MERNDA PRECINCT 2A (PART) DEVELOPMENT PLAN

TRAFFIC ENGINEERING ASSESSMENT

SALT^3

MERNDA PRECINCT 2A (PART) DEVELOPMENT PLAN TRAFFIC ENGINEERING ASSESSMENT
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1 INTRODUCTION

SALT has been engaged by Bridge-Cookes Landowners Group Inc. to undertake a traffic engineering assessment for the proposed Mernda Precinct 2A (Part) Development Plan, located northwest of the Bridge Inn Road/Yan Yean Road intersection in Doreen. In the course of preparing this report:

- The Mernda Strategy Plan (MSP) has been reviewed to determine traffic and transport requirements and objectives;
- The proposed Development Plan prepared by Spiire has been reviewed (refer copy in **Appendix 1**);
- An assessment has been undertaken of vehicle access, road cross-sections, alignments, pedestrian and cycling networks, bus and emergency vehicle access in respect of the relevant requirements within the MSP and Planning Scheme;
- Traffic volume data has been collected, with SIDRA analysis carried out to ascertain the subsequent impact of the development on the surrounding road network; and
- The traffic implications of the proposal have been assessed.

2 EXISTING CONDITIONS

2.1 LOCATION & LAND USE

The site is located in Doreen, approximately 30km north-east of Melbourne's CBD.

The subject site is rectangular in shape and covers an area of approximately 49.9 hectares, comprised of 45 individual land titles. While largely residential, additional land uses within the site include a 175m wide transmission easement and 2.25 hectares of Active Open Space, partially encroaching on the easement. These both are located at the southeast corner of the site and are non-developable.

Two external road connections to the precinct have been established from Painted Hills Road; one via the eastern leg of the Painted Hill Road/Belmont Rise Roundabout, and another via an unnamed roadway between the existing 7/11 store & child care centre. Both of these roads terminate at the western site boundary.

There is notably an existing roundabout at the Cookes Road / Flaxen Hills Road intersection that is intended to provide a connection to the subject site (via a new southern leg) as envisaged by the Mernda Strategy Plan.

An aerial view of the subject site is provided in **Figure 1**. A map of the site's location with respect to the surrounding road network is provided in **Figure 2**.

Figure 1 Nearmap Aerial – Wednesday 27th October 2021

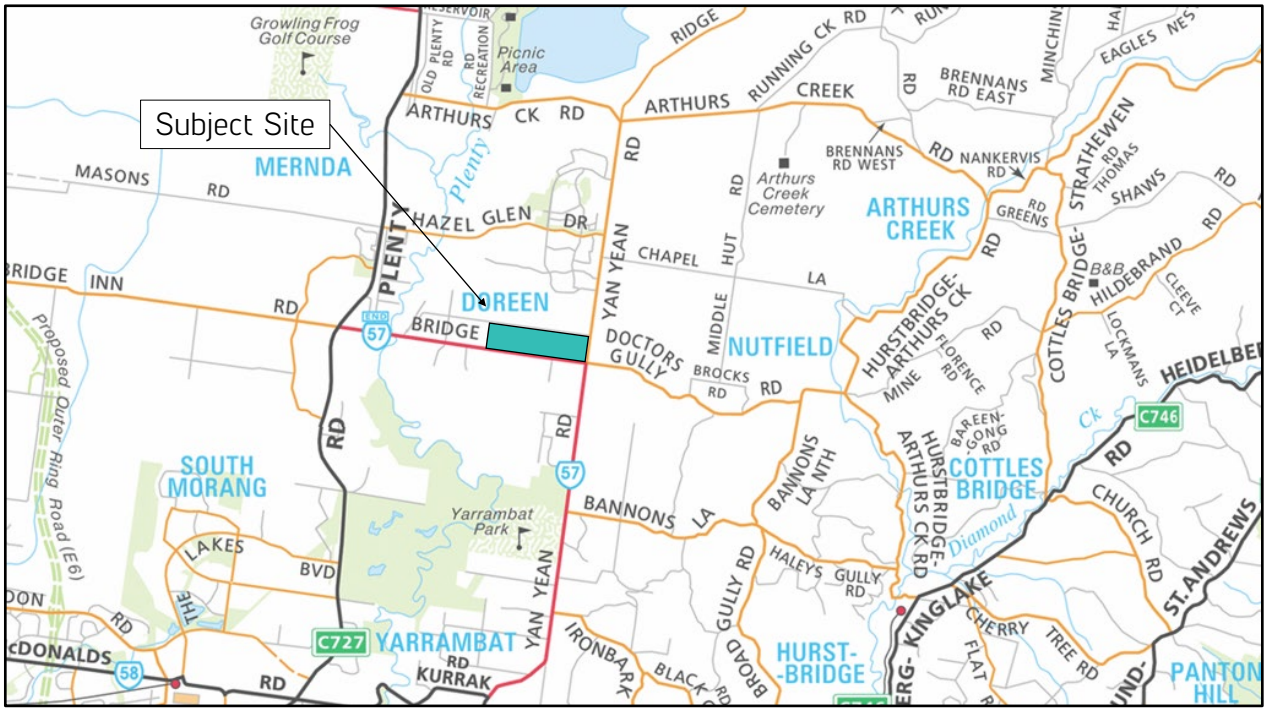


Figure 2 Site location with respect to Melbourne

2.2 SURROUNDING LAND USE

Surrounding land use is largely residential in nature to the north, south and west. Land to the east of Yan Yean Road is largely undeveloped due to the Green Wedge zoning. Of note, Hazel Glen College is located to the north-west of the site, and a retail precinct is located at the south-west corner of the Bridge Inn Road / Yan Yean Road intersection, south of the site.

2.3 ZONING

The subject site is located within the City of Whittlesea. The land is zoned as General Residential Zone – Schedule 1 (GRZ1) and is affected by the following overlays:

- Development Contributions Plan Overlay – Schedule 5 (DCPO5);
- Development Plan Overlay – Schedule 5 (DPO5);
- Incorporated Plan Overlay – Schedule 1 (IPO1);
- Vegetation Protection Overlay – Schedule 1 (VPO1); and
- Specific Controls Overlay – Schedule 13 (SCO13);

The site is not affected by any Parking Overlays (PO), nor does it fall within the Principal Public Transport Network (PPTN).

The subject site falls within the Mernda Strategy Plan (MSP) area – refer discussion in **Section 3**.

2.4 ROAD NETWORK

2.4.1 BRIDGE INN ROAD

Bridge Inn Road is classified as a Secondary Arterial Road under the care and management of the Department of Transport (DoT). It generally features a carriageway width of approximately 6.6m with a single traffic lane in each direction and gravel shoulders.

A posted speed limit of 80km/h applies to Bridge Inn Road.

Bridge Inn Road will be subject to duplication works in the near future under Major Road Projects Victoria (MRPV), with the road to be upgraded to provide two traffic lanes in each direction, separated by a constructed median.

The upcoming alterations to Bridge Inn Road are detailed in **Figure 3** for reference. Of note, this will include signalisation of the Garden Road intersection (including U-turn lane on the eastern approach), and upgraded capacity at the nearby Painted Hills Road intersection.

A view of Bridge Inn Road from Garden Road is provided in **Figure 4**.

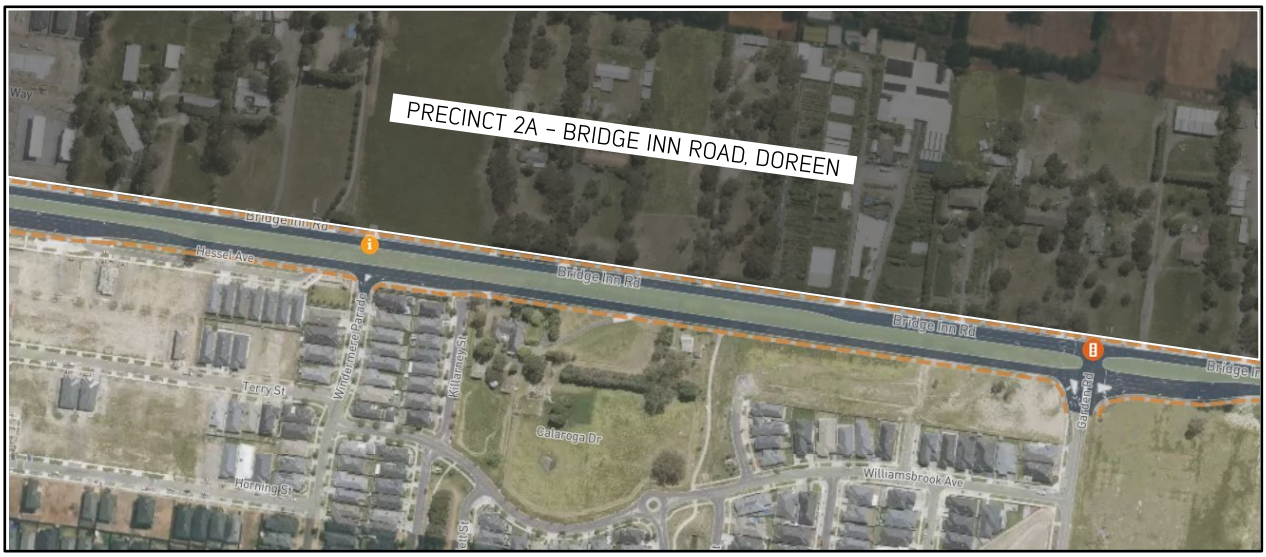


Figure 3 Bridge Inn Road duplication – MRPV

Figure 4 Bridge Inn Road – facing west

2.4.2 YAN YEAN ROAD

Yan Yean Road is classified as a Major Road under the care and management of Whittlesea City Council. The road generally features a carriageway width of approximately 6.6m with a single traffic lane in each direction and gravel shoulders.

A posted speed limit of 80km/h applies.

Yan Yean Road is planned to undergo duplication works through MRPV, seeing the road and key intersections upgraded from Kurrak Road, Yarrambat to Bridge Inn Road, Doreen. It is noted that, as part of the MRPV works, the existing roundabout at Bridge Inn Road/Yan Yean Road shall be upgraded to a signalised intersection. The final design of the intersection, including Bridge Inn Road to the immediate west of the intersection (adjacent the subject site), is yet to be determined but is likely to include duplication of the Bridge Inn Road leg to match into the planned duplication works to the west.

A view of Yan Yean Road is provided in **Figure 5**.

Figure 5 Yan Yean Road – facing south

2.4.3 COOKES ROAD

Cookes Road is classified as a Local Street under the care and management of Whittlesea City Council, though it functions as a collector road by distributing local traffic to/from Yan Yean Road.

The road features a carriageway width of approximately 6.8m with constructed kerb-and-channeling provided on either side. On-street parallel parking is provided at various points of Cookes Road, confined to the northern side of the carriageway only. Parking is provided by means of indented parallel parking areas or widening of the carriageway to permit parking.

A posted speed limit of 50km/h applies to Cookes Road.

The intersection with Yan Yean Road is signalised, and roundabouts are provided at the intersections with Flaxen Hills Road and Painted Hills Road.

A view along Cookes Road is provided in **Figure 6**.

Figure 6 Cookes Road – facing east

2.4.4 PAINTED HILLS ROAD

Painted Hills Road is classified as a Local Street under the care and management of Whittlesea City Council. The road features a carriageway width of approximately 11.2m with a single traffic lane in each direction and constructed kerb-and-channeling provided on either side.

On-street parallel parking is permitted on either side of the carriageway via indented parking areas. Parking along Painted Hills Road is unrestricted.

No posted speed limit has been observed. Accordingly, the default urban limit of 50km.h applies.

A view of Painted Hills Road is provided in **Figure 7**.

Figure 7 Painted Hills Road – facing north

2.5 SUSTAINABLE TRANSPORT

The site is largely serviced by buses, with the Route 381 bus running along Yan Yean Road (*Mernda Station to Diamond Creek Station*) and Routes 388/389 (Mernda Station – Doreen) travelling over Painted Hills Road.

Mernda Railway Station is located approximately 2km west of the site, accessible via the aforementioned bus routes and providing a direct link to the Melbourne CBD.

A map of the public transport routes within the vicinity of the site is provided in **Figure 8**.

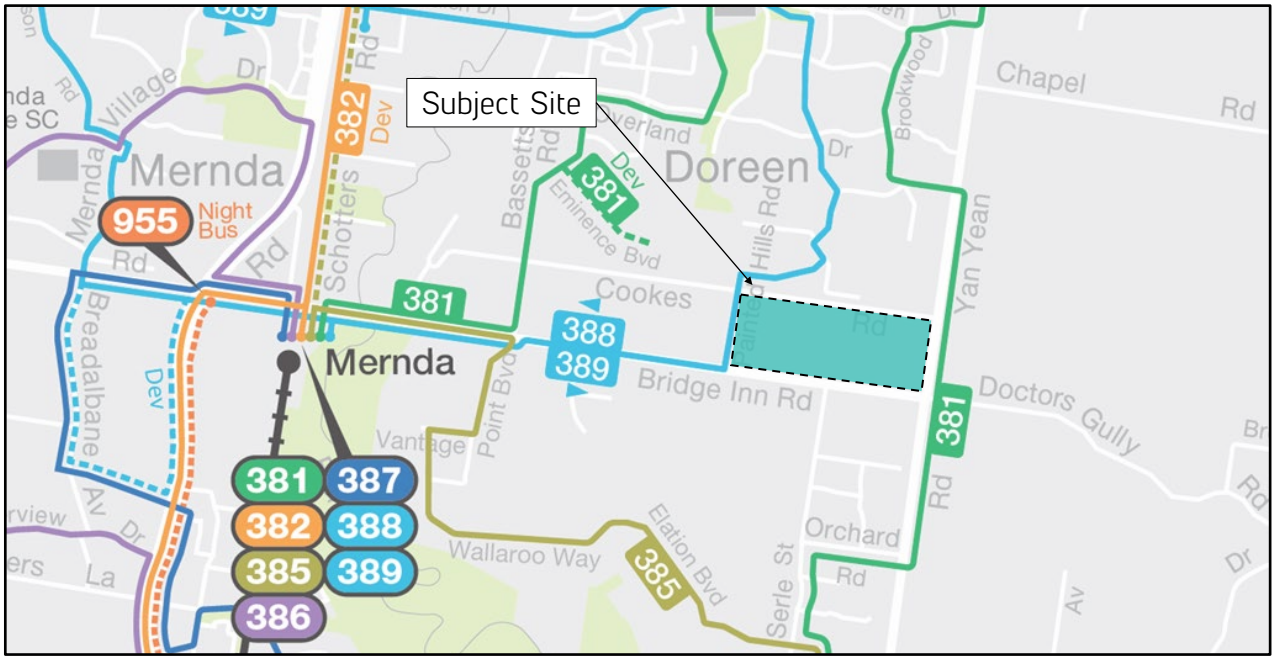


Figure 8 Surrounding Public Transport – City of Whittlesea PTV Local Area Map

2.6 TRAFFIC VOLUMES

In order to ascertain existing traffic conditions within the surrounding road network, vehicle turning movement counts were undertaken by Nationwide Traffic Surveys on Tuesday 3rd August 2021 from 7:00am-9:30am and 2:30pm-7:00pm. Traffic counts were undertaken at the following locations:

- Bridge Inn Road / Garden Road intersection;
- Yan Yean Road / Cookes Road intersection;
- Cookes Road / Flaxen Hills Road intersection and
- Painted Hills Road / Belmont Rise / Venice Rise intersection.

These counts were undertaken prior to a period of Covid lockdown when traffic conditions were 'normal'. This is with the acknowledgement that traffic conditions have generally altered since Covid first started in 2020, and the new normal is not yet known or established.

The corresponding peak hour volumes for each location are provided in **Figures 9-16**.

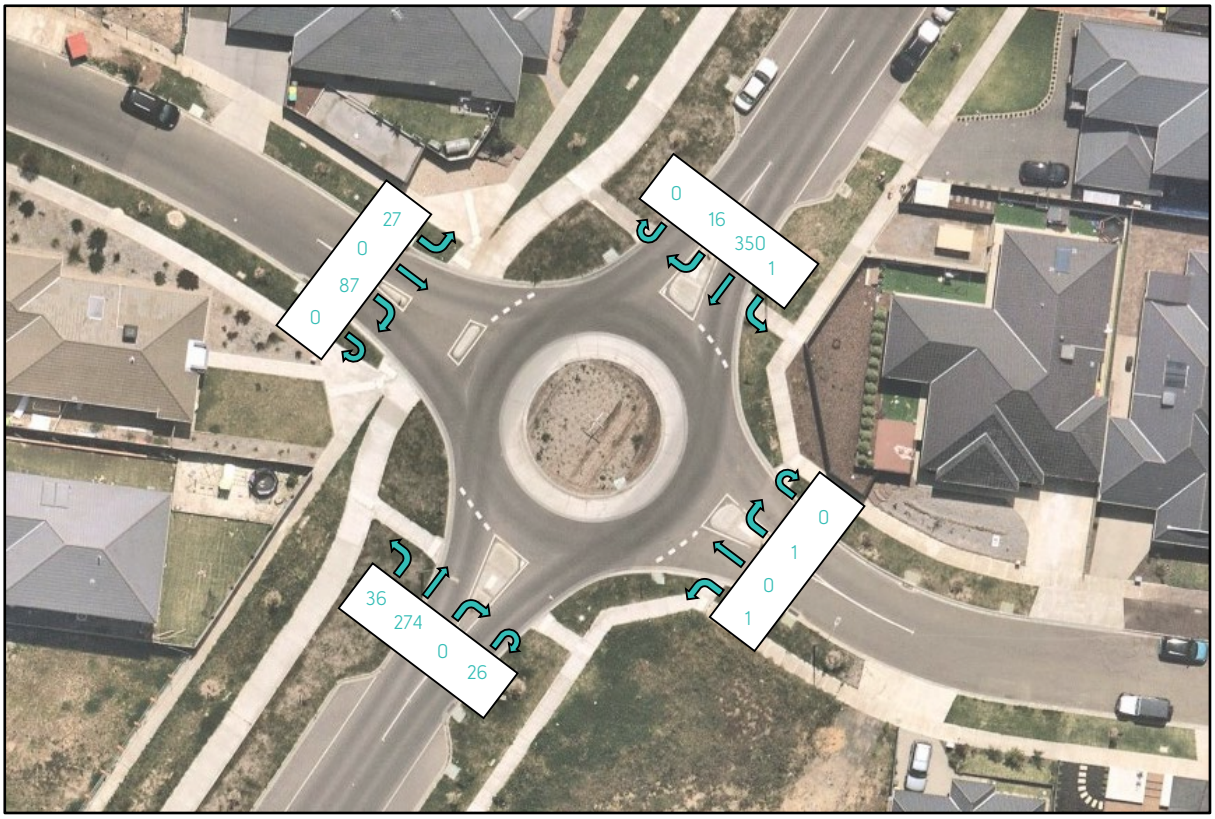


Figure 9 Turning Movement Counts – AM Peak Hour – Painted Hills Road / Belmont Rise

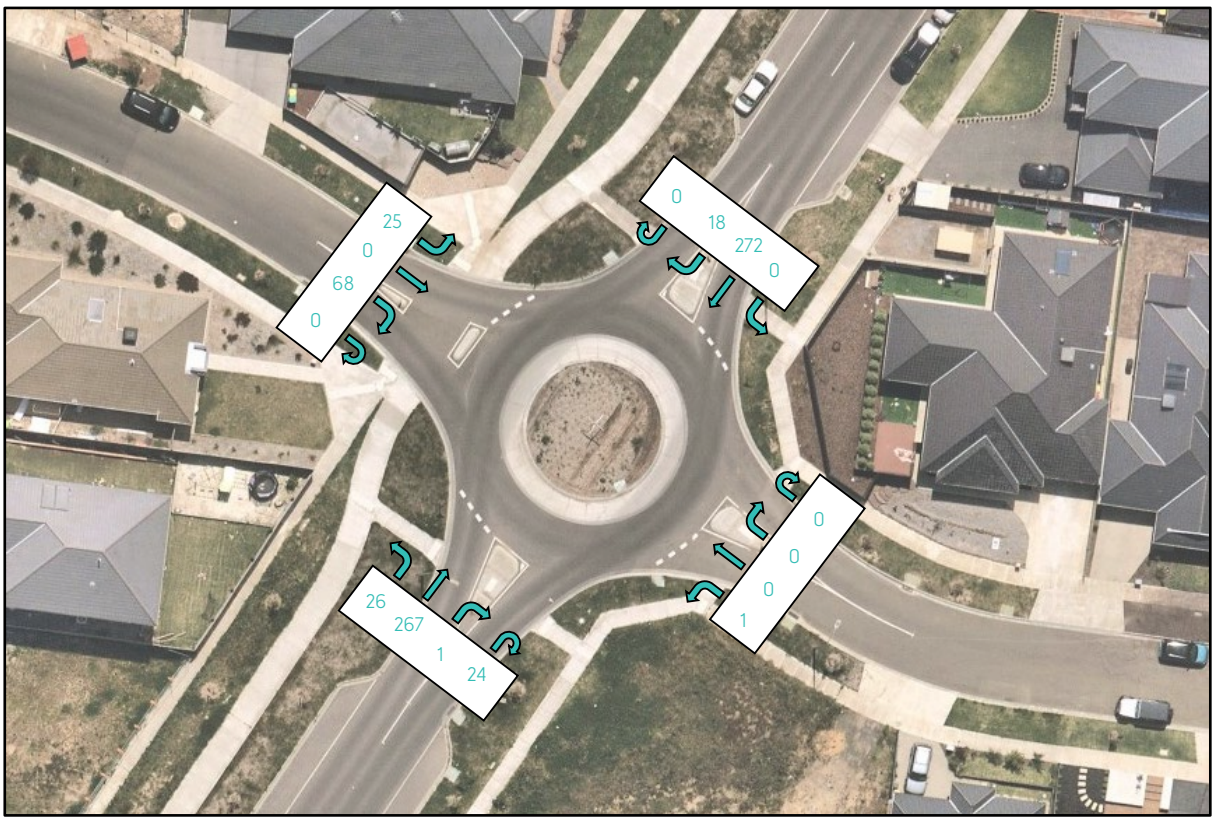


Figure 10Turning Movement Counts – PM Peak Hour – Painted Hills Road / Belmont Rise

Figure 11 Turning Movement Counts – AM Peak Hour – Cookes Road / Flaxen Hills Road

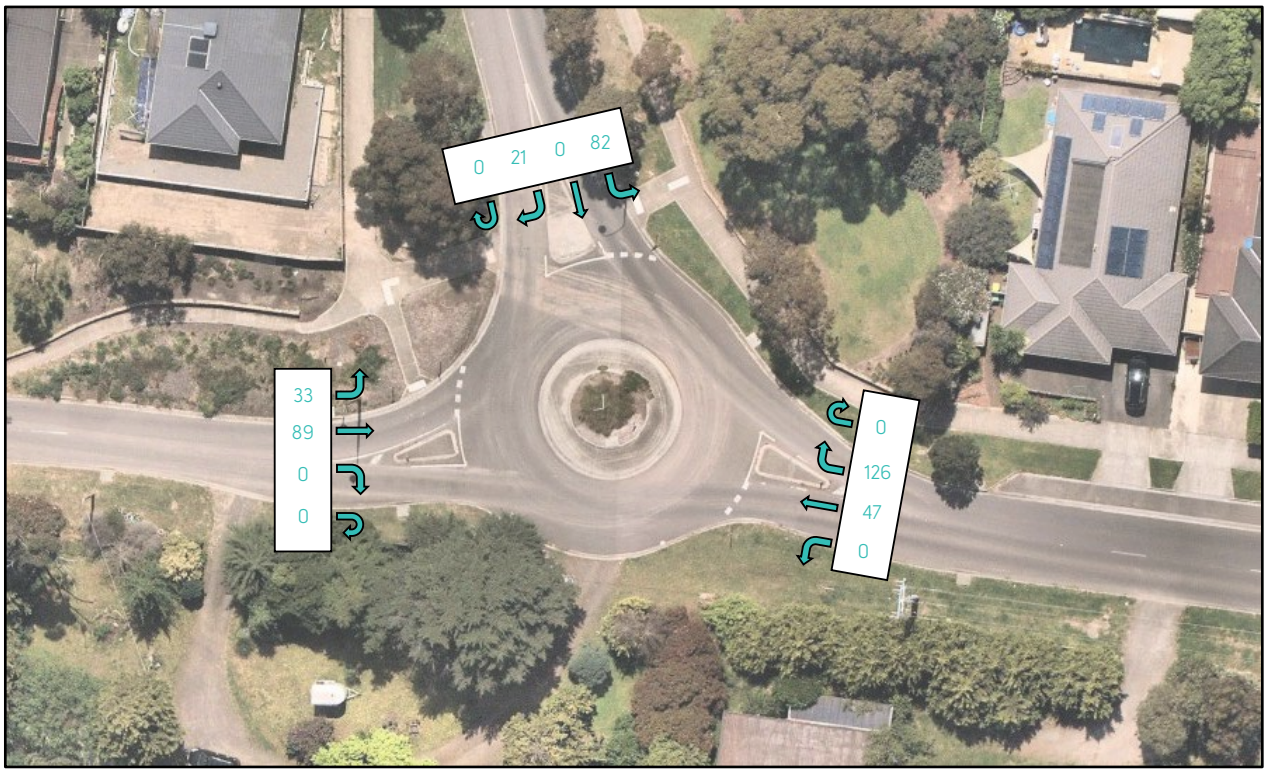


Figure 12 Turning Movement Counts – PM Peak Hour – Cookes Road / Flaxen Hills Road

Figure 13 Turning Movement Counts – AM Peak Hour – Yan Yean Road / Cookes Road

Figure 14 Turning Movement Counts – PM Peak Hour – Yan Yean Road / Cookes Road

Figure 15 Turning Movement Counts – AM Peak Hour – Bridge Inn Road / Garden Road

Figure 16 Turning Movement Counts – PM Peak Hour – Bridge Inn Road / Garden Road

2.7 CRASH HISTORY

An assessment of the crash history within the vicinity of the site has been undertaken by reviewing available crash data for the five (5) year period from 2016–2021, as available on the VicRoads CrashStats database.

The database contains all reported casualty crashes, which include the categories of 'Fatal', 'Serious Injury' and 'Other Injury' crashes. Non-injury or property damage only crashes are not included in this database.

The categories of crash severity are defined as follows:

- **Fatal Injury** – one or more persons are killed in the crash, or die within 30 days from injuries sustained in the crash;
- **Serious Injury** – one or more persons are admitted to hospital as a result of injuries sustained in the crash; and
- **Other Injury** – one or more persons are given medical treatment for injuries sustained in the crash.

Only crashes on the roads directly abutting the site (Bridge Inn Road, Yan Yean Road, Cookes Road and Painted Hills Road) and within the immediate vicinity of the development area have been considered.

A review of available data indicates no crashes on Painted Hills Road or Cookes Road, though over Bridge Inn Road and Yan Yean Road a total of three (3) x 'Serious Injury' and five (5) x 'Other Injury' crashes have occurred. There has does not appear to be any trend to the crash types, though speed may have played a factor in some. It is envisaged that the speed limit on Bridge Inn Road will be reduced from 80km/h to 60km/h (as it currently is to the west of Painted Hills Road) once development of the subject site takes place, which will improve the safety of this roadway.

Crash locations within the vicinity of the site are highlighted in **Figure 17**.

