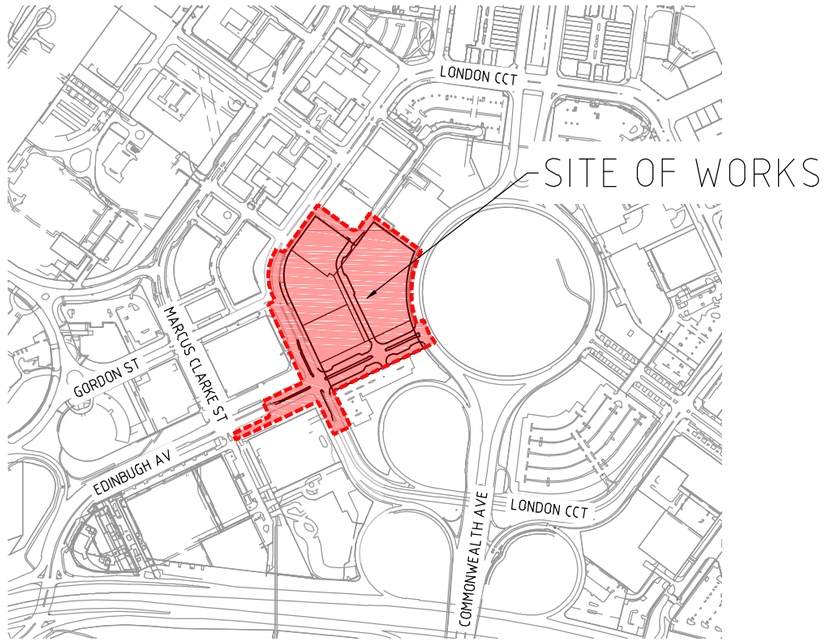
SECTION 100 CANBERRA CITY
MPG CONSTRUCTIONS

DRAWING SCHEDULE

REFERENCE	DESCRIPTION	REVISION
305632CR100	COVER SHEET	A
305632CF200	GENERAL ARRANGEMENT PLAN	A
305632CF215	STAGING PLAN	A
305632CD100	STORMWATER MASTER PLAN	A
305632CS200	SEWER MASTER PLAN	A
305632CS201	SEWER LONG SECTION	A
305632CW200	WATER MASTER PLAN	A
305632CF300	SHARED TRENCH PLAN	A
305632CR200	TYPICAL CROSS SECTIONS EDINBURGH AVENUE SHEET 1	A
305632CR201	TYPICAL CROSS SECTIONS EDINBURGH AVENUE SHEET 2	A
305632CR202	TYPICAL CROSS SECTIONS KNOWLES PLACE SHEET 1	A
305632CR203	TYPICAL CROSS SECTIONS KNOWLES PLACE SHEET 2	A
305632CR300	LONGITUDINAL SECTIONS EDINBURGH AVENUE	A
305632CR301	CROSS SECTIONS EDINBURGH AVENUE	A
305632CR302	LONGITUDINAL SECTION AND CROSS SECTIONS KNOWLES PLACE	A
305632CR400	PAVEMENT PLAN	A
305632CE200	ENVIRONMENTAL MANAGEMENT CONCEPT PLAN	A
305632CF250	DEMOLITION PLAN	A
305632CE220	FENCING PLAN	A
305632CR900	CAR PARK MANAGEMENT PLAN	A
305632CR500	TURNING MOVEMENTS DETAILS SHEET 1	A
305632CR501	TURNING MOVEMENTS DETAILS SHEET 2	A
305632CR502	TURNING MOVEMENTS DETAILS SHEET 3	A
305632	TREE MANAGEMENT PLAN	A



N

LOCALITY PLAN

LEGEND

DESCRIPTION	EXISTING	PROPOSED
EXTENT OF WORKS		
WATER MAIN, VALVE AND HYDRANT	eW	W
WATER RECYCLED	W(R)	W(R)
UNDERGROUND ELECTRICITY	E	E
OVERHEAD ELECTRICITY AND POLE	OE	OE
TELSTRA AND SERVICE PIT	T	T
OVERHEAD TELSTRA	OT	
OPTIC FIBRE	OF	OF
GAS MAIN	eG	G
BRANCH SEWER AND MANHOLE		S
SEWER AND MANHOLE	eS	S
SEWER RISING MAIN	SRM	SRM
CENTRAL INVERT		
STORMWATER MAIN	eSW	SW
STORMWATER PITS		
HOUSE DRAIN	H	H
SUBSOIL DRAIN AND FLUSHING POINT		
CONCRETE VEHICLE CROSSING		
DRIVEWAYS		
SURFACE CONTOUR MINOR	- 168.90 -	- 168.90 -
SURFACE CONTOUR MAJOR	- 169.00 -	- 169.00 -
SURFACE LEVEL	E123.45	E123.45
SIGN AND POST		
BOLLARD		
ROAD CHAINAGES	CH116.57 (L/R)TP CH116.57	CH116.57 (L/R)TP CH116.57
BATTER		
PARKING BAY/PAVED AREA		
TREE (& SURVEYED CANOPY) TO BE RETAINED		
TREE TO BE REMOVED		
VEGETATION LINE		
NCA WORKS APPROVAL AREA		

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WARNING
BEWARE OF UNDERGROUND/OVERHEAD SERVICES
THE LOCATION OF SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN. SPECIAL CONSIDERATION SHOULD BE GIVEN TO CONSTRUCTION PROCEDURES UNDER OVERHEAD ELECTRICITY TRANSMISSION LINES.

NOT APPROVED

Rev	Amendments	Approved	Date

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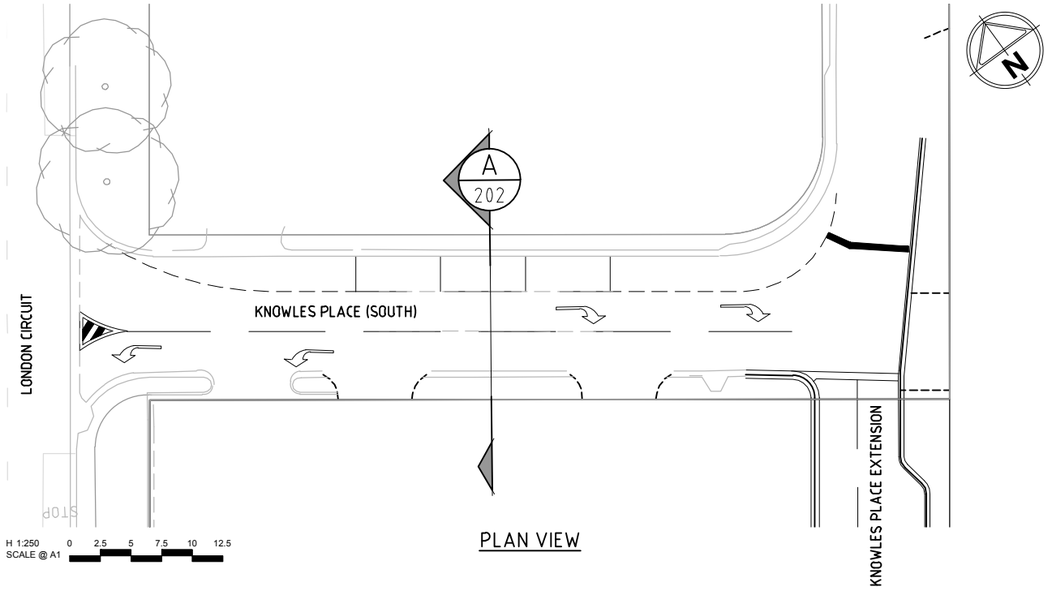
SECTION 100 CANBERRA CITY
DEVELOPMENT APP & WORKS APPROVAL
COVER SHEET

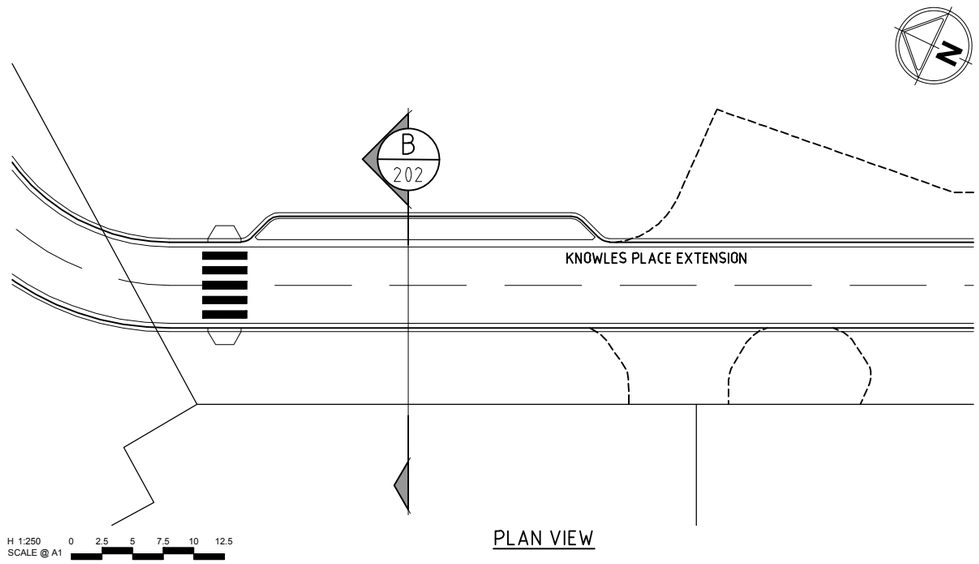
MPG CONSTRUCTIONS

PRELIMINARY | Drg No 305632CR100 | Rev -

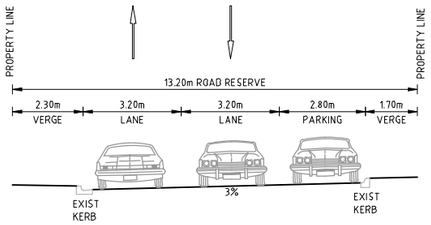
file name 305632CR100_COV.dwg layout name CR100 plotted by Suzie Gilbert
file location G:\301\305632\Civil\ACAD plot date 14/09/2018 1:37 PM Sheet 1 of 23 Sheets



PLAN VIEW

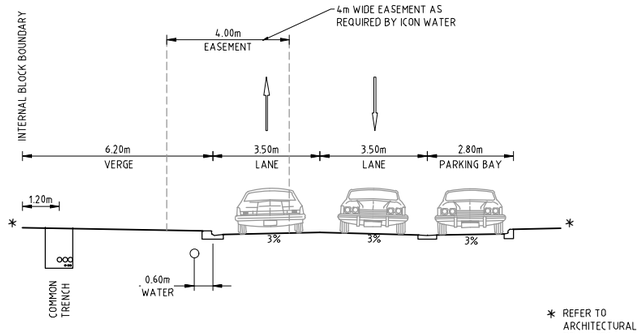


PLAN VIEW



EXISTING KNOWLES PLACE (EXISTING) TWO WAY - A

(6.4m CARRIAGEWAY WITH 2.8m PARKING)



KNOWLES PLACE EXTENSION (PRIVATE ROAD) - B

(7.0m CARRIAGEWAY)

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H 1:500
SCALE @ A1
0 5 10 15 20 25

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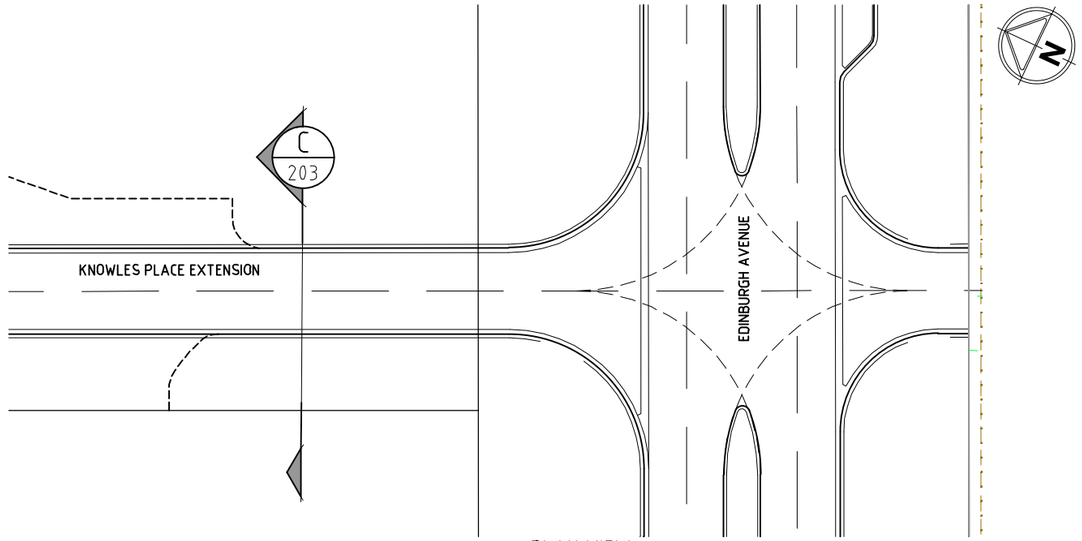
SECTION 100 CANBERRA CITY DEVELOPMENT APP & WORKS APPROVAL

TYPICAL CROSS SECTIONS
KNOWLES PLACE SHEET 1

MPG CONSTRUCTIONS

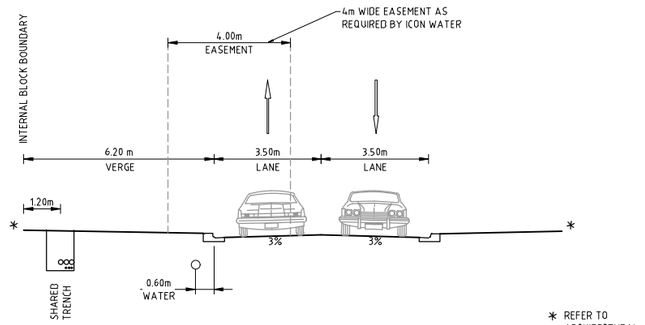
PRELIMINARY Drg No **305632CR202** Rev **-**

file name 305632CR200_TYP.dwg layout name CR202 plotted by Suzie Gilbert
file location G:\305\305632\Civil\ACAD plot date 14/09/2018 1:37 PM Sheet 11 of 23 Sheets



PLAN VIEW

H 1:250 SCALE @ A1 0 2.5 5 7.5 10 12.5



KNOWLES PLACE EXTENSION (PRIVATE ROAD) - C

(7.0m CARRIAGEWAY)

file name 305632CR200 TYP.dwg layout name CR203 plotted by Suzie Gilbert
file location G:\305632\Civil\ACAD plot date 14/09/2018 1:37 PM Sheet 12 of 23 Sheets

NOT APPROVED

Rev	Amendments	Approved	Date

H 1:500 SCALE @ A1 0 5 10 15 20 25

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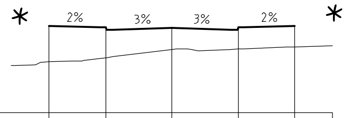
SECTION 100 CANBERRA CITY DEVELOPMENT APP & WORKS APPROVAL

TYPICAL CROSS SECTIONS
KNOWLES PLACE SHEET 2

MPG CONSTRUCTIONS

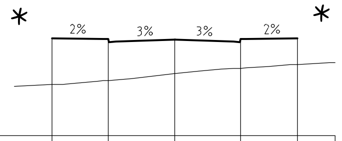
PRELIMINARY Drg No **305632CR203** Rev **-**



DATUM R.L.563.0

DESIGN SURFACE LEVEL	567.583	567.529	567.503	567.529	567.583
EXISTING SURFACE LEVEL	565.690	565.909	566.356	566.366	566.486
OFFSET	-6.500	-3.500	0.000	3.500	6.500

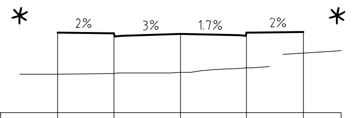
CH 40.00



DATUM R.L.563.0

DESIGN SURFACE LEVEL	568.143	568.089	568.063	568.089	568.143
EXISTING SURFACE LEVEL	565.686	565.913	566.263	566.563	566.760
OFFSET	-6.500	-3.500	0.000	3.500	6.500

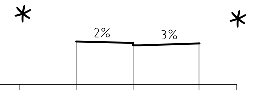
CH 80.00



DATUM R.L.564.0

DESIGN SURFACE LEVEL	568.233	568.179	568.153	568.219	568.273
EXISTING SURFACE LEVEL	566.039	566.073	566.118	566.349	567.150
OFFSET	-6.500	-3.500	0.000	3.500	6.500

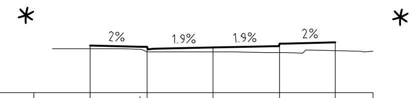
CH 117.14



DATUM R.L.566.0

DESIGN SURFACE LEVEL	568.247	568.193	568.166
EXISTING SURFACE LEVEL			
OFFSET	-6.500	-3.500	0.000

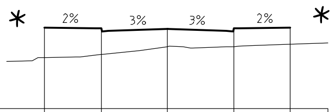
CH 138.06



DATUM R.L.566.0

DESIGN SURFACE LEVEL	568.498	568.444	568.385	568.600	568.653
EXISTING SURFACE LEVEL	568.330	568.160	568.165	568.120	568.214
OFFSET	-6.500	-3.500	0.000	3.500	6.450

