detailed timing of when each bus arrives and leaves each bus stop for each route. Following a sense-check of the travel times calculated from the raw data against AT's Journey Planner App, the average and maximum travel time of the routes were adjusted. The full list of bus services in the model is provided in Appendix D.

3.6 Signal Timing Data

The SCATS signal timing data of 7 March 2018 was provided by AFC for every signalised intersection within the model area. This was used to derive the signal timing coded into the model.

Average of maximum and minimum green times was used to develop the actuated control plan used in the dynamic assignment and initially used in the static assignment. During the model development process, it was noted that a fixed signal plan was more appropriate for model stability in the static assignment. Average green time from the single-day SCATS data was used as a starting point for developing the fixed control plan. Priority was placed on obtaining realistic turn delays and ensuring appropriate route choice distribution across the network rather than strict adherence to the average green times reported from that single day.

4 Model Parameter Inputs

4.1 Network Parameters

4.1.1 Road-Type Parameters

Road type distribution on the model network is summarised in Figure 10. Road type parameters were mostly retained from the ADTA model and provided in Appendix B. Adjustments were made to user-defined cost, third user-defined costs and capacity as part of the calibration process of route choice on the network. Lane-changing cooperation was also adjusted on certain road types to reflect the level of congestion as seen on Google’s traffic view modes, and the travel time data.

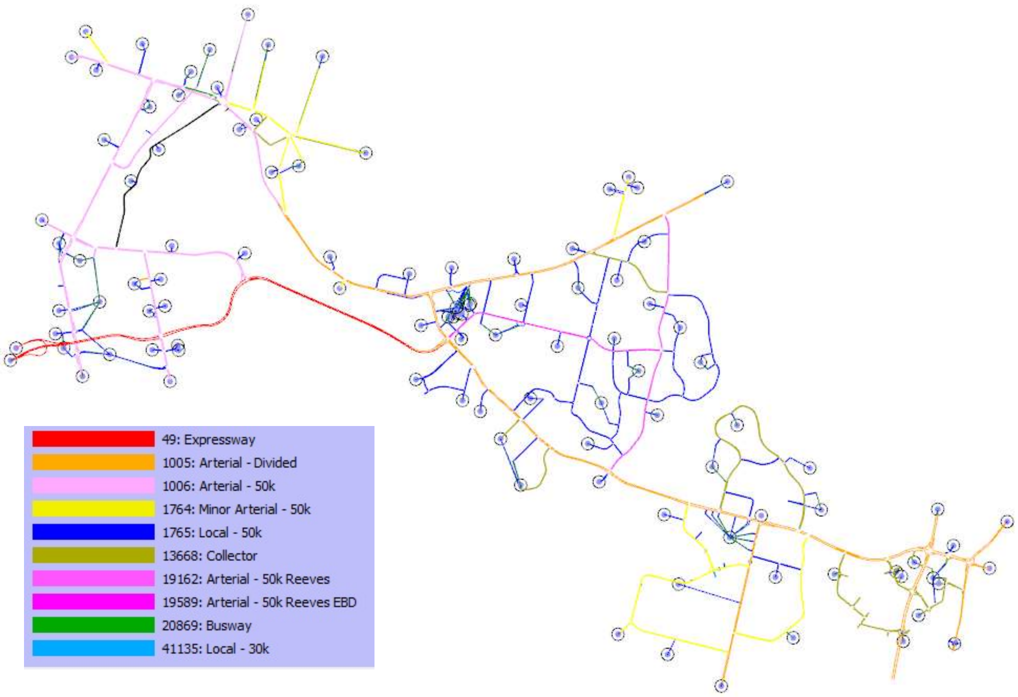


Figure 10 - Road Type Definition in the Aimsun Model

4.1.2 Attribute Overrides

The parameters of some sections and turns were controlled during assignment runs using Aimsun's attribute override functionality. This approach allows parameter values to be adjusted to a value more suitable than the default calculations at a particular section or turn. The parameter values that have been adjusted using attribute overrides are:

- Section maximum speed
- Turn capacity
- Turn look-ahead distance
- Lane-changing cooperation

The full list of these attribute overrides applied in the model is provided in Appendix E.

4.1.3 Traffic Management

Traffic management schemes on the network were applied using Aimsun's traffic management functionality. This approach also allows certain conditions of the road to be applied when they are typically observed during the modelled period and not necessarily throughout the period. Traffic management schemes in the model applied are:

- Panmure Bridge Eastbound Lane Closure: 1 Lane Closed, 6 am – 11 am
- Panmure Bridge Westbound Lane Closure: 1 Lane Closed, 3 pm – 8 pm
- Pakuranga Highway Maximum Speed Change to 55 km/h: 7.15 am – 8.45 am
- Pakuranga Highway Maximum Speed Change to 60 km/h: 4.15 pm – 6.15 pm

Ideally the speed reduction on Pakuranga Highway should be reflected by the model response, rather than the inputs. However this behaviour is hard to replicate in the model due to the unique nature of the road. For example, there is a hidden queue extended from the Pakuranga Highway and Carbine Road intersection to the Wipuna Road in the AM peak. The local drivers reduce their speeds on the bridge accordingly as they know there is a hidden queue in the downstream at the sharp corner. This traffic management inputs were not introduced in this update, they area inherited from the previous model.

4.2 Vehicle Parameters

Vehicle parameters were determined based on comparison and sensitivity testing with those adopted in existing Aimsun models such as ADTA (AFC), and QLD (Aecom) as well as input from the NZTA Axel Classification system. List of key vehicle parameters in the model are provided in Appendix C.

4.3 Cost Calculation

All functions related to calculating the cost of travel time and travel distance in the model were adopted from the ADTA model and used in the static assignment only. The travel time component consists of 1) link travel times, represented by a Volume Delay Function (VDF) on Sections, and 2) delays associated with making a turn at an intersection, represented by a Turn Penalty Function (TPF) and Junction Delay Function (JDF). Cost function scripts used in the model are provided in Appendix G.

The travel distance component reflects perceived vehicle operating costs and helps stabilise the traffic assignment.

4.3.1 Volume Delay Function

The VDF is based on the Akçelik VDF, which is widely adopted by strategic models in New Zealand, including MSM. Its formulation is as follows:

$$\mathbf{t=t_0\,\{1 + 0.25r_f\,[z + (z_2 + 8J_Ax \,/\, (Qt_0r_f\,))_{0.5}\,]\}}$$

where:

t = average travel time per unit distance (seconds per km)

t0 = free flow travel time per unit distance (seconds per km)

J_A = Akçelik friction parameter

z = x – 1

x = q / Q = degree of saturation

q = demand flow rate (pcu/hr)

Q = capacity (pcu/hr)

rf = the ratio of flow period to minimum travel time

The distance component, which is added to the travel time cost, is as follows:

d= df x rf x L

where:

d = the distance cost

df = distance factor (0.5 for cars and 1.0 for Trucks)

rf = road type factor

L = length of the section

This function was applied to every Section in the model, including centroid connectors. Different values of free flow speed, link capacity and Akçelik friction factors were defined by road type using Section attributes (Appendix B).

4.3.2 Intersection Delays – Signalised Movements

Aimsun provides default TPFs for signalised turning movements based on their respective green time split, adopting the procedures from Chapter 18 of the Highway Capacity Manual (HCM) 2010.

This procedure requires a movement capacity as an input and in the model this was estimated based on the following formula:

$$Q = Q_s \times l \times g / C$$

where:

Q = capacity of the turning movement (pcu/hr)

Q_s = saturation flow at signal for the turning movement (pcu/hr/lane)

l = number of lanes for the turning movement

g = green time for the turning movement

C = cycle time at the signal

The saturation flow Qs estimation was adopted from the ADTA model and is based on the relationship between saturation flow and turning speed from simulation tests conducted in Aimsun (Figure 11).

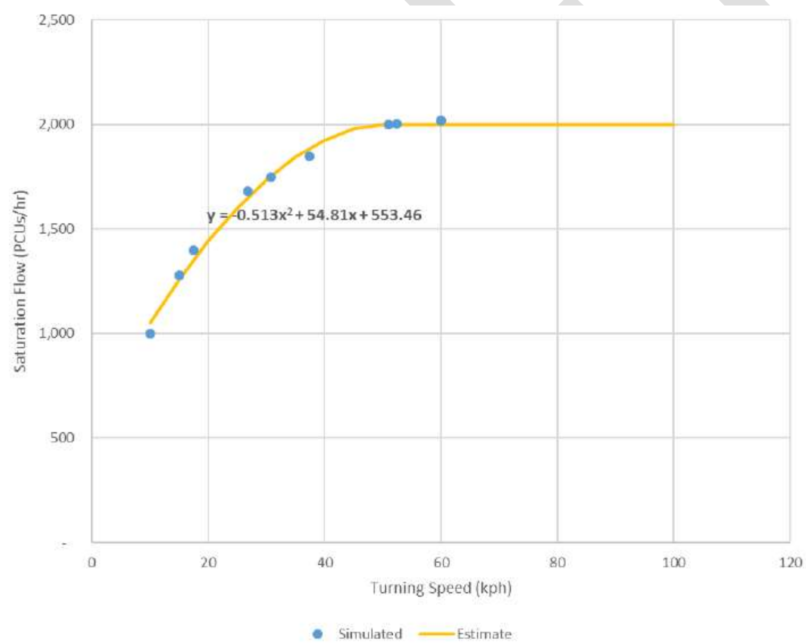


Figure 11 - Adopted Relationship between Signal Saturation Flow and Turning Speed. The line of best fit through the simulated saturation flows for turning speeds between 10 and 50 km/hr, where 10 km/hr is the minimum turning speed applied in ADTA. The saturation flow was capped at 2,000 pcu/hr/lane for turning speeds higher than 50 km/hr.

4.3.3 Intersection Delays – Priority Movements

Delays at priority-controlled intersections were represented by JDFs.

Relationships between the capacity of priority movements and the opposing flow were estimated using a linear relationship:

$$Q = Q_s - r \times f_o$$

where:

Q = capacity of the turning movement (pcu/hr)

Q_s = saturation flow for the turning movement i.e. capacity of the turning movement at zero opposing flow (pcu/hr); intercept

r = the rate at which the capacity decreases as opposing flow increases; slope

f_o = the flow opposing this turning movement (pcu/hr)

The resulting turn capacity **Q** was applied to the Akçelik VDF formula from Chapter 4.3.1 assuming a friction factor of 1.0 to calculate the corresponding turning delay for the priority movement.

The calibrated capacity intercepts and slopes for all priority turning movement types as used in the ADTA model is provided in Appendix F.

4.4 Model Assignment Parameters

4.4.1 Assignment Methodology

Based on previous modelling, an 80-to-20 split in static versus dynamic path assignment was considered appropriate for the microscopic simulation. This gave better control of modelling route choice in the area and sense-checks during the model development process showed that route distribution in the model was reasonable and supported the use of the method.

4.4.2 Static Assignment Parameters

Table 1 shows the key parameters of the static assignment used in the Aimsun model.

Table 1 - Key Static Assignment Parameters

Static Assignment Parameters	
Assignment Engine	Frank and Wolf Assignment
Maximum Iterations	50
Relative Gap	0.1 %

4.4.3 Dynamic Assignment Parameters

All dynamic assignment parameters (Table 2 and Table 3) were determined based on comparison and sensitivity testing with those adopted in existing Aimsun models such as ADTA (AFC), and QLD (Aecom).

Table 2 - Key Dynamic Assignment Parameters

Dynamic Assignment Parameters		
Main		
Network Loading	Microscopic Simulator	
Assignment Approach	Stochastic Route Choice	
Using Warm-Up	(5% of demand, 15 min)	
Using a Saved Initial State	No	
Attributes Overrides	(refer to Appendix E)	
Performance Settings:		
Simulation Threads	4	
Route Choice Threads	4	
Behaviour		
Car Following:		
Two-Lane Car-Following Model	No	
Apply Slope Model	No	
Lane Changing:		
Distance Zone Variability	40%	
Two-Way Two-Lane Overtaking Model	No	
Queue Speeds:		
Queue Entry Speed	1 m/s	
Queue Exit Speed	1 m/s	

Table 3 - Key Dynamic Assignment Parameters continued

Dynamic Assignment Parameters					
Reaction Time					
Simulation Step	0.8 sec				
Reaction Time Settings	Fixed				
Reaction Time at Stop	1.15 sec				
Reaction Time at Traffic Light	1.35 sec				
Arrivals					
Global Arrivals	Normal				
Dynamic Traffic Assignment					
Costs:					
Cycle	5 min				
Number of Intervals	3				
Attractiveness Weight	5				
User-Defined Cost Weight	1				
Use Link Costs from Replication	None				
Group Route Choice Intervals	No				
Fixed Routes:	Following OD Routes	Following Input Path Assignment			
Car	100%	80%			
Truck	100%	100%			
Max. Paths to Use From Input Path Assignment	All				
Stochastic Route Choice:					
Model	C-Logit				
Enroute	No				
Enroute After Virtual Queue	No				
Stochastic Route Choice - Basic:					
Path Calculation	Source	Max. Number of Initial Paths to Consider			
	K-SP	1			
Max. Paths per Interval	For All Veh	3			
Stochastic Route Choice – Parameters:	Origin	Destination	Scale	Beta	Gamma
	All	All	12	0.15	1

5 Calibration and Validation Results

5.1 General Approach

Calibration and validation for the model were undertaken with reference to criteria for Category C: Urban Area in NZTA Model Development Guidelines (Criteria) on individual link flows, turn flows and travel time for each hour between 7am – 9am, and 4pm – 6pm.

Adjustments to demand and network during the calibration process were carefully considered with respect to implications on model response and forecasting.
Several sense-checks were made as part of the calibration process including checks on route-choice, turn delays in the static assignment, demand profiles, HCV counts and visual congestion on the network.

5.2 Demand Adjustment

5.2.1 Manual Adjustment

All demand adjustments for the model were done manually and summarised in Table 4 - Table 9. During the demand adjustment, care was taken to retain the demand distribution from the strategic model. Adjustments were made to resolve majority of the network issues in the first instance, before demand adjustments were made.