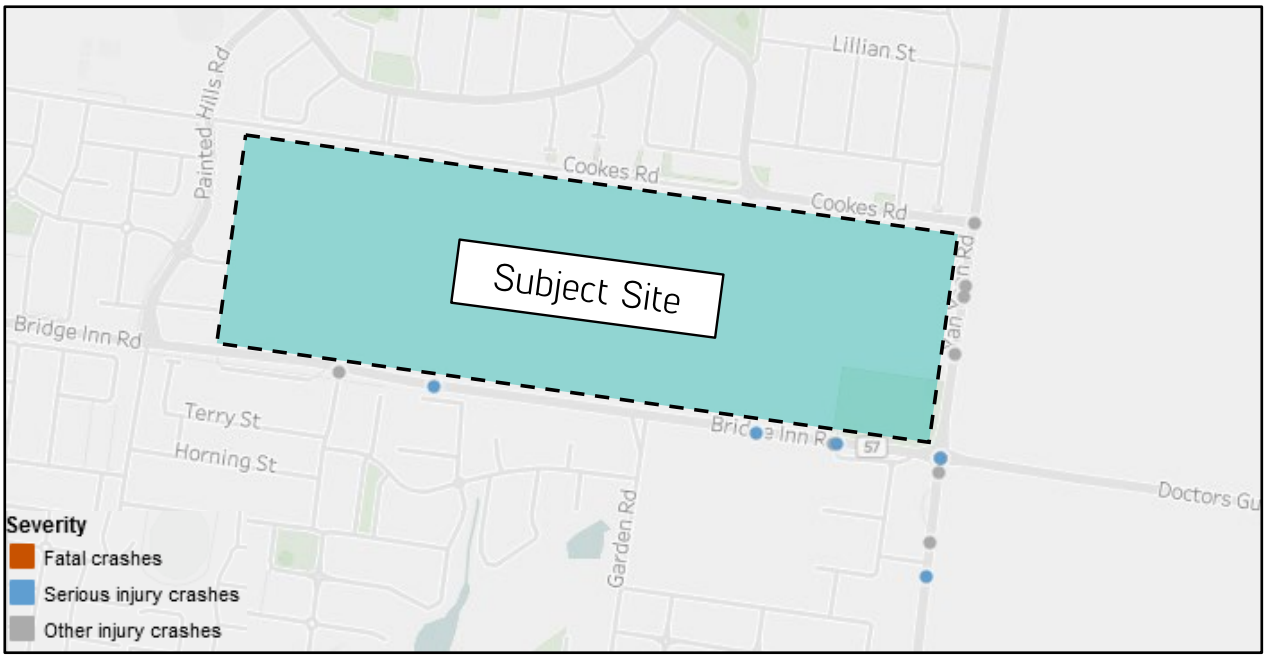


Figure 17 Crashes within site vicinity (2016–2021)

3 MERNDA STRATEGY PLAN

3.1 OVERVIEW

The Mernda Strategy Plan (*approved October 2004, amended January 2008*) builds on the previously approved *Plenty Valley Strategic Plan (PVSP)* approved by the Victorian State Government in 1990, and is the primary reference guide when preparing development and subdivision plans within the Mernda Growth Area.

The MSP highlights six (6) individual precincts, with the key planning objective "*To create an interconnected set of neighbourhoods that each has a distinctive character. They should enable community participation, economic development and adaptation to change over time*".

The subject site is located within Precinct 2A of the MSP, highlighted in **Figure 18**, with the detailed Precinct 2A plan provided in **Figure 19**.

An excerpt from the MSA detailing high-level road and public transport classifications/routes is provided in **Figure 20**, Of note, the alignment of Flaxen Hills Road has been altered from that specified in the 'Roads and Public Transport Plan'. It was originally intended to be constructed west of the Garden Road alignment, but has instead been constructed east of Garden Road.

The Bicycle/Pedestrian Trail Network is provided in **Figure 21**.

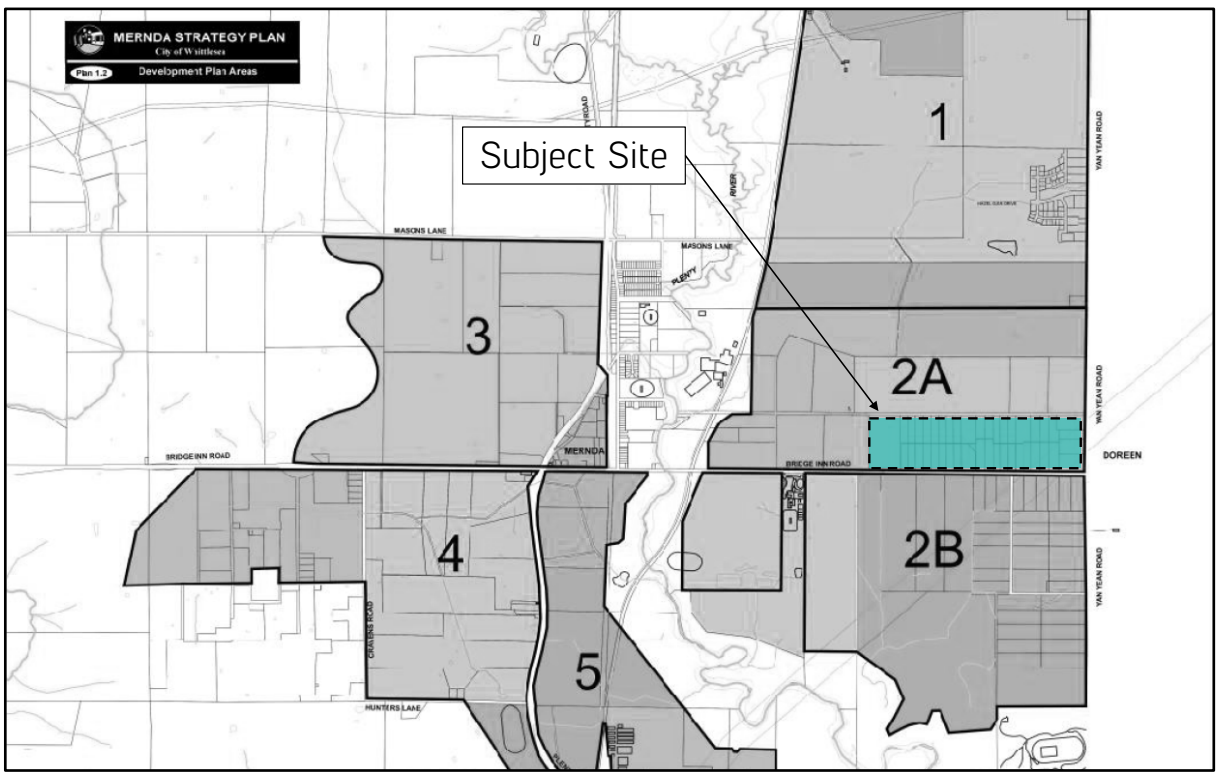


Figure 18 Precinct Boundaries – Mernda Strategy Plan (2008)

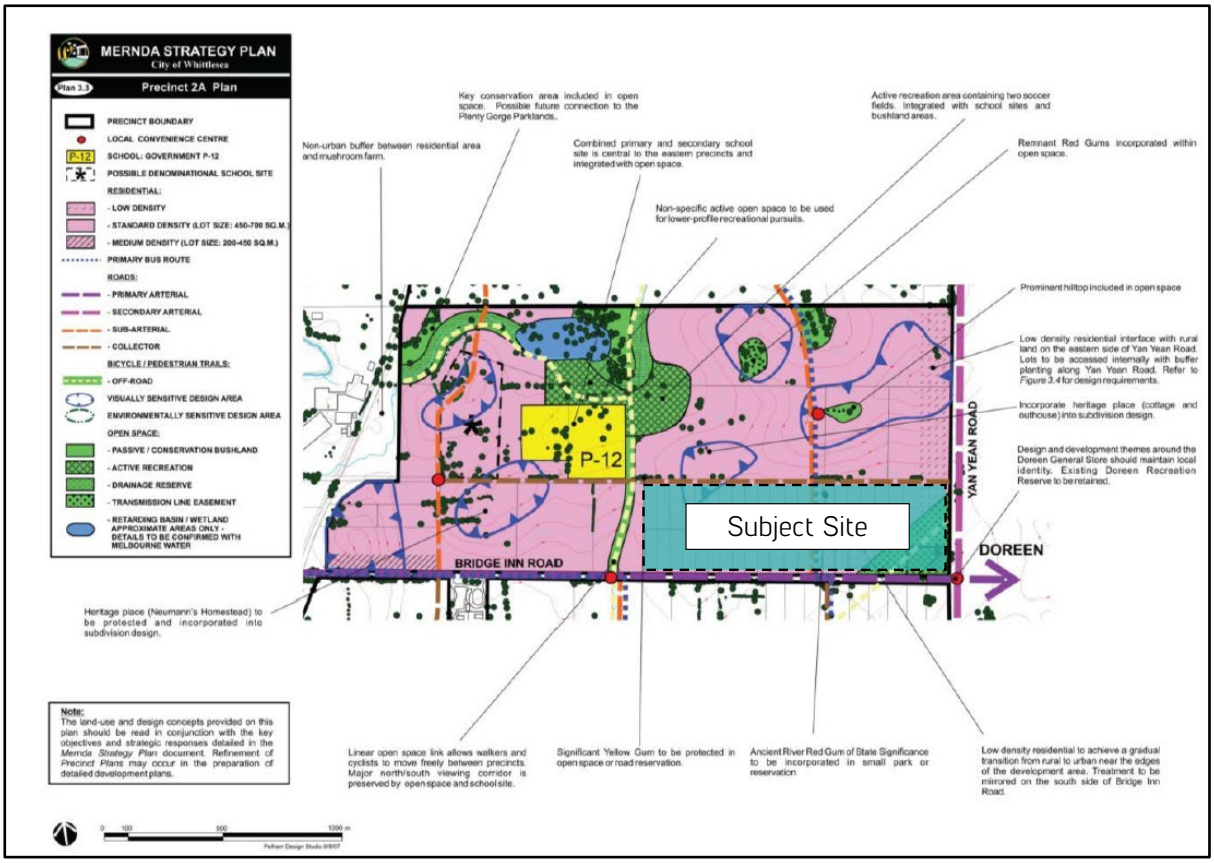


Figure 19 Precinct 2A Plan – Mernda Strategy Plan

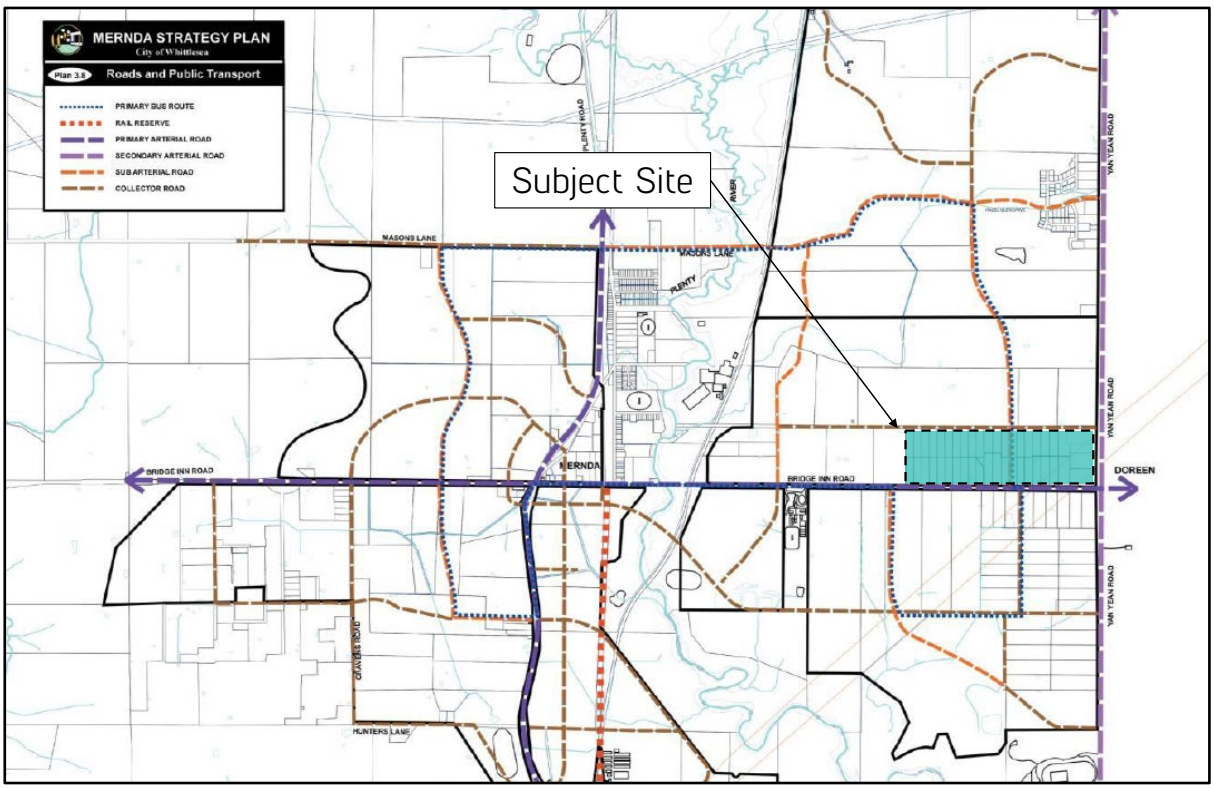


Figure 20 Roads and Public Transport – Mernda Strategy Plan

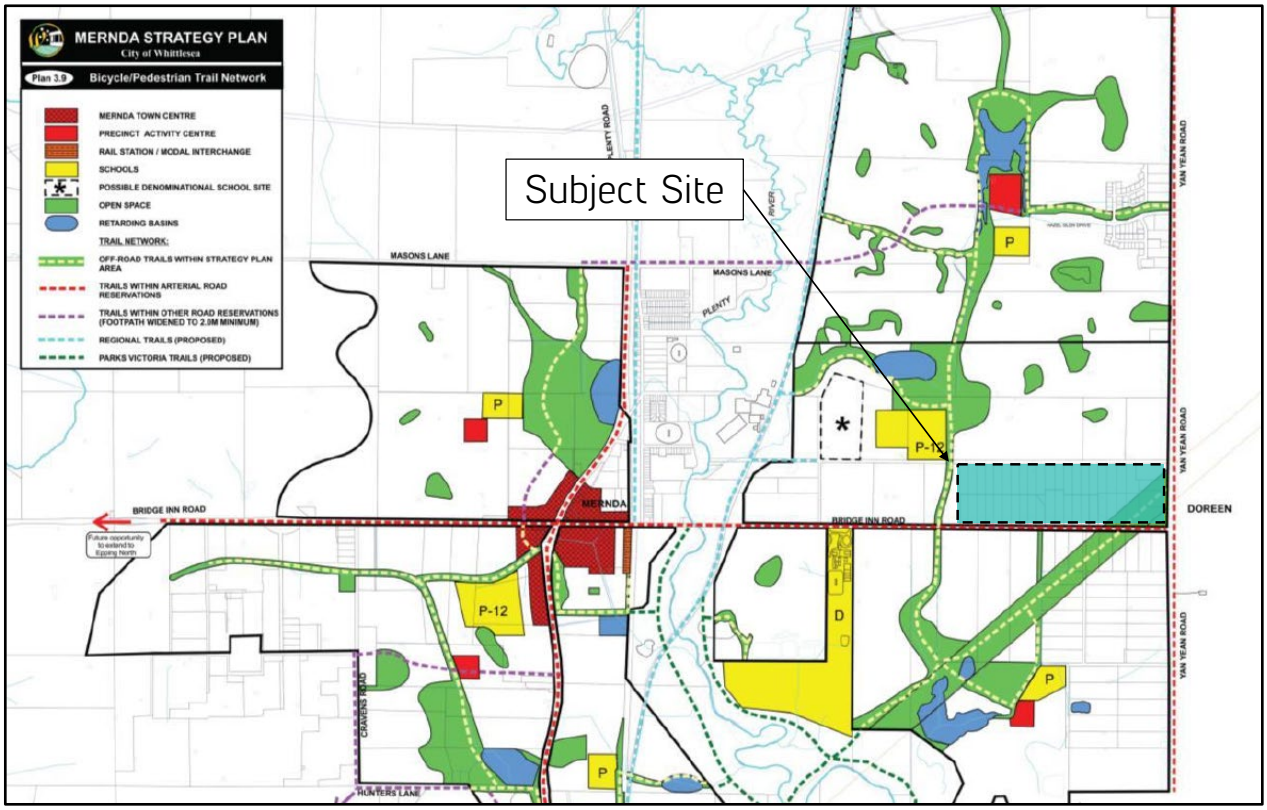


Figure 21 Bicycle/Pedestrian Trail Network – Mernda Strategy Plan

3.2 RELEVANT MSP ROAD CROSS-SECTIONS

There are three (3) relevant 'standard' road cross-sections specified within the Mernda Strategy Plan (excluding the Primary and Secondary Arterial Road which details specific cross sections for Bridge Inn Road, Yan Yean Road and Plenty Road) and are detailed in **Figures 22-25**, including:

- Sub-Arterial Road (Greater than 3000 Vehicles per Day / 20.0m);
- Collector Road (Less than 3000 Vehicles per Day / 20.0m); and
- Local Road – Access Street (15.5m).

All road cross sections permit dual traffic lanes and allow for footpaths on both sides of the road, with allowance for on-road bicycle lanes within the Sub-Arterial and Collector Road cross-sections (though presumably shared with parking lanes – though parking provision is not clearly indicated).

Review of the Mernda Strategy Plan indicates that the abutting roads are classified as follows:

- Bridge Inn Road – Primary Arterial Road;
- Yan Yean Road – Secondary Arterial Road;
- Painted Hills Road – Sub-Arterial Road; and
- Cookes Road – Collector Road.

In addition to the above, the MSP indicates an additional Sub-Arterial Road through the centre of the development area, orientated in a north-south direction – this has been constructed as Flaxen Hills Road to the north of the site and currently intersections with Cookes Road forming a roundabout.

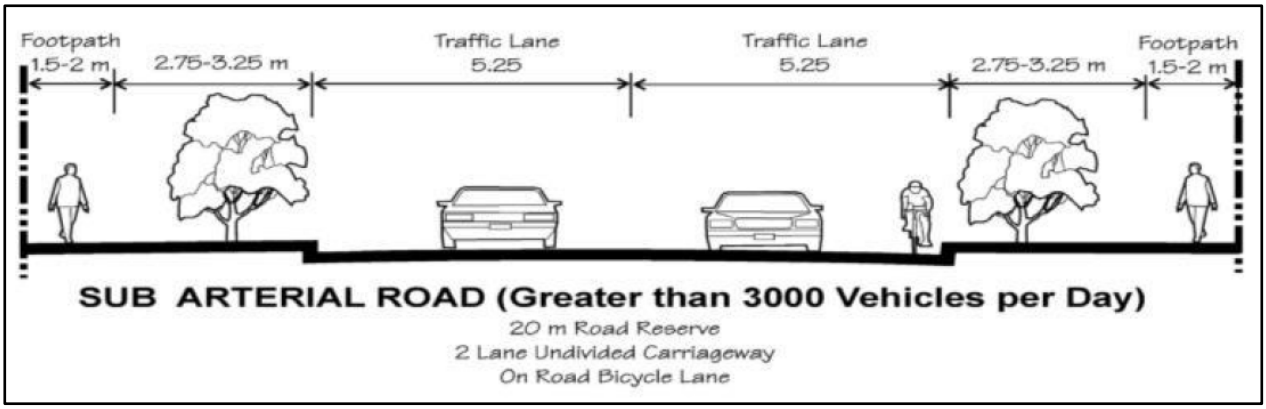


Figure 22 Sub-Arterial Road (20.0m) – Applicable to Painted Hills Road / Flaxen Hills Road

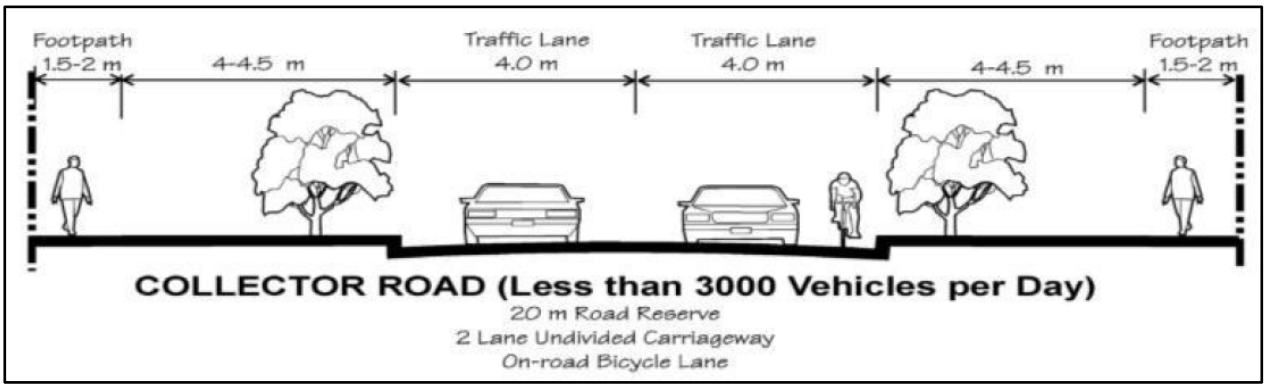


Figure 23 Collector Road (20.0m) – Applicable to Cookes Road

Figure 24 Local Access Street (15.5m) – Applicable to internal roads within the development area

4 PROPOSAL – DEVELOPMENT PLAN

4.1 LAND USES

It is proposed to develop the land for the purposes of a residential subdivision over a total net developable area of 49.90ha, comprising of an estimated 650 dwellings.

Development shall occur at a minimum standard density of 16.5 dwellings per net developable hectare and a minimum medium density of 20 dwellings per net developable hectare. This corresponds to an occupation rate of 3.1 persons per dwelling, offering housing for just under 2,000 residents.

4.2 VEHICLE ACCESS

The proposed Development Plan indicates that the site shall be accessible via:

- Seven (7) connections to Cookes Road;
- One (1) connection to Bridge Inn Road;
- One (1) connection to the Bridge Inn Road service road immediately west of the site; and
- Two (2) connections to Painted Hills Road by way of the existing constructed roadways.

A 20.0m Sub-Arterial Road will be provided north-south through the site as a continuation of Flaxen Hills Road. This will connect with Bridge Inn Road to the east of Garden Road.

The connection of Flaxen Hills Road to Bridge Inn Road shall form a restricted left-in/left out intersection due to the presence of a constructed median on Bridge Inn Road following duplication works, as per the MRPV design.

All remaining internal streets will be designated Access Street – Level 1.

The proposed movement network is attached at **Appendix 1**. An extract is provided in **Figure 25**.

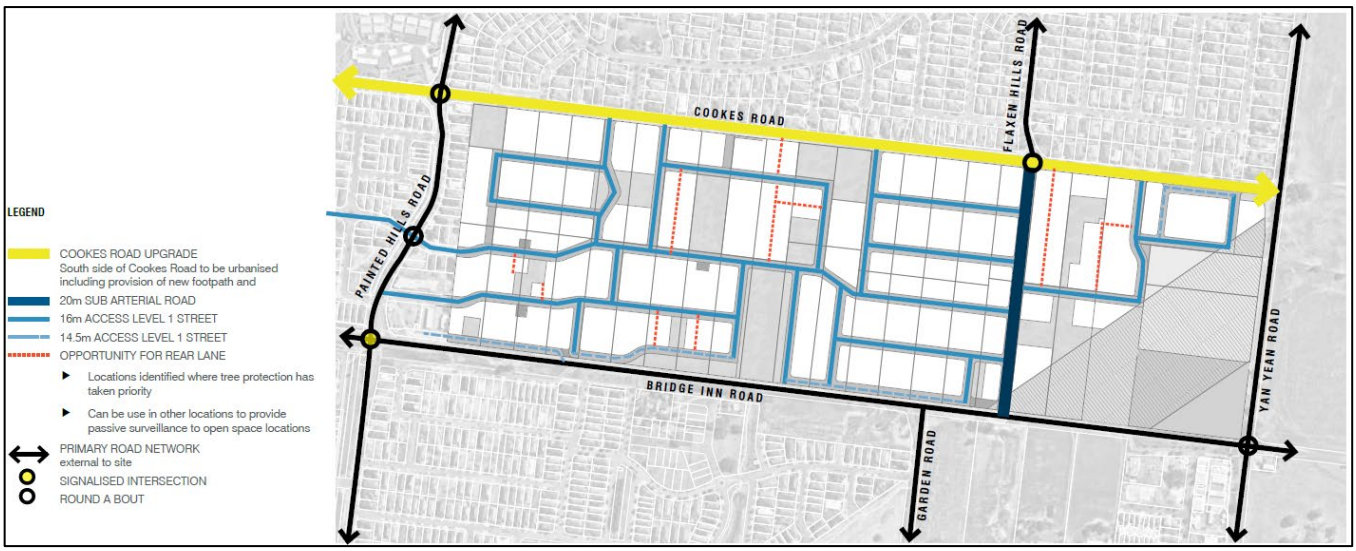


Figure 25 Proposed Movement Network

4.3 WALKING / CYCLING

The MSP indicates provision of on-road bicycle lanes on the north-south Sub-Arterial Road (Flaxen Hills Road extension); however, this has not been provided on Flaxen Hills Road to the north or Garden Road to the south. Instead, 2.5m wide on-road shared paths have been provided on one side only. Accordingly, a shared path will also be provided within the subject site.

A shared path will be provided along the northern side of the site as part of the Bridge Inn Road Upgrade.

Footpaths will be provided on both sides of every street with the exception of single-sided streets.

5 RESIDENTIAL SUBDIVISION DESIGN MATTERS

5.1 OVERVIEW

Where applicable, the proposed residential subdivision has been reviewed in accordance with the requirements and guidelines stipulated in the following documents:

- Mernda Strategy Plan (MSP);
- Clause 56 of the Whittlesea Planning Scheme (Residential Subdivisions);
- VPA Engineering Design and Construction Manual, (December 2019); and
- Guidelines for Urban Development, Whittlesea City Council (2015).

5.2 PROPOSED ROAD HIERARCHY

The proposed Road Hierarchy is shown in the Movement Plan (refer **Figure 25**).

This comprises:

- Sub-Arterial Road (20.0m, running north-south from Flaxen Hills Road to Bridge Inn Road);
- Access Street Level 1 (16.0m) – the majority of remaining streets; and
- Access Street Level 1 (14.5m – applicable to single-sided streets only).

5.3 MERNDA STRATEGY PLAN

A review of the supplied Development Plan in reference to the Mernda Strategy Plan indicates the following:

- The Development Plan indicates a north-south oriented, 20m 'Sub-Arterial Road' (extension of Flaxen Hills Road) through the site. This road reserve width matches that of the MSP, though the MSP cross-section can be improved upon to be similar to that of both Flaxen Hills Road (21.0m road reserve to the north) and Garden Road (20.0m road reserve to the south). It is recommended that the cross-section be as follows:
  - 2 x 3.5m traffic lanes
  - 2 x 2.1m parking lanes
  - 4.0m verge including 1.5m footpath
  - 4.8m verge including 2.5m shared path

  This adequately accommodates vehicular movement (including potential buses), car parking, pedestrians and cyclists.
- An east-west 20m Collector Road, linking the Sub-Arterial Road with Painted Hills Road to the west;
- Remaining roads within the Development Plan have been identified as 16.0m 'Access Level 1 Streets' (14.5m for single sided streets). The Mernda Strategy Plan does not specify cross-sections for sub-categories of Local Access Streets, though at 15.5m, the carriageways are relatively similar. A 7.3m wide carriageway is recommended, which will accommodate car parking on both sides, with adequate residual width for verges and footpaths.
- The Mernda Strategy Plan indicates the north-south Sub-Arterial Road is to intersect with Bridge Inn Road, west of Garden Road. However, this road is instead proposed to intersection with Bridge Inn Road to the east of Garden Road. This change has been brought about by the current-day alignment of Flaxen Hills Road (to the north) which is east of where it was originally intended in the MSP.