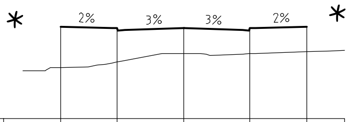
CH 160.00



DATUM R.L.563.0

DESIGN SURFACE LEVEL	567.304	567.250	567.223	567.250	567.304
EXISTING SURFACE LEVEL	565.693	565.861	566.286	566.278	566.404
OFFSET	-6.500	-3.500	0.000	3.500	6.500

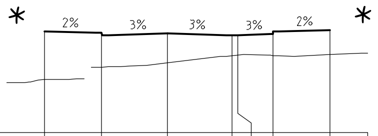
CH 20.00



DATUM R.L.563.0

DESIGN SURFACE LEVEL	567.863	567.809	567.783	567.809	567.863
EXISTING SURFACE LEVEL	565.693	566.006	566.455	566.433	566.543
OFFSET	-6.500	-3.500	0.000	3.500	6.500

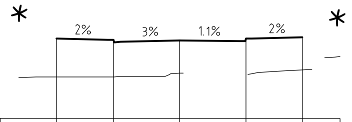
CH 60.00



DATUM R.L.563.0

DESIGN SURFACE LEVEL	568.322	568.268	568.242	568.123	568.148	568.350	568.404
EXISTING SURFACE LEVEL	565.782	566.449	566.678	567.054	567.079	567.063	567.114
OFFSET	-6.500	-3.500	0.000	3.420	3.720	5.600	8.600

CH 100.00



DATUM R.L.564.0

DESIGN SURFACE LEVEL	568.214	568.160	568.134	568.220	568.274
EXISTING SURFACE LEVEL	566.188	566.204	566.375		566.563
OFFSET	-6.500	-3.500	0.000	3.500	6.500

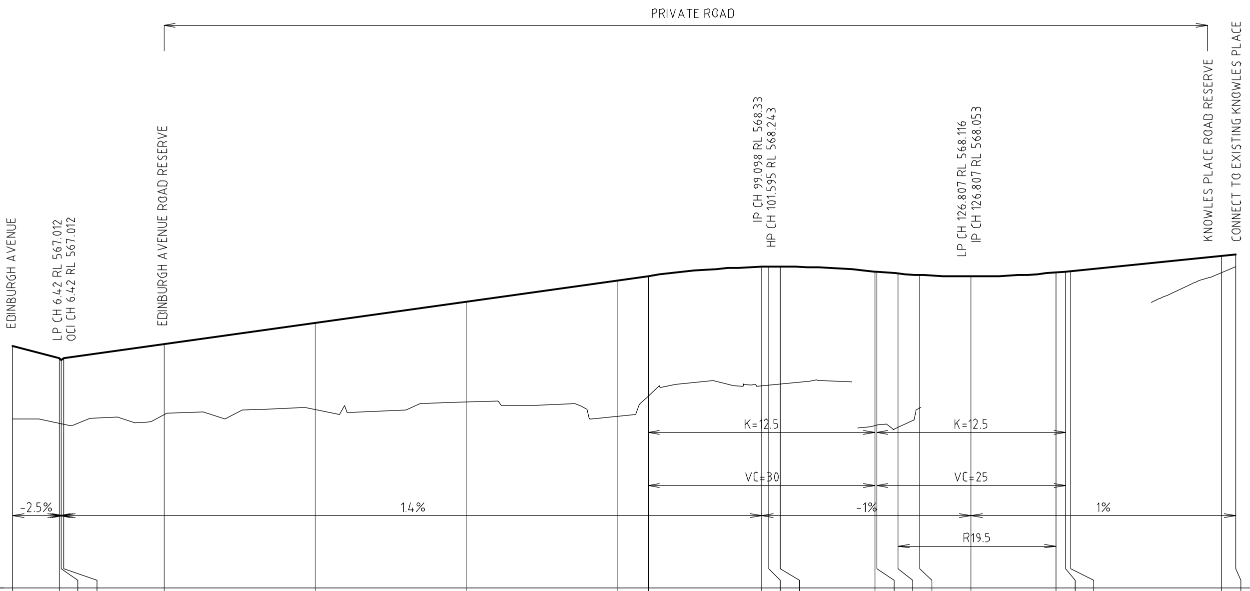
CH 120.00

DATUM R.L.566.0

DESIGN SURFACE LEVEL	568.265	568.211	568.185
EXISTING SURFACE LEVEL			
OFFSET	-6.500	-3.500	0.000

CH 140.00

* REFER TO ARCHITECTURAL DRAWINGS



K VALUE

VERTICAL GEOMETRY

DESIGN GRADELINE

HORIZONTAL GEOMETRY

DATUM RL 564.0

CHAINAGE	DESIGN CENTRELINE	EXISTING SURFACE	DIFFERENCE
0.000	567.191	566.231	-0.960
6.120	567.037	566.175	-0.863
6.420	567.012	566.168	-0.844
6.720	567.037	566.162	-0.876
20.000	567.223	566.286	-0.937
40.000	567.503	566.356	-1.147
60.000	567.783	566.455	-1.328
80.000	568.063	566.263	-1.800
84.098	568.120	566.530	-1.590
99.098	568.240	566.670	-1.570
100.000	568.242	566.678	-1.564
101.595	568.243	566.692	-1.551
114.098	568.180	566.144	-2.036
114.307	568.178	566.149	-2.030
117.138	568.153	566.118	-2.034
120.000	568.134	566.375	-1.759
126.807	568.116		
138.057	568.166		
139.307	568.178		
140.000	568.185		
160.000	568.385	568.165	-0.220
161.845	568.403	568.240	-0.163

KNOWLES PLACE EXTENSION

file name 305632CR300 LS.dwg layout name CR302 plotted by Suzie Gilbert
file location G:\30\305632\Civil\ACAD plot date 14/09/2018 1:38 PM Sheet 15 of 23 Sheets

Rev	Amendments	Approved	Date
	NOT APPROVED		

H 1:500 SCALE @ A1 V 1:50
0 5 10 15 20 25
0 0.5 1.0 1.5 2.0 2.5

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Authorised Date

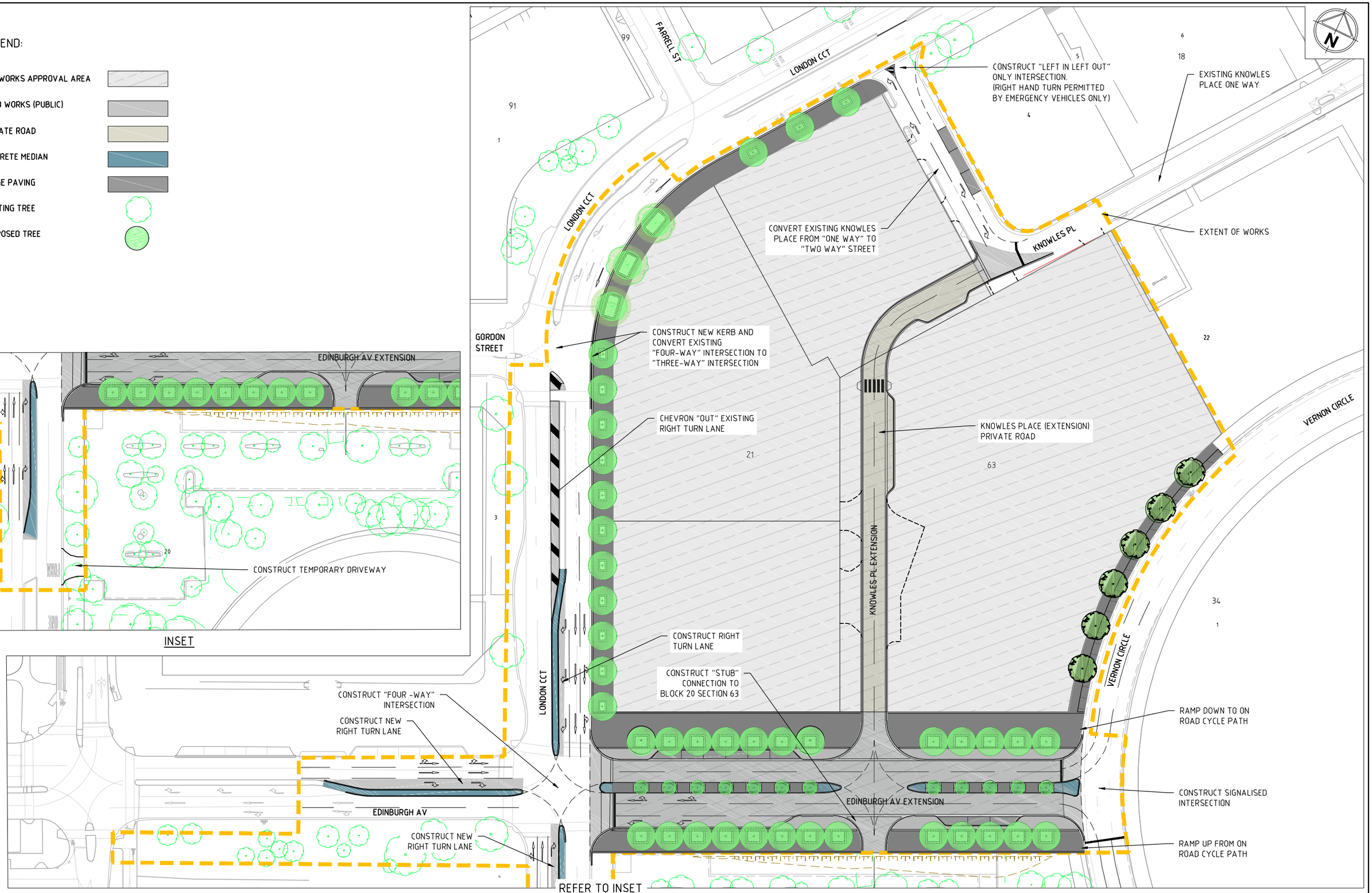
SECTION 100 CANBERRA CITY
DEVELOPMENT APP & WORKS APPROVAL
LONGITUDINAL AND CROSS SECTIONS
LONGITUDINAL AND CROSS SECTIONS KNOWLES PLACE

MPG CONSTRUCTIONS

PRELIMINARY Drg No **305632CR302** Rev **-**

LEGEND:

- NCA WORKS APPROVAL AREA
- ROAD WORKS (PUBLIC)
- PRIVATE ROAD
- CONCRETE MEDIAN
- VERGE PAVING
- EXISTING TREE
- PROPOSED TREE



file name 305632CF200.EDP dwg layout name CF200 plotted by Suzie Gilbert
file location G:\30\305632\Civil\ACAD plot date 14/09/2018 1:37 PM Sheet 2 of 23 Sheets

Rev	Amendments	Approved	Date

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H 1:500 SCALE @ A1 0 5 10 15 20 25

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spiire.com.au ABN 55 050 029 635

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SECTION 100 CANBERRA CITY DEVELOPMENT APP & WORKS APPROVAL

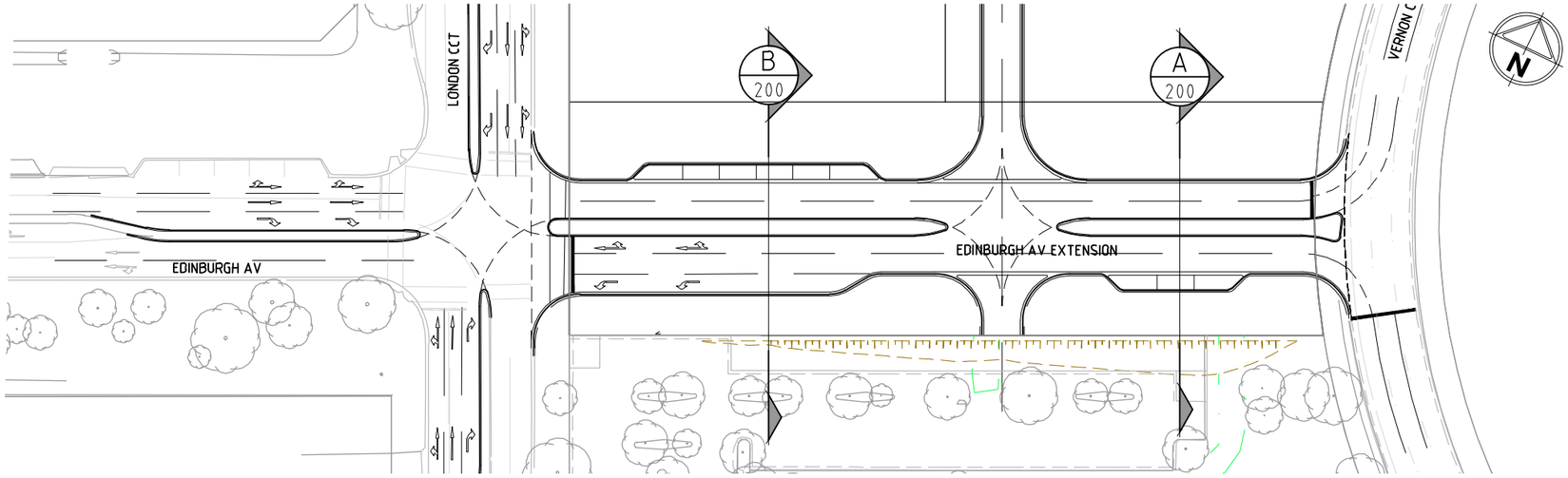
GENERAL ARRANGEMENT PLAN

MPG CONSTRUCTIONS

PRELIMINARY

Drg No 305632CF200

Rev -



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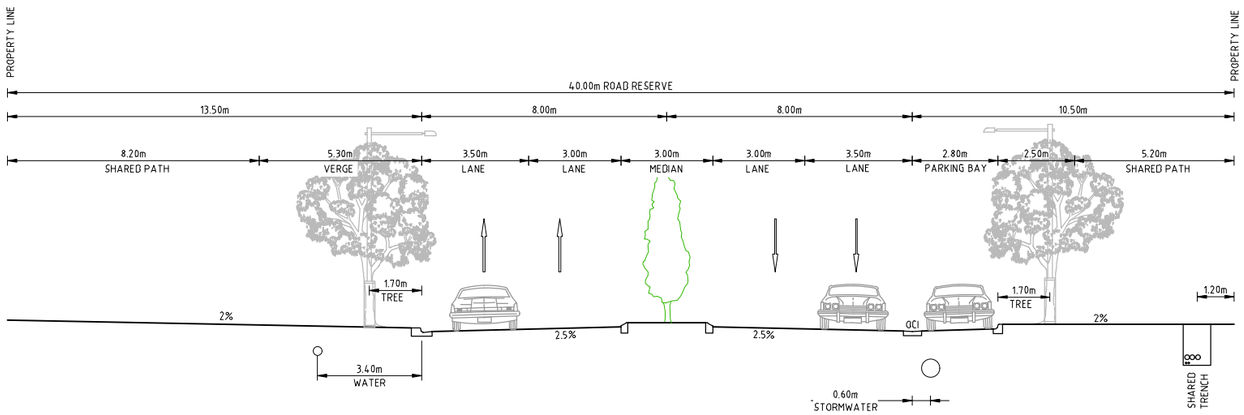
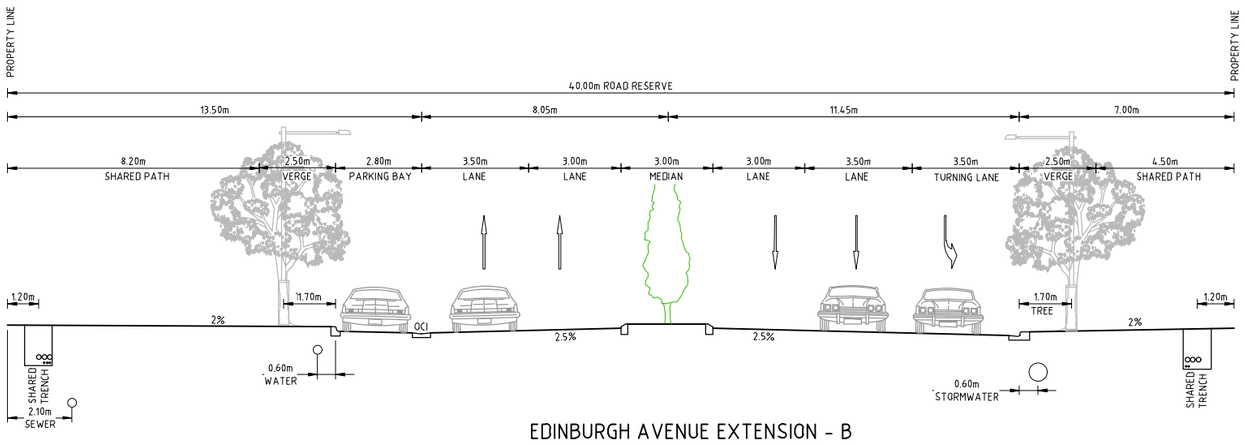
PLAN VIEW



EDINBURGH AVENUE EXTENSION-A

(DUAL 6.5m CARRIAGEWAY)



EDINBURGH AVENUE EXTENSION - B

(DUAL 6.5m CARRIAGEWAY WITH PARKING AND TURNING LANE)

file name 305632CR200 TYP.dwg layout name CR200 plotted by Suzie Gilbert
file location G:\301\305632\Civil\4CAD plot date 14/09/2018 1:37 PM Sheet 9 of 23 Sheets

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Rev	Amendments	Approved	Date

H 1:100 SCALE @ A1 0 1 2 3 4 5

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SECTION 100 CANBERRA CITY DEVELOPMENT APP & WORKS APPROVAL

TYPICAL CROSS SECTIONS
EDINBURGH AVENUE SHEET 1

MPG CONSTRUCTIONS

PRELIMINARY Drg No **305632CR200** Rev **-**

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local people
global experience

3002653.105
14 September 2018

Spiire
Suite 5, Level 1, 243 Northbourne Avenue
Lyneham ACT 2602

Attention: Benjamin Cargill, Associate – Civil Engineering

RE: Section 100 Car Park Compliance Review

Dear Ben,

Thank you for the opportunity to review the proposed car park design for Section 100.

