Merrifield West Precinct Structure Plan

Traffic and Transport Impact Assessment

Prepared for Merrifield Corporation Pty & Evolve Development

July 2012




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1 INTRODUCTION

1.1 Purpose of this report

SMEC has been engaged by Merrifield Corporation Pty Ltd and Evolve Development to undertake traffic modelling for the Merrifield West Precinct Structure Plan (PSP) and translate the outputs into road cross sections and intersection requirements for input into the Planning Scheme Amendment process.

1.2 Draft Northern Growth Corridor Plan

Melbourne's north is undergoing substantial transformation, with a widening socio-economic mix, and a diversifying economy. The region plays an international and interstate gateway role in terms of the Melbourne Airport, Hume Freeway and the Melbourne- Sydney-Brisbane rail line.

The draft Melbourne North Growth Corridor Plan (Corridor Plan) released by the Victorian Government in November 2011 provides for the establishment of a wide range of employment and housing and will make a significant contribution to the growth and diversification of the broader metropolitan area.

The area covered by the Corridor Plans will eventually accommodate a population of 220,000 or more people and has the capacity to provide for at least 68,000 jobs. The majority of new industrial land for the northern metropolitan region will be located within the Northern Growth Corridor.

The Corridor has good accessibility to the CBD and other major employment precincts. It features excellent road, rail, freight and public transport infrastructure, most notably Melbourne Airport and other significant logistics hubs.

The PSP and the broader Merrifield holdings are strategically located in the western portion of the Corridor Plan (see Figure 1 below).

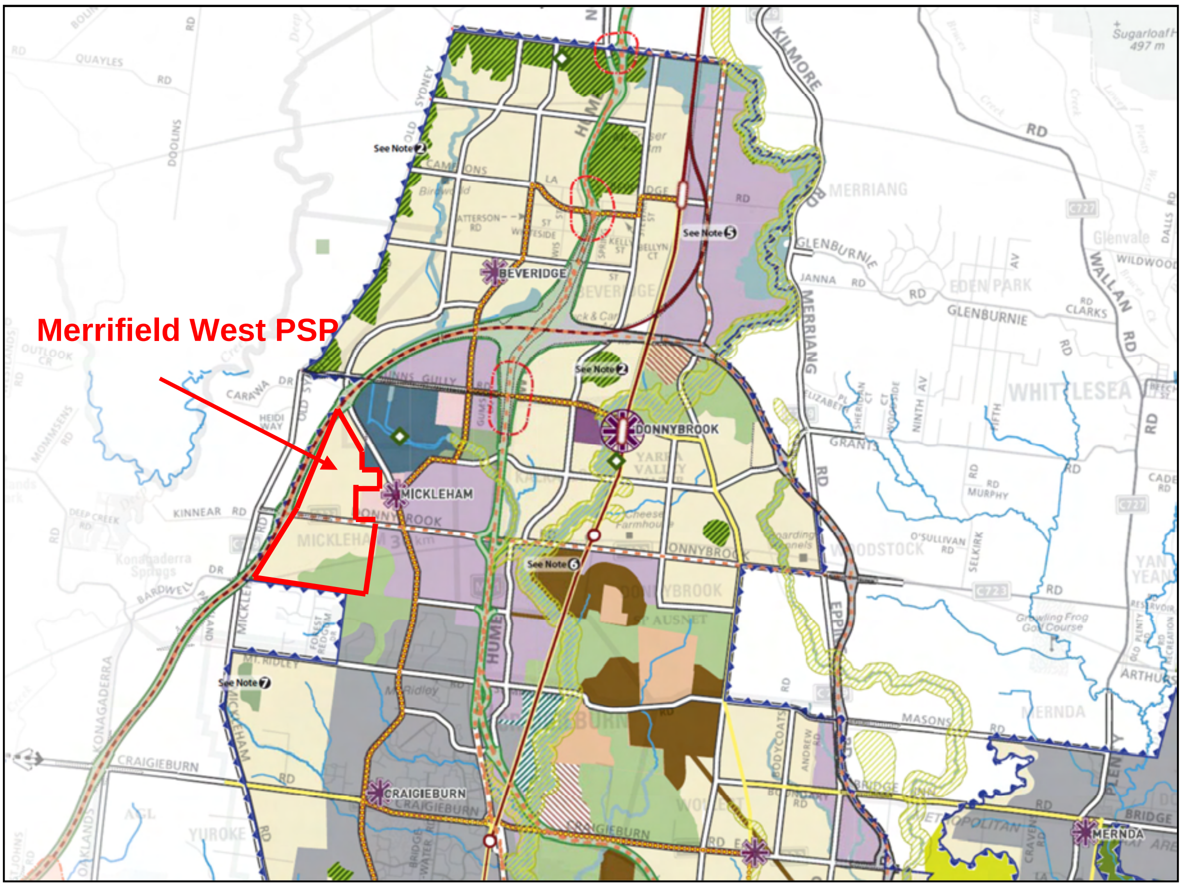


Figure 1: Draft Melbourne North Growth Corridor Plan & the Merrifield West Precinct Structure Plan

Source: GAA website

1.3 Merrifield West Precinct Structure Plan

The ultimate vision for the PSP is for residents and visitors to work live and play in a 24-hour mixed-use community acknowledging the sustainability benefits of providing jobs where people live.

The PSP is bound by Mickleham Road/Old Sydney Road and the Outer Metropolitan Ring Road (OMR) to the west and the Melbourne Water Retarding Basin to the north. Donnybrook Road bisects the PSP area and provides key linkages between the designated Mickleham Major Town Centre (MTC) to the east and the zoned Merrifield and Folkestone employment areas. Towards the south, the PSP is bordered by the existing Mt Ridley Road rural residential area.

The PSP provides for approximately 7,115 allotments for approximately 20,000 residents. The PSP will facilitate delivery of a number of key infrastructure assets including schools, community facilities, active open space, local town centres and parks. The PSP is situated within close proximity to the proposed MTC

The PSP will offer a range of housing types of varying densities including multi-unit and small-lot housing to improve the efficiency of service delivery and positioned to maximise access to a range of retail, commercial, community and open space facilities. The highest densities are likely to occur near the MTC and local town centres within the PSP area. Figure 2 shows the Precinct Structure Plan Staging Plan.

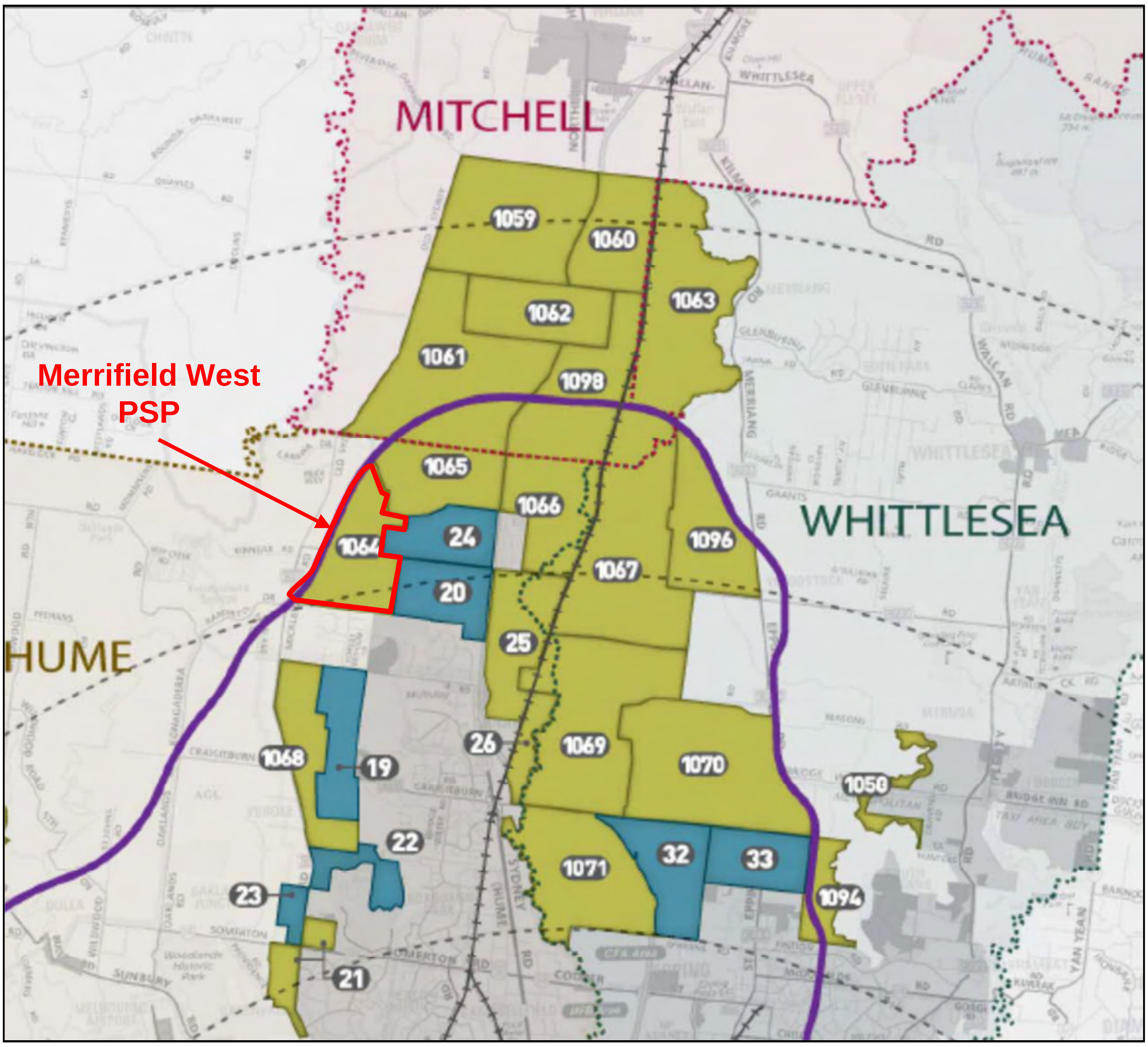


Figure 2: Precinct Structure Plan Staging Plan

Source: GAA website

1.4 Surrounding Land Uses

Future residents of the PSP will have access to jobs within the precinct, and nearby within the MTC and Merrifield and Folkestone employment areas. A wide range of diverse employment opportunities will be provided as the development unfolds – making the PSP a jobs-led-community from the outset and at the completion.

The precinct's proximity adjacent the Melbourne Water Kalkallo Retarding Basin and Mt. Ridley Woodland Park, will, when master planned, offer residents passive and district level active recreational opportunities. A network of passive open space linkages along drainage corridors located within the precinct will connect to the Kalkallo Retarding Basin, the MTC area and Mt. Ridley Woodland Park, encouraging residents to walk and cycle to these key destination locations.

The precinct will be conveniently accessed via the Hume Freeway and OMR. Regional arterial roads servicing the precinct include Donnybrook Road which will provide the link between the OMR, E14/Aitken Boulevard and Hume Highway. Aitkin Boulevard will have a frequent bus rapid transit service linking the precinct south to Broadmeadows via Craigieburn and to the north to Wallan via Beveridge. Cycling will be convenient, with an extensive network on off-road and dedicated on-road trails linking throughout the site and beyond. Figure 3 shows the Merrifield West PSP

Figure 3: Merrifield West PSP

Source: GAA website

2 EXISTING AND FUTURE ROAD NETWORK

2.1 Key Existing Roads

The future regional transport network was determined by the Department of Transport (DoT) in October 2011 based on the original December 2010 version of the MITM. The model also includes a number of road network changes as advised by the Growth Areas Authority (GAA) and VicRoads to accord with the Corridor Plan. The purpose of this work was to establish a future road network consistent with the assumed future land use to adequately cater for the growth and planning needs of the northern region in the long term.

Donnybrook Road

Donnybrook Road is a 2-lane declared arterial road under the control of VicRoads that currently carries 1,900 vehicles per day, with traffic volumes peaking during the morning peak hour period at 200 vehicles/ hour. Towards the south, the PSP will provide for three intersections with Donnybrook Road. Donnybrook Road is currently the primary east west connector and is planned to be constructed as a major arterial and operate as a 6-lane arterial road in its ultimate form.

Mickleham Road / Old Sydney Road

Mickleham Road/Old Sydney Road comprises a 2-lane road, carrying around 3,700 vehicles per day. Mickleham Road (south of Donnybrook Road) is a declared Arterial Road. Old Sydney Road is constructed to a rural standard and services a number of rural properties along its length. The intersection of Mickleham Road/Old Sydney Road and Donnybrook Road is an unsignalised T-intersection

Gunns Gully Road

Gunns Gully Road functions as a 2-lane access lane to properties west of the Hume Highway towards Old Sydney and is mainly an unsealed road north of the PSP. The road currently provides access to a number of rural properties. The road is sealed for a short length near the Hume Freeway end and caters for a very low number of vehicle movements.

Hume Highway/Freeway

The Hume Highway/Freeway corridor provides access to the PSP area via full interchange with Donnybrook Road to the east of the PSP area and adjacent to the Merrifield Employment. The Hume Freeway is currently a divided carriageway and operates as a Limited Access Road under current VicRoads policy. The cross section is generally configured with two traffic lanes and emergency stopping lanes in each direction. A 50 metre carriageway (approx) is set within a 75 metre road reserve (approx).

2.2 E14/ Aitken Boulevard / Future OMR/E6

The PSP abuts the planned OMR/E6 corridor on its western boundary and transport corridor extends some 93 kilometres from the Princes Freeway near Werribee in the south-west of Melbourne to the Metropolitan Ring Road in Thomastown in the north of Melbourne. The OMR section of the corridor abutting the PSP area will ultimately feature four lanes in both directions with a central reserve for four rail tracks carrying both freight and passenger trains.

An interchange is proposed at the intersection of Donnybrook Road/OMR with land surrounding the interchange set aside, assuming movements on all approaches. The OMR is likely to be constructed post 2020 and will form the northern and western boundary of the PSP. The OMR will provide for regional freight connections to the northern metropolitan area including the Melbourne Airport and industrial areas to the west.

The following intersection locations are planned to connect with the OMR with roads in the vicinity of the PSP area

- East of the intersection of Mickleham Road/ Old Sydney Road ; along Donnybrook Road;
- Gunns Gully Road, east of Old Sydney Road;
- Western Connector to the north of the PSP area; and
- Hume Freeway to the north of Gunns Gully Road, in Beveridge.

Regionally, the E14/Aitken Boulevard provides linkages between growth areas in Beveridge in the north and the more established activity areas such as Craigieburn and Broadmeadows in the south.

Figure 4 provides an overview of the existing major roads within the area proposed Merrifield West PSP.

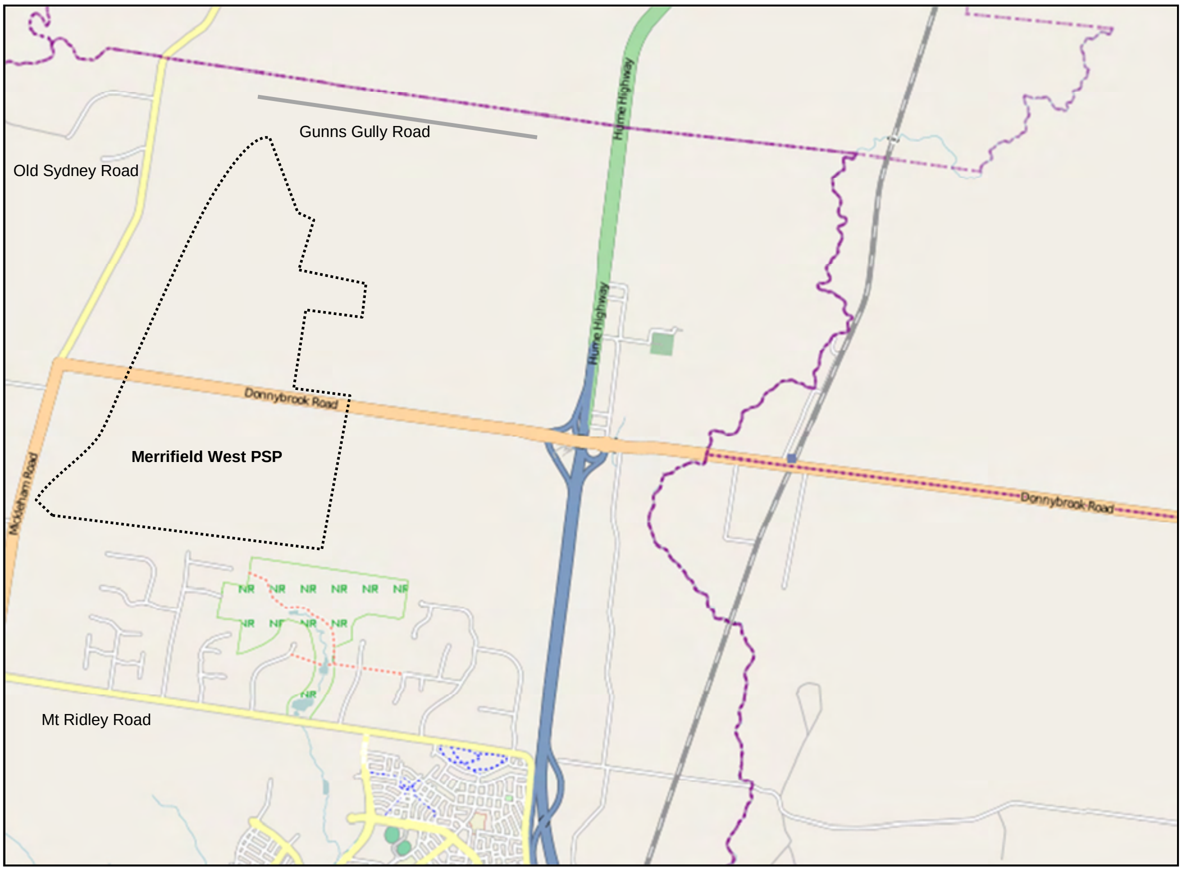


Figure 4: Key existing roads within the vicinity of the Merrifield West PSP

Locality plan (source: http://www.openstreetmap.org)

2.3 Western Connector Road

The “Western Connector” road is proposed as part of the draft Corridor Plan and is located within the Melbourne Water Retarding Basin adjacent to the PSP area. It will provide the northern-eastern access between the MTC, the PSP and the OMR.

3 METHODOLOGY

3.1 Strategic Context

The strategic location of the PSP within the Corridor requires the transport modelling to be conducted on a regional scale. SMEC has utilised the MITM strategic transport model to forecast future travel patterns within the Corridor Plan.

Travel patterns associated with the PSP are aligned with the underlying land use and interact strongly with proposed neighbouring MTC, employment and residential areas. Although the construction of the intersections and road infrastructure are viewed at a local street level, travel patterns need to be modelled at a strategic corridor level since these occur on a much wider regional scale.

3.2 The 4-step Modelling Process

The MITM uses a four-step process: trip generation, trip distribution, mode split and trip assignment. These steps can be described in more detail as follows:

Trip generation involves calculating the total number of trips generated for a collection of land uses (also known as a zone) within a strategic model. The land use inputs are used to generate the number of trips in each zone, based on internal models that divide the distribution of households into various household types, car ownership, number and type of workers, numbers of students and other influencing variables. Trips are generated for 14 trip purposes that include home based work, education, shopping and recreation trips and non-home based work, shopping and other trips.

Trip distribution is the process in which these trips are distributed throughout the model from zone to zone based on the relative cost of travelling through the model. This involves calculating the cost of travelling from zone to zone, and then trips are arranged accordingly in a trip matrix.

Mode split further processes the trip matrix by separating the number of trips within a model based on the mode of travel. Trips are separated by modes such as private vehicles, public transport or walking / cycling depending on the availability of the transport infrastructure associated with each mode.

Trip assignment assigns trips from the trip matrices to the road network. This allows all trips to select the path they wish to take to reach their destination. The trips assigned to the network represent a 2 hour AM peak period. The AM peak is considered to be representative of the highest travel demand during an average weekday.

3.3 Base Year Model Development

MITM is a strategic model widely accepted by consultants and government organisations practicing in Victoria due to the robustness of the calibration process that has been undertaken by the DoT in developing the tool. Model calibration is the process by which strategic model travel demand forecasts for a given base year are compared against observed travel patterns for the same base year. The accuracy and validity of the strategic model promotes confidence in the strategic model to forecast future travel demands.

The base year calibration of this model in the Corridor Plan area required additional enhancement to refine the relatively coarse zone system. To improve the accuracy of MITM, the model's calibration was reviewed and updated in the Hume, Whittlesea and Mitchell LGAs. A full description of the method used and results of the re-calibration are contained in the report "***Northern Growth Corridor MITM Modelling: Calibration and Validation Assessment – Strategic Modelling Report"*** prepared by GTA Consultants included as Appendix 1.

3.4 Future Year Strategic Model Forecasts

Two future years have been modelled:

- **Interim scenario** – An interim scenario has been completed for the 2021 future year. This scenario is required for DCP purposes commensurate with a full build out of the PSP by 2021, but without the inclusion of the OMR.
- **Ultimate scenario** – Based on the vision of the PSP, strategic modelling works have been completed for the future year 2046. This year is considered the ultimate development scenario for the MNGCP.

The 2021 interim scenario is required for DCP purposes to be able to quantify the contributions that land owners need to make towards infrastructure to service the PSP. Calculating construction costs for road infrastructure to service the PSP is the DCP requires travel demand forecasting for an interim development scenario.

The 2046 ultimate scenario is required to be able to assess the future road corridor requirements commensurate with the delivery of the OMR, the E14/Aitken Boulevard and the Western Connector which are planned to be constructed within this timeframe.

The information obtained from these two model time horizons have been used to develop a road hierarchy and select an appropriate cross section for roads within the PSP. To assist with the preparation of the DCP, this information has also been used to prepare a number of Functional Layout Plans for the various intersections along Donnybrook Road.

4 LAND USE AND NETWORK ASSUMPTIONS

4.1 MITM Model Zone Structure for the Melbourne North Growth Corridor

The zone system for the Corridor Plan as represented in MITM has been refined in comparison to previous versions of the model. Figure 5: Corridor Plan zone system

Figure 5 shows the overall zone system of the Corridor Plan in accordance with the information provided by the DOT.

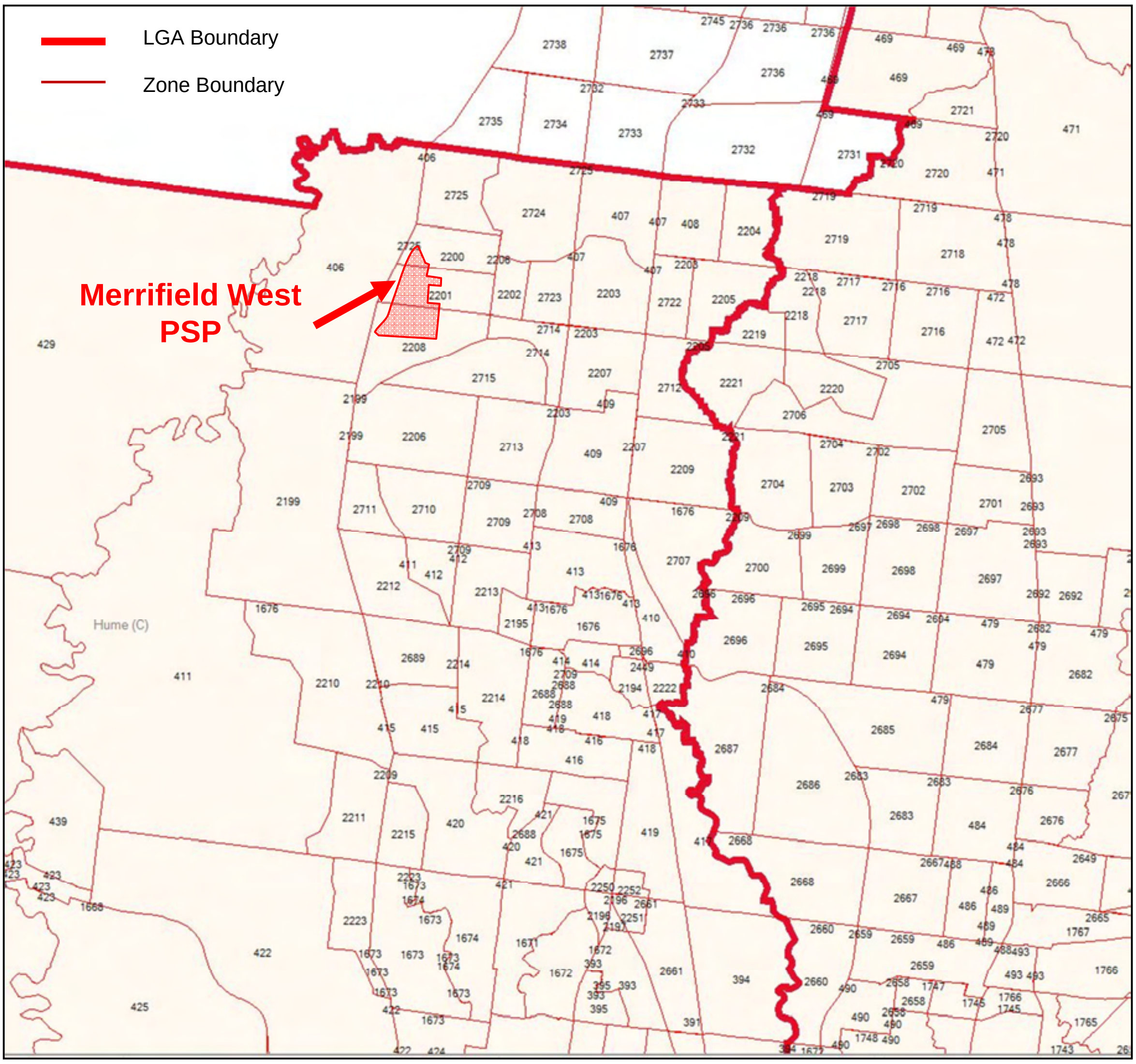


Figure 5: Corridor Plan zone system

Figure 5 shows that the MITM model zone structure in the unmodified MITM in the vicinity of the PSP is very coarsely represented. In addition, there is a poor correlation between the proposed PSP boundary and the current MITM zone structure. A disaggregation and refinement process has therefore been undertaken to better align these boundaries and thereby improving the accuracy of travel patterns within the PSP.

4.2 Merrifield West PSP Zone Structure

The sub-areas boundaries have been developed to align with the internal and external PSP road network reflecting planned land uses such as residential, retail, community and open space.

Figure 6 shows the zone structure within the PSP as a result of the work that was undertaken to disaggregate and reflect the most dominate land uses, i.e. residential, retail and employment. Roads which run through these zones are recognised by the zone connectors are placed onto the internal and surrounding road network.

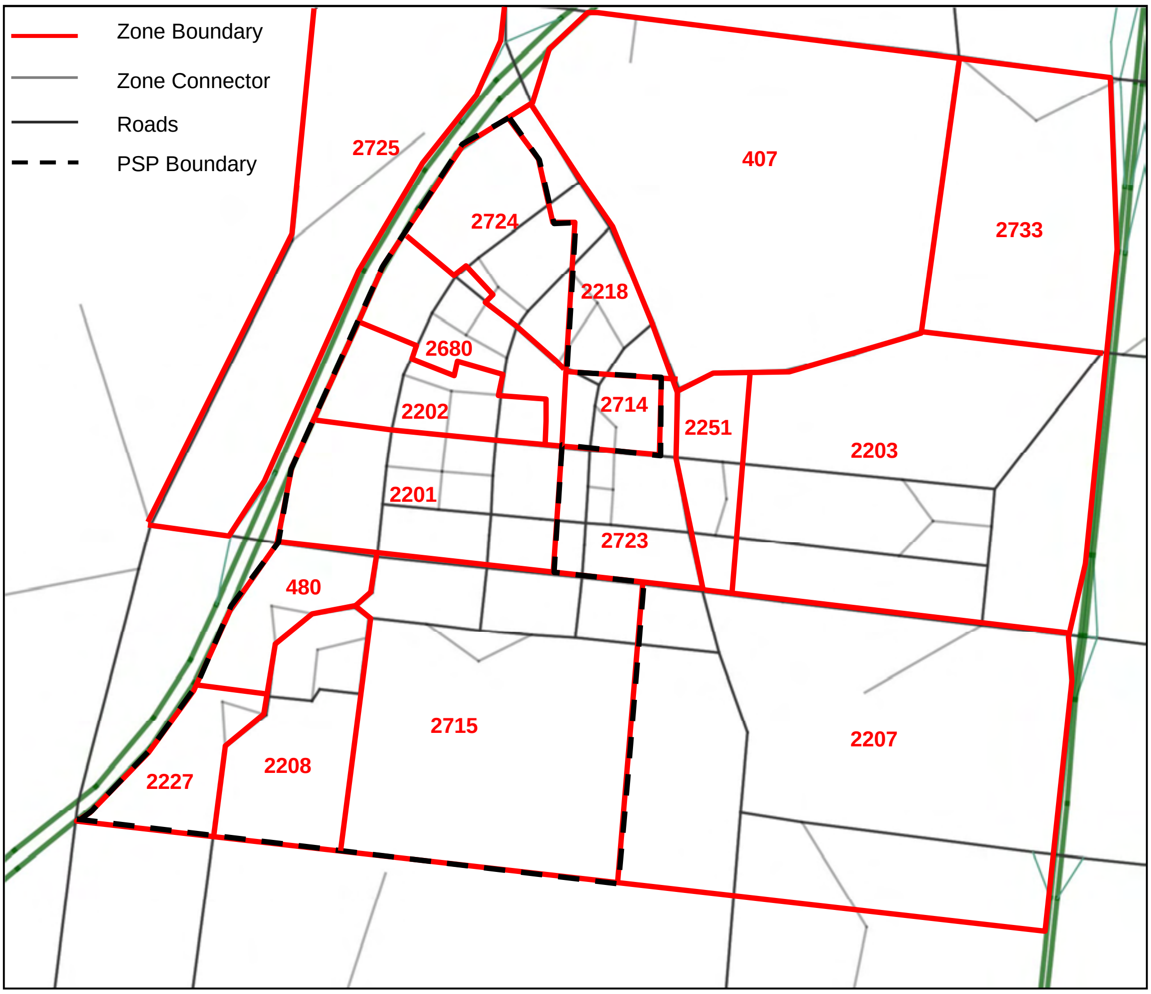


Figure 6: MITM model zone structure within the PSP for 2046

Note: Road network as described above includes additional road links not yet included in the December 2011 version of MITM. Accordingly, the network immediately surrounding the PSP has been modified to recognise the future road shown in the Corridor Plan as follows:

<u>2021</u>

- Connections east of the E14/Aitken Boulevard to recognise future development in the Merrifield West PSP;
- Realigning the E14/Aitken Boulevard towards the north-east and away from the OMR;
- Inclusion of the Western Connector; and
- Modifications to the lower order roads south of Donnybrook Road and their connections through the PSP area.

2046

- Connections east of the E14/Aitken Boulevard to recognise future development in the PSP Realigning the E14/Aitken Boulevard towards the north-east and away from the OMR;
- Inclusion of the OMR;
- Inclusion of the Western Connector; and
- Inclusion of a lower order connection on to the Hume Freeway servicing the future Mickleham North Employment Area.

4.3 Land Use Assumptions

MITM requires land use assumptions to be multiplied by a range of trip generation factors in order to determine the total trips generated for a given area. Land use assumptions for both within the Merrifield West PSP and the immediate vicinity of the PSP have been provided by Merrifield Corporation.

A summary of the assumed land uses contained within each model zone are provided Table 1, Table 2 and Table 3 below:

- Table 1 refers to the land use assumptions specifically within the PSP boundaries which are assumed to remain unchanged in both future model years, i.e. 2021 and 2046.
- Table 2 refers to the assumed land uses outside the PSP for the 2021 model year.
- Table 3 refers to the assumed land uses outside the PSP for the 2046 model year.

Table 1: MITM Land uses within the PSP by Sub-Area for 2021 and 2046 scenarios

Zone Number	Population	Dwellings	Enrolments	Jobs
480	1,950	600	0	0
2201	4,225	1,300	400	0
2202	1,625	500	1,550	0
2208	2,275	700	850	248
2227	975	300	1,500	0
2680	3,250	1,000	0	124
2714	2,025	623	0	0
2715	3,250	1,000	0	0
2724	3,250	1,000	0	124
TOTAL	**22,825**	**7,023**	**4,300**	**496**

Table 2: MITM Land uses outside the PSP by Sub-Area for 2021 scenario

Zone Number	Population	Dwellings	Enrolments	Jobs
407	325	100	0	0
2203	0	0	0	1,000
2207	0	0	0	2,500
2218	0	0	0	0
2251	1,400	500	500	2,500
2723	1,400	500	0	1,000
2725	137	42	0	2
2733	0	0	0	0
TOTAL	**3,262**	**1,142**	**500**	**7,002**

Table 3: MITM Land uses outside the PSP by Sub-Area for 2046 scenario

Zone Number	Population	Dwellings	Enrolments	Jobs
407	4,225	1,300	0	50
2203	0	0	0	12,272
2207	0	0	0	5,000
2218	1,625	500	0	50
2251	2,940	1,050	1,500	7,116
2723	2,940	1,050	0	7,116
2725	3,250	1,000	0	3
2733	0	0	0	7,480
TOTAL	**14,980**	**4,900**	**1,500**	**39,087**

Table 1, Table 2 and Table 3 indicate that the PSP is predominantly represented by residential and educational land uses. Zones adjacent to the PSP such as the zone 2723, representing the MTC, include employment land uses which may attract higher proportion of retail trips during the PM peak period.

The land use plan for the PSP can be seen in Appendix 2.

4.4 Public Transport Infrastructure

Principal public transport infrastructure has been planned along the E14/Aitken Boulevard from the south, turning eastwards through the MTC and then north to the Beveridge Major Town Centre.

These routes will be serviced by a high frequency bus services along clearly demarcated bus routes. Bus drop-off and pick-up points will be located near the MTC retail area. There is also potential for buses to loop further west into the PSP to ensure that the maximum desirable 400 metres walking distances to bus stops is achieved.

Refer to Figure 7 for public transport routes within the Merrifield West PSP in the Ultimate scenario.

Figure 7: Public transport routes within MITM for Ultimate 2046 year

The bus routes as shown in Figure 7 represent services for major links as represented in the MITM strategic model. The Merrifield West PSP will provide opportunity for bus routes to service local connections within the PSP which may not be shown in Figure 7. Links to major bus routes are planned at key interchanges at Donnybrook and the potential future Lockerbie railway stations. Localised feeder bus routes are planned to provide access to and from the PSP to both Donnybrook and the potential future Lockerbie railway stations.

4.5 Cycle and Pedestrian Paths

The PSP is very permeable in that it provides both pedestrians and cyclists with a number of options to connect and cross-connect within the site.

Cycle and pedestrian paths have been planned to focus on providing access between the various activity centres and schools within the MTC. All internal streets have pedestrian paths and on road cycle paths to connect with the broader community as well as creating opportunities for shorter recreational routes within the site.

Figure 8 shows schematically the proposed locations of the cycle and pedestrian paths.

Figure 8: Locations of proposed cycle and pedestrian facilities

5 MODEL OUTPUTS

5.1 Trip Generation Rates

The DoT commissioned a Victorian Integrated Survey of Travel and Activity (VISTA) in 2007 to obtain a detailed picture of how people travel within the metropolitan area and its neighbouring regions on an average weekday. According to the VISTA survey results, the average household produces between 8.5 and 10 trips per day, depending on car ownership rates, accessibility, demographic structure, etc. The MITM trip generation results in an average of 9 trips per household per day. This shows that the average trip generation per household per day is well within the expected range.

Table 4 provides a breakdown of a First Principles Assessment of the MITM Trip Generation Rates for the interim and ultimate scenarios of the PSP. A comparison shows that the number of trips generated by MITM are within 10% of the equivalent number of trips calculated using the First Principles Assessment.

Table 4: First Principles Assessment

<table>
<tr><th>Zone</th><th>PSP Land Use Composition</th><th>PSP Totals</th><th>MITM Daily Trip Generation Rate</th><th>MITM Daily Trips</th><th>First Principles Daily Trip Generation Rate</th><th>First Principles Daily Trips</th></tr>
<tr><td>Households</td><td>N/A</td><td>7,023 households</td><td>9.59 per household</td><td>67,351</td><td>9 per household[1]</td><td>63,207</td></tr>
<tr><td>Employees</td><td>2 x Local Town Centres
1 x Mixed Use Area</td><td>496 employees</td><td rowspan="2">Various[2]</td><td rowspan="2">12,816</td><td>6.61 per employee[3]</td><td>3,279</td></tr>
<tr><td>Enrolments</td><td>2 x State Primary Schools
2 x Catholic Primary Schools
1 x State Secondary School
1 x Catholic Secondary School</td><td>4,300 enrolments</td><td>1.87 per enrolment[3]</td><td>8,031</td></tr>
<tr><td>Total</td><td></td><td></td><td></td><td>80,167</td><td></td><td>74,517</td></tr>
</table>

1 - RTA Guide to Traffic Generating Developments 2002
2 - MITM is a trip production based model and therefore trip attractors can vary in terms of trip generation
3 – ITE Trip Generation Rates 8th Edition 2008

5.2 Future Traffic Demand for 2021 Interim Model Year

The construction of transport infrastructure within the PSP requires a quantifiable method by which estimated infrastructure funding costs can be attributed to all of the relevant stakeholders. Calculating these construction costs is part of the DCP process and requires that a future travel demand forecast for an interim development scenario be established.

For DCP purposes, the 2021 model year has been selected by the Growth Areas Authority and VicRoads as the appropriate year for the future travel demand forecast to be determined. It is assumed that the PSP will be fully developed or approaching full development at this point in time.

Figure 9 shows the forecasted daily travel demands within PSP for the interim 2021 modelled year.

Additional MITM plots are included as Appendix 3.

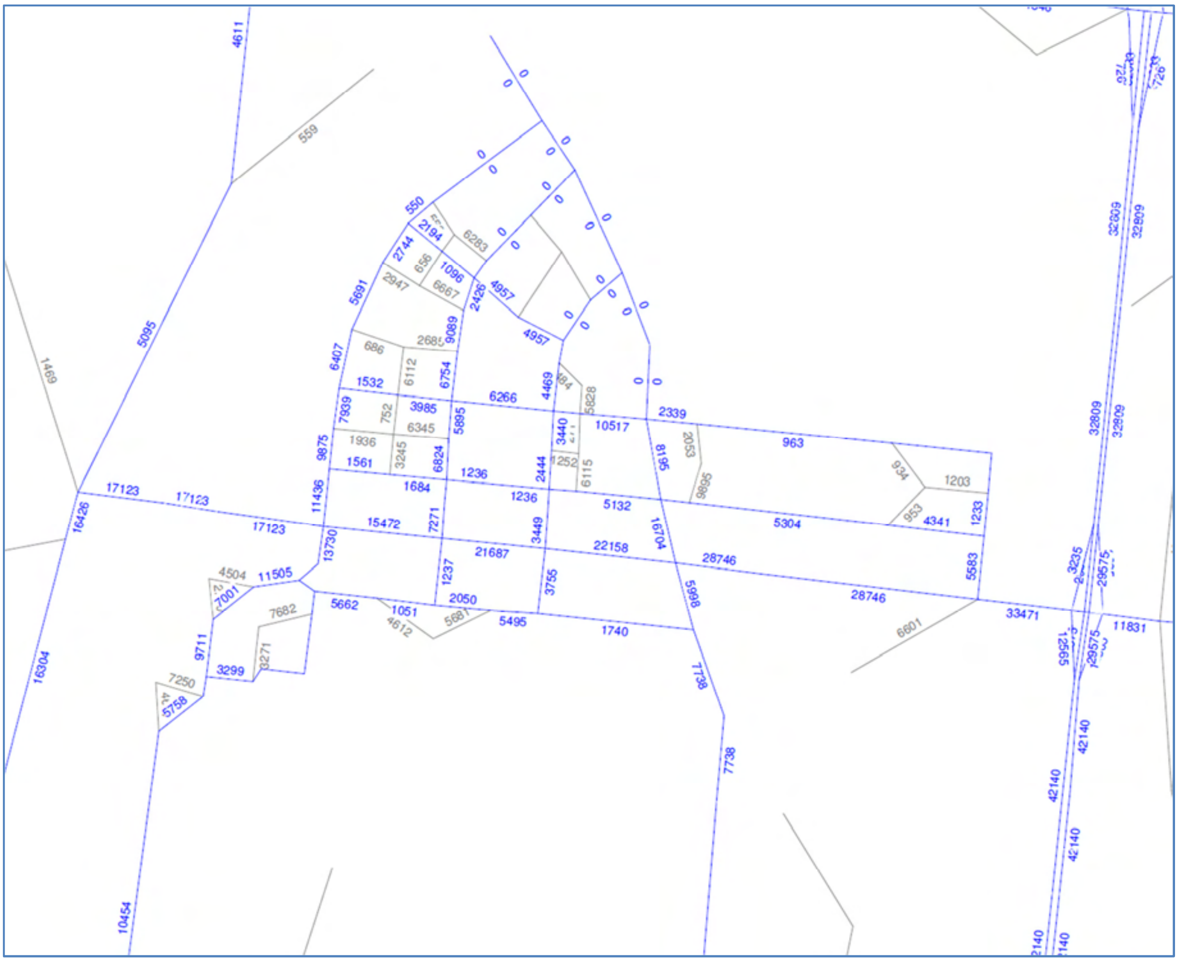


Figure 9: Forecast daily volumes on roads in vicinity of Merrifield West in 2021 interim scenario

The interim scenario indicates that there are significant traffic volumes travelling along Donnybrook Road.

The Western Connector carries zero flows as there are no connections towards the north of the Merrifield West PSP.

Traffic volumes within the immediate vicinity of the MTC are higher than on other local internal streets in response to the anticipated higher number of retail trips assumed for the zones in this part of the model. These daily forecast traffic volumes do not recognise the variation in trip types occurring during the AM versus PM peak, e.g. retail and employment related trips.

5.3 Future Traffic Demand for 2046 Ultimate Model Year

The ultimate scenario has been modelled for the 2046 year to recognise projects that are planned to be constructed within this timeframe.

The projected daily traffic volumes on the road network in around the PSP in 2046 are shown in Figure 10. Additional MITM plots are included as Appendix 3.

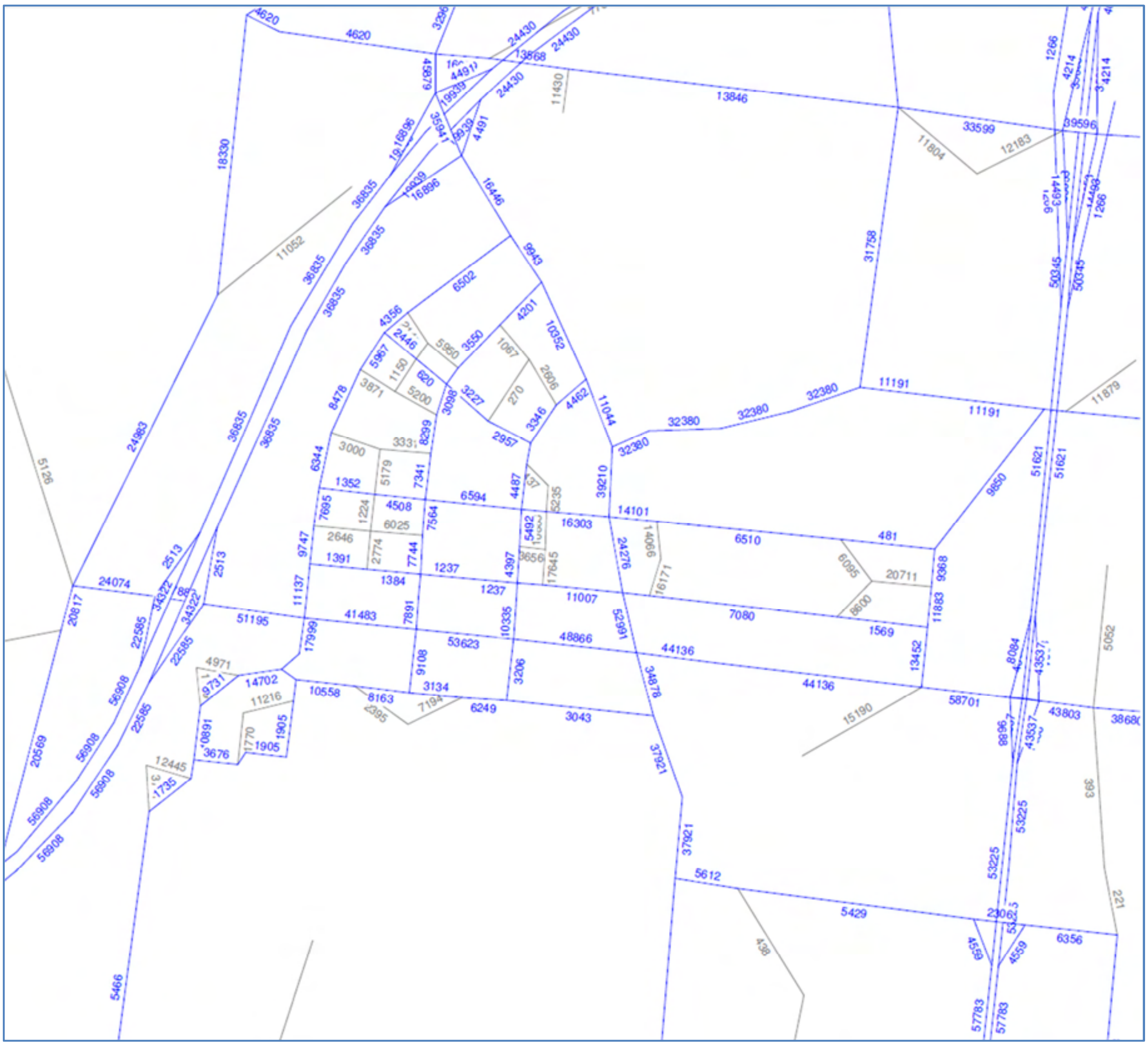


Figure 10: Forecast daily volumes on roads in vicinity of Merrifield West in 2046 ultimate scenario

6 DETAILED INTERSECTION ASSESSMENTS

6.1 Future Intersection Capacity Tests

Analyses of a number of intersections were undertaken using SIDRA Intersection 5.1 to assess the performance of individual traffic signal controlled sites for the 2021 and 2046 years. The following design and operational requirements have been considered:

- Lane configuration, signal phasing and coordination requirements at the traffic signals to ensure the safe and efficient operation of the road network for the current and future design traffic flows, as specified;
- The needs of all road users (e.g. private vehicles, heavy vehicles, freight, buses, pedestrians and cyclists) are taken into account, and
- Traffic signal integration within the VicRoads SCATS® system, which is used to monitor and control traffic signal operation.

It is important to note that the traffic volumes shown in Section 5 reflect an estimated 24-hour demand. In this section, tables represent only the morning peak hour flows that were used to analyse the performance of the intersection during the AM period.

Studies of the distribution of traffic volumes through the day show that the peak hour flows are generally about 55% of the peak 2-hour period flows. The morning peak hour flows are therefore obtained by reducing the MITM 2-hour forecasts by a factor of 0.55.

6.2 Performance Criteria

The modelling using SIDRA has confirmed that the traffic signal design and operation of individual sites satisfies the performance criteria as specified in Table 5. General descriptions of the operating conditions of each of the levels of service are provided below:

Table 5: SIDRA performance criteria

Criterion	New Traffic Signals
Degree of Saturation	≤ 0.95
Level of Service (LOS)	LOS D or better

LOS A describes primarily free-flow operations. Average operating speeds at the free-flow speed generally prevail. Vehicles are almost completely unimpeded in their ability to man oeuvre within the traffic stream. Even at the maximum density for LOS A, the average spacing between vehicles is about 160m, or 26 car lengths, which affords the motorist with a high level of physical and psychological comfort. The effects of incidents or point breakdowns are easily absorbed at this level.

LOS B also represents reasonably free-flow, and speeds at the free-flow speed are generally maintained. The lowest average spacing between vehicles is about 110m, or 18 car lengths. The ability to man oeuvre within the traffic the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still easily absorbed, though local deterioration in service may be more severe than for LOS A.

LOS C provides for flow with speeds still at or near the free-flow speed of the roadway. Freedom to man oeuvre within the traffic stream is noticeably restricted at LOS C, and lane changes require more vigilance on the part of the driver. Minimum average spacings are in the range of 70m, or 11 car lengths. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.

LOS D is the level at which speeds begin to decline slightly with increasing flows. In this range, density begins to deteriorate somewhat more quickly with increasing flow. Freedom to manoeuvre within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.

LOS E describes operation at capacity. Operations in this level are volatile, because there are virtually no useable gaps in the traffic stream. Vehicles are spaced at approximately 6 car lengths, leaving little room to manoeuvre within the traffic stream. Any disruption to the traffic stream, such as vehicles entering from a ramp or a vehicle changing lanes can cause following vehicles to give way to admit the vehicle. This can establish a disruption wave that propagates throughout the upstream traffic flow. At capacity the traffic stream has no ability to dissipate even the most minor disruptions, and any incident can be expected to produce a serious breakdown with extensive queuing.

LOS F describes breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. Such breakdowns occur for a number of reasons. Recurring points of congestion exist, such as merge or weaving areas, where the number of vehicles arriving is greater than the number of vehicles discharged. In forecasting situations, any location presents a problem when the projected peak hour (or other) flow rate exceeds the estimated capacity of the location.

6.3 Pedestrian and Cyclist Movements

All pedestrian and cyclist movements are incorporated in the traffic signal layouts. The pedestrians and cyclists share the same signal group within the phase in which they run.

Pedestrians and cyclists using the pedestrian crossings have been allocated crossing time in the SIDRA models and lanterns would be provided post construction. It is assumed that all pedestrian facilities will be utilised by both pedestrians and cyclists.

Currently, SIDRA assumes that 50 pedestrians pass through each movement per hour. It should be noted that this is a conservative assumption as pedestrian movements tend only to be considered when pedestrian signals are activated.

6.4 Public Transport Priority

Buses have not been identified as an exclusive vehicle class for the purposes of determining overall intersection performance using SIDRA. Rather, buses have been included in the overall heavy vehicle composition, recognising that at some point in the future the traffic signal phasing may need to be modified to give buses the priority they require.

6.5 Intersections Identified as Contributing to the DCP

The strategic model gives an indication of the demand and trip patterns at intersections which will form part of the Development Contribution Plan (DCP). Major intersections within the PSP identified for inclusion in the DCP include:

- **IT01:** Collector Road with Western Connector;
- **IT02:** Collector Road with Western Connector;
- **IT03:** Collector Road with Western Connector;
- **IT04:** Collector Road with Donnybrook Road;
- **IT05:** Collector Road with Donnybrook Road;
- **IT06:** Collector Road with Donnybrook Road; and
- **IT07:** Donnybrook Road Old Sydney Road/Mickleham Road.

Figure 11 shows the location of the proposed intersections within the PSP.

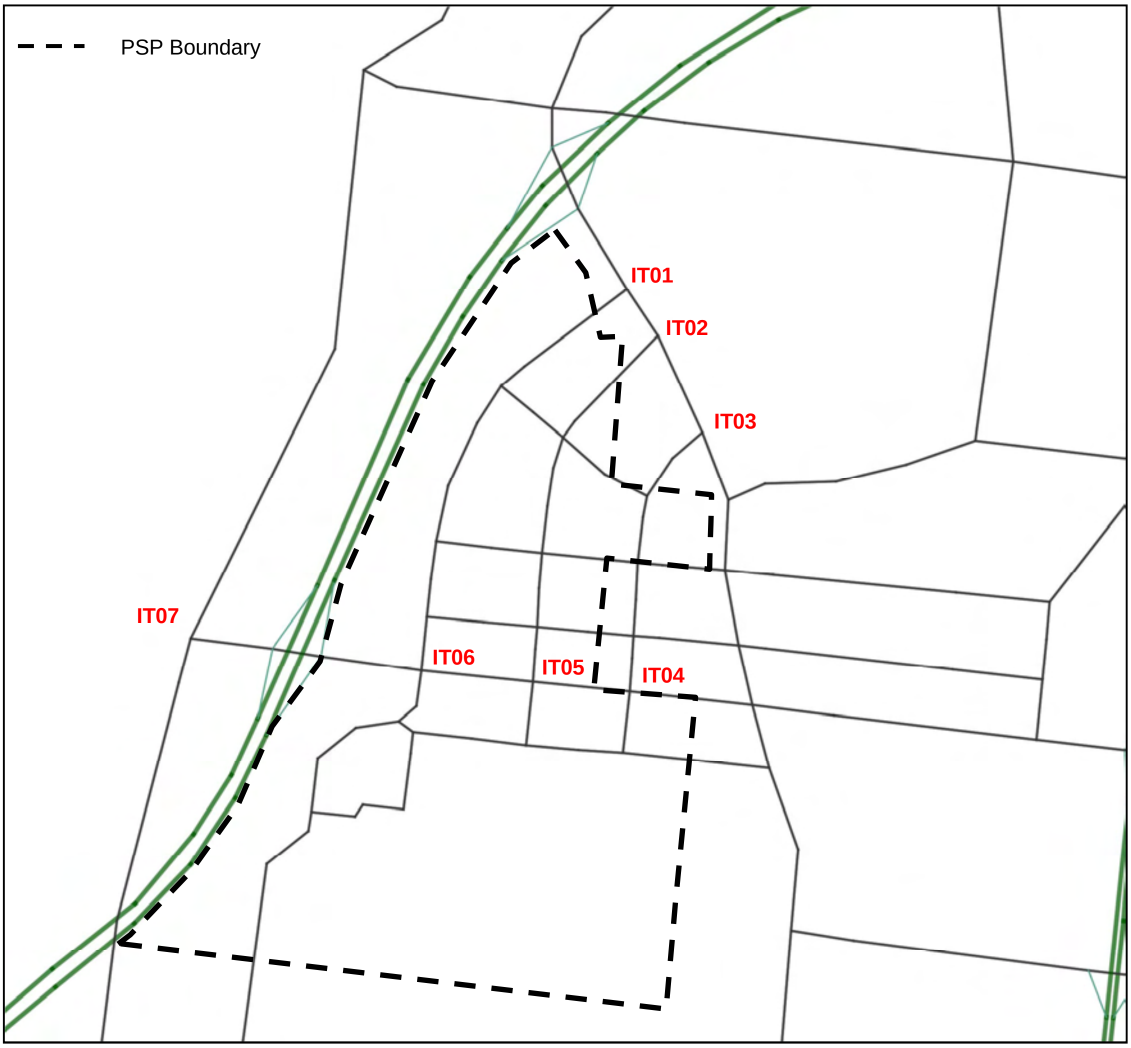


Figure 11: Location of proposed intersections

6.6 Assessment of the 2021 PM Peak Hour

MITM in its current form has been developed to forecast commuter trips in the AM peak 2-hour average weekday period. Although the AM peak is considered to be the critical peak period for assessing major infrastructure projects within Melbourne, trip patterns change during the course of a day which means that the AM peak does not necessarily reflect the same travel patterns and traffic composition during the PM peak. Further analysis using SIDRA was therefore also undertaken for selected intersections within the MTC to confirm their continued acceptable performance during the 2021 PM peak hour.

