

transport ● engineering ● placemaking



Providence Lifestyle Pty Ltd

Transport Impact Assessment

Lot 500, Gavour Road, Wattle Grove

June 2025

Project Code: 08187



Version Control and Approval

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Contents

I	Introduction	I
1.1	Executive Summary of TIA	1
1.2	Background	1
1.3	Purpose of a Transport Impact Assessment	1
1.4	Current Development Proposal	2
1.5	Prior Traffic Report November 2018: Proposed Retirement Villages and Aged Care Facility Development Lot 500 (32) Gavour Road, Wattle Grove – Revised Transport Impact Statement	3
1.6	Land Use Planning Policy Context	3
2	Existing Situation	5
2.1	Existing Site Context and Land Uses	5
2.2	Existing Road Network	5
2.3	Existing RAV Network	7
2.4	Existing Key Intersections	8
2.5	Existing Traffic Volumes	8
2.6	Existing Road Network - Traffic Modelling	10
2.7	Existing Active Travel Network	11
2.8	Existing Public Transport Provision	11
2.9	Crash Assessment	12
3	Proposed Development (Internal Transport Network).....	13
3.1	Proposed Residential Development	13
3.2	Vehicle Access Arrangements	13
3.3	Proposed Internal Transport Networks	13
3.4	Roads & Intersection Controls	14
3.5	Pedestrian and Cycle/Wheeling Access	15
3.6	Public Transport Provision Within the Development	15
3.7	DCP 5.1 – Regional Roads (Vehicular Access)	15
4	Changes to the External Transport Network.....	17
4.1	Changes to Road Network	17
4.2	Changes to Active Transport Network	17

4.3	Changes to Public Transport Network	17
5	Integration with Surrounding Area	18
5.1	Surrounding Attractors / Generators	18
5.2	Proposed Changes to Surrounding Land Uses	18
5.3	Level of Overall Accessibility and Integration	19
6	Analysis of Internal Transport Networks	20
6.1	Development Scale	20
6.2	Development Traffic Generation	20
6.3	Non-Development Traffic (Through Traffic)	20
6.4	Development Design Traffic Flows and Distribution	20
6.5	Access to Frontage Properties	21
6.6	Pedestrian / Cycle Networks	21
6.7	Safe Walk / Cycle to School Assessment	21
6.8	Access to Public Transport	21
7	Analysis of External Transport Networks – Assessment Parameters	22
7.1	Assessment Years	22
7.2	Assessment Time Periods	22
7.3	2031 ‘Opening Year’ Assumptions	22
7.4	2041 ‘Design Year Horizon’ Assumptions	22
7.5	Proposed Development - Traffic Scenarios for Assessment	22
7.6	Proposed Development Vehicular Traffic Assignment	23
8	Analysis of External Transport Networks – Intersection Assessments	24
8.1	Introduction	24
8.2	Extent of Intersection Analysis – Scenarios	24
8.3	Impact on Intersections	24
8.4	ROM24 Traffic Model Assumptions (Background Traffic)	24
8.5	New Access Road / Welshpool Road Intersection	25
8.6	Assessment Results – Scenario One – 2031 Opening Year	25
8.7	Assessment Results – Scenario Two – 2041 Design Year Horizon	26
8.8	Summary of Road Network Performance	26



9	Safety Issues	27
9.1	Existing Safety Issues	27
9.2	Impact of the Development on Safety Issues	27
10	Conclusions	28
10.1	Overall Integration with Surrounding Attractors / Generators	28
10.2	Road Network Accessibility	28
10.3	Pedestrian and Cycle/Wheeled Accessibility	28
10.4	Public Transport Accessibility	29
10.5	Road Safety Considerations	29
10.6	Analysis of the External Transport Network	29
Table 1-1:	Development Scale	3
Table 1-2:	Prior TIA Report Summary	3
Table 2-1:	RAV Categories Characteristics	7
Table 2-2:	AM Peak 2024 Base - SIDRA Results	11
Table 2-3:	PM Peak 2024 Base - SIDRA Results	11
Table 2-4:	Weekend Peak 2024 Base - SIDRA Results	11
Table 2-5:	Bus frequency	12
Table 3-1:	Development Scale	13
Table 3-2:	Liveable Streets Road Specifications	14
Table 5-1:	Traffic Volumes Affecting Pedestrian Crossing Amenity (WAPC)	19
Table 6-1:	Development Scale	20
Table 6-2:	Residential Trip Generation	20
Table 6-3:	Traffic Volumes Affecting Pedestrian Crossing Amenity (WAPC)	21
Table 8-1:	Welshpool Road East ROM24 Background Traffic	24
Table 8-2:	AM Peak 2031 Development - SIDRA Results	25
Table 8-3:	PM Peak 2031 Development - SIDRA Results	25
Table 8-4:	Weekend Peak 2031 Development - SIDRA Results	25
Table 8-5:	AM Peak 2041 Development - SIDRA Results	26
Table 8-6:	PM Peak 2041 Development - SIDRA Results	26
Table 8-7:	Weekend Peak 2041 Development - SIDRA Results	26

Figure 1-1:	Site Location	1
Figure 1-2:	WAPC Land Use / Transport Planning Process	2
Figure 1-3:	Level of Transport Impact Assessment Required	2
Figure 1-4:	Concept Development Plan – Lot 500, Gavour Road, Wattle Grove	3
Figure 1-5:	Local Planning Scheme No.3 (LPS3) Site Context	4
Figure 2-1:	Site Location	5
Figure 2-2:	Road Hierarchy	6
Figure 2-3:	Speed Limits	6
Figure 2-4:	Existing RAV Network	7
Figure 2-5:	Existing Key Intersections within a 2km Radius	8
Figure 2-6:	AM Peak Volumes	9
Figure 2-7:	PM Peak Volumes	9
Figure 2-8:	Weekend Peak Volumes	9
Figure 2-9:	Welshpool Road East / Crystal Brook Road (western intersection)	10
Figure 2-10:	Welshpool Road East / Crystal Brook Road (eastern intersection)	10
Figure 2-11:	Bus Network within Study Area	12
Figure 2-12:	Recorded Crash Extract (01/01/2019 – 31/12/2023)	12
Figure 3-1:	Proposed Road Hierarchy	13
Figure 3-2:	Proposed Road Hierarchy	14
Figure 3-3:	Austroads Figure 3.25 Excerpt	14
Figure 3-4:	AUL Treatment Layout	15
Figure 4-1:	Kelvin, Hale and Welshpool Roads: Tonkin Highway Corridor Upgrades - Artist Impression	17
Figure 5-1:	Existing Surrounding Land Uses	18
Figure 5-2:	Local Planning Scheme No.3 (LPS3) Site Context	18
Figure 7-1:	Development Traffic Distribution	23
Figure 8-1:	New Access Road / Welshpool Road East Modelled Layout	25

Appendix A	TIA Checklist	31
Appendix B	Proposed Development Site Layout	33
Appendix C	SIDRA Intersection Assessment Results	35

I Introduction

I.1 Executive Summary of TIA

In accordance with Western Australian Planning Commission (WAPC) 'Guidelines for Transport Impact Assessment (TIA) Guidelines', this report sets out the details of the proposed lifestyle and residential development set within currently vacant land at Lot 500 Gavour Road in Wattle Grove, Western Australia.

The site is set within an existing 'Special Use' zone intended for development as an Integrated Aged Care Facility. Development is also guided by a Local Development Plan.

This TIA addresses the key transport issues and impacts related to the development of the site including the current level of accessibility by walking, wheeling, public transport and road. This report sets recommendations to explore the potential for improving these to a suitable level where required and appropriate.

The key recommendations and considerations as a result of this TIA process are listed as follows:

- **Proposed access to Welshpool Road East:**

The proposed vehicular access from the development onto Welshpool Road East provides immediate access for the development to a key distributor road. The traffic modelling assessment completed as part of this TIA details the proposed intersection operating effectively and below capacity through to 2041 with minimal impact and delays on Welshpool Road East. The key consideration for the new connection is ensuring the design adheres to the Austroads guidelines and designed safely due to the introduced potential conflict points.

This TIA has been prepared with sufficient detail and analysis to support the staged development based on the assessment of the ultimate development (a total eight stages), the public open space and the network of high and lower order roads throughout the site.

This TIA also acknowledges the future proposed modifications to the surrounding transport networks including Local and State Government projects and initiatives such as:

- **Kelvin, Hale and Welshpool Roads: Tonkin Highway Corridor:**

Planned upgrades are proposed along the Tonkin Highway corridor between Hale Road and Welshpool Road. The improvements include widening the corridor to a six-lane dual carriageway as well as planned interchanges.

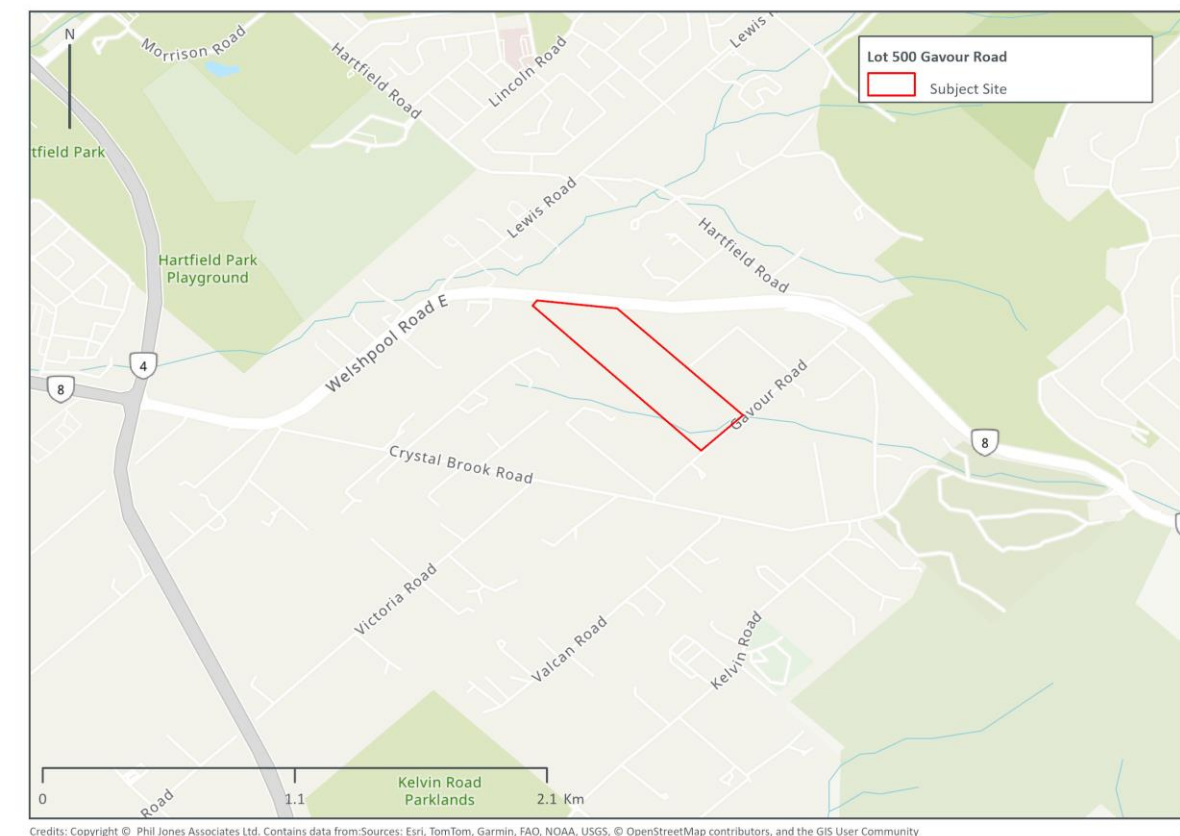
This TIA ultimately demonstrates that the existing road network and planned future road network upgrades are capable of satisfactorily supporting the additional vehicular traffic expected to be generated by the proposed full eight stages of development for a 2031 "opening year", and then the 2041 design horizon for ultimate development.

I.2 Background

PJA Australia has been commissioned by Providence Lifestyle Pty Ltd to prepare this Transport Impact Assessment (TIA) for the proposed lifestyle and residential development set within vacant land at Lot 500 Gavour Road in Wattle Grove, Western Australia.

The location of the development site in relation to the wider Wattle Grove and Forrestfield area and the immediate surrounding road network is shown in **Figure 1-1**.

Figure 1-1: Site Location

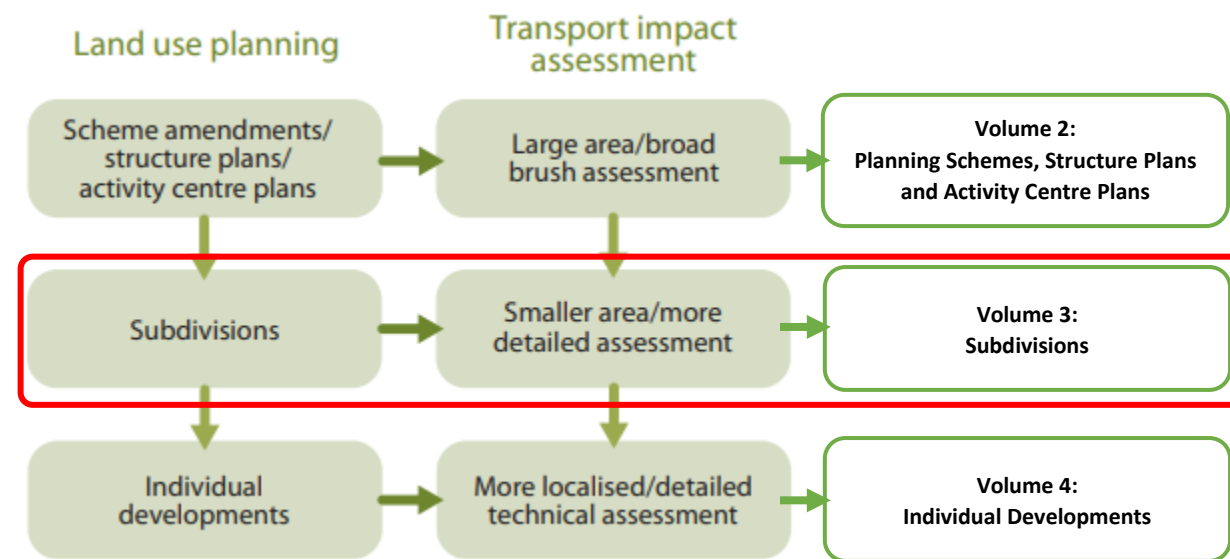


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I.3 Purpose of a Transport Impact Assessment

The planning system in Western Australia stipulates that all developments go through a process of planning stages to ensure that the statutory planning is consistent with the strategic planning. A more detailed assessment of the transport networks for developments is required within the land use planning stages. The WAPC guidelines for a TIA shows the level of detail required at each stage as shown in **Figure 1-2**. **Even though the development is across a single site and an individual development, the development within the site has been considered to be best assessed as a subdivision.**

Figure 1-2: WAPC Land Use / Transport Planning Process



Source: Western Australian Planning Commission (WAPC)

The proposed development is at the development planning stage meaning a smaller area/more detailed transport assessment is required. As shown in the figure above, WAPC have a series of volumes specific to each planning stage. As outlined in the WAPC guidelines, the development application assessment is the second stage of the land use/transport impact process. It provides more detail over a smaller area compared to the structure plan, for both the land use and transport proposals.

The intent of this TIA is to:

- Demonstrate that the proposal is consistent with the overall Special Use zoning and amended Local Development Plan.
- Provide a greater level of detail on the development and its more immediate surrounds.
- Provide details of any transport planning issues specific to the development not covered in the Special Use zoning or Local Development Plan..

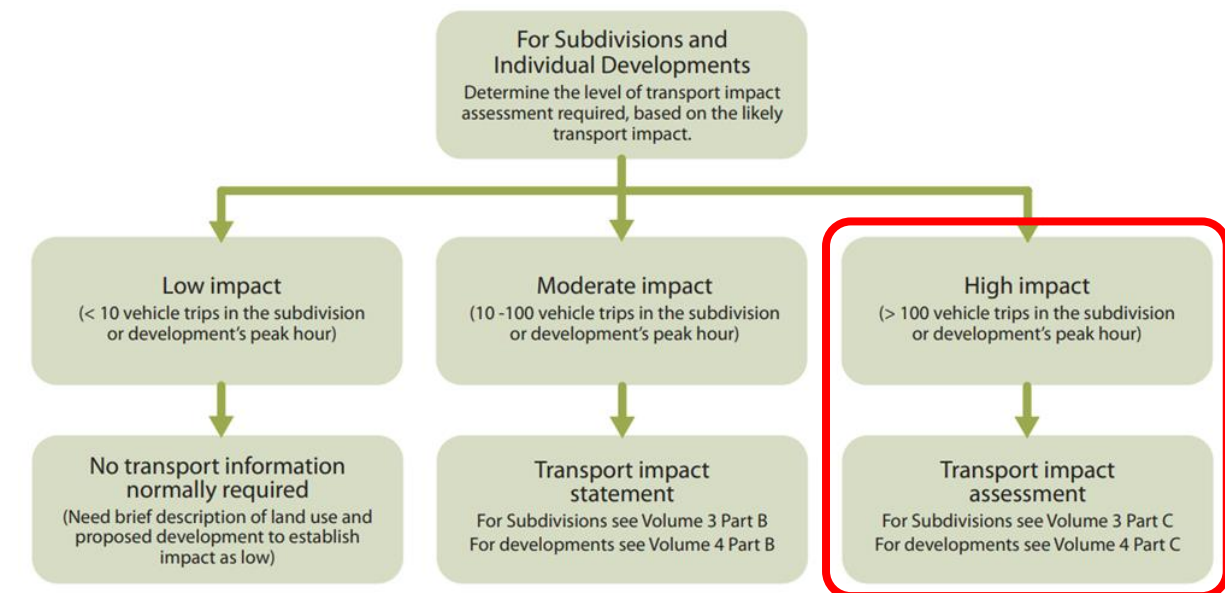
The key components of a TIA for a this development are essentially the same as those for a structure plan, namely to:

- Assess the proposed internal transport networks with respect to accessibility, circulation, safety and priority for all modes, i.e. vehicles, public transport, pedestrians and cyclists.
- Assess the level of transport integration between the development area and the surrounding land uses.
- Determine the impacts of the traffic generated by the development on the surrounding land uses.
- Determine the impacts of the traffic generated by the development on the surrounding transport networks.

The assessment will, however, provide greater detail at a more localised level.

To determine the level of detail and content required, the impact of a development is separated into three groups, dependent upon the forecast vehicle trips generated by the proposed development as shown in **Figure 1-3**.

Figure 1-3: Level of Transport Impact Assessment Required



Source: Western Australian Planning Commission (WAPC)

It is noted that while the development is anticipated to generate less than 100 trips in both the AM and PM peaks, as detailed in **Section 6**, a TIA is still required due to the proposed new access with Welshpool Road East.

1.4 Current Development Proposal

The proposed ultimate development (Stages 1-8) land area is currently vacant and does not currently generate traffic onto the existing road network in its own right.

This TIA report undertakes an analysis of the impact of the currently proposed development scale, specifically the impact of the generated traffic on the immediate and surrounding road network. The proposed yields included in this development are as follows:

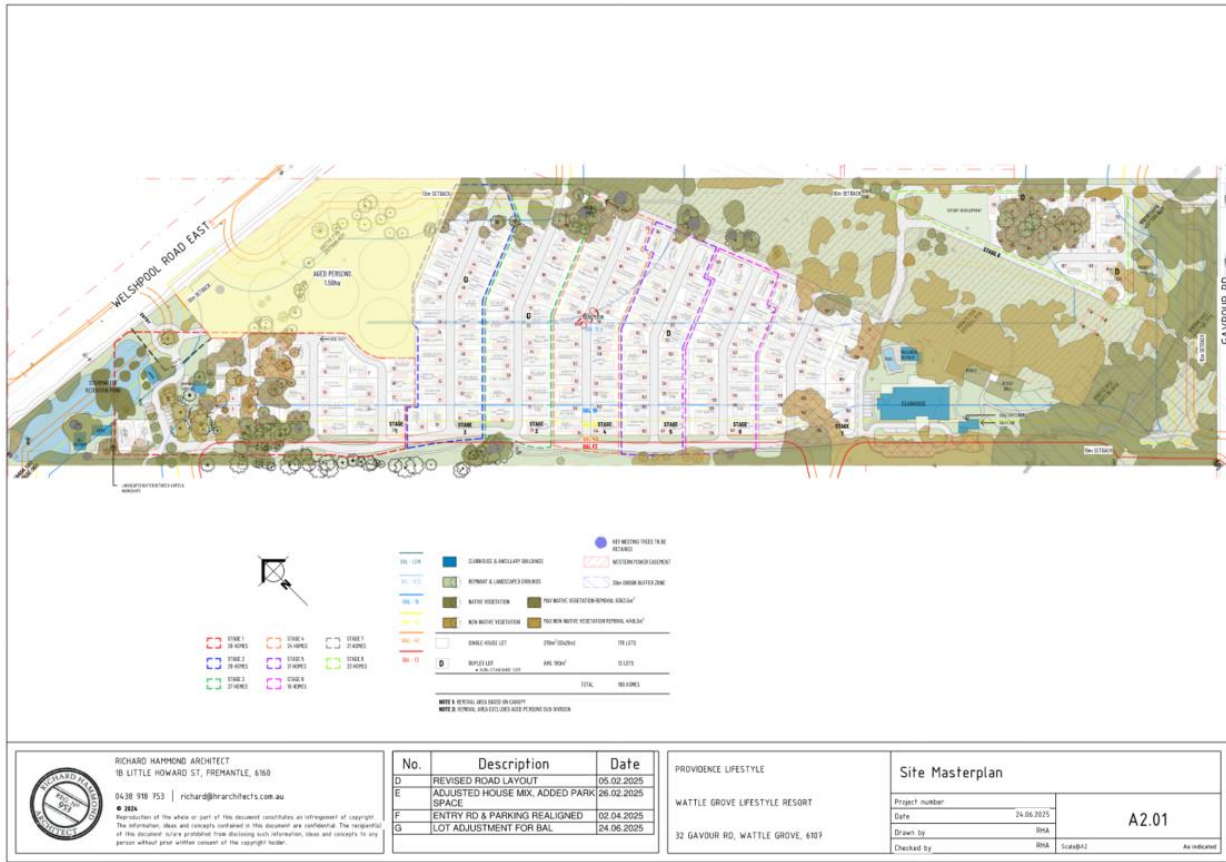


Table 1-1: Development Scale

Development Type		Development Scale
Aged Care Facility		1.503 Ha – 140 beds
Residential Stage Total	1	Residential dwellings (houses) x 28
	2	Residential dwellings (houses) x 28
	3	Residential dwellings (houses) x 27
	4	Residential dwellings (houses) x 24
	5	Residential dwellings (houses) x 21
	6	Residential dwellings (houses) x 18
	7	Residential dwellings (houses) x 21
	8	Residential dwellings (houses) x 23
Total		Residential dwellings (houses) x 190

It should be noted that the Aged Care is NOT proposed as part of the current application has been considered for the remained of the assessment in this report for the purposes of assessing impact on surrounding roads etc at full development scale of the site.

Figure 1-4: Concept Development Plan – Lot 500, Gavour Road, Wattle Grove



Source: Richard Hammond Architect (24.06.25)

1.5 Prior Traffic Report November 2018: Proposed Retirement Villages and Aged Care Facility Development Lot 500 (32) Gavour Road, Wattle Grove – Revised Transport Impact Statement

A traffic report was prepared by others in November 2018 to support the site’s Local Development Plan (LDP). This 2018 traffic report will be referred to as the ‘prior TIA’ in this report. As part of the prior TIA, an assessment of the development generated traffic had been undertaken for the LDP. A summary of the key outcomes of the prior TIA are shown Table 1-2.

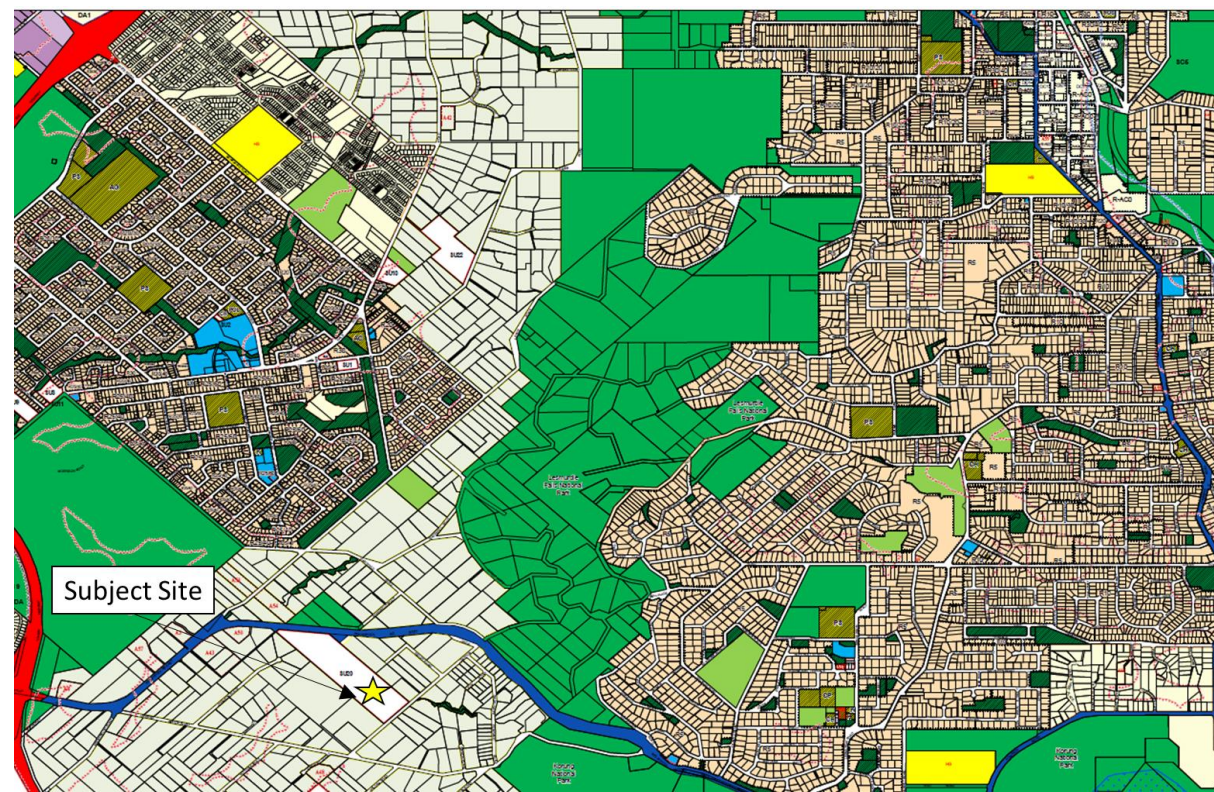
Table 1-2: Prior TIA Report Summary

Criteria	Description (LSP area)
Land Use and Yields	190 independent living units 140 bed residential aged care facility
Proposed Active Travel Network	‘Due to the nature and location of the proposed development the walking and cycling mode share is expected to be minimal and therefore provision of a shared path along Welshpool Road East fronting the proposed development is not justified. However in order to provide a safe and convenient path to the existing bus stop about 200m east of the proposed development it is suggested that the provision of such a footpath should be investigated during the Development Application stage of this project.’
Estimated Trip Generation	‘Accordingly, it is estimated that the proposed development would generate about 620 daily vehicle trips, with approximately 88 and 100 trips during the AM and PM peak hour periods respectively. These trips include both inbound and outbound vehicle movements. It is anticipated that most of the vehicle types would be passenger cars and 4WDs with commercial vehicles representing a significantly smaller proportion of trips’
Assessed Intersection Performance	‘The traffic analysis undertaken in this report shows that the traffic generation of the proposed development is relatively low and as such would not have any significant impact on the surrounding road network. The proposed crossover intersection on Welshpool Road East will operate satisfactory without any impact on Welshpool Road East traffic. - A SIDRA network model was created to analyse the capacity of the proposed Welshpool Road East crossover. SIDRA results indicate the proposed crossover will work satisfactorily and well within capacity with level of services A to C and with minimal queues and delays.

1.6 Land Use Planning Policy Context

The site falls withing the City of Kalamunda Local Planning Scheme No.3 (LPS3) – Forrestfield Locality. The site is presently zoned 'Special Use' under Local Planning Scheme No. 3 (LPS3) and has an approved Local Development Plan to guide development, refer Figure 1-5.

Figure 1-5: Local Planning Scheme No.3 (LPS3) Site Context



LOCAL SCHEME ZONES

Centre	Residential Bushland
Centre : DC1	Rural Agriculture
Commercial	Rural Composite
District Centre	Rural Conservation
General Industry	Rural Landscape Interest
Industrial Development	Service Station
Light Industry	Special Rural
Mixed Use	Special Use
Private Clubs and Institutions	Urban Development
Residential	

Source: City of Kalamunda - Local Planning Scheme No.3 (LPS3)

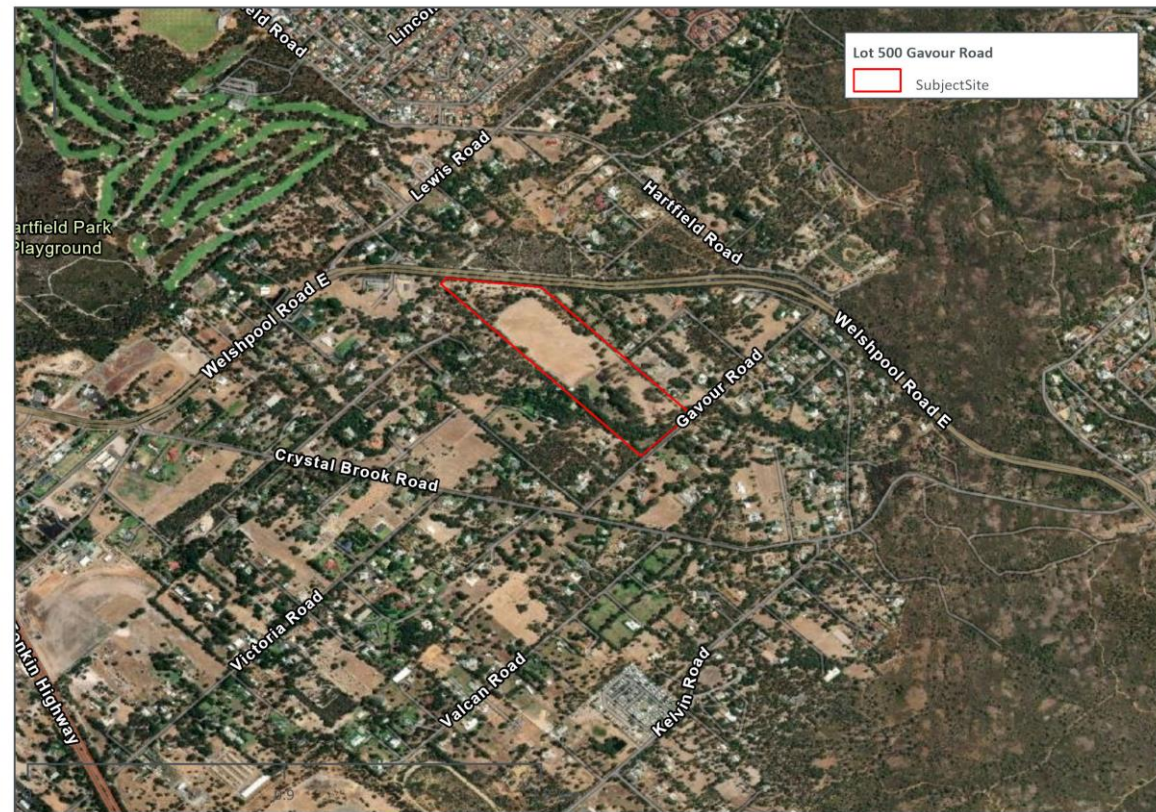
The surrounding land uses are shown as, 'Special Rural' and an 'Other Regional Road' reservation representing Welshpool Road East on the northern boundary.

2 Existing Situation

2.1 Existing Site Context and Land Uses

The proposed development area is a greenfield site, located approximately 15km east of Perth. Welshpool Road East bounds the northern section of the site with Gavour Road at the south-east. The site is currently surrounded low density Special Rural properties, as per **Figure 2-1**. The current site has a single residential dwelling and large outbuildings and open space.

Figure 2-1: Site Location



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2.2 Existing Road Network

Welshpool Road East

Welshpool Road East provides an east-west connection between Lesmurdie and Perth. Welshpool Road East is classified as a 'Distributor A' road in the Main Roads Functional Road Hierarchy and also connects to other key distributors; Tonkin Highway, Roe Highway and Leach Highway. A road reservation of 40m is provided. In addition to being managed by the City of Kalamunda, Welshpool Road East is also classified as a 'Other Regional Road' (ORR) per the Department of Planning Lands and Heritage (DPLH) (Plan Number: SP 694/6, dated August 2023) and therefore under Western Australia Planning

Commission (WAPC) control. The ORR classification is set as 'Category 2' which outlines: 'Frontage access may be allowed subject to approval'.

Welshpool Road East currently carries approximately 1,600 vehicles (two-way) in the peak hour, or approximately 16,000 vehicles per day.

Crystal Brook Road

Crystal Brook Road is classified as an 'Access Road' to the west and 'Distributor B' to the east of Kelvin Road in the MRWA Functional Road Hierarchy. Crystal Brook Road is an east-west orientated road connecting to Welshpool Road East at both ends and is subject to a 70km/h posted speed limit. A road reservation of 20m is provided. Crystal Brook Road is managed by the City of Kalamunda.

Crystal Brook Road currently carries approximately 500 vehicles (two-way) in the peak hour, or approximately 5,000 vehicles per day.

Gavour Road

Gavour Road is classified as an 'Access Road' in the MRWA Functional Road Hierarchy. Gavour Road is a north-south orientated road connecting to Crystal Brook Road and is subject to a default 50km/h in the absence of posted speed limit signs. A road reservation of 20m is provided. Gavour Road is managed by the City of Kalamunda.

Figure 2-2: Road Hierarchy

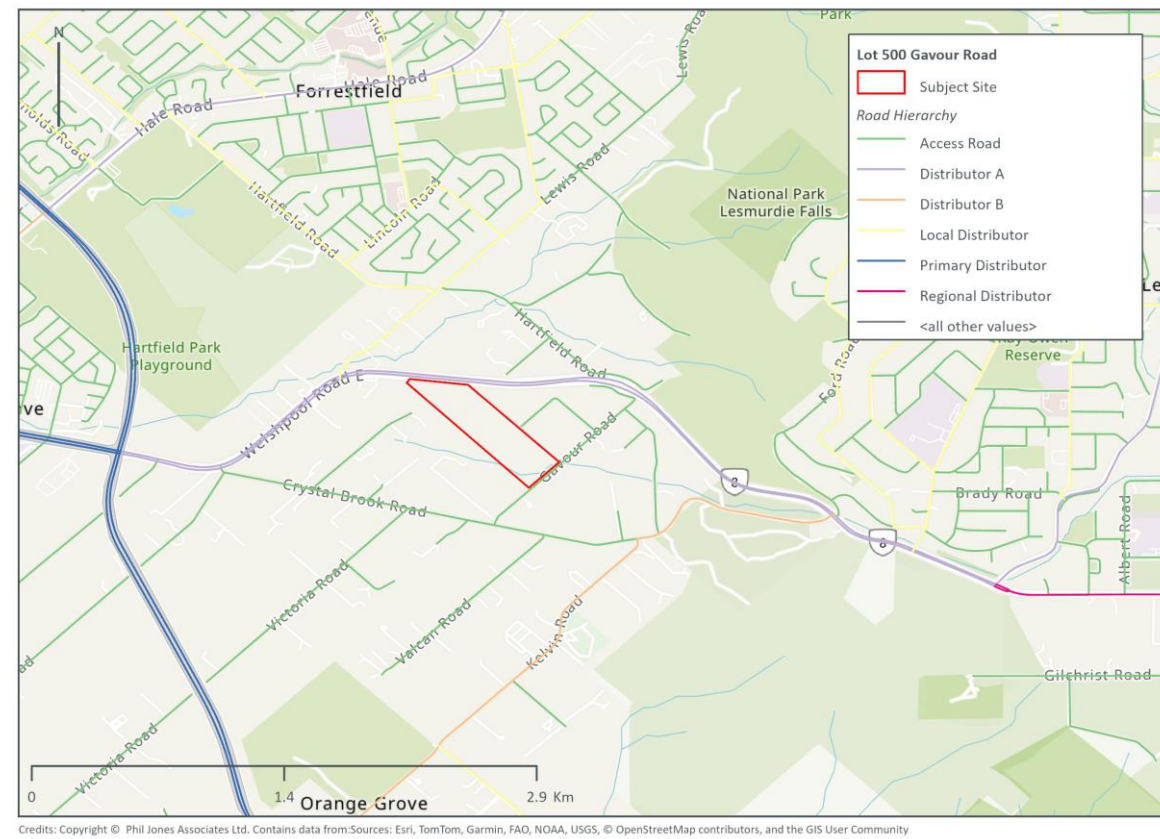
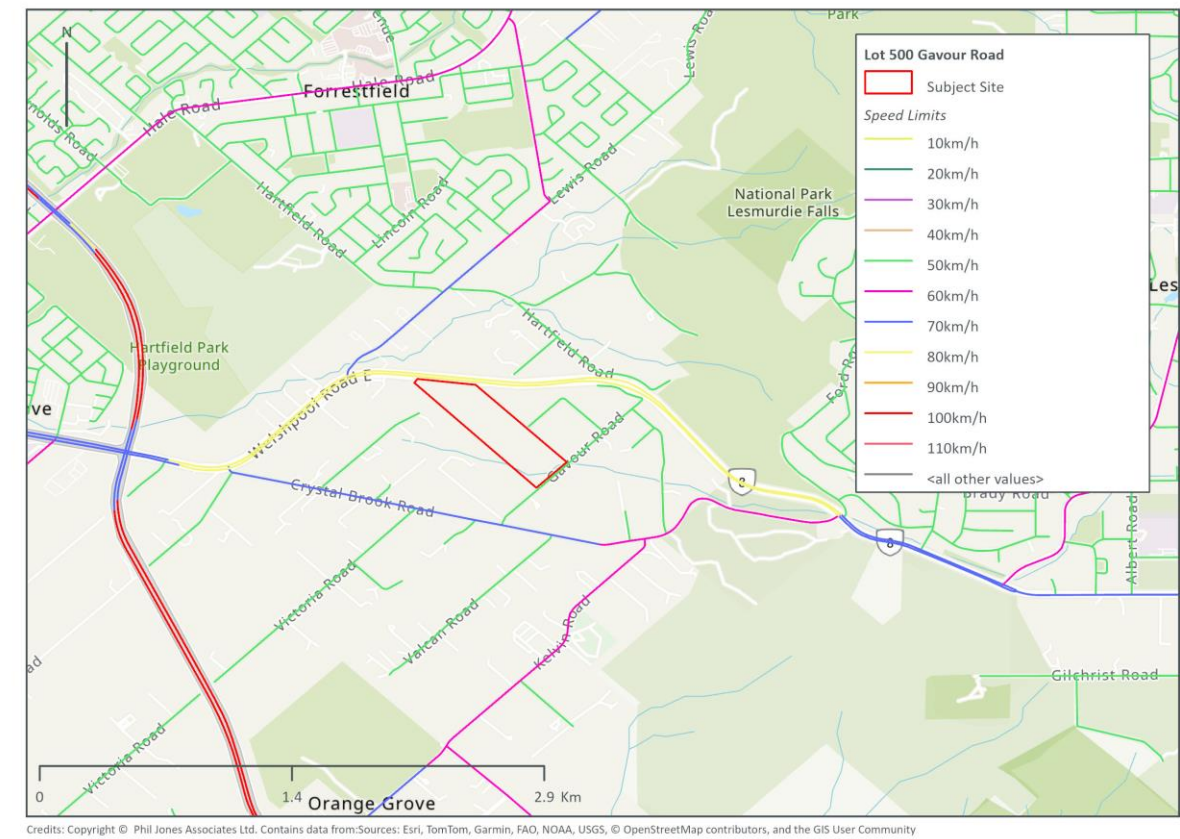


Figure 2-3: Speed Limits





2.3 Existing RAV Network

A description of the Restricted Access Vehicle (RAV) categories as per Main Roads WA (MRWA) Heavy Vehicle Services (HVS) Tandem Drive Prime Mover Combinations (November 2024) is provided in **Table 2-1**.

Table 2-1: RAV Categories Characteristics

RAV Category	Sub-Categories and Vehicle Types	Max. Length	Max. Mass
1	A. Prime Mover, Semi-Trailer & Pig Trailer or Dolly B. Prime Mover & Semi-Trailer C. Short B-Double	A. 20m B. 19m C. 20m	A. 50t B. 48.5t C. 50t
2	A. Prime Mover, Semi-Trailer & Pig Trailer or Dolly B. Prime Mover & Semi-Trailer C. B-Double D. Short B-Triple E. Car Carrier	A. 27.5m B. 20m C. 27.5m D. 27.5m E. 25m	A. 66.5t B. 48.5t C. 68.5t D. 88.5t E. 48.5t
3	A. A-Double	A. 27.5m	A. 85t
4	A. A-Double	A. 27.5m	A. 88.5t
5	A. A-Double B. A-Double towing a Dolly C. B-Double towing a Dolly D. B-Triple	A. 36.5m B. 27.5m + Dolly C. 27.5m + Dolly D. 36.5m	A. 85t B. 85t + Dolly C. 68.5t + Dolly D. 85t
6	A. A-Double B. B-Triple C. A-Double towing a Dolly	A. 36.5m B. 36.5m C. 27.5m + Dolly	A. 88.5t B. 88.5t C. 88.5t + Dolly
7	A. AB-Triple B. BA-Triple	A. 36.5m B. 36.5m	A. 50t B. 48.5t

The existing restrictions for heavy vehicle combinations with context to the site and its surrounds is shown in **Figure 2-4**.

Figure 2-4: Existing RAV Network



Source: Main Roads WA RAV Mapping Tool

The RAV network on the roads surrounding the site under the Accredited Mass Management Scheme (AMMS) are categorised as RAV 4.3 on Welshpool Road East between Tonkin Highway and Canning Road, permitting Tandem Drive Network 4 vehicles with a concessional mass Level 3, RAV 4.1 on Brentwood Road, permitting Tandem Drive Network 4 vehicles with a concessional mass Level 1 and RAV 7.3 on Tonkin Highway and Welshpool Road East (west of Tonkin Highway), permitting Tandem Drive Network 7 vehicles with a concessional mass Level 3.

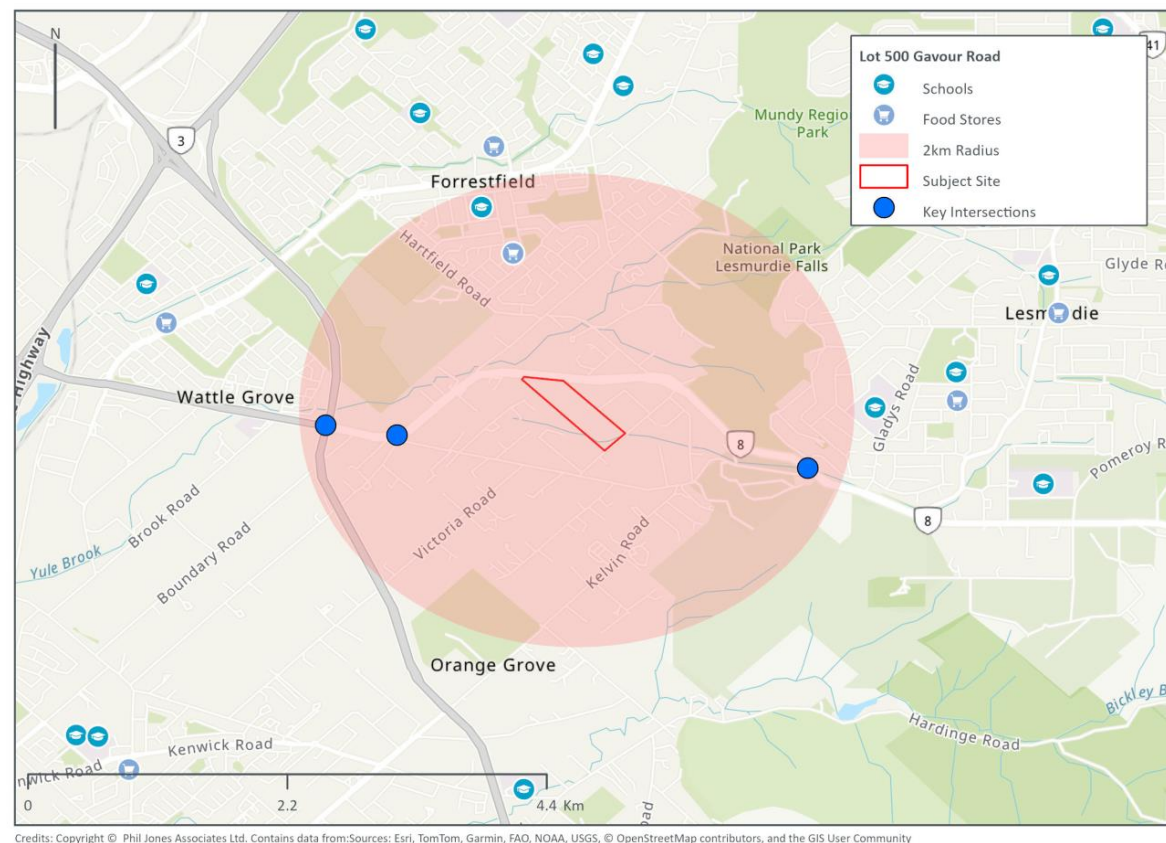
The RAV 4.3 network on Welshpool Road East, fronting the site, permits tandem drive prime mover combinations up to 27.5m in total length and 100t in combined gross vehicle mass.

2.4 Existing Key Intersections

The following key intersections, providing access to the wider road network, are located within a 2.0km radius of the site:

- Tonkin Highway / Welshpool Road East intersection – signalised
- Welshpool Road East / Crystal Brook Road western intersection – Stop controlled
- Welshpool Road East / Crystal Brook Road eastern intersection – Give Way controlled.

Figure 2-5: Existing Key Intersections within a 2km Radius



2.5 Existing Traffic Volumes

The traffic generated from the proposed development (as detailed in Section 6) is not envisaged to impact the Tonkin Highway / Welshpool Road East intersection provided the scale and volume which the intersection currently accommodates. Moreover, the access and impact to Welshpool Road East from the Stop/Give-Way controlled intersections is considered and assessed in this assessment. As such, the traffic surveys were conducted on the Welshpool Road East / Crystal Brook Road eastern and western intersections as well as the Welshpool Road East U-turn manoeuvre north of the site, as per the following:

- Welshpool Road East / Crystal Brook Road western intersection:
 - Thursday 28 November 2024: AM peak (7:00am – 9:00am) and PM peak (3:00pm – 5:00pm)
 - Sunday 1 December 2024: Sunday peak (10:00am – 12:00pm)
- Welshpool Road East / Crystal Brook Road eastern intersection
 - Tuesday 26 November 2024: AM peak (7:00am – 9:00am) and PM peak (3:00pm – 5:00pm)
 - Sunday 24 November 2024: Sunday peak (10:00am – 12:00pm)
- Welshpool Road East U-turn
 - Tuesday 26 November 2024: AM peak (7:00am – 9:00am) and PM peak (3:00pm – 5:00pm)
 - Sunday 24 November 2024: Sunday peak (10:00am – 12:00pm).

It is noted that the Welshpool Road East / Crystal Brook Road western intersection was surveyed on different dates due to a stolen survey camera.

The resultant AM peak, PM peak and Weekend peak traffic volumes are presented in Figures 2-7 to 2-8.



Figure 2-6: AM Peak Volumes

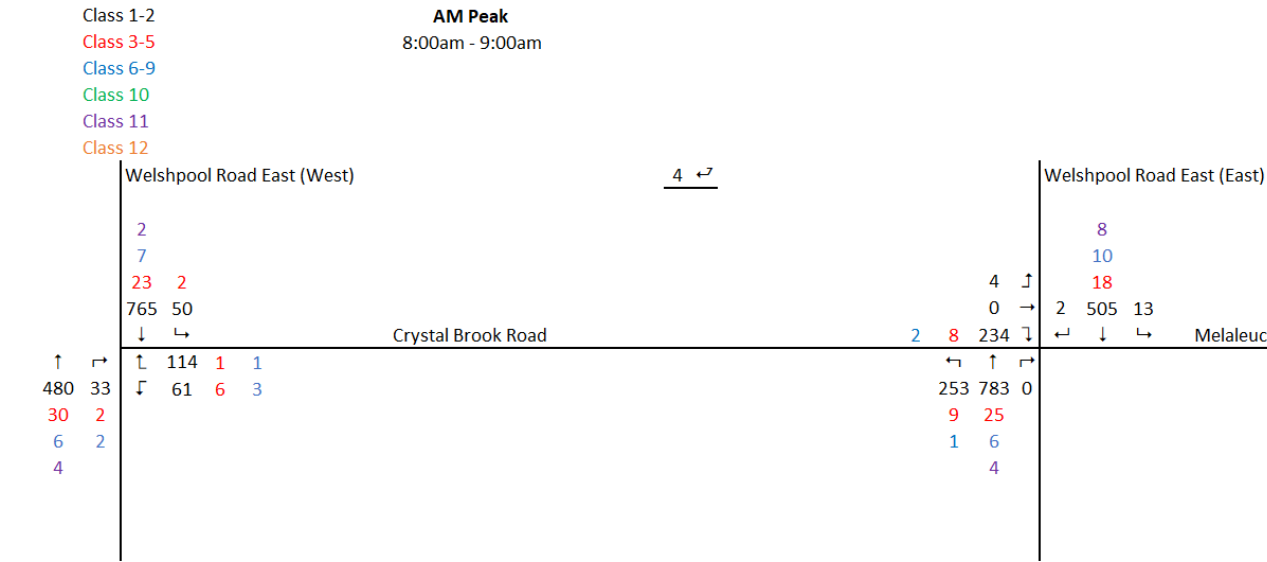


Figure 2-8: Weekend Peak Volumes

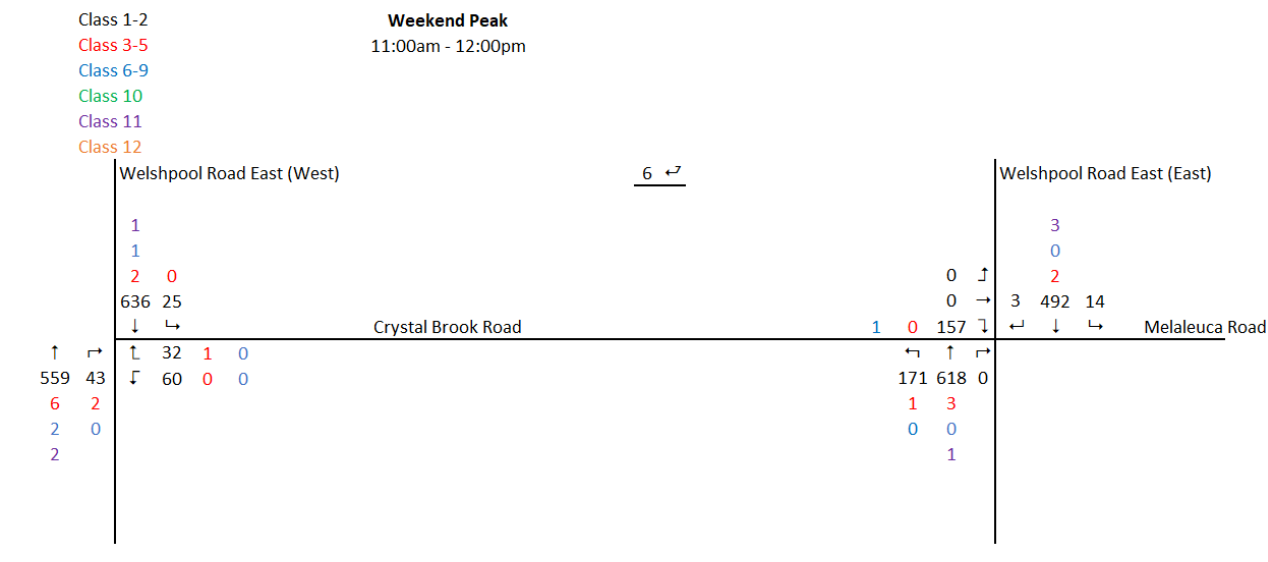
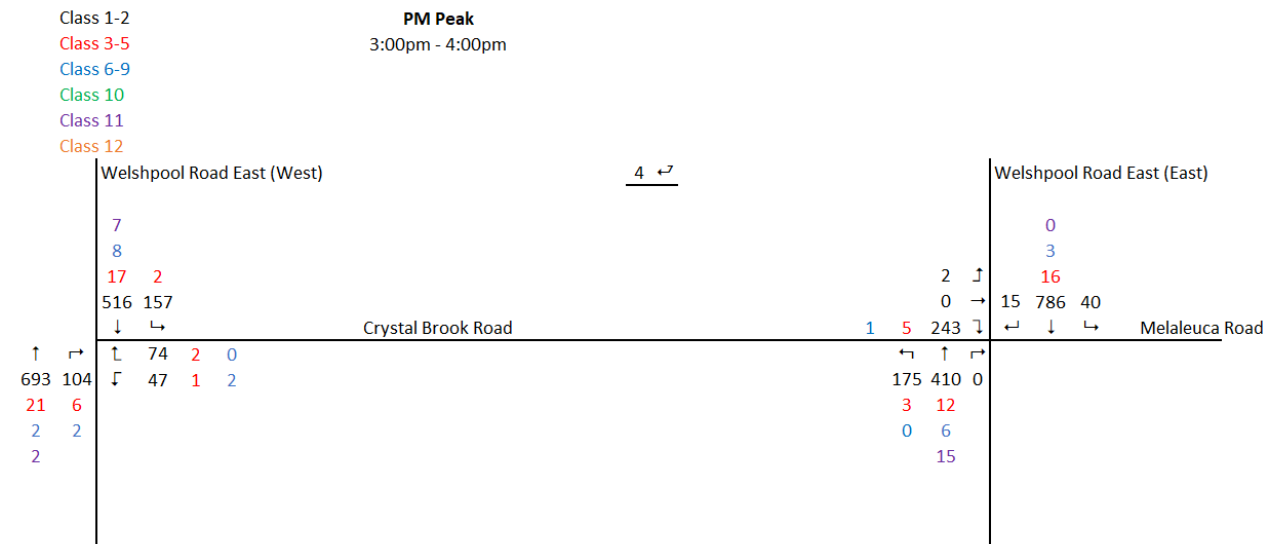


Figure 2-7: PM Peak Volumes



2.6 Existing Road Network - Traffic Modelling

SIDRA Intersection modelling of the two key intersections has been undertaken to establish a baseline of the operation of the existing road network and the key intersections surrounding the development. The modelled intersection layouts and results of the operation and performance of each intersection is summarised in the following sections. Noting that for the Stop/Give-Way controlled intersections the worst delay movement is reported on for the full intersection performance.

Figure 2-9: Welshpool Road East / Crystal Brook Road (western intersection)

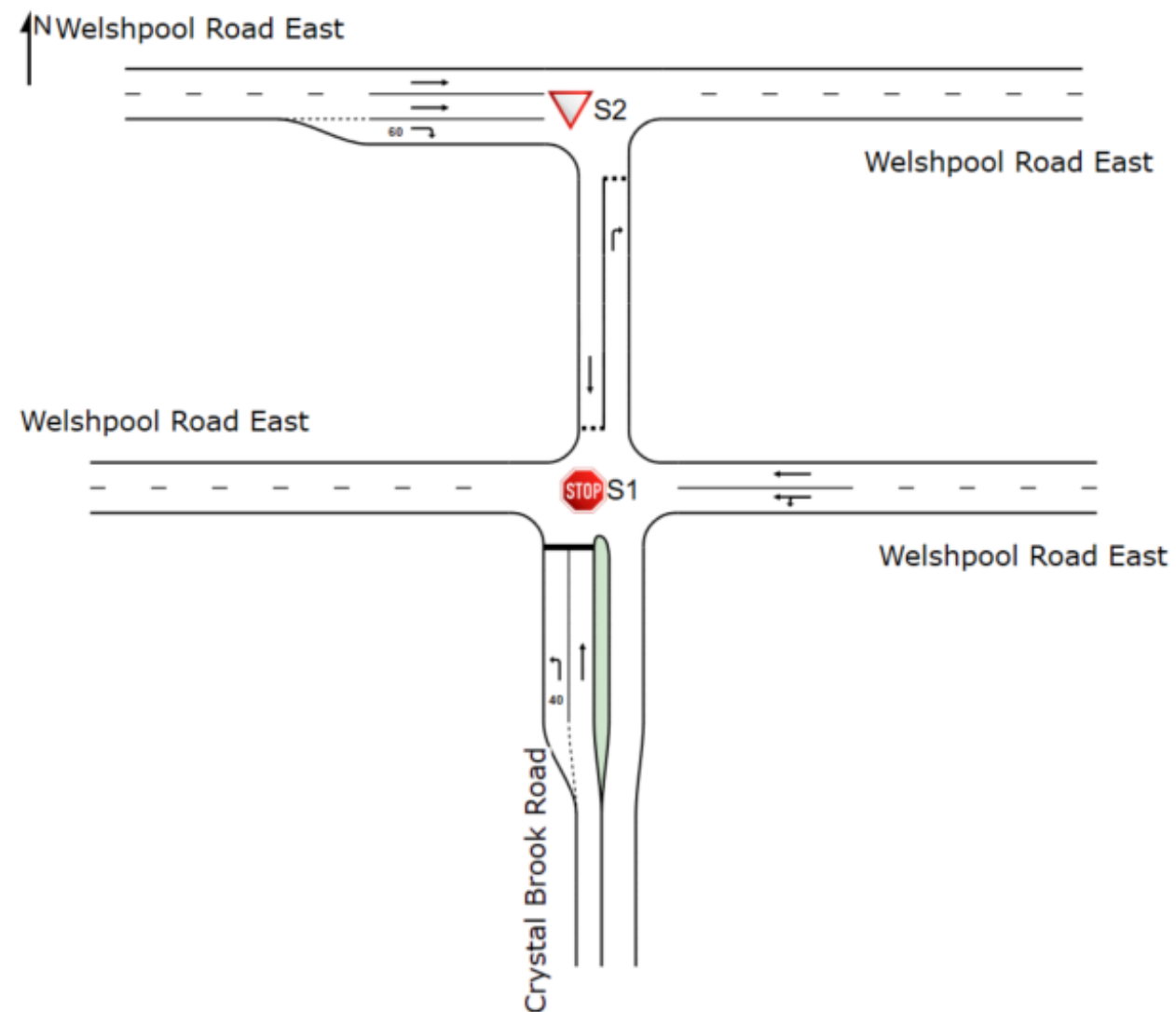


Figure 2-10: Welshpool Road East / Crystal Brook Road (eastern intersection)

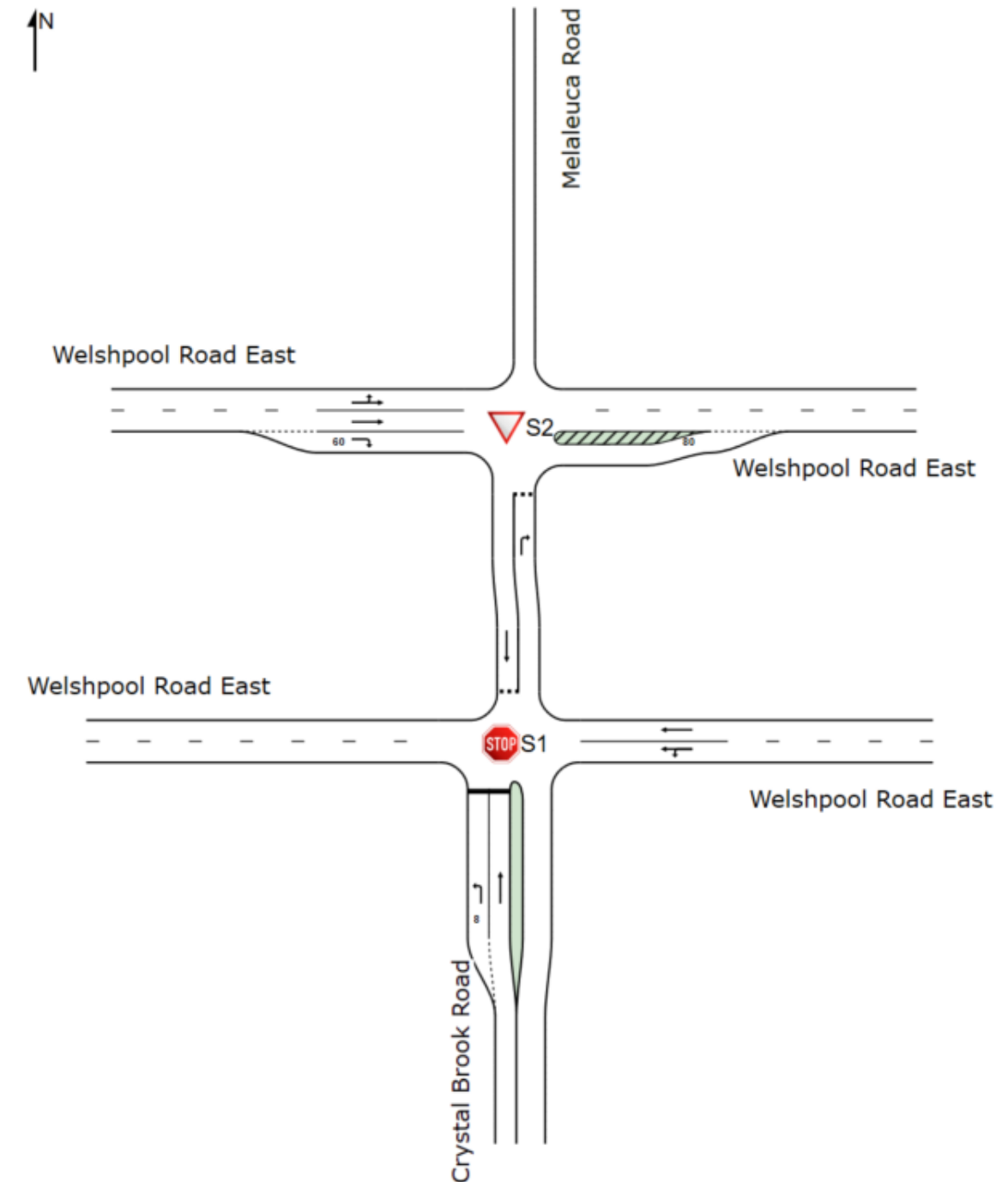




Table 2-2: AM Peak 2024 Base - SIDRA Results

AM Peak Base Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)
Average Delay (seconds)	12	12
Level of Service (LOS)	B	B
Degree of Saturation (DOS)	0.087	0.342
95% Back of Queue Length (metres)	3	9

Table 2-3: PM Peak 2024 Base - SIDRA Results

PM Peak Base Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)
Average Delay (seconds)	10	10
Level of Service (LOS)	A	A
Degree of Saturation (DOS)	0.047	0.234
95% Back of Queue Length (metres)	1	5

Table 2-4: Weekend Peak 2024 Base - SIDRA Results

Weekend Peak Base Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)
Average Delay (seconds)	10	10
Level of Service (LOS)	A	A
Degree of Saturation (DOS)	0.061	0.167
95% Back of Queue Length (metres)	2	3

The base (2024) SIDRA Intersection results indicate the following:

- Welshpool Road East / Crystal Brook Road (western intersection)
 - The results demonstrate that the intersection operates well and under capacity across the assessed AM, PM and Weekend peaks. A LOS A/B is recorded across each peak with Crystal Brook Avenue right turn onto Welshpool Road East shown to be worst performing movement.
- Welshpool Road East / Crystal Brook Road (eastern intersection)
 - Similarly to the western intersection, the results demonstrate the intersection operation under capacity across the assessed AM, PM and Weekend peaks. A LOS A/B is recorded for each peak with the Crystal Brook Avenue right turn onto Welshpool Road East shown to be worst performing movement.