The car park design shown in project MPS100, sheets WA2001, WA2002, WA2003, WA2004 and WA2005, last modified by Alessandro Rossi on 20 July 2018, has been assessed against the requirements of AS2890.1:2004. No aspects of the drawings were found to be non-compliant with the requirements of AS2890.1:2004.

While the current design drawings do not allow detailed assessment of the ramp grades and headroom, it is assumed that the structural design will accommodate these aspects.

Please contact the undersigned should you require further information or assistance.

Yours sincerely,

Josh Everett
Senior Transport Planner
SMEC

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North Sydney, NSW 2060, Australia
(PO Box 1052, North Sydney, NSW 2059, Australia)
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Traffic Report

City Section 100 Traffic Study

Prepared for Spiire
13 September 2018

SMEC INTERNAL REF. 3002653.102

Document Control

Document:	Traffic Report
File Location:	X:\Projects\3002653 Traffic Minor Projects 2018\102 City Section 100 Traffic Study\037 Reports - Outgoing\3002653.102 Section 100 Traffic Study Report Rev2 - 3.4vpd.docx
Project Name:	City Section 100 Traffic Study
Project Number:	3002653.102
Revision Number:	2a

Revision History

REVISION NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED FOR ISSUE BY
0	15/8/2018	Josh Everett Lindsay Jacobsen	Jerome Catbagan	Jerome Catbagan
1	22/8/2018	Josh Everett	Jerome Catbagan	Jerome Catbagan
2	3/9/2018	Josh Everett	Josh Everett	Josh Everett
2a	13/9/2018	Josh Everett	Lindsay Jacobsen	Josh Everett

Issue Register

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SMEC Company Details

Approved by:	Josh Everett		
Address:	Level 1, 243 Northbourne Avenue, Lyneham ACT 2602		
Signature:			
Tel:	(02) 6234 1960	Fax:	(02) 6234 1966
Email:	Josh.Everett@smec.com	Website:	www.smec.com

Important Notice

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This report must be read as a whole. The executive summary is not a substitute for this. Any subsequent report must be read in conjunction with this report.

The report supersedes all previous draft or interim reports, whether written or presented orally, before the date of this report. This report has not and will not be updated for events or transactions occurring after the date of the report or any other matters which might have a material effect on its contents or which come to light after the date of the report. SMEC is not obliged to inform you of any such event, transaction or matter nor to update the report for anything that occurs, or of which SMEC becomes aware, after the date of this report.

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Contents

Appendices

Tables

Figures

1 Introduction

SMEC was commissioned by Spiire Australia Pty Ltd (Spiire) to conduct a traffic study for a proposed development in Section 100, Canberra City. The proposed development includes residential units, commercial space and retail space.

The Section 100 development is a redevelopment of the land currently occupied by a surface car park, which is accessed by the intersection at London Circuit and Gordon Street. The proposed development will provide publicly accessible parking to replace the existing surface parking available at the site.

This study includes traffic generation based on trip generation rates agreed with TCCS, traffic distribution using the Canberra Strategic Transport Model (CSTM) and networked intersection analysis using SIDRA Intersection.

1.1 Project Location

The context and study areas covered by this study are shown in Figure 1.

Figure 1: Context and Study Area

1.2 Objectives

The objectives of this study are to:

- Review existing traffic volumes
- Assess future traffic operations with and without the proposed development
- Provide recommendations about the appropriate intersection arrangements at the proposed development access points and the Edinburgh Avenue extension intersections with London Circuit and Vernon Circle

2 Existing Conditions and Proposed Development

2.1 Site Description and Existing Land Use

City Section 100 has a total area of approximately 25,000 m² and is zoned as a designated area under the National Capital Plan. The site is located in the City Hill precinct and is currently used as a car park, with 730 parking spaces (shown in Figure 1). Under the City Hill precinct controls, the site allows a range of land uses, including residential, retail and commercial.

2.2 Existing Road Network

Section 100 is currently bounded by the following roads:

- London Circuit
- Vernon Circle
- Knowles Place

Current access to Section 100 is via Gordon Street, into the large public car park, and Knowles Place, into the private AFP parking area. The Gordon Street access point is a four-way signalised intersection. Knowles Place operates one-way southbound so vehicles accessing the police car park, at the southern side of the police station, enter at the northern end of Knowles Place and then travel past the ACT Supreme Court to the car park.

Other key roads in the area include:

- Edinburgh Avenue
- Gordon Street
- Farrell Place
- University Avenue

The hierarchy of the roads around the study area is shown in Figure 2. The arterial roads, which allow high capacity travel between districts are Northbourne Avenue, Commonwealth Avenue, Constitution Avenue, Edinburgh Avenue and Parkes Way. Marcus Clarke Street and London Circuit are classified as major collectors, which are intended to connect the arterial network to local districts and should only carry traffic originating or terminating in the local area. University Avenue, McCoy Circuit and Ellery Crescent are classified as minor collectors, which link access streets to the major collector network. All other roads in the area are access streets, which should only carry traffic originating or terminating at land uses on those streets and should not carry any through traffic.

Figure 2: Road Hierarchy

2.3 Proposed Development Land Use

The proposed City Section 100 development includes the land use shown in Table 1.

Table 1: Proposed Section 100 Land Use

LAND USE	QUANTITY
Residential Units	700 dwellings
Commercial Floorspace	38,500 m²
Retail Floorspace	5,322 m²

An additional land use option containing no commercial space and 1,200 residential units was also provided. However, the option shown in Table 1 generates more traffic and has been analysed here to provide a more conservative assessment of the development's traffic impacts.

As noted previously, the existing public parking supply on Section 100 will be incorporated into the basement parking in the development and will remain publicly accessible.

2.4 Proposed Site Access and Internal Road Network

The Section 100 development will be accessible via both Knowles Place and the Edinburgh Avenue extension. The existing access point from the London Circuit – Gordon Street intersection will be removed. The provided public parking will be accessed from the corner of Knowles Place south of the Canberra City Police Station. Knowles Place will be

extended south of this point, connecting to the Edinburgh Avenue extension. This new road will provide midblock driveway access to basement parking for residents and tenants of Section 100.

There will not be any driveway access to the development from London Circuit, Edinburgh Avenue extension or Vernon Circle.

The layout of the development is shown in Figure 3.

Figure 3: City Section 100 Layout (Source: Spiire)

3 Traffic Generation

Traffic generated by the City Section 100 development has been calculated using traffic generation rates from Review of ACT Traffic Generation Rates for High Density Residential Developments in the Vicinity of Town Centres and Northbourne Avenue Corridor (SMEC, 2018) and the RMS Guide to Traffic Generating Developments. AM and PM peak proportions have been sourced from the RMS Guide to Traffic Generating Developments and the ITE Trip Generation Manual. Directional ratios for vehicles entering and exiting the development in each peak period have been sourced from the ITE Trip Generation Manual. The vehicle trip rates, directional splits and traffic generated by the development are shown in Table 2.

Table 2: Traffic Generated by Section 100

Land Use	Yield	Peak Period	Trip Rate	Peak Direction	Peak Split	Trips	Notes
Residential	700 units	AM	0.337 /dwelling	In	0.29	68	Rate: Review of ACT Traffic Generation Rates for High Density Residential Developments in the Vicinity of Town Centres and Northbourne Avenue Corridor, 10% in AM, ITE 223 Mid-rise Apartment for PM proportion Direction: ITE 223 Mid-rise Apartment
				Out	0.71	167	
		PM	0.425 /dwelling	In	0.59	175	
				Out	0.41	122	
Commercial	38,500 m²	AM	1.45 /100 m²	In	0.88	490	Rate: RMS Office and Commercial (daily rate), ITE 710 General Office Building (peak proportions) Direction: ITE 710 General Office Building
				Out	0.12	67	
		PM	1.39 /100 m²	In	0.17	91	
				Out	0.83	443	
Retail	5,322 m²	AM	6.26 /100 m²	In	0.48	160	Rate: RMS Shopping Centre (specialty shop component) Direction: ITE 826 Specialty Retail Centre
				Out	0.52	173	
		PM	4.60 /100 m²	In	0.56	137	
				Out	0.44	108	
Total		**AM**		**In**		**718**	
				Out		**408**	
				Total		**1,126**	
		PM		**In**		**403**	
				Out		**672**	
				Total		**1,075**	

Note: All trips generated in the table refer to vehicle trips

4 Strategic Transport Modelling

The trip distribution has been conducted using the Canberra Strategic Transport Model (CSTM), which was most recently updated in 2017 using the 2011 Census. This model contains a complete representation of the ACT's road network.

The model is an equilibrium model, in which travel decisions (origin/destination, mode choice, travel route etc.) are related to cost, where the cost of travel is minimised for every road user. As such, any changes to the model inputs and assumptions can have impacts far from where the change was made, with the severity of the change decreasing with distance, as the traffic adjusts and redistributes to minimise the average user cost.

The modelling was conducted for the AM and PM peak periods in the 2016 and 2031 model years. The strategic modelling outputs have been used to calculate growth and distribution of traffic volumes for the intersections surrounding the development.

4.1.1 Model Scenarios

Modelling was conducted for the following scenarios:

- **2018 Base Case**: Current land use and transport network assumptions for 2016, supplemented by SCATS traffic data supplied by TCCS
- **2031 Do Minimum**: All land use and network assumptions already in the CSTM for 2031 but with the Edinburgh Avenue extension included.
- **2031 Section 100**: All land use and network assumptions already in the CSTM for 2031 with the Edinburgh Avenue extension and proposed Section 100 land use and car park access locations included.

Each of these scenarios was tested for both the AM and PM peak periods.

4.2 Model Assumptions

4.2.1 Zone Structure

The City Section 100 development area falls within the existing CSTM Zone 16, as shown on the 2018 Base Case road network in Figure 4. The exact location of the development area is also shown. Zones 15 and 16 currently connect directly to the London Circuit – Gordon Street intersection.

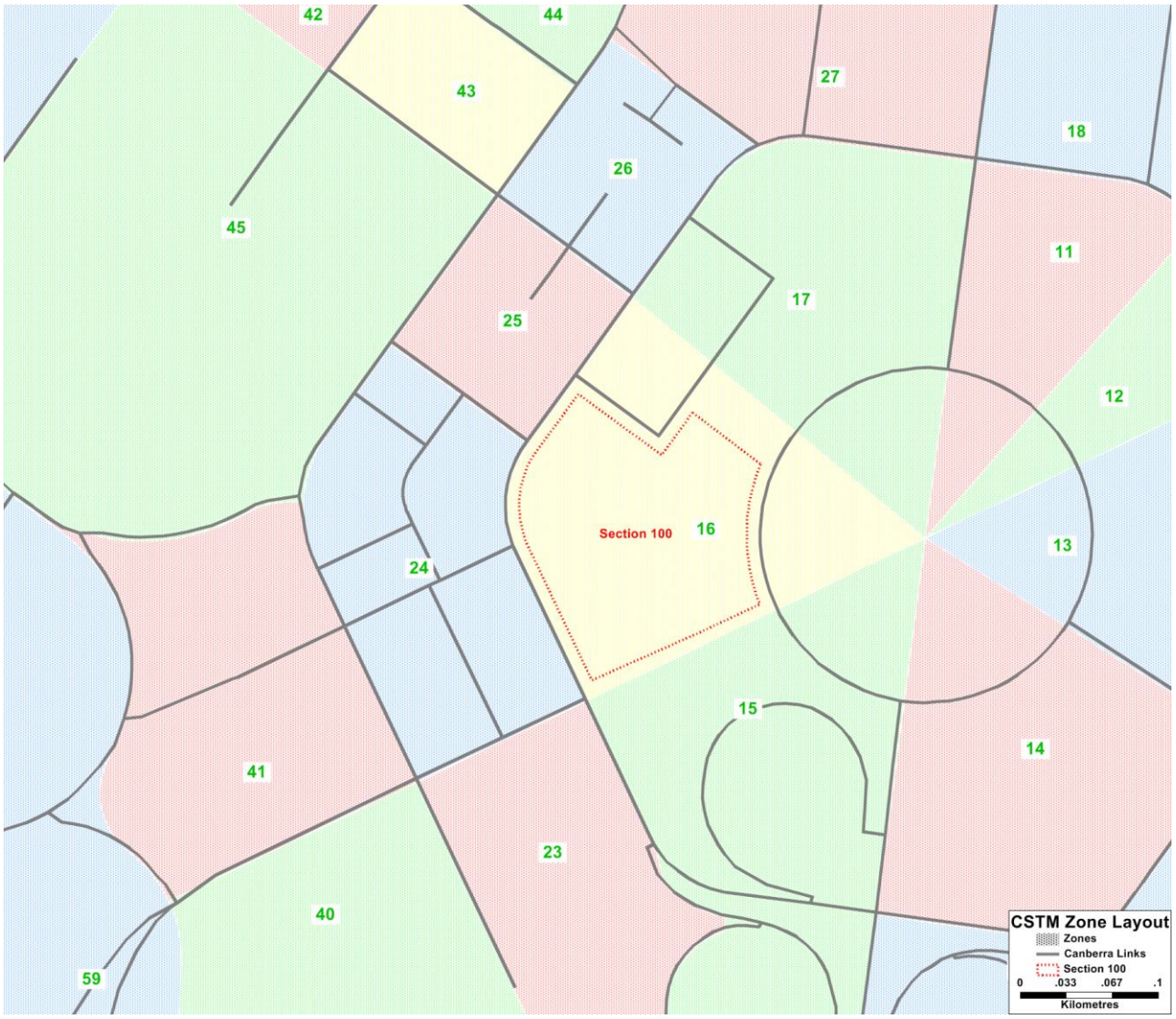


Figure 4: CSTM Zones in Development Area

In *2018 Base Case*, Zones 15 and 16 both access the road network by the intersection of London Circuit and Gordon Street.

In *2031 Do Minimum*, Zone 15 accesses the road network via a connection to Edinburgh Avenue extension, while Zone 16 remains connected to London Circuit – Gordon Street.

For the *2031 With Section 100* scenario, the proposed developments within Section 100 required the addition of a new zone (Zone 900) to the CSTM. The existing Zones 15 and 16 are shown in Figure 5 with the new connection for Zone 900 on Knowles Place extension. Zone 15 is now separated from Zone 16 by Edinburgh Avenue extension and connects to it directly. Zone 16 now represents the existing public parking capacity that is incorporated into the Section 100 development, so its connector has been moved to the corner of Knowles Place, south of the Canberra City Police Station, where the access driveway is expected to be located.

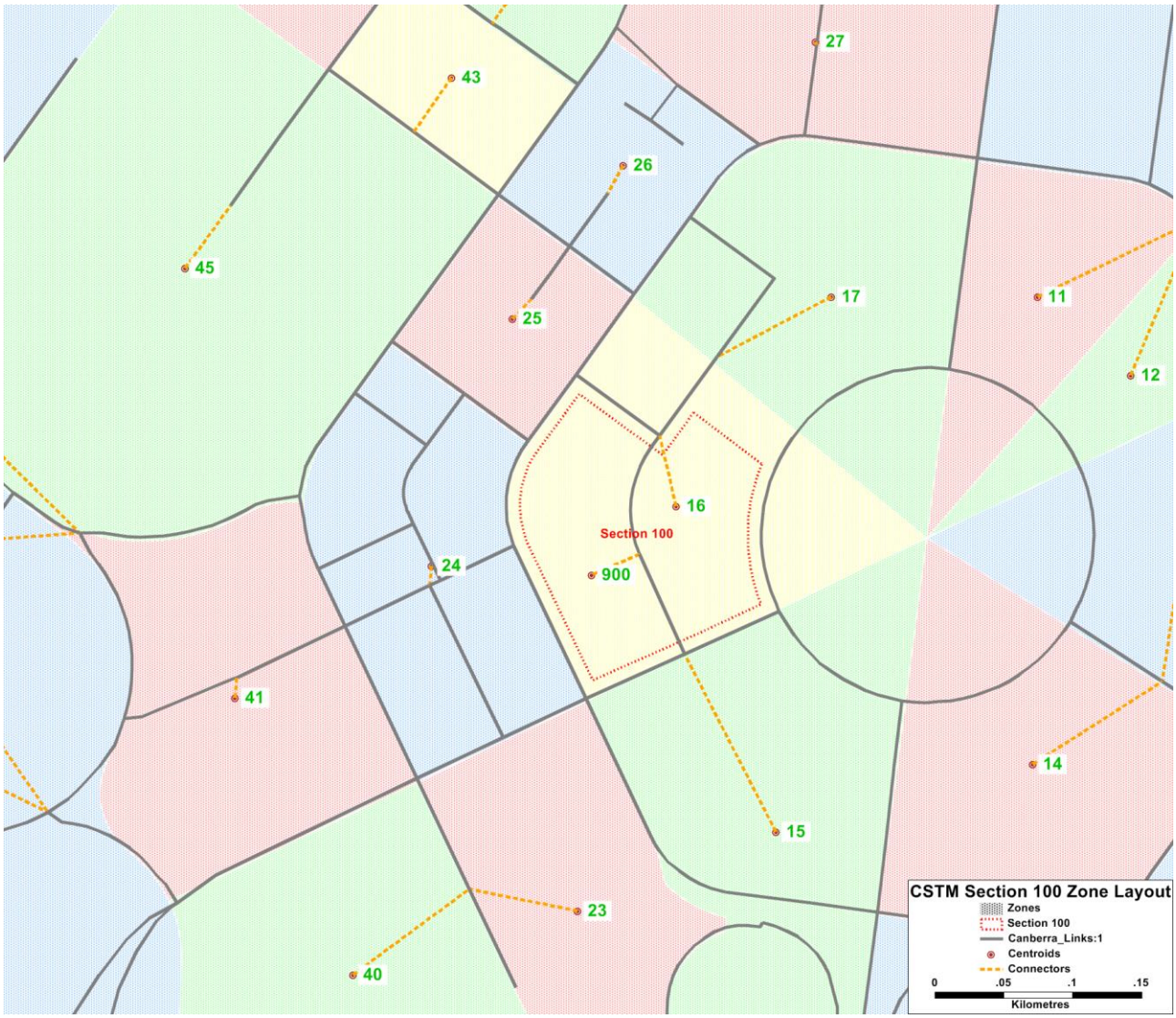


Figure 5: Updated Zone Connectors

4.2.2 Road Network

The road network infrastructure improvements assumed to be present in each year from 2016 to 2031 were confirmed with TCCS in 2017, when the current version of the CSTM was completed. Diagrams showing the upgrades in 2021 and 2031 are included in Appendix A.

