Department of Planning, Industrial and Environment

Pondicherry Precinct Traffic and Transport Study Report

March 2021

Executive summary

GHD has been commissioned by Greenfields Development Company Pty Ltd on behalf of the Department of Planning, Industry and Environment (DPIE) to undertake a Traffic and Transport Assessment for the Pondicherry Precinct.

The proposed Pondicherry Precinct development, as shown in Figure 1-1, is located to the east of The Northern Road, south of South Creek West Land Release Area and north of Oran Park. The site is located in Western Sydney, and is one of 14 precincts included in the South West Growth Area (SWGA). The SWGA is divided into 14 precincts that are progressively being released for planning and rezoning to accommodate increased population growth in Sydney.

The Pondicherry Precinct will consist of approximately 2,700 dwellings with supporting educational and recreational facilities. Further, the precinct is being rezoned via the Precinct Acceleration Proposal. This will allow the precinct to be developed earlier than the timeframes detailed by the Growth Centres Commission.

The proposed road structure / hierarchy for the Pondicherry Precinct is presented in Figure 1-1

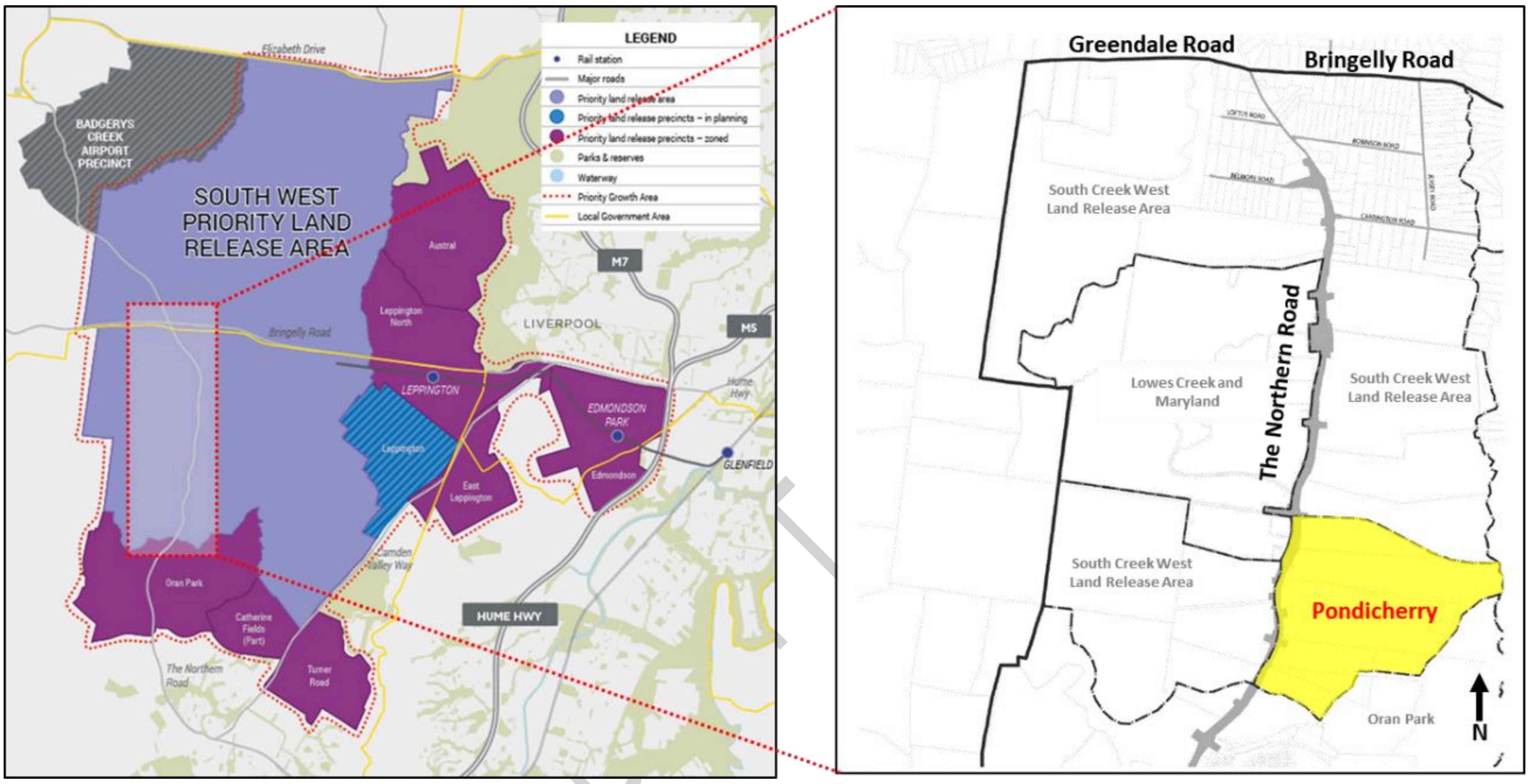
- Two east-west sub-arterials providing access from The Northern Road (TNR) to the precinct via new signalised intersections.
- A sub-arterial extension of Oran Park Drive providing north-south connectivity from Oran Park to the precinct.
- A collector road network that distributes local traffic throughout the subject site and directs vehicles to sub-arterial roads at key intersections.

As approved by DPIE in 2020, a summary of the expected trip generation characteristics of the Pondicherry Precinct (per stage of development) is presented below in Table 5-2 It is assumed Pondicherry will be fully developed by 2036.

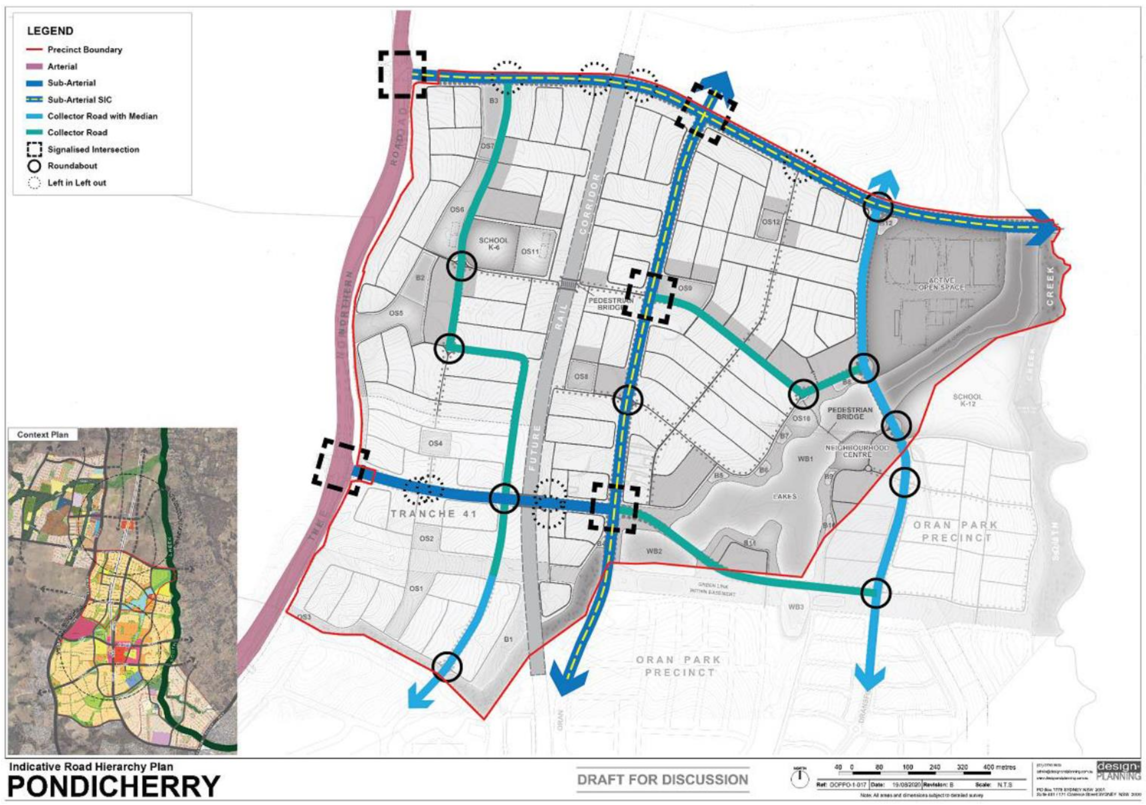
Table 1-1: Trip generation summary – Full Development 2036 Residential and Town Centre

Land Use	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Stage 1	80	321	335	84
Stage 2	72	290	301	75
Stage 3	75	300	310	77
Stage 4	73	291	302	76
Stage 5	122	487	505	126
Stage 6	7	29	37	9
Additional Area	88	332	346	91
Town Centre	-	-	59	59
Primary School	335	335	265	265
High School	602	418	218	342

Extended Impact Area and the location (source: GHD)



Pondicherry Precinct (source: Greenfields)



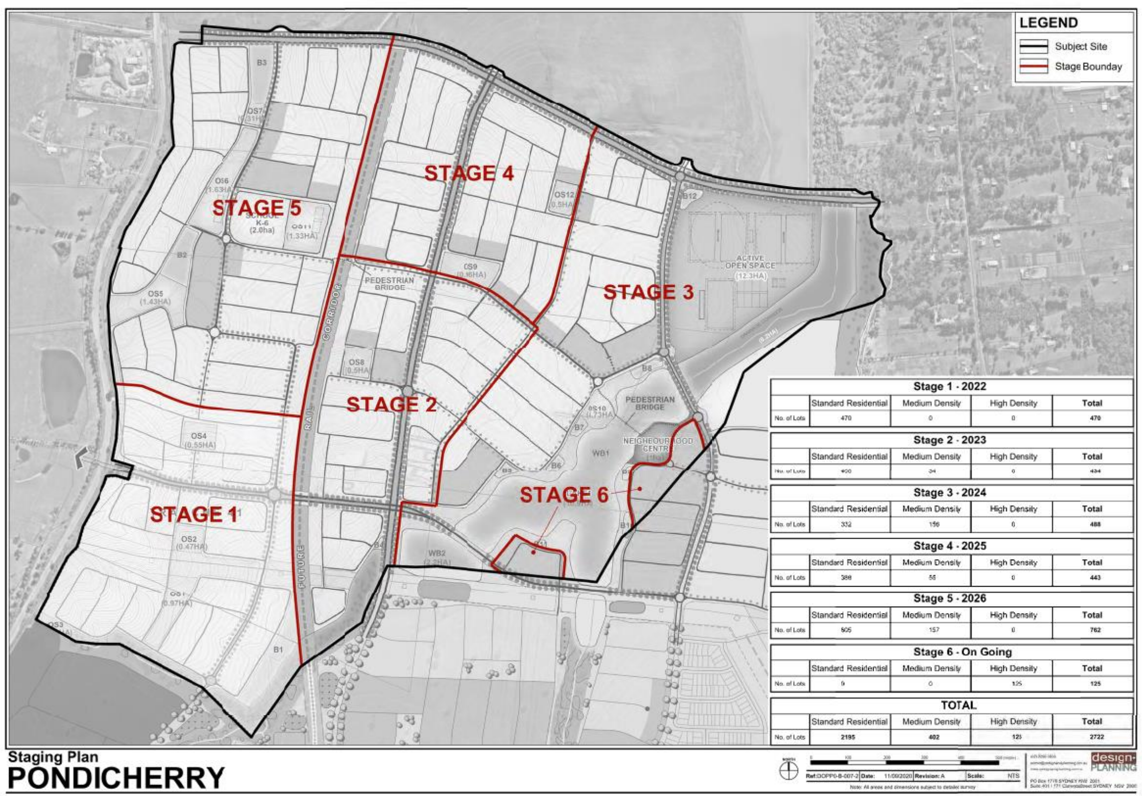


Figure 1-1: Pondicherry Precinct location and Indicative Layout Plan (August 2020)

The traffic impact of Pondicherry was assessed within the wide context of the SWGA, including future development of Oran Park, Lowes Creek and South Creek. It is important to note while the land use forecast within South West Growth Area is rapidly evolving, assumptions were made on the surrounding land uses, in order to provide a basis to assess the traffic impact of Pondicherry Precinct, with the information available to GHD by August 2020. This included a full development of Oran Park north of Cobbitty Road, over 50% development completion within Lowes Creek and South Creek (west of TNR), by 2036. 6-lane TNR and extension of Oran Park Drive to Bringelly Road (2 lanes) were also assumed to facilitate the overall traffic within the extended impact area.

Traffic modelling utilising a series of mesoscopic models (AIMSUN) and intersection models (SIDRA) was undertaken to inform the preliminary layout and the associated impact to the road network, at the intersections accessing Pondicherry from TNR, and those within Pondicherry Precinct. The results revealed the following associated with the future growth along The Northern Road including the full development of Pondicherry Precinct by 2036:

- Within the extended impact area in South West Priority Land Release Area (or South West Growth Area) (top figure in Figure 1-1), the average vehicle speed would be higher than 37 km/h in both AM and PM peak.
- On The Northern Road corridor between Bringelly Road and Cobbitty Road, estimated travel time would range between 11 and 13.5 minutes in both directions during AM and PM peak period. This is correlated to average speed over 40 km/h in peak direction (northbound in AM and southbound in PM).
- On Bringelly Road / Greendale Road the estimated travel time would be approximately 4 minutes in eastbound and range between 5 and 9 minutes in westbound direction in both peak periods. The longer travel time and the associated lower speed in westbound direction was assessed to be resulted from the traffic delay at Bringelly Road and Oran Park Drive (extension) intersection. Investigation of additional capacity at this intersection is potentially required provided the assumed built-out of South Creek utilising Oran Park Drive (extension). Alternatively, a four-lane Oran Park Drive extension may be required to provide additional capacity to accommodate the anticipated movements in 2036.
- All the intersections on The Northern Road would operate within capacity (i.e., at LoS D or better) in 2036, with the proposed 6 lanes alignment.
- All the intersections within Pondicherry Precinct would operate within capacity (i.e., at LoS C or better) in 2036.
- Additional turn lanes are required on Marylands Link Road 1 and Marylands Link Road 2, to facilitate the future traffic generated by the full built-out within Pondicherry and progressive staged development in surrounding area including Oran Park and Lowes Creek.

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1. Introduction

1.1 Background

GHD has been commissioned by Greenfields Development Company Pty Ltd on behalf of the Department of Planning, Industry and Environment (DPIE) to undertake a Traffic and Transport Assessment for the Pondicherry Precinct.

The proposed Pondicherry Precinct development, as shown in Figure 1-1, is located to the east of The Northern Road, south of South Creek West Land Release Area and north of Oran Park. The site is located in Western Sydney and is one of 14 precincts included in the South West Growth Area (SWGA). The SWGA precincts are progressively being released for planning and rezoning to accommodate the increased population growth in Sydney.

The Pondicherry Precinct is proposed to consist of approximately 2,700 dwellings with supporting educational and recreational facilities. Further, the precinct is being rezoned via the Precinct Acceleration Proposal. This process will allow the precinct to be developed earlier than the timeframes detailed by the Growth Centres Commission.

Effective transport planning and management will be required to ensure the provision of an extensive network of traffic and transport facilities that will provide multi-modal travel options for future residents and visitors of Pondicherry Precinct and the wider growth area.

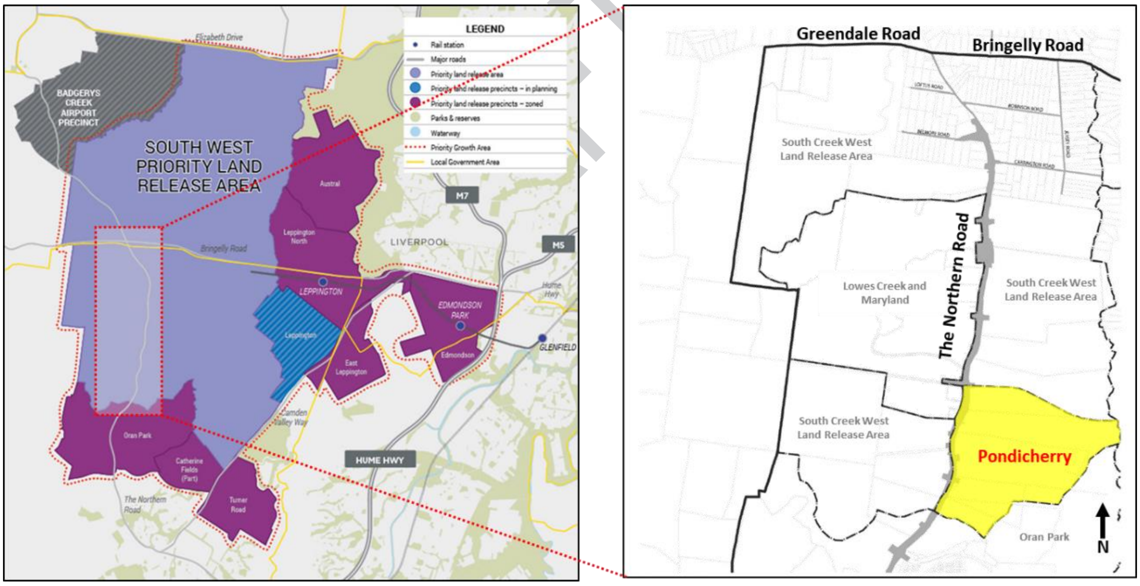


Figure 1-1: Pondicherry Precinct location

1.2 Purpose of this report

This Traffic and Transport Assessment has been undertaken with the following key objectives to support the proposed rezoning of the Pondicherry Precinct:

- Inform future planning controls to ensure a coordinated and efficient approach to land use planning, environmental management and transport infrastructure.
- Provide an integrated approach to determining the optimal mix of land uses and density concentrations as a means of minimising (where possible) trip generation and transport-related demand.
- Ascertain the cumulative and regional traffic and transport impacts associated with future land-based demands associated with the rezoning.

- Maximise efficiency and safety of the existing/proposed transport systems in proximity to the subject site.

1.3 Key Challenges

Some of the key challenges associated with the development of the lands subject to the rezoning application are as follows:

- Locate key access points to the rezoning land and minimise its impacts on the surrounding higher order roads, particularly The Northern Road.
- Support the safety and functionality of key access points to Pondicherry Precinct.
- Evaluate the traffic impacts of the Pondicherry Precinct and surrounding road network in the context of the proposed road/intersection upgrades on The Northern Road.
- Potential sharing the accesses to The Northern Road with Lowes Creek, South Creek in the west and Oran Park in the south.

1.4 Scope and limitations

1.4.1 Scope

The modelling methodology included in the assessment has been reviewed and approved by Transport for New South Wales (TfNSW) and includes the following steps:

- Strategic modelling using the EMME model provided by TfNSW.
- Mesoscopic modelling using AIMSUN to take into account the consideration of commuter peak hour dynamics of the traffic demand.
- SIDRA intersection modelling using the traffic volumes identified in the previous modelling processes, accounting for the existing/proposed infrastructure on the adjoining road network

Due to the impact of the current COVID-19 pandemic on traffic levels, historical source data has been employed in the preparation of this traffic and transport assessment. This data has been diligently collated and checked by GHD. However, given the level of detail of the assessment, and the reliance on assumptions, the accuracy of modelling predictions will be influenced by unknowns or changes to what has been assumed to occur in the future. Every effort has been made to ensure the veracity and accuracy of the analysis included in this report.

1.5 Report Structure

This remainder of this report is structured as follows:

- **Section 2 (Existing and Proposed Infrastructure):** presents a discussion of the land use planning, transport planning and policy context within which the precinct planning process was undertaken.
- **Section 3 (Proposed Development):** outlines the scope of the development, including the proposed access strategy, key planning considerations and the expected trip generation characteristics.
- **Section 4 (Traffic and Transport Assessment):** presents the results of the strategic transport network and intersection assessment undertaken for each tier of modelling. Additionally, it identifies the “preferred” road network hierarchy.
- **Section 5 (Summary and Conclusions):** summarises the key findings of this study.

2. Existing and Proposed Infrastructure

This section outlines the location of the site, its environmental context, connections to the local transport network, other development proposals that are under consideration in the area and the proposed upgrades to the adjoining road network.

2.1 Regional Context

The subject site is located in Western Sydney within the South West Growth Area (SWGA), which is approximately 10,188 ha in size and includes parts of Liverpool, Camden and Campbelltown Local Government Areas (LGA).

The SWGA is divided into 14 precincts that are progressively being released for planning and rezoned, to accommodate the ongoing population growth in Western Sydney. The growth area is proposed to provide 80,000 homes for 256,000 residents, according to DPIE.

The South West Growth Area Context Plan provides a strategic framework on delivery on new communities in the SWGA. The context plan was prepared in 2006 during the establishments of the North West and South West Growth Areas. The Context Plan is currently under review by the NSW Government and will ultimately be superseded by the South West Land Use and Infrastructure Implementation Plan (SWLUIIP).

The SWLUIIP will be a strategic document to enable coordination of infrastructure to unlock new communities. The location of the SWGA in the wider context of Western Sydney is displayed in Figure 2-1.

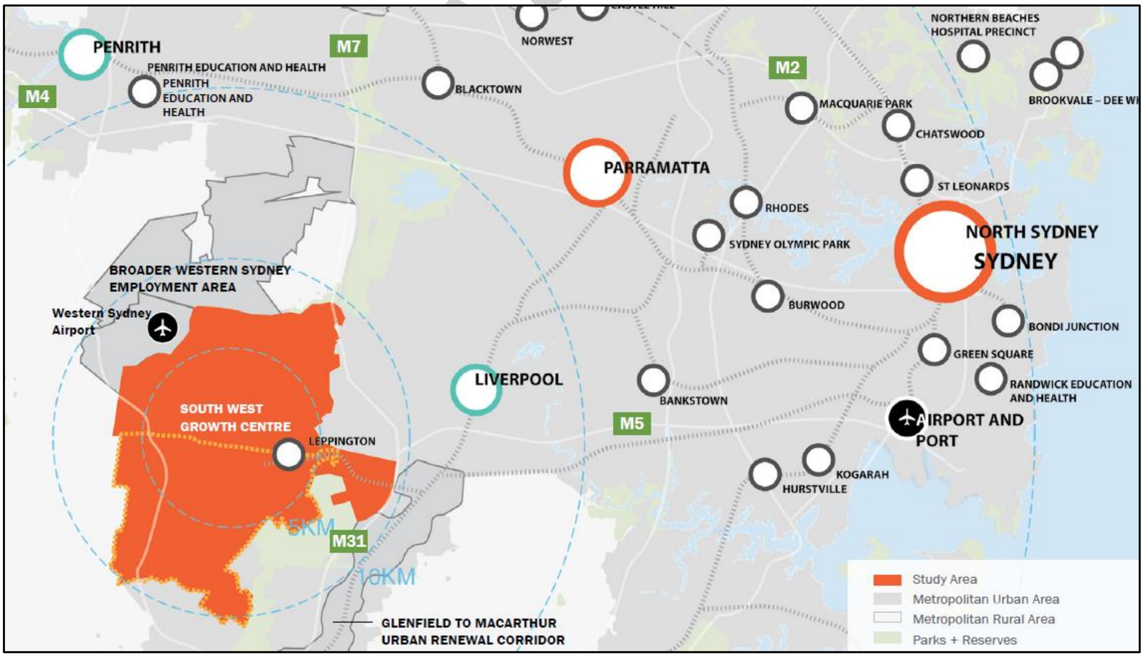


Figure 2-1: SWGA location

Source: Department of Planning, Industry and Environment

2.2 Site Context

The Pondicherry Precinct area is proposed to be developed primarily for residential land uses. The concept ILP, provided by Greenfield Developments and displayed in Figure 2-2, indicates the precinct will also include a neighbourhood centre, schools and active open space facilities with sports and playing fields.

Note that there is a section of land adjacent to the east of the Pondicherry Precinct belonging to the Oran Park Precinct that includes part of the proposed high school and some medium and low density dwellings. Given its proximity to Pondicherry, the land uses in this area have been included in the trip generation assessment (and subsequently considered in the modelling exercises detailed in this report).

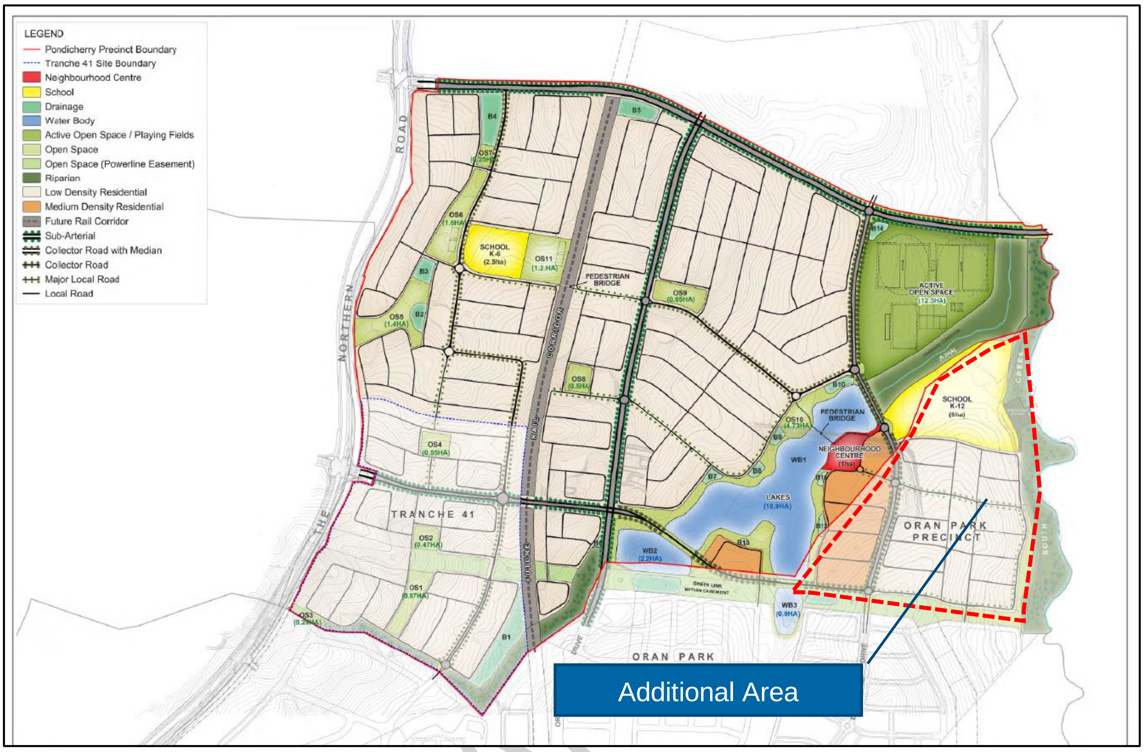


Figure 2-2: Pondicherry Precinct concept ILP (Greenfield, August 2020)

The Pondicherry Precinct is currently occupied by predominantly large landholdings. The Camden Local Environmental Plan (2010) currently zones the Pondicherry Precinct as RU1 Primary Production.

2.3 Planning and Land Use Context

Planning for the rezoning of the Pondicherry Precinct is guided by several policy documents, including:

- The Camden Local Environmental Plan (2010).
- State Environmental Planning Policy (Sydney Regional Growth Centres, 2006).
- Camden Growth Centre Precincts DCP (2015).

In addition, the following documents provide the strategic context of the proposed precinct and the adjoining road network.

2.3.1 Greater Sydney Regional Plan - A Metropolis of Three Cities

The South West Growth Area is identified as being located within the Western Parkland City, which is intended to grow from a population of 740,000 people in 2016 to 1.1 million people by 2036.

Visions/strategies for the Western Parkland City include:

- The Badgerys Creek Aerotropolis and Western Sydney Airport are economic catalysts for the district.

- A polycentric city, capitalising on established centres of Liverpool, Greater Penrith and Campbelltown – Macarthur, promoting a 30 min city.
- Sustainability, liveability and placemaking are core considerations in driving productivity.
- Improving transport connections across the Western Parkland City.
- Prioritising public transport investments to improve north-south and east-west connections to the metropolitan cluster.

2.3.2 Western City District Plan (2018)

The Western City District Plan (District Plan) is a 20-year plan to manage growth in Western Sydney. Key directions in the District Plan include:

- Providing housing supply, choice and affordability, with access to jobs, services and public transport.
- Creating and renewing places and local centres, and respecting the district's heritage.
- Establishing the land use and transport structure to deliver a liveable, productive and sustainable Western Parkland City.

2.3.3 Future Transport 2056

Future Transport Strategy 2056, provides a 40-year vision for customer mobility in NSW and is intended to guide transport investments to support a modern transport network across a "metropolis" of three cities.

The vision for Greater Sydney is one where people can access jobs and services in their nearest metropolitan city and strategic centre by public transport within 30 minutes.

Committed initiatives (0 – 10 years) in the Western Parkland City include:

- The Western Sydney Infrastructure Plan.
- The Western Sydney Growth Roads Program.

Initiatives for investigation (0 – 10 years) include:

- Infrastructure to support rapid bus connections between WSA-Badgerys Creek Aerotropolis and Greater Penrith, Liverpool, Blacktown and Campbelltown-Macarthur.
- Leppington to WSA-Badgerys Creek Aerotropolis rail link.

Initiatives for investigation (10 – 20 years) include:

- Outer Sydney Orbital (motorway and freight rail) from Great Western Highway and Western Line to WSA-Badgerys Creek Aerotropolis.
- Western Sydney Freight Line.

2.3.4 NSW Long Term Transport Master Plan

The NSW Long Term Transport Master Plan (TfNSW, 2012) identifies The Northern Road as one of the corridors that will face "increased demand" in accordance with the ongoing development of the western suburbs of Sydney. Additionally, in Section 5.8 "Providing essential greenfield infrastructure for growth centres", the plan identifies the upgrade of The Northern Road as a "medium to longer term" priority.

Figure 2-3 depicts the long term master plan for NSW.

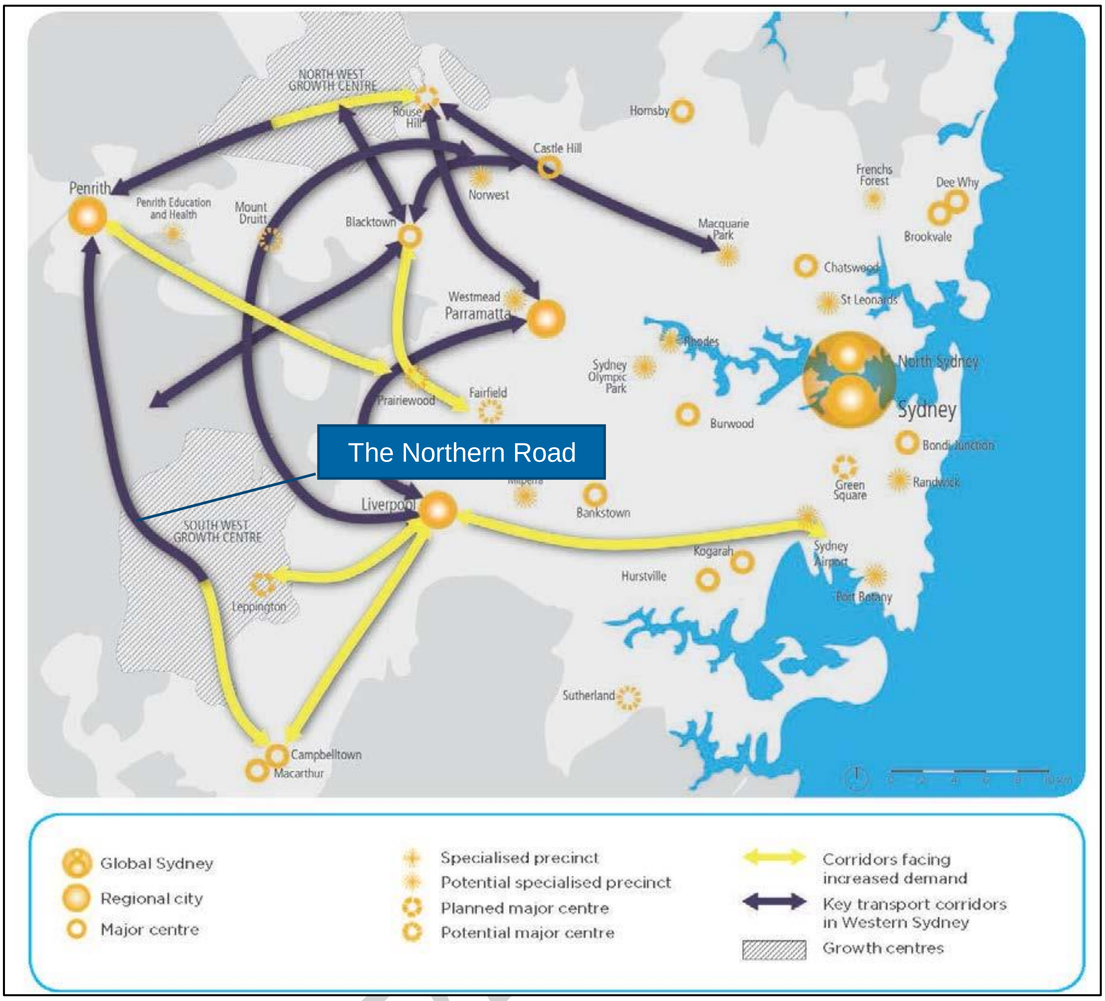


Figure 2-3: NSW long-term master plan (TfNSW)

2.3.5 Western Sydney Infrastructure Plan

TfNSW is currently upgrading The Northern Road and Bringelly Road as part of the Australian and NSW governments' Western Sydney Infrastructure Plan (WSIP), which will deliver $3.6 billion in road infrastructure improvements over the next ten years.

As displayed below in Figure 2-4, upgrades include the investment of $1.6 billion for The Northern Road and $509 million for Bringelly Road. The full upgrade of The Northern Road is expected to completed in 2022, while the upgraded Bringelly Road is anticipated to open to traffic in late 2020.