Table 4 – AM Post-Adjusted Sector-to-Sector Demands

	East	Internal	North	South	Panmure	West	
East	3,465	1,664	210	6,545	940	2,889	15,713
Internal	965	1,101	1,160	1,922	1,570	2,769	9,487
North	520	1,301	0	860	4,128	3,451	10,260
South	3,716	1,268	90	2,865	374	499	8,811
Panmure	493	558	982	448	4,957	5,700	13,137
West	1,177	1,001	1,039	992	3,931	8,024	16,164
	10,336	6,892	3,481	13,632	15,900	23,331	73,572

Table 7 - PM Post-Adjusted Sector-to-Sector Demands

	East	Internal	North	South	Panmure	West	
East	4,374	2,299	916	3,808	1,104	1,881	14,382
Internal	2,293	1,224	1,867	1,239	733	1,431	8,787
North	131	1,582	0	169	1,296	1,319	4,498
South	8,000	2,248	229	3,166	873	793	15,310
Panmure	928	1,671	3,528	507	4,548	4,777	15,958
West	1,867	3,065	4,493	375	5,892	7,621	23,314
	17,592	12,089	11,033	9,264	14,447	17,823	82,249

Table 5 - AM Sector-to-Sector Demand Adjustment

	East	**Internal**	**North**	**South**	**Panmure**	**West**	Total
East	-651	-77	-37	21	74	217	-454
Internal	-506	-68	17	-180	-154	12	-880
North	-397	-50	0	-104	-576	0	-1,128
South	-537	-192	-185	64	2	117	-731
Panmure	-99	-85	230	-417	-1,187	-433	-1,991
West	-25	-6	-3	172	-198	-276	-336
Total	-2,216	-478	22	-444	-2,040	-364	-5,520

Table 8 - PM Sector-to-Sector Demand Adjustment

	East	**Internal**	**North**	**South**	**Panmure**	**West**	Total
East	800	420	162	-218	420	299	1,882
Internal	-216	-21	566	-348	-131	-36	-185
North	-370	356	0	-341	99	-432	-688
South	11	378	-471	599	134	126	778
Panmure	-216	42	976	-129	-335	425	763
West	2	593	-269	-20	141	-1,035	-586
Total	11	1,768	964	-456	329	-653	1,963

Table 6 - AM Sector-to-Sector Demand Percent Adjustment

	East	Internal	North	South	Panmure	West	Total
East	-16%	-4%	-15%	0%	8%	8%	-3%
Internal	-34%	-6%	2%	-9%	-9%	0%	-8%
North	-43%	-4%	0%	-11%	-12%	0%	-10%
South	-13%	-13%	-67%	2%	1%	30%	-8%
Panmure	-17%	-13%	31%	-48%	-19%	-7%	-13%
West	-2%	-1%	0%	21%	-5%	-3%	-2%
Total	-18%	-6%	1%	-3%	-11%	-2%	-7%

Table 9 - PM Sector-to-Sector Demand Percent Adjustment

	East	Internal	North	South	Panmure	West	Total
East	22%	22%	21%	-5%	61%	19%	15%
Internal	-9%	-2%	44%	-22%	-15%	-2%	-2%
North	-74%	29%	0%	-67%	8%	-25%	-13%
South	0%	20%	-67%	23%	18%	19%	5%
Panmure	-19%	3%	38%	-20%	-7%	10%	5%
West	0%	24%	-6%	-5%	2%	-12%	-2%
Total	0%	17%	10%	-5%	2%	-4%	2%

5.2.2 Turn Delay Check

Turn delays from the static assignment were monitored to ensure that no major delays were adversely affecting path assignment and route distribution, as well as to gauge model stability.

To facilitate stability of the static assignment, a fixed signal control plan was used (whereas an actuated control plan was used in the dynamic assignment). Priority was placed on reducing turn delay and ensuring appropriate route choice distribution across the network rather than strict adherence to the maximum green times reported from the single-day SCATS data.

5.3 Static Assignment Results

5.3.1 Convergence

The static assignment for each modelled period was stable and attained the relative gap (rgap) before 50 iterations (Figure 12 and Figure 13). 80% of the path assignments from the static assignment was set to be retained during the dynamic assignment.

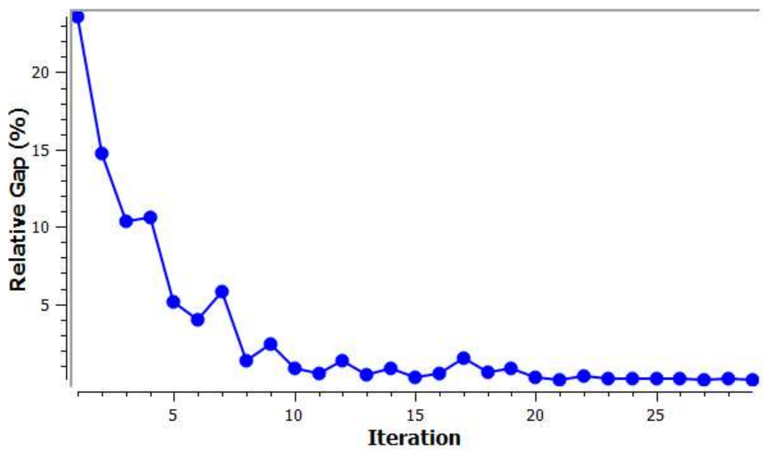


Figure 12 - AM Peak Static Assignment Convergence

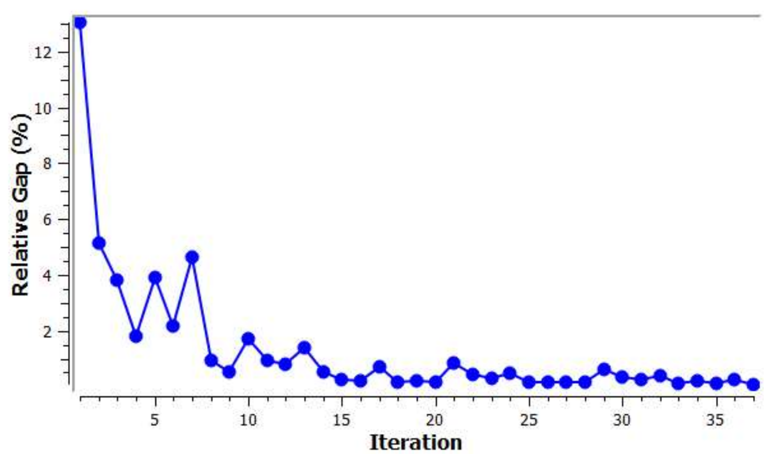


Figure 13 - PM Peak Static Assignment Convergence

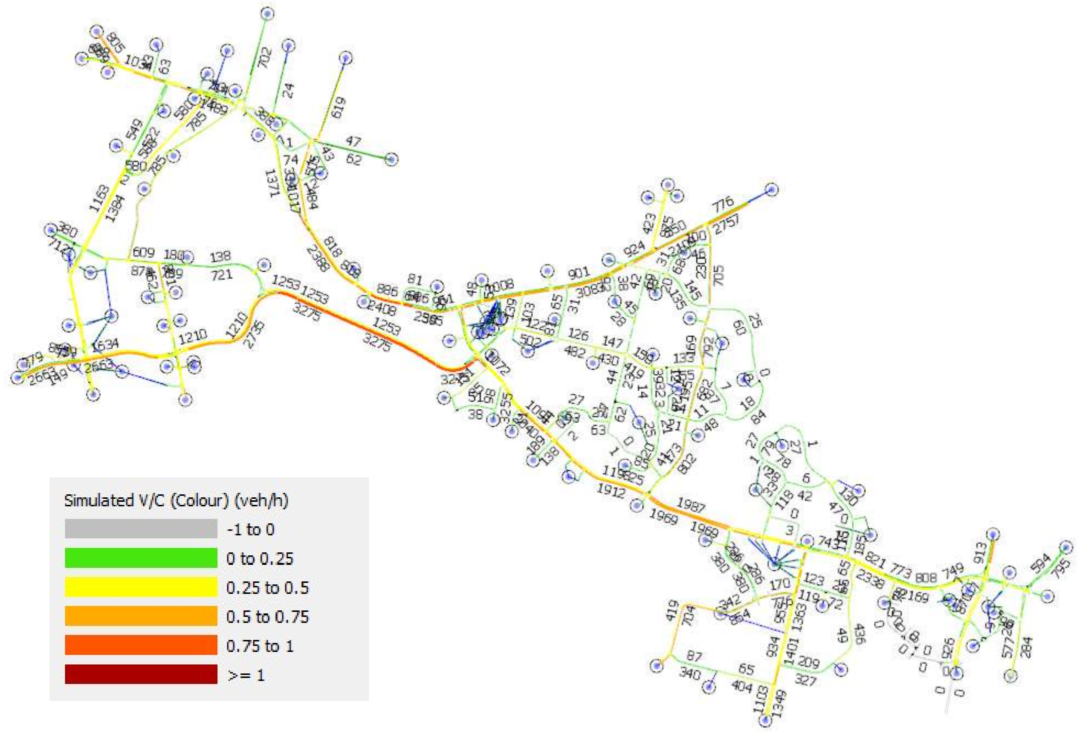


Figure 14 - AM Peak Assigned Flow in PCU/hr (6.15 am – 9.30 am)

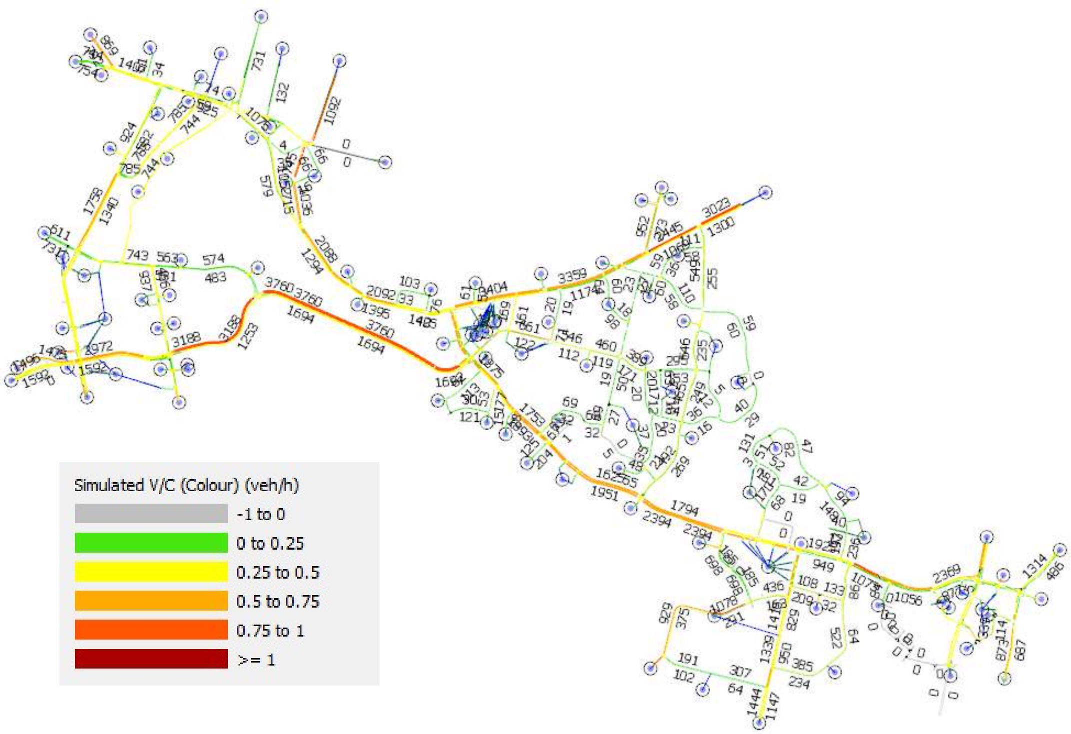


Figure 15 - PM Peak Assigned Flow in PCU/hr (3.15 pm – 6.30 pm)

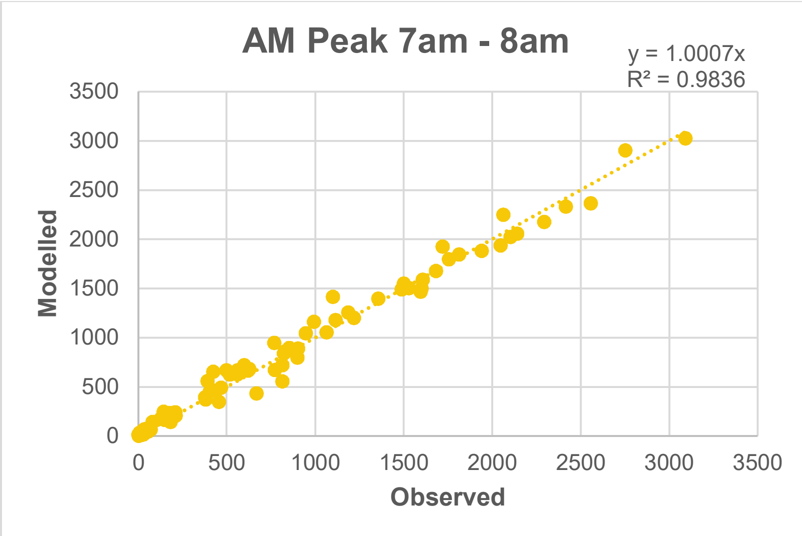
5.4 Validation Results

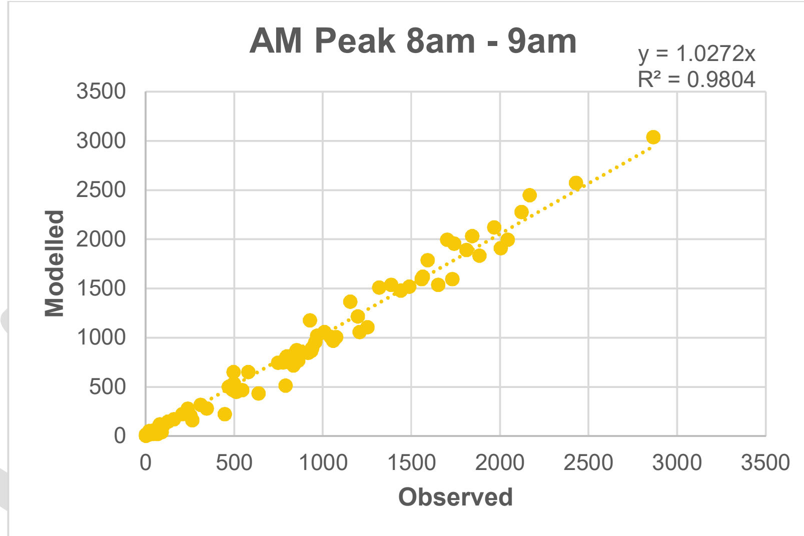
5.4.1 Link Counts Validation

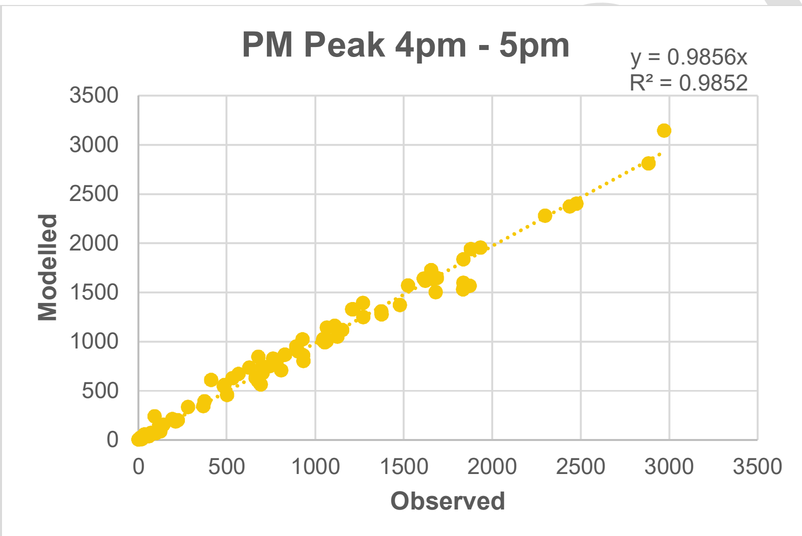
Results for individual link counts (Table 10 and Figure 16) network-wide show that the model satisfies the validation criteria for GEH, R^2 and RMSE.