Intersections are represented in the CSTM at a high level, with those that require vehicles to stop or give way being modelled through a reduction in capacity on the approaching roads. No discrimination is made by intersection control method.

4.2.3 Public Transport

The public transport network in 2021 onwards is based on ACTION's proposed Network 2018 provided to SMEC in March 2017, with the addition of Light Rail Stage 1 (LRS1) and the removal of bus routes operating along the LRS1 corridor. Stage 2 (LRS2) is added in 2031. Light Rail Stage 2 (LRS2) is included in the CSTM using broad assumptions made in 2017 about route, stop location and service frequency.

4.2.4 Parking Capacity

The CSTM contains parking capacity for each of the zones within the City, so that car trips to and from the City are distributed only to locations where parking is available. The existing parking capacity has been retained in zones 15 and 16. A new zone (Zone 900) was created for Section 100, which is not part of this parking distribution. As such, the traffic generated by Section 100 remains in Zone 900, while no other City traffic is moved into it.

4.2.5 Land Use

The base land use data was provided by TCCS and is dated 13 April 2017. The land use assumption for the *2031 Do Minimum* scenario is shown in Table 3. For this scenario, Zone 16 is assumed to be still operating as a surface car park with no development on the site.

Table 3: CSTM 2031 Do Minimum Land Use

Zone	Description	Population	Employment	Retail Space	School Enrolments	Tertiary Enrolments
15	City	350	500	0	0	0
16	City	0	0	0	0	0

For the *2031 Section 100* scenario, the base land use in Zones 15 and 16 is the same as in *2031 Do Minimum*. A new zone (Zone 900) was created to contain the Section 100 land use and to explicitly generate the number of car trips calculated in Table 2. Due to the way the CSTM operates, this modelled land use is not identical to the proposed land use in Table 2, but does generate the required number of car trips after the CSTM's specific trip generation and mode split calculations have been completed.

4.3 Strategic Transport Modelling Results

Diagrams extracted from the CSTM for each scenario are shown in the following sections. These show the hourly peak volumes and volume/capacity ratios, as well as peak volume differences between scenarios. The peak traffic difference (compared to the Base Case) are included for the 2031 With Section 100 scenario.

4.3.1 2016 Base Case

The *2016 Base Case* hourly flow diagrams for AM and PM are shown in Figure 6 and Figure 7, respectively.

In the 2016 AM peak period, most of the road network around the Section 100 site operates well, with a few roads operating near capacity. Edinburgh Avenue, west of McCoy Circuit, is over capacity. Marcus Clarke Street between Edinburgh Avenue and Gordon Street, the ramps between London Circuit and Commonwealth Avenue, Northbourne Avenue north of London Circuit and most of Vernon Circle operate very close to their capacity. London Circuit between Edinburgh Avenue and Northbourne Avenue operates below 70% of its capacity.

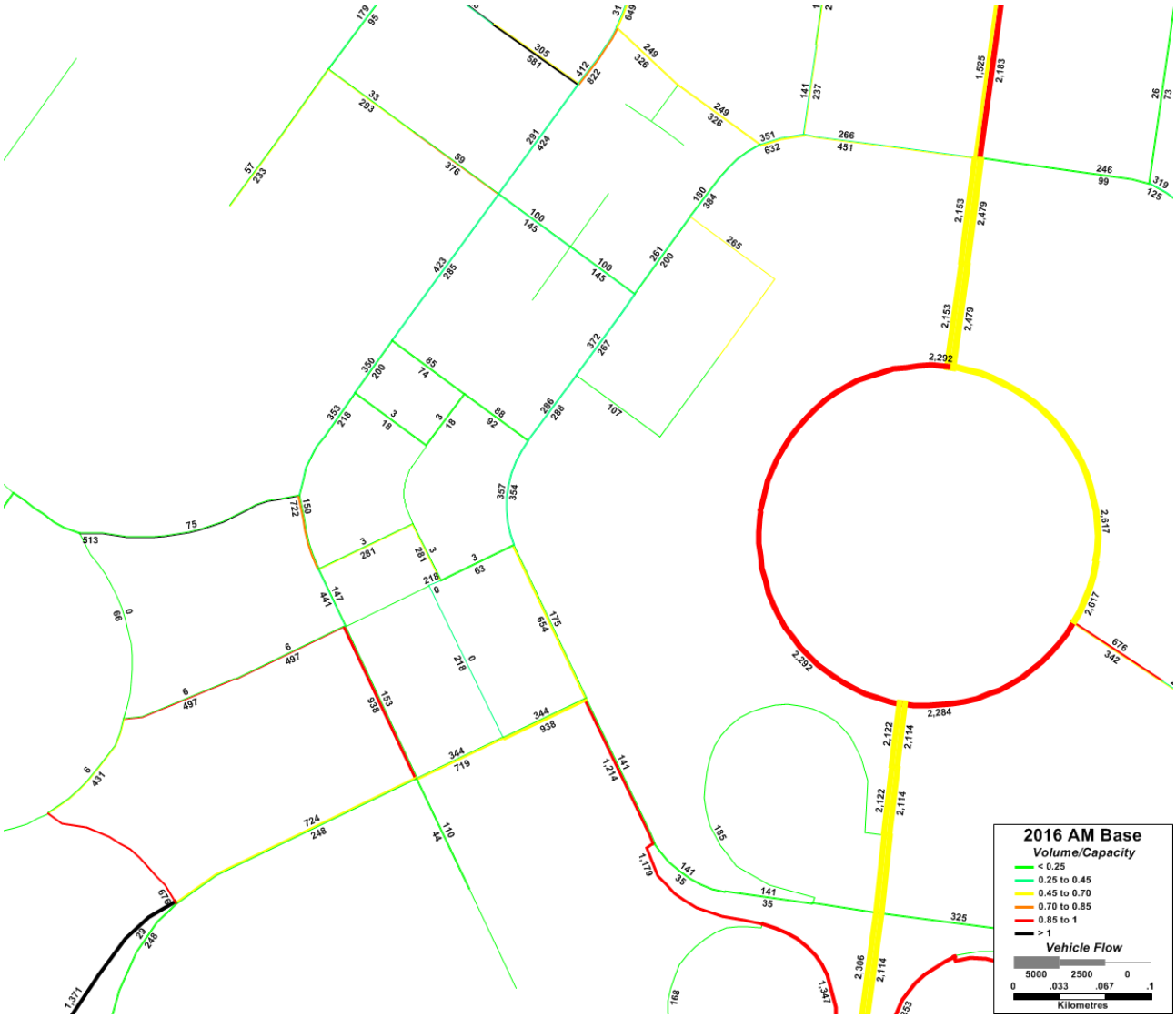


Figure 6: 2016 Base Case AM Hourly Flow and V/C

In the 2016 PM peak period, all of the local network operates well, except for Vernon Circle, which operates just over its modelled capacity, which is 2,300 vehicles per hour. The volume on Vernon Circle only increases by 15 vehicles per hour compared to the AM peak but crosses the capacity threshold.

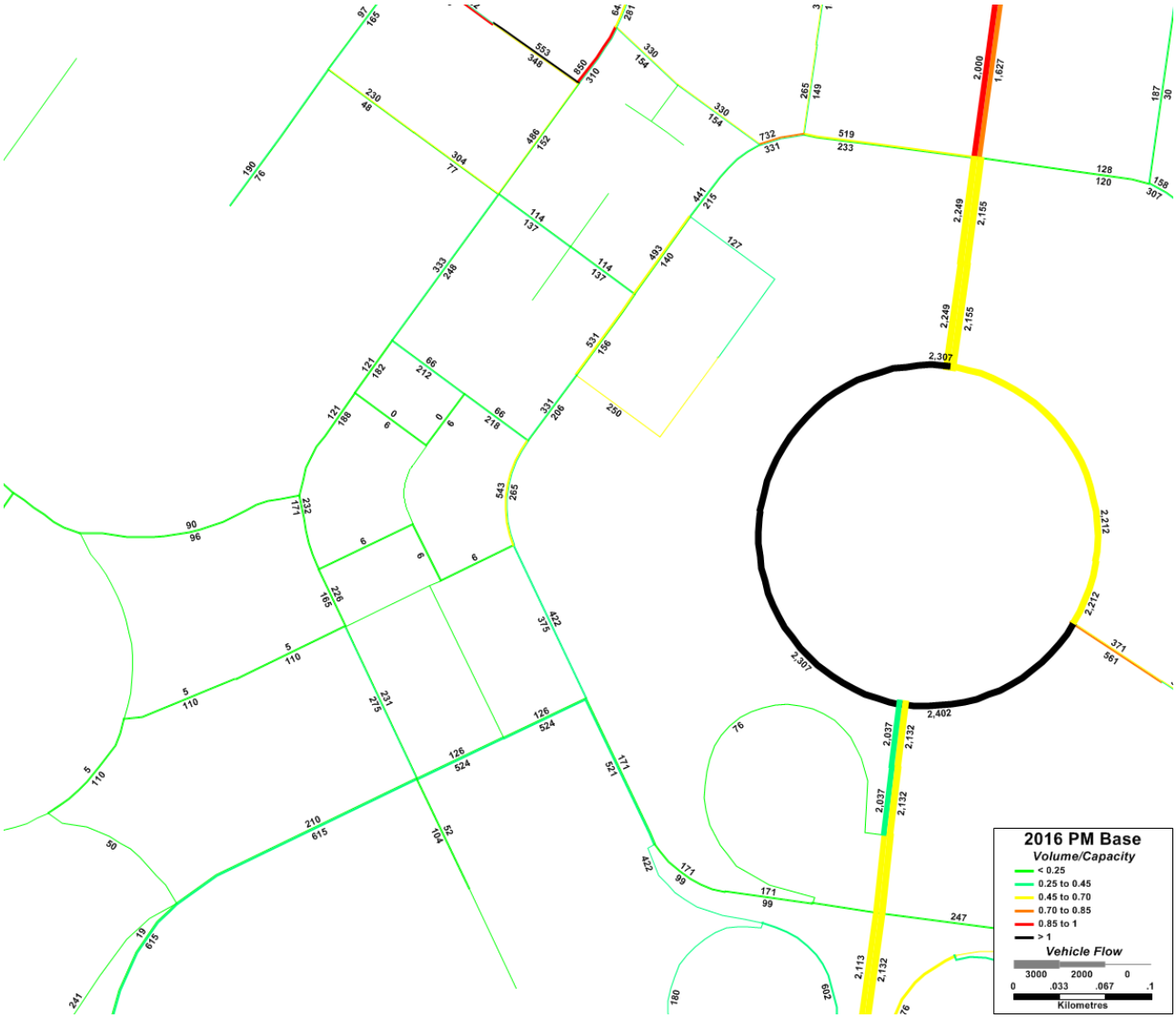


Figure 7: 2016 Base Case PM Hourly Flow and V/C

4.3.2 2031 Do Minimum

The *2031 Do Minimum* scenario includes the extension of Edinburgh Avenue from London Circuit to Vernon Circle, which leads to significant traffic redistribution around the study area.

There appears to be some travel from east to west from Constitution Avenue to Edinburgh Avenue via Vernon Circle. This movement requires many lane changes across a short distance and is likely to be unsafe.

Traffic volumes northbound on Commonwealth Avenue are lower than in 2016 due to the reduced capacity caused by intersections associated with West Basin and the conversion of the London Circuit grade separation to an at-grade intersection. Edinburgh Avenue, west of McCoy Circuit, McCoy Circuit, Gordon Street and Ellery Crescent are all over capacity. London Circuit is generally below 70% of capacity, with some sections near Northbourne Avenue operating below 85% of capacity.

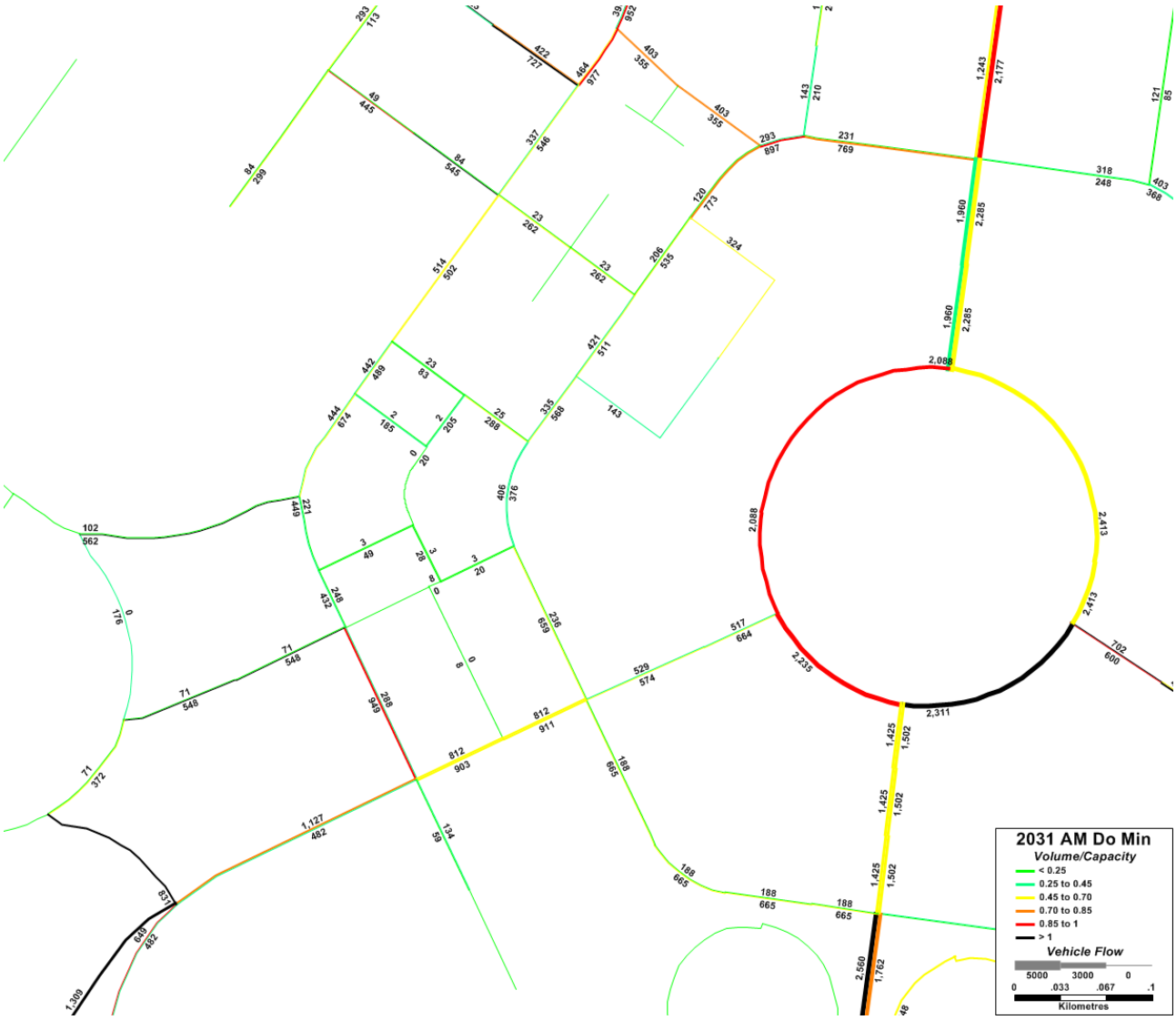


Figure 8: 2031 Do Minimum AM Hourly Flow and V/C

In the 2031 Do Minimum PM peak, Edinburgh Avenue, west of London Circuit operates between 45-85% of capacity, as does London Circuit, between Commonwealth Avenue and Knowles Place. The Edinburgh Avenue extension operates very well northbound and below 70% of capacity southbound. Vernon Circle, between Constitution Avenue and Edinburgh Avenue operates over capacity, while the section between Edinburgh Avenue and Northbourne Avenue operates above 85% of capacity.