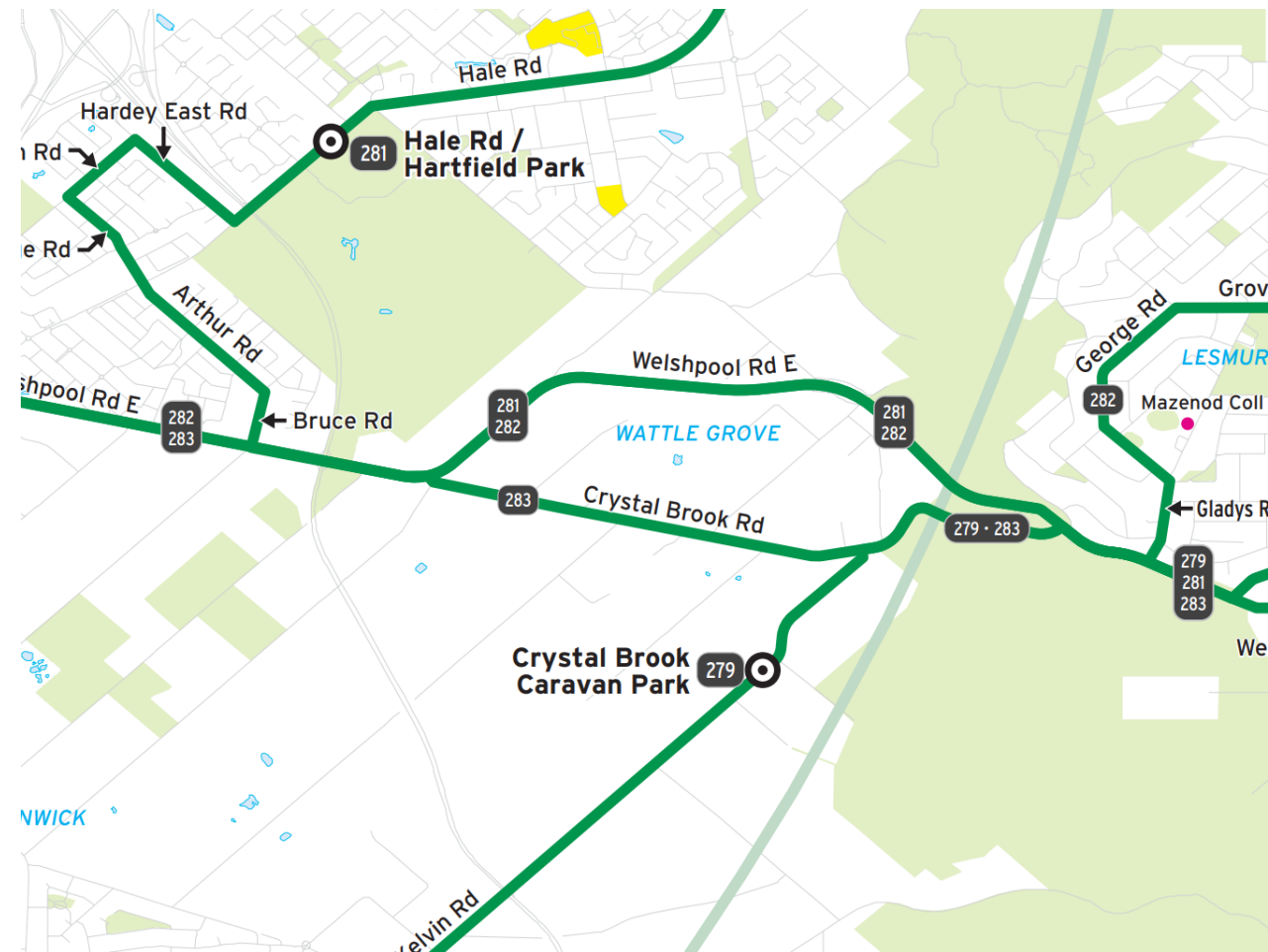
2.7 Existing Active Travel Network

The existing active travel network in Wattle Grove adjacent the site is currently limited with the closest section of off-road shared path available on Welshpool Road East norther verge, west of Lewis Road toward Tonkin Highway. Walking trails are located within close proximity to the site including the Lions Lookout Walk and trails through Lesmurdie Falls.

2.8 Existing Public Transport Provision

Bus service 281 and 282 operate on Welshpool Road East to the north of the site, with the servicing bus stops located approximately 100m from the north-west border. Bus service 283 operates on Crystal Brook Avenue to the south with the associated bus stops within 350m from the southern border. The bus route map is shown in **Figure 2-15**, with the level of frequency detailed in **Table 2-2**.

Figure 2-11: Bus Network within Study Area



Source: Transperth

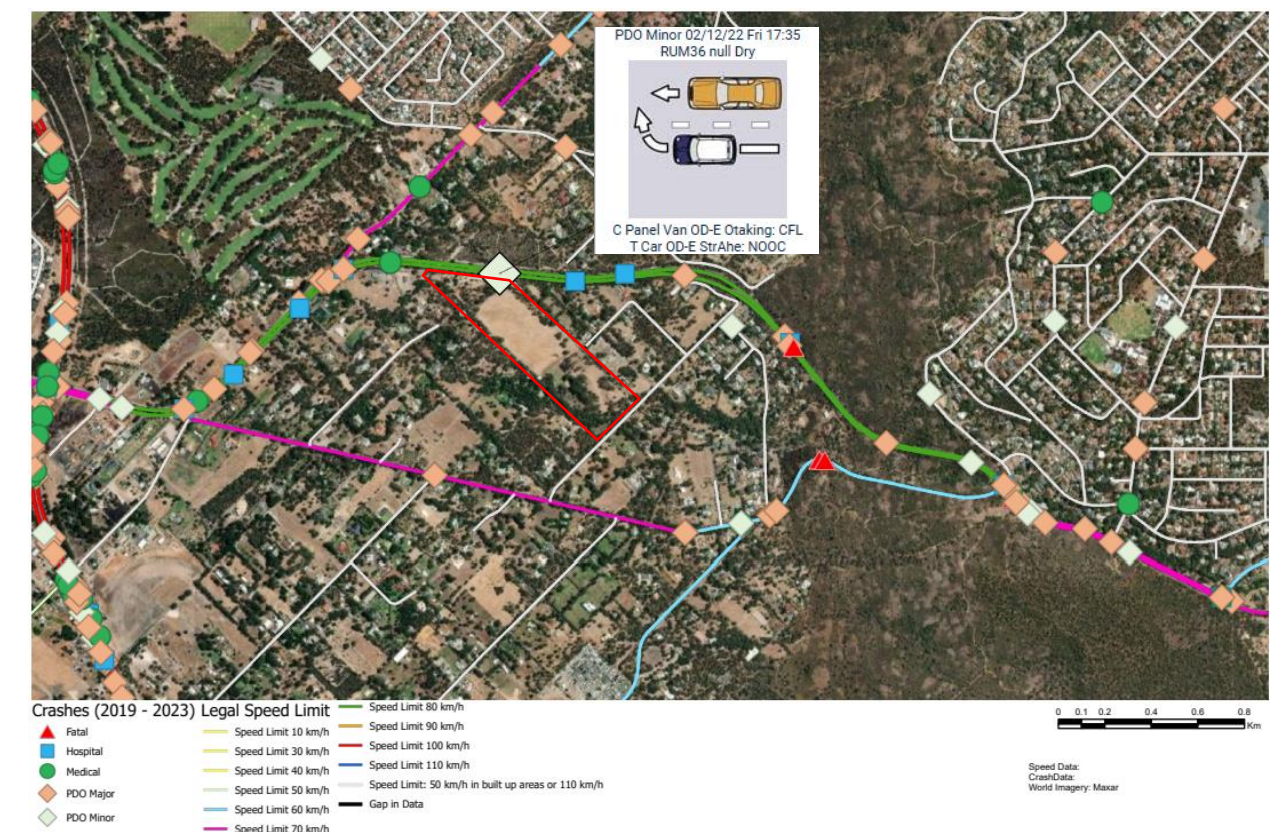
Table 2-5: Bus frequency

Bus Service	Direction	AM Peak Frequency	PM Peak Frequency	Weekend Peak Frequency
281	To Lesmurdie	3	1	-
	To Forrestdale	1	3	-
282	To Perth	3	3	1
	To Kalamunda	1	3	1
283	To Perth	3	2	1
	To Kalamunda	2	3	1

2.9 Crash Assessment

A crash extract for the roads fronting the site and 100m beyond each boundary was sourced from the Main Roads WA Reporting Centre, for all recorded crashes in the most recently available five-year reporting period between 1 January 2019 and 31 December 2023, as shown in Figure 2-16.

Figure 2-12: Recorded Crash Extract (01/01/2019 – 31/12/2023)



Source: Main Roads WA Crash Map

The recorded crashes within the extent of the frontage roads are detailed as follows:

- 1x minor property damage severity sideswipe same direction crash type (RUM 36) on Welshpool Road East, 560m east of Lewis Road travelling westbound. The crash involved a panel van undertaking from the left lane and colliding with the side of a passenger car. The crash was recorded on Friday 2 December 2022 at 5.35pm in dry conditions.

Given that the frontage road extent shows a record of one crash over the latest 5-year period only, there is no perceived crash pattern or apparent critical road safety issue at this location to mitigate to accommodate the development.

3 Proposed Development (Internal Transport Network)

3.1 Proposed Residential Development

The proposed development comprises eight stages of residential dwellings, as per **Table 3-1**, totalling 190 dwellings (14 of which are considered duplex lots). The development is proposed for residents aged 55+ and encompasses land uses purely for the residents on site, these include; aged care facility, pickleball & bowls facility, pool, workshop and a clubhouse. Refer to the Masterplan in Appendix B.

Table 3-1: Development Scale

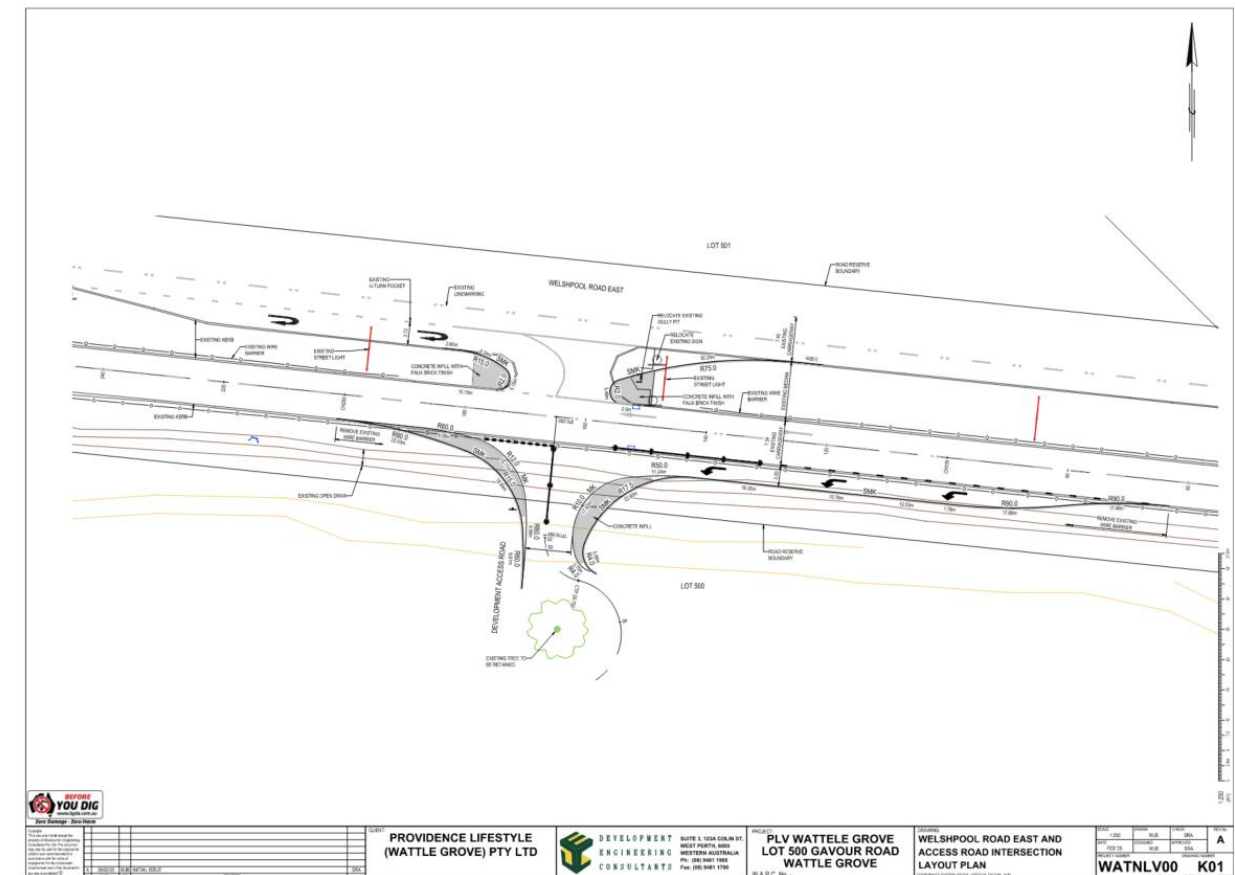
Development Type		Development Scale
Aged Care Facility		1.503 Ha – 140 beds
Residential Stage Total	1	Residential dwellings (houses) x 27
	2	Residential dwellings (houses) x 18
	3	Residential dwellings (houses) x 26
	4	Residential dwellings (houses) x 24
	5	Residential dwellings (houses) x 21
	6	Residential dwellings (houses) x 18
	7	Residential dwellings (houses) x 21
	8	Residential dwellings (houses) x 25
Total		Residential dwellings (houses) x 190

3.2 Vehicle Access Arrangements

The proposed development plan sets out the vehicle access points via the following existing roads.

- The primary access point is proposed to be via a new priority controlled driveway at Welshpool Road East (northern end of the site). The driveway is proposed to be designed as an intersection and will utilise the existing gap in the median which currently provides a U-Turn facility to enable right turn vehicles to enter the site. Additional design and construction will be required to facilitate the left / right turn exit from the site onto Welshpool Road East as well as the left turn in movement into the site which will require a deceleration lane (see Section 3.4 for further details). The primary access point will be used for Stage 1 access to the site. The proposed layout of the intersection is shown in **Figure 3-1** with the detailed drawings in Appendix C.

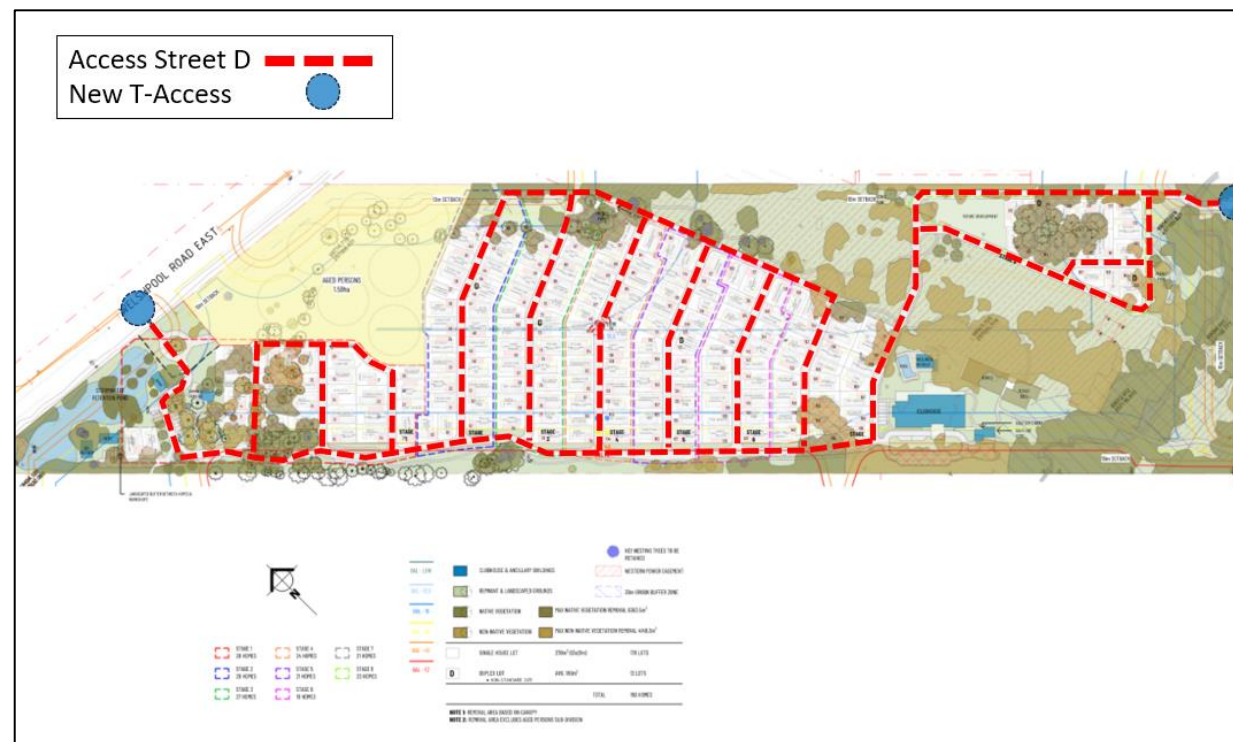
Figure 3-1: Proposed Road Hierarchy



- The secondary access point is proposed to be via a new priority controlled driveway at Gavour Road located to the south east of the site. This access point is likely to be provided with Stage 8.

3.3 Proposed Internal Transport Networks

The proposed internal Road Hierarchy of the development is presented in **Figure 3-2**. Noting that due to the trips generated from the site (see Section 6.2) are under 1,000 vpd, all roads within the development align to Access Street D per the WA Liveable Neighbourhood Guidelines (2009), as shown in **Table 3-2**.

Figure 3-2: Proposed Road Hierarchy

Table 3-2: Liveable Streets Road Specifications

Street Type	Max Design Speed / Target Operating Speed (km/hr)	Indicative Volume (vehicles per day)	Indicative Street Reserve Width (m)	Indicative Road Pavement Width (m)
Access Street D – Narrow Yield or Give Way Street	50/30	1000	14.2	5.5-6

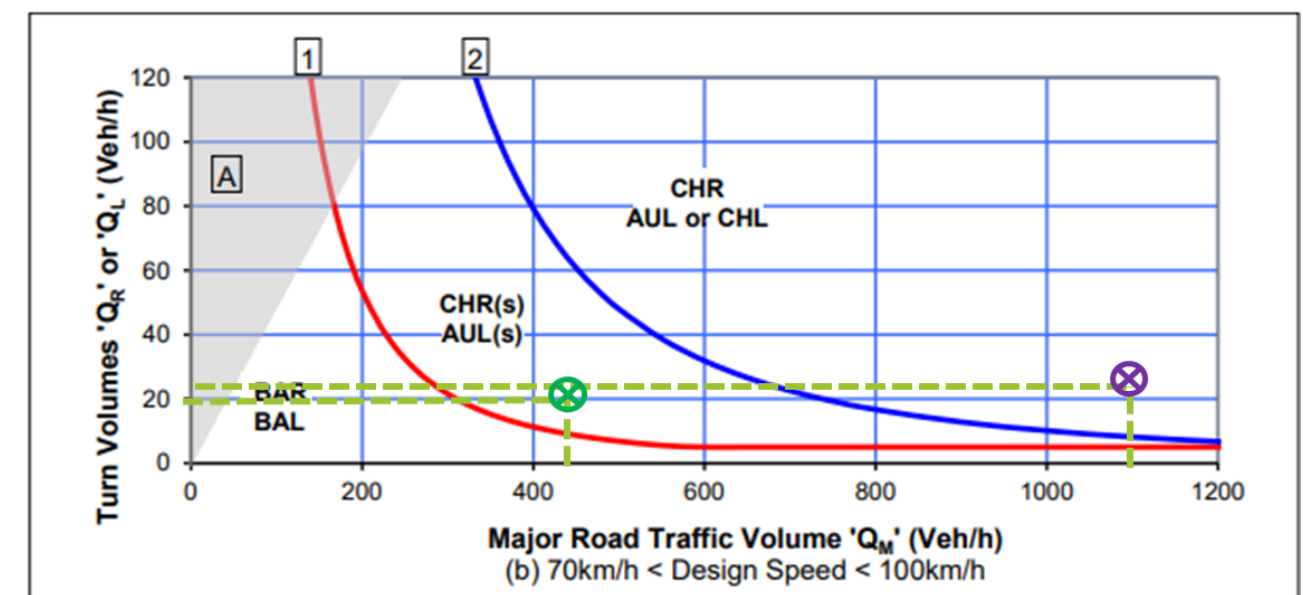
3.4 Roads & Intersection Controls

Internal Site Intersections:

Due to the low volume and low speed residential nature of the development, all intersections along the minor roads within the development are intended to be constructed as priority-controlled T-intersections, single lane roundabouts or staggered four-way priority controlled T-intersections in keeping with the standard separations defined in Liveable Neighbourhoods. Due to low traffic flows on the minor roads (expected below 1,000vpd), this form is considered acceptable.

Site Access Considerations (Welshpool Road East):

The form of the proposed site access T-intersection on Welshpool Road East would be based upon the requirements of Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossing Management (Austroads 2020). Reference to the second chart in Figure 3.25 of the Austroads guide shows the following.

Figure 3-3: Austroads Figure 3.25 Excerpt


- This figure is applicable for design speeds between 70km/h and 100km/h and thus appropriate for the 80km/h speed limit of Welshpool Road East.
- The expected maximum development generated traffic flow turning into the development site at the T-intersection has been plotted on this figure (shown with : right turn treatment : left turn treatment) against the future average peak hour traffic volume on Welshpool Road East in this report's modelled 2041 design year horizon. The results show that a CHR/AUL (Channelised right turn/ Auxiliary left turn) treatment is required at a minimum.

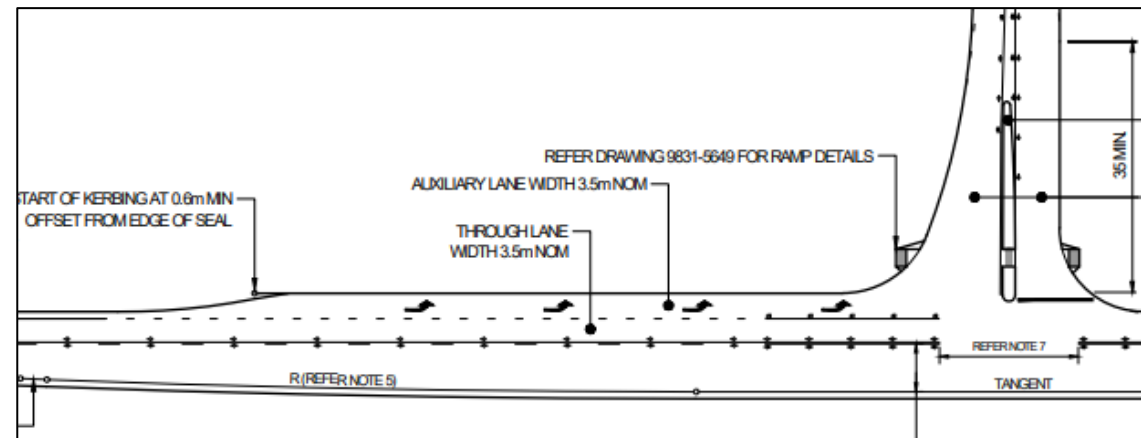
- c) It is worth noting that Austroads Guide Part 6 states:
- *The need for deceleration turn lanes cannot be stated definitively in all instances because of the many factors to be considered, such as speeds, traffic volumes, capacity, type of road, service provided, traffic control and crash history. However, the need is usually established on the basis of ensuring that turning traffic does not impede through traffic to the extent that:*

The operational efficiency of an intersection or intersection approach is compromised.

Section 8 of this TIA report establishes that the future operation of the Welshpool Road East / Site Access driveway intersection is predicted to operate with acceptable performance and efficiency within the thresholds set by WAPC. Therefore, the CHR / AUL turn lane treatments are sufficient in this context at any of the proposed T-intersections on Welshpool Road East.

An example of the AUL treatment is shown below in Figure 3-3

Figure 3-4: AUL Treatment Layout



Source: Main Roads Drawing 200131-0083-6

3.5 Pedestrian and Cycle/Wheeling Access

The safe movement of pedestrians and cyclists/wheeled mobility across the site is to be allowed within the roadways, where traffic flows are expected to be very low, this is in keeping with other similar developments by Providence Lifestyle with land-lease. Cyclists will also cycle on the quiet residential streets within the proposed development.

In regard to the crossing ability across the internal lower order access road network, no single road is predicted to carry more than 1,000 vehicles per day with volumes typically significantly less than this. These roads are therefore not considered to cause an apparent difficult barrier for pedestrians and cyclists/wheeled mobility to cross based on this threshold alone.

3.6 Public Transport Provision Within the Development

There are no proposals for public transport services to operate within this development.

3.7 DCP 5.1 – Regional Roads (Vehicular Access)

The proposed vehicular access from the site to Welshpool Road East has been reviewed against the WAPC's Development Control Policy 5.1 – Regional Roads (Vehicular Access). This policy sets out principles to guide decision-making regarding access to regional roads, with the objective of improving traffic flow and safety by minimising the number of driveways and junctions.

Regional Road Classification and Policy Applicability

Welshpool Road East is reserved as an "Other Regional Road" (ORR) under the Metropolitan Region Scheme and is classified as a 'Distributor A' road under Main Roads WA's functional road hierarchy. In accordance with Section 3.2.2 of DCP 5.1, this policy applies to both primary and district distributors and therefore applies to the subject site.

Safety and Function Considerations (Policy Sections 3.1 & 3.2)

The proposed new site access is located to align with an existing median break currently used for U-turns, thereby minimising the need for additional breaks or access points along the corridor. The design is proposed to include a left-turn deceleration lane (AUL or CHL) and channelised right-turn (CHR) treatment in line with Austroads guidance, thereby mitigating the risk of rear-end or side-impact crashes associated with turning movements. As per Section 3.1.3 of the policy, this design reduces conflict points, supports smoother traffic flow, and addresses safety considerations associated with turning vehicles on regional roads.

SIDRA analysis (refer to Section 8) confirms that the proposed intersection will operate with a Level of Service (LOS) B or better during all assessed peak periods through to the 2041 design horizon. Degree of Saturation (DoS) levels remain well below operational thresholds, supporting the assertion that the development will not adversely affect the function of Welshpool Road East.

Development Scale and Traffic Generation (Policy Section 3.3)

The development is a moderate-traffic generator, with a forecast of no more than approximately 100 two-way trips during peak periods. This level of trip generation, combined with intersection performance modelling, demonstrates that the proposed access is consistent with DCP 5.1 Section 3.3.5, which requires that the volume and type of traffic generated not compromise safety or the function of the road.



Alternative Access Considerations (Policy Section 3.3.2)

DCP 5.1 presumes against direct access to regional roads where alternative access via side or rear streets exists. In this case, no rear access is available due to the landform and road network constraints. Gavour Road will serve as a secondary access, but Welshpool Road East provides the only viable primary connection to the broader road network. The proposed access arrangement is therefore considered justifiable under the “special circumstances” provision of Section 3.3.2.

Design Standards and Visibility (Policy Section 3.3.6)

The access location and layout will meet design standards prescribed by Austroads and Main Roads WA, with appropriate sight distances and turning treatments ensuring safe entry and exit movements. The final detailed design will be undertaken to the satisfaction of the relevant authorities.

4 Changes to the External Transport Network

4.1 Changes to Road Network

Kelvin, Hale and Welshpool Roads: Tonkin Highway Corridor

Planned upgrades are proposed along the Tonkin Highway corridor between Hale Road and Welshpool Road. The improvements include widening the corridor to a six-lane dual carriageway as well as planned interchanges.

The aims of the improvements are to improve safety along this section as well as reducing congestion and delays along the route.

4.2 Changes to Active Transport Network

Kelvin, Hale and Welshpool Roads: Tonkin Highway Corridor

The upgrades mentioned in Section 4.1 also include a new Principal Shared Path (PSP) which is planned to the east of Tonkin Highway extending between Hale Road and Kelvin Road with links to the local cycle network, including underpasses and ramps at the new intersections.

Figure 4-1: Kelvin, Hale and Welshpool Roads: Tonkin Highway Corridor Upgrades - Artist Impression



Source: <https://www.buildingfortomorrow.wa.gov.au/projects/kelvin-hale-and-welshpool-roads/>

4.3 Changes to Public Transport Network

No changes to the existing public transport network are proposed within the vicinity of the site.

5 Integration with Surrounding Area

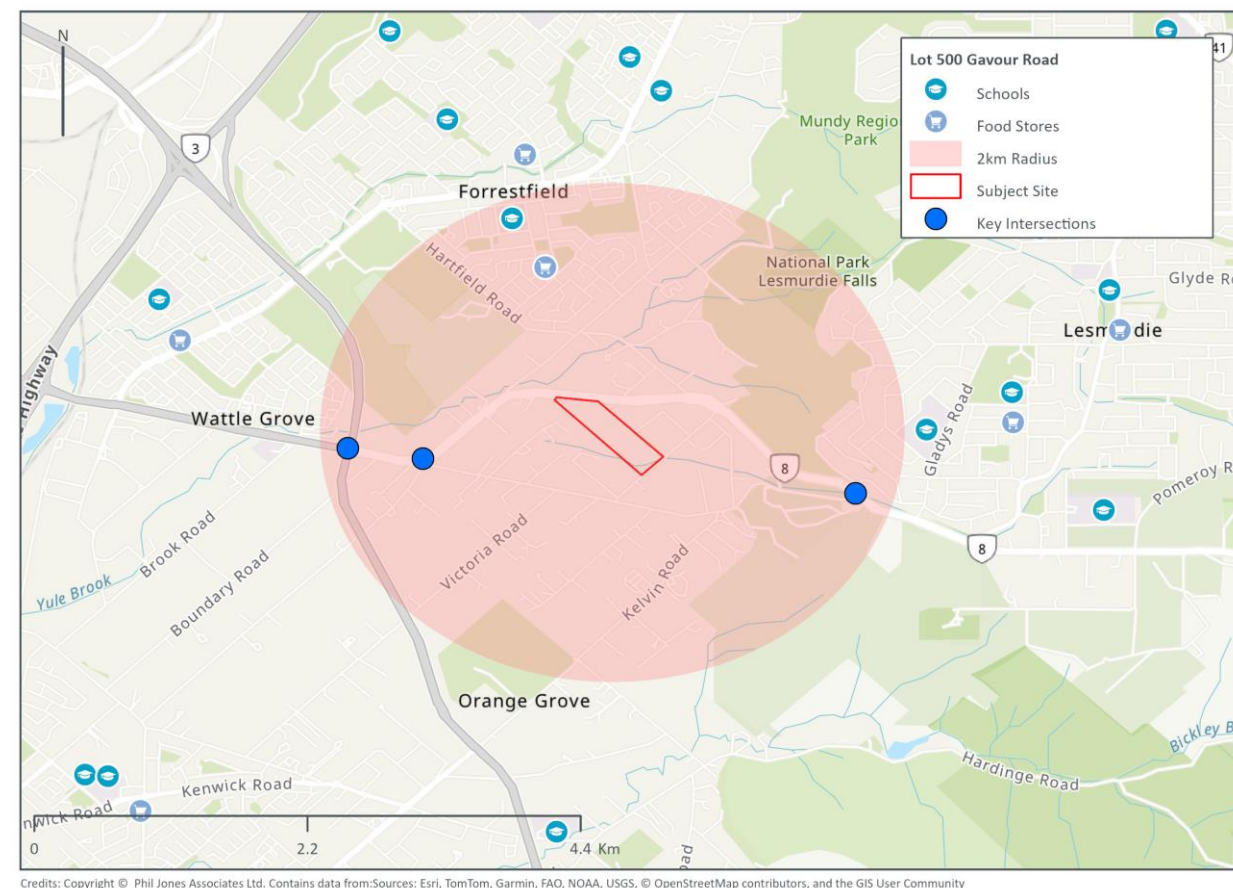
5.1 Surrounding Attractors / Generators

The site is located on vacant bushland and is surrounded by low density rural residential land uses. Gavour Road bounds the eastern side of the site and Welshpool Road East to the north side of the site.

Approximately 3km to west and north west are the Wattle Grove and Forrestfield main shopping centres respectively and some 6km to the north-east is the centre of Kalamunda. To the north-west of the site is Forrestfield Primary School, which is the closest school to the development site.

The key areas around the proposed development are presented in **Figure 5-1**.

Figure 5-1: Existing Surrounding Land Uses

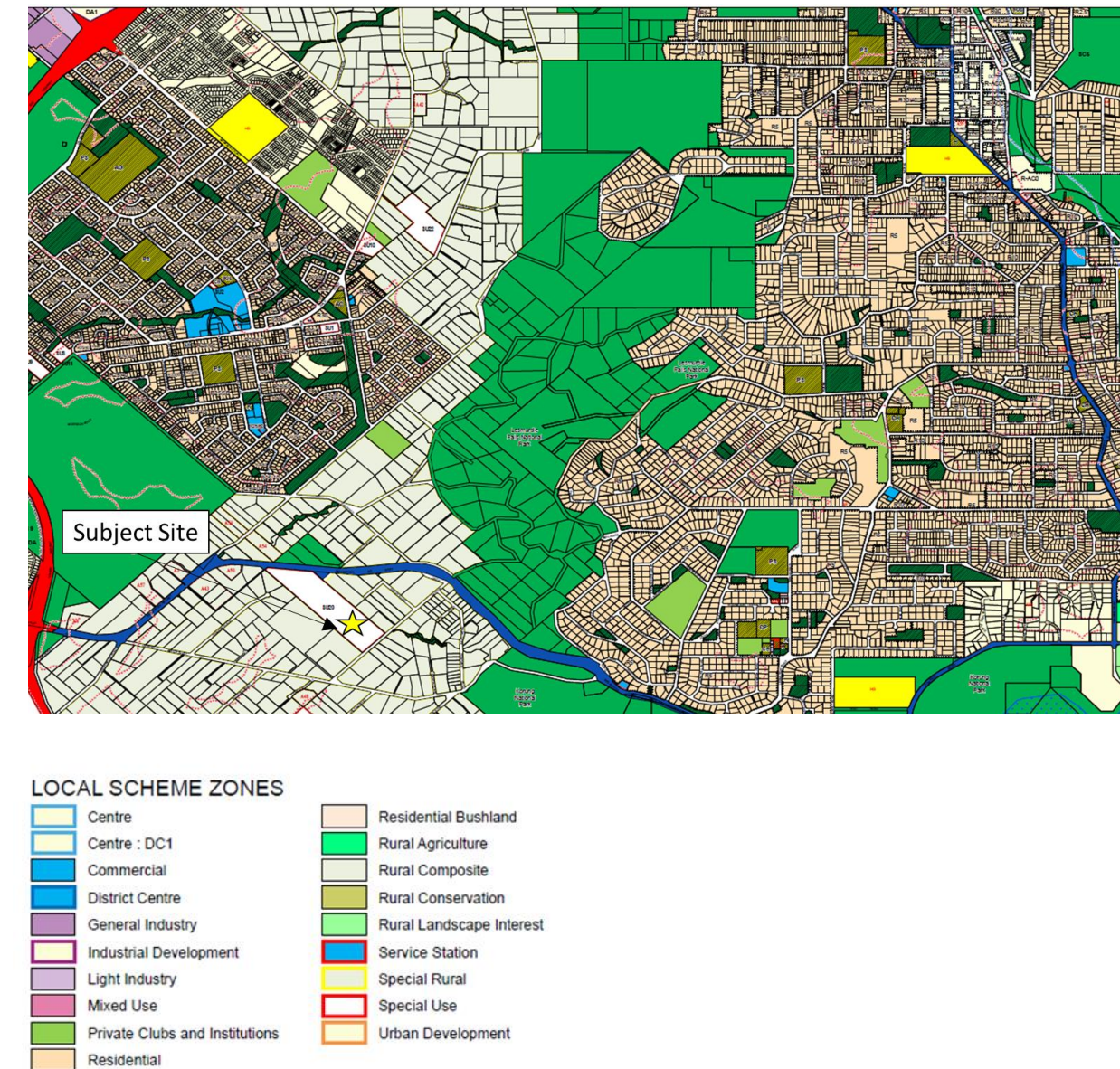


5.2 Proposed Changes to Surrounding Land Uses

The proposed development site is located within the existing 'Special Use 20' zone under Local Planning Scheme 3 (LPS3) with an approved Local Development Plan guiding development at the site. (refer **Figure 5-2**).

The surrounding land uses are shown as, 'Special Rural' and a 'Other Regional Roads' reservation representing Welshpool Road East on the northern boundary.

Figure 5-2: Local Planning Scheme No.3 (LPS3) Site Context



Source: City of Kalamunda - Local Planning Scheme No.3 (LPS3)



5.3 Level of Overall Accessibility and Integration

The site is removed from the current active travel network which is currently limited to an off-road shared path on Welshpool Road East, west of Lewis Road toward Tonkin Highway. However, walking trails are located within proximity (~1km) to the site which include the Lions Lookout Walk and trails through Lesmurdie Falls.

To best utilise and integrate with the existing public transport network it is recommended that a pedestrian connection is incorporated into the proposal to ensure residents can safely access the existing bus stops on Welshpool Road East (100m west from the north-western point of the development). This is nominally suggested to be along the southern verge of Welshpool Road.

Where the current bus stops are located there are pedestrian crossing facilities to allow pedestrians the ability to cross Welshpool Road. This has been modified recently to provide ramps access from one side of the median to the other.

The two-way traffic on Welshpool Road East for the 2041 design year has been forecasted to be around 1,300vph in the AM and PM peaks and 1,100vph in the Weekend peak. Table 4 of the WAPC Guidelines Volume 2, which has been reproduced below, outlines that for a 4 lane divided (or with pedestrian refuge islands) the level of traffic that will affect pedestrian crossing ability is 1,600vph and therefore the 2041 forecasted volumes are below this threshold for Welshpool Road East.

Table 5-1: Traffic Volumes Affecting Pedestrian Crossing Amenity (WAPC)

Road Cross-Section	Traffic volume affecting ability of pedestrians to cross (vehicles per hour – two way)
2 lane undivided	1,100 vph
2 lane divided (or with pedestrian refuge islands)	1,800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1,600 vph



6 Analysis of Internal Transport Networks

6.1 Development Scale

The proposed full development comprises 8 stages of residential dwellings, as per **Table 6-1**, totalling 190 dwellings (14 of which are considered duplex lots). The development is proposed for residents aged 55+ and encompasses land uses purely for the residents on site, these include; aged care facility, pickleball & bowls facility, pool, workshop and a clubhouse.

Table 6-1: Development Scale

Development Type		Development Scale
Aged Care Facility		1.503 Ha – 140 beds
Residential Stage	1	Residential dwellings (houses) x 28
	2	Residential dwellings (houses) x 28
	3	Residential dwellings (houses) x 27
	4	Residential dwellings (houses) x 24
	5	Residential dwellings (houses) x 21
	6	Residential dwellings (houses) x 18
	7	Residential dwellings (houses) x 21
	8	Residential dwellings (houses) x 23
	Total	Residential dwellings (houses) x 190

6.2 Development Traffic Generation

Typical vehicle trip rates for residential land uses are set out in Table 1 of Part A Section 5 of the 'Transport Impact Assessment Guidelines – Volume 5: Technical Guidance', published by the WAPC in 2016.

It should be noted that the typical rates for single (detached) residential dwellings of 8 trips per dwelling per day, where car ownerships may be as high as 3-4 vehicles per dwelling, do not account for the specific type of residential development being proposed.

The proposed development is to house for people aged over 55s and therefore the demographic is less likely to generate typical AM and PM commuter trips. Secondly, it is proposed to provide a range of ancillary community facilities on-site to serve the residents, which will negate the need to travel off-site for many journeys.

On this basis, it is expected that the trip rates for the site would more likely be **4 trips per dwelling per day** (50% of the WAPC trip rates), and summarised in **Table 6-2**. This is further demonstrated by comparable traffic counts from similar communities; reinforcing 4 trips per day.

With regards to modelling of the future Aged Care Facility, the Institute of Transportation Engineers (ITE) trip generation category 'Assisted Living' (no. 254) with the unit 'Beds' has been utilised.

Table 6-2: Residential Trip Generation

Type		AM peak hour			PM peak hour			Weekend peak hour		
		In	Out	Total	In	Out	Total	In	Out	Total
Trip Rate	Houses	0.1	0.3	0.4	0.25	0.15	0.4	0.2	0.2	0.4
	Beds	0.09	0.05	0.14	0.1	0.12	0.22	0.11	0.11	0.22
Trips		30	63	93	59	43	102	51	51	102

The trip rates and quantum of development (140 Aged Care beds and 190 lifestyle dwellings) suggest that ultimate development could generate up to approximately 100 two-way vehicle movements in the peak hours.

Notwithstanding that the impact of development is likely 'moderate' per WAPC Guidelines, PJA has commissioned traffic counts at two key intersections, one on the Welshpool Road East / Crystal Brook Road eastern intersection and the Welshpool Road East / Crystal Brook Road western intersection, to assess the impacts of the expected additional traffic from the development. This is discussed further in Section 8.

6.3 Non-Development Traffic (Through Traffic)

There is intended to be no through / extraneous vehicular movements across the site as the development will be private and gated.

6.4 Development Design Traffic Flows and Distribution

The design traffic flows represent the vehicle volume present on the internal development site roads and interacting with the site access intersections following the opening year (2031) and the +10 year design horizon (2041) of the development. The development is expected to generate a total of approximately 100 two-way vehicle trips in each peak under both the 'opening year' and '+10 year' scenario. For a robust assessment it has been assumed that all eight stages would be developed at the 'opening year' (i.e. 2031 ultimate development).

The roads within the development site will provide access to the development lots only and the maximum total anticipated two-way trips within these internal roads is up to approximately 100 vehicles in the peak hour (across all site accesses combined) and any given single internal site road would not carry more than 1,000 vehicles per day.

The expected distribution of generated traffic flows onto Welshpool Road East has been calculated based on the anticipated accessibility of the site access and the relative intensification of its use.



6.5 Access to Frontage Properties

As previously calculated, the lower order access roads within the development site are to provide access to the development lots only and the maximum total anticipated two-way trips within these internal roads is up to approximately 100 vehicles in the peak hour (across all site accesses combined) and any given single internal site road would not carry more than 1,000 vehicles per day.

Therefore, in accordance with the criteria given in Liveable Neighbourhoods Element 2, direct frontage access to properties on all development internal roads and any other internal side roads would be acceptable.

6.6 Pedestrian / Cycle Networks

In regard to the internal lower order access road network, no single road is predicted to carry more than 1,000 vehicles per day. These roads are therefore not considered to cause a difficult barrier for pedestrians and cyclists to cross.

This is in line with Table 4 of the WAPC Guidelines Volume 2 (as per Table 5-1 and reproduced below in Table 6-3). This states that for a two-lane undivided road, the ability of most pedestrians to cross would only be affected if there are more than 1,100 vehicles per hour (two-way).

Table 6-3: Traffic Volumes Affecting Pedestrian Crossing Amenity (WAPC)

Road Cross-Section	Traffic volume affecting ability of pedestrians to cross (vehicles per hour – two way)
2 lane undivided	1,100 vph
2 lane divided (or with pedestrian refuge islands)	1,800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1,600 vph

6.7 Safe Walk / Cycle to School Assessment

The closest schools to and from the site are determined to not be walkable or cyclable given the limited path and crossing facilities provided on Welshpool Road East. However, given the proposed demographic (+55yo) to reside in the proposed development, a safe walk / cycle school assessment is not envisaged to be critical as no school aged children are expected to be living within the development and attending schools.

6.8 Access to Public Transport

Bus service 281 and 282 operate on Welshpool Road East to the north of the site, with the servicing bus stops approximately 100m from the north-west border, and bus service 283 operates on Crystal Brook Avenue to the south with the associated bus stops within 350m from the southern border. These bus

services provide options to travel into Perth, Kalamunda, Lesmurdie and Forrestdale. Access to the bus stops for these routes has been discussed previously, with suggested improvements as noted.

7 Analysis of External Transport Networks – Assessment Parameters

7.1 Assessment Years

As discussed previously, the development is best assessed using the WAPC Transport Impact Assessment Guidelines – Volume 3 Subdivision, due to the layout of the development and provides the best methodology in assessment and reporting. This guide recommends that the assessment years will generally be the year of full development plus 10 years post full development.

In terms of the proposed development scale of 190 residential lots (and the 140 bed Aged Care facility, for assessment purposes only), it is assumed that this could be fully completed by 2031.

10 years after full opening is suggested for the post full development assessment, being the year 2041.

This assessment of traffic generated by the proposed full development will therefore align with the requirements of the WAPC Transport Impact Assessment Guidelines and as such the assessment years are defined as follows:

- **2031 ‘Opening Year’** (with full development)
- **2041 ‘Design Year Horizon’** (+10 years post opening year with full development).

7.2 Assessment Time Periods

The assessment time periods will be consistent with the identified morning and evening peak periods on the surrounding road network, taken from the traffic surveys commissioned in November 2024 which are typically 8:00am – 9:00am, 3:00pm – 4:00pm and 11:00am – 12:00pm for the AM, PM and Weekend peaks respectively.

To be conservative and provide a robust assessment of traffic impacts of the development on the road network, the peak periods of the network at each of the intersections assessed will be combined with the anticipated peak periods of the development site to provide an overall worst-case baseline from which this traffic assessment is undertaken.

7.3 2031 ‘Opening Year’ Assumptions

The 2031 scenarios will include the full build out of the development. For the assessment it is assumed that 100% of the development traffic will utilise the proposed new access point with Welshpool Road East for a conservative assessment. The east and west splits onto Welshpool Road East will be based on the existing survey distribution for the east and west through traffic.

The background traffic was based on historic annual traffic growth derived from the available traffic data on Trafficmap WA. The percentage traffic growth based on the ROM24 outputs for 2031.

7.4 2041 ‘Design Year Horizon’ Assumptions

The same assumptions will be applied to 2041 scenarios with the exception of the background traffic growth extended an additional 10 years.

7.5 Proposed Development - Traffic Scenarios for Assessment

In order to establish the relative impact of the proposed development on the operation of the surrounding road infrastructure, two assessment scenarios have been undertaken as part of this TIA on the key existing and proposed intersections on the surrounding roads:

- Welshpool Road East / Crystal Brook Avenue (west) – Stop Controlled T-Intersection
- Welshpool Road East / Crystal Brook Avenue (east) – Give Way Controlled T-Intersection
- Welshpool Road East / new site access – Priority Controlled T-Intersection.

To understand the scope and capability of the existing and proposed future intersections to accommodate the predicted traffic generated by the residential development within acceptable performance criteria, the following traffic assessment scenarios have been included in this TIA for comparison purposes in line with the assumed assessment years:

- **Scenario One – 2031 Opening Year:**

Assumed Traffic and Land Use Composition Includes:

- 2031 Road Network Traffic Volumes
- Traffic generation from the 190 proposed residential lots
- Traffic generation from 140 aged care beds.

- **Scenario Two – 2041 Design Year Horizon:**

Assumed Traffic and Land Use Composition Includes:

- 2041 Road Network Traffic Volumes
- Traffic generation from the 190 proposed residential lots
- Traffic generation from 140 aged care beds.

7.6 Proposed Development Vehicular Traffic Assignment

The proposed distribution of development traffic onto the surrounding road network is based upon the existing proportions of east/west traffic travelling along Welshpool Road East intersection for each peak period.

The traffic assignment proportions are therefore assumed as:

AM Peak:

- Out:
 - 43% eastbound on Welshpool Road East
 - 57% westbound on Welshpool Road East.
- In:
 - 43% from Welshpool Road East eastbound
 - 57% from Welshpool Road East westbound.

PM Peak:

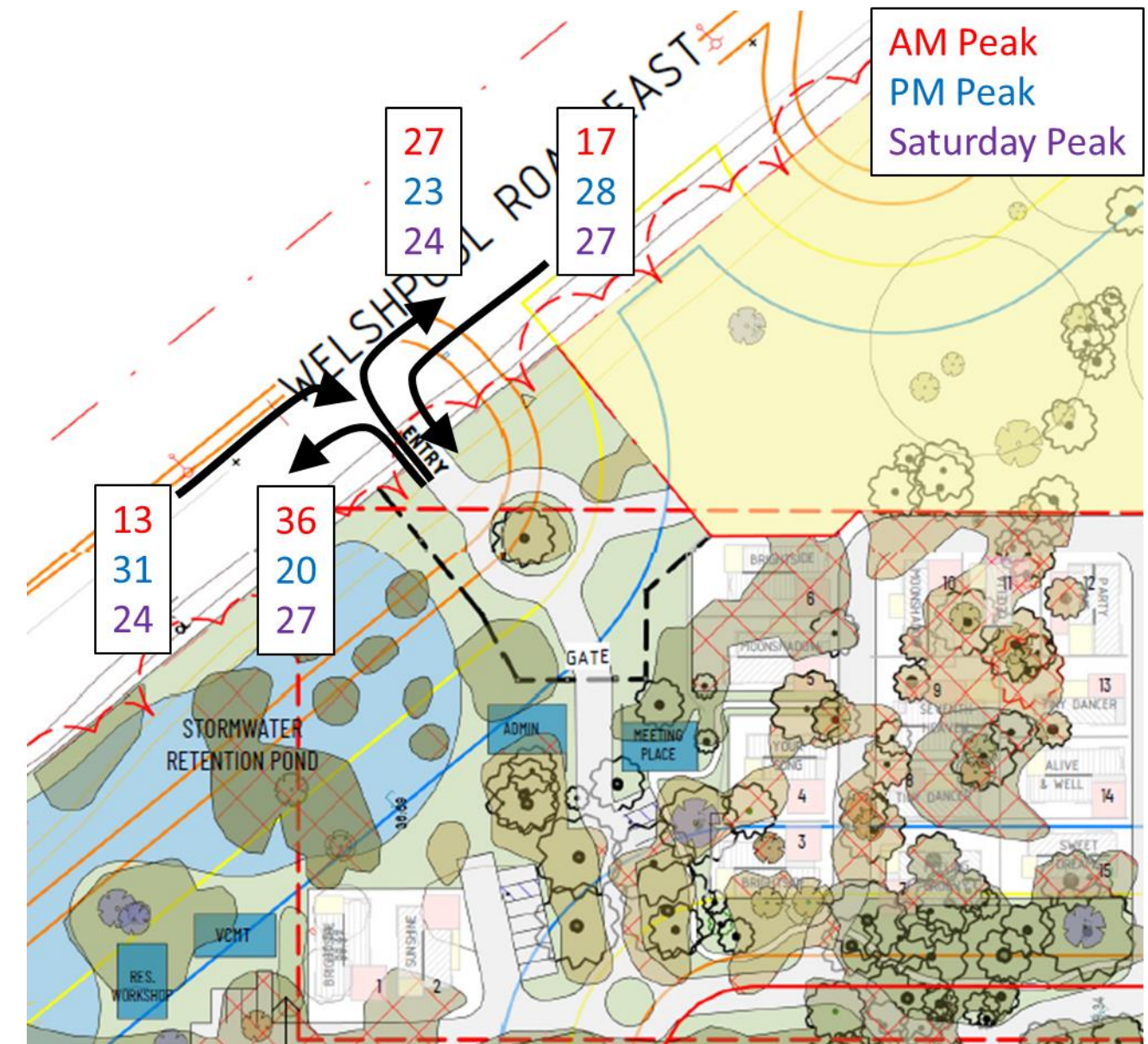
- Out:
 - 53% eastbound on Welshpool Road East
 - 47% westbound on Welshpool Road East.
- In:
 - 53% from Welshpool Road East eastbound
 - 47% from Welshpool Road East westbound.

Weekend Peak:

- Out:
 - 48% eastbound on Welshpool Road East
 - 52% westbound on Welshpool Road East.
- In:
 - 48% from Welshpool Road East eastbound
 - 52% from Welshpool Road East westbound.

The traffic distribution relevant to the proposed development generated traffic volume is shown in Figure 7-1.

Figure 7-1: Development Traffic Distribution





8 Analysis of External Transport Networks – Intersection Assessments

8.1 Introduction

This section of the TIA presents the analysis of the transport network in particular the key intersections identified on the surrounding road network. Section 7 of this TIA report previously sets out in detail the assessment parameters assumed for each of the following traffic scenarios tested.

8.2 Extent of Intersection Analysis – Scenarios

The intersections included within the SIDRA Intersection Analysis include:

- Welshpool Road East / Crystal Brook Avenue (west) – Stop Controlled T-Intersection
- Welshpool Road East / Crystal Brook Avenue (east) – Give Way Controlled T-Intersection
- Welshpool Road East / new site access – Priority Controlled T-Intersection.

- **Scenario One – 2031 Opening Year:**

Assumed Traffic and Land Use Composition Includes:

- 2031 Road Network Traffic Volumes
- Traffic generation from the 190 proposed residential lots
- Traffic generation from 140 aged care beds.

- **Scenario Two – 2041 Design Year Horizon:**

Assumed Traffic and Land Use Composition Includes:

- 2041 Road Network Traffic Volumes
- Traffic generation from the 190 proposed residential lots
- Traffic generation from 140 aged care beds.

8.3 Impact on Intersections

Across each of the following assessment scenarios, the SIDRA Intersection capacity results for each approach are presented in the form of Degree of Saturation (DOS), Average Delay, Level of Service (LOS) and 95th Percentile Queue. These characteristics are defined as follows:

- **Degree of Saturation (DOS):** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded for an un-signalised intersection where $DOS > 0.80$; or up to 1.0 for a signal-controlled intersection at a +10 year design horizon.
- **95% Queue:** is the statistical estimate of the queue length up to or below which 95% of all observed queues would be expected.
- **Average Delay:** is the average of all travel time delays for vehicles through the intersection. An unsignalised intersection is considered to be operated at capacity where the average delay exceeds 45 seconds for any individual movement.

Level of Service (LOS): is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers.

8.4 ROM24 Traffic Model Assumptions (Background Traffic)

Given that Welshpool Road East serves an important use in the network as a key distributor, it is appropriate to assess future year traffic scenarios using the State Government's ROM 24 Traffic Model. This approach has been endorsed by the City of Kalamunda.

In line with the WAPC Guidelines, the analysis of the proposed site access intersections and surrounding road network has been considered to be at the 'opening year' of development (2031) and at a +10-year design horizon of 2041. These scenario years also align with that of the State Governments' ROM 24 traffic model.

Main Roads WA's Traffic Modelling Services have provided the 2021, 2031 and 2041 all day link volumes which have been factored into AM and PM peak period volumes in accordance with the requirements of the MRWA Operational Modelling Guidelines. Main Roads WA has confirmed that the provided traffic plots¹ are based on Main Roads' 20-Year Road Network Development Plan network and the Department of Planning, Lands and Heritage's DAEDS land use assumptions (DAEDS Version 3.1).

The ROM24 outputs will be used to growth the background through traffic on Welshpool Road East, noting that linear interpolation will be used to adjust the growth factor between 2021 and 2031/2041 to account for the 2024 base year, the background traffic growth associated with Welshpool Road East is demonstrated in **Table 8-1**.

Table 8-1: Welshpool Road East ROM24 Background Traffic

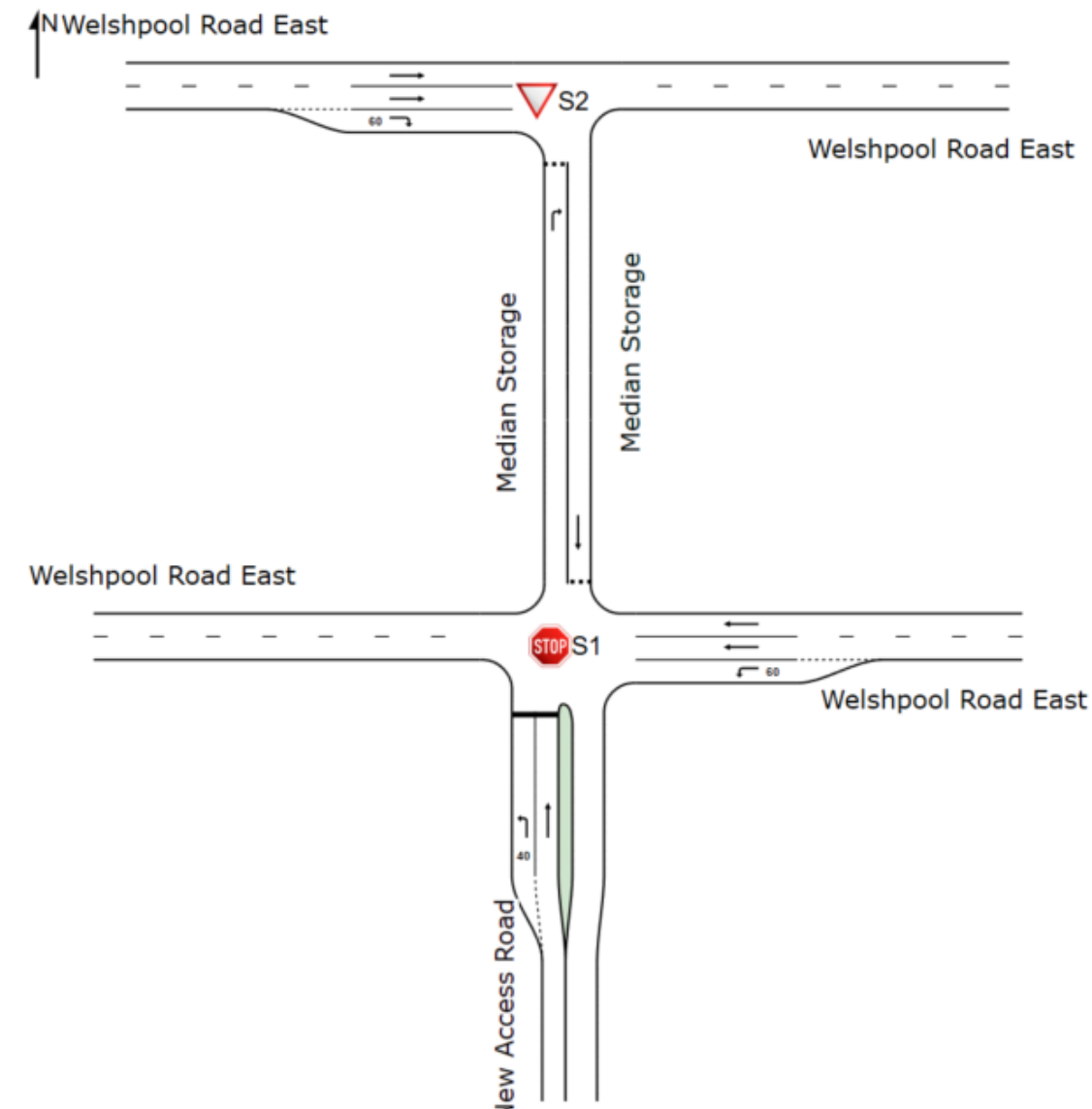
Welshpool Road East	2021	2024	2031		2041	
	Daily Volume	Daily Volume	Daily Volume	% Change	Daily Volume	% Change
Eastbound	10,217	10,245	10,310	0.6%	9,985	-2.5%
Westbound	10,801	10,642	10,269	-3.5%	9,708	-8.8%

¹ Email from Main Roads WA to PJA, dated 23 January 2025.