The local town centres within the PSP, north and south of Donnybrook Road, are also expected to produce retail trips during the PM peak. It is assumed that the additional traffic generated by these smaller centres service short-distance local traffic only. The anticipated catchment of these town centres is therefore expected to be small and in turn have a minimal effect on major intersections recognised in the DCP process.

During the PM peak, the travel patterns associated with the MTC are anticipated to contain a large number of retail trips as during the PM peak, activity within the retail precinct coincides with a much higher travel demand. To recognise this shift in travel behaviour between the AM peak and PM peak, a desktop analysis has been undertaken to determine a more likely set of PM peak turning volumes for input into the SIDRA analyses.

The PM peak turning movement volumes have been developed as follows:

1. Extract the AM peak traffic volumes from MITM for the intersections that are required to be analysed.
2. Transpose the AM peak traffic volumes to produce an indicative set of PM peak traffic volumes as a starting point for the calculation.
3. Determine total number of retail trips produced by the MTC within the PM peak period using a First Principles Assessment
4. Distribute total additional trips in accordance with the anticipated travel patterns within the Corridor in 2021.
5. Add home-based retail trips (trips to and from the MTC) to PM peak starting volumes.
6. Perform SIDRA intersection analyses using these revised traffic volumes to determine a more likely set of PM peak intersection performance conditions.

It should be noted that the total number of commuter trips has not been reduced in this approach, i.e. retail trips have simply been added to the overall intersection demands. This is a conservative approach in recognition of the fact that the PM peak is likely to be the critical peak associated with the close proximity of the neighbouring MTC. To simplify the process, the MTC is analysed as a standalone influence.

The purpose of the 2021 PM peak hour turning volume assessment is to ensure that all of the intersections along Donnybrook are able to adequately cater for the projected AM and PM traffic conditions in 2021. Other neighbouring retail areas have been assumed to service local their local environments in a similar way but to a lesser extent.

Step 1 – AM Peak Traffic Volumes

Figure 12 shows the AM peak hour traffic volumes extracted from MITM for intersections IT04, IT05, IT06 and IT07 along Donnybrook Road to be assessed using SIDRA analysis.

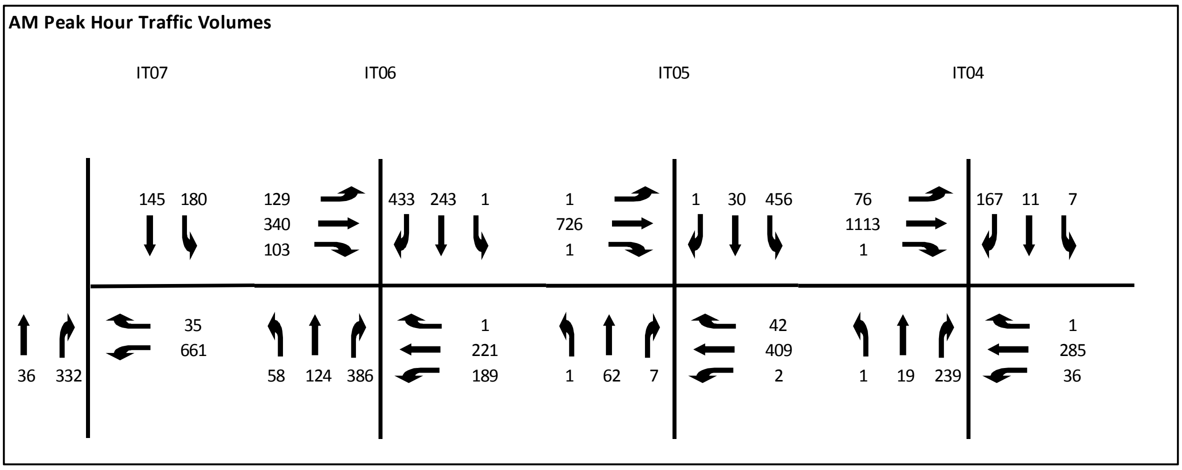


Figure 12: AM peak traffic volumes

Step 2 – Transposed AM Peak Traffic Volumes

Figure 13 shows the transposed AM peak hour traffic volumes at these intersections.

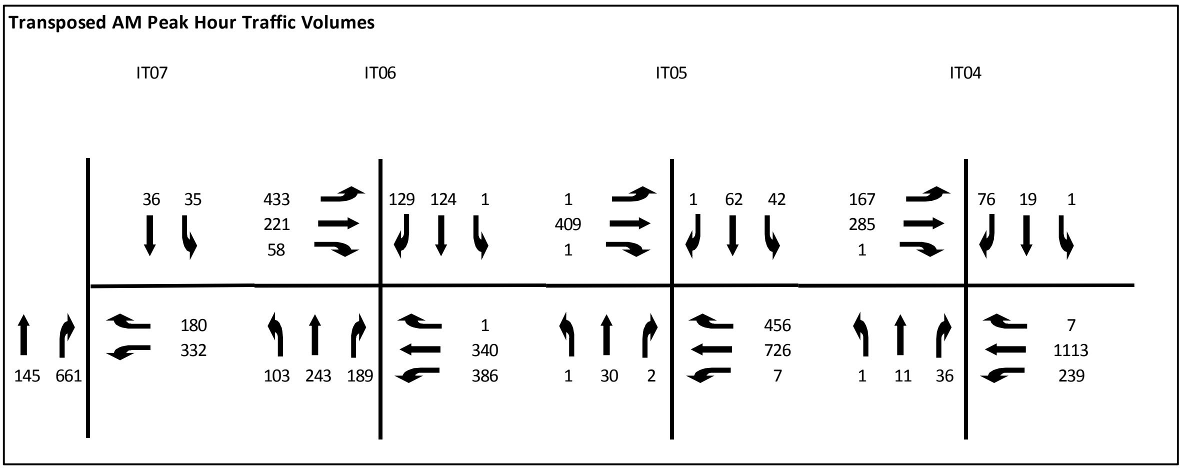


Figure 13: Transposed AM peak traffic volumes

Step 3 – First Principles Assessment

Preliminary master planning by Merrifield Corporation suggests that up to 98,333 sqm of retail and 46,650 sqm bulky goods floor space and approximately 2,100 dwellings can be supported in the MTC. It should be noted that these figures were determined prior to approval of the NGCP and thus represents a 'worst case' demand scenario. The ultimate retail floor space and dwellings numbers will be confirmed through a separate planning and rezoning process for the MTC.

The Roads and Traffic Authority (RTA) of New South Wales Guide to Traffic Generating Developments (2002) indicates that a Friday PM peak produces approximately 11 trips per 1,000 sqm of retail. However, retail rates can vary greatly depending on the total floor area of the retail precinct.

As the planned retail area is above 40,000sqm maximum category for retail floor space referred to in the RTA Guide, the lowest rate was applied. This equates to a total of 1,149 trips per hour produced by the MTC within the PM peak period, as shown in Table 6 below:

Table 6: PM trip generation by land use within the MTC

Land Use	Land Use Size	Trip Rate	Trips	Internal trip Reduction %	Additional PM Retail Trips
Retail	98,333sqm	11 trips per 1,000 sqm	1,082 trips	0%	Add 1,082 trips
Bulky Goods Retail	46,650sqm	11 trips per 1,000 sqm	513 trips	0%	Add 513 trips
Residential	2,100 dwellings	0.85 trips per dwelling	1,785 trips	25%	Minus 446 trips
				TOTAL	**1,149 trips**

According to the RTA Guide, not all residential trips are considered to be external trips. As a guide, about 25% of trips will be internal to any subdivision, involving local shopping, schools and local social visits. When reviewing the impact of traffic generated on subregional and regional roads, some adjustment can be claimed, depending on the location of retail centres, schools and recreational facilities relative to any town centre development. During the PM peak, these conditions are considered to be met based on the land use composition for zone 2723 and 2251 representing the MTC.

Step 4 – Retail Trip Distribution

Although the MTC is planned to service the PSP, it is assumed that a proportion of trips are also long distance trips which may travel to and from zones external of the PSP. The following assumptions have been used to determine trip distribution to and from the MTC:

- 50% of trips will travel to and from the PSP north of Donnybrook Road,

NOTE: (According to the Austroads Guide to Traffic Management – Part 3, the theoretical maximum lane capacity for a local road is deemed to have been reached at 900 vehicles per lane per hour. This means that when including these additional trips, the resultant PM hourly volumes within the PSP can be accommodated on the available local road network. (Refer to Appendix 3 for hourly volumes)

- 20% of trips will travel to and from the PSP south of Donnybrook Road,
- 10% of trips are considered to be long distance trips travelling to and from Mickleham Road in the west; and
- 20% of trips are considered to be long distance trips travelling to and from both the Hume Freeway and other PSP developments to the east.

Table 7: Retail Trip Distribution based on First Principles Assessment

Land Use	Additional PM Retail Trips	50% North	20% South	20% East	10% West
Retail	+ 1,082 trips	+ 541	+216	+216	+ 108
Bulky Goods Retail	+ 513 trips	+257	+103	+103	+ 51
Residential	- 446 trips	-223	- 89	- 89	- 45
TOTAL	**1,149 trips**	**575 trips**	**230 trips**	**230 trips**	**115 trips**

Step 5 – Add Home-based Retail Trips

Figure 14 shows the additional home-based retail trips to and from the MTC to be added to the transposed AM peak traffic volumes.

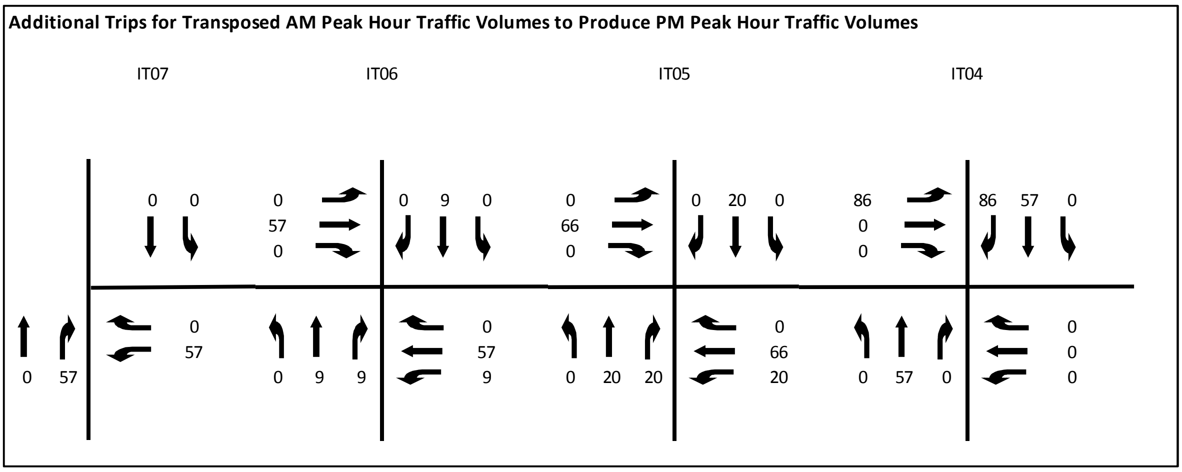


Figure 14: Additional trips from Retail to be added to transposed AM matrix

Step 6 – PM Peak Traffic Volumes

Figure 15 shows the PM peak hour traffic volumes for intersections IT04, IT05, IT06 and IT07 along Donnybrook Road to be assessed using SIDRA analysis.

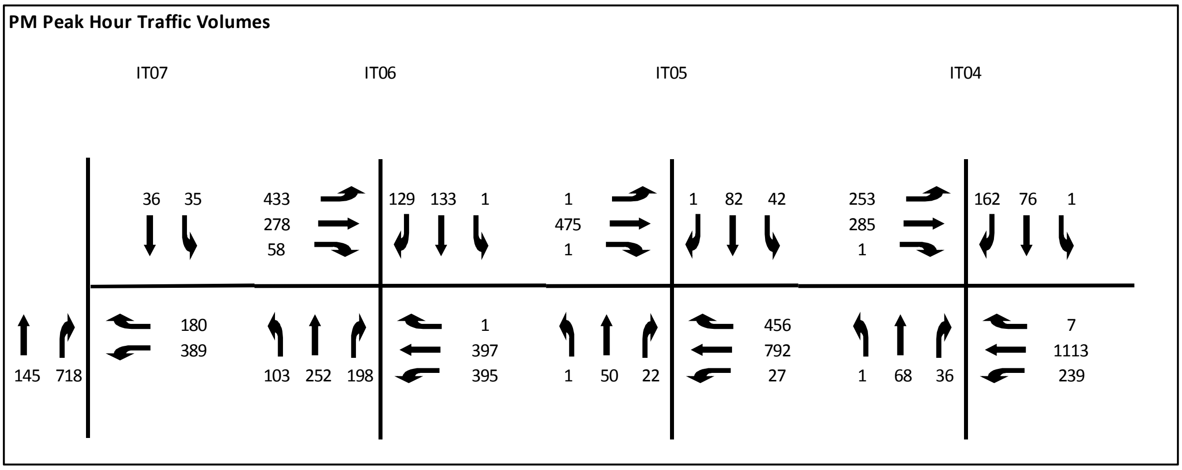


Figure 15: PM peak traffic volumes

6.7 Interim Intersection Assessments

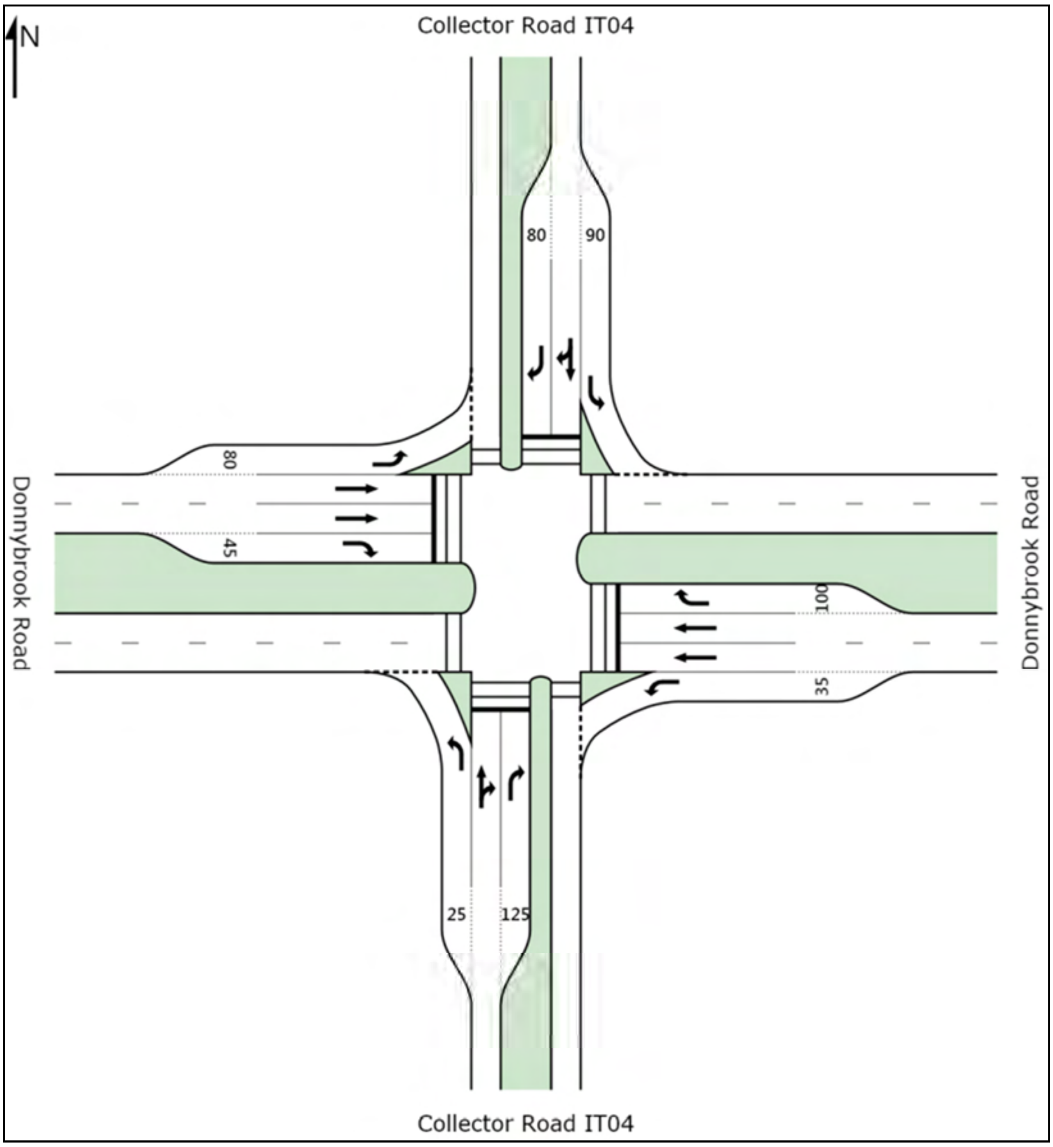
6.7.1 Intersections IT01, IT02 and IT03 along Western Connector

These intersections have not been assessed for the interim scenario based on the 2021 MITM model analysis which indicates that because the OMR has not been constructed as there is no demand for travel to the north and therefore the Western Connector is not required.

Detailed SIDRA outputs for all of the remaining intersections for the interim year are provided in Appendix 4. Turn lane lengths modelled in SIDRA represent the storage length of the turn lanes only. The turn lane lengths as shown in any functional layout will comprise of the storage lengths as determined by SIDRA, plus provision for vehicle deceleration and pocket taper.

6.7.2 Intersection IT04: Collector Road IT04 and Donnybrook Road

The interim layout of the Collector Road IT04 and Donnybrook Road intersection is shown below.



Results for this intersection are shown in Table 8 and Table 9. This table shows that the intersection operates at LOS A during the AM and PM peak periods with approximately 33 seconds delay for all vehicles being experienced on average.

Table 8: Results of SIDRA Analysis for intersection IT04, 2021 AM peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT04											
10	L	1	5.0	0.002	7.9	LOS A	0.0	0.1	0.15	0.59	44.7
11	T	19	5.0	0.567	55.0	LOS A	9.1	66.3	0.99	0.79	21.0
12	R	239	5.0	0.568	62.3	LOS A	9.1	66.3	0.99	0.80	21.9
Approach		259	5.0	0.568	61.5	LOS A	9.1	66.3	0.99	0.80	21.9
East: Donnybrook Road											
1	L	37	5.0	0.029	8.3	LOS A	0.1	0.6	0.05	0.62	47.7
2	T	285	5.0	0.145	4.6	LOS A	2.0	14.3	0.17	0.14	56.9
3	R	1	5.0	0.011	68.8	LOS A	0.1	0.7	0.97	0.59	21.8
Approach		323	5.0	0.145	5.2	LOS A	2.0	14.3	0.16	0.20	55.5
North: Collector Road IT04											
7	L	7	5.0	0.014	11.1	LOS A	0.1	0.9	0.25	0.65	47.7
8	T	11	5.0	0.455	57.2	LOS A	6.7	48.9	0.98	0.77	21.2
9	R	168	5.0	0.455	64.7	LOS A	6.7	48.9	0.98	0.78	22.7
Approach		186	5.0	0.455	62.3	LOS A	6.7	48.9	0.95	0.77	23.1
West: Donnybrook Road											
7	L	77	5.0	0.058	9.1	LOS A	0.4	3.1	0.12	0.65	53.3
8	T	1113	5.0	0.565	6.0	LOS A	10.4	75.7	0.29	0.26	57.5
9	R	1	5.0	0.011	66.4	LOS A	0.1	0.6	0.93	0.59	21.5
Approach		1191	5.0	0.564	6.3	LOS A	10.4	75.7	0.28	0.29	57.1
All Vehicles		1959	5.0	0.568	18.7	LOS A	10.4	75.7	0.42	0.38	41.5

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

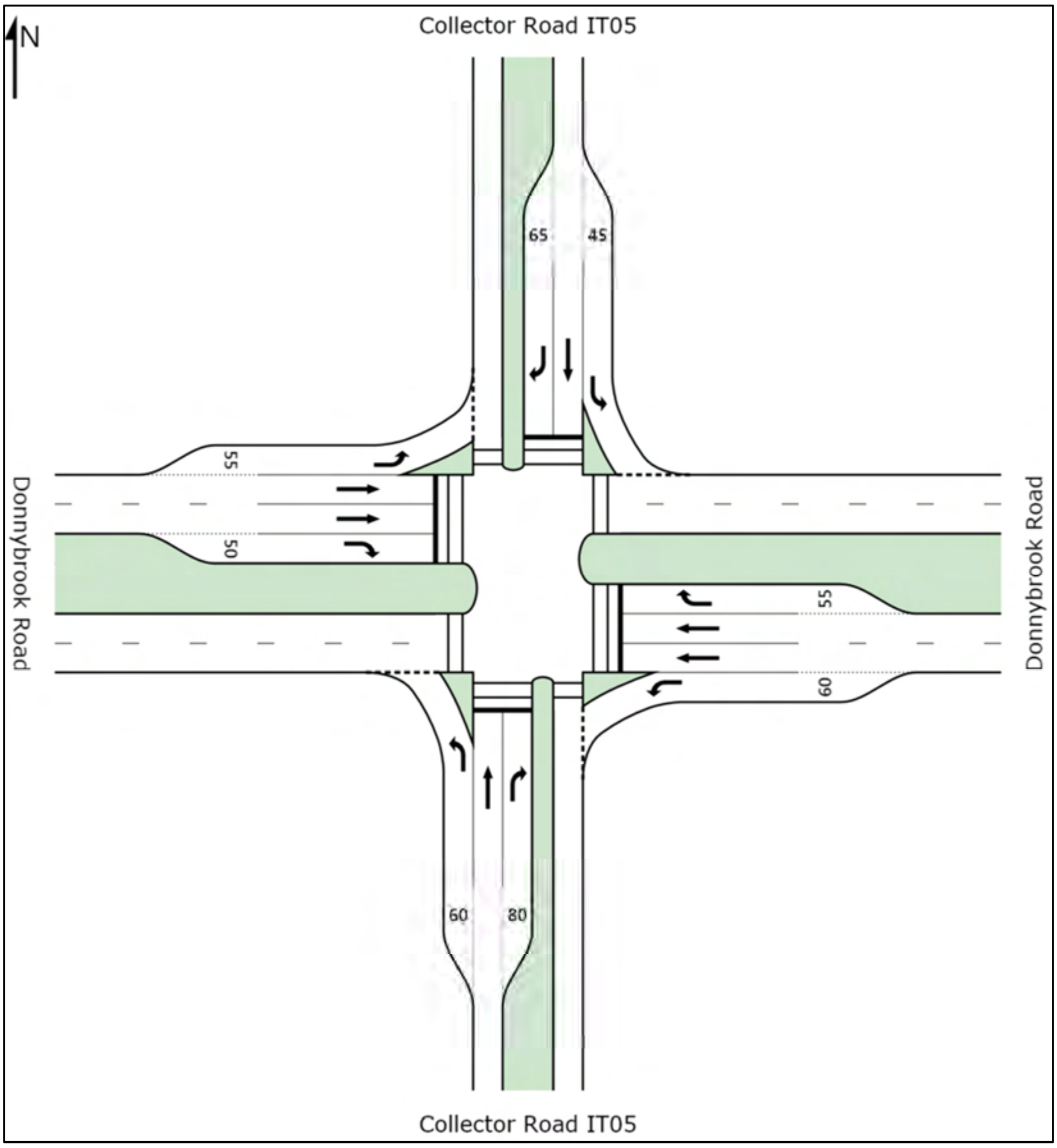
Table 9: Results of SIDRA Analysis for intersection IT04, 2021 PM peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT04											
10	L	1	5.0	0.003	9.2	LOS A	0.0	0.1	0.23	0.60	43.6
11	T	68	5.0	0.329	54.9	LOS A	3.8	27.7	0.96	0.74	21.4
12	R	36	5.0	0.183	61.1	LOS A	2.0	14.4	0.94	0.73	22.1
Approach		105	5.0	0.329	56.6	LOS A	3.8	27.7	0.95	0.73	21.7
East: Donnybrook Road											
1	L	239	5.0	0.200	8.4	LOS A	0.5	3.9	0.06	0.63	47.6
2	T	1113	5.0	0.556	5.3	LOS A	7.8	57.0	0.26	0.23	54.7
3	R	7	5.0	0.017	42.3	LOS A	0.3	2.1	0.75	0.67	29.6
Approach		1359	5.0	0.556	6.1	LOS A	7.8	57.0	0.23	0.31	53.2
North: Collector Road IT04											
7	L	1	5.0	0.001	9.3	LOS A	0.0	0.0	0.16	0.63	49.4
8	T	76	5.0	0.554	56.9	LOS A	6.9	50.5	0.99	0.79	21.7
9	R	162	5.0	0.554	64.5	LOS A	6.9	50.5	0.99	0.79	22.8
Approach		239	5.0	0.554	61.9	LOS A	6.9	50.5	0.99	0.79	22.6
West: Donnybrook Road											
7	L	253	5.0	0.220	9.4	LOS A	1.4	10.5	0.17	0.67	53.0
8	T	285	5.0	0.249	24.3	LOS A	4.7	34.6	0.60	0.49	38.8
9	R	1	5.0	0.011	66.4	LOS A	0.1	0.4	0.93	0.59	21.5
Approach		539	5.0	0.249	17.4	LOS A	4.7	34.6	0.40	0.57	44.1
All Vehicles		2242	5.0	0.556	17.1	LOS A	7.8	57.0	0.38	0.44	40.3

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.7.3 Intersection IT05: Collector Road IT05 and Donnybrook Road

The interim layout of the Collector Road IT05 and Donnybrook Road intersection is shown below.



Results for this intersection are shown in Table 10 and Table 11. This table shows that the intersection operates at LOS D during the AM peak and LOS A during the PM peak periods with approximately 35 seconds delay for all vehicles being experienced on average.

Note:

For the PM peak, westbound right turn volumes have been equally apportioned between IT05 and IT06. Local modelling phenomenon such as this can usually be overcome by including junction delays at the trip path assignment stage in the four-step modelling process or through the use of micro-simulation modelling at a local street level.

Table 10: Results of SIDRA Analysis for intersection IT05, 2021 AM peak

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Collector Road IT05											
10	L	1	5.0	0.001	8.4	LOS A	0.0	0.1	0.19	0.59	44.2
11	T	62	5.0	0.156	41.9	LOS A	3.0	21.7	0.86	0.66	24.6
12	R	8	5.0	0.088	69.0	LOS A	0.5	3.4	0.98	0.66	20.6
Approach		71	5.0	0.156	44.5	LOS A	3.0	21.7	0.86	0.66	24.2
East: Donnybrook Road											
1	L	2	5.0	0.002	8.5	LOS A	0.0	0.0	0.11	0.62	47.2
2	T	409	5.0	0.514	37.8	LOS A	9.6	70.2	0.84	0.70	25.0
3	R	43	5.0	0.158	37.9	LOS A	1.7	12.4	0.71	0.72	31.5
Approach		454	5.0	0.514	37.7	LOS A	9.6	70.2	0.83	0.70	25.7
North: Collector Road IT05											
7	L	456	5.0	0.915	18.4	LOS D	10.1	73.4	0.51	0.76	41.6
8	T	31	5.0	0.078	42.2	LOS A	1.5	10.6	0.84	0.64	26.4
9	R	2	5.0	0.022	69.0	LOS A	0.1	0.8	0.97	0.61	21.8
Approach		489	5.0	0.915	20.1	LOS D	10.1	73.4	0.53	0.76	40.1
West: Donnybrook Road											
7	L	1	5.0	0.001	9.1	LOS A	0.0	0.0	0.14	0.63	53.1
8	T	726	5.0	0.913	50.2	LOS D	22.8	166.1	1.00	0.97	26.6
9	R	1	5.0	0.004	36.1	LOS A	0.0	0.3	0.68	0.61	31.3
Approach		728	5.0	0.913	50.1	LOS D	22.8	166.1	1.00	0.97	26.6
All Vehicles		1742	5.0	0.915	38.2	LOS D	22.8	166.1	0.82	0.83	29.3

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

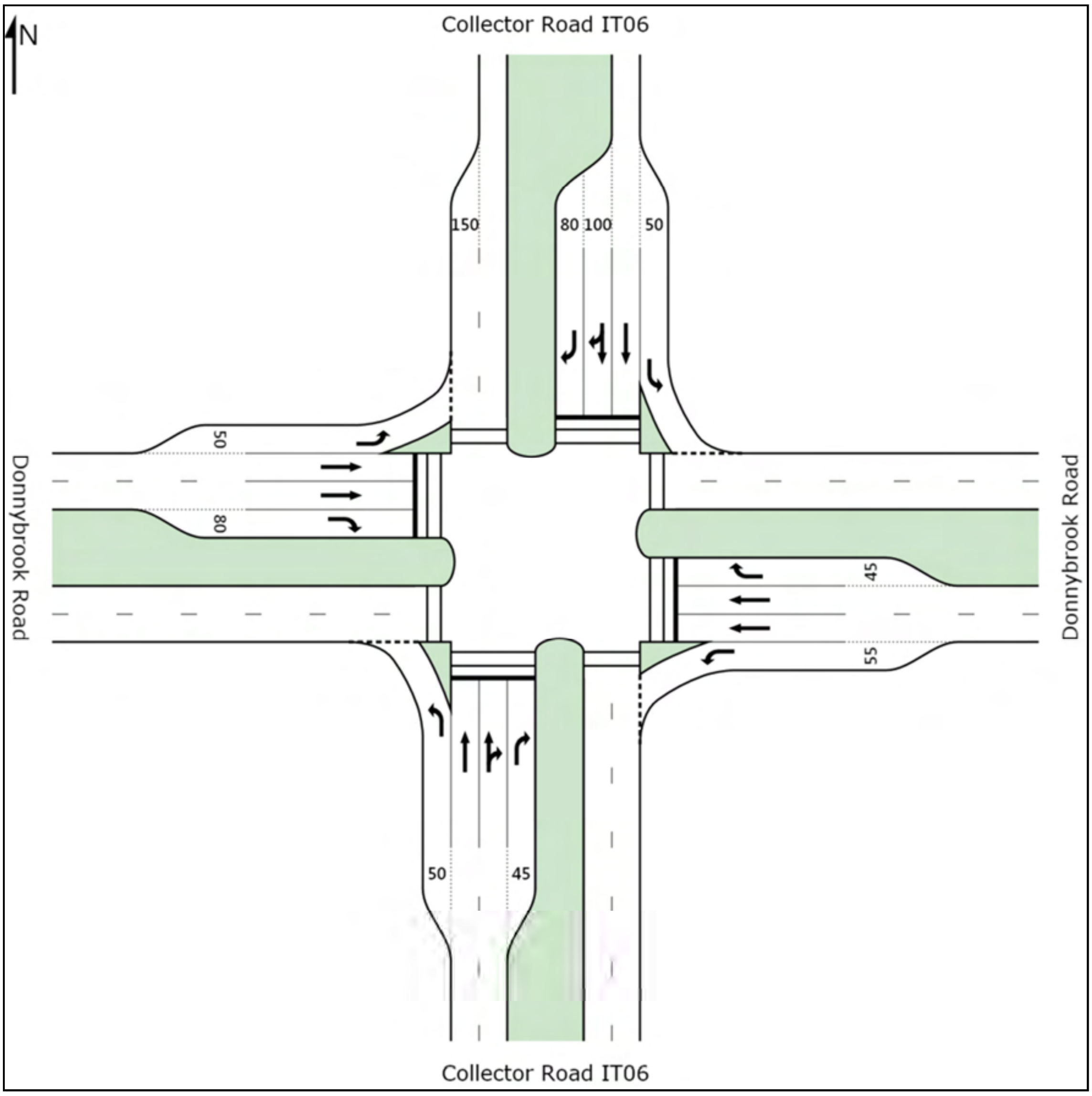
Table 11: Results of SIDRA Analysis for intersection IT05, 2021 PM peak

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Collector Road IT05											
10	L	1	5.0	0.002	8.1	LOS A	0.0	0.0	0.17	0.59	44.4
11	T	50	5.0	0.242	54.2	LOS A	2.8	20.1	0.95	0.72	21.5
12	R	22	5.0	0.243	70.2	LOS A	1.3	9.6	0.99	0.71	20.3
Approach		73	5.0	0.243	58.4	LOS A	2.8	20.1	0.95	0.71	21.3
East: Donnybrook Road											
1	L	27	5.0	0.026	8.8	LOS A	0.1	1.0	0.14	0.63	47.0
2	T	792	5.0	0.453	10.3	LOS A	8.3	60.3	0.39	0.34	46.1
3	R	256	5.0	0.546	24.3	LOS A	5.8	42.3	0.78	0.79	39.1
Approach		1075	5.0	0.546	13.6	LOS A	8.3	60.3	0.47	0.45	43.7
North: Collector Road IT05											
7	L	42	5.0	0.064	10.2	LOS A	0.4	2.7	0.21	0.65	48.6
8	T	82	5.0	0.397	56.6	LOS A	4.6	33.7	0.97	0.76	22.2
9	R	1	5.0	0.011	68.6	LOS A	0.1	0.4	0.97	0.59	21.9
Approach		125	5.0	0.397	41.1	LOS A	4.6	33.7	0.72	0.72	27.7
West: Donnybrook Road											
7	L	1	5.0	0.001	10.6	LOS A	0.0	0.1	0.23	0.63	51.3
8	T	475	5.0	0.553	36.0	LOS A	11.1	80.8	0.84	0.70	32.0
9	R	1	5.0	0.005	50.6	LOS A	0.0	0.3	0.83	0.60	25.8
Approach		477	5.0	0.553	36.0	LOS A	11.1	80.8	0.83	0.70	32.0
All Vehicles		1750	5.0	0.553	23.5	LOS A	11.1	80.8	0.61	0.55	36.0

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.7.4 Intersection IT06: Collector Road IT06 and Donnybrook Road

The interim layout of the Collector Road IT06 and Donnybrook Road intersection is shown below.



Results for this intersection are shown in Table 12 and Table 13. This table shows the intersection operates at LOS A during the AM peak and LOS C during the PM peak periods with approximately 35 seconds delay for all vehicles being experienced on average.

Note:

For the PM peak, westbound right turn volumes have been equally apportioned between IT05 and IT06. Local modelling phenomenon such as this can usually be overcome by including junction delays at the trip path assignment stage in the four-step modelling process or through the use of micro-simulation modelling at a local street level.

Table 12: Results of SIDRA Analysis for intersection IT06, 2021 AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT06											
10	L	58	5.0	0.100	10.0	LOS A	0.7	5.1	0.27	0.64	43.0
11	T	125	5.0	0.254	38.0	LOS A	5.8	42.4	0.84	0.68	25.8
12	R	387	5.0	0.575	48.0	LOS A	13.8	100.8	0.90	0.81	25.3
Approach		570	5.0	0.575	41.9	LOS A	13.8	100.8	0.82	0.76	26.6
East: Donnybrook Road											
1	L	190	5.0	0.314	11.4	LOS A	2.6	18.9	0.30	0.68	43.2
2	T	221	5.0	0.347	41.9	LOS A	5.2	38.3	0.84	0.67	23.5
3	R	1	5.0	0.006	60.9	LOS A	0.1	0.4	0.92	0.60	23.7
Approach		412	5.0	0.347	27.8	LOS A	5.2	38.3	0.59	0.67	29.2
North: Collector Road IT06											
7	L	1	5.0	0.002	12.5	LOS A	0.0	0.1	0.31	0.62	46.3
8	T	244	5.0	0.465	40.2	LOS A	11.9	86.8	0.88	0.76	27.0
9	R	434	5.0	0.580	47.3	LOS A	11.6	84.4	0.87	0.81	27.4
Approach		679	5.0	0.580	44.7	LOS A	11.9	86.8	0.88	0.79	27.3
West: Donnybrook Road											
7	L	130	5.0	0.144	9.5	LOS A	0.8	5.9	0.17	0.66	52.8
8	T	340	5.0	0.535	43.5	LOS A	8.6	62.8	0.89	0.73	28.9
9	R	103	5.0	0.569	66.1	LOS A	6.0	43.8	1.00	0.79	21.7
Approach		573	5.0	0.569	39.8	LOS A	8.6	62.8	0.75	0.72	30.3
All Vehicles		2234	5.0	0.580	39.6	LOS A	13.8	100.8	0.78	0.74	28.1

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

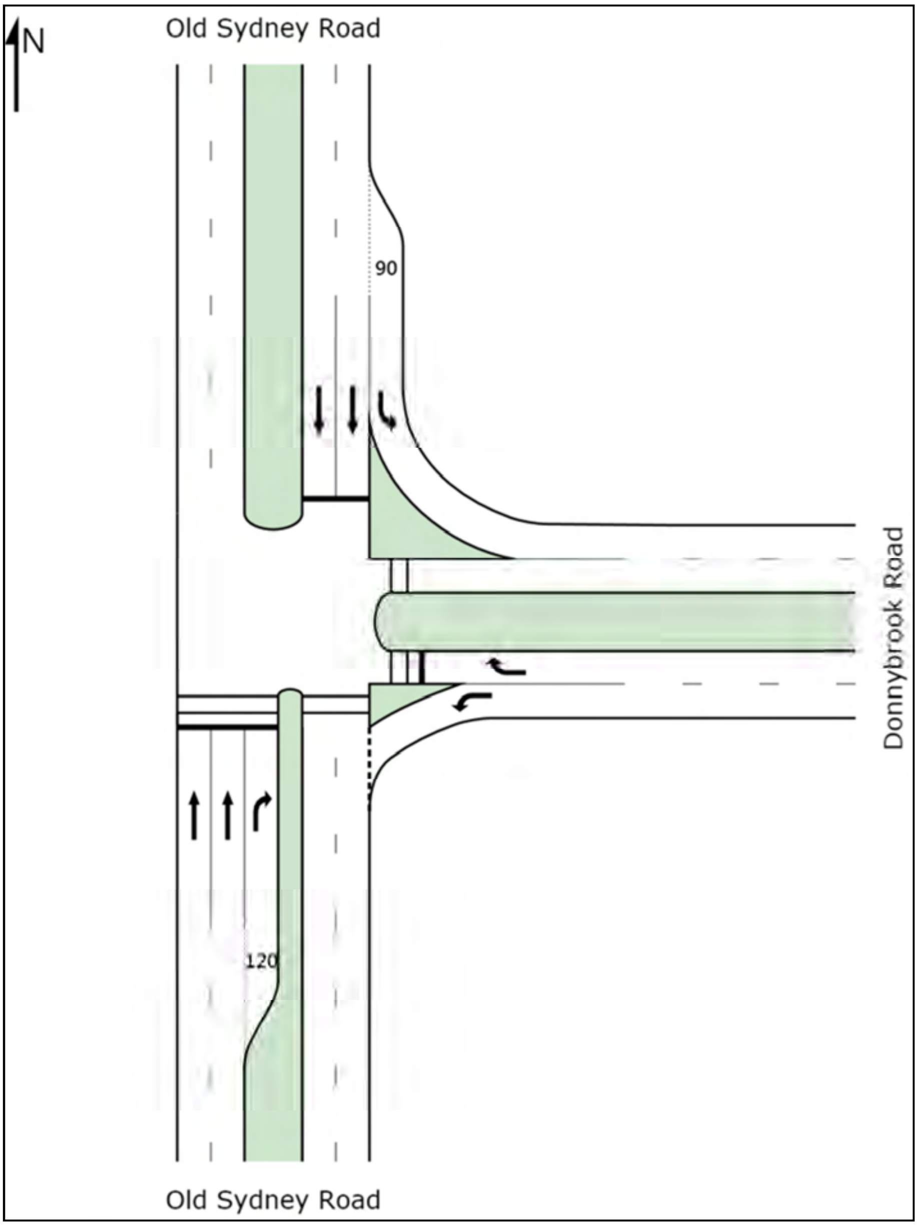
Table 13: Results of SIDRA Analysis for intersection IT06, 2021 PM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT06											
10	L	103	5.0	0.155	9.6	LOS A	1.1	8.4	0.26	0.64	43.3
11	T	252	5.0	0.729	56.7	LOS C	10.1	74.0	1.00	0.85	20.9
12	R	198	5.0	0.729	64.6	LOS C	10.1	74.0	0.99	0.87	21.5
Approach		553	5.0	0.729	50.7	LOS C	10.1	74.0	0.86	0.82	23.5
East: Donnybrook Road											
1	L	395	5.0	0.463	9.4	LOS A	3.4	24.5	0.23	0.67	46.0
2	T	397	5.0	0.734	49.4	LOS C	11.2	81.6	0.98	0.82	21.0
3	R	200	5.0	0.772	42.6	LOS C	8.8	64.3	0.74	0.85	29.6
Approach		992	5.0	0.772	32.1	LOS C	11.2	81.6	0.63	0.77	28.5
North: Collector Road IT06											
7	L	1	5.0	0.002	10.4	LOS A	0.0	0.1	0.22	0.62	48.4
8	T	133	5.0	0.434	56.9	LOS A	5.1	37.0	0.98	0.76	22.0
9	R	129	5.0	0.434	64.4	LOS A	4.9	36.1	0.98	0.78	22.9
Approach		263	5.0	0.434	60.4	LOS A	5.1	37.0	0.98	0.77	22.5
West: Donnybrook Road											
7	L	433	5.0	0.718	12.4	LOS C	6.8	49.3	0.38	0.72	49.4
8	T	278	5.0	0.514	46.8	LOS A	7.2	52.9	0.91	0.73	27.8
9	R	58	5.0	0.139	29.9	LOS A	2.0	14.4	0.62	0.71	34.6
Approach		769	5.0	0.718	26.1	LOS C	7.2	52.9	0.59	0.73	37.4
All Vehicles		2577	5.0	0.772	37.2	LOS C	11.2	81.6	0.70	0.77	28.4

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.7.5 Intersection IT07: Donnybrook Road and Old Sydney Road

The interim layout of the Donnybrook Road and Old Sydney Road intersection is shown below.



Results for this intersection are shown in Table 14 and Table 15. This table shows the intersection operates at LOS A during the AM peak and LOS D PM peak periods with approximately 25 seconds delay for all vehicles being experienced on average.

Table 14: Results of SIDRA Analysis for intersection IT07, 2021 AM peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Old Sydney Road											
11	T	37	5.0	0.012	2.7	LOS A	0.3	2.5	0.22	0.16	63.1
12	R	332	5.0	0.432	19.2	LOS A	9.9	72.0	0.46	0.76	44.4
Approach		369	5.0	0.432	17.6	LOS A	9.9	72.0	0.44	0.70	45.7
East: Donnybrook Road											
1	L	661	5.0	0.418	10.5	LOS A	6.9	50.6	0.22	0.70	48.0
3	R	35	5.0	0.178	63.4	LOS A	2.8	20.6	0.94	0.73	24.1
Approach		696	5.0	0.418	13.2	LOS A	6.9	50.6	0.25	0.70	44.9
North: Old Sydney Road											
7	L	181	5.0	0.100	9.5	X	X	X	X	0.65	54.6
8	T	145	5.0	0.415	57.6	LOS A	5.6	41.1	0.99	0.75	24.5
Approach		326	5.0	0.415	30.9	LOS A	5.6	41.1	0.44	0.70	35.3
All Vehicles		1391	5.0	0.432	18.5	LOS A	9.9	72.0	0.35	0.70	42.0

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

Table 15: Results of SIDRA Analysis for intersection IT07, 2021 PM peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Old Sydney Road											
11	T	145	5.0	0.048	2.8	LOS A	0.9	6.5	0.23	0.18	62.9
12	R	718	5.0	0.923	34.3	LOS D	26.8	195.8	0.89	0.91	34.4
Approach		863	5.0	0.923	29.0	LOS D	26.8	195.8	0.78	0.79	37.2
East: Donnybrook Road											
1	L	389	5.0	0.239	10.0	LOS A	1.8	13.0	0.15	0.68	48.6
3	R	180	5.0	0.917	83.1	LOS D	12.5	91.1	1.00	1.02	20.0
Approach		569	5.0	0.917	33.1	LOS D	12.5	91.1	0.42	0.79	30.9
North: Old Sydney Road											
7	L	35	5.0	0.019	9.5	X	X	X	X	0.65	54.6
8	T	36	5.0	0.113	56.4	LOS A	1.0	7.3	0.96	0.67	24.8
Approach		71	5.0	0.113	33.3	LOS D	1.0	7.3	0.48	0.66	34.0
All Vehicles		1503	5.0	0.923	30.8	LOS D	26.8	195.8	0.63	0.78	34.8

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.8 Ultimate Intersection Assessments

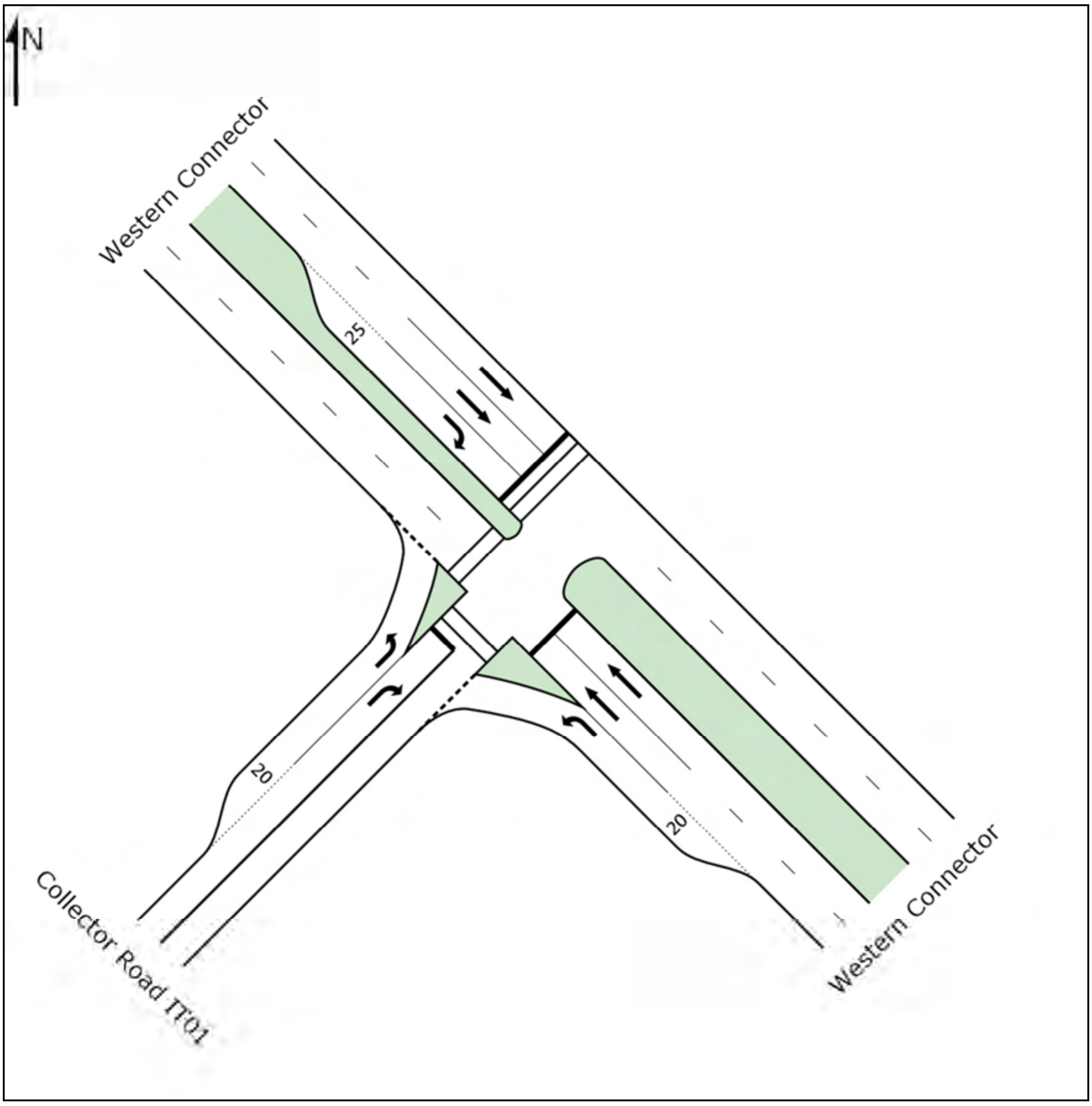
Detailed SIDRA outputs for all of the ultimate year configurations discussed below are provided in Appendix 4.

6.8.1 Western Connector Intersection Linking

Intersections IT01, IT02 and IT03 were analysed to determine the impact of signalising all three intersections simultaneously. A second analysis was performed where right turns were banned at IT02 and IT03 to determine if IT01 would still continue to perform adequately with this additional right turn traffic from IT02 and IT03.

6.8.2 Intersection IT01: Collector Road IT01 and Western Connector

The ultimate layout of the Collector Road IT01 and Western Connector intersection for the AM and PM peaks in 2046 is shown below.



Results for this intersection (with no turn bans at IT02 and IT03 on the E14/ Aitken Boulevard) during the AM peak are shown in Table 16 and Table 17 while the PM peak is shown in Table 18 and Table 19. This table shows the intersection operates at LOS B and LOS D during the AM and PM peaks respectively. This indicates that the intersection will perform adequately in 2046.

Table 16: Results of SIDRA Analysis for intersection IT01, 2046 AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	1	5.0	0.001	8.3	LOS A	0.0	0.0	0.05	0.62	47.7
2	T	235	5.0	0.672	55.8	LOS B	6.8	49.9	0.99	0.80	19.4
Approach		236	5.0	0.672	55.6	LOS B	6.8	49.9	0.99	0.80	19.4
North West: Western Connector											
8	T	568	5.0	0.208	1.0	LOS A	1.0	7.4	0.07	0.06	67.3
9	R	284	5.0	0.364	14.3	LOS A	1.1	8.0	0.25	0.71	46.6
Approach		852	5.0	0.364	5.5	LOS A	1.1	8.0	0.13	0.28	59.2
South West: Collector Road IT01											
10	L	246	5.0	0.473	8.7	LOS A	1.8	13.3	0.27	0.65	44.0
12	R	1	5.0	0.003	49.7	LOS A	0.0	0.3	0.83	0.60	24.7
Approach		247	5.0	0.473	8.8	LOS A	1.8	13.3	0.27	0.65	43.8
All Vehicles		1335	5.0	0.672	14.9	LOS B	6.8	49.9	0.31	0.44	44.1

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

If right turns are banned at IT02 and IT03, the analysis shows that IT01 would still operate satisfactorily at LOS C. Table 17 shows the result of this analysis. This is the design that has been adopted for the ultimate year.

Table 17: Results of SIDRA Analysis for intersection IT01 (turn bans at IT02 and IT03), 2046 AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	1	5.0	0.002	8.3	LOS A	0.0	0.0	0.05	0.62	47.7
2	T	235	5.0	0.672	55.8	LOS B	6.8	49.9	0.99	0.80	19.4
Approach		236	5.0	0.672	55.6	LOS B	6.8	49.9	0.99	0.80	19.4
North West: Western Connector											
8	T	568	5.0	0.208	1.0	LOS A	1.0	7.4	0.07	0.06	67.3
9	R	496	5.0	0.613	17.7	LOS B	2.6	19.1	0.47	0.77	43.3
Approach		1064	5.0	0.613	8.8	LOS B	2.6	19.1	0.26	0.39	54.1
South West: Collector Road IT01											
10	L	246	5.0	0.473	8.7	LOS A	1.8	13.3	0.27	0.65	44.0
12	R	240	5.0	0.723	59.4	LOS C	13.8	100.6	1.00	0.87	22.4
Approach		486	5.0	0.723	33.7	LOS C	13.8	100.6	0.63	0.76	29.8
All Vehicles		1786	5.0	0.723	21.8	LOS C	13.8	100.6	0.45	0.54	38.3

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

Table 18: Results of SIDRA Analysis for intersection IT01, 2046 PM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	1	5.0	0.001	8.3	LOS A	0.0	0.0	0.05	0.62	47.7
2	T	568	5.0	0.812	46.1	LOS C	16.2	117.9	0.98	0.87	22.0
Approach		569	5.0	0.812	46.0	LOS C	16.2	117.9	0.98	0.87	22.0
North West: Western Connector											
8	T	235	5.0	0.086	0.9	LOS A	0.4	2.7	0.06	0.05	67.6
9	R	246	5.0	0.825	35.7	LOS C	4.5	32.6	0.80	0.83	31.5
Approach		481	5.0	0.825	18.7	LOS C	4.5	32.6	0.44	0.45	43.5
South West: Collector Road IT01											
10	L	284	5.0	0.906	14.8	LOS D	4.5	32.6	0.51	0.72	39.6
12	R	1	5.0	0.003	49.7	LOS A	0.0	0.3	0.83	0.60	24.7
Approach		285	5.0	0.906	14.9	LOS D	4.5	32.6	0.51	0.72	39.5
All Vehicles		1335	5.0	0.906	29.5	LOS D	16.2	117.9	0.68	0.69	31.9

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

If right turns are banned at IT02 and IT03, the analysis shows that IT01 would still operate satisfactorily at LOS C. Table 17 shows the result of this analysis. This is the design that has been adopted for the ultimate year.