Table 10 - Summary of Individual Link Counts Validation Results across Network

	AM (%)		PM (%)		NZTA Guideline
	7am - 8am	8am - 9am	4pm - 5pm	5pm - 6pm	Category C
GEH <5	85	85	91	87	>80%
GEH <7.5	94	95	98	99	>85%
GEH <10	99	98	99	100	>90%
R^2	0.98	0.98	0.99	0.99	>0.95
RMSE	12	13	10	9	<20%







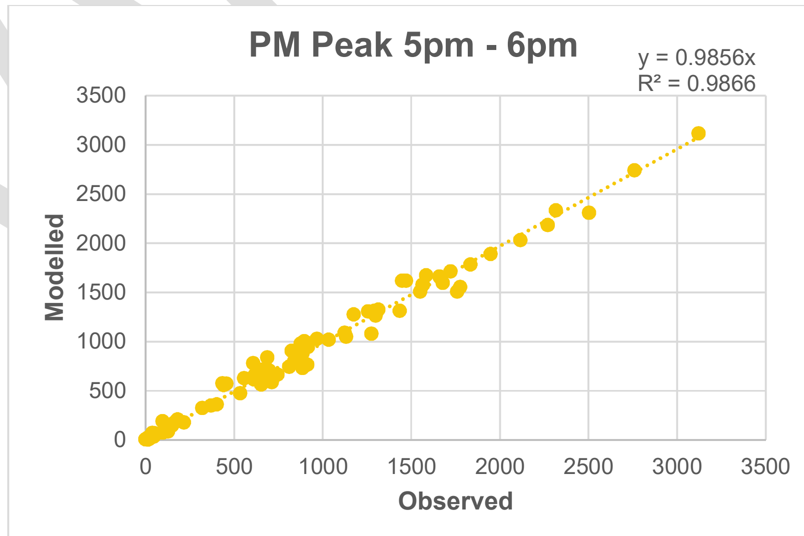


Figure 16 - Link Counts Validation Scatter Plots

5.4.2 Turn Counts Validation

Results for individual turn counts (Table 11) in the focus area show that the model satisfies the validation criteria for GEH, R^2 and RMSE. Where the modelled counts did not meet the GEH <5 criteria, the manual counts at that turn were either found to be unreasonable when cross-checked with adjacent counts or there was lack of information on reliability and therefore given less priority for validation.

Table 11 - Summary of Individual Turn Counts Validation Results in Focused Area

	AM (%)		PM (%)		NZTA Guideline
	7am - 8am	8am - 9am	4pm - 5pm	5pm - 6pm	Category C
GEH <5	84	85	78	84	>80%
GEH <7.5	93	91	94	94	>85%
GEH <10	96	98	99	100	>90%
R^2	0.99	0.98	0.99	0.99	>0.95
RMSE	19	19	19	14	<20%

5.5 Flow Profile Validation

Flow profiles at key locations across the network (Figure 17) were monitored. Overall, the modelled flow profiles follow the observed profiles reasonably well (Figure 18 and Figure 19).

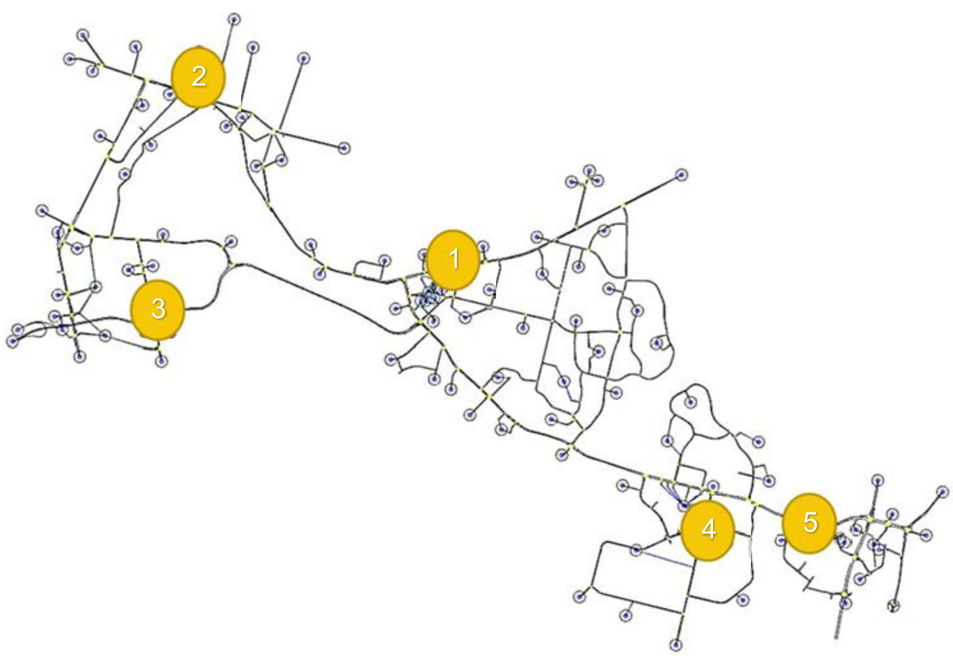
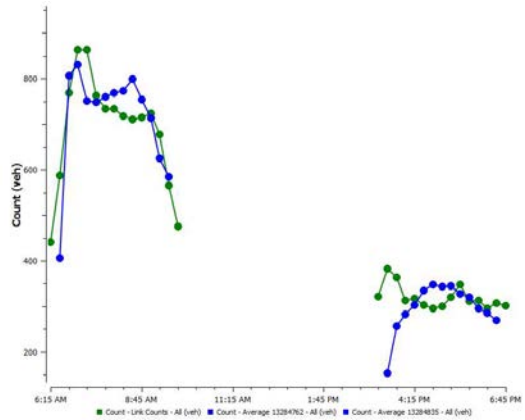


Figure 17 - Profile Validation Locations

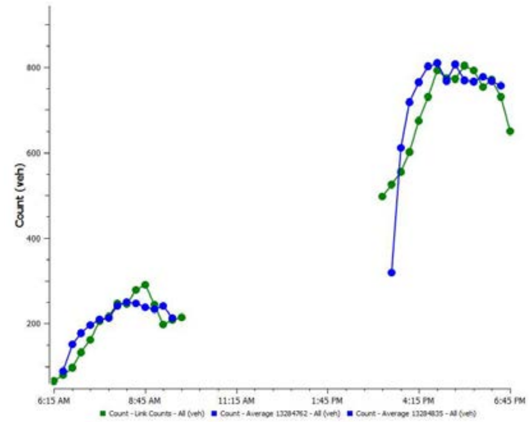
1 – Pakuranga Road / Lewis Road

Westbound



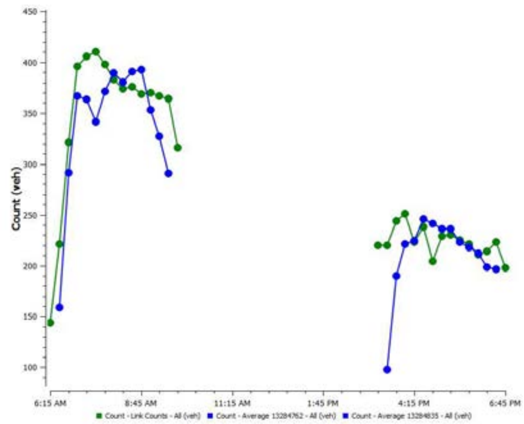
1 – Pakuranga Road / Lewis Road

Eastbound



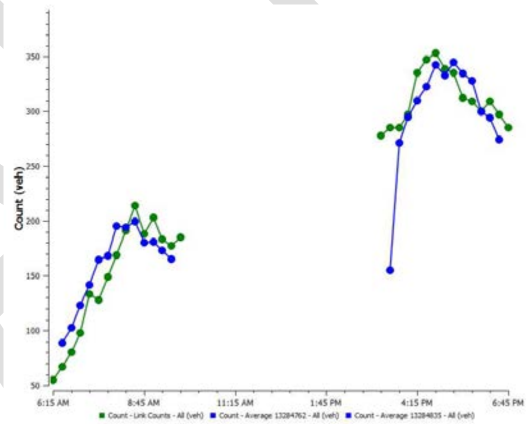
2 – Panmure Roundabout, Mount Wellington Approach

Westbound



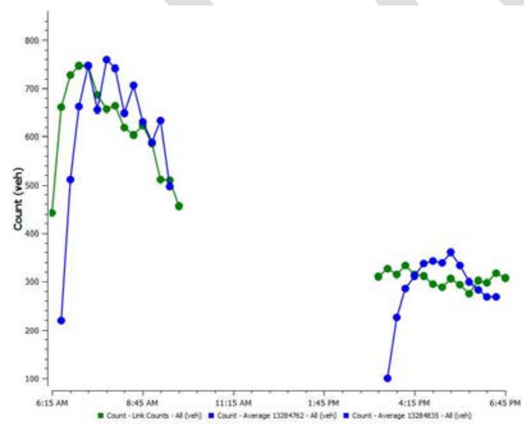
2 – Panmure Roundabout, Mount Wellington Approach

Eastbound



3 –South-Eastern Highway / Carbine Road

Westbound



3 – South-Eastern Highway / Carbine Road

Eastbound

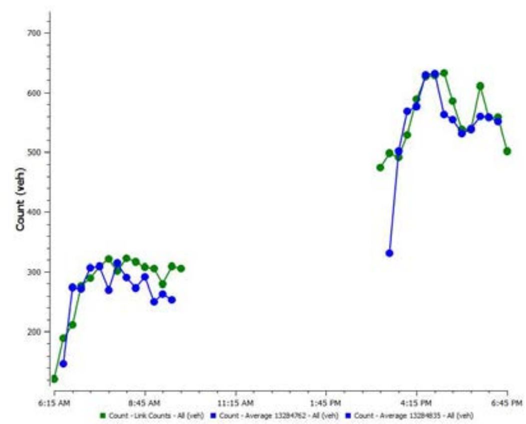
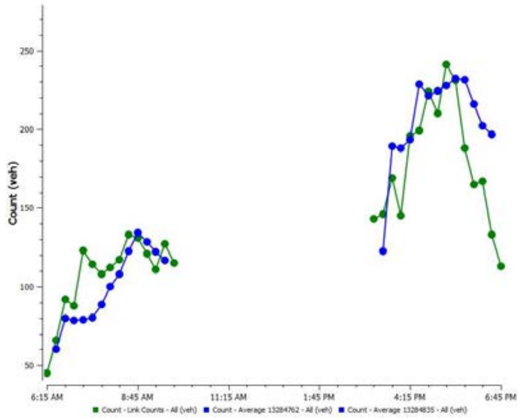


Figure 18 - Flow Profile Validation (modelled in blue, observed in green)

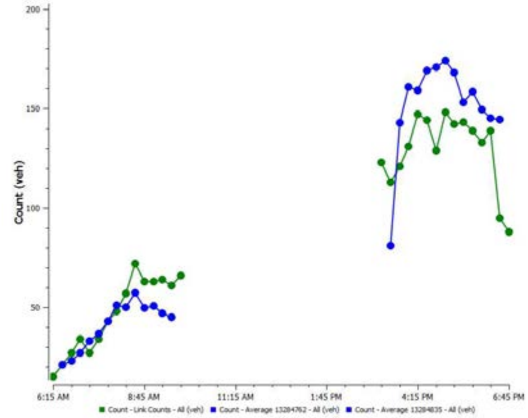
4 –Ti Rakau Drive / Harris Road

Harris Road Westbound



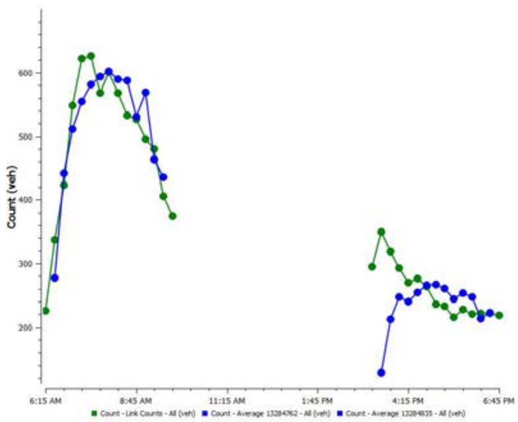
4 –Ti Rakau Drive / Harris Road

Harris Road Eastbound



5 – Ti Rakau Drive / Huntington Drive

Westbound



5 – Ti Rakau Drive / Huntington Drive

Eastbound

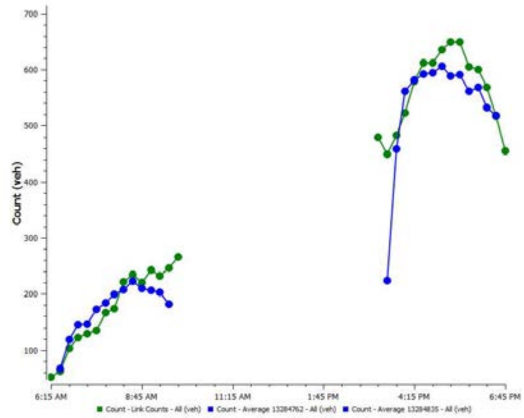


Figure 19 - Flow Profile Validation (modelled in blue, observed in green) continued

5.6 HCV Count Validation

A sense-check of the modelled proportion of vehicles assigned as NZTA Axel Class 4 and above (medium and heavy vehicles) was made at key locations across the network. Estimates of car to HCV proportions were made based on available tube count data and judgement. Overall, the modelled proportions match the estimates reasonably well (Figure 20).