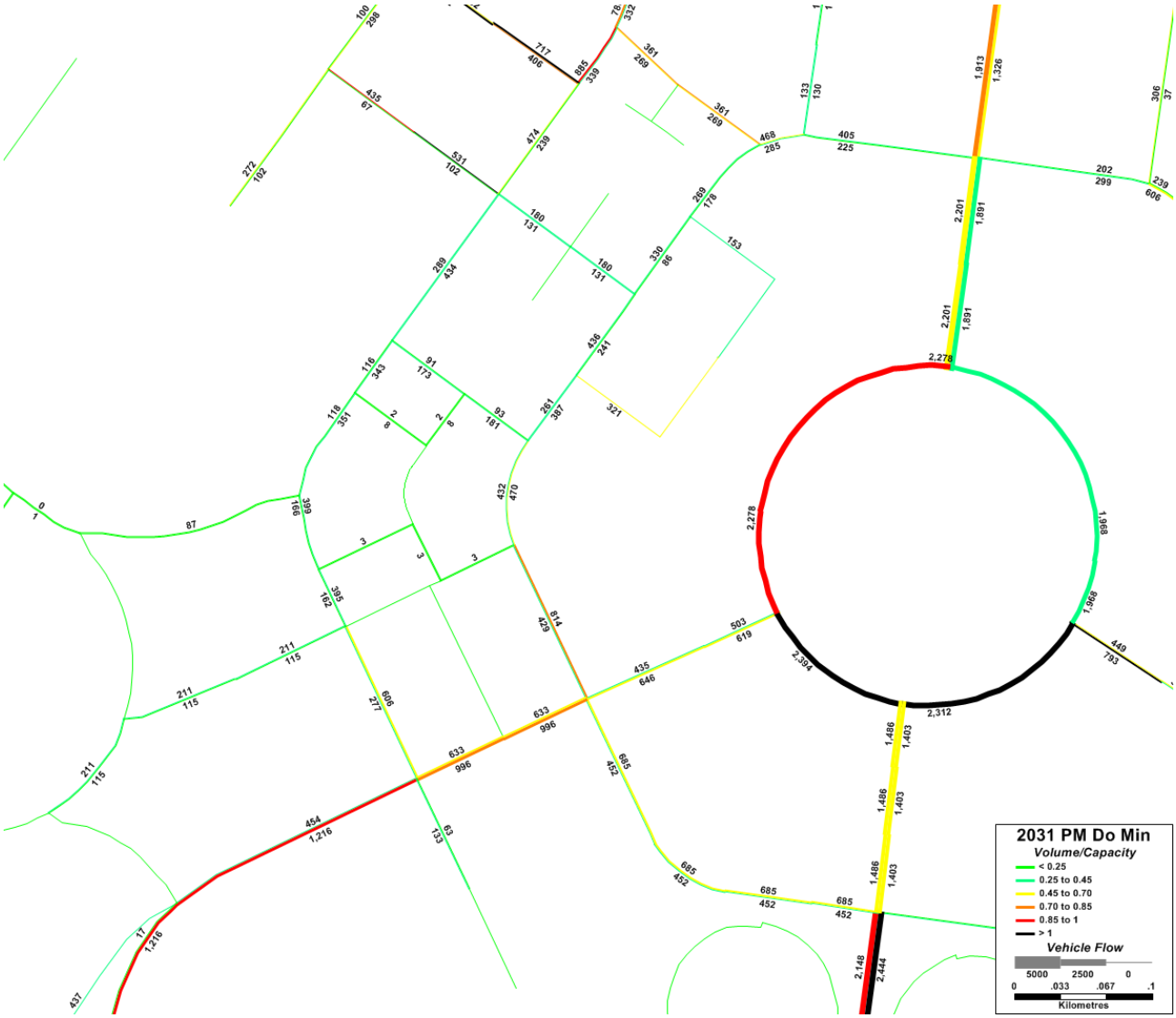


Figure 9: 2031 Do Minimum PM Hourly Flow and V/C

4.3.3 2031 Section 100

The *2031 Section 100* scenario includes the extension of Knowles Place to intersect the Edinburgh Avenue extension and converts the existing southern part of Knowles Place to two-way operation. Along with the Section 100 land use, there are substantial changes to the traffic volume and distribution in the area. The traffic volume differences between the 2031 Do Minimum and 2031 With Section 100 scenarios have also been included.

In the 2031 With Section 100 AM peak period, shown in Figure 10, there is an increase in congestion around the study area. Knowles Place and Knowles Place extension both operate over capacity. Congestion on the eastern side of Vernon Circle (southbound) has decreased but the northbound section between Commonwealth Avenue and Edinburgh Avenue extension operates over capacity. Edinburgh Avenue extension, between Vernon Circle and Knowles Place extension operates between 70-85% of capacity.

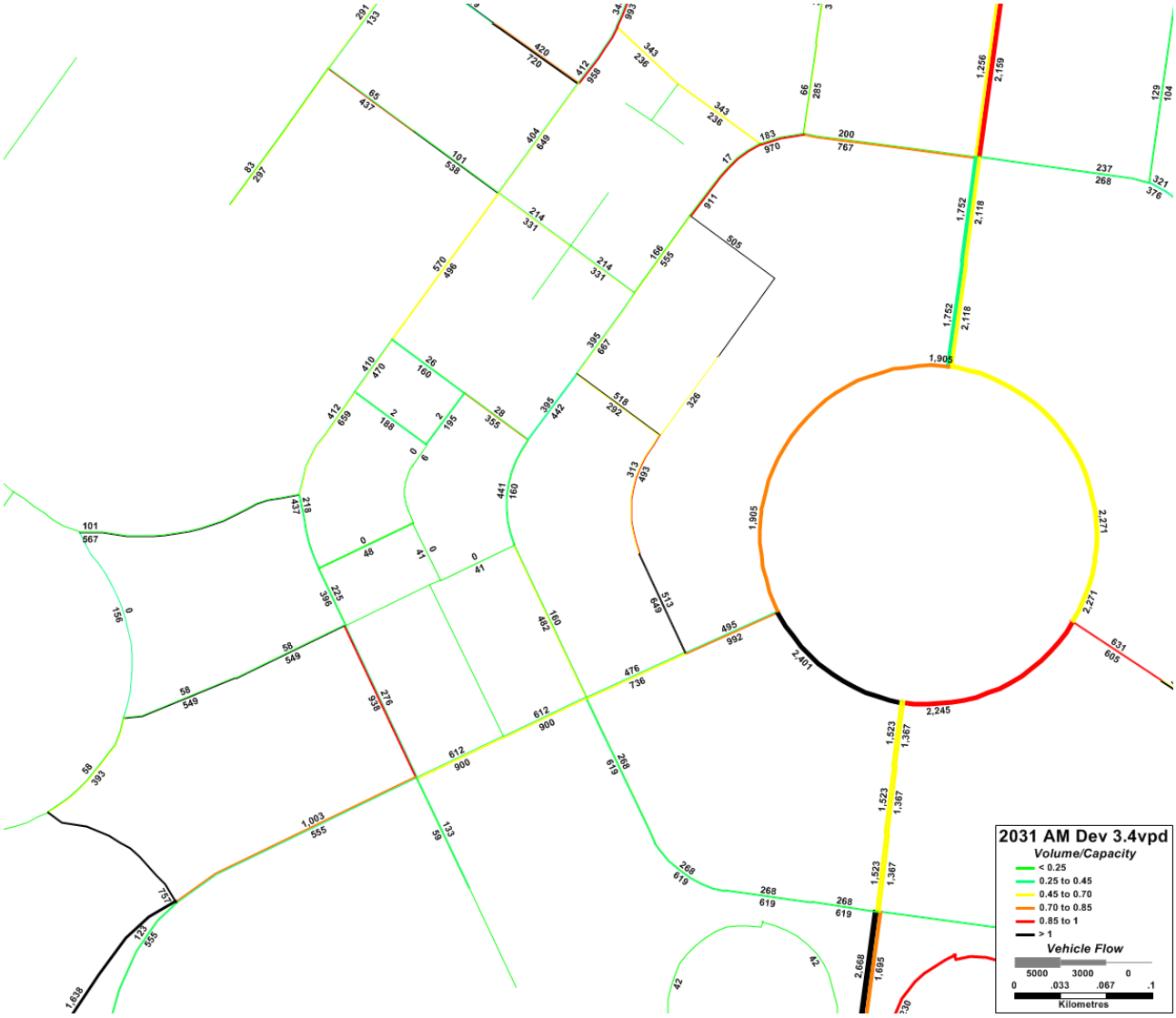


Figure 10: 2031 With Section 100 AM Hourly Flow and V/C

Figure 11 shows the flow differences between 2031 Do Minimum and 2031 With Section 100 in the AM peak period. There is a decrease in traffic on most of Vernon Circle and Northbourne Avenue, which is likely caused by the additional traffic on Commonwealth Avenue and Vernon Circle, south of Edinburgh Avenue, which is travelling to Section 100. There are increases to traffic volumes on Commonwealth Avenue northbound, part of Vernon Circle, Edinburgh Avenue extension, Knowles Place, Knowles Place extension, Farrell Place, University Avenue and parts of Marcus Clarke Street and London Circuit, likely from traffic travelling between Section 100 and Belconnen. Outside of the immediate area shown in Figure 11, volume changes on roads is less than 50 vehicles per hour.

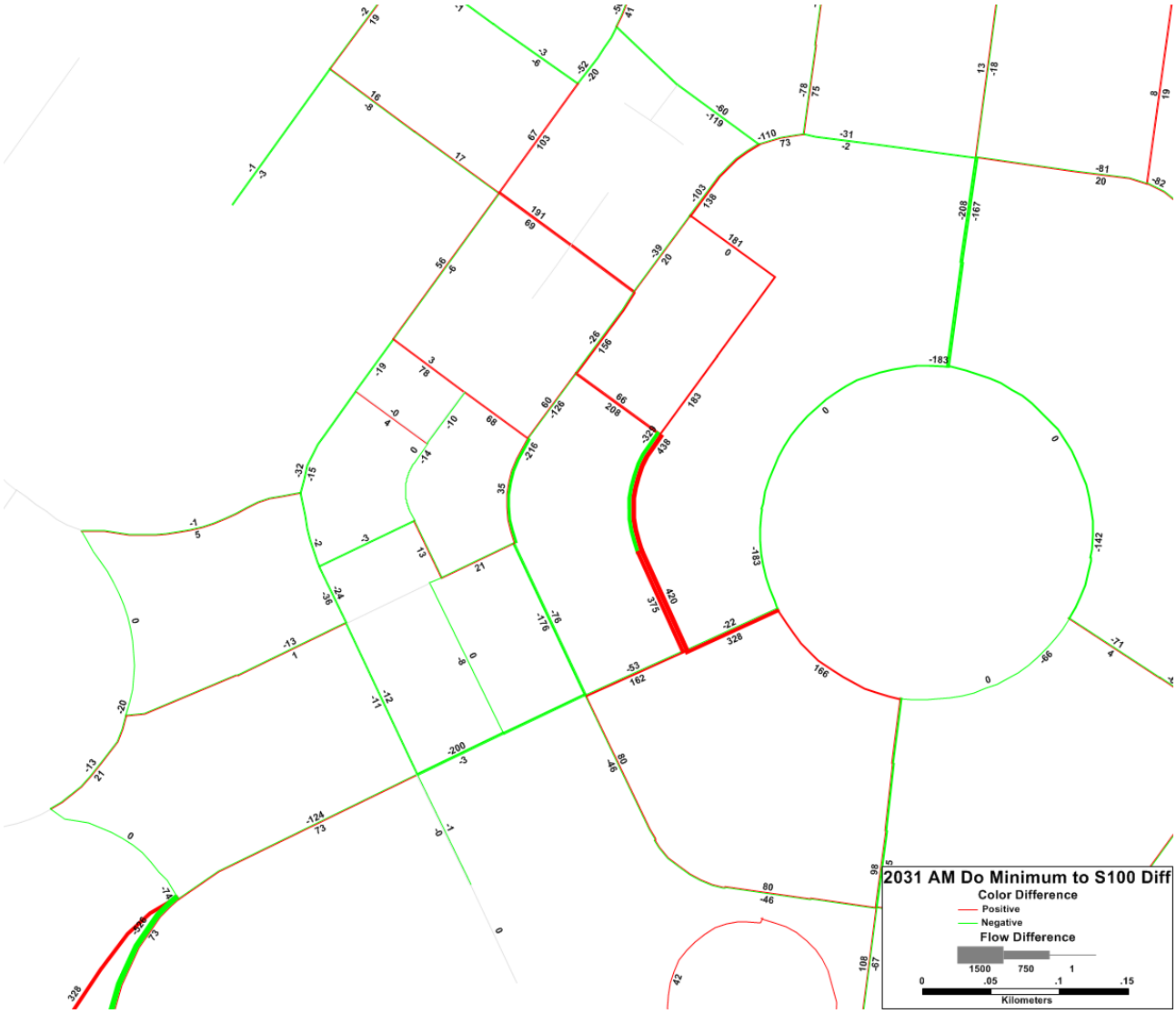


Figure 11: 2031 With Section 100 Compared to Do Minimum 2031 AM Hourly Flow Difference

In the 2031 With Section 100 PM peak period, shown in Figure 12, the western (northbound) section of Vernon Circle operates over capacity, as do parts of Knowles Place and Knowles Place extension. Edinburgh Avenue and London Circuit generally operate below 70% of capacity.

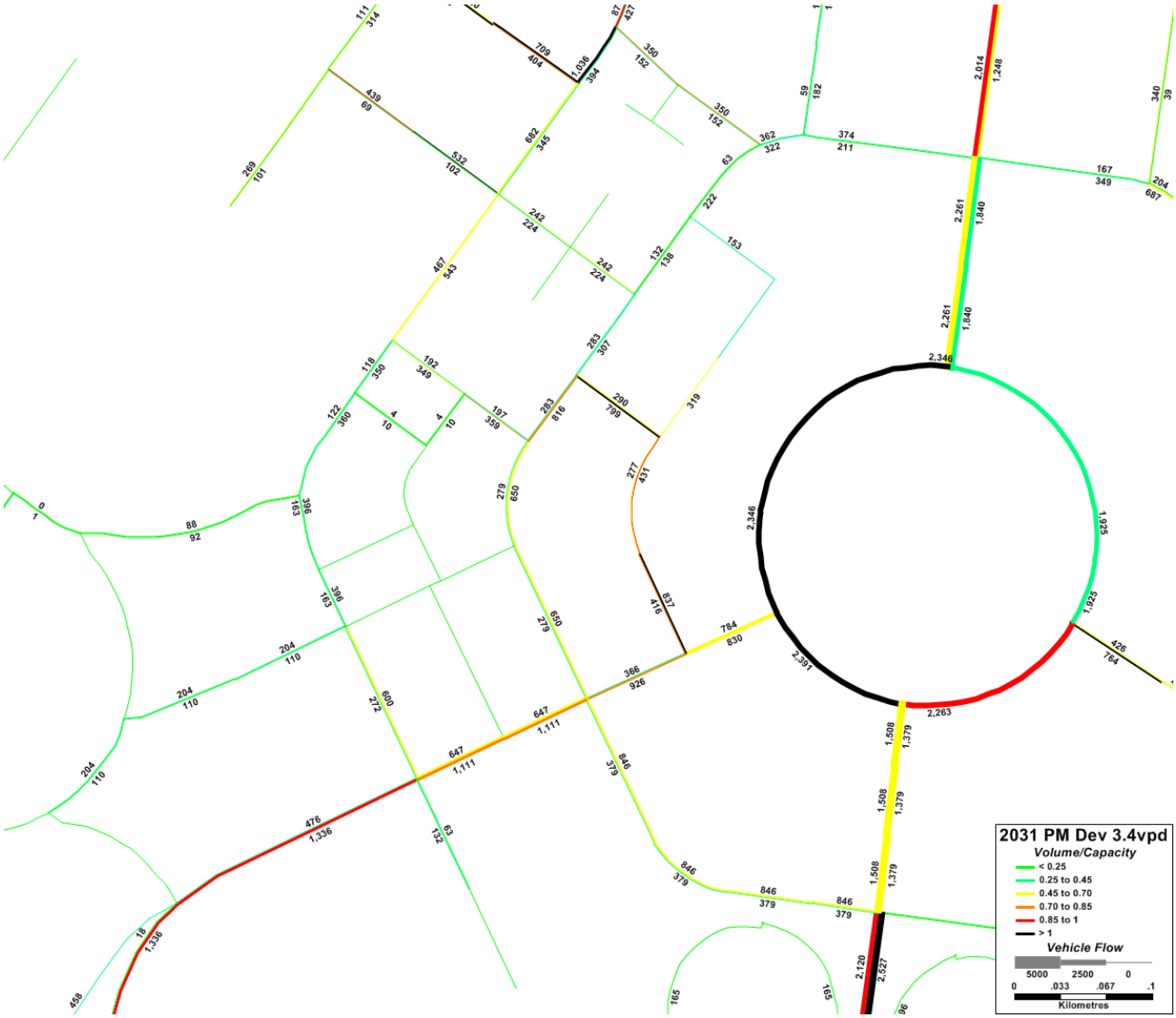


Figure 12: 2031 With Section 100 PM Hourly Flow and V/C

Figure 13 shows the traffic volume differences in the 2031 PM peak period with the Section 100 compared to the Do Minimum scenario. Volume differences are typically small, with growth on Knowles Place, Knowles Place extension, Edinburgh Avenue, Edinburgh Avenue extension, London Circuit, Farrell Place, University Avenue and Marcus Clarke Street. There is a reduction in southbound traffic on Northbourne Avenue and Vernon Circle, likely because of additional southbound traffic from Section 100 joining Commonwealth Avenue at London Circuit. The traffic volume changes suggest that the major origin/destination of traffic travelling to and from Section 100 is Belconnen. Outside of the immediate area shown in Figure 13, differences are less than 100 vehicles per hour.