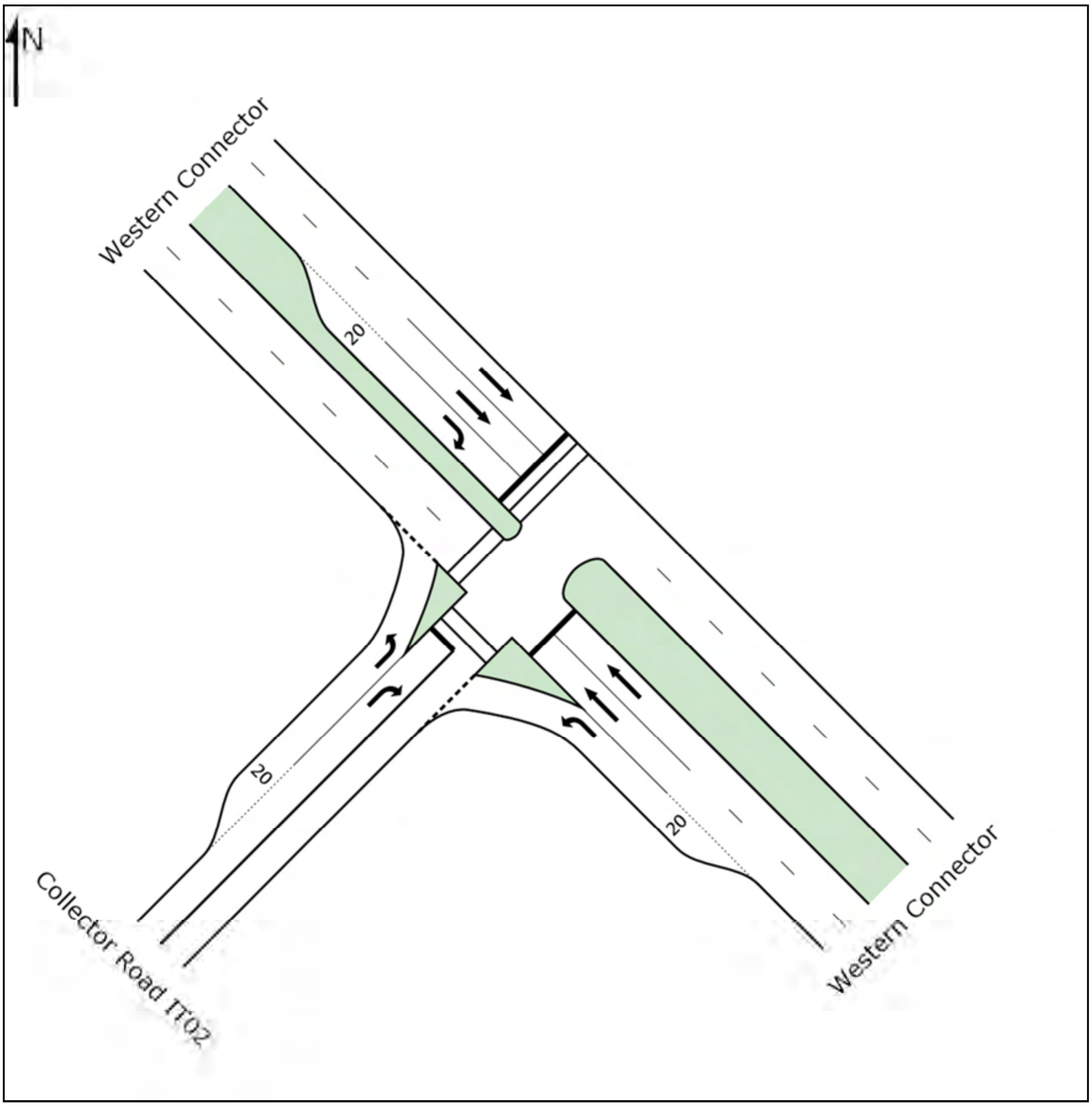
Table 19: Results of SIDRA Analysis for intersection IT01 (turn bans at IT02 and IT03), 2046 PM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	1	5.0	0.001	8.3	LOS A	0.0	0.0	0.05	0.62	47.7
2	T	568	5.0	0.893	52.8	LOS C	17.6	128.2	1.00	0.94	20.1
Approach		569	5.0	0.893	52.7	LOS C	17.6	128.2	1.00	0.94	20.1
North West: Western Connector											
8	T	235	5.0	0.086	0.9	LOS A	0.4	2.7	0.06	0.05	67.6
9	R	344	5.0	0.891	33.7	LOS C	5.6	40.8	0.87	0.85	32.5
Approach		579	5.0	0.891	20.4	LOS C	5.6	40.8	0.54	0.52	41.9
South West: Collector Road IT01											
10	L	284	5.0	0.749	14.7	LOS C	4.5	32.6	0.49	0.71	39.6
12	R	162	5.0	0.488	55.6	LOS A	8.7	63.1	0.95	0.81	23.3
Approach		446	5.0	0.749	29.6	LOS C	8.7	63.1	0.66	0.74	31.6
All Vehicles		1594	5.0	0.893	34.5	LOS C	17.6	128.2	0.74	0.73	29.6

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.8.3 Intersection IT02: Collector Road IT02 and Western Connector

The ultimate layout of the Collector Road IT02 and Western Connector intersection for the AM and PM peaks in 2046 is shown below.



Results for this intersection (with no turn bans at IT02 and IT03 on the Western Connector) during the AM peak are shown in Table 20 while the PM peak is shown in Table 21. This table shows the intersection operates at LOS A and LOS A during the AM and PM peaks respectively. This indicates that the intersection will perform adequately in 2046.

Table 20: Results of SIDRA Analysis for intersection IT02, 2046 AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	70	5.0	0.074	8.3	LOS A	0.1	0.8	0.06	0.62	47.7
2	T	178	5.0	0.373	48.1	LOS A	4.6	33.5	0.90	0.70	21.5
Approach		248	5.0	0.373	36.9	LOS A	4.6	33.5	0.66	0.68	24.9
North West: Western Connector											
8	T	470	5.0	0.172	1.0	LOS A	0.8	5.8	0.06	0.05	67.4
9	R	98	5.0	0.181	12.3	LOS A	0.6	4.4	0.13	0.68	48.8
Approach		568	5.0	0.181	3.0	LOS A	0.8	5.8	0.08	0.16	63.6
South West: Collector Road IT02											
10	L	57	5.0	0.102	7.8	LOS A	0.3	2.2	0.14	0.61	44.8
12	R	119	5.0	0.358	54.2	LOS A	6.2	45.1	0.92	0.79	23.6
Approach		176	5.0	0.358	39.2	LOS A	6.2	45.1	0.67	0.73	27.9
All Vehicles		992	5.0	0.373	17.9	LOS A	6.2	45.1	0.33	0.39	41.4

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

If right turns are banned at IT02 (and IT03), it is anticipated that the volume of right turning vehicles from Collector Road IT02 and the north-west approach of the Western Connector would divert to IT01. This is confirmed by the results of the SIDRA analysis as shown in Table 17, and the analysis results which indicate that IT01 would operate satisfactorily with right turn bans at IT02 and IT03.

Due to the redistribution of right turning vehicles to IT01, signals may not be required at IT02. This is the design that has been adopted for the ultimate year.

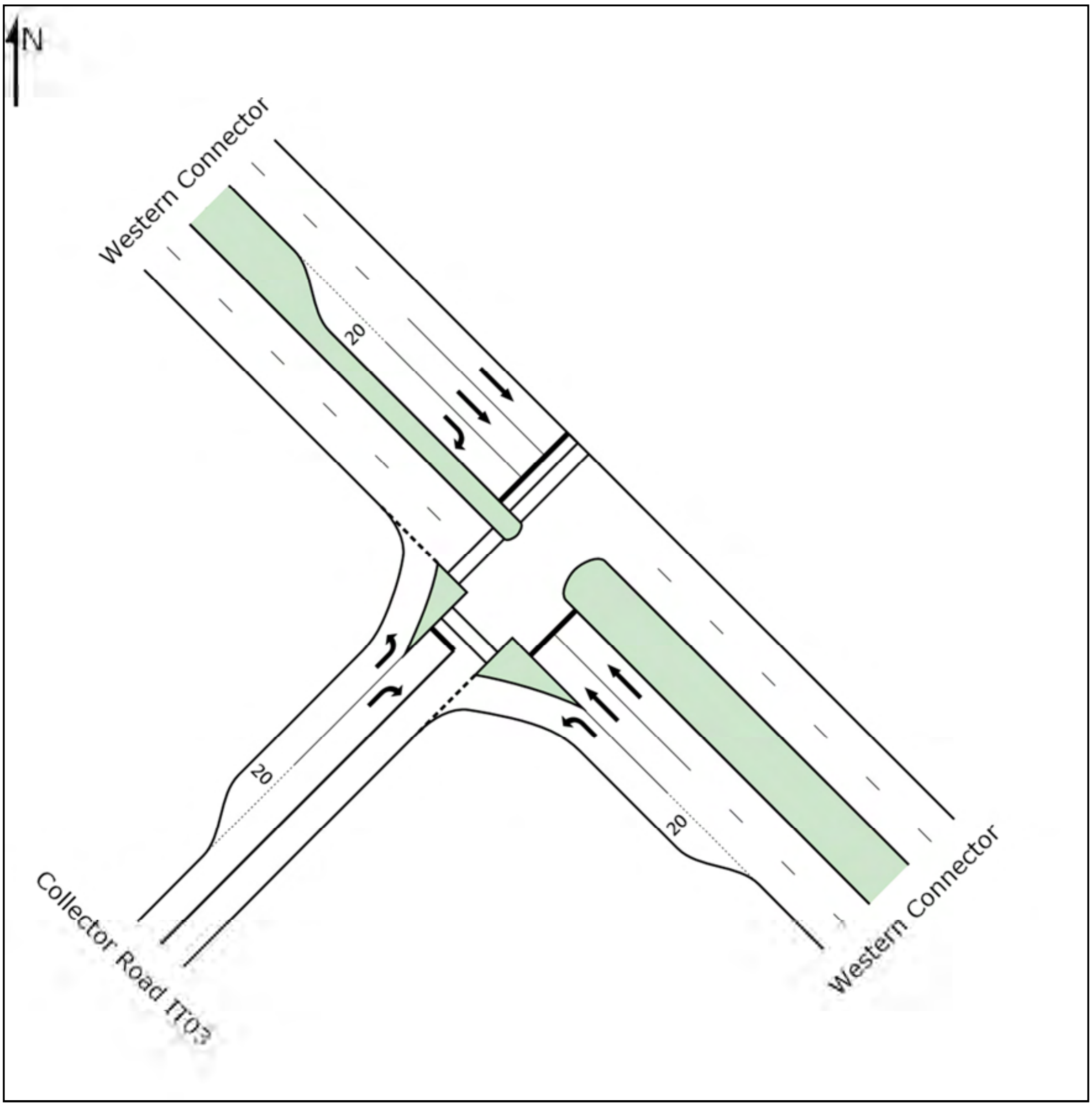
Table 21: Results of SIDRA Analysis for intersection IT02, 2046 PM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	119	5.0	0.123	8.4	LOS A	0.2	1.5	0.06	0.63	47.7
2	T	470	5.0	0.369	21.7	LOS A	7.7	55.9	0.59	0.50	34.1
Approach		589	5.0	0.369	19.0	LOS A	7.7	55.9	0.49	0.53	35.9
North West: Western Connector											
8	T	178	5.0	0.065	0.9	LOS A	0.3	2.0	0.06	0.05	67.6
9	R	57	5.0	0.366	28.3	LOS A	1.5	11.3	0.49	0.71	35.5
Approach		235	5.0	0.366	7.6	LOS A	1.5	11.3	0.16	0.21	56.3
South West: Collector Road IT02											
10	L	98	5.0	0.262	8.4	LOS A	0.8	5.7	0.19	0.63	44.3
12	R	70	5.0	0.211	52.7	LOS A	3.5	25.7	0.89	0.76	23.9
Approach		168	5.0	0.262	26.8	LOS A	3.5	25.7	0.48	0.68	32.8
All Vehicles		992	5.0	0.369	17.6	LOS A	7.7	55.9	0.41	0.48	39.2

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.8.4 Intersection IT03: Collector Road IT03 and Western Connector

The ultimate layout of the Collector Road IT03 and Western Connector intersection for the AM and PM peaks in 2046 is shown below.



Results for this intersection (with no turn bans at IT02 and IT03 on the E14/ Aitken Boulevard) during the AM peak are shown in Table 22 while the PM peak is shown in Table 23. This table shows the intersection operates at LOS A and LOS A during the AM and PM peaks respectively. This indicates that the intersection will perform adequately in 2046.

Table 22: Results of SIDRA Analysis for intersection IT03, 2046 AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	91	5.0	0.101	8.4	LOS A	0.2	1.2	0.06	0.63	47.7
2	T	207	5.0	0.271	36.7	LOS A	4.5	32.6	0.77	0.61	25.6
Approach		298	5.0	0.271	28.0	LOS A	4.5	32.6	0.55	0.62	29.3
North West: Western Connector											
8	T	475	5.0	0.189	1.2	LOS A	0.8	6.0	0.07	0.06	67.0
9	R	114	5.0	0.555	26.6	LOS A	2.3	17.1	0.52	0.73	36.6
Approach		589	5.0	0.555	6.1	LOS A	2.3	17.1	0.15	0.19	58.4
South West: Collector Road IT03											
10	L	41	5.0	0.076	7.8	LOS A	0.2	1.5	0.14	0.61	44.8
12	R	120	5.0	0.274	47.4	LOS A	5.7	41.8	0.86	0.78	25.3
Approach		161	5.0	0.274	37.3	LOS A	5.7	41.8	0.67	0.74	28.5
All Vehicles		1048	5.0	0.555	17.1	LOS A	5.7	41.8	0.35	0.39	42.0

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

If right turns are banned at IT03 (and IT02), it is anticipated that the volume of right turning vehicles from Collector Road IT03 and the north-west approach of the Western Connector would divert to IT01. This is confirmed by the results of the SIDRA analysis as shown in Table 17, and the analysis results which indicate that IT01 would operate satisfactorily with right turn bans at IT02 and IT03.

Due to the redistribution of right turning vehicles to IT01, signals may not be required at IT03. This is the design that has been adopted for the ultimate year.

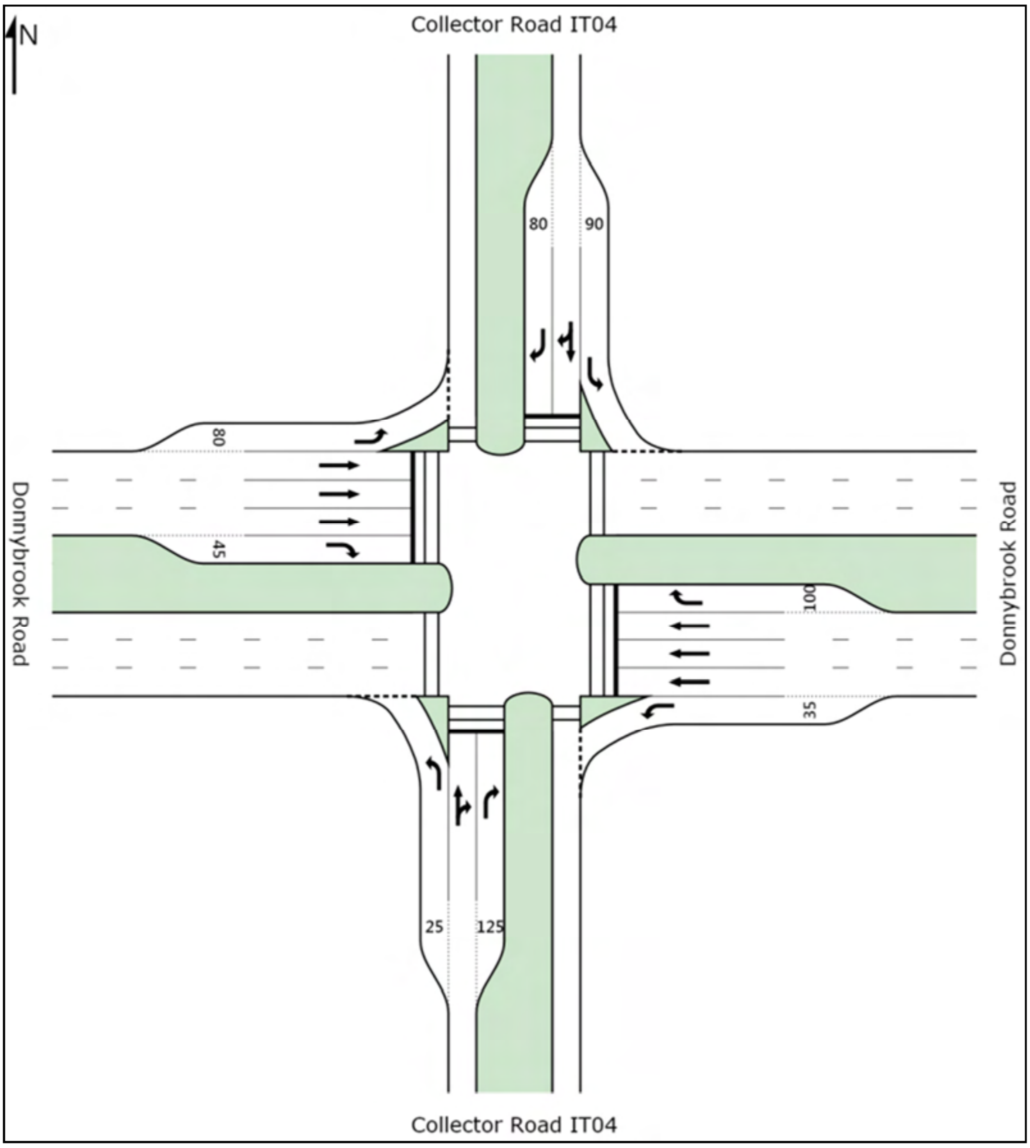
Table 23: Results of SIDRA Analysis for intersection IT03, 2046 PM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South East: Western Connector											
1	L	120	5.0	0.121	8.4	LOS A	0.2	1.5	0.06	0.63	47.7
2	T	475	5.0	0.318	15.4	LOS A	6.0	44.0	0.47	0.39	39.9
Approach		595	5.0	0.318	14.0	LOS A	6.0	44.0	0.38	0.44	41.1
North West: Western Connector											
8	T	207	5.0	0.076	0.9	LOS A	0.3	2.3	0.06	0.05	67.6
9	R	41	5.0	0.315	34.5	LOS A	1.3	9.8	0.59	0.71	32.1
Approach		248	5.0	0.315	6.5	LOS A	1.3	9.8	0.14	0.16	58.0
South West: Collector Road IT03											
10	L	114	5.0	0.287	8.1	LOS A	0.8	5.8	0.18	0.63	44.5
12	R	91	5.0	0.274	53.4	LOS A	4.6	33.8	0.90	0.77	23.8
Approach		205	5.0	0.287	28.2	LOS A	4.6	33.8	0.50	0.69	32.1
All Vehicles		1048	5.0	0.318	15.0	LOS A	6.0	44.0	0.35	0.42	41.8

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.8.5 Intersection IT04: Collector Road IT04 and Donnybrook Road

The ultimate layout of the Collector Road IT04 and Donnybrook Road intersection for the AM and PM peaks in 2046 is shown below.



Analysis shows that this intersection will operate at LOS B during the AM peak and LOS C during the PM peak, which is satisfactory. Results of the analysis are shown in Table 24 and Table 25.

Table 24: Results of SIDRA Analysis for intersection IT04, 2046 AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
Movement Performance - Vehicles											
South: Collector Road IT04											
10	L	1	5.0	0.004	11.8	LOS A	0.0	0.1	0.32	0.60	41.6
11	T	44	5.0	0.354	52.1	LOS A	4.8	34.9	0.95	0.74	21.8
12	R	129	5.0	0.354	59.3	LOS A	4.8	34.9	0.95	0.77	22.6
Approach		174	5.0	0.354	57.2	LOS A	4.8	34.9	0.95	0.76	22.5
East: Donnybrook Road											
1	L	63	5.0	0.065	8.6	LOS A	0.2	1.6	0.12	0.63	47.2
2	T	1803	5.0	0.663	10.2	LOS B	15.3	111.4	0.47	0.42	45.8
3	R	1	5.0	0.011	68.6	LOS A	0.1	0.4	0.97	0.59	21.9
Approach		1867	5.0	0.663	10.2	LOS B	15.3	111.4	0.46	0.43	45.8
North: Collector Road IT04											
7	L	97	5.0	0.186	12.7	LOS A	1.6	11.5	0.34	0.70	46.2
8	T	27	5.0	0.656	55.6	LOS B	9.7	71.1	1.00	0.83	21.7
9	R	311	5.0	0.656	63.0	LOS B	9.7	71.1	1.00	0.83	23.2
Approach		435	5.0	0.656	51.3	LOS B	9.7	71.1	0.85	0.80	26.0
West: Donnybrook Road											
7	L	365	5.0	0.289	9.2	LOS A	1.8	13.1	0.16	0.67	53.0
8	T	1780	5.0	0.655	10.1	LOS B	14.9	108.4	0.47	0.42	51.4
9	R	1	5.0	0.011	66.2	LOS A	0.1	0.4	0.93	0.59	21.7
Approach		2146	5.0	0.655	10.0	LOS B	14.9	108.4	0.41	0.46	51.6
All Vehicles		4622	5.0	0.663	15.7	LOS B	15.3	111.4	0.49	0.49	42.9

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

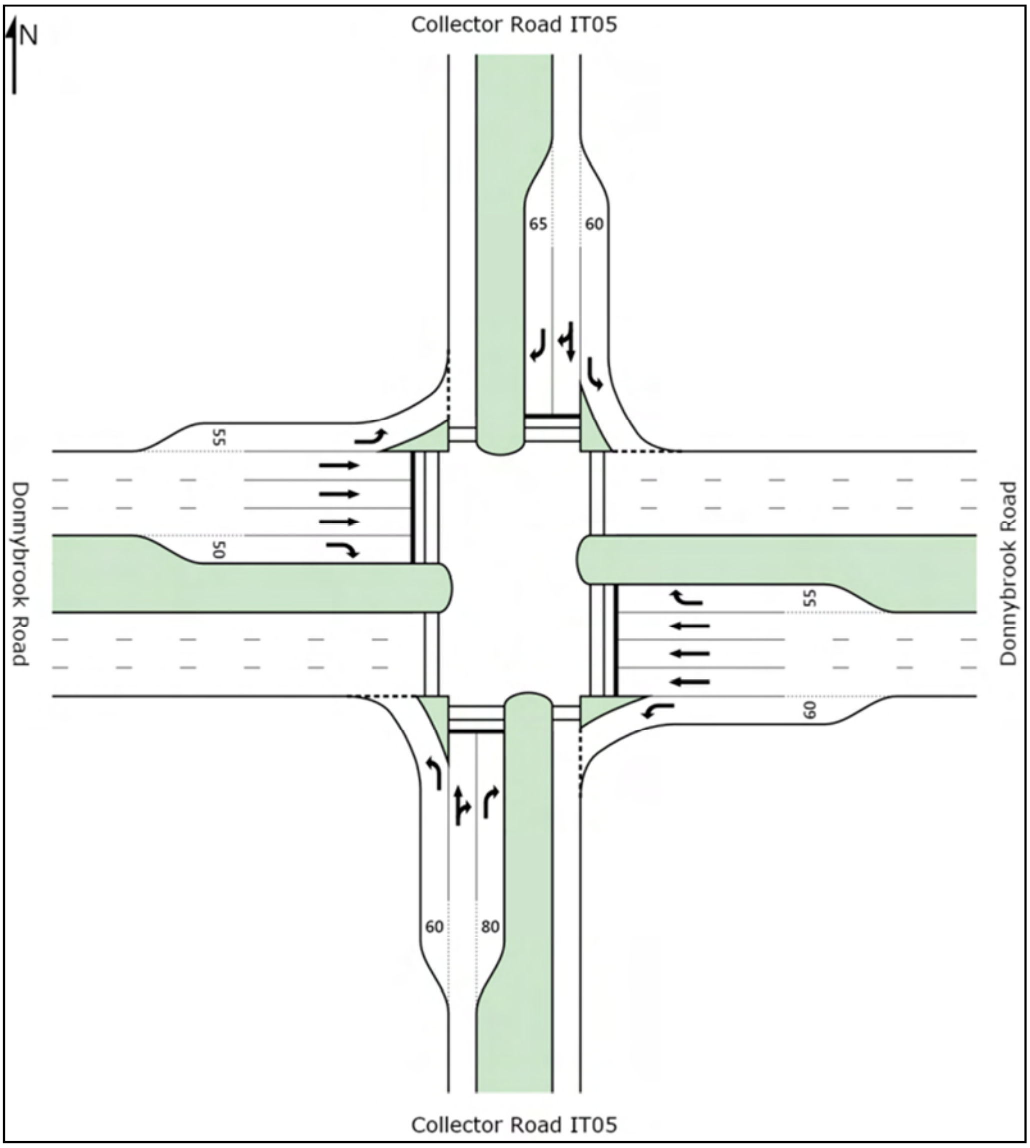
Table 25: Results of SIDRA Analysis for intersection IT04, 2046 PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
Movement Performance - Vehicles											
South: Collector Road IT04											
10	L	1	5.0	0.005	16.9	LOS A	0.0	0.2	0.45	0.60	38.1
11	T	84	5.0	0.330	51.9	LOS A	4.6	33.3	0.95	0.74	22.0
12	R	63	5.0	0.261	58.5	LOS A	3.4	24.7	0.94	0.76	22.7
Approach		148	5.0	0.330	54.5	LOS A	4.6	33.3	0.94	0.74	22.4
East: Donnybrook Road											
1	L	129	5.0	0.177	9.0	LOS A	0.8	6.0	0.17	0.65	46.6
2	T	1780	5.0	0.794	20.4	LOS C	25.3	184.8	0.78	0.70	34.5
3	R	97	5.0	0.803	75.5	LOS C	6.2	45.3	1.00	0.88	20.5
Approach		2006	5.0	0.803	22.4	LOS C	25.3	184.8	0.75	0.71	33.5
North: Collector Road IT04											
7	L	1	5.0	0.002	14.3	LOS A	0.0	0.1	0.36	0.63	44.7
8	T	101	5.0	0.791	53.8	LOS C	18.0	131.1	1.00	0.91	22.2
9	R	451	5.0	0.791	60.8	LOS C	18.0	131.1	0.99	0.91	23.8
Approach		553	5.0	0.791	59.4	LOS C	18.0	131.1	0.99	0.91	23.5
West: Donnybrook Road											
7	L	397	5.0	0.386	10.2	LOS A	3.7	27.2	0.24	0.69	52.0
8	T	1803	5.0	0.804	20.8	LOS C	26.2	191.0	0.79	0.72	40.6
9	R	1	5.0	0.008	62.7	LOS A	0.1	0.4	0.91	0.59	22.5
Approach		2201	5.0	0.804	18.9	LOS C	26.2	191.0	0.69	0.71	42.2
All Vehicles		4908	5.0	0.804	26.0	LOS C	26.2	191.0	0.75	0.73	34.7

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.8.6 Intersection IT05: Collector Road IT05 and Donnybrook Road

The ultimate layout of the Collector Road IT05 and Donnybrook Road intersection for the AM and PM peaks in 2046 is shown below.



Analysis shows that this intersection will operate at LOS C during the AM peak and LOS D during the PM peak, which is still a good operating level. Results of the analysis are shown in Table 26 and Table 27.

Note:

For the PM peak, westbound right turn volumes have been equally apportioned between IT05 and IT06. Local modelling phenomenon such as this can usually be overcome by including junction delays at the trip path assignment stage in the four-step modelling process or through the use of micro-simulation modelling at a local street level.

Table 26: Results of SIDRA Analysis for intersection IT05, 2046 AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT05											
10	L	86	5.0	0.177	10.5	LOS A	1.2	8.6	0.30	0.65	42.6
11	T	42	5.0	0.300	52.7	LOS A	3.8	27.9	0.95	0.73	21.7
12	R	96	5.0	0.300	59.8	LOS A	3.8	27.9	0.95	0.76	22.5
Approach		224	5.0	0.300	39.5	LOS A	3.8	27.9	0.70	0.71	27.3
East: Donnybrook Road											
1	L	449	5.0	0.414	8.9	LOS A	2.7	19.5	0.18	0.66	46.7
2	T	1516	5.0	0.676	18.4	LOS B	18.3	133.5	0.67	0.59	36.4
3	R	150	5.0	0.710	67.1	LOS C	9.0	65.4	1.00	0.85	22.3
Approach		2115	5.0	0.710	19.9	LOS C	18.3	133.5	0.59	0.62	35.6
North: Collector Road IT05											
7	L	410	5.0	0.795	22.8	LOS C	12.0	87.3	0.49	0.79	38.6
8	T	40	5.0	0.126	47.3	LOS A	2.0	14.6	0.89	0.68	24.7
9	R	2	5.0	0.008	53.0	LOS A	0.1	0.7	0.85	0.63	25.7
Approach		452	5.0	0.795	25.1	LOS C	12.0	87.3	0.53	0.78	36.8
West: Donnybrook Road											
7	L	1	5.0	0.001	10.0	LOS A	0.0	0.1	0.20	0.63	52.1
8	T	1638	5.0	0.731	19.0	LOS C	21.1	154.1	0.71	0.64	42.1
9	R	29	5.0	0.142	56.0	LOS A	1.4	10.5	0.86	0.71	24.2
Approach		1668	5.0	0.731	19.6	LOS C	21.1	154.1	0.72	0.64	41.7
All Vehicles		4459	5.0	0.795	21.3	LOS C	21.1	154.1	0.64	0.65	37.5

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

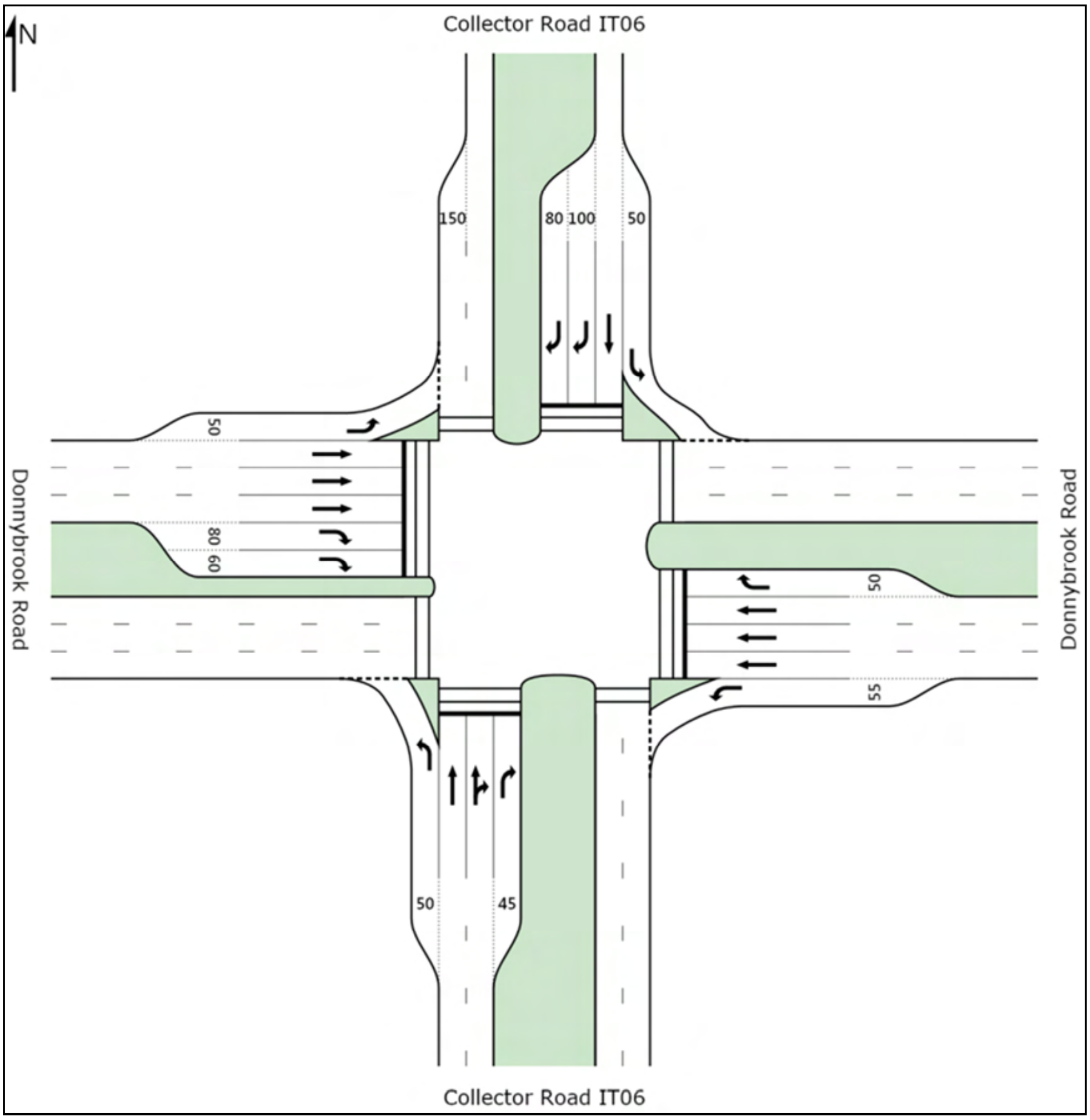
Table 27: Results of SIDRA Analysis for intersection IT05, 2046 PM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT05											
10	L	29	5.0	0.067	10.1	LOS A	0.4	2.6	0.27	0.63	42.9
11	T	60	5.0	0.917	70.5	LOS D	18.5	134.9	1.00	1.09	18.3
12	R	469	5.0	0.917	76.4	LOS D	18.5	134.9	1.00	1.06	19.4
Approach		558	5.0	0.917	72.3	LOS D	18.5	134.9	0.96	1.04	19.8
East: Donnybrook Road											
1	L	116	5.0	0.124	9.3	LOS A	0.8	6.1	0.19	0.65	46.2
2	T	1704	5.0	0.674	13.4	LOS B	17.3	126.0	0.56	0.50	41.5
3	R	210	5.0	0.918	63.7	LOS D	12.3	89.8	0.95	0.89	23.1
Approach		2030	5.0	0.918	18.4	LOS D	17.3	126.0	0.58	0.55	37.5
North: Collector Road IT05											
7	L	150	5.0	0.373	22.4	LOS A	4.2	30.7	0.57	0.73	38.8
8	T	62	5.0	0.244	52.3	LOS A	3.3	24.2	0.93	0.72	23.3
9	R	1	5.0	0.004	56.6	LOS A	0.1	0.4	0.88	0.60	24.7
Approach		213	5.0	0.373	31.3	LOS A	4.2	30.7	0.68	0.73	32.9
West: Donnybrook Road											
7	L	1	5.0	0.001	10.6	LOS A	0.0	0.1	0.23	0.63	51.3
8	T	1582	5.0	0.921	41.1	LOS D	32.5	236.9	0.99	0.99	29.7
9	R	86	5.0	0.712	68.9	LOS C	5.2	38.2	1.00	0.80	21.1
Approach		1669	5.0	0.921	42.5	LOS D	32.5	236.9	0.99	0.98	29.1
All Vehicles		4470	5.0	0.921	34.7	LOS D	32.5	236.9	0.79	0.78	29.8

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.8.7 Intersection IT06: Collector Road IT06 and Donnybrook Road

The ultimate layout of the Collector Road IT06 and Donnybrook Road intersection for the AM and PM peaks in 2046 is shown below.



Analysis shows that this intersection will operate at LOS C during the AM peak and LOS D during the PM peak, which is still a good operating level.. Results of the analysis are shown in Table 28 and Table 29.

Note:

For the PM peak, westbound right turn volumes have been equally apportioned between IT05 and IT06. Local modelling phenomenon such as this can usually be overcome by including junction delays at the trip path assignment stage in the four-step modelling process or through the use of micro-simulation modelling at a local street level.

Table 28: Results of SIDRA Analysis for intersection IT06, 2046 AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT06											
10	L	269	5.0	0.697	19.1	LOS B	7.4	53.7	0.54	0.74	36.9
11	T	95	5.0	0.260	44.8	LOS A	4.8	34.8	0.89	0.71	23.8
12	R	257	5.0	0.480	53.4	LOS A	8.8	64.3	0.92	0.79	24.0
Approach		621	5.0	0.697	37.2	LOS B	8.8	64.3	0.75	0.75	28.3
East: Donnybrook Road											
1	L	227	5.0	0.406	12.9	LOS A	3.8	28.0	0.36	0.69	41.3
2	T	1377	5.0	0.780	29.6	LOS C	22.2	162.3	0.87	0.78	28.6
3	R	1	5.0	0.011	68.5	LOS A	0.1	0.4	0.97	0.59	22.0
Approach		1605	5.0	0.780	27.2	LOS C	22.2	162.3	0.80	0.77	29.7
North: Collector Road IT06											
7	L	1	5.0	0.003	13.1	LOS A	0.0	0.1	0.32	0.63	45.7
8	T	194	5.0	0.610	52.1	LOS B	10.7	78.5	0.98	0.81	23.3
9	R	469	5.0	0.777	64.2	LOS C	14.0	102.5	1.00	0.90	23.0
Approach		664	5.0	0.777	60.6	LOS C	14.0	102.5	0.99	0.87	23.1
West: Donnybrook Road											
7	L	151	5.0	0.159	9.4	LOS A	0.9	6.4	0.16	0.66	52.9
8	T	1411	5.0	0.629	18.0	LOS B	16.1	117.7	0.63	0.56	43.2
9	R	385	5.0	0.797	60.4	LOS C	11.3	82.5	1.00	0.86	23.1
Approach		1947	5.0	0.797	25.7	LOS C	16.1	117.7	0.67	0.63	37.7
All Vehicles		4837	5.0	0.797	32.5	LOS C	22.2	162.3	0.77	0.72	31.1

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

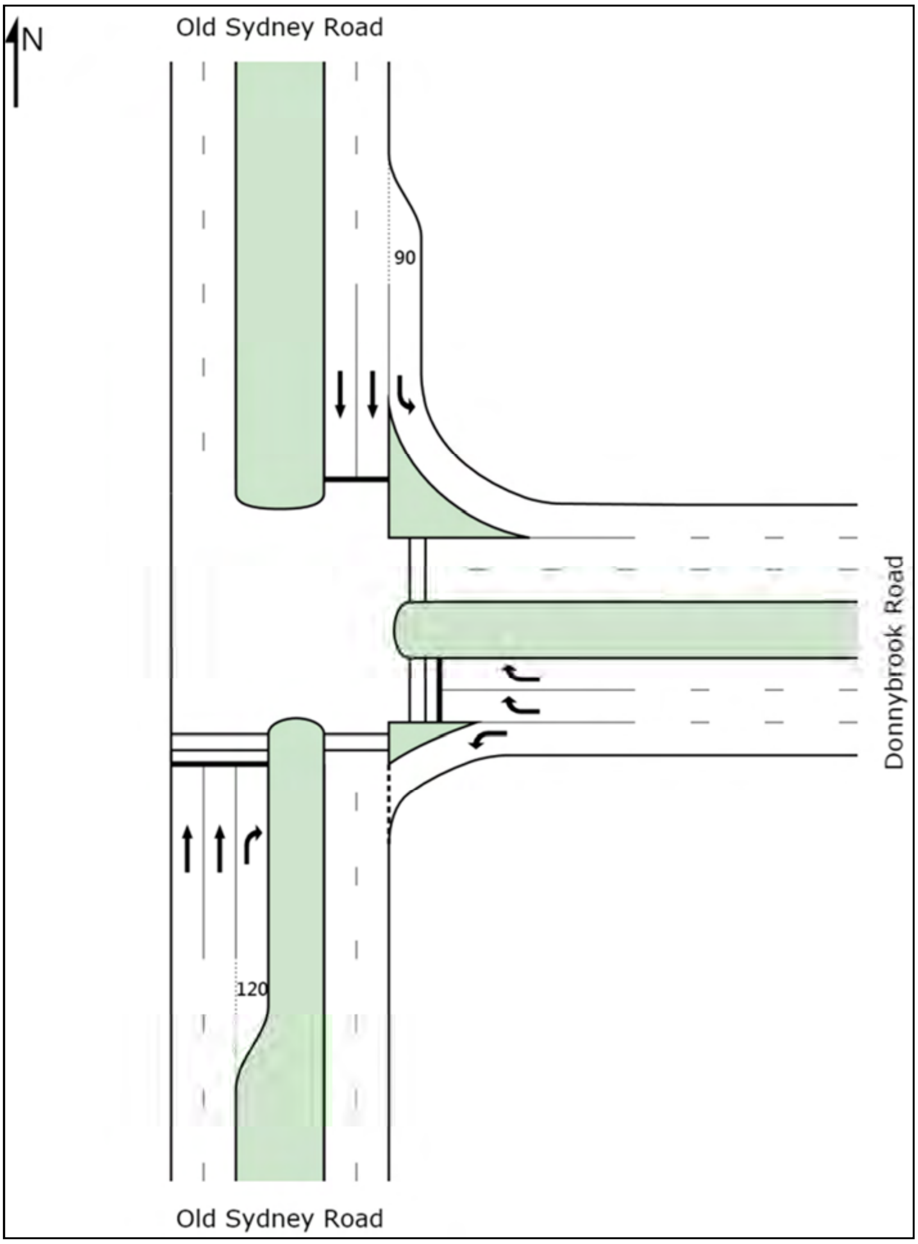
Table 29: Results of SIDRA Analysis for intersection IT06, 2046 PM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Collector Road IT06											
10	L	385	5.0	0.862	22.7	LOS C	11.2	81.6	0.51	0.77	34.9
11	T	203	5.0	0.584	51.2	LOS A	9.4	68.8	0.97	0.79	22.1
12	R	236	5.0	0.584	57.8	LOS A	9.4	68.8	0.96	0.80	23.0
Approach		824	5.0	0.862	39.8	LOS C	11.2	81.6	0.75	0.78	27.1
East: Donnybrook Road											
1	L	266	5.0	0.387	10.2	LOS A	2.9	21.5	0.26	0.68	44.8
2	T	1468	5.0	0.905	40.7	LOS D	29.3	214.1	0.99	0.96	23.7
3	R	200	5.0	0.930	59.8	LOS D	11.2	81.6	0.92	0.87	24.1
Approach		1934	5.0	0.930	38.4	LOS D	29.3	214.1	0.88	0.91	25.2
North: Collector Road IT06											
7	L	1	5.0	0.003	15.7	LOS A	0.0	0.1	0.39	0.62	43.5
8	T	104	5.0	0.409	53.8	LOS A	5.7	41.7	0.96	0.76	22.9
9	R	151	5.0	0.313	60.3	LOS A	4.1	29.9	0.95	0.77	23.9
Approach		256	5.0	0.409	57.5	LOS A	5.7	41.7	0.95	0.76	23.6
West: Donnybrook Road											
7	L	469	5.0	0.819	21.0	LOS C	11.2	81.6	0.46	0.78	41.5
8	T	1434	5.0	0.884	38.4	LOS C	27.6	201.2	0.97	0.93	30.8
9	R	269	5.0	0.410	42.2	LOS A	6.4	46.6	0.75	0.76	28.8
Approach		2172	5.0	0.884	35.1	LOS C	27.6	201.2	0.83	0.87	32.3
All Vehicles		5186	5.0	0.930	38.2	LOS D	29.3	214.1	0.84	0.87	28.3

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

6.8.8 Intersection IT07: Donnybrook Road and Old Sydney Road

The ultimate layout of the Donnybrook Road and Old Sydney Road intersection for the AM and PM peaks in 2046 is shown below.



The analysis shows that this intersection will operate at LOS A during the AM peak and LOS C during the PM peak, which is satisfactory. Results of the analysis are shown in Table 30 and Table 31.

The double right turn lanes on Donnybrook Road are required to service the evening peak right turn movement which is expected to be much higher than in the morning peak given the high volume of left turning vehicles from Old Sydney Road in the morning peak.

Table 30: Results of SIDRA Analysis for intersection IT07, 2046 AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Old Sydney Road											
11	T	35	5.0	0.012	2.7	LOS A	0.2	1.5	0.22	0.16	63.1
12	R	268	5.0	0.563	47.7	LOS A	13.1	95.4	0.88	0.83	28.8
Approach		303	5.0	0.563	42.5	LOS A	13.1	95.4	0.81	0.75	30.7
East: Donnybrook Road											
1	L	348	5.0	0.338	16.0	LOS A	8.8	64.0	0.50	0.77	41.3
3	R	74	5.0	0.189	63.4	LOS A	2.0	14.8	0.95	0.74	24.2
Approach		422	5.0	0.338	24.3	LOS A	8.8	64.0	0.58	0.76	35.4
North: Old Sydney Road											
7	L	959	5.0	0.529	9.6	X	X	X	X	0.65	54.5
8	T	949	5.0	0.553	25.7	LOS A	20.1	146.9	0.79	0.70	37.4
Approach		1908	5.0	0.553	17.6	LOS A	20.1	146.9	0.39	0.67	44.4
All Vehicles		2633	5.0	0.563	21.6	LOS A	20.1	146.9	0.47	0.70	40.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

Table 31: Results of SIDRA Analysis for intersection IT07, 2046 PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Old Sydney Road											
11	T	949	5.0	0.452	17.1	LOS A	16.4	119.5	0.64	0.57	43.9
12	R	405	5.0	0.759	42.1	LOS C	19.2	139.9	0.84	0.85	30.9
Approach		1354	5.0	0.759	24.6	LOS C	19.2	139.9	0.70	0.66	39.0
East: Donnybrook Road											
1	L	325	5.0	0.201	9.9	LOS A	1.2	9.1	0.13	0.68	48.8
3	R	959	5.0	0.756	47.3	LOS C	25.1	183.3	0.95	0.88	29.0
Approach		1284	5.0	0.756	37.8	LOS C	25.1	183.3	0.74	0.83	31.4
North: Old Sydney Road											
7	L	74	5.0	0.041	9.5	X	X	X	X	0.65	54.6
8	T	35	5.0	0.085	52.7	LOS A	0.9	6.9	0.93	0.66	25.9
Approach		109	5.0	0.085	23.4	LOS C	0.9	6.9	0.30	0.65	40.3
All Vehicles		2747	5.0	0.759	30.7	LOS C	25.1	183.3	0.70	0.74	35.2

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Vehicle movement LOS values are based on degree of saturation per movement
Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.
SIDRA Standard Delay Model used.

7 CROSS SECTIONS

7.1 Overview

For roads that are noted for inclusion in the PSP, we have identified the following road profiles in accordance with the projected traffic volumes for the interim and ultimate model years. Table 32 provides an indication of the minimum cross section for all the roads contained within the PSP.

Table 32: Minimum cross sections

Road Name	Lane Configuration	Volumes (vehicles per day)
Connector Street	2-lane (Undivided)	3,000 to 7,000
Boulevard Connector	2-lane (Divided)	7,000 to 12,000
E14/ Aitken Boulevard	4-lane Secondary Arterial Road	12,000 to 40,000
Donnybrook Road – 2021 Interim	4-lane Secondary Arterial Road	12,000 to 40,000
Donnybrook Road – 2046 Ultimate	6-lane Primary Arterial Road	40,000 +

7.2 Road Hierarchy Assessment

The road network, hierarchy and cross sections that are applied to the roads within the PSP have been guided by the outputs from the MITM strategic model.

Daily vehicle volumes have been calculated by extracting the 2-hour two-way AM peak period volumes from MITM and applying a conversion factor of 6.76 to obtain the equivalent daily flows. This factoring of the peak period volume to a daily flow is generally expressed as a two-way volume output to remove any misrepresentation that may be caused by factoring any heavily directional peak period travel pattern that might occur.

The road network, hierarchy and cross sections that are applied to the roads within the PSP have been guided by the outputs from the MITM model. Both the GAA and VicRoads have standards relating to the daily vehicular capacity of particular road types. Due to the coarseness of the strategic model, a 10% margin of error should be applied to any link volumes referred to in Table 33 and Table 34.

To assess the suitability of individual roads to carry the volumes forecast in the strategic model, a number of select points were created to produce specific 'traffic counts' across the network. The location of the detector points are shown in Figure 16. These have been tabulated against the published volume thresholds of the GAA and Austroads for the interim and ultimate scenarios as shown in Table 33 and Table 34.

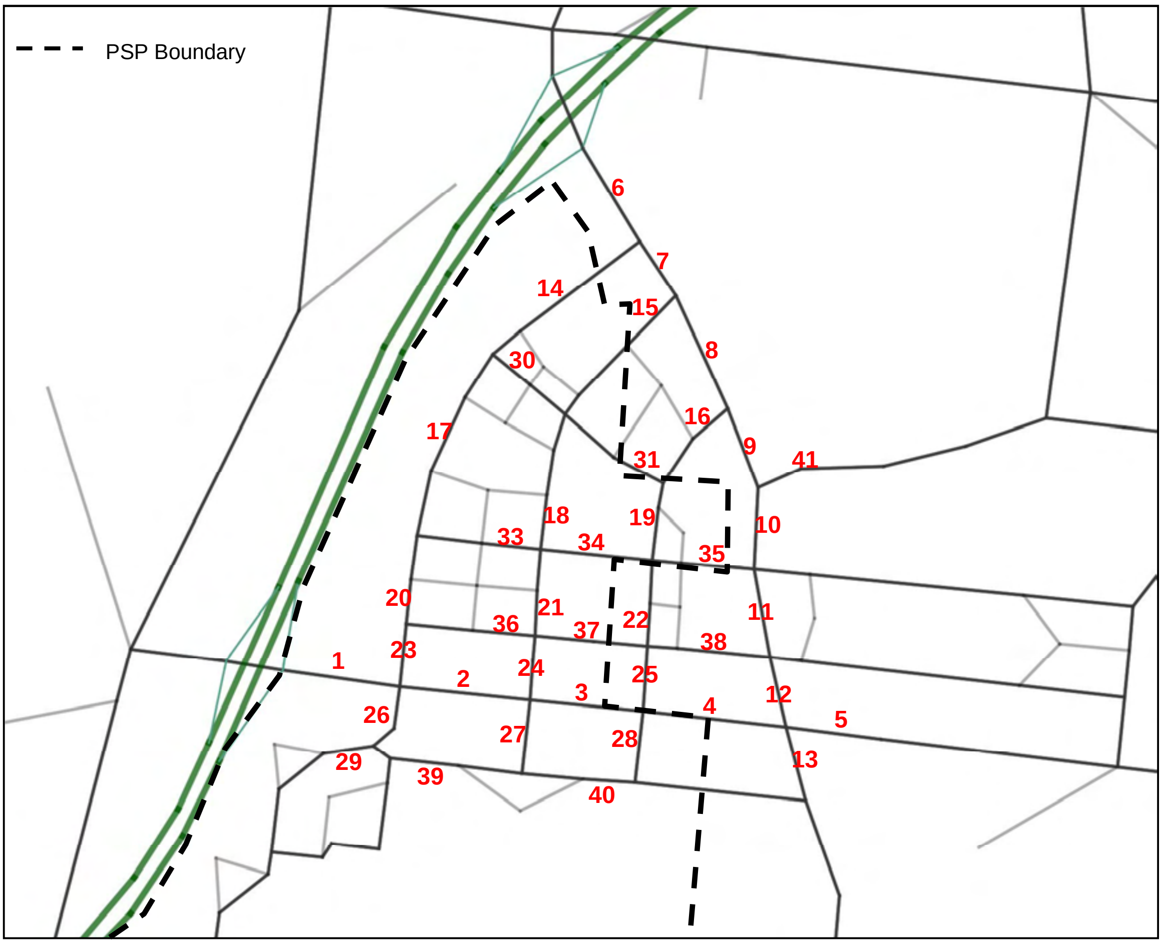


Figure 16: Location of detector points

The cross sections provided in Table 33 and Table 34 confirm that the projected MITM traffic volumes fall within the intended road classifications as outlined in the Merrifield West PSP.

Small variations in link type coding and the position of zone connectors within the model may influence travel time and travel distance calculations which in turn may influence the actual demand flows assigned to each competing link. Where the projected volumes do not fit within the banding identified for any specific road, it is important to note that this variance may need to be viewed in conjunction with the projected traffic volume associated with any other nearby parallel link. Being a strategic transport model, MITM by its very nature, is sometimes unable to fully balance the demand flows across the various road links.

Major improvements which are likely to have an impact on the difference in travel patterns between the interim and ultimate models include:

- The delivery of the OMR by 2046 including a new diamond interchange to the north of the PSP;
- The upgrade of Donnybrook Road from a 4-lane Arterial Road to a 6-lane Arterial Road;
- The construction of the E14/Aitken Boulevard, including any public transport priority; and
- The construction of the Western Connection joining the E14/ Aitken Boulevard with the OMR.

Table 33: PSP – 2021 Interim volumes scenario 1 high residential (vehicles per day)

Detector Points	GAA		MITM (vpd)
	Volume	Category	
1	40,000 +	Primary Arterial Road	17,123
2	40,000 +	Primary Arterial Road	15,472
3	40,000 +	Primary Arterial Road	21,687
4	40,000 +	Primary Arterial Road	22,158
5	40,000 +	Primary Arterial Road	28,746
6	12,000 to 40,000	Secondary Arterial Road	N/A
7	12,000 to 40,000	Secondary Arterial Road	N/A
8	12,000 to 40,000	Secondary Arterial Road	N/A
9	12,000 to 40,000	Secondary Arterial Road	N/A
10	12,000 to 40,000	Secondary Arterial Road	N/A
11	12,000 to 40,000	Secondary Arterial Road	8,195
12	12,000 to 40,000	Secondary Arterial Road	16,704
13	12,000 to 40,000	Secondary Arterial Road	5,998
14	7,000 to 12,000	Connector Boulevard	N/A
15	3,000 to 7,000	Connector Street (Undivided)	N/A
16	3,000 to 7,000	Connector Street (Undivided)	N/A
17	7,000 to 12,000	Connector Boulevard	5,691
18	3,000 to 7,000	Connector Street (Undivided)	6,754
19	3,000 to 7,000	Connector Street (Undivided)	4,469
20	7,000 to 12,000	Connector Boulevard	9,875
21	3,000 to 7,000	Connector Street (Undivided)	6,824
22	7,000 to 12,000	Connector Boulevard	2,444
23	7,000 to 12,000	Connector Boulevard	11,436
24	3,000 to 7,000	Connector Street (Undivided)	7,271
25	7,000 to 12,000	Connector Boulevard	3,449
26	12,000 to 40,000	Secondary Arterial Road	13,730 (see note)
27	3,000 to 7,000	Connector Street (Undivided)	1,237
28	7,000 to 12,000	Connector Boulevard	3,755
29	7,000 to 12,000	Connector Boulevard	11,505
30	3,000 to 7,000	Connector Street (Undivided)	2,194
31	3,000 to 7,000	Connector Street (Undivided)	4,957
33	3,000 to 7,000	Connector Street (Undivided)	3,985
34	3,000 to 7,000	Connector Street (Undivided)	6,266
35	7,000 to 12,000	Connector Boulevard	10,517
36	3,000 to 7,000	Connector Street (Undivided)	1,684
37	3,000 to 7,000	Connector Street (Undivided)	1,236
38	7,000 to 12,000	Connector Boulevard	5,132
39	7,000 to 12,000	Connector Boulevard	5,662
40	7,000 to 12,000	Connector Boulevard	5,495
41	7,000 to 12,000	Connector Boulevard	N/A

Note:

- Point 26 represents a very high demand related to the nearby secondary school which is planned to have 1,500 enrolments at full build out. The location of this secondary school is however likely to change and this has the potential to reduce volumes at this point. It should also be noted that volumes reduce significantly south of this point.