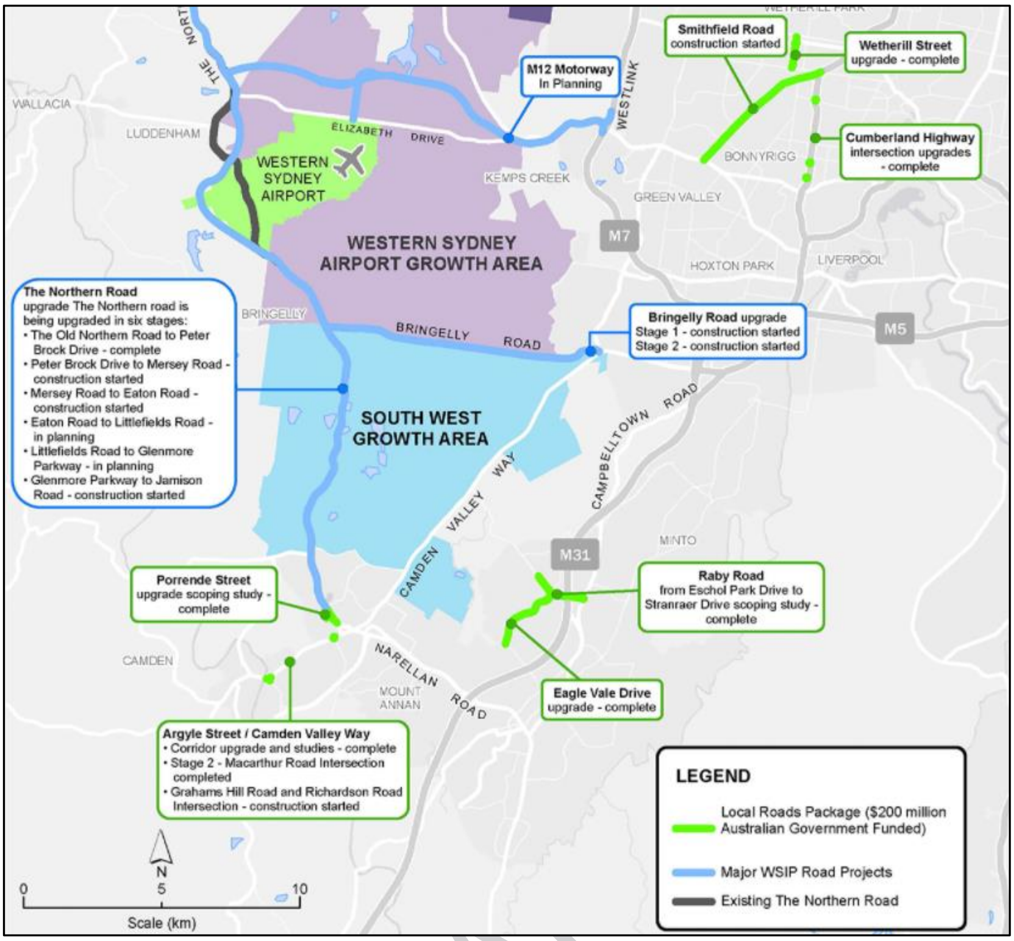


Figure 2-4: Western Sydney infrastructure upgrades

Source: https://buildingourfuture.gov.au/projects/featured/western-sydney-infrastructure-plan

2.4 Current Transport Context

2.4.1 Public transport

Busways operate a small number of bus services within and in proximity to the precinct study area, as listed in Table 2-1.

Table 2-1 Bus services in Study Area

No.	Route	Frequency
850	Between Narellan Town Centre and Minto	6 in AM peak, 8 in PM peak
856	Between Bringelly and Liverpool	2 in AM peak, 2 in PM peak
858	Between Oran Park Town Centre and Leppington	7 in AM peak, 7 in PM peak
896	Between Campbelltown and Oran Park	6 in AM peak, 6 in PM peak

Two train stations are located approximately 14 km from the Pondicherry Precinct site – Leppington Station to the north-east and Campbelltown Station to the south-east.

Leppington Station is located on the T2 Inner West and Leppington Line and T5 Cumberland Line, which provide direct connectivity to a number of Sydney's key commercial, and population centres including Liverpool, Parramatta, Strathfield, and the Sydney CBD. The 856 bus route provides a feeder service to Leppington Station. In addition, a large park and ride facility is provided at the station.

Campbelltown station is located on the T8 Airport & South Line, and provides access to Sydney Airport and CBD. The 896 route links Oran Park and Campbelltown Station.

2.4.2 Road network

The location of the Pondicherry Precinct in the context of the adjoining road network is displayed in Figure 2-5.

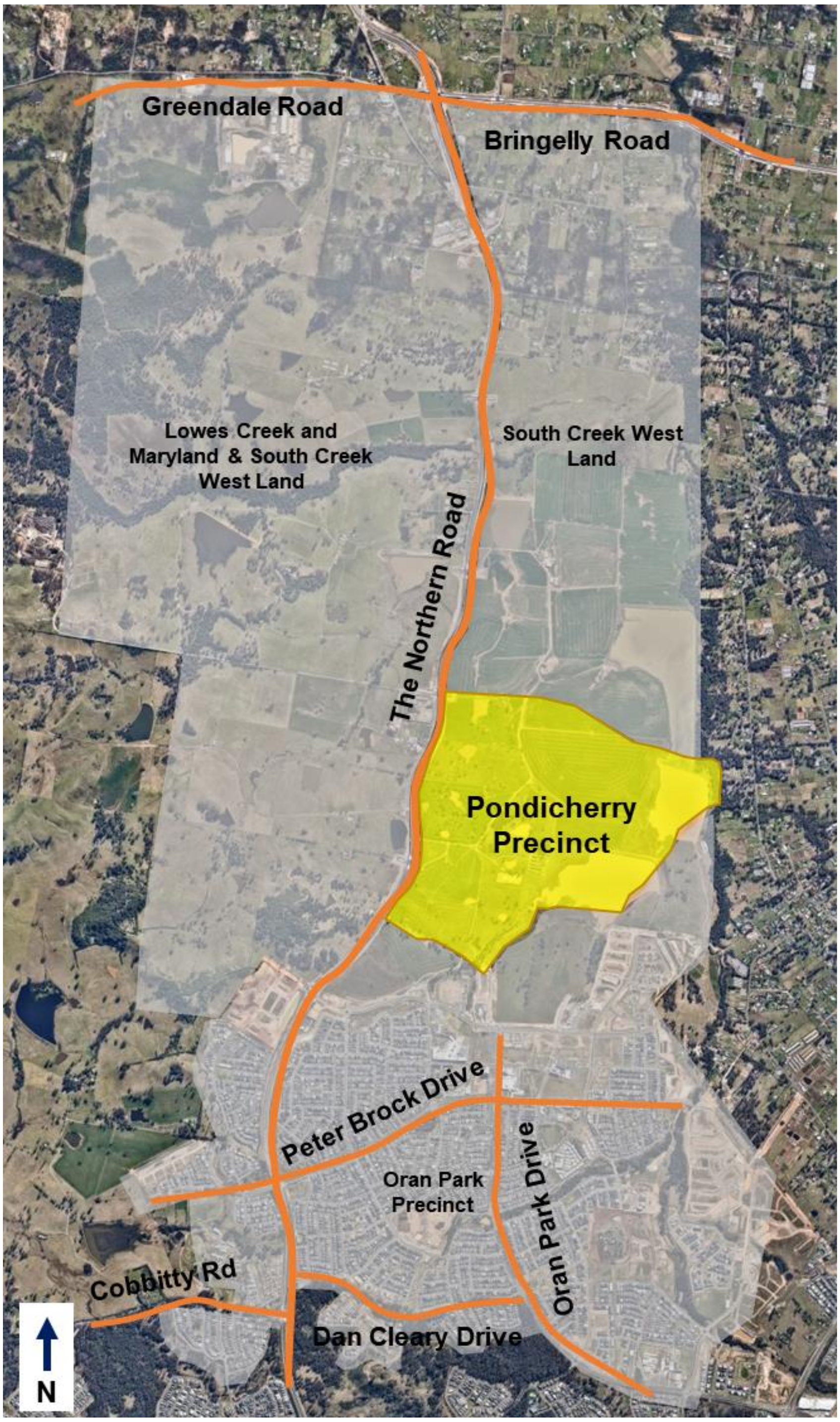


Figure 2-5: Pondicherry Precinct adjoining road network

A brief description of the major road network in proximity to the subject site is provided below.

2.4.3 The Northern Road

The Northern Road is a state arterial road, that forms part of the A9 Outer Western Sydney Bypass, adjacent to the west of the Pondicherry Precinct. The A9 runs in a north-south direction and serves as a major traffic corridor connecting the Campbelltown and Windsor.

The Northern Road was originally constructed as a single carriageway with a travel lane in either direction. However, as part of the WSIP, The Northern Road is currently being upgraded by TfNSW from two lanes to a four-lane divided road (and bus jump off lanes at intersections), with the provision of a wide median allowing for six traffic lanes be provided in the future.

As of April 2018, construction was completed on The Northern Road south of Peter Brock Drive. Construction for the remainder of The Northern Road within the study area is underway (Peter Brock Drive to Mersey Road) and is due to be complete in late 2020.

The road characteristics of The Northern Road as of 2018 are outlined in Table 2-2.

Table 2-2 Key characteristics of The Northern Road

Feature	Description
Carriageway	The Northern Road is a major arterial road. South of Peter Brock Drive the road has two lanes in each direction, as well as dedicated bus-only lanes. Designated turning lanes are provided on the approaches to the majority of the intersections. North of Peter Brock Drive the road is one lane in each direction and undivided.
Parking	Parking is not provided on The Northern Road for the segment in the study area.
Speed Limit	Primarily 80 km/h, 60 km/h at residential areas
Pedestrian Facilities	Pedestrian crossings are limited to the signalised intersections.
Bicycle Facilities	No dedicated facilities.
Public Transport	Multiple bus services and stops.

2.4.4 Other roads

Table 2-3 provides a description of the other major arterial roads as of 2018 – the year for which the intersection performances were assessed.

Table 2-3 Description of the key other roads inside study area

Road Name	Description
Greendale Road	• An arterial road, connecting The Northern Road and Tyson Road in the northwest section of the study area extending up to Wallacia. • A two-way road with dividing line and predominantly one lane in each direction. • Speed limit of 60 km/h on both directions on the east of Hutchinson Road. • Speed limit of 80 km/h on both directions on the west of Hutchinson Road.
Bringelly Road	• An arterial road, connecting The Northern Road and Jersey Road in the northeast section of the study area extending up to Horningsea Park. • A two-way road with dividing line and predominantly one lane in each direction. The road is currently being upgraded to two lanes in each direction with a dividing median.

Road Name	Description
	• Speed limit of 60 km/h in both directions.
Peter Brock Drive	• A sub-arterial road providing access to residential precincts in Oran Park. • This road connects The Northern Road and Oran Park Drive with walkways on either side. • A two-way road with median and two lanes in each direction. • Speed limit of 60 km/h in both directions.
Dan Cleary Drive	• A road connecting The Northern Road and Oran Park Drive in the south of the study area. • A two-way road with dividing line and predominantly one lane in each direction. • Speed limit of 60 km/h in both directions.
Oran Park Drive	• A sub-arterial road providing access to residential precincts in Oran Park in the south. • Connects Peter Brock Drive and Dan Cleary Drive with walkways on either side. • A two-way road with median and two lanes in each direction. • Speed limit of 60 km/hr on both directions.
Cobbitty Road	• A road, connecting The Northern Road and Werombi Road in the southwest section of the study area. • A two-way road with dividing line and predominantly one lane in each direction. • Speed limit of 60 km/hr on both directions.

2.4.5 Active transport

Concrete footpaths are located on the north side of Greendale Road in proximity to the primary school and on the western side of The Northern Road in the proximity of the Oran Park residential development. Concrete footpaths are also provided on Peter Brock Drive, Oran Park Drive and Cobbitty Road.

The Camden Council Bicycle Map (1996) identifies The Northern Road as a “regional route’ (proposed). However, given the road’s narrow shoulders and high design speeds, it has been deemed unsuitable for full inclusion as part of the bicycle network. As such, on-road cycle facilities are only signed on The Northern Road south of Peter Brock Drive. These were included as a part of the current The Northern Road improvements. The road has also been upgraded beyond Bringelly Road with on-road and off-road cycling facilities. On-road cycle facilities are signed on The Northern Road south of Peter Brock Drive. These have been included as a part of The Northern Road improvements.

2.4.6 Travel Mode Survey

Travel mode survey was recently undertaken for the residents in Oran Park (south of Pondicherry) by Greenfields Development Company in 2019 and 2020. The results revealed that on a daily basis, approximately 80 percent of residents travel by cars to the destinations. Among 18% claimed that they use public transport, approximately 12 percent use trains and 6 percent use buses. It is worth nothing either Leppington and Campbelltown Station is outside reasonable walking distance, and therefore, it is likely the travellers adopt ‘park and ride’ or ‘kiss and ride’ to accesses the train stations.

In summary, over 90 percent of the Oran Park residents use the car as a primary travel mode, to the destinations or the train stations. This provides a benchmark of travel mode for the residents in Pondicherry, adjacent to Oran Park, prior to the provision of potential new metro service, improved bus or active transport services.

2.5 Future Road Network

2.5.1 The Northern Road

The Northern Road upgrade is being delivered in six stages, with two of these stages coinciding with the study area of this assessment. These two stages are:

- **Stage 1**: Between The Old Northern Road, Narellan and Peter Brock Drive, Oran Park – completed April 2018
- **Stage 2**: Between Peter Brock Drive, Oran Park and Mersey Road - under construction

The key features of The Northern Road upgrade are:

- Two lanes in each direction with a four metre wide shoulder and wide central median allowing for widening to six lanes when required in the future.
- Additional short right and left turning lanes.
- A grade separated interchange at Bringelly Road to the east of Bringelly Village shops and the existing intersection with Bringelly Road/Greendale Road.
- A three metre wide shared pedestrian and cyclist path on the eastern side of The Northern Road and designated turning lanes at traffic lights.
- Bicycle and pedestrian crossing provisions at traffic lights.
- Bus priority lanes at traffic lights and indented bus bays.
- Nine intersection upgrades with new traffic lights (six of which are located within the study area of this assessment).

The four lane cross section (at intersections) of The Northern Road is displayed in Figure 2-6.

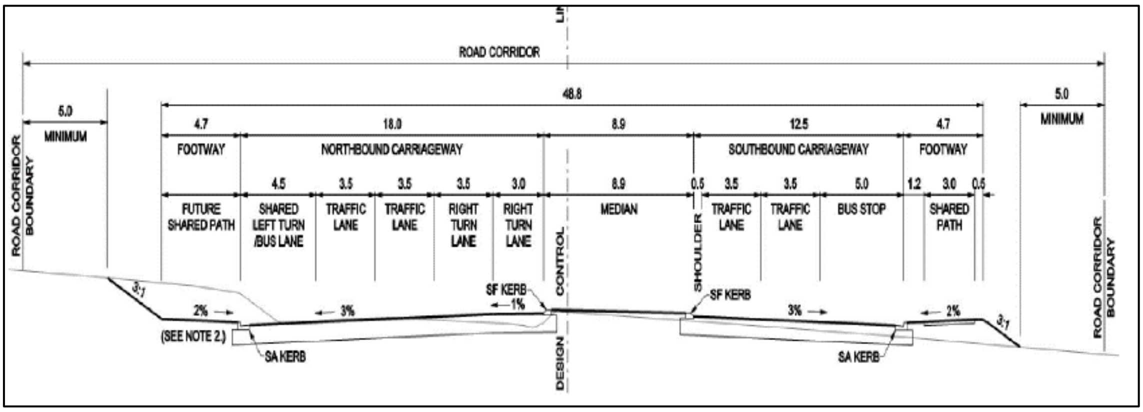


Figure 2-6: The Northern Road (4 lane) cross section (at intersections)

Following sources were used to inform the road geometry included in the traffic modelling undertaken in this report.

- Intersection layouts presented in 2012 report titled MR154 The Northern Road Upgrade between Old Northern Road and Mersey Road (SKM 2012)

- By June 2020, the construction on The Northern Road has commenced. The snapshots of the new alignments and the layouts at some intersections, while under construction, are now visible through aerial photography (via NearMap).

2.5.2 Bringelly Road

The Australian and NSW Governments have provided $509 million to upgrade Bringelly Road between Camden Valley Way and The Northern Road to support the development of growth areas, employment and the proposed Western Sydney Airport at Badgerys Creek. As part of the WSIP works, TfNSW are planning to grade-separate the interchange of The Northern Road and Bringelly Road.

The grade separation proposal includes the following:

- Relocating the interchange approximately 300 m to the east of its current location.
- Providing a new signalised junction on Bringelly Road.
- Providing dual right lanes for all movements to and from The Northern Road.

Additional key features of the Bringelly Road upgrade are:

- Two lanes in each direction with a central median, allowing for widening to six lanes, when required.
- A three metre wide off road shared pedestrian and cyclist path with crossings at traffic lights to improve safety.
- New four way intersection at Jersey Road with traffic lights and a temporary U-turn facility.
- New three way intersection at Kelvin Park Drive with traffic lights.
- Designated turning lanes at traffic lights along with bus priority and indented bus bays on both sides of Bringelly Road.

2.5.3 Other Roads

The Australian and NSW Government are proposing to build the M12 Motorway, which would provide direct access to the proposed Western Sydney Airport. The proposal is for an east-west motorway between the M7 Motorway and The Northern Road, approximately 18 km north of the project study area. Construction of the M12 Motorway is due to commence in 2022.

The M9 Motorway (Outer Sydney Orbital) is proposed to consist of an orbital road running from the Central Coast to Illawarra via a corridor to the west of the M7 and The Northern Road. In 2014 the NSW Government announced provided $4.6 million for planning the M9 Motorway.

2.6 Future Public Transport

As described in Section 2.4.3, the current upgrade work on The Northern Road includes the provision of bus lanes in either direction. This is already present on The Northern Road south of Peter Brock Drive.

Currently, no bus services operate on The Northern Road in proximity to the Pondicherry Precinct, with all bus routes in the study area travelling either in Oran Park or on Bringelly Road. However, as the SWGA is developed, increased population densities may encourage the introduction of new bus routes in the region.

Sydney's Bus Future (2013) specifies that rapid service routes will be provided for western growth areas. Accordingly, The Northern Road could potentially be included on any future rapid bus routes.

The South West Rail Link (SWRL, which commenced operation in 2015) is a NSW Government initiative to provide additional connectivity to facilitate the mobility of resident/visitors in the developing suburbs of Southwest Sydney and includes an 11.4 km rail line between Glenfield and Leppington.

In order to facilitate the possible future extension of the SWRL (as part of the North South Rail Line), the NSW Government is protecting a public transport corridor in Western Sydney. The extension corridor is proposed to connect Leppington Station to Narellan and meet up with the proposed North South Rail Line.

Proposed core stations are located near the Pondicherry Precinct at Oran Park and Bringelly. The preliminary routes and station locations of the North South Rail Link are displayed in Figure 2-7.

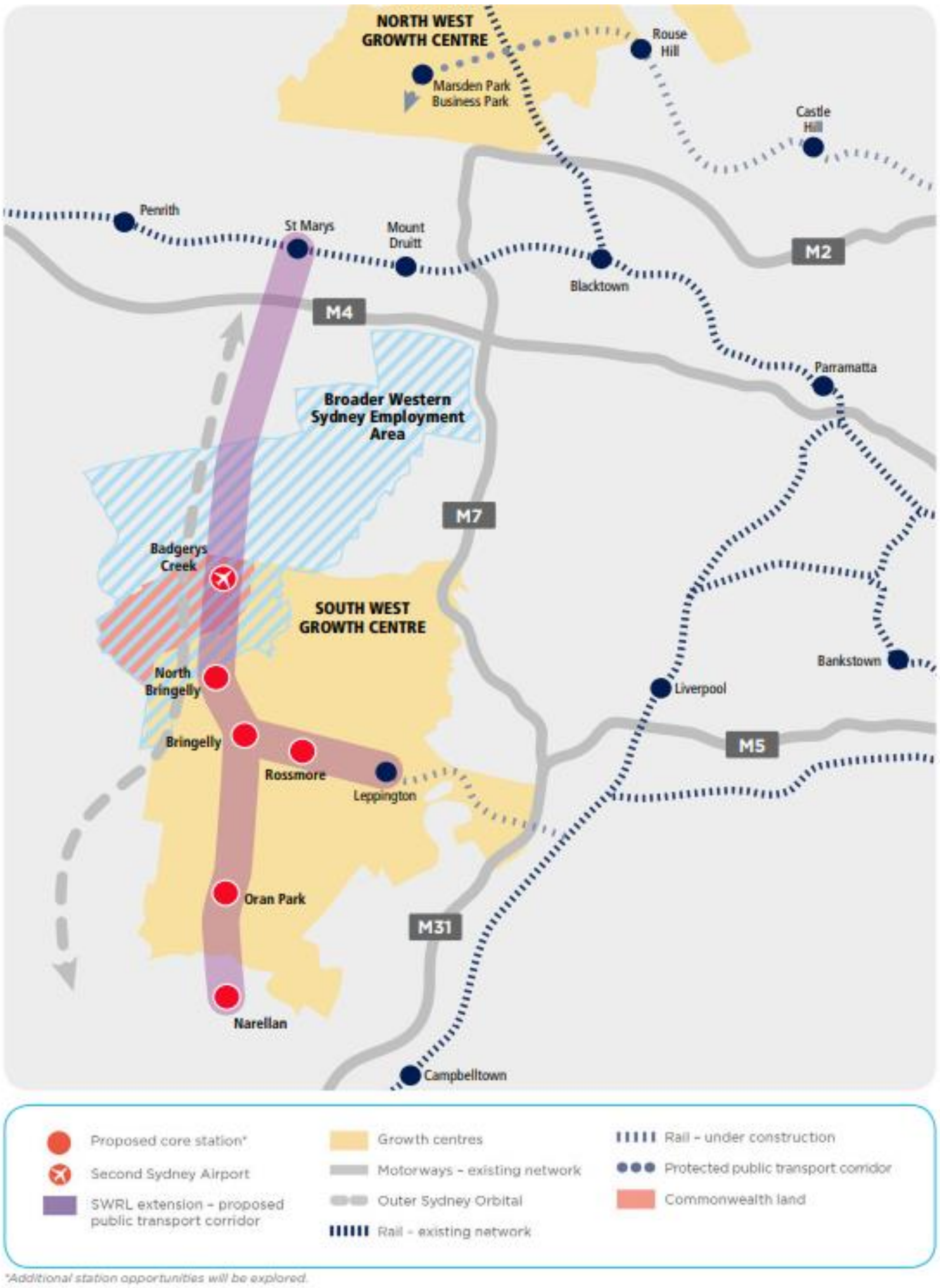


Figure 2-7: South West Rail Link extension route and core stations

TfNSW could not confirm when the North South Rail / Metro Link site will become operational, therefore it has been excluded in the horizon years of analysis (up to 2036), and therefore, the impact (e.g. changes to travel mode) will not be considered in the assessment.

However, it is noted that a north/south corridor for a potential future rail link has been reserved within Pondicherry Precinct.

2.7 Future Active Transport

In addition to the active transport provisions provided following the completion of Stage 1 of The Northern Road upgrade (The Old Northern Road to Peter Brock Drive), The Northern Road upgrade will include the following active transport provisions:

- Provision of signalised junctions with pedestrian phasing between Peter Brock Drive and Mersey Road, including two intersections on the Northern Road providing access to the Pondicherry Precinct.

- The introduction of a three metre wide shared path on the eastern side of The Northern Road.
- A three metre wide off road shared pedestrian and cyclist path with crossings at traffic lights to improve safety on Bringelly Road.

Upon completion, The Northern Road upgrades will facilitate a significantly improved active transport environment for residents and visitors of the proposed precinct and its surrounds.

The Pondicherry Precinct internal road network will be developed (in accordance with the Camden Growth Centre Development Control Plan) to expedite the mobility of pedestrians and bicycle riders.

2.8 Traffic Surveys and Analysis

Disruptions to travel patterns due to COVID-19 from March 2020 has resulted in a lower level of traffic that is not representative of typical weekday conditions in proximity to the subject site. Following discussion with DPIE and TfNSW, it was agreed and approved (at a meeting on 3rd April 2020) that the available historical traffic counts would be utilised to identify the current traffic activity and to calibrate and validate the base mesoscopic model for the Pondicherry Precinct.

Historical traffic data, collected between 2016 and 2018, were utilised for the existing conditions analysis and development of the mesoscopic base model. Table 2-4 summarises the historical data available for the study, and Figure 2-8 depicts the survey locations.

Table 2-4: Traffic survey data summary

Data Type	Source	Numbers	Collection Date
Intersection turning movement count data[1)]	Matrix Traffic and Transport Data	7	Wednesday, 31 August 2016
Intersection turning movement count data	TTM	6	Tuesday, 20 February, 2018
Travel time[1)]	Site Inspection	2	Tuesday, 20 September, 2016
Bus Data, GTFS	TfNSW	4	Tuesday, 20 February, 2018

1) Lowes Creek Traffic Study (GHD, 2018)

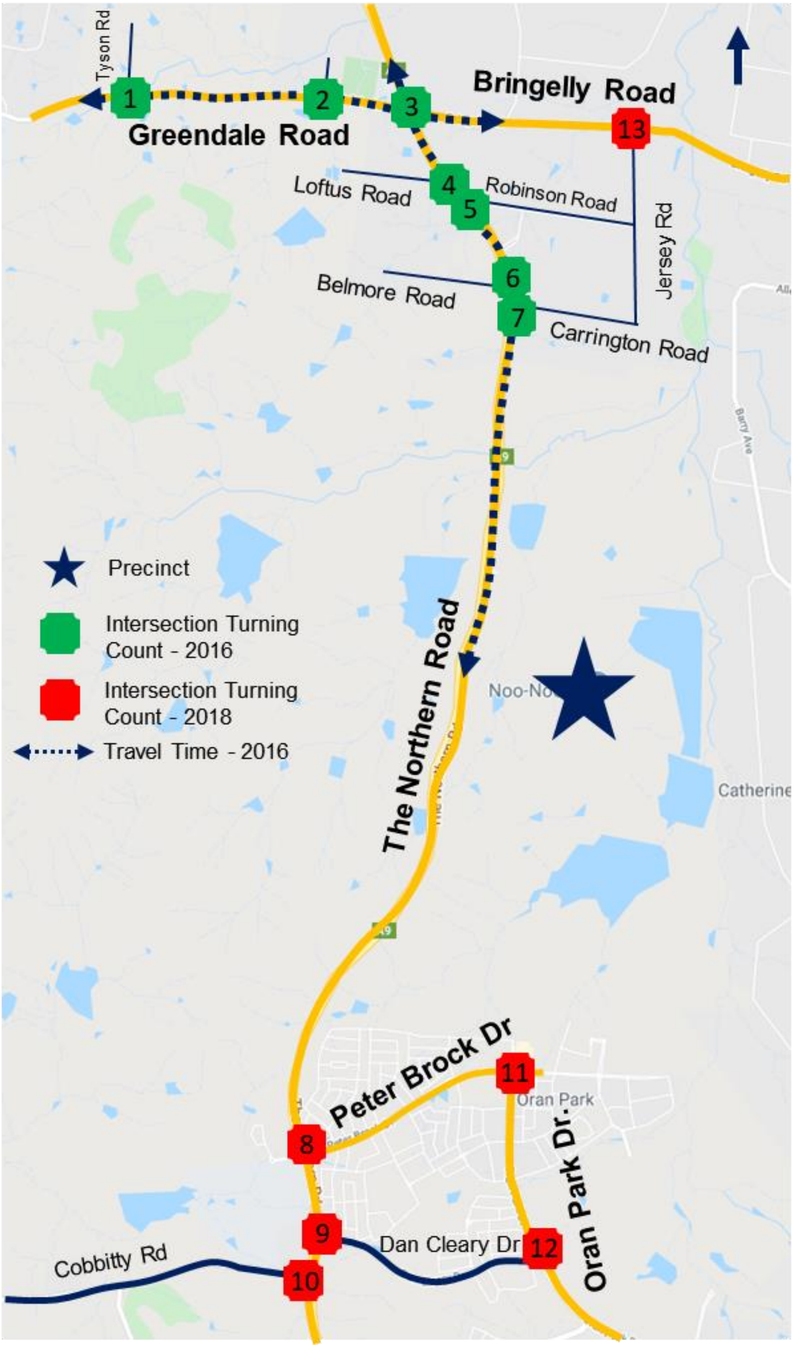


Figure 2-8: Traffic survey locations

Classified intersection data was collected between 6:00 am – 10:00 am and 3:00 pm - 7:00 pm at 13 intersections between 2016 and 2018, as follows:

- Site 1 - Greendale Road and Typson Road (Priority)
- Site 2 - Greendale Road and Hutchinson Road (Priority)
- Site 3 - The Northern Road and Greendale Road & Bringelly Road (Signal)
- Site 4 - The Northern Road and Loftus Road (Priority)
- Site 5 - The Northern Road and Robinson Road (Priority)
- Site 6 - The Northern Road and Belmore Road (Roundabout)
- Site 7 - The Northern Road and Carrington Road (Roundabout)
- Site 8 - The Northern Road, Peter Brock Drive and Charles Mcintosh Parkway (Signal)

- Site 9 - The Northern Road and Dan Cleary Drive (Priority)
- Site 10 - The Northern Road and Cobbitty Road (Roundabout)
- Site 11 - Peter Brock Drive and Oran Park Drive (Signal)
- Site 12 - Dan Cleary Drive and Oran Park Drive (Signal)
- Site 13 - Bringelly Road and Jersey Road (Priority)

To determine the 2018 AM and PM peak periods, all intersection count data collected in 2018, i.e. site 8 -13, was aggregated for hourly traffic volume analysis. As presented in Figure 2-9 and Figure 2-10, the AM and PM peak periods are:

- 7:00 – 9:00 am
- 4:00 – 6:00 pm

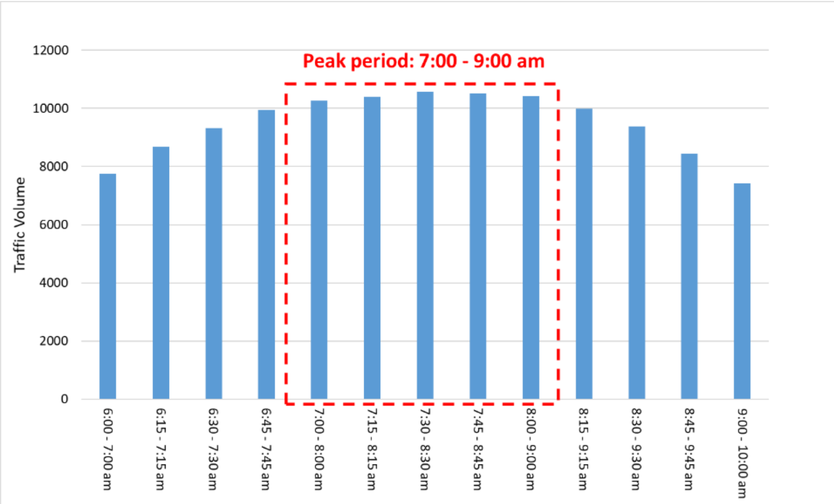


Figure 2-9: AM hourly traffic profile

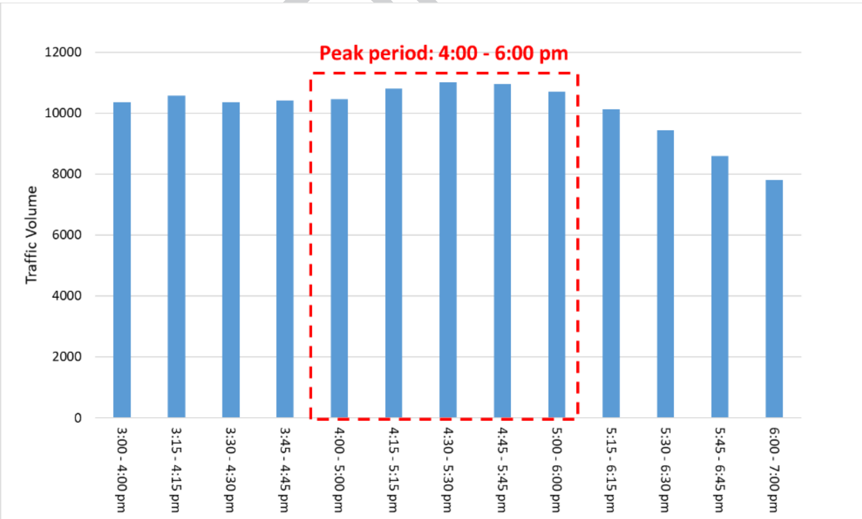


Figure 2-10: PM hourly traffic profile

To uplift the 2016 counts to a 2018 analysis year, the difference in traffic volume on The Northern Road, between Site 7 and Site 8 was calculated for each peak hour (Figure 2-11). Table 2-5 demonstrates the factors applied for hourly interval traffic volumes in AM and PM peak periods for the seven sites surveyed in 2016.

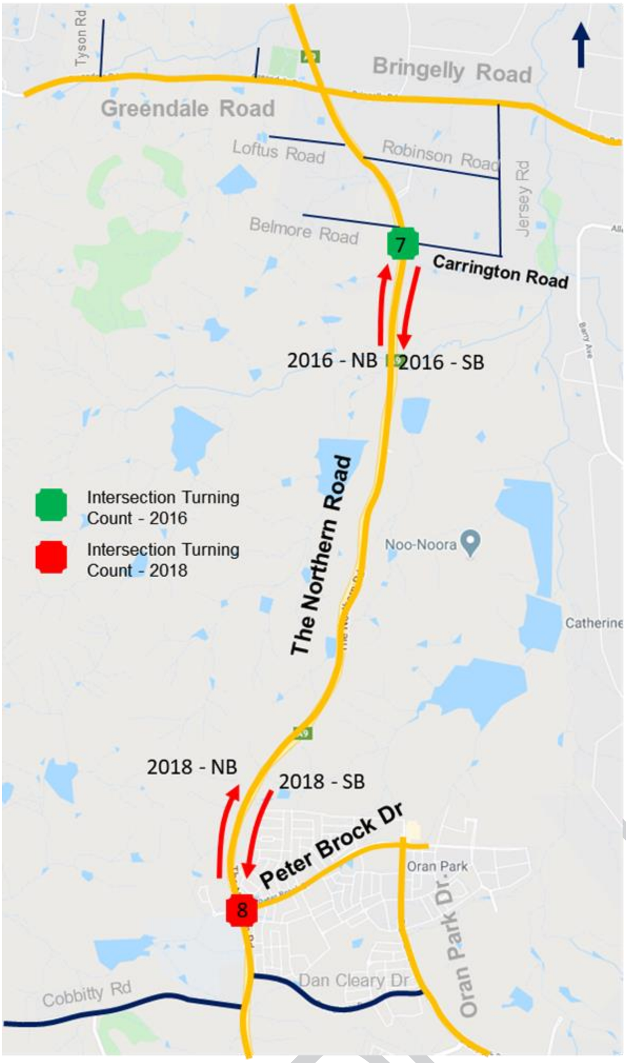


Figure 2-11: Traffic volume balancing location

Table 2-5 Volume change factors (2016-2018) on TNR

Vehicle Type	AM Peak		PM Peak	
	7-8 am	8-9 am	4-5 pm	5-6 pm
All Vehicles	9.3% (157)	-8.4% (-121)	-1.1% (-18)	-3.4% (-58)

The results indicated that:

- The 2016 traffic volume would be increased by 9.3 percent to lift to the 2018 level between 7:00 am – 8:00 am.
- Meanwhile, it would be reduced by 8.4 percent between 8:00 am – 9:00 am (e.g. 2016 traffic volumes were higher than those in 2018).
- In the PM peak, the difference in the traffic is negligible, with 1.1 percent and 3.4 percent in 4:00 pm – 5:00 pm and 5:00 pm – 6:00 pm, respectively.

2.9 Summary of Base Model Development (existing condition)

Mesoscopic traffic models (using AIMSUN) was developed for the weekday AM peak period of 7:00 am – 9:00 am and PM peak period of 4:00 pm – 6:00 pm. The models were calibrated and validated in accordance with the TfNSW Traffic Modelling Guidelines 2013.

Observed traffic counts were used to calibrate the microsimulation traffic model. TfNSW criteria advocate that 95 percent of intersection traffic movements must have a GEH statistic less than or equal to 5, and the coefficient of determination (R^2) between the observed and modelled flows must exceed 0.9. It was determined that the modelled traffic counts were a good fit to the observed counts in both peak hours, with 100 percent of movements meeting the GEH criteria.

Travel time data on The Northern Road northbound and southbound and Greendale Road/Bringelly Road east and westbound was used to validate the mesoscopic simulation model. TfNSW criteria used to validate the model advises that 95 percent of modelled routes must have travel times falling within ±15 percent or ±1 minute of the observed time, if higher than 15 percent. All the routes considered for travel time validation have met the criteria.