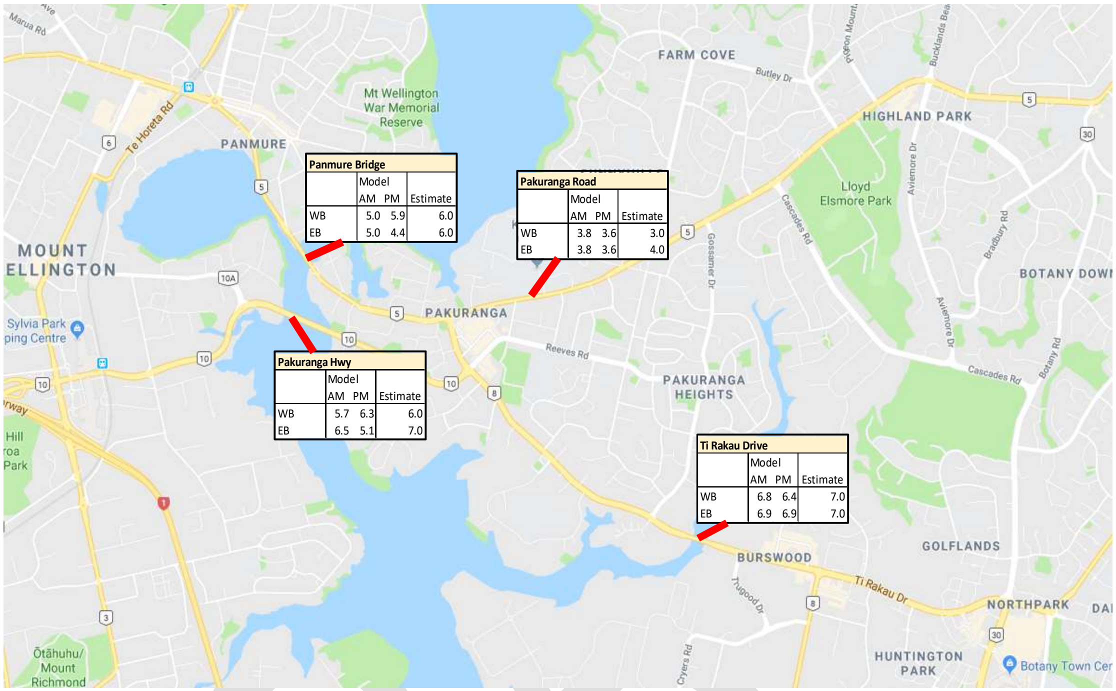


Figure 20 - Comparison of HCV percentage at key locations on the network

As described, the HCV includes MCV counts and we understand the survey at intersections only include pure HCV and hence this data was not used in this validation.

5.7 Travel Time Validation

Journey time versus distance graphs show that the modelled travel times were generally a good fit to the observed travel time (Figure 22 - **Error! Reference source not found.**). Signals at the modelled intersections were actuated based on minimum and maximum green times provided from the SCATS data of 7 March 2018. Adjustments were made up to five seconds above and below the maximum green time where required to calibrate travel times. Despite these adjustments, it is noted that:

- For the AM peak, modelled travel time from Edgewater Drive to Pakuranga Highway on Ti Rakau Drive is slightly low in the second hour. Overall 92% of the routes meet the Criteria for the AM peak.
- For the PM peak, modelled travel time from Jellicoe Road to Ti Rakau Drive is slightly low in the second hour. Overall 92% of the routes meet the Criteria for the PM peak.

Nevertheless, all modelled travel times (routes summarised in Figure 21) were within the 15th and 85th percentile of observed travel time. Therefore, the model is considered acceptably validated for travel time.

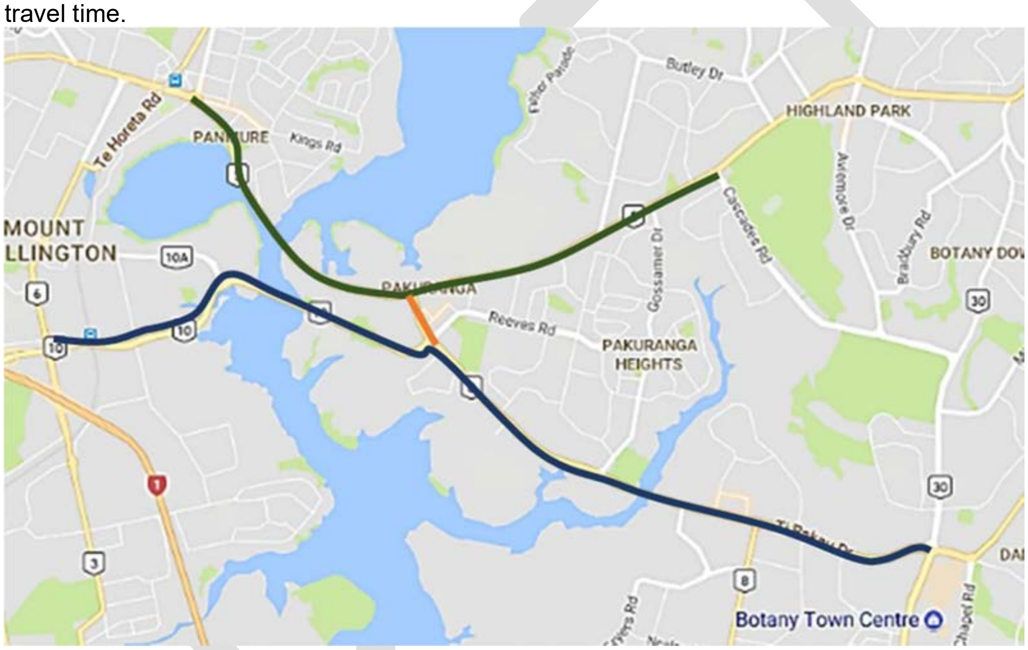


Figure 21 - Travel time routes (traffic) from Snitch GPS data for reporting travel time validation in Chapter 5

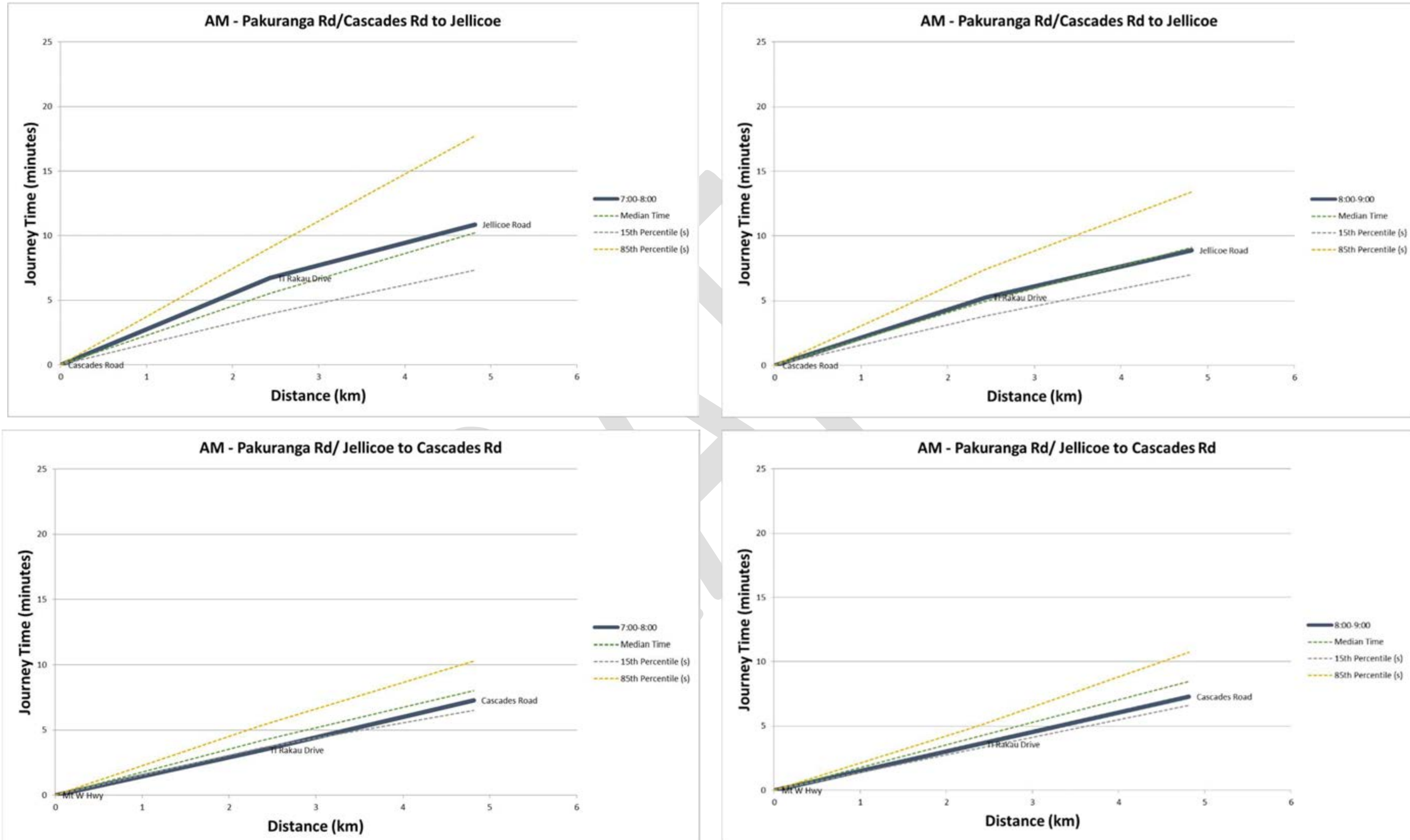


Figure 22 - Travel Time Validation Graphs: AM Pakuranga Road/ Cascades Road to Mount Wellington Highway

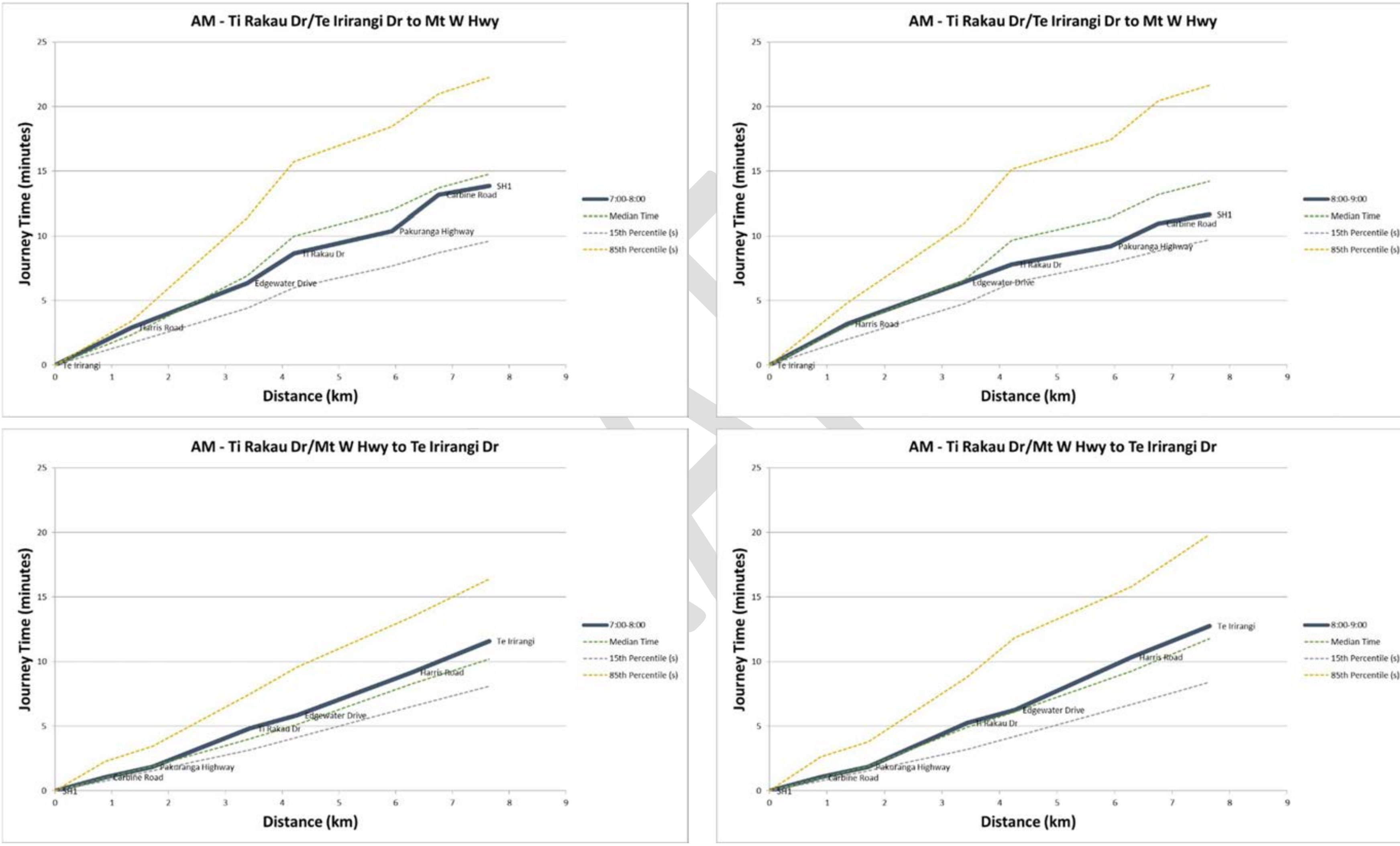


Figure 23 - Travel Time Validation Graphs: AM Ti Rakau Drive/ Te Irirangi Drive to Mount Wellington Highway