8.5 New Access Road / Welshpool Road Intersection

The proposed new access with Welshpool Road East, at the time of this TIA, is yet to be designed. As such, for the purpose of the modelling a standard intersection layout with the required turn lanes detailed within the TIA has been assumed, as shown in **Figure 8-1**.

Figure 8-1: New Access Road / Welshpool Road East Modelled Layout



8.6 Assessment Results – Scenario One – 2031 Opening Year

The results for the 2031 Opening Year scenarios are presented in following tables. Detailed SIDRA results can be found in **Appendix D**.

Table 8-2: AM Peak 2031 Development - SIDRA Results

AM Peak 2031 Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)	New Access Road / Welshpool Road Intersection
Average Delay (seconds)	13	14	13
Level of Service (LOS)	B	B	B
Degree of Saturation (DOS)	0.244	0.333	0.227
95% Back of Queue Length (metres)	5	9	2

Table 8-3: PM Peak 2031 Development - SIDRA Results

PM Peak 2031 Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)	New Access Road / Welshpool Road Intersection
Average Delay (seconds)	13	12	13
Level of Service (LOS)	B	B	B
Degree of Saturation (DOS)	0.212	0.242	0.239
95% Back of Queue Length (metres)	4	6	1

Table 8-4: Weekend Peak 2031 Development - SIDRA Results

Weekend Peak 2031 Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)	New Access Road / Welshpool Road Intersection
Average Delay (seconds)	12	12	12
Level of Service (LOS)	B	B	B
Degree of Saturation (DOS)	0.183	0.247	0.164
95% Back of Queue Length (metres)	3	4	2



8.7 Assessment Results – Scenario Two – 2041 Design Year Horizon

The results for the 2041 Design Year scenarios are presented in following tables. Detailed SIDRA results can be found in **Appendix D**.

Table 8-5: AM Peak 2041 Development - SIDRA Results

AM Peak 2041 Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)	New Access Road / Welshpool Road Intersection
Average Delay (seconds)	13	14	12
Level of Service (LOS)	B	B	B
Degree of Saturation (DOS)	0.244	0.333	0.215
95% Back of Queue Length (metres)	5	9	2

Table 8-6: PM Peak 2041 Development - SIDRA Results

PM Peak 2041 Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)	New Access Road / Welshpool Road Intersection
Average Delay (seconds)	13	12	13
Level of Service (LOS)	B	B	B
Degree of Saturation (DOS)	0.212	0.242	0.233
95% Back of Queue Length (metres)	4	6	1

Table 8-7: Weekend Peak 2041 Development - SIDRA Results

Weekend Peak 2041 Results	Welshpool Road East / Crystal Brook Road (western intersection)	Welshpool Road East / Crystal Brook Road (eastern intersection)	New Access Road / Welshpool Road Intersection
Average Delay (seconds)	12	12	12
Level of Service (LOS)	B	B	B
Degree of Saturation (DOS)	0.183	0.247	0.155
95% Back of Queue Length (metres)	3	4	2

8.8 Summary of Road Network Performance

The 2031 and 2041 Development SIDRA Intersection results indicate the following:

- Welshpool Road East / Crystal Brook Road (western intersection)
 - The results demonstrate that the intersection operates well and under capacity across both the 2031 and 2041 design years for the assessed AM, PM and Weekend peaks. A LOS B is recorded across each peak with Crystal Brook Avenue right turn onto Welshpool Road East shown to be worst performing movement.
- Welshpool Road East / Crystal Brook Road (eastern intersection)
 - Similarly to the western intersection, the results demonstrate the intersection operation under capacity across both the 2031 and 2041 design years for the assessed AM, PM and Weekend peaks. A LOS B is recorded for each peak with the Crystal Brook Avenue right turn onto Welshpool Road East shown to be worst performing movement.
- New Access Road / Welshpool Road East intersection
 - Similarly to the above intersections, the results demonstrate the intersection operates well and under capacity across both the 2031 and 2041 design years for the assessed AM, PM and Weekend peaks. A LOS B is recorded for each peak with the New Access Road right turn onto Welshpool Road East shown to be worst performing movement, noting that minimal queuing is recorded back into the site or along Welshpool Road East.



9 Safety Issues

9.1 Existing Safety Issues

As detailed in Section 2.9, a crash assessment for a five-year reporting period between 1 January 2019 and 31 December 2023 for roads surrounding the site was conducted.

With regards to the development proposing to introduce a new connection with Welshpool Road East a particular focus on the frontage of the site was assessed. On this basis, given that the frontage road extent shows a record of one crash over the latest 5-year period, there is no perceived crash pattern or critical road safety issue requiring additional mitigation to accommodate the development.

9.2 Impact of the Development on Safety Issues

Given the relatively low number of crashes recorded at the frontage of the with Welshpool Road East it is reasonable to assume that whilst the proposed development will contribute to increased crash exposure (in addition to the future background traffic growth), there is a low likelihood that the proposed development will increase the chances of specific crash types occurring given there is no obvious road safety crash trend.

The introduction of the new connection with Welshpool Road East will however introduce new conflict points with the proposed priority controlled driveway intersection. As such, appropriate turn lane lengths and tapers, as discussed in Section 3.4, should be implemented to adhere to Austroads Guidelines.

The low delays for vehicles turning to and from the site access indicates that drivers should be able to find sufficient gaps in traffic on Welshpool Road East, in consideration of the ROM24 forecasts also, and not be under undue pressure in the section of small gaps in traffic and thus take risks. This suggests the additional movements should not unduly increase the crash risk at this location.



10 Conclusions

In accordance with WAPC 'Guidelines for Transport Impact Assessment (TIA) Guidelines', this report sets out the details of the proposed lifestyle and residential development set within vacant land at Lot 500 Gavour Road in Wattle Grove, Western Australia.

The site is set within an approved Local Development Plan (LDP) area within Wattle Grove.

This TIA includes the key transport issues and impacts related to the development of the development site including the current level of accessibility by foot, cycle, public transport and on road. This report sets recommendations to explore the potential for improving these to a suitable level where required and appropriate.

The key recommendations and considerations as a result of this TIA process are listed as follows:

Proposed access to Welshpool Road East:

The proposed access from the development onto Welshpool Road East provides immediate access for the development to a key distributor road. The traffic modelling assessment completed as part of this TIA details the proposed driveway intersection operating effectively and below capacity through to 2041 with minimal delays on Welshpool Road East. The key consideration for the new connection is ensuring the design adheres to the Austroads Guidelines and designed safely due to the introduced potential conflict points.

This TIA has been prepared with sufficient detail and analysis to support the full development application based on the proposed configuration of the development, the public open space and the network of high and lower order roads throughout the site.

This TIA also acknowledges the future proposed modifications to the surrounding transport networks including Local and State Government projects and initiatives such as:

Kelvin, Hale and Welshpool Roads: Tonkin Highway Corridor:

Planned upgrades are proposed along the Tonkin Highway corridor between Hale Road and Welshpool Road. The improvements include widening the corridor to a six-lane dual carriageway as well as planned interchanges.

This TIA ultimately demonstrates that the existing road network and planned future road network upgrades are capable of satisfactorily supporting the additional vehicular traffic expected to be generated by the proposed full development at the 2031 opening year and 2041 design horizon.

10.1 Overall Integration with Surrounding Attractors / Generators

The site is located on vacant bushland and is surrounded by low density rural residential land uses. Gavour Road bounds the eastern side of the site and Welshpool Road East to the north side.

Approximately 3km to west and north west are the Wattle Grove and Forrestfield Shopping Centres respectively and some 6km to the north-east is the centre of Kalamunda. To the north-west of the site is Forrestfield Primary School, which is the closest school to the development site, although no children are expected to access the school from the development site as it will be an over 55s residential development.

The site is removed from the current active travel network which is currently limited to an off-road shared path on Welshpool Road East, west of Lewis Road toward Tonkin Highway. However, walking trails are located within proximity (~1km) to the site which include the Lions Lookout Walk and trails through Lesmurdie Falls.

10.2 Road Network Accessibility

The key connection for the development will be the proposed access to Welshpool Road East which provides an east-west connection between Lesmurdie and Perth. Welshpool Road is classified as a 'Distributor A' road in the Main Roads Functional Road Hierarchy East and also connects to other key distributors; Tonkin Highway, Roe Highway and Leach Highway.

The proposed access to Welshpool Road East is consistent with the intent and specific measures of DCP 5.1. It minimises conflict points, preserves the function of the regional road, ensures safe vehicle movements, and is necessitated by site-specific constraints. The design incorporates appropriate turn treatments and intersection geometry, and its traffic impact has been demonstrated to be low.

The proposed internal Road Hierarchy of the development demonstrates all roads proposed as Access Street D due to all roads envisaged to accommodate less than 1,000 vpd as per the WA Liveable Neighbourhood Guidelines (2009).

10.3 Pedestrian and Cycle/Wheeled Accessibility

The safe movement of pedestrians and cyclists/wheeled mobility across the site is to be allowed within the roadways, where traffic flows are expected to be very low. Cyclists will also cycle on the quiet residential streets within the proposed development.

In regard to the crossing ability across the internal lower order access road network, no single road is predicted to carry more than 1,000 vehicles per day with volumes typically significantly less than this. These roads are therefore not considered to cause an apparent difficult barrier for pedestrians and cyclists/wheeled mobility to cross based on this threshold alone.



10.4 Public Transport Accessibility

Bus service 281 and 282 operate on Welshpool Road East to the north of the site, with the servicing bus stops approximately 100m from the north-west border, and bus service 283 operates on Crystal Brook Avenue to the south with the associated bus stops within 350m from the southern border. These bus services provide options to travel into Perth, Kalamunda, Lesmurdie and Forrestdale.

Access to the bus stops located on Welshpool Road East (100m from the north-west border) may need to be addressed as part of the proposal to best utilise and integrate with the existing network. Access to the bus stops along the southern verge is suggested as the most logical route to and from these bus stops.

10.5 Road Safety Considerations

Given the relatively low number of crashes recorded at the site's frontage with Welshpool Road East it is reasonable to assume that whilst the proposed development will contribute to increased traffic volumes in future years (in addition to the future background traffic growth), there is a low likelihood that the proposed development will increase the chances of regular crashes occurring given there is no obvious road safety crash trend.

The low delays for vehicles turning to and from the site access indicates that drivers should be able to find sufficient gaps in traffic on Welshpool Road East and not be under undue pressure to take unsafe gaps in traffic. This suggests the additional movements should not unduly increase the crash risk at this location.

The introduction of the new vehicular driveway with Welshpool Road East will introduce new potential conflict points with the proposed priority controlled intersection. As such, appropriate turn lane lengths and tapers, as discussed in Section 3.4, should be implemented to adhere to Austroads Guidelines.

10.6 Analysis of the External Transport Network

The 2031 full development opening year and 2041 +10 year design horizon SIDRA Intersection results indicate the following:

- Welshpool Road East / Crystal Brook Road (western intersection)
 - The results demonstrate that the intersection operates well and under capacity across both the 2031 and 2041 design years for the assessed AM, PM and Weekend peaks. A LOS A/B is recorded across each peak with Crystal Brook Avenue right turn onto Welshpool Road East shown to be worst performing movement.
- Welshpool Road East / Crystal Brook Road (eastern intersection)
 - Similarly to the western intersection, the results demonstrate the intersection operation under capacity across both the 2031 and 2041 design years for the assessed AM, PM and Weekend peaks. A LOS A/B is recorded for each peak with the Crystal Brook Avenue right turn onto Welshpool Road East shown to be worst performing movement.
- New Access Road / Welshpool Road East intersection
 - Similarly to the above intersections, the results demonstrate the intersection operates well and under capacity across both the 2031 and 2041 design years for the assessed AM, PM and Weekend peaks. A LOS A/B is recorded for each peak with the New Access Road right turn onto Welshpool Road East shown to be worst performing movement, noting that minimal queuing is recorded back into the site or along Welshpool Road East.

Appendix A **TIA Checklist**



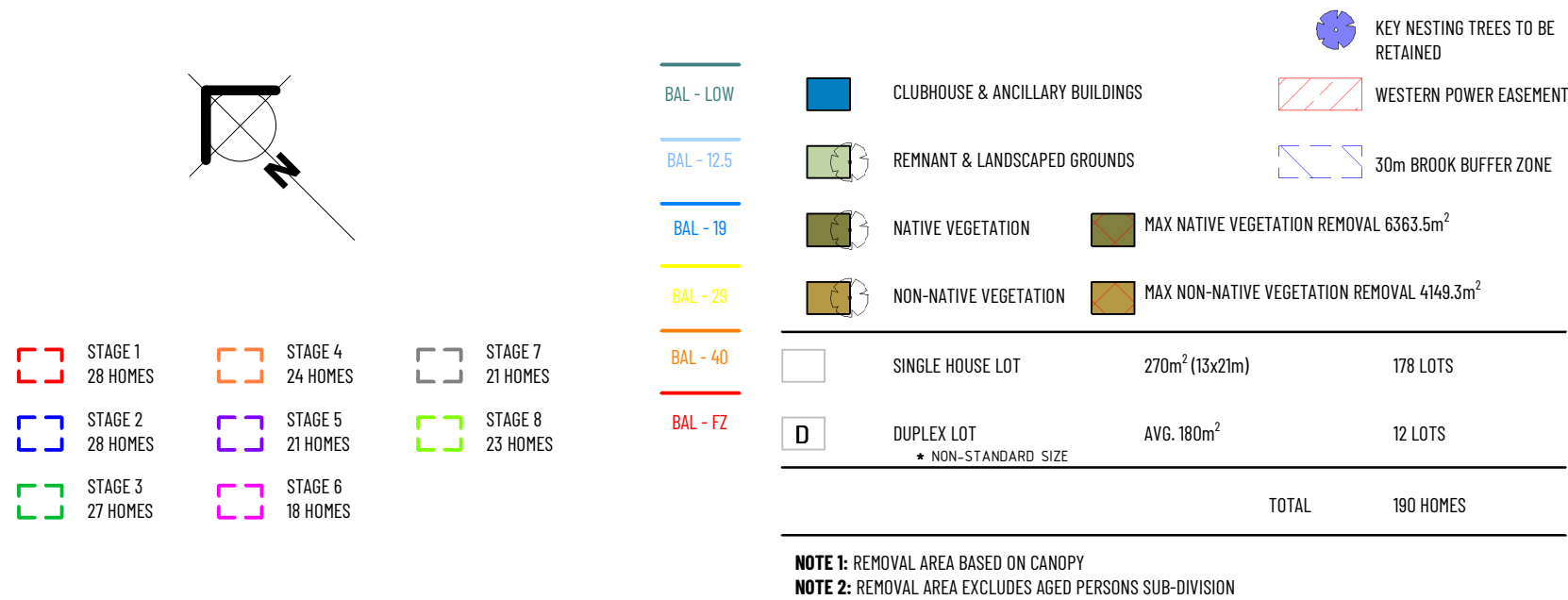
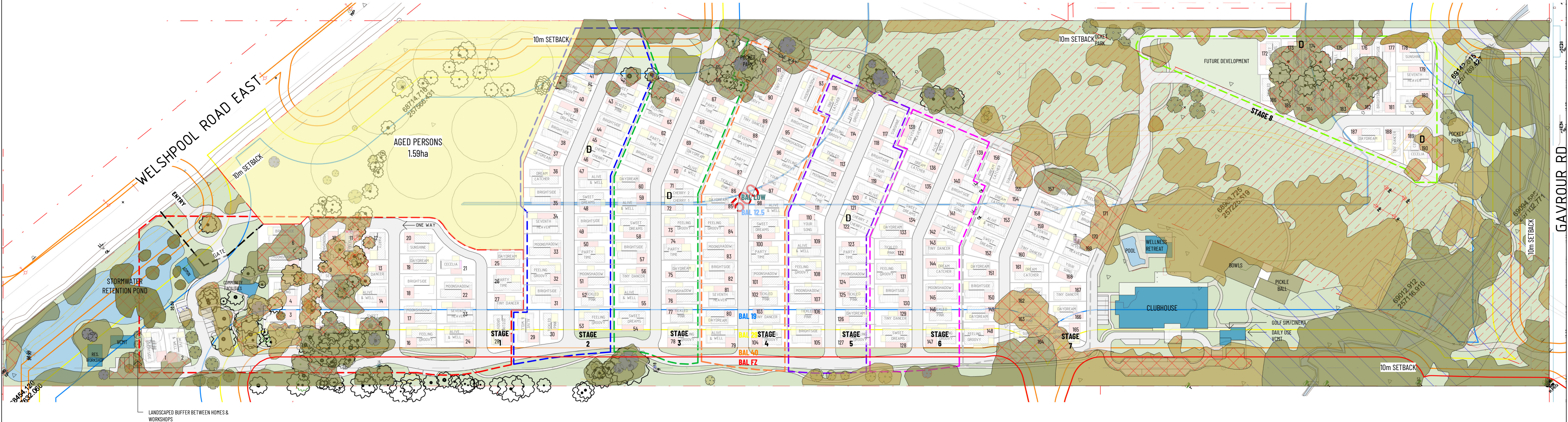
Appendix A TIA Checklist

Item	Provided	Comments/Proposals
Summary	Y	
Introduction / Background	Y	
Structure Plan Proposal	Y	
Regional context	Y	
Proposed land uses	Y	
Table of land uses and quantities	Y	
Major attractors / generators	Y	
Specific issues	Y	
Existing Situation	Y	
Existing land uses within structure plan	Y	
Existing land uses within 800m of structure plan area	Y	
Existing road network within structure plan area	Y	
Existing pedestrian / cycle network within structure plan area	Y	
Existing public transport services within structure plan area	Y	
Existing road network within 2 (or 5) km of structure plan area	Y	
Traffic flows on roads within structure plan area (PM and/or AM peak hours)	Y	
Existing pedestrian / cycle networks within 800m of structure plan area.	Y	
Existing public transport services within 800m of structure plan area.	Y	
Proposed Internal Transport Networks	Y	
Changes / additions to existing road network or proposed new road network	Y	
Road reservation widths	Y	
Road cross-sections & speed limits	Y	
Intersection controls	Y	
Pedestrian / cycle networks and crossing facilities	Y	
Changes to External Transport Networks	Y	
Road network	Y	
Intersection controls	Y	
Pedestrian/cycle networks and crossing facilities	Y	
Public transport services	Y	

Integration with surrounding area	Y	
Trip attractors / generators within 800 metres	Y	
proposed changes to land uses within 800 metres	Y	
travel desire lines from development to these attractors/ generators	Y	
adequacy of external transport networks	Y	
deficiencies in external transport networks	Y	
remedial measures to address deficiencies	Y	
Analysis of internal transport networks	Y	
assessment years	Y	
time periods	Y	
Structure plan generated traffic	Y	
Extraneous (through) traffic	Y	
Design traffic flows (that is, total traffic)	Y	
Road cross-sections	Y	
Intersection controls	Y	
Access strategy	Y	
Pedestrian / cycle networks	Y	
Safe routes to schools	Y	
Pedestrian permeability & efficiency	Y	
Access to public transport	Y	
Analysis of external transport networks	Y	
Extent of analysis	Y	
Base flows for assessment year(s)	Y	
Total traffic flows	Y	
Road cross-sections	Y	
Intersection layouts and controls	Y	
Pedestrian / cycle networks	Y	
Conclusions	Y	

Appendix B

Proposed Development Site Layout



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No.	Description	Date
D	REVISED ROAD LAYOUT	05.02.2025
E	ADJUSTED HOUSE MIX, ADDED PARK SPACE	26.02.2025
F	ENTRY RD & PARKING REALIGNED	02.04.2025
G	LOT ADJUSTMENT FOR BAL	24.06.2025

PROVIDENCE LIFESTYLE

WATTLE GROVE LIFESTYLE RESORT

32 GAVOUR RD, WATTLE GROVE, 6107

Site Masterplan

Project number

Date 24.06.2025

Drawn by RHA

Checked by RHA

Scale@A2

A2.01

As indicated



STAGE 1
28 HOMES

STAGE 2
28 HOMES

STAGE 3
28 HOMES

STAGE 4
26 HOMES

STAGE 5
23 HOMES

STAGE 6
20 HOMES

STAGE 7
24 HOMES

STAGE 8
24 HOMES

BAL - LOW

BAL - 12.5

BAL - 19

BAL - 29

BAL - 40

BAL - FZ

CLUBHOUSE & ANCILLARY BUILDINGS

REMNANT & LANDSCAPED GROUNDS

NATIVE VEGETATION

NON-NATIVE VEGETATION

MAX NATIVE VEGETATION REMOVAL 7554.5m²

MAX NON-NATIVE VEGETATION REMOVAL 4149.3m²

SINGLE HOUSE LOT
270m² (13x21m)

D
DUPLICATE LOT
★ NON-STANDARD SIZE
AVG. 180m²

187 LOTS

14 LOTS

TOTAL

201 HOMES

KEY NESTING TREES TO BE RETAINED

WESTERN POWER EASEMENT

30m BROOK BUFFER ZONE

NOTE 1: REMOVAL AREA BASED ON CANOPY

NOTE 2: REMOVAL AREA EXCLUDES AGED PERSONS SUB-DIVISION

RICHARD HAMMOND ARCHITECT
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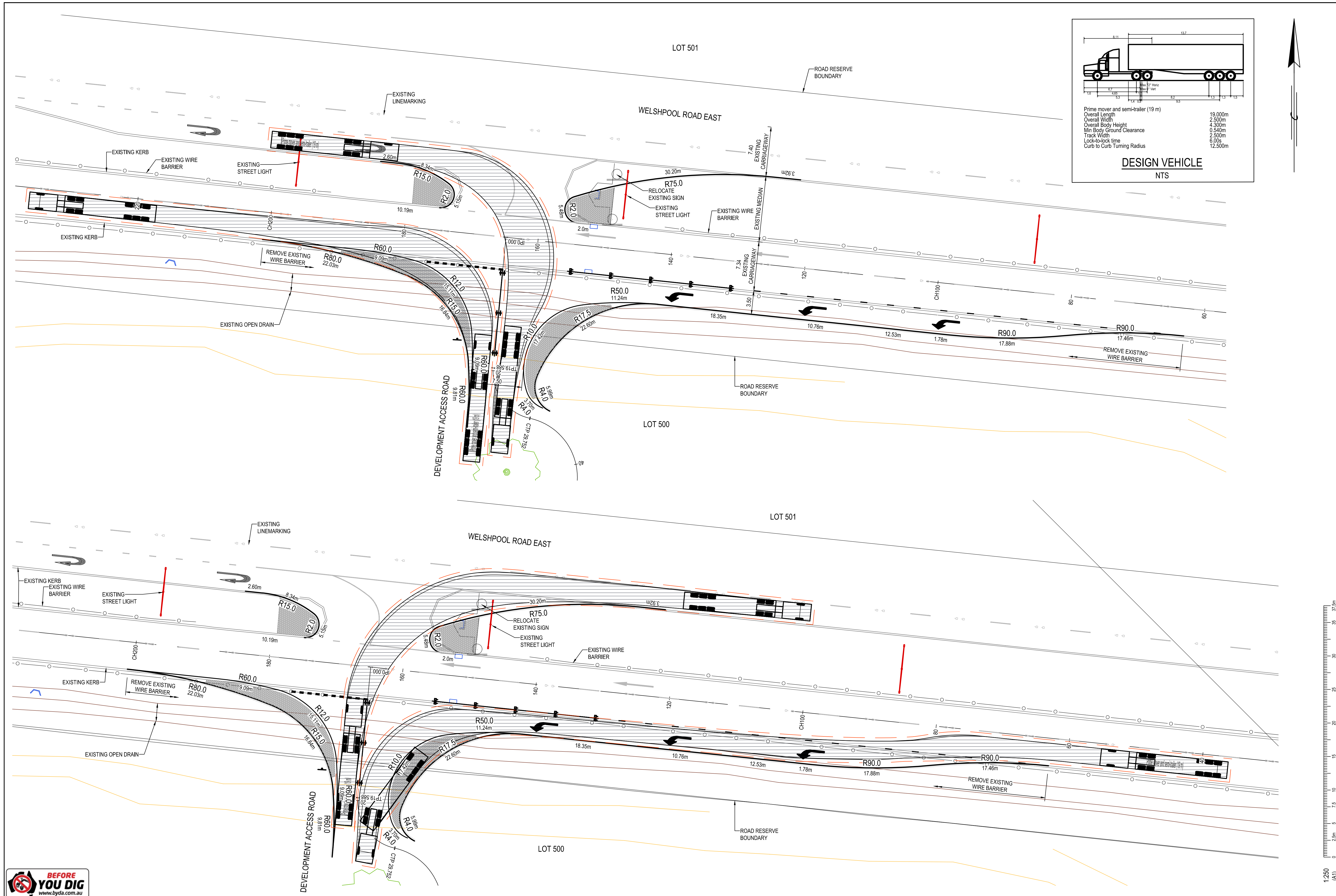
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No.	Description	Date
C	REVISED ROAD LAYOUT	05.02.2025
D	ADJUSTED HOUSE MIX, ADDED PARK SPACE	26.02.2025
E	ENTRY RD & PARKING REALIGNED	02.04.2025
F	LOT ADJUSTMENT FOR BAL	24.06.2025

PROVIDENCE LIFESTYLE		Site Masterplan - Extra Lots	
WATTLE GROVE LIFESTYLE RESORT		Project number	A2.02
32 GAVOUR RD, WATTLE GROVE, 6107		Date	
		Drawn by	
		Checked by	
		Scale@A2	As indicated

Appendix C

Proposed Entrance Channelisation





Zero Damage - Zero Harm

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No.	DATE	BY	INITIAL ISSUE	REVISION
A	28/02/25	WJB		

CLIENT:

PROVIDENCE LIFESTYLE (WATTLE GROVE) PTY LTD



DEVELOPMENT
ENGINEERING
CONSULTANTS

SUITE 3, 123A COLIN ST,
WEST PERTH, 6005
WESTERN AUSTRALIA
Ph: (08) 9481 1900
Fax: (08) 9481 1700

PROJECT:

**PLV WATTELE GROVE
LOT 500 GAVOUR ROAD
WATTLE GROVE**

W.A.P.C. No. -

DRAWING:

**WELSHPOOL ROAD EAST AND
ACCESS ROAD INTERSECTION
TURNING MOVEMENTS**

COORDINATE SYSTEM: PCGM; VERTICAL DATUM: AHD

SCALE	DRAWN	CHECK	REV No.
1:250	WJB	SRA	A
DATE	DESIGNED	APPROVED	
FEB '25	WJB	SRA	

PROJECT NUMBER: **WATNLV00**
DRAWING NUMBER: **K02**

S:\IN\WATNLV00\Drawings\WATNLV00_K02.dwg 28/02/2025

Appendix D

SIDRA Intersection Assessment Results

USER REPORT FOR NETWORK

 **Project:** 08187 - S - 01 - D - Lot 500 Gavour Road
Output produced by SIDRA INTERSECTION Version: 9.1.6.228

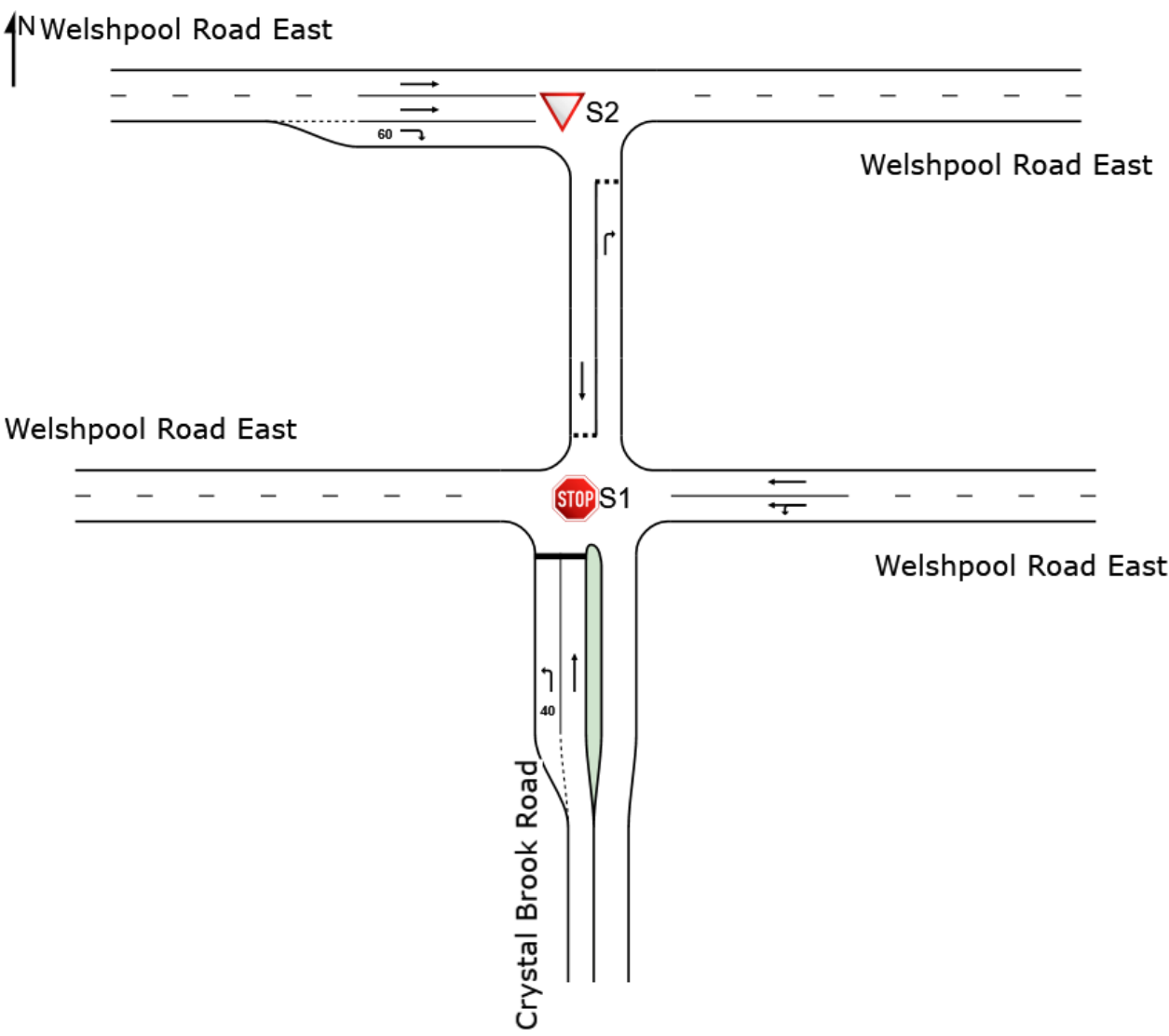
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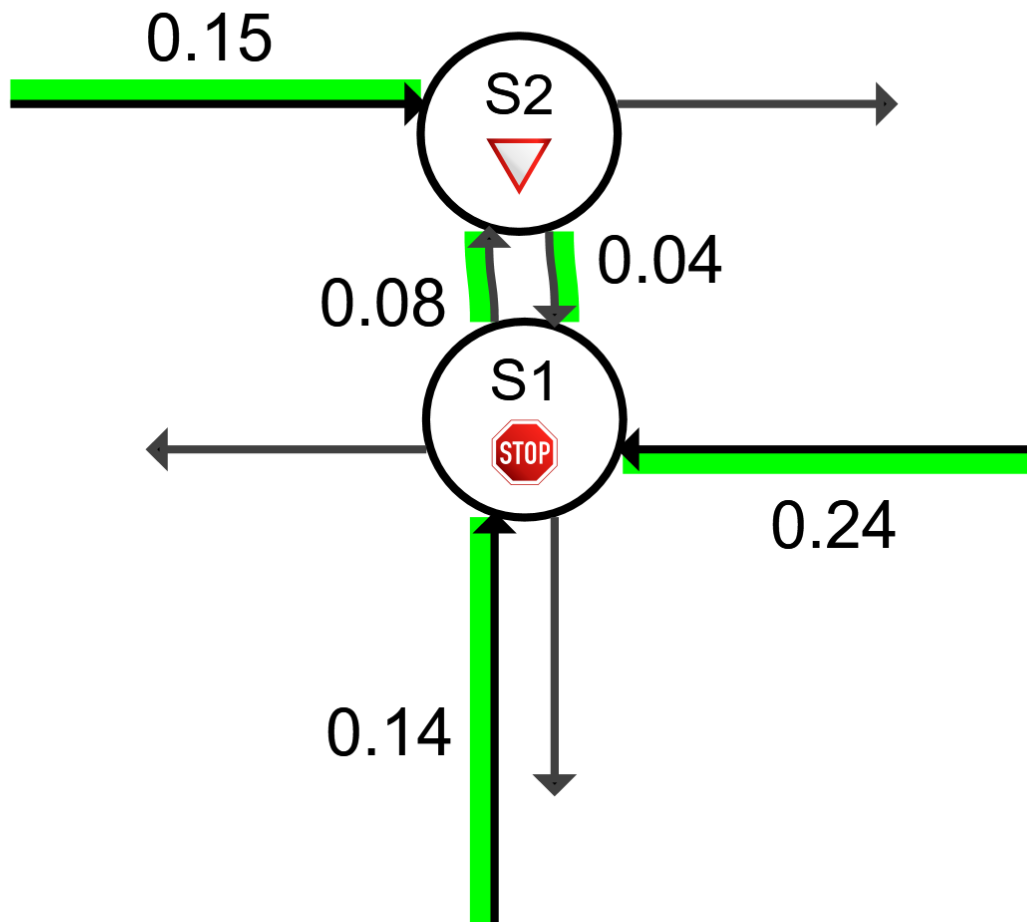
Sign controlled T-intersection with Median Storage for two-staged turn movements
Major Road Turn opposes Stage 2 of the Minor Road turn movement (Type A)
Network Category: (None)

Network Layout

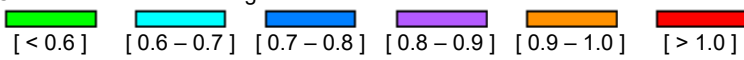
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



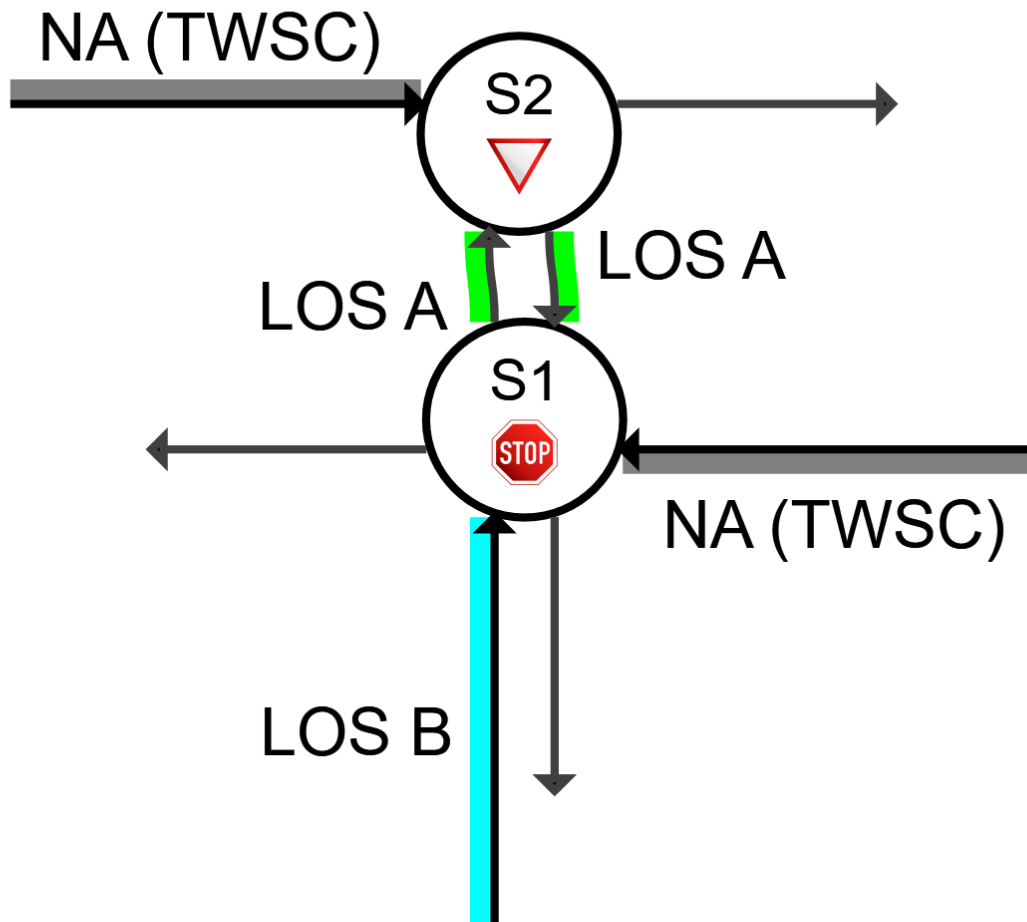
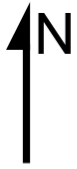
Degree of Saturation



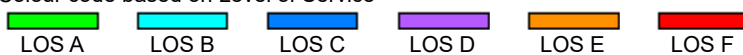
Colour code based on Degree of Saturation



Approach Level of Service



Colour code based on Level of Service

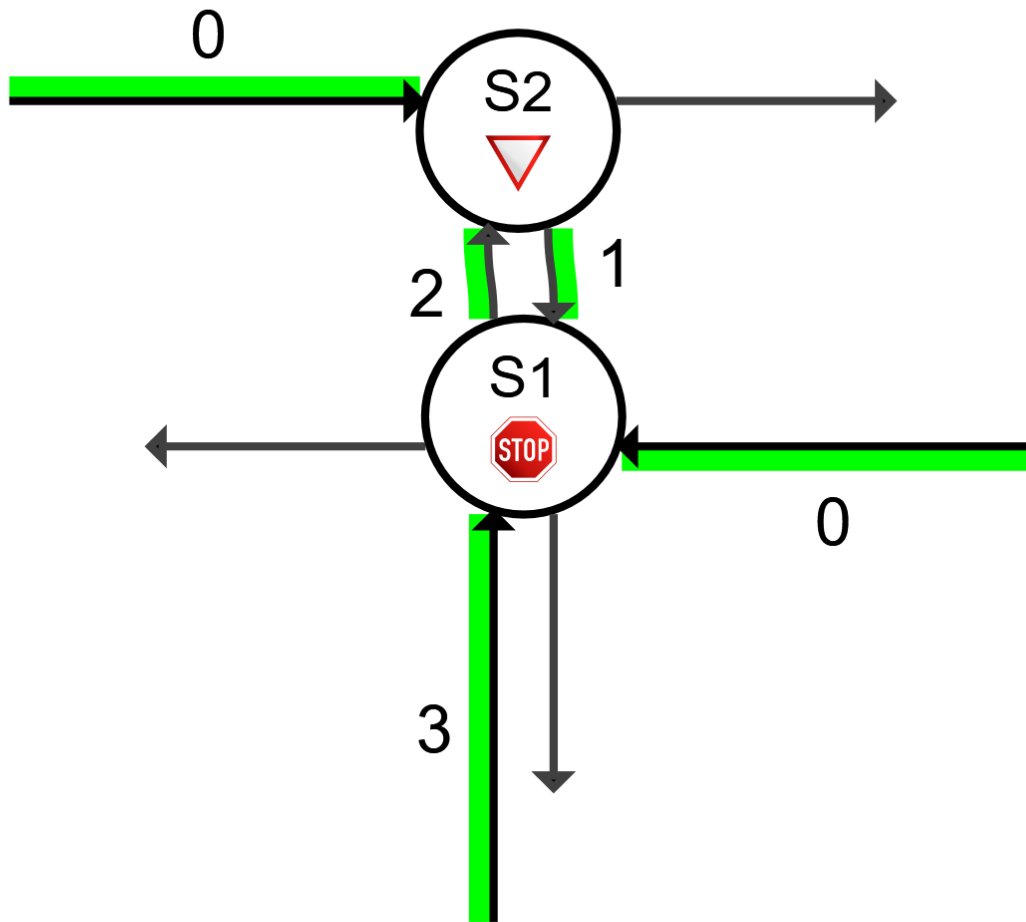


NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

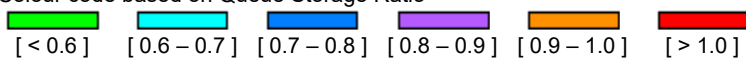
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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

Queue Distance (Percentile)



Colour code based on Queue Storage Ratio



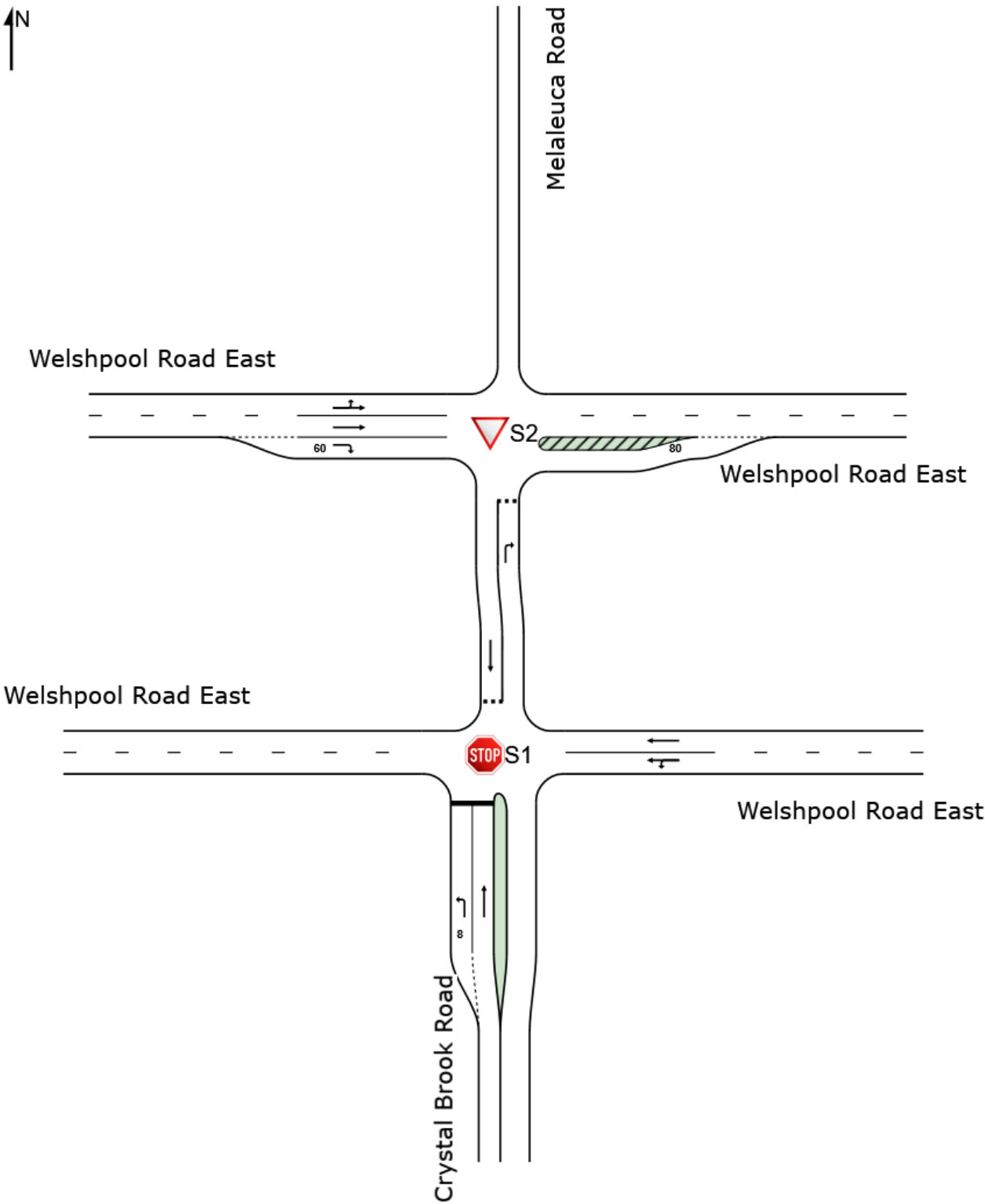
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - AM Peak (Network Folder: 2024 Base)]

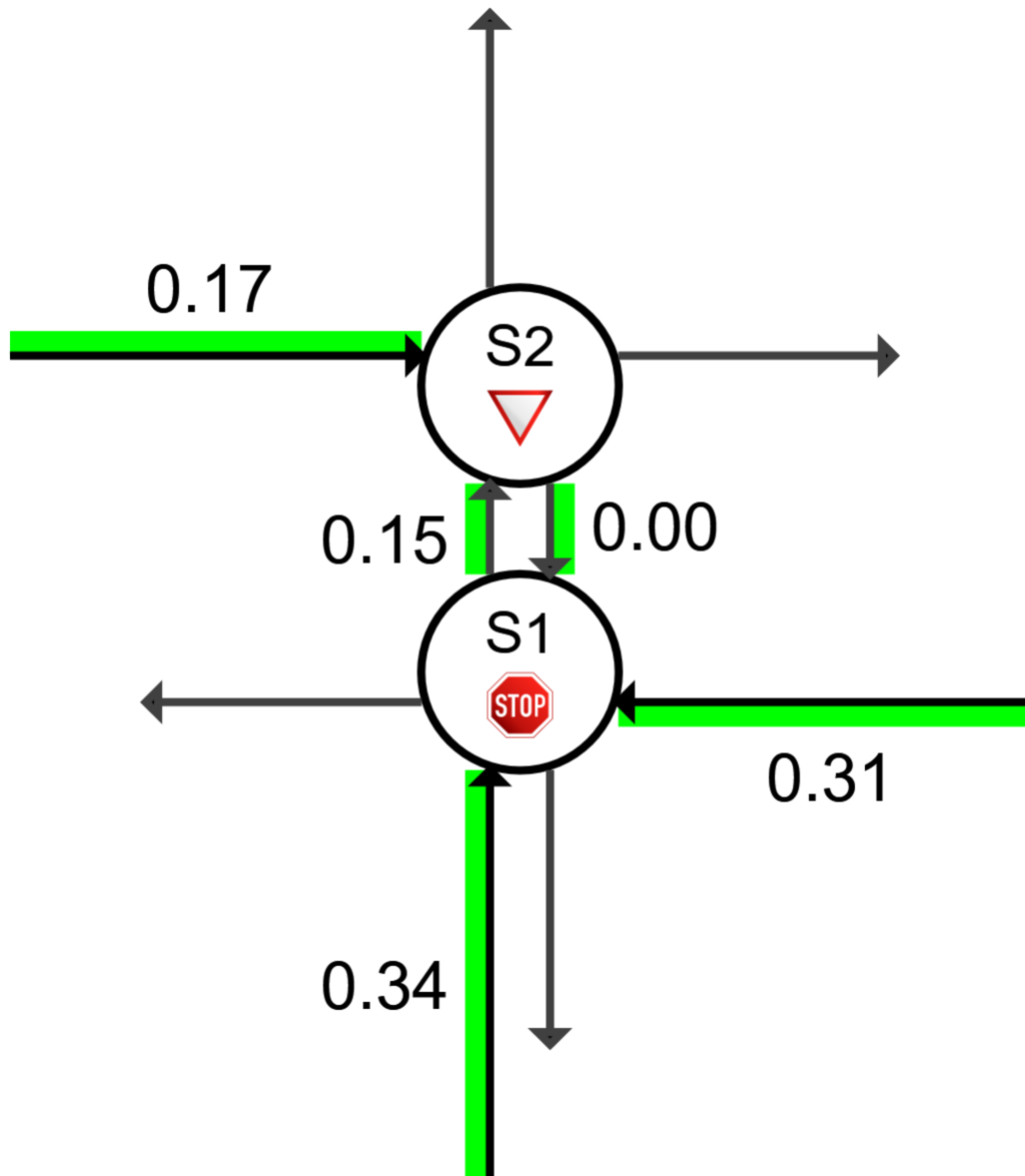
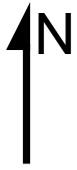
New Network
Network Category: (None)

Network Layout

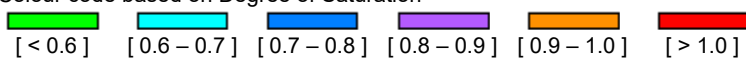
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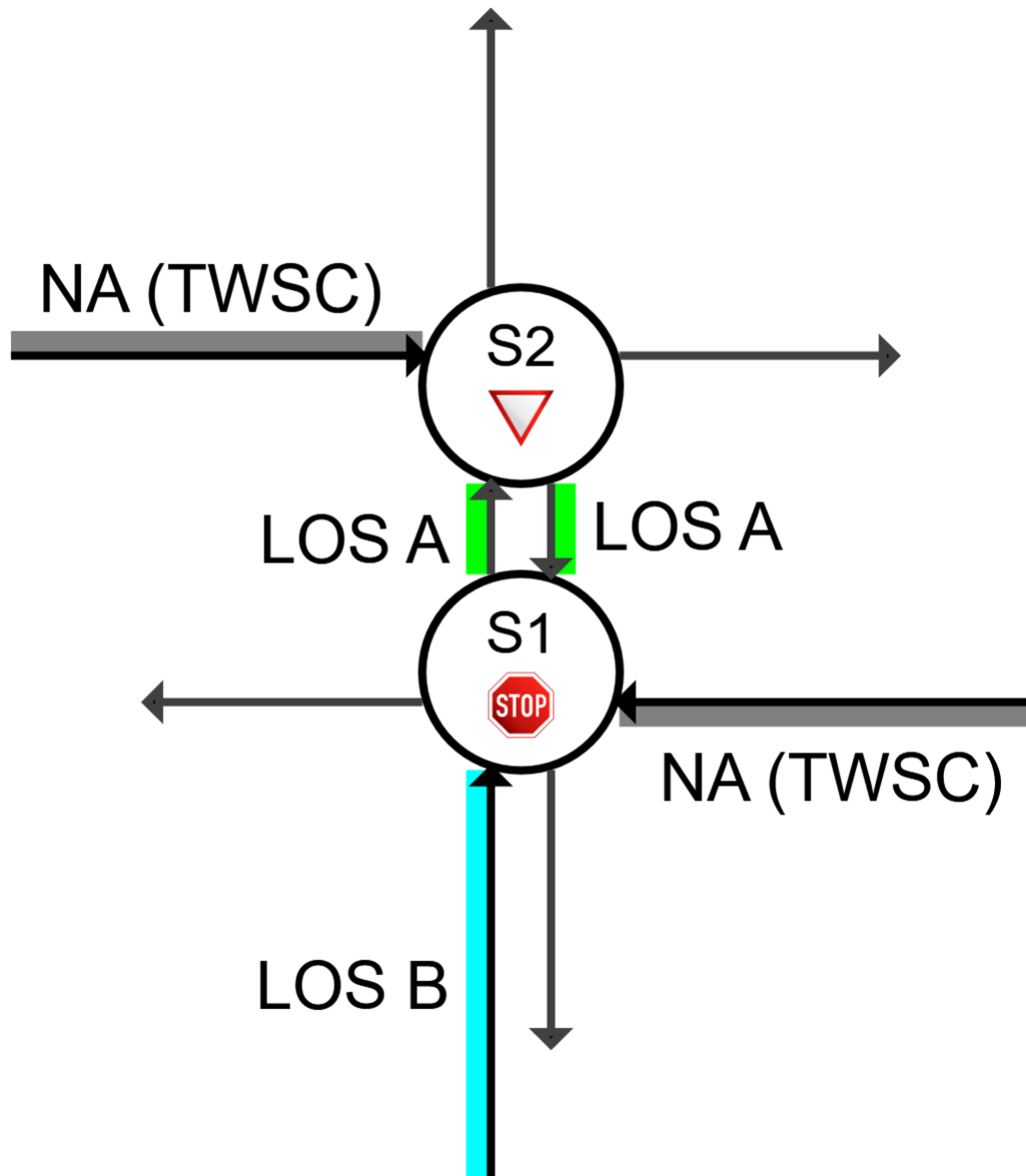
Degree of Saturation



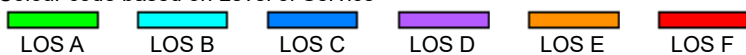
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Approach Level of Service



Colour code based on Level of Service

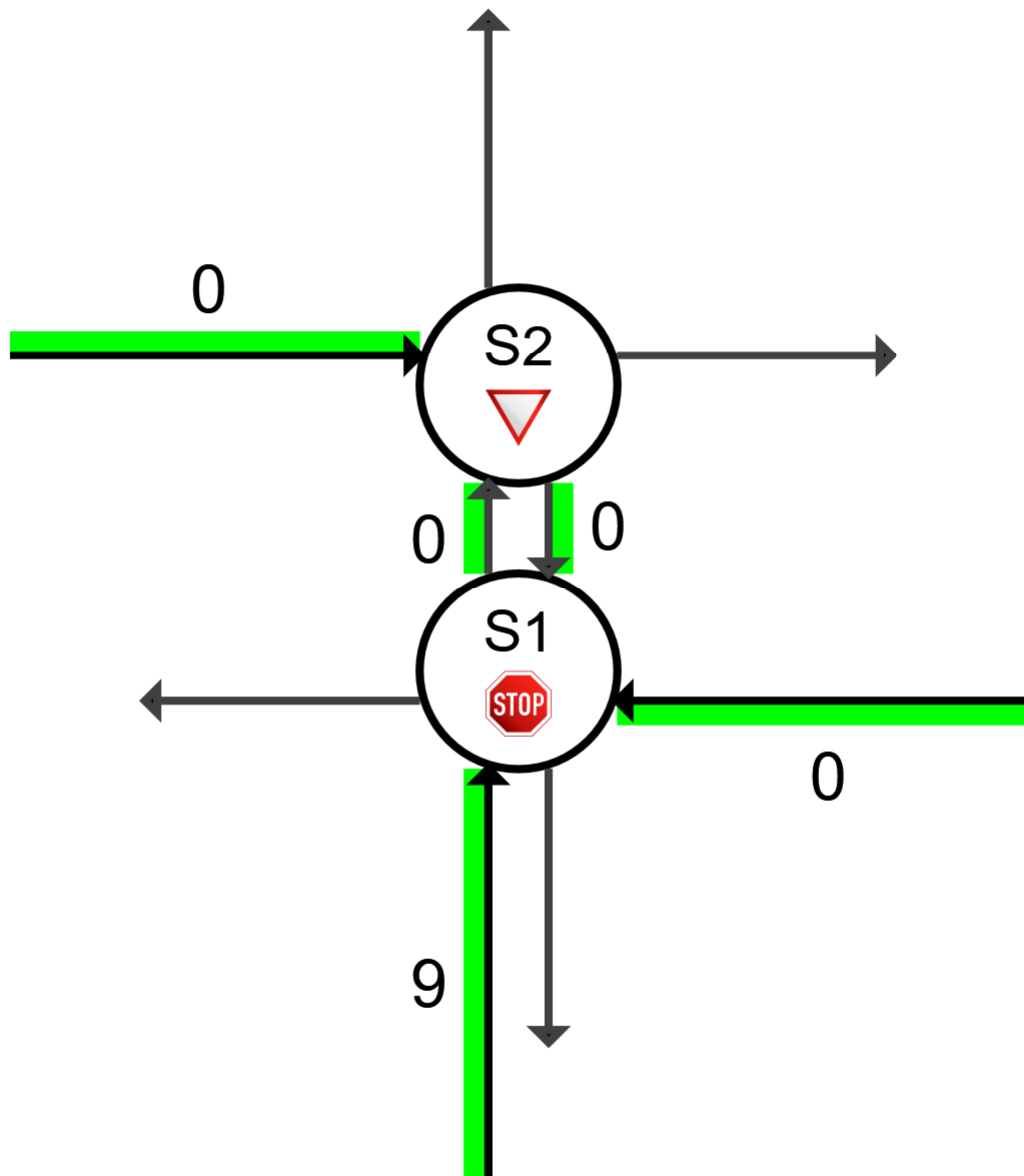


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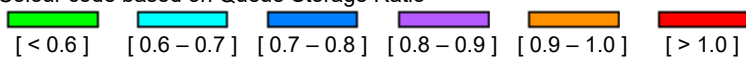
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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

Queue Distance (Percentile)



Colour code based on Queue Storage Ratio



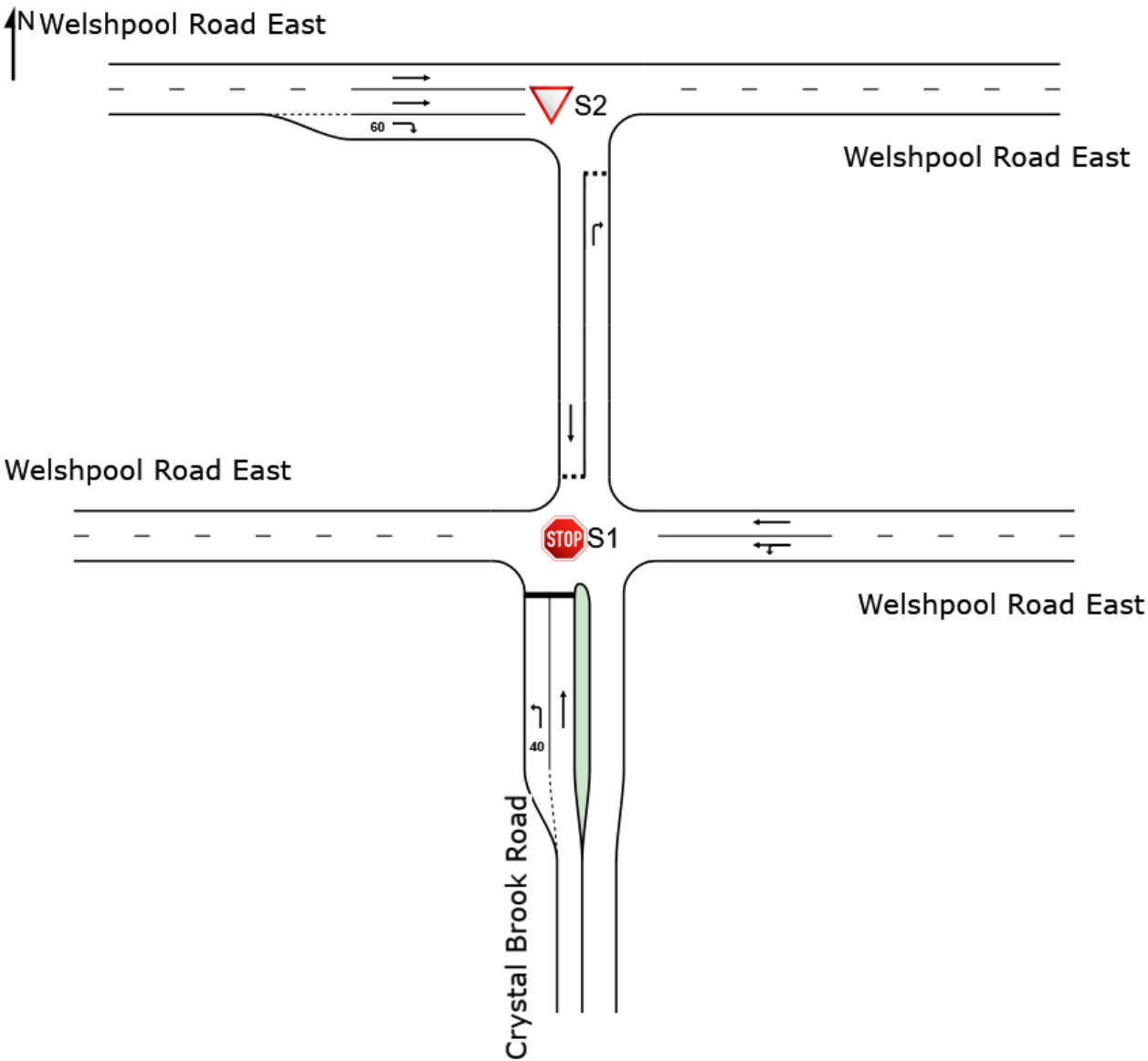
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

■■ Network: N101 [Crystal Brook Road / Welshpool Road East (west) - PM Peak (Network Folder: 2024 Base)]