With respect to the above, the proposed residential subdivision will be in general accordance with the Mernda Strategy Plan, with the exception that the east-west 20m collector road will be replaced with a 16m Access Street Level 1 including a 7.3m wide carriageway. This ensures continuity with the existing 7.3m wide road carriageway on Venice Rise to the west and is appropriate for the expected traffic volumes.

It is further noted that Cookes Road fulfils the function of an east-west collector road in this case, and will distribute traffic between the site and Yan Yean Road / Painted Hills Road. There is hence no imperative

5.4 WHITTLESEA PLANNING SCHEME

Clause 56.06 of the Whittlesea Planning Scheme details Access and Mobility Management Requirements for new residential subdivisions. The applicable components are detailed below:

5.4.1 CLAUSE 56.06-2: WALKING AND CYCLING NETWORK OBJECTIVES

Standard C15 states:

The walking and cycling network should be designed to:

- *Implement any relevant regional and local walking and cycling strategy, plan or policy for the area set out in this scheme.*
- *Link to any existing pedestrian and cycling networks.*
- *Provide safe walkable distances to activity centres, community facilities, public transport stops and public open spaces.*
- *Provide an interconnected and continuous network of safe, efficient and convenient footpaths, shared paths, cycle paths and cycle lanes based primarily on the network of arterial roads, neighbourhood streets and regional public open spaces.*
- *Provide direct cycling routes for regional journeys to major activity centres, community facilities, public transport and other regional activities and for regional recreational cycling.*
- *Ensure safe street and road crossings including the provision of traffic controls where required.*
- *Provide an appropriate level of priority for pedestrians and cyclists.*
- *Have natural surveillance along streets and from abutting dwellings and be designed for personal safety and security particularly at night.*
- *Be accessible to people with disabilities.*

The proposed residential subdivision satisfies the requirements stipulated within Clause 52.06-2 of the Planning Scheme. In accordance with the relevant road cross-sections, all newly constructed streets should be capable of supporting footpaths on either side of the carriageway. The road network, together with various pocket parks, will facilitate convenient pedestrian linkages both within and external to the site.

A shared path will be provided on the north south sub-arterial road in line with the MSP, accommodating both pedestrians and cyclists. A shared path will also be provided along the northern side of Bridge Inn Road as part of the MRPV upgrade project.

5.4.2 CLAUSE 56.06-3: PUBLIC TRANSPORT NETWORK OBJECTIVES

Standard C16 states:

The public transport network should be designed to:

- *Implement any relevant public transport strategy, plan or policy for the area set out in this scheme.*
- *Connect new public transport routes to existing and proposed routes to the satisfaction of the relevant public transport authority.*
- *Provide for public transport links between activity centres and other locations that attract people using the Principal Public Transport Network in Metropolitan Melbourne and the regional public transport network outside Metropolitan Melbourne.*
- *Locate regional bus routes principally on arterial roads and locate local bus services principally on connector streets to provide:*
  - *Safe and direct movement between activity centres without complicated turning manoeuvres.*
  - *Direct travel between neighbourhoods and neighbourhood activity centres.*
  - *A short and safe walk to a public transport stop from most dwellings.*

The Mernda Strategy Plan indicates that a 'Primary Bus Route' shall be provided in a north-south direction, linking Flaxen Hills Road to Bridge Inn Road at a T-intersection to the west of Garden Road. However, it is noted that the transport route identified within the MSP was predicated on the Cookes Road / Flaxen Hills Road intersection being located west of the Garden Road alignment, but it has instead been constructed further east.

Accordingly, the proposed alignment of the north-south Sub-Arterial Road has been relocated to the east, forming a T-intersection with Bridge Inn Road.

A revised bus route shall therefore be provided, amended with due consideration to the Flaxen Hills Road position and future duplication of Bridge Inn Road. This is discussed in **Section 5.8** and is considered an acceptable outcome with respect to the Clause 56.06-3 requirements, whilst being in general accordance with the MSP.

5.4.3 CLAUSE 56.06-4: NEIGHBOURHOOD STREET NETWORK OBJECTIVE

Standard C17 states:

The neighbourhood street network must:

- *Take account of the existing mobility network of arterial roads, neighbourhood streets, cycle paths, shared paths, footpaths and public transport routes.*
- *Provide clear physical distinctions between arterial roads and neighbourhood street types.*
- *Comply with the Head, Transport for Victoria's arterial road access management policies.*
- *Provide an appropriate speed environment and movement priority for the safe and easy movement of pedestrians and cyclists and for accessing public transport.*
- *Provide safe and efficient access to activity centres for commercial and freight vehicles.*
- *Provide safe and efficient access to all lots for service and emergency vehicles.*
- *Provide safe movement for all vehicles.*
- *Incorporate any necessary traffic control measures and traffic management infrastructure.*

The neighbourhood street network should be designed to:

- *Implement any relevant transport strategy, plan or policy for the area set out in this scheme.*
- *Include arterial roads at intervals of approximately 1.6 kilometres that have adequate reservation widths to accommodate long term movement demand.*
- *Include connector streets approximately halfway between arterial roads and provide adequate reservation widths to accommodate long term movement demand.*
- *Ensure connector streets align between neighbourhoods for direct and efficient movement of pedestrians, cyclists, public transport and other motor vehicles.*
- *Provide an interconnected and continuous network of streets within and between neighbourhoods for use by pedestrians, cyclists, public transport and other vehicles.*
- *Provide an appropriate level of local traffic dispersal.*
- *Indicate the appropriate street type.*
- *Provide a speed environment that is appropriate to the street type.*
- *Provide a street environment that appropriately manages movement demand (volume, type and mix of pedestrians, cyclists, public transport and other motor vehicles).*
- *Encourage appropriate and safe pedestrian, cyclist and driver behaviour.*
- *Provide safe sharing of access lanes and access places by pedestrians, cyclists and vehicles.*
- *Minimise the provision of culs-de-sac.*
- *Provide for service and emergency vehicles to safely turn at the end of a dead-end street.*
- *Facilitate solar orientation of lots.*
- *Facilitate the provision of the walking and cycling network, integrated water management systems, utilities and planting of trees.*
- *Contribute to the area's character and identity.*
- *Take account of any identified significant features.*

The proposed Development Plan is generally in accordance with the objectives listed in Clause 56.06-4. Access to the subdivision will be accessed via multiple connections to the external road network, with a single connection to the arterial Bridge Inn Road, by means of a proposed north-south 'sub-arterial' road (acting as a Collector Road), offering a clear physical distinction between the neighbourhood street types. All roads within the subdivision area are categorised within a defined road hierarchy.

Additional internal collector (connector) roads are not necessary in this case given the presence of Cookes Road to function as a collector road, and given the relatively low internal traffic volumes on each street.

It is envisaged that Local Area Traffic Management (LATM) measures will be implemented with the aim of controlling vehicle speeds on long stretches of road. This will be considered as part of individual planning applications.

5.4.4 CLAUSE 56.06-5: WALKING AND CYCLING DETAIL NETWORK OBJECTIVES

Standard C18 states:

Footpaths, shared paths, cycle paths and cycle lanes should be designed to:

- *Be part of a comprehensive design of the road or street reservation.*
- *Be continuous and connect.*
- *Provide for public transport stops, street crossings for pedestrians and cyclists and kerb crossovers for access to lots.*
- *Accommodate projected user volumes and mix.*
- *Meet the requirements of Table C1.*
- *Provide pavement edge, kerb, channel and crossover details that support safe travel for pedestrians, footpath bound vehicles and cyclists, perform required drainage functions and are structurally sound.*
- *Provide appropriate signage.*
- *Be constructed to allow access to lots without damage to the footpath or shared path surfaces.*
- *Be constructed with a durable, non-skid surface.*
- *Be of a quality and durability to ensure:*
  - *Safe passage for pedestrians, cyclists, footpath bound vehicles and vehicles.*
  - *Discharge of urban run-off.*
  - *Preservation of all-weather access.*
  - *Maintenance of a reasonable, comfortable riding quality.*
  - *A minimum 20 year life span.*
- *Be accessible to people with disabilities and include tactile ground surface indicators, audible signals and kerb ramps required for the movement of people with disabilities.*

Based on available road cross-sections, all roads within the subdivision shall be provided with footpaths on both sides of the carriageway. A shared path shall be provided on the north-south sub-arterial road.

Detailed design matters will be resolved through subsequent planning permit applications.

5.4.5 CLAUSE 56.06-6: PUBLIC TRANSPORT NETWORK DETAIL OBJECTIVES

Standard C19 states:

- *Bus priority measures must be provided along arterial roads forming part of the existing or proposed Principal Public Transport Network in Metropolitan Melbourne and the regional public transport network outside Metropolitan Melbourne to the requirements of the relevant roads authority.*
- *Road alignment and geometry along bus routes should provide for the efficient, unimpeded movement of buses and the safety and comfort of passengers.*
- *The design of public transport stops should not impede the movement of pedestrians.*
- *Bus and tram stops should have:*
  - *Surveillance from streets and adjacent lots.*
  - *Safe street crossing conditions for pedestrians and cyclists.*
- *Safe pedestrian crossings on arterial roads and at schools including the provision of traffic controls as required by the roads authority.*
  - *Continuous hard pavement from the footpath to the kerb.*
  - *Sufficient lighting and paved, sheltered waiting areas for forecast user volume at neighbourhood centres, schools and other locations with expected high patronage.*

- *Appropriate signage.*
- *Public transport stops and associated waiting areas should be accessible to people with disabilities and include tactile ground surface indicators, audible signals and kerb ramps required for the movement of people with physical disabilities.*

Refer **Section 5.8** for discussion pertaining to future bus routes.

The north-south sub-arterial road will be able to accommodate indented car parking bays and hence indented bus parking bays.

Detailed design matters will be resolved through subsequent planning permit applications.

5.4.6 CLAUSE 56.06-7: NEIGHBOURHOOD STREET NETWORK DETAIL OBJECTIVE

Standard C20 states:

The design of streets and roads should:

- *Meet the requirements of Table C1. Where the widths of access lanes, access places, and access streets do not comply with the requirements of Table C1, the requirements of the relevant fire authority and roads authority must be met.*
- *Provide street blocks that are generally between 120 metres and 240 metres in length and generally between 60 metres to 120 metres in width to facilitate pedestrian movement and control traffic speed.*
- *Have verges of sufficient width to accommodate footpaths, shared paths, cycle paths, integrated water management, street tree planting, lighting and utility needs.*
- *Have street geometry appropriate to the street type and function, the physical land characteristics and achieve a safe environment for all users.*
- *Provide a low-speed environment while allowing all road users to proceed without unreasonable inconvenience or delay.*
- *Provide a safe environment for all street users applying speed control measures where appropriate.*
- *Ensure intersection layouts clearly indicate the travel path and priority of movement for pedestrians, cyclists and vehicles.*
- *Provide a minimum 5 metre by 5 metre corner splay at junctions with arterial roads and a minimum 3 metre by 3 metre corner splay at other junctions unless site conditions justify a variation to achieve safe sight lines across corners.*
- *Ensure streets are of sufficient strength to:*
  - *Enable the carriage of vehicles.*
  - *Avoid damage by construction vehicles and equipment.*
- *Ensure street pavements are of sufficient quality and durability for the:*
  - *Safe passage of pedestrians, cyclists and vehicles.*
  - *Discharge of urban run-off.*
  - *Preservation of all-weather access and maintenance of a reasonable, comfortable riding quality.*
- *Ensure carriageways of planned arterial roads are designed to the requirements of the relevant road authority.*
- *Ensure carriageways of neighbourhood streets are designed for a minimum 20 year life span.*
- *Provide pavement edges, kerbs, channel and crossover details designed to:*
  - *Perform the required integrated water management functions.*
  - *Delineate the edge of the carriageway for all street users.*
  - *Provide efficient and comfortable access to abutting lots at appropriate locations.*
  - *Contribute to streetscape design.*
- *Provide for the safe and efficient collection of waste and recycling materials from lots.*
- *Be accessible to people with disabilities.*
- *Meet the requirements of Table C1. Where the widths of access lanes, access places, and access streets do not comply with the requirements of Table C1, the requirements of the relevant fire authority and roads*

authority must be met. Where the widths of connector streets do not comply with the requirements of Table C1, the requirements of the relevant public transport authority must be met.

- *A street detail plan should be prepared that shows, as appropriate:*
  - *The street hierarchy and typical cross-sections for all street types.*
  - *Location of carriageway pavement, parking, bus stops, kerbs, crossovers, footpaths, tactile surface indicators, cycle paths and speed control and traffic management devices.*
  - *Water sensitive urban design features.*
  - *Location and species of proposed street trees and other vegetation.*
  - *Location of existing vegetation to be retained and proposed treatment to ensure its health.*
  - *Any relevant details for the design and location of street furniture, lighting, seats, bus stops, telephone boxes and mailboxes.*

The Development Plan details road hierarchies with suitable street geometry & layout throughout the subdivision area. Detailed design matters (e.g. corner splays, speed control devices) will be resolved through subsequent planning permit applications.

5.4.7 CLAUSE 56.06-8: LOT ACCESS OBJECTIVE

Standard C21 states:

- *Vehicle access to lots abutting arterial roads should be provided from service roads, side or rear access lanes, access places or access streets where appropriate and in accordance with the access management requirements of the relevant roads authority.*
- *Vehicle access to lots of 300 square metres or less in area and lots with a frontage of 7.5 metres or less should be provided via rear or side access lanes, places or streets.*
- *The design and construction of a crossover should meet the requirements of the relevant road authority.*

The relevant road design characteristics supplied within Clause 56.06-8 are listed in **Table 1** below.

Table 1 Design of roads and neighbourhood streets – (Clause 56.06-8; Table C1)

Measure	Access Lane	Access Place	Access Street – Level 1	Access Street – Level 2	Connector Street – Level 1	Connector Street – Level 2
Traffic Volume	300 vpd	300–1000 vpd	1000–2000 vpd	2000–3000 vpd	3000vpd	3000–7000vpd
Target Speed	10 km/h	15 km/h	30 km/h	40 km/h	50 km/h (40 km/h at schools, 20 km/h at crossing points	60 km/h or 50 km/h (40km/h at schools)
Carriageway Width	5.5m	5.5m	5.5m	7-7.5m	3.5m per lane (4.0m at intersection)	3.5m per lane (4.0m at intersections)
Parking Provision	None	1 verge space per 2 lots, or one-side of carriageway only	1 verge space per 2 lots	Both sides of carriageway	Dedicated lane 2.3m where required	Dedicated lane 2.3m where required
Verge Width	Not required	7.5m (For services, 3.5m on one side and 2.5m on other)	4.0m min each side	4.5m min each side	4.5m min each side	6.0m min each side
Footpath Provision	Shared Zone	1 x 1.5m (Not required if serving < 5 dwellings)	2 x 1.5m (2.0m at schools, shops, activity centre)	2 x 1.5m (2.0m at schools, shop, activity centre)	2 x 1.5m (2.0m at schools, shop, activity centre)	2 x 1.5m (2.0m at schools, shop, activity centre)
Cycle Path Provision	None	None	Carriageway designed as Shared Zone	Carriageway designed as Shared Zone	0.7m – 1.7m (various options)	0.3m – 1.7m (various options) or shared path

The proposed 20.0m road reserve for the north-south sub-arterial road will facilitate a cross-section that approximates that of Flaxen Hills Road (21.0m) and Garden Road (20.0m). As discussed in **Section 5.3**, the following configuration is recommended:

- 2 x 3.5m traffic lanes
- 2 x 2.1m parking lanes
- 4.0m verge including 1.5m footpath
- 4.8m verge including 2.5m shared path

As the road reserve width has been adopted based on the MSP requirements, this cross-section does not strictly accord with Clause 56.06-8. Nonetheless, it follows the general principles of a Connector Street Level 1 or 2 and will adequately facilitate vehicular movement (including buses), parking, pedestrians and cyclists. In respect of traffic volumes, it is likely that this road will carry no more than 3,000 vehicles per day, having regard to the anticipated traffic distribution (refer **Section 6.2**).

All remaining streets will be designed as single-sided (14.5m) or double-sided (16.0m) Access Street Level 1's. A 7.3m carriageway is recommended (rather than 5.5m as specified in Clause 56.06) which will facilitate parking on both sides, with an adequate residual verge width to accommodate underground services and footpaths. This also accommodates higher traffic volumes that may be experienced on the east-west road connecting to Venice Rise.

5.5 VICTORIAN PLANNING AUTHORITY (VPA) STANDARDS

The Victorian Planning Authority (VPA) has published the document titled *Engineering Design and Construction Manual for Subdivision in Growth Areas* (December 2019). This outlines a series of shared engineering standards and specifications prepared by the VPA and various municipalities.

Whilst it is not strictly applicable in this case, as the site is not subject to a Precinct Structure Plan, it nonetheless provides a useful and up to date resource for the design of new subdivisions.

The manual offers standard road cross-sections within Section 10.6 of the document, with the dimensions detailed in **Table 2** below.

Table 2 Engineering Design and Construction Manual for Subdivision in Growth Areas (VPA) – Road cross-sections

	Access Lane	Access Place	Access Street 1	Access Street 2	Connector Street	Trunk Connector (2 lane)	Secondary Arterial	Primary Arterial
Traffic Volume (vpd)	300	300-1000	1000-2000	2000-3000	3000-7000	7000-12000	12000-40000	>30000
Target Operating Speed (kph)	10	15	30	40	50	60	60-70	70-80
Carriageway Width (m) [1]	7.0[12]	5.5[2]	7.3	6.0	7.0	3.5 lane each way	2 x 10.5[7]	2 x 10.5[7]
Parking Within Street	None	Unmarked	Unmarked	2.3 marked lanes both sides	2.3 marked lanes both sides	2.3 marked	Generally none. 2.3 indented adjacent to activity centres	None
Verge Width (m) [3]	0.5[12] (if required)	4.35[9]	4.35[9]	4.7 min each side	5.0 min each side	5.0 min each side	6.5 min each side	6.5 min each side
Kerbing [5]	Subject to pavement cross-fall	600B2, SM2 10	600B2, SM2[10]	600B2, SM2 10	600B2, SM2[10]	600B2, SM2[10]	SM2	SM2
Footpath Provision [8]	None	2 x 1.5[4]	2 x 1.5	2 x 1.5	2 x 1.5	2 x 1.5	2 x 1.5 min	2 x 1.5 min
Cycle Path/Lane Provision [8]	None	None	None[6]	Optional	2 x 1.7	2 x 1.7	2.0 on-road both sides. 3.0 shared paths both sides off-road. Preference for segregated Pedestrian and Cycle paths.	2.0 on-road both sides. 3.0 shared paths both sides off-road. Preference for segregated Pedestrian and Cycle paths.

[1] – Carriageway Width is line of kerb to line of kerb.
[2] – 7.3m if parking both sides.
[3] –Verge Width (measured from face of kerb or invert) include nature strip and footpath (where required).
[4] – For <300vpd, may be reduced to 1 subject to Council approval.
[5] – 600B2 and SM2 for standard cross fall, refer to Standard Drawings.
[6] –Carriageway designed as a shared zone and appropriately signed.
[7] – 6 lane arterial; if 4 lane arterial is adopted reduce to 2*7.0.
[8] – Refer Table 5 (Engineering Design and Construction Manual) when shared path required.
[9] –Verge widths may vary for each side to accommodate services.
[10] – Use of either 600B2 or SM2 kerb and channel will be subject to Council approval.
[11] – Refer to the relevant PSP for individual road reserve widths.
[12] –Minimum Road Reserve width 7 metres. Carriageway width of 7 metres may be reduced to a minimum of 6 metres to allow for services in 0.5 metre verges.

Based on review of the supplied Development Plan with reference to the above cross-section elements, the following is provided:

- A 20m 'Sub-Arterial' road is proposed within the site. When compared to the VPA manual, the most applicable road cross-section is that of a 'Connector Street' (3000-7000 Vehicles per day), corresponding to a total width of 25 metres – above what is proposed. However, as stated under **Section 5.3.7**, a 20.0m road reserve is considered acceptable on the basis that this is specified in the MSP, and a varied cross-section can be introduced that still achieves the same components (2 x 3.5m traffic lanes, indented parking bays, footpath and shared path).
- The provision of 16m Access Streets – Level 1 is in accordance with the requirements stipulated within the VPA manual. A reduced 14.5m wide Access Street – Level 1 has been indicated on the Development Plan, restricted to the service road (accessible from Bridge Inn Road) and the southernmost local road (orientated east-west). As these roads are single-sided, it is not necessary to provide a full verge and footpath on the opposite side to the dwellings.

5.6 CITY OF WHITTLESEA GUIDELINES FOR URBAN DEVELOPMENT

The document *Guidelines for Urban Development* (2015) has been prepared by the City of Whittlesea with the aim of providing objectives and requirements for the subdivision and development of land.

The road design criteria are presented in **Table 3**.

Table 3 City of Whittlesea Guidelines for Urban Development (2015) – Road cross-sections

	ACCESS LANE	ACCESS PLACE	ACCESS STREET 1	ACCESS STREET 2	CONNECTOR STREET	TRUNK CONNECTOR	ARTERIAL
Traffic Volume (vpd)	300	300-1000	1000-2000	2000-3000	3000-7000	7000-12000	12000-60000
Target Operating Speed (kph)	10	15	30	40	50	60	60-80
Carriageway Width (m) [1]	6.0	5.5 [2]	7.3	6.0	7.0	3.5 lane each way	2*10.5 [7]
Parking Within Street	None	Unmarked	Unmarked	2.3 marked lanes both sides	2.3 marked lanes both sides	2.3 marked lanes	None
Verge Width (m) [3]	Only if required for servicing	4.50 and 4.20 [9]	4.50 and 4.20 [9]	4.7 min each side	5.0 min each side	5.25 min each side	5.0 min
Kerbing	Subject to pavement cross fall	B2, SM2 [10]	B2, SM2 [10]	B2, SM2 [10]	B2, SM2 [10]	B2, SM2 [10]	B2, SM2 [10]
Footpath Provision [8]	None	2 * 1.5 [4]	2 * 1.5	2 * 1.5	2 * 1.5	2 * 1.5	2*1.5 min - opportunity for shared paths

Notes:

1 Carriageway Width is line of kerb to line of kerb.
2 For parking both sides increase to 7.3m.
3 Verge Width includes nature strip, kerb and footpath (where required).
4 For <300vpd, may be reduced to 1 subject to Council approval.
5 B2 and SM2 for standard cross fall, refer to Standard Drawings.
6 Carriageway designed as a shared zone and appropriately signed.
7 6 lane arterial; if 4 lane arterial is adopted reduce to 2*7.0.
8 Refer Table 5 when shared path required.
9 Verge width is different for each side to accommodate services (each side).
10 SM2 kerb and channel may be used subject to Council approval.
11 Refer to the relevant PSP for individual road reserve widths.

The recommended cross-section for the north-south sub-arterial road refer **Section 5.3.7**) is in general accordance with these guidelines, taking into consideration that a reduced road reserve of 20.0m will be provided as per the MSP and in keeping with nearby similar road cross-sections (i.e. Flaxen Hills Road and Garden Road.

The proposed Access Street Level 1 road reserve width of 16.0m is in accordance with the above table and is slightly greater than that specified by the MSP (15.5m).

5.7 EXTERNAL INTERSECTIONS

External intersection treatments will include:

- Left-in / left-out to Bridge Inn Road (with left-turn deceleration lane);

  Note: Access to this intersection from the east will be facilitated by way of the future U-turn lane planned at the Bridge Inn Road / Garden Road intersection (works to be carried out by MRPV)
- Existing roundabout at Cookes Road / Flaxen Hills Road;
- Existing roundabout at Painted Hills Road / Belmont Rise / Venice Rise;
- Various standard T-intersections to Cookes Road.

SIDRA analysis for key intersections is provided in **Section 6.3**.

5.8 PUBLIC TRANSPORT

The Mernda Strategy Plan indicates provision of a north-south bus route from Flaxen Hills Road – Bridge Inn Road – Garden Road – refer **Figure 26**. However, this cannot be facilitated given that Bridge Inn Road will be duplicated. This restricts the Bridge Inn Road site access to left-in/left-out only and would require buses to undertake a U-turn movement at the Bridge Inn Road/Yan Yean Road intersection, which has been identified as an undesirable outcome by transport authorities. In addition, Flaxen Hills Road has been constructed further east than what was originally intended by the MSP.

Therefore, the only way to facilitate a direct north-south bus route would be to provide a northern leg to the intersection of Garden Road and Bridge Inn Road, which will be signalised as part of the upcoming duplication works. However, the Mernda Strategy Plan Development Contributions Plan (DCP) does not contemplate traffic signals at the frontage of the subject site, nor does it provide any funding arrangements. It would therefore not be a fair and equitable outcome if the landowners were to fully fund a 4th leg at the future Garden Rd signals, given a north-south bus route is a broader strategic outcome rather than an outcome solely for the benefit of the subject site.

Furthermore, DoT has indicated Bridge Inn Road fulfils a GT2 function under Movement and Place principles that should prioritise east-west traffic movements. Adding a 4th leg at the future signals would introduce delay to east-west movements due to the need for added signal phasing. This was affirmed by DoT in the pre-application meeting, where it was also advised that there was no real need for cross-migration of people within the subject land given there are no major trip attractors nearby (e.g. shopping, medical, sporting etc);

For the above reasons, an alternate bus route is required. Options are presented in **Figure 26**. This ensures that all dwellings will be within 400m of a bus route, in accordance with PTV guidelines.

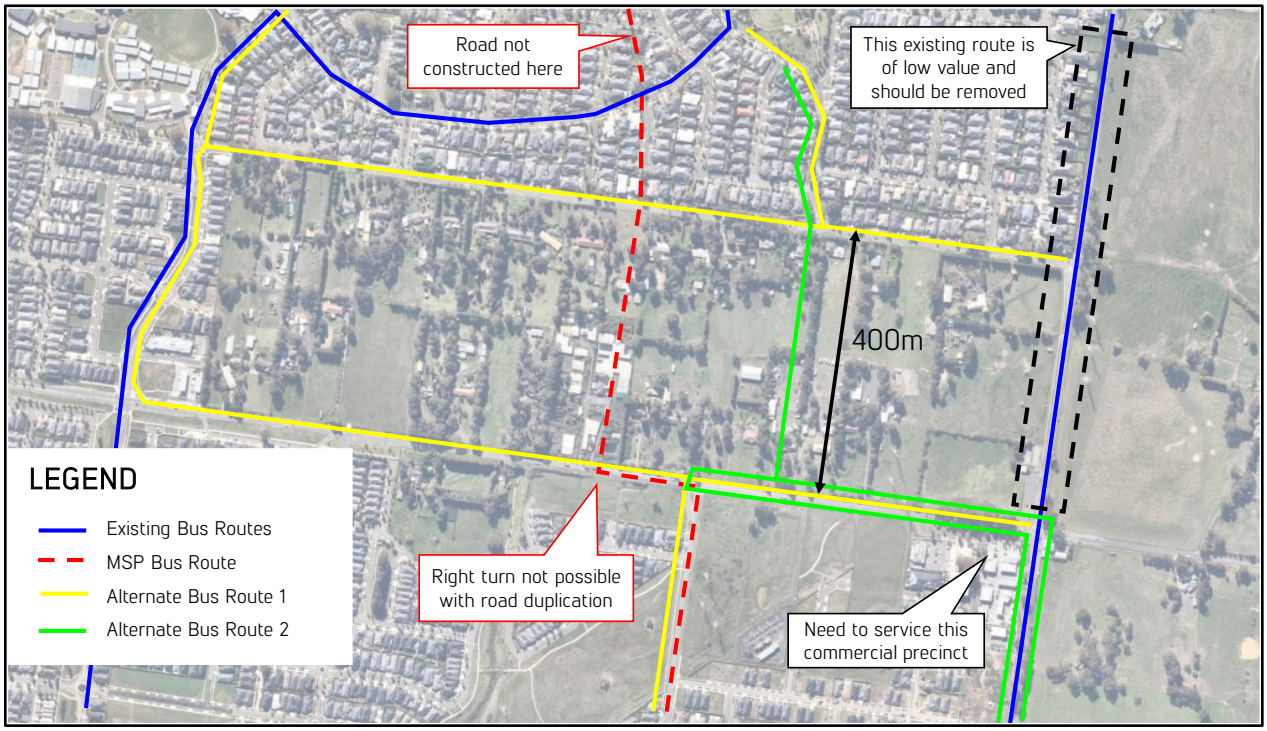


Figure 26 Bus Route Options

These options also fulfil DoT's desire (as advised in the pre-application meeting) to move the 381 bus route off Yan Yean Road, as it is of low value given there is undeveloped 'Green Wedge Zone' to the east and the rear fences of properties to the west. As well as servicing the subject site, the new route would allow for servicing of the commercial precinct and Mernda Sports Precinct at the corner of Yan Yean Road / Bridge Inn Road, whilst still servicing Plenty Valley Christian College before entering Orchard Road (to the south) as it presently does.