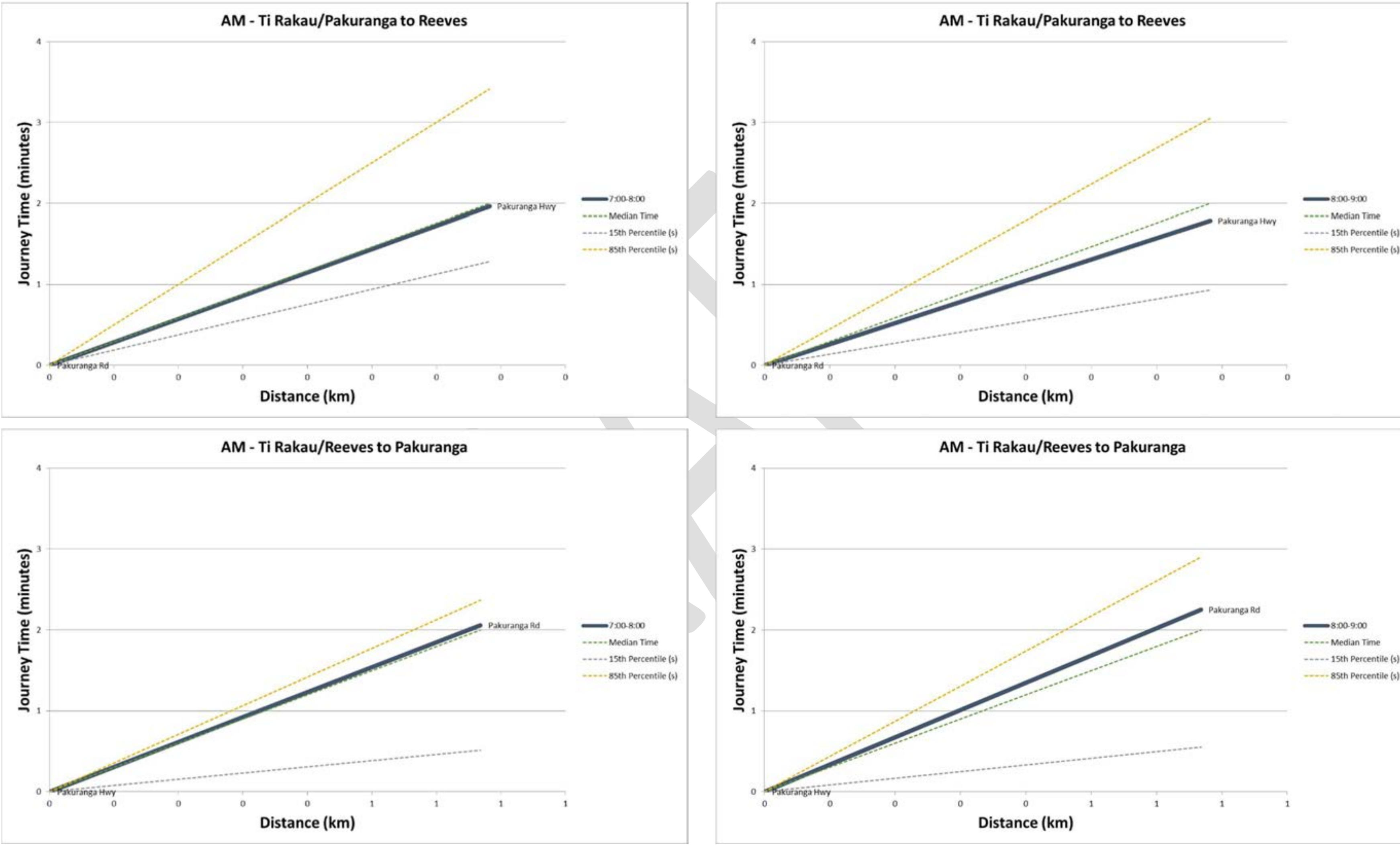


Figure 24 - Travel Time Validation Graphs: AM Ti Rakau Drive/ Pakuranga Road to Reeves Road

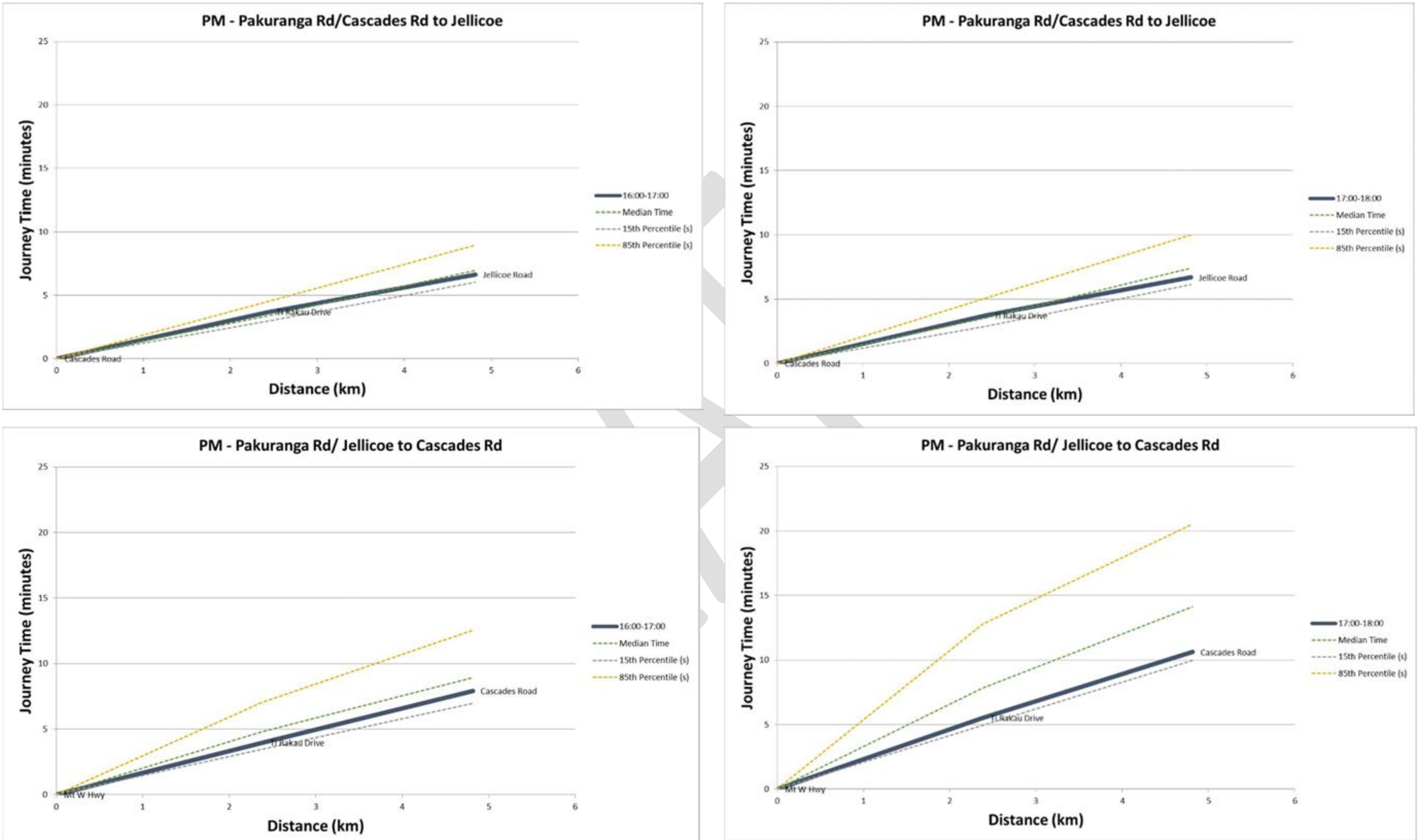


Figure 25 - Travel Time Validation Graphs: PM Pakuranga Road/ Cascades Road to Mount Wellington Highway

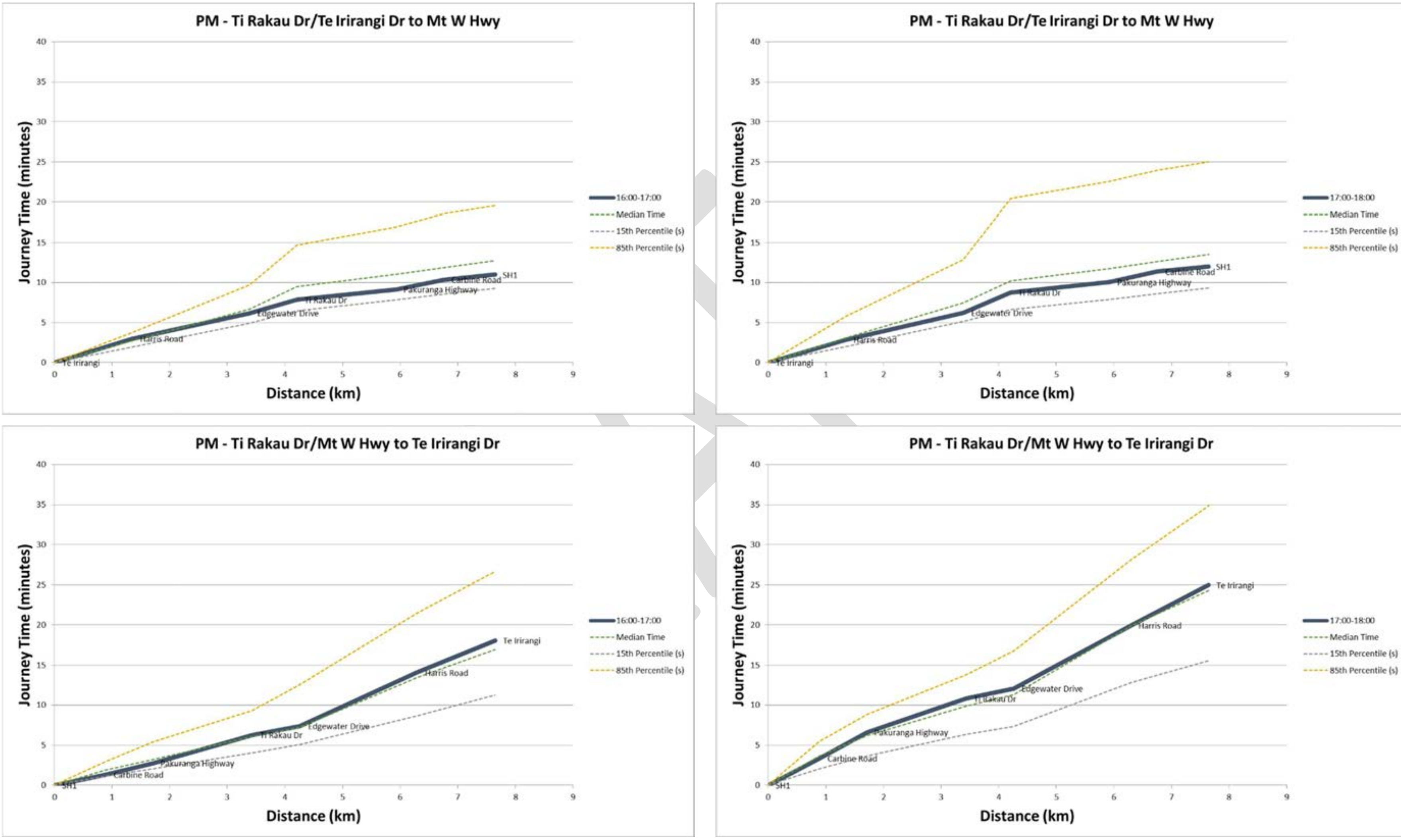


Figure 26 - Travel Time Validation Graphs: PM Ti Rakau Drive/ Te Irirangi Drive to Mount Wellington Highway