Table 34: PSP – 2046 Ultimate volumes scenario 1 high residential (vehicles per day)

Detector Points	GAA		MITM (vpd)
	Volume	Category	
1	40,000 +	Primary Arterial Road	51,195
2	40,000 +	Primary Arterial Road	41,483
3	40,000 +	Primary Arterial Road	53,623
4	40,000 +	Primary Arterial Road	48,866
5	40,000 +	Primary Arterial Road	44,136
6	12,000 to 40,000	Secondary Arterial Road	16,446
7	12,000 to 40,000	Secondary Arterial Road	9,943
8	12,000 to 40,000	Secondary Arterial Road	10,352
9	12,000 to 40,000	Secondary Arterial Road	11,044
10	40,000 +	Primary Arterial Road	39,210
11	40,000 +	Primary Arterial Road	24,276
12	40,000 +	Primary Arterial Road	52,991
13	40,000 +	Primary Arterial Road	34,878
14	7,000 to 12,000	Connector Boulevard	6,502
15	3,000 to 7,000	Connector Street (Undivided)	4,201
16	3,000 to 7,000	Connector Street (Undivided)	4,462
17	7,000 to 12,000	Connector Boulevard	8,478
18	3,000 to 7,000	Connector Street (Undivided)	7,341
19	3,000 to 7,000	Connector Street (Undivided)	4,487
20	7,000 to 12,000	Connector Boulevard	9,747
21	3,000 to 7,000	Connector Street (Undivided)	7,744
22	7,000 to 12,000	Connector Boulevard	4,397
23	7,000 to 12,000	Connector Boulevard	11,137
24	3,000 to 7,000	Connector Street (Undivided)	7,891
25	7,000 to 12,000	Connector Boulevard	10,035
26	12,000 to 40,000	Secondary Arterial Road	17,999 (see note)
27	3,000 to 7,000	Connector Street (Undivided)	9,108 (see note)
28	7,000 to 12,000	Connector Boulevard	3,206 (see note)
29	12,000 to 40,000	Secondary Arterial Road	14,702 (see note)
30	3,000 to 7,000	Connector Street (Undivided)	2,446
31	3,000 to 7,000	Connector Street (Undivided)	2,957
33	3,000 to 7,000	Connector Street (Undivided)	4,508
34	3,000 to 7,000	Connector Street (Undivided)	6,594
35	7,000 to 12,000	Connector Boulevard	16,303 (see note)
36	3,000 to 7,000	Connector Street (Undivided)	1,384
37	3,000 to 7,000	Connector Street (Undivided)	1,237
38	7,000 to 12,000	Connector Boulevard	11,007
39	7,000 to 12,000	Connector Boulevard	10,558
40	7,000 to 12,000	Connector Boulevard	6,249
41	40,000 +	Primary Arterial Road	32,380

Note:

- Point 26 and Point 29 represents a very high demand related to the nearby secondary school which is planned to have 1,500 enrolments at full build out. The location of this secondary school is however likely to change and this has the potential to reduce volumes at these points. It should also be noted that volumes reduce significantly south of these points.

- In terms of overcoming the apparent excess demand observed at Point 27, it is recommended that this demand be ‘paired’ with the available capacity at Point 28 to accommodate the total demand emanating from Zone 2715. Local modelling phenomenon such as this can usually be overcome by including junction delays at the trip path assignment stage in the four-step modelling process or through the use of micro-simulation modelling at a local street level.
- Excess demand observed at Point 35 is as a result of a road link being removed from an earlier version of the PSP. In the absence of this link, traffic along Point 35 represents a larger catchment including the town centre traffic almost exclusively. Further refinement of the road network will occur through the master planning process. It is anticipated that additional local road connections will allow for a further redistribution of local traffic demand seeking access onto the E14 (e.g. through the use of left-in left-out treatments and service road provisions).

7.3 Confirmation of Higher Order Roads

Table 33 and Table 34 above indicate that the proposed 4-lane configuration for the E14/ Aitken Boulevard will cater for the required demand by the ultimate 2046 model year. However, volumes on the section immediately north of Donnybrook Road would be starting to approach the capacity of a typical 4-lane roadway by this time.

The daily demand for travel on Donnybrook Road indicates that it will need 6 lanes west of the E14/ Aitken Boulevard and east of the OMR. Although volumes on Donnybrook Road within the PSP indicate that a 4-lane configuration would suffice, this section should be constructed as a 6-lane cross-section for continuity with the design which has been approved for the Merrifield and Folkestone Employment Precincts.

The forecast daily volumes on the Western Connector suggest that this road requires 4 lanes along its entire length, including the short length through Melbourne Water property. Further detailed design and the precise form of the road is the subject of a separate project.

The proposed road hierarchy is shown in Figure 17.

Figure 17: Proposed road hierarchy

7.4 Standard Drawings

The following set of cross sections is provided as reference to the descriptions which have been used in Table 33 and Table 34 above. These cross sections have been extracted from the PSP document for ease of reference at this point in the report.

7.4.1 Connector Street

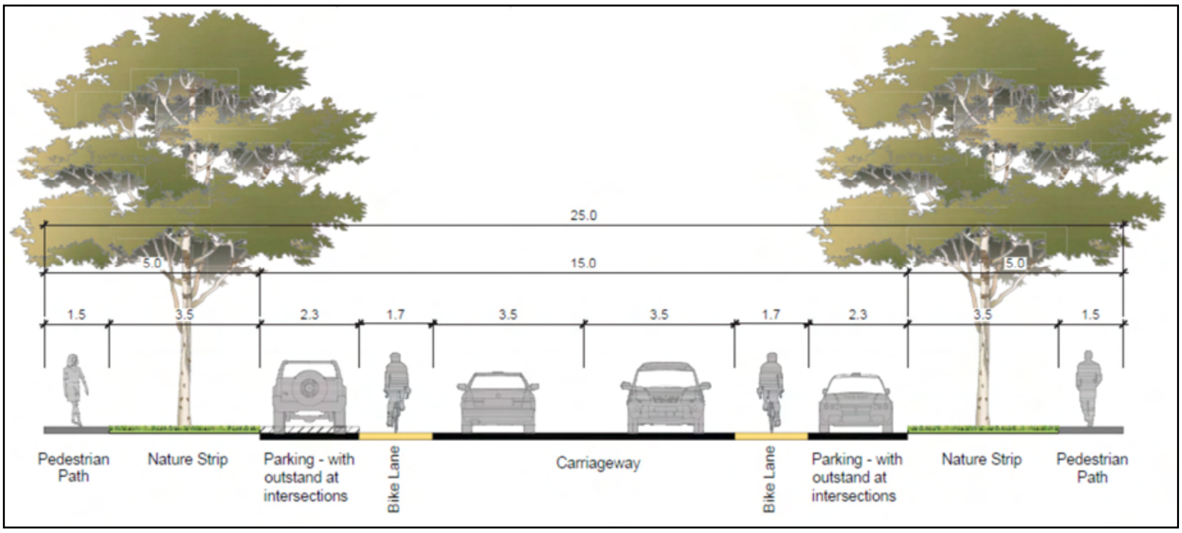


Figure 18: Sample cross section for 2-lane connector street (Source: VicRoads, "Growth Areas: Typical Intersection Drawings")

It is intended that Connector Streets carry between 3,000 and 7,000 vehicles per day. These are the lowest order of roads that are coded into the MITM model.

7.4.2 Boulevard Connector

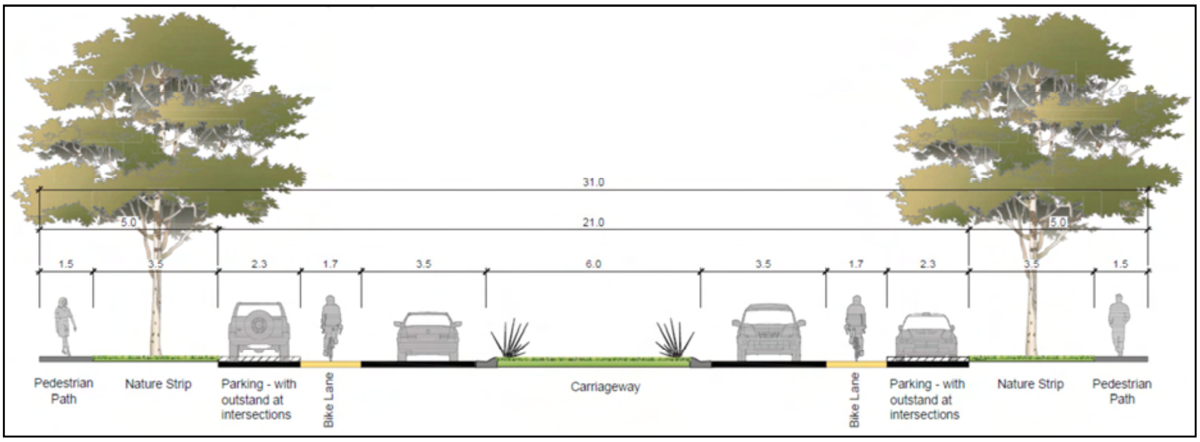


Figure 19: Sample cross section for 2-lane boulevard connector (Source: VicRoads, "Growth Areas: Typical Intersection Drawings")

It is intended that a Boulevard Connector carry between 7,000 and 12,000 vehicles per day.

7.4.3 Secondary Arterial Road

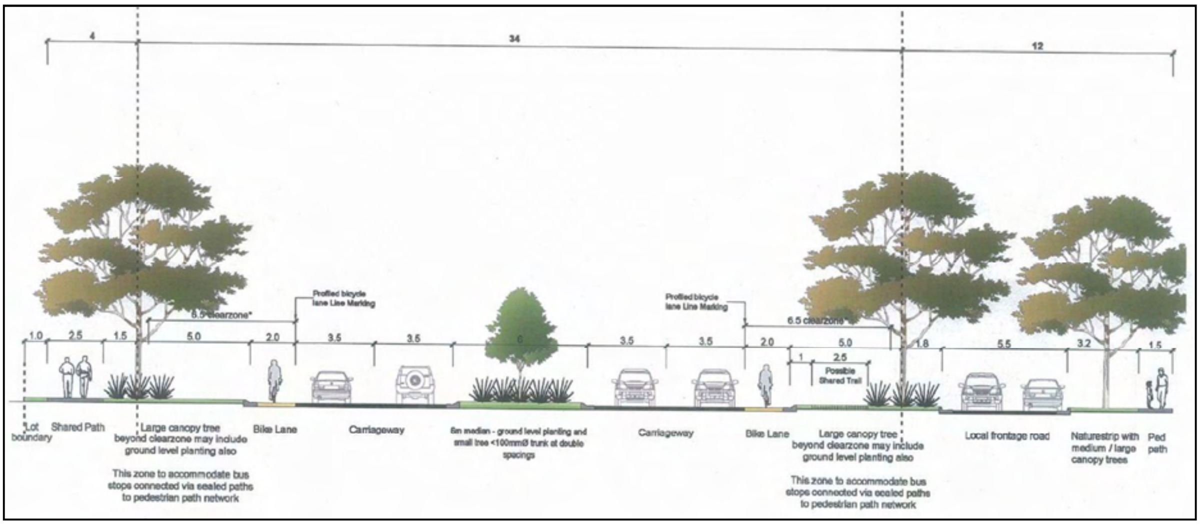


Figure 20: Sample cross section for 4-lane secondary arterial (Source: VicRoads, "Growth Areas: Typical Intersection Drawings")

Secondary Arterial Roads are designed to carry between 12,000 and 40,000 vehicles per day. The MITM model suggests that in both the interim and ultimate model years, the E14/ Aitken Boulevard will need to be a Secondary Arterial Road.

7.4.4 Primary Arterial Road

Figure 21 shows the proposed cross section for Donnybrook Road. This cross section has been developed under the guidance of VicRoads and in consultation with all the relevant service authorities. This cross section will apply for the full length of Donnybrook Road between E14/ Aitken Boulevard in the east and Old Sydney Road in the west, immediately servicing the PSP.

It is intended that a Primary Arterial Road be a 6-lane divided roadway and be designed to carry in excess of 40,000 vehicles per day. The cross section provided in Figure 21 indicates that the Donnybrook Road reserve will be in the order of 50m as opposed to the GAA standard of 40m, excluding service roads, for a similar road. This is in response to the consultation that has been undertaken with all the service authorities involved.

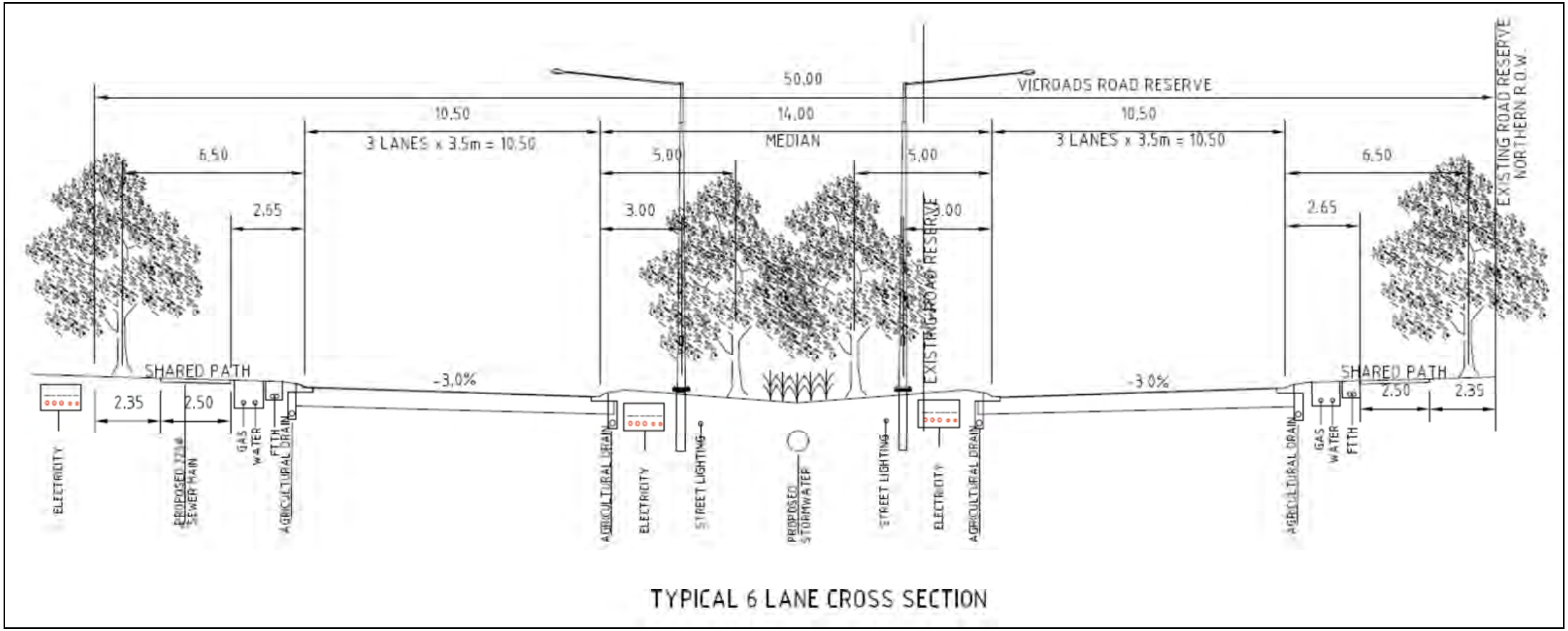


Figure 21: Cross section proposed for Donnybrook Road (Source: Functional Layout Plan produced by SMEC on behalf of Merrifield Corporation in 2011 for VicRoads)

8 CONCLUSIONS

The infrastructure requirements in accordance with the results of the future year forecasting for the interim and ultimate development scenarios are summarised below. Layout plans for each of the intersections have previously been included in Section 6.

8.1 Collector Road IT01 and Western Connector

Intersection Not Required in 2021 due to Zero Travel Demands

2046 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.723	0.893
Level of Service	C	C

Note: These results assume right turn bans are in place at IT02 and IT03.

8.2 Collector Road IT02 and Western Connector

Intersection Not Required in 2021 due to Zero Travel Demands

In 2046, there will be right turn bans in place for both the Western Connector and Collector Road IT02 approaches, therefore no signalised intersection required.

8.3 Collector Road IT03 and Western Connector

Intersection Not Required in 2021 due to Zero Travel Demands

In 2046, there will be right turn bans in place for both the Western Connector and Collector Road IT03 approaches, therefore no signalised intersection required.

8.4 Collector Road IT04 and Donnybrook Road

2021 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.568	0.556
Level of Service	A	A

2046 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.663	0.804
Level of Service	B	C

8.5 Collector Road IT05 and Donnybrook Road

2021 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.915	0.553
Level of Service	D	A

2046 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.795	0.921
Level of Service	C	D

8.6 Collector Road IT06 and Donnybrook Road

2021 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.580	0.772
Level of Service	A	C

2046 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.797	0.930
Level of Service	C	D

8.7 IT07 Donnybrook Road and Old Sydney Road

2021 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.432	0.923
Level of Service	A	D

2046 – Intersection performance as follows:

Performance Measure	AM Peak	PM Peak
Degree of Saturation	0.563	0.759
Level of Service	A	C

9 RECOMMENDATIONS

In accordance with the modelling that has been undertaken for the interim 2021 modelled year, we recommend that:

- The construction of the Western Connector towards the OMR will not be required by the 2021 model year. This includes intersections IT01, IT02 and IT03. As such, the cost of constructing the Western Connector should not be attributed to the PSP.
- Donnybrook Road will be the major 4-lane Arterial Road servicing the interim traffic in 2021. Therefore, intersections IT04, IT05, IT06 and IT07 will be required by the 2021 interim model year.

In accordance with the modelling that has been undertaken for the ultimate 2046 modelled year, we recommend that:

- The Western Connector will be required by 2046 as it provides a key linkage to the OMR via a new interchange.
- Intersections IT01, IT02 and IT03 will be required for the ultimate scenario commensurate with the construction of the Western Connector. The recommended form of intersection control at IT01 is traffic signals, while IT02 and IT03 may not need to be signalised at the same time.
- Traffic volumes along Donnybrook Road will continue to increase after 2021 and beyond the 2046 scenario. Intersections IT04, IT05, IT06 and IT07 will therefore require further upgrades by the ultimate 2046 scenario year to accommodate the 6-laning of Donnybrook Road.

APPENDIX 1 – MITM CALIBRATION AND VALIDATION REPORT

Northern Growth Corridor
MITM Modelling
Model Calibration and Validation Report

transportation planning, de[illegible] and delivery

GTAconsultants

Northern Growth Corridor

MITM Modelling

Model Calibration and Validation Report

Issue: A 17/02/2012

Client: Growth Areas Authority
Reference: 12M1274000
GTA Consultants Office: VIC

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1. Introduction

1.1 Background

In mid 2011 discussions were coordinated by the Growth Areas Authority (GAA) to obtain consensus and sign-off on an agreed strategic modelling process for the Northern Growth Corridor. At the time, the GAA was yet to release corridor framework plans for the area, and planning for growth in the corridor via the formulation of Precinct Structure Plans (PSPs) needed to continue, supported by an agreed base model for the purpose of preparing future PSPs.

At a meeting in late August between GAA, VicRoads, Department of Transport (DoT) and the Department of Planning and Community Development (DPCD) it was agreed that the DoT December 2010 version of the Melbourne Integrated Transport Model (MITM) was to be used as a basis for the initial planning of the corridor and that a number of future year land use/road network scenarios were to be tested in the absence of a corridor framework plan for the area.

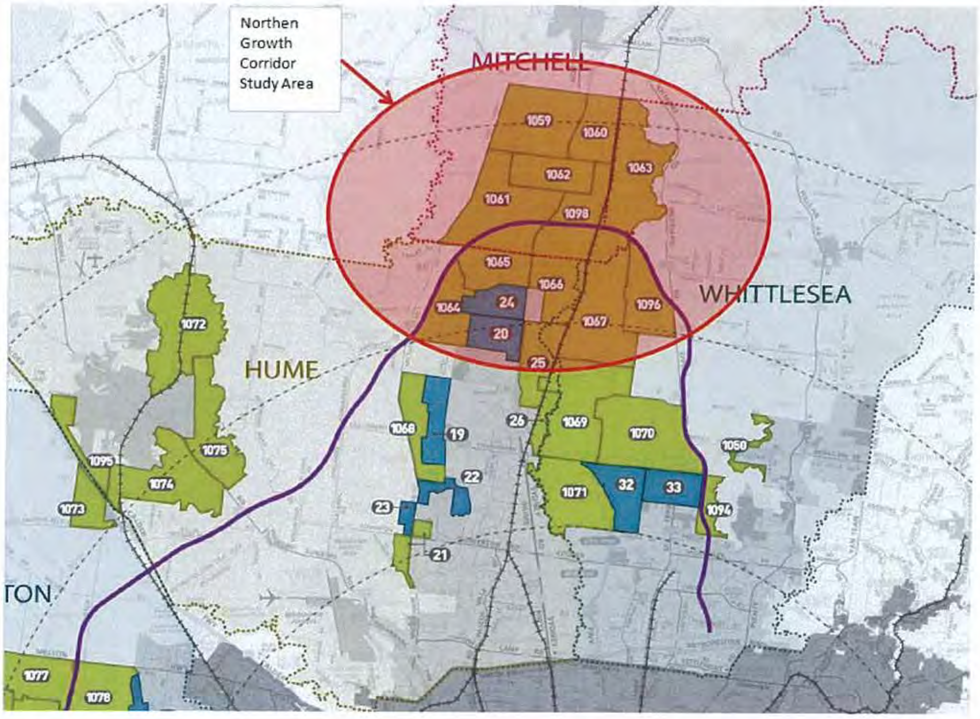
GTA Consultants (GTA) with the assistance of SMEC (peer reviewer) were engaged to develop a base year MITM model suitable for testing future land use and road network scenarios in the Northern Growth Corridor area.

The following report confirms the validity of the MITM base year model developed by GTA for testing future scenarios in the Northern Growth Corridor area.

1.2 Study Area

The extent of the Northern Growth Corridor study area is shown in Figure 1.1.

Figure 1.1: Northern Growth Corridor Study Area



1.3 Purpose of the Strategic Model

The strategic model is to be used to:

- understand the travel patterns through the study area in the base year (2010)
- run option tests for future year models to determine changes in traffic patterns across the study area, with varying land use and transport infrastructure assumptions.

1.4 Model Limitations

The MITM model is an AM peak two hour period model, which means it does not produce daily traffic volume information directly. However, this is dealt with by preparing daily traffic volume estimates for existing and future years using conversion factors based on actual recorded volumes.

Furthermore the purpose of the strategic modelling is to identify broad level traffic and travel patterns and changes as an input to more detailed consideration during the Precinct Structure Planning (PSP) process.

1.5 Model Establishment

1.5.1 Base Year Model

For the purpose of this study, the DoT (December 2010) MITM model has been adopted and refined. This model is a travel demand model incorporating a link-based network model with an integrated public transport model. The model is implemented in the Cube Voyager software environment. The MITM networks contain all major freeways, main arterials and connector roads covering the entire Melbourne Statistical Division.

1.5.2 Future Year Models

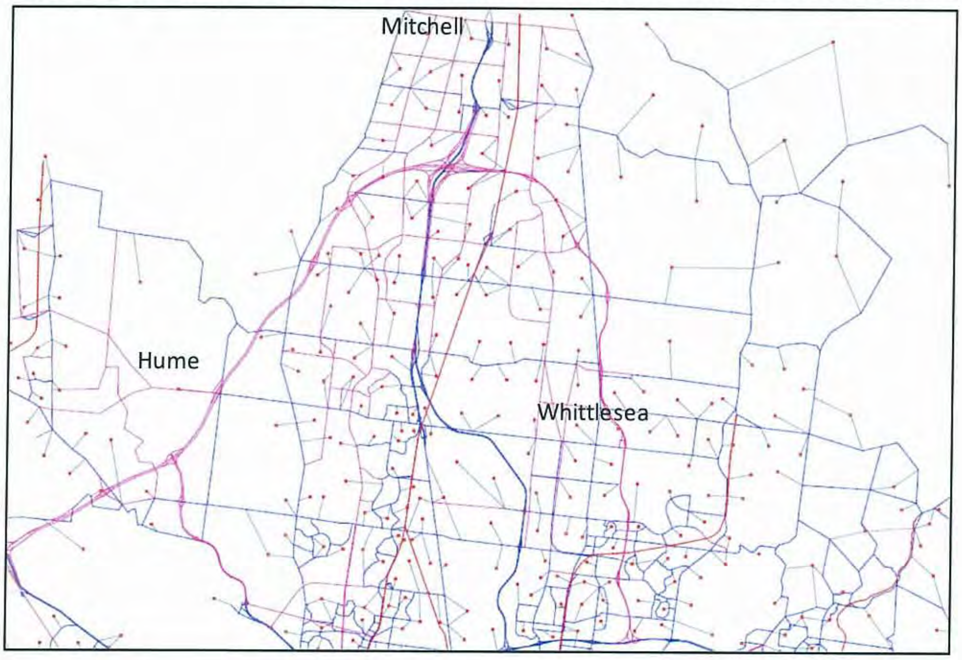
Once agreement is reached on the calibration and validation of the base year (existing condition) model, the future year models will be developed. This involves using the base year network and applying road network and land use scenarios that are to be tested.

2. Model Structure

2.1 Zone System

The generic MITM zone system contains 2,912 zones (including external zones) which were developed based on Census Collector Districts (CCD) and aggregated/disaggregated where necessary. The zone system for the Strategic Modelling Study Area is shown in Figure 2.1 with the complete metropolitan network coverage area shown in Appendix A.

Figure 2.1: Northern Growth Corridor Strategic Modelling Area-Base Year Modelled Network and Zones



As shown in Figure 2.1 the Strategic Modelling Area encompasses the Whittlesea, Hume and Mitchell Local Government Authority (LGA) area.

2.2 Network Refinements

For the purpose of this study a full review of all links within the Whittlesea, Hume and Mitchell LGAs was conducted to ensure that they reflect actual road conditions. Zone centroid connectors were also adjusted in some cases to assist in satisfying the VicRoads' criteria for validation.

No refinements have been made to the zone structure (e.g. no zone splitting) in MITM as part this calibration/validation exercise.

3. Land Use Information

3.1 DoT MITM Land Uses

Population and employment forecast figures have been produced by the Department of Planning and Community Development (DPCD) and Ratio Consultants for the DoT. The DPCD population forecasts, commonly referred to as the *'Victoria In Future'* forecasts, are relevant for each year up to 2031, while Ratio Consultants employment data were exclusively produced for modelling purposes and are only for the years 2006, 2011, 2021 and 2031.

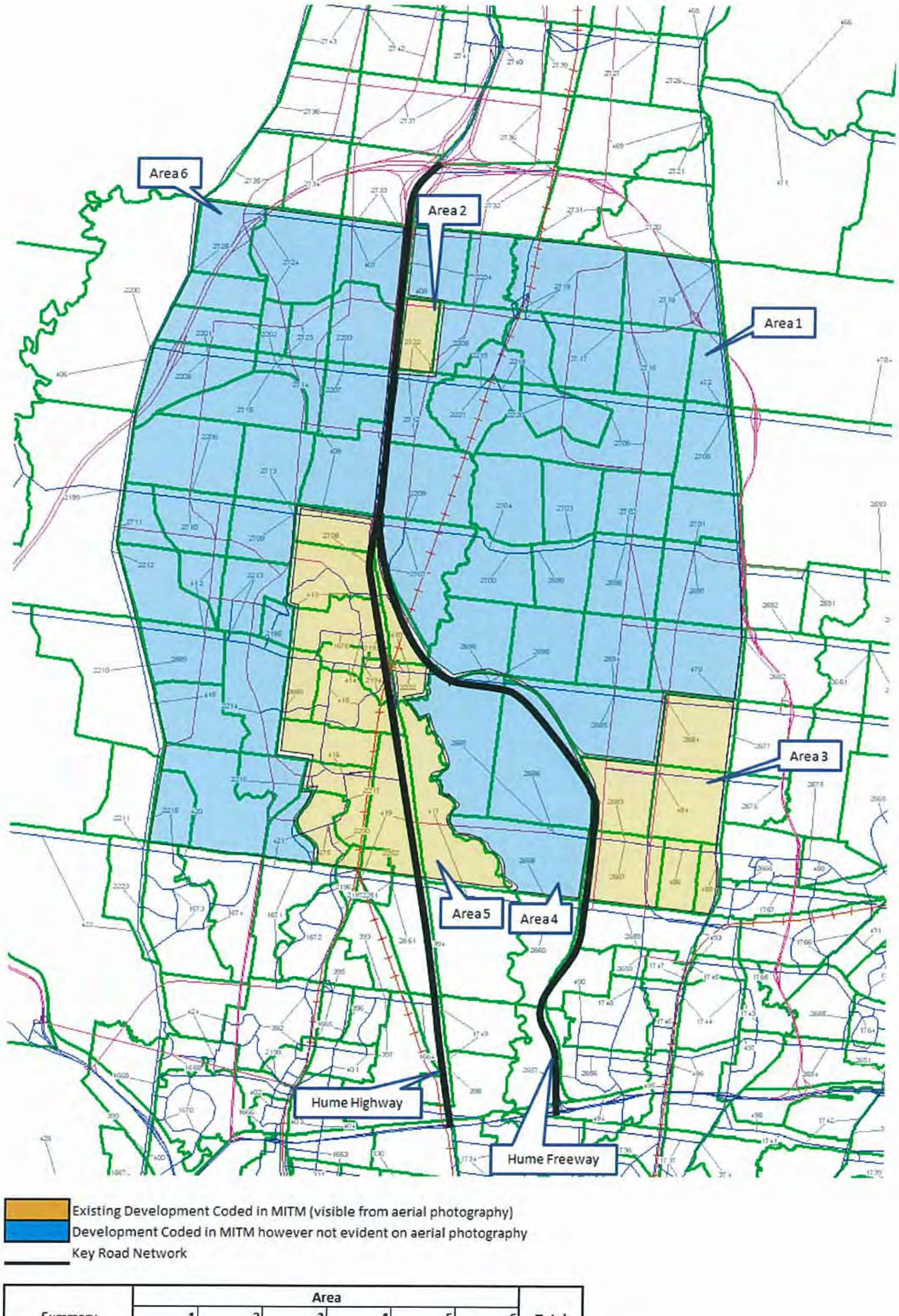
MITM inputs population in the form of households and educational facilities in the form of enrolments. All other uses such as retail floor space are input as jobs in 17 categories across blue collar and white collar jobs.

3.2 Land Use Refinements

For the purposes for this calibration/validation exercise refinements have been made to the existing conditions DoT MITM model to reflect the current land use patterns in the Northern Growth Corridor area.

A high level review of the land uses coded the Northern Growth corridor area was undertaken by comparing the land use coded to recent aerial photographs. It was found that some zones in the DoT MITM contained notable land uses that were not visible on the aerial photography. Figure 3.1 summaries the differences observed between MITM and the aerial photography.

Figure 3.1: DoT MITM Modelled verses Visible Land Uses



Summary	Area 1	2	3	4	5	6	Total
House Holds	338	7	1,531	6	10,339	3,183	15,405
Enrollments	3	0	34	7	4,475	3,101	7,620
Employment	754	10	917	865	8,850	3,385	14,781

As shown in Figure 3.1 the area west of the Hume Highway (Area 6) contained a notable level of development not visible on recent aerial photographs. Accordingly refinements were made to the MITM land uses in selected zones.

The refinements made in the GTA MITM based model are summarised in Table 3.1.

Table 3.1: MITM Land Use Refinements

VITM Zone Number	DoT Land Use			Land Use Refinements		
	Households	Employment	Enrolments	Households	Employment	Enrolments
2659	67	3,766	0	0	0	0
2199	27	42	132	0	0	0
2713	61	12	0	0	0	0
2709	57	16	193	0	0	0
2213	286	16	474	0	0	0
2214	640	15	0	0	0	0
2216	227	58	0	0	0	0
Total	**1,365**	**3,925**	**799**	**0**	**0**	**0**

4. Methodology

4.1 Model Calibration Procedure

4.1.1 General

Model calibration is a process in which the model inputs are adjusted to reflect actual road characteristics to allow the model to produce travel demands in line with actual measured traffic conditions.

Existing traffic counts are used to compare against modelled link volumes after each model assignment. Following any link adjustments the model demands are once again assigned and modelled results compared to the traffic counts. This process is repeated until the model results converge to a point where they meet a number of calibration criteria.

Strategic network models are generally calibrated to reflect existing traffic counts across a wide corridor or regional area. Strategic network models are not expected to accurately match traffic counts at individual locations, instead model calibration is typically measured by comparing counts across a number of locations such as a screenline, and/or a group of counts at a regional level.

4.1.2 Model Calibration Guidelines

Model Calibration and Validation guidelines are provided by VicRoads for use in strategic modelling work. The document entitled *'Guidelines on the Validation Process and Criteria for Strategic Transport Modelling (March 2010)'* has been used as a reference in presenting the model results. This document outlines the model calibration targets for modelled traffic volumes.

The Percent Root Mean Square Error (%RMSE), Coefficient of Determination (R^2) and slope of best-fit regression line statistics are used to measure the level of calibration where the targets are %RMSE of less than 30% for the study area, R^2 of greater than 0.90 and slope of best-fit regression line to have a gradient that is between 0.9 and 1.1 while constrained to pass through the origin.

4.2 Model Coverage Feedback

The current CUBE Voyager MITM model adopts 6 iterations from trip distribution to trip assignment.

5. Model Calibration Results

5.1 Traffic Volumes Used for Calibration Purposes

Historic traffic count data for the Whittlesea, Hume, and Mitchell was provided by VicRoads and Councils. This data was refined by initially discarding counts prior to 2008. Where multiple counts were still present for the same location over a number of years the most recent traffic count was retained.

In the case of the Hume LGA, traffic counts directly relating to Melbourne Airport (e.g. the Tullamarine Freeway On-Ramp at the Airport) were also discarded. These counts were discarded as the traffic volumes in MITM are based on residential, employment and enrolment land uses only and do not take into consideration airport passenger generated trips. Hence including such surveyed traffic volumes in the calibration process would result in the overall outputs being skewed.

Furthermore it is noted that the DoT MITM model included the proposed relocation of the Melbourne's Wholesale Fruit and Vegetable Markets from West Melbourne to Epping. Given that this relocation has not occurred at the time the surveyed count data was collected, data points in close proximity to the proposed Epping Market site were discarded.

The survey data (2008 onwards) provided by VicRoads are included in Appendix B.

5.2 VicRoads Validation Criteria

5.2.1 Overview

The following detail of this section focuses on the VicRoads validation for the entire Strategic Modelling Area (i.e. the combined Whittlesea, Hume and Mitchell LGAs) with details of the individual LGAs provided in Appendix C.

5.2.2 Root Mean Squared Error

The Percentage Root Mean Squared Error (%RMSE) is an indication of the correlation between modelled volumes and counts; however it is dependent on the size of the count volume. RMSE is ideal to be used during the validation process of a strategic model as it emphasises the need for counts with high volumes to be validated accurately and as such counts less than 1,000 vehicles have been excluded from the %RMSE calculation. It is expressed as:

$$\%RMSE = 100N\frac{\sqrt{\frac{\sum(M-C)^2}{(N-1)}}}{\sum C}$$

Where:

- %RMSE is the percentage root mean squared error
- N is the number of count/modelled link pairs
- $\sum$ is the summation of count/modelled link pair 1 to N
- M is the modelled one-way link volume (peak period)
- C is the measured average one-way link volume (peak period).

The VicRoads criteria for the validation of strategic models states that the overall %RMSE should be below 30%. The summary of the %RMSE (for counts greater than 1000 vehicles) is shown in Table 5.1.

Table 5.1: MITM 2 Hour AM Peak Period – Root Mean Squared Error Calibration Statistics

Count Category	Count Range	Number of Counts	% RMSE
2	1000 - 2000	70	31.1
3	2000 - 5000	64	29.0
4	5000 - 10000	12	20.4
5	> 10000	0	n/a
	All Counts	**146**	**29.5**

Table 5.1 shows that although the %RMSE is greater than 30% for counts between 1,000 and 2,000 (Count Category 2), the overall %RMSE is 29.5% which meets the VicRoads Criteria for an overall %RMSE of less than 30%. It is highlighted that strategic network models are not expected to accurately match traffic counts at individual locations; instead model calibration is typically measured by comparing counts at regional level where traffic volumes are higher and less effected by typical traffic variations. As such given that the overall %RMSE meets the VicRoads requirement, the refined model is considered suitable for testing the land use and road network scenarios proposed for the Northern Growth Corridor.

5.2.3 Coefficient of Determination (R^2)

The Coefficient of Determination (R-Squared) is used in the validation process as it is a measure of the correlation between modelled flows and count volumes in the form of a linear trend line. Although the R-Squared value is an efficient means of expressing correlation between two sets of data, it is not sufficient to use the R-Squared as the only method of validation as it is possible for the modelled flows to be well above or below measured counts and still produce a strong linear correlation. The R-Squared value is defined as:

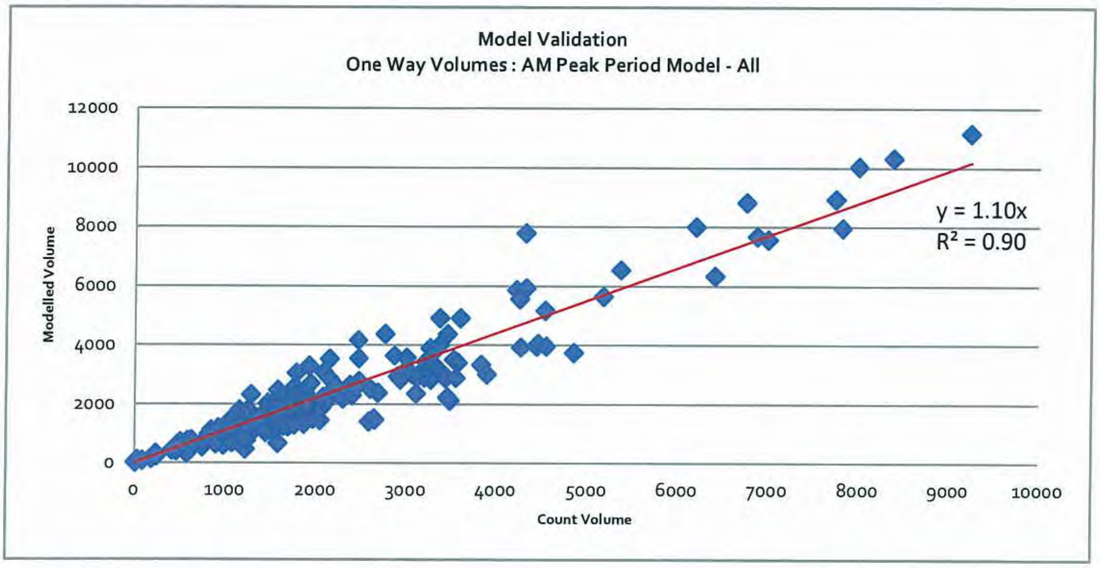
$$r = \frac{\sum(C - \bar{C})(M - \bar{M})}{\sqrt{\sum(C - \bar{C})^2 \sum(M - \bar{M})^2}}$$

Where:

- r is the Coefficient of Determination (R-Squared)
- $\sum$ is the summation of count/modelled link pairs
- M is the modelled one-way link volume (peak period)
- C is the measured average one-way link volume (peak period)

Although the standard R-squared target for strategic models is a value above 0.88, the VicRoads guideline states that models should be validated to have an R-Squared value above 0.90. Figure 5.1 summarises the R-Squared value for the refined MITM model. Figure 5.1 indicates that the R-squared calculation for the refined MITM model is 0.90 which meets the VicRoads requirement exceedes the generally accepted targets for strategic modelling.

Figure 5.1: MITM 2-Hour AM Peak Period – R-Squared Summary



5.2.4 Slope of Best Fit

The slope of best-fit regression line is similar to the R-squared process however this validation criterion is an overall measure of model performance and therefore it is not necessarily a measure of individual modelled volume correlation with its corresponding count volume. The VicRoads validation criteria require that the gradient of the trend line to be between 0.9 and 1.1 while restricted to pass through the origin.

Figure 5.1 calculates the gradient for the trend line to be 1.10 which satisfies the criterion and is considered satisfactory. Furthermore Figure 5.1 indicates that modelled traffic volumes are conservatively higher than surveyed volumes and as such would present a conservative assessment of future traffic volumes within the study area. This is considered acceptable in this instance given the intended use of the model (i.e. validating the future road network requirements) as it adds an inherent design contingency into any future road network.

5.3 Summary of Model Validation

The VicRoads guidelines for the validation of strategic models require three main criteria to be met. This includes the calculation of the Percent Root Mean Square Error (%RMSE), Coefficient of Determination (R^2) and the slope of best-fit regression line. The results show that the strategic model for the Study Area satisfies all three criteria and is therefore satisfactory for the purposes of modelling existing and future years based on the statistics summarised in Table 5.2:

Table 5.2: Summary of VicRoads Validation Criteria

Criteria	VicRoads Requirement	Overall
Percent Root Square Mean Error for counts greater than 1,000 vehicles(%RMSE)	Below 30% overall	29.5%
Coefficient of Determination (R-Squared)	above 0.90	0.90
Slope of Best-Fit	Gradient of trend line between and 0.9 and 1.1 while constrained to pass through the origin	1.10

6. Existing Conditions Results

6.1 Travel Pattern Summary

A comparison of the refined MITM model splits to the Victorian Integrated Survey of Travel and Activity (VIISTA) 2007 is presented in Table 6.1.

Table 6.1: Mode Split Comparison

LGA	Refined MITM				VISTA				
	Walk	Private Vehicle	Public Transport	Total	Walk	Private Vehicle	Public Transport	Other	Total
Hume	42,243 (9%)	384,793 (84%)	33,312 (7%)	460,349	37,571 (9%)	331,606 (81%)	37,163 (9%)	2,450 (1%)	408,790
Mitchell	71 (2%)	3661 (98%)	7 (0%)	3,740	n/a	n/a	n/a	n/a	n/a
Whittlesea	30,863 (8%)	349,905 (86%)	24,375 (6%)	405,143	24,849 (8%)	273,340 (85%)	24,204 (8%)	323 (0%)	322,716

Note: VISTA does not include data for the Mitchell LGA

As shown in Table 6.1 the refined MITM mode splits are consistent with VISTA data.

6.2 Trip Frequencies and Times Travelled

Figure 6.1 shows a comparison between the DoT MITM model and the GTA/SMEC refined MITM model.

Figure 6.1: Trip Length Frequency Distribution

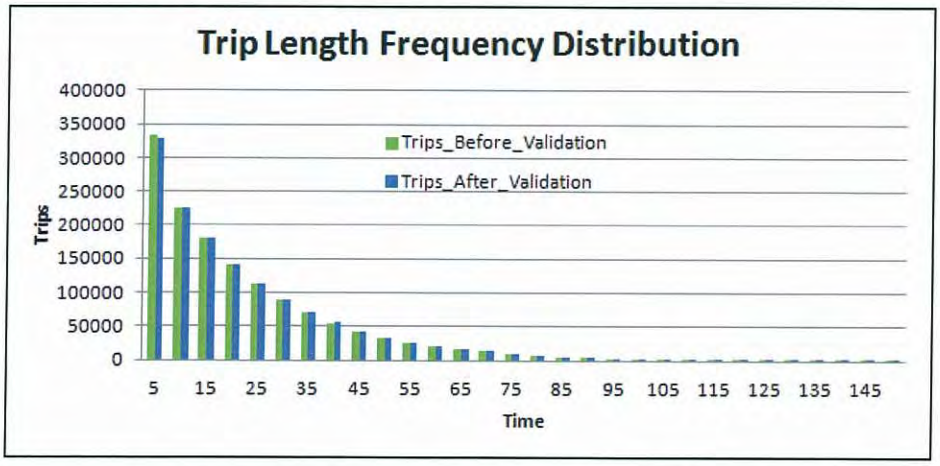


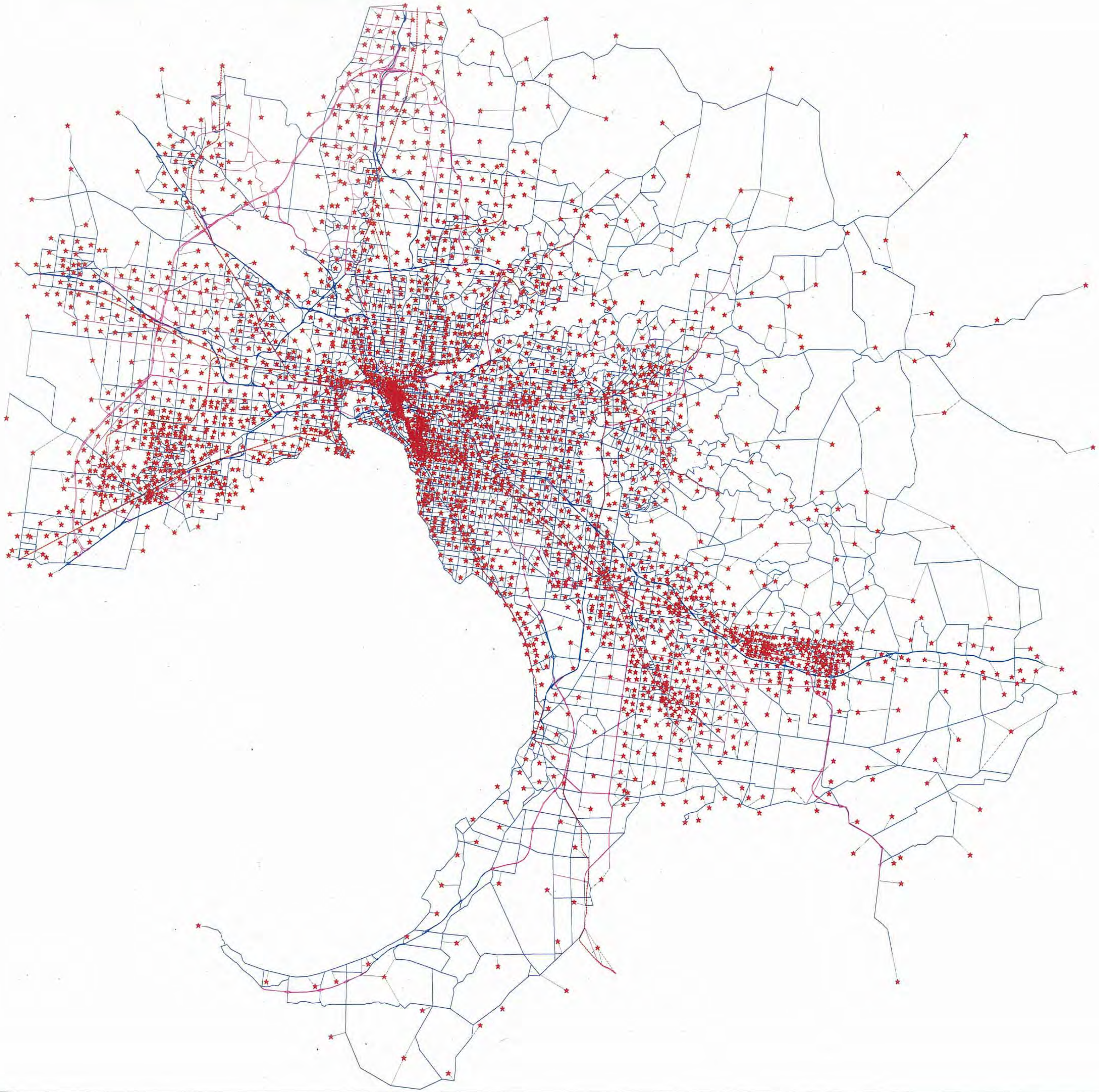
Figure 6.1 shows the trip length frequency distribution before and after the refinement process are consistent.

7. Conclusions

The MITM model refinement process undertaken by GTA and reviewed by SMEC has resulted in the development of a model suitable for testing future land uses and road network scenarios in the Northern Growth Corridor for the purposes of Growth Area Planning. The model meets all the VicRoads Validation Criteria and is therefore considered fit for purpose.