6 TRAFFIC GENERATION, DISTRIBUTION & IMPACT

6.1 TRAFFIC GENERATION

The proposed subdivision will comprise a total of approximately 650 residential lots. Given the majority of the development will comprise of medium/standard density lots, it can be expected that traffic would be generated in the order of 9 trips per dwelling per day.

This equates to 650 x 9 = 5,931 daily trips (two-way, in and out).

Typically, 10% would be generated in the weekday AM and PM peak hours, equating to 593 peak hour trips.

The following standard peak hour splits are adopted:

- Weekday AM Peak Hour: 20% IN / 80% OUT
- Weekday PM Peak Hour: 60% IN / 40% OUT

This equates to:

- Weekday AM Peak Hour: 117 IN / 468 OUT
- Weekday PM Peak Hour: 351 IN / 234 OUT

6.2 TRAFFIC DISTRIBUTION

The site will be accessible from the north via Cookes Road, the west via Painted Hills Road and the South via Bridge Inn Road. The key connections to the surrounding road network will consist of the Flaxen Hills Road extension, offering a connection to Bridge Inn Road and Cookes Road, as well as the Painted Hills Road / Belmont Rise / Venice Rise between Flaxen Hills Road and the Painted Hills Road/Belmont Rise roundabout. Additionally, a number of local access street connections will be provided to Cookes Road, with an additional local access street connection to Painted Hills Road, located between Bridge Inn Road and Belmont Rise.

Based on the layout of the surrounding road network and locations of major activity generators and employment areas, together with the existing traffic distribution and future duplication of Bridge Inn Road, it is estimated that traffic would be distributed as follows:

Inbound:

- 25% of trips would be distributed from Painted Hills Road;
- 50% of trips would be distributed from Bridge Inn Road;
- 18% of trip would be distributed from Flaxen Hills Road; and
- 6% of trips would be distributed from Cookes Road (via local streets); and
- 1% of trips would be distributed from Bridge Inn Road (via service road).

Outbound:

- 53% of trips would be distributed to Painted Hills Road;
- 23% of trips would be distributed to Bridge Inn Road;
- 18% of trips would be distributed to Flaxen Hills Road;
- 6% of trips would be distributed to Cookes Road (via local streets); and
- 1% of trips would be distributed to Bridge Inn Road (via service road).

The estimated AM and PM peak hour trip distribution is shown diagrammatically in **Figure 27** and **Figure 28**.

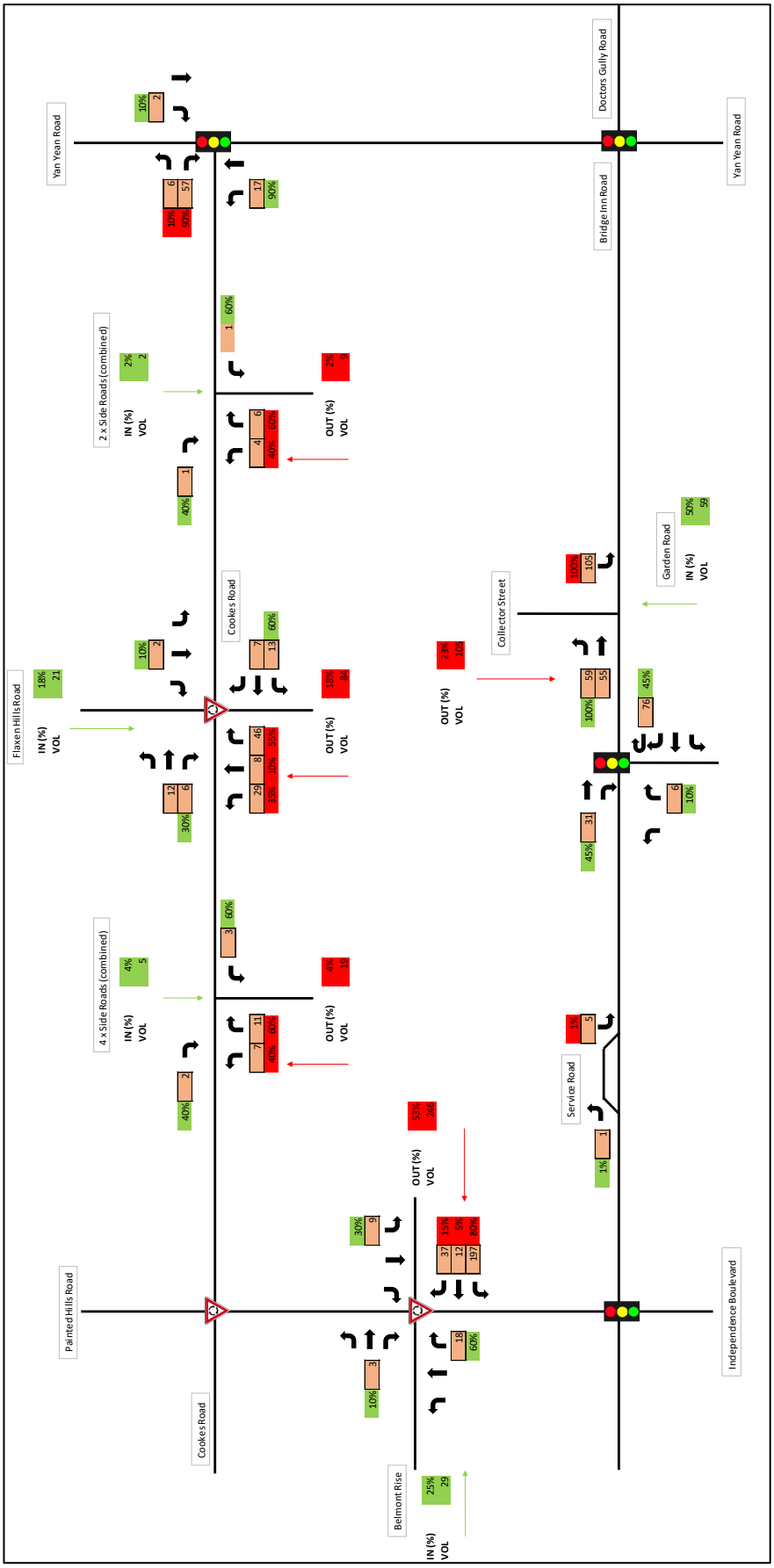


Figure 27 AM peak hour traffic distribution

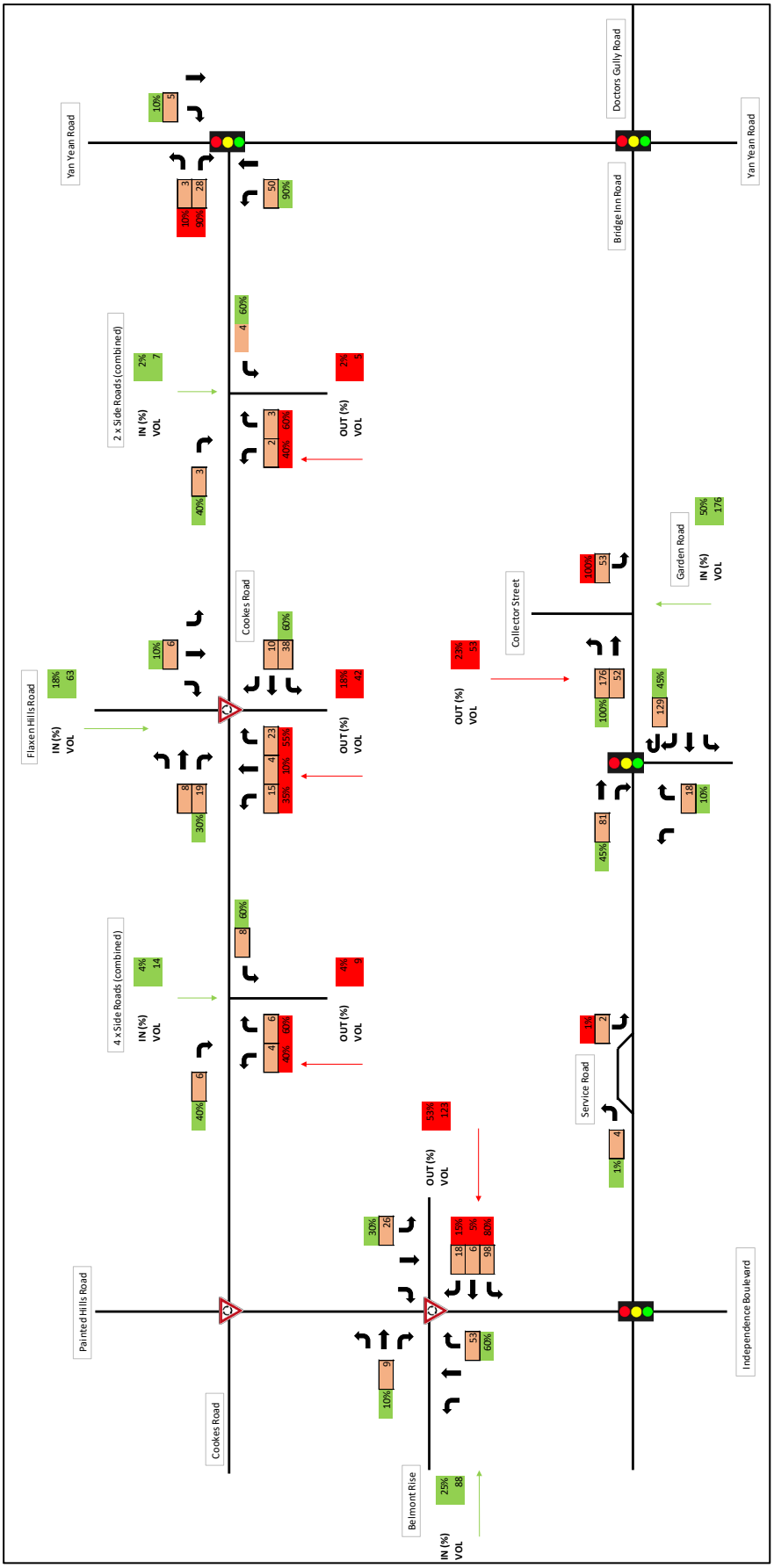


Figure 28 PM peak hour traffic distribution

6.3 TRAFFIC IMPACT

To quantify the level of traffic impact, traffic modelling has been undertaken using SIDRA Intersection V9. SIDRA is an advanced micro-analytical traffic evaluation tool that provided estimates of capacity and performance statistics (delay, queue lengths etc) on a lane by lane basis.

Key performance criteria include:

Degree of Saturation (DOS): This represents the ratio of traffic volume to capacity. Generally speaking, a DOS of below 0.9 indicates acceptable performance. A DOS of over 1.0 indicates that capacity has been exceeded.

Level of Service (LOS): An index of the operational performance of traffic based on service measures such as delay, degree of saturation, density and speed during a given flow period. A guide to LOS ratings is provided in Table 1.

Average Delay: The average delay time that can be expected for a given movement.

95th Percentile Queue: The maximum queue length that can be expected in 95% of all observed queue lengths during the hour.

Table 4 Level of Service Ratings

Level of Service	
A	Excellent
B	Very Good
C	Good
D	Acceptable
E	Poor
F	Very Poor

The following key intersections have been modelled using SIDRA Intersection v9:

- Bridge Inn Road / Sub-Arterial Road (Proposed Left-in/Left-out);
- Bridge Inn Road / Garden Road (future traffic signals);
- Painted Hills Road / Belmont Rise / Venice Rise (Existing Roundabout);
- Flaxen Hills Road / Cookes Road (Existing Roundabout); and
- Cookes Road / Yan Yean Road (Existing Signalised Intersection).

Analysis has been completed for existing conditions together with a post-development 10-year assessment (Year 2031). This adopts the assumed growth rates shown in **Table 5** *(Note: no future traffic projection data was forthcoming from MRPV or DoT).*

Table 5 Assumed Traffic Growth Rates

Traffic Growth Rates	Percentage Growth per Annum
Bridge Inn Road	7%
Yan Yean Road (near Cookes Road)	3%
Painted Hills Road	5%
Cookes Road	3%
Garden Road	3%
Flaxen Hills Road	3%
Belmont Rise	3%

In addition, it has been assumed that:

- Existing Garden Road traffic volumes will increase by 25% once the traffic signals are constructed (representing the chance that some traffic movements will shift across from elsewhere); and
- 50 peak hour U-turn movements are added to the east approach at the Bridge Inn Road / Garden Road future signalised intersection.

The SIDRA outputs are provided in **Appendices 2 – 5**.

The key performance factors for are summarised in **Table 4** (AM Existing), **Table 5** (PM Existing), **Table 6** (AM Future – 2031) and **Table 7** (PM Future – 2031).

Table 6 SIDRA outputs – AM Peak Hour (Existing)

Location	Approach	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue Vehicles (VEH)
Cookes Road / Yan Yean Road	North	T	0.412	7.4	LOS A	7.4
		R	0.051	34.6	LOS C	0.3
	South	T	0.693	17.3	LOS B	12.5
		L	0.118	8.3	LOS A	0.4
	West	L	0.681	29.1	LOS C	8.3
		R	0.681	29.0	LOS C	8.3
Cookes Road / Flaxen Hills Road	North	L	0.178	3.8	LOS A	0.9
		R	0.178	7.2	LOS A	0.9
	East	T	0.110	3.8	LOS A	0.6
		R	0.110	7.3	LOS A	0.6
	West	T	0.069	3.7	LOS A	0.3
		L	0.069	3.7	LOS A	0.3
Painted Hills Road / Belmont Rise	North	T	0.312	3.7	LOS A	2
		L	0.312	3.9	LOS A	2
		R	0.312	7.8	LOS A	2
		U	0.312	9.4	LOS A	2
	South	T	0.235	3.1	LOS A	1.4
		L	0.235	3.3	LOS A	1.4
		R	0.235	7.1	LOS A	1.4
		U	0.235	10.3	LOS B	1.4
	East	T	0.005	5.5	LOS A	0
		L	0.005	5.6	LOS A	0
		R	0.005	9.5	LOS A	0
		U	0.005	11.2	LOS B	0
	West	T	0.119	4.7	LOS A	0.6
		L	0.119	4.8	LOS A	0.6
		R	0.119	8.7	LOS A	0.6
		U	0.119	10.4	LOS B	0.6
Garden Road / Bridge Inn Road	South	L	0.168	6.2	LOS A	0.6
		R	0.230	25.8	LOS D	0.8
	East	T	0.171	0	LOS A	0
		L	0.017	7.1	LOS A	0
	West	T	0.289	0.1	LOS A	0
		R	0.226	9	LOS A	1

Table 7 SIDRA outputs – PM Peak Hour (Existing)

Location	Approach	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue Vehicles (VEH)
Cookes Road / Yan Yean Road	North	T	0.378	3.9	LOS A	6
		R	0.040	34.5	LOS C	0.2
	South	T	0.898	27.3	LOS C	26.1
		L	0.181	8.4	LOS A	0.7
	West	L	0.681	35.4	LOS D	4.2
		R	0.681	35.4	LOS D	4.2
Cookes Road / Flaxen Hills Road	North	L	0.090	3.9	LOS A	0.4
		R	0.090	7.5	LOS A	0.4
	East	T	0.126	3.6	LOS A	0.7
		R	0.126	7	LOS A	0.7
	West	T	0.108	4	LOS A	0.5
		L	0.108	4	LOS A	0.5
Painted Hills Road / Belmont Rise	North	T	0.246	3.5	LOS A	1.5
		L	0.246	3.7	LOS A	1.5
		R	0.246	7.6	LOS A	1.5
		U	0.246	9.3	LOS A	1.5
	South	T	0.227	3.2	LOS A	1.3
		L	0.227	3.3	LOS A	1.3
		R	0.227	7.2	LOS A	1.3
		U	0.227	10.3	LOS B	1.3
	East	T	0.004	4.9	LOS A	0
		L	0.004	5	LOS A	0
		R	0.004	8.9	LOS A	0
		U	0.004	10.6	LOS B	0
	West	T	0.098	4.6	LOS A	0.5
		L	0.098	4.8	LOS A	0.5
		R	0.098	8.6	LOS A	0.5
		U	0.098	10.3	LOS B	0.5
Garden Road / Bridge Inn Road	South	L	0.296	6.9	LOS A	1.3
		R	0.184	17.3	LOS C	0.6
	East	T	0.202	0	LOS A	0
		L	0.043	7	LOS A	0
	West	T	0.200	0	LOS A	0
		R	0.129	9.5	LOS A	0.5

Table 8 SIDRA outputs – AM Future Peak Hour (2031)

Location	Approach	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue Vehicles (VEH)
Cookes Road / Yan Yean Road	North	T	0.701	12.5	LOS B	12.7
		R	0.063	25.4	LOS C	0.3
	South	T	0.807	16.4	LOS B	16
		L	0.174	8.5	LOS A	0.7
	West	L	0.783	25.6	LOS C	11.7
		R	0.783	25.6	LOS C	11.7
Cookes Road / Flaxen Hills Road	North	L	0.268	4.3	LOS A	1.5
		T	0.268	4.3	LOS A	1.5
		R	0.268	7.8	LOS A	1.5
	South	L	0.085	4.9	LOS A	0.4
		T	0.085	4.9	LOS A	0.4
		R	0.085	8.4	LOS A	0.4
	East	L	0.169	3.9	LOS A	1
		T	0.169	4	LOS A	1
		R	0.169	7.4	LOS A	1
	West	L	0.116	4.1	LOS A	0.5
		T	0.116	4.1	LOS A	0.5
		R	0.116	7.5	LOS A	0.5
Painted Hills Road / Belmont Rise	North	L	0.538	4.6	LOS A	4.5
		T	0.538	4.5	LOS A	4.5
		R	0.538	8.5	LOS A	4.5
		U	0.538	10.2	LOS B	4.5
	South	L	0.425	3.7	LOS A	3.4
		T	0.425	3.5	LOS A	3.4
		R	0.425	7.6	LOS A	3.4
		U	0.425	10.6	LOS B	3.4
	East	L	0.404	9.7	LOS A	2.9
		T	0.404	9.6	LOS A	2.9
		R	0.404	13.7	LOS B	2.9
		U	0.404	15.3	LOS B	2.9
	West	L	0.199	6.6	LOS A	1.2
		T	0.199	6.4	LOS A	1.2
		R	0.199	10.5	LOS B	1.2
		U	0.199	12.1	LOS B	1.2
Garden Road / Bridge Inn Road	South	L	0.256	8.3	LOS A	2.3
		R	0.286	31.4	LOS C	2.1
	East	L	0.045	8.5	LOS A	0.4
		T	0.594	20.6	LOS C	8.4
		U	0.574	37.9	LOS D	2.5
	West	T	0.644	14	LOS B	12.9
		R	0.606	27	LOS C	8
Bridge Inn Road / Site Access	North	L	0.166	9.3	LOS A	0.6
	East	T	0.18	0	LOS A	0
	West	L	0.033	6.2	LOS A	0
		T	0.312	0	LOS A	0

Table 9 SIDRA outputs – PM Future Peak Hour (2031)

Location	Approach	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue Vehicles (VEH)
Cookes Road / Yan Yean Road	North	T	0.460	4.6	LOS A	12.6
		R	0.078	20.6	LOS C	0.5
	South	T	0.931	29.5	LOS C	42.8
		L	0.307	8.4	LOS A	1.8
	West	L	0.935	75.5	LOS E	14.1
		R	0.935	75.4	LOS E	14.1
Cookes Road / Flaxen Hills Road	North	L	0.136	4.3	LOS A	0.7
		T	0.136	4.4	LOS A	0.7
		R	0.136	8	LOS A	0.7
	South	L	0.043	4.9	LOS A	0.2
		T	0.043	4.9	LOS A	0.2
		R	0.043	8.3	LOS A	0.2
	East	L	0.217	3.7	LOS A	1.3
		T	0.217	3.8	LOS A	1.3
		R	0.217	7.2	LOS A	1.3
	West	L	0.180	4.4	LOS A	0.9
		T	0.180	4.4	LOS A	0.9
		R	0.180	7.9	LOS A	0.9
Painted Hills Road / Belmont Rise	North	L	0.472	4.8	LOS A	3.5
		T	0.472	4.6	LOS A	3.5
		R	0.472	8.7	LOS A	3.5
		U	0.472	10.3	LOS B	3.5
	South	L	0.422	3.5	LOS A	3.2
		T	0.422	3.4	LOS A	3.2
		R	0.422	7.4	LOS A	3.2
		U	0.422	10.5	LOS B	3.2
	East	L	0.174	7	LOS A	1
		T	0.174	6.9	LOS A	1
		R	0.174	10.9	LOS B	1
		U	0.174	12.6	LOS B	1
	West	L	0.176	6.7	LOS A	1
		T	0.176	6.6	LOS A	1
		R	0.176	10.6	LOS B	1
		U	0.176	12.2	LOS B	1
Garden Road / Bridge Inn Road	South	L	0.455	9.3	LOS A	4.9
		R	0.405	32	LOS C	3.1
	East	L	0.099	7.3	LOS A	0.7
		T	0.542	16.5	LOS B	9
		U	0.639	33.7	LOS C	4.9
	West	T	0.612	17.1	LOS B	10.5
		R	0.445	30.2	LOS C	4.1
Bridge Inn Road / Site Access	North	L	0.067	7.7	LOS A	0.2
	East	T	0.230	0	LOS A	0
	West	L	0.131	6.2	LOS A	0
		T	0.229	0	LOS A	0

Key points from the SIDRA assessment for each intersection are listed hereunder:

6.3.1 COOKES ROAD / YAN YEAN ROAD

The results of the preceding SIDRA assessment indicate:

- The AM peak hour will operate acceptably in the 2031 scenario, with a maximum Degree of Saturation equal to 0.807;
- The PM peak hour will operate with a Degree of Saturation equal to 0.935 on the west approach and 0.931 on the south approach in the 2031 scenario. This is with adoption of a filtered right-turn from the north into Cookes Road, versus the existing controlled right-turn. Whilst these results are relatively high, a DoS <0.950 is generally regarded as acceptable for a signalised intersection;
- The future impacts to this intersection will be largely caused by future growth on Yan Yean Road, as opposed to the traffic generated by the proposed subdivision (which is relatively modest). This is indicated by the current need for Yan Yean Road to be duplicated further south.

Based on this, no changes are considered necessary to this intersection, though it *may* become necessary for Yan Yean Road to be duplicated in future regardless of whether the subdivision goes ahead (which would involve works carried out by DoT/MRPV).

6.3.2 COOKES ROAD / FLAXEN HILLS ROAD

The results of the preceding SIDRA assessment indicate:

- The maximum Degree of Saturation is 0.268 associated with the northern leg of the roundabout during the AM peak period, indicating an overall satisfactory level of performance;
- All movements operate at Level of Service A (Excellent), with minimal delays and vehicle queuing expected over all approaches.

Based on this, no changes are required to the existing roundabout.

6.3.3 PAINTED HILLS ROAD / BELMONT RISE / VENICE RISE

The results of the preceding SIDRA assessment indicate:

- The maximum Degree of Saturation is 0.538, associated with the northern intersection approach during the AM peak period, indicating an overall satisfactory level of performance;
- All movements operate at Level of Service A to B (Excellent to Very Good) and are not anticipated to experience significant adverse delays or vehicle queues;
- The maximum 95th percentile vehicle queue length is 4.5 vehicles, associated with the northern leg of Painted Hills Road. This will still experience minimal delay and generally operate at Level of Service A.

Based on this, no changes are required to the existing roundabout.

6.3.4 GARDEN ROAD / BRIDGE INN ROAD

SIDRA assessment for Bridge Inn Road has been undertaken based on the future duplicated road alignment and the current design plans for the signalised intersection upgrade.

The results of the preceding SIDRA assessment indicate:

- The maximum Degree of Saturation is 0.644, associated with the western leg of Bridge Inn Road during the AM peak period, indicating an overall satisfactory level of performance;
- All movements operate at Level of Service A to D (Excellent to Acceptable);
- Vehicle queuing associated with Bridge Inn Road is not expected to exceed 9-13 vehicles (95th percentile) during the AM and PM peak periods – a relatively low number of vehicles for an arterial road.

Based on this, no changes will be required to the intersection.

6.3.5 BRIDGE INN ROAD / SITE ACCESS

The results of the preceding SIDRA assessment indicate:

- The maximum Degree of Saturation is 0.312, associated with the through movement at the western leg of Bridge Inn Road, indicating an overall satisfactory level of performance;
- All movements operate at Level of Service Aa (Excellent), with minimal delays and vehicle queuing with maximums at 9.3 seconds and 0.6 vehicles respectively;
- The proposed operation as left-in/left-out will result in a negligible adverse impact to the surrounding road network. Any vehicle queuing or delay that does arise would likely be confined within the development area and not over Bridge Inn Road. Additionally, the proximity to the Garden Road signalised intersection provides the added opportunity to provide breaks in traffic, permitting egress from the site in instances where vehicle queuing/delay may occur; and
- Ingress from the east to this intersection will be facilited by way of the U-turn lane proposed as part of the Bridge Inn Road / Garden Road signalised intersection upgrade. Egress toward the west can be facilitated from Painted Hills Road.

Based on this, the proposed intersection will operate acceptably as left in / left out.

A left-turn deceleration lane will be required for reasons of safety and this can be facilitated in accordance with AustRoads guidelines within the proposed setback distance from the Garden Road signals. A concept layout plan has been prepared – refer **Appendix 6**. This includes the planned duplication of Bridge Inn Road.