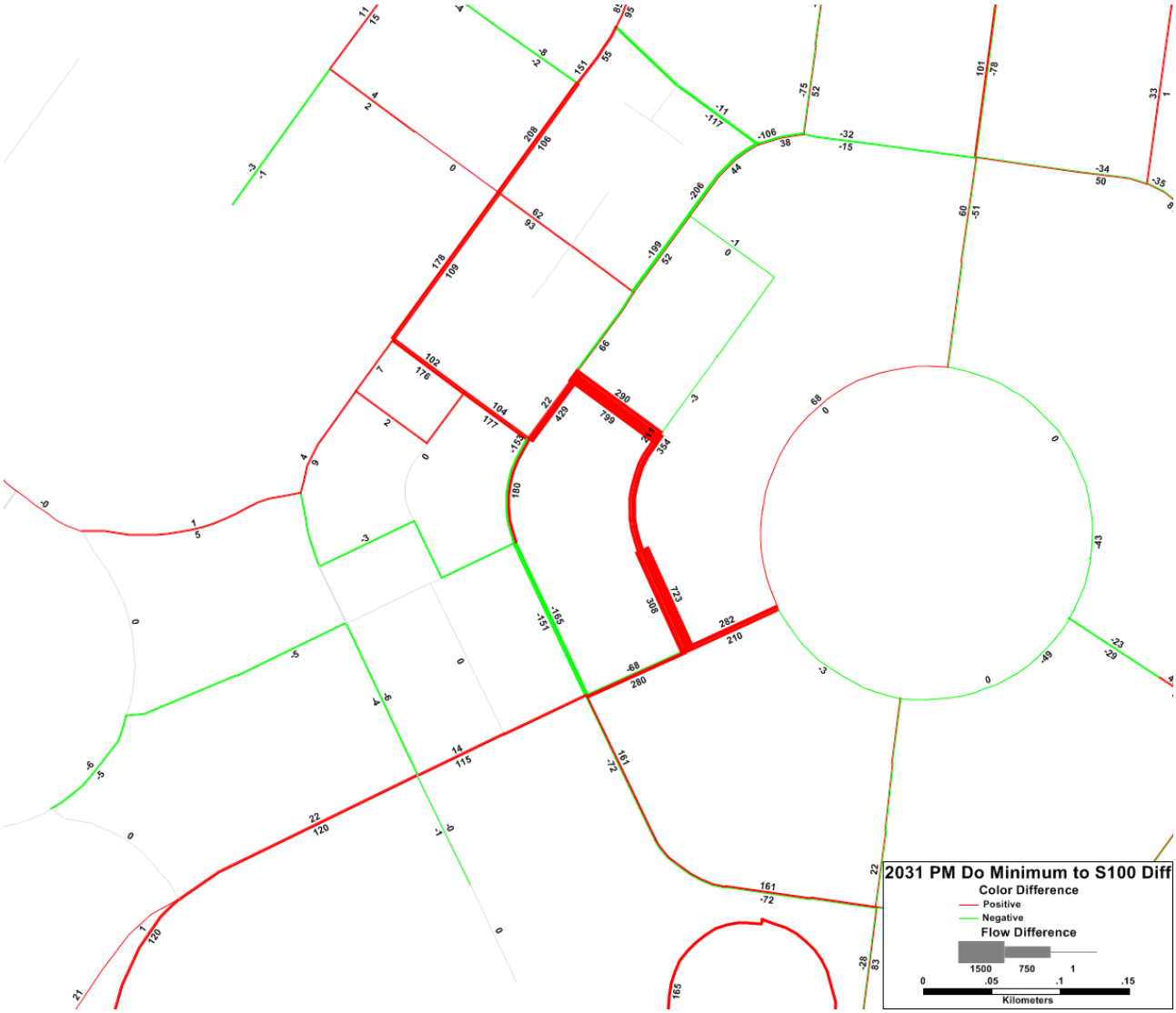


Figure 13: 2031 With Section 100 Compared to Do Minimum 2031 PM Hourly Flow Difference

4.3.4 Strategic Transport Modelling Summary

The strategic transport modelling carried out has shown the expected growth from 2016 to 2031 and the likely impact of the traffic generated by Section 100 on the local road network. Increased traffic volumes and delays on some roads, including Edinburgh Avenue, London Circuit and Marcus Clarke Street, has led to reductions in traffic on other roads connected to those roads, including Northbourne Avenue, Commonwealth Avenue and Constitution Avenue.

For most of the roads that are expected to have an increase in traffic, the additional traffic does not cause the roads to operate over capacity. However, the section of Vernon Circle between Commonwealth Avenue and Edinburgh Avenue and most of Knowles Place goes over capacity because of the Section 100 development in the AM peak in 2031. In the 2031 PM peak, the development of Section 100 causes the Knowles Place extension and the section of Vernon Circle between Edinburgh Avenue and Northbourne Avenue to operate over capacity. All other roads are expected to be able to cater for the additional Section 100 traffic without going over capacity.

5 Intersection Assessment

Turning movement counts from SCATS were obtained from TCCS for the following intersections:

1. London Circuit – Edinburgh Avenue
2. London Circuit – Gordon Street

These volumes were counted by the SCATS traffic signal control system for the seven days starting 25 July 2018. These volumes were combined with the CSTM turning volumes to synthesise demand for the following intersections:

1. London Circuit – Edinburgh Avenue
2. Edinburgh Avenue extension – Knowles Place extension (2031 only)
3. Vernon Circle – Edinburgh Avenue extension (2031 only)
4. London Circuit – Gordon Street
5. London Circuit – Farrell Place
6. London Circuit – Knowles Place (south)
7. London Circuit – University Avenue
8. London Circuit – Knowles Place (north)
9. Knowles Place – Knowles Place extension (2031 Section 100 only)

Details of the modelled turning movement volumes are included in Appendix B.

The intersection analysis has been conducted using the network functionality of SIDRA Intersection 8. This considers the impact of queuing, platooning, signal coordination and other interactions between intersections on the performance of each intersection in the network. The performance is measured by average delay in seconds, Level of Service (determined from average delay) and worst approach 95th percentile queue (measured in metres) with the approach on which that queue occurs. The analysis is discussed in the following sections and detailed outputs are included in Appendix C.

Table 4 shows the Level of Service (LoS) delay thresholds and colour code used in output figures presented later in this chapter.

Table 4: SIDRA Intersection Level of Service Criteria (Delay and HCM 2010 Method)

LEVEL OF SERVICE	GIVE-WAY / ROUNDABOUT	SIGNAL CONTROL	COLOUR CODE
A	D ≤ 10s	D ≤ 10s	
B	10s < D ≤ 15s	10s < D ≤ 20s	
C	15s < D ≤ 25s	20s < D ≤ 35s	
D	25s < D ≤ 35s	35s < D ≤ 50s	
E	35s < D ≤ 50s	55s < D ≤ 80s	
F	D ≥ 50s	D ≥ 80s or V/C ≥ 1	

5.1 2018 Base Case

The summary of SIDRA Intersection network results for the *2018 Base Case* scenario is shown in Table 5. The 2018 models indicate a good level of performance under current conditions.

Table 5: 2018 Base Case Intersection Performance Summary

INTERSECTION		AM PEAK			PM PEAK		
		DELAY	LOS	QUEUE	DELAY	LOS	QUEUE
1	London Circuit – Edinburgh Avenue	25.2	C	58 (S)	22.4	C	50 (S)
4	London Circuit – Gordon Street	20.3	C	48 (S)	15.7	B	29 (S)
5	London Circuit – Farrell Place	1.6 (16.0)	C*	2 (W)	2.1 (17.2)	C*	2 (W)
6	London Circuit – Knowles Place (S)	1.4 (13.4)	B*	3 (E)	3.3 (13.7)	B*	7 (E)
7	London Circuit – University Avenue	2.1 (15.9)	C*	1 (W)	1.8 (16.6)	C*	1 (W)
8	London Circuit – Knowles Place (N)	1.6 (4.1)	A*	2 (S)	0.7 (4.1)	A*	2 (S)

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead and the worst movement delay is also shown in parenthesis.

The SIDRA Intersection network layout and lane Level of Service diagrams for 2018 AM and 2018 PM are shown in Figures 14 and 15 respectively.

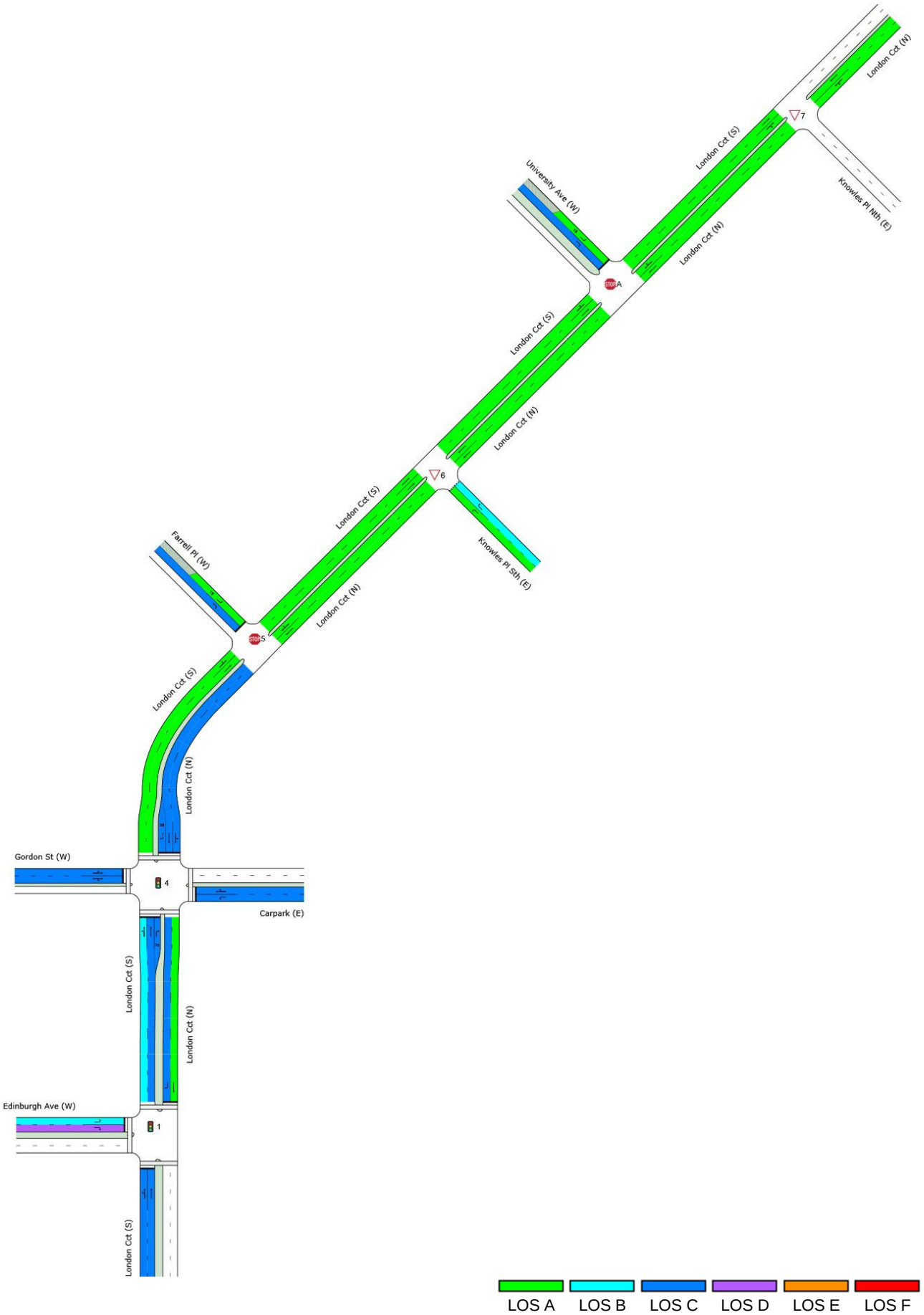


Figure 14: 2018 AM Base Case Network Level of Service

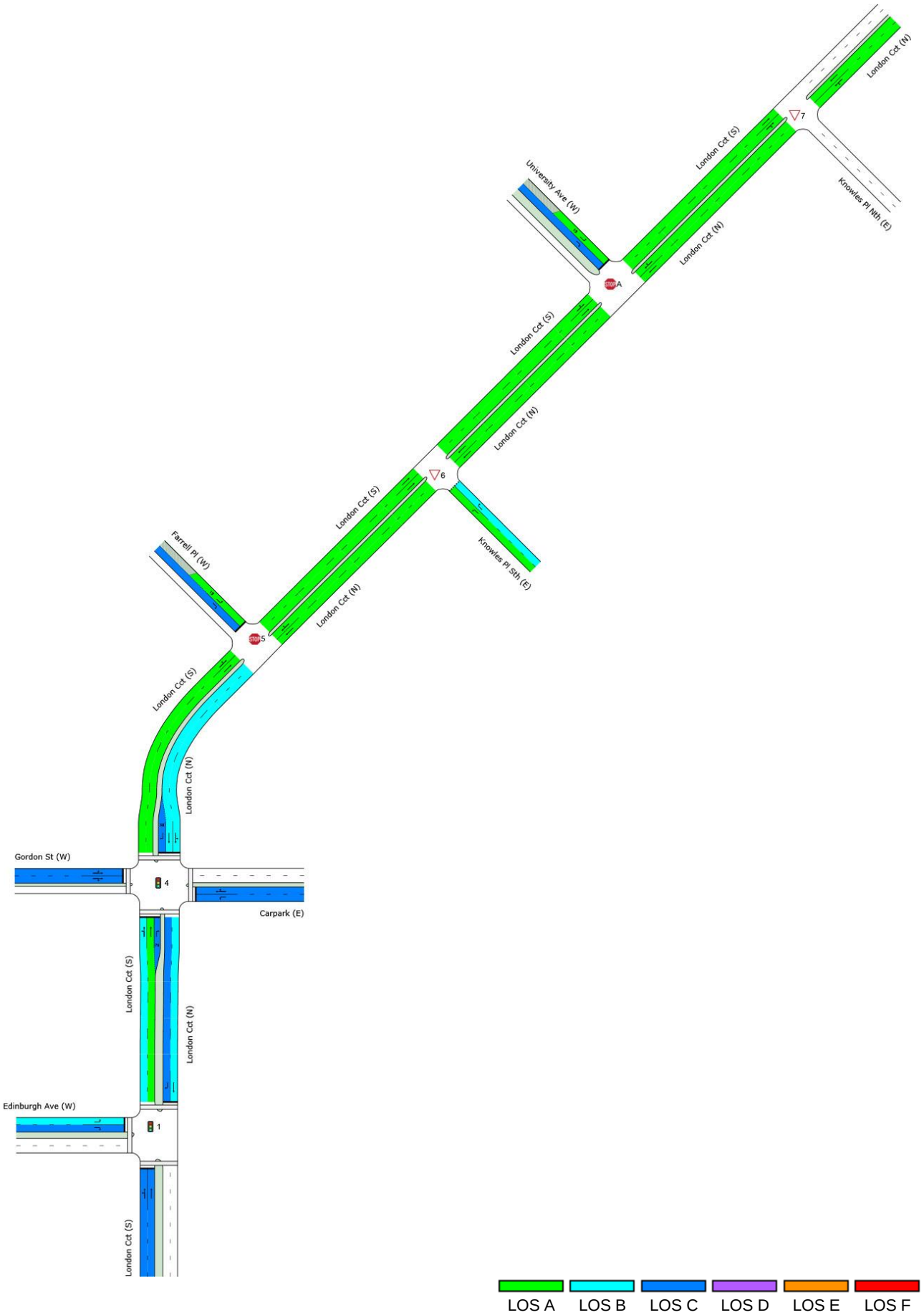


Figure 15: 2018 PM Base Case Network Level of Service

5.2 2031 Do Minimum

The SIDRA Network layout for 2031 Do Minimum scenario is shown in Figure 16. For this scenario, the Edinburgh Avenue extension has been included, with access to assumed developments on the southern side. Edinburgh Avenue has been modelled with a similar layout to the Constitution Avenue extension, with two lanes each way between London Circuit and Vernon Circle. There is an additional left turn lane from Edinburgh Avenue extension westbound to London Circuit southbound. To maximise pedestrian safety and accessibility, no left-turn slip lanes have been included and all left turns are signal controlled.

All other intersections remain as they were in 2018. The potential installation of light rail lines on London Circuit has not been considered.