Given that the model was found to be well calibrated to the observed counts, and met the criteria for validation, it is reasonable to conclude that the 2018 base year AIMSUN mesoscopic simulation models provide a sound representation of the current traffic conditions in the study area during weekday AM and PM peak periods. We, therefore, believe that the Pondicherry mesoscopic base year traffic models would be suitable to assess the impacts of any proposed network upgrades and land-use changes within the study area in the future years.

The base mesoscopic model and the report was reviewed by DPIE and TfNSW. Following the updates made by GHD based on the review comments, the final Base Model and the report were approved by TfNSW and deemed fit to be used as a basis for future impact assessment of Pondicherry Precinct on 23rd October 2020.

3. Pondicherry and the surrounding Land Use

This section details GHD's assumptions for traffic modelling, in relevance to the Pondicherry development and surrounding land uses such as Oran Park and, Lowes Creek.

It is important to note while the land use forecast within SWGA is rapidly evolving, the data below is proposed to be used as a 'reasonable context' to assess the traffic impacts of Pondicherry Precinct in 2036, based on the information available to GHD by August 2020. The land use assumption was provided to DPIE in September 2020.

3.1 Proposed Land Uses in Pondicherry

The Pondicherry Precinct will include residential developments (low, medium and high density) and supporting land-uses including retail, commercial, recreational and educational facilities. The draft ILP for Pondicherry Precinct, including the expected residential staging is shown in Figure 3-1.

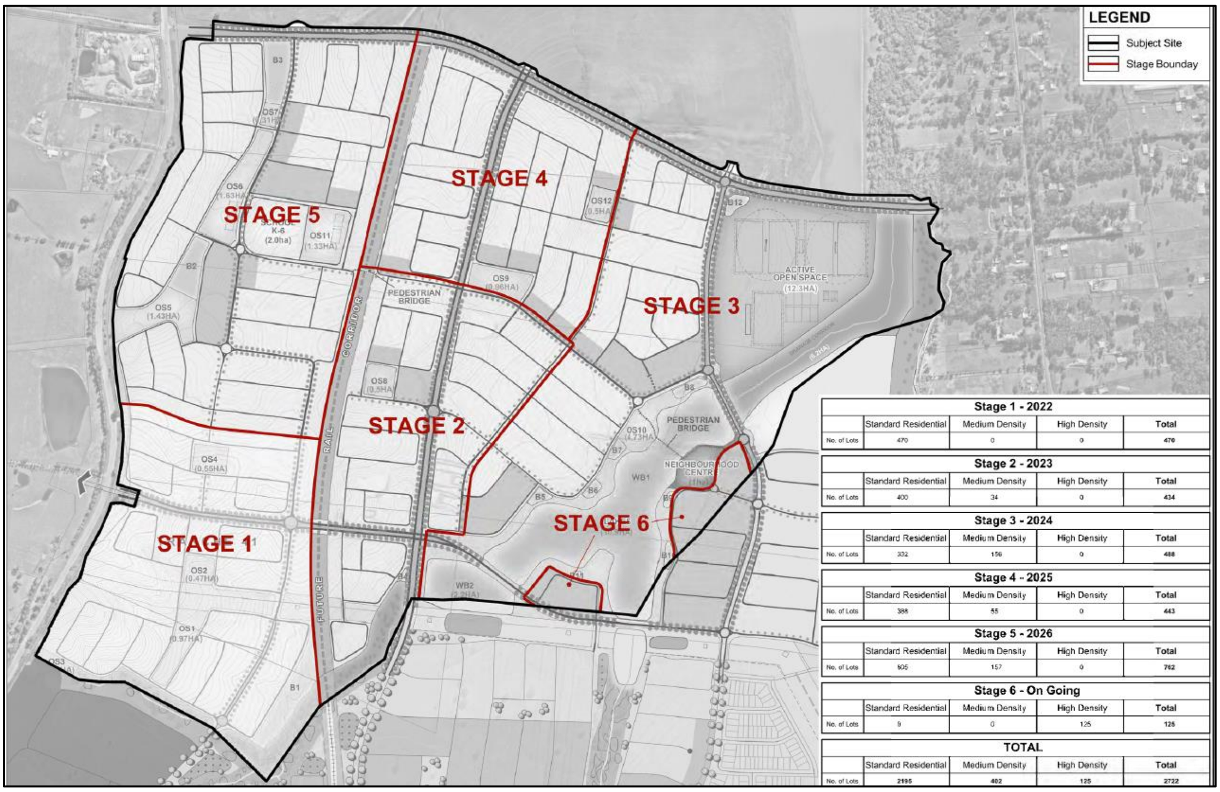


Figure 3-1: Pondicherry precinct draft ILP (August 2020)

3.1.1 Residential

It is proposed to provide a variety of different dwelling types, as follows:

- Low density residential dwelling (e.g. houses) with an average density of 16 dwellings per hectare.
- Medium density residential dwellings (e.g. town houses) with an average density of 30 – 40 dwellings per hectare.
- High density residential dwellings (e.g. apartment buildings) with up to 60 dwellings per hectare.

The expected residential land use schedule for the Pondicherry Precinct, by stage is displayed below in Table 3-1.

Table 3-1: Pondicherry Precinct yield (no. of dwellings)

Stage	Yield
Stage 1	470 low density dwellings
Stage 2	400 low density dwellings 34 medium density dwellings
Stage 3	332 low density dwellings 156 medium density dwellings
Stage 4	388 low density dwellings 55 medium density dwellings
Stage 5	605 low density dwellings 157 medium density dwellings
Stage 6	125 high density dwellings
Pondicherry (residential area)	2,195 low density dwellings 402 medium density dwellings 125 high density dwellings
Additional Area	485 low density dwellings

3.1.2 Retail and commercial

An assessment of the expected retail/commercial land uses for Pondicherry Precinct Neighbourhood Centre has been provided to GHD by Greenfields, as follows:

- 1,500 sqm – 2,000 sqm of retail is planned. This could potentially consist of a "convenience based" retail centre consisting of:
  - A small supermarket of approximately 500 sqm
  - Speciality retailers, i.e. hairdresser, florist, liquor store, café
- Commercial land uses, i.e. real estate agent, accountant

Additionally, it was noted that given the proximity of major retail developments in Oran Park (which includes a Woolworths supermarket), the retail/commercial facilities in Pondicherry will:

- Primarily serve the local residents
- Likely be developed over a longer timeframe, i.e. 2030

To provide a robust analysis, it has been assumed that the Pondicherry Precinct Neighbourhood Centre will provide:

- A 500 sqm supermarket
- 1,500 sqm speciality retail
- 500 sqm commercial land uses

3.1.3 Recreational and education facilities

Recreational facilities including parks, sports ovals and playing fields will be provided to serve the residents of the Pondicherry. The sports/ovals, tennis courts and playing fields are proposed to be located the north east of the precinct, while parks will be distributed throughout the precinct to provide convenient and equitable access for residents.

It proposed to provide the following education facilities:

- A primary school of 1,000 students
- A high school (partially located with Pondicherry Precinct and the adjoining Oran Park Precinct) of 2,000 students

3.2 Estimated Trip Generation in Pondicherry

3.2.1 Trip generation rate

The trip generation assessment for the Pondicherry area has been undertaken in accordance with the:

- The Guide to Traffic Generating Developments Updated traffic surveys – Technical Direction TDT2013/04a
- The Roads and Maritime Guide to Traffic Generating Developments
- The TfNSW Trip Generation Surveys School Analysis Report

The following trip rates are used and approved by TfNSW and DPIE (TfNSW Reference: SYD17/01577/09), that are applicable to the proposed development:

- Low density dwellings – 0.95 trips per dwelling in AM peak periods and 0.99 trips per dwelling in PM peak periods.
- To be conservative, the low density rate has also been applied to the medium density dwellings.

The Guide to Traffic Generating (2002) provides the following rates for shopping centres:

- Supermarkets – 155 trips per 1,000 sqm GFA
- Specialty stores – 46 trips per 1,000 sqm GFA
- Offices – 22 trips per 1,000 sqm GFA

These rates are applicable to **Thursday evening** trade and are consistent with a “worst case” scenario.

Roads and Maritime’s Guide does not provide trip rates for educational facilities. Accordingly, the trip generation characteristics of the proposed primary schools and high schools have been identified in accordance with the rates detailed in the TfNSW Trip Generation Survey School Analysis Report. The average rate for Sydney Metropolitan Schools are as follows:

- Primary schools – 0.67 trips per student in the AM peak hour and 0.52 trips in the PM peak hour
- High schools – 0.51 trips per student in the AM peak hour and 0.28 trips in the PM peak hour

3.2.2 Mode split

Journey to work data indicates that public transport utilisation in the proximity to the subject site is low (in the order of four percent).

It is noted that a future rail corridor associated with the potential future provision of the future South West Rail Line, traverses Pondicherry Precinct in a north/south direction.

Information provided by TfNSW indicates that the North South Rail Link is identified for investigation in the short term. However, there is currently no commitment or funding for construction and therefore, it conservatively has not been assumed in the modelling scenarios for the assessment.

The likely introduction of a rapid bus route on The Northern Road may facilitate an increased public transport mode share.

Accordingly, for the purposes of analysis, it is assumed that **ten (10) percent of the peak hour trips** generated by the proposed Structure Plan area will utilise public transport. This estimation excludes the impact of potential metro line within the vicinity, as instructed by TfNSW and Council.

3.2.3 Trip generation characteristics

Residences

For the purposes of analysis, it has been assumed that for residential land uses, trips will be 80 percent outbound and 20 percent inbound in AM peak periods and 80 percent inbound and 20 percent outbound in evening peak periods.

Retail (Town Centre)

Retail developments (shopping centres) typically generate negligible trips during AM peak hour periods. For the retail facilities it has been assumed that during peak evening periods of road network activity, trips will be 50 percent inbound and 50 percent outbound. It has further been assumed that gross leasable retail areas will be 75 percent of gross floor areas.

For mixed use developments a portion of trips are typically internal, namely trips that both begin and end within the development. This could consist of a resident walking or driving to an onsite retail/commercial facility. As a result, a mixed-use development that generates a given number of total trips creates less demand on the external road system than single-use developments generating the same number of trips.

The proposed development's retail/commercial components are intended to serve the residents of the Pondicherry Precinct. They are expected to generate little (if any) external trips.

Accordingly, for the purposes of analysis, it has been assumed that all the trips they generate will be internal to the development.

Primary and High Schools

In accordance with the data in the TfNSW Trip Generation Survey School Analysis Report, it has been assumed that for the:

- Primary school trips will be 51 percent inbound and 49 percent outbound in the AM peak and 49 percent inbound and 51 percent outbound in the PM peak.
- High school trips will be 59 percent inbound and 41 percent outbound in the AM peak and 39 percent inbound and 61 percent outbound in the PM peak.

3.2.4 Trip generation summary

A summary of the expected trip generation characteristics of the Pondicherry Precinct (per stage of development) is presented below in Table 3-2. The location of development stage is shown in Figure 3-1.

It is assumed Pondicherry will be fully developed by 2036.

Table 3-2: Trip generation summary – Full Development 2036 Residential and Town Centre

Land Use	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Stage 1	80	321	335	84
Stage 2	72	290	301	75
Stage 3	75	300	310	77
Stage 4	73	291	302	76
Stage 5	122	487	505	126
Stage 6	7	29	37	9
Additional Area	88	332	346	91
Town Centre	-	-	59	59
Total	**505**	**2,021**	**2,158**	**584**

Table 3-3: Trip generation summary – Full Development 2036 (School)

Total traffic generation	AM Peak		PM Peak	
	Inbound	Inbound	Inbound	Outbound
Primary School	335	335	265	265
High School	602	418	218	342
Total	**937**	**753**	**483**	**607**

The above data indicates that the Pondicherry Precinct (full development) and adjoining area will generate approximately 4,200 trips in the AM peak hour and 3,800 trips in the PM peak hour.

3.2.5 Proposed road network and access

The proposed road structure/hierarchy for the Pondicherry Precinct is as follows:

- Two east-west sub-arterial roads providing access from The Northern Road to the precinct via new signalised intersections at Maryland Link Road 1 and Maryland Link Road 2.
- A sub-arterial extension of Oran Park Drive providing north-south connectivity from Oran Park to the precinct. It is proposed to provide three signalised intersections along the sub-arterial road, within Pondicherry Precinct.
- A collector road network that distributes local traffic throughout the subject site and directs vehicles to sub-arterial roads at key intersections.
- A local road network providing access to the proposed residences.

Intersections on collector roads are generally specified as roundabouts, while signalised intersections are assigned at the juncture of all sub-arterial and arterial roads.

The proposed road network, hierarchy and accesses are depicted in Figure 3-2.

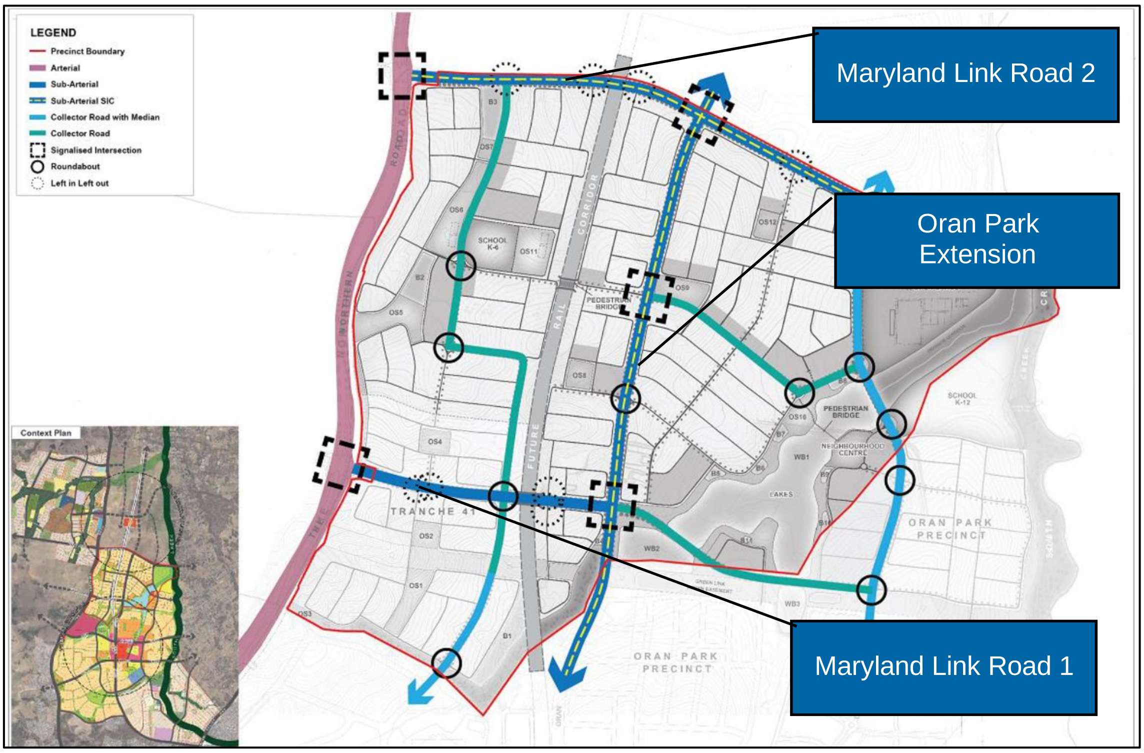


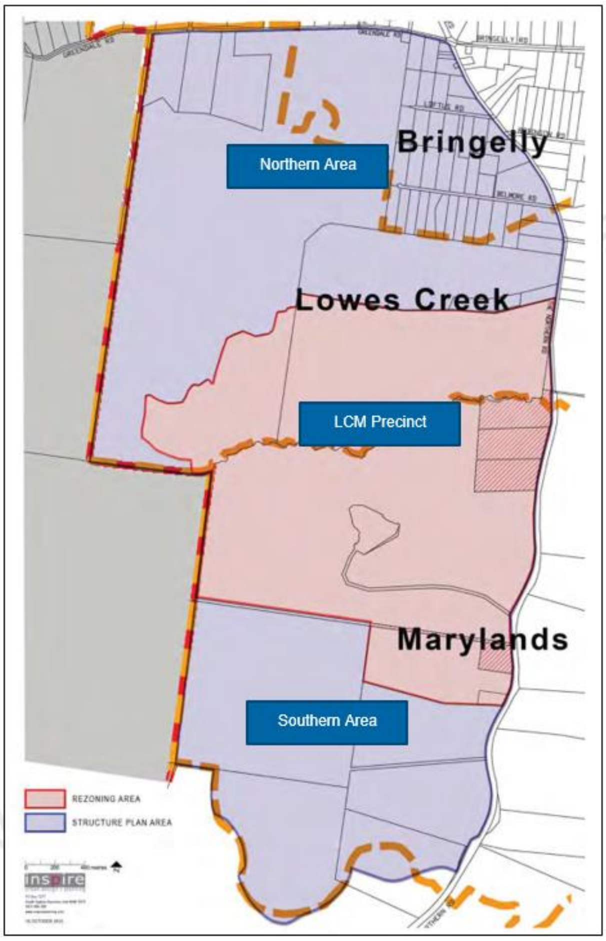
Figure 3-2: Pondicherry Precinct road network and hierarchy

3.3 Trip Generation Assumptions: Surrounding Land Uses

3.3.1 Lowes Creek Maryland Precinct and South Creek West Land, west of TNR (2036)

As presented in Figure 3-3, Lowes Creek Marylands Precinct (indicated as ‘LCM Precinct) and South Creek West Land (indicated as ‘Northern Area’ and ‘Southern Area’) are both located west of the proposed Pondicherry Precinct.

It is anticipated the traffic generation from Lowes Creek would share the intersection capacity of those on TNR, such as at TNR | Maryland Link Road 2.



Source: Lowes Creek Maryland Context Plan Principles

Figure 3-3 Lowes Creek (Rezone Area) and South Creek West Land (Structure Plan Area)

The following has been assumed with respect to the development of Lowes Creek Maryland Precinct and South Creek West Land (west of The Norther Road) in 2036 future year scenario:

- Sources:
  - Lowes Creek Maryland Precinct Traffic, Transport and Access Assessment (GHD, 2018) – hereafter referred to be 2018 Lows Creek Traffic Report.
  - The Draft Lowes Creek Maryland Precinct Economic (Retail and Employment) Analysis 2016.

2031 stage development identified in 2018 Lows Creek Traffic Report is applied to the 2036 scenario (highlighted in red brackets in Figure 3-4).

The 2036 land use within Lowes Creek and South Creek includes:

- Total dwelling of 7,000 with predominantly low density dwellings (approximately 3,500 from Lowes Creek and the rest from South Creek West Land).
- One high school and two primary schools.
- Retail/Commercial land uses including: one town centre, a mixed-use precinct, a convenience centre, Maryland South Village, Bringelly Village.

Land Use	Morning peak		Evening peak	
	Inbound	Outbound	Inbound	Outbound
LCM Precinct 2021 (Stage 1)	641	802	786	383
LCM Precinct 2026 (Stage 2)	262	1,049	1,274	455
LCM Precinct 2031 (Stage 3)	255	1,018	1,079	283
LCM Precinct 2036 (Stage 4)	256	1,025	1,163	373
LCM Precinct 2041 (Stage 5)	261	1,043	1,067	267
Sub-Total	1,675	4,937	5,370	1,760
Other Areas 2026* (Stage 2)	226	903	941	235
Other Areas 2031* (Stage 3)	597	1,892	2,054	643
Other Areas 2036* (Stage 4)	1,097	2,132	2,092	717
Other Areas 2041* (Stage 5)	226	903	941	235
Sub Total	2,145	5,829	6,026	1,831
TOTAL	**3,820**	**10,766**	**11,396**	**3,591**

Source: Table 3-13 in 2018 Lows Creek Traffic Report

Figure 3-4 Lowes Creek and South Creek West Land (W of TNR) – assumed land use in 2036 (taken from 2031 staging in 2018 GHD report)

For the purpose of traffic modelling for the impact of Pondicherry, only the traffic accessing TNR and Greendale Road is included, since they enter the study area.

Volume plots document in *Figure 4.18 of Lows Creek Traffic Report* was also used to discern the total traffic accessing TNR from Lowes Creek and South Creek West Land (west of TNR).

The internal local road network within Lowes Creek is not explicitly modelled for this project and instead represented by the centroid connection, as shown in Figure 3-5.

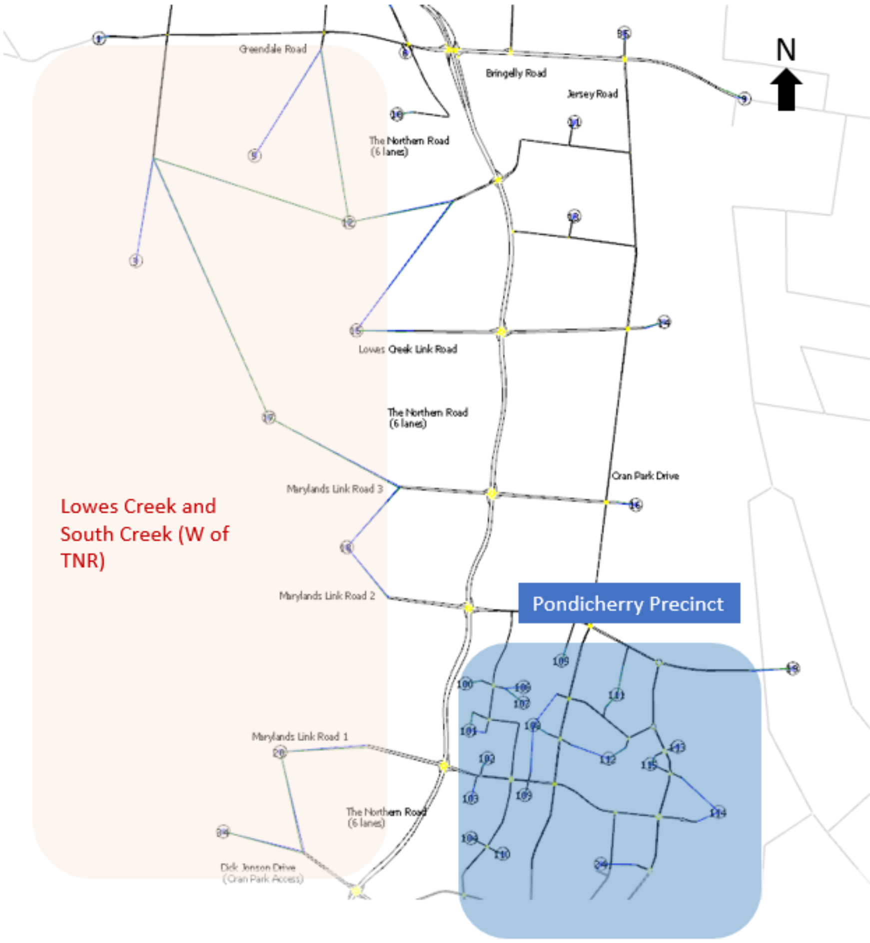


Figure 3-5 Inclusion of Lowes Creek and South Creek Traffic in Pondicherry Mesoscopic Model

3.3.2 South Creek West Land, east of TNR (2036)

The trips generated from the South Creek West Land area locating at the west of TNR was estimated based on the outputs of STFM in 2036. The total dwelling that would impact The Northern Road in 2036 is estimated to be 1,900 (i.e., 50 percent of 3,800) in accordance with the generated trips.

Oran Park Drive extension is also proposed within South Creek West Land as a two-lane road, extending to connect with Bringelly Road (Figure 3-6).

It is anticipated that provided the land use forecast (2036) is much higher than those provided in STFM, a four-lane Oran Park Drive may be required.

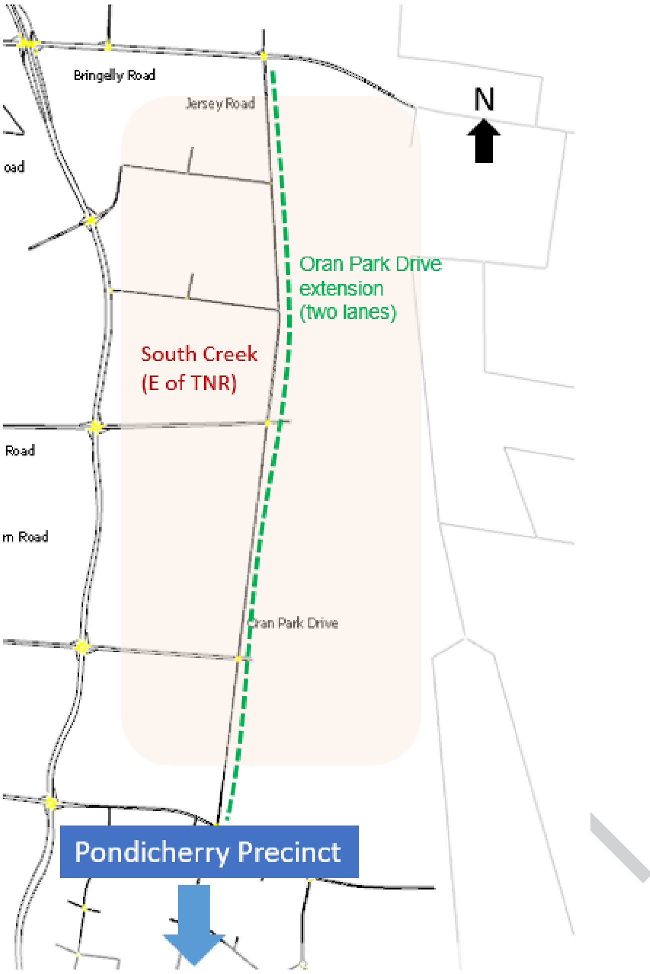


Figure 3-6 Inclusion of South Creek Traffic (east of TNR) and Oran Park Drive in Pondicherry Mesoscopic Model

3.3.3 Oran Park Precinct (2036)

Oran Park Precinct is located south and adjacent to Pondicherry Precinct. It is anticipated that the traffic from the northern part of Oran Park may access the local road network within Pondicherry, e.g. accessing the schools and Town Centre. Therefore, it was agreed that with northern part of Oran Park will be included in this assessment (Figure 3-7).

The mesoscopic traffic modelling includes the northern part of the Oran Park Precinct (or Oran Park *excluding* Oran Park South) that will account for approximate 5,200 dwellings in 2036, as well as:

- A primary school of 1000 students.
- A high school of 2,000 students
- A high school of 2,000 students (partially located with Pondicherry Precinct and the adjoining Oran Park Precinct)
- A K-12 Anglican School of 1200 students
- A town centre
- Source:
  - STFM 2036 model output
  - Aerial image (Nearmap) for the local road network within Oran Park

– Land use information provided by Greenfields

In addition, GHD is currently updating the Oran Park Precinct Strategic Model based on the latest land use forecast for 2036. A sanity check will be undertaken to ensure the consistency between the above land use and the consequent traffic generation assumptions in Section 3.3.4 adopted for the purpose of assessing the impact of the road network within Pondicherry and TNR.

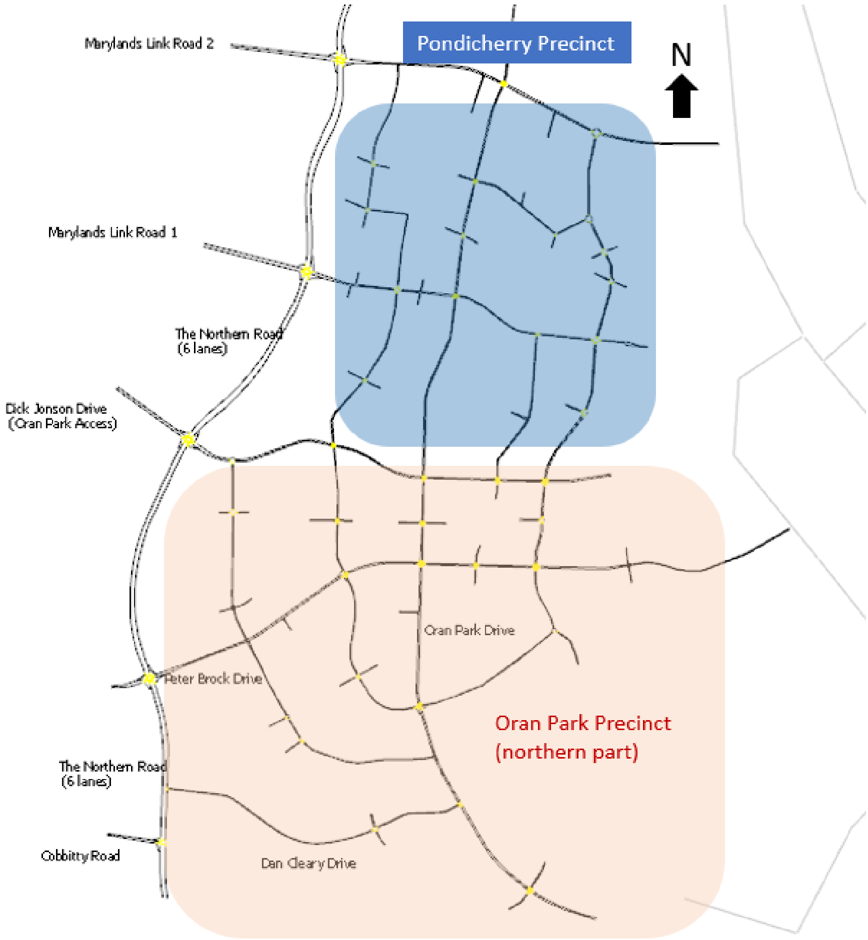


Figure 3-7 Inclusion of Oran Park (northern) Traffic and Network in Pondicherry Mesoscopic Model

3.3.4 Summary of trip generation

In the context of the assumptions in the above sections, the dwelling number and trips generated from each precinct in the forecast year 2036 are summarised in Table 3-4 and Figure 3-8 (overleaf).

It is important to note while the land use forecast within South West Growth Area is rapidly evolving, below is proposed to be used as a 'reasonable context' to assess the traffic impact of Pondicherry Precinct, based on the information available to GHD by August 2020.

Table 3-4: Dwelling and trip generation summary

Land Use (2036)	Dwelling	AM Peak			PM Peak		
		Inbound	Outbound	Total	Inbound	Outbound	Total
Pondicherry	2,700	1,810	3,090	4,900	2,270	930	3,200
Lowes Creek Maryland Precinct and South Creek West Land (W of TNR)	7,000	930	4,030	4,960	4,310	1,200	5,510
South Creek West Land (E of TNR)	1,800	830	900	1,730	750	1,070	1,820
Oran Park	5,000	4,740	5,380	10,120	3,960	3,610	7,570
Total	16,500	8,310	13,400	21,710	11,290	6,810	18,100

3.4 Trip distribution

The trip distribution from Pondicherry Precinct to the external road network was primarily based on the outputs from the STFM. The results demonstrated the following trip distribution patterns:

- Approximately 23 percent (AM) and 19 percent (PM) between the Pondicherry and the Northern Road (north).
- Approximately 21 percent (AM) and 25 percent (PM) between the Pondicherry and the Northern Road (south).
- Approximately 47 percent (AM) and 51 percent (PM) between the Pondicherry and the internal precincts including Oran Park, Lowes Creek and South Creek West.
- Approximately 4 percent (AM) and 3 percent (PM) are Pondicherry internal traffic
- Approximately 5 percent (AM) and 1 percent (PM) between the Pondicherry and the Camden Valley Way (south east) via Oran Park Drive.
- Minimum traffic between the Pondicherry and the Bringelly Road (east) via Northern Road based on the result of STFM.

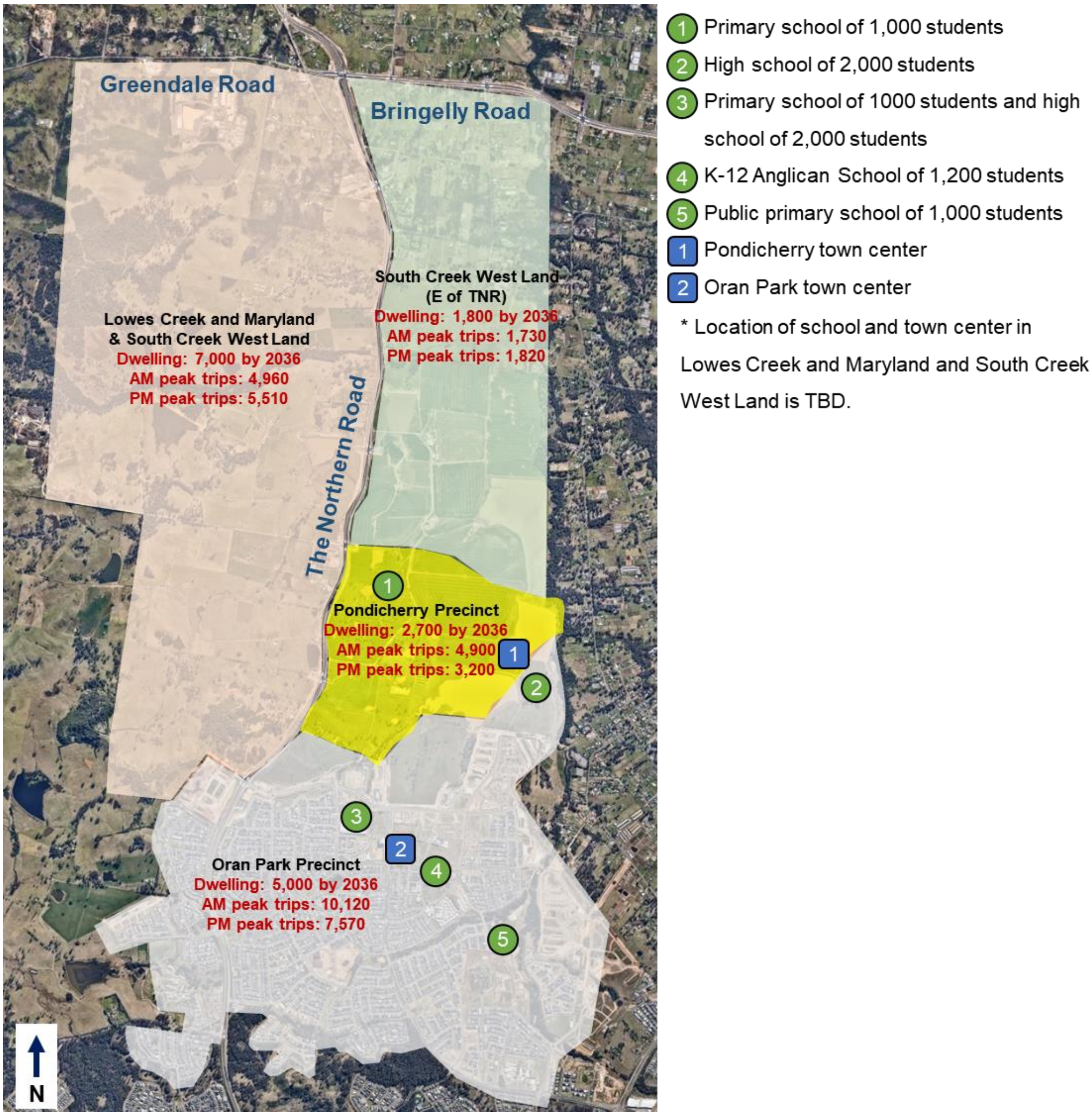


Figure 3-8: Dwellings and trip generations in 2036

Development Traffic – Lowes Creek and South Creek (west of TNR), accessing TNR and Greendale Road

Development Traffic –South Creek (east of TNR), accessing TNR and Bringelly Road

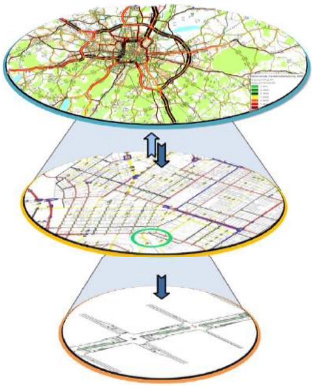
Development Traffic – Oran Park; primarily north of Dan Cleary Drive, accessing TNR

4. Traffic and Transport Assessment

4.1 Modelling Methodology

4.1.1 Introduction

A three-tiered modelling process has been adopted for the Pondicherry Precinct Traffic and Transport Assessment, as follows:



Tier 1 – Traffic distribution based on the available information, including the traffic distribution from the EMME model provided by TfNSW.