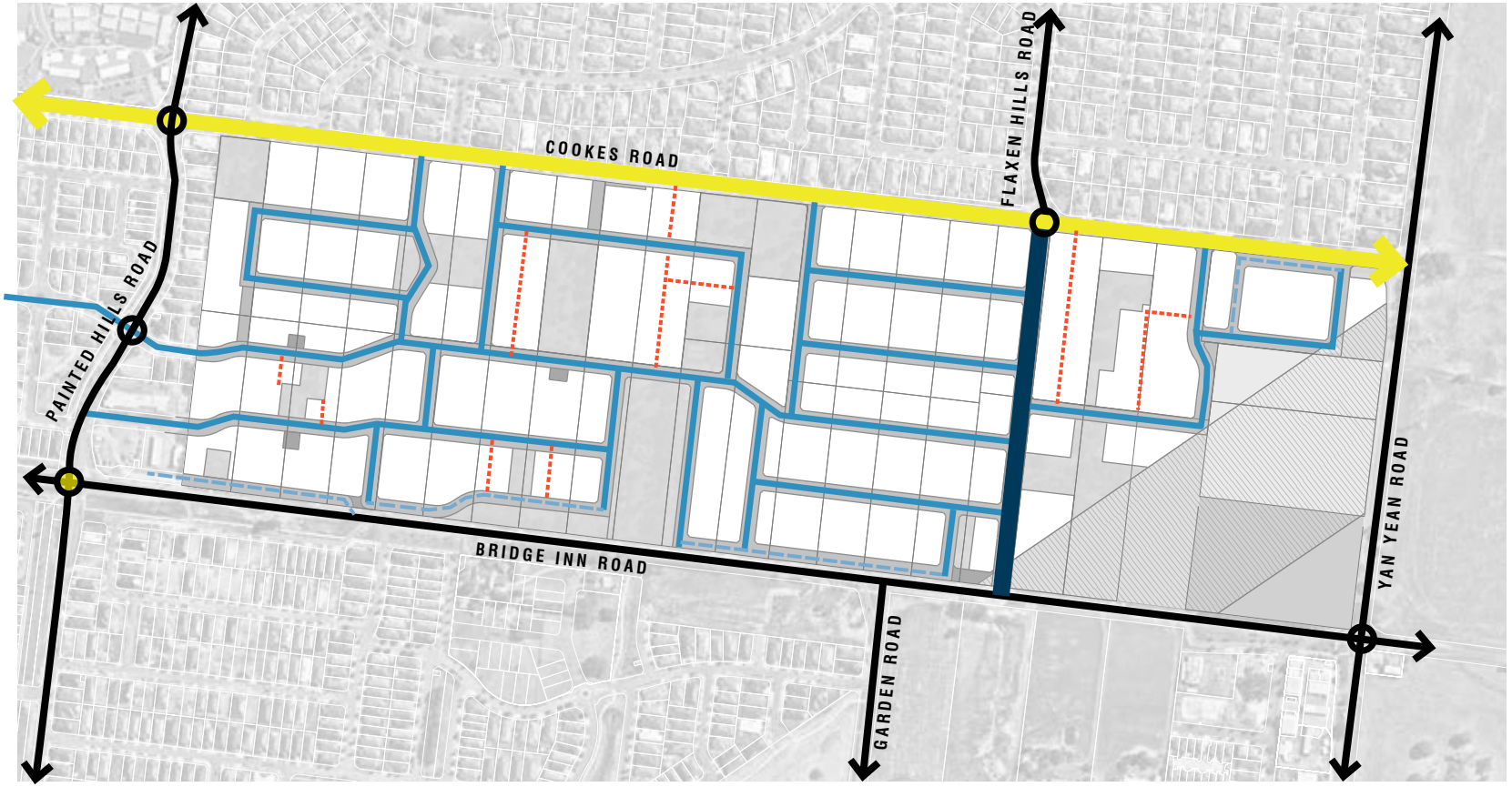
7 CONCLUSION

Based on the considerations outlined in this report, it is concluded that:

- The Development Plan seeks to provide a residential subdivision accommodating approximately 650 dwellings;
- The proposed Development Plan has been prepared generally in accordance with the road network requirements set out in the Mernda Strategy Plan, noting the following main departures:
  - The proposed extension of Flaxen Hills Road intersects with Bridge Inn Road on the eastern side of Garden Road (as opposed to the western side). This is a result of Flaxen Hills Road (north of the development area) having previously being constructed in a different location to that contemplated by the MSP;
  - A priority bus route is no longer able to be provided north-south from Flaxen Hills Road to Bridge Inn Road (then onto Garden Road). This is the result of the aforementioned lateral shift of Flaxen Hills Road and upcoming duplication of Bridge Inn Road which will see a constructed median physically separating the east & westbound traffic lanes.
  - An alternative bus route/s can be adopted, including the option of modifying the existing 381 route to travel through the subject site, eliminating the existing low-value section of route that travels on Yan Yean Road north of Bridge Inn Road (that currently abuts rear fences and undeveloped Green Wedge land);
  - Whilst traffic signals could be provided at Garden Road to facilitate a direct north-south bus route, the Mernda Strategy Plan DCP does not contemplate signals at this location, and therefore it would not be a fair and equitable outcome for the developer/s of this land parcel to fund such an upgrade, particularly as a bus route would service a much wider area. Alternate bus routes will be available;
  - The internal road hierarchy is in general accordance with that specified in the MSP, though alternate road cross-sections are recommended as an improvement to those specified by the MSP; and
- A left-turn deceleration lane will be required at the proposed Bridge Inn Road access point; and
- SIDRA modelling demonstrates that the existing key intersections within the vicinity of the site will accommodate the additional traffic generated by the future subdivision in the 2031 (10-year) scenario. Yan Yean Road *may* need to be upgraded though if this becomes the case, it will be as a result of general traffic growth rather than the traffic generated by the future subdivision.

Accordingly, we find there are no traffic engineering grounds to inhibit approval of the proposed Development Plan.

APPENDIX 1 MOVEMENT PLAN



LEGEND

- COOKES ROAD UPGRADE
  South side of Cookes Road to be urbanised including provision of new footpath and
- 20m SUB ARTERIAL ROAD
- 16m ACCESS LEVEL 1 STREET
- 14.5m ACCESS LEVEL 1 STREET
- OPPORTUNITY FOR REAR LANE
  - ▶ Locations identified where tree protection has taken priority
  - ▶ Can be use in other locations to provide passive surveillance to open space locations
- PRIMARY ROAD NETWORK external to site
- SIGNALISED INTERSECTION
- ROUND A BOUT

Figure 1. Road Network

0 75 150

SCALE 1:7500@A3

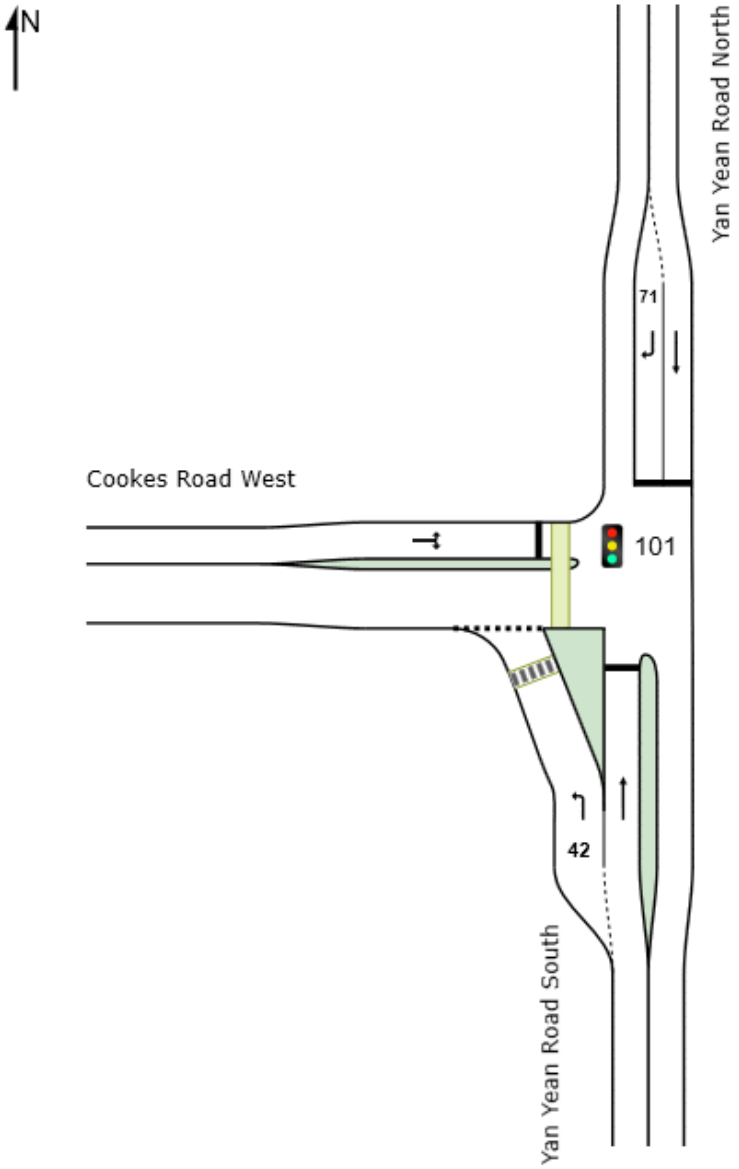
APPENDIX 2 SIDRA RESULTS – AM PEAK HOUR (EXISTING)

SITE LAYOUT

Site: 101 [Cookes Rd / Yan Yean Rd - AM Ex (Site Folder: AM Existing Conditions)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - AM Ex (Site Folder: AM Existing Conditions)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Yan Yean Road South														
1	L2	123	1	129	0.8	0.118	8.3	LOS A	0.4	3.1	0.23	0.66	0.23	54.4
2	T1	474	18	499	3.8	* 0.693	17.3	LOS B	12.5	90.6	0.88	0.78	0.91	58.0
Approach		597	19	628	3.2	0.693	15.4	LOS B	12.5	90.6	0.75	0.76	0.77	57.2
North: Yan Yean Road North														
8	T1	436	15	459	3.4	0.412	7.4	LOS A	7.4	53.3	0.59	0.51	0.59	68.8
9	R2	9	0	9	0.0	* 0.051	34.6	LOS C	0.3	1.9	0.93	0.67	0.93	38.6
Approach		445	15	468	3.4	0.412	8.0	LOS A	7.4	53.3	0.59	0.52	0.59	67.8
West: Cookes Road West														
10	L2	15	0	16	0.0	0.681	29.1	LOS C	8.3	58.1	0.97	0.87	1.04	39.8
12	R2	259	1	273	0.4	* 0.681	29.0	LOS C	8.3	58.1	0.97	0.87	1.04	40.0
Approach		274	1	288	0.4	0.681	29.0	LOS C	8.3	58.1	0.97	0.87	1.04	40.0
All Vehicles		1316	35	1385	2.7	0.693	15.7	LOS B	12.5	90.6	0.74	0.70	0.77	55.1

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

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
West: Cookes Road West												
P4	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	190.9	216.5	1.13
All Pedestrians		50	53	24.4	LOS C	0.1	0.1	0.90	0.90	190.9	216.5	1.13

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - AM Ex (Site Folder: AM Existing Conditions)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B*, C
Output Phase Sequence: A, B*, C
(* Variable Phase)

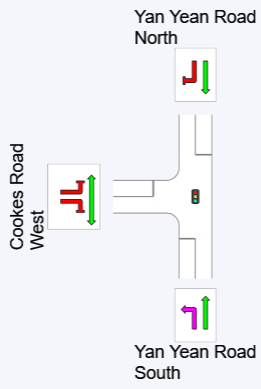
Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	29	41
Green Time (sec)	23	6	13
Phase Time (sec)	29	12	19
Phase Split	48%	20%	32%

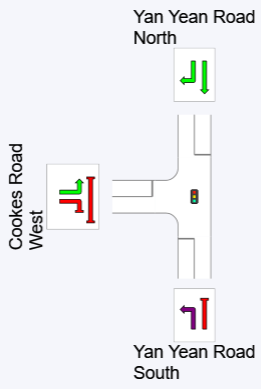
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

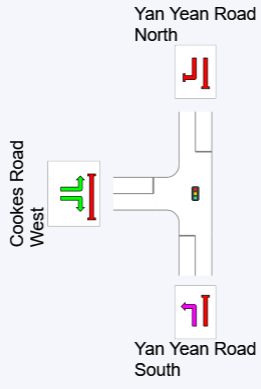
Phase A REF



Phase B VAR



Phase C

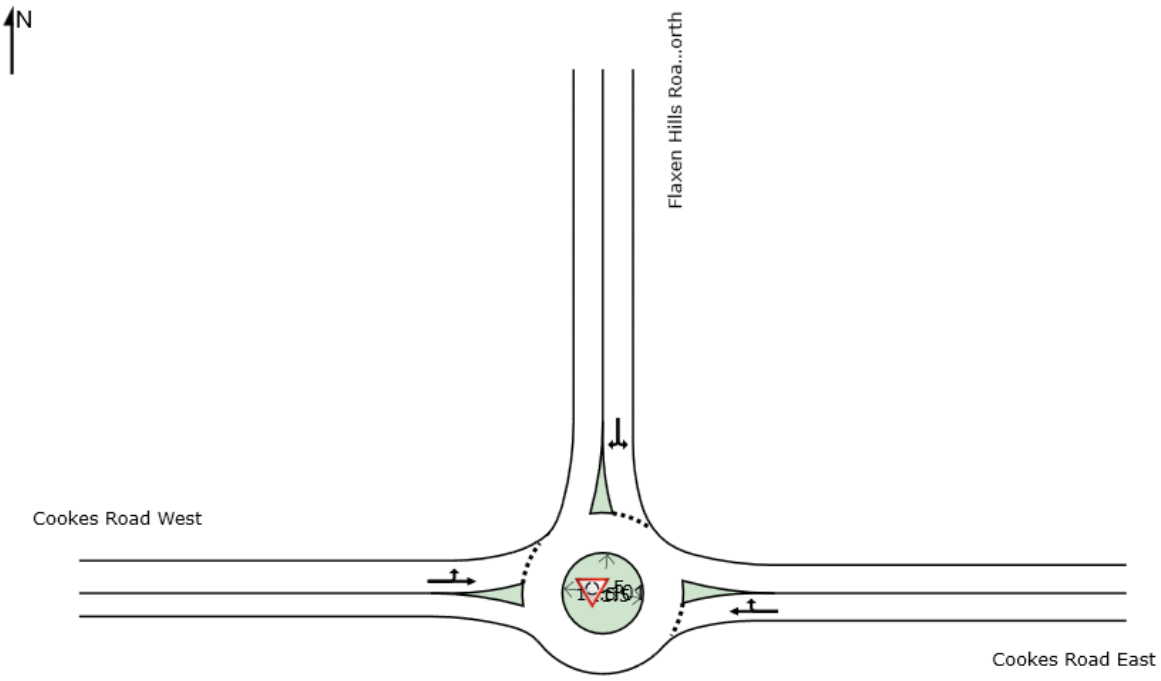


SITE LAYOUT

Site: 101 [Cookes Rd / Flaxen Hills Rd - AM Ex (Site Folder: AM Existing Conditions)]

Site Access
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Flaxen Hills Rd - AM Ex (Site Folder: AM Existing Conditions)]

Site Access
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Cookes Road East														
5	T1	76	1	80	1.3	0.110	3.8	LOS A	0.6	4.1	0.20	0.50	0.20	46.7
6	R2	59	1	62	1.7	0.110	7.3	LOS A	0.6	4.1	0.20	0.50	0.20	46.6
Approach		135	2	142	1.5	0.110	5.3	LOS A	0.6	4.1	0.20	0.50	0.20	46.6
North: Flaxen Hills Road North														
7	L2	168	0	177	0.0	0.178	3.8	LOS A	0.9	6.3	0.20	0.51	0.20	46.3
9	R2	57	1	60	1.8	0.178	7.2	LOS A	0.9	6.3	0.20	0.51	0.20	47.0
Approach		225	1	237	0.4	0.178	4.6	LOS A	0.9	6.3	0.20	0.51	0.20	46.5
West: Cookes Road West														
10	L2	22	0	23	0.0	0.069	3.7	LOS A	0.3	2.1	0.17	0.41	0.17	46.7
11	T1	61	0	64	0.0	0.069	3.7	LOS A	0.3	2.1	0.17	0.41	0.17	47.6
Approach		83	0	87	0.0	0.069	3.7	LOS A	0.3	2.1	0.17	0.41	0.17	47.4
All Vehicles		443	3	466	0.7	0.178	4.7	LOS A	0.9	6.3	0.19	0.49	0.19	46.7

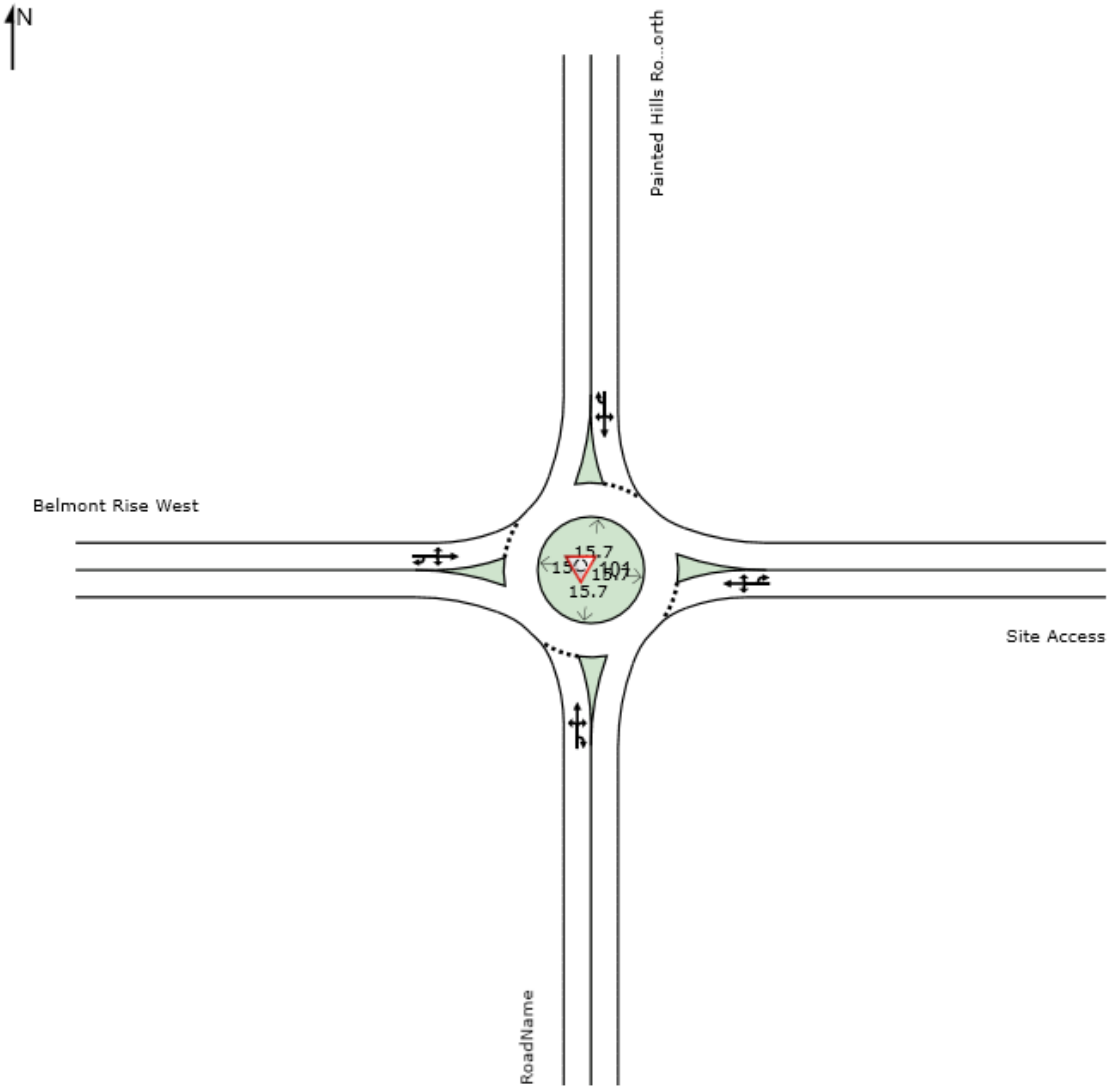
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101 [Painted Hills Rd / Belmont Rise - AM Ex (Site Folder: AM Existing Conditions)]

New Site
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Painted Hills Rd / Belmont Rise - AM Ex (Site Folder: AM Existing Conditions)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	36	0	38	0.0	0.235	3.3	LOS A	1.4	10.1	0.12	0.40	0.12	47.3
2	T1	274	0	288	0.0	0.235	3.1	LOS A	1.4	10.1	0.12	0.40	0.12	47.5
3	R2	1	0	1	0.0	0.235	7.1	LOS A	1.4	10.1	0.12	0.40	0.12	48.2
3u	U	26	1	27	3.8	0.235	10.3	LOS B	1.4	10.1	0.12	0.40	0.12	51.9
Approach		337	1	355	0.3	0.235	3.7	LOS A	1.4	10.1	0.12	0.40	0.12	47.9
East: Site Access														
4	L2	1	0	1	0.0	0.005	5.6	LOS A	0.0	0.2	0.56	0.57	0.56	44.8
5	T1	1	0	1	0.0	0.005	5.5	LOS A	0.0	0.2	0.56	0.57	0.56	45.6
6	R2	1	0	1	0.0	0.005	9.5	LOS A	0.0	0.2	0.56	0.57	0.56	44.1
6u	U	1	0	1	0.0	0.005	11.2	LOS B	0.0	0.2	0.56	0.57	0.56	46.2
Approach		4	0	4	0.0	0.005	7.9	LOS A	0.0	0.2	0.56	0.57	0.56	45.2
North: Painted Hills Road North														
7	L2	1	0	1	0.0	0.312	3.9	LOS A	2.0	14.1	0.36	0.44	0.36	45.3
8	T1	350	1	368	0.3	0.312	3.7	LOS A	2.0	14.1	0.36	0.44	0.36	46.4
9	R2	16	0	17	0.0	0.312	7.8	LOS A	2.0	14.1	0.36	0.44	0.36	46.4
9u	U	1	0	1	0.0	0.312	9.4	LOS A	2.0	14.1	0.36	0.44	0.36	45.8
Approach		368	1	387	0.3	0.312	3.9	LOS A	2.0	14.1	0.36	0.44	0.36	46.4
West: Belmont Rise West														
10	L2	27	0	28	0.0	0.119	4.8	LOS A	0.6	4.2	0.46	0.64	0.46	43.2
11	T1	1	0	1	0.0	0.119	4.7	LOS A	0.6	4.2	0.46	0.64	0.46	45.7
12	R2	87	0	92	0.0	0.119	8.7	LOS A	0.6	4.2	0.46	0.64	0.46	45.7
12u	U	1	0	1	0.0	0.119	10.4	LOS B	0.6	4.2	0.46	0.64	0.46	46.3
Approach		116	0	122	0.0	0.119	7.8	LOS A	0.6	4.2	0.46	0.64	0.46	45.2
All Vehicles		825	2	868	0.2	0.312	4.4	LOS A	2.0	14.1	0.28	0.45	0.28	46.8

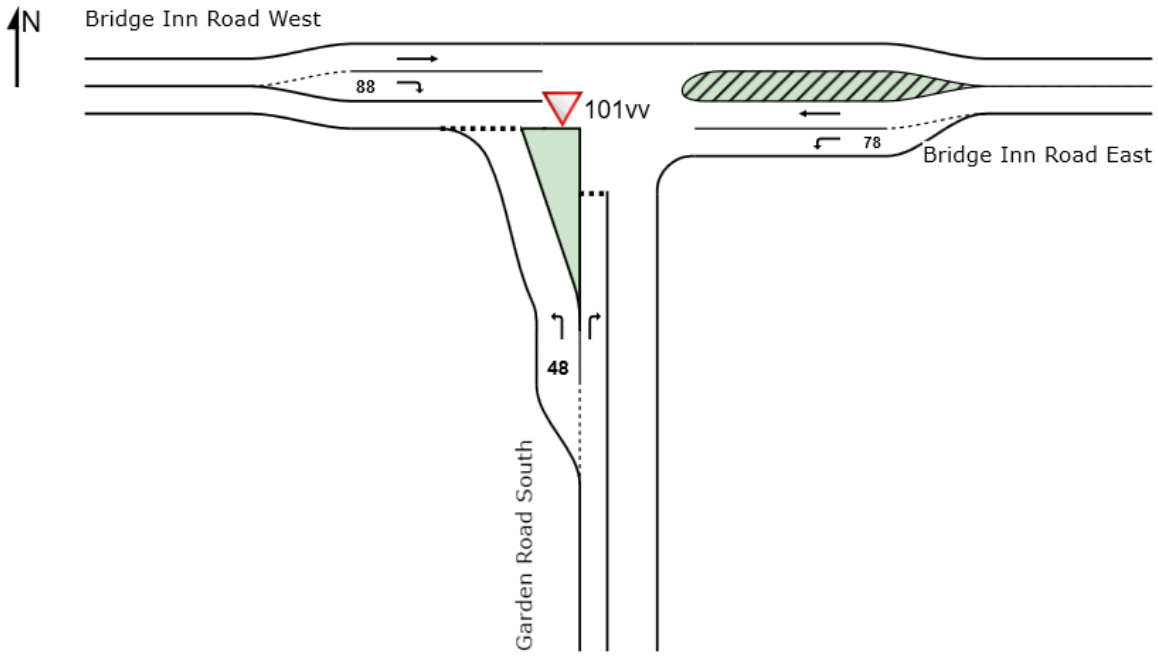
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101vv [Garden Road / Bridge Inn Road - AM Ex (Site Folder: AM Existing Conditions)]

New Site
Site Category: (None)
Give-Way (Two-Way)

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



MOVEMENT SUMMARY

Site: 101vv [Garden Road / Bridge Inn Road - AM Ex (Site Folder: AM Existing Conditions)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Garden Road South														
1	L2	152	0	160	0.0	0.168	6.2	LOS A	0.6	4.4	0.41	0.62	0.41	53.2
3	R2	40	2	42	5.0	0.230	25.8	LOS D	0.8	5.7	0.86	0.96	0.94	40.7
Approach		192	2	202	1.0	0.230	10.2	LOS B	0.8	5.7	0.51	0.69	0.52	50.0
East: Bridge Inn Road East														
4	L2	29	2	31	6.9	0.017	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	63.1
5	T1	313	7	329	2.2	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		342	9	360	2.6	0.171	0.6	NA	0.0	0.0	0.00	0.05	0.00	78.1
West: Bridge Inn Road West														
11	T1	525	8	553	1.5	0.289	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
12	R2	212	1	223	0.5	0.226	9.0	LOS A	1.0	6.9	0.47	0.72	0.47	53.2
Approach		737	9	776	1.2	0.289	2.6	NA	1.0	6.9	0.14	0.21	0.14	69.8
All Vehicles		1271	20	1338	1.6	0.289	3.2	NA	1.0	6.9	0.16	0.24	0.16	67.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

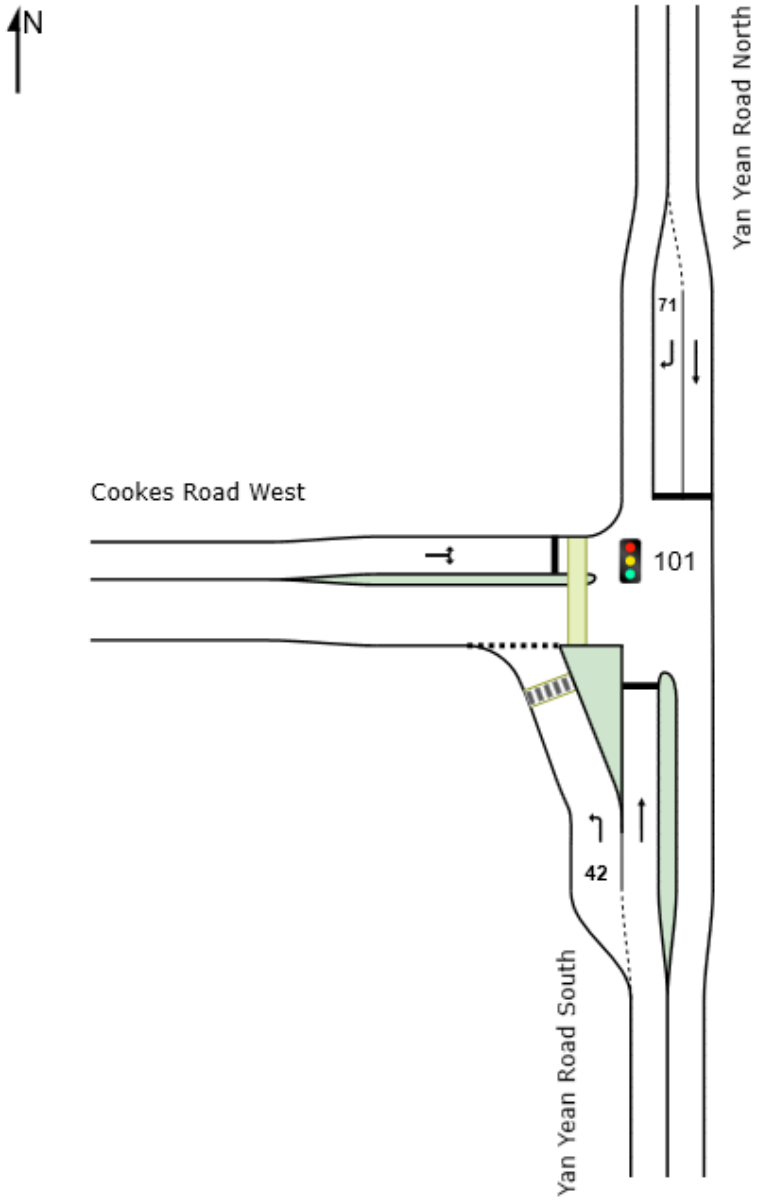
APPENDIX 3 SIDRA RESULTS – PM PEAK HOUR (EXISTING)