Appendix A

MITM Network Coverage Area



Appendix B

Suveyed and Modelled Traffic Volumes

Table 1. Surveyed vs Modelled Traffic Volumes

Location	Year	Surveyed Count	Factored Survey Count	Modelled Count
Whittlesea Area				
Settlement Rd W of Dalton Rd	2009	279	507	719
Settlement Rd E of Dalton Rd	2009	494	898	644
Dalton Rd SW of Settlement Rd	2009	765	1391	1291
Dalton Rd NE of Settlement Rd	2009	2671	4856	3730
Donnybrook Rd 1km E of Brookville Rd	2008	52	95	82
Donnybrook Rd 1km E of Brookville Rd	2008	138	251	228
Metropolitan Ring Road Offramp E of Edgars Rd	2008	588	1069	687
Metro Ring Road Offramp W of Edgars Rd	2008	807	1467	2014
Metropolitan Ring Rd Offramp to Dalton Rd	2008	892	1622	1748
Hume Fwy btw Oherns Rd & Craigieburn Rd East	2010	975	1773	1902
Metropolitan Ring Rd Offramp to Plenty Rd	2008	982	1785	3029
Cooper Street btw Merri Creek & Hume Fwy	2008	1005	1827	1853
Metropolitan Ring Rd In Bd Onramp from Plenty Rd	2008	1046	1902	2549
Metropolitan Ring Rd Onramp from Dalton Rd	2008	1046	1902	2048
Hume Fwy Onramp from Metropolitan Ring Rd W Bd	2008	1056	1920	1982
Hume Fwy Offramp to Metropolitan Ring Rd W Bd	2008	1480	2691	2383
Hume Fwy btw Oherns Rd & Craigieburn Rd East	2010	1854	3371	4892
Cooper Street btw Hume Fwy Ramps & Merri Creek	2008	1953	3551	2881
Plenty Rd btw Childs Rd & Mayfield Dr	2010	2452	4458	4040
Settlement Rd W of Dalton Rd	2009	565	1027	856
Dalton Rd NE of Settlement Rd	2009	1126	2047	2047
Dalton Rd SW of Settlement Rd	2009	1712	3113	2358
Metro Ring Rd btw Plenty Rd & Dalton Rd	2010	2376	4320	7783
Metro Ring Rd btw Dalton Rd & Edgars Rd	2010	3413	6205	7990
Metro Ring Rd btw Hume Hwy & Craigieburn Byp	2010	3528	6415	6339
Metro Ring Rd btw Craigieburn Byp & Edgars Rd	2010	3716	6756	8808
Metro Ring Rd btw Plenty Rd & Dalton Rd	2010	3851	7002	7549
Metro Ring Rd btw Dalton Rd & Edgars Rd	2010	4298	7815	7946
Metro Ring Rd btw Edgars Rd & Craigieburn Byp	2010	4395	7991	10035
Metro Ring Rd btw Craigieburn Byp & Hume Hwy	2010	4606	8375	10312
Hume Fwy Off Ramp S of Craigieburn Rd East	2008	231	420	410
Settlement Rd E of High St	2008	255	464	402
Paschke Cr E of High St	2009	291	529	632
Craigieburn Rd East E of Hume Fwy Off Ramp	2008	350	636	698
Wood St W of Settlement Rd	2008	409	744	528
Cooper St W of Davisson St	2008	417	758	693
Craigieburn Rd East W of Hume Fwy Off Ramp	2008	448	815	973
Keon Pde W of Dalton Rd	2010	454	825	805
Settlement Rd NW of Wood St	2008	467	849	1122
McDonalds Rd W of Plenty Rd	2008	510	927	1170
Kingsway Dr W of High St	2009	567	1031	1066
High St S of Paschke Cr	2009	633	1151	874
Childs Rd W of Plenty Rd	2010	636	1156	1782
The Boulevard E of Dalton Rd	2008	660	1200	1452
High St S of Settlement Rd	2008	669	1216	1018
Mckimmies Rd W of Plenty Rd	2010	680	1236	1657

Location	Year	Surveyed Count	Factored Survey Count	Modelled Count
Edgars Rd SE of Victoria Dr	2010	689	1253	1814
Plenty Rd S of Gorge Rd	2008	705	1282	2305
Edgars Rd S of Barry Rd	2008	713	1296	1351
Edgars Rd S of Metro Ring Rd	2008	766	1393	1580
Childs Rd W of Prince of Wales Dr	2008	795	1445	1038
Gorge Rd E of Plenty Rd	2008	798	1451	1092
Metro Ring Rd Exit E of Dalton Rd	2008	816	1484	1539
Mahoneys Rd W of Edgars Rd	2010	858	1560	1437
Settlement Rd E of Wood St	2008	867	1576	1225
Edgars Rd N of Barry Rd	2008	868	1578	2451
Mahoneys Rd W of Hughes Pde	2010	898	1633	2296
High St SW of Cooper St	2010	906	1647	1237
Craigieburn Bypass Onramp S of Cooper St	2008	930	1691	1798
High St S of Childs Rd	2008	969	1762	1273
Childs Rd E of Prince of Wales Dr	2008	978	1778	2286
Dalton Rd S of The Boulevard	2008	991	1802	1763
Dalton Rd S of Metro Ring Rd	2008	1021	1856	2047
Plenty Rd N of Gorge Rd	2008	1058	1924	3278
Cooper St W of Craigieburn Bypass	2008	1132	2058	1846
High St N of Childs Rd	2008	1145	2082	2217
High St N of Settlement Rd	2008	1150	2091	3061
Dalton Rd N of Metro Ring Rd	2008	1162	2113	2051
Edgars Rd NW of Victoria Dr	2010	1184	2153	3512
High St N of Kingsway	2009	1185	2155	2859
Cooper St W of Edgars Rd	2008	1216	2211	2627
Mahoneys Rd E of Edgars Rd	2010	1342	2440	2552
Dalton Rd N of The Boulevard	2008	1433	2605	2501
Craigieburn Bypass Offramp S of Cooper St	2008	1460	2655	1468
Edgars Rd N of Metro Ring Rd	2008	1523	2769	4349
Edgars Rd N of Mahoneys Rd	2010	1616	2938	2827
Dalton Rd NE of Keon Pde	2010	1717	3122	2894
Plenty Rd SW of Metropolitan Ring Rd	2008	1769	3216	3424
Edgars Rd S of Metro Ring Rd	2008	1800	3273	2827
Cooper St E of Hospital Ent	2010	1811	3293	3366
Cooper St E of Craigieburn Bypass	2008	1830	3327	3816
High St NE of Cooper St	2010	1856	3375	4000
Dalton Rd N of Alexander Av	2008	1891	3438	2866
Mahoneys Rd E of Hughes Pde	2010	1918	3487	2117
Plenty Rd N of Mckimmies Rd	2010	2496	4538	5157
Dalton Rd N of Metro Ring Rd	2008	2502	4549	3962
Plenty Rd N of Milton Pde	2010	2849	5180	5632
Hume Area				
Mitchells La W of Horne St	2010	322	585	757
Vineyard Rd S of McDougall Rd	2010	671	1220	1506
Melbourne-Lancefield Rd 300m S of Konagaderra Rd at 42.8km	2010	106	193	145
Sunbury-Riddells Creek Rd 200m S of Jacksons Creek at 11.9km	2010	123	224	232
Mitchells La btw Vineyard Rd & Pasley St	2010	134	244	307

Location	Year	Surveyed Count	Factored Survey Count	Modelled Count
Sunbury-Riddells Creek Rd 200m S of Jacksons Creek at 11.9km	2010	244	444	475
Melbourne-Lancefield Rd 300m S of Konagaderra Rd at 42.8km	2010	318	578	319
Riggall St E of Railway Cres	2008	529	962	1106
Riggall St E of Railway Cres	2008	536	975	976
Gap Rd btw Horne St & Pasley St	2010	539	980	602
Widford Street S of Jacana Ave	2008	585	1064	1290
Vineyard Rd btw Calder Fwy & Moore Rd	2010	594	1080	1515
Hume Fwy S of Craigieburn at 22.9km Post	2008	596	1084	1062
Widford Street S of Jacana Ave	2008	662	1204	1134
Station St btw Horne St & Evans St	2010	678	1233	762
Riddell Rd btw Horne St & Pasley St	2010	758	1378	1308
Somerton Rd btw Brendan Rd & Pascoe Vale Rd	2010	780	1418	1418
Gap Rd btw Horne St & Pasley St	2010	844	1535	1033
Barry Road btw Pascoe Vale Road & Yinnar St	2008	870	1582	653
Vineyard Rd btw Obeid Dr & Elizabeth Dr	2010	905	1645	2033
Station St btw Horne St & Evans St	2010	919	1671	1624
Macedon St btw Horne St & Evans St	2010	931	1693	1219
Somerton Rd btw Brendan Rd & Pascoe Vale Rd	2010	973	1769	2601
Vineyard Rd btw Calder Fwy & Moore Rd	2010	989	1798	2050
Horne St btw Mitchells La & Neill St	2010	996	1811	1626
Camp Road btw Pascoe Vale Road & Blair Street	2008	1027	1867	1323
Camp Road btw Blair Street & Pascoe Vale Road	2008	1126	2047	1441
Riddell Rd btw Horne St & Pasley St	2010	1265	2300	2167
Macedon St btw Horne St & Evans St	2010	1425	2591	1405
Barry Road btw Pascoe Vale Road & Yinnar St	2008	1453	2642	1520
Somerton Road btw Reservoir Dr & Union Rd	2008	1633	2969	3076
Mickleham Rd btw Barrymore Rd & Ardlie St	2010	1771	3220	3028
Hume Fwy S of Craigieburn at 22.9km Post	2008	1902	3458	2224
Hume Hwy 88 M South of Glenbarry Rd	2010	1981	3602	4889
Hume Fwy btw Metropolitan Ring Rd & Cooper St	2010	2143	3896	2988
Hume Fwy btw Metropolitan Ring Rd & Cooper St	2010	2378	4324	5915
Hume Hwy 150m North of Ainslie Rd	2010	2446	4447	3934
Horne St NE of Reece Access Departure	2010	704	1280	1588
Vineyard Rd N of McDougall Rd Departure	2010	730	1327	1583
Vineyard Rd S of McDougall Rd Departure	2010	839	1525	2033
Vineyard Rd SW of Reece Access Departure	2010	933	1696	2071
Western Ring Rd btw Hume Hwy and Pascoe Vale Rd	2010	3783	6878	7682
Western Ring Rd btw Hume Hwy and Pascoe Vale Rd	2009	4257	7740	8919
Western Ring Rd btw Tullamarine Fwy & Pascoe Vale Rd	2010	5080	9236	11147
Sydney Rd S of Cooper St	2008	1042	1895	2342
Sydney Rd S of Camp Rd	2008	2952	5367	6534
Coleraine St W of Pascoe Vale Rd	2010	299	544	453
Shankland Bvd SW of Pascoe Vale Rd	2008	345	627	765
Paringa Blvd NW of Pascoe Vale Rd	2010	368	669	608
Hume Hwy S of Stanley Dr	2010	553	1005	1292
Craigieburn Rd W of Bridgewater Rd	2008	595	1082	691
Camp Rd W of Hume Hwy	2008	609	1107	1174

Location	Year	Surveyed Count	Factored Survey Count	Modelled Count
Broadmeadows Rd W of Nth Circular Rd	2008	618	1124	1022
Craigieburn Rd E of Bridgewater Rd	2008	672	1222	462
Bridgewater Rd S of Craigieburn Rd	2008	700	1273	956
Mickleham Rd N of Tangemere Av	2008	710	1291	1677
Deviation Rd E of Nth Circular Rd	2008	846	1538	1412
Pascoe Vale Rd SE of Shankland Bvd	2008	941	1711	1459
Cooper St E of Hume Hwy	2010	1069	1944	2690
Pascoe Vale Rd SW of Paringa Blvd	2010	1085	1973	1485
Pascoe Vale Rd S of Coleraine St	2010	1171	2129	2290
Mickleham Rd N of Tangemere Av	2008	1308	2378	2624
Mickleham Rd S of Rylandes Dr	2008	1321	2402	2275
Mahoneys Rd E of Hume Hwy	2008	1349	2453	2584
Western Ring Rd Offramp E of Hume Hwy	2008	1356	2465	4155
Pascoe Vale Rd NW of Shankland Bvd	2008	1360	2473	3545
Somerton Rd W of Hume Hwy	2010	1364	2480	2765
Pascoe Vale Rd NE of Dimboola Rd	2010	1655	3009	3558
Pascoe Vale Rd NE of Paringa Blvd	2010	1682	3058	3009
Hume Hwy N of Somerton Rd	2010	1741	3165	3094
Cooper St E of Freight Dr	2008	1762	3204	2881
Pascoe Vale Rd N of Coleraine St	2010	1799	3271	3885
Hume Hwy N of Stanley Dr	2010	1862	3385	3096
Hume Hwy N of Somerset Rd	2010	1900	3455	4358
Pascoe Vale Rd N of Western Ring Rd	2010	1941	3529	3505
Pascoe Vale Rd N of Sunset Blvd	2008	1966	3575	3392
Pascoe Vale Rd S of Sunset Blvd	2008	2105	3827	3317
Hume Hwy N of Western Ring Rd	2008	2322	4222	5861
Hume Hwy N of Western Ring Rd	2008	2322	4222	5861
Hume Hwy S of Somerset Rd	2010	2338	4251	5562
Mickleham Rd N of Rylandes Dr	2008	2348	4269	3919
Mitchell				
Old Sydney Rd 2.2km N of Donnybrook Rd	2010	8	15	12
Old Sydney Rd 2.2km N of Donnybrook Rd	2010	20	36	105
Hume Fwy 800m S of Northern Hwy	2009	839	1525	1723
Hume Hwy S of Beveridge at 36.9km Post	2010	860	1564	1881
Hume Hwy S of Beveridge at 36.9km Post	2010	1578	2869	3641
Hume Fwy 800m S of Northern Hwy	2009	1598	2905	2937

Table 2. The Counts Which Have Been Removed

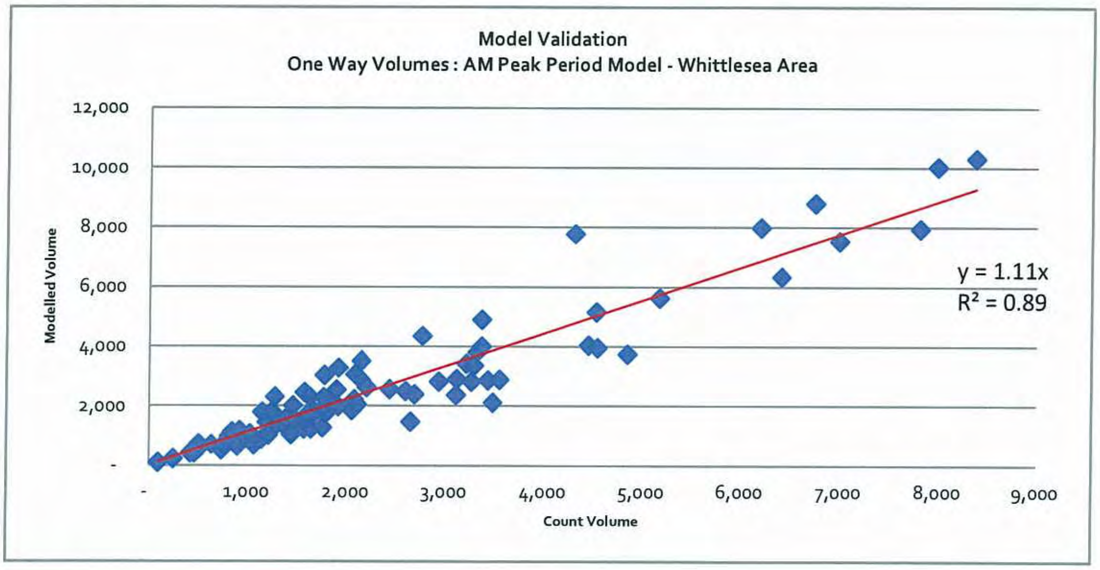
Location	Year	Surveyed Count	Comment
Whittlesea Area			
Edgars Rd N of Barry Rd	2008	868	To close to proposed Epping market site
Edgars Rd S of Barry Rd	2008	713	
Barry Rd W of Edgars Rd	2008	211	
Victoria Dr SW of Edgars Rd	2010	422	
Edgars Rd SE of Victoria Dr	2010	689	
Edgars Rd NW of Victoria Dr	2010	1184	
Edgars Rd N of Metro Ring Rd	2008	1523	
Edgars Rd N of Metro Ring Rd	2008	598	
Metro Ring Rd Onramp E of Edgars Rd	2008	433	
Edgars Rd S of Metro Ring Rd	2008	1800	
Metro Ring Rd Offramp E of Edgars Rd	2008	511	
Metro Ring Rd Onramp W of Edgars Rd	2008	720	
Metro Ring Road Onramp W of Edgars Rd	2008	745	
Metro Ring Rd Offramp W of Edgars Rd	2008	783	
Metro Ring Road Offramp W of Edgars Rd	2008	807	
Edgars Rd S of Metro Ring Rd	2008	766	
Mahoneys Rd W of Edgars Rd	2010	858	
Edgars Rd N of Mahoneys Rd	2010	1616	
Metropolitan Ring Road Onramp E of Edgars Rd	2008	445	
Metropolitan Ring Road Offramp E of Edgars Rd	2008	588	
Metropolitan Ring Rd Offramp to Dalton Road	2008	1150	Traffic Count same location in model
Settlement Rd E of Dalton Rd	2009	806	
Dalton Rd S of Darebin Dr	2008	1072	
Metro Ring Rd Exit W of Dalton Rd	2008	1140	
Metropolitan Ring Rd Onramp from Dalton Road	2008	451	
Metro Ring Rd Entry W of Dalton Rd	2008	937	
Metro Ring Rd Offramp W of Plenty Rd	2008	919	
High St SW of Epping Plaza Sth	2008	1092	
High St NE of Epping Plaza Sth	2008	1048	
Dalton Rd S of Metro Ring Rd	2008	2928	
Cooper St E of High St	2010	574	
Wallan-Woodstock Rd .3km N of Station Ln	2010	148	To close to Beveridge area which was more modelled growth than visible on aerial photograph
Wallan-Woodstock Rd .3km N of Station Ln	2010	82	
Beveridge Rd 750m W of Merriang Rd	2008	11	
Beveridge Rd 750m W of Merriang Rd	2008	19	

Location	Year	Surveyed Count	Comment
Hume Area			
Centre Rd SW of Melbourne Dr	2008	342	Airport
Tullamarine Fwy btw Centre Rd & Melbourne Dr (From Sunbury)	2008	1194	
Tullamarine Fwy btw Airport Dr & Centre Rd (To Sunbury)	2008	332	
Tullamarine Fwy Onramp from Airport (Melbourne Drive)	2008	1981	
Tullamarine Fwy btw Centre Rd/Melbourne Dr & Mickleham Rd	2010	3025	
Tullamarine Fwy 1km NW of Mickleham Rd	2010	2939	
Tullamarine Fwy btw Mickleham Rd & Western Ring Rd	2010	4269	
Tullamarine Fwy btw Mickleham Rd & Western Ring Rd	2010	3456	
Tullamarine Fwy 1km NW of Mickleham Rd	2010	3026	Traffic Count same location in model
Tullamarine Fwy btw Airport Dr and Mickleham Rd	2010	3035	
Western Ring Rd btw Pascoe Vale Rd & Tullamarine Fwy	2010	4839	
Western Ring Rd btw Hume Hwy & Pascoe Vale Rd	2009	3935	
Western Ring Rd btw Hume Hwy & Pascoe Vale Rd	2009	4283	
Sydney Rd S of Cooper St	2008	2326	
Hume Hwy btw Glenbarry Rd & Jessica Rd	2010	2049	
Hume Hwy S of Camp Rd	2008	2808	
Somerton Road btw Reservoir Dr & Union Rd	2008	751	
Hume Hwy S of Somerton Rd	2010	621	
Vineyard Rd N of McDougall Rd	2010	916	
Mitchells La btw Vineyard Rd & Pasley St	2010	293	
Vineyard Rd btw McDougall Rd & Watsons Rd	2010	904	
Vineyard Rd btw McDougall Rd & Watsons Rd	2010	593	
Horne St btw Mitchells La & Neill St	2010	663	
Horne St NE of Reece Access	2010	775	
Mitchells La W of Horne St Departure	2010	129	
Vineyard Rd SW of Reece Access	2010	678	
Brookville Dr 300 M South of Donnybrook Rd	2008	40	TC too small
Brookville Dr 300 M South of Donnybrook Rd	2008	23	
Reece Access E of Horne St Departure	2010	38	
Reece Access E of Horne St	2010	29	

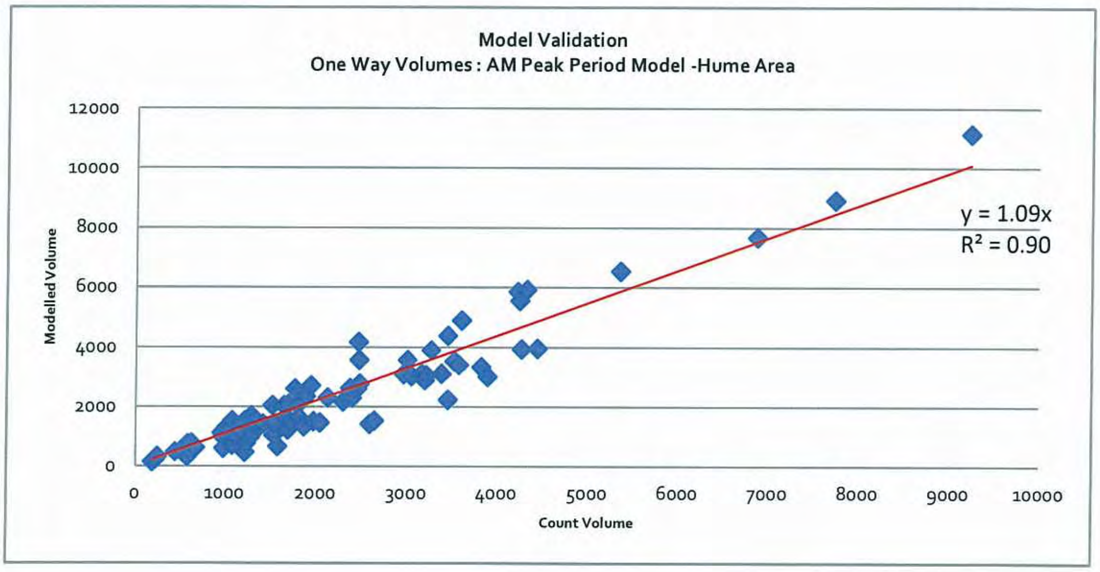
Appendix C

VicRoads Validation Criteria by LGA

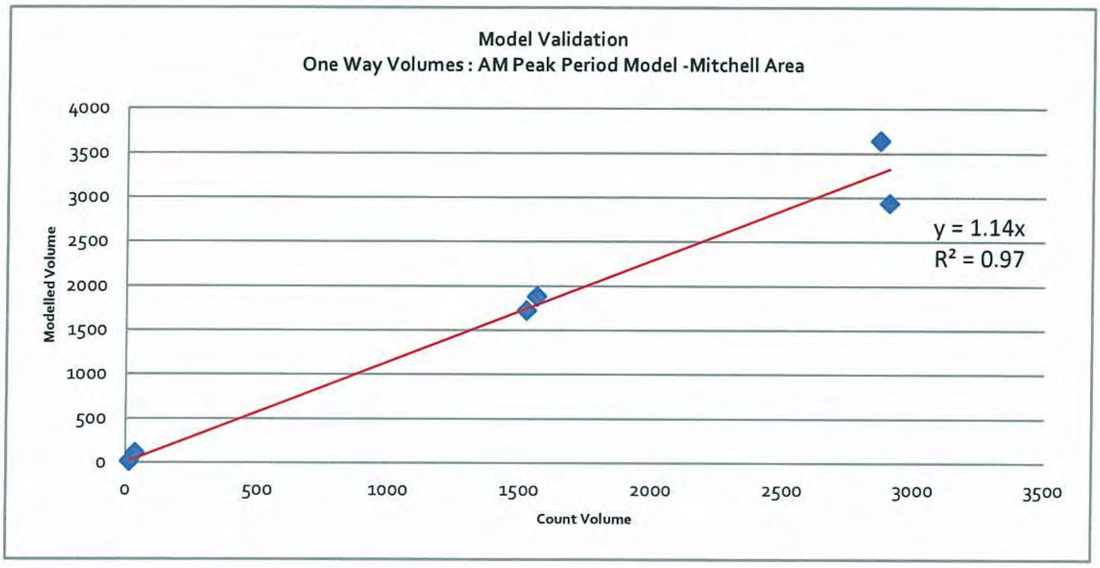
Whittlesea



Hume



Mitchell



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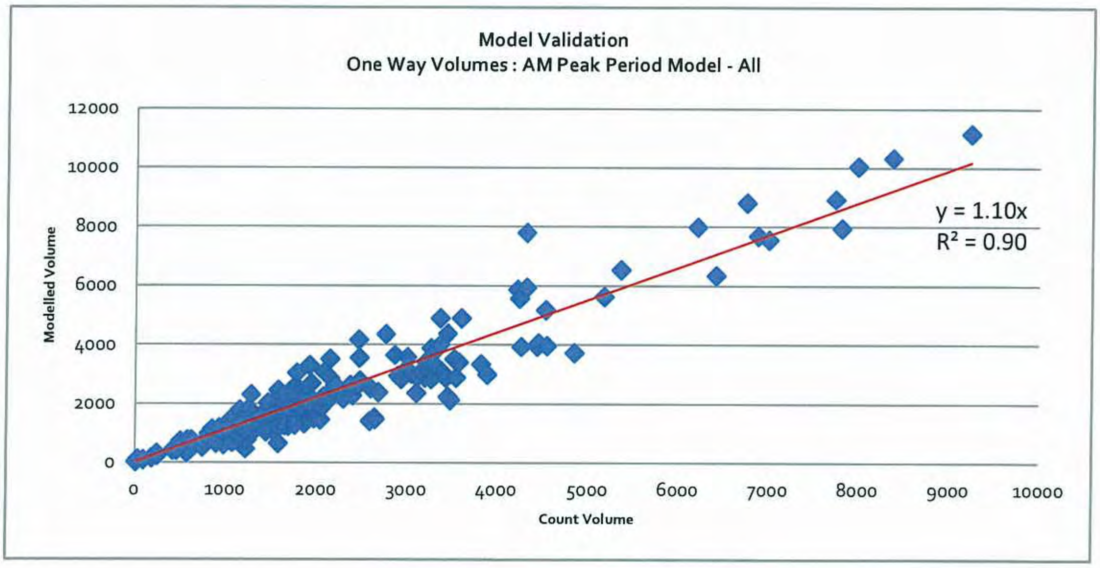

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A 87 High Street South
PO Box 684
KEW VIC 3101
P +613 9851 9600
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GTAconsultants

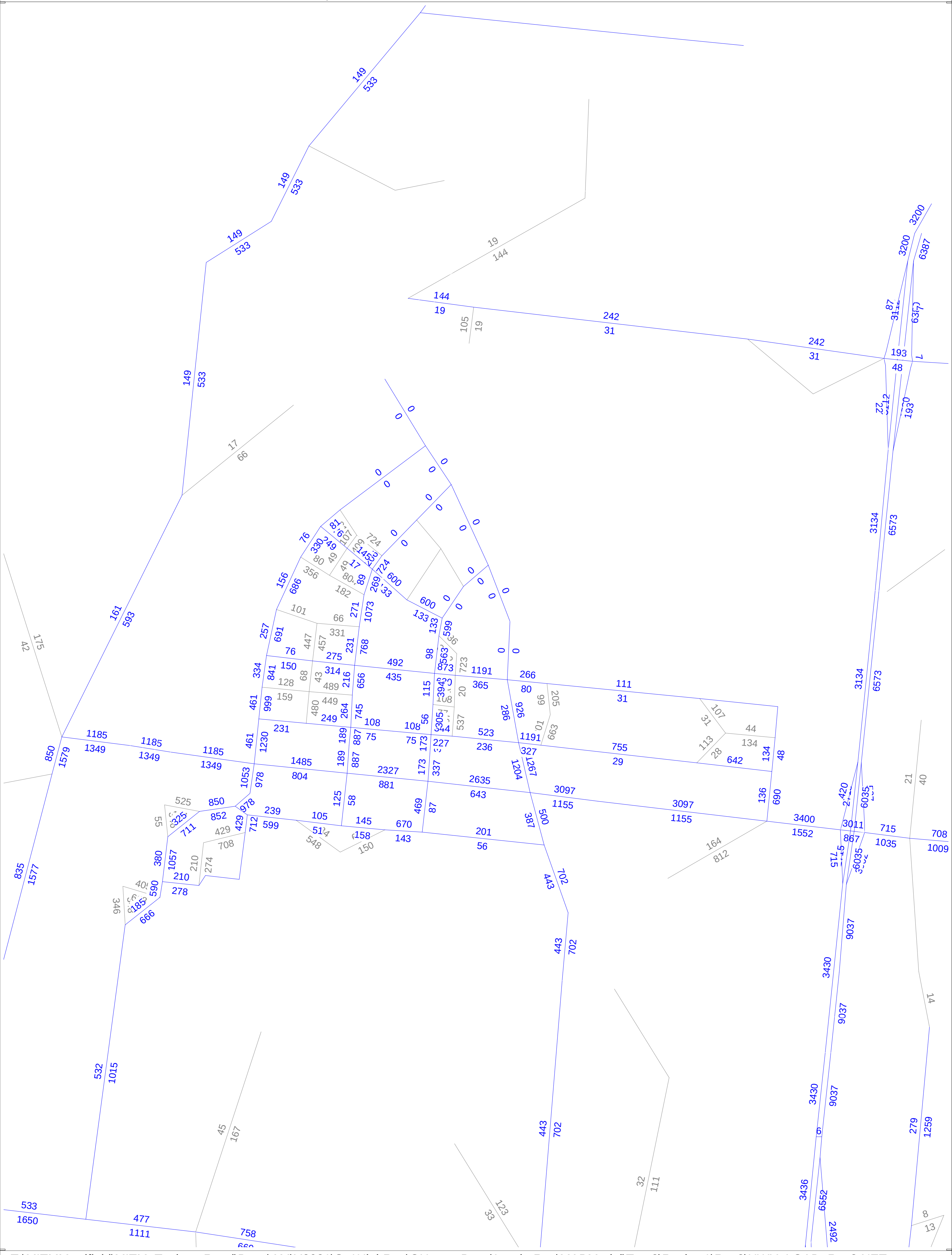
APPENDIX 2 – MERRIFIELD WEST PRECINCT STRUCTURE PLAN

future urban structure

merrifield west precinct structure plan

APPENDIX 3 – MITM INTERIM (2021) AND ULTIMATE (2046) NETWORK PLOTS

MITM Merrifield West PSP
2021 Interim Year - 2 Hour AM Peak Period Volumes By Direction



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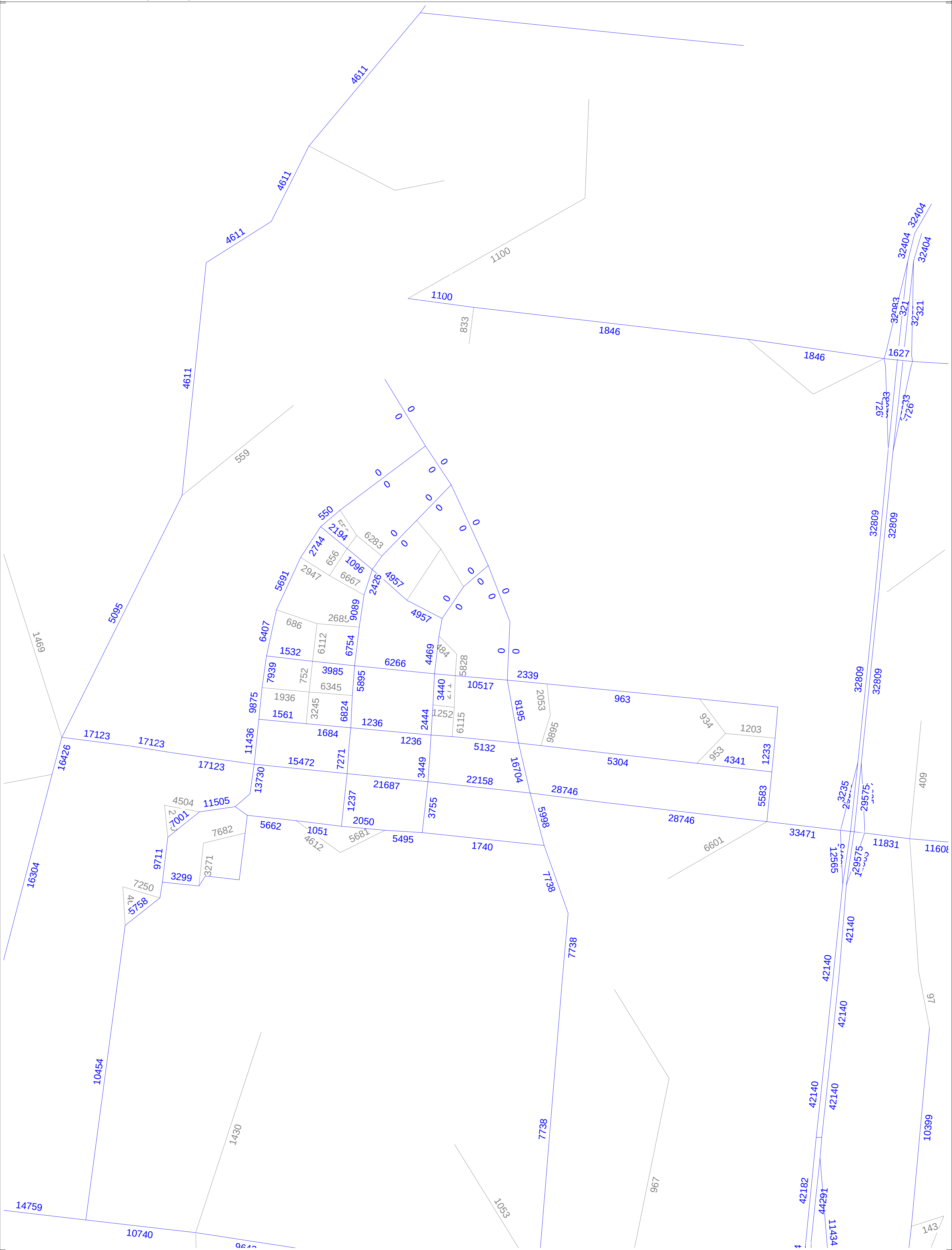
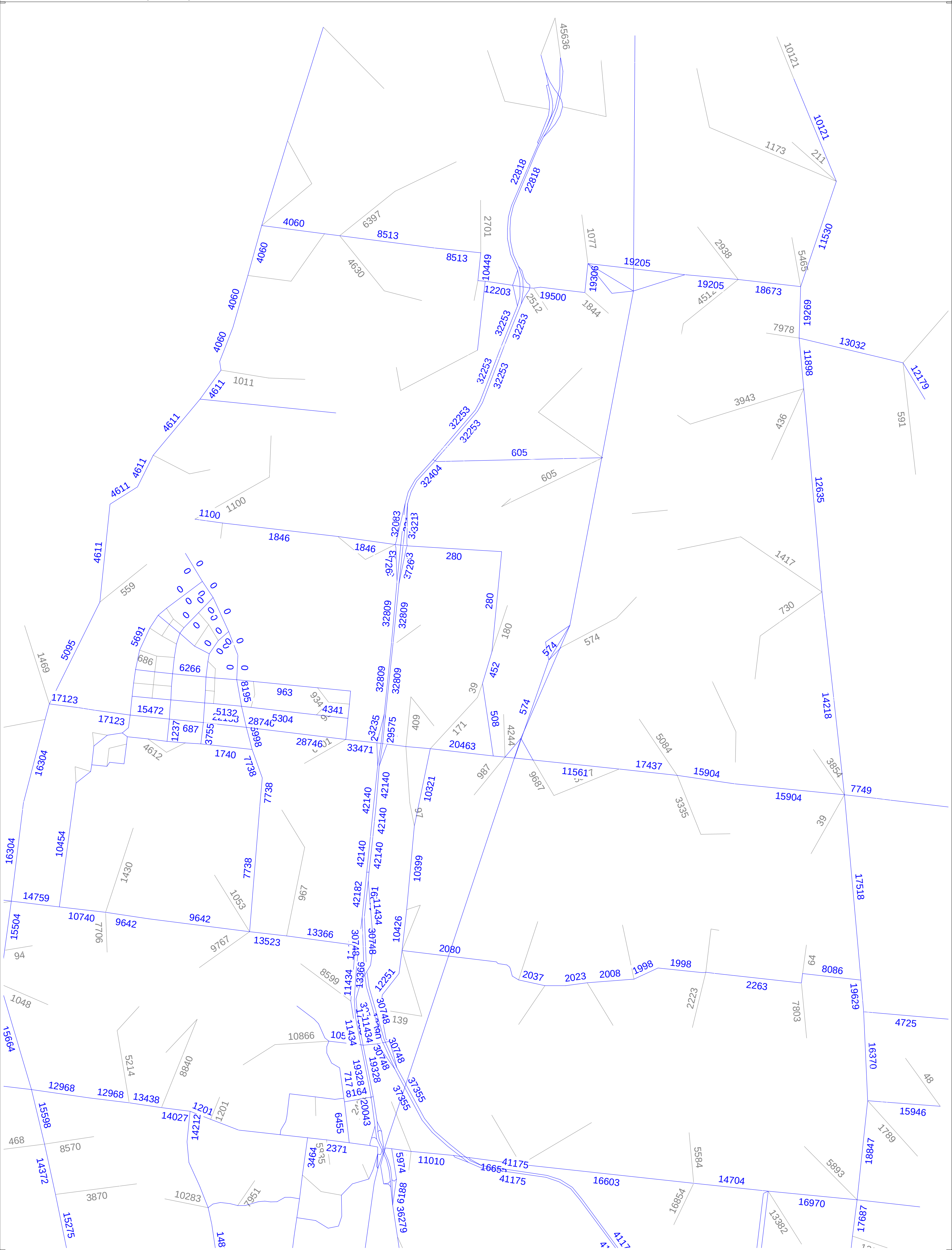
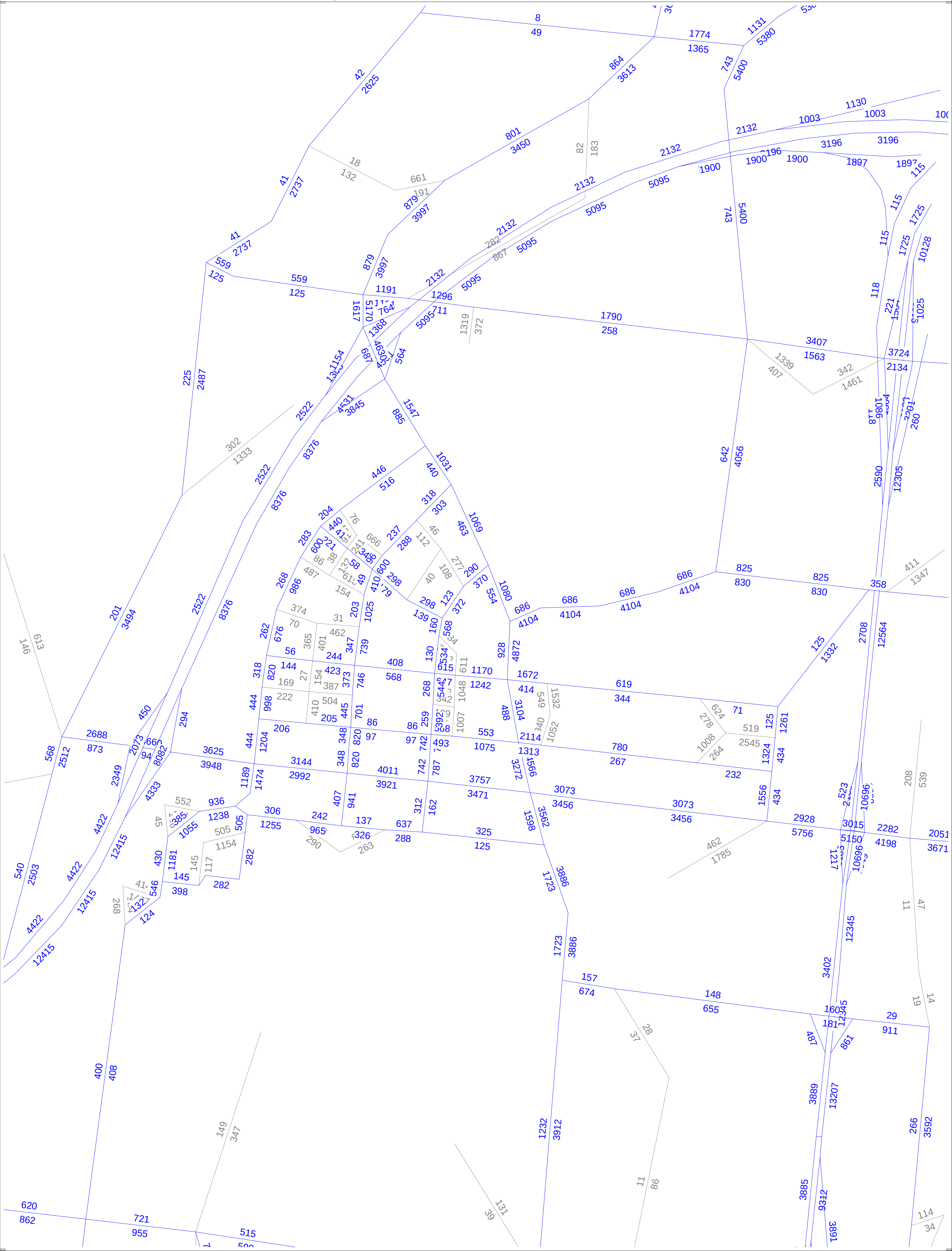
22/05/2012

cube

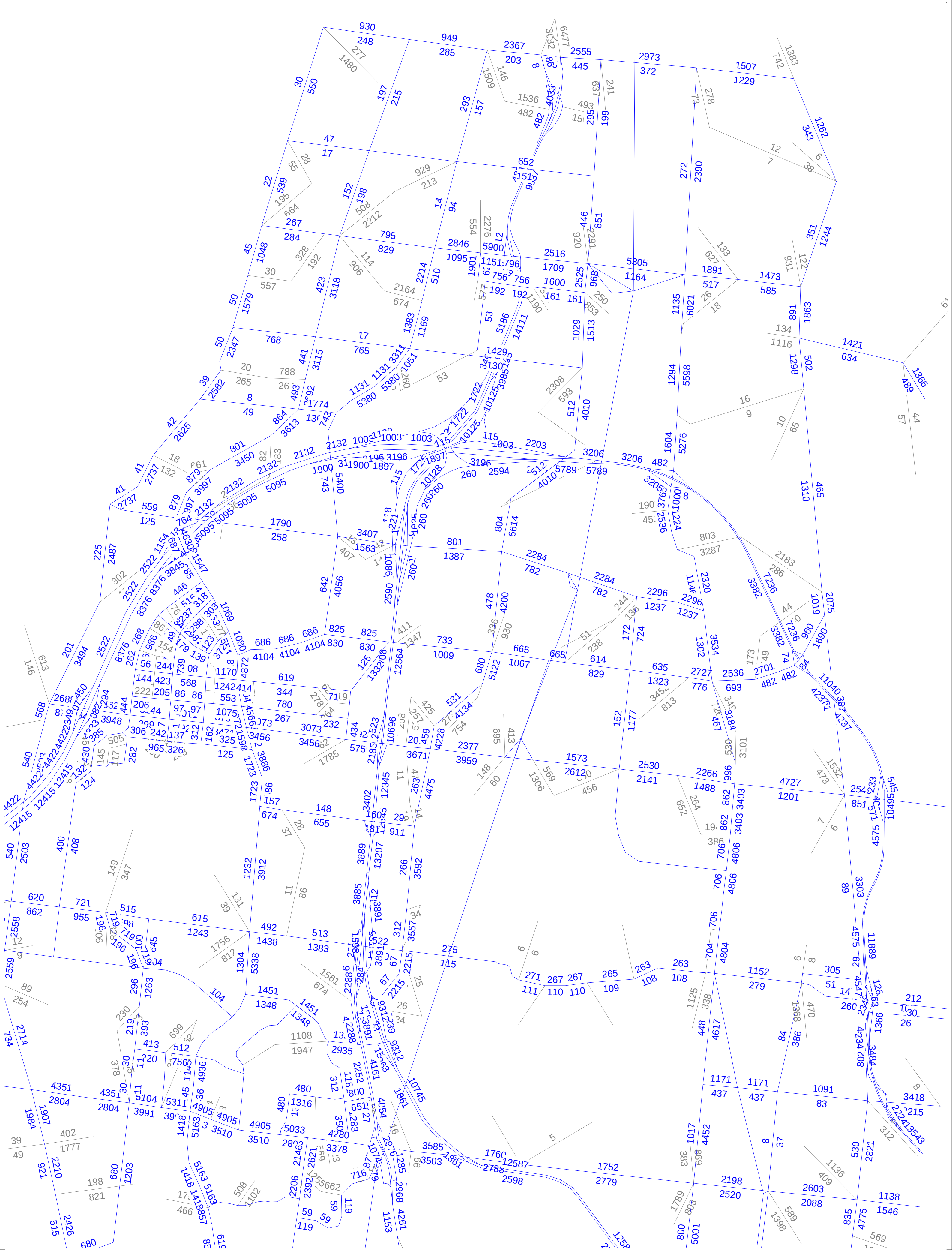


MITM Merrifield West PSP - Northern Growth Corridor Plan Area
2021 Interim Year - Daily 2-Way Volumes





MITM Merrifield West PSP - Northern Growth Corridor Plan Area
2046 Ultimate Year - 2 Hour AM Peak Period Volumes By Direction



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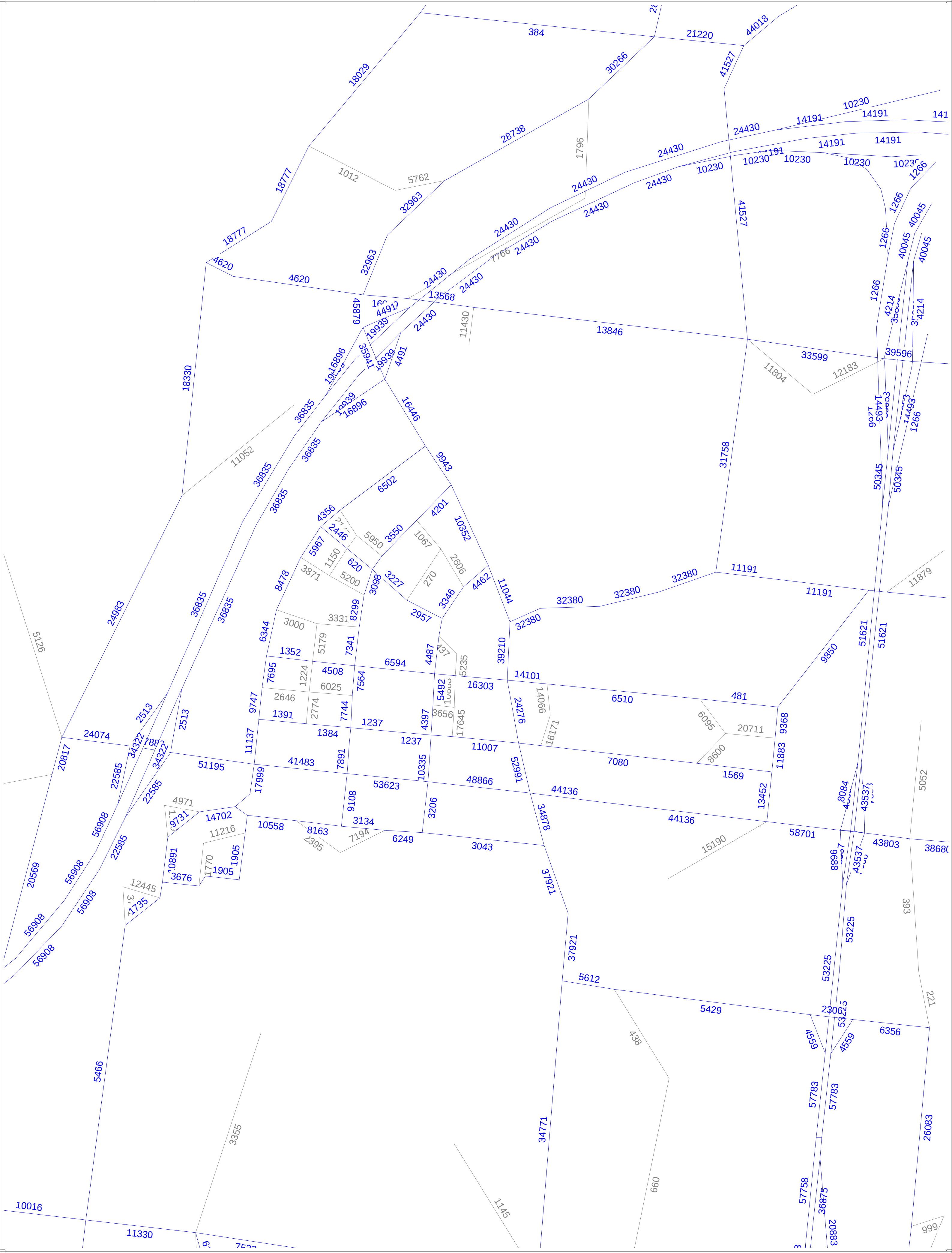
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1266
40045
4620
13846
45879
13568
11430
33599
12183
11804
39596
18330
36835
16446
9943
6502
4201
10352
11052
31758
32380
11191
11879
24983
5126
8478
4462
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50345
24276
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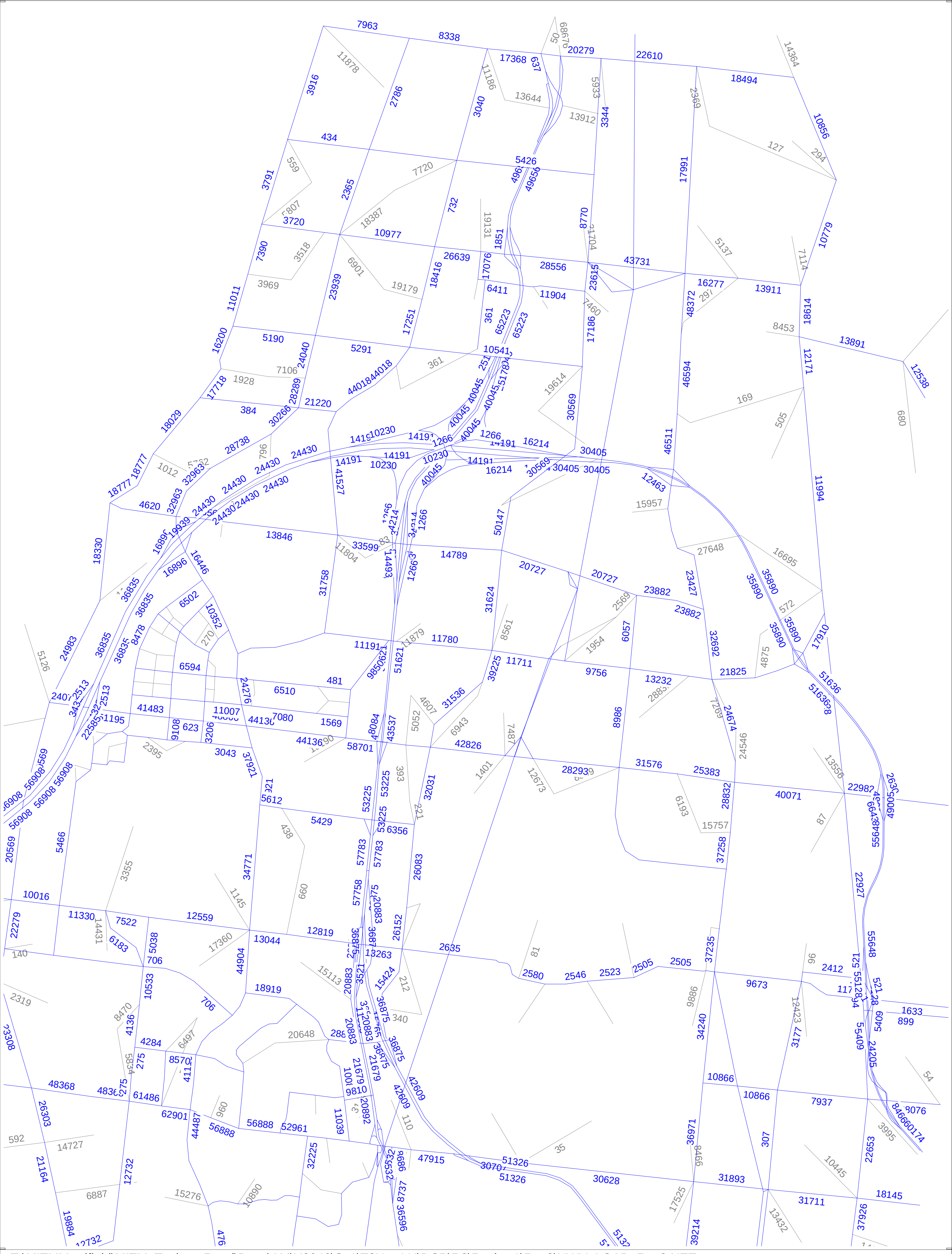
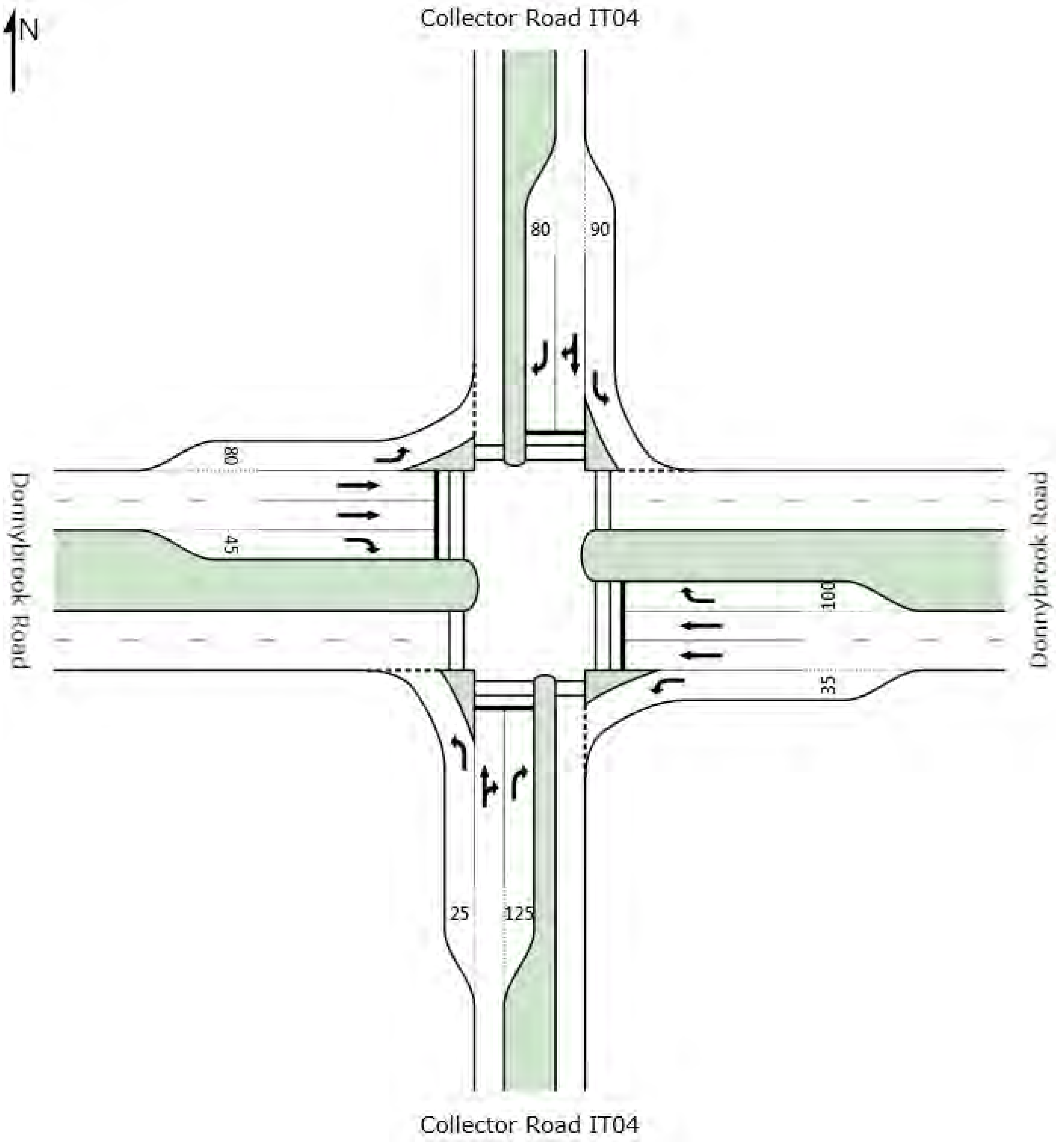


APPENDIX 4 – SIDRA OUTPUTS


N
Collector Road IT04
80
90
80
45
Donnybrook Road
100
35
Donnybrook Road
25
125
Collector Road IT04

LANE SUMMARY

Site: 2021_AM Peak

IT04
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT04																
Lane 1	1	0	0	1	5.0	552[1]	0.002	100	7.9	LOS A	0.0	0.0	25	Turn Bay	0.0	0.0
Lane 2	0	19	110	129	5.0	228	0.568	100	61.2	LOS A	7.4	53.8	500	–	0.0	0.0
Lane 3	0	0	129	129	5.0	226	0.568	100	62.3	LOS A	7.3	53.4	125	Turn Bay	0.0	0.0
Approach	1	19	239	259	5.0		0.568		61.5	LOS A	7.4	53.8				
East: Donnybrook Road																
Lane 1	37	0	0	37	5.0	1289[1]	0.029	100	8.3	LOS A	0.1	0.4	35	Turn Bay	0.0	0.0
Lane 2	0	143	0	143	5.0	986	0.145	100	4.6	LOS A	1.3	9.4	500	–	0.0	0.0
Lane 3	0	143	0	143	5.0	986	0.145	100	4.6	LOS A	1.3	9.4	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	91	0.011	100	68.8	LOS A	0.1	0.4	100	Turn Bay	0.0	0.0
Approach	37	285	1	323	5.0		0.145		5.2	LOS A	1.3	9.4				
North: Collector Road IT04																
Lane 1	7	0	0	7	5.0	499[1]	0.014	100	11.1	LOS A	0.1	0.6	90	Turn Bay	0.0	0.0
Lane 2	0	11	79	90	5.0	197	0.455	100	63.8	LOS A	5.1	37.3	500	–	0.0	0.0
Lane 3	0	0	89	89	5.0	196	0.455	100	64.7	LOS A	5.1	37.1	80	Turn Bay	0.0	0.0
Approach	7	11	168	186	5.0		0.455		62.3	LOS A	5.1	37.3				
West: Donnybrook Road																
Lane 1	77	0	0	77	5.0	1320[1]	0.058	100	9.1	LOS A	0.3	2.0	80	Turn Bay	0.0	0.0
Lane 2	0	557	0	557	5.0	986	0.564	100	6.0	LOS A	8.7	63.3	500	–	0.0	0.0
Lane 3	0	557	0	557	5.0	986	0.564	100	6.0	LOS A	8.7	63.3	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	91	0.011	100	66.4	LOS A	0.1	0.4	45	Turn Bay	0.0	0.0
Approach	77	1113	1	1191	5.0		0.564		6.3	LOS A	8.7	63.3				
Intersection				1959	5.0		0.568		18.7	LOS A	8.7	63.3				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

SIDRA INTERSECTION

PHASING SUMMARY

Site: 2021_AM Peak

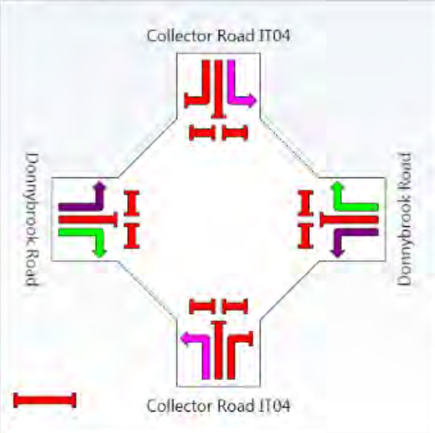
IT04
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	6	62	15	13
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	12	68	21	19
Phase Split	10 %	57 %	18 %	16 %

Phase A



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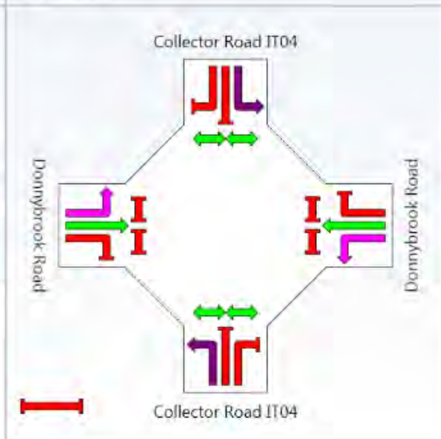
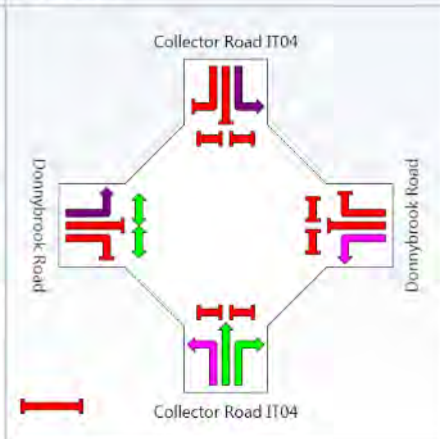
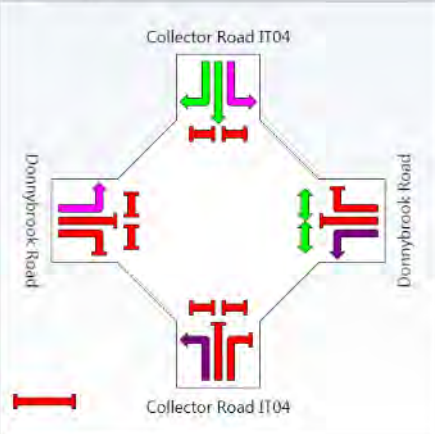