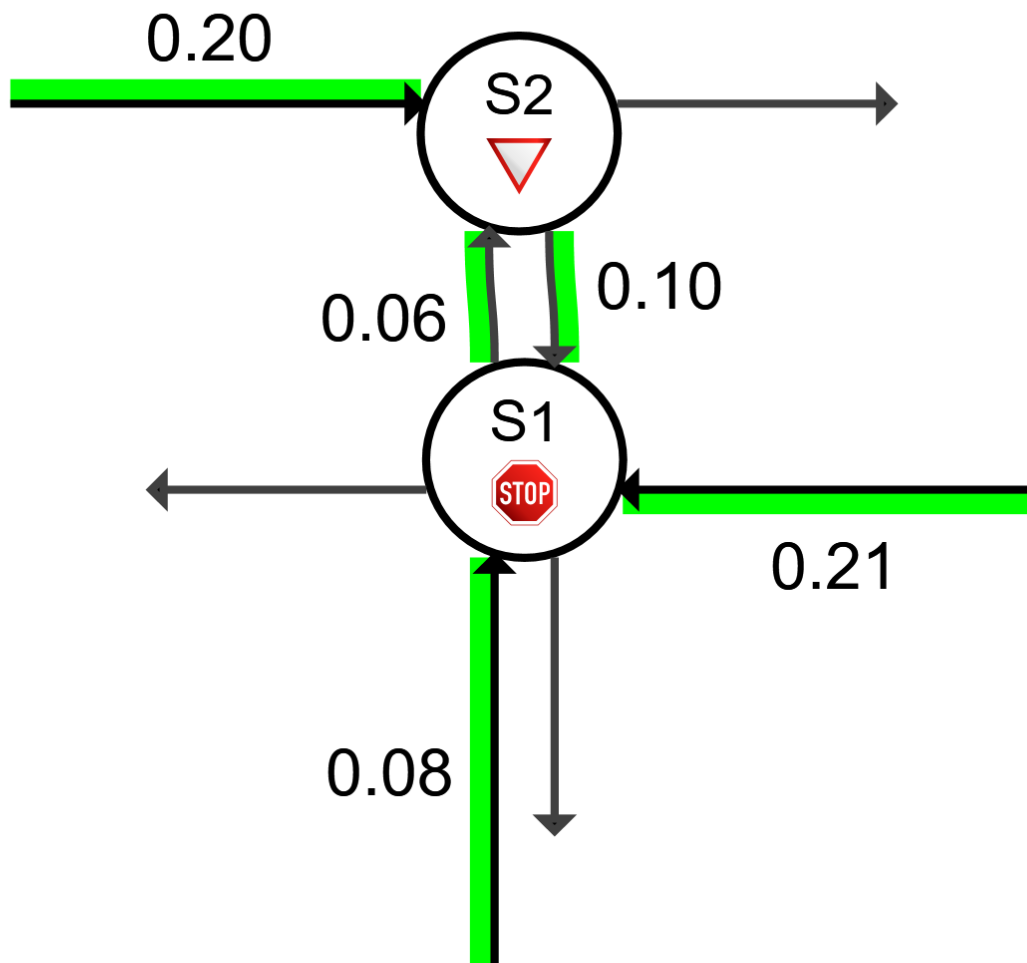
New Network
 Network Category: (None)

Network Layout

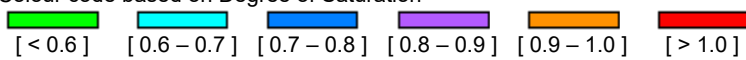
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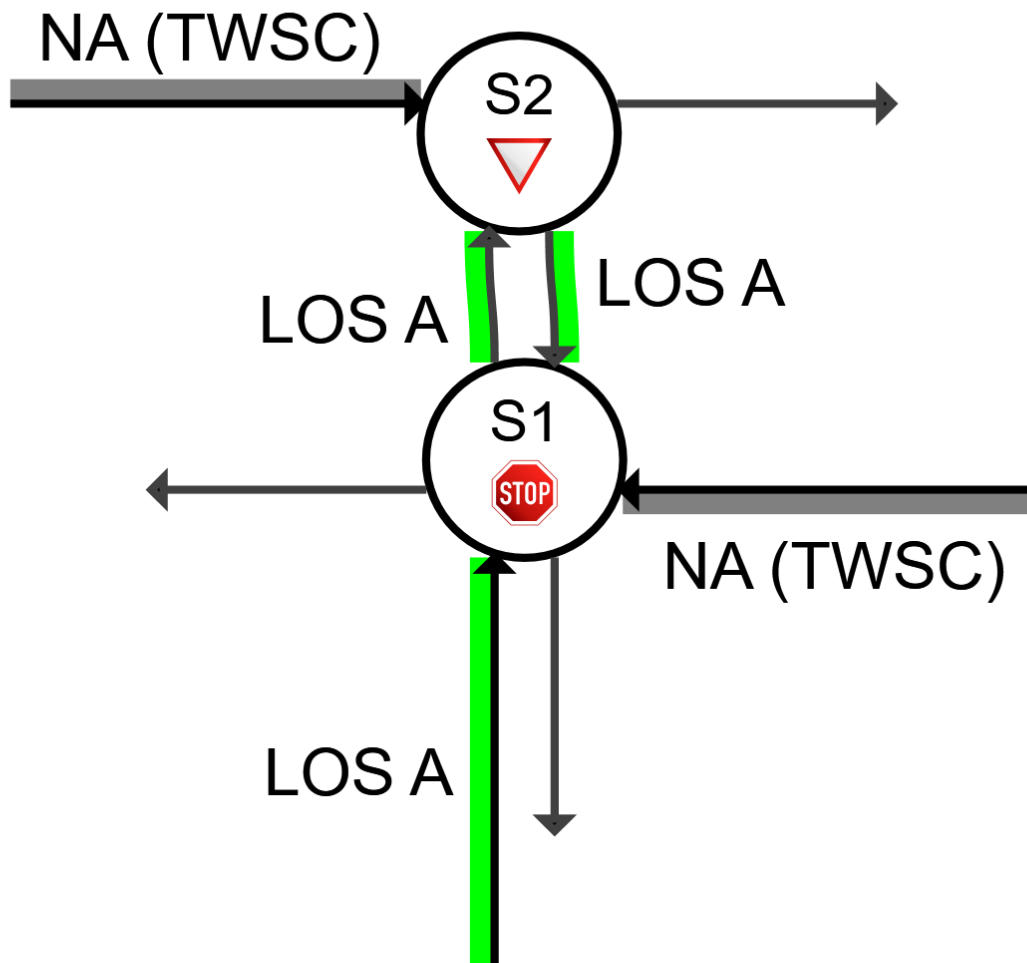
Degree of Saturation



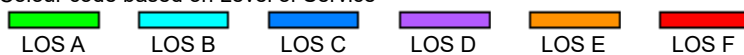
Colour code based on Degree of Saturation



Approach Level of Service



Colour code based on Level of Service

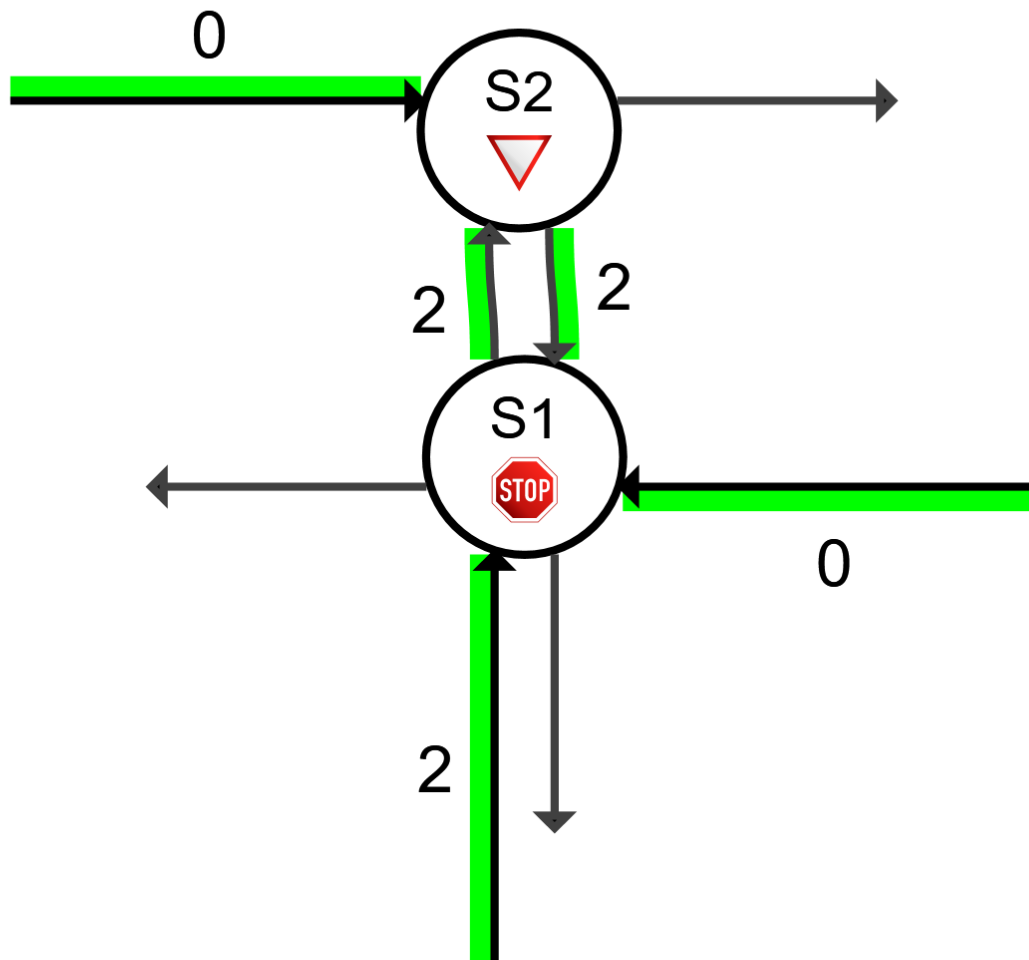


NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

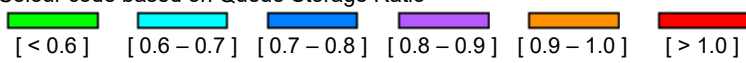
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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

Queue Distance (Percentile)



Colour code based on Queue Storage Ratio



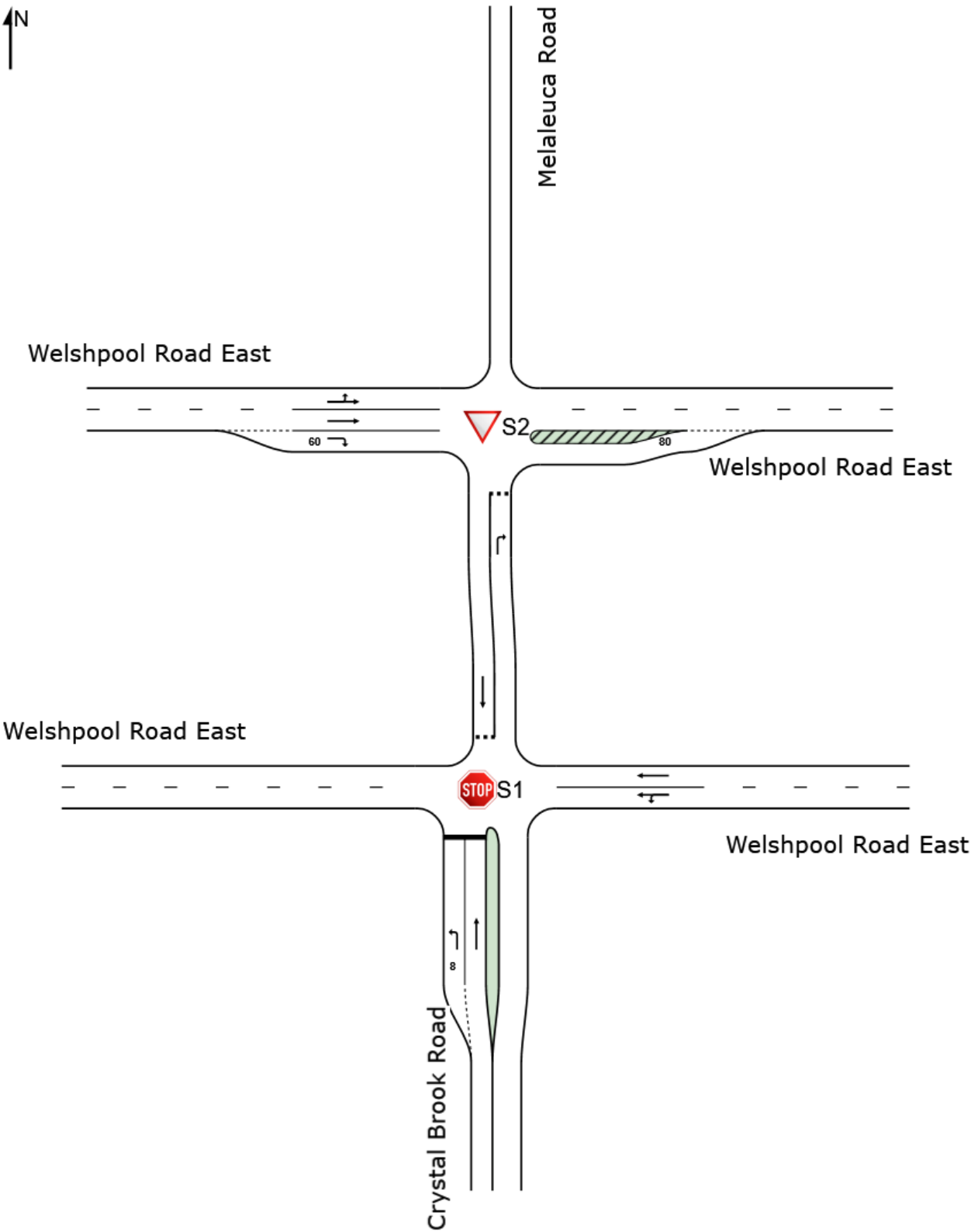
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

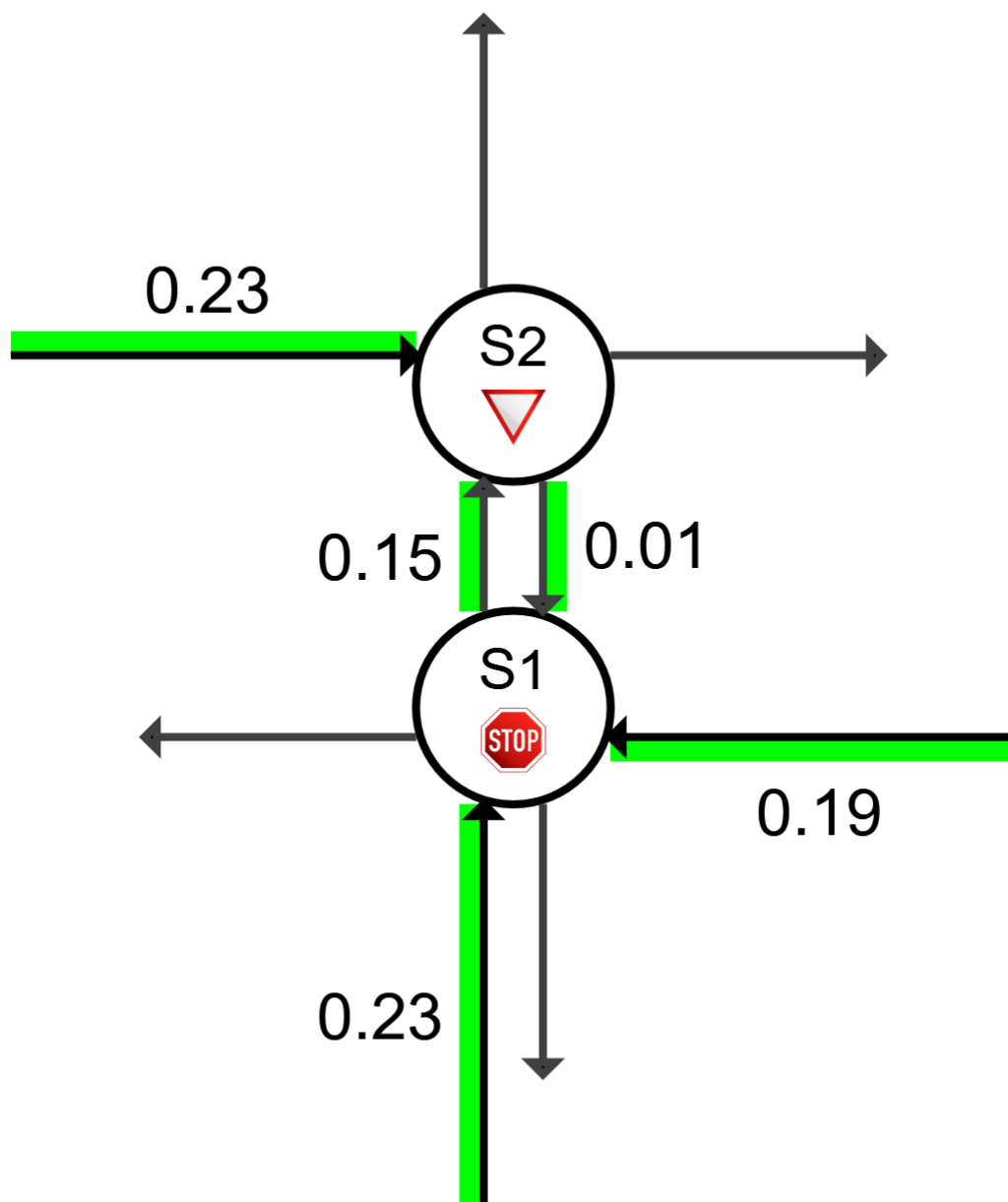
■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - PM Peak (Network Folder: 2024 Base)]

New Network
Network Category: (None)

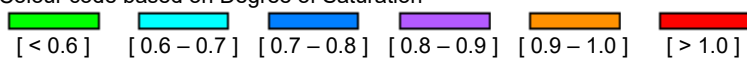
Network Layout

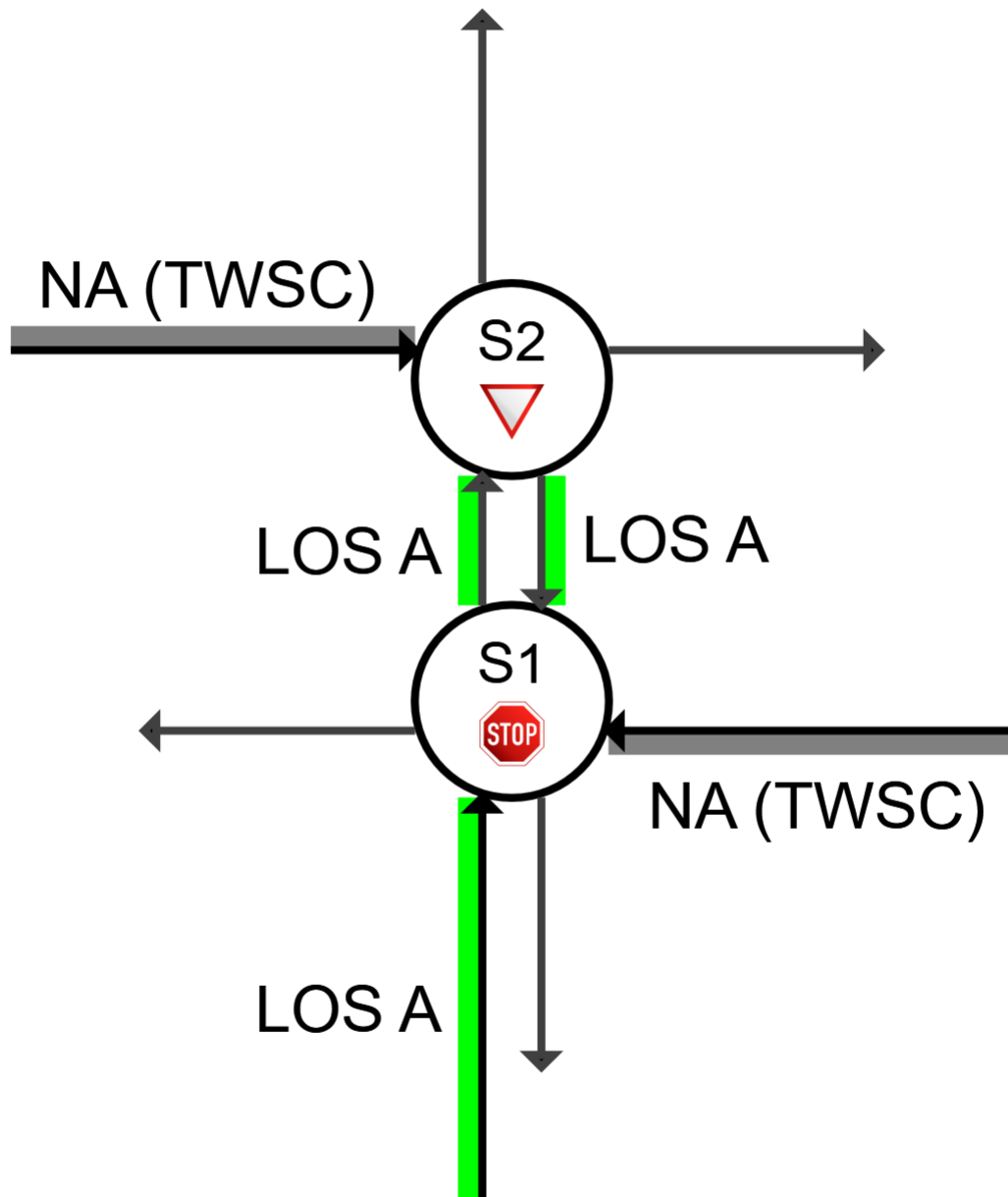
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.





Colour code based on Degree of Saturation





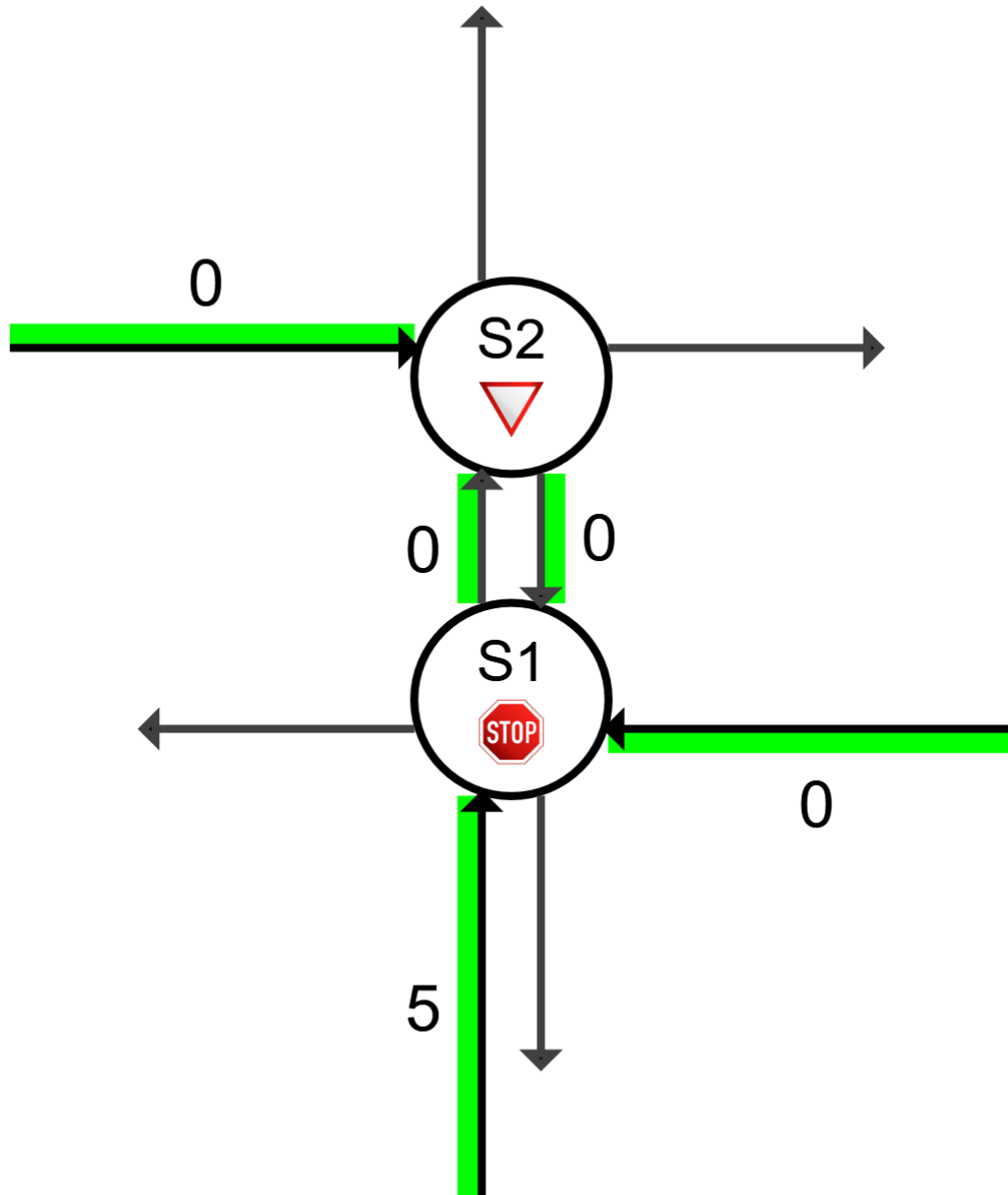
Colour code based on Level of Service



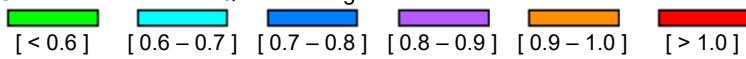
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



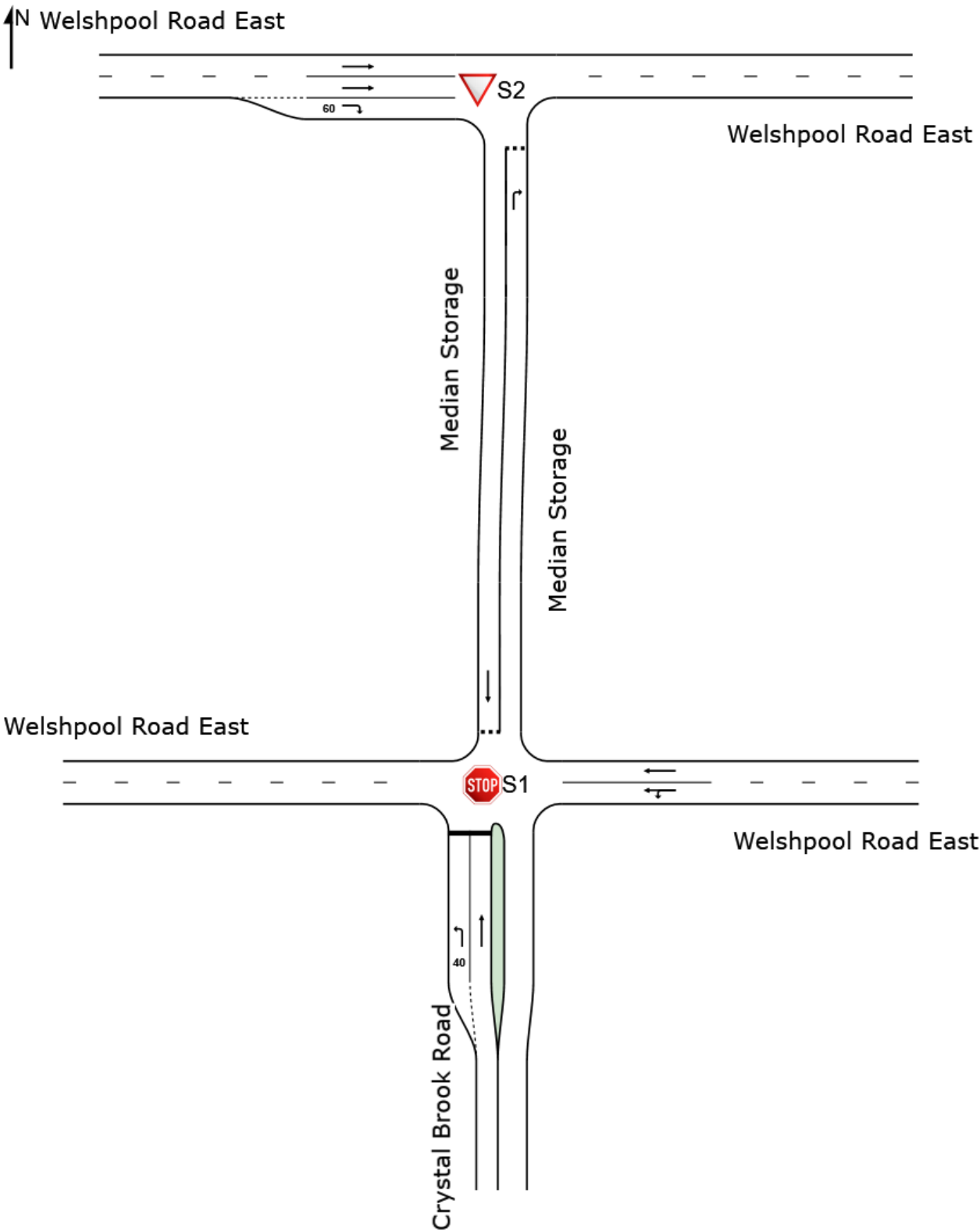
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

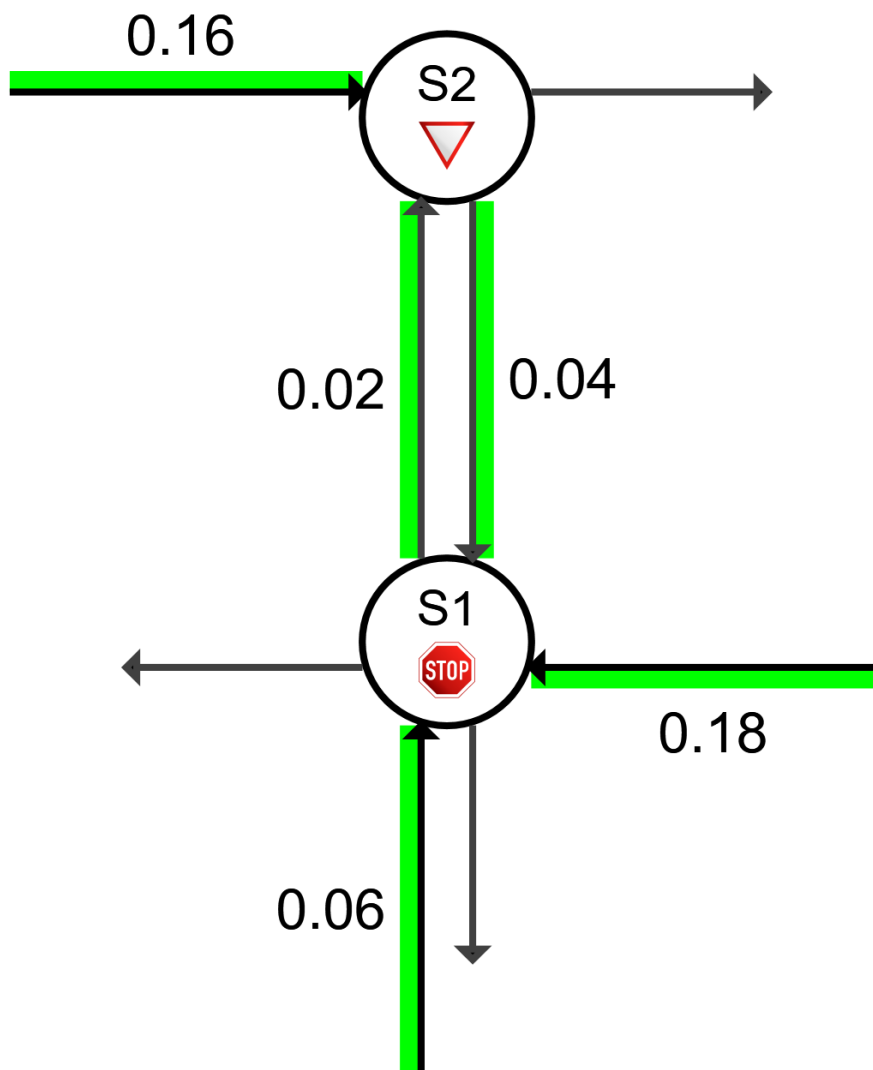
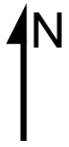
■ Network: N101 [Crystal Brook Road / Welshpool Road East (west) - Weekend Peak (Network Folder: 2024 Base)]

New Network
Network Category: (None)

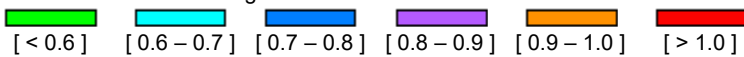
Network Layout

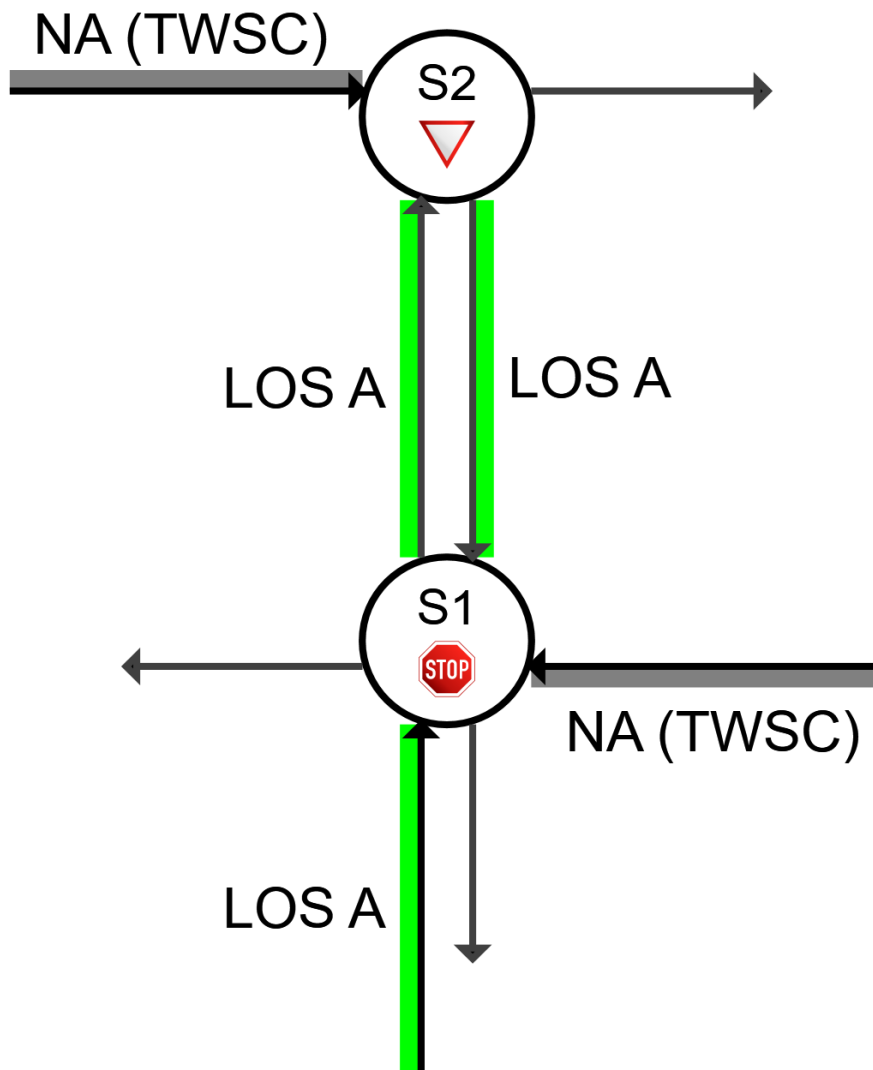
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



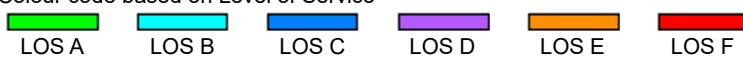


Colour code based on Degree of Saturation





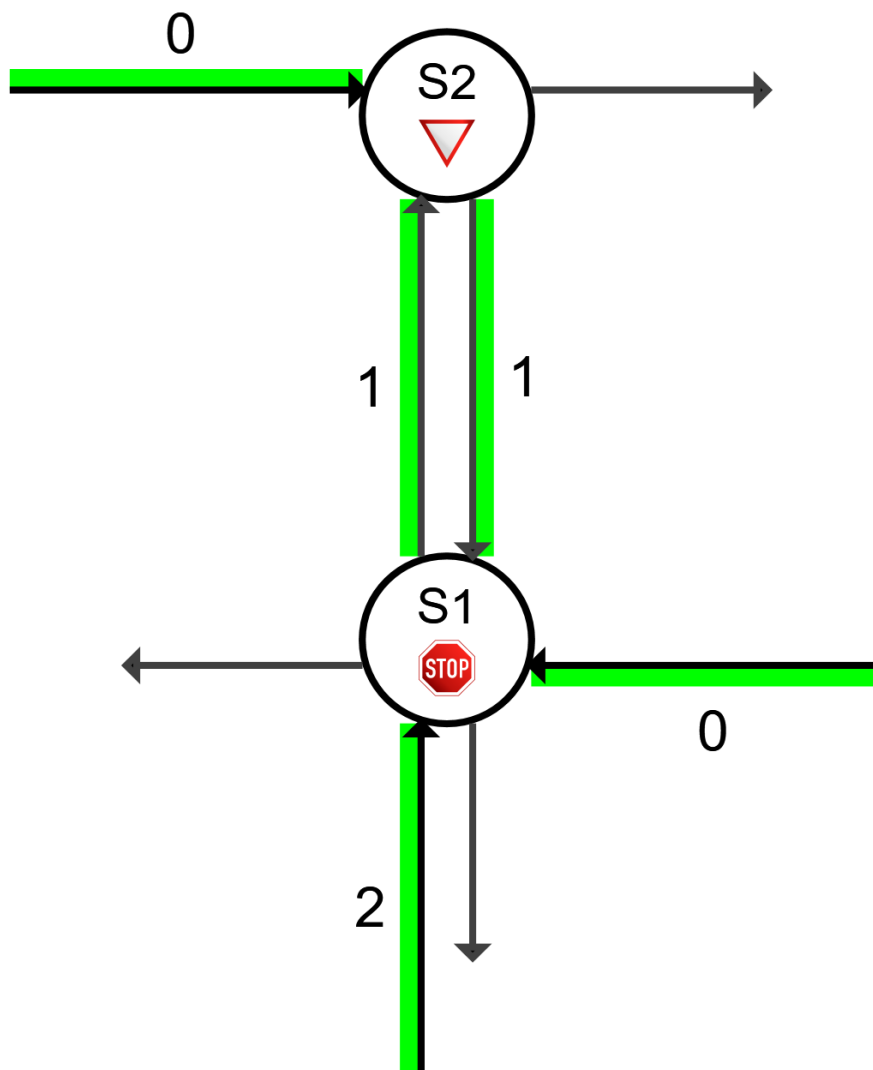
Colour code based on Level of Service



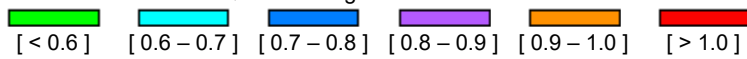
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



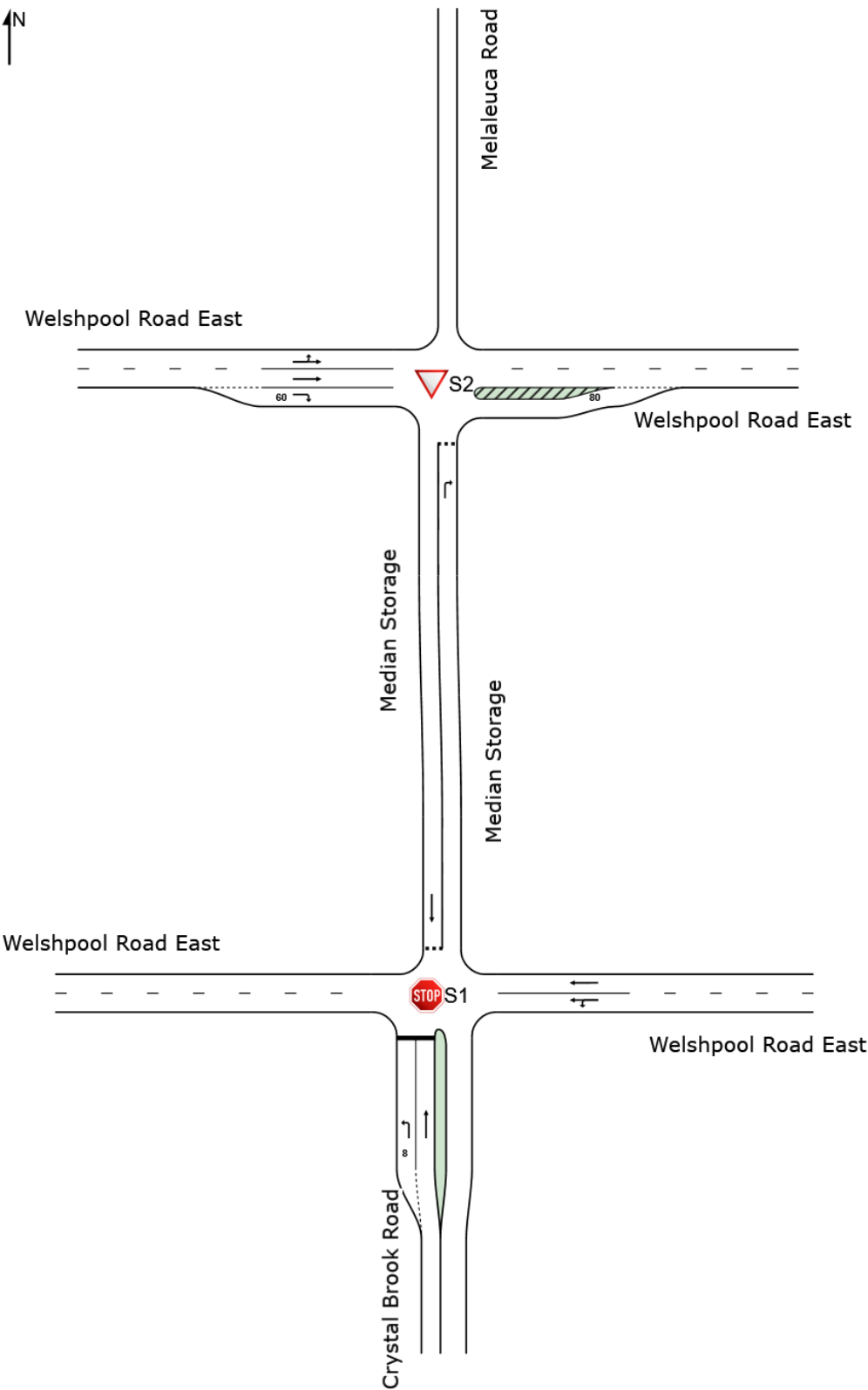
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

■■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - Weekend Peak (Network Folder: 2024 Base)]

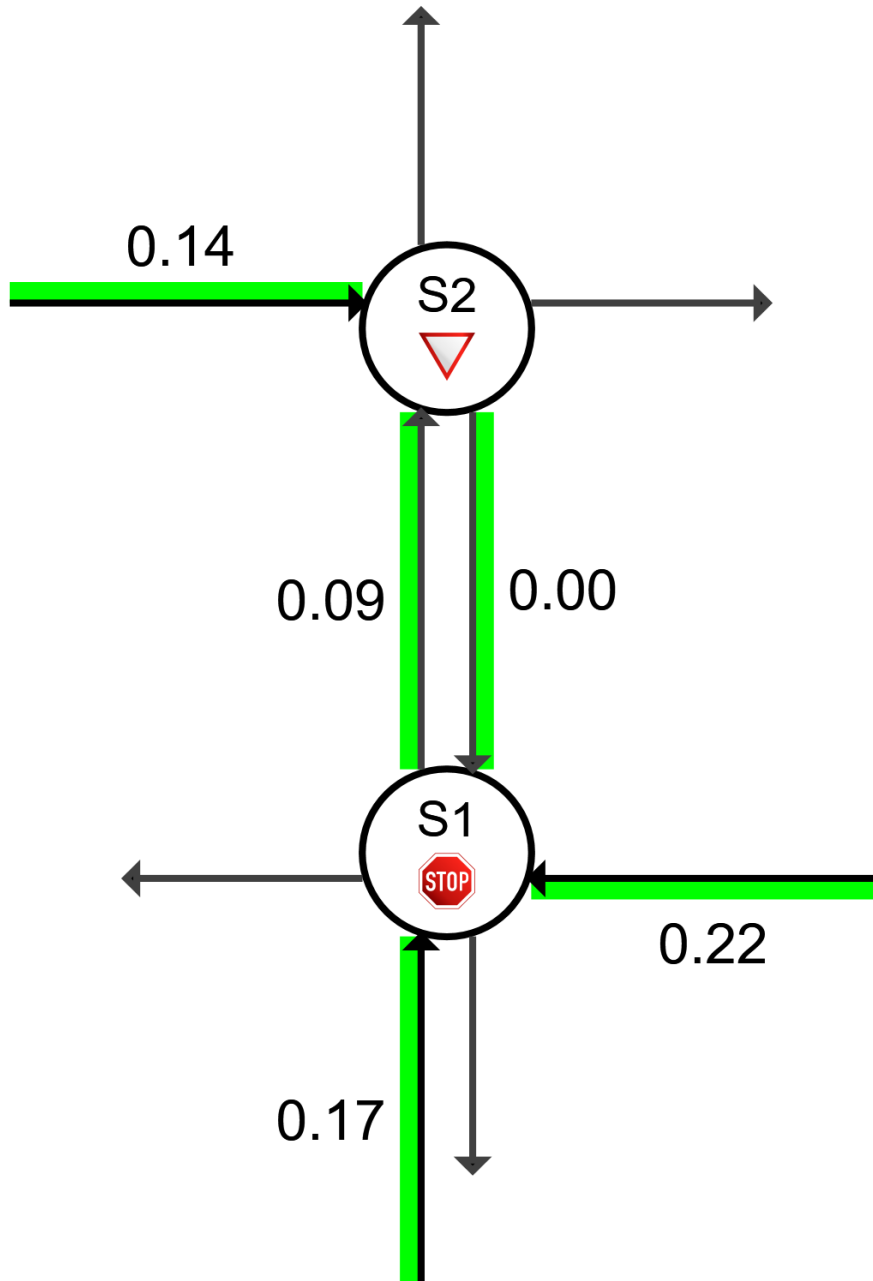
New Network
 Network Category: (None)

Network Layout

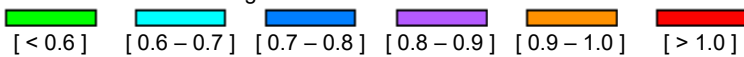
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



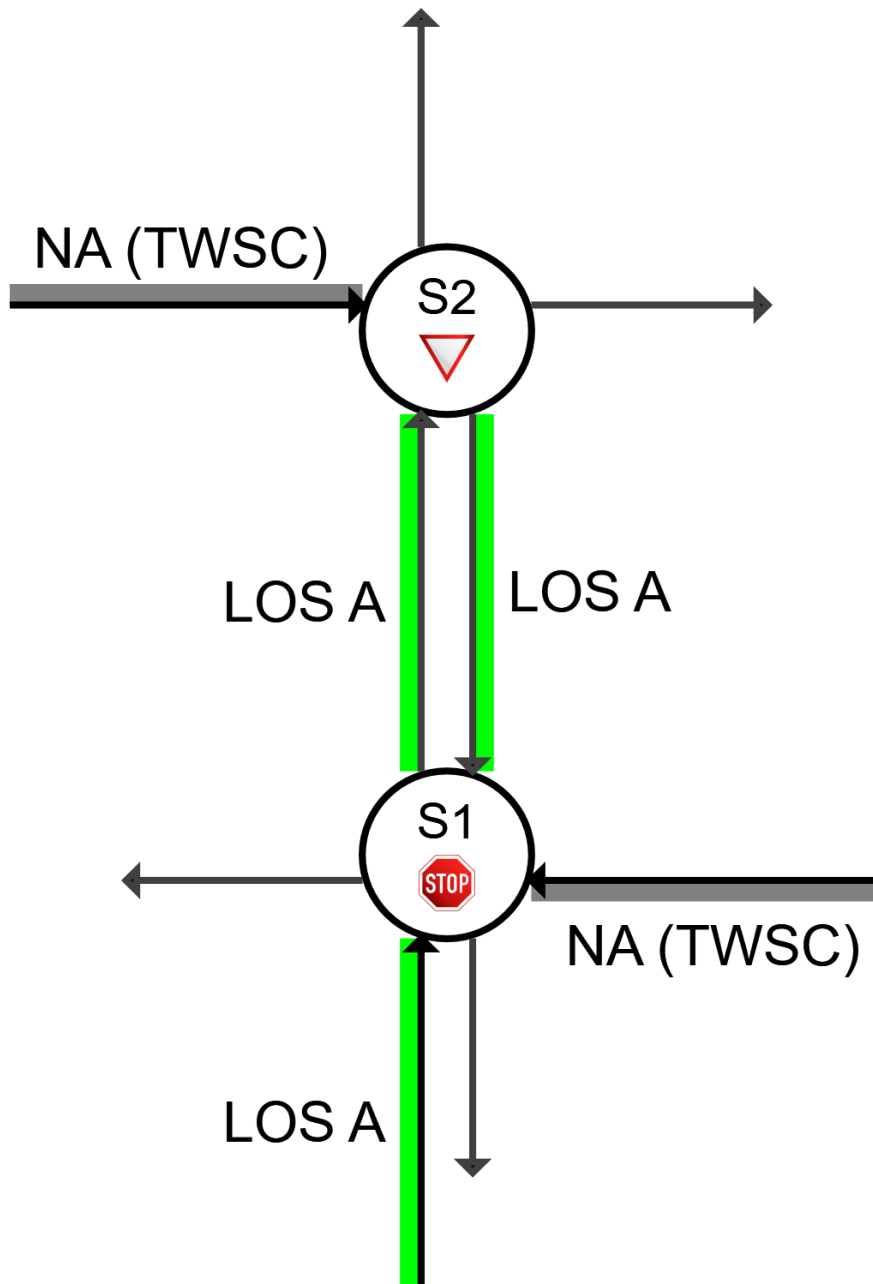
Degree of Saturation



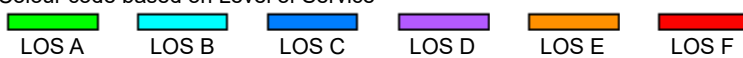
Colour code based on Degree of Saturation



Approach Level of Service



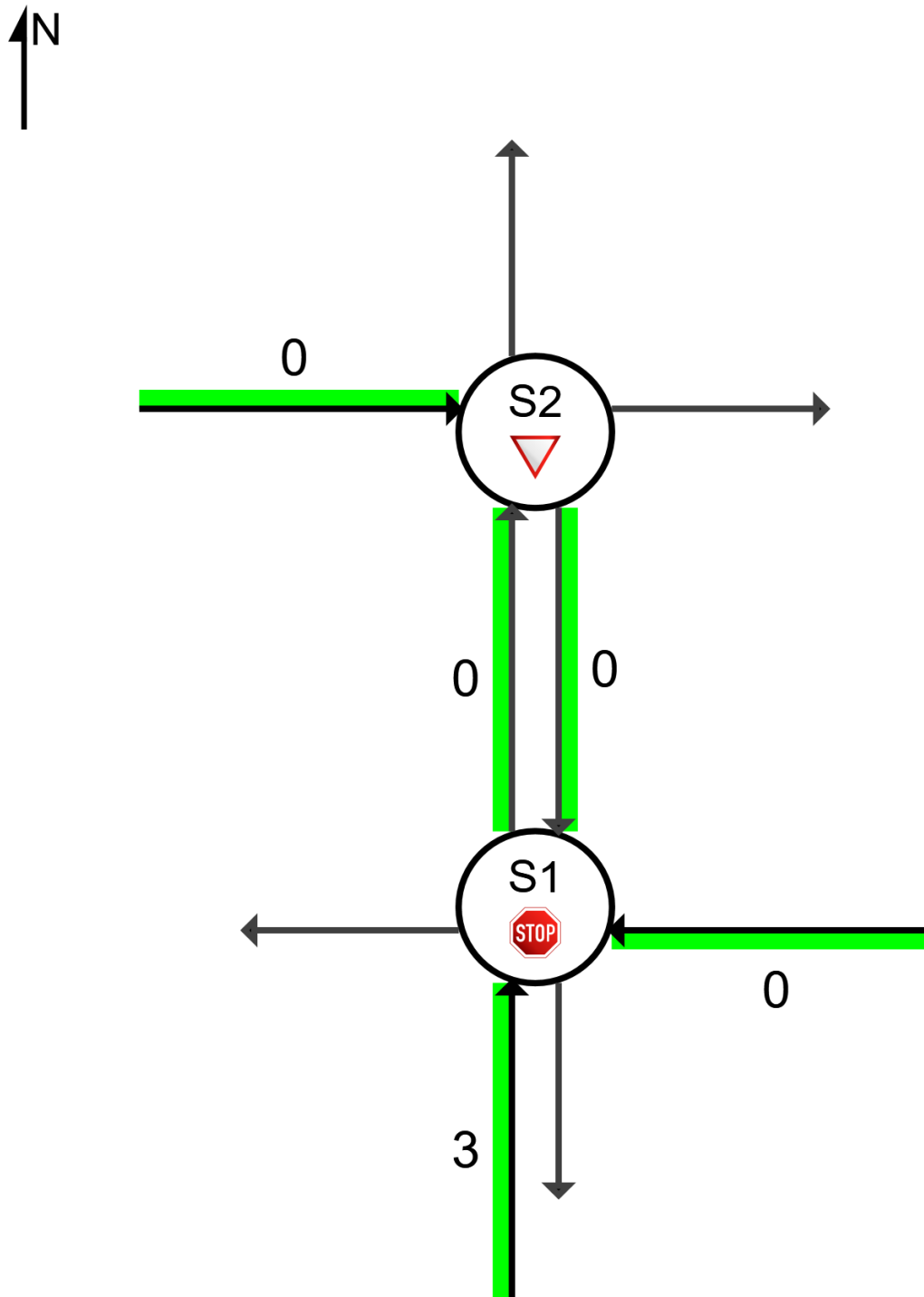
Colour code based on Level of Service



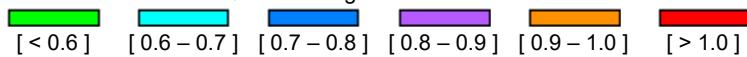
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



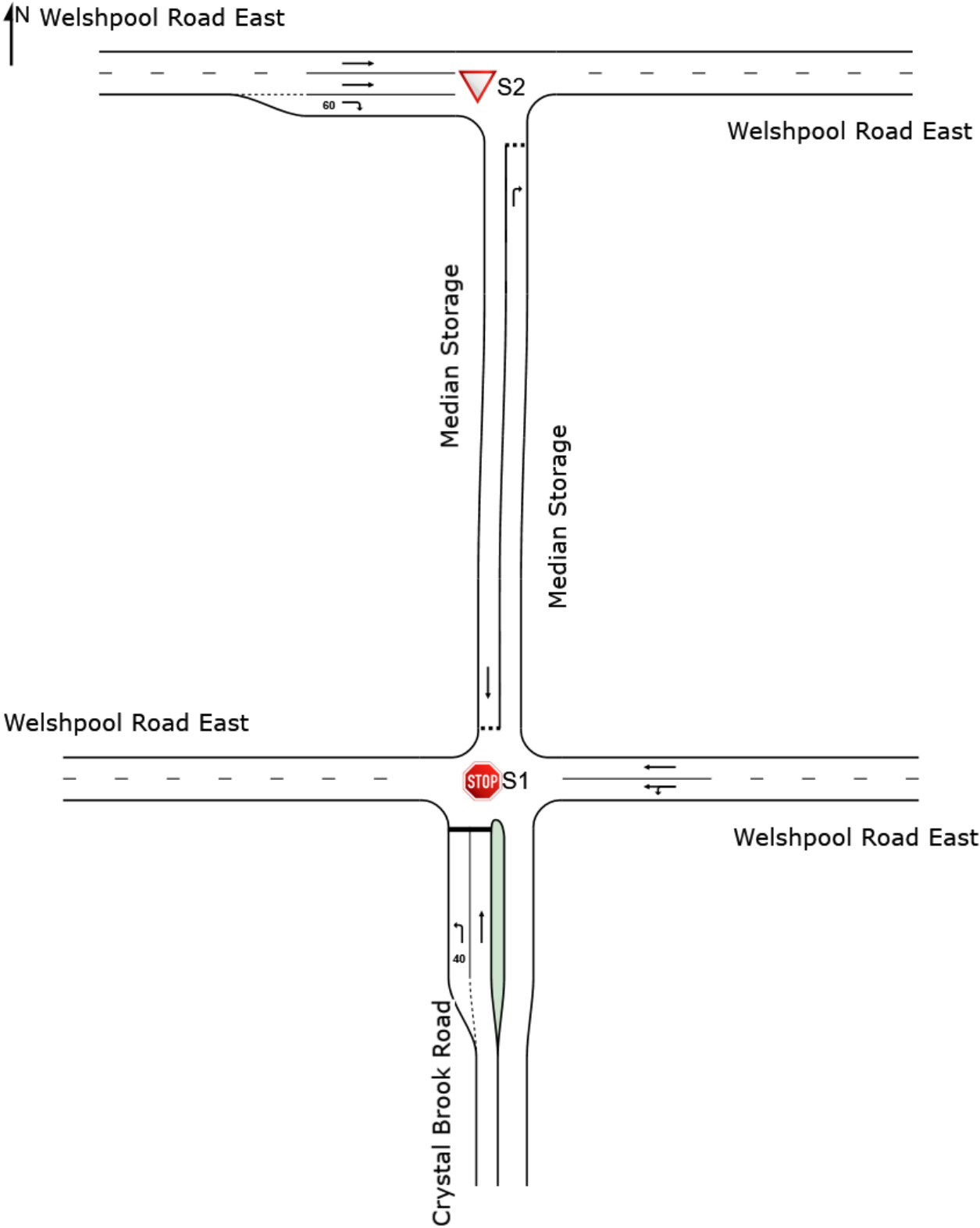
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

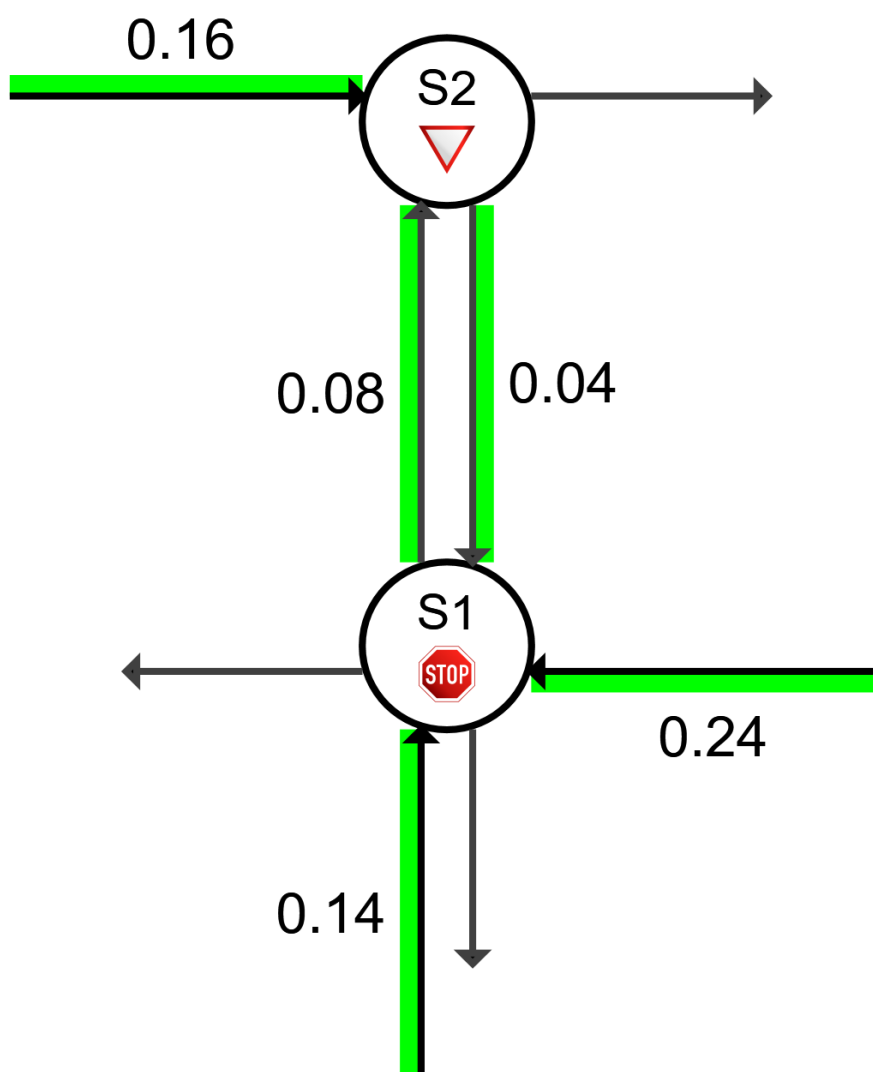
■ Network: N101 [Crystal Brook Road / Welshpool Road East (west) - AM Peak - 2031 (Network Folder: 2031 Development)]