Tier 2 – Mesoscopic modelling using AIMSUN to take into account the consideration of time dynamics of the traffic demand.

Tier 3 – SIDRA intersection modelling using the traffic volumes identified in the previous modelling processes, accounting for the existing/proposed infrastructure on the adjoining road network.

As typical for traffic modelling projects, the scope of this work entails a number of limitations, as follows.

- The road network structure within the mesoscopic model focuses on the higher order road network only – motorways, arterials and sub-arterials.
- Road network coding considers the coarse network developed within the ILP area (i.e. arterial and sub-arterial roads). Further refinement of the local and collector road network will be required as part of the precinct planning process.
- Traffic analysis has been undertaken for the weekday morning and evening peak periods.
- Traffic simulation has been limited to mesoscopic simulation of private vehicles only and excludes public transport operations.

All modelling tiers are to be assessed for a 2036 year only, assuming full development of the Pondicherry Precinct. The remainder of this section discusses the individual modelling tiers in detail.

4.1.2 Strategic Modelling

The main traffic growth within the South West Growth Area was dictated by the land use development within Pondicherry, Oran Park, South Creek and Lowes Creek. The adopted land use assumptions and the adopted traffic generation rates (primarily based on the TfNSW Guideline) are discussed in details in Section 3.2 and Section 3.3.

The following sources were used to produce the trip distribution pattern, predominantly between The Northern Road and each Precinct:

- Oran Park Precinct (east of TNR): calibrated 2018 traffic demands.
- Pondicherry Precinct (east of TNR): estimated based on the adjacent Oran Park Precinct.

- Lowes Creek and South Creek (west of TNR): adopted from 2018 GHD report which assessed the traffic distribution in details (e.g. left and right turn on TNR).
- Other origin and destination: based on the traffic distribution within Sydney Traffic Model (STM), owned by TfNSW.

In parallel, GHD has developed a strategic model in EMME focusing on Oran Park (Oran Park Traffic Model, OPTM), however, also include the majority of the strategic road links within SWGA. Though the differences on the road network were anticipated due to the different nature and level of details between the two model suites, efforts have been made to reconcile and minimise the difference. The future investigation of the traffic impact within SWGA could potentially be assessed using this OPTM in lieu of the current version of STM.

4.1.3 Mesoscopic Modelling and Intersection Modelling

This section summarises the results of the future scenario assessment results, based upon the modelling results at three levels of details, namely:

- **Network-level**: considers high-level key performance indicators such as Vehicle Kilometres Travelled (VKT), Vehicle Hours Travelled (VHT), traffic throughput and latent demand in order to compare scenarios globally. The network-level results were produced from the mesoscopic model in AIMSUN.
- **Corridor-level**: considers high-level operations along the length of the corridors, including mean travel time and mean travel speed. The corridor-level results were produced from the mesoscopic model in AIMSUN.
- **Intersection-level**: considers the detailed operational performance at signalised and priority intersections, such as traffic flows by turn, average delay and Level of Service (LoS). It also assessed the implied queues along with key approaches. The intersection-level results were predominantly produced from intersection modelling in SIDRA.

Whilst the network-level statistics were presented for each peak hour, the narratives of corridor-level and intersection-level results focused on the last hour of each peak period, i.e. 8:00 am-9:00 am and 5:00 pm-6:00 pm.

Mesoscopic modelling takes account of the time dynamics of traffic. It is useful for determining optimum vehicle routes between all origins and destinations in the network based on congestion and travel times throughout the modelled period. Mesoscopic modelling provides a greater level of understanding of network operations than strategic modelling can provide.

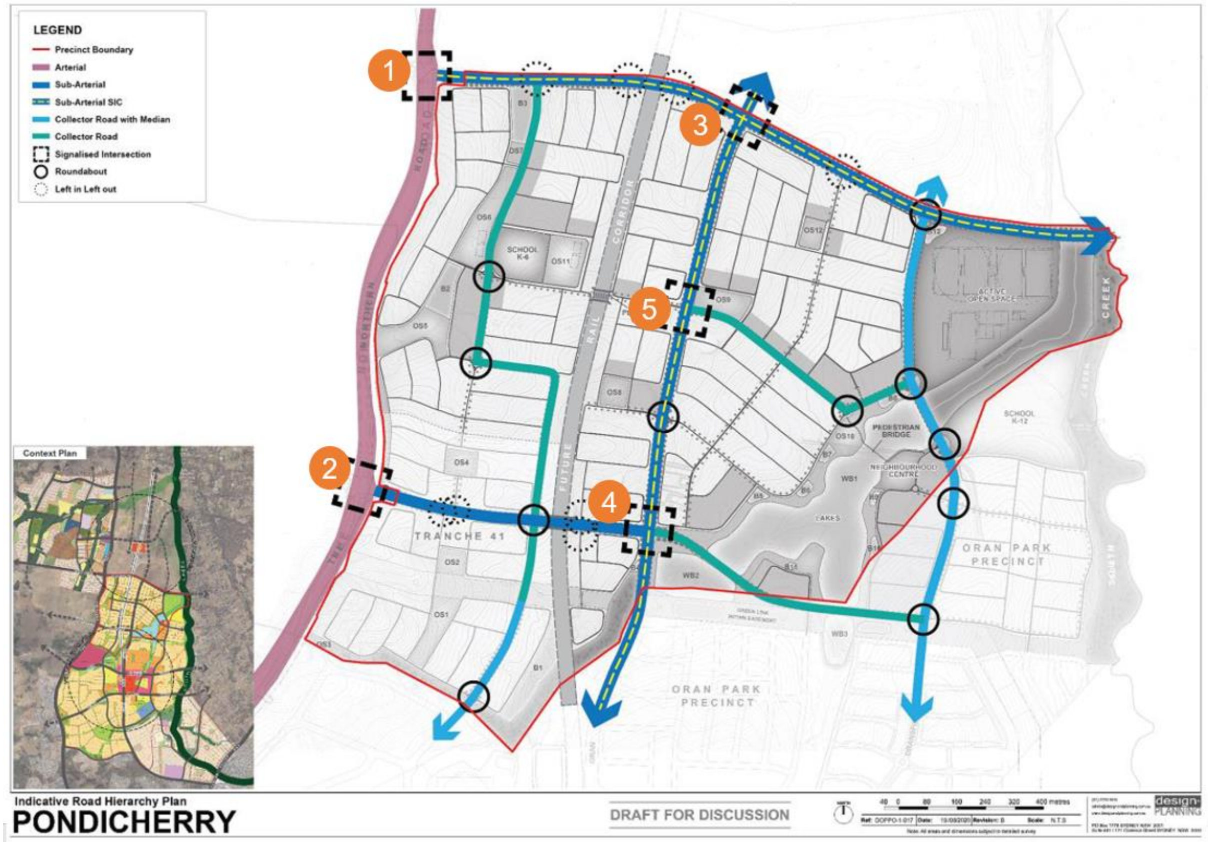
More detailed investigation at the key signalised intersections within Pondicherry was undertaken in SIDRA 9, with optimised phasing and proposed improvement to the layout: SIDRA analysis has been undertaken utilising the turning volumes extracted from AIMSUN and the proposed road geometry for each horizon year scenario. The results from SIDRA have been used to reaffirm the performance of the proposed intersections.

4.2 Base year (existing condition 2018)

As detailed in section 2.9, the base model was found to be well calibrated to the observed counts and met the criteria for validation. The final Base Model and the report were approved by TfNSW and deemed fit to be used as a basis for future impact assessment of Pondicherry Precinct on 23 October 2020

4.3 Future scenarios 2036: (Pondicherry) Full Development

The objective of this scenario was to assess road network capacity within Pondicherry (ILP presented in Figure 4-1 with five signalised intersections) and the key intersections on the Northern Road between Bringelly Road and Cobbitty Road. Other details are summarised in Table 4-1.



Source: Greenfield & DPIE, August 2020

Figure 4-1 Pondicherry draft Indicative Layout Plan (August 2020)

Table 4-1 Summary of 2036 land use and key network assumptions

Traffic Modelling	Scenario 1
Pondicherry	Included.
Lowes Creek & South Creek, west of TNR	Included. Detailed in Section 3.3.1
South Creek, east of TNR	Included. Detailed in Section 3.3.2
Oran Park	Included. Detailed in Section 3.3.3
The Northern Road upgrade	Six lanes

Oran Park Drive extension	Two lanes

The breakdown of the traffic demands in the forecast year 2036 are summarised in Table 4-2.

Table 4-2 Future AM and PM peak hour traffic – Full Development 2036

Traffic volumes (veh/hr)	2036 AM Peak	2036 PM Peak
Existing Traffic (2019)	*Approx. 5200*	*Approx. 5600*
Total 2036 Scenario v.s. *2018 Traffic*	*20,730 or approx. 400% increase*	*19,000, or approx. 300% increase*
Development Traffic - Pondicherry	4,900	3,200
Development Traffic – Lowes Creek and South Creek (west of TNR) ***Accessing TNR and Greendale Road***	4,960	5,510
Development Traffic –South Creek (east of TNR) ***Accessing TNR and Bringelly Road***	1,730	1,820
Development Traffic – Oran Park ***Primarily north of Dan Cleary Drive, accessing TNR***	10,120	7,570

The preliminary layouts at the following signalised intersections (correspondent to the numbering in Figure 4-1) were presented in Figure 4-2 and Figure 4-3.

1. The Northern Road | Marylands Link Road 1
2. The Northern Road | Marylands Link Road 2
3. Oran Park Drive | Marylands Link Road 1
4. Oran Park Drive | Marylands Link Road 2
5. Marylands Link Road 2 | Local Street

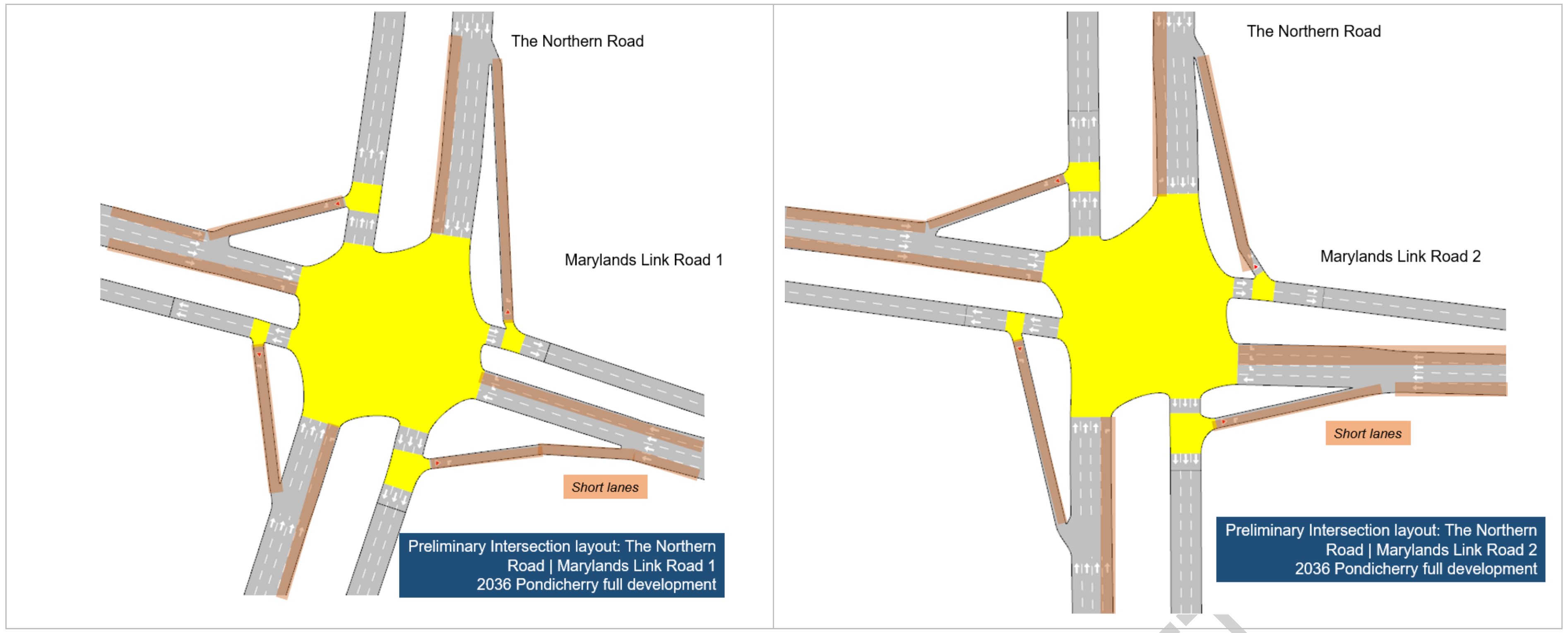


Figure 4-2 Preliminary Intersecting layout – TNR | Marylands Link Road 1 & TNR | Marylands Link Road 2

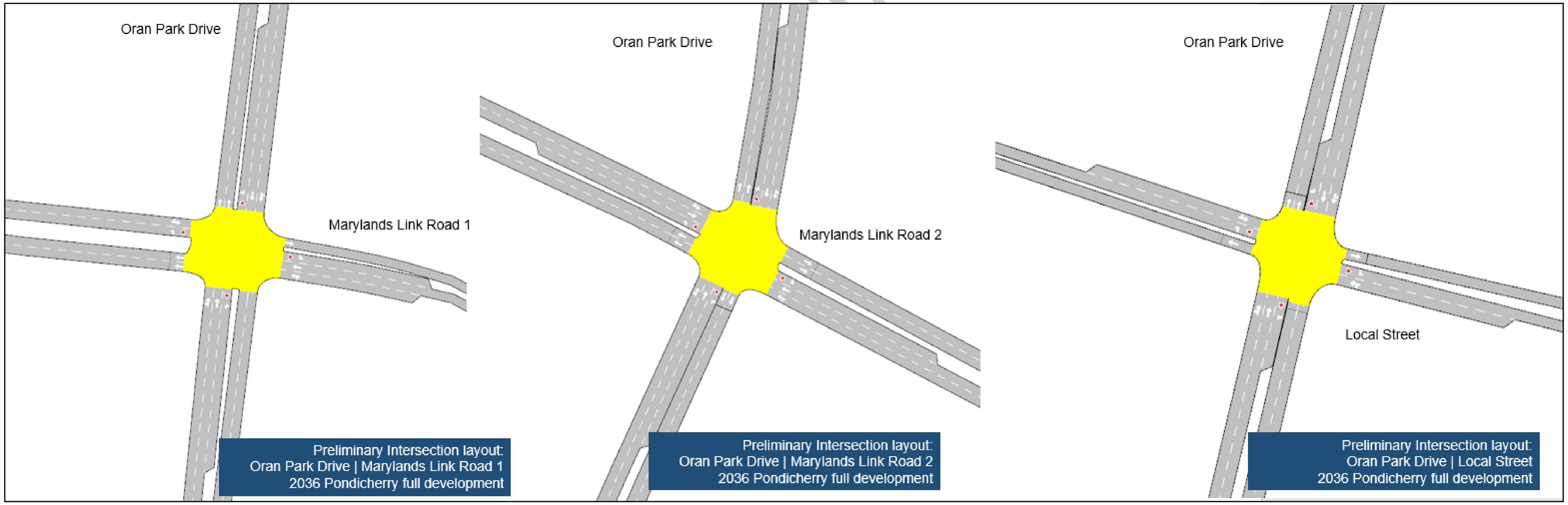


Figure 4-3 Preliminary Intersecting layouts – Oran Park Drive | Marylands Link Road 1 & Oran Park Drive | Marylands Link Road 2 & Oran Park Drive | Local Street

4.3.1 Network level: Statistics Results

Network-level traffic statistics were summarised in Table 4-3 for both AM peak and PM peak results. The predicted network performance revealed that:

- The network-wide vehicle delays up to 50 seconds in AM peak and 43 seconds in PM peak.
- Average Network speed higher than 37 km/h in both AM and PM peak.
- The number of unreleased vehicles less than 300 vehicles in AM and 100 vehicles in PM peak, less than 2 percent of the total traffic flow inputs.

Table 4-3 Summary of Network Statistics – full development 2036

Indicator	Unit	AM peak - 2036		PM peak - 2036	
		7-8 am	8-9 am	7-8 am	8-9 am
Traffic flow Input	no.	18,340	20,730	17,470	18,740
VKT	km	82,170	90,430	77,790	82,400
VHT	hrs	2,150	2,480	1,950	2,210
Veh Delay	sec	45	50	37	43
Vehicles Active	no.	9,070	9,810	7,910	9,130
Vehicles Arrived	no.	17,690	20,690	17,370	18,430
Unreleased Vehicles	no.	30	80	0	280
Network Speed	km/h	38	37	40	38

For the purpose of demonstrating the network traffic condition, the results of 8:00 am - 9:00 am. and 5:00 pm – 6:00 pm were used to represent the traffic condition in the respective AM and PM peak hour.

The density plots presented in Figure 4-4 (AM), Figure 4-5 (PM),.Figure 4-6 (Pondicherry AM) and Figure 4-7 (Pondicherry PM) demonstrated the proposed road network would be able to accommodate the full development of Pondicherry Precinct by 2036.

The following pinch points were identified on the wider network, primarily as a result of the substantial development propised in the northern part of SWGA and South Creek east of TNR:

- AM peak: Bringelly Road in eastbound direction, east of Oran Park Drive
- AM peak: The Northern Road northbound direction, north of Marylands Link Road 2
- PM Peak: The Northern Road southbound direction, north of Marylands Link Road 2

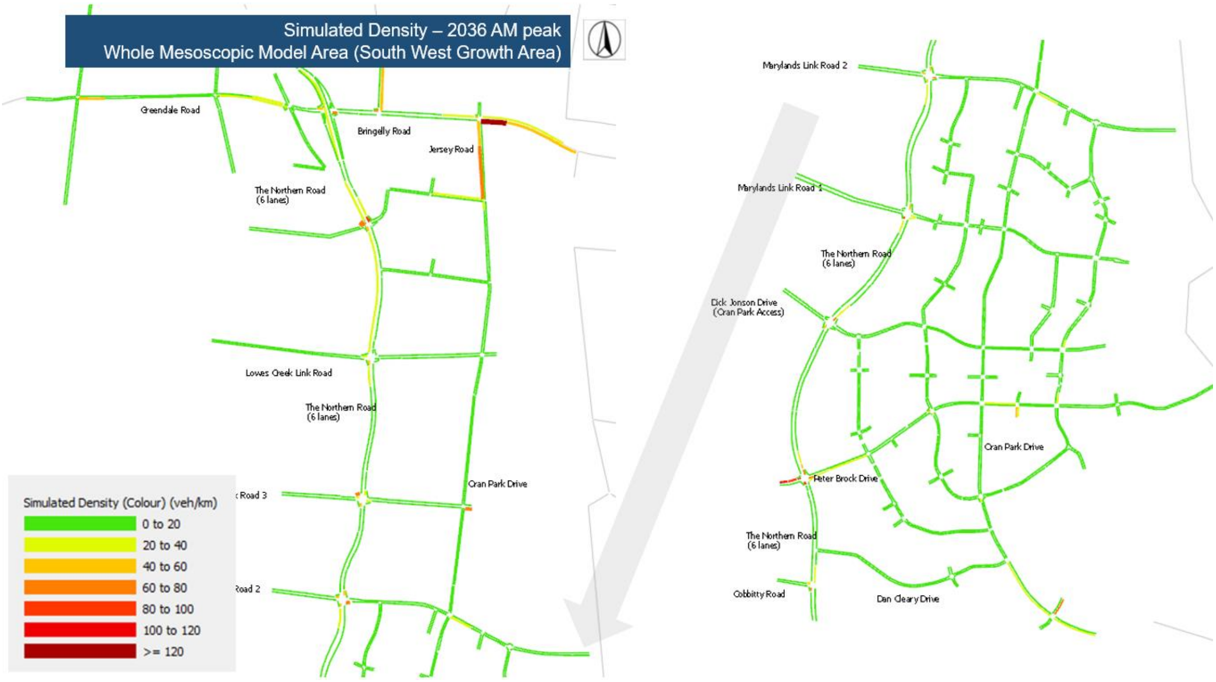


Figure 4-4 Density Plot: Network Wide 2036 AM peak hour

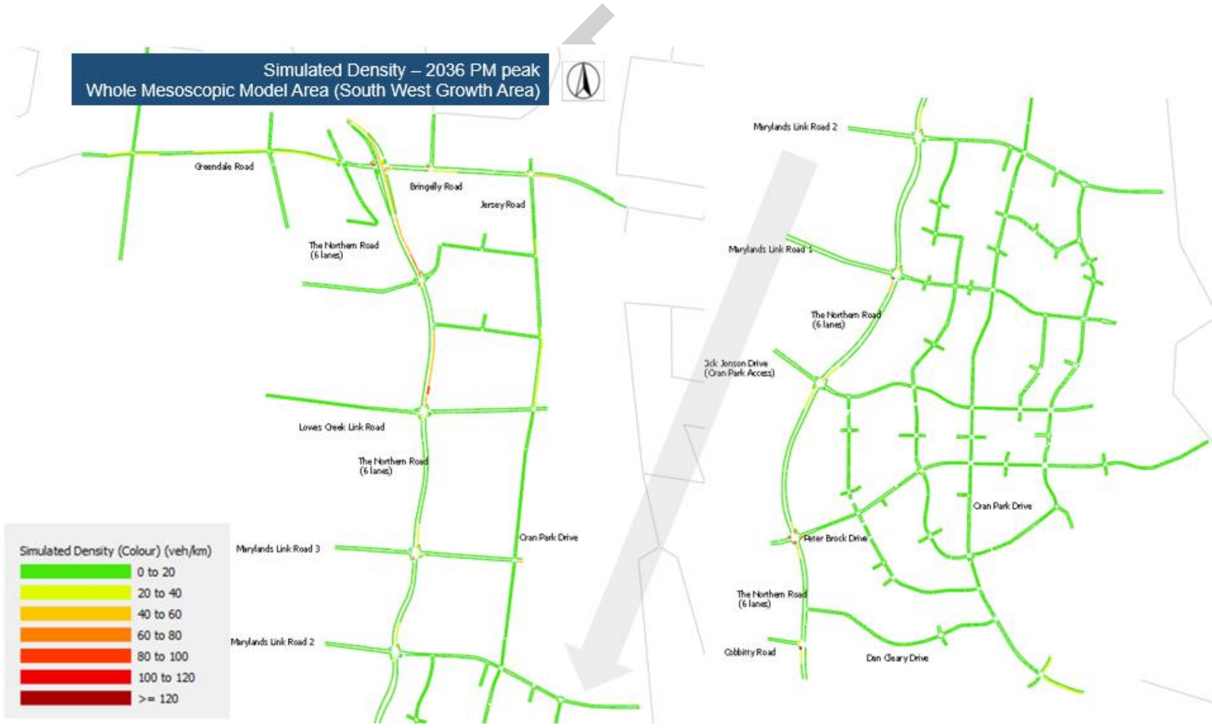


Figure 4-5 Density Plot: Network Wide 2036 PM peak hour

Figure 4-6 Density Plot: Pondicherry full development 2036 AM peak hour

Figure 4-7 Density Plot: Pondicherry full development 2036 PM peak hour

4.3.2 Corridor level: Travel Time Results on TNR and Bringelly Road

The travel time results on the following two corridors were extracted

- The Northern Road, between Cobbitty Road and Bringelly Road, of approximately 9.0 km

- Bringelly Road, between Oran Park Drive (extension) and Tyson Road, of approximately 3.3 km

The corresponding speed results on both corridors were summarised in Table 4-4. The results demonstrated that in 2036:

- Estimated travel time on The Northern Road would range between 11 and 13.5 minutes in both directions during AM and PM peak period. This is correlated to average speed over 40 km/h in peak direction (northbound in AM and southbound in PM).
- Estimated travel time on Bringelly Road / Greendale Road would be approximately 4 minutes in eastbound and range between 5 and 9 minutes in westbound direction. The longer travel time and the associated lower speed in westbound direction was assessed to result from the traffic delay at Bringelly Road and Oran Park Drive (extension) intersection. Investigation of additional capacity at this intersection is potentially required provided the assumed built-out of South Creek utilising Oran Park Drive (extension). The adopted land use assumption of South Creek (west of TNR) for this study is approximately 1900 low-density dwellings impacting TNR in Section 3.3.2). Alternatively, a four-lane Oran Park Drive extension may be required to provide additional capacity to accommodate the anticipated movements in 2036.

Table 4-4 Simulated travel time and speed on TNR and Bringelly Road

2036	Direction / Speed (km/h)	AM peak 8 – 9	PM peak 5 - 6
		2036	2036
The Northern Road	Northbound	12:03	12:32
	Speed	*45*	*43*
	Southbound	11:27	13:22
	Speed	*47*	*40*
Bringelly Road	Eastbound	04:37	04:20
	Speed	*43*	*46*
	Westbound	08:36	05:10
	Speed	*23*	*38*

4.3.3 Intersection Level – within Pondicherry Precinct

The intersection assessment was undertaken primarily in AIMSUN (mesoscopic model), for:

- All the signalised intersections on the Northern Road, between Cobbitty Road and Bringelly Road
- All the intersections (traffic signals, roundabouts and priority junctions) within Pondicherry Precinct.

The intersections of interest have been assessed based on overall average delay per vehicles (sec/veh). The performance of a road network is largely dependent on the operating performance of key intersections of interest, which are critical capacity control points. The criteria for evaluating the operational performance of signalised intersections is provided by the TfNSW Guide to Traffic Generating Developments (2002) as displayed in Table 4-5.

Table 4-5 LoS criteria for signalised intersections

LoS	Average delay per vehicle (secs/veh)	Traffic signals operation
A	< 14	Good operation
B	15 to 28	Good with acceptable delays & spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals, incidents will cause excessive delays.
F	> 70	Unsatisfactory with excessive queuing

The simulated intersection delay and the associated level of service were presented in Figure 4-8 (The Northern Road AM and PM), Figure 4-9 (Pondicherry Precinct AM) and Figure 4-10 (Pondicherry Precinct PM), respectively.

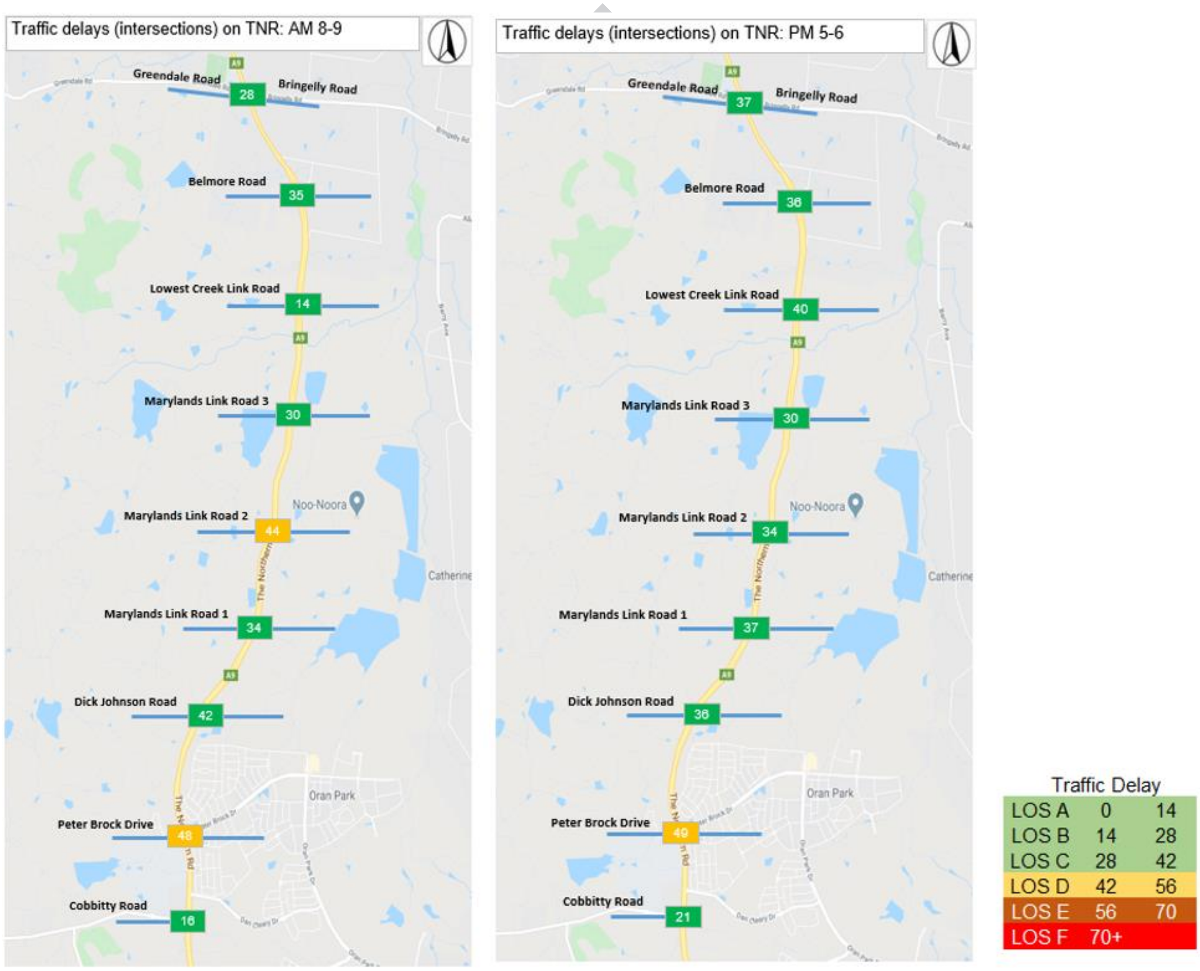


Figure 4-8 Intersection Delay and LoS on TNR: Pondicherry full development 2036

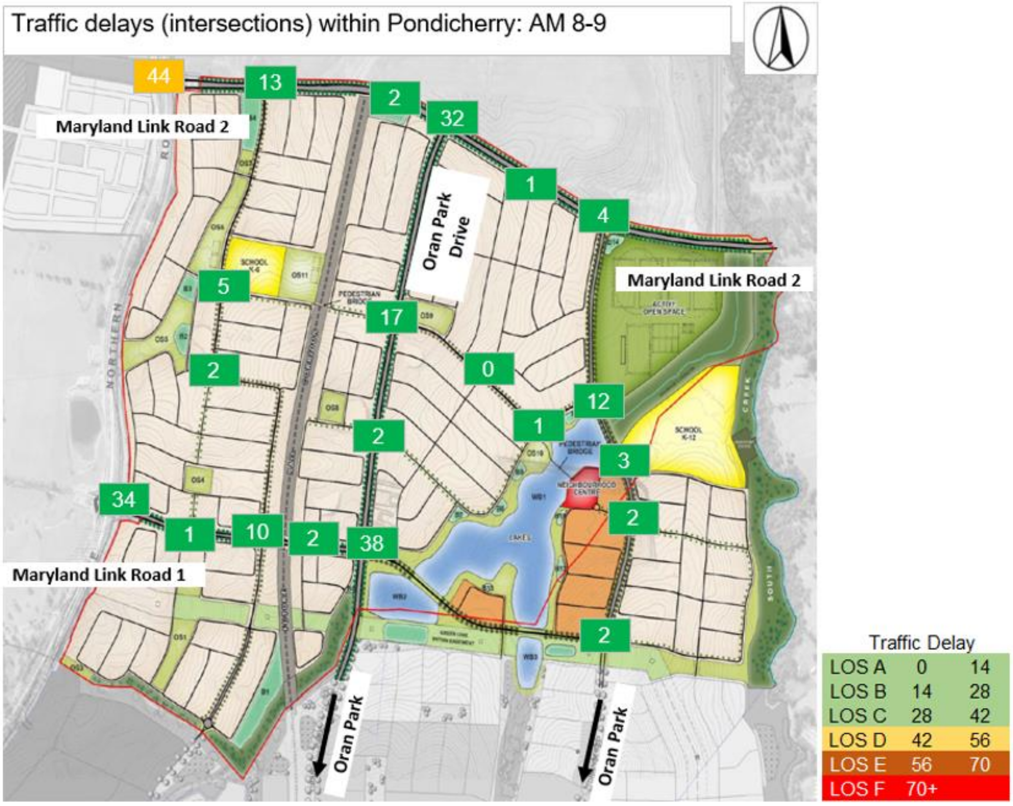


Figure 4-9 Intersection Delay and LoS within Pondicherry full development 2036 AM peak

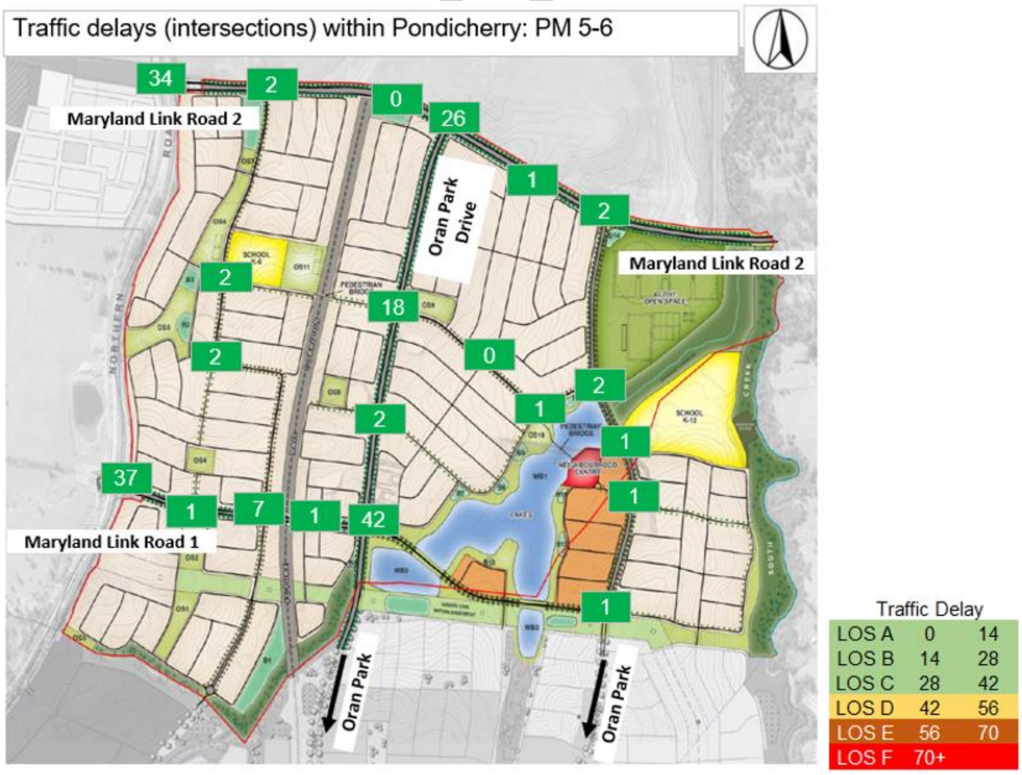


Figure 4-10 Intersection Delay and LoS within Pondicherry full development 2036 PM peak

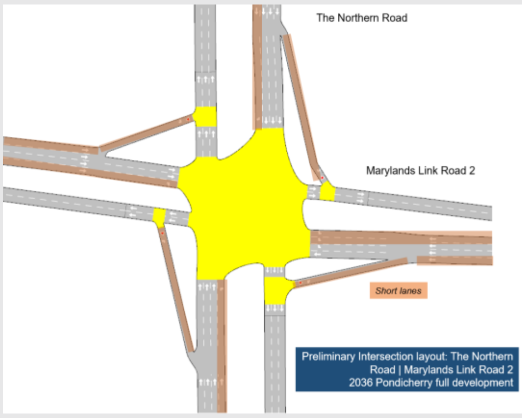
The results based on the mesoscopic model demonstrated that all the assessed intersection would operate within capacity (LoS D or better) in both AM and PM peak in 2036.