Phase C



Phase D



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

LANE SUMMARY

Site: 2021_PM Peak

IT04
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT04																
Lane 1	1	0	0	1	5.0	312 [1]	0.003	100	9.2	LOS A	0.0	0.1	25	Turn Bay	0.0	0.0
Lane 2	0	68	0	68	5.0	207	0.329	100	54.9	LOS A	3.8	27.7	500	–	0.0	0.0
Lane 3	0	0	36	36	5.0	196	0.183	56 [5]	61.1	LOS A	2.0	14.4	125	Turn Bay	0.0	0.0
Approach	1	68	36	105	5.0		0.329		56.6	LOS A	3.8	27.7				
East: Donnybrook Road																
Lane 1	239	0	0	239	5.0	1198 [1]	0.200	100	8.4	LOS A	0.5	3.9	35	Turn Bay	0.0	0.0
Lane 2	0	557	0	557	5.0	1002	0.556	100	5.3	LOS A	7.8	57.0	500	–	0.0	0.0
Lane 3	0	557	0	557	5.0	1002	0.556	100	5.3	LOS A	7.8	57.0	500	–	0.0	0.0
Lane 4	0	0	7	7	5.0	414 [1]	0.017	100	42.3	LOS A	0.3	2.1	100	Turn Bay	0.0	0.0
Approach	239	1113	7	1359	5.0		0.556		6.1	LOS A	7.8	57.0				
North: Collector Road IT04																
Lane 1	1	0	0	1	5.0	922 [1]	0.001	100	9.3	LOS A	0.0	0.0	90	Turn Bay	0.0	0.0
Lane 2	0	76	45	121	5.0	218	0.554	100	59.7	LOS A	6.9	50.5	500	–	0.0	0.0
Lane 3	0	0	117	117	5.0	211	0.554	100	64.5	LOS A	6.7	48.9	80	Turn Bay	0.0	0.0
Approach	1	76	162	239	5.0		0.554		61.9	LOS A	6.9	50.5				
West: Donnybrook Road																
Lane 1	253	0	0	253	5.0	1149 [1]	0.220	100	9.4	LOS A	1.4	10.5	80	Turn Bay	0.0	0.0
Lane 2	0	143	0	143	5.0	572	0.249	100	24.3	LOS A	4.7	34.6	500	–	0.0	0.0
Lane 3	0	143	0	143	5.0	572	0.249	100	24.3	LOS A	4.7	34.6	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	91	0.011	100	66.4	LOS A	0.1	0.4	45	Turn Bay	0.0	0.0
Approach	253	285	1	539	5.0		0.249		17.4	LOS A	4.7	34.6				
Intersection				2242	5.0		0.556		17.1	LOS A	7.8	57.0				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

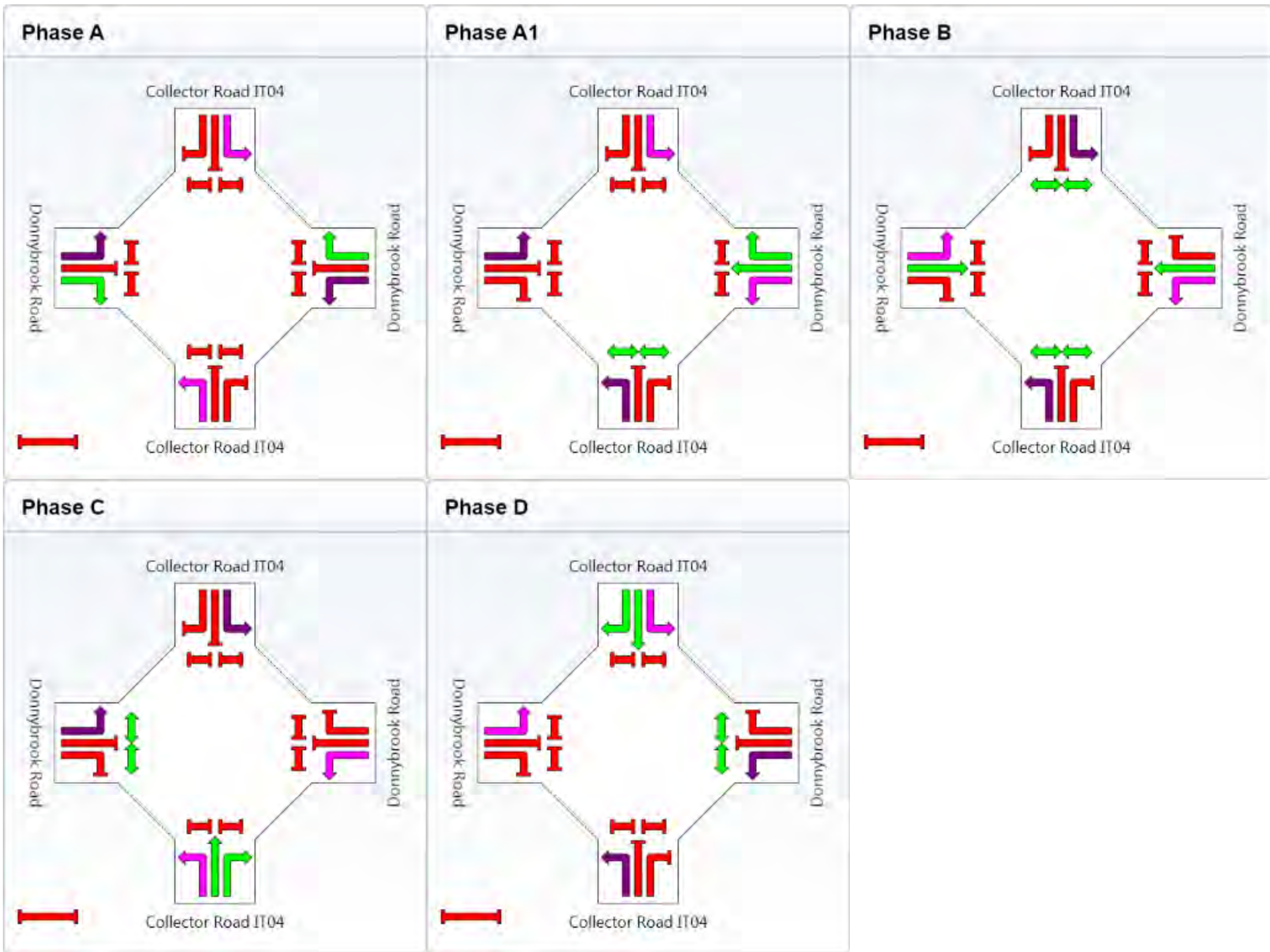
PHASING SUMMARY

IT04
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, A1, B, C, D
Output Sequence: A, A1, B, C, D

Phase Timing Results

Phase	A	A1	B	C	D
Green Time (sec)	6	21	36	13	14
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	12	27	42	19	20
Phase Split	10 %	23 %	35 %	16 %	17 %



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

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SIDRA INTERSECTION 5.1.9.2068

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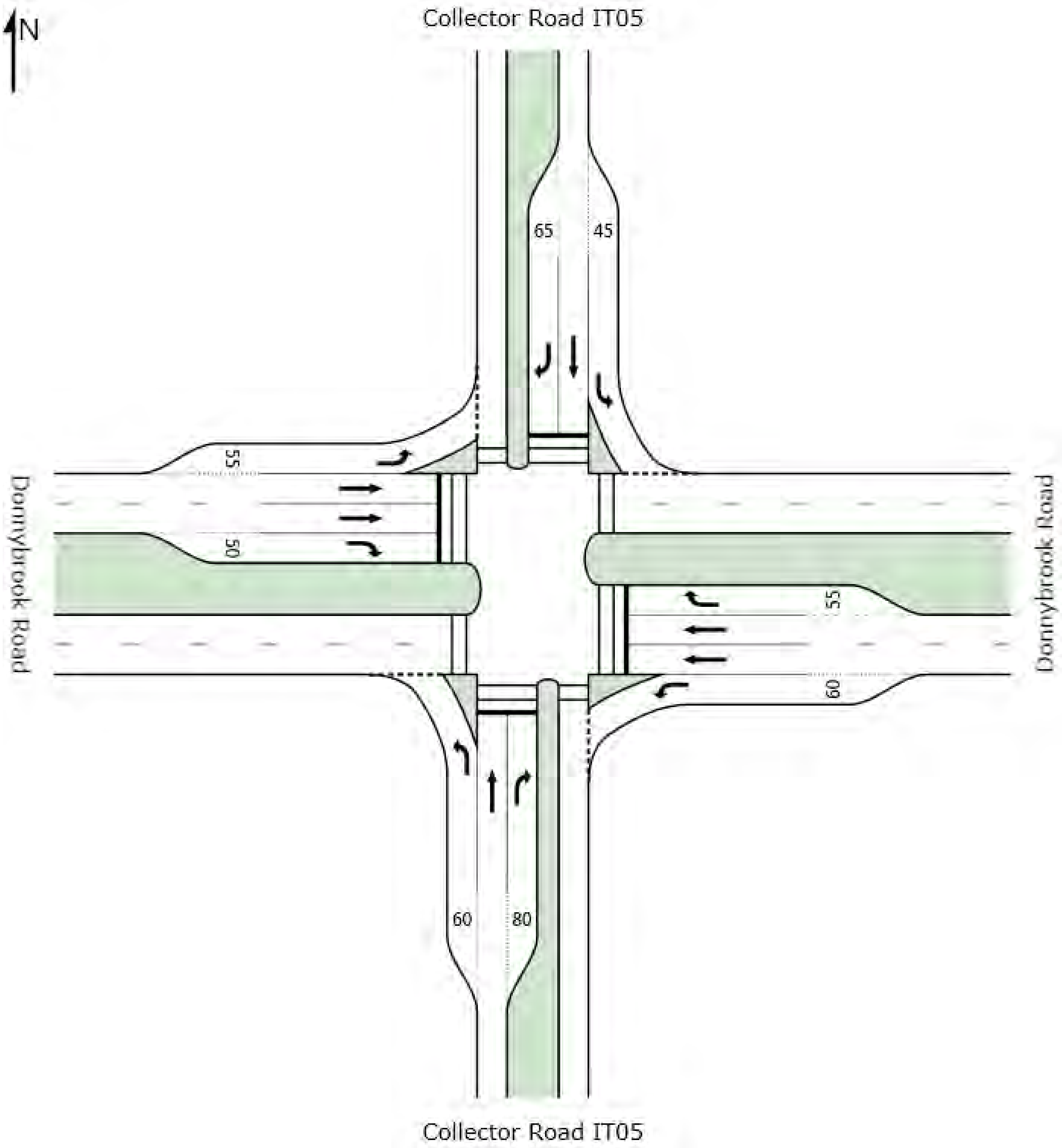

N
Collector Road IT05
65
45
55
50
Donnybrook Road
55
60
Donnybrook Road
60
80
Collector Road IT05

LANE SUMMARY

Site: 2021_AM Peak

IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT05																
Lane 1	1	0	0	1	5.0	754[1]	0.001	100	8.4	LOS A	0.0	0.1	60	Turn Bay	0.0	0.0
Lane 2	0	62	0	62	5.0	398	0.156	100	41.9	LOS A	3.0	21.7	500	–	0.0	0.0
Lane 3	0	0	8	8	5.0	91	0.088	100	69.0	LOS A	0.5	3.4	80	Turn Bay	0.0	0.0
Approach	1	62	8	71	5.0		0.156		44.5	LOS A	3.0	21.7				
East: Donnybrook Road																
Lane 1	2	0	0	2	5.0	1131[1]	0.002	100	8.5	LOS A	0.0	0.0	60	Turn Bay	0.0	0.0
Lane 2	0	205	0	205	5.0	398	0.514	100	37.8	LOS A	9.6	70.2	500	–	0.0	0.0
Lane 3	0	205	0	205	5.0	398	0.514	100	37.8	LOS A	9.6	70.2	500	–	0.0	0.0
Lane 4	0	0	43	43	5.0	272[1]	0.158	100	37.9	LOS A	1.7	12.4	55	Turn Bay	0.0	0.0
Approach	2	409	43	454	5.0		0.514		37.7	LOS A	9.6	70.2				
North: Collector Road IT05																
Lane 1	456	0	0	456	5.0	499[1]	0.915	100	18.4[8]	LOS D[8]	10.1[8]	73.4[8]	45	Turn Bay	0.0	50.0
Lane 2	0	31	0	31	5.0	398	0.078	100	42.2	LOS A	1.5	10.6	500	–	0.0	0.0
Lane 3	0	0	2	2	5.0	91	0.022	100	69.0	LOS A	0.1	0.8	65	Turn Bay	0.0	0.0
Approach	456	31	2	489	5.0		0.915		20.1	LOS D	10.1	73.4				
West: Donnybrook Road																
Lane 1	1	0	0	1	5.0	961[1]	0.001	100	9.1	LOS A	0.0	0.0	55	Turn Bay	0.0	0.0
Lane 2	0	363	0	363	5.0	398	0.913	100	50.2	LOS D	22.8	166.1	500	–	0.0	0.0
Lane 3	0	363	0	363	5.0	398	0.913	100	50.2	LOS D	22.8	166.1	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	254[1]	0.004	100	36.1	LOS A	0.0	0.3	50	Turn Bay	0.0	0.0
Approach	1	726	1	728	5.0		0.913		50.1	LOS D	22.8	166.1				
Intersection				1742	5.0		0.915		38.2	LOS D	22.8	166.1				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

SIDRA INTERSECTION

PHASING SUMMARY

Site: 2021_AM Peak

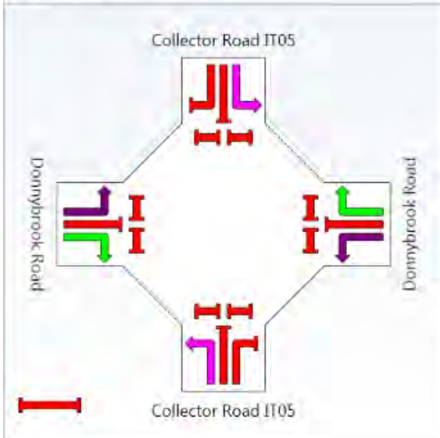
IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Leading Right Turn
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

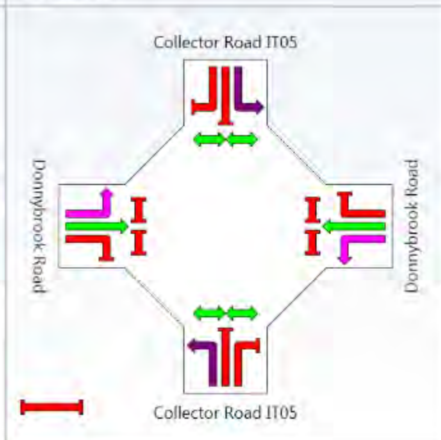
Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	40	25	6	25
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	46	31	12	31
Phase Split	38 %	26 %	10 %	26 %

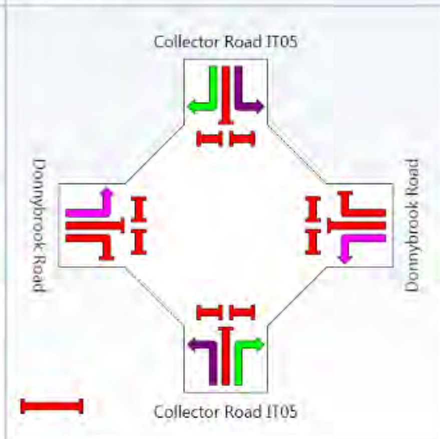
Phase A



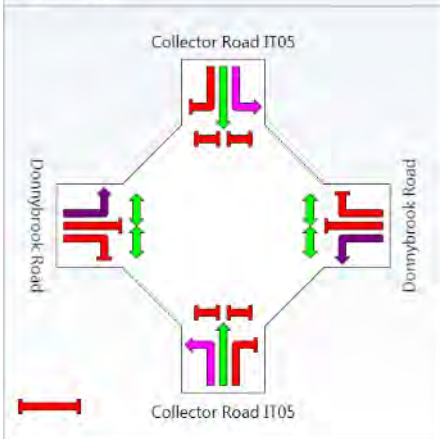
Phase B



Phase C



Phase D



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

LANE SUMMARY

Site: 2021_PM Peak

IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT05																
Lane 1	1	0	0	1	5.0	505[1]	0.002	100	8.1	LOS A	0.0	0.0	60	Turn Bay	0.0	0.0
Lane 2	0	50	0	50	5.0	207	0.242	100	54.2	LOS A	2.8	20.1	500	–	0.0	0.0
Lane 3	0	0	22	22	5.0	91	0.243	100	70.2	LOS A	1.3	9.6	80	Turn Bay	0.0	0.0
Approach	1	50	22	73	5.0		0.243		58.4	LOS A	2.8	20.1				
East: Donnybrook Road																
Lane 1	27	0	0	27	5.0	1020[1]	0.026	100	8.8	LOS A	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	396	0	396	5.0	875	0.453	100	10.3	LOS A	8.3	60.3	500	–	0.0	0.0
Lane 3	0	396	0	396	5.0	875	0.453	100	10.3	LOS A	8.3	60.3	500	–	0.0	0.0
Lane 4	0	0	256	256	5.0	469[1]	0.546	100	24.3	LOS A	5.8	42.3	55	Turn Bay	0.0	0.0
Approach	27	792	256	1075	5.0		0.546		13.6	LOS A	8.3	60.3				
North: Collector Road IT05																
Lane 1	42	0	0	42	5.0	659[1]	0.064	100	10.2	LOS A	0.4	2.7	45	Turn Bay	0.0	0.0
Lane 2	0	82	0	82	5.0	207	0.397	100	56.6	LOS A	4.6	33.7	500	–	0.0	0.0
Lane 3	0	0	1	1	5.0	91	0.011	100	68.6	LOS A	0.1	0.4	65	Turn Bay	0.0	0.0
Approach	42	82	1	125	5.0		0.397		41.1	LOS A	4.6	33.7				
West: Donnybrook Road																
Lane 1	1	0	0	1	5.0	688[1]	0.001	100	10.6	LOS A	0.0	0.1	55	Turn Bay	0.0	0.0
Lane 2	0	238	0	238	5.0	429	0.553	100	36.0	LOS A	11.1	80.8	500	–	0.0	0.0
Lane 3	0	238	0	238	5.0	429	0.553	100	36.0	LOS A	11.1	80.8	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	210[1]	0.005	100	50.6	LOS A	0.0	0.3	50	Turn Bay	0.0	0.0
Approach	1	475	1	477	5.0		0.553		36.0	LOS A	11.1	80.8				
Intersection				1750	5.0		0.553		23.5	LOS A	11.1	80.8				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

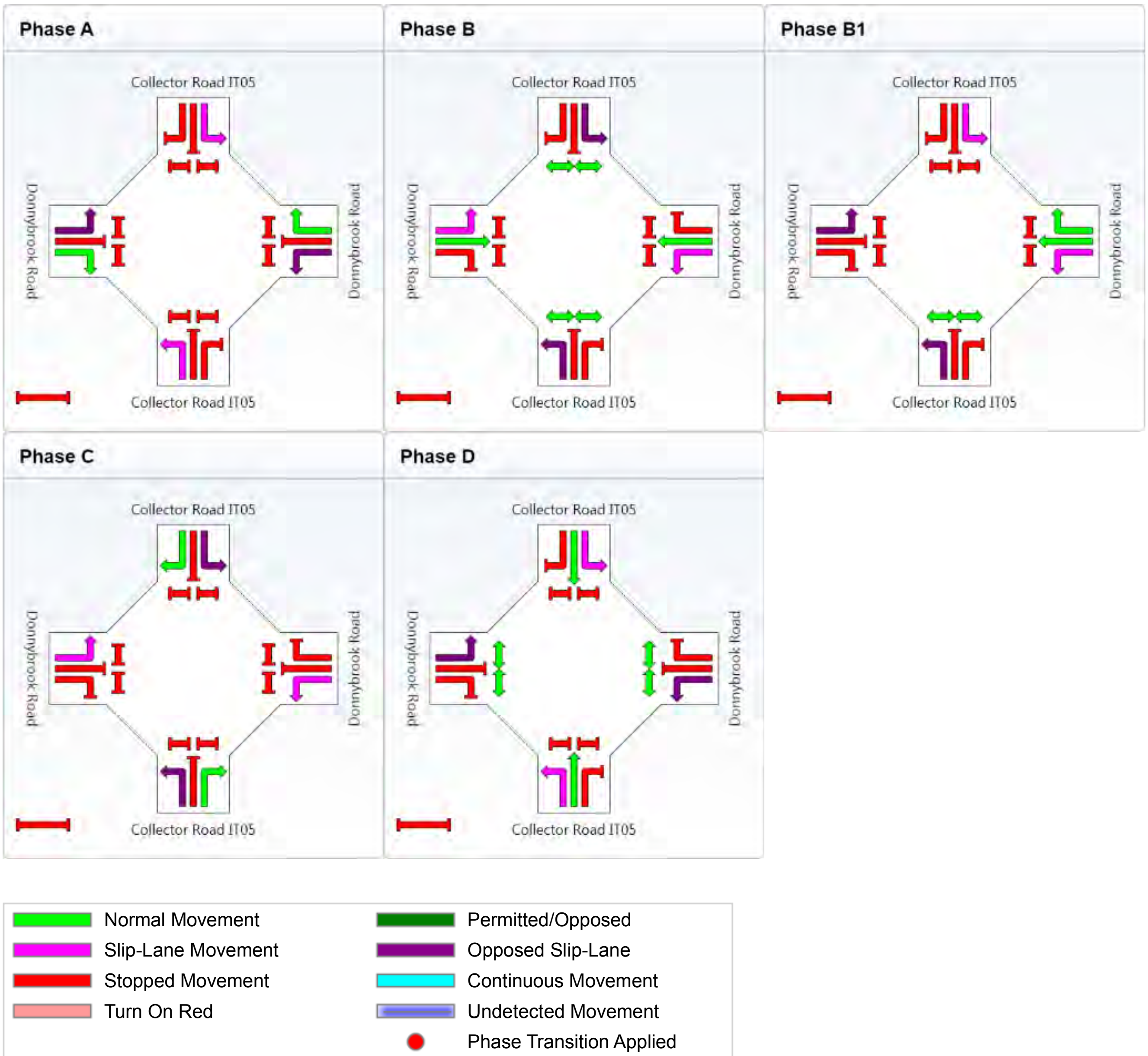
PHASING SUMMARY

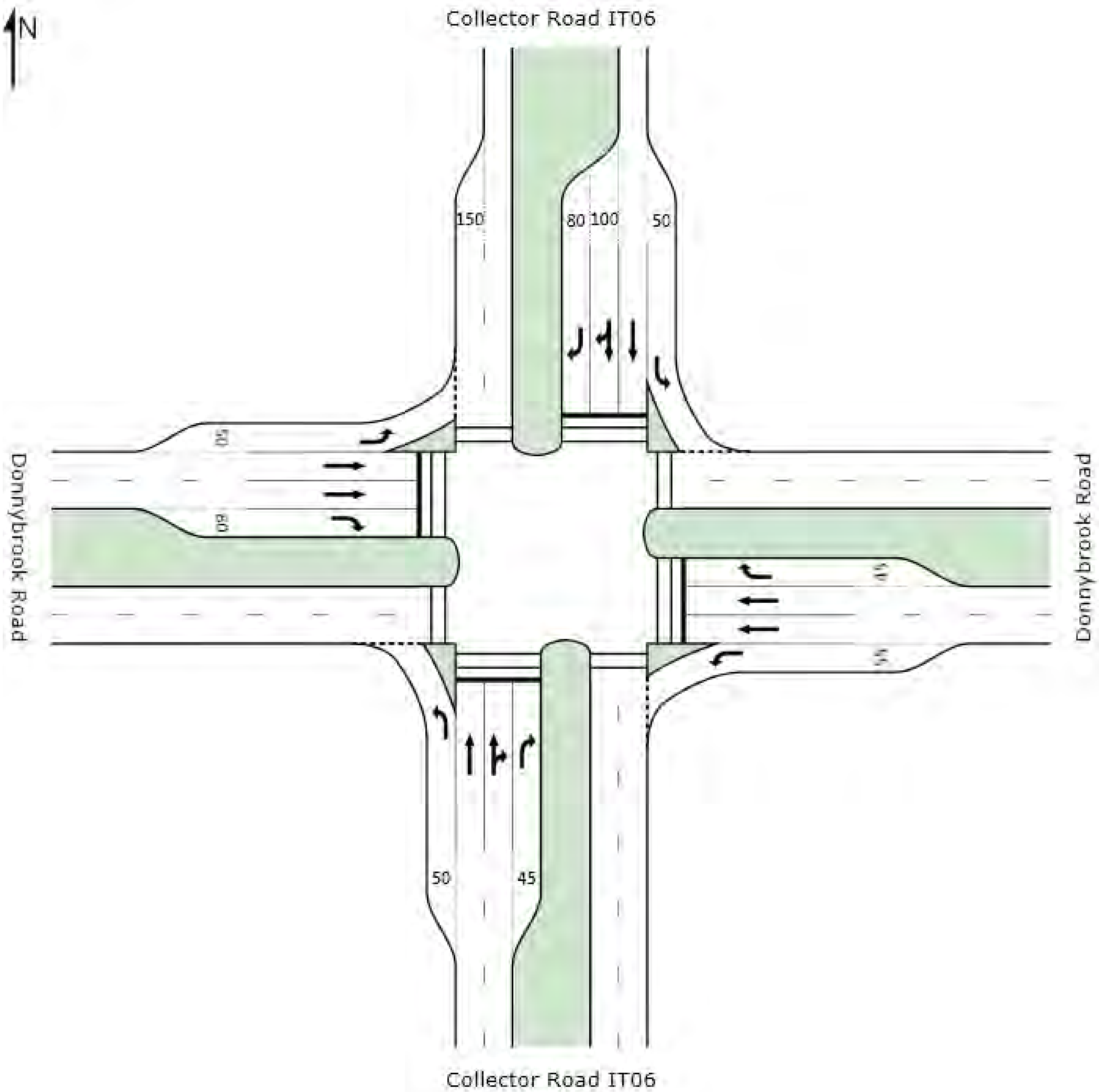
IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Leading Right Turn
Input Sequence: A, B, B1, C, D
Output Sequence: A, B, B1, C, D

Phase Timing Results

Phase	A	B	B1	C	D
Green Time (sec)	22	27	22	6	13
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	28	33	28	12	19
Phase Split	23 %	28 %	23 %	10 %	16 %




N
Collector Road IT06
150
80
100
50
50
60
Donnybrook Road
60
55
Donnybrook Road
50
45
Collector Road IT06

LANE SUMMARY

Site: 2021_AM Peak

IT06

Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT06																
Lane 1	58	0	0	58	5.0	580 [1]	0.100	100	10.0	LOS A	0.7	5.1	50	Turn Bay	0.0	0.0
Lane 2	0	125	0	125	5.0	493	0.254	44 [5]	38.0	LOS A	5.8	42.4	500	–	0.0	0.0
Lane 3	0	0	269	269	5.0	468	0.575	100	49.2	LOS A	13.8	100.8	500	–	0.0	0.0
Lane 4	0	0	118	118	5.0	205 [1]	0.575	100	45.2	LOS A	5.5	40.0	45	Turn Bay	0.0	0.0
Approach	58	125	387	570	5.0		0.575		41.9	LOS A	13.8	100.8				
East: Donnybrook Road																
Lane 1	190	0	0	190	5.0	604 [1]	0.314	100	11.4	LOS A	2.6	18.9	55	Turn Bay	0.0	0.0
Lane 2	0	111	0	111	5.0	318	0.347	100	41.9	LOS A	5.2	38.3	500	–	0.0	0.0
Lane 3	0	111	0	111	5.0	318	0.347	100	41.9	LOS A	5.2	38.3	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	181	0.006	100	60.9	LOS A	0.1	0.4	45	Turn Bay	0.0	0.0
Approach	190	221	1	412	5.0		0.347		27.8	LOS A	5.2	38.3				
North: Collector Road IT06																
Lane 1	1	0	0	1	5.0	487 [1]	0.002	100	12.5	LOS A	0.0	0.1	50	Turn Bay	0.0	0.0
Lane 2	0	244	0	244	5.0	525	0.465	80 [5]	40.2	LOS A	11.9	86.8	500	–	0.0	0.0
Lane 3	0	0	236	236	5.0	407 [1]	0.580	100	47.8	LOS A	11.6	84.4	100	Turn Bay	0.0	0.0
Lane 4	0	0	198	198	5.0	341 [1]	0.580	100	46.8	LOS A	9.5	69.0	80	Turn Bay	0.0	0.0
Approach	1	244	434	679	5.0		0.580		44.7	LOS A	11.9	86.8				
West: Donnybrook Road																
Lane 1	130	0	0	130	5.0	902 [1]	0.144	100	9.5	LOS A	0.8	5.9	50	Turn Bay	0.0	0.0
Lane 2	0	170	0	170	5.0	318	0.535	100	43.5	LOS A	8.6	62.8	500	–	0.0	0.0
Lane 3	0	170	0	170	5.0	318	0.535	100	43.5	LOS A	8.6	62.8	500	–	0.0	0.0
Lane 4	0	0	103	103	5.0	181	0.569	100	66.1	LOS A	6.0	43.8	80	Turn Bay	0.0	0.0
Approach	130	340	103	573	5.0		0.569		39.8	LOS A	8.6	62.8				
Intersection				2234	5.0		0.580		39.6	LOS A	13.8	100.8				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

SIDRA INTERSECTION

PHASING SUMMARY

Site: 2021_AM Peak

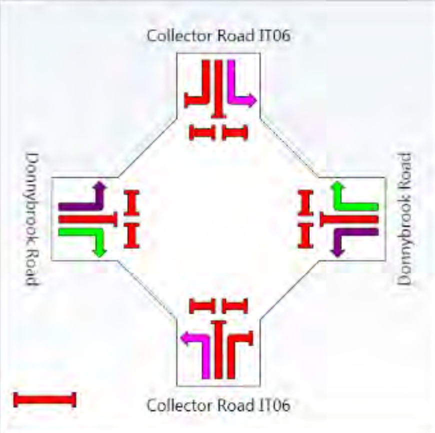
IT06
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

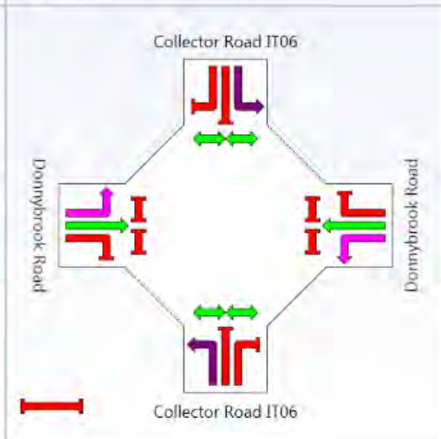
Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	12	20	31	33
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	18	26	37	39
Phase Split	15 %	22 %	31 %	33 %

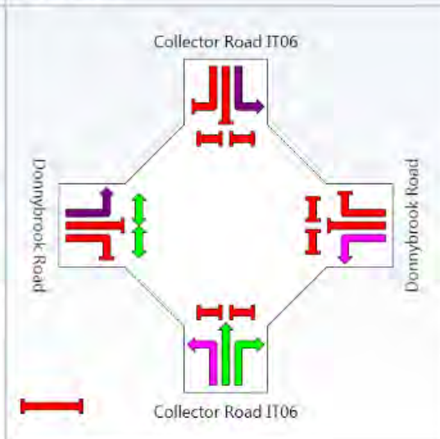
Phase A



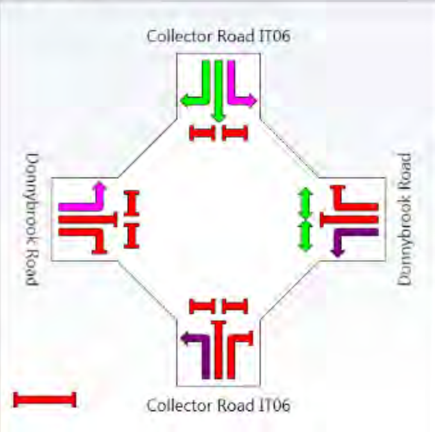
Phase B



Phase C



Phase D



- Normal Movement
- Slip-Lane Movement
- Stopped Movement
- Turn On Red
- Permitted/Opposed
- Opposed Slip-Lane
- Continuous Movement
- Undetected Movement
- Phase Transition Applied

Processed: Wednesday, 23 May 2012 11:09:51 AM
SIDRA INTERSECTION 5.1.9.2068

Project: I:\Projects\3004740 - Merrifield West Precinct Strcuture Plan\Engineering\Traffic\SIDRA\20120517 - 2021 sidras\IT06.sip
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LANE SUMMARY

Site: 2021_PM Peak

IT06
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT06																
Lane 1	103	0	0	103	5.0	665[1]	0.155	100	9.6	LOS A	1.1	8.4	50	Turn Bay	0.0	0.0
Lane 2	0	155	0	155	5.0	239	0.649	89[6]	55.9	LOS B	9.0	65.4	500	–	0.0	0.0
Lane 3	0	97	73	170	5.0	233	0.729	100	61.0	LOS C	10.1	74.0	500	–	0.0	0.0
Lane 4	0	0	125	125	5.0	172[1]	0.729	100	64.3	LOS C	7.4	53.7	45	Turn Bay	0.0	21.1
Approach	103	252	198	553	5.0		0.729		50.7	LOS C	10.1	74.0				
East: Donnybrook Road																
Lane 1	395	0	0	395	5.0	853[1]	0.463	100	9.4	LOS A	3.4	24.5	55	Turn Bay	0.0	0.0
Lane 2	0	199	0	199	5.0	270	0.734	100	49.4	LOS C	11.2	81.6	500	–	0.0	0.0
Lane 3	0	199	0	199	5.0	270	0.734	100	49.4	LOS C	11.2	81.6	500	–	0.0	0.0
Lane 4	0	0	200	200	5.0	259[1]	0.772	100	42.6	LOS C	8.8	64.3	45	Turn Bay	0.0	37.6
Approach	395	397	200	992	5.0		0.772		32.1	LOS C	11.2	81.6				
North: Collector Road IT06																
Lane 1	1	0	0	1	5.0	643[1]	0.002	100	10.4	LOS A	0.0	0.1	50	Turn Bay	0.0	0.0
Lane 2	0	90	0	90	5.0	207	0.434	100	56.9	LOS A	5.1	37.0	500	–	0.0	0.0
Lane 3	0	43	44	87	5.0	201	0.434	100	60.7	LOS A	4.9	36.1	100	Turn Bay	0.0	0.0
Lane 4	0	0	85	85	5.0	196	0.434	100	64.4	LOS A	4.8	35.3	80	Turn Bay	0.0	0.0
Approach	1	133	129	263	5.0		0.434		60.4	LOS A	5.1	37.0				
West: Donnybrook Road																
Lane 1	433	0	0	433	5.0	603[1]	0.718	100	12.4	LOS C	6.8	49.3	50	Turn Bay	0.0	3.7
Lane 2	0	139	0	139	5.0	270	0.514	100	46.8	LOS A	7.2	52.9	500	–	0.0	0.0
Lane 3	0	139	0	139	5.0	270	0.514	100	46.8	LOS A	7.2	52.9	500	–	0.0	0.0
Lane 4	0	0	58	58	5.0	417[1]	0.139	100	29.9	LOS A	2.0	14.4	80	Turn Bay	0.0	0.0
Approach	433	278	58	769	5.0		0.718		26.1	LOS C	7.2	52.9				
Intersection				2577	5.0		0.772		37.2	LOS C	11.2	81.6				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

PHASING SUMMARY

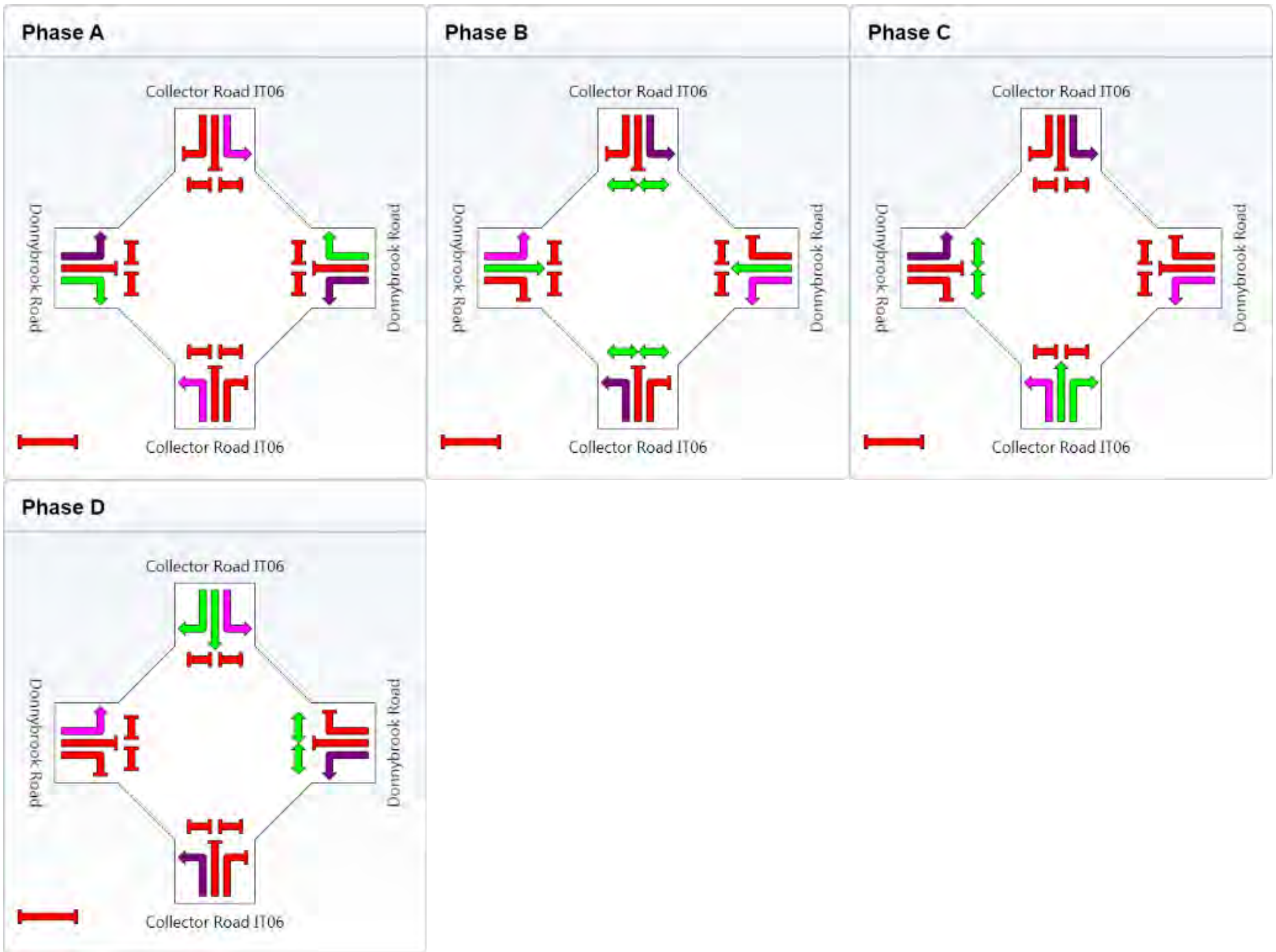
Site: 2021_PM Peak

IT06
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

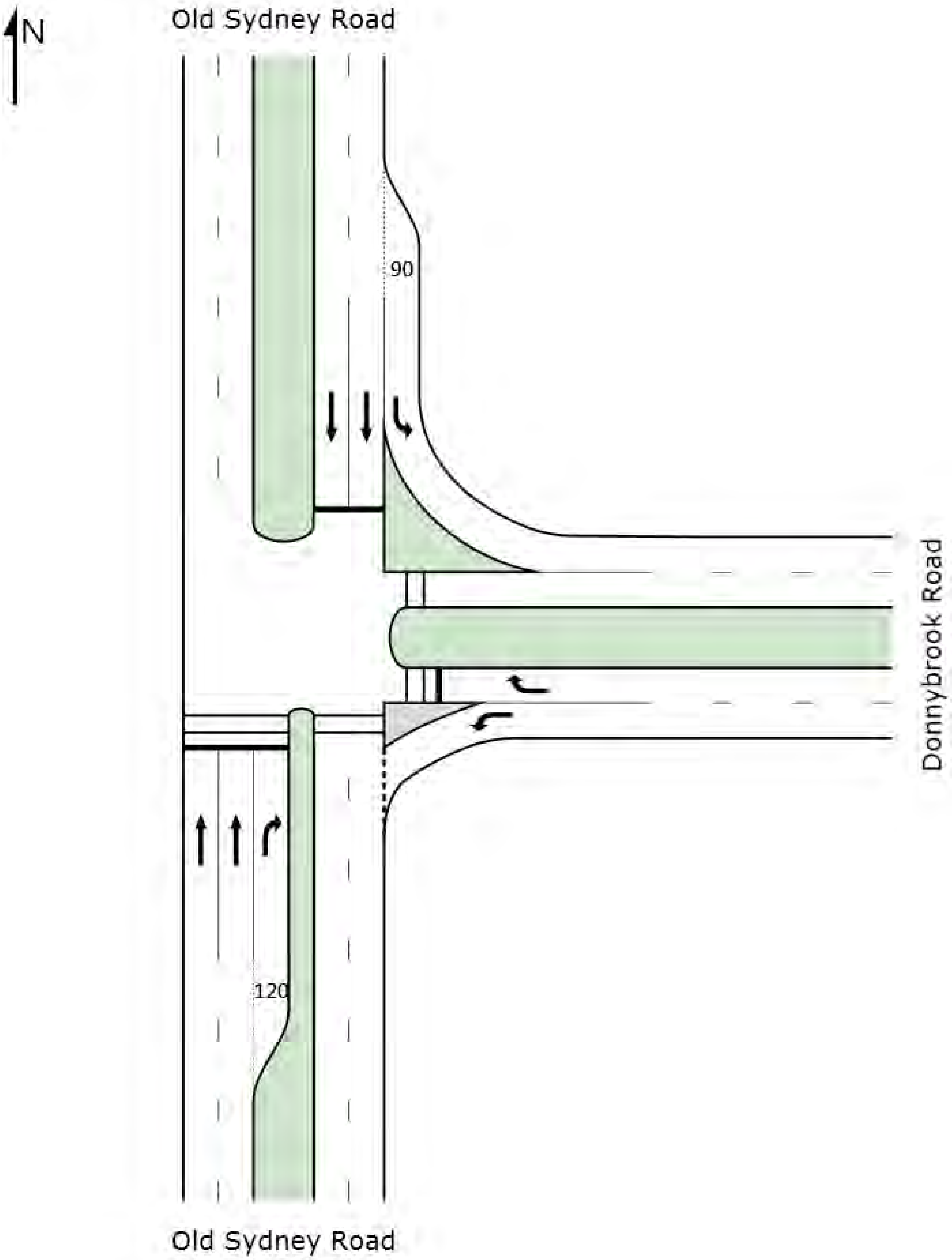
Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	51	17	15	13
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	57	23	21	19
Phase Split	48 %	19 %	18 %	16 %



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

SIDRA INTERSECTION


N
Old Sydney Road
90
Donnybrook Road
120
Old Sydney Road

LANE SUMMARY

Site: 2021_AM Peak

IT07
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Old Sydney Road																
Lane 1	0	19	0	19	5.0	1511	0.012	100	2.7	LOS A	0.2	1.6	500	–	0.0	0.0
Lane 2	0	19	0	19	5.0	1511	0.012	100	2.7	LOS A	0.2	1.6	500	–	0.0	0.0
Lane 3	0	0	332	332	5.0	769[1]	0.432	100	19.2	LOS A	8.2	59.5	120	Turn Bay	0.0	0.0
Approach	0	37	332	369	5.0		0.432		17.6	LOS A	8.2	59.5				
East: Donnybrook Road																
Lane 1	661	0	0	661	5.0	1580	0.418	100	10.5	LOS A	5.3	38.8	500	–	0.0	0.0
Lane 2	0	0	35	35	5.0	196	0.178	100	63.4	LOS A	1.9	14.0	500	–	0.0	0.0
Approach	661	0	35	696	5.0		0.418		13.2	LOS A	5.3	38.8				
North: Old Sydney Road																
Lane 1	181	0	0	181	5.0	1812	0.100	100	9.5	X	X	X	90	Turn Bay	0.0	X
Lane 2	0	73	0	73	5.0	175	0.415	100	57.6	LOS A	4.2	30.4	500	–	0.0	0.0
Lane 3	0	73	0	73	5.0	175	0.415	100	57.6	LOS A	4.2	30.4	500	–	0.0	0.0
Approach	181	145	0	326	5.0		0.415		30.9	LOS A	4.2	30.4				
Intersection				1391	5.0		0.432		18.5	LOS A	8.2	59.5				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 22 May 2012 2:12:18 PM
SIDRA INTERSECTION 5.1.9.2068

Project: I:\Projects\3004740 - Merrifield West Precinct Strcuture Plan\Engineering\Traffic\SIDRA\20120517 - 2021 sidras\IT07.sip
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PHASING SUMMARY

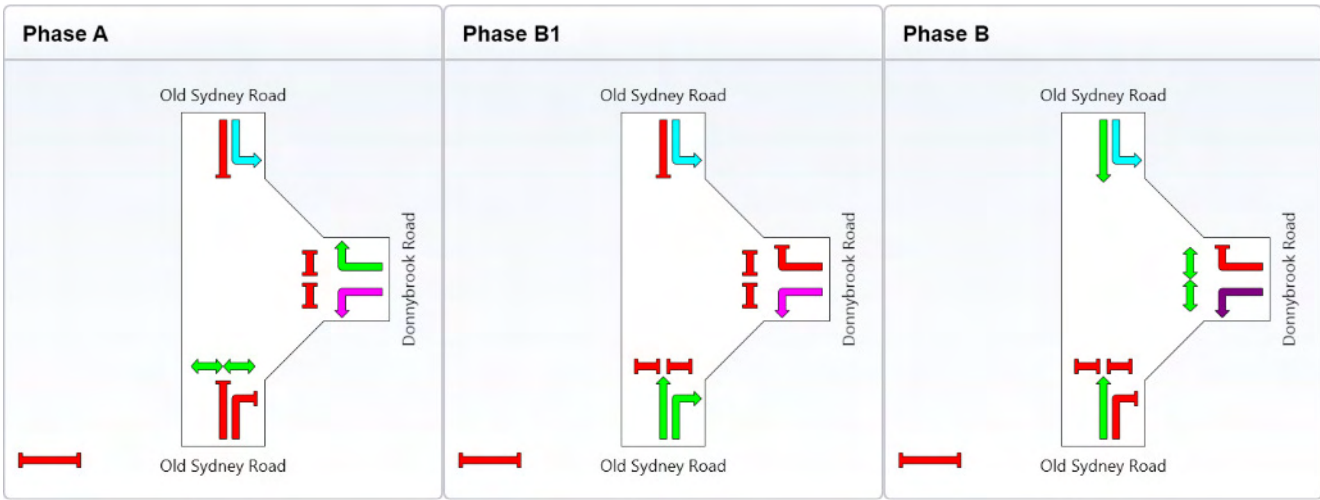
Site: 2021_AM Peak

IT07
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, B1, B
Output Sequence: A, B1, B

Phase Timing Results

Phase	A	B1	B
Green Time (sec)	13	78	11
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	19	84	17
Phase Split	16 %	70 %	14 %



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

LANE SUMMARY

Site: 2021_PM Peak

IT07
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Old Sydney Road																
Lane 1	0	73	0	73	5.0	1511	0.048	100	2.8	LOS A	0.9	6.5	500	–	0.0	0.0
Lane 2	0	73	0	73	5.0	1511	0.048	100	2.8	LOS A	0.9	6.5	500	–	0.0	0.0
Lane 3	0	0	718	718	5.0	778[1]	0.923	100	34.3[8]	LOS D[8]	26.8[8]	195.8[8]	120	Turn Bay	0.0	50.0
Approach	0	145	718	863	5.0		0.923		29.0	LOS D	26.8	195.8				
East: Donnybrook Road																
Lane 1	389	0	0	389	5.0	1626	0.239	100	10.0	LOS A	1.8	13.0	500	–	0.0	0.0
Lane 2	0	0	180	180	5.0	196	0.917	100	83.1	LOS D	12.5	91.1	500	–	0.0	0.0
Approach	389	0	180	569	5.0		0.917		33.1	LOS D	12.5	91.1				
North: Old Sydney Road																
Lane 1	35	0	0	35	5.0	1812	0.019	100	9.5	X	X	X	90	Turn Bay	0.0	X
Lane 2	0	18	0	18	5.0	159	0.113	100	56.4	LOS A	1.0	7.3	500	–	0.0	0.0
Lane 3	0	18	0	18	5.0	159	0.113	100	56.4	LOS A	1.0	7.3	500	–	0.0	0.0
Approach	35	36	0	71	5.0		0.113		33.3	LOS D	1.0	7.3				
Intersection				1503	5.0		0.923		30.8	LOS D	26.8	195.8				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

SIDRA INTERSECTION

PHASING SUMMARY

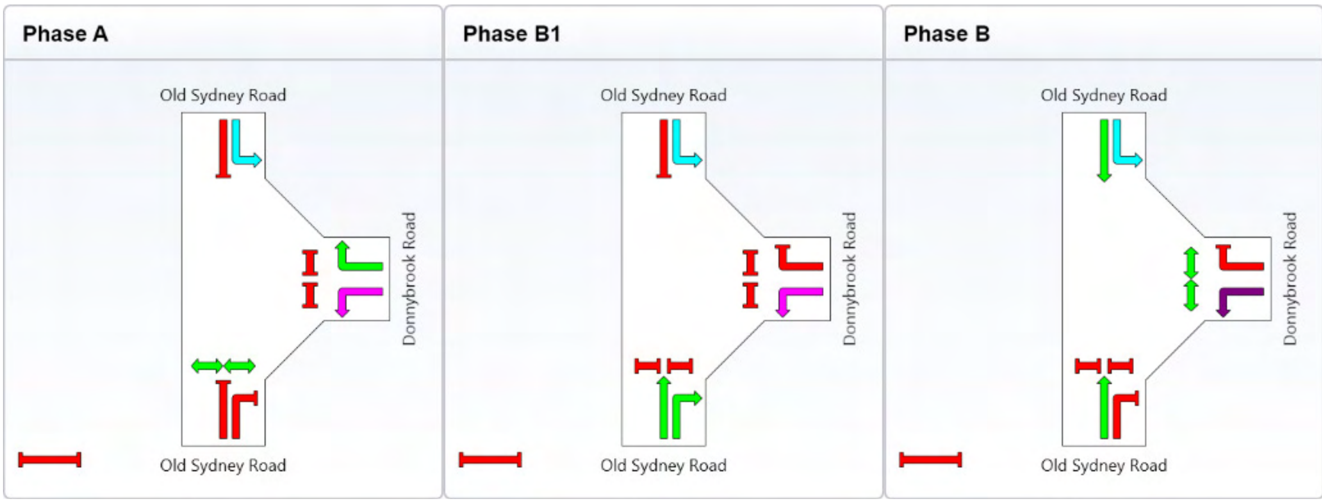
Site: 2021_PM Peak

IT07
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

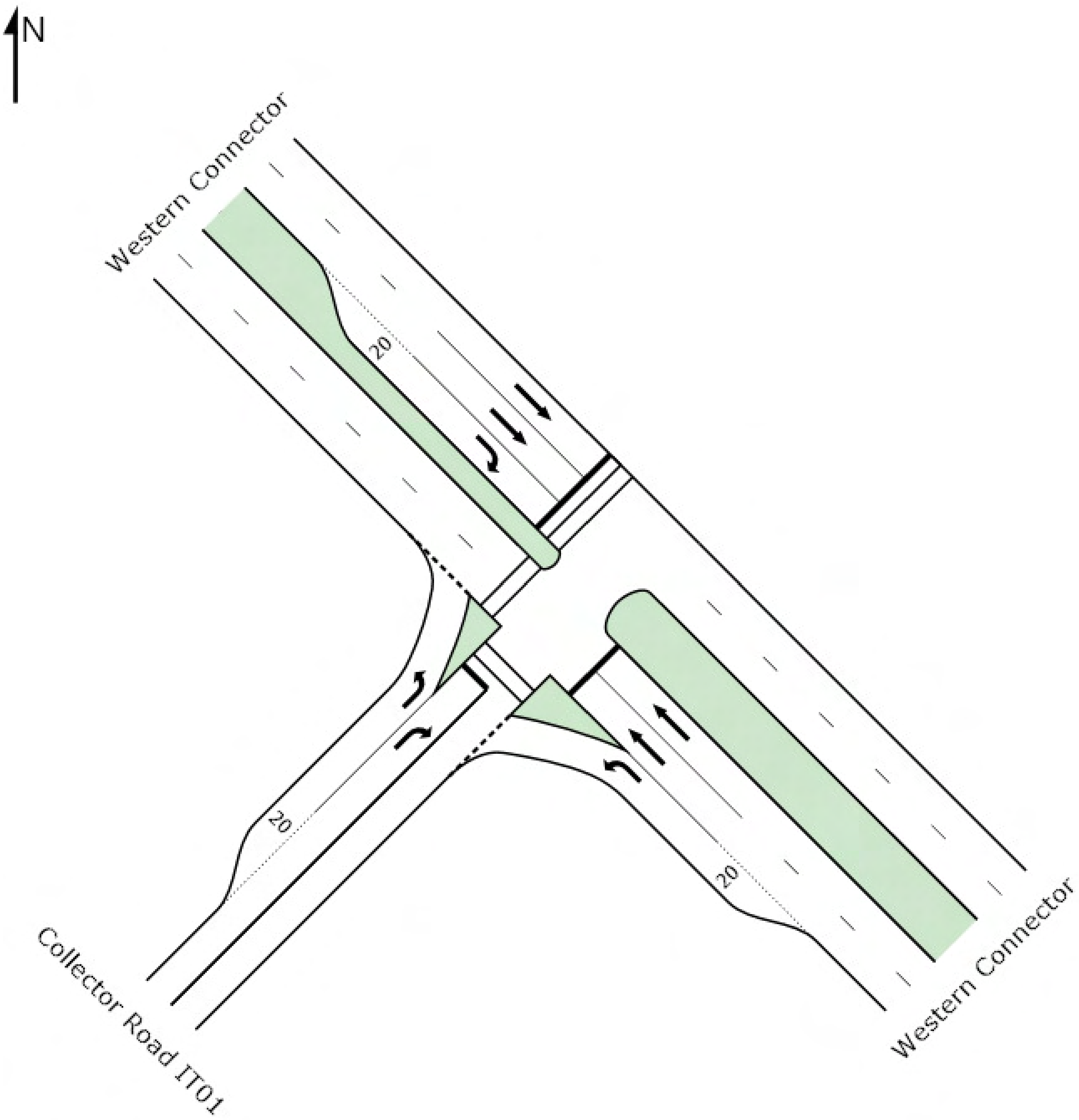
Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, B1, B
Output Sequence: A, B1, B

Phase Timing Results

Phase	A	B1	B
Green Time (sec)	13	79	10
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	19	85	16
Phase Split	16 %	71 %	13 %