New Network
Network Category: (None)

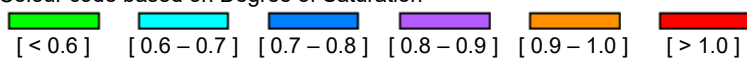
Network Layout

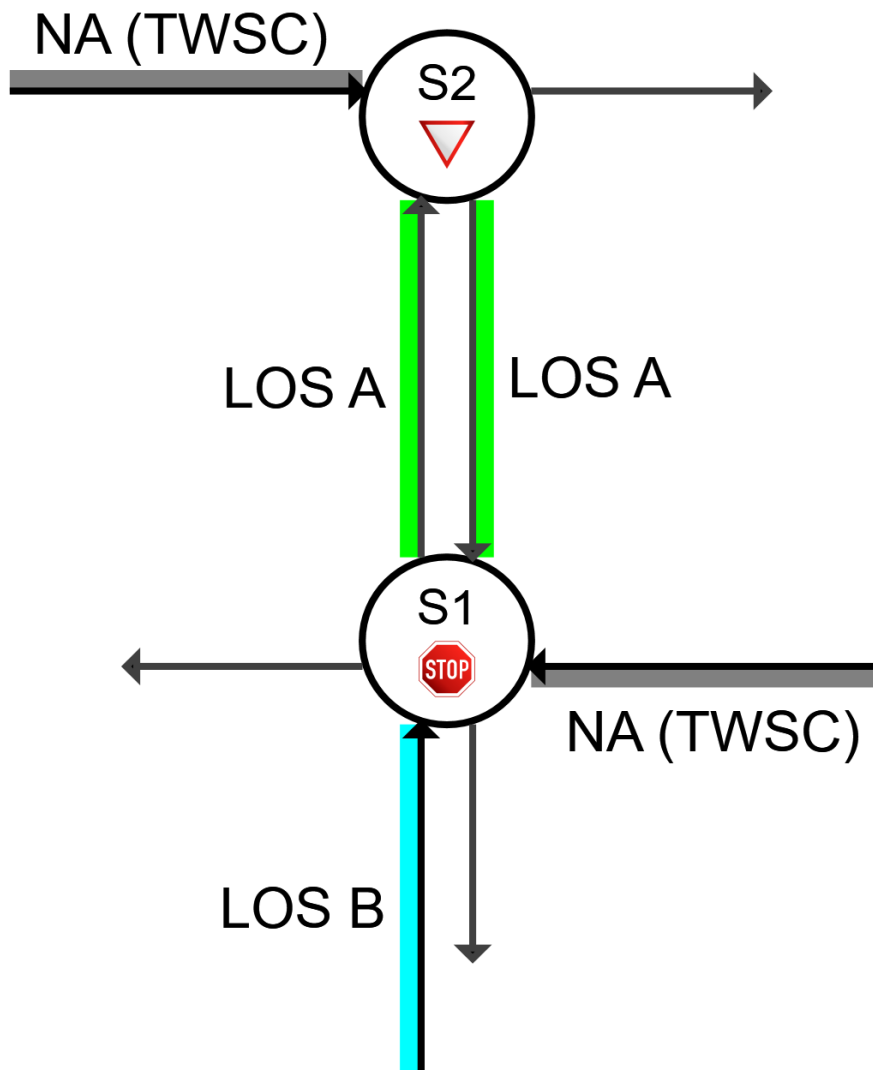
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



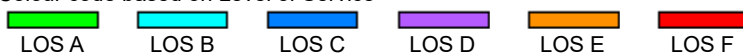


Colour code based on Degree of Saturation





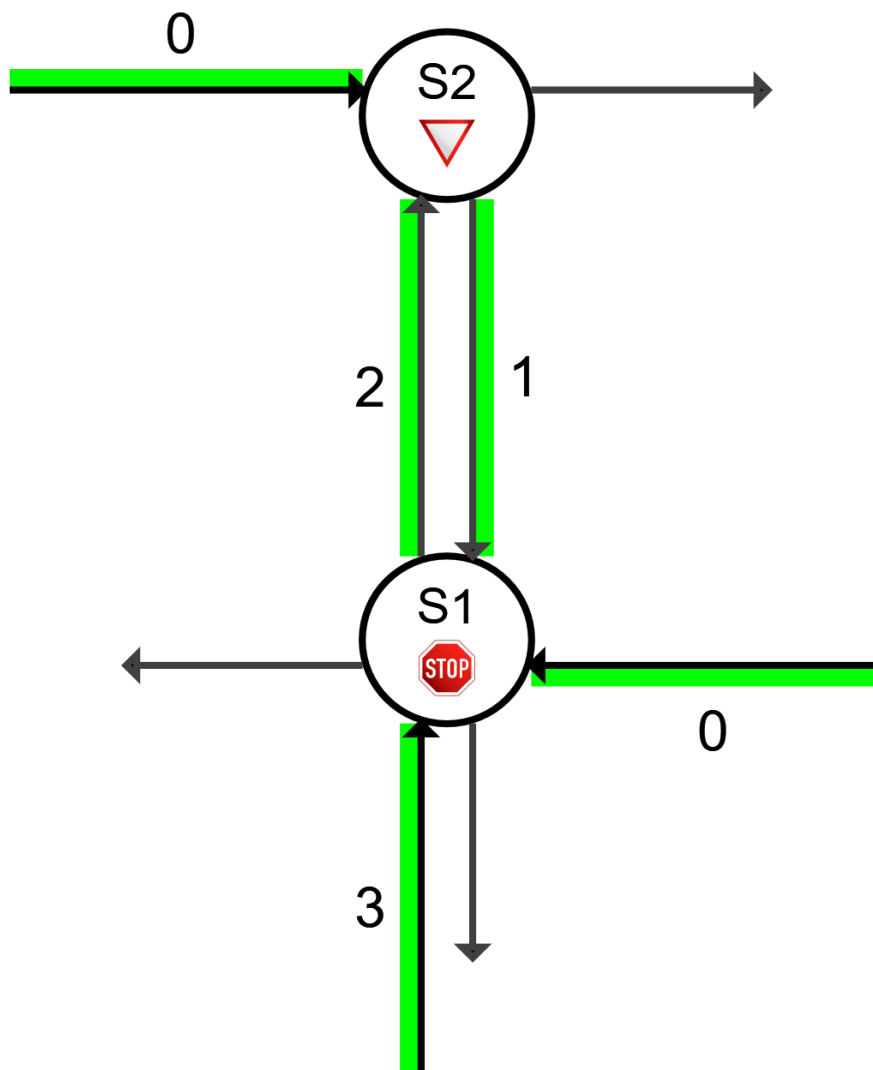
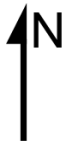
Colour code based on Level of Service



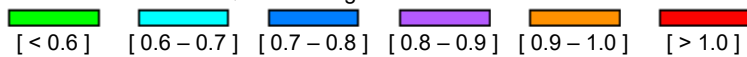
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



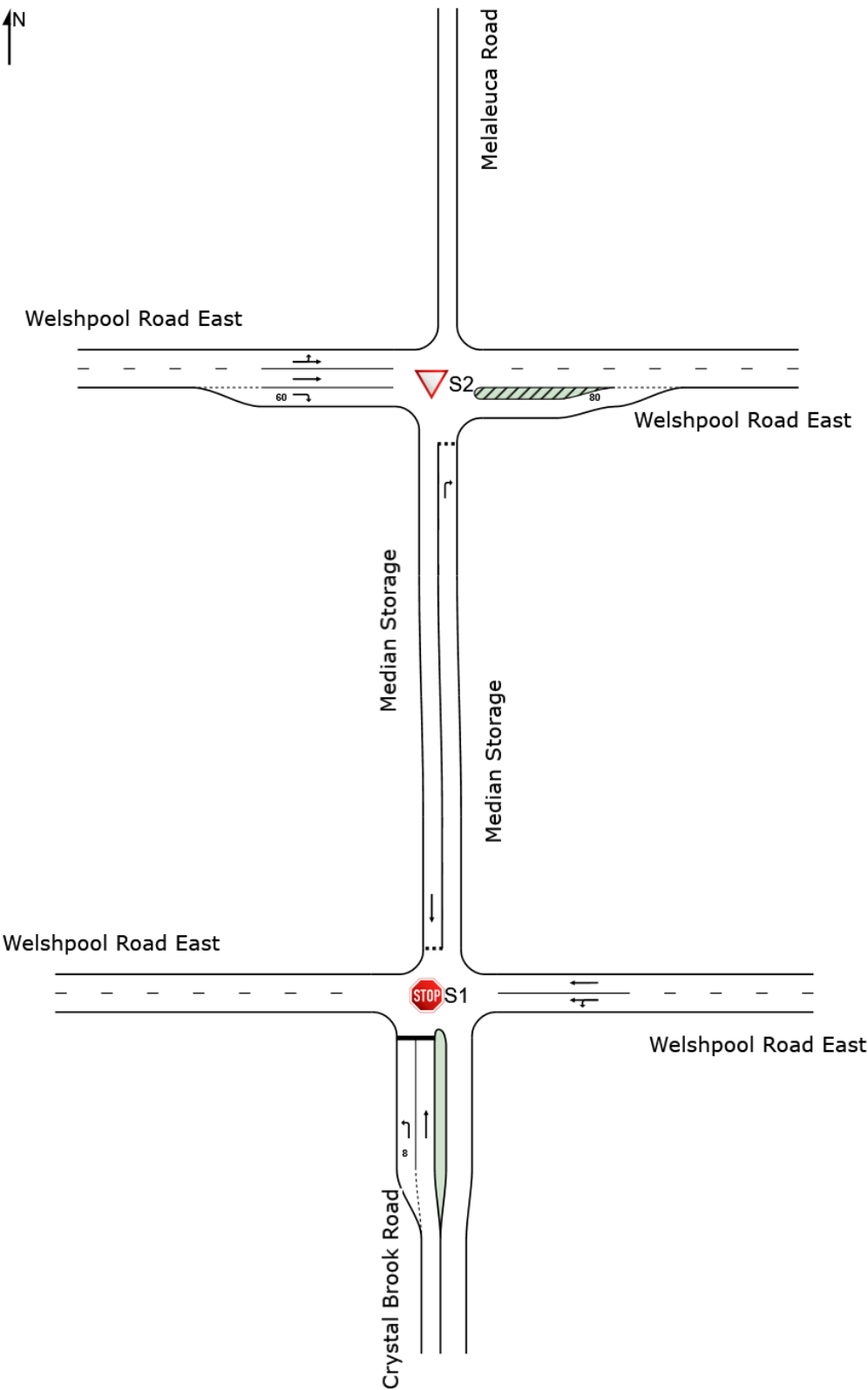
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - AM Peak - 2031 (Network Folder: 2031 Development)]

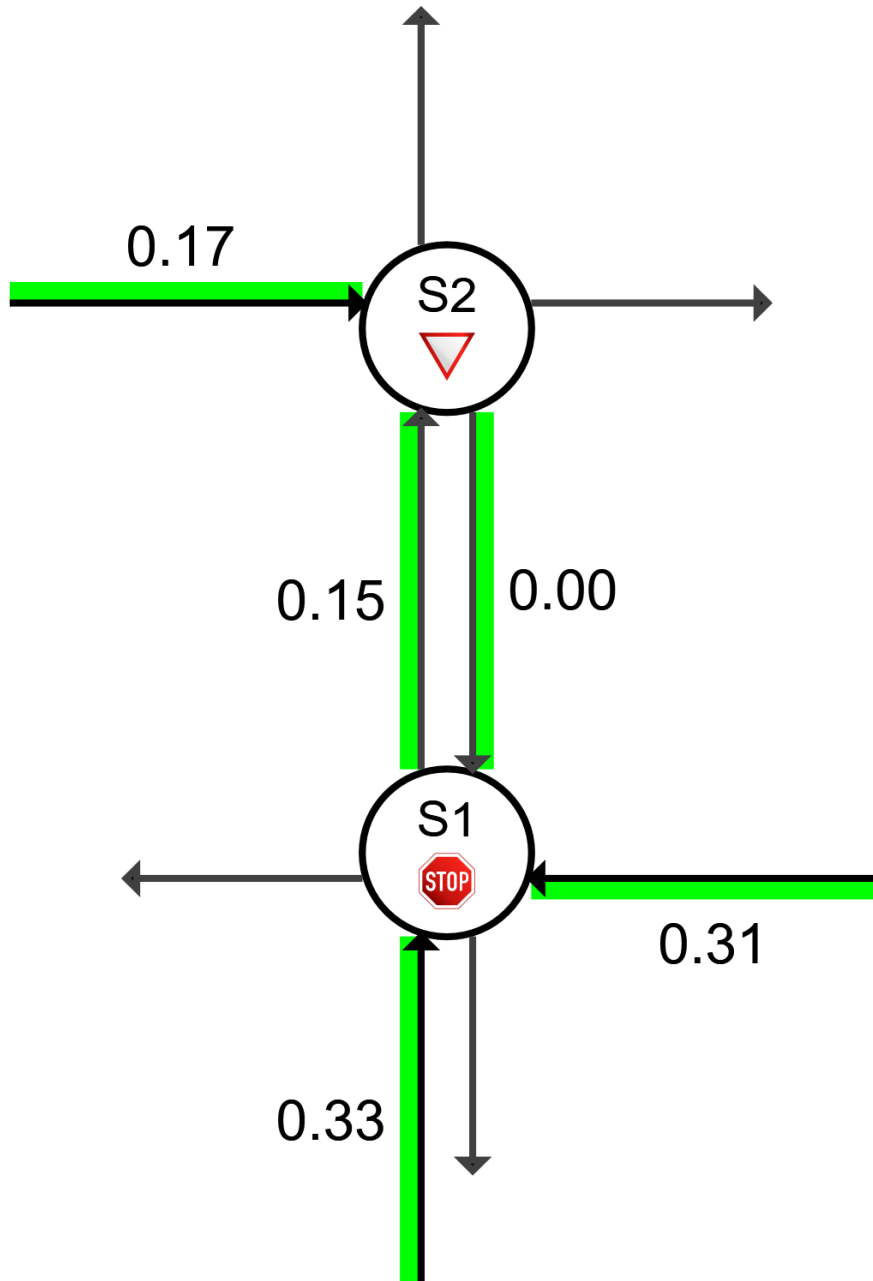
New Network
Network Category: (None)

Network Layout

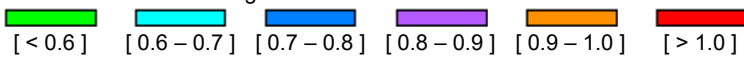
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



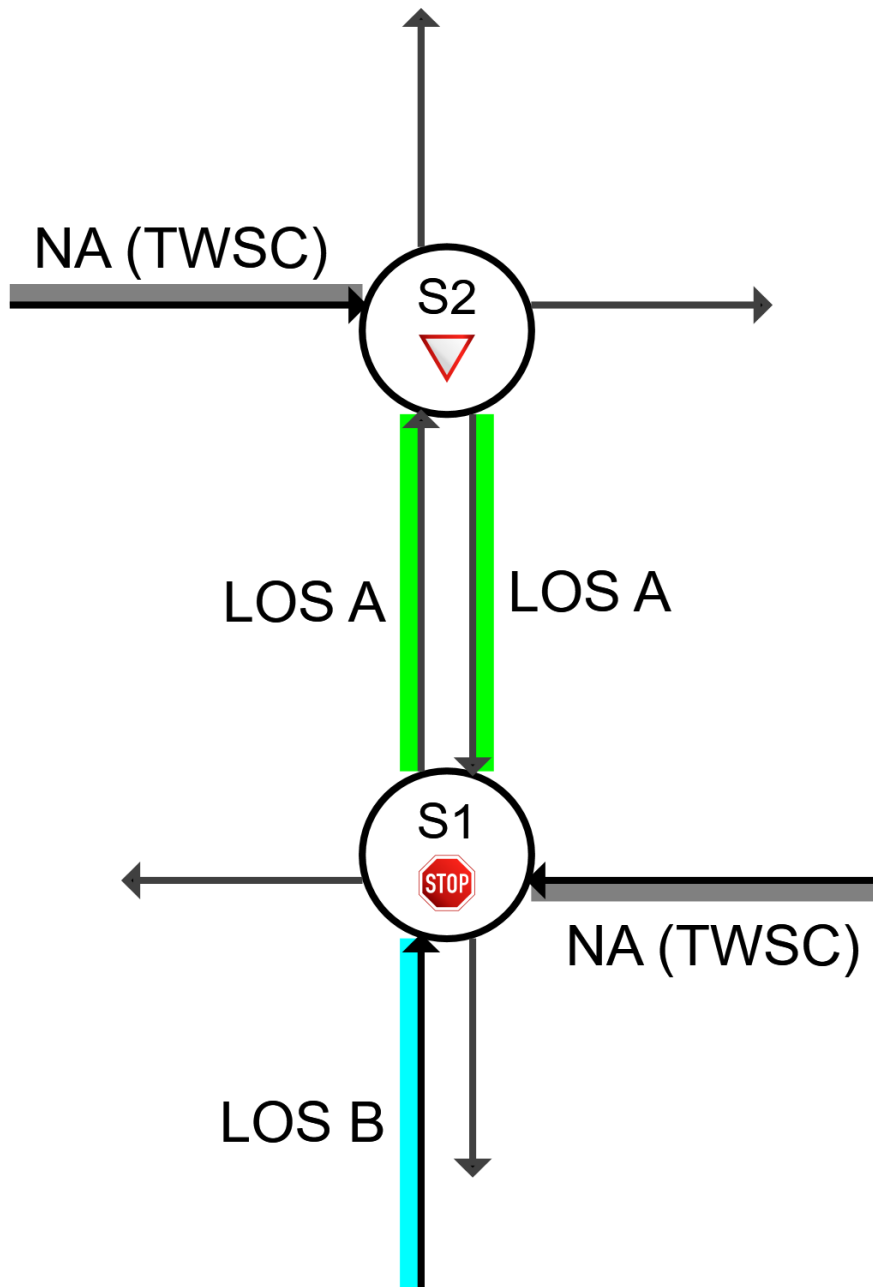
Degree of Saturation



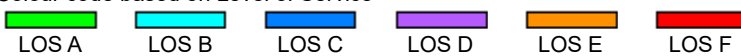
Colour code based on Degree of Saturation



Approach Level of Service



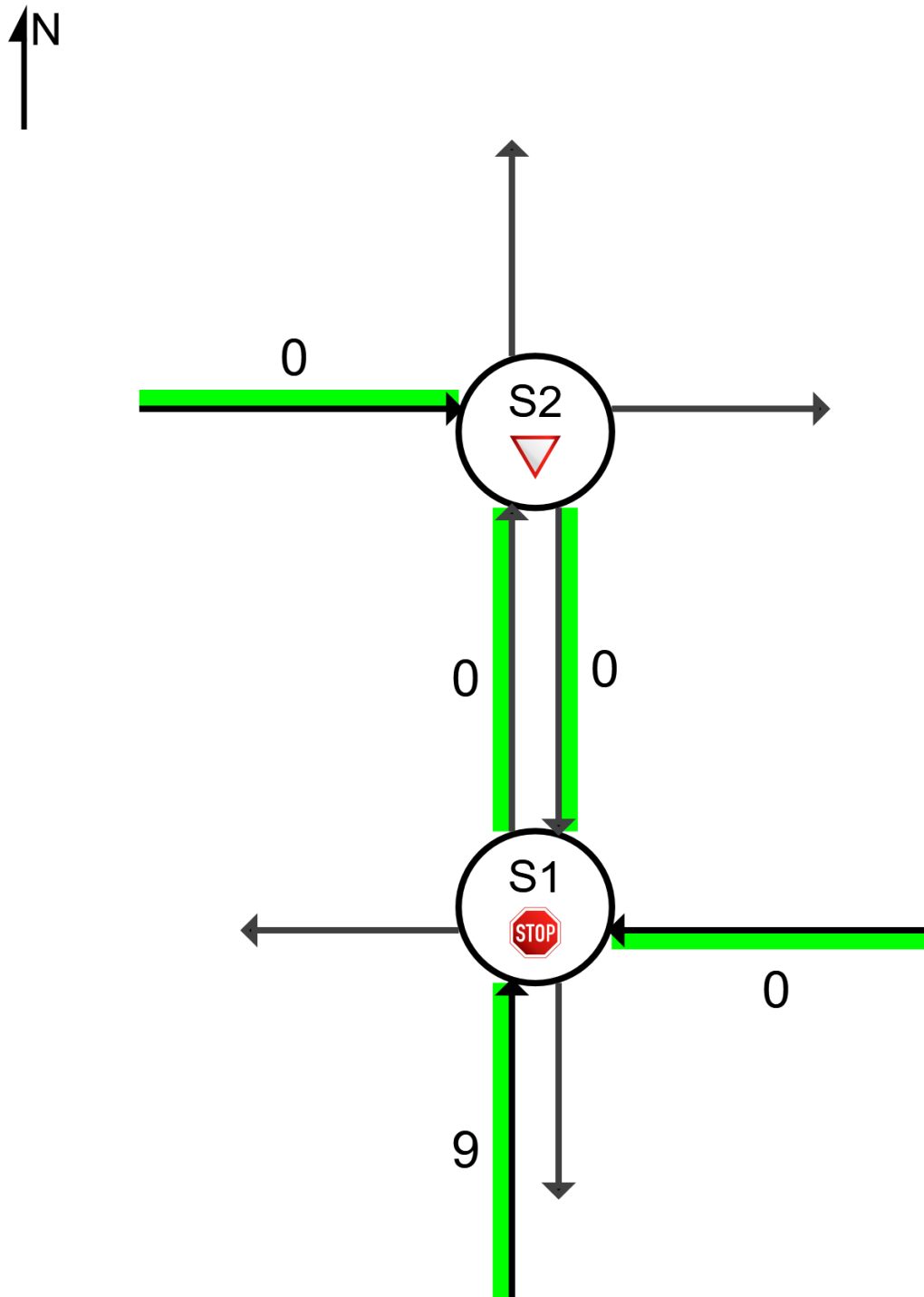
Colour code based on Level of Service



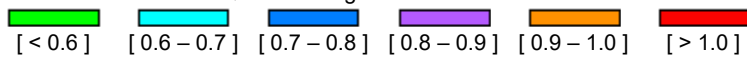
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

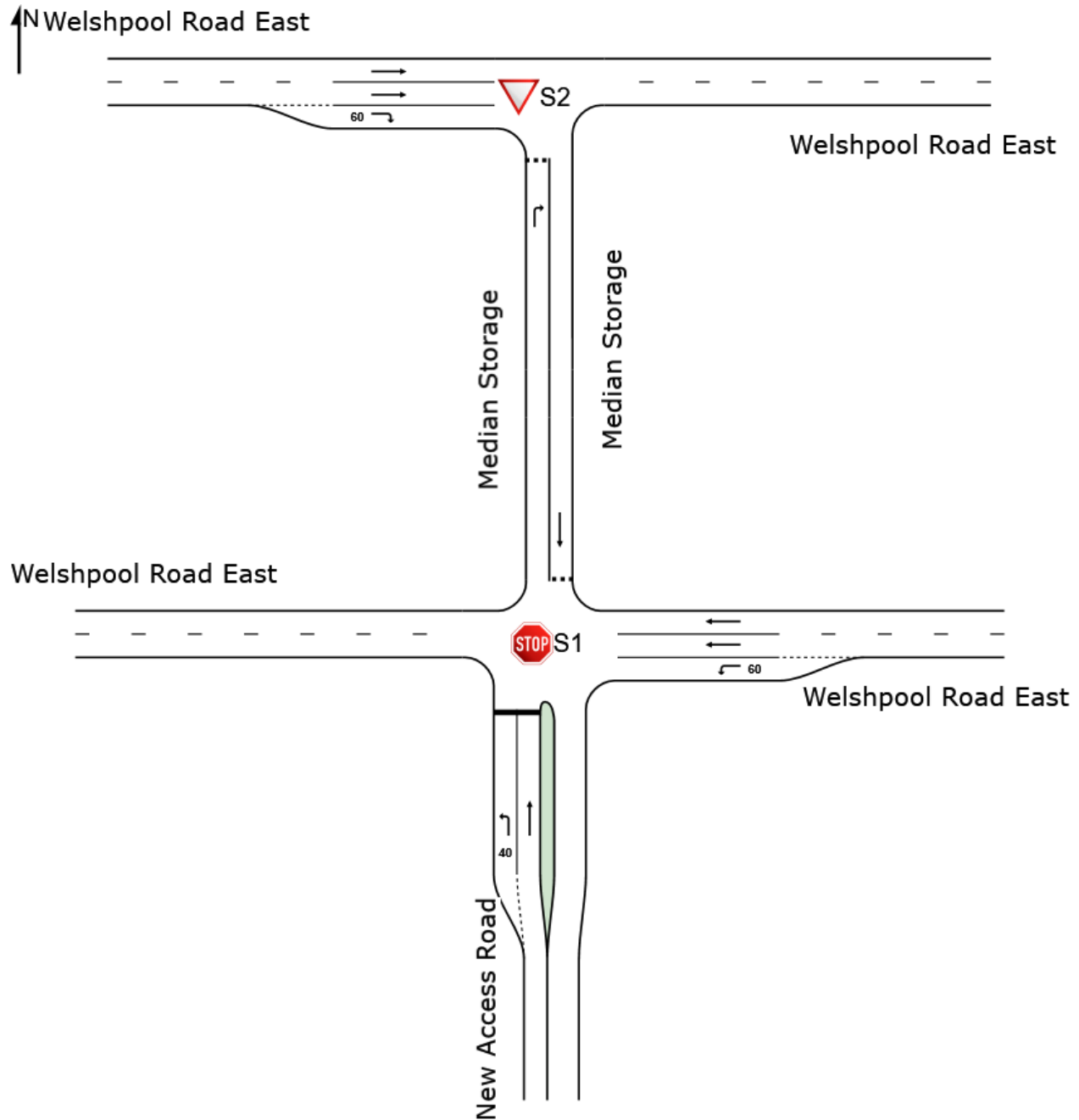
■ Network: N101 [New Access / Welshpool Road East - AM Peak - 2031 (Network Folder: 2031 Development)]

New Network

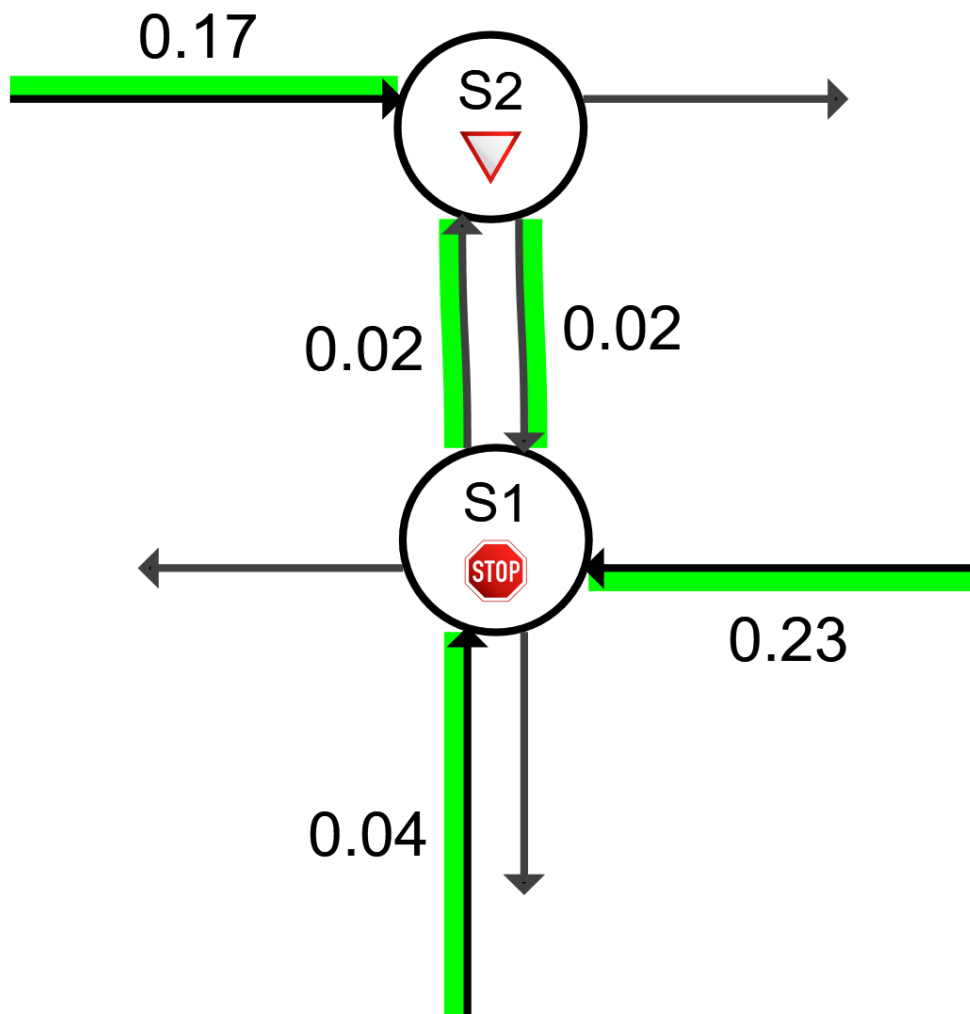
Network Category: (None)

Network Layout

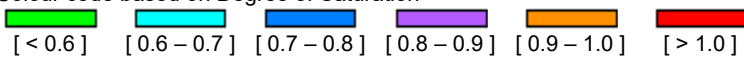
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



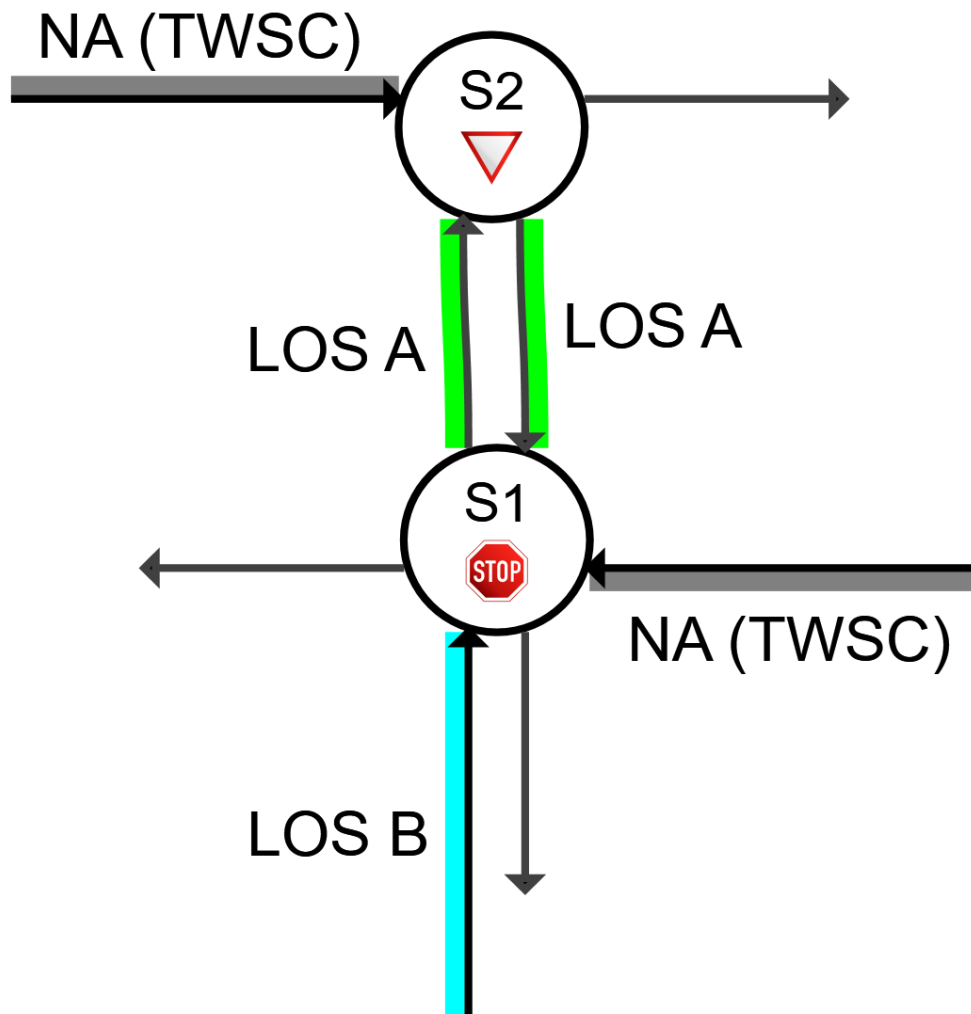
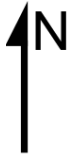
Degree of Saturation



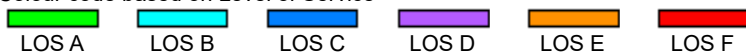
Colour code based on Degree of Saturation



Approach Level of Service



Colour code based on Level of Service

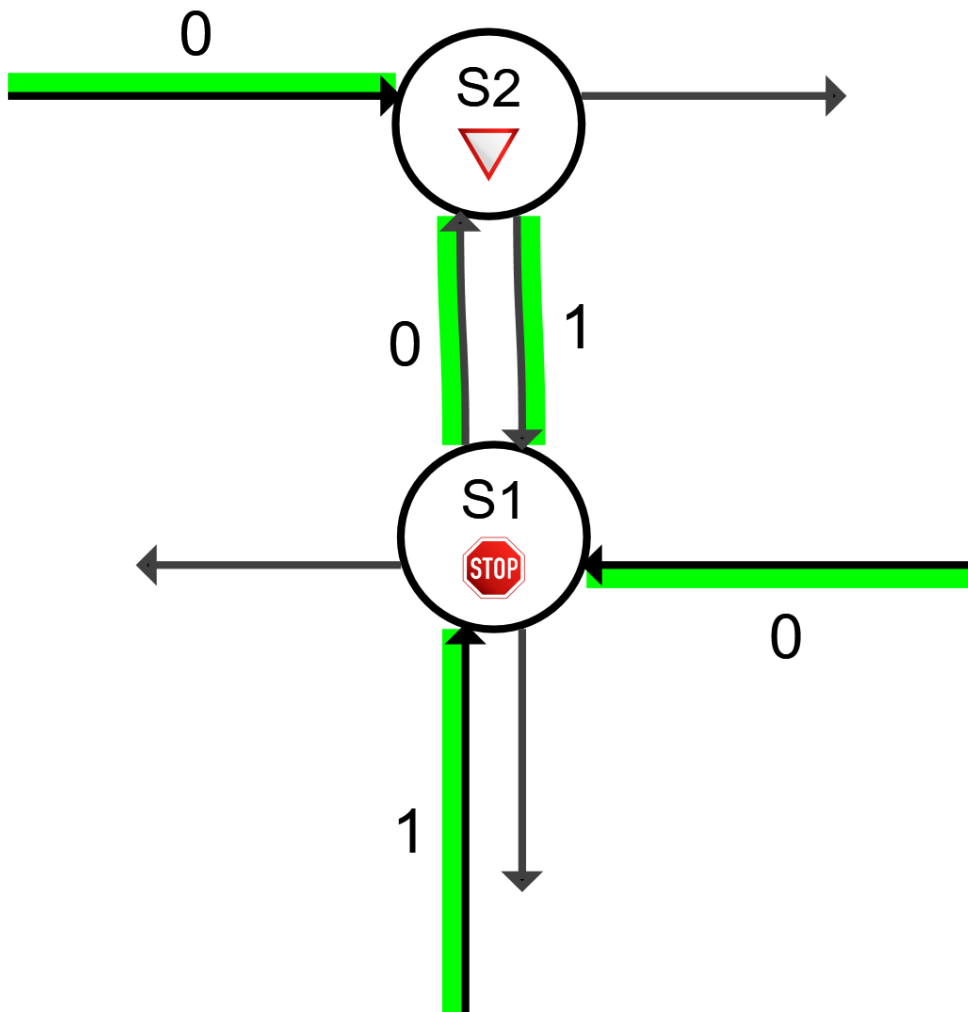


NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

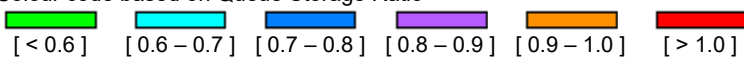
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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

Queue Distance (Percentile)



Colour code based on Queue Storage Ratio



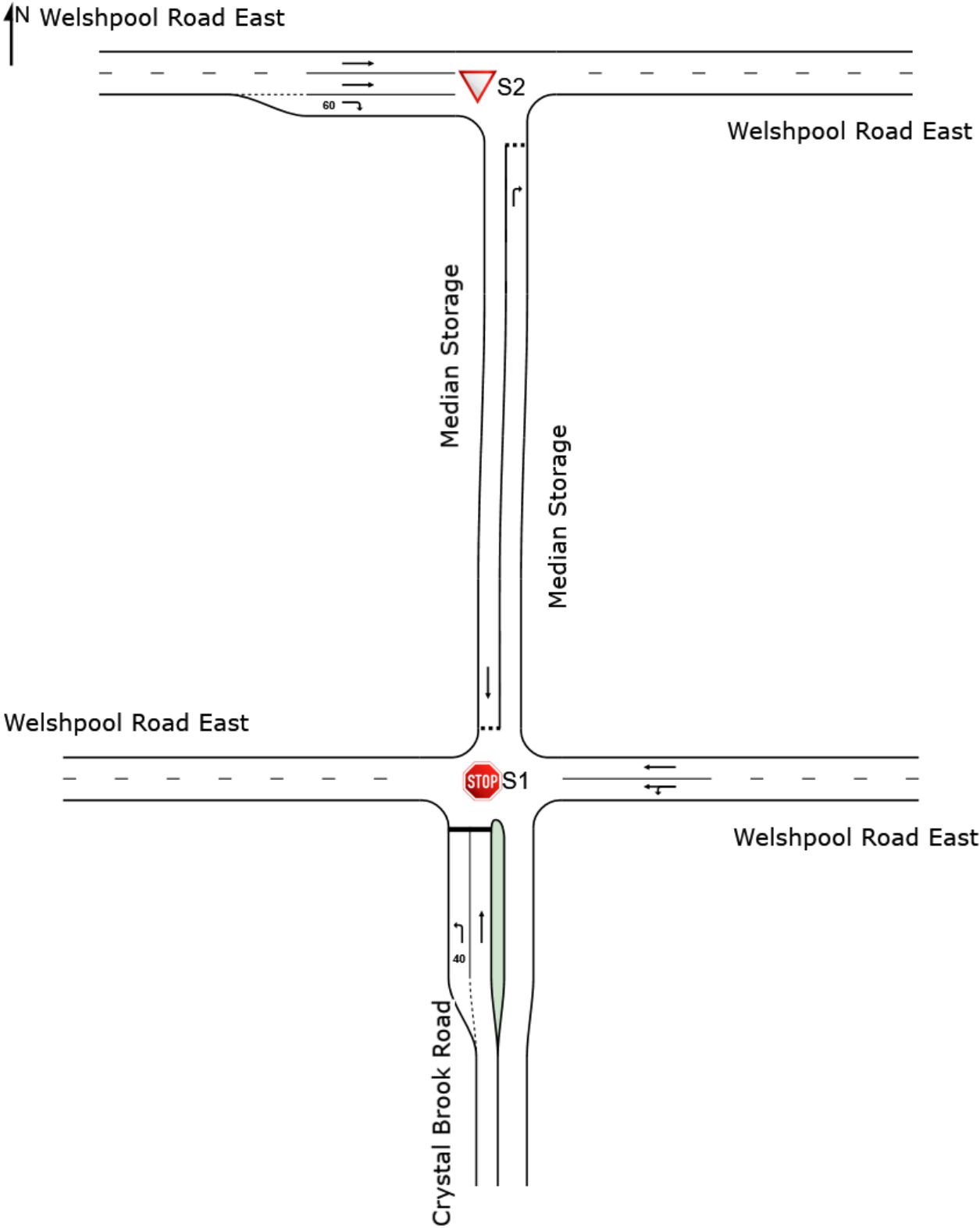
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

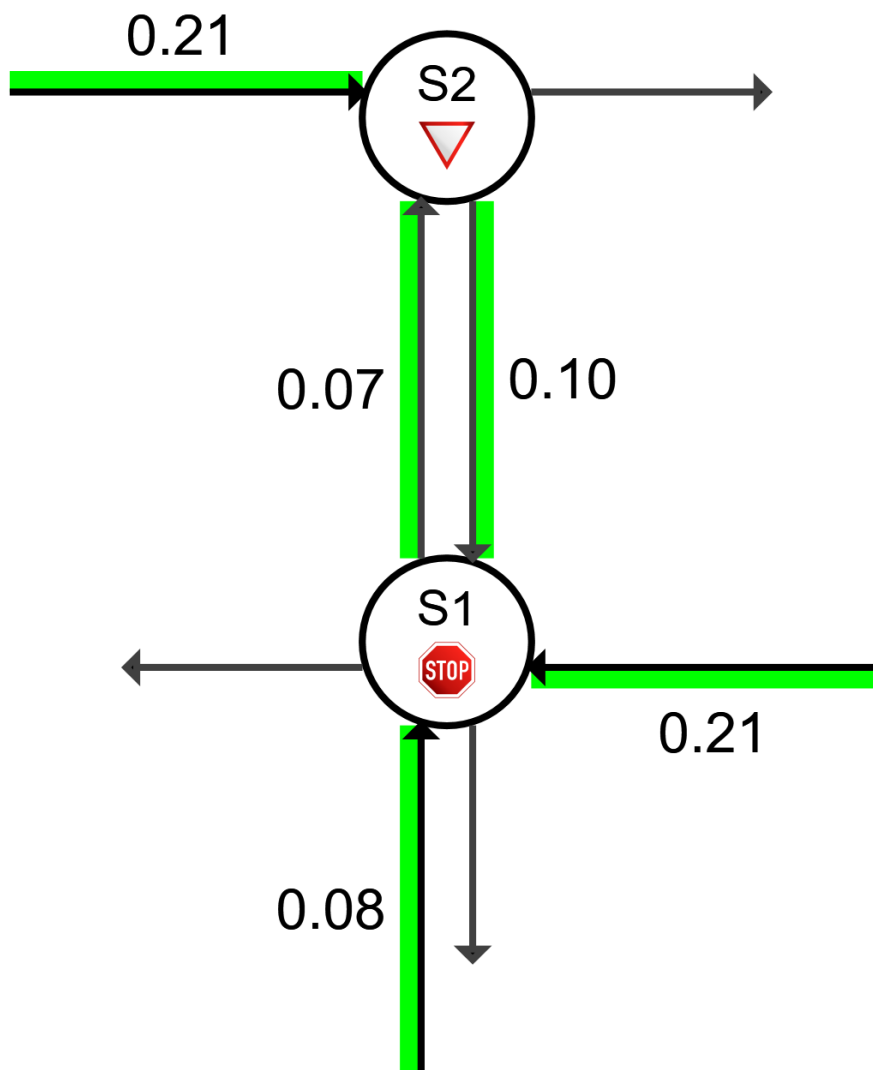
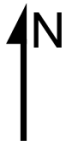
■ Network: N101 [Crystal Brook Road / Welshpool Road East (west) - PM Peak - 2031 (Network Folder: 2031 Development)]

New Network
Network Category: (None)

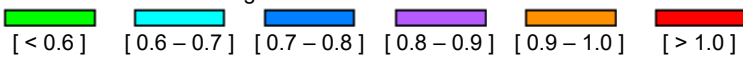
Network Layout

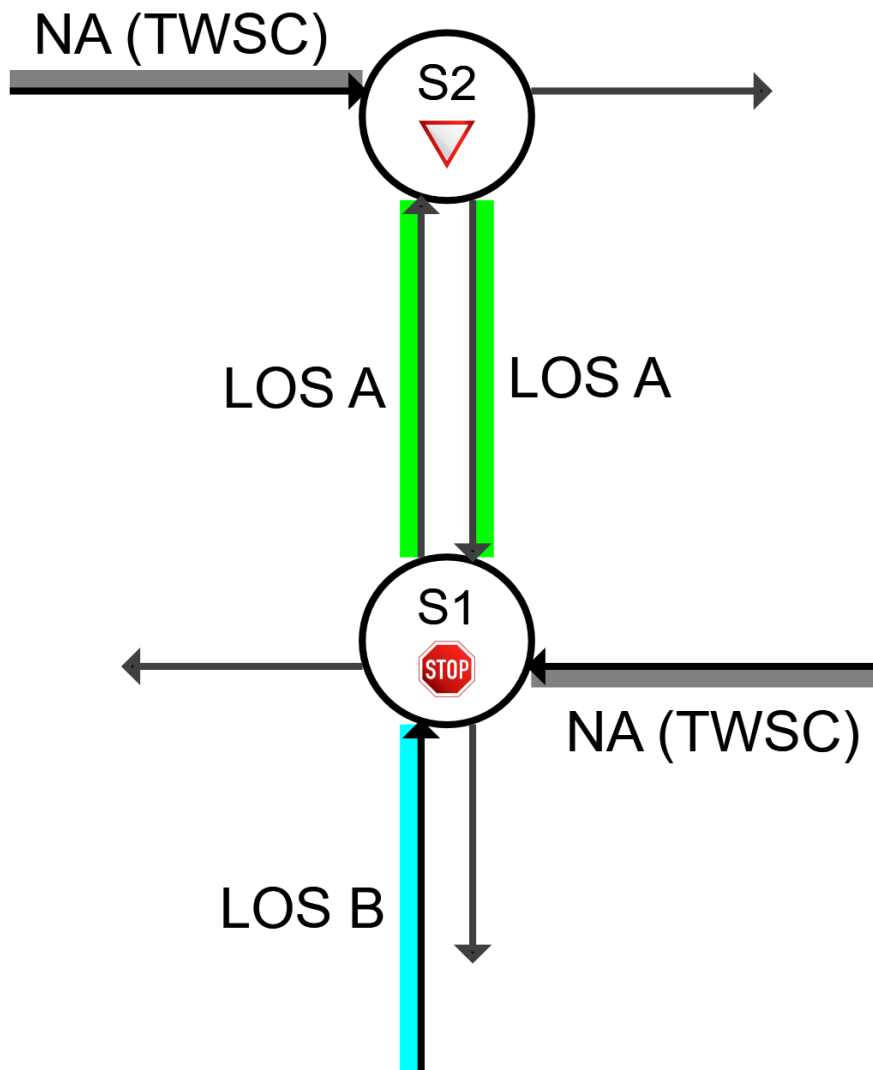
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



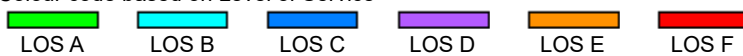


Colour code based on Degree of Saturation





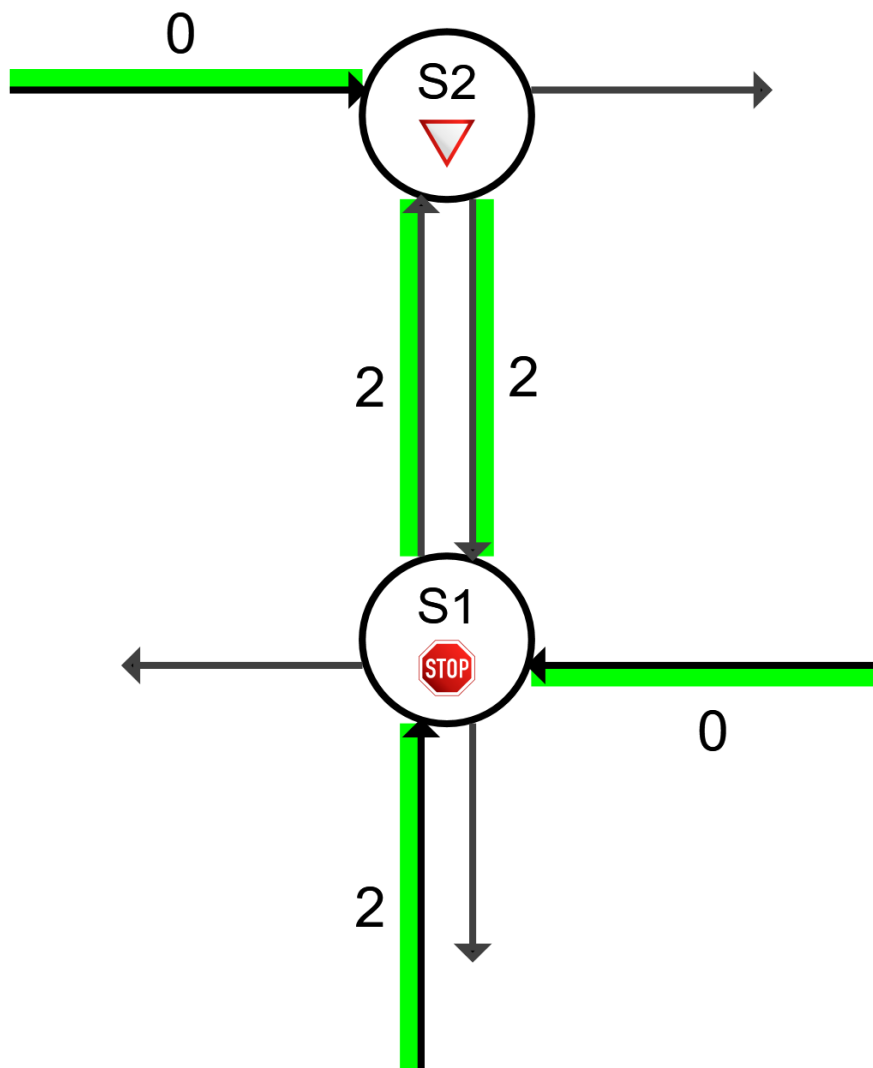
Colour code based on Level of Service



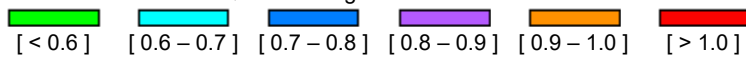
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



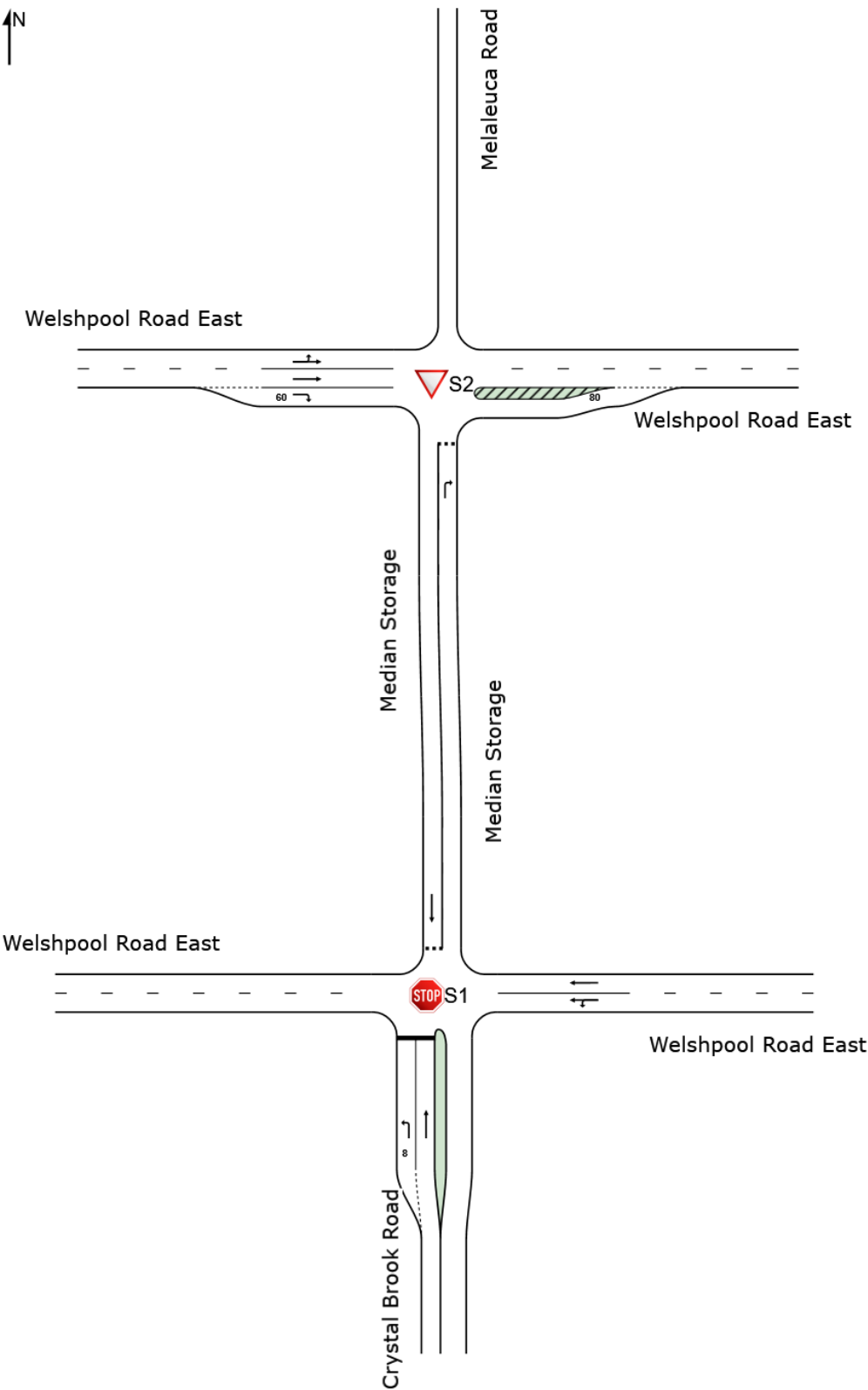
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - PM Peak - 2031 (Network Folder: 2031 Development)]

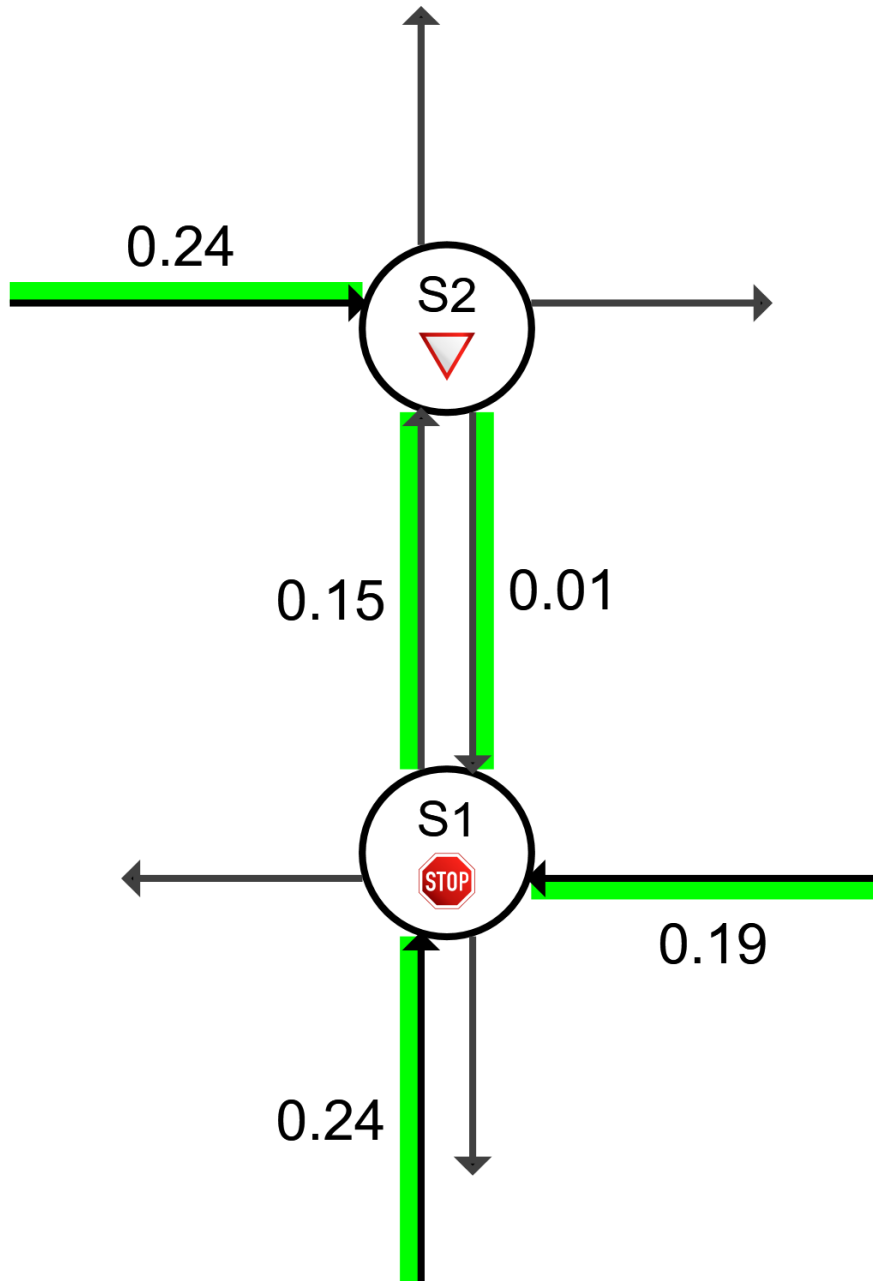
New Network
Network Category: (None)

Network Layout

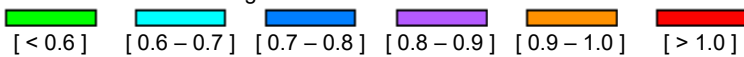
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



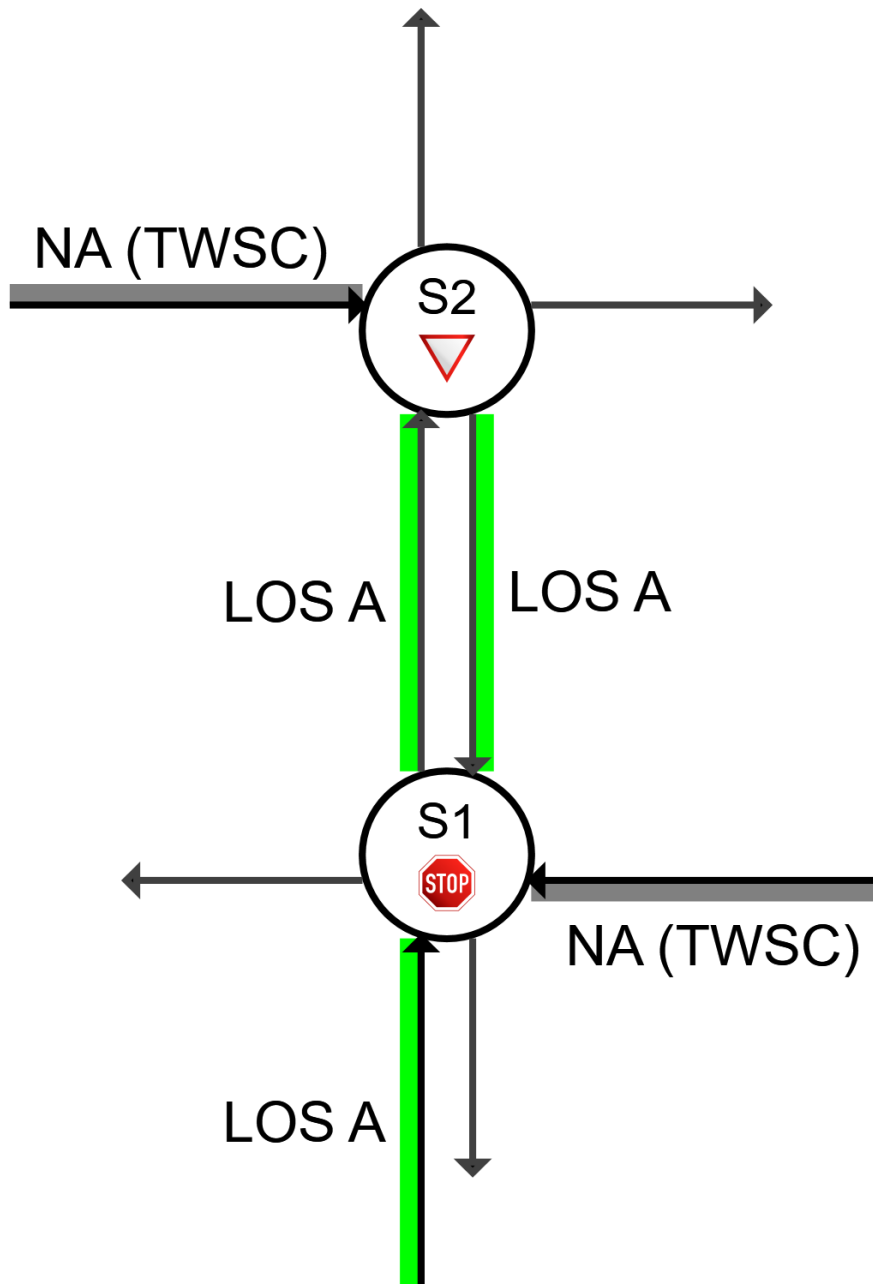
Degree of Saturation



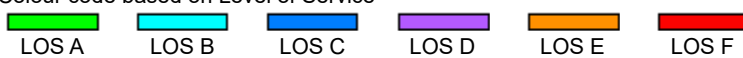
Colour code based on Degree of Saturation