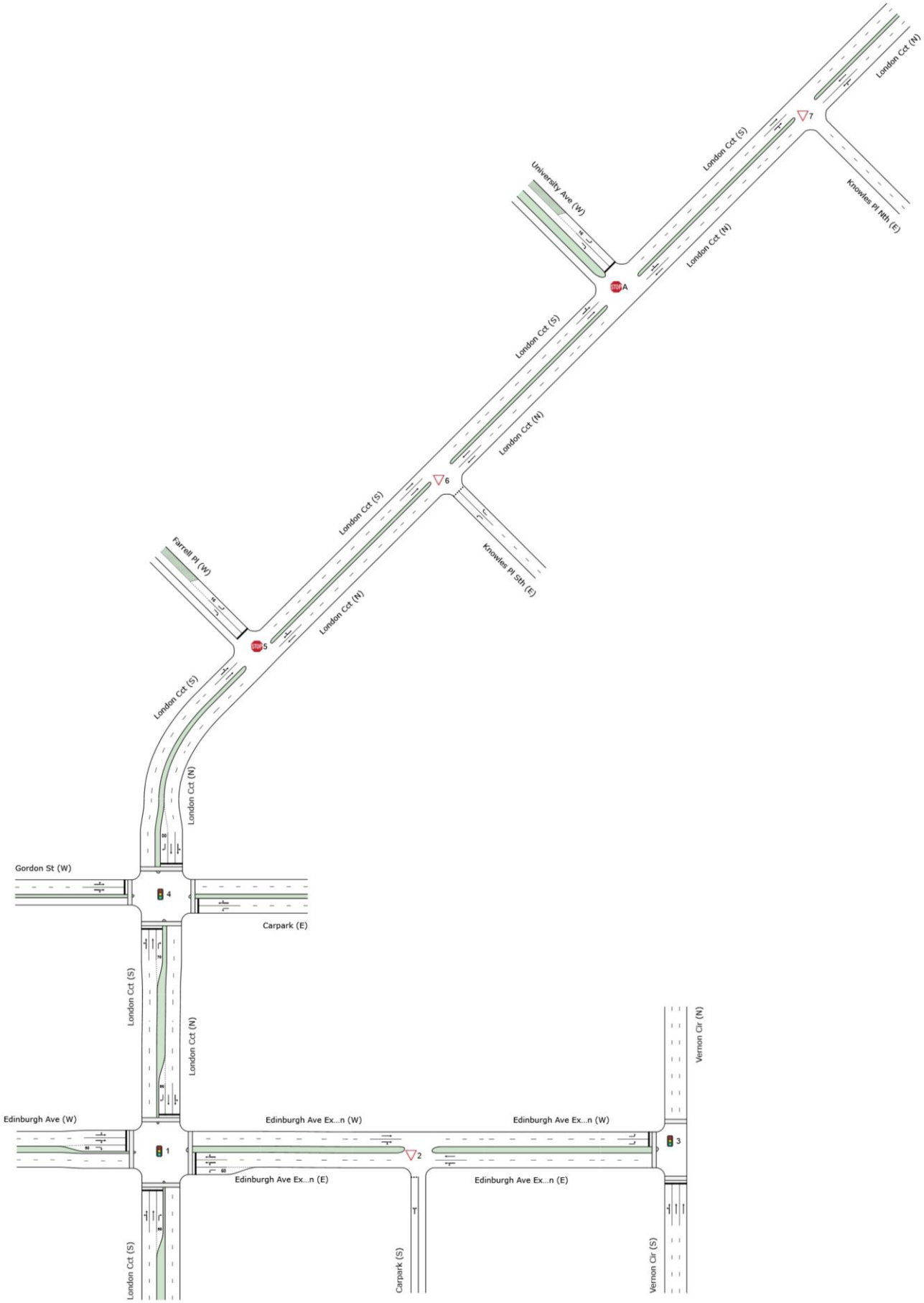


Figure 16: 2031 Do Minimum SIDRA Network Layout

The summary of SIDRA Intersection network results for the *2031 Do Minimum* scenario is shown in Table 6, which indicate that the network generally operates at an acceptable level with all intersections operating at LoS E or better. The intersection of London Circuit with Edinburgh Avenue operates very close to capacity with some individual movements operating at LoS F.

Gordon Street operates with longer average delays than in 2018, but remains at LoS C.

Many of the give-way intersections still have good average delay, however at Farrell Place the right turn out of the side street has performance issues, particularly in the PM peak, where it operates at LoS F.

Table 6: 2031 Do Minimum Intersection Performance Summary

INTERSECTION		AM PEAK			PM PEAK		
		DELAY	LOS	QUEUE	DELAY	LOS	QUEUE
1	London Circuit – Edinburgh Avenue	61.0	E	153.7 (W)	73.8	E	164.3 (S)
2	Edinburgh Avenue ext'n – Knowles Place ext'n	1.9 (20.6)	C*	34.9 (W)	3.7 (27.1)	D*	40.0 (E)
3	Vernon Circle – Edinburgh Avenue ext'n	24.7	C	134.8 (S)	21.6	C	137.0 (S)
4	London Circuit – Gordon Street	24.9	C	60.7 (S)	23.0	C	64.4 (E)
5	London Circuit – Farrell Place	2.3 (26.2)	D*	4.9 (N)	7.2 (82.0)	F*	14.9 (W)
6	London Circuit – Knowles Place (S)	1.9 (22.9)	C*	4.4 (E)	3.7 (20.7)	C*	8.8 (E)
7	London Circuit – University Avenue	1.8 (21.4)	C*	1.9 (N)	5.9 (26.1)	D*	11.3 (W)
8	London Circuit – Knowles Place (N)	1.6 (5.7)	A*	1.8 (S)	1.0 (4.0)	A*	1.9 (S)

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead and the worst movement delay is also shown in parenthesis.

The SIDRA Intersection network layout and lane Level of Service diagrams for 2018 AM and 2018 PM are shown in Figures 17 and 18 respectively.

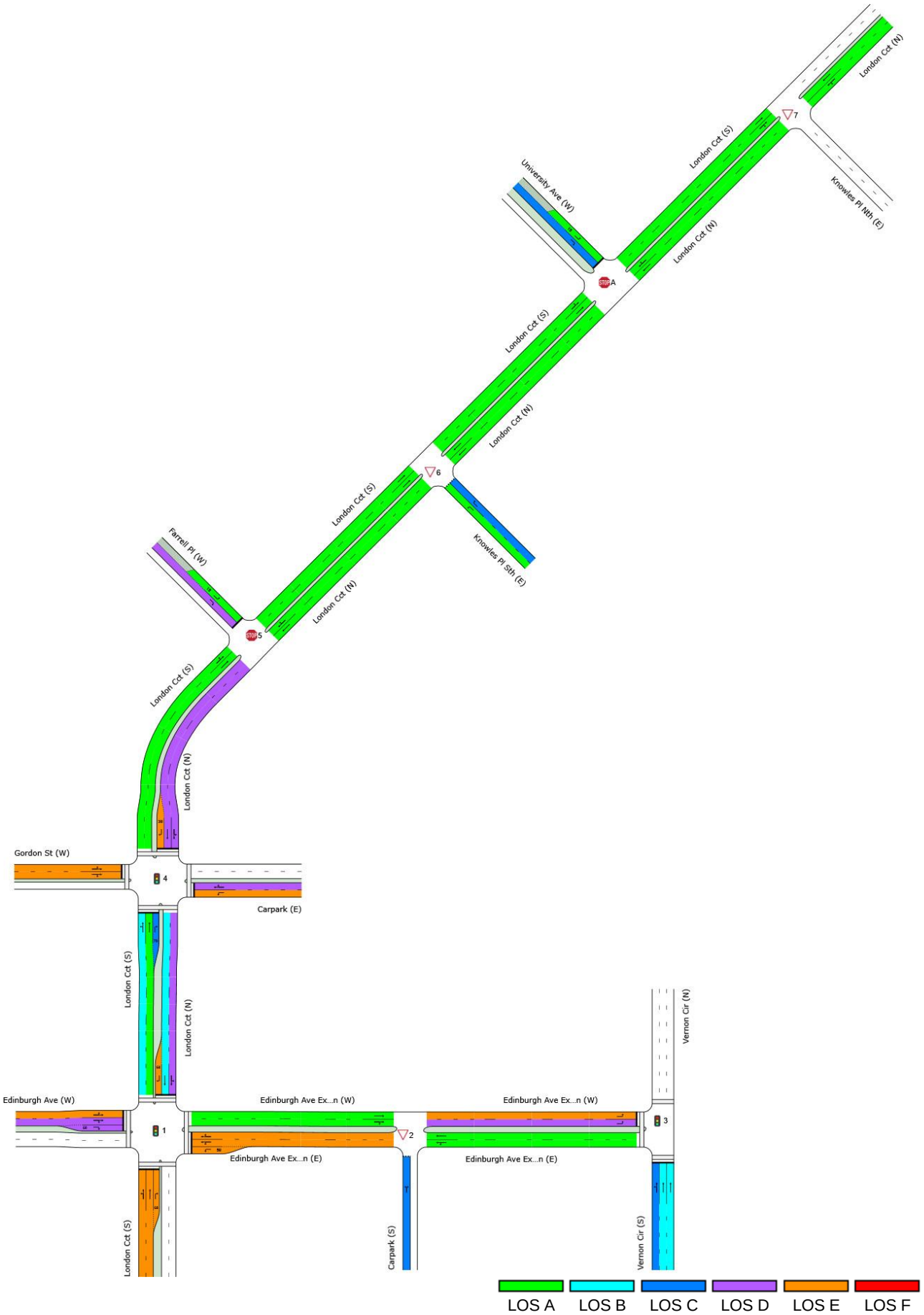


Figure 17: 2031 Do Minimum AM Network Level of Service

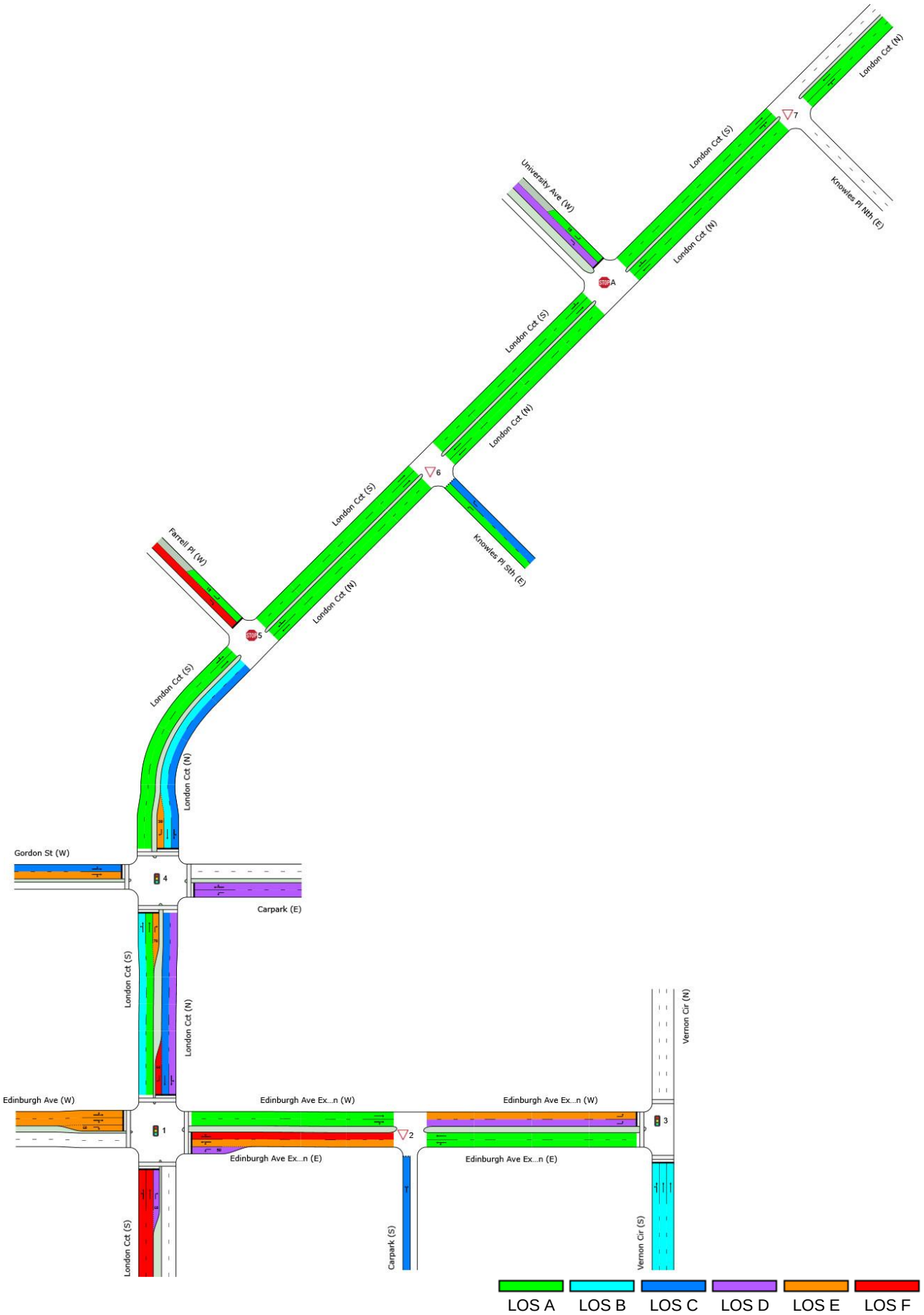


Figure 18: 2031 Do Minimum PM Network Level of Service

5.3 2031 Section 100

The SIDRA Network layout for 2031 Do Minimum scenario is shown in Figure 19. For this scenario, the Knowles Place extension to Edinburgh Avenue extension has been included, with full access to Edinburgh Avenue. Edinburgh Avenue has again been modelled with a similar layout to the Constitution Avenue extension, with two lanes each way for the entire length. There is an additional left turn lane from Edinburgh Avenue extension to London Circuit southbound. To maximise pedestrian safety and accessibility, no left-turn slip lanes have been included and all left turns are signal controlled. At the intersection of Knowles Place and Knowles Place extension (including Section 100 public carpark access,) priority is given to the major traffic movements, which are east-west, to and from the carpark. Knowles Place between London Circuit and Knowles Place extension operates two-way but has Left-In/Left-Out access only at London Circuit.

All other intersections remain as they were in 2018. The potential installation of light rail lines on London Circuit has not been considered.

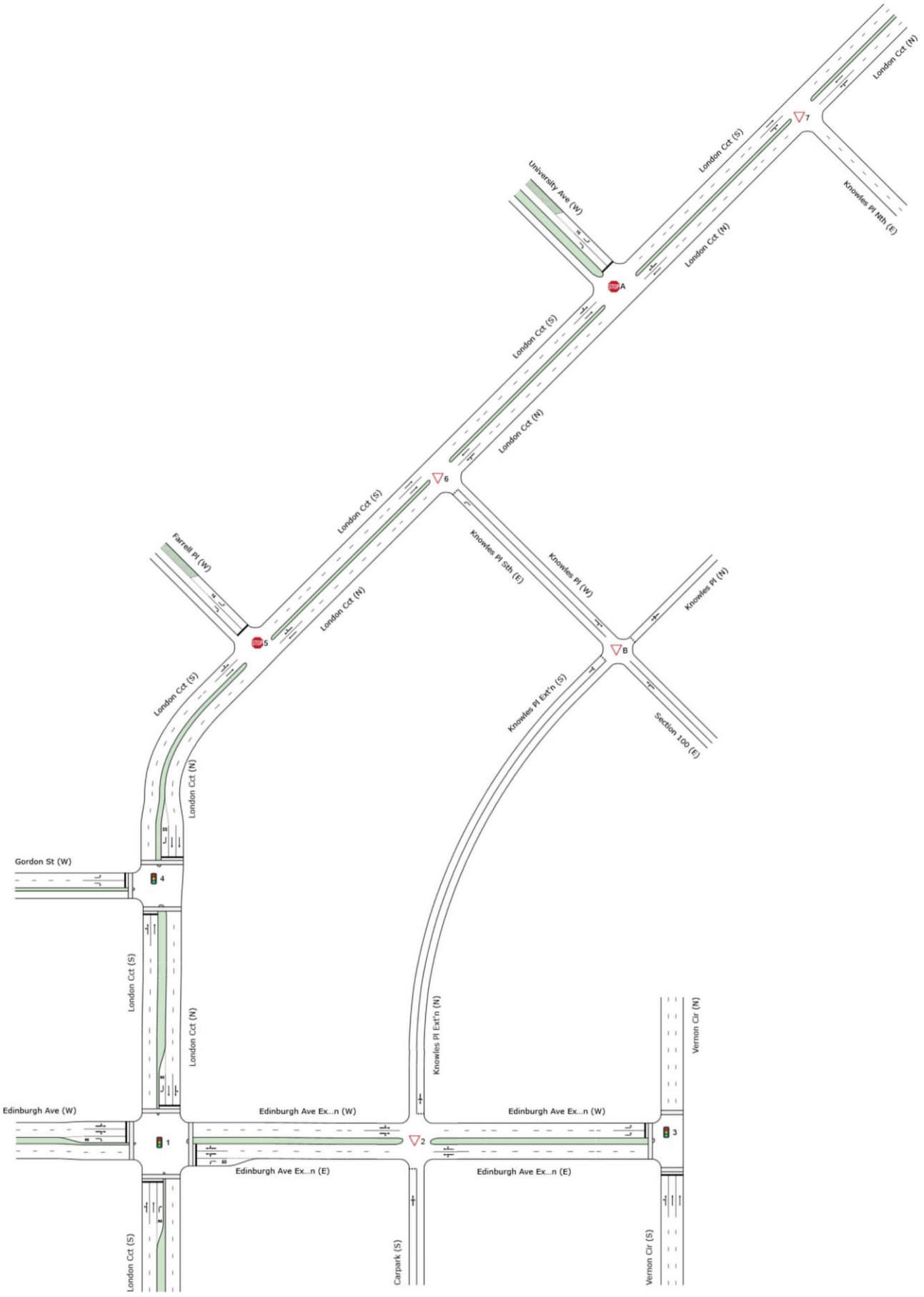


Figure 19: 2031 Section 100 SIDRA Network Layout

The summary of SIDRA Intersection network results for the *2031 Section 100* scenario is shown in Table 7. Two intersections along Edinburgh Avenue have performance issues. The poor performance at Edinburgh Avenue extension – Knowles Place extension is largely confined to the right turns out of Knowles Place extension. The queue generated along Knowles Place extension southbound then has knock-on effects further upstream. The average delay at London Circuit – Edinburgh Avenue has increased only slightly from *2031 Do Minimum*, however the queue that develops on Edinburgh Avenue extension westbound overflows and blocks the Knowles Place extension intersection.