More detailed investigation at the four signalised intersections was undertaken in SIDRA, with optimised phasing and proposed improvement to the layout:

1. The Northern Road | Marylands Link Road 1
2. The Northern Road | Marylands Link Road 2
3. Oran Park Drive | Marylands Link Road 1
4. Oran Park Drive | Marylands Link Road 2

Mesoscopic model (AIMSUN) intersection layouts, turning volumes and comparable phase sequence for 2036 design year horizon have been used to inform the road geometry inputs into the SIDRA models. Table 4-6 illustrates these layouts modelled within SIDRA software suite.

Table 4-6: 2036 Detailed investigation of the intersection layouts (SIDRA)

<table>
<tr><th>Aimsun Layout</th><th>SIDRA layout</th></tr>
<tr><td colspan="2">The Northern Road / Marylands Link Road 2 (external intersection)</td></tr>
<tr><td>


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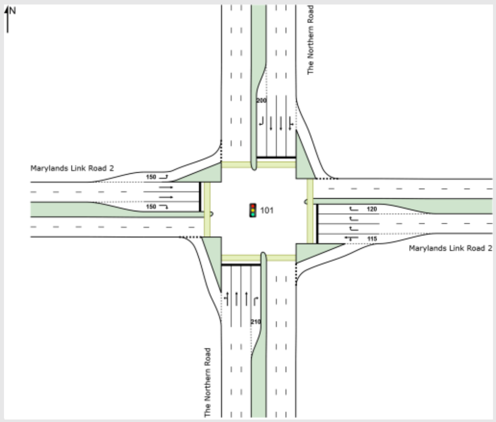

</td></tr>
<tr><td colspan="2">The Northern Road / Marylands Link Road 1 (external intersection)</td></tr>
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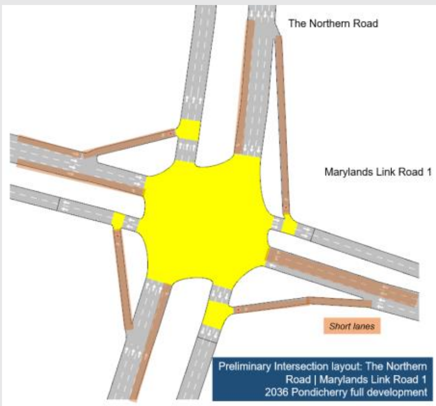

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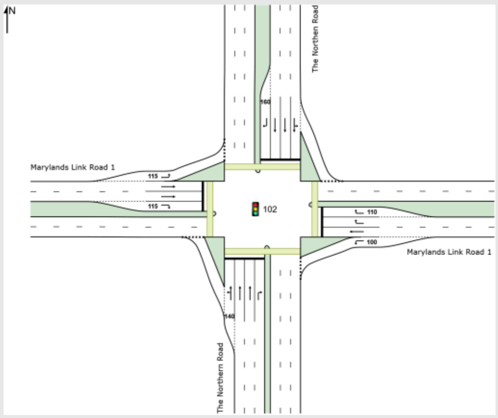
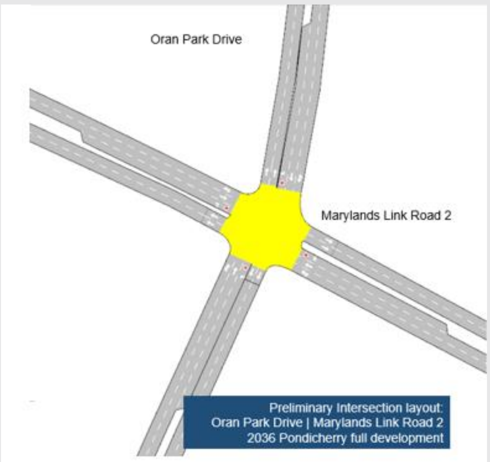
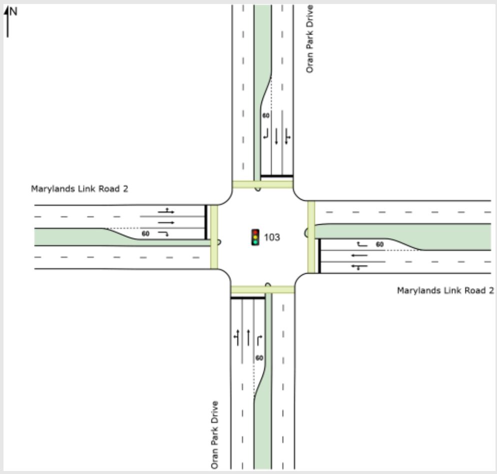
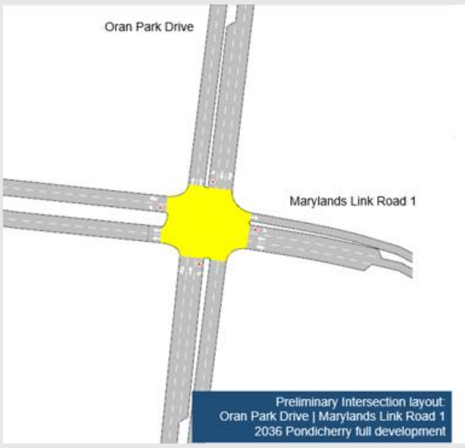


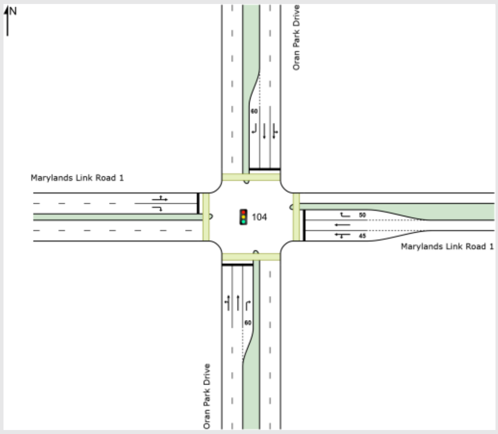
</td></tr>
<tr><td colspan="2">Oran Park Drive / Marylands Link Road 2 (internal intersection)</td></tr>
</table>





Oran Park Drive / Marylands Link Road 1 (internal intersection)





The following assumptions and parameter settings have been used in SIDRA to model 2036 design year horizon:

- SIDRA default peak hour factor of 95 percent has been incorporated for all the permitted movements.
- SIDRA default lane saturation flow rate of 1,950 pcu/h has been retained for all the approaches.
- Traffic volumes used in SIDRA are inherited from 2036 AIMSUN design year flows.
- The internal and external road network was modelled for the horizon year 2036.
- SIDRA area type factor is a parameter used for saturation flow adjustment for signalised intersections. For 2036 design year scenario, application of area type factor of 1.2 increases lane capacity by 20 percent to represent lane capacity allocated in the AIMSUN mesoscopic model as well as demonstrating more urban conditions expected by 2036.
- Following a conservative approach, a default 50 pedestrian per hour across all approaches and intersections for the analysis.
- A maximum cycle time of 140 seconds was assumed for all intersections.

In order to quantify intersection performance, the following performance measures have been reported for each scenario:

- Degree of Saturation (DoS) (%) – ratio of demand flow to capacity

- Average delay (seconds) – average delay per vehicle in seconds incurred by vehicles over the modelled time period;
- 95th percentile queue length (m) – queue length which 95 percent of all observed cycle queue lengths fall, or five percent of all observed queue length exceed.
- Level of Service (LoS) – An index of the traffic operational performance on a given approach (based on average delay).

The criteria for acceptable limits of operation for intersections specified by Austroads *Guide to Traffic Management Part 12: Traffic Impacts of Development (2019)* has been adopted for this assessment. The acceptable limit of operation is reached when the DoS exceeds 90 percent for the signal-controlled intersections and 85 percent for roundabouts.

The Northern Road / Marylands Link Road 2

The Northern Road / Marylands Link Road 2 is the most north western external signal-controlled intersection with geometric layouts to facilitate the south and northbound traffic demands along the Northern Road. It includes triple right turns on the eastern approach to accommodate the future demands induced from the Pondicherry development precinct.

The intersection performance results by each approach were presented in Table 4-7. Marylands Link Road 2 (east approach) is highlighted as an access road to Pondicherry Precinct.

Table 4-7:The Northern Road / Marylands Link Road 2 model results - 2036

Approach (direction)	Approach	Total Veh/h	DoS	Avg. Delay (sec)	LoS	95% Back of Queue (m)
AM PEAK						
The Northern Road	S	2350	0.75	35	LoS C	320
Marylands Link Road 2	**E**	**980**	**0.53**	**47**	**LoS D**	**101**
The Northern Road	N	1600	0.52	29	LoS C	190
Marylands Link Road 2	W	280	0.81	60	LoS E	103
Intersection		**5220**	**0.81**	**37**	**LoS C**	**320**
PM PEAK						
The Northern Road	S	1890	0.69	37	LoS C	241
Marylands Link Road 2	**E**	**270**	**0.15**	**33**	**LoS C**	**34**
The Northern Road	N	2300	0.90	52	LoS D	402
Marylands Link Road 2	W	90	0.27	58	LoS E	35
Intersection		**4540**	**0.90**	**44**	**LoS D**	**402**

The key findings from the traffic analysis shows that:

- The intersection (with the proposed layout in Table 4-6) would operate within capacity with overall delays within LoS D threshold and within DoS 0.9 during both AM and PM peaks in 2036.

- Marylands Link Road 2 east approach currently operating within delay performance thresholds of LoS D. The worse 95th percentile queues on this approach is 101 m and 34 m occurring on the right movement for AM and PM peak respectively.

The Northern Road / Marylands Link Road 1

The Northern Road / Marylands Link Road 1 is the most south western external signal-controlled intersection with geometric layouts similar to The Northern Road / Maryland Link Road 2. However, with the inclusion of dual right turns on the eastern approach to accommodate for the future demands induced from the Pondicherry development precinct.

The intersection performance results by each approach were presented in Table 4-8. Marylands Link Road 1 (east approach) is highlighted as an access road to Pondicherry Precinct.

Table 4-8:The Northern Road / Marylands Link Road 1 model results - 2036

Approach (direction)	Approach	Total Veh/h	DoS	Avg. Delay (sec)	LoS	95% Back of Queue (m)
AM PEAK						
The Northern Road	S	1750	0.79	24	LoS B	115
Marylands Link Road 1	**E**	**920**	**0.75**	**25**	**LoS B**	**84**
The Northern Road	N	2000	0.78	25	LoS B	155
Marylands Link Road 1	W	430	0.58	14	LoS A	62
Intersection		**5100**	**0.79**	**24**	**LoS B**	**155**
PM PEAK						
The Northern Road	S	2160	0.89	42	LoS C	210
Marylands Link Road 1	**E**	**290**	**0.26**	**30**	**LoS C**	**22**
The Northern Road	N	2270	0.84	41	LoS C	246
Marylands Link Road 1	W	100	0.10	12	LoS A	12
Intersection		**4800**	**0.89**	**40**	**LoS C**	**246**

The key findings from the traffic analysis shows that:

- The intersection (with the proposed layout in Table 4-6) would operate within delays thresholds of LoS D and under DoS 0.9 during both AM and PM peaks.
- Marylands Link Road 1 east approach currently operating within delay performance thresholds of LoS D. The worse 95th percentile queues on this approach is 84 m and 22 m occurring on the left movement for AM and PM peak respectively.

Oran Park Drive / Maryland Link Road 2

Oran Park Drive / Marylands Link Road 2 is the most north eastern internal signal-controlled intersection with geometric layouts to facilitate internal network traffic demands.

The intersection performance results by each approach were presented in Table 4-9,

Table 4-9: Oran Park Drive / Marylands Link Road 2 model results - 2036

Approach (direction)	Approach	Total Veh/h	DoS	Avg. Delay (sec)	LoS	95% Back of Queue (m)
AM PEAK						
Oran Park Drive	S	150	0.20	20	LoS B	25
Marylands Link Road 2	E	880	0.72	26	LoS B	82
Oran Park Drive	N	250	0.20	23	LoS B	23
Marylands Link Road 2	W	110	0.09	23	LoS B	9
Intersection		**1390**	**0.72**	**25**	**LoS B**	**82**
PM PEAK						
Oran Park Drive	S	70	0.10	17	LoS B	9
Marylands Link Road 2	E	380	0.46	21	LoS B	32
Oran Park Drive	N	680	0.56	20	LoS B	62
Marylands Link Road 2	W	280	0.48	22	LoS B	33
Intersection		**1400**	**0.56**	**21**	**LoS B**	**62**

The key findings from the traffic analysis shows that:

- The intersection would operate within delays thresholds of LoS D and DoS 0.9 during both AM and PM peaks.
- Through movement on the eastern approach is the worst performing movement with 82 m queues and DoS 0.72 during AM peak.
- Worst performing movement during PM peak is the north approach shared lane with 62 m queues and DoS 0.56.

Oran Park Drive / Marylands Link Road 1

Oran Park Drive / Marylands Link Road 1 is the most south eastern external signal-controlled intersection with geometric layouts to facilitate internal traffic flows towards the overarching external intersections.

The intersection performance results by each approach were presented in Table 4-10.

Table 4-10: Oran Park Drive / Marylands Link Road 1 model results - 2036

Approach (direction)	Approach	Total Veh/h	DoS	Avg. Delay (sec)	LoS	95% Back of Queue (m)
AM PEAK						
Oran Park Drive	S	350	0.67	27	LoS B	44
Marylands Link Road 1	E	90	0.13	22	LoS B	6
Oran Park Drive	N	320	0.73	26	LoS B	47

Marylands Link Road 1	W	290	0.58	25	LoS B	30
Intersection		**1040**	**0.73**	**26**	**LoS B**	**47**
PM PEAK						
Oran Park Drive	S	440	0.64	28	LoS B	47
Marylands Link Road 1	E	120	0.13	22	LoS B	7
Oran Park Drive	N	170	0.31	25	LoS B	19
Marylands Link Road 1	W	430	0.72	27	LoS B	62
Intersection		**1160**	**0.72**	**26**	**LoS B**	**62**

The key findings from the traffic analysis shows that:

- The intersection would operate within delays thresholds of LoS D and below DoS 0.9 during both AM and PM peaks.
- Right movement on the northern approach is the worst performing movement with 47 m queues and DoS 0.73 during AM peak.
- Worst performing movement during PM peak is the west approach shared lane with 62 m queues and DoS 0.56.

Refer to Appendix A for detailed 2036 SIDRA outputs.

5. Summary and Conclusion

5.1 Introduction

GHD has been commissioned by Greenfields Development Company Pty Ltd on behalf of the Department of Planning, Industry and Environment (DPIE) to undertake a Traffic and Transport Assessment for the Pondicherry Precinct. The proposed Pondicherry Precinct development, as shown in Figure 1-1, is located to the east of The Northern Road, south of South Creek West Land Release Area and north of Oran Park. The site is located in Western Sydney, and is one of 14 precincts included in the South West Growth Area (SWGA). The SWGA is divided into 14 precincts that are progressively being released for planning and rezoning to accommodate increased population growth in Sydney.

The Pondicherry Precinct will consist of approximately 2,700 dwellings with supporting educational and recreational facilities. Further, the precinct is being rezoned via the Precinct Acceleration Proposal. This will allow the precinct to be developed earlier than the timeframes detailed by the Growth Centres Commission.

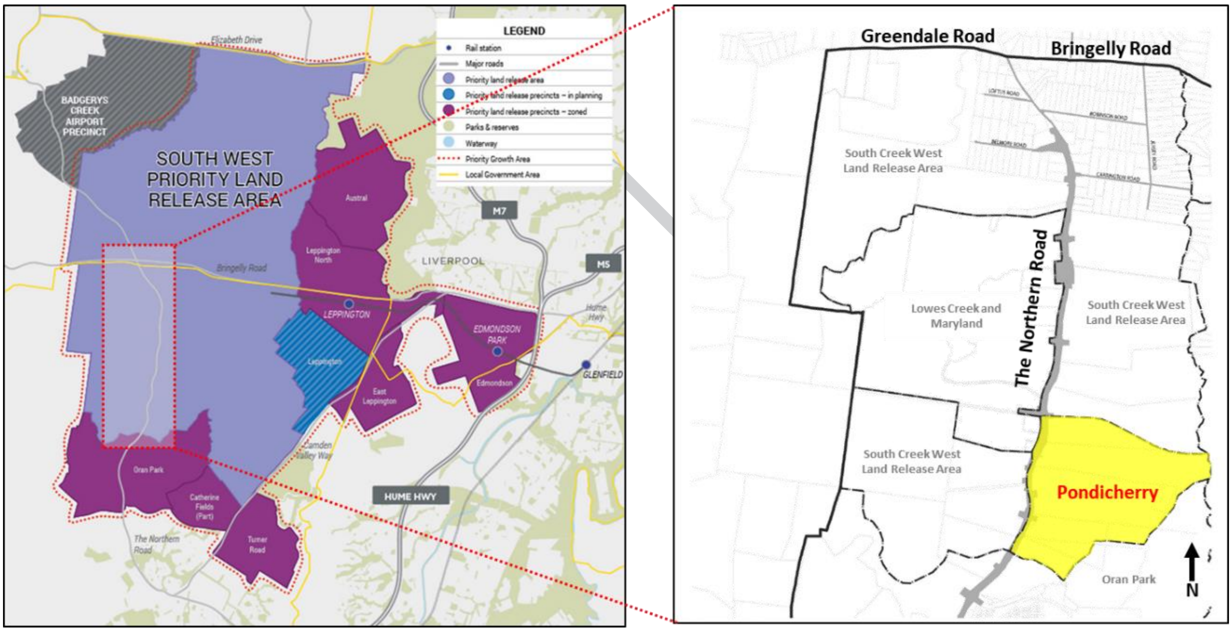
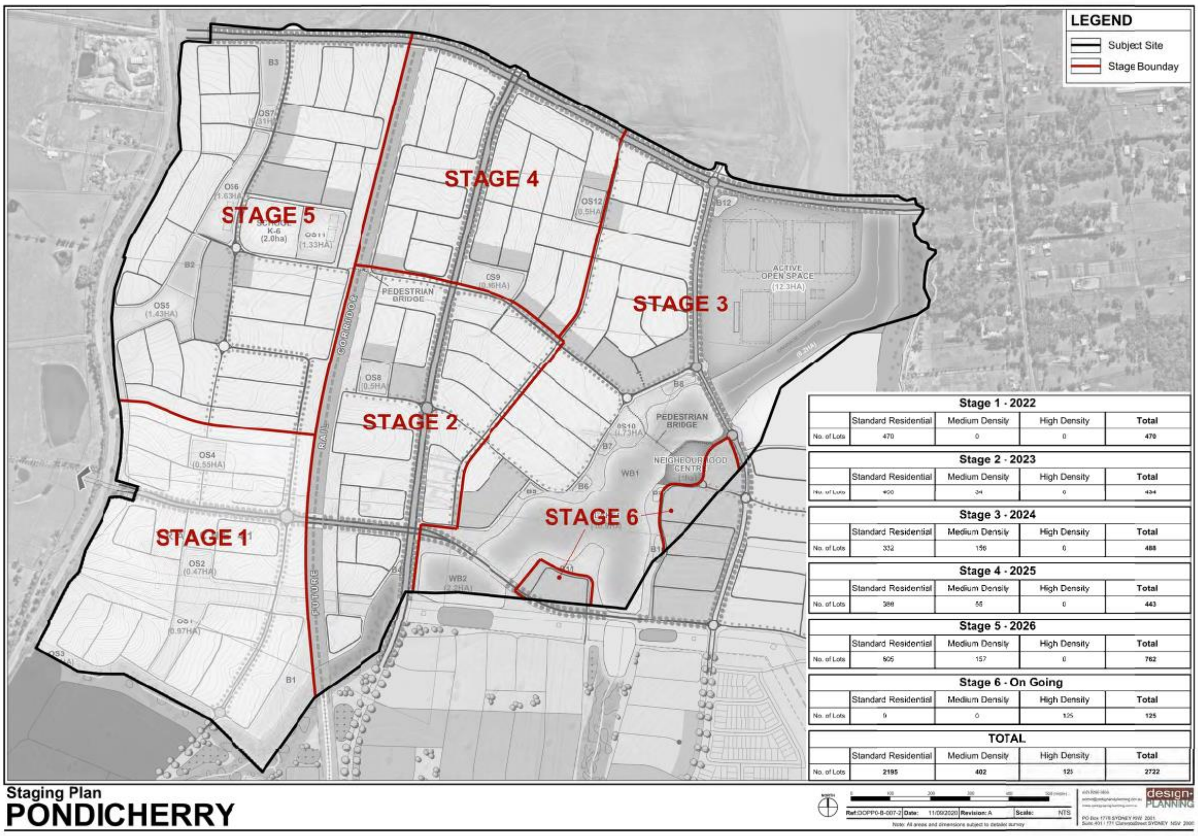


Figure 5-1: Pondicherry Precinct location

5.2 Proposed Land Uses: Pondicherry and South West Growth Area

The Pondicherry Precinct will be host to residential developments and supporting land-uses including retail, commercial, recreational and educational facilities. The draft ILP (August 2020) and indicative staging for the precinct is shown in Figure 3-1.



Note that there is a section of land adjacent to the east of the Pondicherry Precinct belonging to the Oran Park Precinct that includes part of the proposed high school and some medium and low density dwellings. Given its proximity to Pondicherry, the land uses in this area have been included in the trip generation assessment as ***Additional Area****.*

Figure 5-2: Pondicherry precinct ILP and staging (August 2020)

Table 5-1: Pondicherry Precinct yield (no. of dwellings)

Stage	Yield
Stage 1	470 low density dwellings
Stage 2	400 low density dwellings 34 medium density dwellings
Stage 3	332 low density dwellings 156 medium density dwellings
Stage 4	388 low density dwellings 55 medium density dwellings
Stage 5	605 low density dwellings 157 medium density dwellings
Stage 6	125 high density dwellings
Pondicherry (residential area)	2195 low density dwellings

Stage	Yield
	402 medium density dwellings 125 high density dwellings
Neighbourhood Centre	500 sqm supermarket 1,500 sqm speciality retail 500 sqm commercial land uses
Schools	A primary school of 1,000 students A high school (within Additional Area) of 2,000 students
Additional Area	485 low density dwellings

A summary of the expected trip generation characteristics of the Pondicherry Precinct (per stage of development) is presented below in Table 5-2 and Table 5-3. **It is assumed Pondicherry will be fully developed by 2036.**

Table 5-2: Trip generation summary – Full Development 2036 Residential and Town Centre

Land Use	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Stage 1	80	321	335	84
Stage 2	72	290	301	75
Stage 3	75	300	310	77
Stage 4	73	291	302	76
Stage 5	122	487	505	126
Stage 6	7	29	37	9
Additional Area	88	332	346	91
Town Centre	-	-	59	59

Table 5-3: Trip generation summary – Full Development 2036 (School)

Total traffic generation	AM Peak		PM Peak	
	Inbound	Inbound	Inbound	Outbound
Primary School	335	335	265	265
High School	602	418	218	342

100% 8-9 am and 100% 3-4 pm for school traffic

The traffic impact of Pondicherry was assessed within the wide context of the SWGA, including future development of Oran Park, Lowes Creek and South Creek.

It is important to note while the land use forecast within South West Growth Area is rapidly evolving, below is proposed to be used as a 'reasonable context' to assess the traffic impact of Pondicherry Precinct, based on the information available to GHD by August 2020.

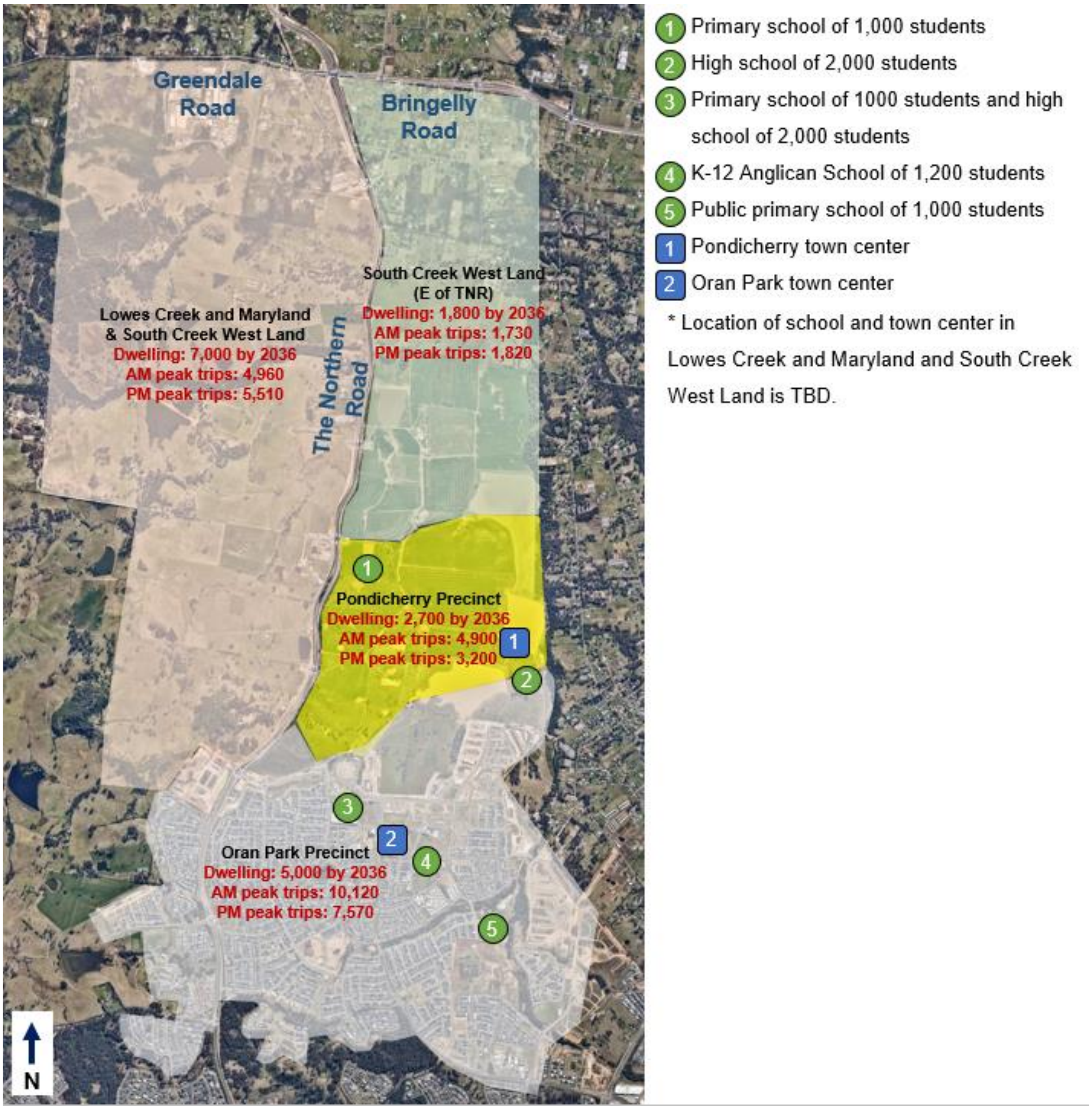


Figure 5-3 Dwelling and trip generation impacting TNR - SWGA

Development Traffic – Lowes Creek and South Creek (west of TNR), accessing TNR and Greendale Road

Development Traffic –South Creek (east of TNR), accessing TNR and Bringelly Road

Development Traffic – Oran Park; primarily north of Dan Cleary Drive, accessing TNR

5.3 Road Network and Access and Traffic Impact

The proposed road structure/hierarchy for the Pondicherry Precinct is as follows:

- Two east-west sub-arterial roads providing access from The Northern Road to the precinct via new signalised intersections.
- A sub-arterial extension of Oran Park Drive providing north-south connectivity from Oran Park to the precinct.
- A collector road network that distributes local traffic throughout the subject site and directs vehicles to sub-arterial roads at key intersections.

Intersections on collector roads are generally specified as roundabouts, while signalised intersections are assigned at the juncture of all sub-arterial and arterial roads.

The proposed road network, hierarchy and accesses are depicted in Figure 3-2.

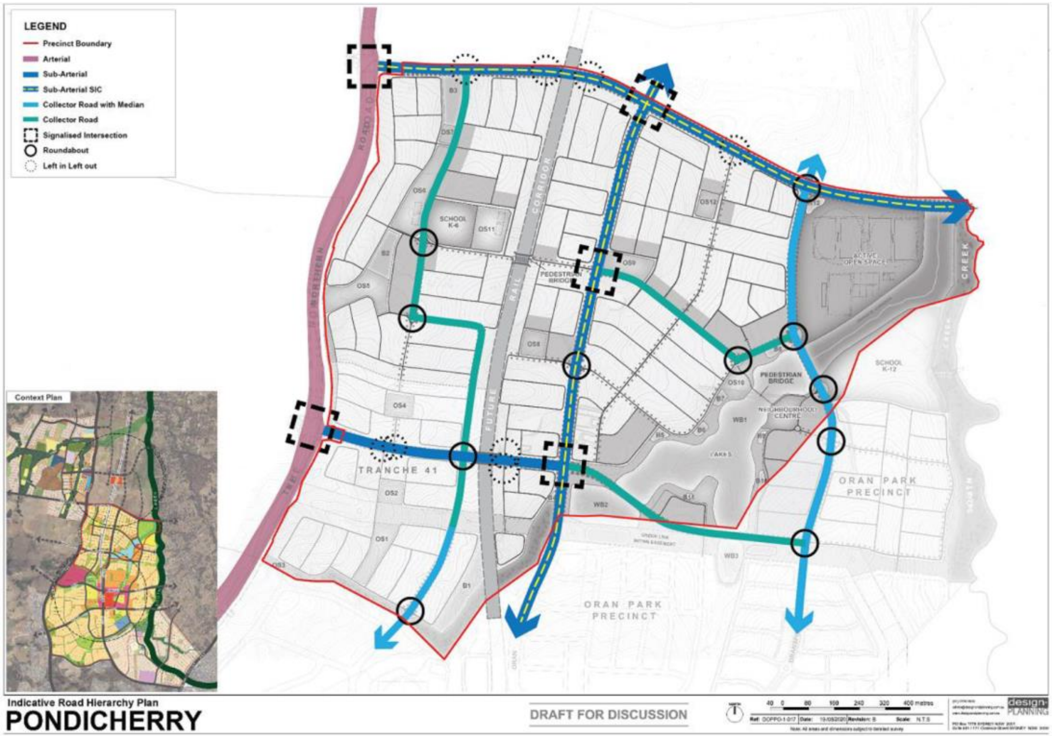


Figure 5-4: Pondicherry Precinct road network and hierarchy (August 2020)

5.3.1 Ultimate road network and performance (2036)

With the proposed road network and intersection layout and the full development of Pondicherry Precinct by 2036, the traffic impact were revealed for:

- Within the extended impact area:
  - The network-wide vehicle delay was estimated to be up to 50 seconds in AM peak and 44 seconds in PM peak
  - Average Network speed higher than 37 km/h in both AM and PM peak
  - The number of unreleased vehicles less than 300 vehicles in AM and 100 vehicles in PM peak, less than 2 percent of the total traffic flow inputs.
- On The Northern Road corridor between Bringelly Road and Cobbitty Road, estimated travel time would range between 11 and 13.5 minutes in both directions during AM and PM peak period. This is correlated to average speed over 40 km/h in peak direction (northbound in AM and southbound in PM).
- On Bringelly Road / Greendale Road the estimated travel time would be approximately 4 minutes in eastbound and range between 5 and 9 minutes in westbound direction. The longer travel time and the associated lower speed in westbound direction was assessed to have resulted from the traffic delay at Bringelly Road and Oran Park Drive (extension) intersection. Investigation of additional capacity at this intersection is potentially required provided the assumed built-out of South Creek utilising Oran Park Drive (extension). Alternatively, a four-lane Oran Park Drive extension may be required to provide additional capacity to accommodate the anticipated movements in 2036.

- All the intersections on The Northern Road would operate within capacity (LoS D or better) in 2036, with the proposed six lanes alignment.
- All the intersections within Pondicherry would operate within capacity (LoS C or better) in 2036.
- Additional turn lanes are required on Marylands Link Road 1 and Marylands Link Road 2, to facilitate the future traffic generated by the full built-out within Pondicherry and progressive staged development in the surrounding area including Oran Park and Lowes Creek. Subject to the intersection at later stage of the project, the additional right turn could be:
  - Converted from the through lane with changes in lane marking
  - Utilise the current wide median
- Figure 5-5 and Figure 5-6 summarised the preliminary intersection layouts at:
  - The Northern Road | Marylands Link Road 1
  - The Northern Road | Marylands Link Road 2
  - Oran Park Drive | Marylands Link Road 1
  - Oran Park Drive | Marylands Link Road 2
  - Marylands Link Road 2 | Local Street.