Approach Level of Service



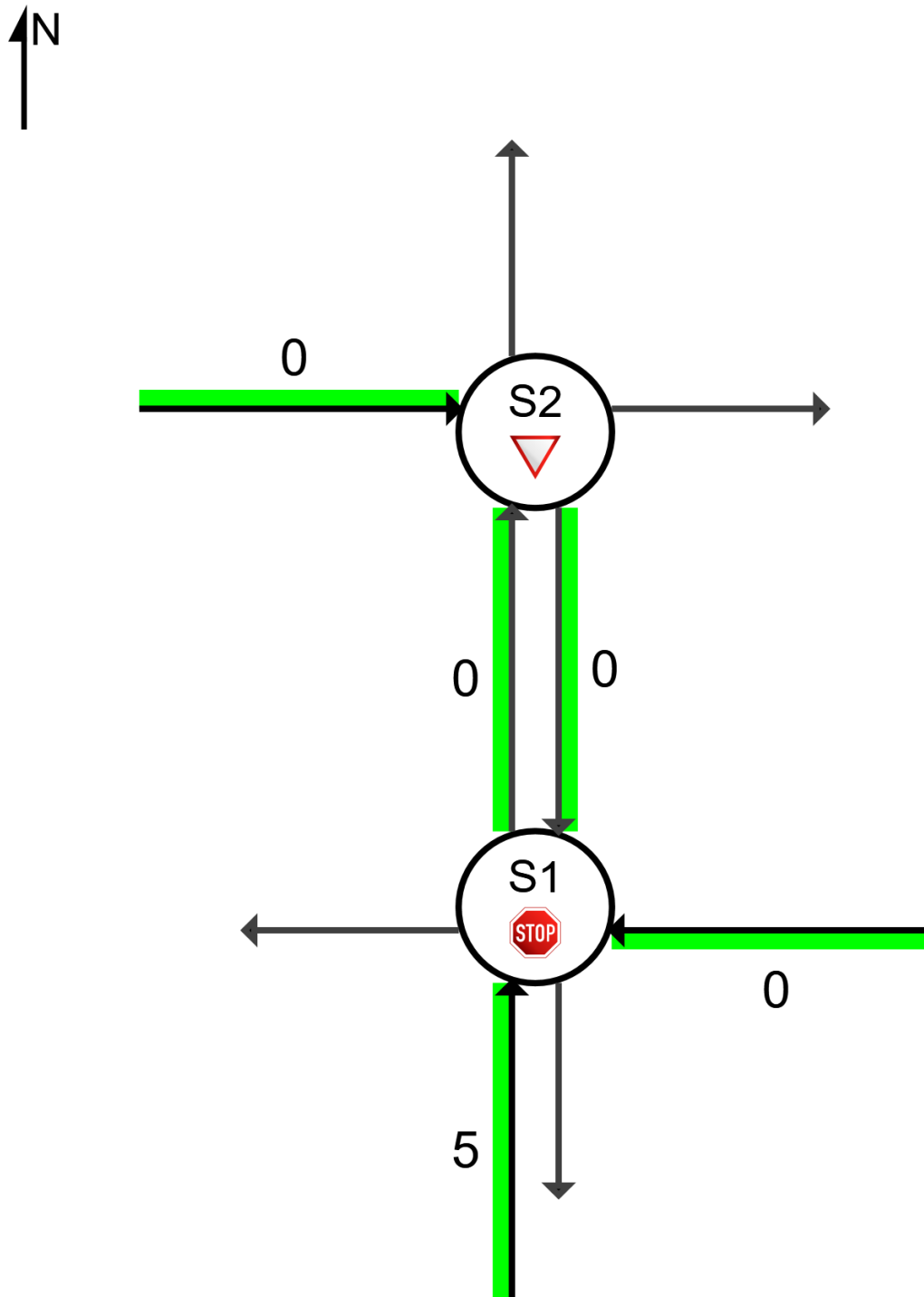
Colour code based on Level of Service



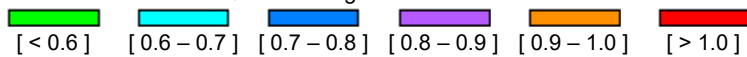
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

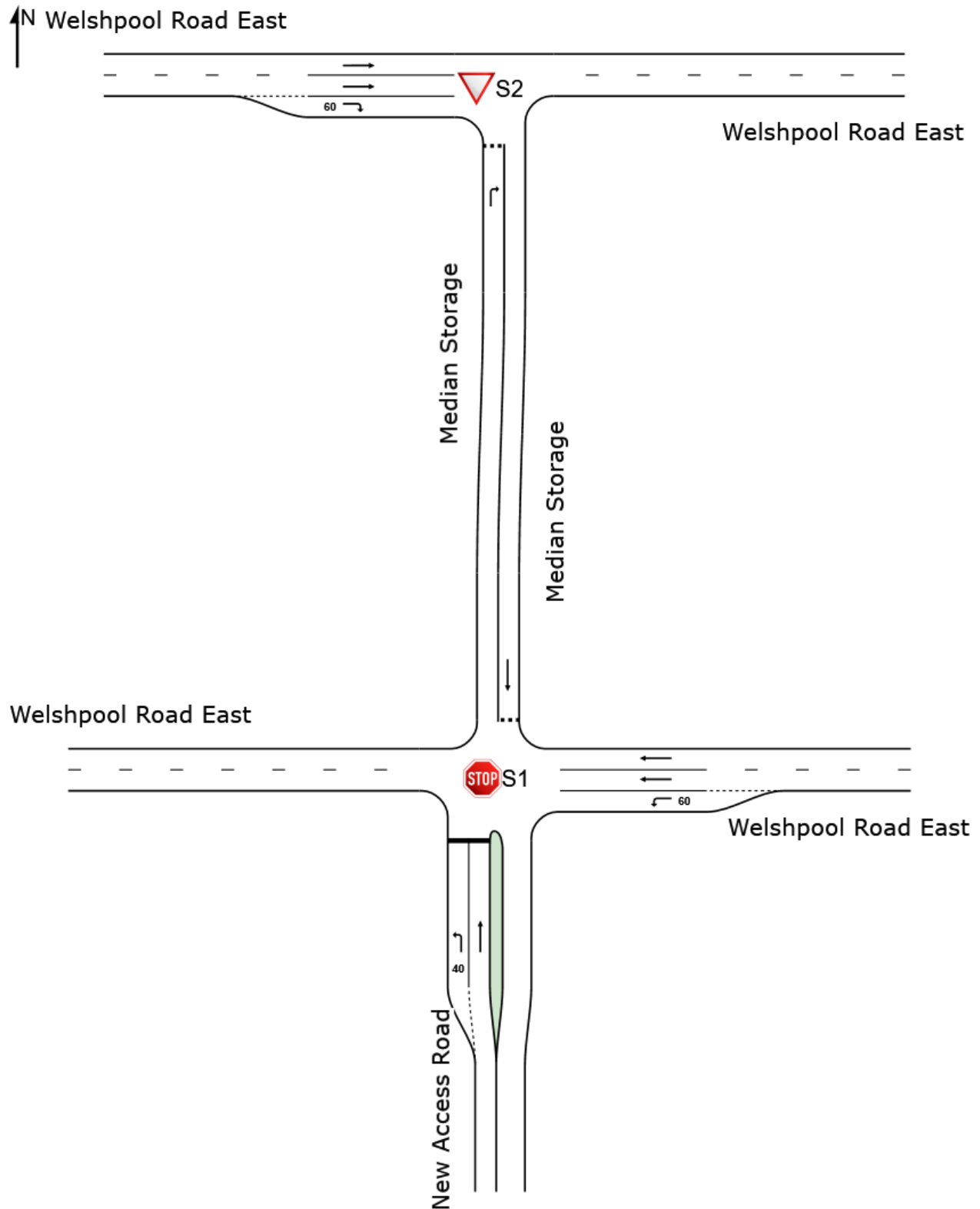
■ Network: N101 [New Access / Welshpool Road East - PM Peak - 2031 (Network Folder: 2031 Development)]

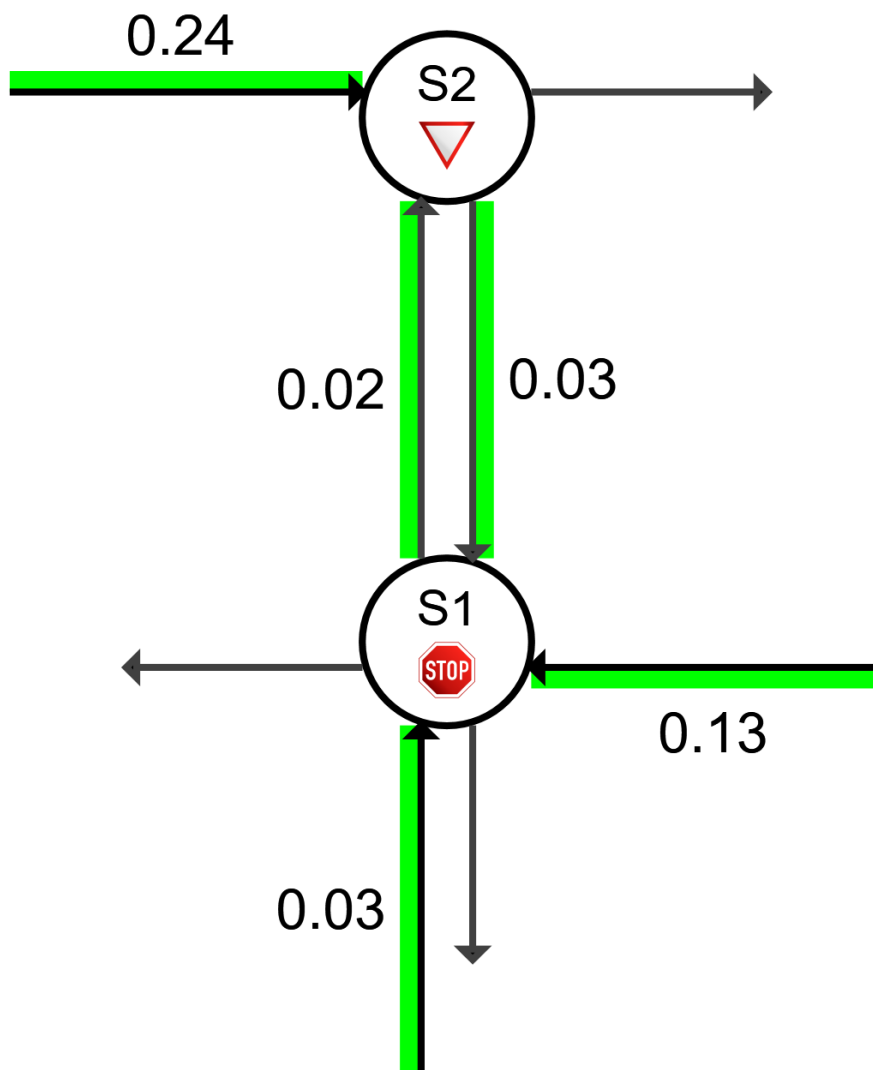
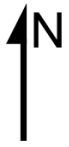
New Network

Network Category: (None)

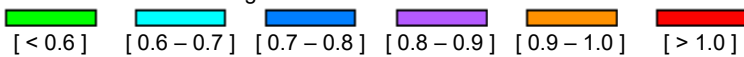
Network Layout

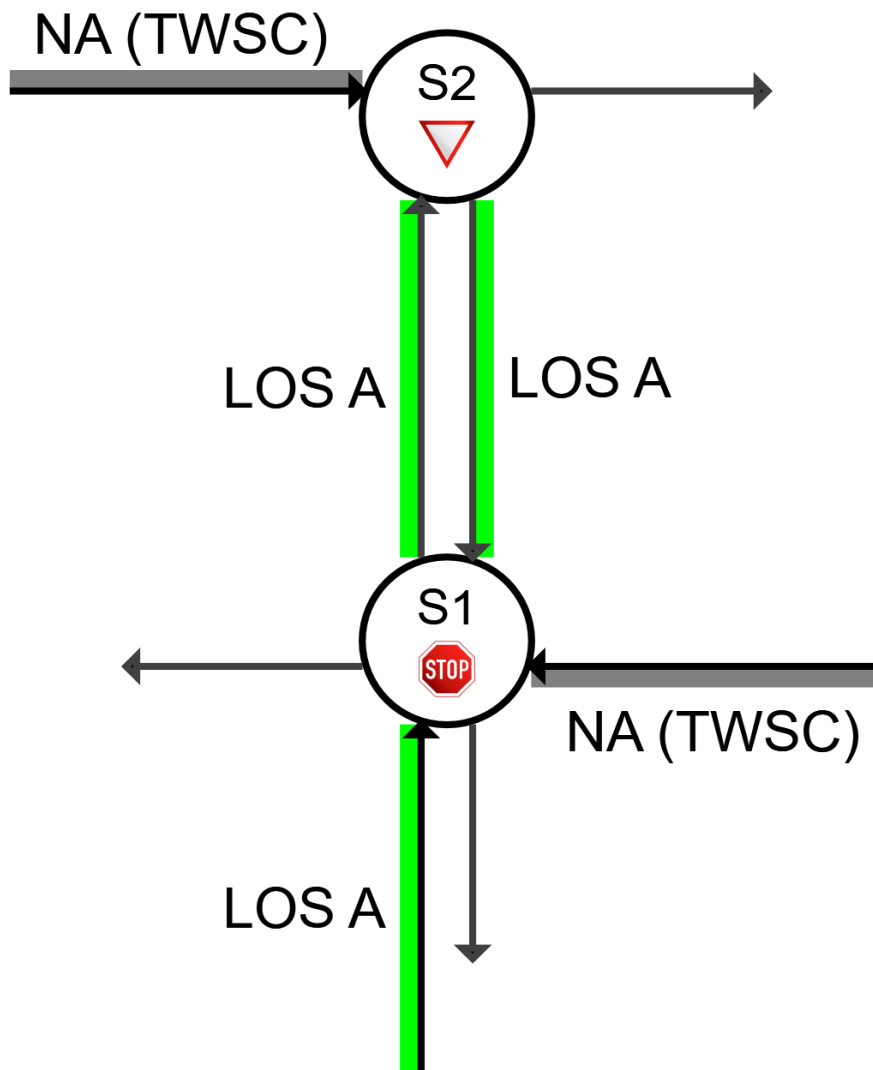
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



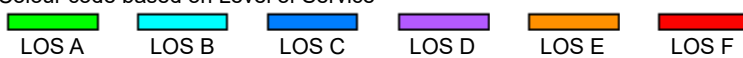


Colour code based on Degree of Saturation





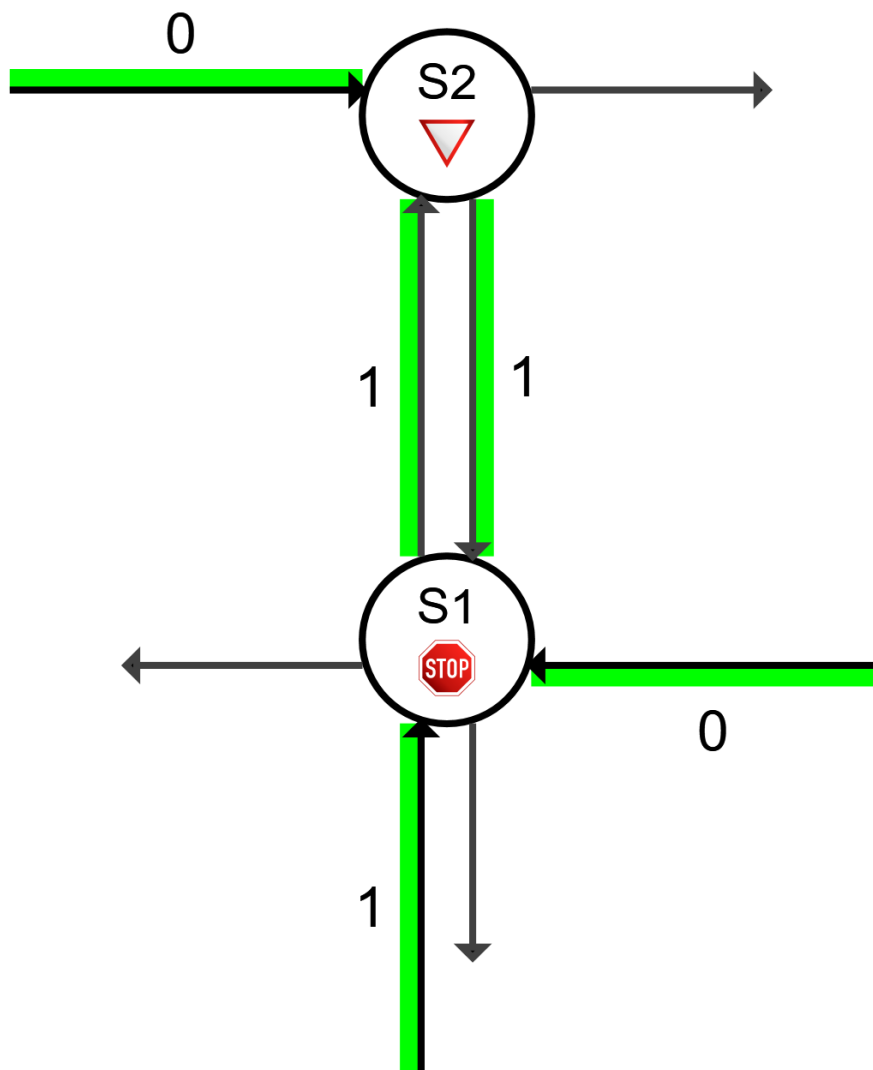
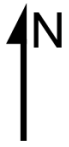
Colour code based on Level of Service



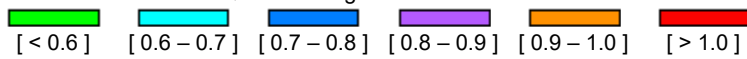
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

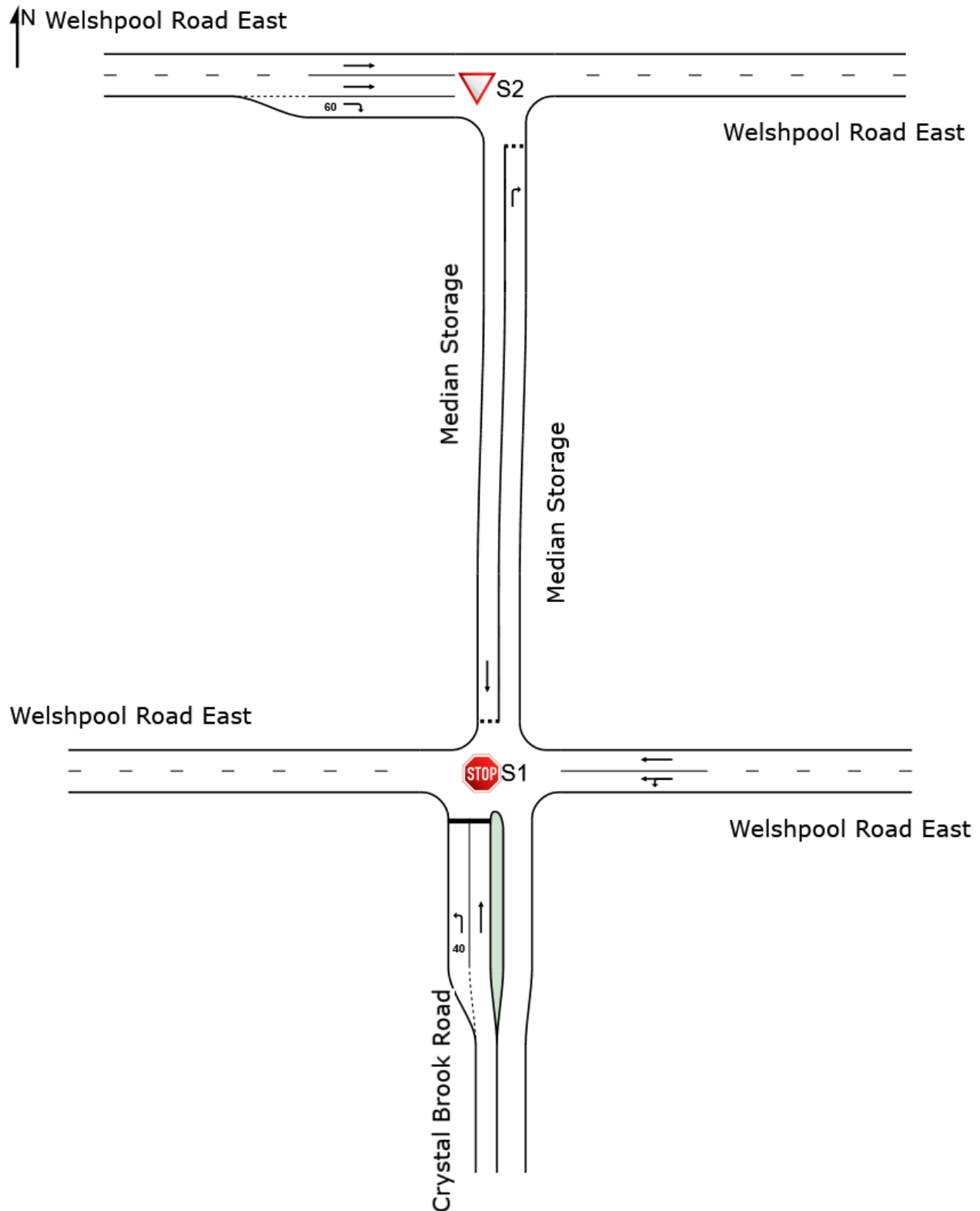
■ Network: N101 [Crystal Brook Road / Welshpool Road East (west) - Weekend Peak - 2031
(Network Folder: 2031 Development)]

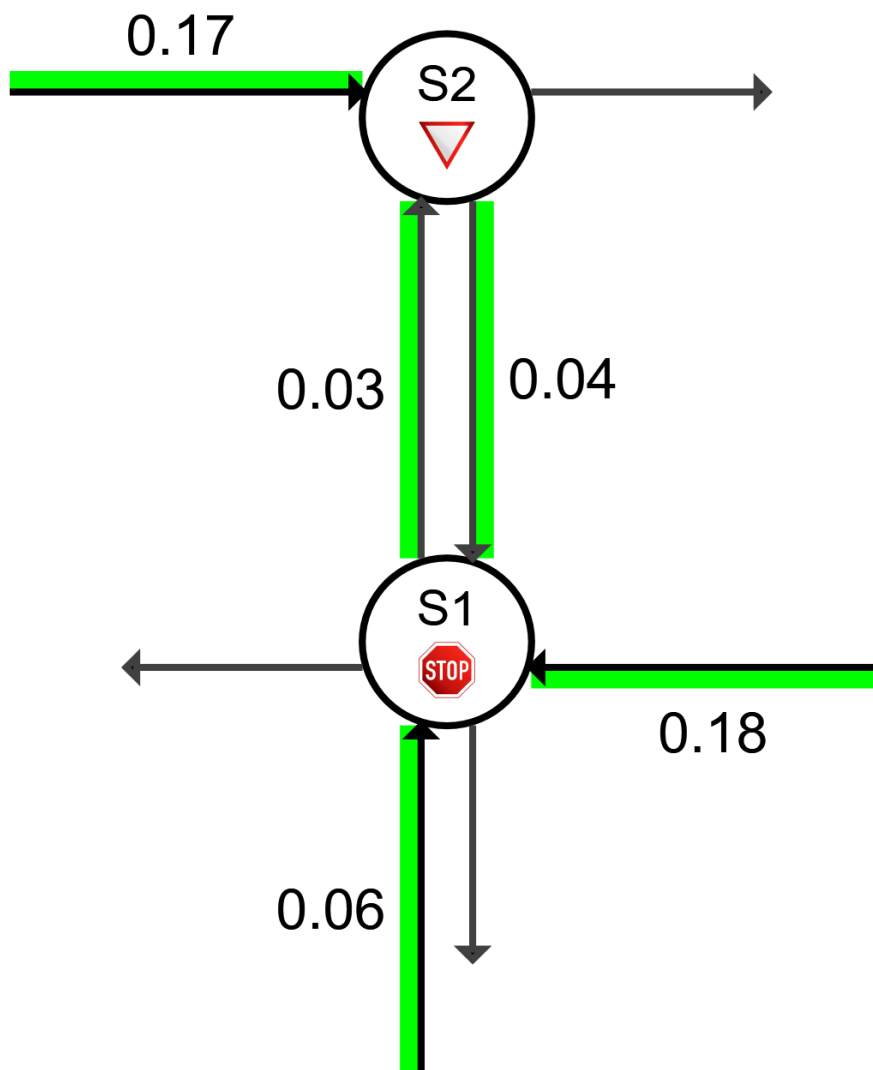
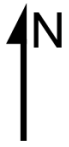
New Network

Network Category: (None)

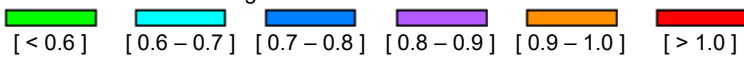
Network Layout

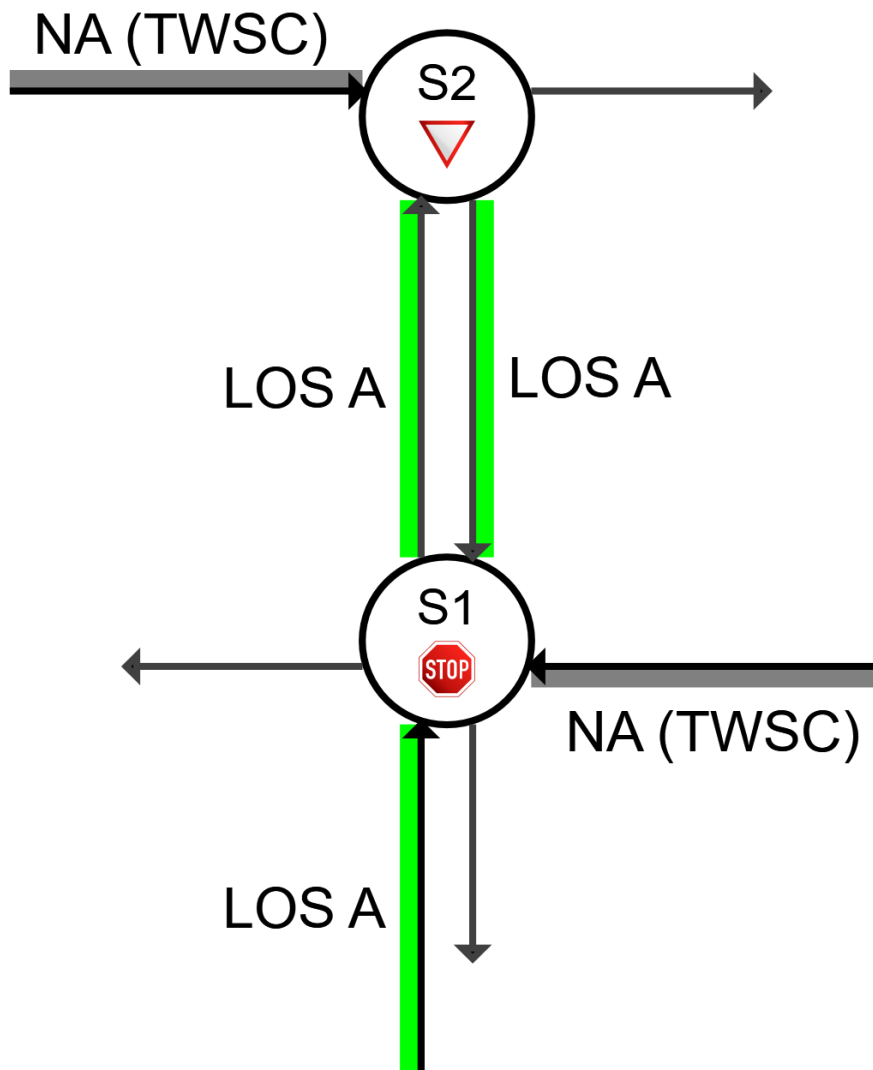
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



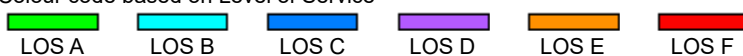


Colour code based on Degree of Saturation





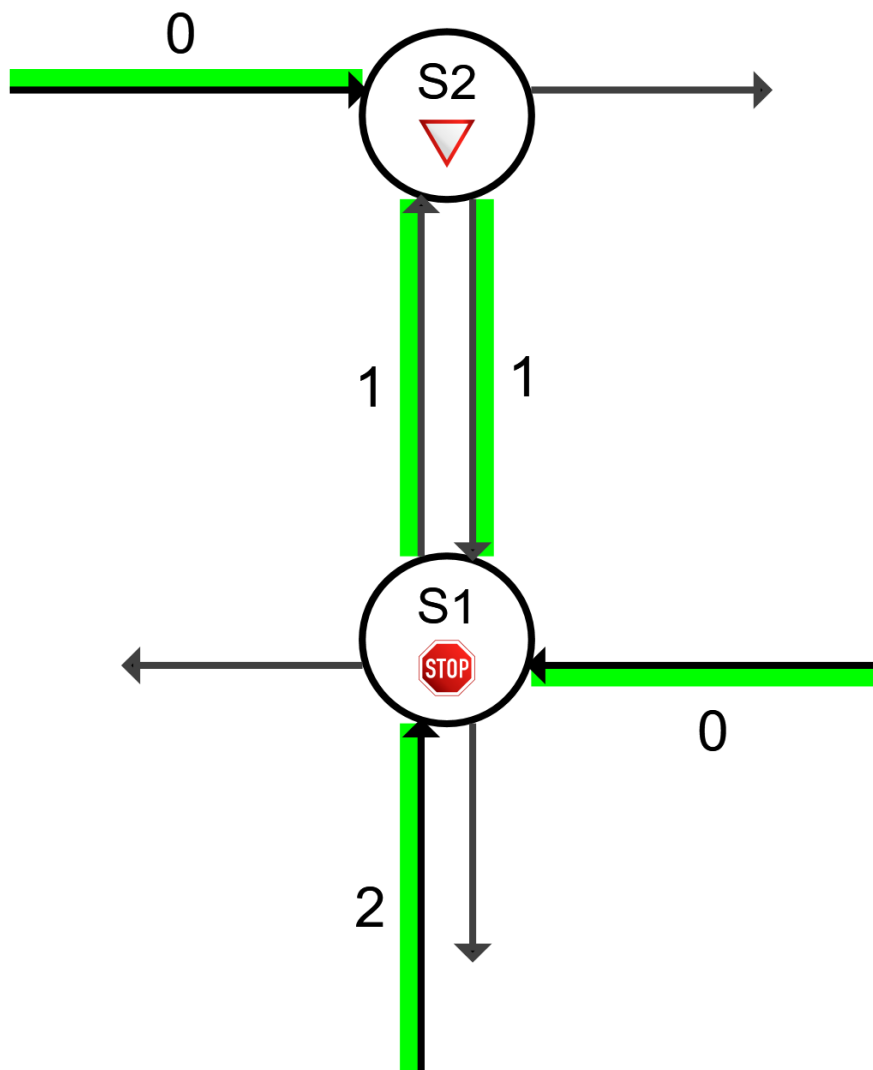
Colour code based on Level of Service



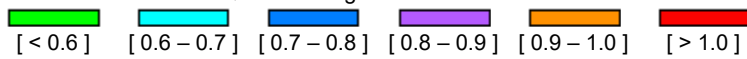
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

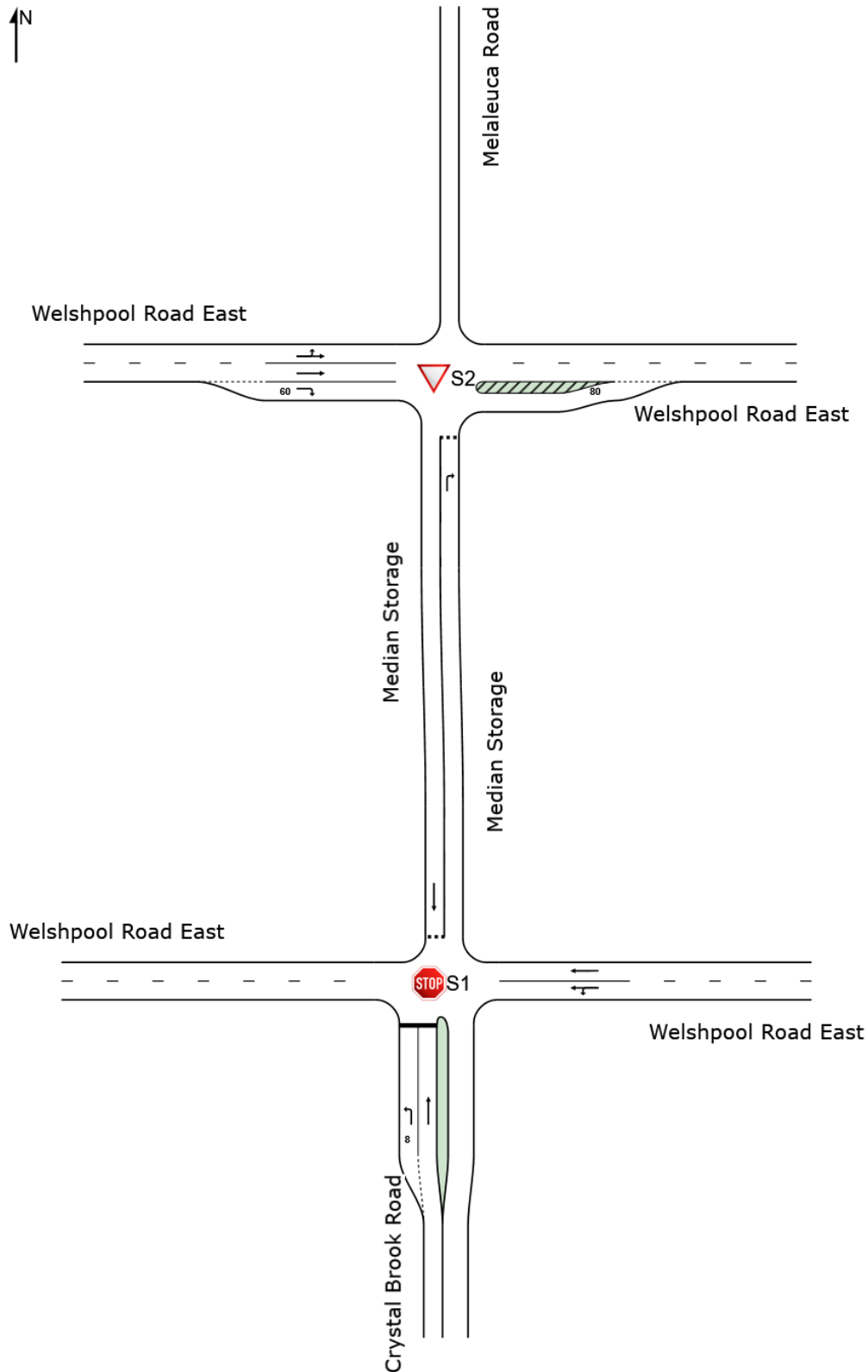
■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - Weekend Peak - 2031
(Network Folder: 2031 Development)]

New Network

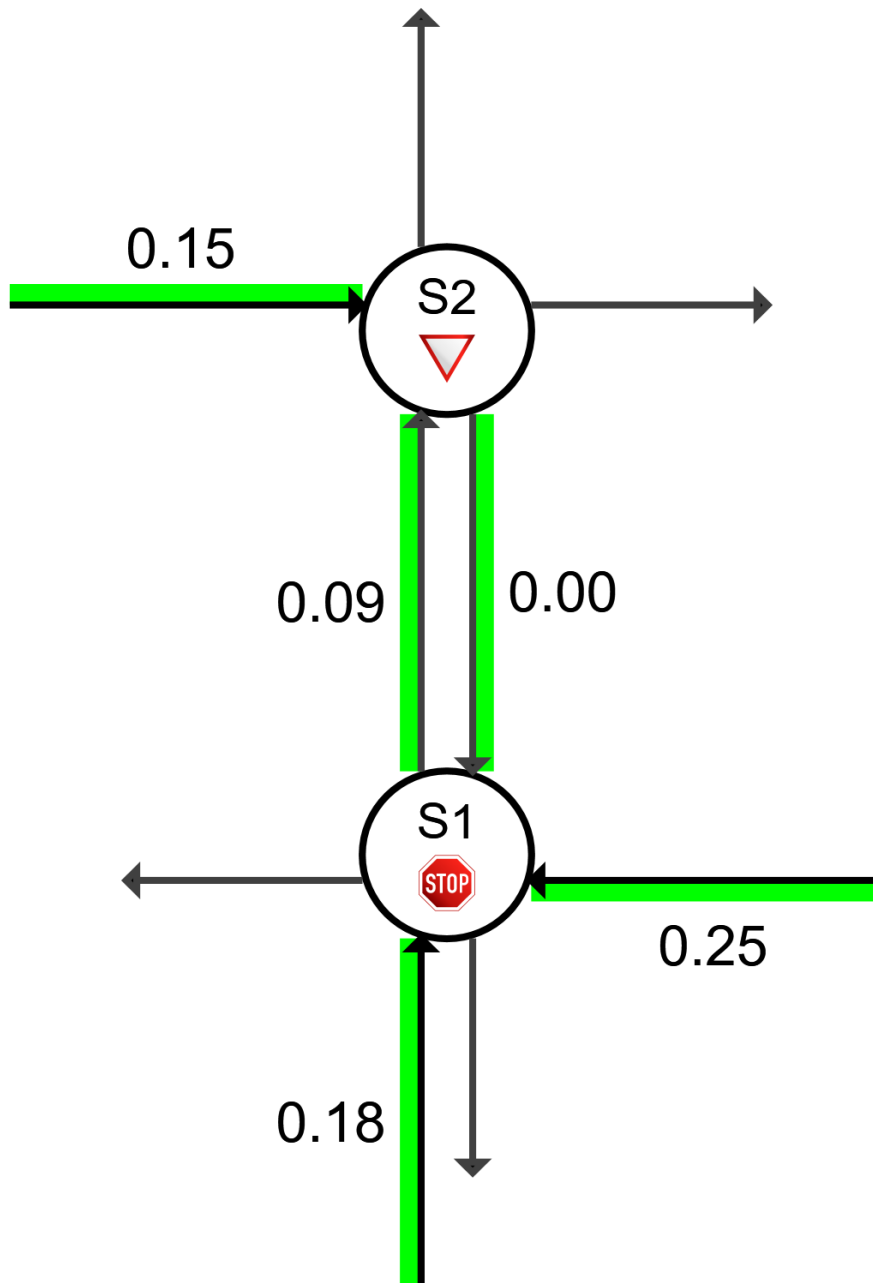
Network Category: (None)

Network Layout

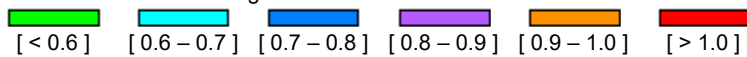
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



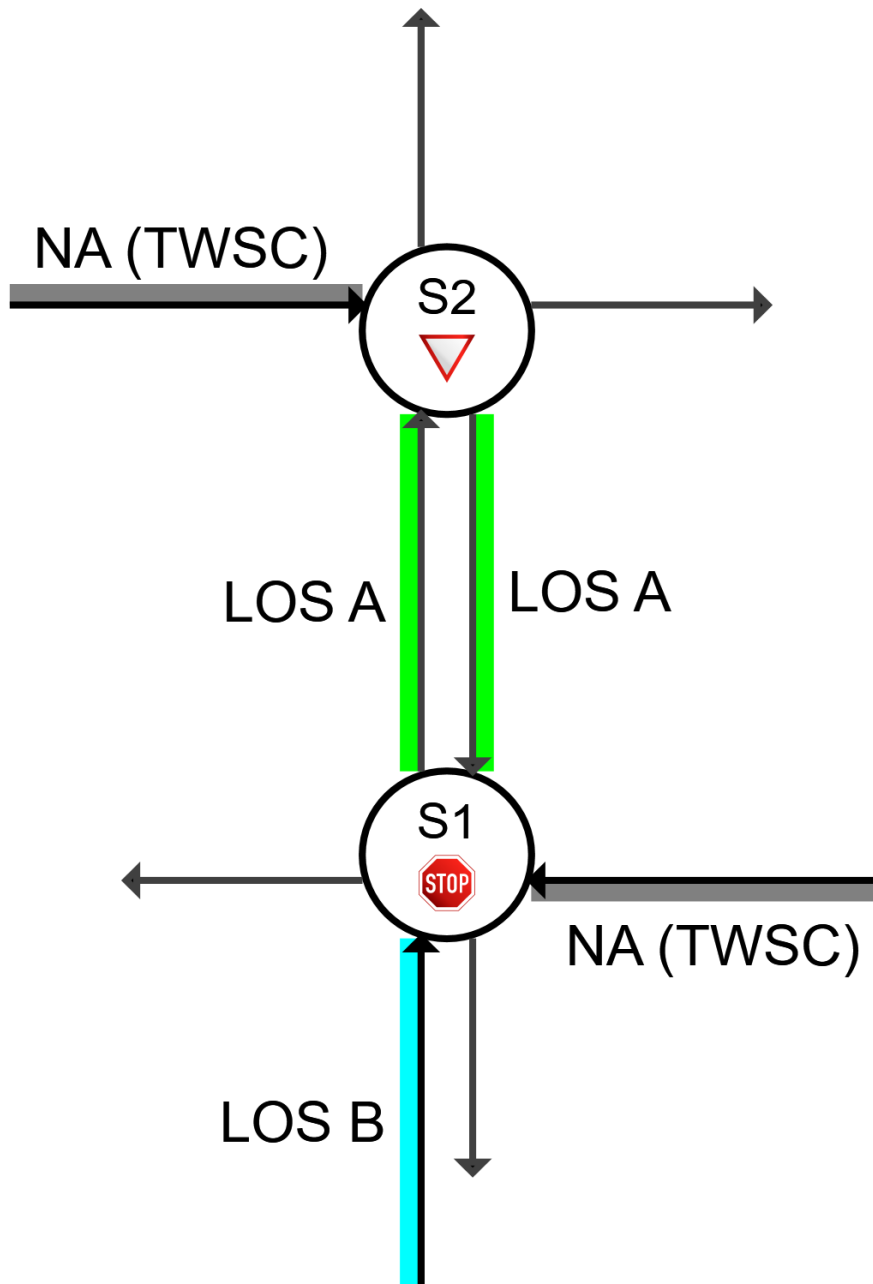
Degree of Saturation



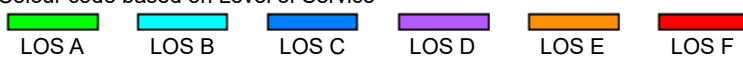
Colour code based on Degree of Saturation



Approach Level of Service



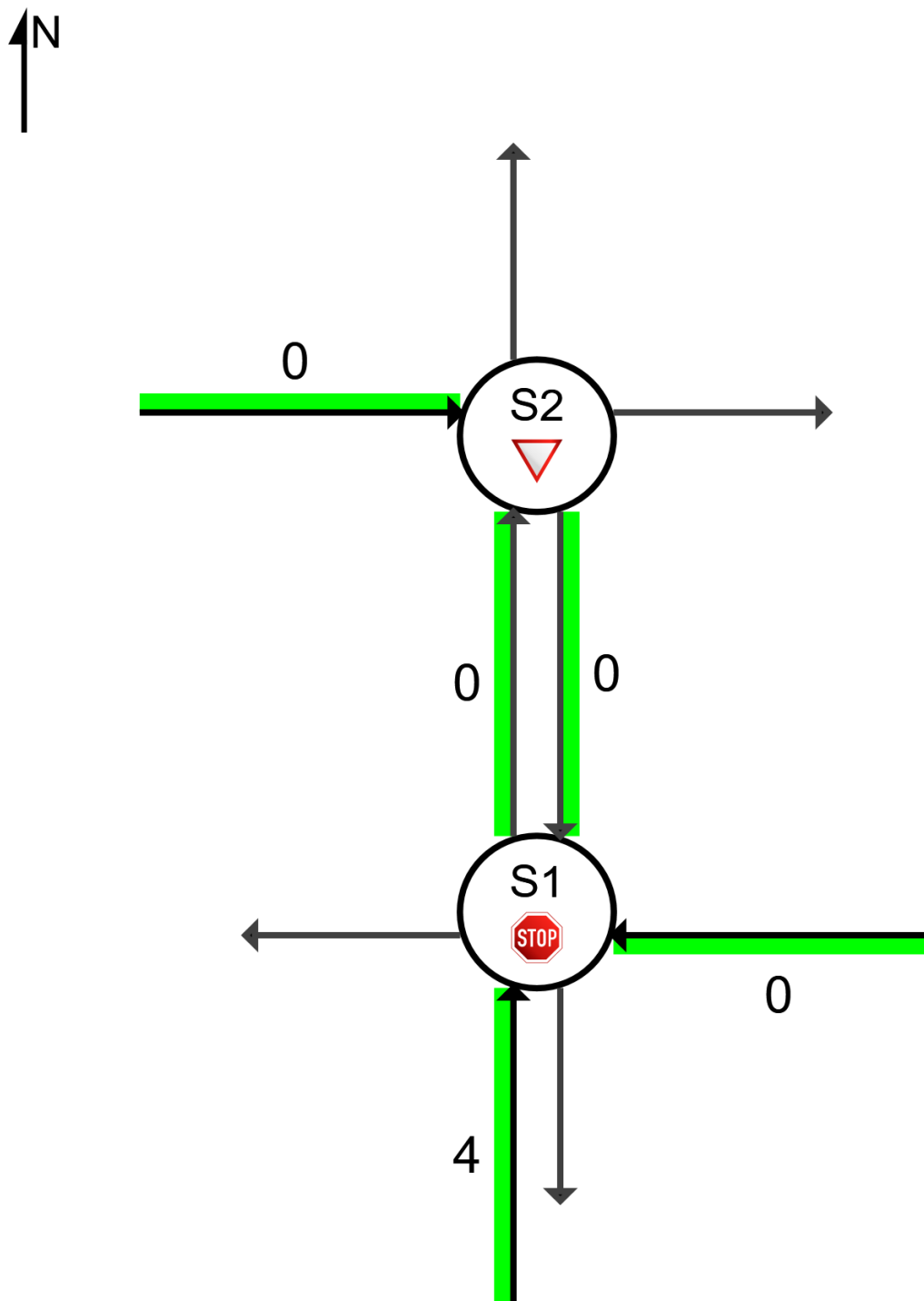
Colour code based on Level of Service



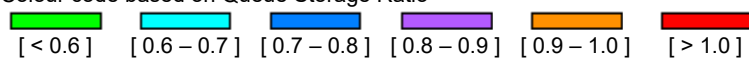
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

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



Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

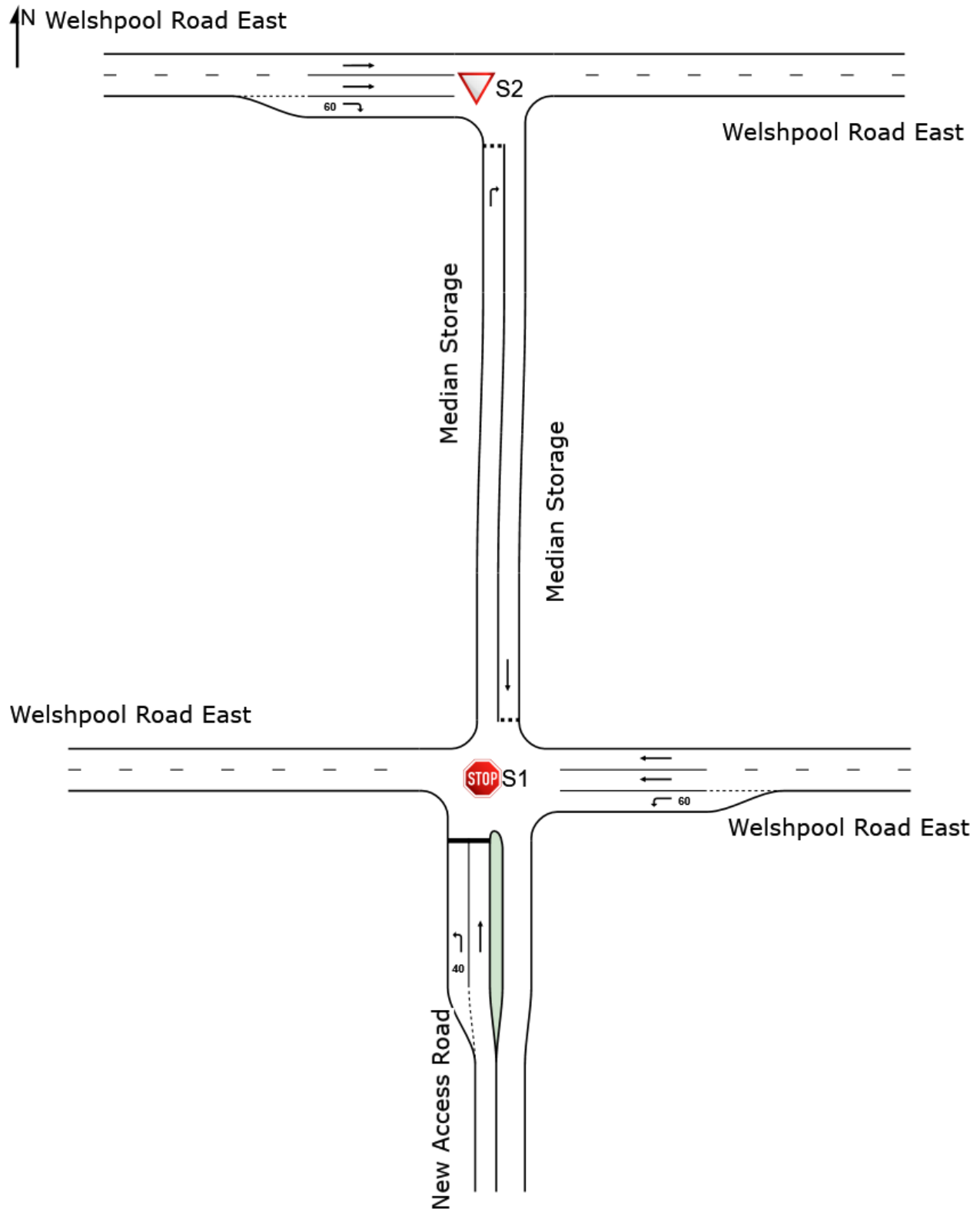
■ Network: N101 [New Access / Welshpool Road East - Weekend Peak - 2031 (Network Folder: 2031 Development)]

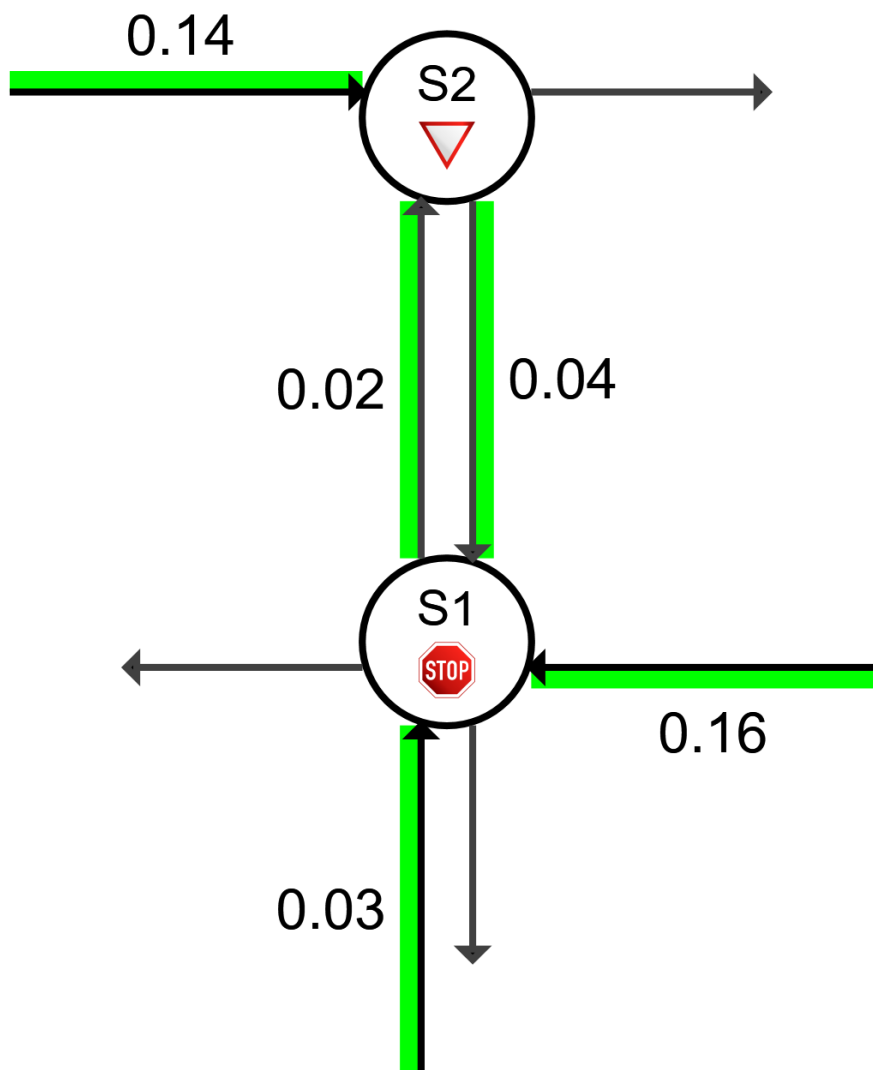
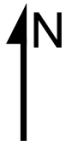
New Network

Network Category: (None)

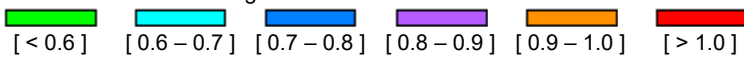
Network Layout

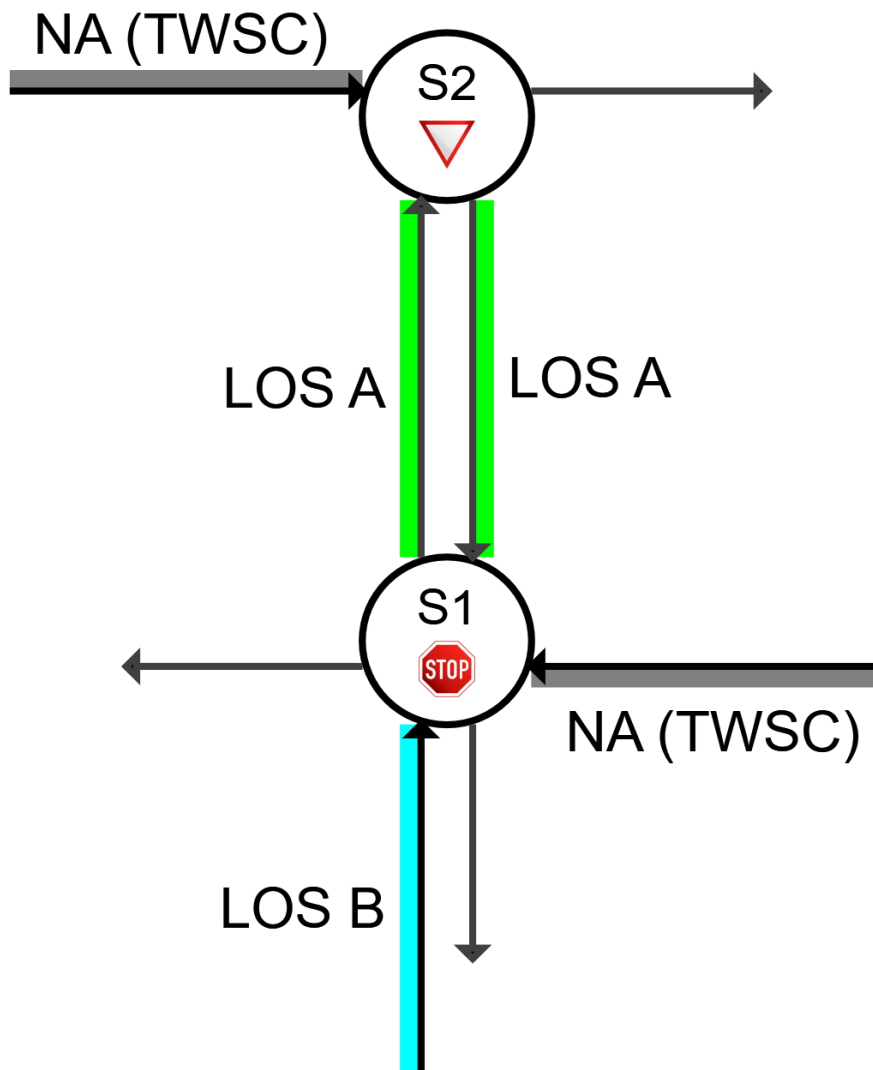
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



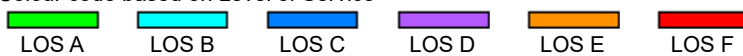


Colour code based on Degree of Saturation





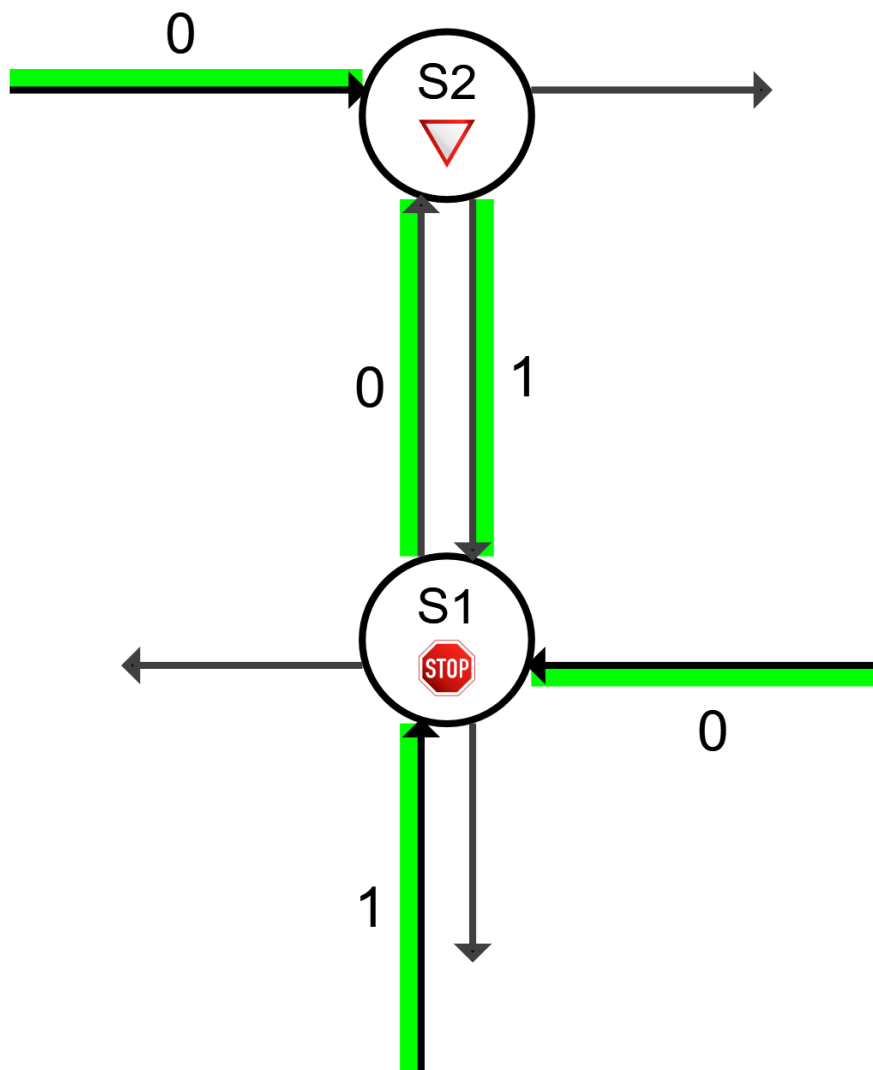
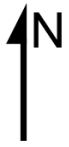
Colour code based on Level of Service



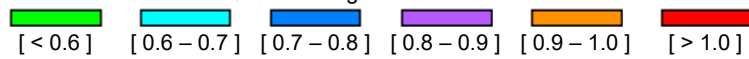
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Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