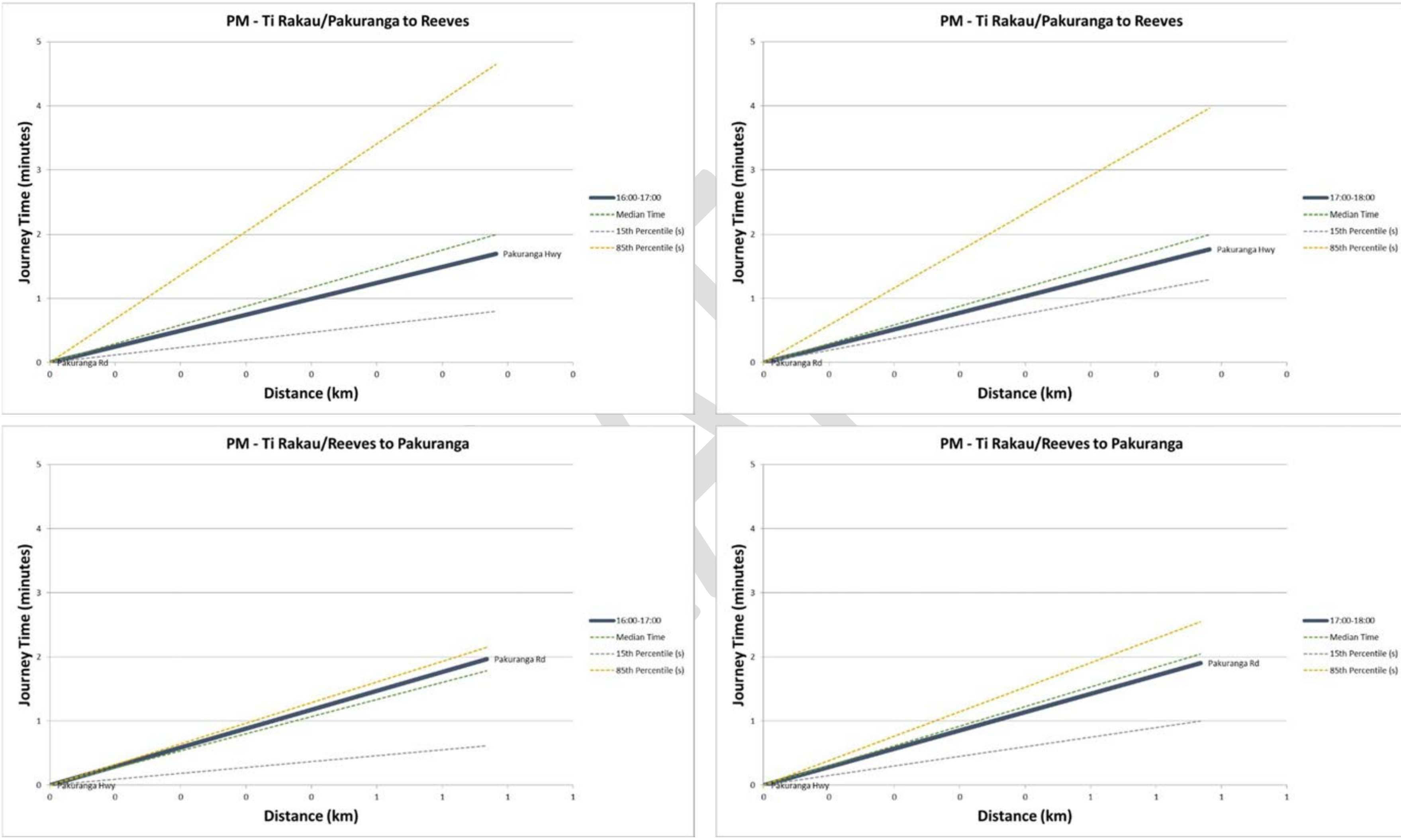


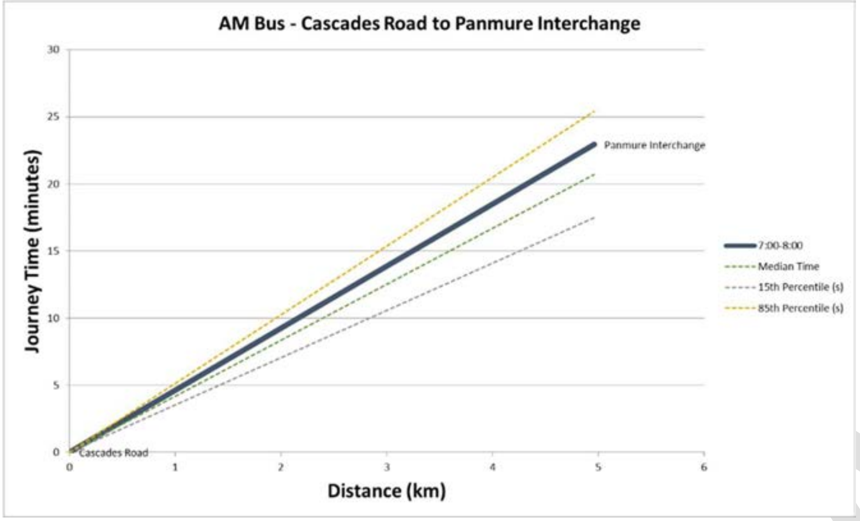
Figure 27 - Travel Time Validation Graphs: PM Ti Rakau Drive/ Pakuranga Road to Reeves Road

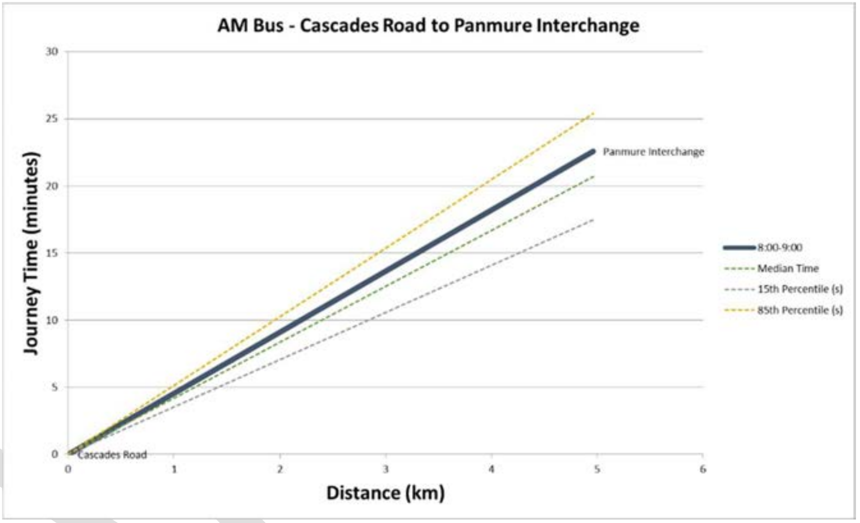
Bus travel time for key corridors in the model also fit reasonably well with observed (Figure 28 - Figure 29). The routes are:

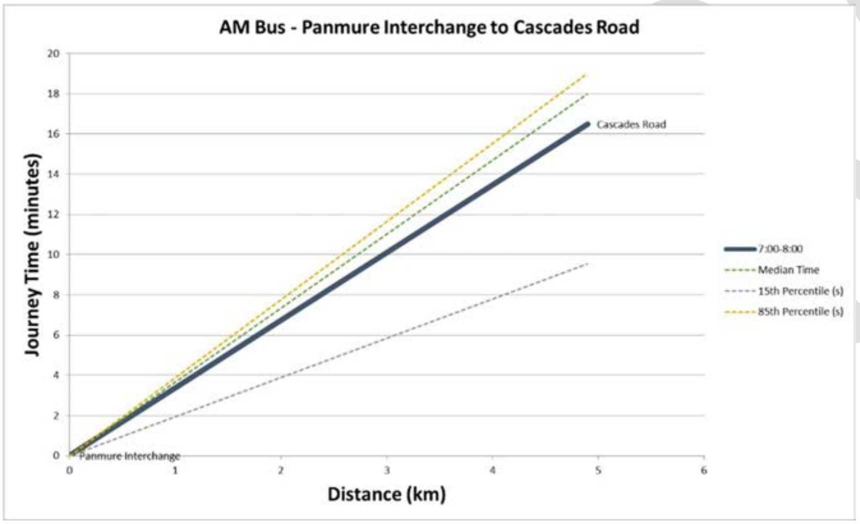
- Bus Route 70 – between Botany Town Centre and Panmure Interchange.
- Bus Route 72 – between Cascades Road and Panmure Interchange.

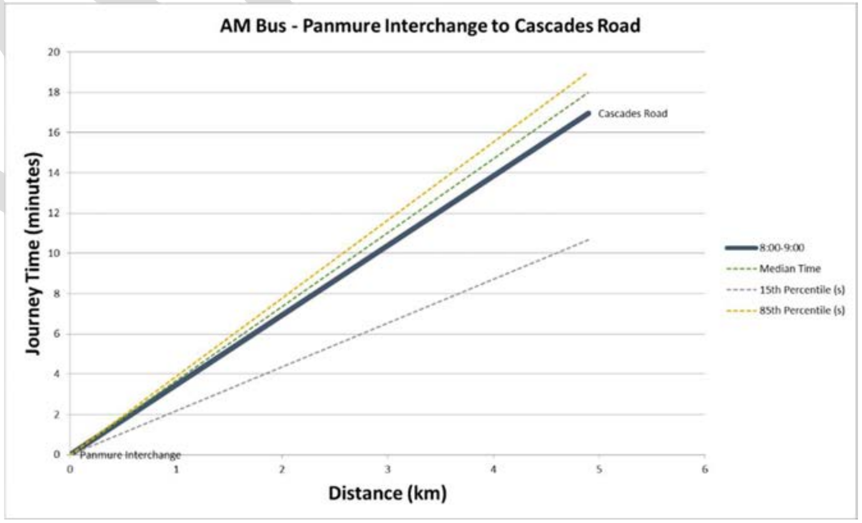
From the bus journey time graphs, it is noted that

- For the AM peak, modelled travel time from the Botany to Panmure Town Centre is low in the first hour. Overall 88% of the routes meet the Criteria for the AM peak.
- For the PM peak, modelled travel time between the Botany and Panmure from Jellicoe Road to Ti Rakau Drive is high in the second hour. The additional travel time is occurring in the Panmure area and does not impact on the focus area. For the future year, the bus travel time along this route will be monitored to ensure it does not increase unrealistically. Overall 75% of the routes meet the Criteria for the PM peak which is below the target 85%.


AM Bus - Cascades Road to Panmure Interchange
Journey Time (minutes)
Distance (km)
Panmure Interchange
Cascades Road
7:00-8:00
Median Time
15th Percentile (s)
85th Percentile (s)


AM Bus - Cascades Road to Panmure Interchange
Journey Time (minutes)
Distance (km)
Panmure Interchange
Cascades Road
8:00-9:00
Median Time
15th Percentile (s)
85th Percentile (s)


AM Bus - Panmure Interchange to Cascades Road
Journey Time (minutes)
Distance (km)
Cascades Road
Panmure Interchange
7:00-8:00
Median Time
15th Percentile (s)
85th Percentile (s)


AM Bus - Panmure Interchange to Cascades Road
Journey Time (minutes)
Distance (km)
Cascades Road
Panmure Interchange
8:00-9:00
Median Time
15th Percentile (s)
85th Percentile (s)

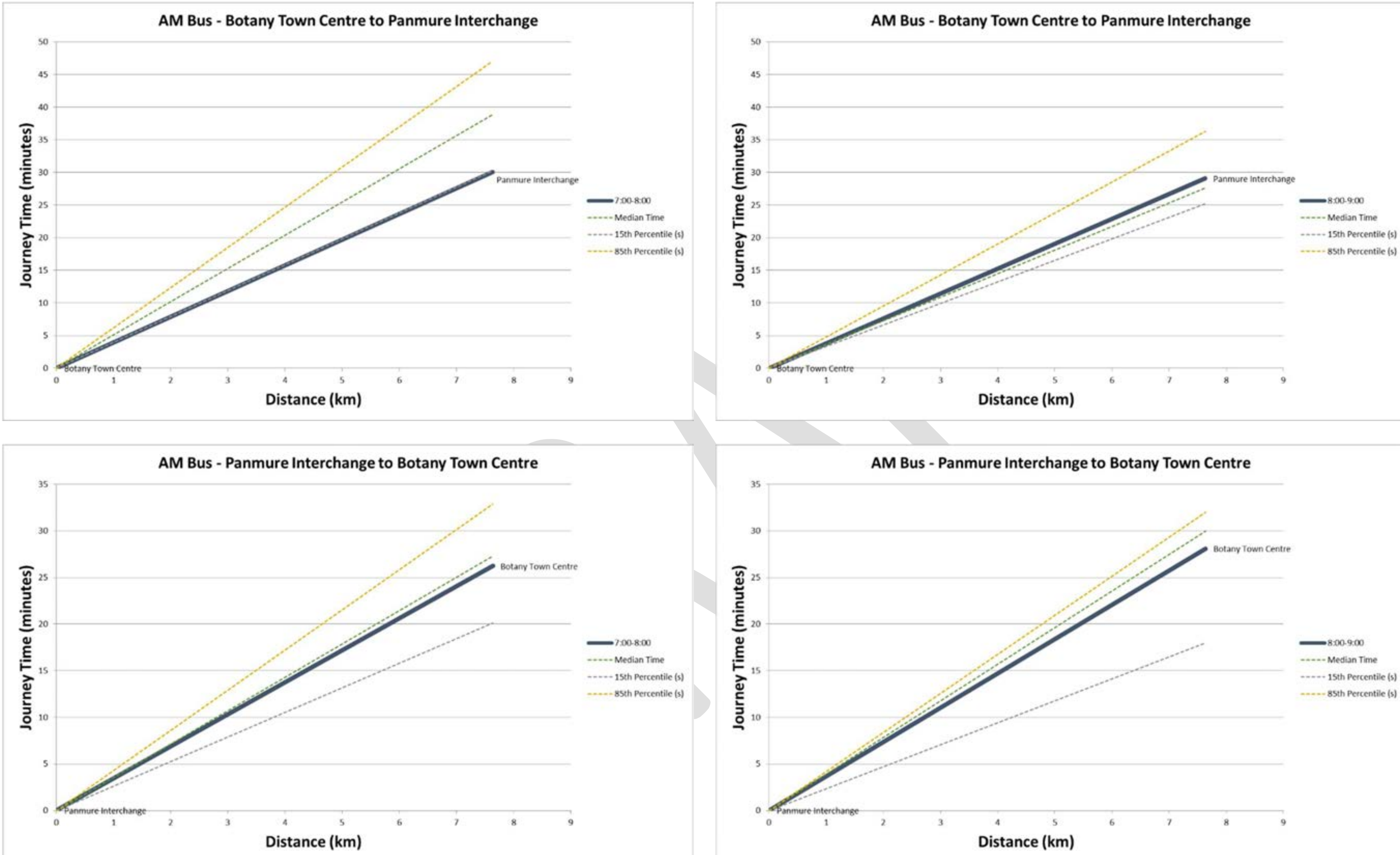
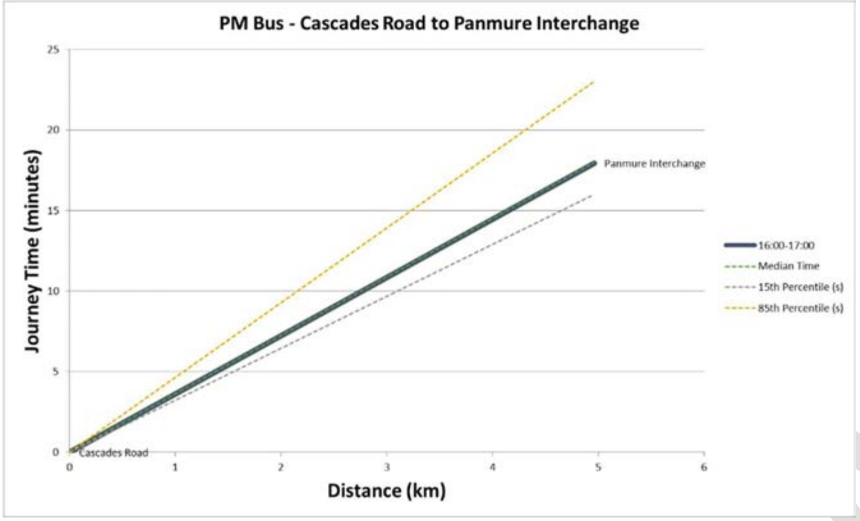
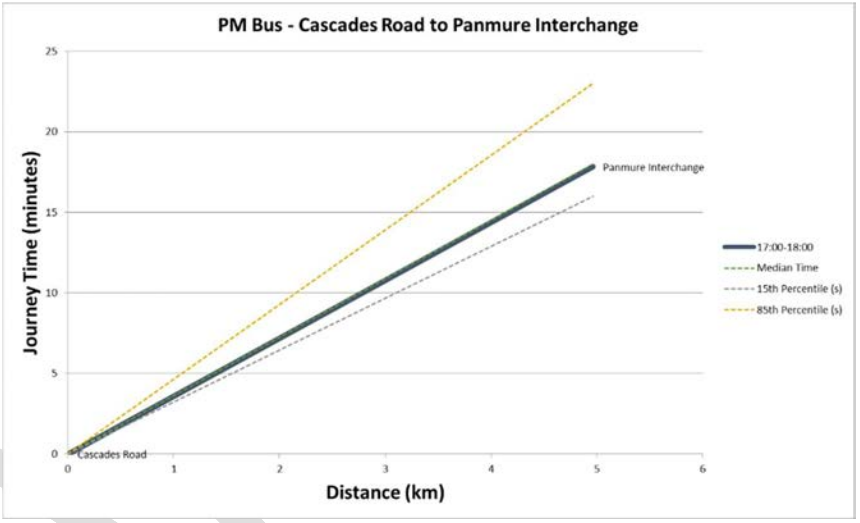