SITE LAYOUT

Site: 101 [Cookes Rd / Yan Yean Rd - PM Ex (Site Folder: PM Existing Conditions)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - PM Ex (Site Folder: PM Existing Conditions)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Yan Yean Road South														
1	L2	188	3	198	1.6	0.181	8.4	LOS A	0.7	5.2	0.25	0.67	0.25	54.3
2	T1	728	16	766	2.2	* 0.898	27.3	LOS C	26.1	186.0	0.87	0.98	1.22	50.0
Approach		916	19	964	2.1	0.898	23.4	LOS C	26.1	186.0	0.74	0.91	1.02	50.9
North: Yan Yean Road North														
8	T1	482	12	507	2.5	0.378	3.9	LOS A	6.0	43.2	0.44	0.39	0.44	73.6
9	R2	7	0	7	0.0	* 0.040	34.5	LOS C	0.2	1.4	0.93	0.66	0.93	38.6
Approach		489	12	515	2.5	0.378	4.4	LOS A	6.0	43.2	0.44	0.39	0.44	72.7
West: Cookes Road West														
10	L2	9	0	9	0.0	0.681	35.4	LOS D	4.2	29.8	1.00	0.87	1.17	37.3
12	R2	119	1	125	0.8	* 0.681	35.4	LOS D	4.2	29.8	1.00	0.87	1.17	37.3
Approach		128	1	135	0.8	0.681	35.4	LOS D	4.2	29.8	1.00	0.87	1.17	37.3
All Vehicles		1533	32	1614	2.1	0.898	18.4	LOS B	26.1	186.0	0.67	0.74	0.85	54.4

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

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
West: Cookes Road West												
P4	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	190.9	216.5	1.13
All Pedestrians		50	53	24.4	LOS C	0.1	0.1	0.90	0.90	190.9	216.5	1.13

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - PM Ex (Site Folder: PM Existing Conditions)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B*, C
Output Phase Sequence: A, B*, C
(* Variable Phase)

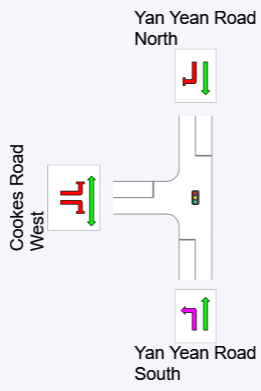
Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	36	48
Green Time (sec)	30	6	6
Phase Time (sec)	36	12	12
Phase Split	60%	20%	20%

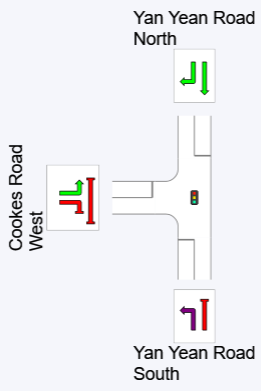
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

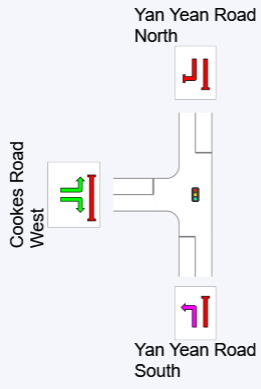
Phase A **REF**



Phase B **VAR**



Phase C

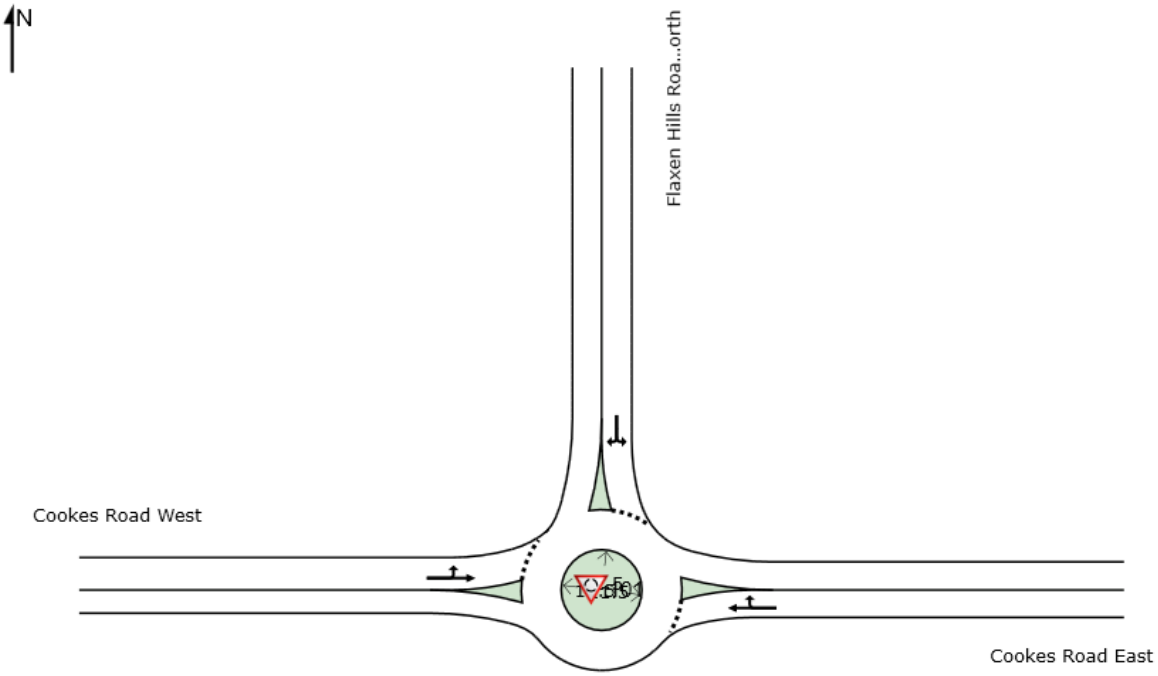


SITE LAYOUT

Site: 101 [Cookes Rd / Flaxen Hills Rd - PM Ex (Site Folder: PM Existing Conditions)]

Site Access
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Flaxen Hills Rd - PM Ex (Site Folder: PM Existing Conditions)]

Site Access
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Cookes Road East														
5	T1	47	1	49	2.1	0.126	3.6	LOS A	0.7	4.8	0.11	0.56	0.11	46.3
6	R2	126	0	133	0.0	0.126	7.0	LOS A	0.7	4.8	0.11	0.56	0.11	46.3
Approach		173	1	182	0.6	0.126	6.1	LOS A	0.7	4.8	0.11	0.56	0.11	46.3
North: Flaxen Hills Road North														
7	L2	82	0	86	0.0	0.090	3.9	LOS A	0.4	3.1	0.24	0.51	0.24	46.3
9	R2	21	2	22	9.5	0.090	7.5	LOS A	0.4	3.1	0.24	0.51	0.24	46.9
Approach		103	2	108	1.9	0.090	4.6	LOS A	0.4	3.1	0.24	0.51	0.24	46.4
West: Cookes Road West														
10	L2	33	0	35	0.0	0.108	4.0	LOS A	0.5	3.3	0.26	0.45	0.26	46.5
11	T1	89	0	94	0.0	0.108	4.0	LOS A	0.5	3.3	0.26	0.45	0.26	47.4
Approach		122	0	128	0.0	0.108	4.0	LOS A	0.5	3.3	0.26	0.45	0.26	47.1
All Vehicles		398	3	419	0.8	0.126	5.1	LOS A	0.7	4.8	0.19	0.51	0.19	46.6

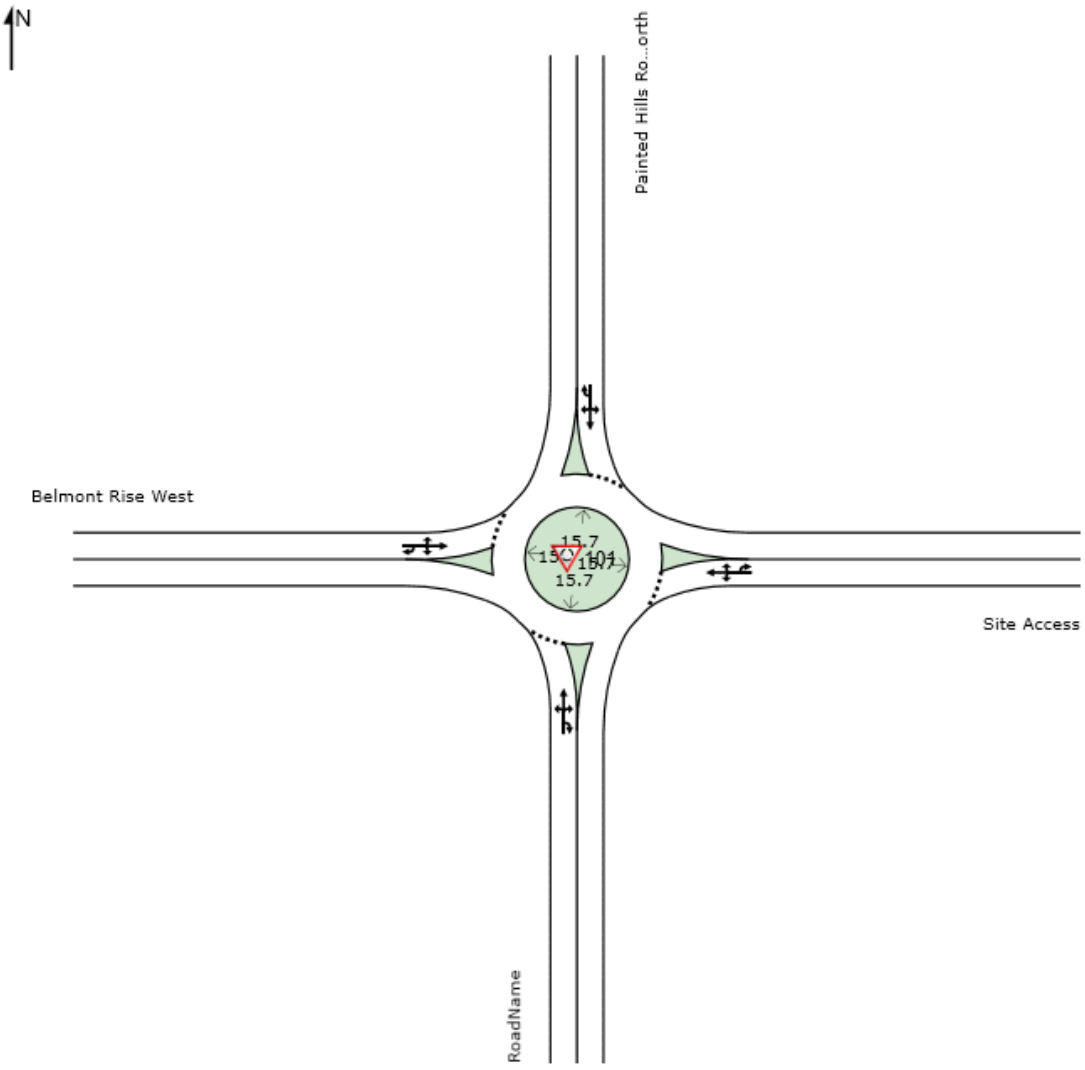
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101 [Painted Hills Rd / Belmont Rise - AM Ex - Copy (Site Folder: PM Existing Conditions)]

New Site
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Painted Hills Rd / Belmont Rise - AM Ex - Copy (Site Folder: PM Existing Conditions)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	26	0	27	0.0	0.227	3.3	LOS A	1.3	9.4	0.14	0.40	0.14	47.2
2	T1	267	0	281	0.0	0.227	3.2	LOS A	1.3	9.4	0.14	0.40	0.14	47.4
3	R2	1	0	1	0.0	0.227	7.2	LOS A	1.3	9.4	0.14	0.40	0.14	48.1
3u	U	24	0	25	0.0	0.227	10.3	LOS B	1.3	9.4	0.14	0.40	0.14	51.9
Approach		318	0	335	0.0	0.227	3.7	LOS A	1.3	9.4	0.14	0.40	0.14	47.8
East: Site Access														
4	L2	1	0	1	0.0	0.004	5.0	LOS A	0.0	0.2	0.50	0.55	0.50	45.1
5	T1	1	0	1	0.0	0.004	4.9	LOS A	0.0	0.2	0.50	0.55	0.50	45.9
6	R2	1	0	1	0.0	0.004	8.9	LOS A	0.0	0.2	0.50	0.55	0.50	44.5
6u	U	1	0	1	0.0	0.004	10.6	LOS B	0.0	0.2	0.50	0.55	0.50	46.5
Approach		4	0	4	0.0	0.004	7.4	LOS A	0.0	0.2	0.50	0.55	0.50	45.5
North: Painted Hills Road North														
7	L2	1	0	1	0.0	0.246	3.7	LOS A	1.5	10.4	0.30	0.43	0.30	45.4
8	T1	272	2	286	0.7	0.246	3.5	LOS A	1.5	10.4	0.30	0.43	0.30	46.5
9	R2	18	0	19	0.0	0.246	7.6	LOS A	1.5	10.4	0.30	0.43	0.30	46.6
9u	U	4	0	4	0.0	0.246	9.3	LOS A	1.5	10.4	0.30	0.43	0.30	46.0
Approach		295	2	311	0.7	0.246	3.9	LOS A	1.5	10.4	0.30	0.43	0.30	46.5
West: Belmont Rise West														
10	L2	25	0	26	0.0	0.098	4.8	LOS A	0.5	3.5	0.45	0.63	0.45	43.3
11	T1	1	0	1	0.0	0.098	4.6	LOS A	0.5	3.5	0.45	0.63	0.45	45.8
12	R2	68	0	72	0.0	0.098	8.6	LOS A	0.5	3.5	0.45	0.63	0.45	45.8
12u	U	2	0	2	0.0	0.098	10.3	LOS B	0.5	3.5	0.45	0.63	0.45	46.4
Approach		96	0	101	0.0	0.098	7.6	LOS A	0.5	3.5	0.45	0.63	0.45	45.3
All Vehicles		713	2	751	0.3	0.246	4.3	LOS A	1.5	10.4	0.25	0.44	0.25	46.9

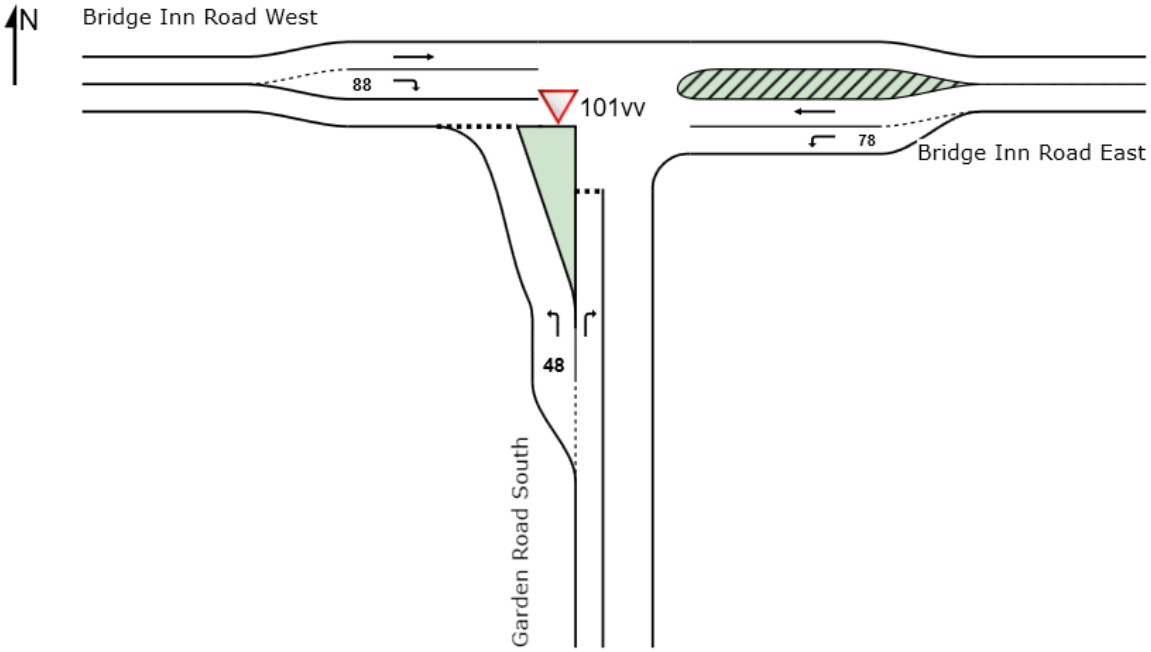
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101vv [Garden Road / Bridge Inn Road - AM Ex - Copy (Site Folder: PM Existing Conditions)]

New Site
Site Category: (None)
Give-Way (Two-Way)

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



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Organisation: SUSTAINABLE TRANSPORT SURVEYS PTY LTD T/A SALT3 | Licence: NETWORK / 1PC | Created: Monday, 22 November 2021 12:44:03 PM
Project: Z:\2020\20033T - Bridge Inn & Cookes Rd, Doreen\07 Analysis\20033SID01.sip9

MOVEMENT SUMMARY

Site: 101vv [Garden Road / Bridge Inn Road - AM Ex - Copy (Site Folder: PM Existing Conditions)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Garden Road South														
1	L2	247	4	260	1.6	0.296	6.9	LOS A	1.3	9.0	0.49	0.71	0.52	52.4
3	R2	48	2	51	4.2	0.184	17.3	LOS C	0.6	4.6	0.78	0.90	0.79	45.0
Approach		295	6	311	2.0	0.296	8.6	LOS A	1.3	9.0	0.54	0.74	0.56	51.1
East: Bridge Inn Road East														
4	L2	74	2	78	2.7	0.043	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.5
5	T1	368	9	387	2.4	0.202	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		442	11	465	2.5	0.202	1.2	NA	0.0	0.0	0.00	0.11	0.00	76.8
West: Bridge Inn Road West														
11	T1	360	10	379	2.8	0.200	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	107	0	113	0.0	0.129	9.5	LOS A	0.5	3.6	0.50	0.74	0.50	52.9
Approach		467	10	492	2.1	0.200	2.2	NA	0.5	3.6	0.11	0.17	0.11	71.5
All Vehicles		1204	27	1267	2.2	0.296	3.4	NA	1.3	9.0	0.18	0.28	0.18	66.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

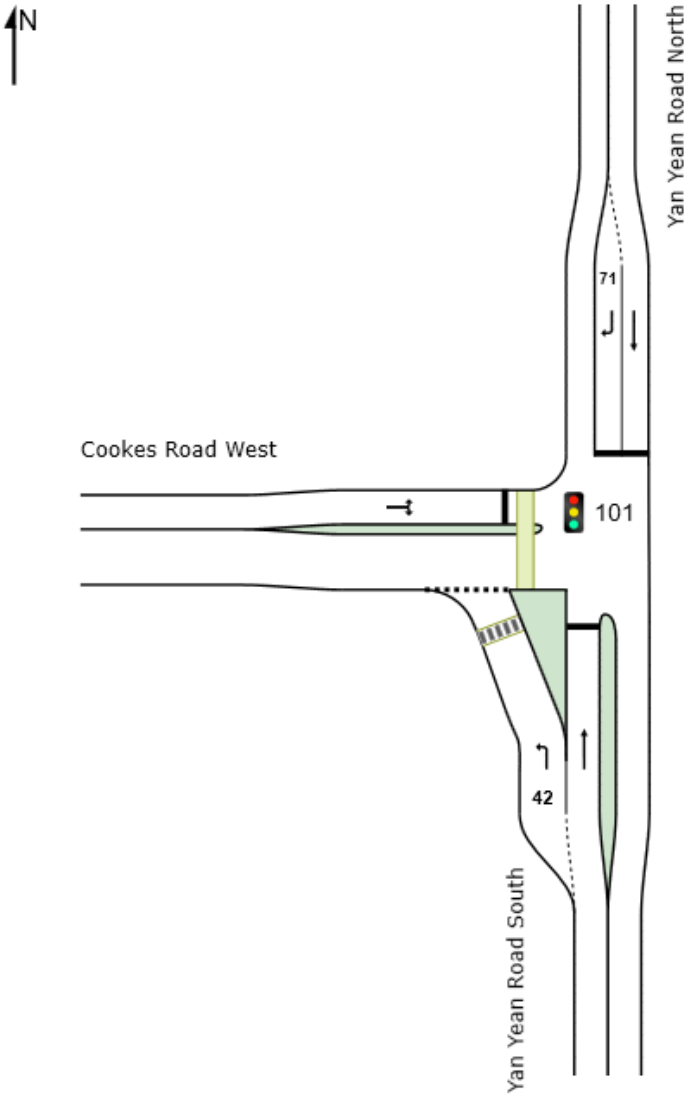
APPENDIX 4 SIDRA RESULTS – AM PEAK HOUR (2031)

SITE LAYOUT

Site: 101 [Cookes Rd / Yan Yean Rd - AM Fut (2031) - Filtered RT (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - AM Fut (2031) - Filtered RT (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Yan Yean Road South														
1	L2	182	1.0	192	1.0	0.174	8.5	LOS A	0.7	4.8	0.29	0.68	0.29	54.2
2	T1	637	3.0	671	3.0	* 0.807	16.4	LOS B	16.0	114.5	0.87	0.86	1.05	58.8
Approach		819	2.6	862	2.6	0.807	14.7	LOS B	16.0	114.5	0.74	0.82	0.88	57.7
North: Yan Yean Road North														
8	T1	586	3.0	617	3.0	0.701	12.5	LOS B	12.7	90.9	0.85	0.77	0.89	62.8
9	R2	14	1.0	15	1.0	0.063	25.4	LOS C	0.3	2.2	0.84	0.70	0.84	42.7
Approach		600	3.0	632	3.0	0.701	12.8	LOS B	12.7	90.9	0.85	0.77	0.89	62.1
West: Cookes Road West														
10	L2	26	1.0	27	1.0	0.783	25.6	LOS C	11.7	82.3	0.97	0.95	1.17	41.2
12	R2	405	1.0	426	1.0	* 0.783	25.6	LOS C	11.7	82.3	0.97	0.95	1.17	41.4
Approach		431	1.0	454	1.0	0.783	25.6	LOS C	11.7	82.3	0.97	0.95	1.17	41.4
All Vehicles		1850	2.3	1947	2.3	0.807	16.6	LOS B	16.0	114.5	0.83	0.84	0.95	54.0

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

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
West: Cookes Road West												
P4	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	185.9	216.5	1.16
All Pedestrians		50	53	19.4	LOS B	0.1	0.1	0.88	0.88	185.9	216.5	1.16

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - AM Fut (2031) - Filtered RT (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

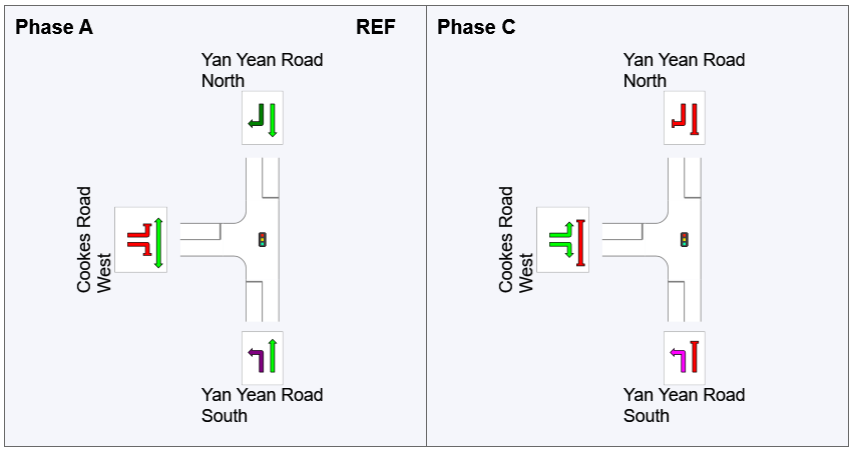
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn - Copy
Reference Phase: Phase A
Input Phase Sequence: A, C
Output Phase Sequence: A, C

Phase Timing Summary

Phase	A	C
Phase Change Time (sec)	0	29
Green Time (sec)	23	15
Phase Time (sec)	29	21
Phase Split	58%	42%

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

Output Phase Sequence

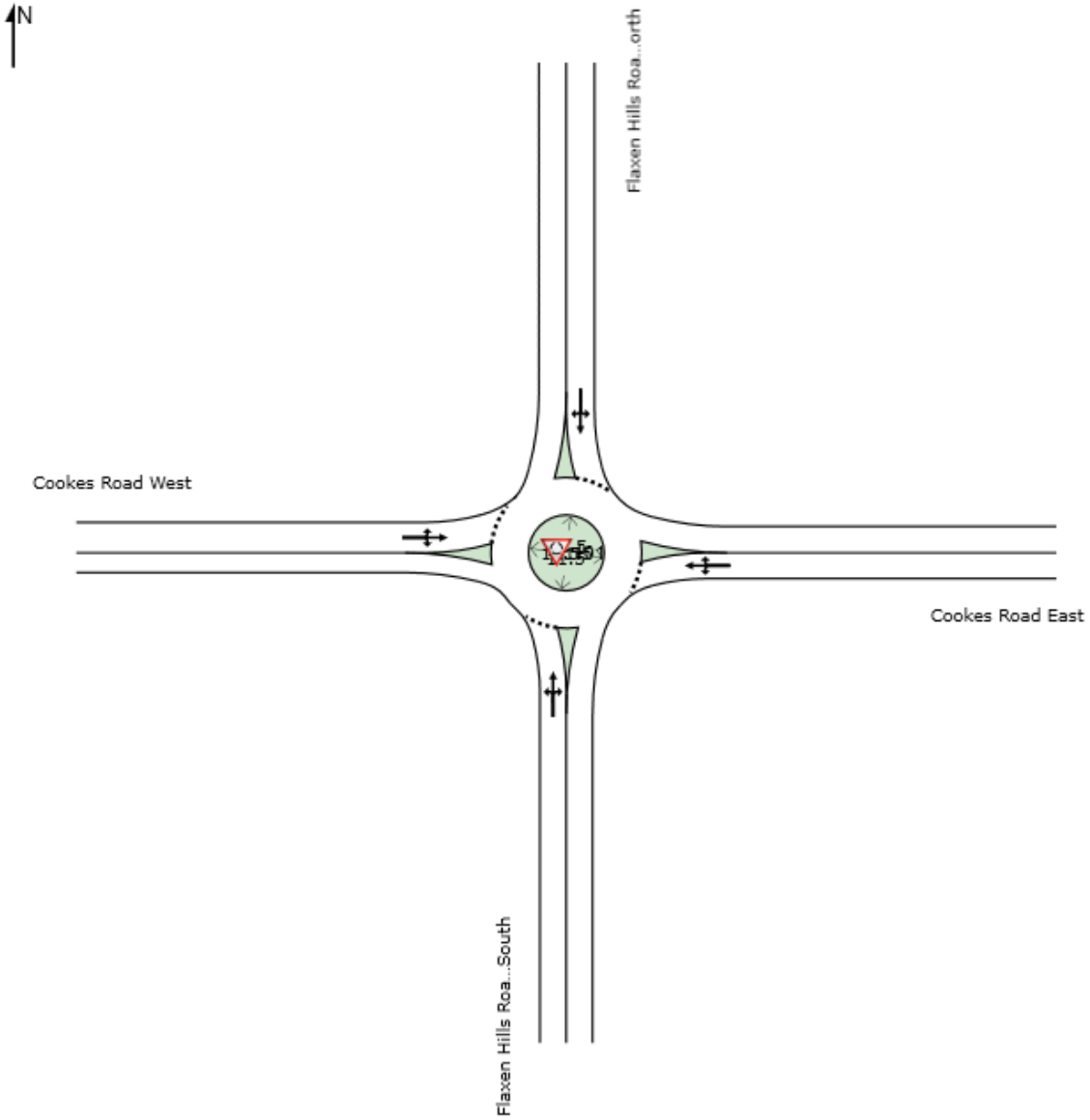


SITE LAYOUT

Site: 101 [Cookes Rd / Flaxen Hills Rd - AM Fut (2031) (Site Folder: AM Future (2031))]