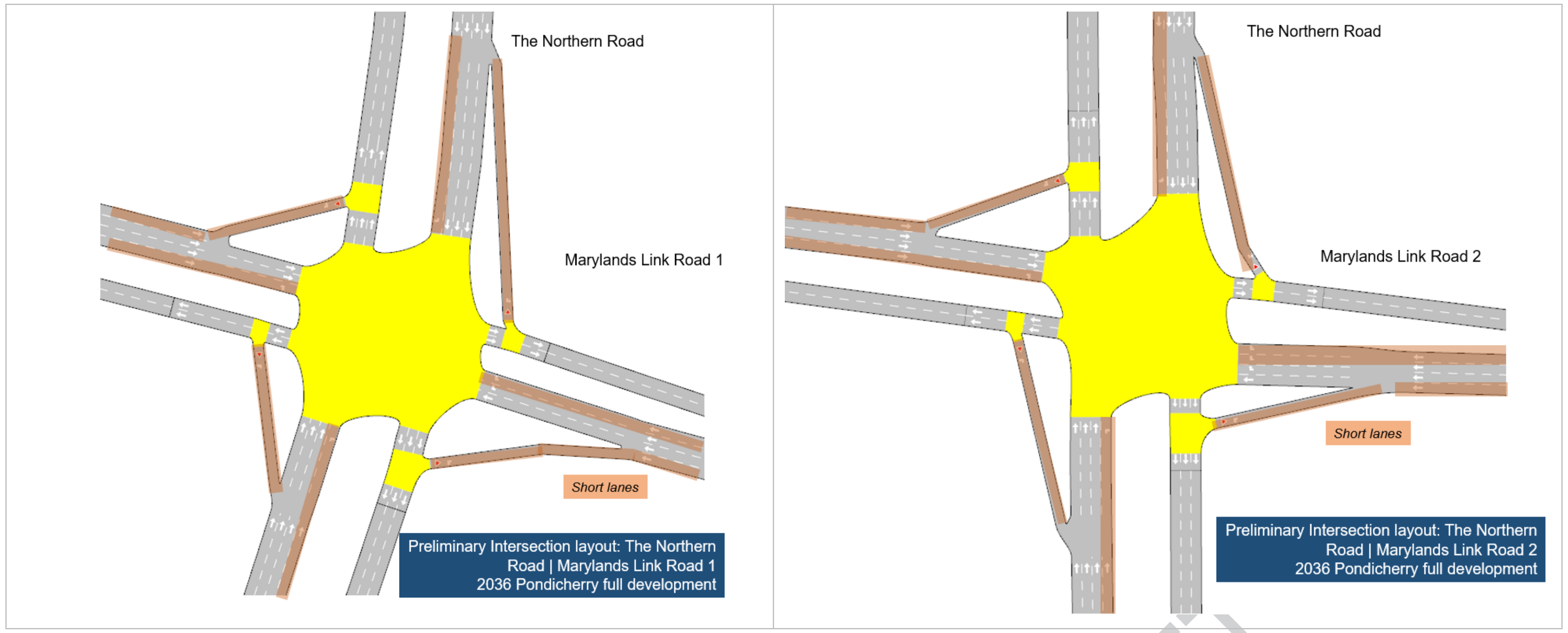


Figure 5-5 Preliminary Intersecting layout – TNR | Marylands Link Road 1 & TNR | Marylands Link Road 2

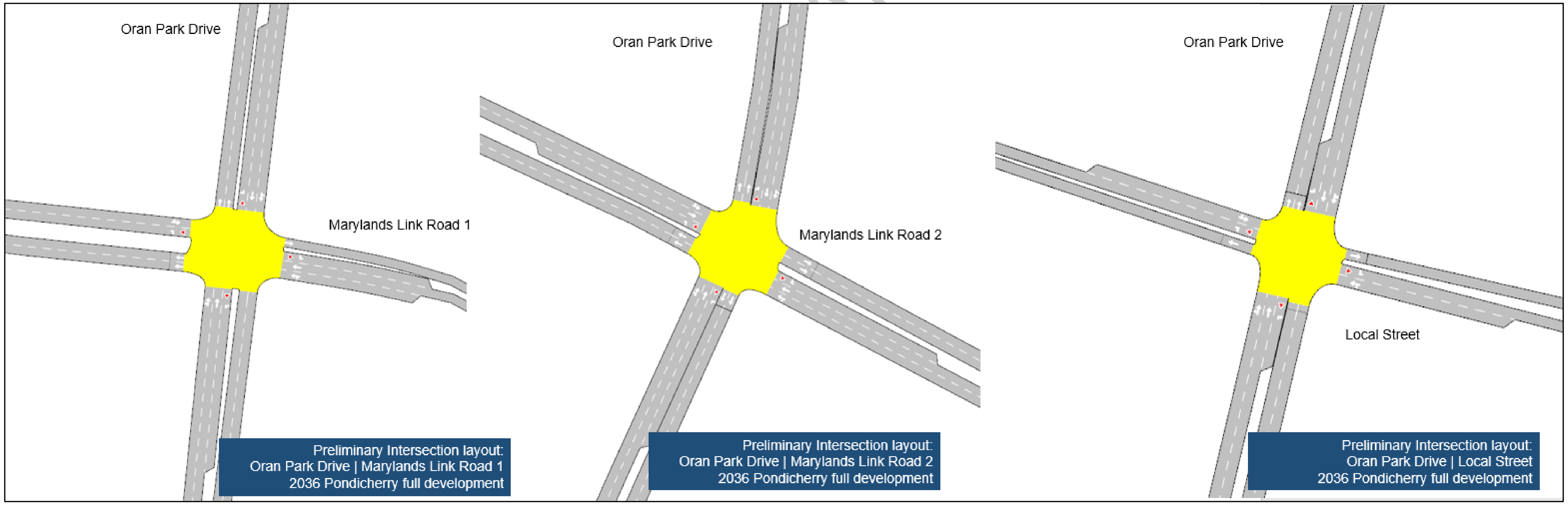


Figure 5-6 Preliminary Intersecting layouts – Oran Park Drive | Marylands Link Road 1 & Oran Park Drive | Marylands Link Road 2 & Oran Park Drive | Local Street

Appendices

Appendix A – Sidra Outputs

USER REPORT FOR SITE

All Movement Classes

Project: 2026 Analysis_Update

Template: Default Site User Report

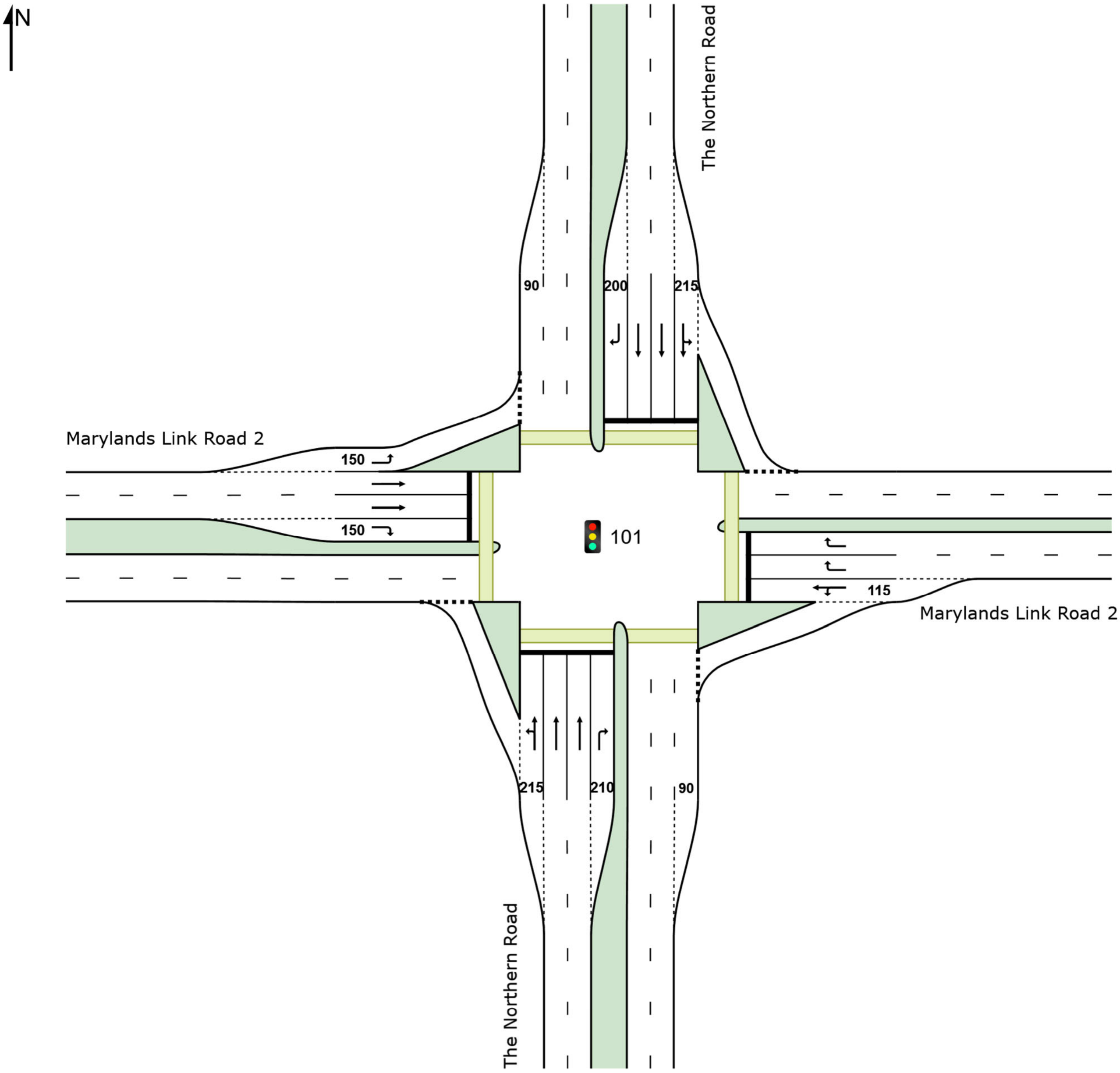
Site: 101 [2026 - AM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2026 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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

Site Layout

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


N
The Northern Road
90
200
215
Marylands Link Road 2
150
150
101
115
Marylands Link Road 2
215
210
90
The Northern Road

LANE SUMMARY

Site: 101 [2026 - AM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2026 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Road													
Lane 1	21	26.1	1525	0.014	100	9.6	LOS A	0.3	2.5	Short	215	0.0	NA
Lane 2	985	7.0	1242[1]	0.793	100	26.4	LOS B	52.5	389.5	Full	500	0.0	0.0
Lane 3	986	7.0	1243[1]	0.793	100	26.5	LOS B	52.6	390.1	Full	500	0.0	0.0
Lane 4	1	0.0	97	0.010	100	77.5	LOS F	0.1	0.5	Short	210	0.0	NA
Approach	1993	7.2		0.793		26.3	LOS B	52.6	390.1				
East: Marylands Link Road 2													
Lane 1	33	38.8	877	0.038	100	8.6	LOS A	0.4	4.0	Short	115	0.0	NA
Lane 2	2	10.0	195	0.008	100	67.4	LOS E	0.1	0.7	Full	500	0.0	0.0
Lane 3	2	10.0	195	0.008	100	67.4	LOS E	0.1	0.7	Full	500	0.0	0.0
Approach	36	36.4		0.038		13.5	LOS A	0.4	4.0				
North: The Northern Road													
Lane 1	8	58.6	1042	0.008	100	9.6	LOS A	0.1	1.3	Short	215	0.0	NA
Lane 2	471	10.7	1216	0.387	100	18.9	LOS B	17.9	137.2	Full	500	0.0	0.0
Lane 3	471	10.7	1216	0.387	100	18.9	LOS B	17.9	137.2	Full	500	0.0	0.0
Lane 4	5	0.0	97	0.052	100	78.8	LOS F	0.3	2.4	Short	200	0.0	NA
Approach	955	11.1		0.387		19.1	LOS B	17.9	137.2				
West: Marylands Link Road 2													
Lane 1	1	0.0	569	0.002	100	16.8	LOS B	0.0	0.2	Short	150	0.0	NA
Lane 2	1	0.0	281	0.002	100	54.2	LOS D	0.0	0.2	Full	500	0.0	0.0
Lane 3	1	0.0	281	0.002	100	54.2	LOS D	0.0	0.2	Full	500	0.0	0.0
Lane 4	50	9.0	252	0.198	100	63.4	LOS E	3.0	23.0	Short	150	0.0	NA
Approach	52	8.6		0.198		62.3	LOS E	3.0	23.0				
Intersection	3036	8.8		0.793		24.5	LOS B	52.6	390.1				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: The Northern Road

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	17	4	-	21	26.1	1525	0.014	100	0.0	2
Lane 2	-	985	-	985	7.0	1242[1]	0.793	100	NA	NA
Lane 3	-	986	-	986	7.0	1243[1]	0.793	100	NA	NA
Lane 4	-	-	1	1	0.0	97	0.010	100	0.0	3
Approach	17	1975	1	1993	7.2		0.793			

East: Marylands Link Road 2

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	32	1	-	33	38.8	877	0.038	100	0.0	2
Lane 2	-	-	2	2	10.0	195	0.008	100	NA	NA
Lane 3	-	-	2	2	10.0	195	0.008	100	NA	NA
Approach	32	1	3	36	36.4		0.038			

North: The Northern Road

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	4	4	-	8	58.6	1042	0.008	100	0.0	2
Lane 2	-	471	-	471	10.7	1216	0.387	100	NA	NA
Lane 3	-	471	-	471	10.7	1216	0.387	100	NA	NA
Lane 4	-	-	5	5	0.0	97	0.052	100	0.0	3
Approach	4	946	5	955	11.1		0.387			

West: Marylands Link Road 2

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	-	-	1	0.0	569	0.002	100	0.0	2
Lane 2	-	1	-	1	0.0	281	0.002	100	NA	NA
Lane 3	-	1	-	1	0.0	281	0.002	100	NA	NA
Lane 4	-	-	50	50	9.0	252	0.198	100	0.0	3
Approach	1	1	50	52	8.6		0.198			

	Total	%HV	Deg.Satn (v/c)
Intersection	3036	8.8	0.793

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: The Northern Road Merge Type: **Priority**												
Exit Short Lane	1	90	0.0	503	535	3.00	2.00	4	1250	0.003	0.9	1.0
Merge Lane	2	-	100.0	Merge Lane is not Opposed				503	1800	0.279	0.0	0.0
East Exit: Marylands Link Road 2 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: The Northern Road Merge Type: **Priority**												
Exit Short Lane	1	90	0.0	987	1022	3.00	2.00	4	732	0.006	2.8	3.0

Merge Lane	2	-	100.0	Merge Lane is not Opposed	987	1800	0.549	0.0	0.0
West Exit: Marylands Link Road 2 Merge Type: **Not Applied**									
Full Length Lane	1	Merge Analysis not applied.							
Full Length Lane	2	Merge Analysis not applied.							

PHASING SUMMARY

Site: 101 [2026 - AM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2026 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site Optimum Cycle Time - Minimum Delay)

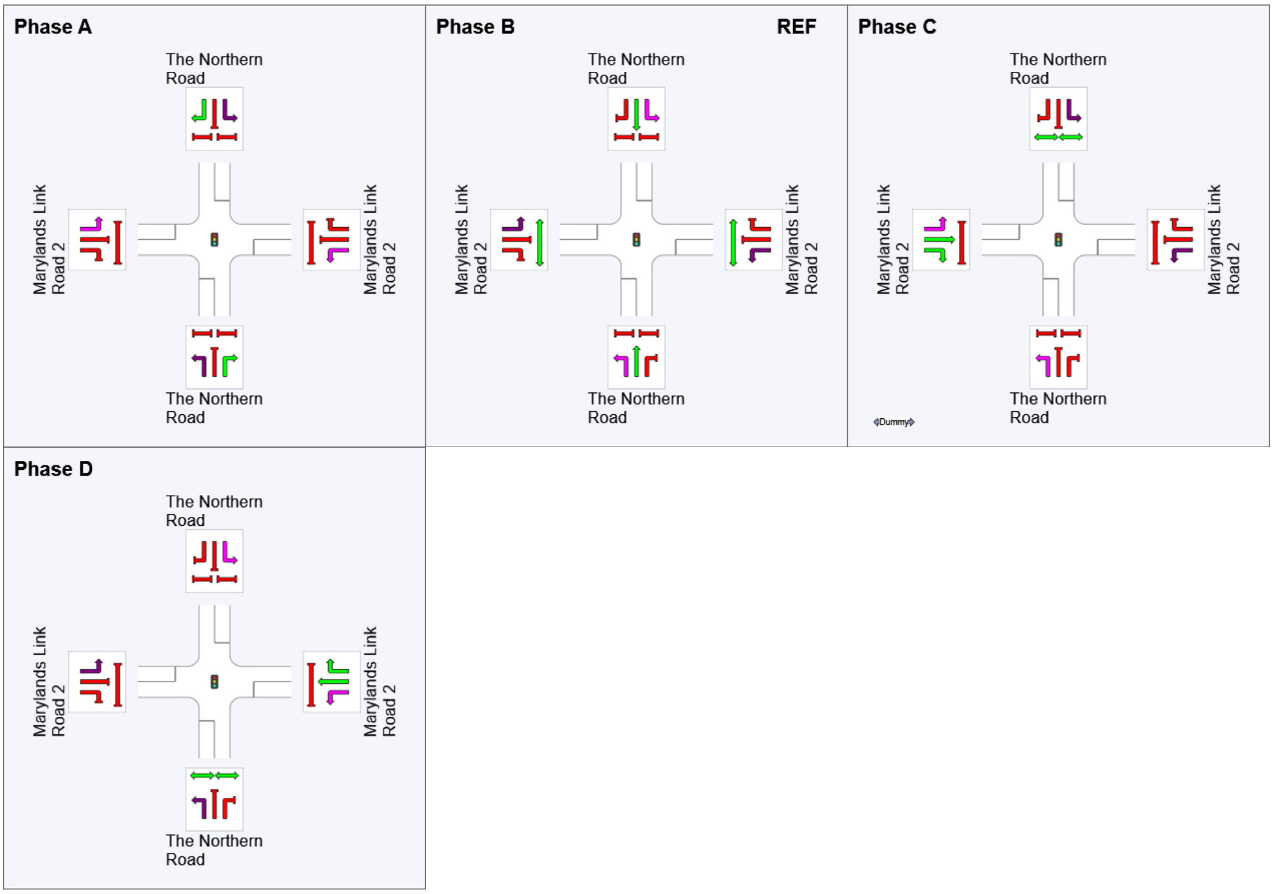
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	128	0	83	109
Green Time (sec)	6	77	20	13
Phase Time (sec)	12	83	26	19
Phase Split	9%	59%	19%	14%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

USER REPORT FOR SITE

All Movement Classes

Project: 2026 Analysis_Update

Template: Default Site User Report

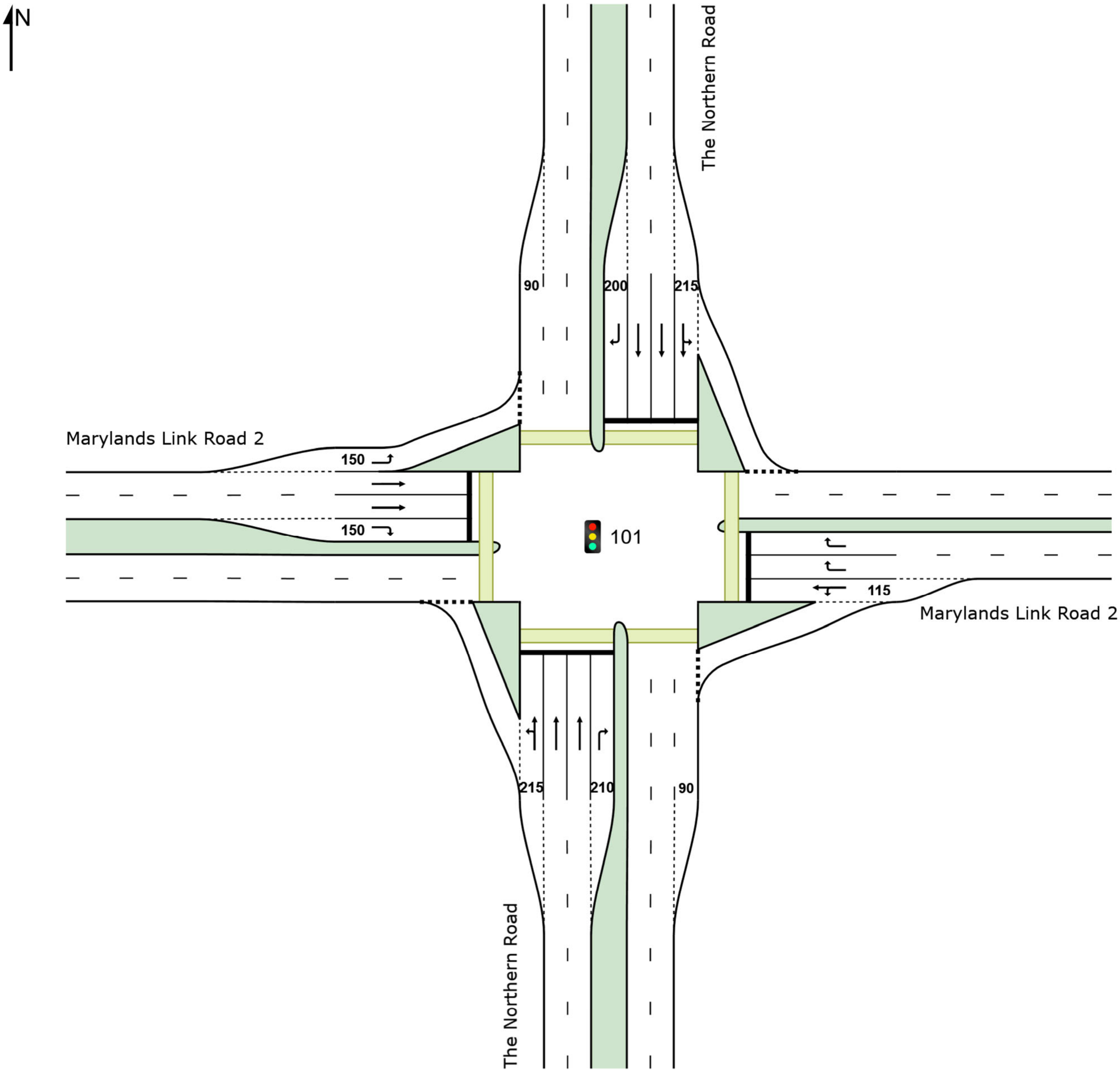
Site: 101 [2026 - PM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2026 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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

Site Layout

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



N
The Northern Road
90
200
215
Marylands Link Road 2
150
150
101
115
Marylands Link Road 2
215
210
90
The Northern Road

LANE SUMMARY

Site: 101 [2026 - PM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2026 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Road													
Lane 1	269	11.5	1324	0.203	54[6]	15.3	LOS B	7.7	59.1	Short	215	0.0	NA
Lane 2	465	10.8	1247	0.373	100	17.7	LOS B	17.1	130.7	Full	500	0.0	0.0
Lane 3	465	10.8	1247	0.373	100	17.7	LOS B	17.1	130.7	Full	500	0.0	0.0
Lane 4	1	0.0	97	0.010	100	77.5	LOS F	0.1	0.5	Short	210	0.0	NA
Approach	1200	10.9		0.373		17.2	LOS B	17.1	130.7				
East: Marylands Link Road 2													
Lane 1	6	0.0	802	0.007	100	11.5	LOS A	0.1	0.9	Short	115	0.0	NA
Lane 2	7	15.8	188	0.037	100	68.4	LOS E	0.4	3.5	Full	500	0.0	0.0
Lane 3	7	15.8	188	0.037	100	68.4	LOS E	0.4	3.5	Full	500	0.0	0.0
Approach	20	11.1		0.037		51.4	LOS D	0.4	3.5				
North: The Northern Road													
Lane 1	401	13.0	1231	0.326	54[6]	23.2	LOS B	14.2	110.5	Short	215	0.0	NA
Lane 2	740	12.1	1237	0.598	100	21.1	LOS B	32.5	250.8	Full	500	0.0	0.0
Lane 3	740	12.1	1237	0.598	100	21.1	LOS B	32.5	250.8	Full	500	0.0	0.0
Lane 4	1	0.0	97	0.010	100	77.6	LOS F	0.1	0.5	Short	200	0.0	NA
Approach	1881	12.3		0.598		21.6	LOS B	32.5	250.8				
West: Marylands Link Road 2													
Lane 1	1	0.0	761	0.001	100	7.6	LOS A	0.0	0.1	Short	150	0.0	NA
Lane 2	1	0.0	253	0.002	100	56.1	LOS D	0.0	0.2	Full	500	0.0	0.0
Lane 3	1	0.0	253	0.002	100	56.1	LOS D	0.0	0.2	Full	500	0.0	0.0
Lane 4	77	5.2	233	0.331	100	66.6	LOS E	4.9	35.7	Short	150	0.0	NA
Approach	79	5.1		0.331		65.7	LOS E	4.9	35.7				
Intersection	3180	11.6		0.598		21.2	LOS B	32.5	250.8				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

Approach Lane Flows (veh/h)

South: The Northern Road

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	55	214	-	269	11.5	1324	0.203	54[6]	0.0	2
Lane 2	-	465	-	465	10.8	1247	0.373	100	NA	NA
Lane 3	-	465	-	465	10.8	1247	0.373	100	NA	NA
Lane 4	-	-	1	1	0.0	97	0.010	100	0.0	3
Approach	55	1144	1	1200	10.9		0.373			
East: Marylands Link Road 2										
Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	1	-	6	0.0	802	0.007	100	0.0	2
Lane 2	-	-	7	7	15.8	188	0.037	100	NA	NA
Lane 3	-	-	7	7	15.8	188	0.037	100	NA	NA
Approach	5	1	14	20	11.1		0.037			
North: The Northern Road										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	400	-	401	13.0	1231	0.326	54[6]	0.0	2
Lane 2	-	740	-	740	12.1	1237	0.598	100	NA	NA
Lane 3	-	740	-	740	12.1	1237	0.598	100	NA	NA
Lane 4	-	-	1	1	0.0	97	0.010	100	0.0	3
Approach	1	1879	1	1881	12.3		0.598			
West: Marylands Link Road 2										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	-	-	1	0.0	761	0.001	100	0.0	2
Lane 2	-	1	-	1	0.0	253	0.002	100	NA	NA
Lane 3	-	1	-	1	0.0	253	0.002	100	NA	NA
Lane 4	-	-	77	77	5.2	233	0.331	100	0.0	3
Approach	1	1	77	79	5.1		0.331			

	Total	%HV	Deg.Satn (v/c)
Intersection	3180	11.6	0.598

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: The Northern Road Merge Type: **Priority**												
Exit Short Lane	1	90	0.0	745	789	3.00	2.00	400	980	0.408	1.7	3.1
Merge Lane	2	-	100.0	Merge Lane is not Opposed				745	1800	0.414	0.0	0.0
East Exit: Marylands Link Road 2 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: The Northern Road Merge Type: **Priority**												
Exit Short Lane	1	90	0.0	473	499	3.00	2.00	214	1288	0.166	0.8	1.1
Merge Lane	2	-	100.0	Merge Lane is not Opposed				473	1800	0.263	0.0	0.0

West Exit: Marylands Link Road 2 Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.
Full Length Lane	2	Merge Analysis not applied.

PHASING SUMMARY

Site: 101 [2026 - PM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2026 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site Optimum Cycle Time - Minimum Delay)

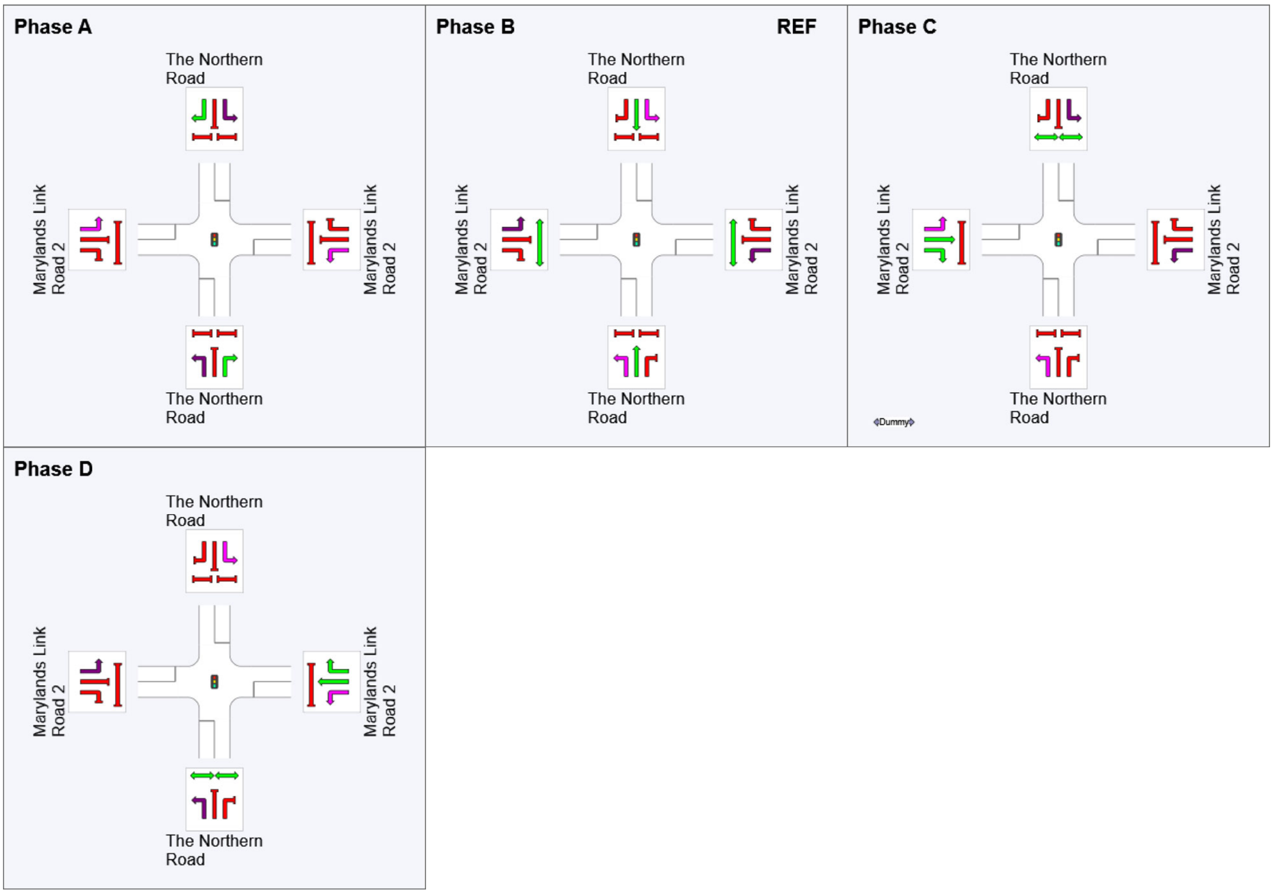
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	128	0	85	109
Green Time (sec)	6	79	18	13
Phase Time (sec)	12	85	24	19
Phase Split	9%	61%	17%	14%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

USER REPORT FOR SITE

All Movement Classes

Project: 2026 Analysis_Update

Template: Default Site User Report

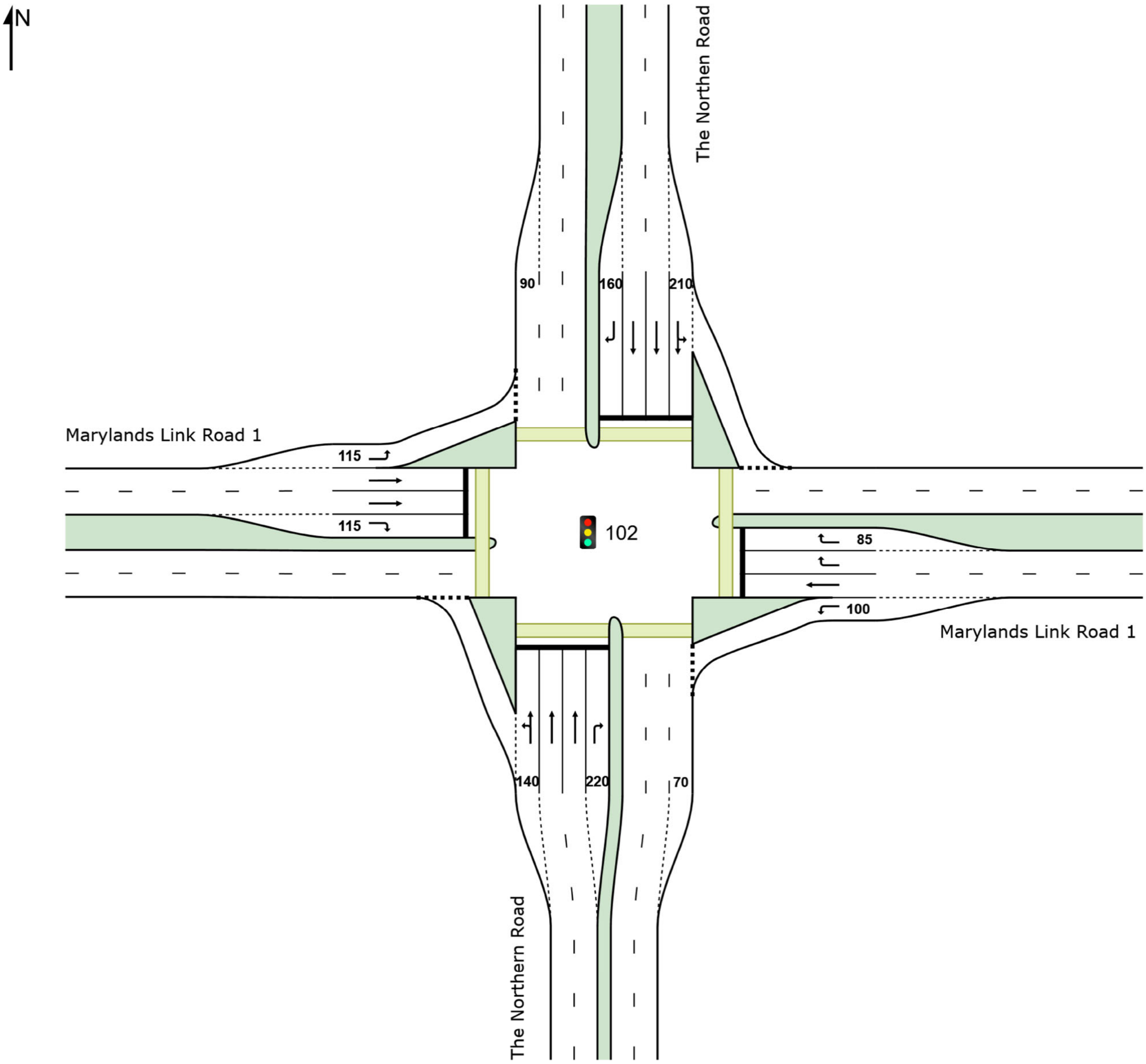
Site: 102 [2026 - AM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2036 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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

Site Layout

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


N
The Northen Road
90
160
210
Marylands Link Road 1
115
115
102
85
100
Marylands Link Road 1
140
220
70
The Northern Road

LANE SUMMARY

Site: 102 [2026 - AM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2036 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Road													
Lane 1	352	8.1	955	0.368	54[6]	24.3	LOS B	9.3	69.6	Short	140	0.0	NA
Lane 2	651	6.9	962	0.676	100	20.0	LOS B	20.5	151.9	Full	500	0.0	0.0
Lane 3	651	6.9	962	0.676	100	20.0	LOS B	20.5	151.9	Full	500	0.0	0.0
Lane 4	35	13.8	154	0.228	100	47.4	LOS D	1.4	10.7	Short	220	0.0	NA
Approach	1688	7.3		0.676		21.4	LOS B	20.5	151.9				
East: Marylands Link Road 1													
Lane 1	164	9.6	778	0.211	100	11.0	LOS A	2.4	18.0	Short	100	0.0	NA
Lane 2	1	0.0	207	0.005	100	36.2	LOS C	0.0	0.3	Full	300	0.0	0.0
Lane 3	130	6.4	242	0.537	100	43.6	LOS D	5.0	37.2	Full	300	0.0	0.0
Lane 4	130	6.4	242	0.537	100	43.6	LOS D	5.0	37.2	Short	85	0.0	NA
Approach	425	7.7		0.537		31.0	LOS C	5.0	37.2				
North: The Northen Road													
Lane 1	210	13.2	1085	0.194	45[6]	10.4	LOS A	3.7	28.6	Short	210	0.0	NA
Lane 2	405	10.8	939	0.432	100	17.4	LOS B	11.1	85.0	Full	500	0.0	0.0
Lane 3	405	10.8	939	0.432	100	17.4	LOS B	11.1	85.0	Full	500	0.0	0.0
Lane 4	7	7.7	160	0.044	100	45.9	LOS D	0.3	2.0	Short	160	0.0	NA
Approach	1028	11.3		0.432		16.2	LOS B	11.1	85.0				
West: Marylands Link Road 1													
Lane 1	61	10.9	657	0.093	100	13.4	LOS A	1.0	7.8	Short	115	0.0	NA
Lane 2	1	0.0	172	0.003	100	36.3	LOS C	0.0	0.1	Full	500	0.0	0.0
Lane 3	1	0.0	172	0.003	100	36.3	LOS C	0.0	0.1	Full	500	0.0	0.0
Lane 4	1	0.0	211	0.005	100	39.9	LOS C	0.0	0.2	Short	115	0.0	NA
Approach	63	10.6		0.093		14.1	LOS A	1.0	7.8				
Intersection	3204	8.7		0.676		20.9	LOS B	20.5	151.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

Approach Lane Flows (veh/h)

South: The Northern Road											
Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	

Lane 1	1	351	-	352	8.1	955	0.368	54[6]	0.0	2
Lane 2	-	651	-	651	6.9	962	0.676	100	NA	NA
Lane 3	-	651	-	651	6.9	962	0.676	100	NA	NA
Lane 4	-	-	35	35	13.8	154	0.228	100	0.0	3
Approach	1	1652	35	1688	7.3		0.676			

East: Marylands Link Road 1

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	164	-	-	164	9.6	778	0.211	100	0.0	2
Lane 2	-	1	-	1	0.0	207	0.005	100	NA	NA
Lane 3	-	-	130	130	6.4	242	0.537	100	NA	NA
Lane 4	-	-	130	130	6.4	242	0.537	100	0.0	3
Approach	164	1	260	425	7.7		0.537			

North: The Northen Road

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	62	148	-	210	13.2	1085	0.194	45[6]	0.0	2
Lane 2	-	405	-	405	10.8	939	0.432	100	NA	NA
Lane 3	-	405	-	405	10.8	939	0.432	100	NA	NA
Lane 4	-	-	7	7	7.7	160	0.044	100	0.0	3
Approach	62	959	7	1028	11.3		0.432			

West: Marylands Link Road 1

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	61	-	-	61	10.9	657	0.093	100	0.0	2
Lane 2	-	1	-	1	0.0	172	0.003	100	NA	NA
Lane 3	-	1	-	1	0.0	172	0.003	100	NA	NA
Lane 4	-	-	1	1	0.0	211	0.005	100	0.0	3
Approach	61	1	1	63	10.6		0.093			

	Total	%HV	Deg.Satn (v/c)
Intersection	3204	8.7	0.676

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: The Northern Road Merge Type: **Priority**												
Exit Short Lane	1	70	0.0	569	599	3.00	2.00	148	1182	0.126	1.1	1.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				569	1800	0.316	0.0	0.0
East Exit: Marylands Link Road 1 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: The Northen Road Merge Type: **Priority**												
Exit Short Lane	1	90	0.0	842	871	3.00	2.00	351	892	0.394	2.0	3.5

Merge Lane	2	-	100.0	Merge Lane is not Opposed		842	1800	0.468	0.0	0.0
West Exit: Marylands Link Road 1 Merge Type: **Not Applied**										
Full Length Lane	1	Merge Analysis not applied.								
Full Length Lane	2	Merge Analysis not applied.								