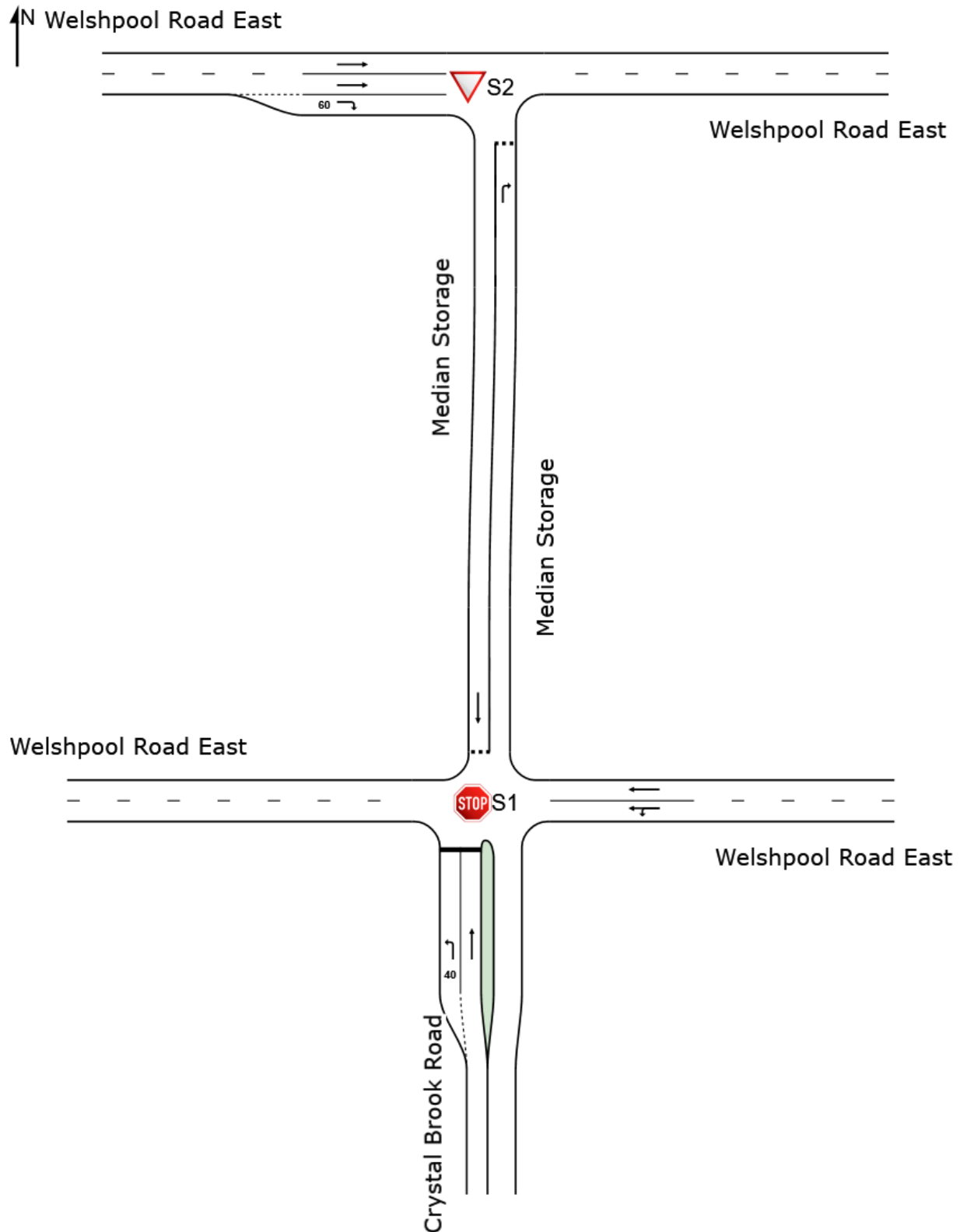
Colour code based on Queue Storage Ratio

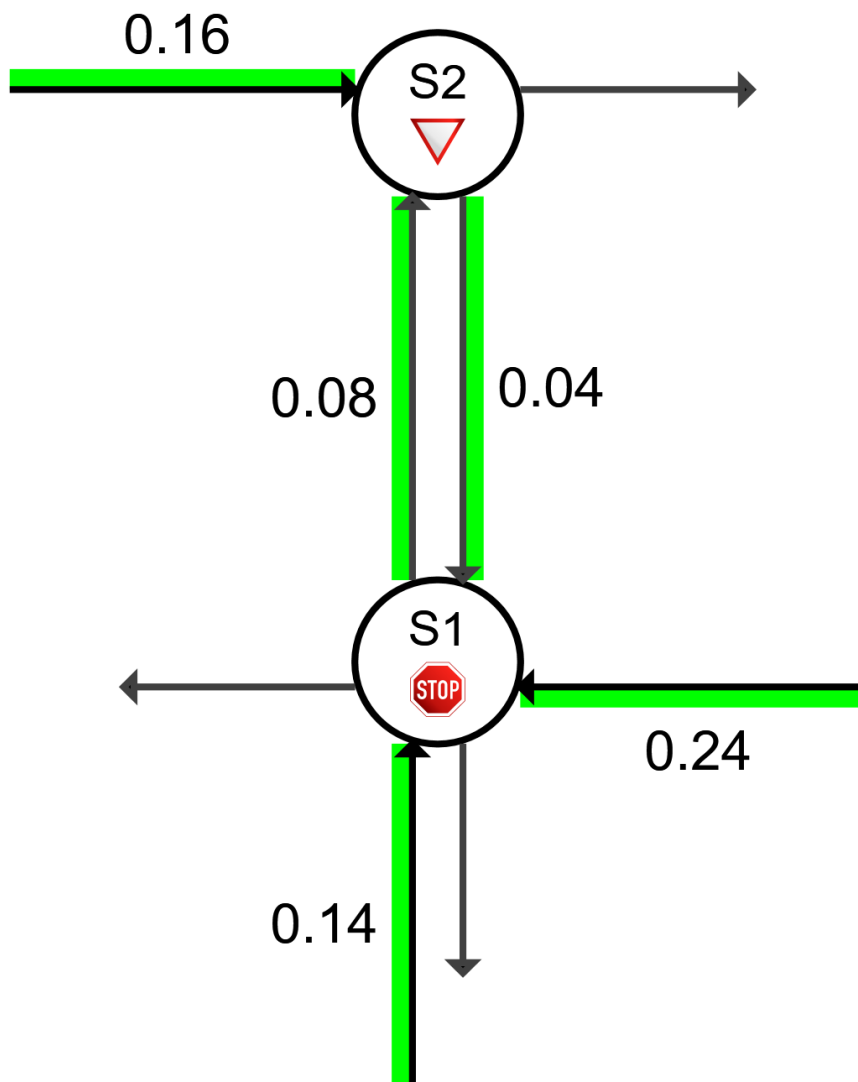
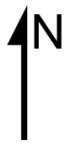


Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

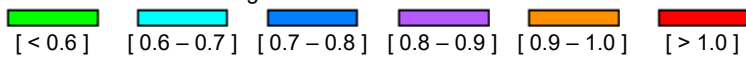
New Network
Network Category: (None)

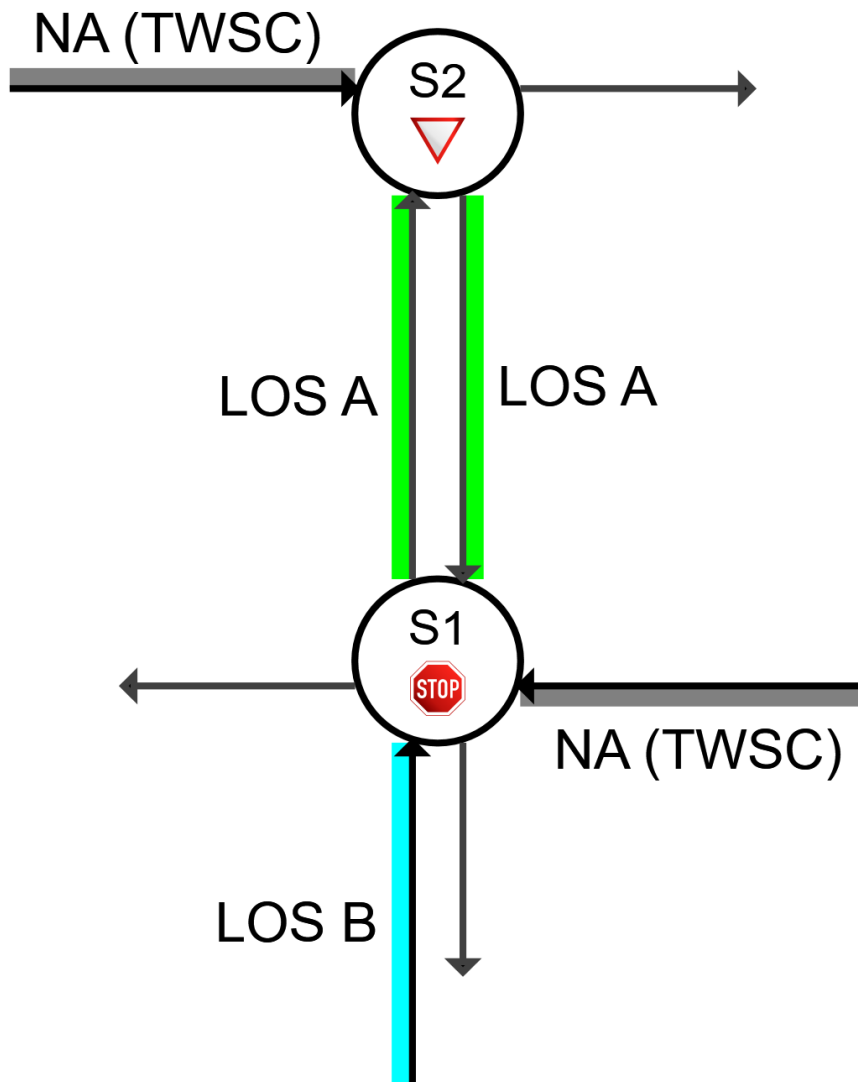
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



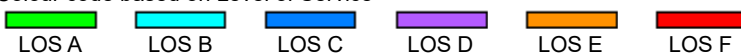


Colour code based on Degree of Saturation





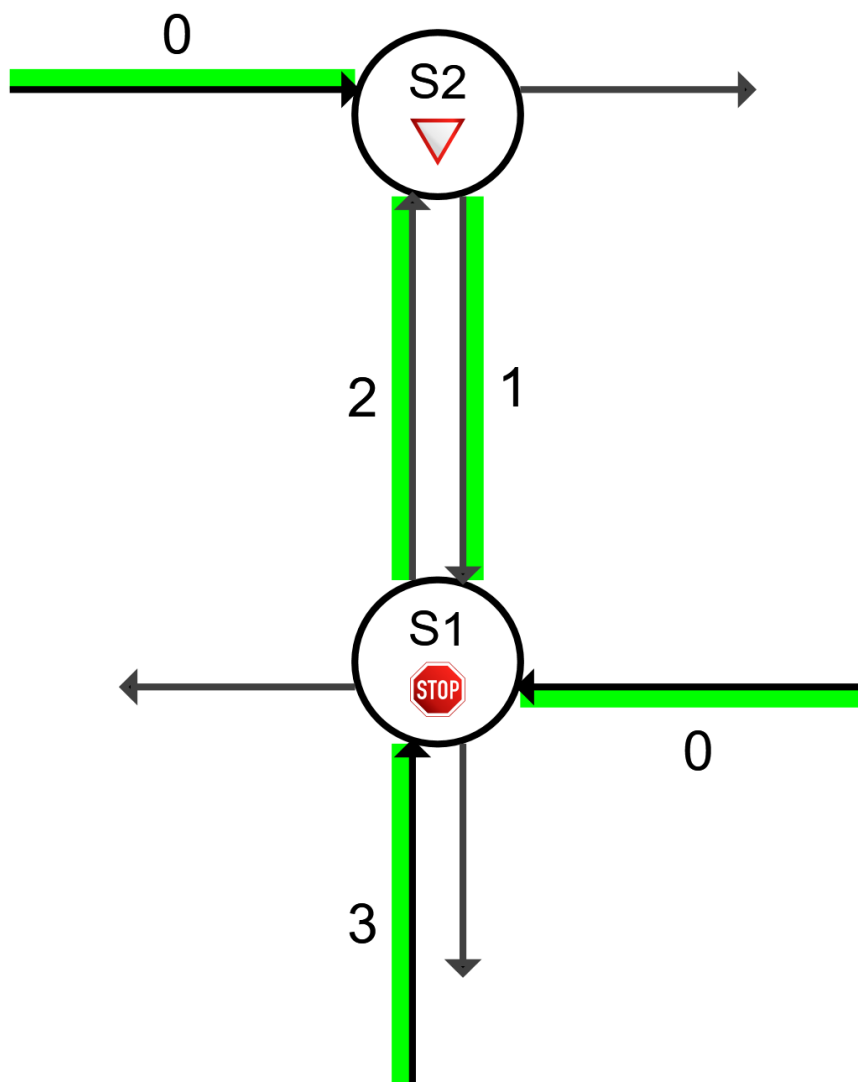
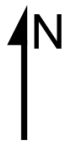
Colour code based on Level of Service



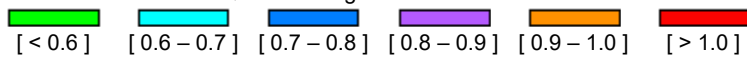
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

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



Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

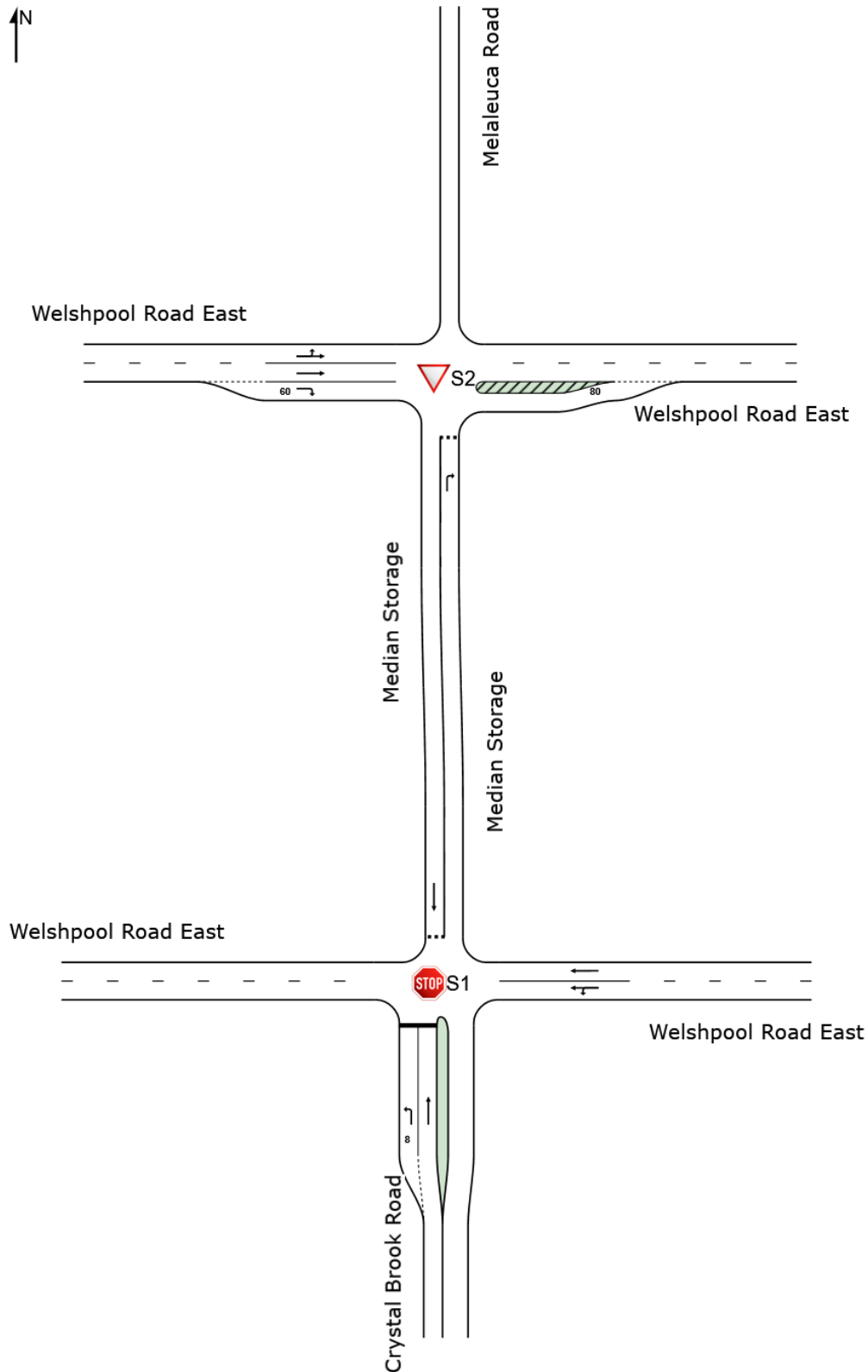
■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - AM Peak - 2041 (Network Folder: 2041 Development)]

New Network

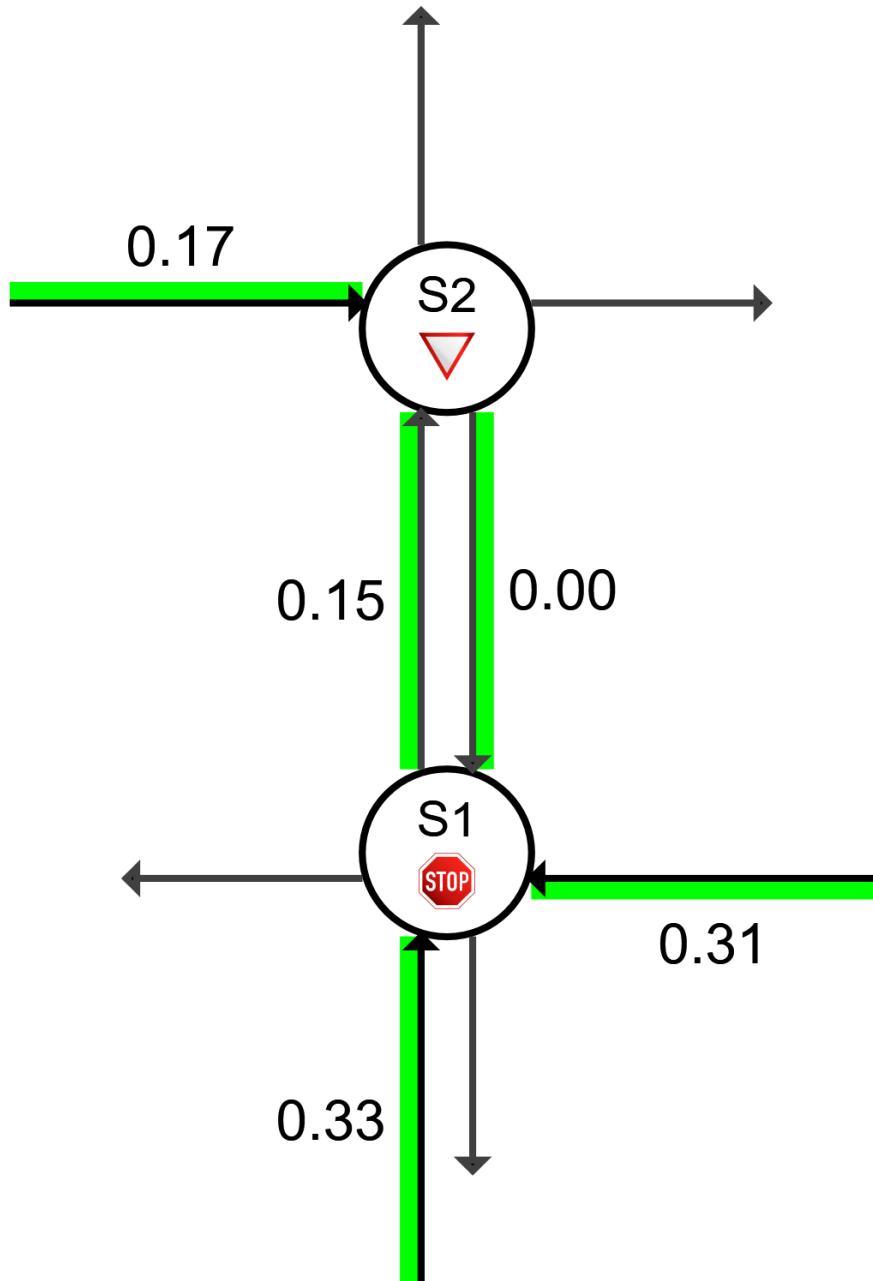
Network Category: (None)

Network Layout

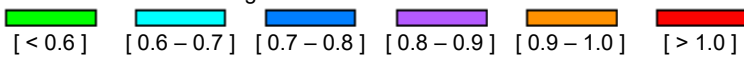
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



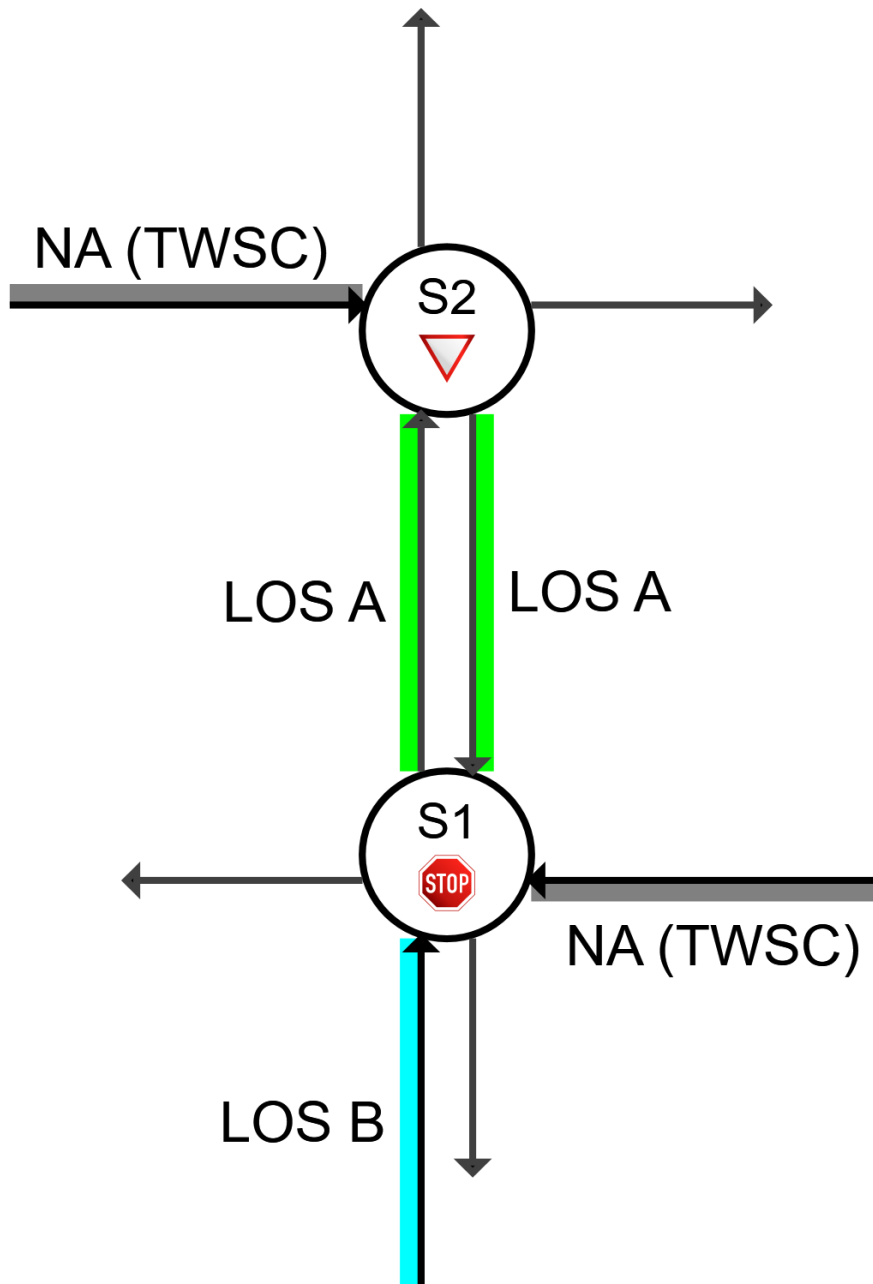
Degree of Saturation



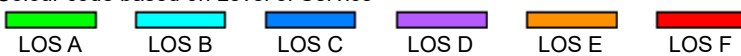
Colour code based on Degree of Saturation



Approach Level of Service



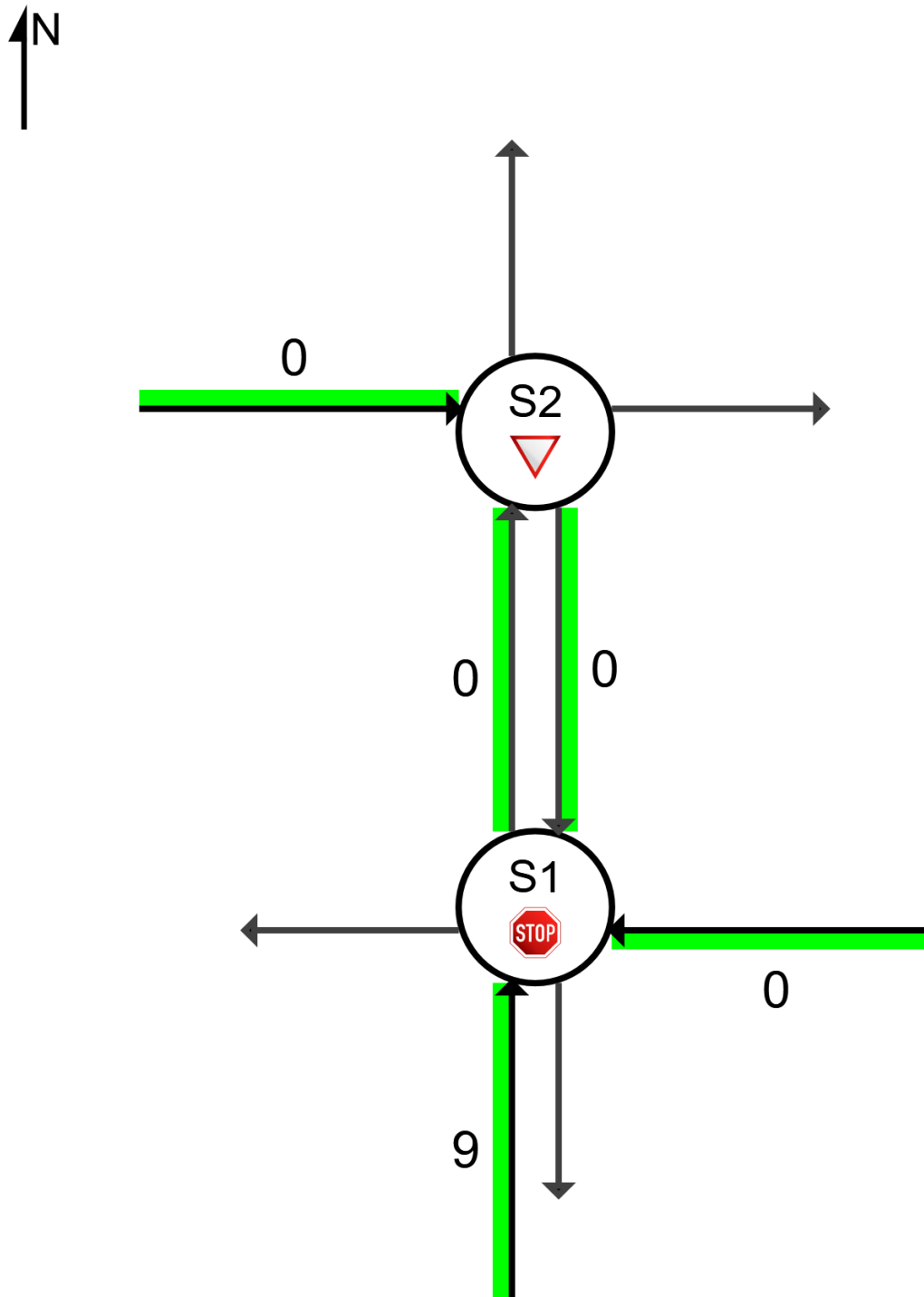
Colour code based on Level of Service



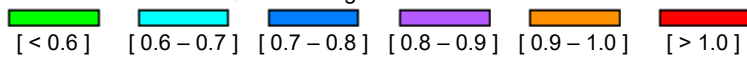
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Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



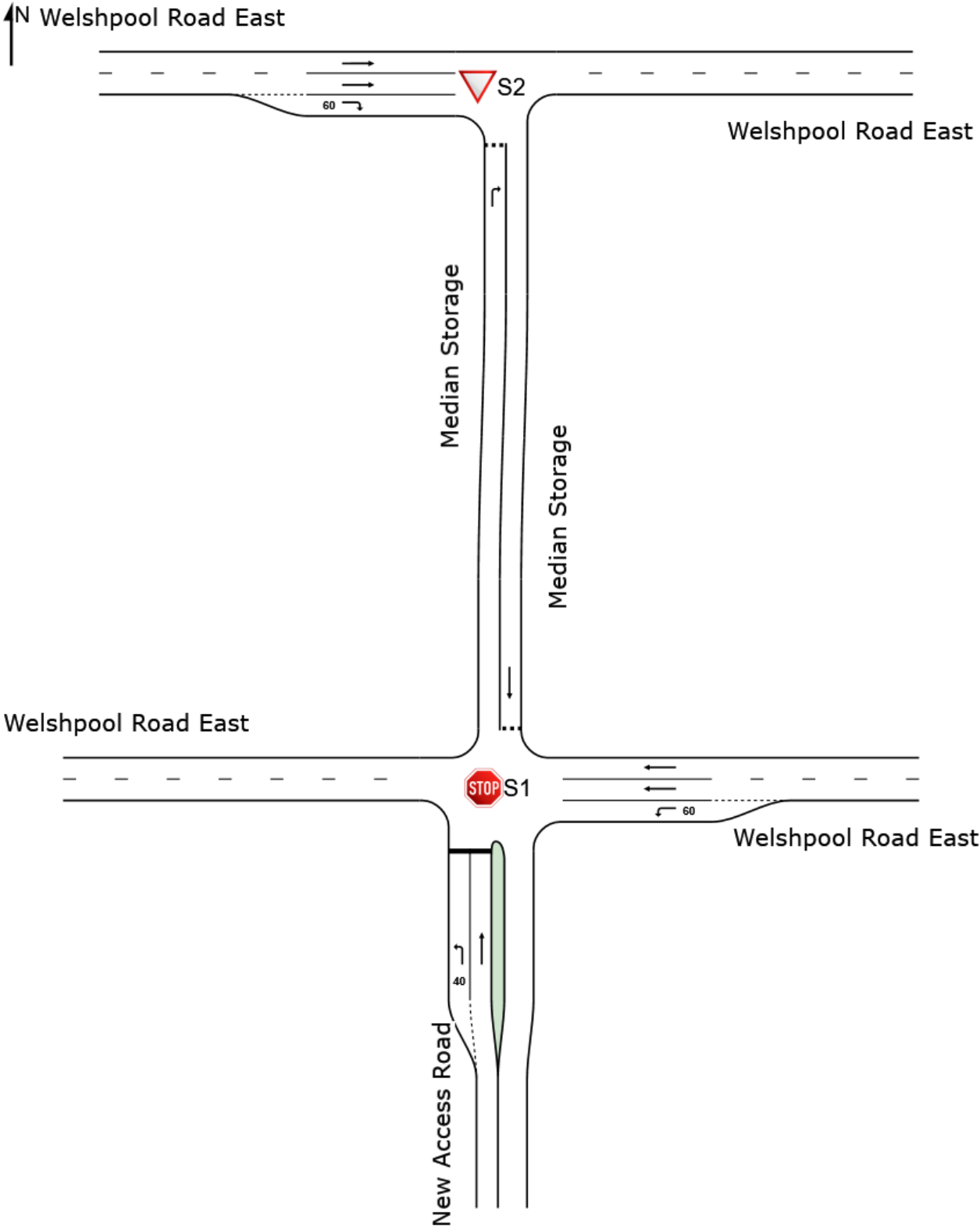
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

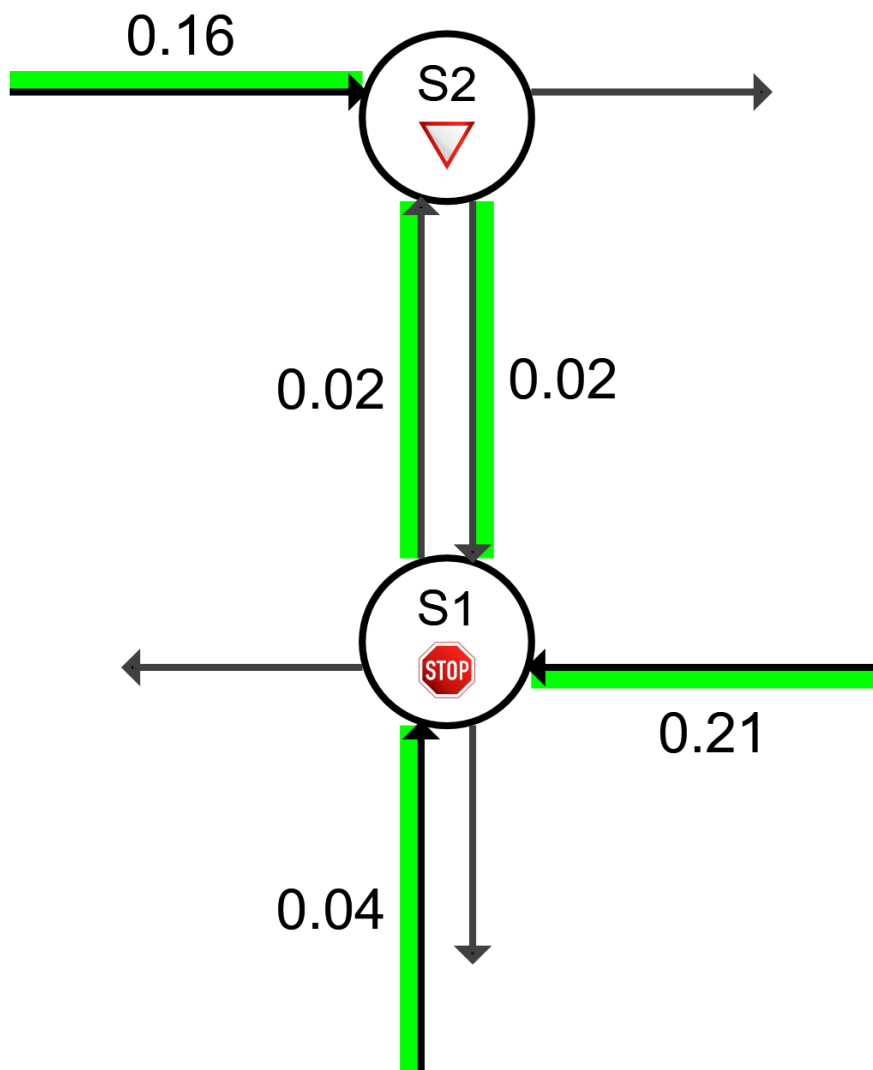
■ Network: N101 [New Access / Welshpool Road East - AM Peak - 2041 (Network Folder: 2041 Development)]

New Network
Network Category: (None)

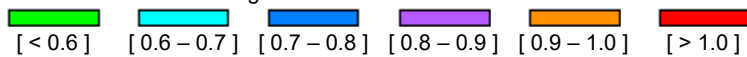
Network Layout

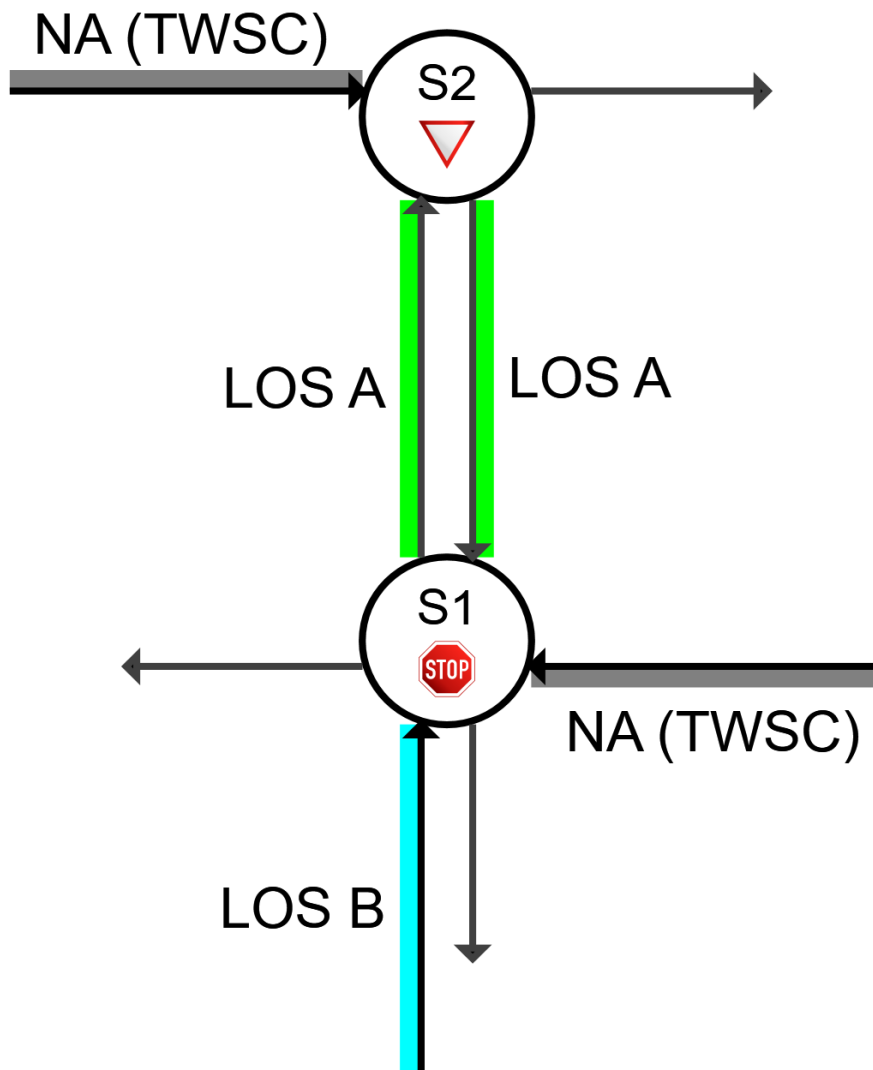
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



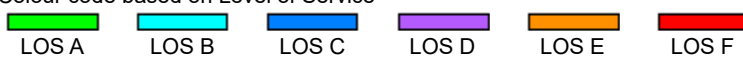


Colour code based on Degree of Saturation





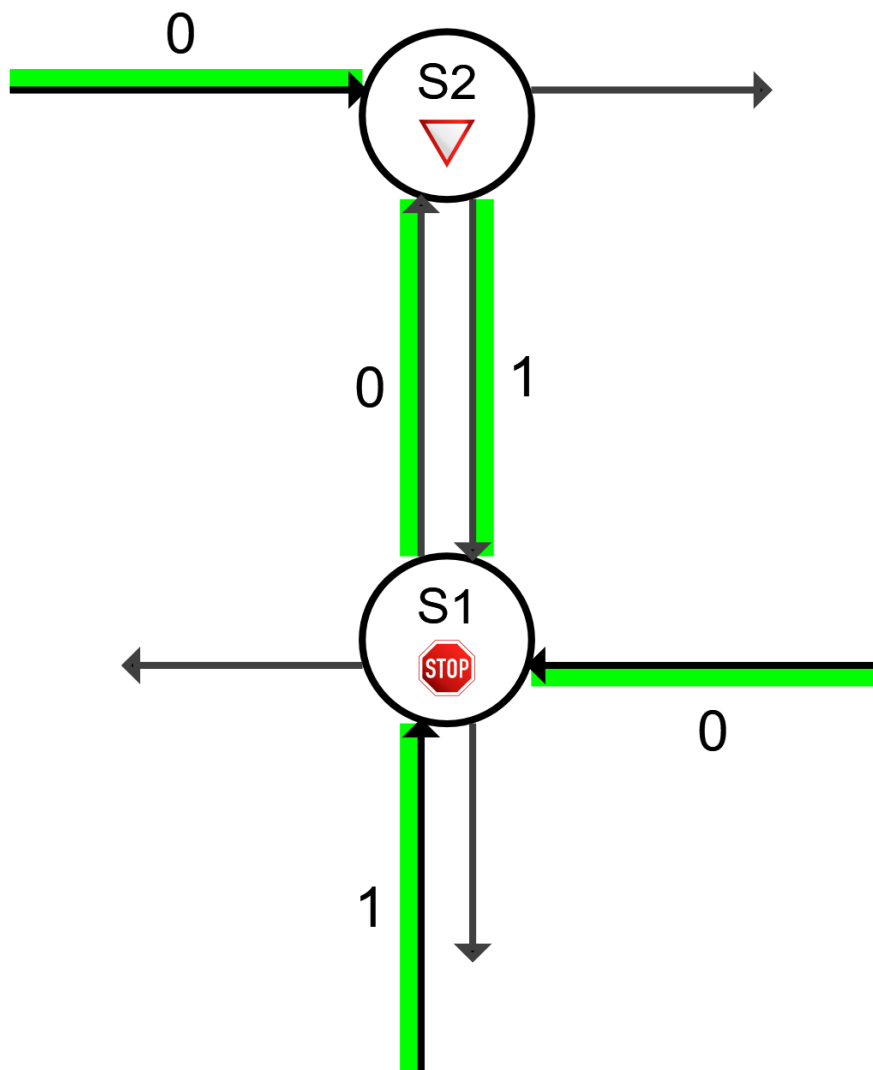
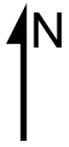
Colour code based on Level of Service



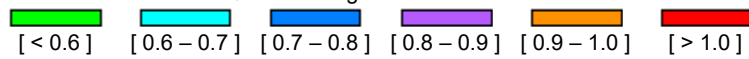
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Colour code based on Queue Storage Ratio



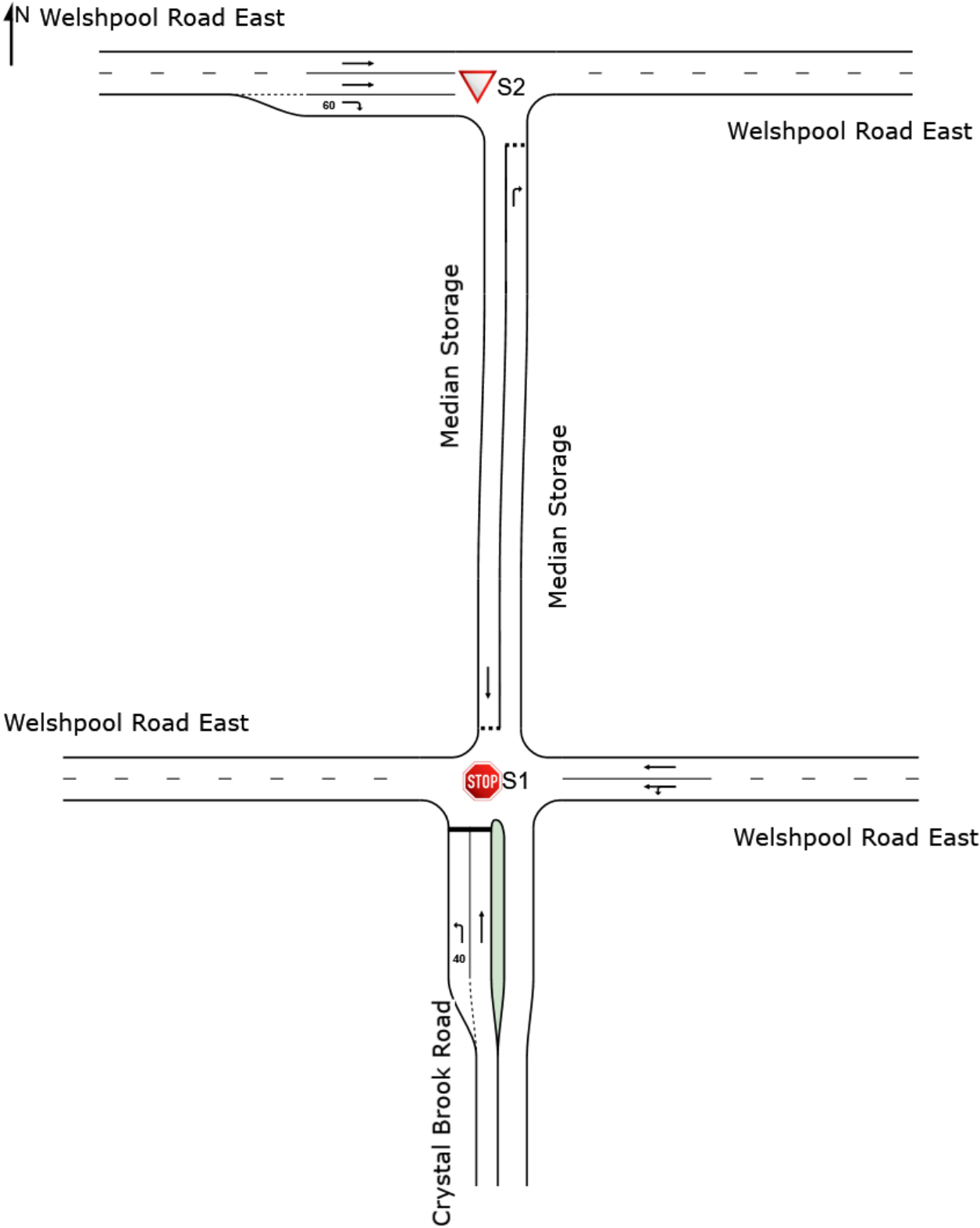
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

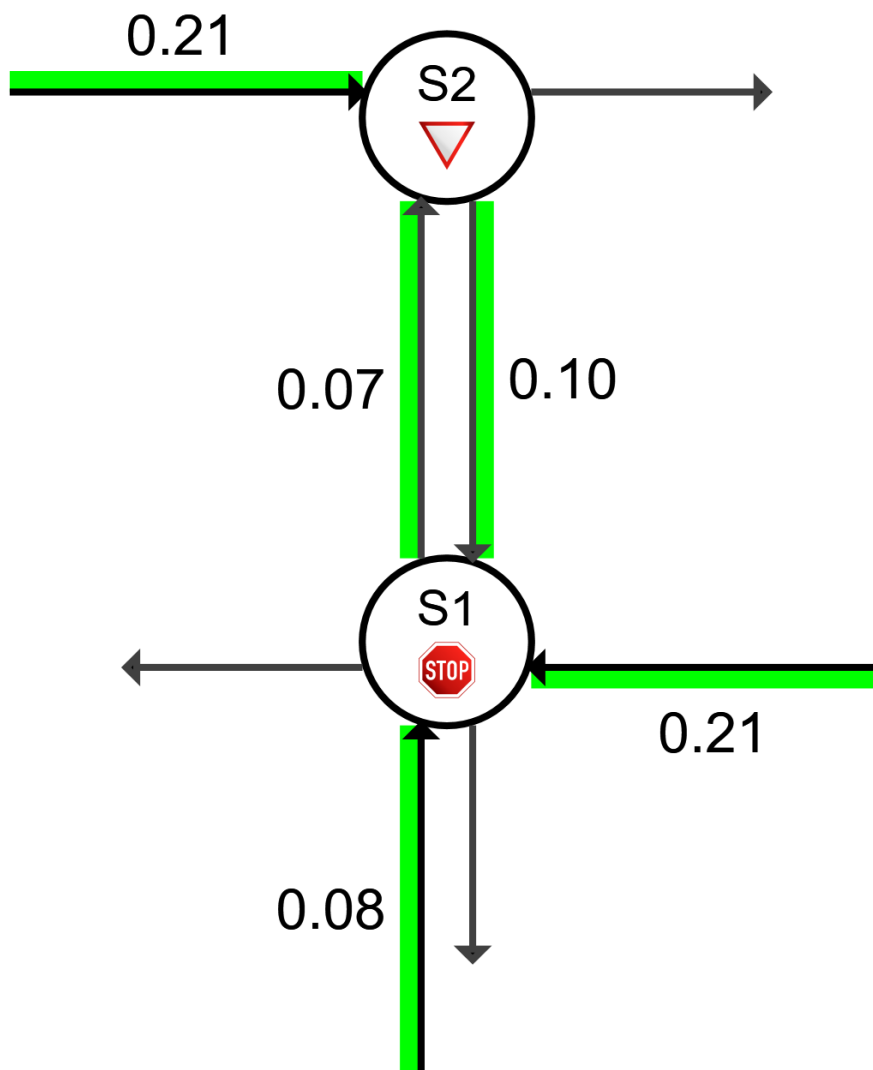
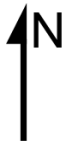
■ Network: N101 [Crystal Brook Road / Welshpool Road East (west) - PM Peak - 2041 (Network Folder: 2041 Development)]

New Network
Network Category: (None)

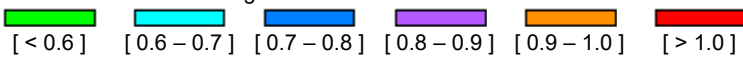
Network Layout

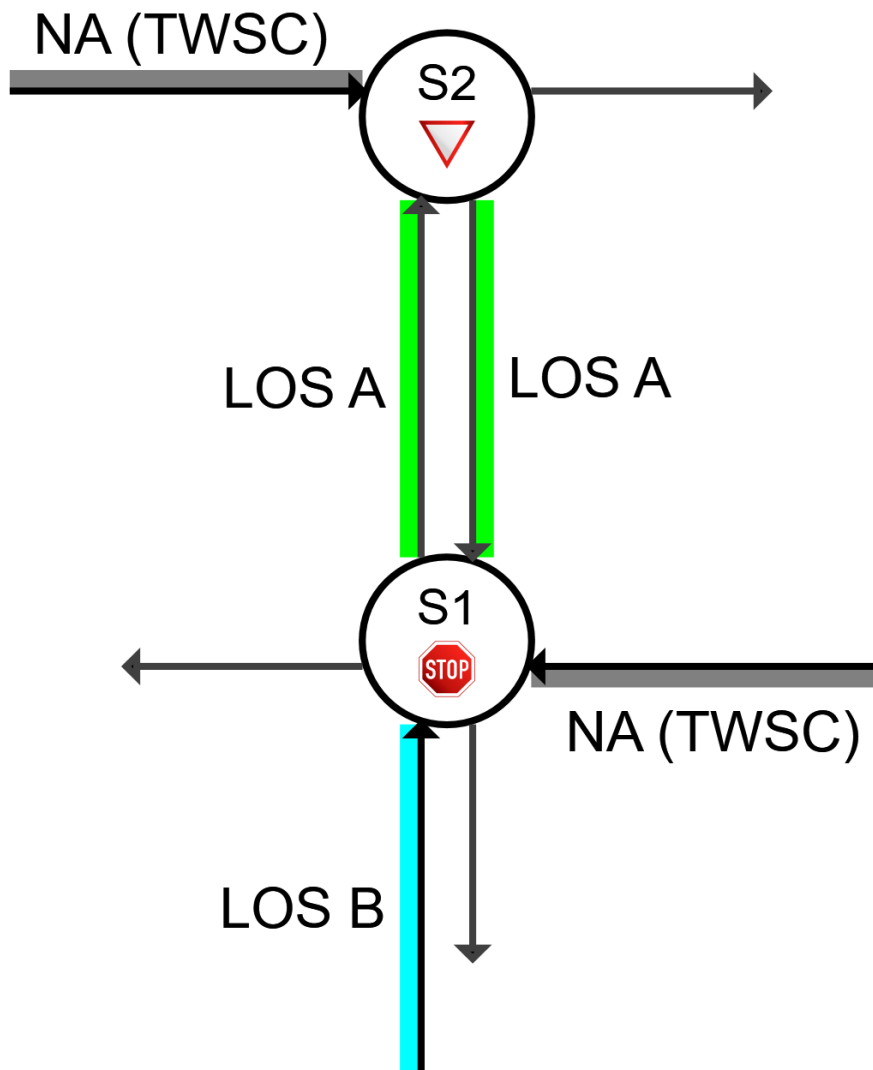
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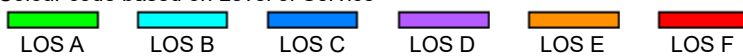


Colour code based on Degree of Saturation





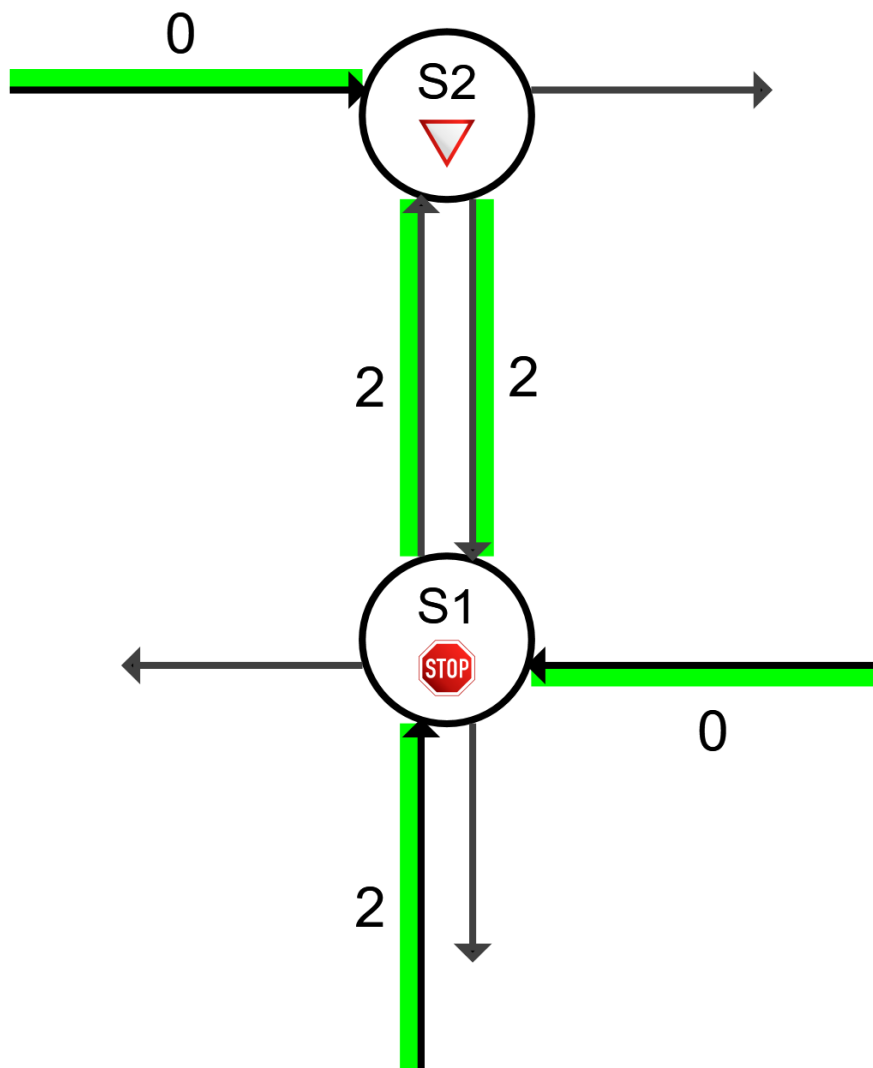
Colour code based on Level of Service



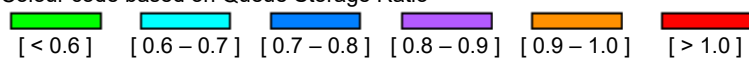
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Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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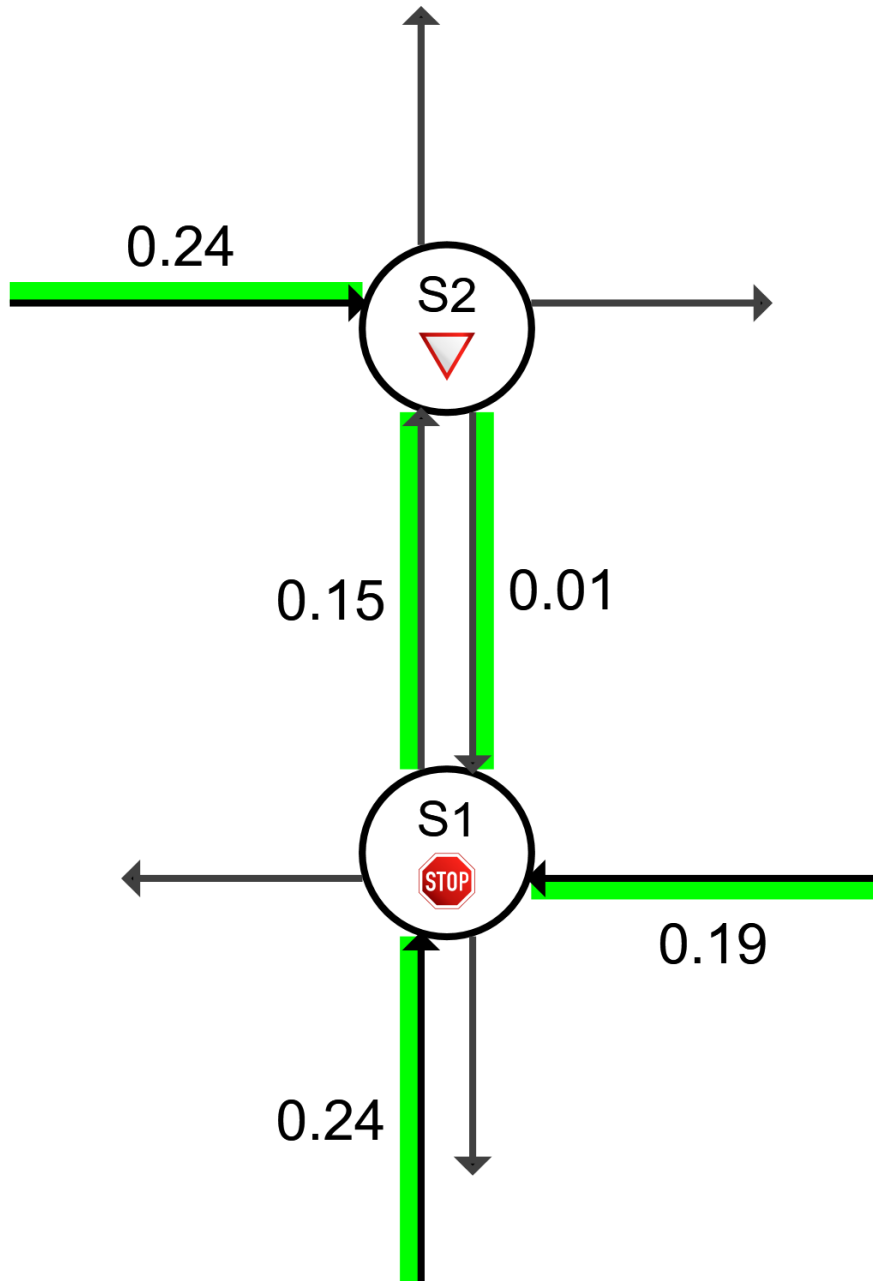


Colour code based on Queue Storage Ratio

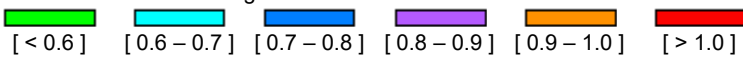


Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

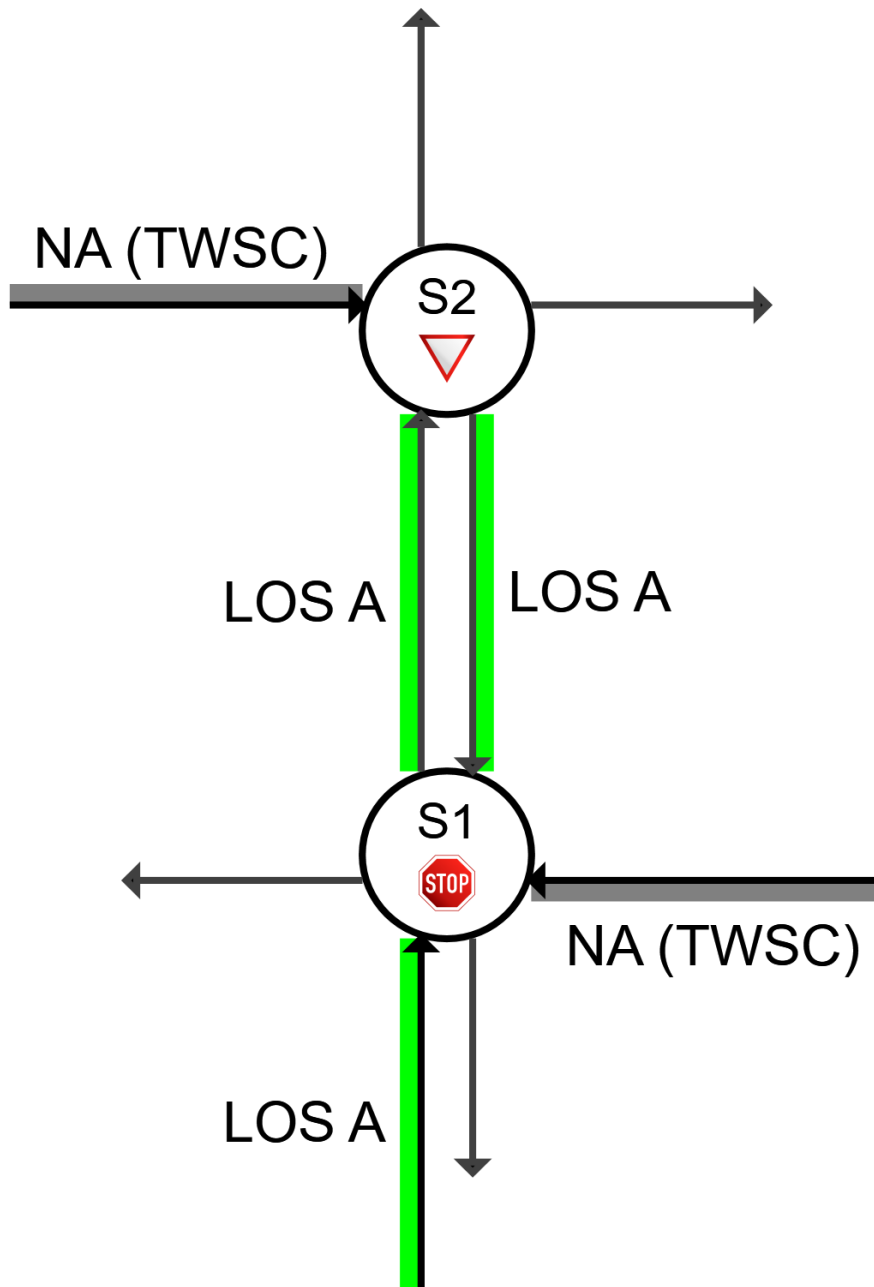
Degree of Saturation



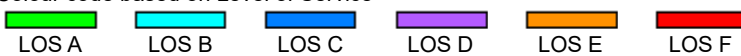
Colour code based on Degree of Saturation