Site Access
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Flaxen Hills Rd - AM Fut (2031) (Site Folder: AM Future (2031))]

Site Access
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flaxen Hills Road South														
1	L2	29	0.0	31	0.0	0.085	4.9	LOS A	0.4	3.0	0.43	0.61	0.43	45.2
2	T1	8	0.0	8	0.0	0.085	4.9	LOS A	0.4	3.0	0.43	0.61	0.43	46.0
3	R2	46	0.0	48	0.0	0.085	8.4	LOS A	0.4	3.0	0.43	0.61	0.43	45.9
Approach		83	0.0	87	0.0	0.085	6.8	LOS A	0.4	3.0	0.43	0.61	0.43	45.7
East: Cookes Road East														
4	L2	13	0.0	14	0.0	0.169	3.9	LOS A	1.0	6.8	0.27	0.51	0.27	45.8
5	T1	109	1.0	115	1.0	0.169	4.0	LOS A	1.0	6.8	0.27	0.51	0.27	46.6
6	R2	79	1.0	83	1.0	0.169	7.4	LOS A	1.0	6.8	0.27	0.51	0.27	46.5
Approach		201	0.9	212	0.9	0.169	5.3	LOS A	1.0	6.8	0.27	0.51	0.27	46.5
North: Flaxen Hills Road North														
7	L2	226	0.0	238	0.0	0.268	4.3	LOS A	1.5	10.4	0.35	0.55	0.35	46.0
8	T1	2	0.0	2	0.0	0.268	4.3	LOS A	1.5	10.4	0.35	0.55	0.35	46.8
9	R2	77	0.0	81	0.0	0.268	7.8	LOS A	1.5	10.4	0.35	0.55	0.35	46.7
Approach		305	0.0	321	0.0	0.268	5.2	LOS A	1.5	10.4	0.35	0.55	0.35	46.2
West: Cookes Road West														
10	L2	30	0.0	32	0.0	0.116	4.1	LOS A	0.5	3.6	0.28	0.46	0.28	46.4
11	T1	94	0.0	99	0.0	0.116	4.1	LOS A	0.5	3.6	0.28	0.46	0.28	47.2
12	R2	6	0.0	6	0.0	0.116	7.5	LOS A	0.5	3.6	0.28	0.46	0.28	47.1
Approach		130	0.0	137	0.0	0.116	4.2	LOS A	0.5	3.6	0.28	0.46	0.28	47.0
All Vehicles		719	0.3	757	0.3	0.268	5.2	LOS A	1.5	10.4	0.32	0.53	0.32	46.4

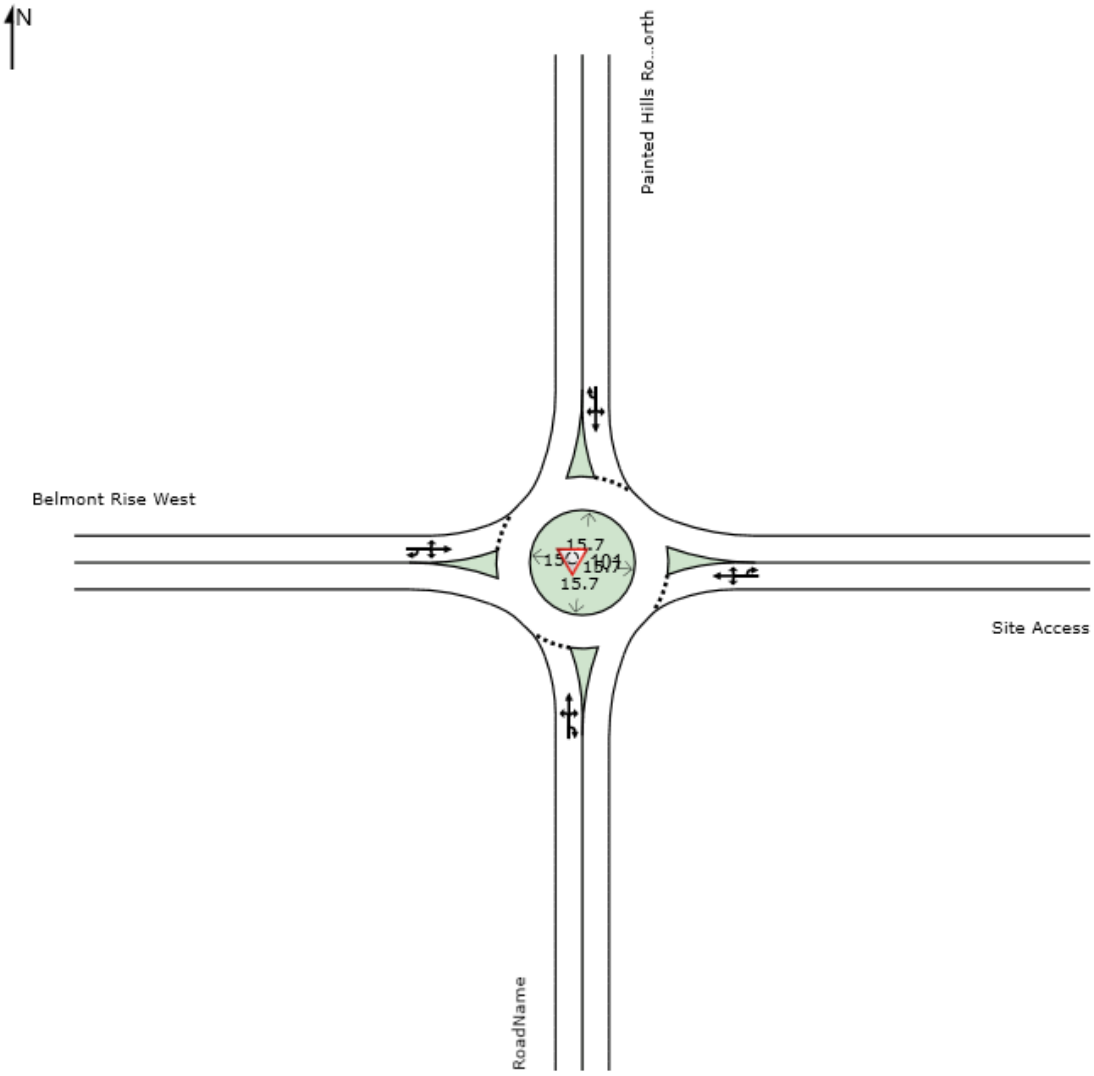
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101 [Painted Hills Rd / Belmont Rise (Option 2) - AM Fut (2031) (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Painted Hills Rd / Belmont Rise (Option 2) - AM Fut (2031) (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	48	0.0	51	0.0	0.425	3.7	LOS A	3.4	23.8	0.34	0.44	0.34	46.6
2	T1	446	0.0	469	0.0	0.425	3.5	LOS A	3.4	23.8	0.34	0.44	0.34	46.5
3	R2	18	0.0	19	0.0	0.425	7.6	LOS A	3.4	23.8	0.34	0.44	0.34	47.5
3u	U	35	0.0	37	0.0	0.425	10.6	LOS B	3.4	23.8	0.34	0.44	0.34	51.2
Approach		547	0.0	576	0.0	0.425	4.1	LOS A	3.4	23.8	0.34	0.44	0.34	46.9
East: Site Access														
4	L2	197	0.0	207	0.0	0.404	9.7	LOS A	2.9	20.3	0.86	0.91	0.90	43.5
5	T1	12	0.0	13	0.0	0.404	9.6	LOS A	2.9	20.3	0.86	0.91	0.90	44.3
6	R2	37	0.0	39	0.0	0.404	13.7	LOS B	2.9	20.3	0.86	0.91	0.90	42.4
6u	U	1	0.0	1	0.0	0.404	15.3	LOS B	2.9	20.3	0.86	0.91	0.90	44.8
Approach		247	0.0	260	0.0	0.404	10.3	LOS B	2.9	20.3	0.86	0.91	0.90	43.4
North: Painted Hills Road North														
7	L2	10	0.0	11	0.0	0.538	4.6	LOS A	4.5	31.4	0.56	0.54	0.56	44.5
8	T1	570	0.0	600	0.0	0.538	4.5	LOS A	4.5	31.4	0.56	0.54	0.56	45.6
9	R2	22	0.0	23	0.0	0.538	8.5	LOS A	4.5	31.4	0.56	0.54	0.56	45.6
9u	U	1	0.0	1	0.0	0.538	10.2	LOS B	4.5	31.4	0.56	0.54	0.56	44.5
Approach		603	0.0	635	0.0	0.538	4.6	LOS A	4.5	31.4	0.56	0.54	0.56	45.6
West: Belmont Rise West														
10	L2	36	0.0	38	0.0	0.199	6.6	LOS A	1.2	8.1	0.66	0.76	0.66	42.1
11	T1	3	0.0	3	0.0	0.199	6.4	LOS A	1.2	8.1	0.66	0.76	0.66	44.8
12	R2	117	0.0	123	0.0	0.199	10.5	LOS B	1.2	8.1	0.66	0.76	0.66	44.8
12u	U	1	0.0	1	0.0	0.199	12.1	LOS B	1.2	8.1	0.66	0.76	0.66	45.4
Approach		157	0.0	165	0.0	0.199	9.5	LOS A	1.2	8.1	0.66	0.76	0.66	44.3
All Vehicles		1554	0.0	1636	0.0	0.538	5.9	LOS A	4.5	31.4	0.54	0.59	0.55	45.4

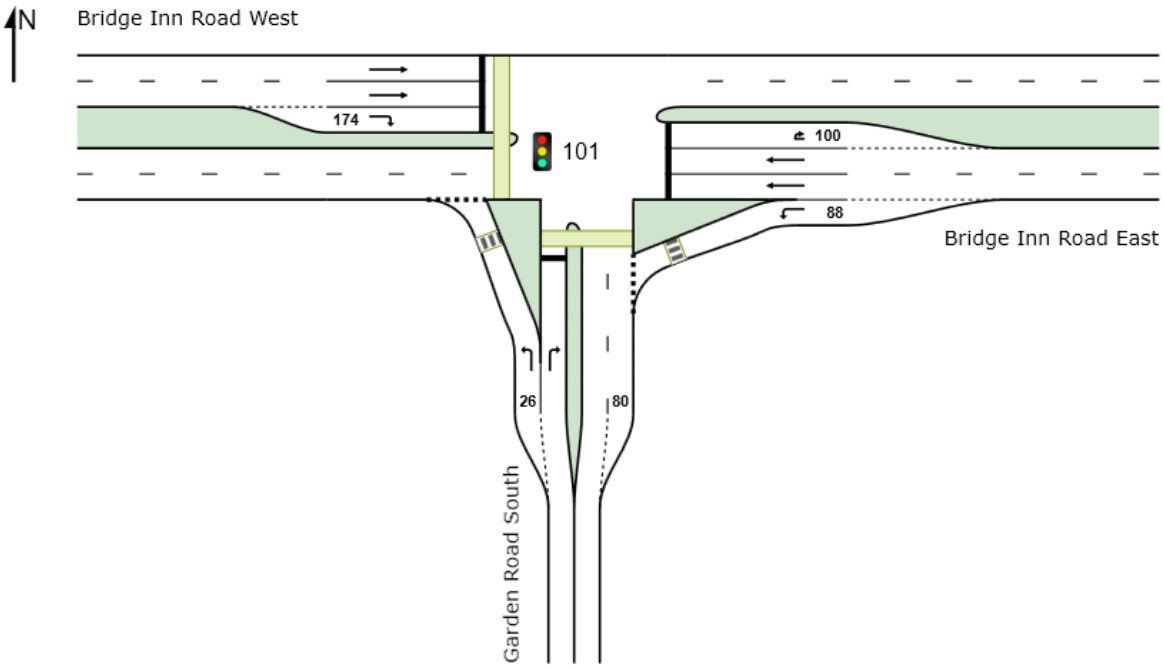
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101 [Garden Rd / Bridge Inn Rd (Option 2) - AM Fut (2031) (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



MOVEMENT SUMMARY

Site: 101 [Garden Rd / Bridge Inn Rd (Option 2) - AM Fut (2031) (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Garden Road South														
1	L2	255	0.0	268	0.0	0.256	8.3	LOS A	2.3	16.0	0.43	0.68	0.43	52.2
3	R2	73	5.0	77	5.0	* 0.286	31.4	LOS C	2.1	15.4	0.93	0.75	0.93	32.5
Approach		328	1.1	345	1.1	0.286	13.5	LOS B	2.3	16.0	0.54	0.69	0.54	47.8
East: Bridge Inn Road East														
4	L2	49	7.0	52	7.0	0.045	8.5	LOS A	0.4	2.7	0.36	0.63	0.36	48.6
5	T1	616	2.0	648	2.0	0.594	20.6	LOS C	8.4	60.1	0.91	0.77	0.91	39.1
6u	U	76	0.0	80	0.0	* 0.574	37.9	LOS D	2.5	17.6	1.00	0.80	1.09	17.0
Approach		741	2.1	780	2.1	0.594	21.6	LOS C	8.4	60.1	0.89	0.77	0.90	37.4
West: Bridge Inn Road West														
11	T1	1064	1.5	1120	1.5	* 0.644	14.0	LOS B	12.9	91.4	0.83	0.73	0.83	44.0
12	R2	285	0.0	300	0.0	0.606	27.0	LOS C	8.0	55.8	0.93	0.82	0.93	40.8
Approach		1349	1.2	1420	1.2	0.644	16.7	LOS B	12.9	91.4	0.85	0.75	0.85	43.0
All Vehicles		2418	1.5	2545	1.5	0.644	17.8	LOS B	12.9	91.4	0.82	0.75	0.82	42.1

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

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Garden Road South												
P1	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	188.9	213.9	1.13
West: Bridge Inn Road West												
P4	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	194.0	220.5	1.14
All Pedestrians		100	105	24.4	LOS C	0.1	0.1	0.90	0.90	191.4	217.2	1.13

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Garden Rd / Bridge Inn Rd (Option 2) - AM Fut (2031) (Site Folder: AM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

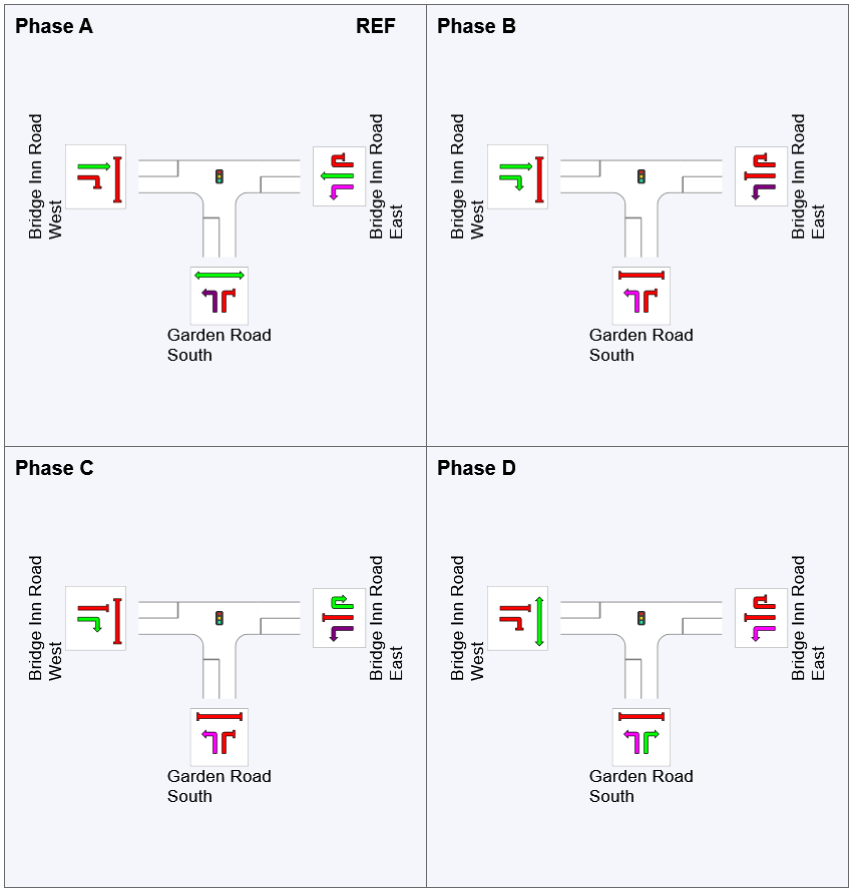
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	23	33	45
Green Time (sec)	17	4	6	9
Phase Time (sec)	23	10	12	15
Phase Split	38%	17%	20%	25%

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

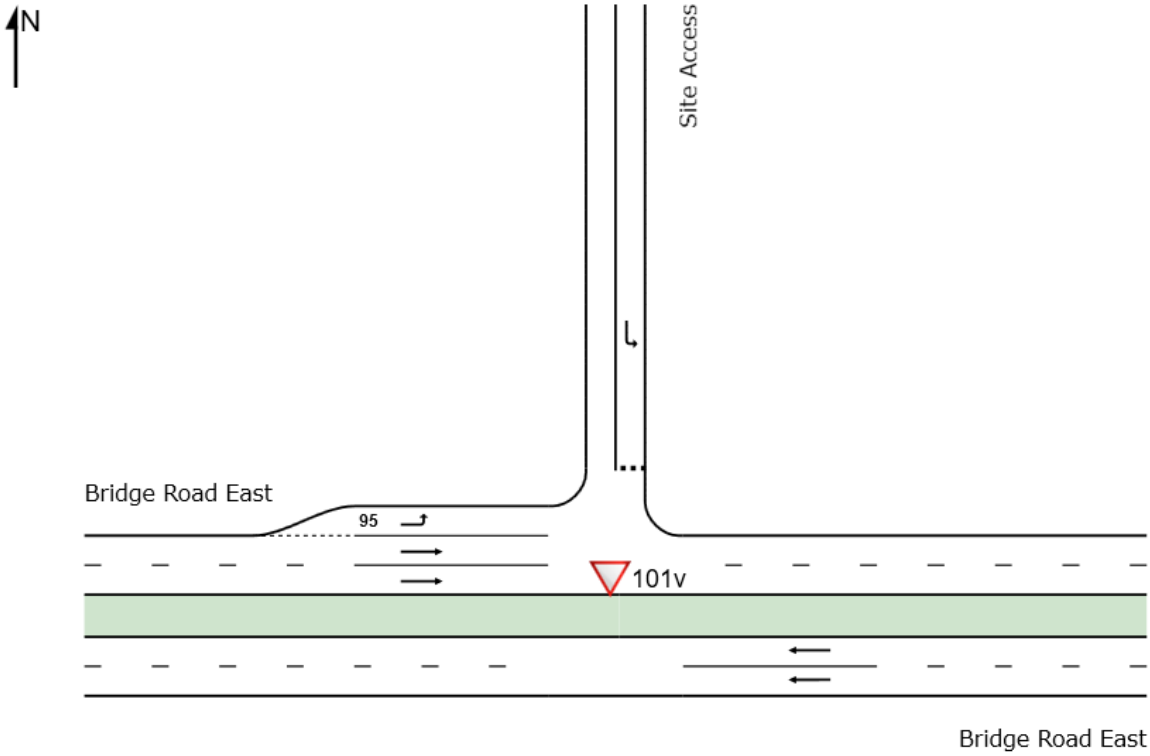


SITE LAYOUT

▽ Site: 101v [Bridge Inn Road / Subject Site (Option 2) - AM Fut (2031) (Site Folder: AM Future (2031))]

Site Category: (None)
Give-Way (Two-Way)

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



MOVEMENT SUMMARY

Site: 101v [Bridge Inn Road / Subject Site (Option 2) - AM Fut (2031) (Site Folder: AM Future (2031))]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bridge Road East														
5	T1	664	2.0	699	2.0	0.180	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		664	2.0	699	2.0	0.180	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.9
North: Site Access														
7	L2	105	0.0	111	0.0	0.166	9.3	LOS A	0.6	4.1	0.56	0.81	0.56	55.4
Approach		105	0.0	111	0.0	0.166	9.3	LOS A	0.6	4.1	0.56	0.81	0.56	55.4
West: Bridge Road East														
10	L2	59	0.0	62	0.0	0.033	6.2	LOS A	0.0	0.0	0.00	0.62	0.00	60.3
11	T1	1155	1.5	1216	1.5	0.312	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1214	1.4	1278	1.4	0.312	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.8
All Vehicles		1983	1.5	2087	1.5	0.312	0.7	NA	0.6	4.1	0.03	0.06	0.03	64.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

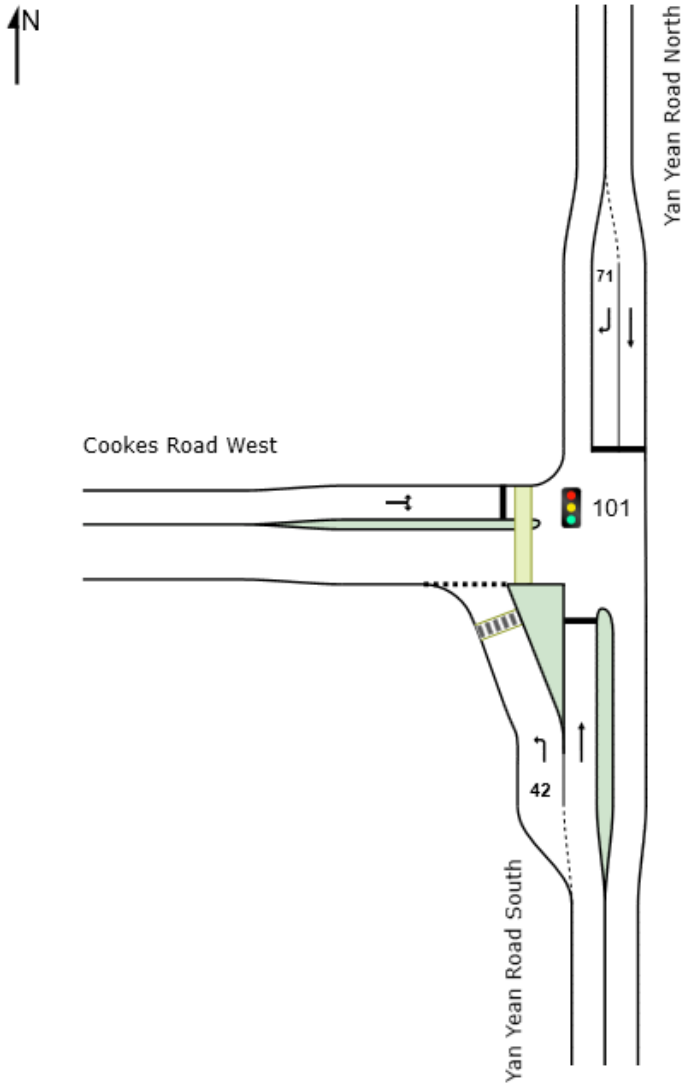
APPENDIX 5 SIDRA RESULTS – PM PEAK HOUR (2031)

SITE LAYOUT

Site: 101 [Cookes Rd / Yan Yean Rd - PM Fut (2031) - Filtered RT (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - PM Fut (2031) - Filtered RT (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Yan Yean Road South														
1	L2	319	1.6	336	1.6	0.307	8.4	LOS A	1.8	12.6	0.18	0.66	0.18	54.6
2	T1	978	2.3	1029	2.3	* 0.931	29.5	LOS C	42.8	305.3	0.51	0.63	0.71	48.6
Approach		1297	2.1	1365	2.1	0.931	24.3	LOS C	42.8	305.3	0.43	0.64	0.58	49.9
North: Yan Yean Road North														
8	T1	648	2.6	682	2.6	0.460	4.6	LOS A	12.6	90.4	0.38	0.35	0.38	72.6
9	R2	16	0.0	17	0.0	0.078	20.6	LOS C	0.5	3.2	0.51	0.70	0.51	45.3
Approach		664	2.5	699	2.5	0.460	5.0	LOS A	12.6	90.4	0.39	0.36	0.39	71.6
West: Cookes Road West														
10	L2	15	0.0	16	0.0	0.935	75.5	LOS E	14.1	99.2	1.00	1.09	1.53	26.5
12	R2	188	0.9	198	0.9	* 0.935	75.4	LOS E	14.1	99.2	1.00	1.09	1.53	26.5
Approach		203	0.8	214	0.8	0.935	75.4	LOS E	14.1	99.2	1.00	1.09	1.53	26.5
All Vehicles		2164	2.1	2278	2.1	0.935	23.2	LOS C	42.8	305.3	0.47	0.59	0.61	50.4

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

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
West: Cookes Road West												
P4	Full	50	53	49.3	LOS E	0.2	0.2	0.95	0.95	215.8	216.5	1.00
All Pedestrians		50	53	49.3	LOS E	0.2	0.2	0.95	0.95	215.8	216.5	1.00

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Cookes Rd / Yan Yean Rd - PM Fut (2031) - Filtered RT (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Optimum Cycle Time - Minimum Delay)

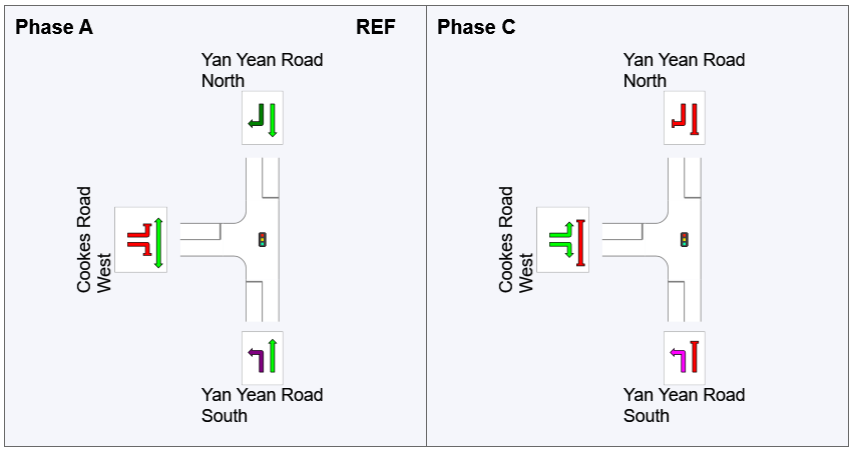
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn - Copy
Reference Phase: Phase A
Input Phase Sequence: A, C
Output Phase Sequence: A, C