	Normal Movement		Permitted/Opposed
	Slip-Lane Movement		Opposed Slip-Lane
	Stopped Movement		Continuous Movement
	Turn On Red		Undetected Movement
			Phase Transition Applied



N
Western Connector
20
20
20
Collector Road IT01
Western Connector

LANE SUMMARY

Site: 2046_AM Peak

IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	1	0	0	1	5.0	768[1]	0.001	100	8.3	LOS A	0.0	0.0	20	Turn Bay	0.0	0.0
Lane 2	0	118	0	118	5.0	175	0.672	100	55.8	LOS B	6.8	49.9	500	–	0.0	0.0
Lane 3	0	118	0	118	5.0	175	0.672	100	55.8	LOS B	6.8	49.9	500	–	0.0	0.0
Approach	1	235	0	236	5.0		0.672		55.6	LOS B	6.8	49.9				
North West: Western Connector																
Lane 1	0	284	0	284	5.0	1367	0.208	100	1.0	LOS A	1.0	7.4	500	–	0.0	0.0
Lane 2	0	284	0	284	5.0	1367	0.208	100	1.0	LOS A	1.0	7.4	500	–	0.0	0.0
Lane 3	0	0	284	284	5.0	779[1]	0.364	100	14.3	LOS A	1.1	8.0	20	Turn Bay	0.0	0.0
Approach	0	568	284	852	5.0		0.364		5.5	LOS A	1.1	8.0				
South West: Collector Road IT01																
Lane 1	246	0	0	246	5.0	520[1]	0.473	100	8.7	LOS A	1.8	13.3	20	Turn Bay	0.0	0.0
Lane 2	0	0	1	1	5.0	332	0.003	100	49.7	LOS A	0.0	0.3	500	–	0.0	0.0
Approach	246	0	1	247	5.0		0.473		8.8	LOS A	1.8	13.3				
Intersection				1335	5.0		0.672		14.9	LOS B	6.8	49.9				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

PHASING SUMMARY

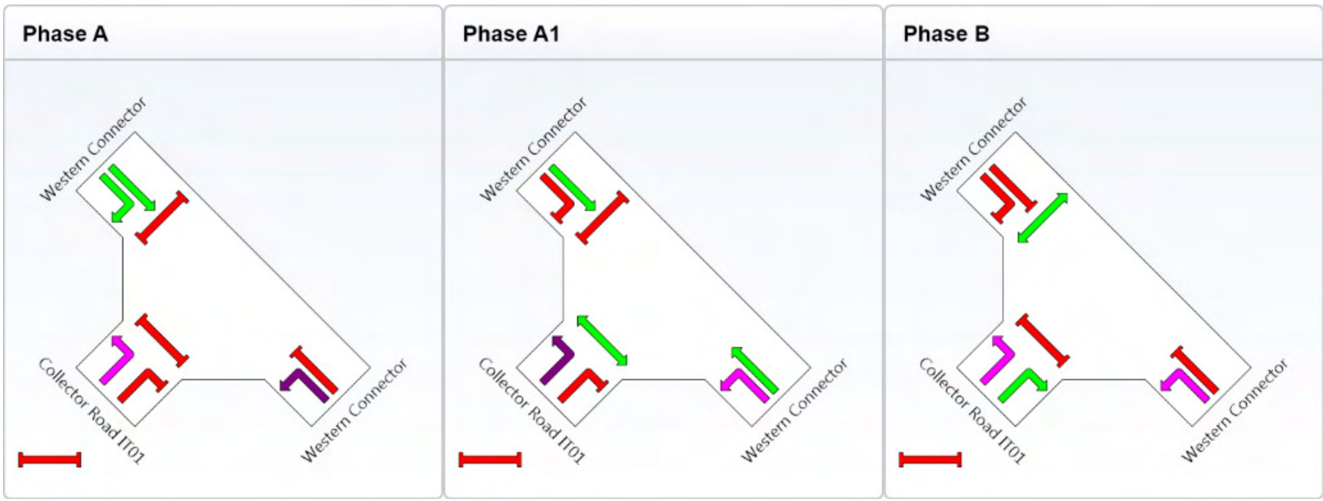
Site: 2046_AM Peak

IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

Phase Timing Results

Phase	A	A1	B
Green Time (sec)	69	11	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	75	17	28
Phase Split	63 %	14 %	23 %



Normal Movement
Slip-Lane Movement
Stopped Movement
Turn On Red
Permitted/Opposed
Opposed Slip-Lane
Continuous Movement
Undetected Movement
Phase Transition Applied

Processed: Tuesday, 22 May 2012 2:21:01 PM
SIDRA INTERSECTION 5.1.9.2068

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LANE SUMMARY

Site: 2046_PM Peak

IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	1	0	0	1	5.0	781[1]	0.001	100	8.3	LOS A	0.0	0.0	20	Turn Bay	0.0	0.0
Lane 2	0	284	0	284	5.0	350	0.812	100	46.1	LOS C	16.2	117.9	500	–	0.0	0.0
Lane 3	0	284	0	284	5.0	350	0.812	100	46.1	LOS C	16.2	117.9	500	–	0.0	0.0
Approach	1	568	0	569	5.0		0.812		46.0	LOS C	16.2	117.9				
North West: Western Connector																
Lane 1	0	118	0	118	5.0	1367	0.086	100	0.9	LOS A	0.4	2.7	500	–	0.0	0.0
Lane 2	0	118	0	118	5.0	1367	0.086	100	0.9	LOS A	0.4	2.7	500	–	0.0	0.0
Lane 3	0	0	246	246	5.0	298[1]	0.825	100	35.7[8]	LOS C[8]	4.5[8]	32.6[8]	20	Turn Bay	0.0	50.0
Approach	0	235	246	481	5.0		0.825		18.7	LOS C	4.5	32.6				
South West: Collector Road IT01																
Lane 1	284	0	0	284	5.0	314[1]	0.906	100	14.8[8]	LOS D[8]	4.5[8]	32.6[8]	20	Turn Bay	0.0	50.0
Lane 2	0	0	1	1	5.0	332	0.003	100	49.7	LOS A	0.0	0.3	500	–	0.0	0.0
Approach	284	0	1	285	5.0		0.906		14.9	LOS D	4.5	32.6				
Intersection				1335	5.0		0.906		29.5	LOS D	16.2	117.9				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

PHASING SUMMARY

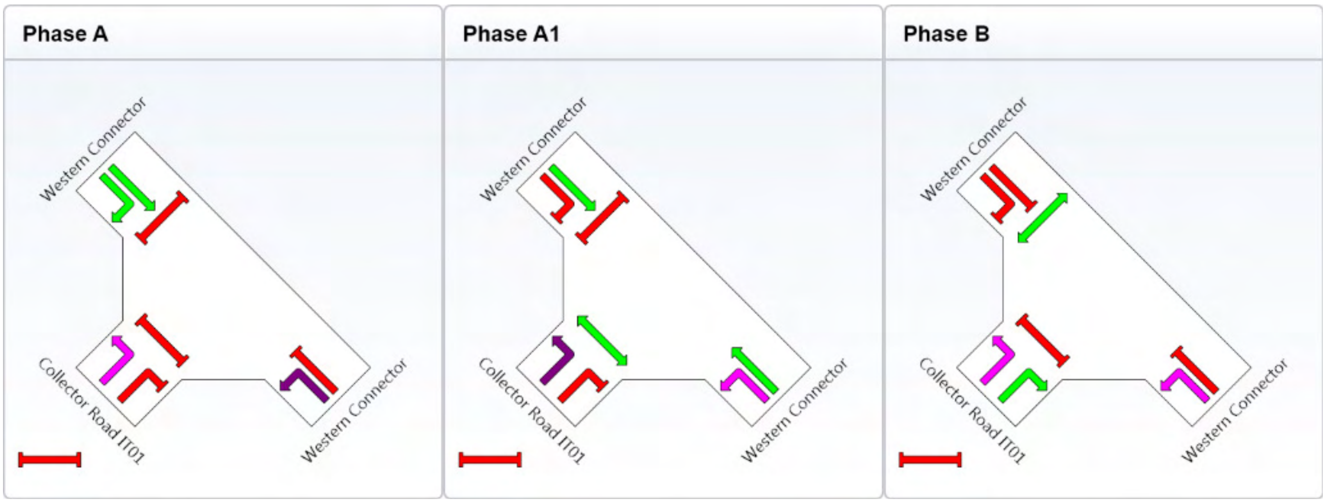
Site: 2046_PM Peak

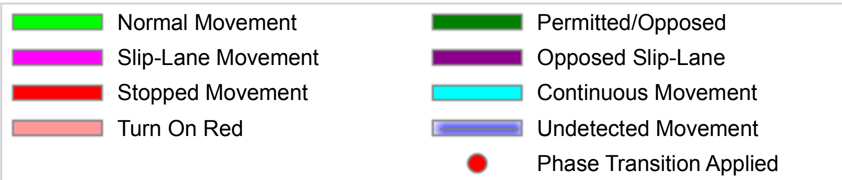
IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

Phase Timing Results

Phase	A	A1	B
Green Time (sec)	58	22	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	64	28	28
Phase Split	53 %	23 %	23 %





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SIDRA INTERSECTION 5.1.9.2068

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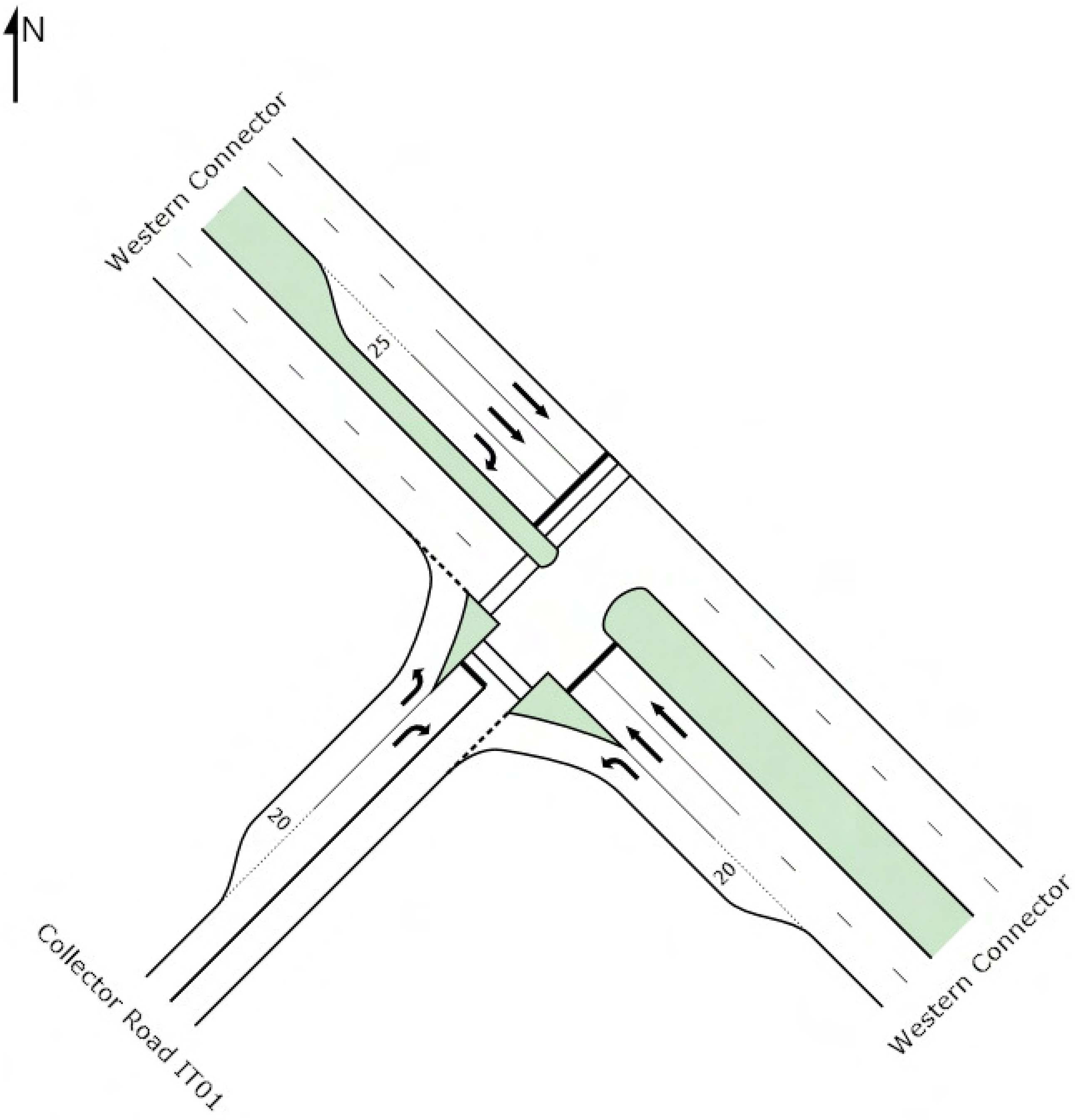


N
Western Connector
25
20
20
Collector Road IT01
Western Connector

LANE SUMMARY

Site: 2046_AM Peak (RT bans)

IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	1	0	0	1	5.0	545[1]	0.002	100	8.3	LOS A	0.0	0.0	20	Turn Bay	0.0	0.0
Lane 2	0	118	0	118	5.0	175	0.672	100	55.8	LOS B	6.8	49.9	500	–	0.0	0.0
Lane 3	0	118	0	118	5.0	175	0.672	100	55.8	LOS B	6.8	49.9	500	–	0.0	0.0
Approach	1	235	0	236	5.0		0.672		55.6	LOS B	6.8	49.9				
North West: Western Connector																
Lane 1	0	284	0	284	5.0	1367	0.208	100	1.0	LOS A	1.0	7.4	500	–	0.0	0.0
Lane 2	0	284	0	284	5.0	1367	0.208	100	1.0	LOS A	1.0	7.4	500	–	0.0	0.0
Lane 3	0	0	496	496	5.0	809[1]	0.613	100	17.7	LOS B	2.6	19.1	25	Turn Bay	0.0	0.0
Approach	0	568	496	1064	5.0		0.613		8.8	LOS B	2.6	19.1				
South West: Collector Road IT01																
Lane 1	246	0	0	246	5.0	520[1]	0.473	100	8.7	LOS A	1.8	13.3	20	Turn Bay	0.0	0.0
Lane 2	0	0	240	240	5.0	332	0.723	100	59.4	LOS C	13.8	100.6	500	–	0.0	0.0
Approach	246	0	240	486	5.0		0.723		33.7	LOS C	13.8	100.6				
Intersection				1786	5.0		0.723		21.8	LOS C	13.8	100.6				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

SIDRA INTERSECTION

PHASING SUMMARY

Site: 2046_AM Peak (RT bans)

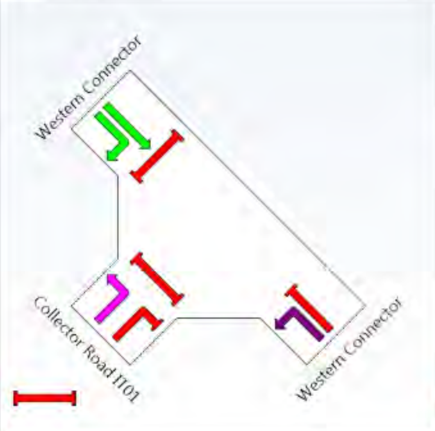
IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

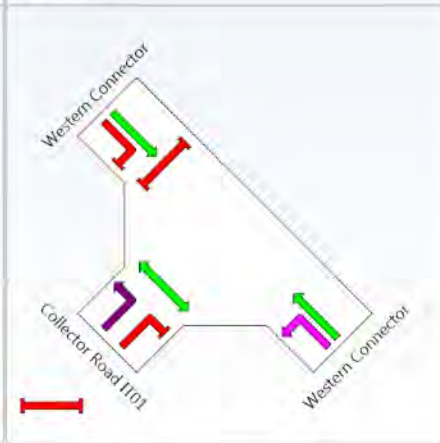
Phase Timing Results

Phase	**A**	**A1**	**B**
Green Time (sec)	69	11	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	75	17	28
Phase Split	63 %	14 %	23 %

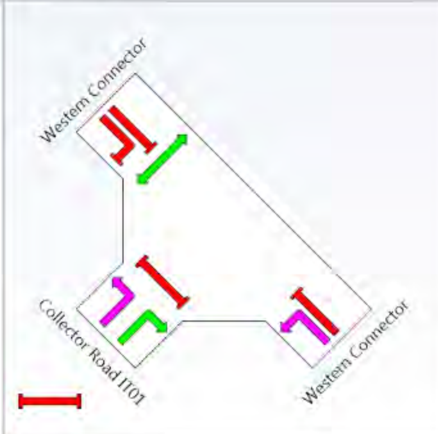
Phase A



Phase A1



Phase B



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

Processed: Tuesday, 22 May 2012 2:21:03 PM
SIDRA INTERSECTION 5.1.9.2068

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SIDRA INTERSECTION

LANE SUMMARY

Site: 2046_PM Peak (RT bans)

IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	1	0	0	1	5.0	684[1]	0.001	100	8.3	LOS A	0.0	0.0	20	Turn Bay	0.0	0.0
Lane 2	0	284	0	284	5.0	318	0.893	100	52.8	LOS C	17.6	128.2	500	–	0.0	0.0
Lane 3	0	284	0	284	5.0	318	0.893	100	52.8	LOS C	17.6	128.2	500	–	0.0	0.0
Approach	1	568	0	569	5.0		0.893		52.7	LOS C	17.6	128.2				
North West: Western Connector																
Lane 1	0	118	0	118	5.0	1367	0.086	100	0.9	LOS A	0.4	2.7	500	–	0.0	0.0
Lane 2	0	118	0	118	5.0	1367	0.086	100	0.9	LOS A	0.4	2.7	500	–	0.0	0.0
Lane 3	0	0	344	344	5.0	386[1]	0.891	100	33.7[8]	LOS C[8]	5.6[8]	40.8[8]	25	Turn Bay	0.0	50.0
Approach	0	235	344	579	5.0		0.891		20.4	LOS C	5.6	40.8				
South West: Collector Road IT01																
Lane 1	284	0	0	284	5.0	379[1]	0.749	100	14.7[8]	LOS C[8]	4.5[8]	32.6[8]	20	Turn Bay	0.0	50.0
Lane 2	0	0	162	162	5.0	332	0.488	100	55.6	LOS A	8.7	63.1	500	–	0.0	0.0
Approach	284	0	162	446	5.0		0.749		29.6	LOS C	8.7	63.1				
Intersection				1594	5.0		0.893		34.5	LOS C	17.6	128.2				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

PHASING SUMMARY

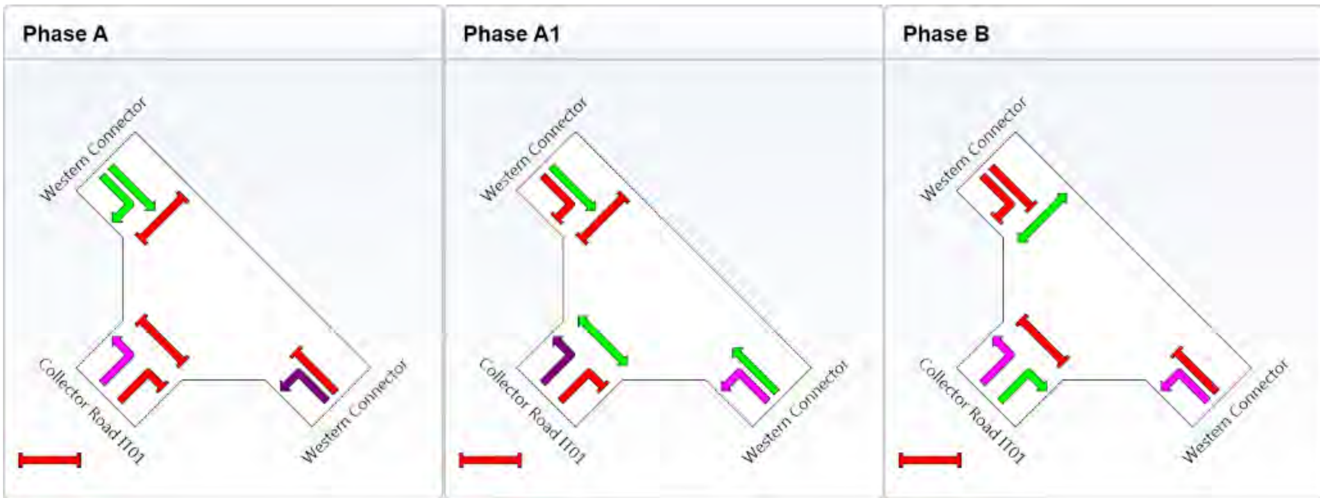
Site: 2046_PM Peak (RT bans)

IT01
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

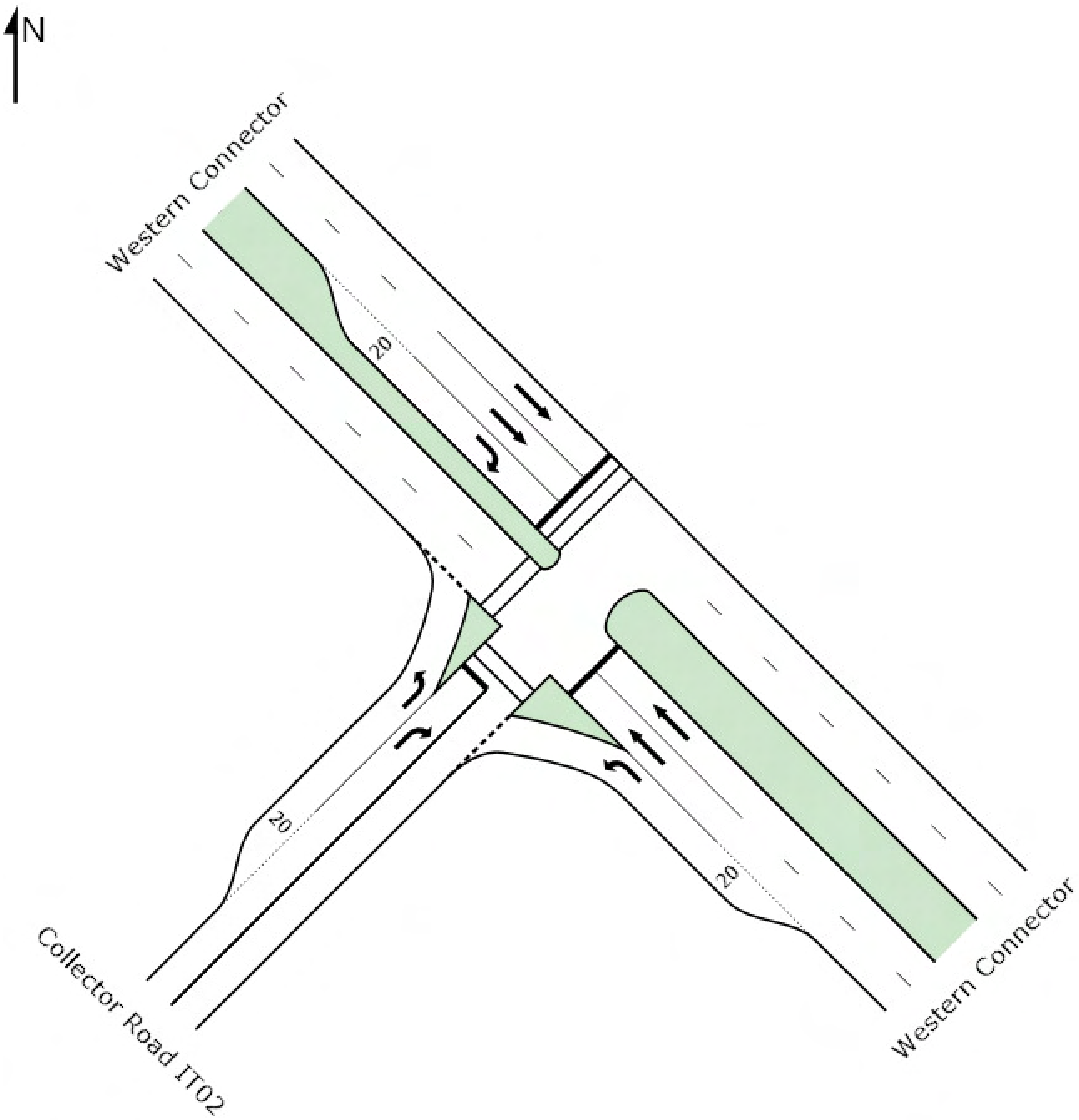
Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

Phase Timing Results

Phase	A	A1	B
Green Time (sec)	60	20	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	66	26	28
Phase Split	55 %	22 %	23 %



Normal Movement
Slip-Lane Movement
Stopped Movement
Turn On Red
Permitted/Opposed
Opposed Slip-Lane
Continuous Movement
Undetected Movement
Phase Transition Applied



N
Western Connector
20
20
20
Collector Road IT02
Western Connector

LANE SUMMARY

Site: 2046_AM Peak

IT02
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	70	0	0	70	5.0	949[1]	0.074	100	8.3	LOS A	0.1	0.8	20	Turn Bay	0.0	0.0
Lane 2	0	89	0	89	5.0	239	0.373	100	48.1	LOS A	4.6	33.5	500	–	0.0	0.0
Lane 3	0	89	0	89	5.0	239	0.373	100	48.1	LOS A	4.6	33.5	500	–	0.0	0.0
Approach	70	178	0	248	5.0		0.373		36.9	LOS A	4.6	33.5				
North West: Western Connector																
Lane 1	0	235	0	235	5.0	1367	0.172	100	1.0	LOS A	0.8	5.8	500	–	0.0	0.0
Lane 2	0	235	0	235	5.0	1367	0.172	100	1.0	LOS A	0.8	5.8	500	–	0.0	0.0
Lane 3	0	0	98	98	5.0	542[1]	0.181	100	12.3	LOS A	0.6	4.4	20	Turn Bay	0.0	0.0
Approach	0	470	98	568	5.0		0.181		3.0	LOS A	0.8	5.8				
South West: Collector Road IT02																
Lane 1	57	0	0	57	5.0	562[1]	0.102	100	7.8	LOS A	0.3	2.2	20	Turn Bay	0.0	0.0
Lane 2	0	0	119	119	5.0	332	0.358	100	54.2	LOS A	6.2	45.1	500	–	0.0	0.0
Approach	57	0	119	176	5.0		0.358		39.2	LOS A	6.2	45.1				
Intersection				992	5.0		0.373		17.9	LOS A	6.2	45.1				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 22 May 2012 2:28:07 PM
SIDRA INTERSECTION 5.1.9.2068

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PHASING SUMMARY

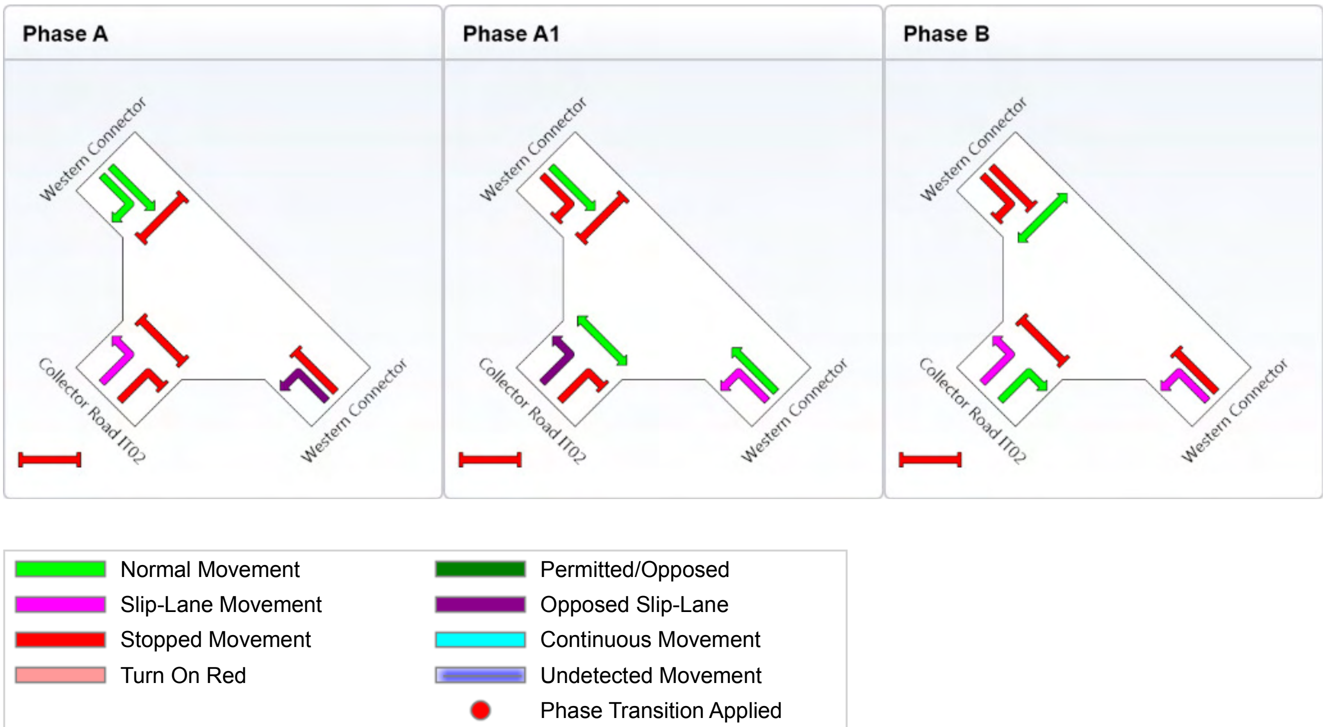
Site: 2046_AM Peak

IT02
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

Phase Timing Results

Phase	A	A1	B
Green Time (sec)	65	15	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	71	21	28
Phase Split	59 %	18 %	23 %



Processed: Tuesday, 22 May 2012 2:28:07 PM
SIDRA INTERSECTION 5.1.9.2068

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SIDRA INTERSECTION

LANE SUMMARY

Site: 2046_PM Peak

IT02
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	119	0	0	119	5.0	970[1]	0.123	100	8.4	LOS A	0.2	1.5	20	Turn Bay	0.0	0.0
Lane 2	0	235	0	235	5.0	636	0.369	100	21.7	LOS A	7.7	55.9	500	–	0.0	0.0
Lane 3	0	235	0	235	5.0	636	0.369	100	21.7	LOS A	7.7	55.9	500	–	0.0	0.0
Approach	119	470	0	589	5.0		0.369		19.0	LOS A	7.7	55.9				
North West: Western Connector																
Lane 1	0	89	0	89	5.0	1367	0.065	100	0.9	LOS A	0.3	2.0	500	–	0.0	0.0
Lane 2	0	89	0	89	5.0	1367	0.065	100	0.9	LOS A	0.3	2.0	500	–	0.0	0.0
Lane 3	0	0	57	57	5.0	156[1]	0.366	100	28.3	LOS A	1.5	11.3	20	Turn Bay	0.0	0.0
Approach	0	178	57	235	5.0		0.366		7.6	LOS A	1.5	11.3				
South West: Collector Road IT02																
Lane 1	98	0	0	98	5.0	374[1]	0.262	100	8.4	LOS A	0.8	5.7	20	Turn Bay	0.0	0.0
Lane 2	0	0	70	70	5.0	332	0.211	100	52.7	LOS A	3.5	25.7	500	–	0.0	0.0
Approach	98	0	70	168	5.0		0.262		26.8	LOS A	3.5	25.7				
Intersection				992	5.0		0.369		17.6	LOS A	7.7	55.9				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

SIDRA INTERSECTION

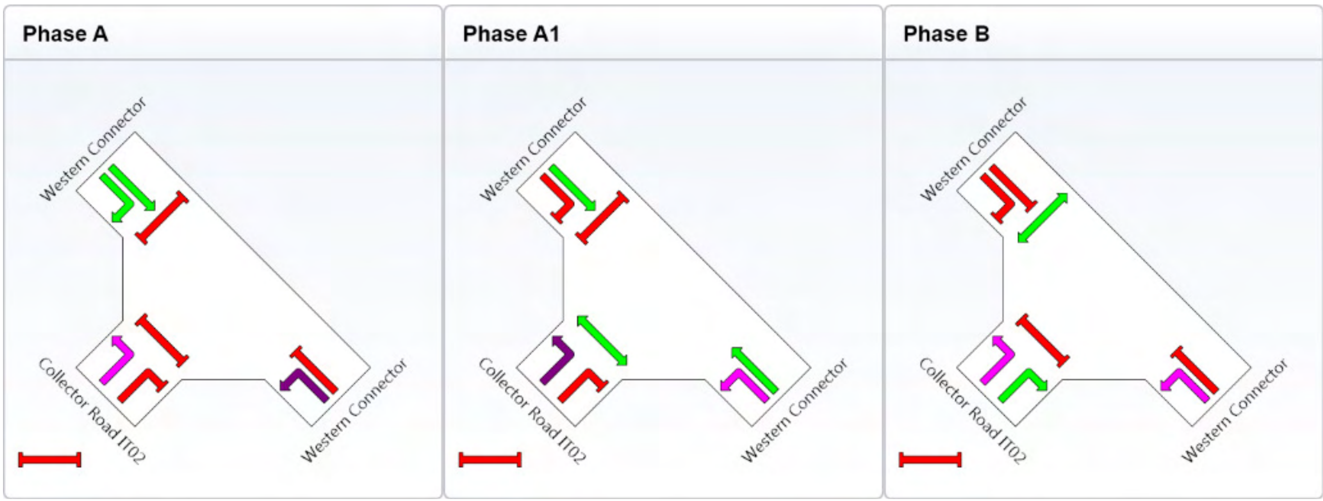
PHASING SUMMARY

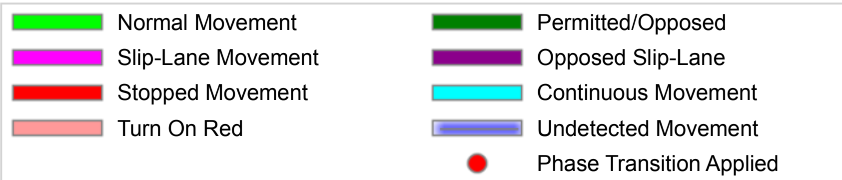
IT02
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

Phase Timing Results

Phase	A	A1	B
Green Time (sec)	40	40	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	46	46	28
Phase Split	38 %	38 %	23 %





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SIDRA INTERSECTION 5.1.9.2068

Project: I:\Projects\3004740 - Merrifield West Precinct Strcuture Plan\Engineering\Traffic\SIDRA\20120517 - 2046 sidras\IT02.sip
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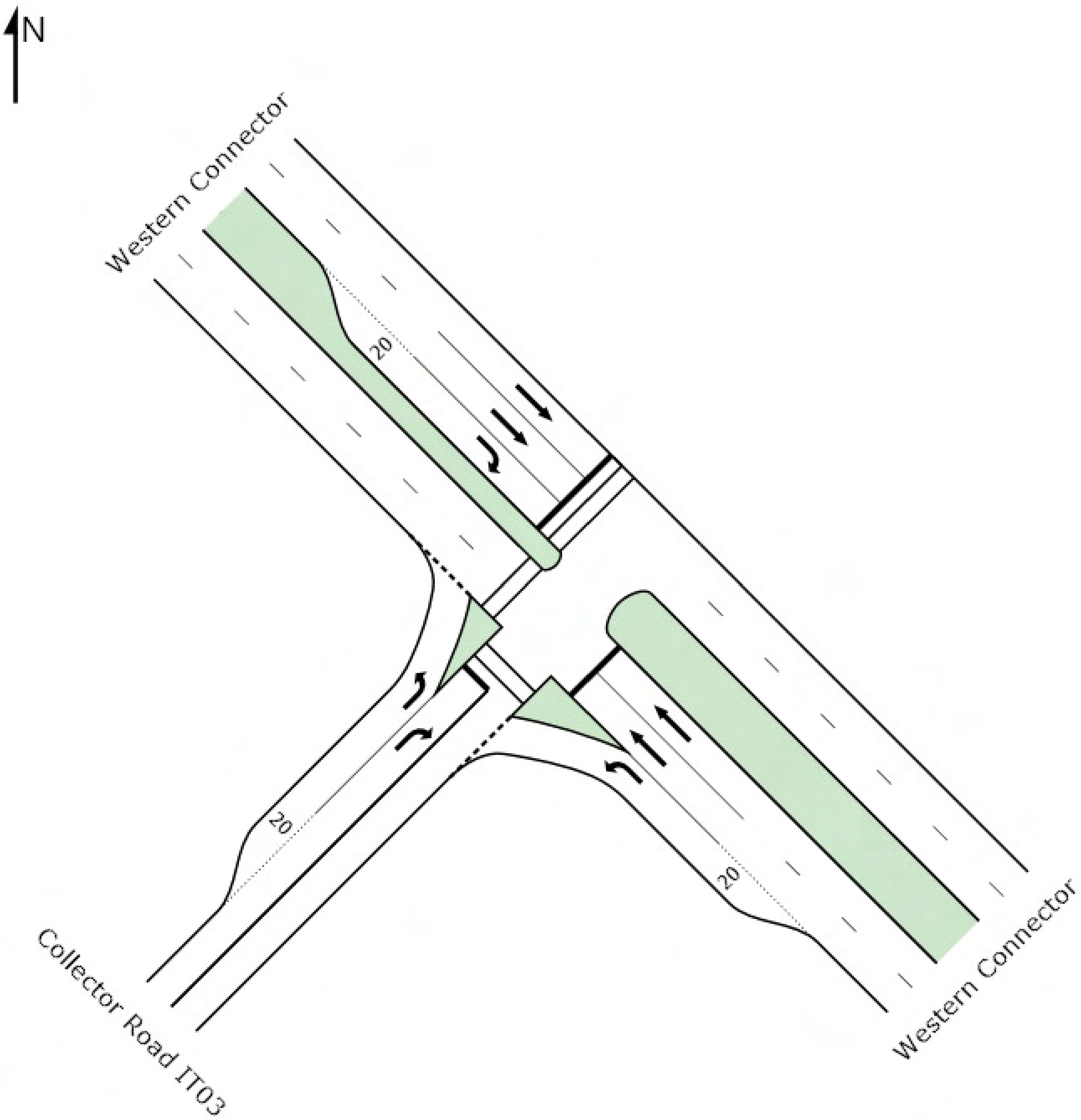


N
Western Connector
20
20
20
Collector Road IT03
Western Connector

LANE SUMMARY

Site: 2046_AM Peak

IT03
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	91	0	0	91	5.0	903[1]	0.101	100	8.4	LOS A	0.2	1.2	20	Turn Bay	0.0	0.0
Lane 2	0	104	0	104	5.0	382	0.271	100	36.7	LOS A	4.5	32.6	500	–	0.0	0.0
Lane 3	0	104	0	104	5.0	382	0.271	100	36.7	LOS A	4.5	32.6	500	–	0.0	0.0
Approach	91	207	0	298	5.0		0.271		28.0	LOS A	4.5	32.6				
North West: Western Connector																
Lane 1	0	238	0	238	5.0	1256	0.189	100	1.2	LOS A	0.8	6.0	500	–	0.0	0.0
Lane 2	0	238	0	238	5.0	1256	0.189	100	1.2	LOS A	0.8	6.0	500	–	0.0	0.0
Lane 3	0	0	114	114	5.0	205[1]	0.555	100	26.6	LOS A	2.3	17.1	20	Turn Bay	0.0	0.0
Approach	0	475	114	589	5.0		0.555		6.1	LOS A	2.3	17.1				
South West: Collector Road IT03																
Lane 1	41	0	0	41	5.0	538[1]	0.076	100	7.8	LOS A	0.2	1.5	20	Turn Bay	0.0	0.0
Lane 2	0	0	120	120	5.0	438	0.274	100	47.4	LOS A	5.7	41.8	500	–	0.0	0.0
Approach	41	0	120	161	5.0		0.274		37.3	LOS A	5.7	41.8				
Intersection				1048	5.0		0.555		17.1	LOS A	5.7	41.8				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

PHASING SUMMARY

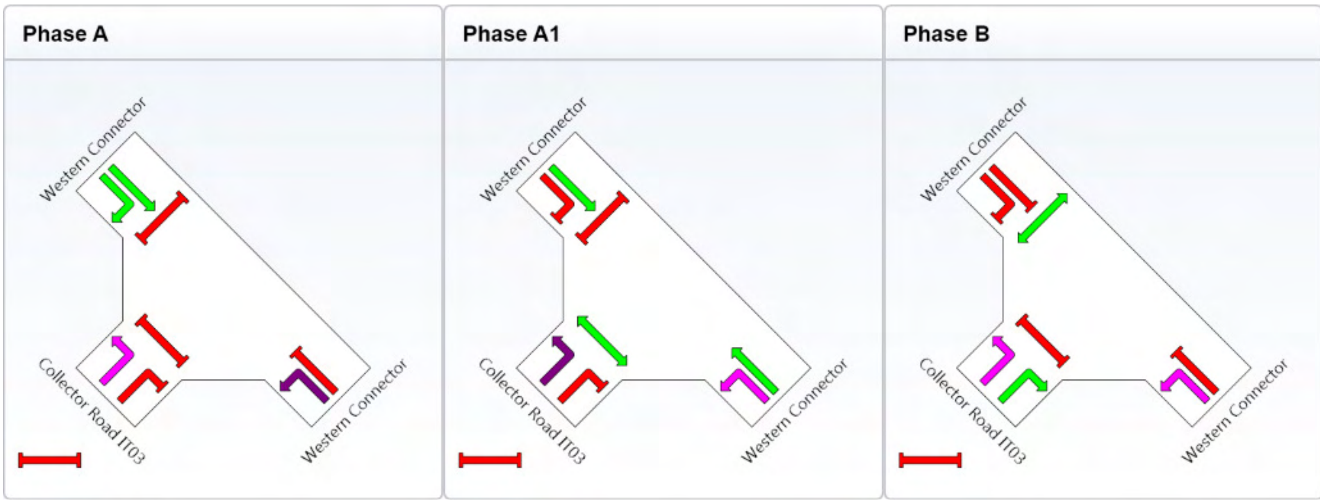
Site: 2046_AM Peak

IT03
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

Phase Timing Results

Phase	A	A1	B
Green Time (sec)	49	24	29
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	55	30	35
Phase Split	46 %	25 %	29 %



	Normal Movement		Permitted/Opposed
	Slip-Lane Movement		Opposed Slip-Lane
	Stopped Movement		Continuous Movement
	Turn On Red		Undetected Movement
			Phase Transition Applied

LANE SUMMARY

Site: 2046_PM Peak

IT03
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South East: Western Connector																
Lane 1	120	0	0	120	5.0	994[1]	0.121	100	8.4	LOS A	0.2	1.5	20	Turn Bay	0.0	0.0
Lane 2	0	238	0	238	5.0	747	0.318	100	15.4	LOS A	6.0	44.0	500	–	0.0	0.0
Lane 3	0	238	0	238	5.0	747	0.318	100	15.4	LOS A	6.0	44.0	500	–	0.0	0.0
Approach	120	475	0	595	5.0		0.318		14.0	LOS A	6.0	44.0				
North West: Western Connector																
Lane 1	0	104	0	104	5.0	1367	0.076	100	0.9	LOS A	0.3	2.3	500	–	0.0	0.0
Lane 2	0	104	0	104	5.0	1367	0.076	100	0.9	LOS A	0.3	2.3	500	–	0.0	0.0
Lane 3	0	0	41	41	5.0	130[1]	0.315	100	34.5	LOS A	1.3	9.8	20	Turn Bay	0.0	0.0
Approach	0	207	41	248	5.0		0.315		6.5	LOS A	1.3	9.8				
South West: Collector Road IT03																
Lane 1	114	0	0	114	5.0	398[1]	0.287	100	8.1	LOS A	0.8	5.8	20	Turn Bay	0.0	0.0
Lane 2	0	0	91	91	5.0	332	0.274	100	53.4	LOS A	4.6	33.8	500	–	0.0	0.0
Approach	114	0	91	205	5.0		0.287		28.2	LOS A	4.6	33.8				
Intersection				1048	5.0		0.318		15.0	LOS A	6.0	44.0				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

SIDRA INTERSECTION

PHASING SUMMARY

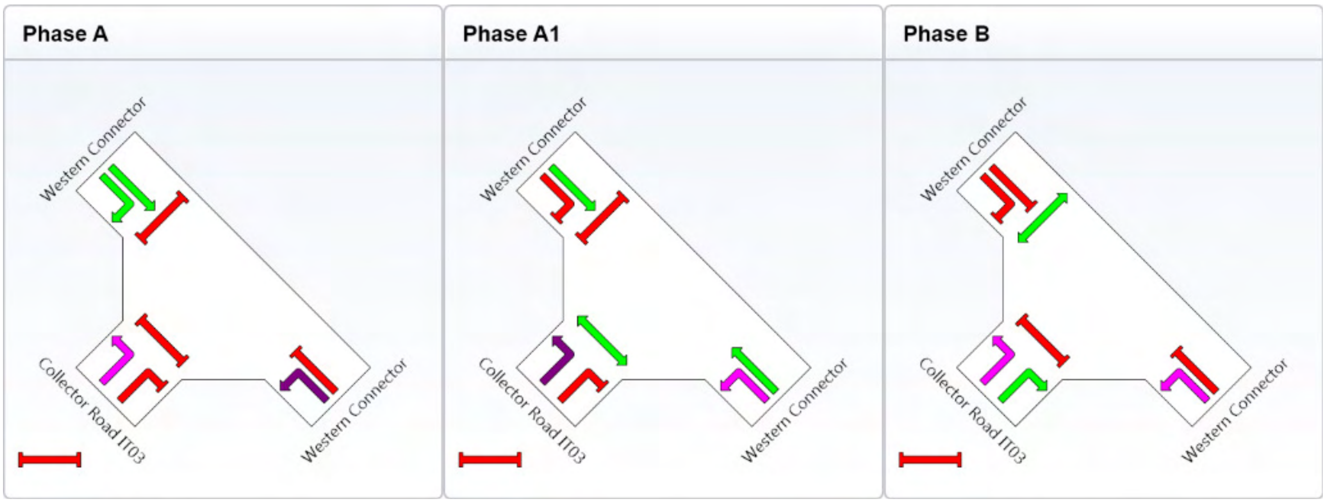
Site: 2046_PM Peak

IT03
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, A1, B
Output Sequence: A, A1, B

Phase Timing Results

Phase	**A**	**A1**	**B**
Green Time (sec)	33	47	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	39	53	28
Phase Split	33 %	44 %	23 %



- Normal Movement
- Slip-Lane Movement
- Stopped Movement
- Turn On Red
- Permitted/Opposed
- Opposed Slip-Lane
- Continuous Movement
- Undetected Movement
- Phase Transition Applied

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SIDRA INTERSECTION 5.1.9.2068

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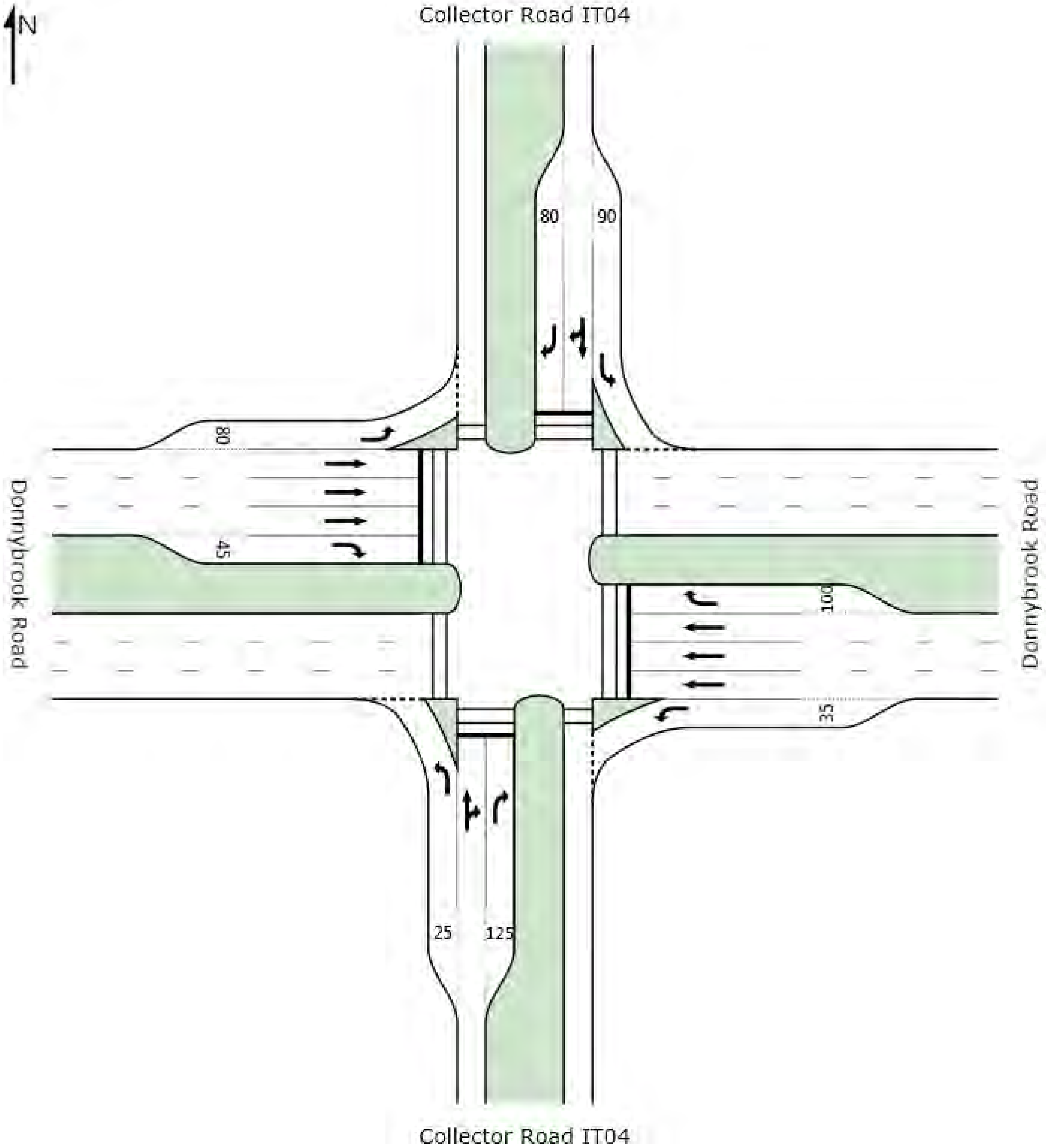

N
Collector Road IT04
80
90
80
45
Donnybrook Road
Donnybrook Road
100
35
25
125
Collector Road IT04

LANE SUMMARY

Site: 2046_AM Peak

IT04
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT04																
Lane 1	1	0	0	1	5.0	246[1]	0.004	100	11.8	LOS A	0.0	0.1	25	Turn Bay	0.0	0.0
Lane 2	0	44	44	88	5.0	248	0.354	100	55.7	LOS A	4.8	34.9	500	–	0.0	0.0
Lane 3	0	0	85	85	5.0	242	0.354	100	59.3	LOS A	4.7	34.0	125	Turn Bay	0.0	0.0
Approach	1	44	129	174	5.0		0.354		57.2	LOS A	4.8	34.9				
East: Donnybrook Road																
Lane 1	63	0	0	63	5.0	964[1]	0.065	100	8.6	LOS A	0.2	1.6	35	Turn Bay	0.0	0.0
Lane 2	0	601	0	601	5.0	906	0.663	100	10.2	LOS B	15.3	111.4	500	–	0.0	0.0
Lane 3	0	601	0	601	5.0	906	0.663	100	10.2	LOS B	15.3	111.4	500	–	0.0	0.0
Lane 4	0	601	0	601	5.0	906	0.663	100	10.2	LOS B	15.3	111.4	500	–	0.0	0.0
Lane 5	0	0	1	1	5.0	91	0.011	100	68.6	LOS A	0.1	0.4	100	Turn Bay	0.0	0.0
Approach	63	1803	1	1867	5.0		0.663		10.2	LOS B	15.3	111.4				
North: Collector Road IT04																
Lane 1	97	0	0	97	5.0	522[1]	0.186	100	12.7	LOS A	1.6	11.5	90	Turn Bay	0.0	0.0
Lane 2	0	27	143	170	5.0	259	0.656	100	61.8	LOS B	9.7	71.1	500	–	0.0	0.0
Lane 3	0	0	168	168	5.0	257	0.656	100	63.0	LOS B	9.7	70.6	80	Turn Bay	0.0	0.0
Approach	97	27	311	435	5.0		0.656		51.3	LOS B	9.7	71.1				
West: Donnybrook Road																
Lane 1	365	0	0	365	5.0	1264[1]	0.289	100	9.2	LOS A	1.8	13.1	80	Turn Bay	0.0	0.0
Lane 2	0	593	0	593	5.0	906	0.655	100	10.1	LOS B	14.9	108.4	500	–	0.0	0.0
Lane 3	0	593	0	593	5.0	906	0.655	100	10.1	LOS B	14.9	108.4	500	–	0.0	0.0
Lane 4	0	593	0	593	5.0	906	0.655	100	10.1	LOS B	14.9	108.4	500	–	0.0	0.0
Lane 5	0	0	1	1	5.0	91	0.011	100	66.2	LOS A	0.1	0.4	45	Turn Bay	0.0	0.0
Approach	365	1780	1	2146	5.0		0.655		10.0	LOS B	14.9	108.4				
Intersection				4622	5.0		0.663		15.7	LOS B	15.3	111.4				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

PHASING SUMMARY

Site: 2046_AM Peak

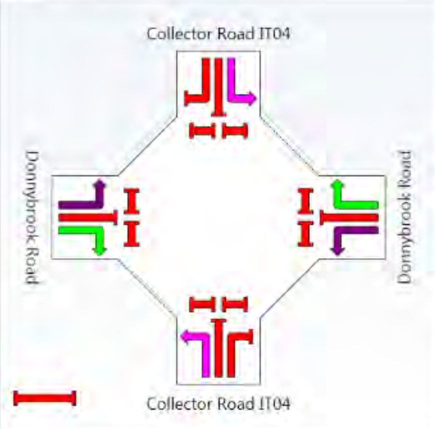
IT04
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

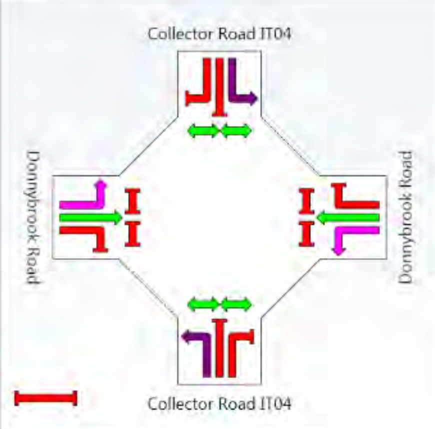
Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	6	57	16	17
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	12	63	22	23
Phase Split	10 %	53 %	18 %	19 %