Approach Level of Service



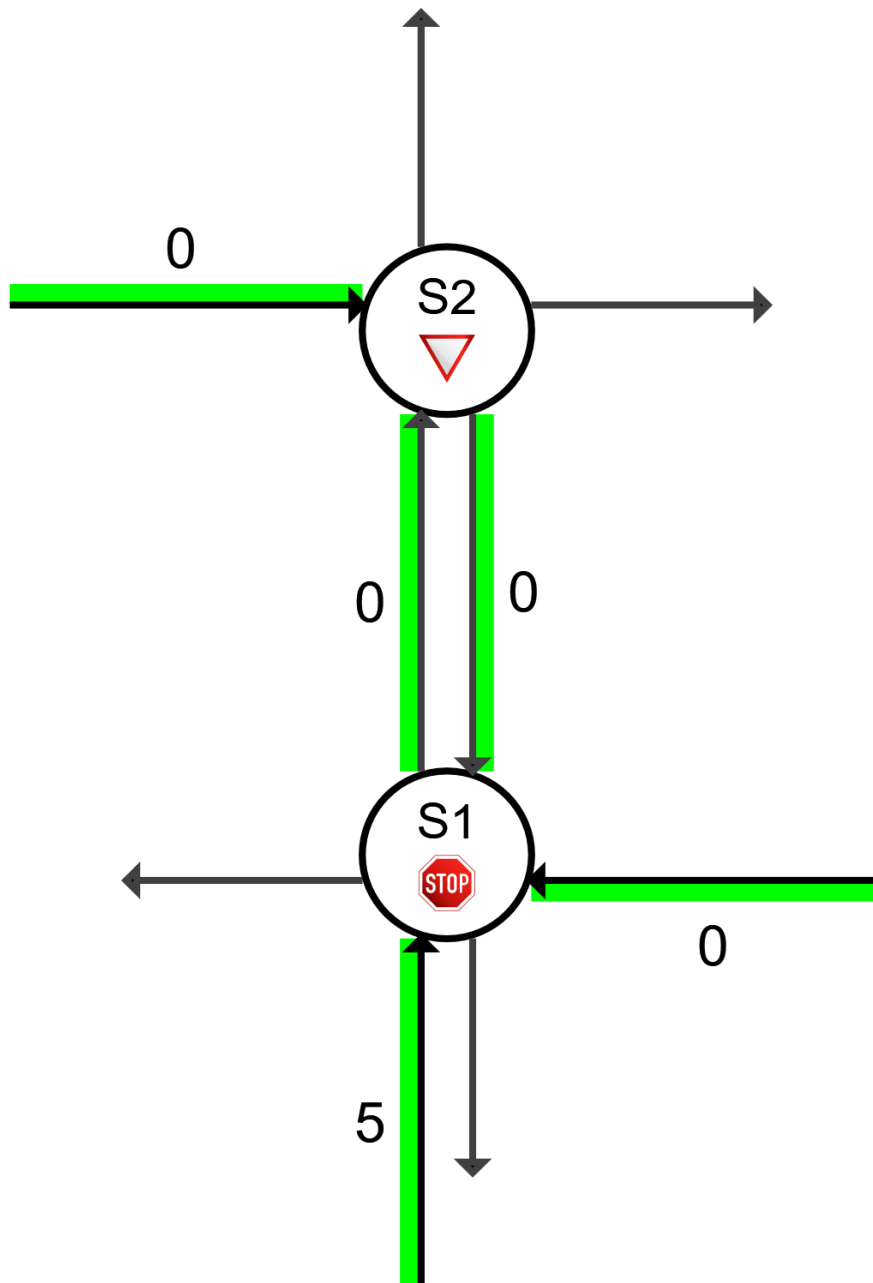
Colour code based on Level of Service



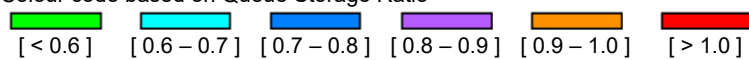
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

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



Colour code based on Queue Storage Ratio



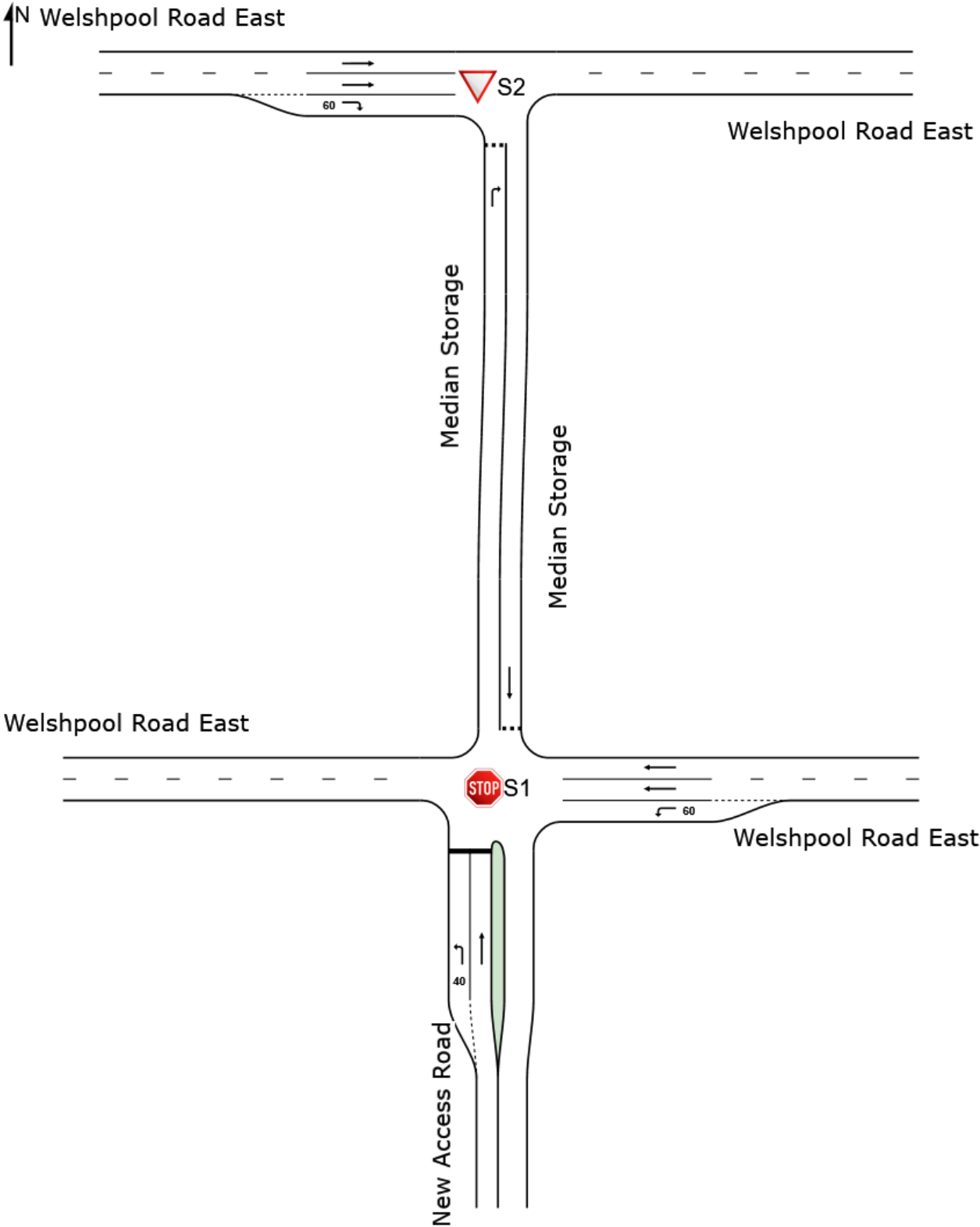
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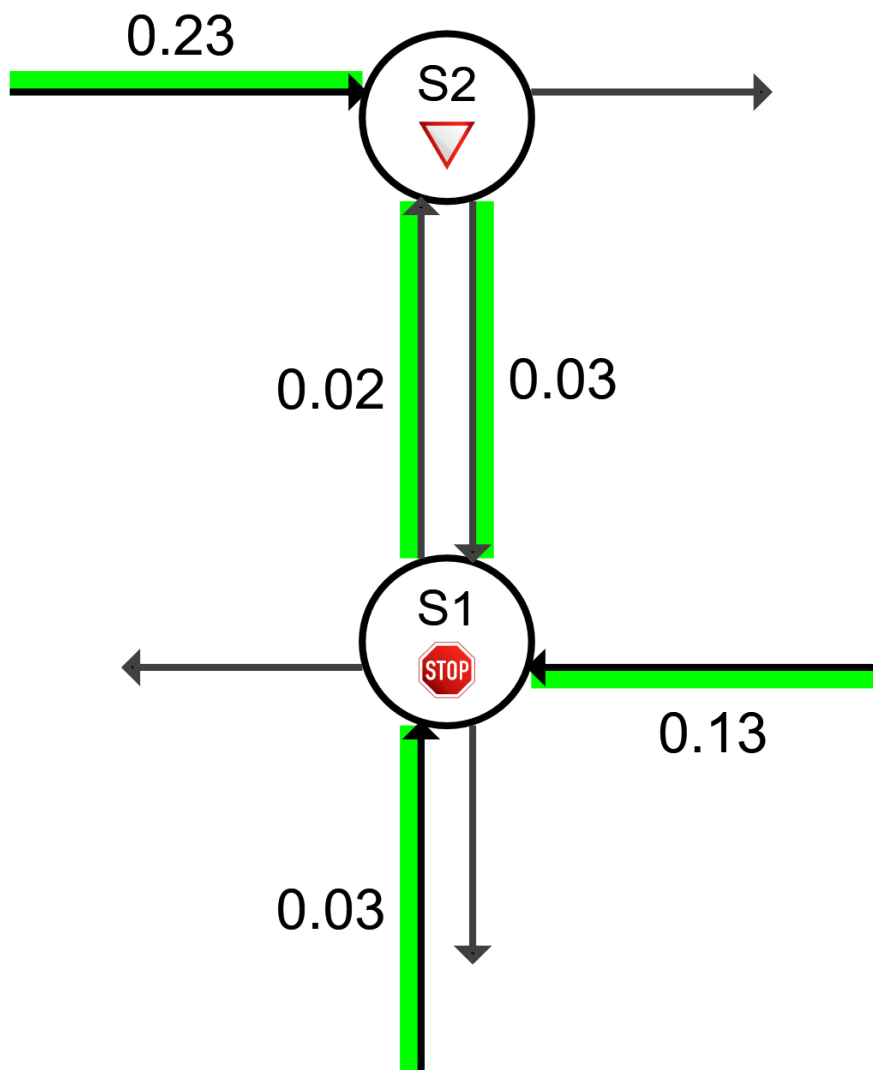
■ Network: N101 [New Access / Welshpool Road East - PM Peak - 2041 (Network Folder: 2041 Development)]

New Network
Network Category: (None)

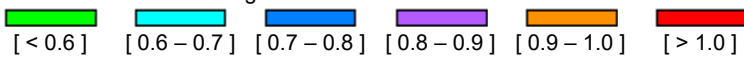
Network Layout

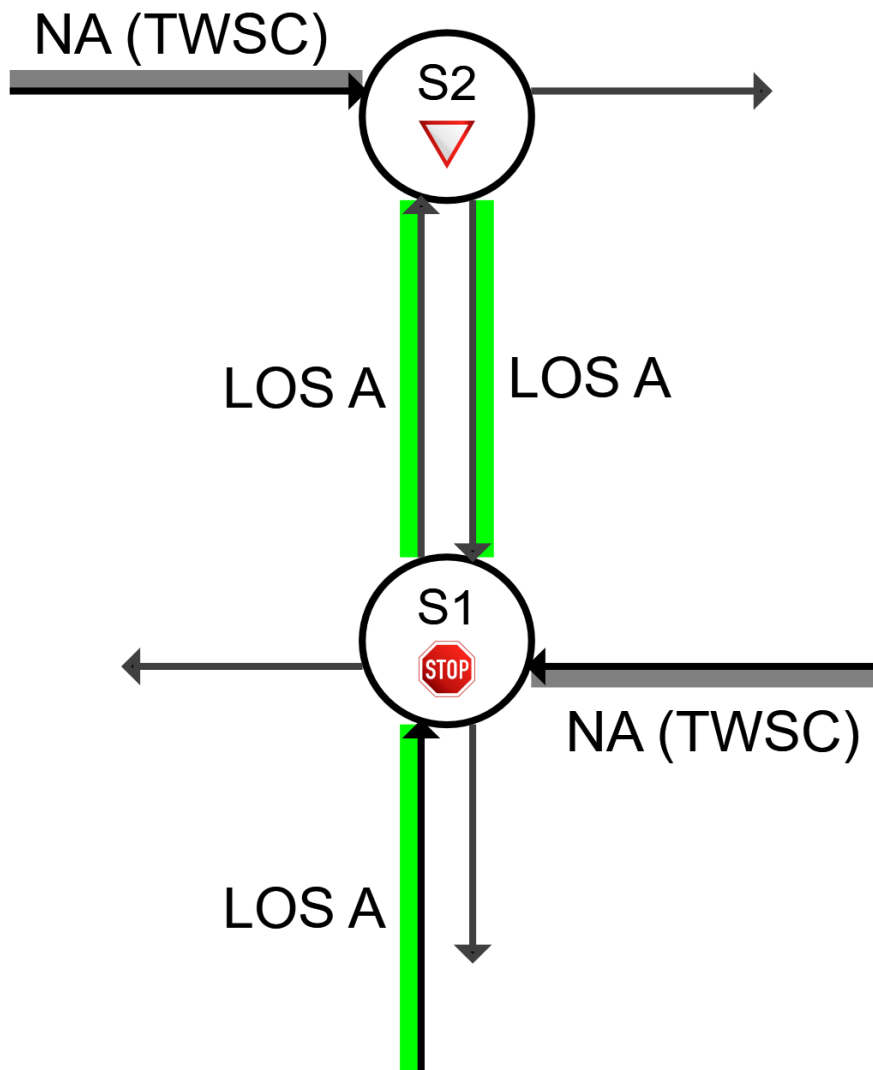
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



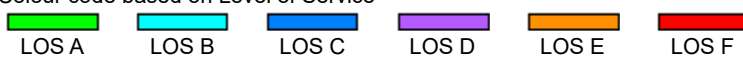


Colour code based on Degree of Saturation





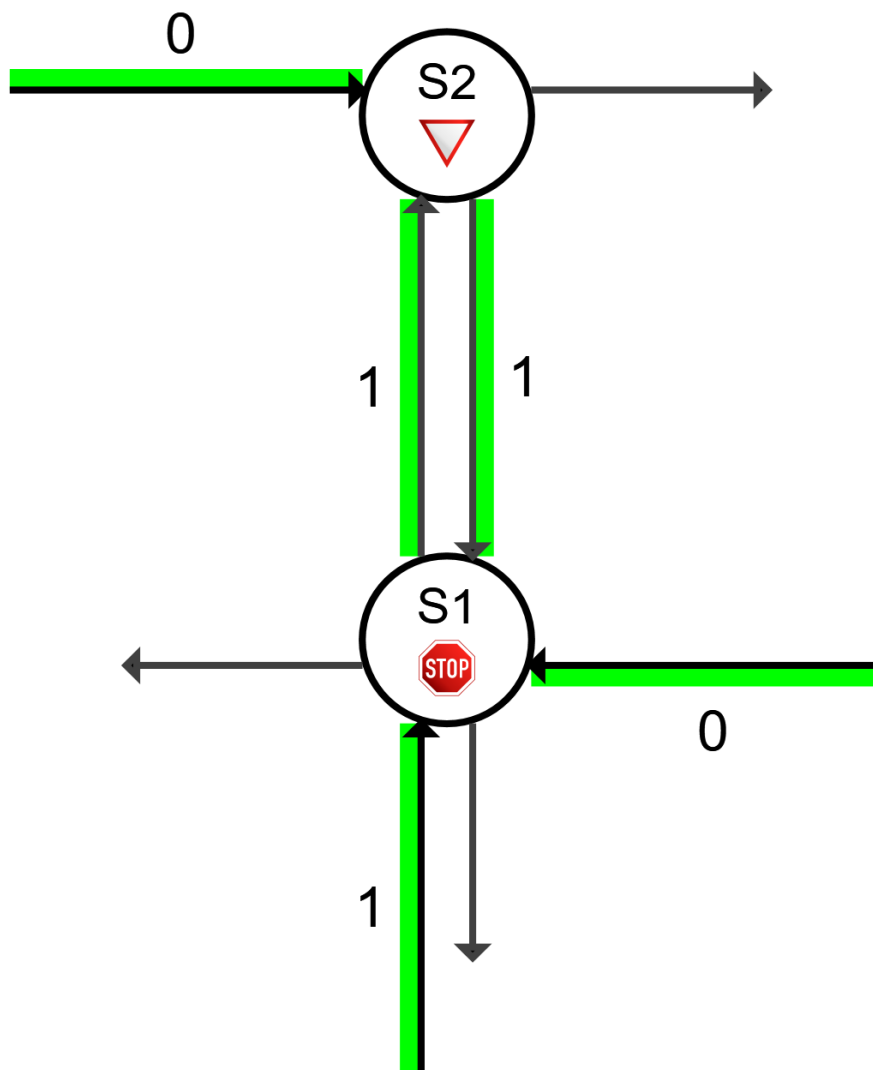
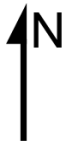
Colour code based on Level of Service



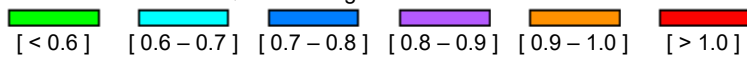
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Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).



Colour code based on Queue Storage Ratio



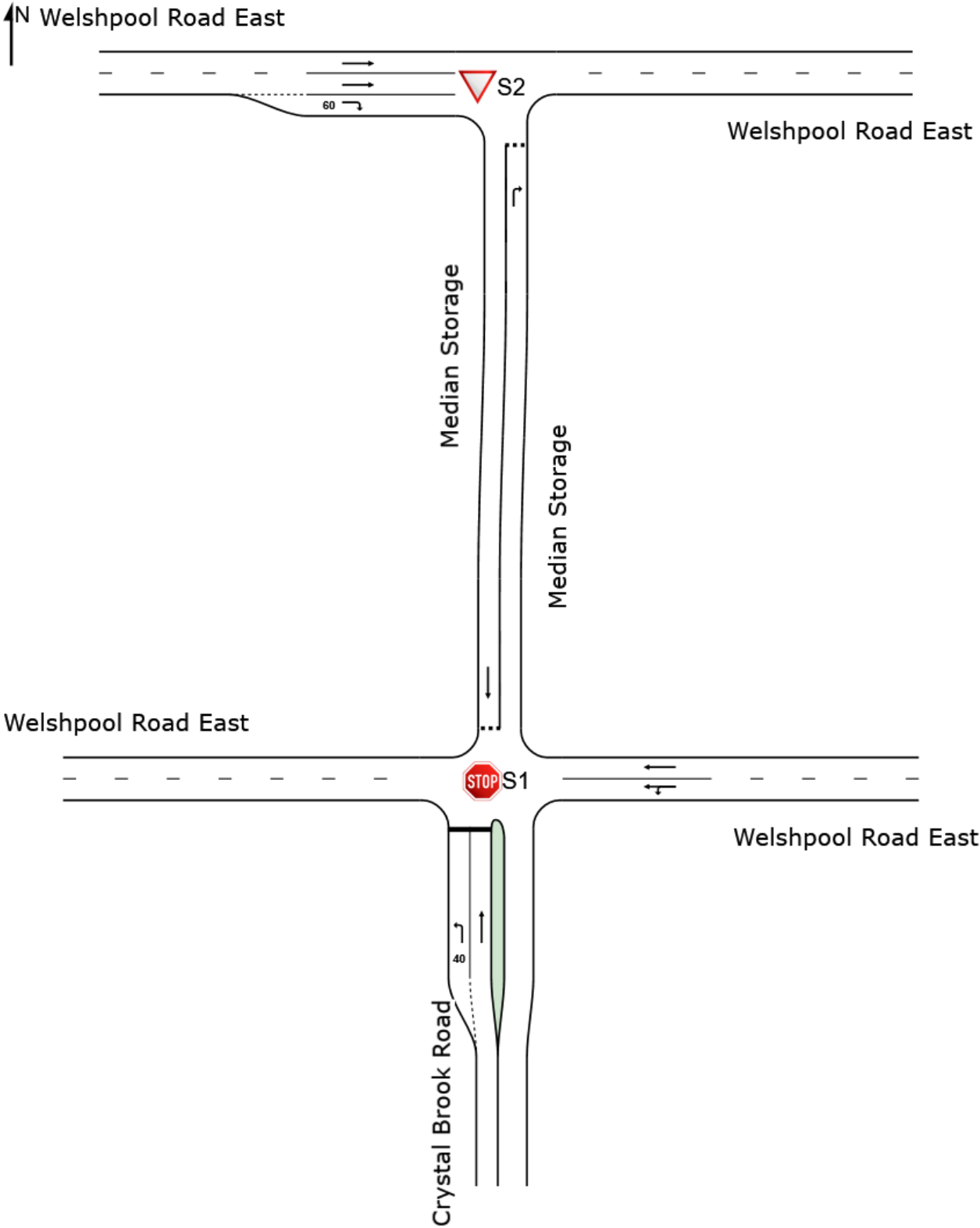
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

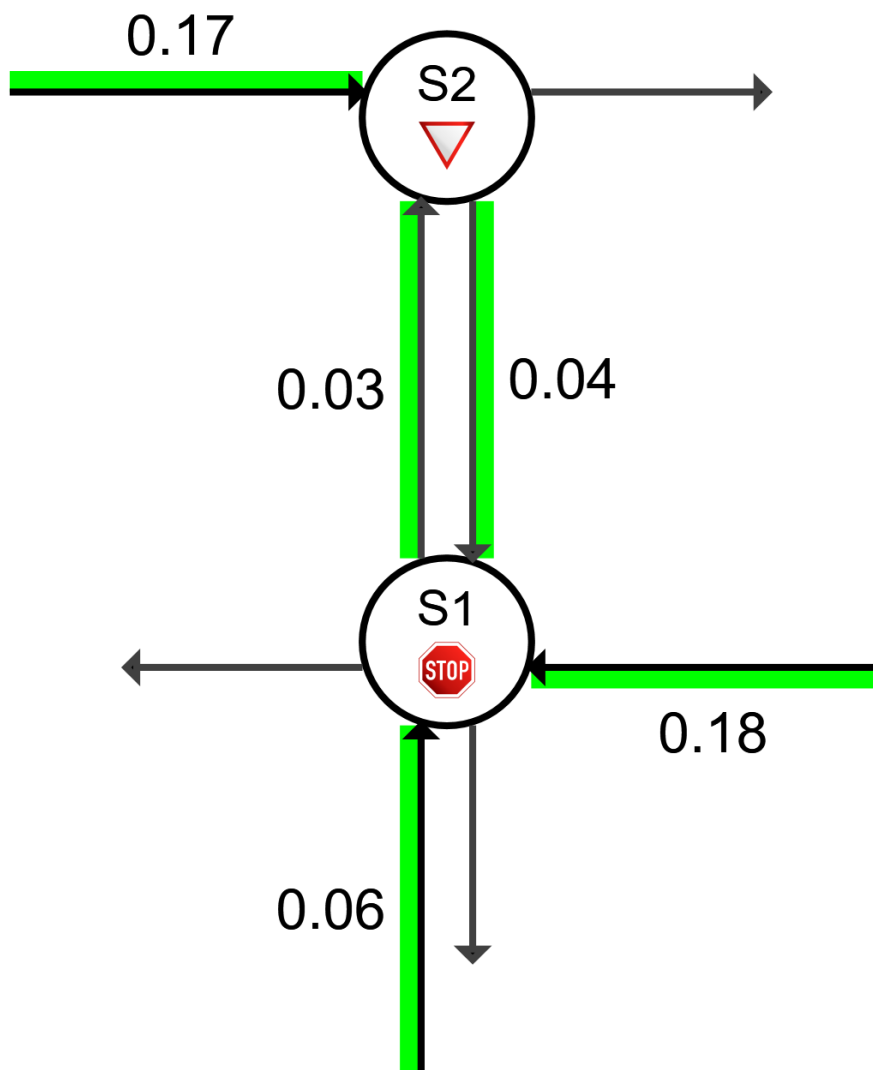
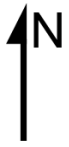
■ ■ Network: N101 [Crystal Brook Road / Welshpool Road East (west) - Weekend Peak - 2041
(Network Folder: 2041 Development)]

New Network
Network Category: (None)

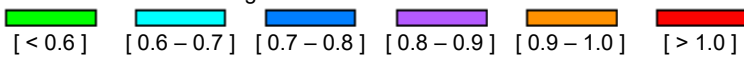
Network Layout

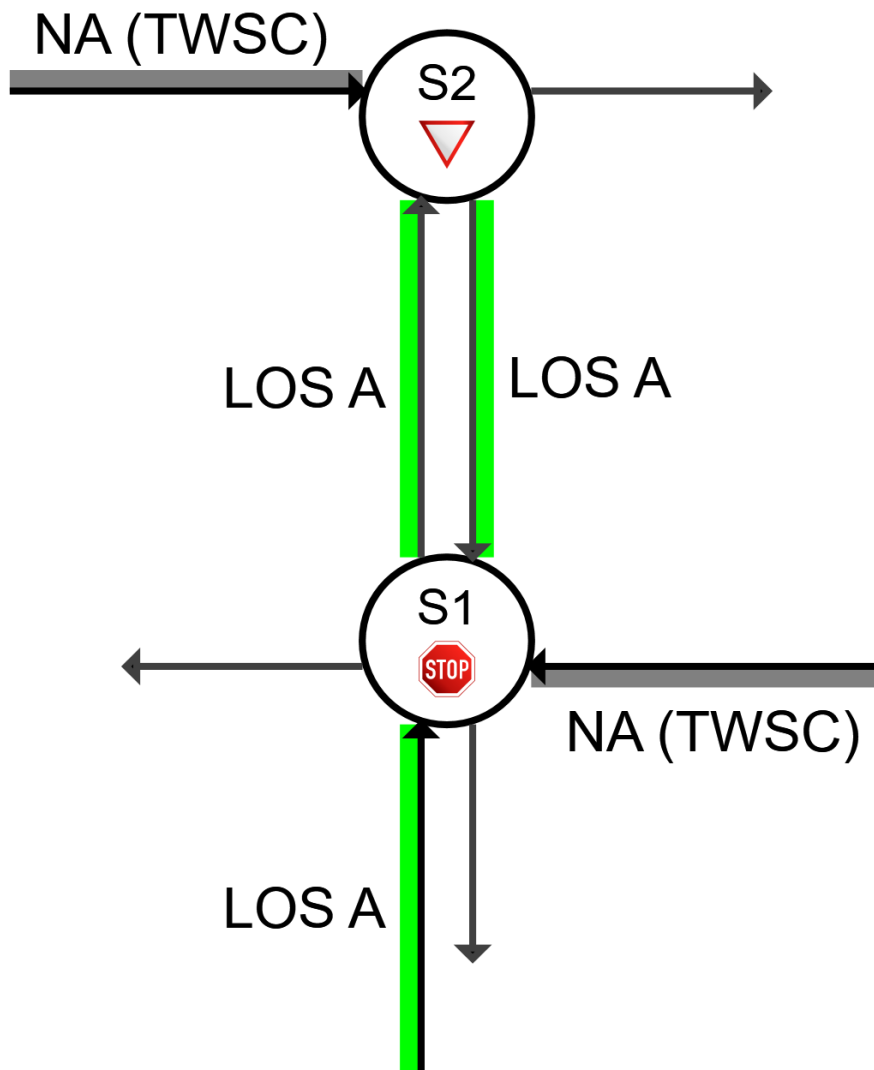
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Colour code based on Degree of Saturation

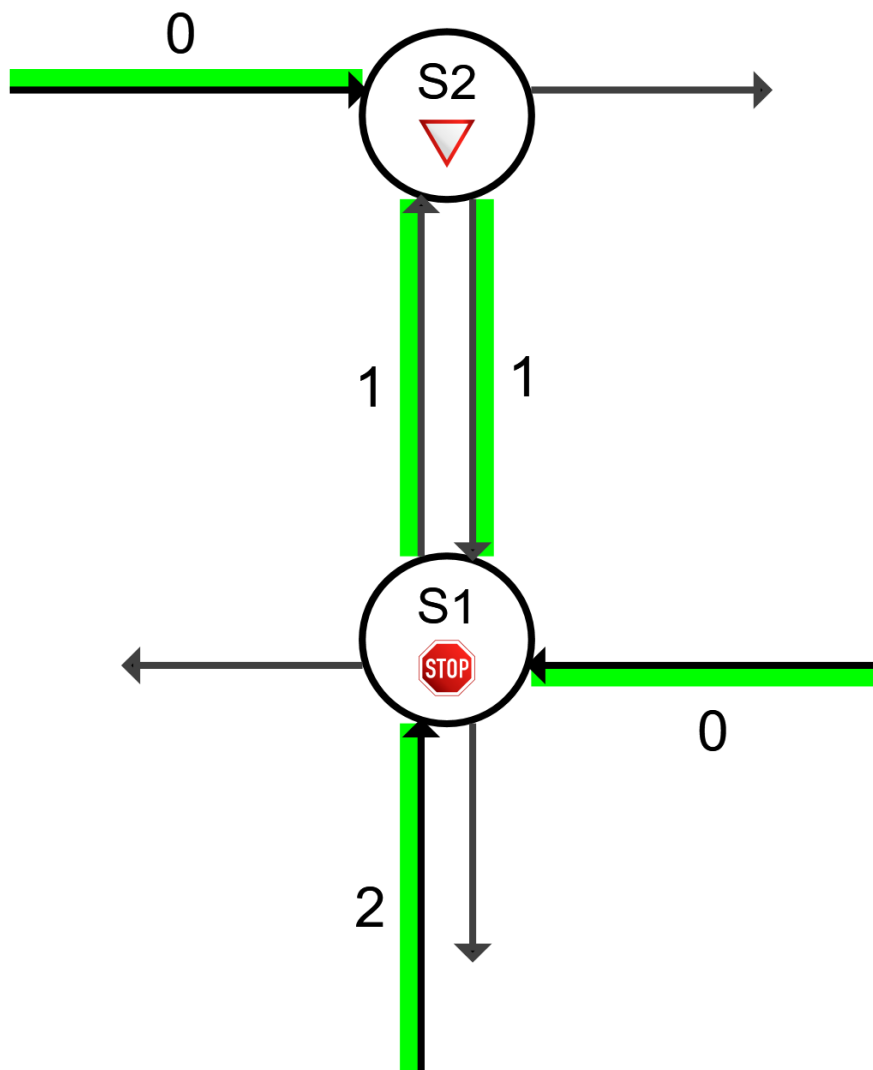




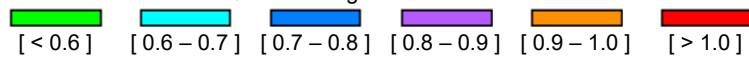
 LOS A
  LOS B
  LOS C
  LOS D
  LOS E
  LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

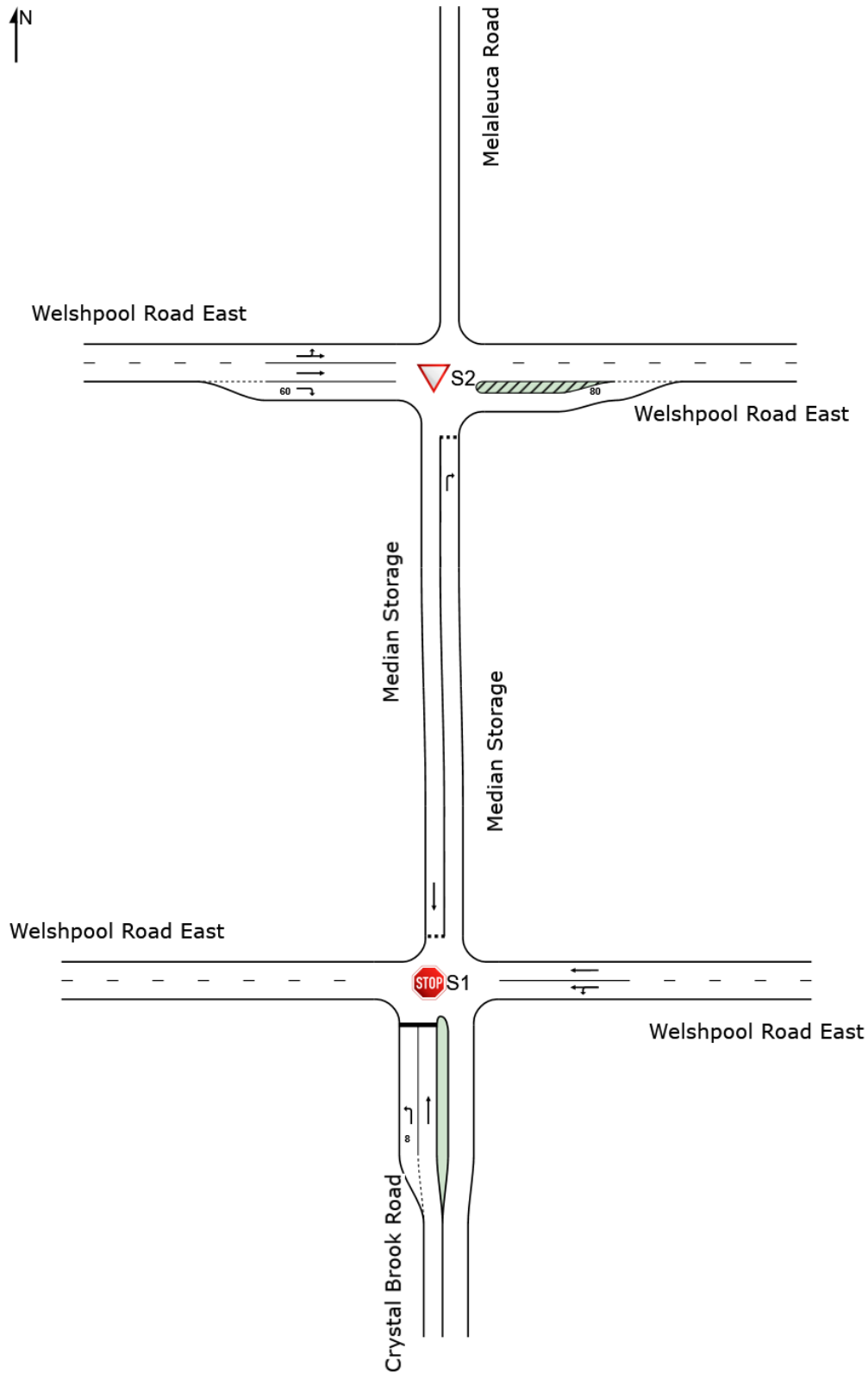
■ Network: N101 [Crystal Brook Road / Welshpool Road East (east) - Weekend Peak - 2041
(Network Folder: 2041 Development)]

New Network

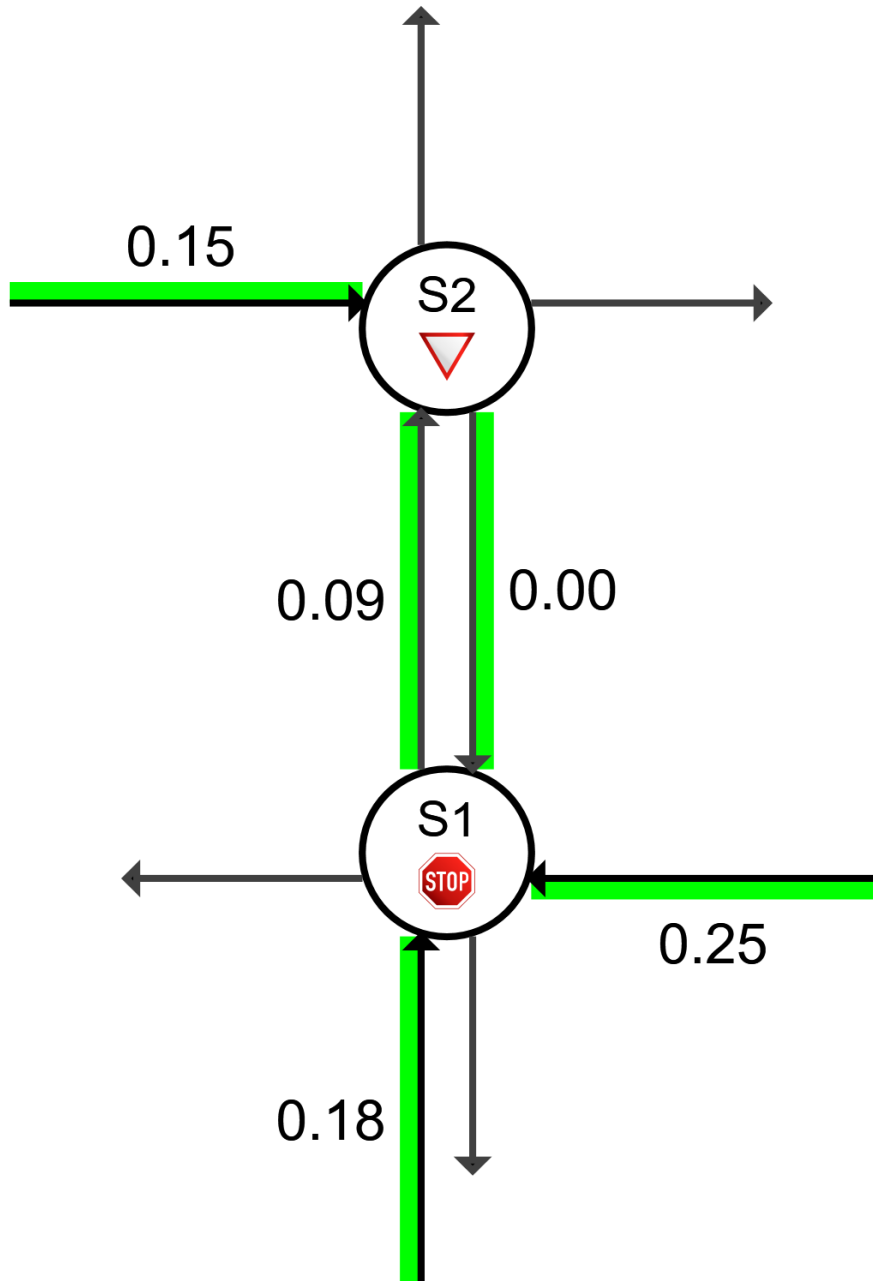
Network Category: (None)

Network Layout

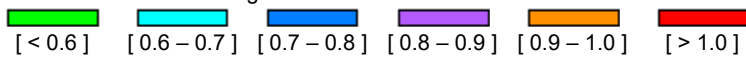
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



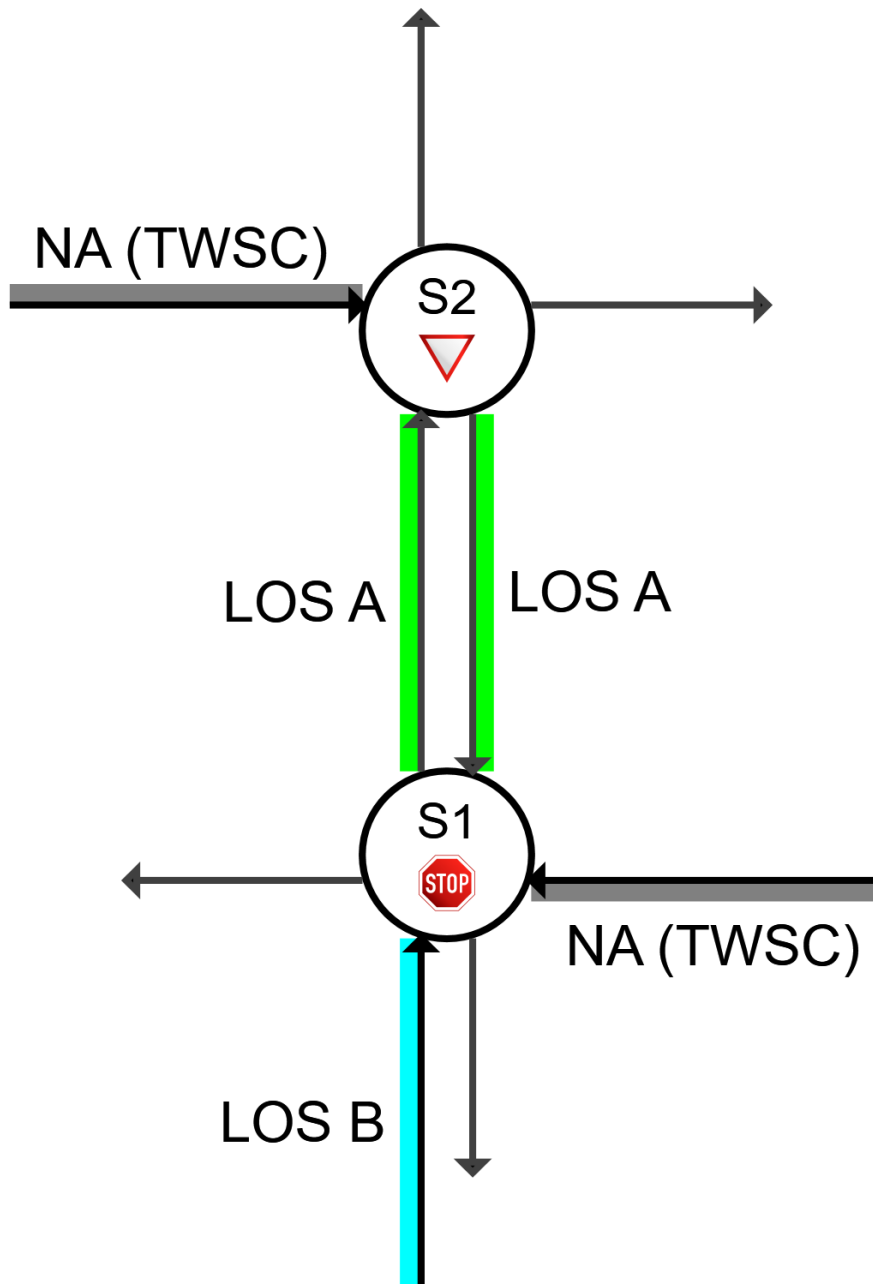
Degree of Saturation



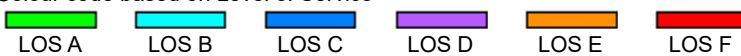
Colour code based on Degree of Saturation



Approach Level of Service



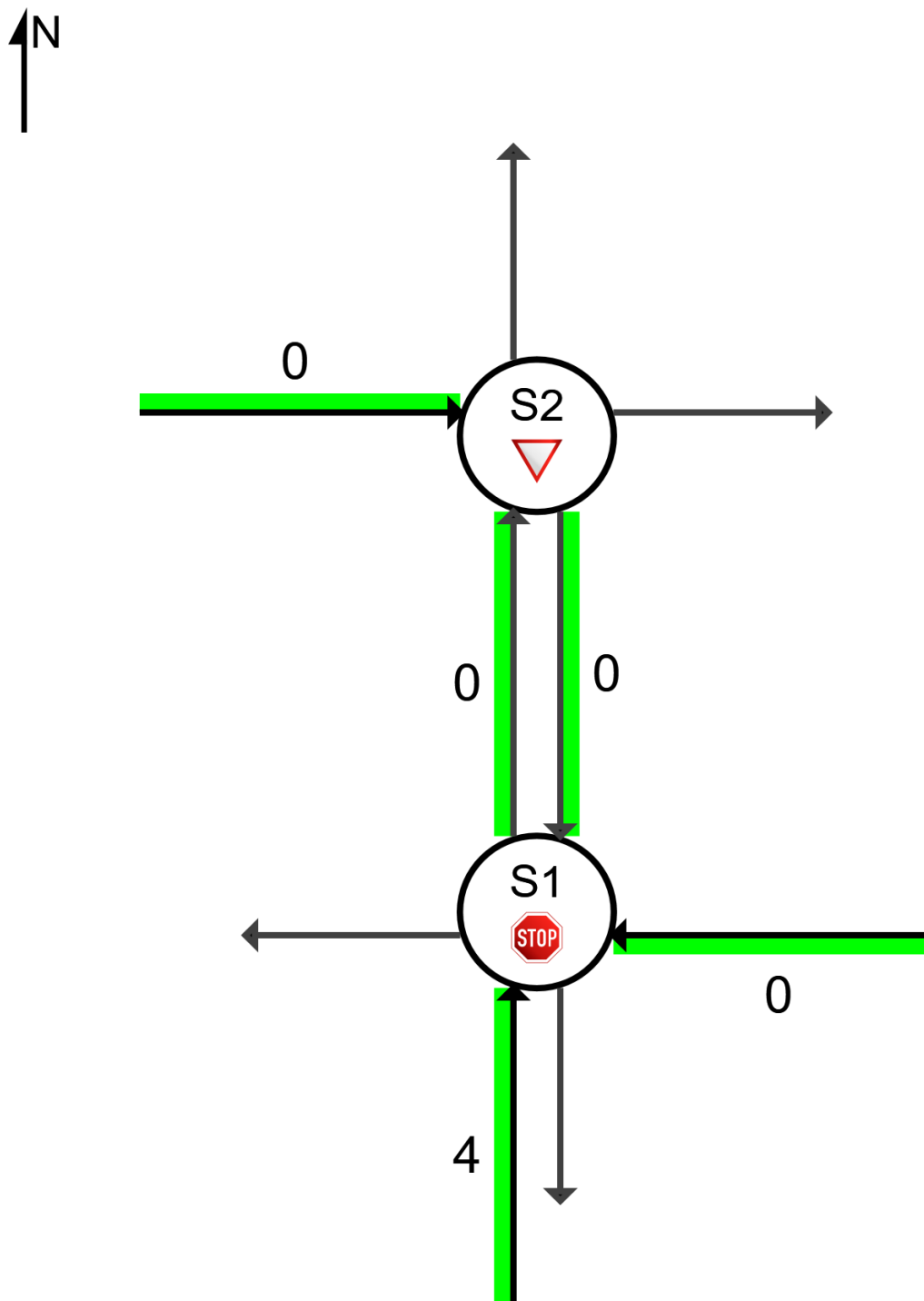
Colour code based on Level of Service



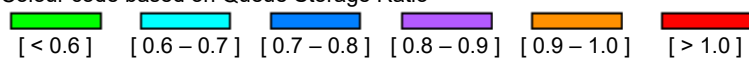
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

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



Colour code based on Queue Storage Ratio



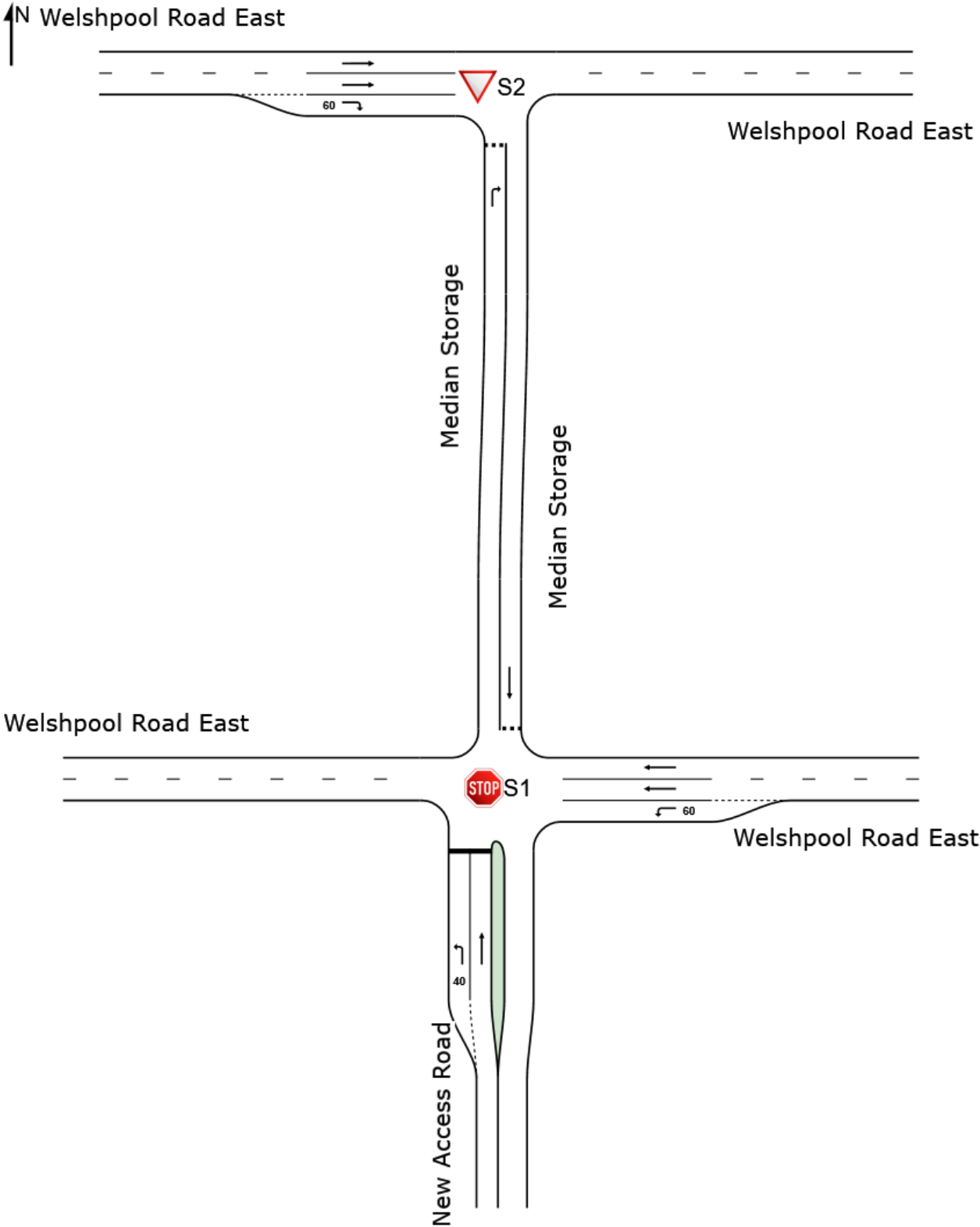
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

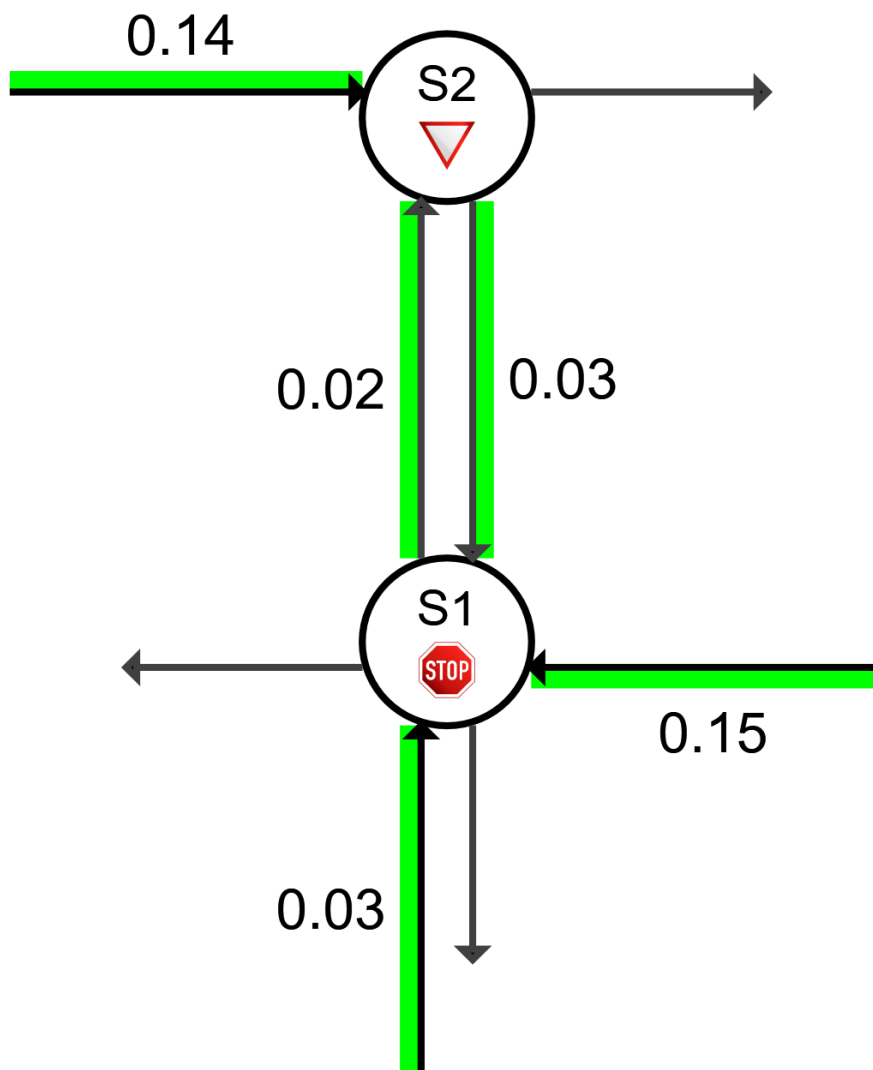
■ Network: N101 [New Access / Welshpool Road East - Weekend Peak - 2041 (Network Folder: 2041 Development)]

New Network
Network Category: (None)

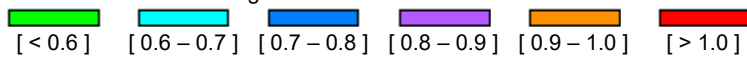
Network Layout

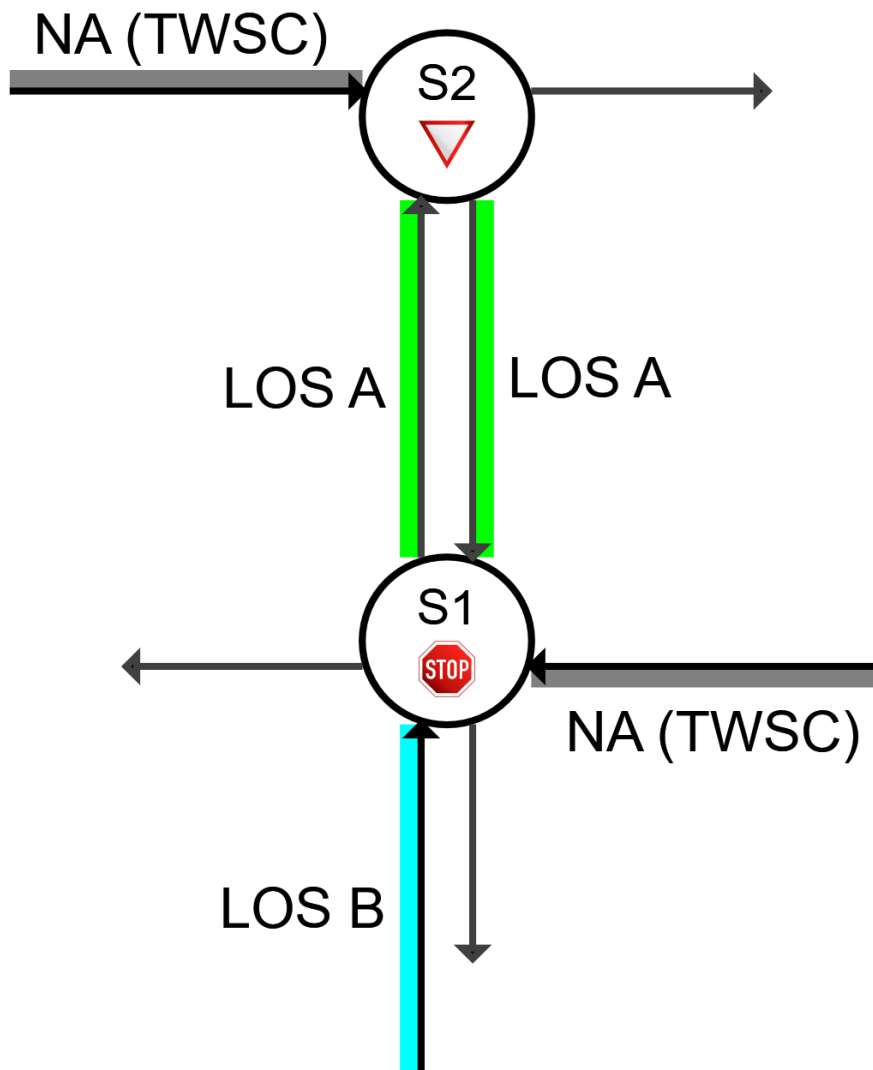
Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



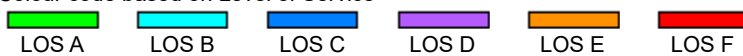


Colour code based on Degree of Saturation





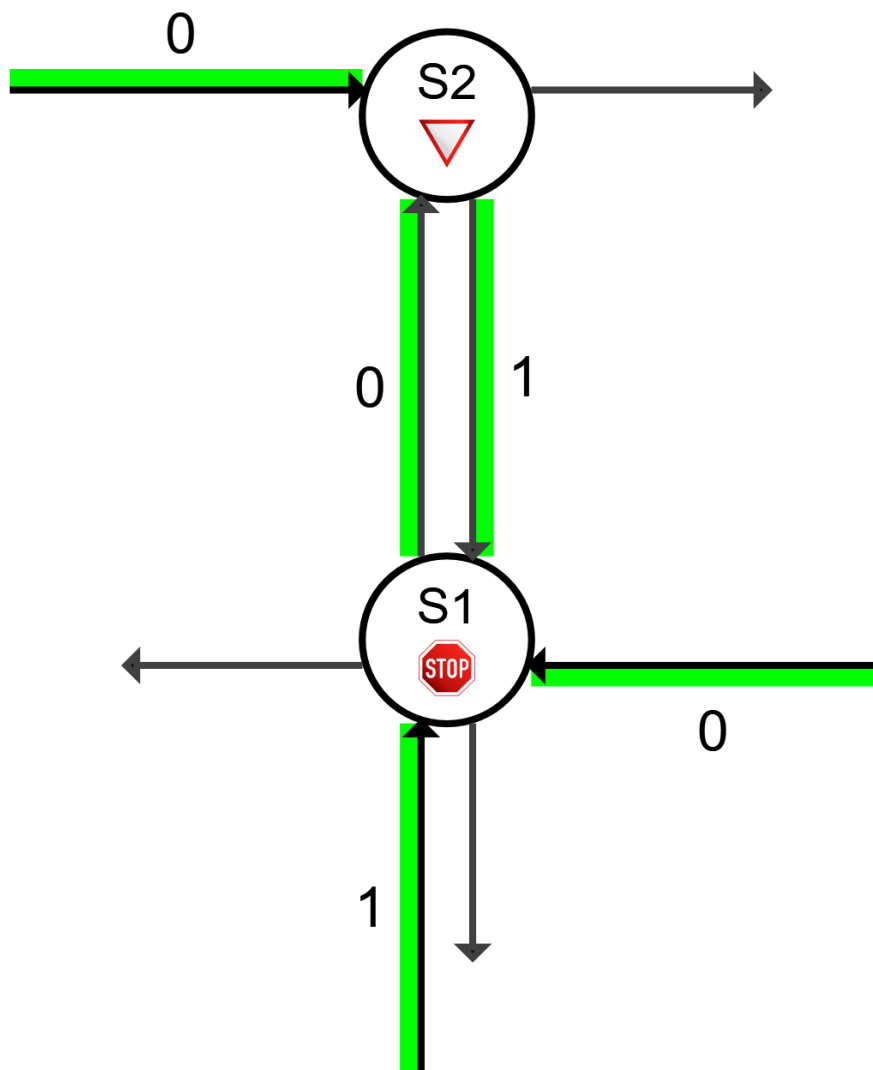
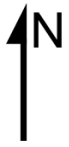
Colour code based on Level of Service



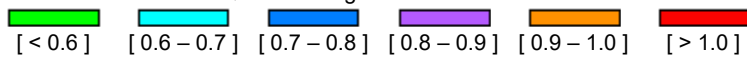
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Colour code based on Queue Storage Ratio



Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

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