Phase Timing Summary

Phase	A	C
Phase Change Time (sec)	0	91
Green Time (sec)	85	13
Phase Time (sec)	91	19
Phase Split	83%	17%

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

Output Phase Sequence

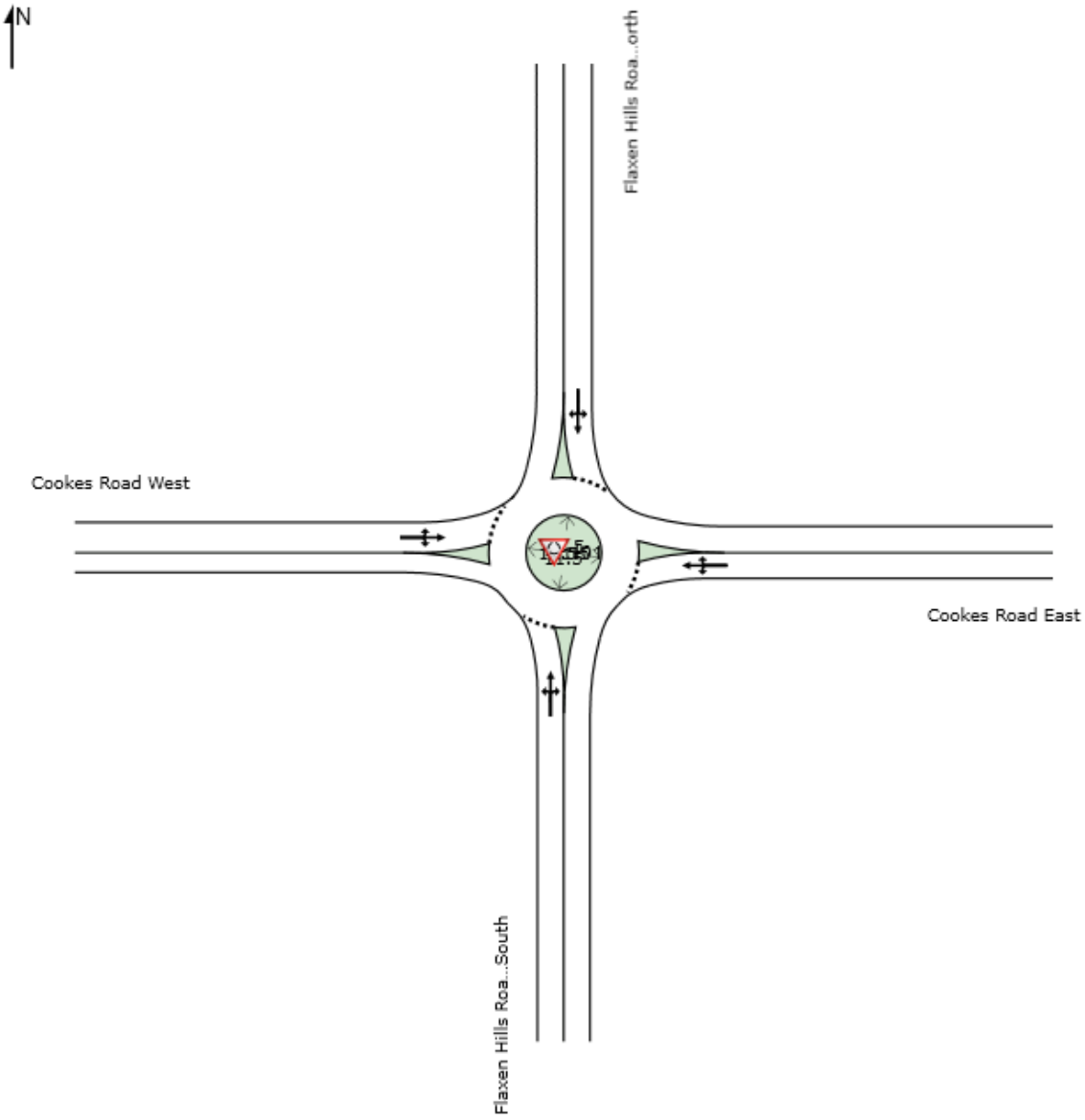


SITE LAYOUT

Site: 101 [Cookes Rd / Flaxen Hills Rd - PM Fut (2031) (Site Folder: PM Future (2031))]

Site Access
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Cookes Rd / Flaxen Hills Rd - PM Fut (2031) (Site Folder: PM Future (2031))]

Site Access
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flaxen Hills Road South														
1	L2	15	0.0	16	0.0	0.043	4.9	LOS A	0.2	1.5	0.43	0.59	0.43	45.3
2	T1	4	0.0	4	0.0	0.043	4.9	LOS A	0.2	1.5	0.43	0.59	0.43	46.1
3	R2	23	0.0	24	0.0	0.043	8.3	LOS A	0.2	1.5	0.43	0.59	0.43	46.0
Approach		42	0.0	44	0.0	0.043	6.8	LOS A	0.2	1.5	0.43	0.59	0.43	45.7
East: Cookes Road East														
4	L2	38	0.0	40	0.0	0.217	3.7	LOS A	1.3	9.0	0.21	0.54	0.21	45.6
5	T1	73	2.2	77	2.2	0.217	3.8	LOS A	1.3	9.0	0.21	0.54	0.21	46.4
6	R2	169	0.0	178	0.0	0.217	7.2	LOS A	1.3	9.0	0.21	0.54	0.21	46.3
Approach		280	0.6	295	0.6	0.217	5.9	LOS A	1.3	9.0	0.21	0.54	0.21	46.2
North: Flaxen Hills Road North														
7	L2	110	0.0	116	0.0	0.136	4.3	LOS A	0.7	4.9	0.35	0.54	0.35	46.1
8	T1	6	0.0	6	0.0	0.136	4.4	LOS A	0.7	4.9	0.35	0.54	0.35	47.0
9	R2	28	10.5	29	10.5	0.136	8.0	LOS A	0.7	4.9	0.35	0.54	0.35	46.7
Approach		144	2.0	152	2.0	0.136	5.1	LOS A	0.7	4.9	0.35	0.54	0.35	46.2
West: Cookes Road West														
10	L2	44	0.0	46	0.0	0.180	4.4	LOS A	0.9	6.0	0.36	0.51	0.36	46.1
11	T1	128	2.0	135	2.0	0.180	4.4	LOS A	0.9	6.0	0.36	0.51	0.36	46.9
12	R2	19	0.0	20	0.0	0.180	7.9	LOS A	0.9	6.0	0.36	0.51	0.36	46.8
Approach		191	1.3	201	1.3	0.180	4.8	LOS A	0.9	6.0	0.36	0.51	0.36	46.7
All Vehicles		657	1.1	692	1.1	0.217	5.4	LOS A	1.3	9.0	0.30	0.54	0.30	46.3

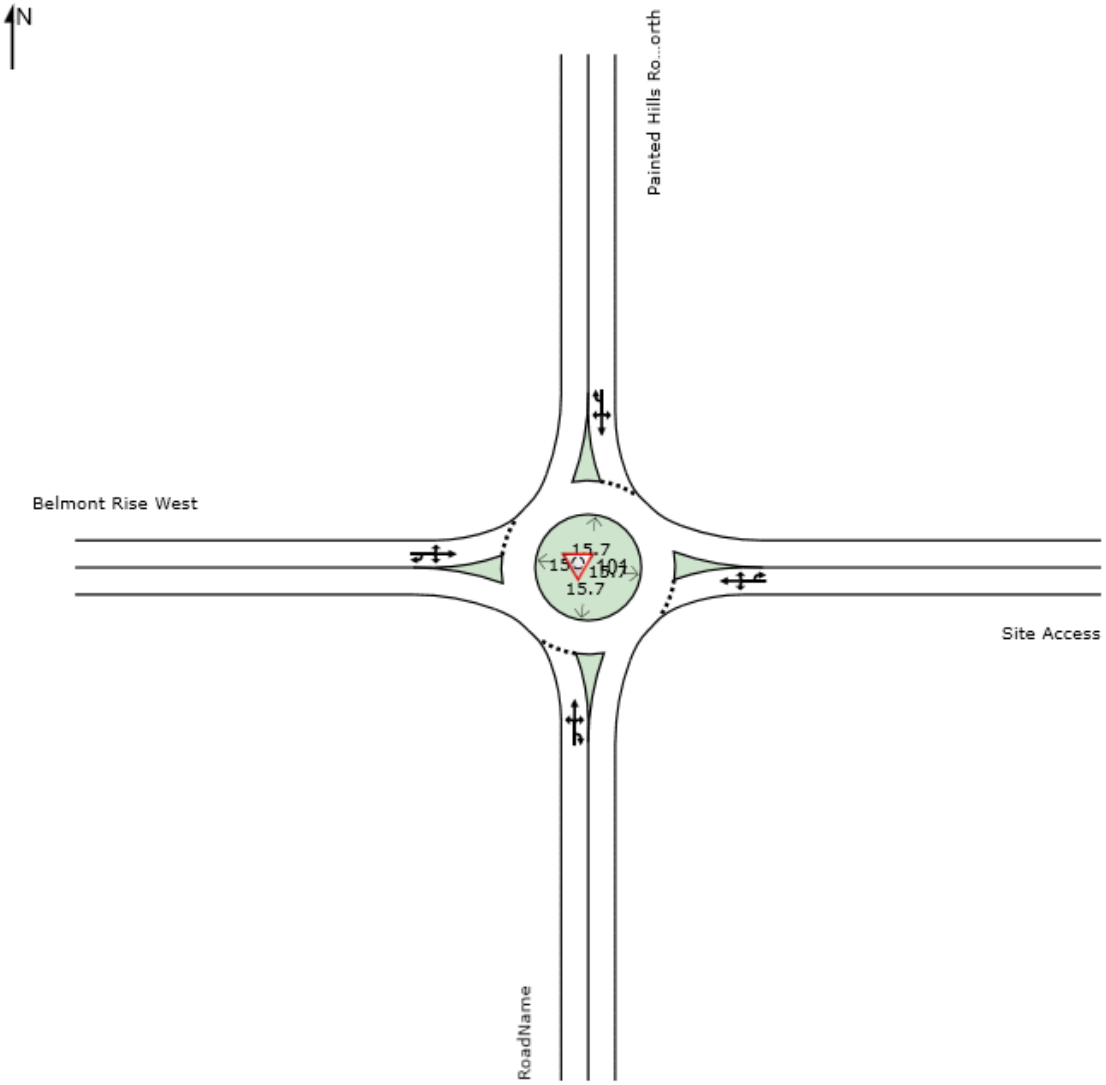
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101 [Painted Hills Rd / Belmont Rise (Option 2) - PM Fut (2031) (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Roundabout

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



MOVEMENT SUMMARY

Site: 101 [Painted Hills Rd / Belmont Rise (Option 2) - PM Fut (2031) (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	35	0.0	37	0.0	0.422	3.5	LOS A	3.2	22.6	0.26	0.44	0.26	46.6
2	T1	435	0.0	458	0.0	0.422	3.4	LOS A	3.2	22.6	0.26	0.44	0.26	46.6
3	R2	72	0.0	76	0.0	0.422	7.4	LOS A	3.2	22.6	0.26	0.44	0.26	47.5
3u	U	32	0.0	34	0.0	0.422	10.5	LOS B	3.2	22.6	0.26	0.44	0.26	51.2
Approach		574	0.0	604	0.0	0.422	4.3	LOS A	3.2	22.6	0.26	0.44	0.26	47.0
East: Site Access														
4	L2	100	0.0	105	0.0	0.174	7.0	LOS A	1.0	7.3	0.70	0.74	0.70	45.0
5	T1	6	0.0	6	0.0	0.174	6.9	LOS A	1.0	7.3	0.70	0.74	0.70	45.8
6	R2	18	0.0	19	0.0	0.174	10.9	LOS B	1.0	7.3	0.70	0.74	0.70	44.3
6u	U	1	0.0	1	0.0	0.174	12.6	LOS B	1.0	7.3	0.70	0.74	0.70	46.4
Approach		125	0.0	132	0.0	0.174	7.6	LOS A	1.0	7.3	0.70	0.74	0.70	44.9
North: Painted Hills Road North														
7	L2	35	0.0	37	0.0	0.472	4.8	LOS A	3.5	24.4	0.55	0.56	0.55	44.6
8	T1	443	0.7	466	0.7	0.472	4.6	LOS A	3.5	24.4	0.55	0.56	0.55	45.7
9	R2	24	0.0	25	0.0	0.472	8.7	LOS A	3.5	24.4	0.55	0.56	0.55	45.7
9u	U	1	0.0	1	0.0	0.472	10.3	LOS B	3.5	24.4	0.55	0.56	0.55	44.6
Approach		503	0.7	529	0.7	0.472	4.9	LOS A	3.5	24.4	0.55	0.56	0.55	45.6
West: Belmont Rise West														
10	L2	34	0.0	36	0.0	0.176	6.7	LOS A	1.0	7.1	0.65	0.75	0.65	42.2
11	T1	12	0.0	13	0.0	0.176	6.6	LOS A	1.0	7.1	0.65	0.75	0.65	44.9
12	R2	91	0.0	96	0.0	0.176	10.6	LOS B	1.0	7.1	0.65	0.75	0.65	44.9
12u	U	1	0.0	1	0.0	0.176	12.2	LOS B	1.0	7.1	0.65	0.75	0.65	45.5
Approach		138	0.0	145	0.0	0.176	9.3	LOS A	1.0	7.1	0.65	0.75	0.65	44.4
All Vehicles		1340	0.2	1411	0.2	0.472	5.3	LOS A	3.5	24.4	0.45	0.54	0.45	46.0

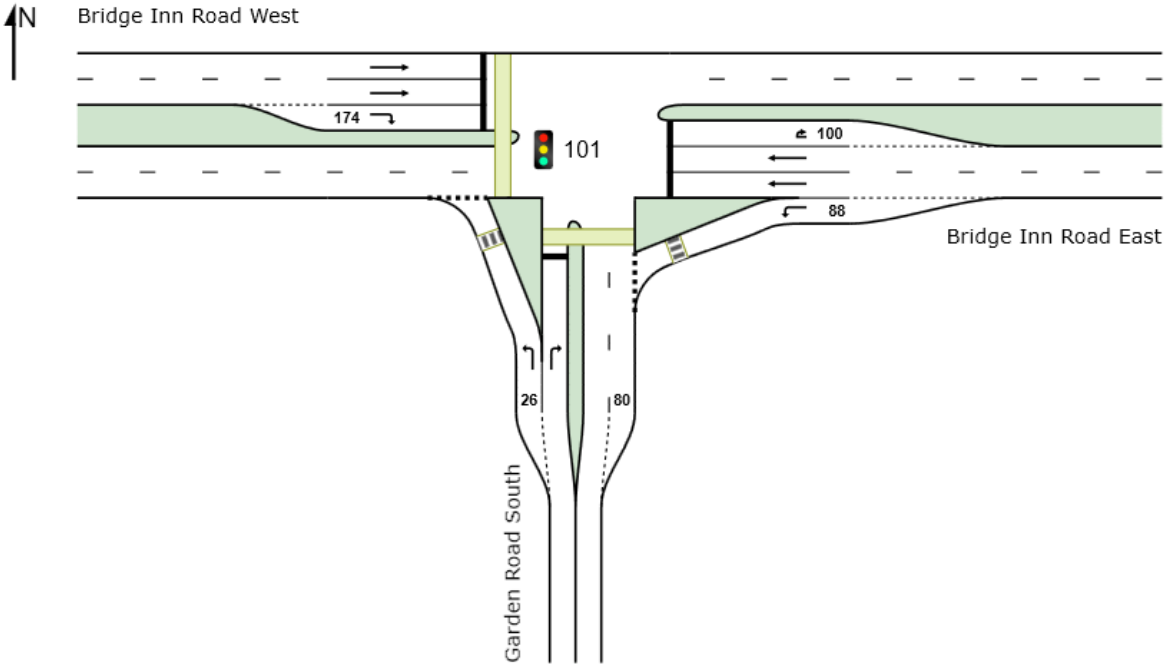
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

SITE LAYOUT

Site: 101 [Garden Rd / Bridge Inn Rd (Option 2) - PM Fut (2031) (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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



MOVEMENT SUMMARY

Site: 101 [Garden Rd / Bridge Inn Rd (Option 2) - PM Fut (2031) (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Garden Road South														
1	L2	415	1.7	437	1.7	0.455	9.3	LOS A	4.9	34.9	0.54	0.72	0.54	51.4
3	R2	104	4.4	109	4.4	* 0.405	32.0	LOS C	3.1	22.4	0.95	0.77	0.95	32.3
Approach		519	2.2	546	2.2	0.455	13.9	LOS B	4.9	34.9	0.62	0.73	0.62	47.6
East: Bridge Inn Road East														
4	L2	124	2.8	131	2.8	0.099	7.3	LOS A	0.7	5.1	0.30	0.63	0.30	49.7
5	T1	724	2.5	762	2.5	0.542	16.5	LOS B	9.0	64.4	0.84	0.72	0.84	42.0
6u	U	155	0.0	163	0.0	* 0.639	33.7	LOS C	4.9	34.0	0.97	0.84	1.07	18.4
Approach		1003	2.2	1056	2.2	0.639	18.0	LOS B	9.0	64.4	0.80	0.73	0.81	39.3
West: Bridge Inn Road West														
11	T1	816	2.9	859	2.9	* 0.612	17.1	LOS B	10.5	75.3	0.87	0.75	0.87	41.6
12	R2	144	0.0	152	0.0	0.445	30.2	LOS C	4.1	29.0	0.93	0.79	0.93	39.4
Approach		960	2.4	1011	2.4	0.612	19.0	LOS B	10.5	75.3	0.88	0.76	0.88	41.1
All Vehicles		2482	2.3	2613	2.3	0.639	17.5	LOS B	10.5	75.3	0.79	0.74	0.80	42.0

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

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Garden Road South												
P1	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	188.9	213.9	1.13
West: Bridge Inn Road West												
P4	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	194.0	220.5	1.14
All Pedestrians		100	105	24.4	LOS C	0.1	0.1	0.90	0.90	191.4	217.2	1.13

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [Garden Rd / Bridge Inn Rd (Option 2) - PM Fut (2031) (Site Folder: PM Future (2031))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

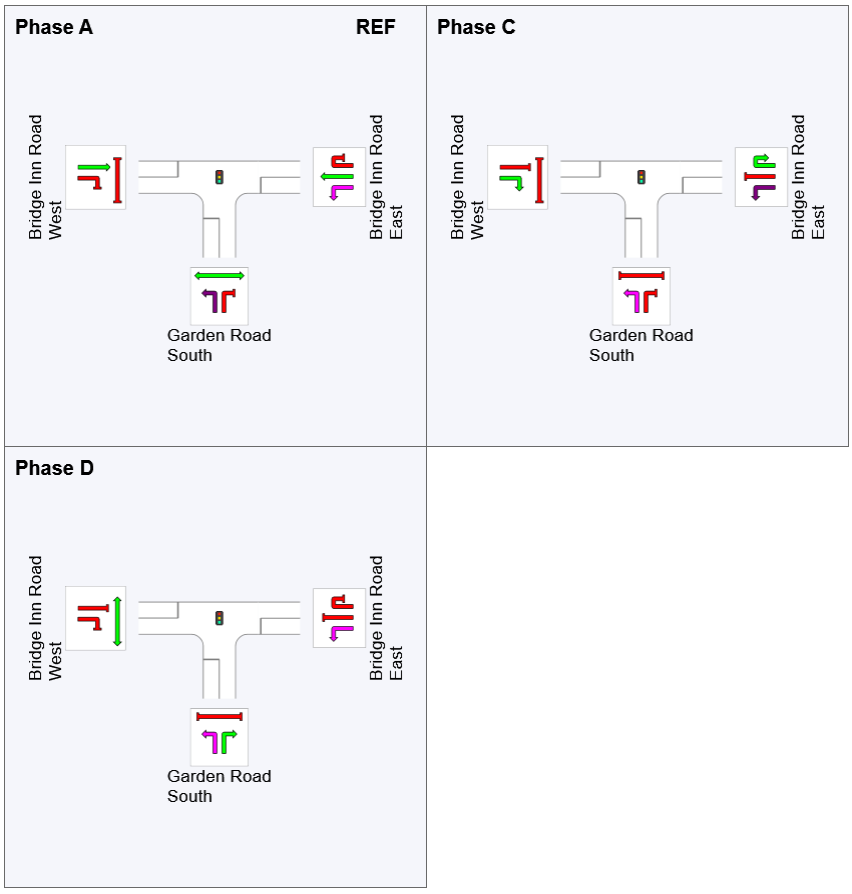
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn (phase reduction applied)
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, C, D

Phase Timing Summary

Phase	A	C	D
Phase Change Time (sec)	0	28	45
Green Time (sec)	22	11	9
Phase Time (sec)	28	17	15
Phase Split	47%	28%	25%

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

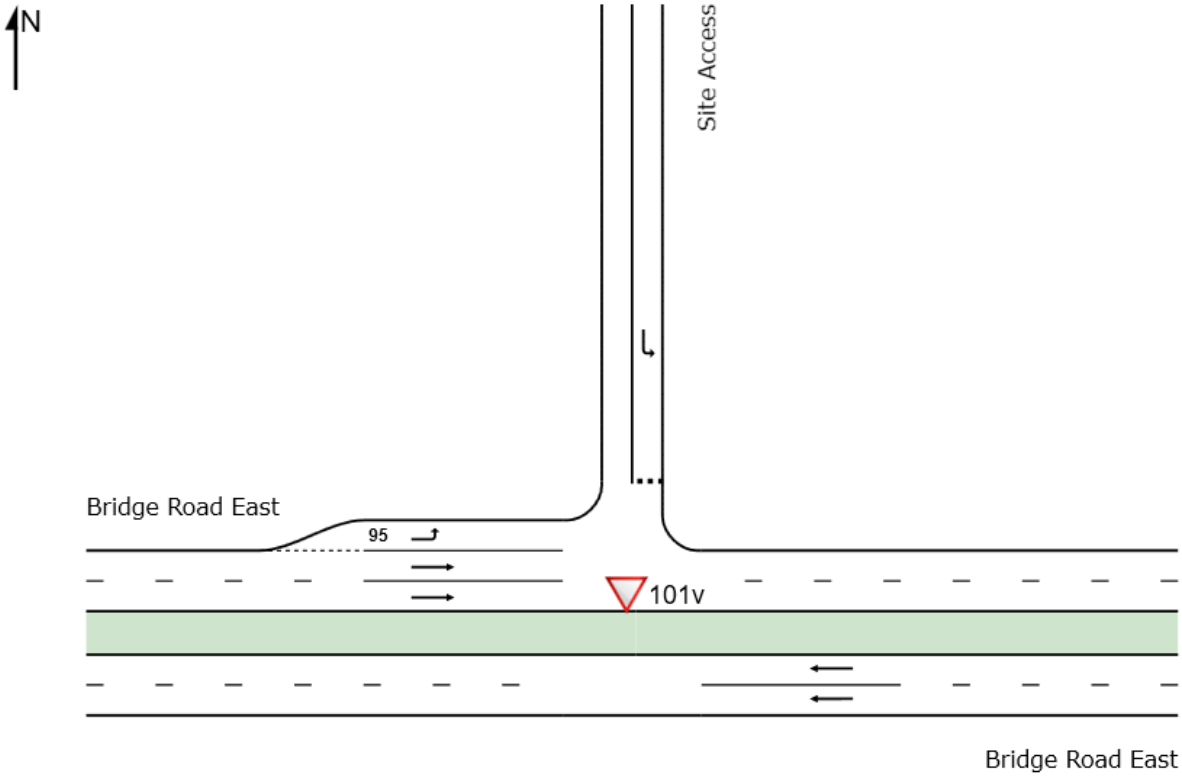


SITE LAYOUT

Site: 101v [Bridge Inn Road / Subject Site (Option 2) - PM Fut (2031) (Site Folder: PM Future (2031))]

Site Category: (None)
Give-Way (Two-Way)

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



MOVEMENT SUMMARY

Site: 101v [Bridge Inn Road / Subject Site (Option 2) - PM Fut (2031) (Site Folder: PM Future (2031))]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Bridge Road East														
5	T1	848	2.5	893	2.5	0.230	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		848	2.5	893	2.5	0.230	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.9
North: Site Access														
7	L2	53	0.0	56	0.0	0.067	7.7	LOS A	0.2	1.6	0.45	0.68	0.45	56.7
Approach		53	0.0	56	0.0	0.067	7.7	LOS A	0.2	1.6	0.45	0.68	0.45	56.7
West: Bridge Road East														
10	L2	234	0.0	246	0.0	0.131	6.2	LOS A	0.0	0.0	0.00	0.62	0.00	60.3
11	T1	841	2.9	885	2.9	0.229	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1075	2.3	1132	2.3	0.229	1.4	NA	0.0	0.0	0.00	0.14	0.00	60.0
All Vehicles		1976	2.3	2080	2.3	0.230	1.0	NA	0.2	1.6	0.01	0.09	0.01	66.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX 6 CONCEPT LAYOUT PLAN – BRIDGE INN ROAD ACCESS

BY: egan.cook
DATE: 04/08/22 13:51:31

FILE: Y:\2020\20033I - Bridge Inn & Cookes Rd, Doreen\04 Design\DGN\02 Sketches\SALT-20033-SK-001.dgn

PROPOSED COLLECTOR ROAD

PROPOSED KERB AND CHANNEL (TYP)

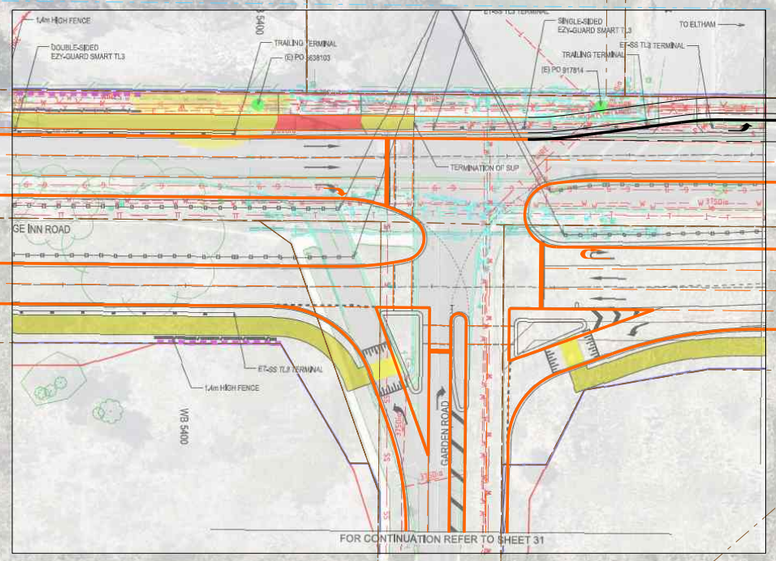
20.0

PROPOSED SHARED USER PATH (TYP)

PROPOSED PAVEMENT MARKING (TYP)

PROPOSED FOOTPATH

INDICATIVE ULTIMATE ROAD ALIGNMENT
BASED ON MRPV BRIDGE INN ROAD DUPLICATION
DRAWING No. RG01-2019
(SHOWN IN ORANGE)



MRPV BRIDGE INN ROAD DUPLICATION
DRAWING No. RG01-2019

BRIDGE INN ROAD

GARDEN ROAD

HICA

MERNDA 2A DEVELOPMENT PLAN

BRIDGE INN RD AND GARDEN RD, DOREEN

CONCEPT LAYOUT PLAN

LEFT TURN DECEL LANE ACCESS

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0 5 10 20
SCALE: 1:1000 @ A3

MELWAY MAP REF
391 F11

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EC / JW	08.04.2022	A3
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