PHASING SUMMARY

Site: 102 [2026 - AM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2036 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

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

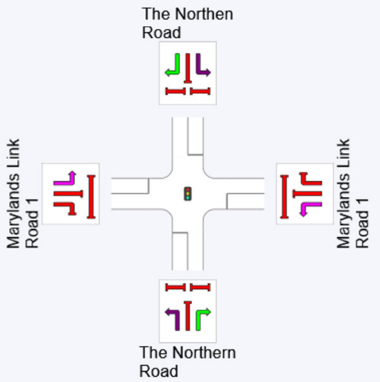
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	68	0	40	53
Green Time (sec)	6	34	7	9
Phase Time (sec)	12	40	13	15
Phase Split	15%	50%	16%	19%

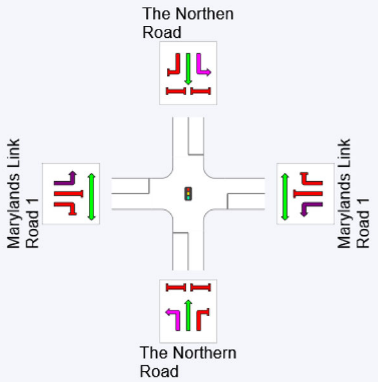
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

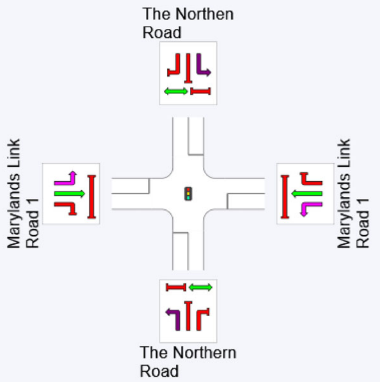
Phase A



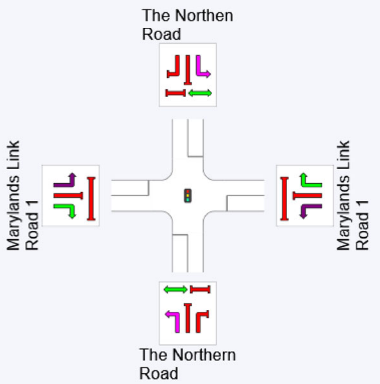
Phase B **REF**



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

USER REPORT FOR SITE

All Movement Classes

Project: 2026 Analysis_Update

Template: Default Site User Report

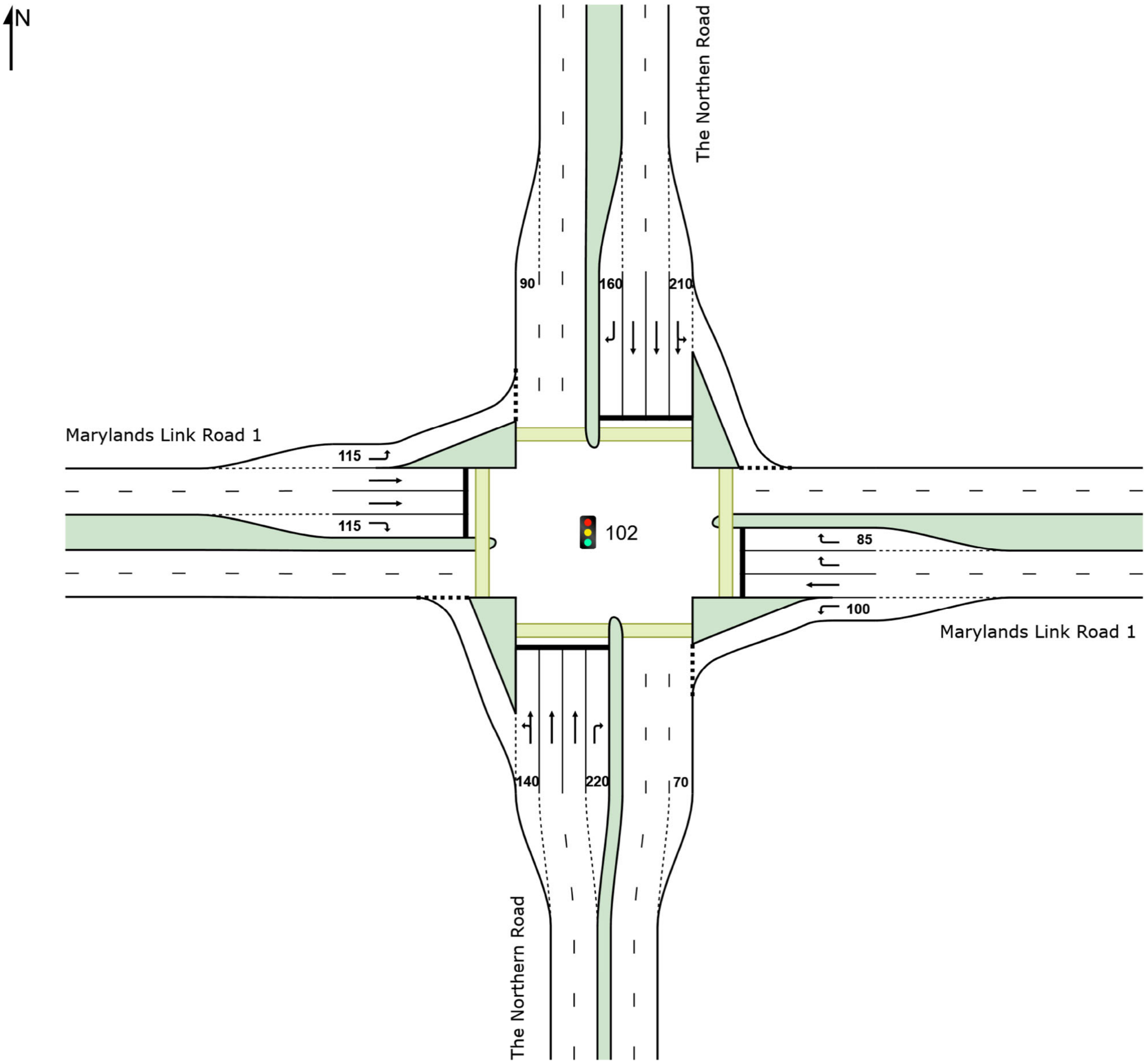
Site: 102 [2026 - PM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2026 - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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

Site Layout

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


N
The Northen Road
90
160
210
Marylands Link Road 1
115
115
102
85
100
Marylands Link Road 1
140
220
70
The Northern Road

LANE SUMMARY

Site: 102 [2026 - PM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2026 - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Road													
Lane 1	231	11.9	934	0.248	54 [6]	21.3	LOS B	5.8	44.4	Short	140	0.0	NA
Lane 2	428	10.4	941	0.455	100	17.6	LOS B	11.9	90.6	Full	500	0.0	0.0
Lane 3	428	10.4	941	0.455	100	17.6	LOS B	11.9	90.6	Full	500	0.0	0.0
Lane 4	135	6.8	161	0.838	100	53.7	LOS D	5.9	44.1	Short	220	0.0	NA
Approach	1222	10.3		0.838		22.3	LOS B	11.9	90.6				
East: Marylands Link Road 1													
Lane 1	45	6.5	710	0.063	100	12.3	LOS A	0.7	5.1	Short	100	0.0	NA
Lane 2	8	0.0	207	0.039	100	36.9	LOS C	0.3	2.1	Full	300	0.0	0.0
Lane 3	48	13.4	231	0.208	100	41.9	LOS C	1.8	13.8	Full	300	0.0	0.0
Lane 4	48	13.4	231	0.208	100	41.9	LOS C	1.8	13.8	Short	85	0.0	NA
Approach	149	10.6		0.208		32.7	LOS C	1.8	13.8				
North: The Northen Road													
Lane 1	397	11.5	1080	0.368	45 [6]	15.7	LOS B	8.7	67.1	Short	210	0.0	NA
Lane 2	762	12.3	930	0.819	100	25.2	LOS B	28.5	220.6	Full	500	0.0	0.0
Lane 3	762	12.3	930	0.819	100	25.2	LOS B	28.5	220.6	Full	500	0.0	0.0
Lane 4	40	7.5	160	0.249	100	47.3	LOS D	1.6	11.6	Short	160	0.0	NA
Approach	1961	12.1		0.819		23.8	LOS B	28.5	220.6				
West: Marylands Link Road 1													
Lane 1	17	4.8	766	0.022	100	10.5	LOS A	0.2	1.6	Short	115	0.0	NA
Lane 2	1	0.0	172	0.003	100	36.3	LOS C	0.0	0.1	Full	500	0.0	0.0
Lane 3	1	0.0	172	0.003	100	36.3	LOS C	0.0	0.1	Full	500	0.0	0.0
Lane 4	1	0.0	211	0.005	100	39.9	LOS C	0.0	0.2	Short	115	0.0	NA
Approach	19	4.3		0.022		13.4	LOS A	0.2	1.6				
Intersection	3351	11.3		0.838		23.6	LOS B	28.5	220.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

Approach Lane Flows (veh/h)

South: The Northern Road

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	230	-	231	11.9	934	0.248	54[6]	0.0	2
Lane 2	-	428	-	428	10.4	941	0.455	100	NA	NA
Lane 3	-	428	-	428	10.4	941	0.455	100	NA	NA
Lane 4	-	-	135	135	6.8	161	0.838	100	0.0	3
Approach	1	1086	135	1222	10.3		0.838			

East: Marylands Link Road 1

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	45	-	-	45	6.5	710	0.063	100	0.0	2
Lane 2	-	8	-	8	0.0	207	0.039	100	NA	NA
Lane 3	-	-	48	48	13.4	231	0.208	100	NA	NA
Lane 4	-	-	48	48	13.4	231	0.208	100	0.0	3
Approach	45	8	96	149	10.6		0.208			

North: The Northen Road

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	194	203	-	397	11.5	1080	0.368	45[6]	0.0	2
Lane 2	-	762	-	762	12.3	930	0.819	100	NA	NA
Lane 3	-	762	-	762	12.3	930	0.819	100	NA	NA
Lane 4	-	-	40	40	7.5	160	0.249	100	0.0	3
Approach	194	1727	40	1961	12.1		0.819			

West: Marylands Link Road 1

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	17	-	-	17	4.8	766	0.022	100	0.0	2
Lane 2	-	1	-	1	0.0	172	0.003	100	NA	NA
Lane 3	-	1	-	1	0.0	172	0.003	100	NA	NA
Lane 4	-	-	1	1	0.0	211	0.005	100	0.0	3
Approach	17	1	1	19	4.3		0.022			

	Total	%HV	Deg.Satn (v/c)
Intersection	3351	11.3	0.838

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: The Northern Road Merge Type: **Priority**												
Exit Short Lane	1	70	0.0	807	855	3.00	2.00	203	909	0.224	1.9	2.7
Merge Lane	2	-	100.0	Merge Lane is not Opposed				807	1800	0.448	0.0	0.0
East Exit: Marylands Link Road 1 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: The Northen Road Merge Type: **Priority**												
Exit Short Lane	1	90	0.0	493	519	3.00	2.00	230	1267	0.182	0.9	1.2

Merge Lane	2	-	100.0	Merge Lane is not Opposed	493	1800	0.274	0.0	0.0
West Exit: Marylands Link Road 1 Merge Type: **Not Applied**									
Full Length Lane	1	Merge Analysis not applied.							
Full Length Lane	2	Merge Analysis not applied.							

PHASING SUMMARY

Site: 102 [2026 - PM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2026 - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

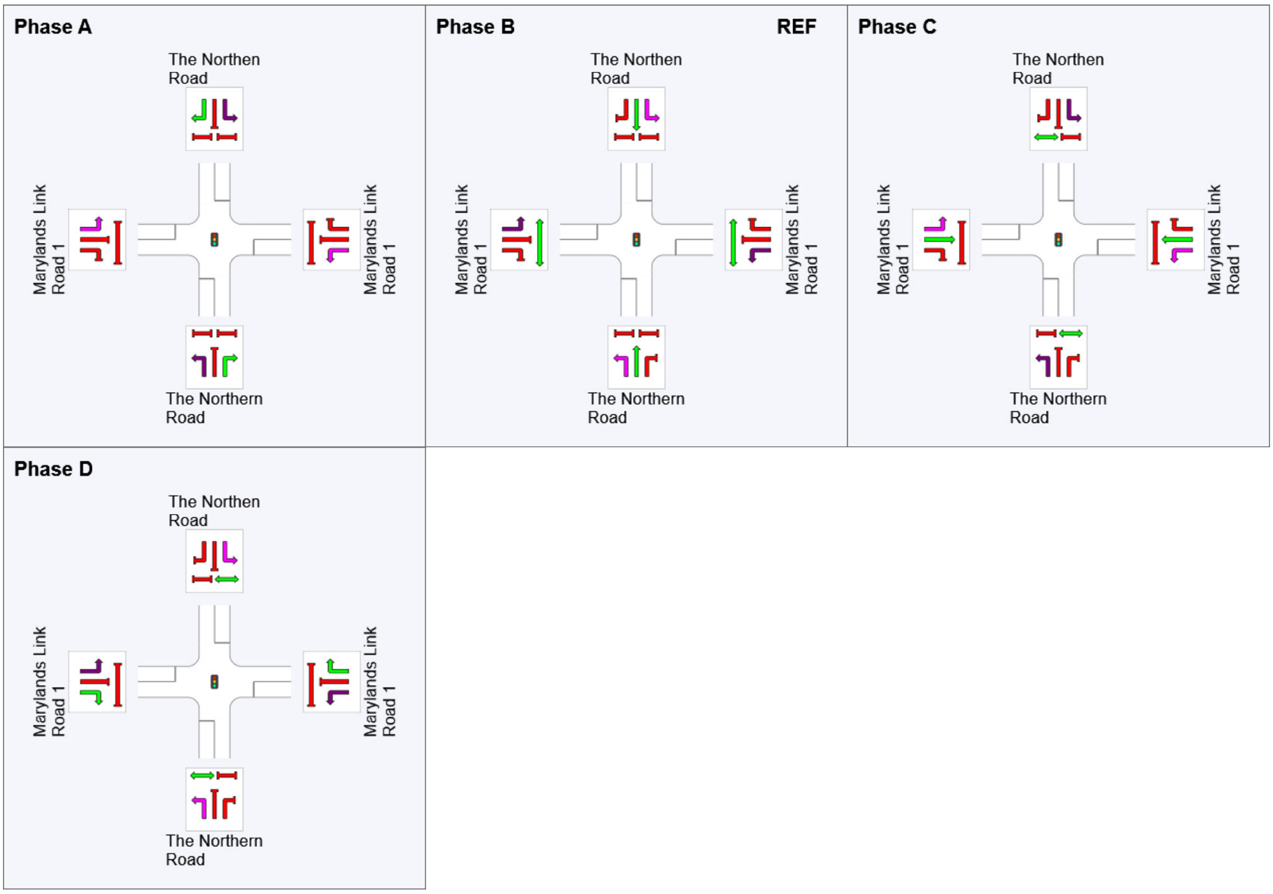
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	68	0	40	53
Green Time (sec)	6	34	7	9
Phase Time (sec)	12	40	13	15
Phase Split	15%	50%	16%	19%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated

Template: Default Site User Report

Site: 101 [2036 - AM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2036 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Split Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

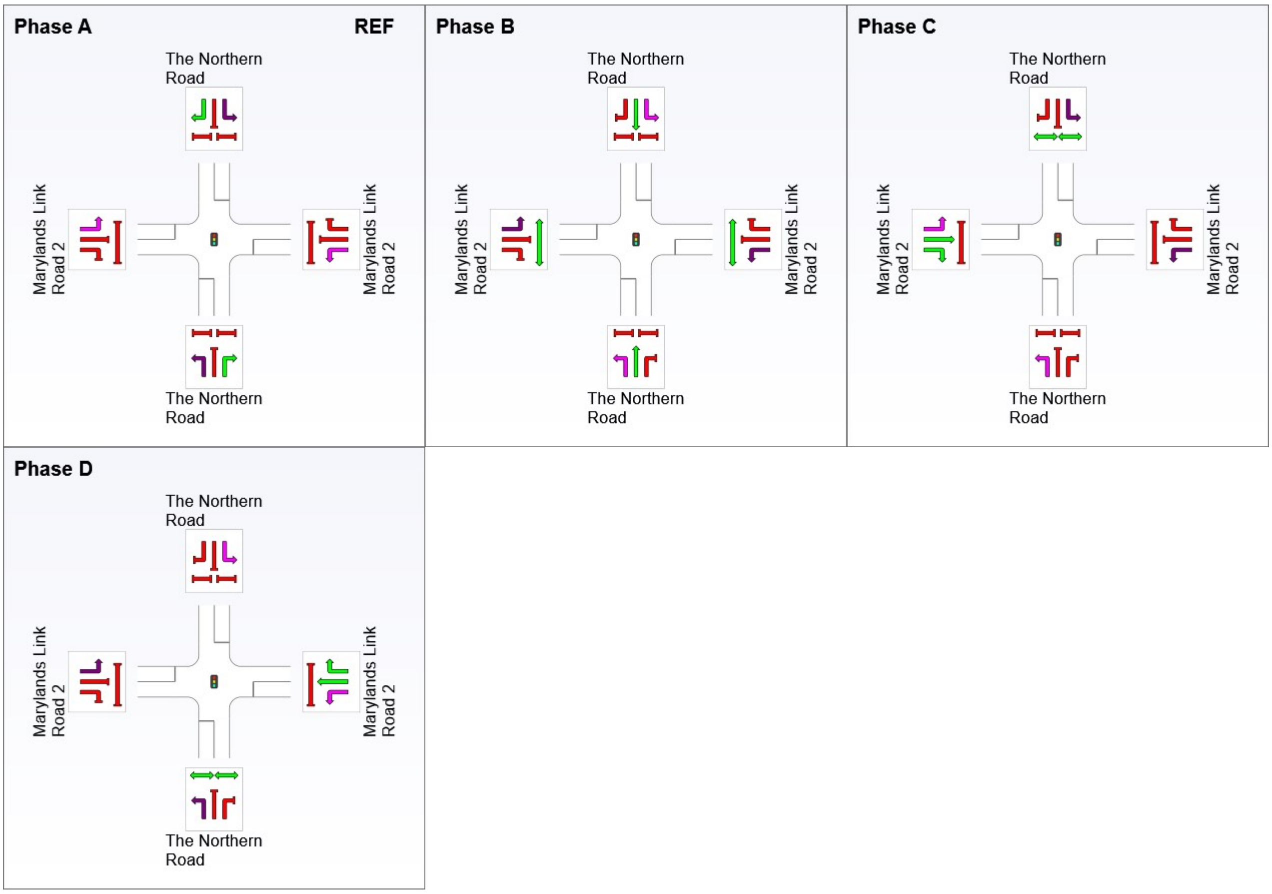
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Road													
Lane 1	794	8.4	1057	0.751	100	37.5	LOS C	41.9	314.0	Full	500	0.0	0.0
Lane 2	770	8.2	1026	0.751	100	33.2	LOS C	42.7	319.9	Full	500	0.0	0.0
Lane 3	770	8.2	1026	0.751	100	33.2	LOS C	42.7	319.9	Full	500	0.0	0.0
Lane 4	11	0.0	97	0.114	100	79.6	LOS F	0.8	5.3	Short	210	0.0	NA
Approach	2345	8.2		0.751		34.9	LOS C	42.7	319.9				
East: Marylands Link Road 2													
Lane 1	319	10.3	899	0.355	100	18.0	LOS B	11.3	85.8	Short	115	0.0	NA
Lane 2	222	6.3	416	0.533	100	60.5	LOS E	13.7	100.8	Full	500	0.0	0.0
Lane 3	222	6.3	416	0.533	100	60.5	LOS E	13.7	100.8	Full	500	0.0	0.0
Lane 4	222	6.3	416	0.533	100	60.5	LOS E	13.7	100.8	Short	120	0.0	NA
Approach	984	7.6		0.533		46.8	LOS D	13.7	100.8				
North: The Northern Road													
Lane 1	539	11.0	1044	0.517	100	27.7	LOS B	22.0	168.9	Full	500	0.0	0.0
Lane 2	520	11.4	1006	0.517	100	28.5	LOS C	24.7	190.2	Full	500	0.0	0.0
Lane 3	520	11.4	1006	0.517	100	28.5	LOS C	24.7	190.2	Full	500	0.0	0.0
Lane 4	23	8.7	91	0.253	100	81.1	LOS F	1.6	12.1	Short	200	0.0	NA
Approach	1602	11.2		0.517		29.0	LOS C	24.7	190.2				
West: Marylands Link Road 2													
Lane 1	77	7.8	512	0.150	100	20.8	LOS B	2.5	18.8	Short	150	0.0	NA
Lane 2	4	0.0	267	0.013	100	55.8	LOS D	0.2	1.4	Full	500	0.0	0.0
Lane 3	4	0.0	267	0.013	100	55.8	LOS D	0.2	1.4	Full	500	0.0	0.0
Lane 4	200	4.0	248	0.808	100	74.8	LOS F	14.3	103.3	Short	150	0.0	NA
Approach	284	4.9		0.808		59.7	LOS E	14.3	103.3				
Intersection	5215	8.9		0.808		36.7	LOS C	42.7	319.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A	Yes	0	6	6	6	12	6	100.0[1]	12	9
B	No	12	6	18	64	82	6	100.0[1]	70	50
C	No	82	6	88	19	107	6	100.0[1]	25	18
D	No	107	6	113	27	140	6	100.0[1]	33	24

1 Phase Frequency has been given with User-Specified Phase Times.

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated **Template: Default Site User Report**

Site: 101 [2036 - PM Peak - The Northern Road / Maryland Link Road 2 (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Maryland Link Road 2
2036 - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Split Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Lane Use and Performance

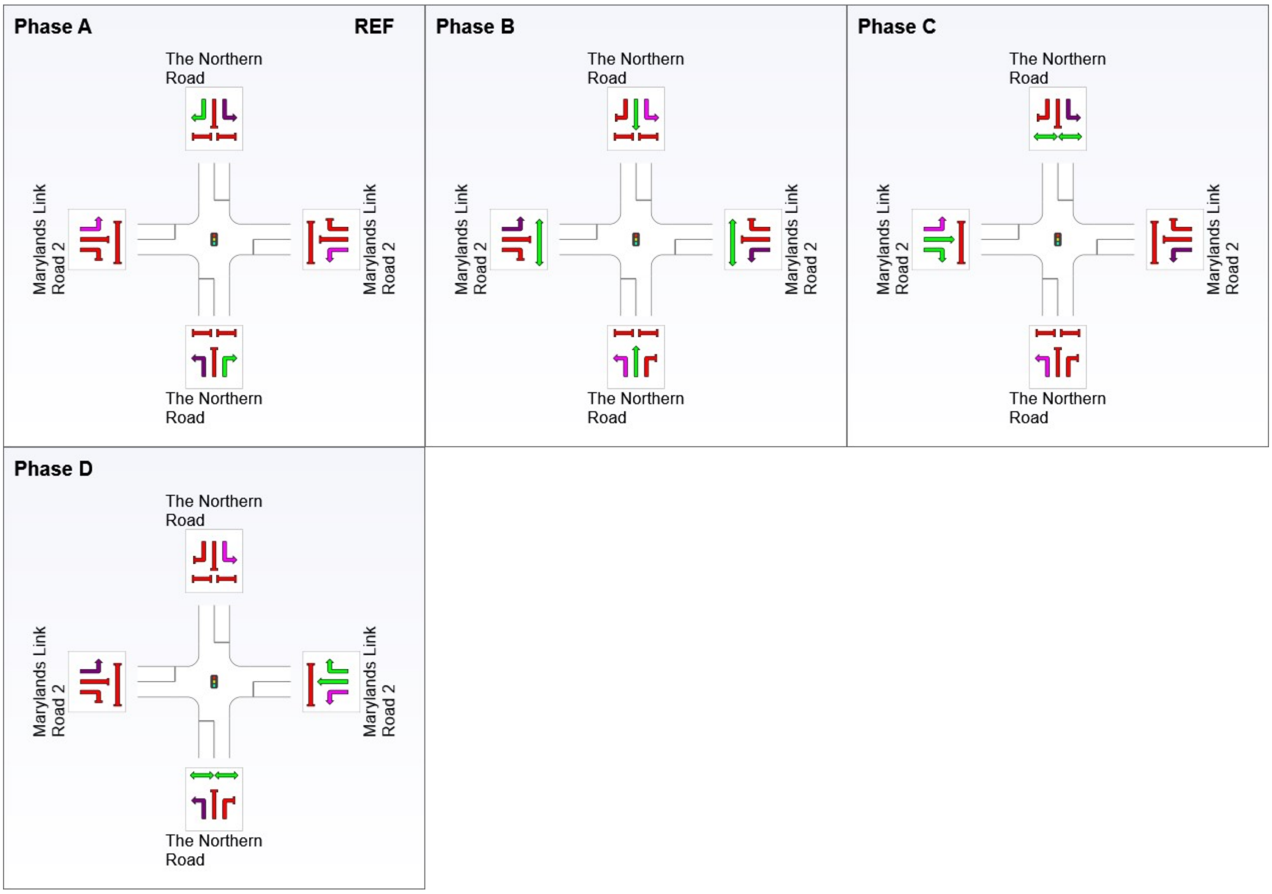
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Road													
Lane 1	711	8.6	1029	0.691	100	34.3	LOS C	30.7	230.5	Full	500	0.0	0.0
Lane 2	580	10.0	839	0.691	100	37.6	LOS C	31.7	241.3	Full	500	0.0	0.0
Lane 3	580	10.0	839	0.691	100	37.6	LOS C	31.7	241.3	Full	500	0.0	0.0
Lane 4	15	0.0	100	0.150	100	77.2	LOS F	1.0	7.0	Short	210	0.0	NA
Approach	1886	9.4		0.691		36.7	LOS C	31.7	241.3				
East: Marylands Link Road 2													
Lane 1	147	10.2	997	0.147	100	18.6	LOS B	4.4	33.6	Short	115	0.0	NA
Lane 2	41	15.6	465	0.087	100	49.3	LOS D	2.1	16.5	Full	500	0.0	0.0
Lane 3	41	15.6	465	0.087	100	49.3	LOS D	2.1	16.5	Full	500	0.0	0.0
Lane 4	41	15.6	465	0.087	100	49.3	LOS D	2.1	16.5	Short	120	0.0	NA
Approach	269	12.6		0.147		32.5	LOS C	4.4	33.6				
North: The Northern Road													
Lane 1	817	11.5	907	0.901	100	49.9	LOS D	50.6	389.3	Full	500	0.0	0.0
Lane 2	742	12.9	824	0.901	100	52.5	LOS D	51.7	402.3	Full	500	0.0	0.0
Lane 3	742	12.9	824[1]	0.901	100	52.5	LOS D	51.7	402.2	Full	500	0.0	0.0
Lane 4	1	0.0	100	0.010	100	74.9	LOS F	0.1	0.4	Short	200	0.0	NA
Approach	2303	12.4		0.901		51.6	LOS D	51.7	402.3				
West: Marylands Link Road 2													
Lane 1	1	0.0	662	0.002	100	11.1	LOS A	0.0	0.1	Short	150	0.0	NA
Lane 2	1	0.0	336	0.003	100	48.9	LOS D	0.1	0.4	Full	500	0.0	0.0
Lane 3	1	0.0	336	0.003	100	48.9	LOS D	0.1	0.4	Full	500	0.0	0.0
Lane 4	82	7.3	304	0.270	100	58.6	LOS E	4.7	35.3	Short	150	0.0	NA
Approach	85	7.1		0.270		57.8	LOS E	4.7	35.3				
Intersection	4543	11.1		0.901		44.4	LOS D	51.7	402.3				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase

- Normal Movement
- Permitted/Opposed
- Slip/Bypass-Lane Movement
- Opposed Slip/Bypass-Lane
- Stopped Movement
- Turn On Red
- Other Movement Class (MC) Running
- Undetected Movement
- Mixed Running & Stopped MCs
- Continuous Movement
- Other Movement Class (MC) Stopped
- Phase Transition Applied

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A	Yes	0	6	6	6	12	6	100.0 [1]	12	9
B	No	12	6	18	51	69	6	100.0 [1]	57	42
C	No	69	6	75	23	98	6	100.0 [1]	29	21
D	No	98	6	104	31	135	6	100.0 [1]	37	27

1 Phase Frequency has been given with User-Specified Phase Times.

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated

Template: Default Site User Report

Site: 102 [2036 - AM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2036 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