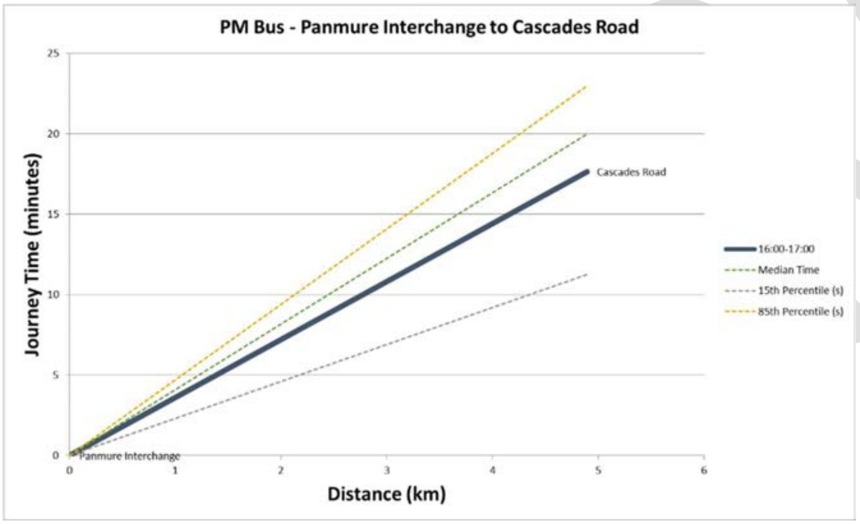
Figure 28 – Travel Time Validation: AM Bus



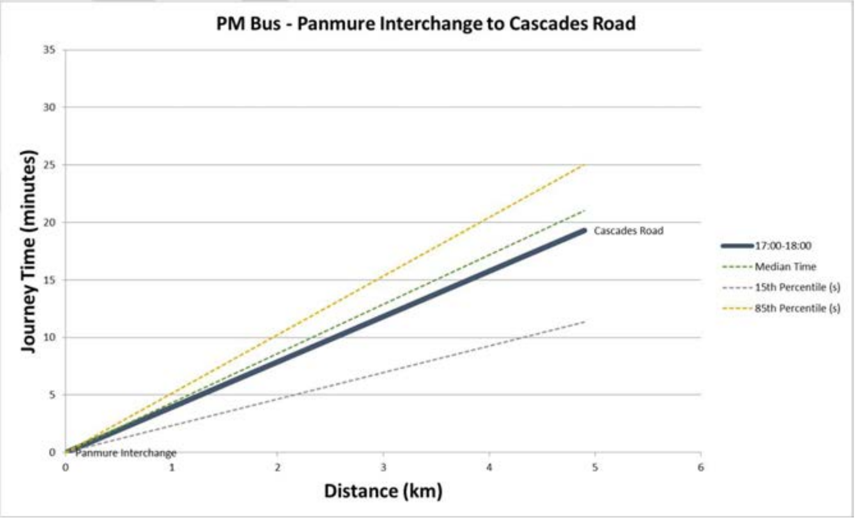
PM Bus - Cascades Road to Panmure Interchange
Journey Time (minutes)
Distance (km)
Panmure Interchange
Cascades Road
16:00-17:00
Median Time
15th Percentile (s)
85th Percentile (s)



PM Bus - Cascades Road to Panmure Interchange
Journey Time (minutes)
Distance (km)
Panmure Interchange
Cascades Road
17:00-18:00
Median Time
15th Percentile (s)
85th Percentile (s)



PM Bus - Panmure Interchange to Cascades Road
Journey Time (minutes)
Distance (km)
Cascades Road
Panmure Interchange
16:00-17:00
Median Time
15th Percentile (s)
85th Percentile (s)



PM Bus - Panmure Interchange to Cascades Road
Journey Time (minutes)
Distance (km)
Cascades Road
Panmure Interchange
17:00-18:00
Median Time
15th Percentile (s)
85th Percentile (s)

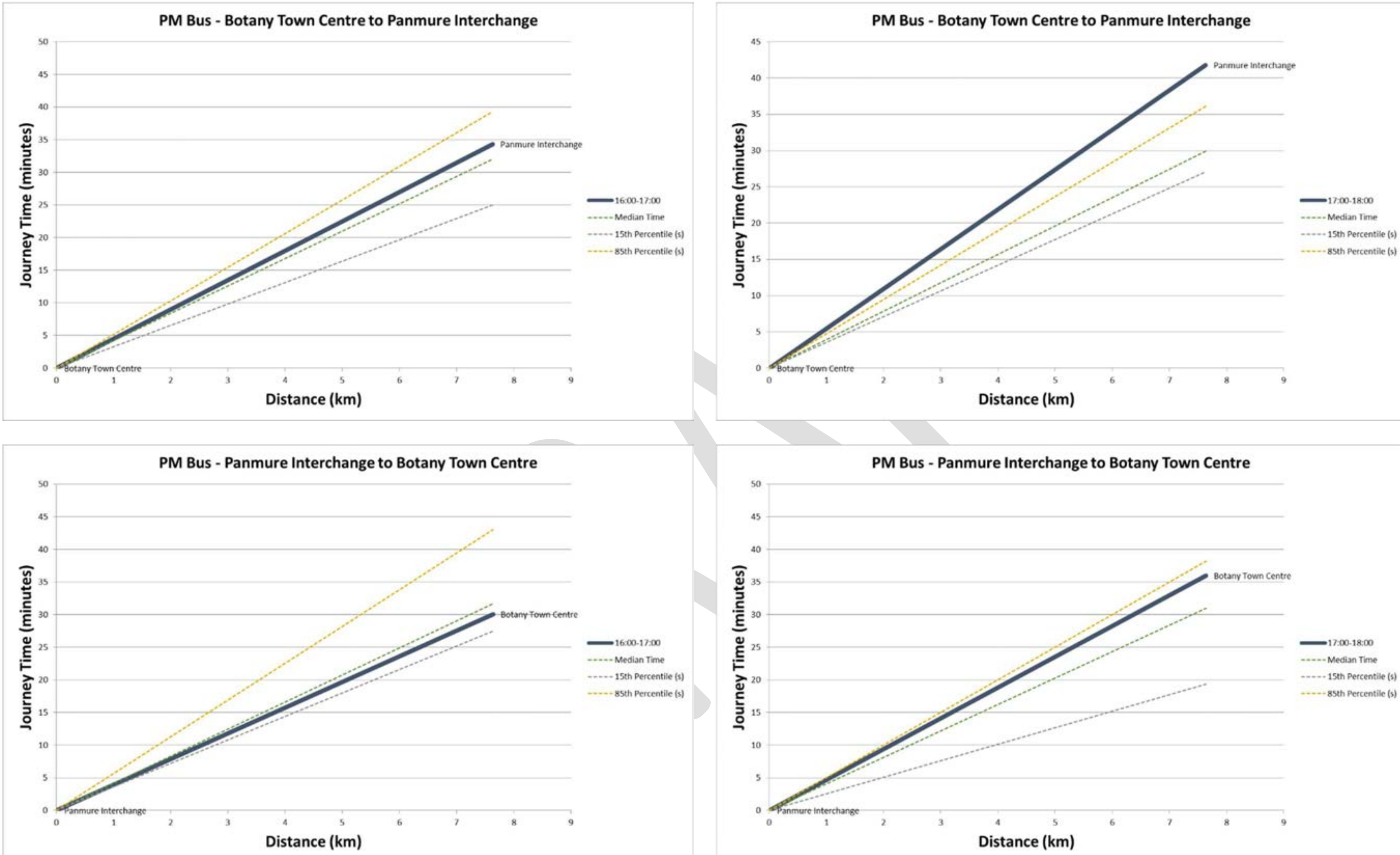


Figure 29 - Travel Time Validation: PM Bus

5.8 Traffic Congestion Check

Traffic count and travel time data are the principle measures of the model performance. Traffic congestion on the network was monitored as an additional sense-check of model performance.

Side-by-side comparison to Google's live traffic view-mode for Thursday 21 February 2019 show that the model represents congestion on the network reasonably well (Figure 30 and Figure 31). In the AM peak, less congestion was seen on Ti Rakau Drive Northbound in the model compared to observed, and this was reflected in the faster travel time for that segment. However, also in the AM, although less congestion was seen on Pakuranga Highway Westbound in the model compared to observed, this was not reflected in the travel time validation. In the PM peak, less congestion was seen on Ti Rakau Eastbound in the model, however this was not reflected in the travel time validation.