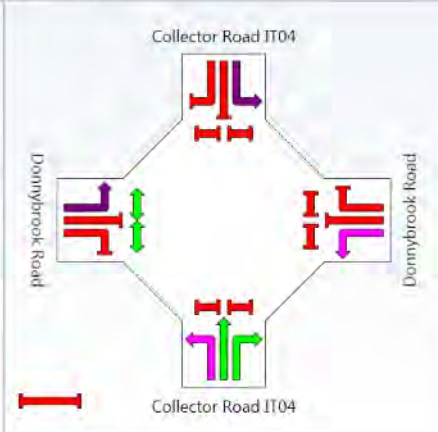
Phase A



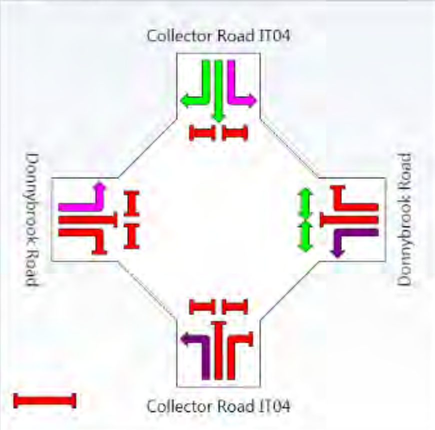
Phase B



Phase C



Phase D



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

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SIDRA INTERSECTION 5.1.9.2068

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LANE SUMMARY

Site: 2046_PM Peak

IT04

Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT04																
Lane 1	1	0	0	1	5.0	203[1]	0.005	100	16.9	LOS A	0.0	0.2	25	Turn Bay	0.0	0.0
Lane 2	0	84	0	84	5.0	254	0.330	100	51.9	LOS A	4.6	33.3	500	–	0.0	0.0
Lane 3	0	0	63	63	5.0	242	0.261	79[5]	58.5	LOS A	3.4	24.7	125	Turn Bay	0.0	0.0
Approach	1	84	63	148	5.0		0.330		54.5	LOS A	4.6	33.3				
East: Donnybrook Road																
Lane 1	129	0	0	129	5.0	730[1]	0.177	100	9.0	LOS A	0.8	6.0	35	Turn Bay	0.0	0.0
Lane 2	0	593	0	593	5.0	747	0.794	100	20.4	LOS C	25.3	184.8	500	–	0.0	0.0
Lane 3	0	593	0	593	5.0	747	0.794	100	20.4	LOS C	25.3	184.8	500	–	0.0	0.0
Lane 4	0	593	0	593	5.0	747	0.794	100	20.4	LOS C	25.3	184.8	500	–	0.0	0.0
Lane 5	0	0	97	97	5.0	121	0.803	100	75.5	LOS C	6.2	45.3	100	Turn Bay	0.0	0.0
Approach	129	1780	97	2006	5.0		0.803		22.4	LOS C	25.3	184.8				
North: Collector Road IT04																
Lane 1	1	0	0	1	5.0	592[1]	0.002	100	14.3	LOS A	0.0	0.1	90	Turn Bay	0.0	0.0
Lane 2	0	101	203	304	5.0	384	0.791	100	58.7	LOS C	18.0	131.1	500	–	0.0	0.0
Lane 3	0	0	248	248	5.0	314[1]	0.791	100	60.5	LOS C	14.4	105.1	80	Turn Bay	0.0	29.9
Approach	1	101	451	553	5.0		0.791		59.4	LOS C	18.0	131.1				
West: Donnybrook Road																
Lane 1	397	0	0	397	5.0	1027[1]	0.386	100	10.2	LOS A	3.7	27.2	80	Turn Bay	0.0	0.0
Lane 2	0	601	0	601	5.0	747	0.804	100	20.8	LOS C	26.2	191.0	500	–	0.0	0.0
Lane 3	0	601	0	601	5.0	747	0.804	100	20.8	LOS C	26.2	191.0	500	–	0.0	0.0
Lane 4	0	601	0	601	5.0	747	0.804	100	20.8	LOS C	26.2	191.0	500	–	0.0	0.0
Lane 5	0	0	1	1	5.0	121	0.008	100	62.7	LOS A	0.1	0.4	45	Turn Bay	0.0	0.0
Approach	397	1803	1	2201	5.0		0.804		18.9	LOS C	26.2	191.0				
Intersection				4908	5.0		0.804		26.0	LOS C	26.2	191.0				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

SIDRA INTERSECTION

PHASING SUMMARY

Site: 2046_PM Peak

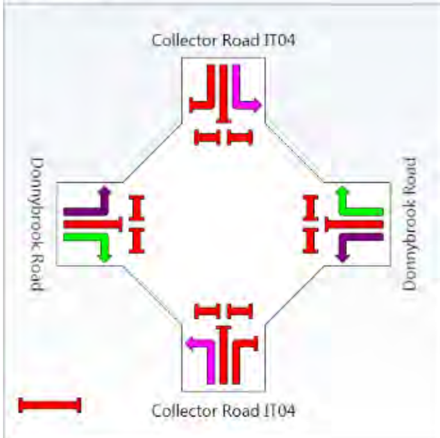
IT04
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Split Phasing
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

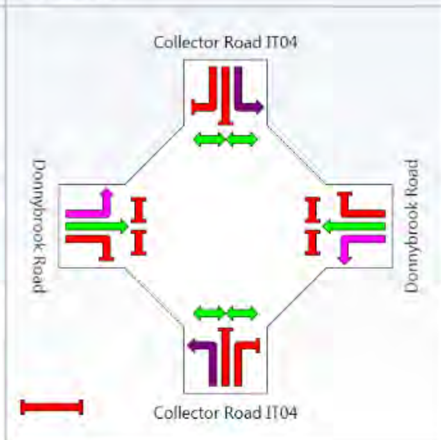
Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	8	47	16	25
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	14	53	22	31
Phase Split	12 %	44 %	18 %	26 %

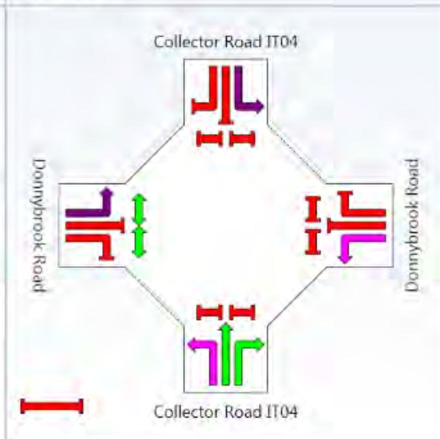
Phase A



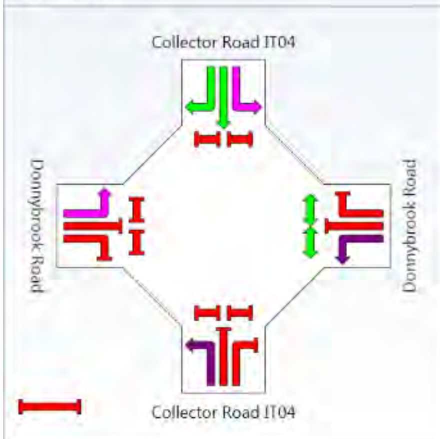
Phase B



Phase C



Phase D



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

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SIDRA INTERSECTION 5.1.9.2068

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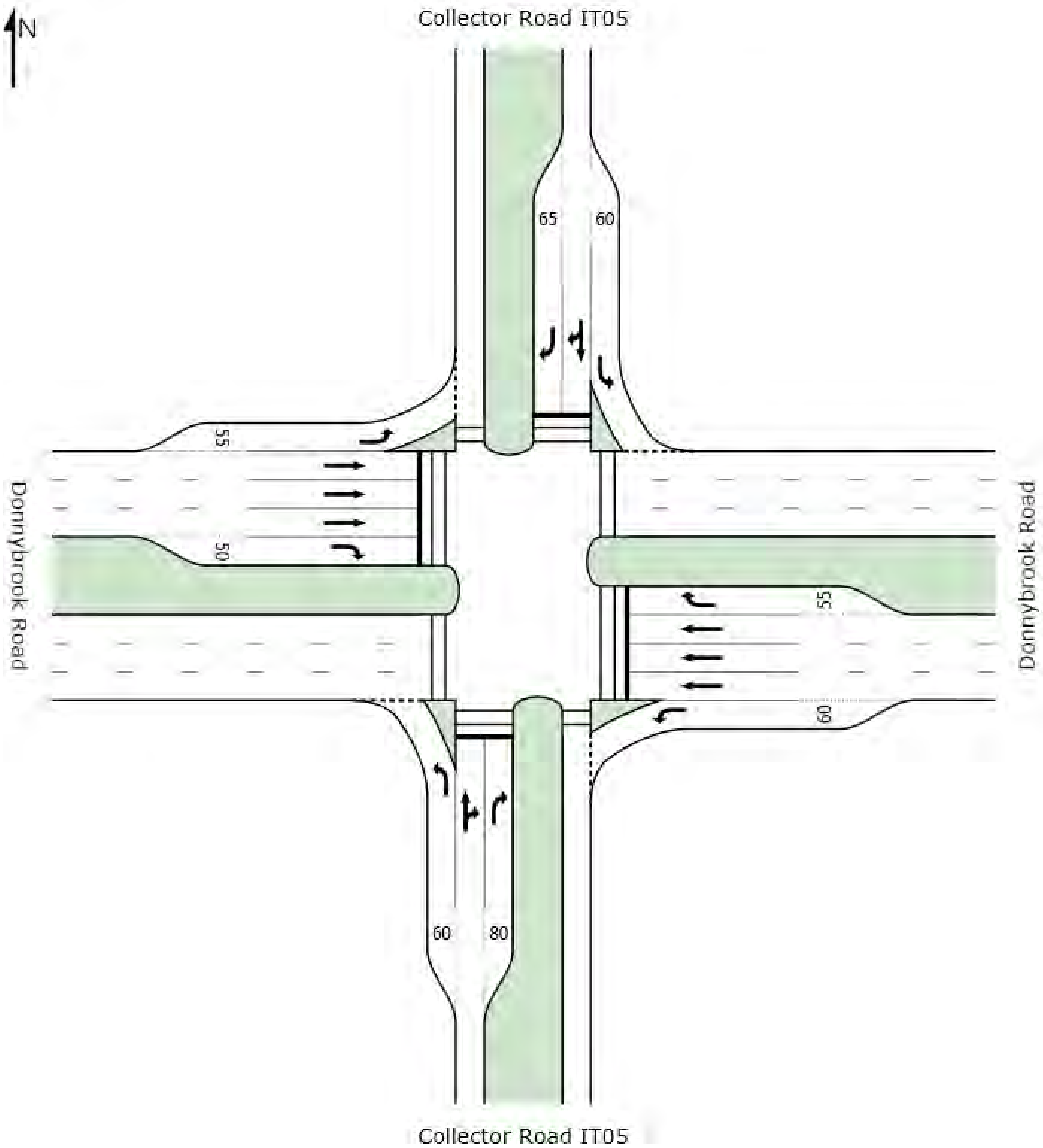

N
Collector Road IT05
65
60
55
50
Donnybrook Road
Donnybrook Road
55
60
60
80
Collector Road IT05

LANE SUMMARY

Site: 2046_AM Peak

IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT05																
Lane 1	86	0	0	86	5.0	486 [1]	0.177	100	10.5	LOS A	1.2	8.6	60	Turn Bay	0.0	0.0
Lane 2	0	42	28	70	5.0	234	0.300	100	55.5	LOS A	3.8	27.9	500	–	0.0	0.0
Lane 3	0	0	68	68	5.0	226	0.300	100	59.9	LOS A	3.7	27.1	80	Turn Bay	0.0	0.0
Approach	86	42	96	224	5.0		0.300		39.5	LOS A	3.8	27.9				
East: Donnybrook Road																
Lane 1	449	0	0	449	5.0	1086 [1]	0.414	100	8.9	LOS A	2.7	19.5	60	Turn Bay	0.0	0.0
Lane 2	0	505	0	505	5.0	747	0.676	100	18.4	LOS B	18.3	133.5	500	–	0.0	0.0
Lane 3	0	505	0	505	5.0	747	0.676	100	18.4	LOS B	18.3	133.5	500	–	0.0	0.0
Lane 4	0	505	0	505	5.0	747	0.676	100	18.4	LOS B	18.3	133.5	500	–	0.0	0.0
Lane 5	0	0	150	150	5.0	211	0.710	100	67.1	LOS C	9.0	65.4	55	Turn Bay	0.0	20.7
Approach	449	1516	150	2115	5.0		0.710		19.9	LOS C	18.3	133.5				
North: Collector Road IT05																
Lane 1	410	0	0	410	5.0	516 [1]	0.795	100	22.8	LOS C	12.0	87.3	60	Turn Bay	0.0	39.3
Lane 2	0	40	0	40	5.0	318	0.126	100	47.3	LOS A	2.0	14.6	500	–	0.0	0.0
Lane 3	0	0	2	2	5.0	258 [1]	0.008	6 [5]	53.0	LOS A	0.1	0.7	65	Turn Bay	0.0	0.0
Approach	410	40	2	452	5.0		0.795		25.1	LOS C	12.0	87.3				
West: Donnybrook Road																
Lane 1	1	0	0	1	5.0	792 [1]	0.001	100	10.0	LOS A	0.0	0.1	55	Turn Bay	0.0	0.0
Lane 2	0	546	0	546	5.0	747	0.731	100	19.0	LOS C	21.1	154.1	500	–	0.0	0.0
Lane 3	0	546	0	546	5.0	747	0.731	100	19.0	LOS C	21.1	154.1	500	–	0.0	0.0
Lane 4	0	546	0	546	5.0	747	0.731	100	19.0	LOS C	21.1	154.1	500	–	0.0	0.0
Lane 5	0	0	29	29	5.0	204 [1]	0.142	100	56.0	LOS A	1.4	10.5	50	Turn Bay	0.0	0.0
Approach	1	1638	29	1668	5.0		0.731		19.6	LOS C	21.1	154.1				
Intersection				4459	5.0		0.795		21.3	LOS C	21.1	154.1				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

SIDRA INTERSECTION

PHASING SUMMARY

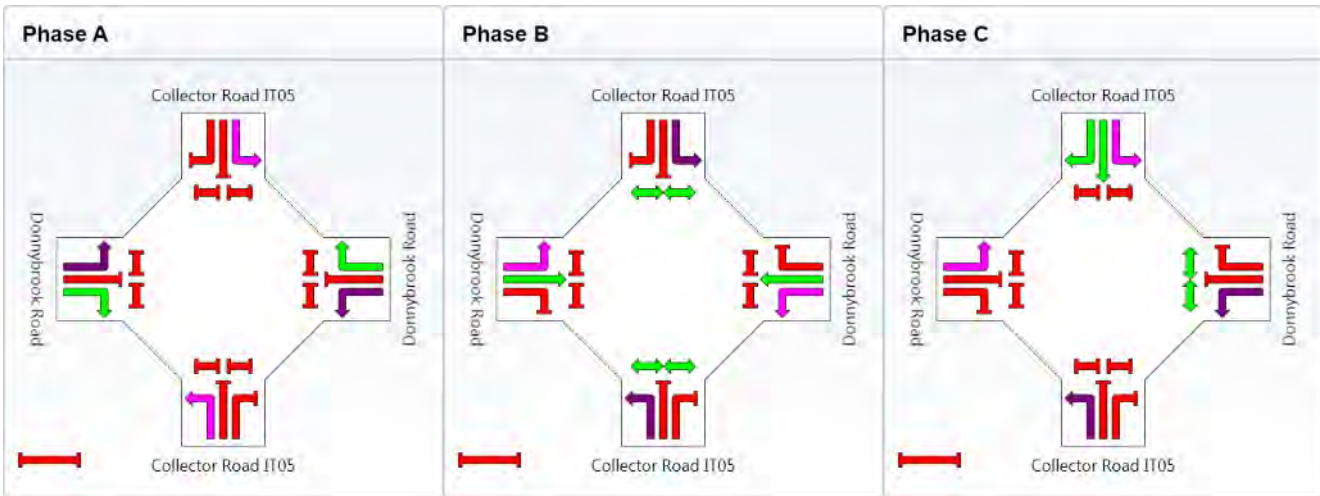
Site: 2046_AM Peak

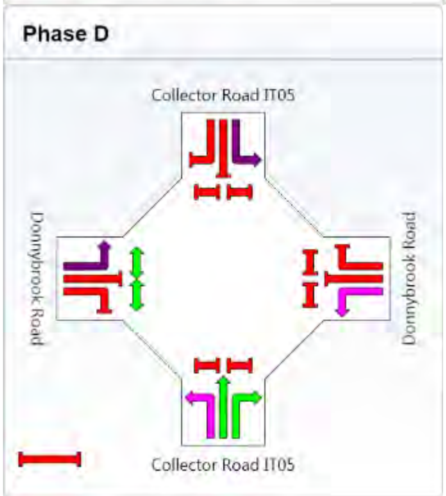
IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Leading Right Turn
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	14	47	20	15
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	20	53	26	21
Phase Split	17 %	44 %	22 %	18 %





Processed: Tuesday, 22 May 2012 2:45:50 PM
SIDRA INTERSECTION 5.1.9.2068

SIDRA INTERSECTION

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8000617, SMEC AUSTRALIA PTY LTD, SINGLE

LANE SUMMARY

Site: 2046_PM Peak

IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT05																
Lane 1	29	0	0	29	5.0	436[1]	0.067	100	10.1	LOS A	0.4	2.6	60	Turn Bay	0.0	0.0
Lane 2	0	60	206	266	5.0	290	0.917	100	76.0	LOS D	18.5	134.9	500	–	0.0	0.0
Lane 3	0	0	263	263	5.0	287	0.917	100	75.5[8]	LOS D[8]	17.9[8]	130.6[8]	80	Turn Bay	0.0	50.0
Approach	29	60	469	558	5.0		0.917		72.3	LOS D	18.5	134.9				
East: Donnybrook Road																
Lane 1	116	0	0	116	5.0	935[1]	0.124	100	9.3	LOS A	0.8	6.1	60	Turn Bay	0.0	0.0
Lane 2	0	568	0	568	5.0	843	0.674	100	13.4	LOS B	17.3	126.0	500	–	0.0	0.0
Lane 3	0	568	0	568	5.0	843	0.674	100	13.4	LOS B	17.3	126.0	500	–	0.0	0.0
Lane 4	0	568	0	568	5.0	843	0.674	100	13.4	LOS B	17.3	126.0	500	–	0.0	0.0
Lane 5	0	0	210	210	5.0	229[1]	0.918	100	63.7[8]	LOS D[8]	12.3[8]	89.8[8]	55	Turn Bay	0.0	50.0
Approach	116	1704	210	2030	5.0		0.918		18.4	LOS D	17.3	126.0				
North: Collector Road IT05																
Lane 1	150	0	0	150	5.0	402[1]	0.373	100	22.4	LOS A	4.2	30.7	60	Turn Bay	0.0	0.0
Lane 2	0	62	0	62	5.0	254	0.244	100	52.3	LOS A	3.3	24.2	500	–	0.0	0.0
Lane 3	0	0	1	1	5.0	242	0.004	2[5]	56.6	LOS A	0.1	0.4	65	Turn Bay	0.0	0.0
Approach	150	62	1	213	5.0		0.373		31.3	LOS A	4.2	30.7				
West: Donnybrook Road																
Lane 1	1	0	0	1	5.0	683[1]	0.001	100	10.6	LOS A	0.0	0.1	55	Turn Bay	0.0	0.0
Lane 2	0	527	0	527	5.0	572	0.921	100	41.1	LOS D	32.5	236.9	500	–	0.0	0.0
Lane 3	0	527	0	527	5.0	572	0.921	100	41.1	LOS D	32.5	236.9	500	–	0.0	0.0
Lane 4	0	527	0	527	5.0	572	0.921	100	41.1	LOS D	32.5	236.9	500	–	0.0	0.0
Lane 5	0	0	86	86	5.0	121	0.712	100	68.9	LOS C	5.2	38.2	50	Turn Bay	0.0	0.0
Approach	1	1582	86	1669	5.0		0.921		42.5	LOS D	32.5	236.9				
Intersection				4470	5.0		0.921		34.7	LOS D	32.5	236.9				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

PHASING SUMMARY

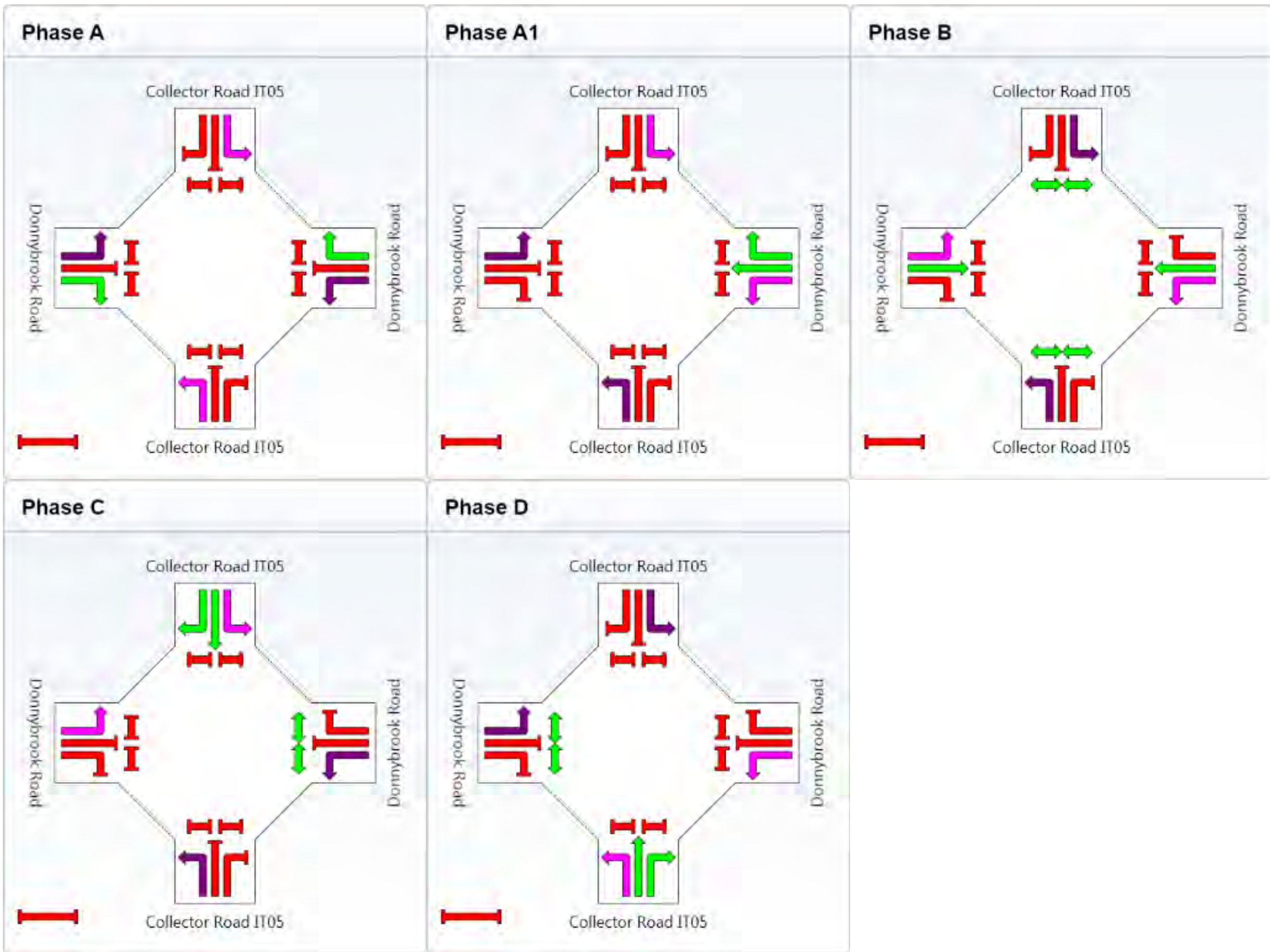
Site: 2046_PM Peak

IT05
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

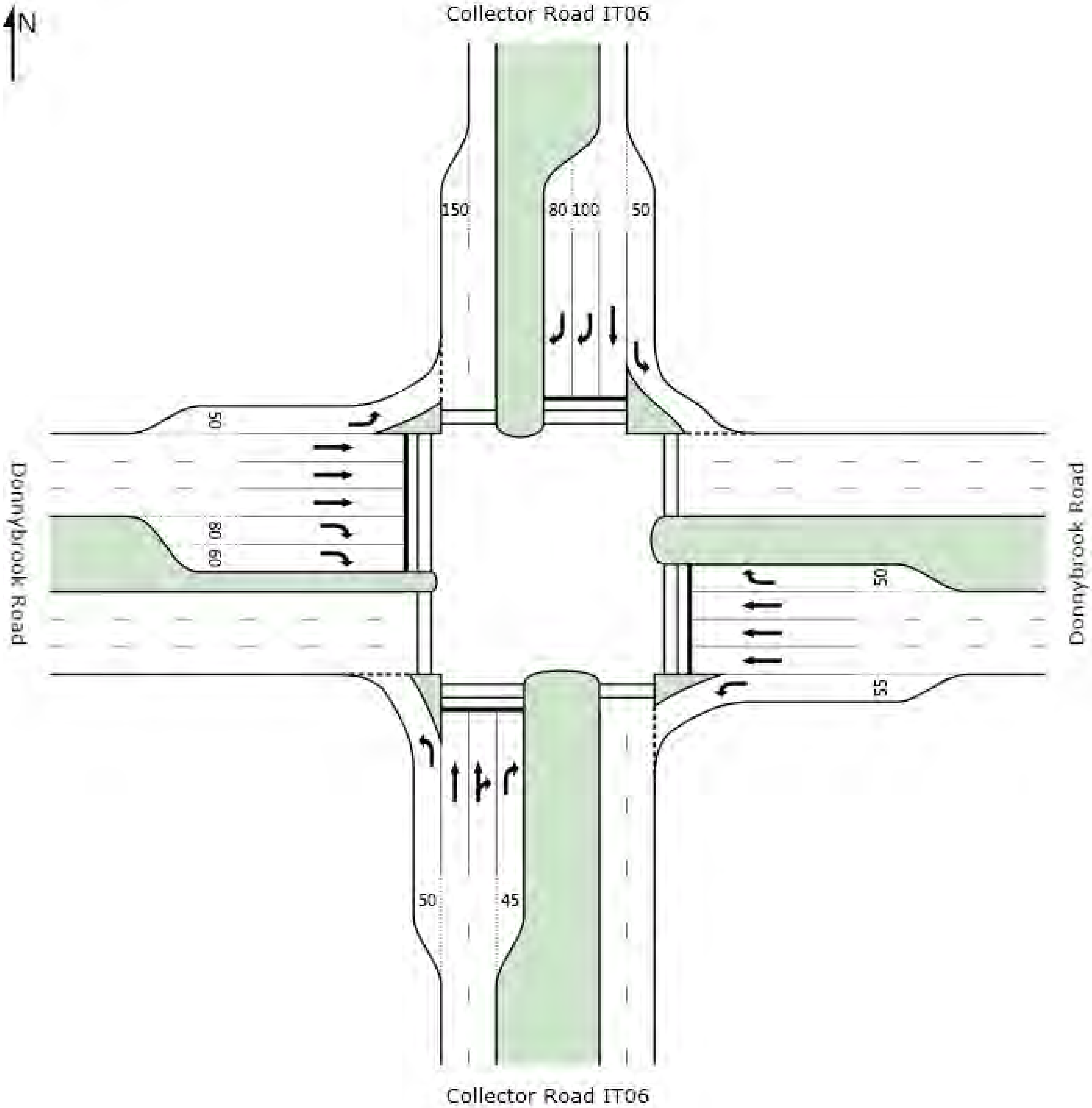
Phase times determined by the program
Sequence: Leading Right Turn
Input Sequence: A, A1, B, C, D
Output Sequence: A, A1, B, C, D

Phase Timing Results

Phase	A	A1	B	C	D
Green Time (sec)	8	11	36	16	19
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	14	17	42	22	25
Phase Split	12 %	14 %	35 %	18 %	21 %



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied


N
Collector Road IT06
150
80 100
50
Donnybrook Road
50
80
60
Donnybrook Road
50
55
50
45
Collector Road IT06

LANE SUMMARY

Site: 2046_AM Peak

IT06

Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT06																
Lane 1	269	0	0	269	5.0	386[1]	0.697	100	19.1	LOS B	7.4	53.7	50	Turn Bay	0.0	11.4
Lane 2	0	95	0	95	5.0	366	0.260	54[5]	44.8	LOS A	4.8	34.8	500	–	0.0	0.0
Lane 3	0	0	167	167	5.0	347	0.480	100	54.2	LOS A	8.8	64.3	500	–	0.0	0.0
Lane 4	0	0	90	90	5.0	189[1]	0.480	100	51.9	LOS A	4.6	33.2	45	Turn Bay	0.0	0.0
Approach	269	95	257	621	5.0		0.697		37.2	LOS B	8.8	64.3				
East: Donnybrook Road																
Lane 1	227	0	0	227	5.0	559[1]	0.406	100	12.9	LOS A	3.8	28.0	55	Turn Bay	0.0	0.0
Lane 2	0	459	0	459	5.0	588	0.780	100	29.6	LOS C	22.2	162.3	500	–	0.0	0.0
Lane 3	0	459	0	459	5.0	588	0.780	100	29.6	LOS C	22.2	162.3	500	–	0.0	0.0
Lane 4	0	459	0	459	5.0	588	0.780	100	29.6	LOS C	22.2	162.3	500	–	0.0	0.0
Lane 5	0	0	1	1	5.0	91	0.011	100	68.5	LOS A	0.1	0.4	50	Turn Bay	0.0	0.0
Approach	227	1377	1	1605	5.0		0.780		27.2	LOS C	22.2	162.3				
North: Collector Road IT06																
Lane 1	1	0	0	1	5.0	354[1]	0.003	100	13.1	LOS A	0.0	0.1	50	Turn Bay	0.0	0.0
Lane 2	0	194	0	194	5.0	318	0.610	100	52.1	LOS B	10.7	78.5	500	–	0.0	0.0
Lane 3	0	0	235	235	5.0	302	0.777	100	64.2	LOS C	14.0	102.5	100	Turn Bay	0.0	7.2
Lane 4	0	0	235	235	5.0	302	0.777	100	64.2	LOS C	14.0	102.5	80	Turn Bay	0.0	27.6
Approach	1	194	469	664	5.0		0.777		60.6	LOS C	14.0	102.5				
West: Donnybrook Road																
Lane 1	151	0	0	151	5.0	947[1]	0.159	100	9.4	LOS A	0.9	6.4	50	Turn Bay	0.0	0.0
Lane 2	0	470	0	470	5.0	747	0.629	100	18.0	LOS B	16.1	117.7	500	–	0.0	0.0
Lane 3	0	470	0	470	5.0	747	0.629	100	18.0	LOS B	16.1	117.7	500	–	0.0	0.0
Lane 4	0	470	0	470	5.0	747	0.629	100	18.0	LOS B	16.1	117.7	500	–	0.0	0.0
Lane 5	0	0	193	193	5.0	242	0.797	100	60.4	LOS C	11.3	82.5	80	Turn Bay	0.0	7.8
Lane 6	0	0	193	193	5.0	242	0.797	100	60.4	LOS C	11.3	82.5	60	Turn Bay	0.0	34.0
Approach	151	1411	385	1947	5.0		0.797		25.7	LOS C	16.1	117.7				
Intersection				4837	5.0		0.797		32.5	LOS C	22.2	162.3				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

SIDRA INTERSECTION

PHASING SUMMARY

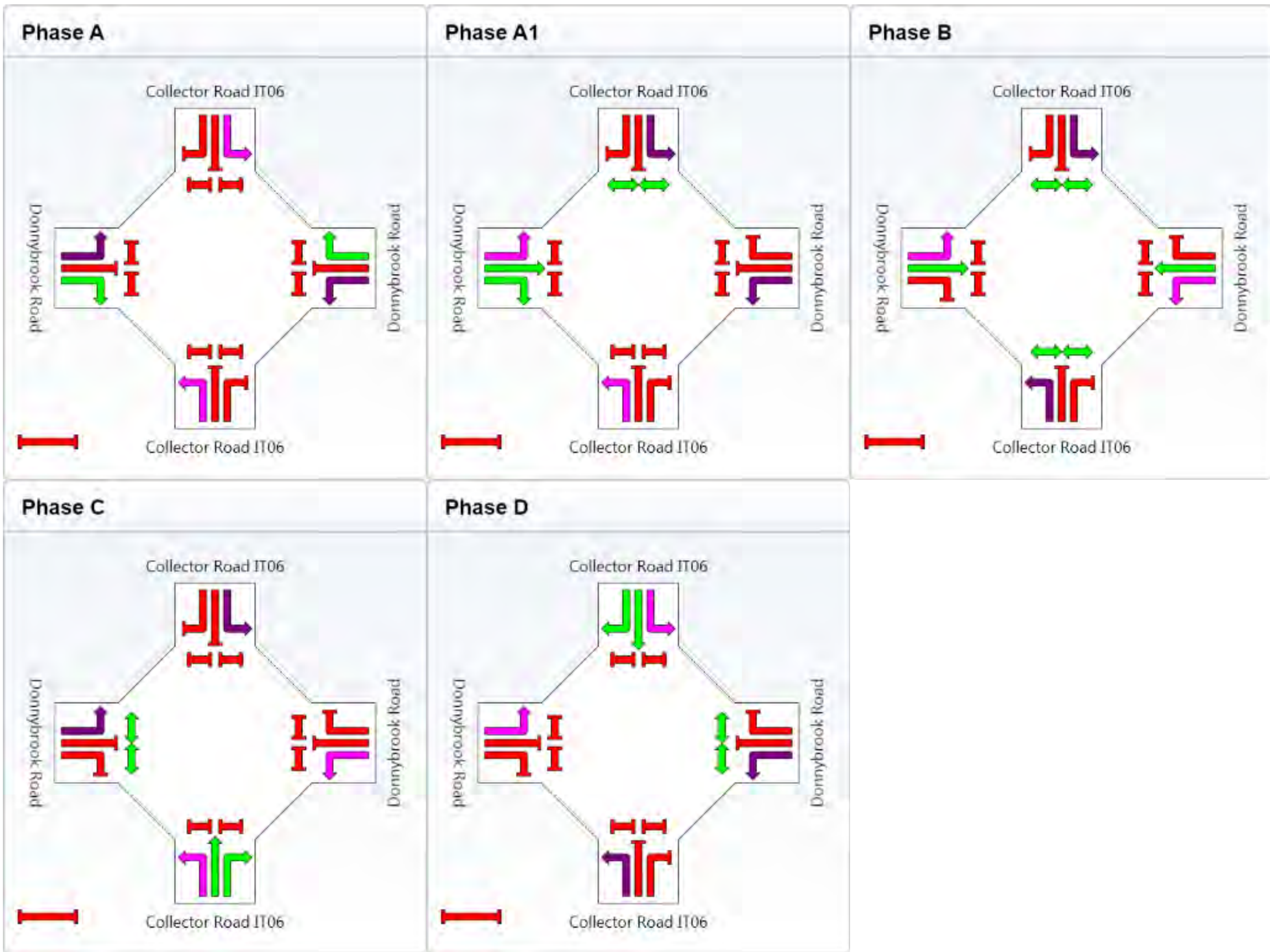
Site: 2046_AM Peak

IT06
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Diamond 1
Input Sequence: A, A1, B, C, D
Output Sequence: A, A1, B, C, D

Phase Timing Results

Phase	A	A1	B	C	D
Green Time (sec)	6	4	37	23	20
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	12	10	43	29	26
Phase Split	10 %	8 %	36 %	24 %	22 %



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

LANE SUMMARY

Site: 2046_PM Peak

IT06
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Collector Road IT06																
Lane 1	385	0	0	385	5.0	447[1]	0.862	100	22.7[8]	LOS C[8]	11.2[8]	81.6[8]	50	Turn Bay	0.0	50.0
Lane 2	0	164	0	164	5.0	302	0.543	93[6]	51.1	LOS A	9.0	65.9	500	–	0.0	0.0
Lane 3	0	39	131	170	5.0	290	0.584	100	57.0	LOS A	9.4	68.8	500	–	0.0	0.0
Lane 4	0	0	105	105	5.0	180[1]	0.584	100	56.7	LOS A	5.6	41.1	45	Turn Bay	0.0	0.0
Approach	385	203	236	824	5.0		0.862		39.8	LOS C	11.2	81.6				
East: Donnybrook Road																
Lane 1	266	0	0	266	5.0	687[1]	0.387	100	10.2	LOS A	2.9	21.5	55	Turn Bay	0.0	0.0
Lane 2	0	489	0	489	5.0	541	0.905	100	40.7	LOS D	29.3	214.1	500	–	0.0	0.0
Lane 3	0	489	0	489	5.0	541	0.905	100	40.7	LOS D	29.3	214.1	500	–	0.0	0.0
Lane 4	0	489	0	489	5.0	541	0.905	100	40.7	LOS D	29.3	214.1	500	–	0.0	0.0
Lane 5	0	0	200	200	5.0	215[1]	0.930	100	59.8[8]	LOS D[8]	11.2[8]	81.6[8]	50	Turn Bay	0.0	50.0
Approach	266	1468	200	1934	5.0		0.930		38.4	LOS D	29.3	214.1				
North: Collector Road IT06																
Lane 1	1	0	0	1	5.0	391[1]	0.003	100	15.7	LOS A	0.0	0.1	50	Turn Bay	0.0	0.0
Lane 2	0	104	0	104	5.0	254	0.409	100	53.8	LOS A	5.7	41.7	500	–	0.0	0.0
Lane 3	0	0	76	76	5.0	242	0.313	100	60.3	LOS A	4.1	29.9	100	Turn Bay	0.0	0.0
Lane 4	0	0	76	76	5.0	242	0.313	100	60.3	LOS A	4.1	29.9	80	Turn Bay	0.0	0.0
Approach	1	104	151	256	5.0		0.409		57.5	LOS A	5.7	41.7				
West: Donnybrook Road																
Lane 1	469	0	0	469	5.0	573[1]	0.819	100	21.0[8]	LOS C[8]	11.2[8]	81.6[8]	50	Turn Bay	0.0	50.0
Lane 2	0	478	0	478	5.0	541	0.884	100	38.4	LOS C	27.6	201.2	500	–	0.0	0.0
Lane 3	0	478	0	478	5.0	541	0.884	100	38.4	LOS C	27.6	201.2	500	–	0.0	0.0
Lane 4	0	478	0	478	5.0	541	0.884	100	38.4	LOS C	27.6	201.2	500	–	0.0	0.0
Lane 5	0	0	149	149	5.0	364[1]	0.410	100	42.5	LOS A	6.4	46.6	80	Turn Bay	0.0	0.0
Lane 6	0	0	120	120	5.0	291[1]	0.410	100	41.8	LOS A	4.9	36.1	60	Turn Bay	0.0	0.0
Approach	469	1434	269	2172	5.0		0.884		35.1	LOS C	27.6	201.2				
Intersection				5186	5.0		0.930		38.2	LOS D	29.3	214.1				

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

SIDRA INTERSECTION

PHASING SUMMARY

Site: 2046_PM Peak

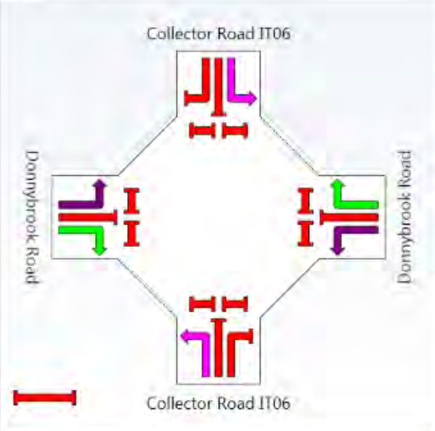
IT06
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Diamond 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

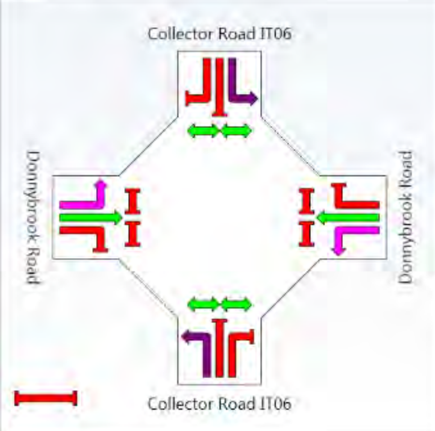
Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	27	34	19	16
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	33	40	25	22
Phase Split	28 %	33 %	21 %	18 %

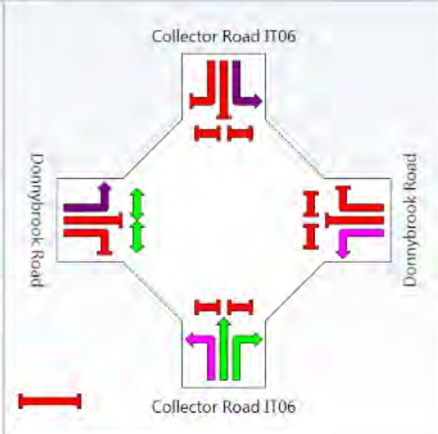
Phase A



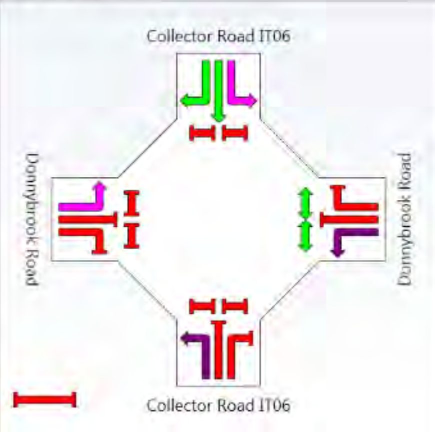
Phase B



Phase C



Phase D



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

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SIDRA INTERSECTION 5.1.9.2068

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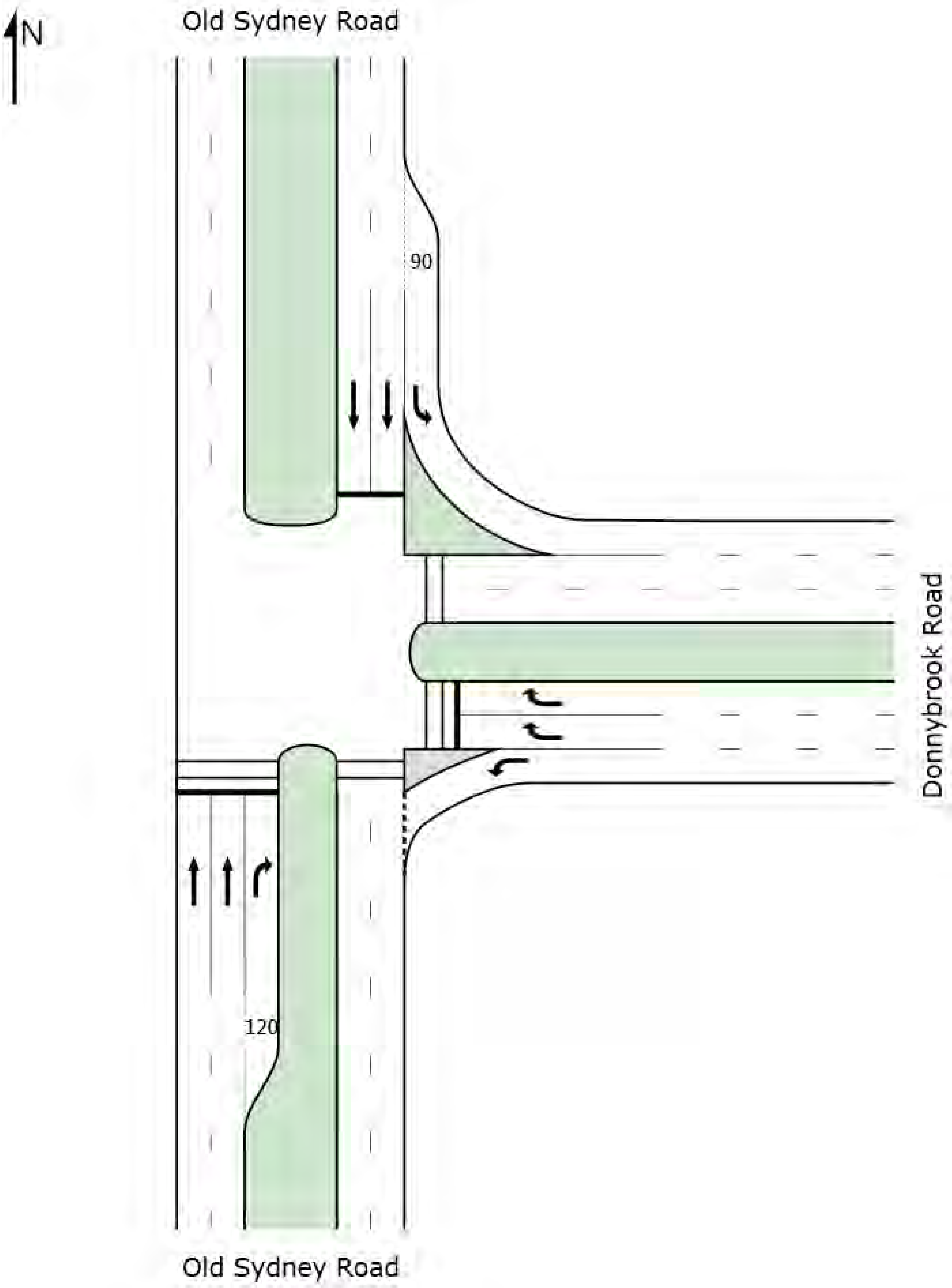

N
Old Sydney Road
90
Donnybrook Road
120
Old Sydney Road

LANE SUMMARY

Site: 2046_AM Peak

IT07
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Old Sydney Road																
Lane 1	0	18	0	18	5.0	1511	0.012	100	2.7	LOS A	0.2	1.5	500	–	0.0	0.0
Lane 2	0	18	0	18	5.0	1511	0.012	100	2.7	LOS A	0.2	1.5	500	–	0.0	0.0
Lane 3	0	0	268	268	5.0	476[1]	0.563	100	47.7	LOS A	13.1	95.4	120	Turn Bay	0.0	0.0
Approach	0	35	268	303	5.0		0.563		42.5	LOS A	13.1	95.4				
East: Donnybrook Road																
Lane 1	348	0	0	348	5.0	1029	0.338	100	16.0	LOS A	8.8	64.0	500	–	0.0	0.0
Lane 2	0	0	37	37	5.0	196	0.189	100	63.4	LOS A	2.0	14.8	500	–	0.0	0.0
Lane 3	0	0	37	37	5.0	196	0.189	100	63.4	LOS A	2.0	14.8	500	–	0.0	0.0
Approach	348	0	74	422	5.0		0.338		24.3	LOS A	8.8	64.0				
North: Old Sydney Road																
Lane 1	959	0	0	959	5.0	1812	0.529	100	9.6	X	X	X	90	Turn Bay	0.0	X
Lane 2	0	475	0	475	5.0	859	0.553	100	25.7	LOS A	20.1	146.9	500	–	0.0	0.0
Lane 3	0	475	0	475	5.0	859	0.553	100	25.7	LOS A	20.1	146.9	500	–	0.0	0.0
Approach	959	949	0	1908	5.0		0.553		17.6	LOS A	20.1	146.9				
Intersection				2633	5.0		0.563		21.6	LOS A	20.1	146.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

SIDRA INTERSECTION

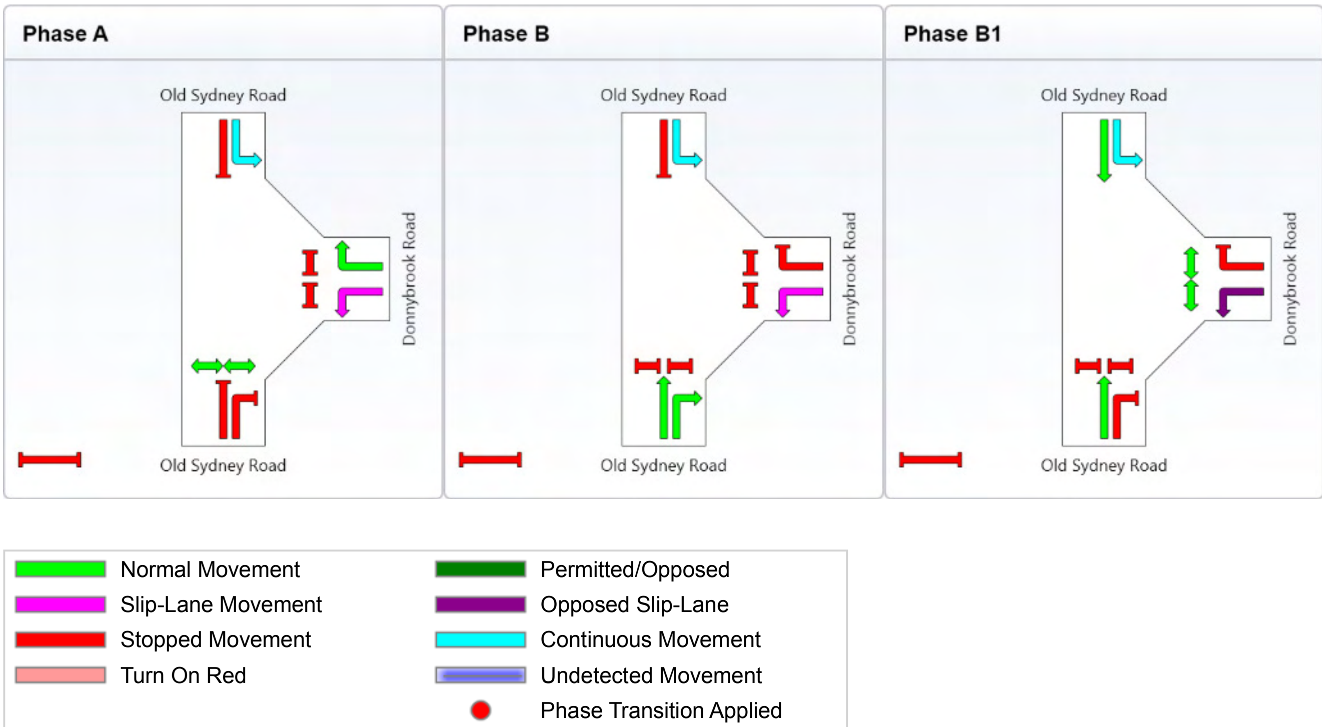
PHASING SUMMARY

IT07
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, B, B1
Output Sequence: A, B, B1

Phase Timing Results

Phase	A	B	B1
Green Time (sec)	13	35	54
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	19	41	60
Phase Split	16 %	34 %	50 %



LANE SUMMARY

Site: 2046_PM Peak

IT07
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Old Sydney Road																
Lane 1	0	475	0	475	5.0	1049	0.452	100	17.1	LOS A	16.4	119.5	500	–	0.0	0.0
Lane 2	0	475	0	475	5.0	1049	0.452	100	17.1	LOS A	16.4	119.5	500	–	0.0	0.0
Lane 3	0	0	405	405	5.0	534[1]	0.759	100	42.1	LOS C	19.2	139.9	120	Turn Bay	0.0	18.9
Approach	0	949	405	1354	5.0		0.759		24.6	LOS C	19.2	139.9				
East: Donnybrook Road																
Lane 1	325	0	0	325	5.0	1618	0.201	100	9.9	LOS A	1.2	9.1	500	–	0.0	0.0
Lane 2	0	0	480	480	5.0	634	0.756	100	47.3	LOS C	25.1	183.3	500	–	0.0	0.0
Lane 3	0	0	480	480	5.0	634	0.756	100	47.3	LOS C	25.1	183.3	500	–	0.0	0.0
Approach	325	0	959	1284	5.0		0.756		37.8	LOS C	25.1	183.3				
North: Old Sydney Road																
Lane 1	74	0	0	74	5.0	1812	0.041	100	9.5	X	X	X	90	Turn Bay	0.0	X
Lane 2	0	18	0	18	5.0	207	0.085	100	52.7	LOS A	0.9	6.9	500	–	0.0	0.0
Lane 3	0	18	0	18	5.0	207	0.085	100	52.7	LOS A	0.9	6.9	500	–	0.0	0.0
Approach	74	35	0	109	5.0		0.085		23.4	LOS C	0.9	6.9				
Intersection				2747	5.0		0.759		30.7	LOS C	25.1	183.3				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Degree of Saturation (SIDRA METHOD).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

PHASING SUMMARY

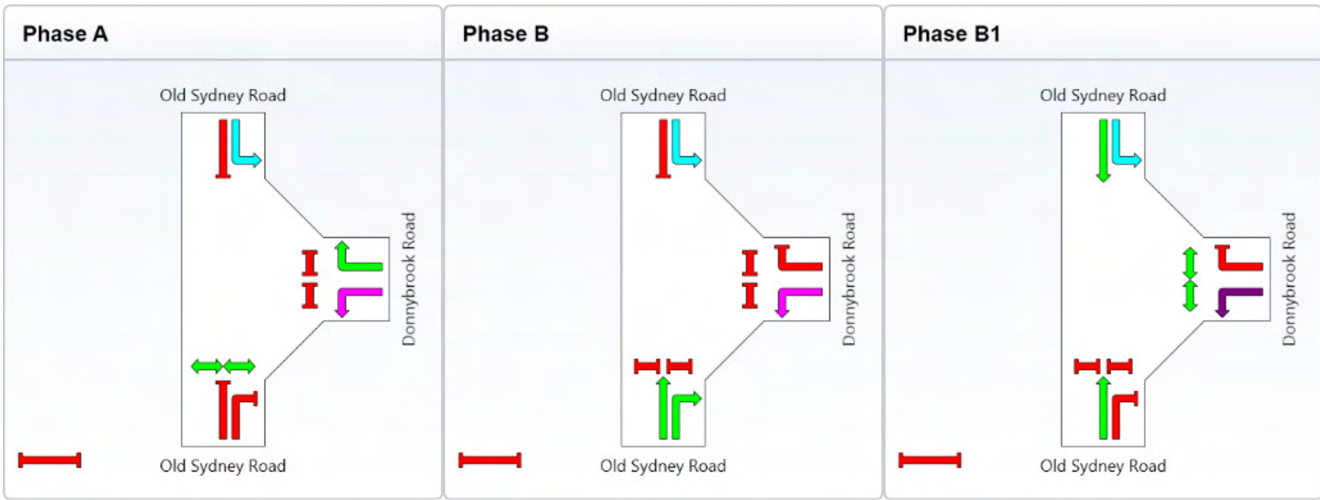
Site: 2046_PM Peak

IT07
Signals - Fixed Time   Cycle Time = 120 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, B, B1
Output Sequence: A, B, B1

Phase Timing Results

Phase	A	B	B1
Green Time (sec)	42	47	13
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	48	53	19
Phase Split	40 %	44 %	16 %



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

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SIDRA INTERSECTION 5.1.9.2068

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