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

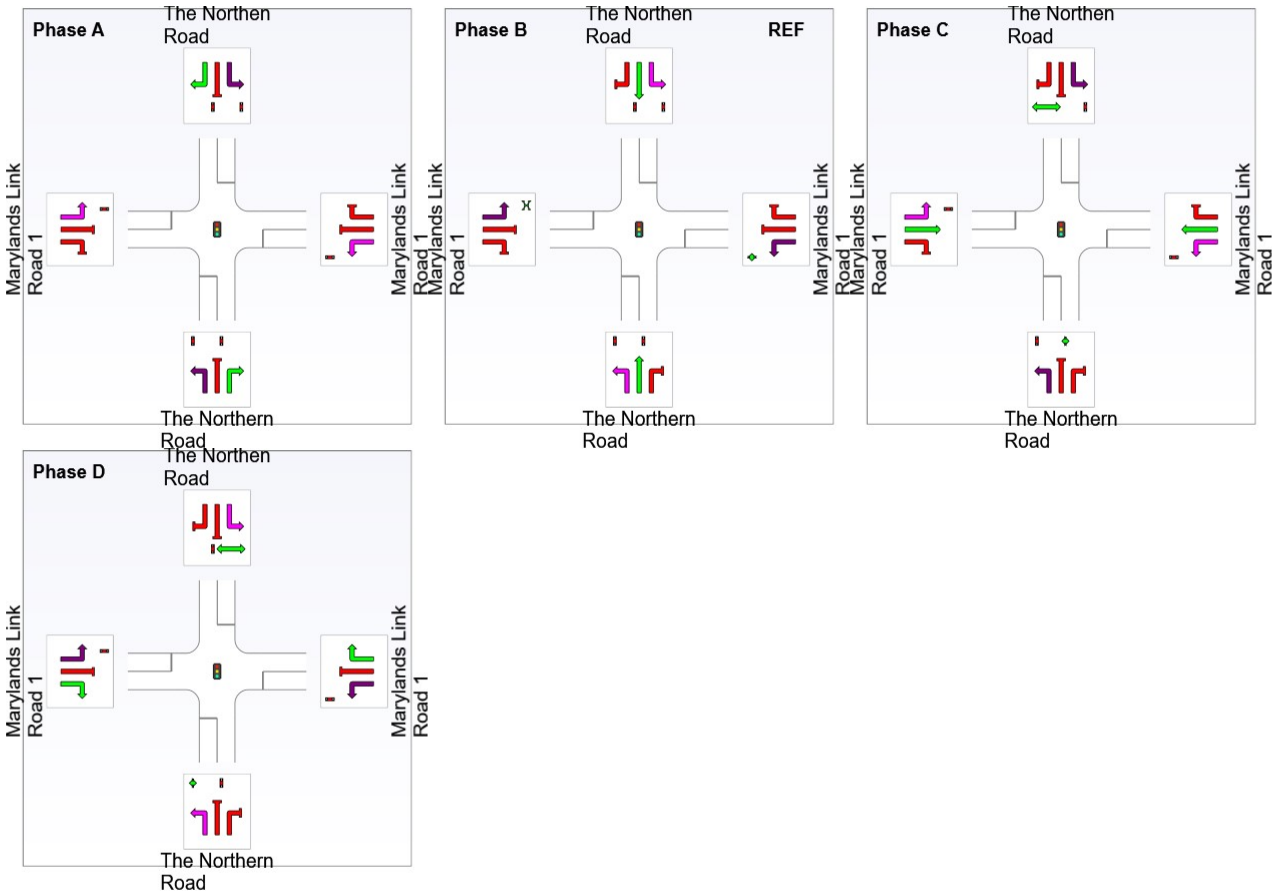
Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Road													
Lane 1	529	7.7	804	0.658	100	25.4	LOS B	15.3	114.4	Short	140	0.0	NA
Lane 2	529	7.8	804	0.658	100	20.6	LOS B	15.3	114.5	Full	500	0.0	0.0
Lane 3	529	7.8	804	0.658	100	20.6	LOS B	15.3	114.5	Full	500	0.0	0.0
Lane 4	167	9.6	211	0.792	100	45.7	LOS D	6.3	47.6	Full	500	0.0	0.0
Approach	1754	7.9		0.792		24.4	LOS B	15.3	114.5				
East: Marylands Link Road 1													
Lane 1	541	10.7	808	0.669	100	13.5	LOS A	10.9	83.6	Short	100	0.0	NA
Lane 2	13	0.0	203	0.064	100	32.9	LOS C	0.4	3.0	Full	300	0.0	0.0
Lane 3	184	6.3	246	0.747	100	41.7	LOS C	6.7	49.5	Full	300	0.0	0.0
Lane 4	184	6.3	246	0.747	100	41.7	LOS C	6.7	49.5	Short	110	0.0	NA
Approach	922	8.8		0.747		25.0	LOS B	10.9	83.6				
North: The Northen Road													
Lane 1	694	10.1	888	0.782	100	23.4	LOS B	18.8	142.7	Full	500	0.0	0.0
Lane 2	617	10.9	789	0.782	100	24.1	LOS B	20.2	154.7	Full	500	0.0	0.0
Lane 3	617	10.9	789	0.782	100	24.1	LOS B	20.2	154.7	Full	500	0.0	0.0
Lane 4	72	9.7	211	0.342	100	41.0	LOS C	2.4	18.4	Short	160	0.0	NA
Approach	1999	10.6		0.782		24.5	LOS B	20.2	154.7				
West: Marylands Link Road 1													
Lane 1	423	11.3	732	0.578	100	13.6	LOS A	8.1	61.9	Short	115	0.0	NA
Lane 2	1	0.0	169	0.003	100	32.1	LOS C	0.0	0.1	Full	500	0.0	0.0
Lane 3	1	0.0	169	0.003	100	32.1	LOS C	0.0	0.1	Full	500	0.0	0.0
Lane 4	1	0.0	214	0.005	100	35.6	LOS C	0.0	0.2	Short	115	0.0	NA
Approach	425	11.3		0.578		13.7	LOS A	8.1	61.9				
Intersection	5100	9.4		0.792		23.7	LOS B	20.2	154.7				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A	No	57	6	63	7	0	6	NA	13	19
B	Yes	0	6	6	25	31	6	NA	31	44
C	No	31	6	37	6	43	6	NA	12	17
D	No	43	6	49	8	57	6	NA	14	20

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated

Template: Default Site User Report

Site: 102 [2036 - PM Peak - The Northern Road / Marylands Link Road 1 - Staged Cross (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
The Northern Road / Marylands Link Road 1
2036 - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 106 seconds (Site Optimum Cycle Time - Minimum Delay)

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

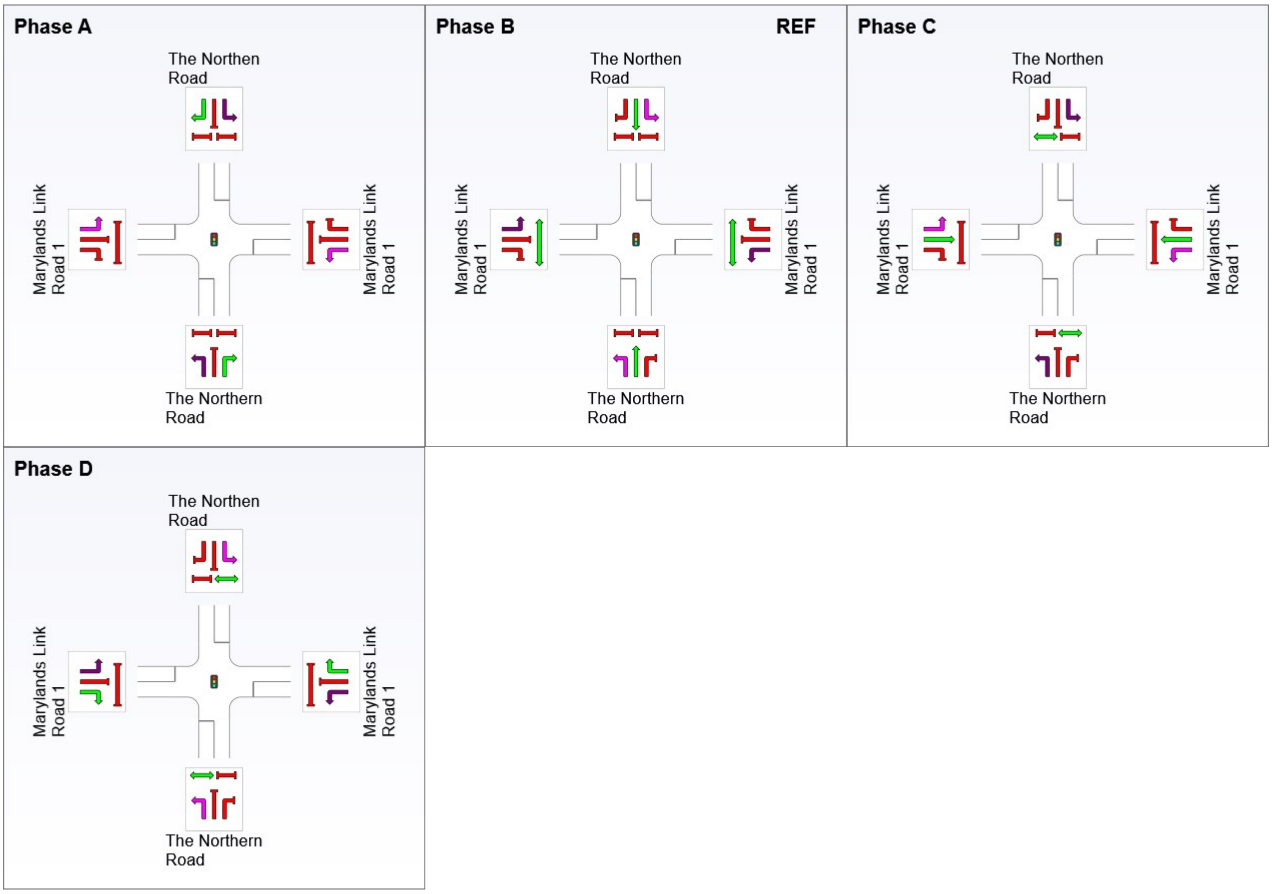
Lane Use and Performance

	DEMAND FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: The Northern Road													
Lane 1	562	9.4	736	0.763	100	43.0	LOS D	26.3	199.1	Short	140	0.0	NA
Lane 2	562	9.4	736	0.763	100	34.8	LOS C	26.3	199.1	Full	500	0.0	0.0
Lane 3	562	9.4	736	0.763	100	34.8	LOS C	26.3	199.1	Full	500	0.0	0.0
Lane 4	471	11.5	530	0.888	100	59.4	LOS E	27.4	210.3	Full	500	0.0	0.0
Approach	2156	9.8		0.888		42.3	LOS C	27.4	210.3				
East: Marylands Link Road 1													
Lane 1	162	5.6	951	0.170	100	12.1	LOS A	2.9	21.5	Short	100	0.0	NA
Lane 2	7	0.0	201	0.035	100	48.6	LOS D	0.3	2.4	Full	300	0.0	0.0
Lane 3	58	7.8	221	0.262	100	54.2	LOS D	2.8	21.3	Full	300	0.0	0.0
Lane 4	58	7.8	221	0.262	100	54.2	LOS D	2.8	21.3	Short	110	0.0	NA
Approach	285	6.3		0.262		30.1	LOS C	2.9	21.5				
North: The Northen Road													
Lane 1	705	13.4	836	0.843	100	39.8	LOS C	29.5	230.1	Full	500	0.0	0.0
Lane 2	606	13.3	718	0.843	100	40.4	LOS C	31.6	246.3	Full	500	0.0	0.0
Lane 3	606	13.3	718	0.843	100	40.4	LOS C	31.6	246.3	Full	500	0.0	0.0
Lane 4	351	9.1	539	0.652	100	45.8	LOS D	16.3	123.3	Short	160	0.0	NA
Approach	2267	12.7		0.843		41.1	LOS C	31.6	246.3				
West: Marylands Link Road 1													
Lane 1	93	7.5	894	0.104	100	11.4	LOS A	1.5	11.5	Short	115	0.0	NA
Lane 2	1	0.0	167	0.003	100	47.9	LOS D	0.0	0.2	Full	500	0.0	0.0
Lane 3	1	0.0	167	0.003	100	47.9	LOS D	0.0	0.2	Full	500	0.0	0.0
Lane 4	1	0.0	195	0.005	100	51.5	LOS D	0.0	0.3	Short	115	0.0	NA
Approach	95	7.4		0.104		12.2	LOS A	1.5	11.5				
Intersection	4803	10.9		0.888		40.4	LOS C	31.6	246.3				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A	No	73	6	79	27	0	6	NA	33	31
B	Yes	0	6	6	35	41	6	NA	41	39
C	No	41	6	47	9	56	6	NA	15	14
D	No	56	6	62	11	73	6	NA	17	16

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated

Template: Default Site User Report

Site: 103 [2036 - AM Peak - Oran Park Drive / Marylands Link Road 2 (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
Oran Park Drive / Marylands Link Road 2
2036 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase A1
Input Phase Sequence: A1, B, C, D
Output Phase Sequence: A1, B, C, D

Lane Use and Performance

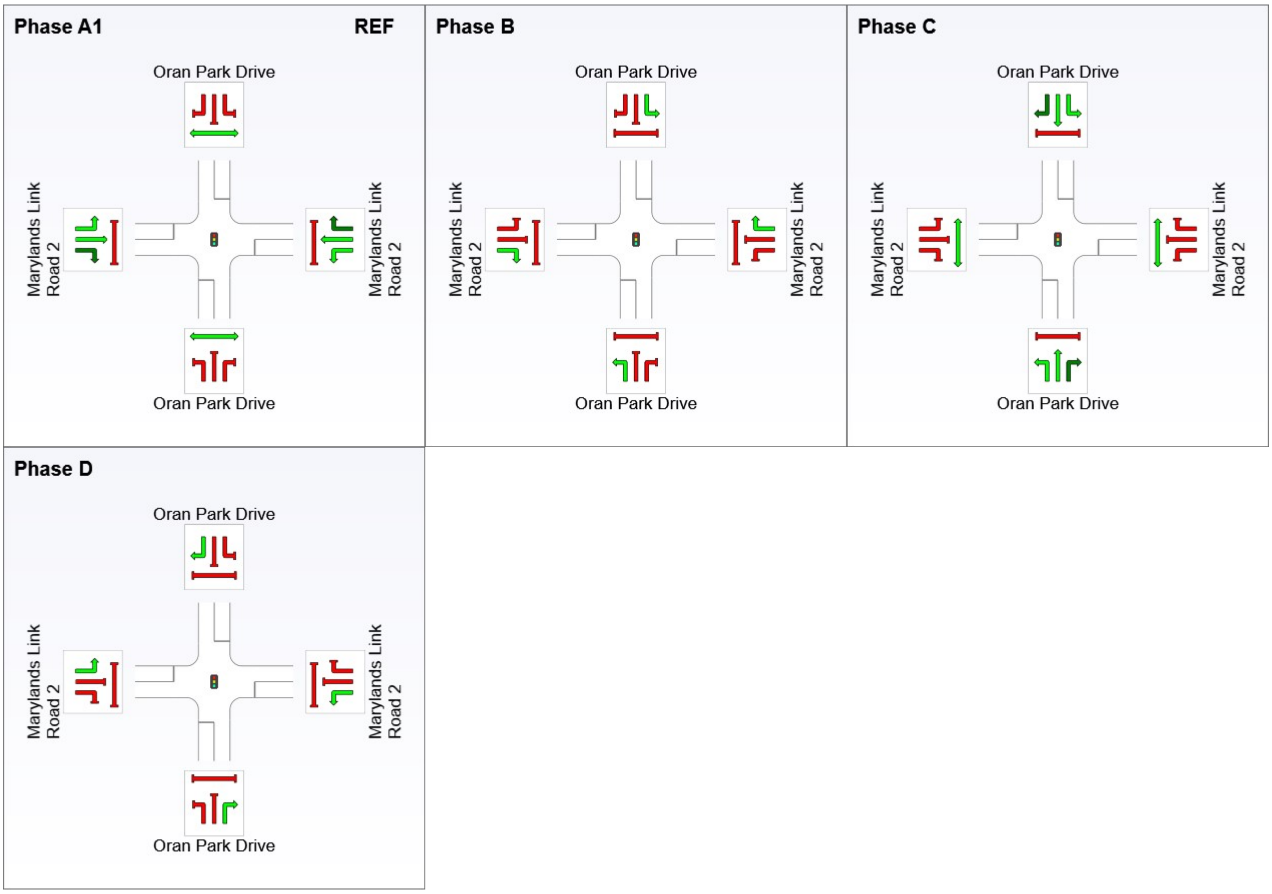
	DEMAND FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Oran Park Drive													
Lane 1	146	11.6	718	0.203	100	19.9	LOS B	3.2	24.7	Full	500	0.0	0.0
Lane 2	1	0.0	338	0.003	1 [5]	25.8	LOS B	0.0	0.2	Full	500	0.0	0.0
Lane 3	1	0.0	388	0.003	100	23.8	LOS B	0.0	0.2	Short	60	0.0	NA
Approach	148	11.5		0.203		20.0	LOS B	3.2	24.7				
East: Marylands Link Road 2													
Lane 1	328	6.7	458	0.717	100	28.2	LOS B	10.9	80.6	Full	500	0.0	0.0
Lane 2	329	6.6	459	0.717	100	28.4	LOS B	11.0	81.6	Full	500	0.0	0.0
Lane 3	219	1.8	635	0.345	100	18.8	LOS B	4.8	34.5	Short	60	0.0	NA
Approach	876	5.5		0.717		25.9	LOS B	11.0	81.6				
North: Oran Park Drive													
Lane 1	142	2.2	729	0.195	100	20.3	LOS B	3.2	22.6	Full	500	0.0	0.0
Lane 2	62	7.8	318	0.195	100	27.7	LOS B	1.9	14.0	Full	500	0.0	0.0
Lane 3	50	0.0	426	0.117	100	23.4	LOS B	1.2	8.5	Short	60	0.0	NA
Approach	254	3.1		0.195		22.7	LOS B	3.2	22.6				
West: Marylands Link Road 2													
Lane 1	43	4.2	462	0.094	100	23.2	LOS B	1.2	8.4	Full	500	0.0	0.0
Lane 2	44	5.0	463	0.094	100	22.4	LOS B	1.2	8.5	Full	500	0.0	0.0
Lane 3	25	20.0	387	0.065	100	24.8	LOS B	0.6	5.2	Short	60	0.0	NA
Approach	112	8.0		0.094		23.3	LOS B	1.2	8.5				
Intersection	1390	5.9		0.717		24.5	LOS B	11.0	81.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase A1
Input Phase Sequence: A1, B, C, D



REF: Reference Phase
VAR: Variable Phase

- Normal Movement
- Slip/Bypass-Lane Movement
- Stopped Movement
- Other Movement Class (MC) Running
- Mixed Running & Stopped MCs
- Other Movement Class (MC) Stopped
- Permitted/Opposed
- Opposed Slip/Bypass-Lane
- Turn On Red
- Undetected Movement
- Continuous Movement
- Phase Transition Applied

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A1	Yes	0	6	6	17	23	6	NA	23	33
B	No	23	6	29	11	40	6	NA	17	24
C	No	40	6	46	12	58	6	NA	18	26
D	No	58	6	64	6	70	6	NA	12	17

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated

Template: Default Site User Report

Site: 103 [2036 - PM Peak - Oran Park Drive / Marylands Link Road 2 (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
Oran Park Drive / Marylands Link Road 2
2036 - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 55 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase A1
Input Phase Sequence: A1, B, C, D
Output Phase Sequence: A1, B, C, D

Lane Use and Performance

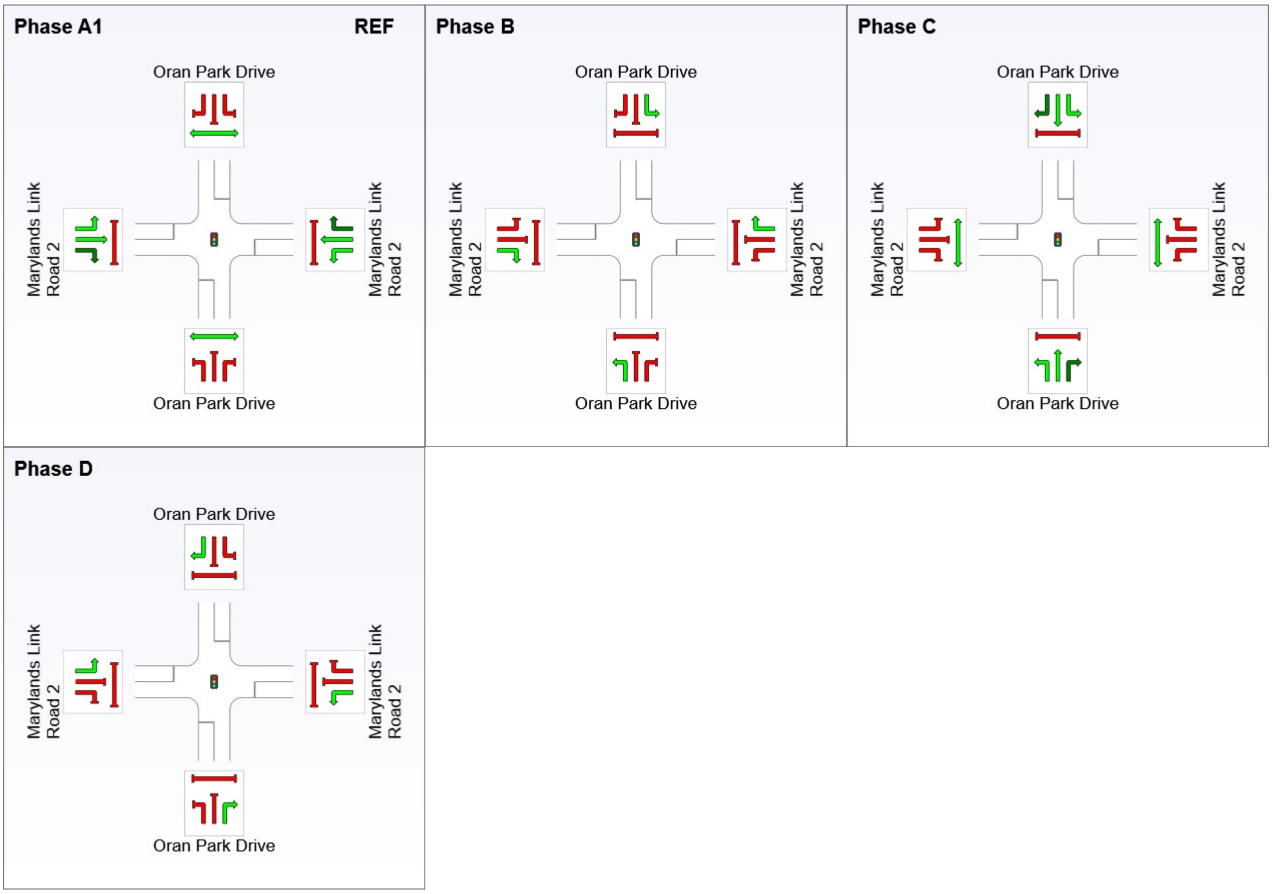
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Oran Park Drive													
Lane 1	67	13.4	685	0.098	100	16.9	LOS B	1.1	8.9	Full	500	0.0	0.0
Lane 2	1	0.0	358	0.003	3[5]	19.9	LOS B	0.0	0.2	Full	500	0.0	0.0
Lane 3	1	0.0	401	0.002	100	19.0	LOS B	0.0	0.1	Short	60	0.0	NA
Approach	69	13.0		0.098		17.0	LOS B	1.1	8.9				
East: Marylands Link Road 2													
Lane 1	81	12.8	296	0.274	100	23.3	LOS B	2.0	15.5	Full	500	0.0	0.0
Lane 2	81	14.4	295	0.274	100	22.9	LOS B	2.0	15.8	Full	500	0.0	0.0
Lane 3	214	2.3	462	0.463	100	20.2	LOS B	4.4	31.7	Short	60	0.0	NA
Approach	376	7.2		0.463		21.4	LOS B	4.4	31.7				
North: Oran Park Drive													
Lane 1	404	3.7	724	0.558	100	19.7	LOS B	8.6	62.0	Full	500	0.0	0.0
Lane 2	123	13.8	325	0.378	68[5]	22.5	LOS B	3.1	24.0	Full	500	0.0	0.0
Lane 3	151	8.6	488	0.309	100	18.6	LOS B	2.9	21.5	Short	60	0.0	NA
Approach	678	6.6		0.558		19.9	LOS B	8.6	62.0				
West: Marylands Link Road 2													
Lane 1	38	3.2	311	0.122	100	23.8	LOS B	0.9	6.5	Full	500	0.0	0.0
Lane 2	38	4.7	313	0.122	100	22.1	LOS B	0.9	6.6	Full	500	0.0	0.0
Lane 3	199	8.5	411	0.484	100	21.8	LOS B	4.3	32.5	Short	60	0.0	NA
Approach	275	7.3		0.484		22.1	LOS B	4.3	32.5				
Intersection	1398	7.2		0.558		20.6	LOS B	8.6	62.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase A1
Input Phase Sequence: A1, B, C, D



REF: Reference Phase
VAR: Variable Phase

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A1	Yes	0	6	6	9	15	6	NA	15	27
B	No	15	6	21	6	27	6	NA	12	22
C	No	27	6	33	10	43	6	NA	16	29
D	No	43	6	49	6	55	6	NA	12	22

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated

Template: Default Site User Report

Site: 104 [2036 - AM Peak - Oran Park Drive / Marylands Link Road 1 (Site Folder: Prelim - AM)]

Pondicherry Traffic assessment
Oran Park Drive / Marylands Link Road 1
2036 - AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 54 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase A2
Input Phase Sequence: A2, B, C2, D
Output Phase Sequence: A2, B, C2, D

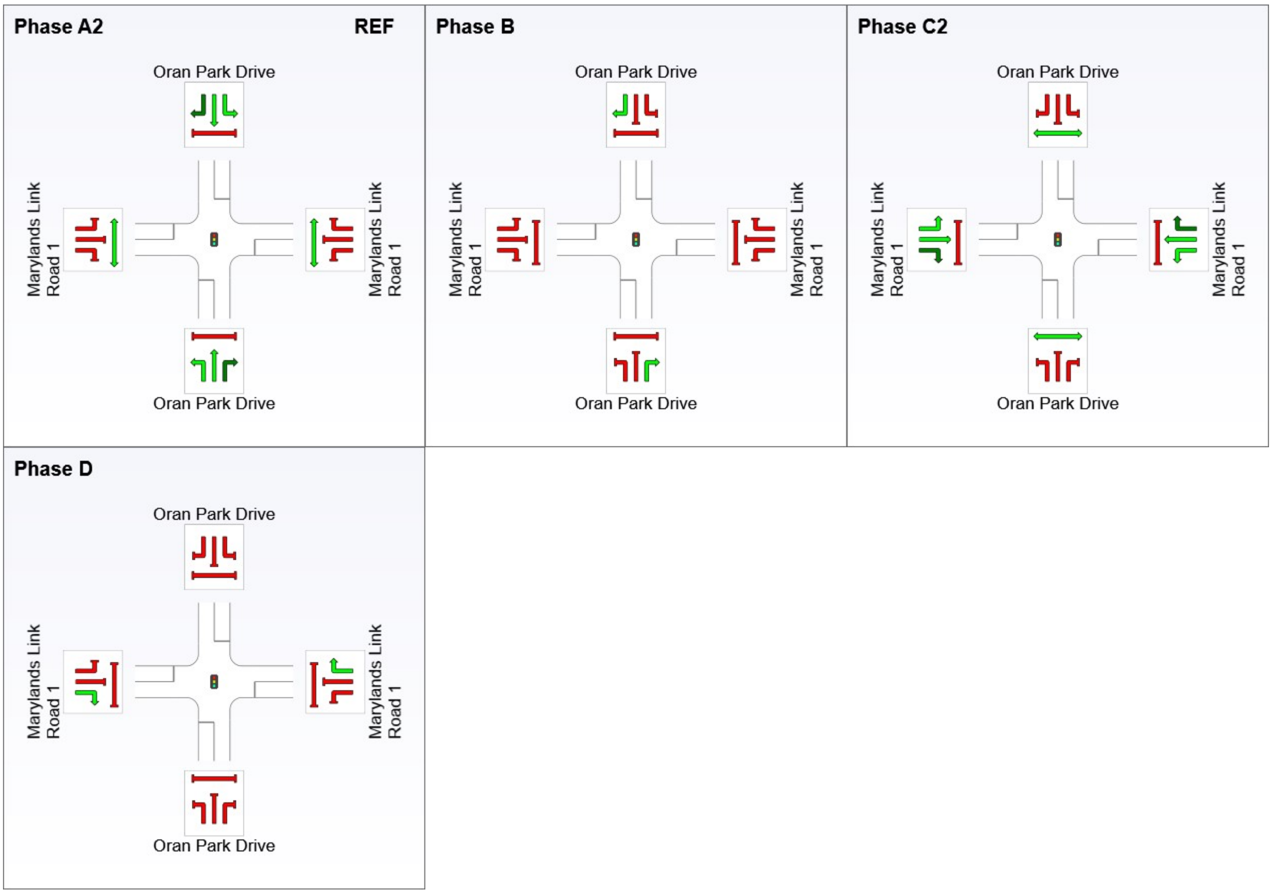
Lane Use and Performance														
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Oran Park Drive													
Lane 1	225	3.6	335	0.671	100	29.9	LOS C	6.0	43.5	Full	500	0.0	0.0
Lane 2	120	13.3	332	0.361	54[5]	21.8	LOS B	2.9	22.7	Full	500	0.0	0.0
Lane 3	1	0.0	502	0.002	100	16.3	LOS B	0.0	0.1	Short	60	0.0	NA
Approach	346	6.9		0.671		27.1	LOS B	6.0	43.5				
East: Marylands Link Road 1													
Lane 1	37	2.6	283	0.131	100	23.0	LOS B	0.9	6.4	Short	45	0.0	NA
Lane 2	37	2.8	284	0.131	100	22.6	LOS B	0.9	6.4	Full	500	0.0	0.0
Lane 3	13	0.0	368	0.035	100	20.5	LOS B	0.3	1.8	Short	50	0.0	NA
Approach	87	2.3		0.131		22.4	LOS B	0.9	6.4				
North: Oran Park Drive													
Lane 1	33	4.9	345	0.097	100	22.1	LOS B	0.8	5.5	Full	500	0.0	0.0
Lane 2	34	7.0	345	0.097	100	20.4	LOS B	0.8	5.6	Full	500	0.0	0.0
Lane 3	250	11.6	344	0.726	100	27.6	LOS B	6.1	47.0	Short	60	0.0	NA
Approach	317	10.4		0.726		26.3	LOS B	6.1	47.0				
West: Marylands Link Road 1													
Lane 1	152	8.6	263	0.577	100	29.0	LOS C	4.0	30.4	Full	500	0.0	0.0
Lane 2	137	3.6	442	0.310	100	19.6	LOS B	2.7	19.4	Full	500	0.0	0.0
Approach	289	6.2		0.577		24.6	LOS B	4.0	30.4				
Intersection	1039	7.4		0.726		25.7	LOS B	6.1	47.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase A2
Input Phase Sequence: A2, B, C2, D



REF: Reference Phase
VAR: Variable Phase

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A2	Yes	0	6	6	10	16	6	NA	16	30
B	No	16	6	22	6	28	6	NA	12	22
C2	No	28	6	34	8	42	6	NA	14	26
D	No	42	6	48	6	54	6	NA	12	22

USER REPORT FOR SITE

All Movement Classes

Project: 2036 Analysis - rev6 - volume updated

Template: Default Site User Report

Site: 104 [2036 - PM Peak - Oran Park Drive / Marylands Link Road 1 (Site Folder: Prelim - PM)]

Pondicherry Traffic assessment
Oran Park Drive / Marylands Link Road 1
2036 - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase A2
Input Phase Sequence: A2, B, C2, D
Output Phase Sequence: A2, B, C2, D

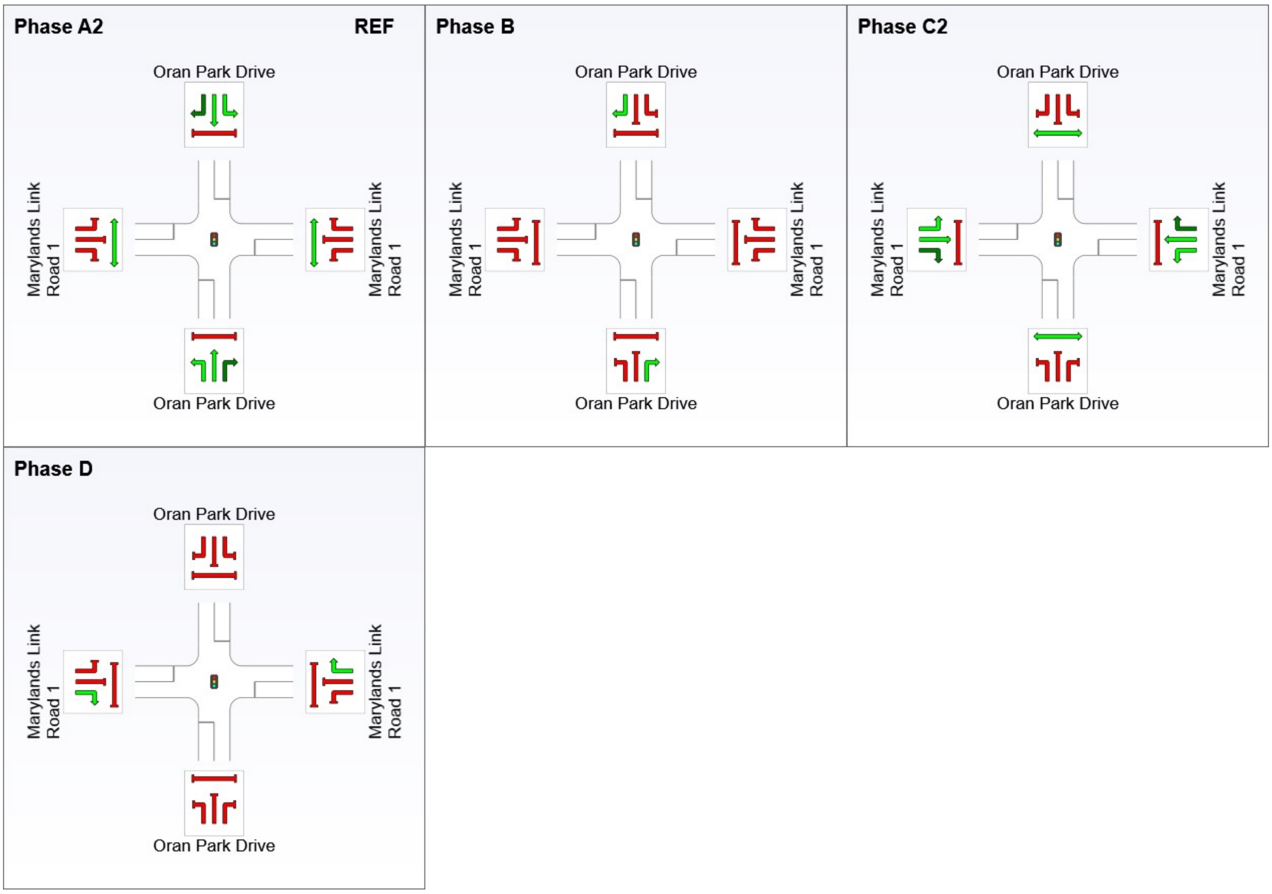
Lane Use and Performance

	DEMAND FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Oran Park Drive													
Lane 1	213	5.9	332	0.641	100	30.3	LOS C	6.2	45.6	Full	500	0.0	0.0
Lane 2	221	5.6	345	0.641	100	26.2	LOS B	6.4	47.1	Full	500	0.0	0.0
Lane 3	8	0.0	468	0.017	100	19.3	LOS B	0.2	1.1	Short	60	0.0	NA
Approach	442	5.7		0.641		28.1	LOS B	6.4	47.1				
East: Marylands Link Road 1													
Lane 1	37	1.3	418	0.088	100	20.8	LOS B	0.9	6.3	Short	45	0.0	NA
Lane 2	37	1.4	419	0.088	100	20.7	LOS B	0.9	6.3	Full	500	0.0	0.0
Lane 3	44	0.0	341	0.129	100	23.4	LOS B	1.0	7.2	Short	50	0.0	NA
Approach	118	0.8		0.129		21.7	LOS B	1.0	7.2				
North: Oran Park Drive													
Lane 1	36	13.8	325	0.110	100	23.9	LOS B	0.9	7.1	Full	500	0.0	0.0
Lane 2	35	17.2	322	0.110	100	22.8	LOS B	0.9	7.2	Full	500	0.0	0.0
Lane 3	101	8.9	323	0.313	100	25.5	LOS B	2.5	18.7	Short	60	0.0	NA
Approach	172	11.6		0.313		24.6	LOS B	2.5	18.7				
West: Marylands Link Road 1													
Lane 1	272	10.7	379	0.718	100	30.6	LOS C	8.1	62.1	Full	500	0.0	0.0
Lane 2	153	15.0	475	0.322	100	19.2	LOS B	3.1	24.6	Full	500	0.0	0.0
Approach	425	12.2		0.718		26.5	LOS B	8.1	62.1				
Intersection	1157	8.5		0.718		26.3	LOS B	8.1	62.1				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Input Phase Sequence

Phase Sequence: Split Phasing
Reference Phase: Phase A2
Input Phase Sequence: A2, B, C2, D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Phase Information

Phase	Ref. Phase	Change Time sec	Starting Intergreen sec	Green Start sec	Displayed Green sec	Green End sec	Terminating Intergreen sec	Phase Frequency %	Phase Time sec	Phase Split %
A2	Yes	0	6	6	11	17	6	NA	17	28
B	No	17	6	23	6	29	6	NA	12	20
C2	No	29	6	35	13	48	6	NA	19	32
D	No	48	6	54	6	60	6	NA	12	20

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Phil Guo Dr Mingjie Ding	Ali Syed		Jayme Akstein		06/11/2020
B	Phil Guo	Ali Syed	On File	Jayme Akstein	On File	24/11/2020
C	Phil Guo	Ali Syed		Jayme Akstein		15/02/2021

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