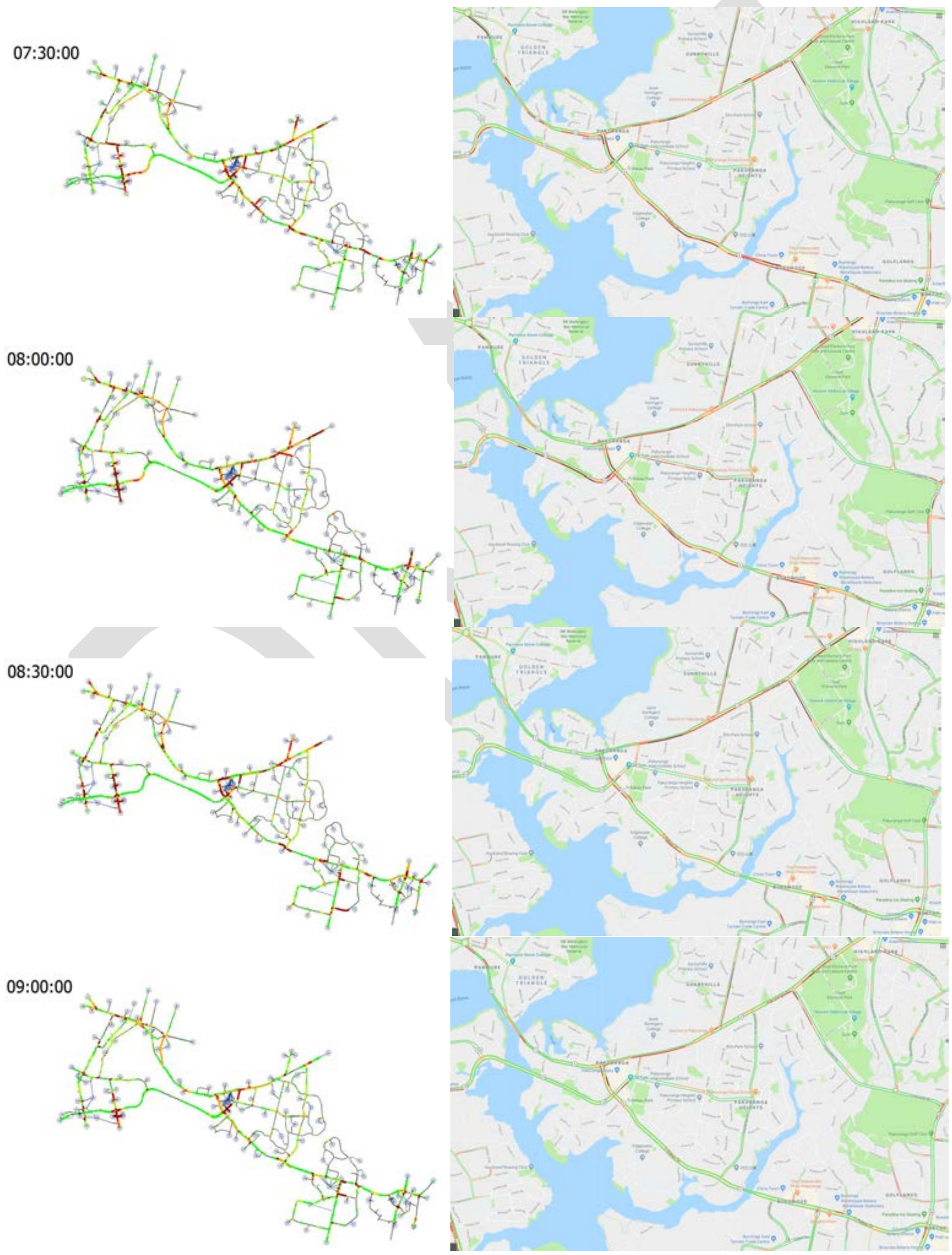


Figure 30 – AM Modelled Congestion versus Observed

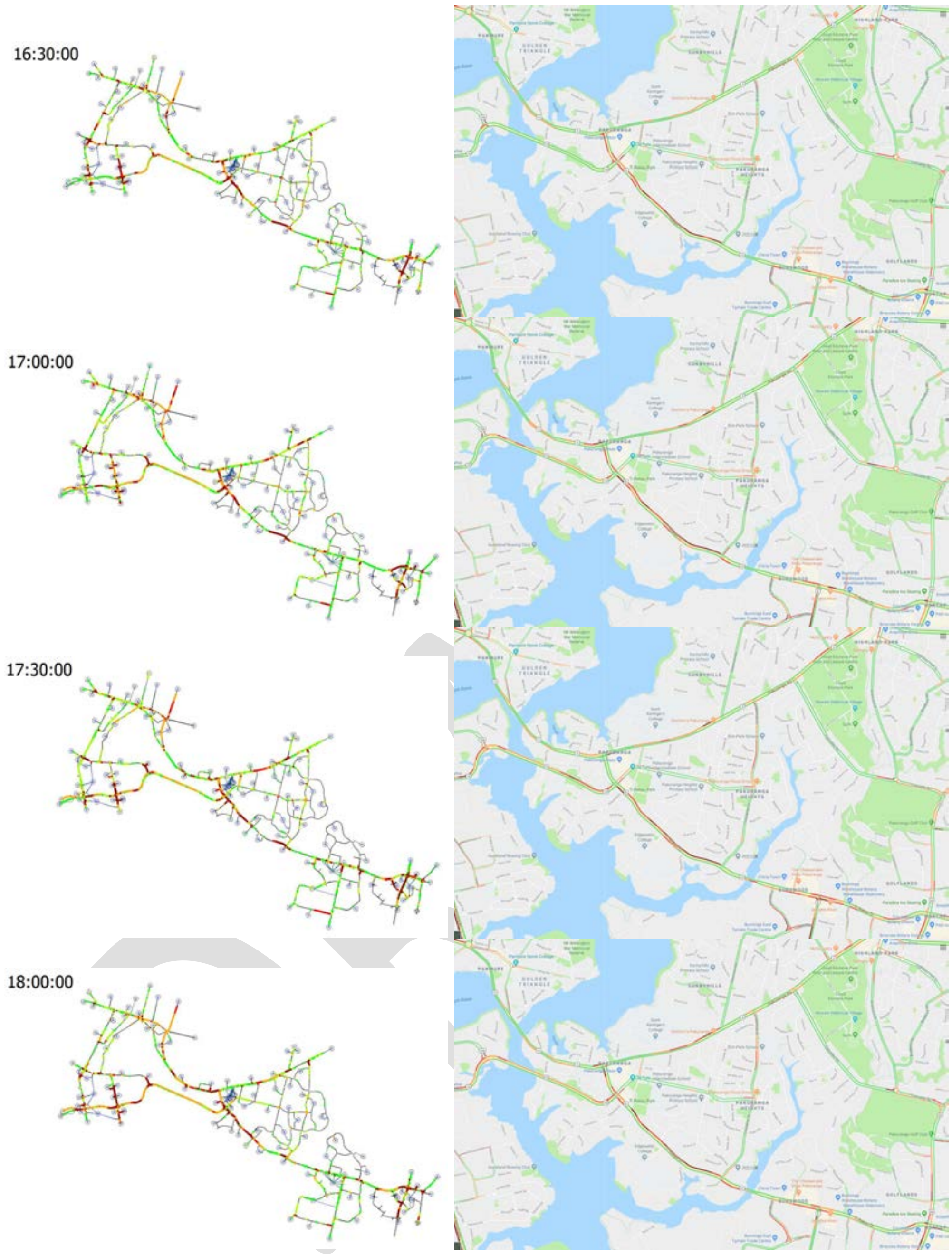


Figure 31 - PM Modelled Congestion versus Observed

This comparison is useful to understand the location of the congestion however the exact definition of congestion in Google's traffic is unknown. Hence it is used as an indication.

5.9 Route Choice Sense Check

Route choice in the model could not be directly calibrated and/or validated because there was no available data. However, sense-checks were made in the **static** model (which contributes 80% of the route choice) using previous experiences and observed traffic count-split information at intersections. Overall, route distribution in the model appears reasonable (Figure 32 - Figure 34).

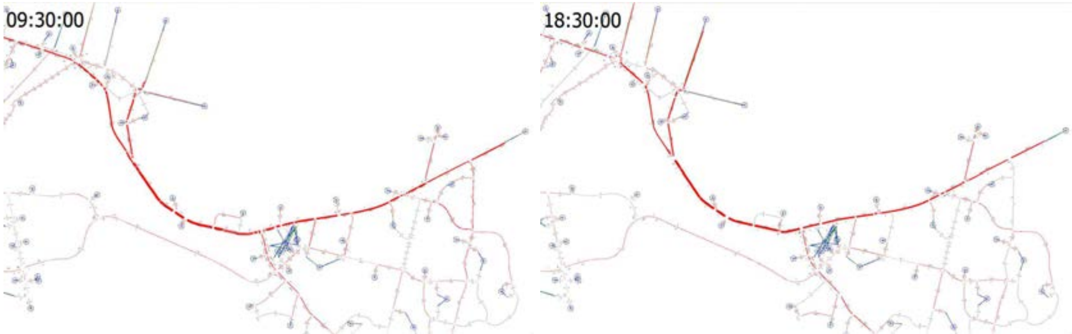


Figure 32 - Route Choice Split: AM Panmure Bridge Westbound (left) and PM Panmure Bridge Eastbound (right)

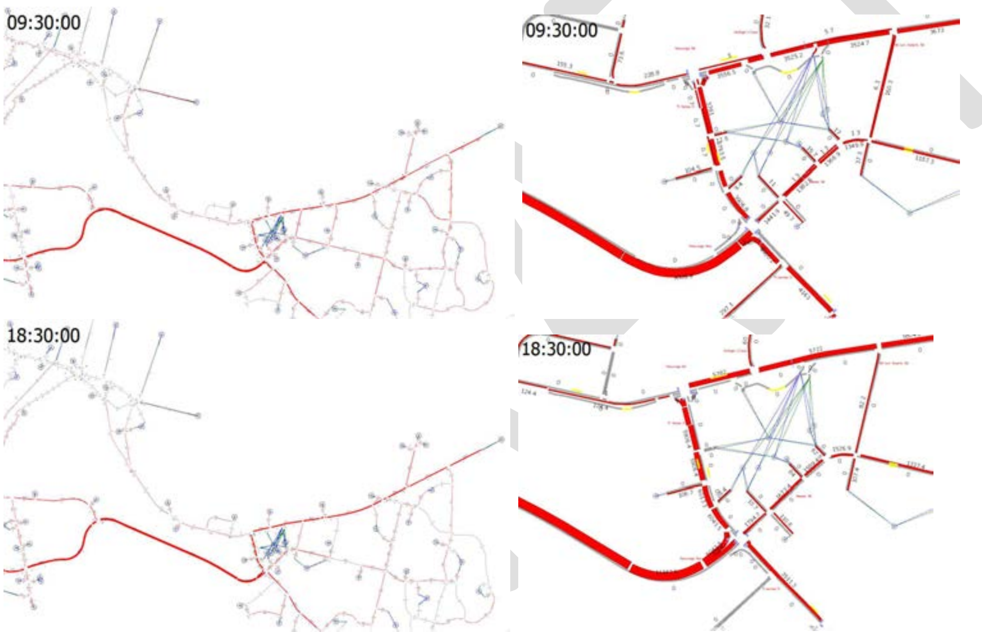


Figure 33 - Route Choice Split: AM Pakuranga Highway Westbound (above) and PM Pakuranga Highway Eastbound (below)

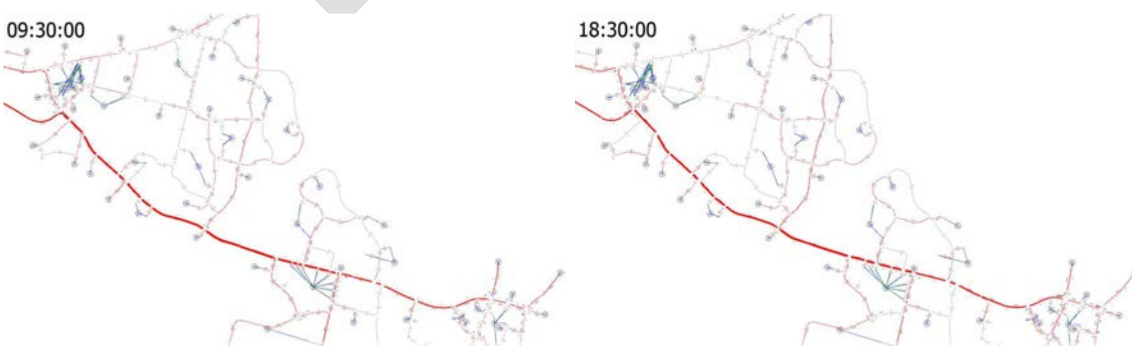


Figure 34 - Route Choice Split: AM Pakuranga Highway Westbound (above) and PM Pakuranga Highway Eastbound (below)

5.10 Model Stability

Model stability was monitored and found to be within acceptable thresholds of a coefficient of variance (COV) <5% across the modelled periods, except in the AM past 9am (Figure 35). However, since the demand and the total travel time are fulling at approximately the same profile, this is not an issue.

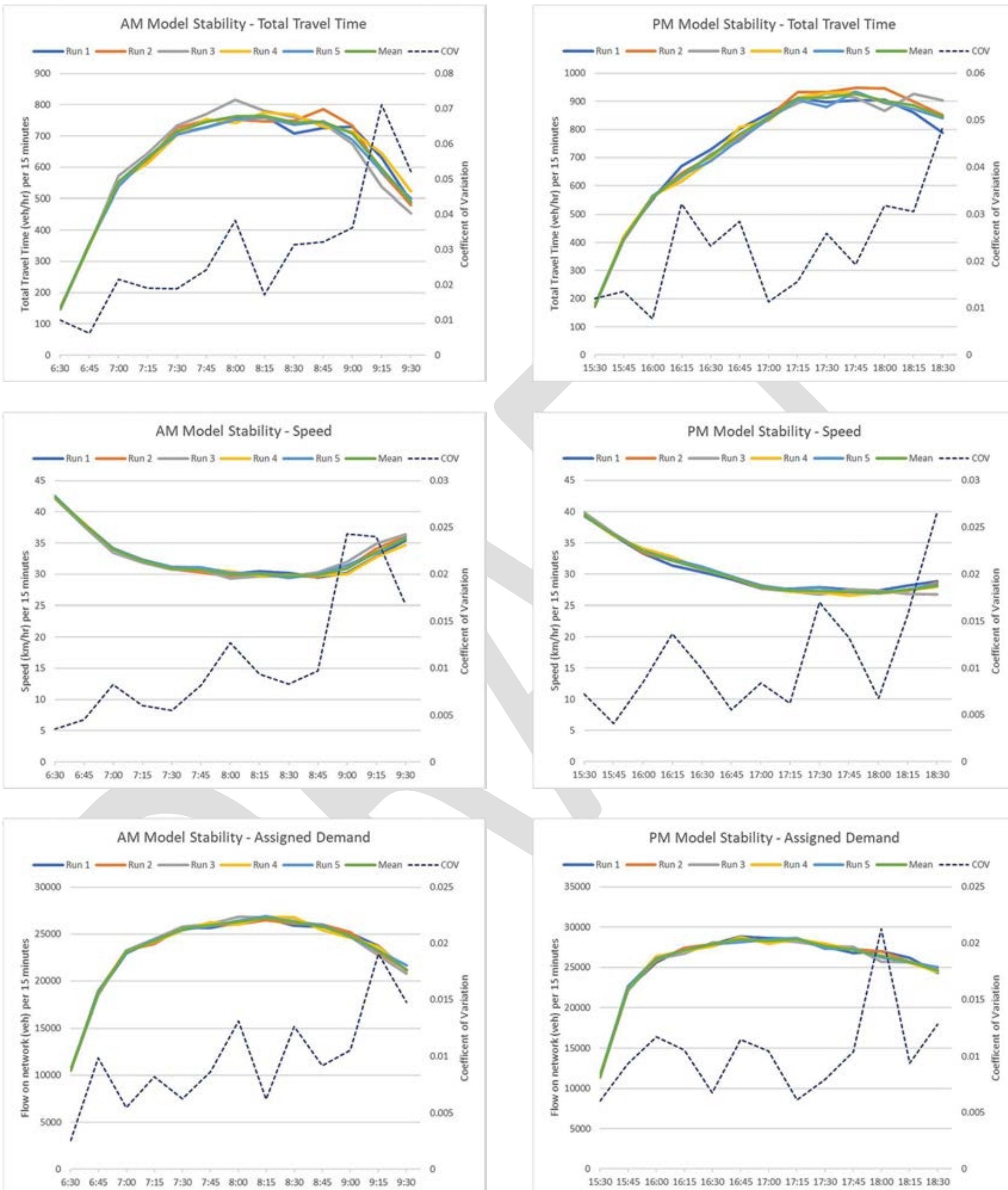


Figure 35 - Model Stability: Total Travel Time, Speed and Flow Plots

6 Conclusion

This report details the update and calibration/validation of the Aimsun model for the Eastern Busway Project. The purpose of this model is to provide a consistent and common base for project developments in the East Auckland Area, primarily along Ti Rakau Drive for the EB 2 and EB3 detailed design work.

The model covers two three-hour peak periods (6.30 am – 9.30 am, and 3.30 pm – 6.30 pm). The modelled periods were chosen to capture the congestion typically experienced in the modelled area.

The model consists of macro and micro tiers with the respective assignment methods: static assignment and microscopic dynamic assignment (DTA). The macro tier provides an interim stage to calibrate the demand through demand adjustment and to generate 80% of paths for the micro DTA. Based on previous modelling of the area, an 80-to-20 split in static versus dynamic path assignment was considered appropriate. This gave better control of modelling route choice in the area and sense-checks during the model development process showed that route distribution in the model is reasonable.

Various observed data were provided by Auckland Transport (AT) for the model development. These included traffic counts, travel time, public transport timing, and signal timing.

The traffic demands come from the AMETI EMME traffic model and were processed before assigning to the Aimsun model. This demand interface process includes a minor refinement of AMETI traffic model zones and application of 2-to-3 hour expansion factors to fit the Aimsun model period. Demand adjustment as part of the validation process was done manually.

The model network was developed in line with the Auckland Dynamic Traffic Assignment Model (ADTA) network coding guideline, which sets out the recommended network coding methodology for Aimsun models in Auckland. This included a standard system of classification and labelling of different turn movement types which were important function variables in the ADTA-developed cost functions also adopted in this model for calculating junction and turn delays.

Model validation showed that the model meets the validation target criteria for Category C: Urban Area in NZTA Model Development Guidelines on individual link flows and turn flows for each hour between 7am – 9am, and 4pm – 6pm. Travel times in the model fit reasonably well with the observed.

Overall, the base year model is considered acceptably calibrated and validated for the purposes of the EB2/3 design work.