These issues suggest some changes to the road network assumptions to improve performance:

- Provision of only Left-In/Left-Out (LILO) access between Knowles Place extension and Edinburgh Avenue. This would eliminate the right turn delays and the reduction in traffic entering Edinburgh Avenue extension would also reduce the effect of the queue on Vernon Circle. However, it should be noted that this would shift traffic and increase the demand on Knowles Place.
- Provision of two-way access at Knowles Place (north), to allow vehicles leaving the City Block 13 Section 63 car park (adjacent the law courts) direct access to London Circuit. Knowles Place along the front of the law courts can remain one-way. This will reduce traffic at the Knowles Place – Knowles Place extension intersection.

With the removal of the car park access from the London Circuit – Gordon Street intersection, it is now a three-way intersection and its performance has improved as a result.

The poor performance at University Avenue in the AM peak and Farrell Place in the PM peak is dominated by the right turn out of each side street, being unable to find sufficient gaps in the flow on both directions of London Circuit. Management of or improvement to these intersections might need to be considered, for example coordinated signal control at University Avenue.

Table 7: 2031 With Section 100 Intersection Performance Summary

INTERSECTION		AM PEAK			PM PEAK		
		DELAY	LOS	QUEUE	DELAY	LOS	QUEUE
1	London Circuit – Edinburgh Avenue	76.0	E	203.8 (S)	60.9	E	152.0 (S)
2	Edinburgh Avenue ext'n – Knowles Place ext'n	>1,000 (>1,000)	F*	139.9 (N)	>1,000 (>1,000)	F*	189.7 (S)
3	Vernon Circle – Edinburgh Avenue ext'n	18.2	B	196.9 (S)	17.0	B	126.3 (S)
4	London Circuit – Gordon Street	8.9	A	41.1 (S)	9.1	A	36.4 (N)
5	London Circuit – Farrell Place	4.6 (48.7)	E*	10.3 (N)	280.2 (>1,000)	F*	323.0 (W)
6	London Circuit – Knowles Place (S)	1.8 (4.3)	A*	60.0 (N)	2.3 (4.3)	A*	60.0 (N)
7	London Circuit – University Avenue	58.1 (431.2)	F*	132.3 (W)	5.0 (15.1)	C*	60.0 (N)
8	London Circuit – Knowles Place (N)	2.9 (3.4)	A*	>1,000 (N)	1.7 (4.1)	A*	>1,000 (N)
9	Knowles Place – Knowles Place ext'n	201.1 (492.0)	F*	>1,000 (E)	168.7 (800.0)	F*	544.4 (E)

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead and the worst movement delay is also shown in parenthesis.

The SIDRA Intersection network layout and lane Level of Service diagrams for 2018 AM and 2018 PM are shown in Figures 20 and 21 respectively.

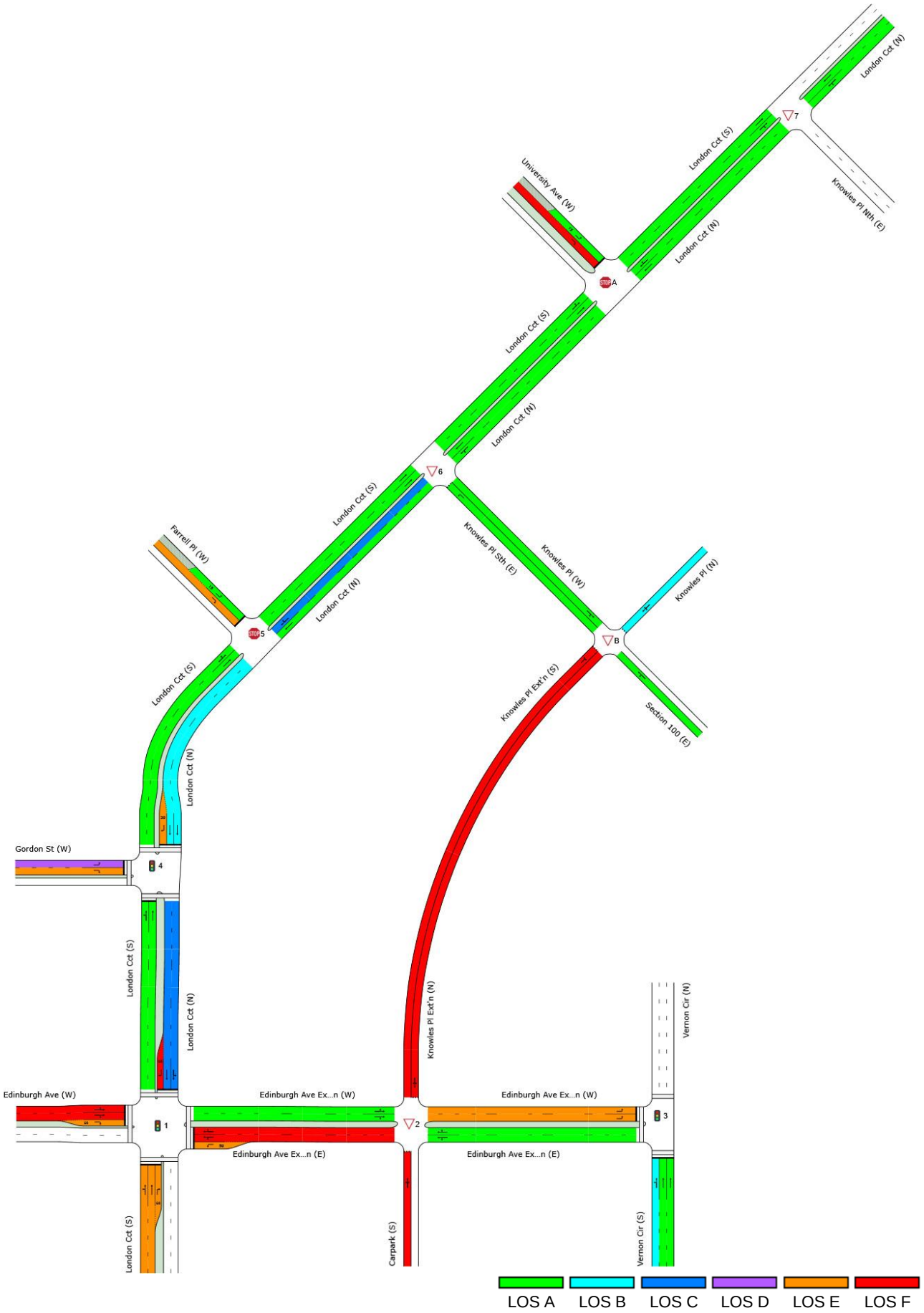


Figure 20: 2031 With Section 100 AM Network Level of Service

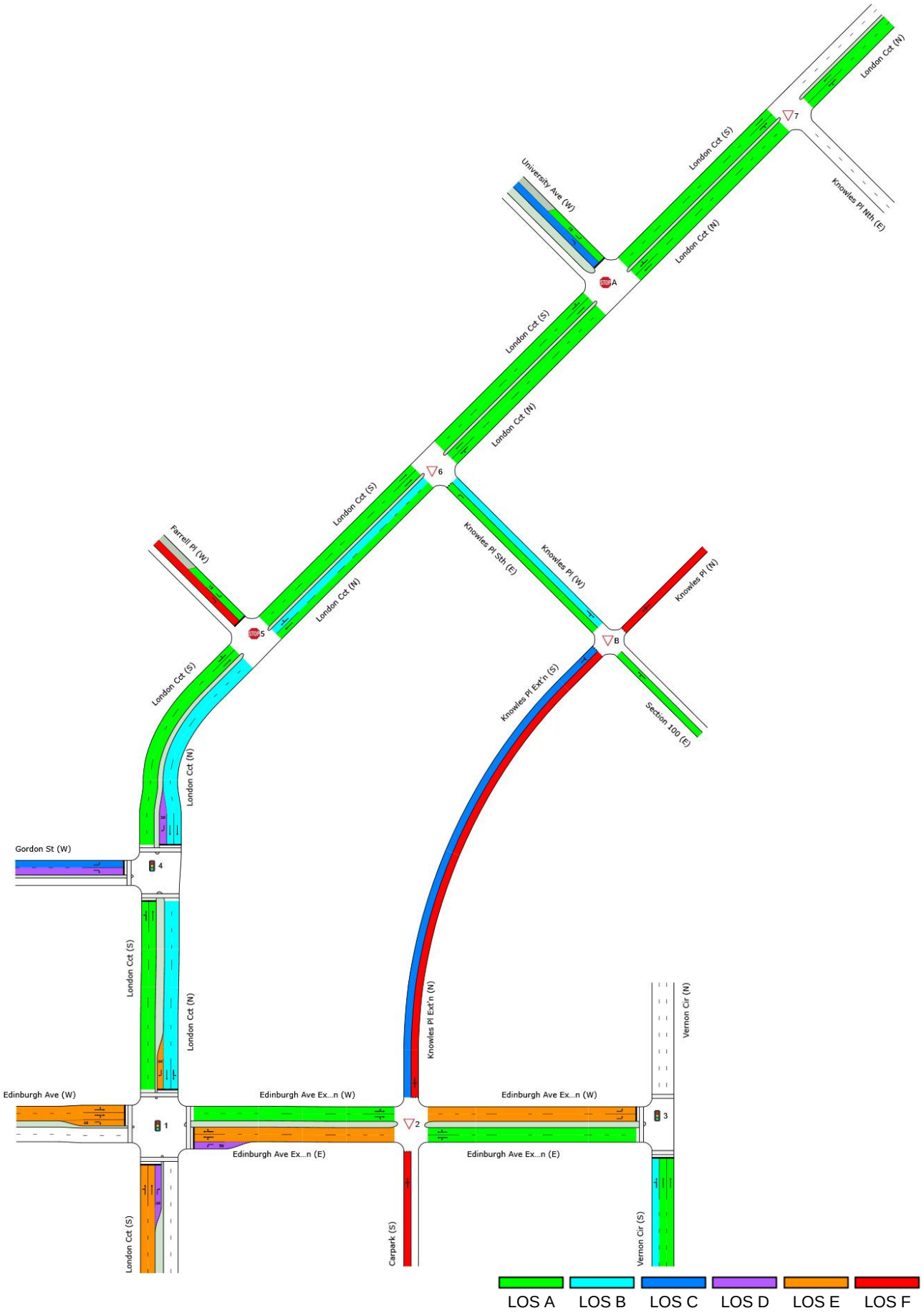


Figure 21: 2031 With Section 100 PM Network Level of Service

5.4 Intersection Modelling Summary

Table 8 shows a comparison of the 2031 Do Minimum and Section 100 intersection analysis results. In the 2031 Do Minimum scenario, the following intersections operate below an acceptable LoS:

- London Circuit – Farrell Place (PM peak right turn out of Farrell Place only)
- London Circuit – Edinburgh Avenue (operates close to capacity with some movements at LoS F)

The development of Section 100, using the trip generation rates and road network assumptions discussed earlier, would cause the following intersections to fall below an acceptable LoS:

- Edinburgh Avenue extension – Knowles Place extension (AM and PM peaks)
- London Circuit – University Avenue (AM peak right turn out of University Avenue)

The intersections of London Circuit with Farrell Place and University Avenue have been modelled as priority controlled, as per their current layout. It is possible that the construction of LRS2 will lead to changes to these intersections as it is unlikely that priority controlled vehicle movements will be permitted across the light rail route.

In addition, the new intersection between Knowles Place and Knowles Place extension is expected to operate at LoS F in 2031.

The new intersection of Edinburgh Avenue extension with London Circuit is expected to operate at LoS E in all future scenarios.

Table 8: 2031 Intersection Performance Summary Comparison

INTERSECTION		AM PEAK				PM PEAK			
		DO MINIMUM		SECTION 100		DO MINIMUM		SECTION 100	
		DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1	London Circuit – Edinburgh Avenue	61.0	E	76.0	E	73.8	E	60.9	E
2	Edinburgh Avenue ext'n – Knowles Place ext'n	1.9 (20.6)	C*	>1,000 (>1,000)	F*	3.7 (27.1)	D*	>1,000 (>1,000)	F*
3	Vernon Circle – Edinburgh Avenue ext'n	24.7	C	18.2	B	21.6	C	17.0	B
4	London Circuit – Gordon Street	24.9	C	8.9	A	23.0	C	9.1	A
5	London Circuit – Farrell Place	2.3 (26.2)	D*	4.6 (48.7)	E*	7.2 (82.0)	F*	280.2 (>1,000)	F*
6	London Circuit – Knowles Place (S)	1.9 (22.9)	C*	1.8 (4.3)	A*	3.7 (20.7)	C*	2.3 (4.3)	A*
7	London Circuit – University Avenue	1.8 (21.4)	C*	58.1 (431.2)	F*	5.9 (26.1)	D*	5.0 (15.1)	C*
8	London Circuit – Knowles Place (N)	1.6 (5.7)	A*	2.9 (3.4)	A*	1.0 (4.0)	A*	1.7 (4.1)	A*
9	Knowles Place – Knowles Place ext'n	-	-	201.1 (492.0)	F*	-	-	168.7 (800.0)	F*

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead.

The SIDRA Intersection analysis of City Section 100 indicates the following:

- Performance in the area is quite good in 2018.
- There is a significant increase in delay at some intersections between 2018 and 2031, before considering any additional development in Section 100. Most intersections continue to operate reasonably well overall, however turning right out of some side streets would be difficult. In particular, the right turn out of Farrell Place in the PM peak operates at LoS F. The intersection of London Circuit with Edinburgh Avenue operates very close to capacity and some movements operate at LoS F.
- The addition of land use and Knowles Place extension in the *2031 Section 100* scenario will require careful thought regarding the network connectivity and the routes vehicles will be allowed to use to enter and exit the precinct. The London Circuit – Edinburgh Avenue intersection experiences an impact in the AM peak, although it still operates at LoS E, while the additional traffic on Edinburgh Avenue extension means that the right turns out of both sides of Knowles Place extension operate very poorly. The queue from the right turn out of Knowles Place extension causes substantial queueing inside the Section 100 development area and may cause issues with driveway access to the basement parking areas.
- The traffic generated by Section 100 causes additional delays for traffic turning right out of University Avenue onto London Circuit, particularly in the AM peak, and the access arrangements at this intersection will need to be reviewed.
- Some possible improvements to the proposed *2031 Section 100* road network have been identified:
  - Allow only Left-In/Left-Out access to Knowles Place extension where it meets Edinburgh Avenue extension.
  - Allow two-way access on Knowles Place north so that vehicles leaving the existing law courts car park do not have to travel south on Knowles Place to access London Circuit.
  - Signal control at London Circuit – University Avenue to better control traffic and the intersection's performance.

6 Conclusion

6.1 Summary

SMEC was engaged by Spiire to undertake an assessment of the impact on the road network of traffic generated by a proposed development on Section 100, City. The proposed development includes residential, commercial and retail land uses. The development would be accessed via a new extension of Knowles Place, connecting the existing Knowles Place to the proposed Edinburgh Avenue extension to Vernon Circle. The existing car parking on the site, currently accessed via Gordon Street, would be accessed via Knowles Place.

SMEC generated traffic volumes in accordance with ACT and RMS published generation rates. The traffic was distributed using ITE published proportions. The generated traffic was assigned to the Canberra road network using the CSTM, which distributes trips across the whole urban area. This process allows the redistribution of trips caused by increased congestion or displaced trip ends to be accurately modelled.

The CSTM results showed that the increased traffic is confined to a relatively small area on the western side of Civic and Acton. The increased traffic causes the western part of Vernon Circle and the Knowles Place extension to operate over capacity. All other roads in the area do not operate over capacity after the proposed development.

The CSTM outputs were used in conjunction with SCATS traffic counts supplied by TCCS to conduct intersection modelling using SIDRA Network. SIDRA Network allows closely spaced intersections to be modelled by quantifying the effects of platoons and queues on adjacent intersections in the network.

Intersection layouts for the future scenarios were developed using the assumptions made at Constitution Avenue extension as a basis and emphasising pedestrian amenity by omitting left-turn slip lanes.

The SIDRA Network analysis showed that the local road network operates well in 2018 but degrades in 2031 Do Minimum and then degrades further with the proposed development at Section 100. In the 2031 Do Minimum scenario, the following intersection already operates at LoS F in at least one of the peak periods:

- London Circuit – Farrell Place (PM peak right turn out of Farrell Place only)
- London Circuit – Edinburgh Avenue (close to capacity with some movements operating at LoS F))

The proposed Section 100 development is expected to further worsen the performance of these intersections and would also cause three more intersections to operate poorly in 2031. These are:

- London Circuit – Edinburgh Avenue (AM Peak, overall LoS E)
- Edinburgh Avenue extension – Knowles Place extension (AM and PM peaks)
- London Circuit – University Avenue (AM peak right turn out of University Avenue only)

Substantial queueing associated with the right turn out of Knowles Place onto Edinburgh Avenue extension will extend back into Section 100 and may interfere with the operation of other intersections and basement parking access driveways.

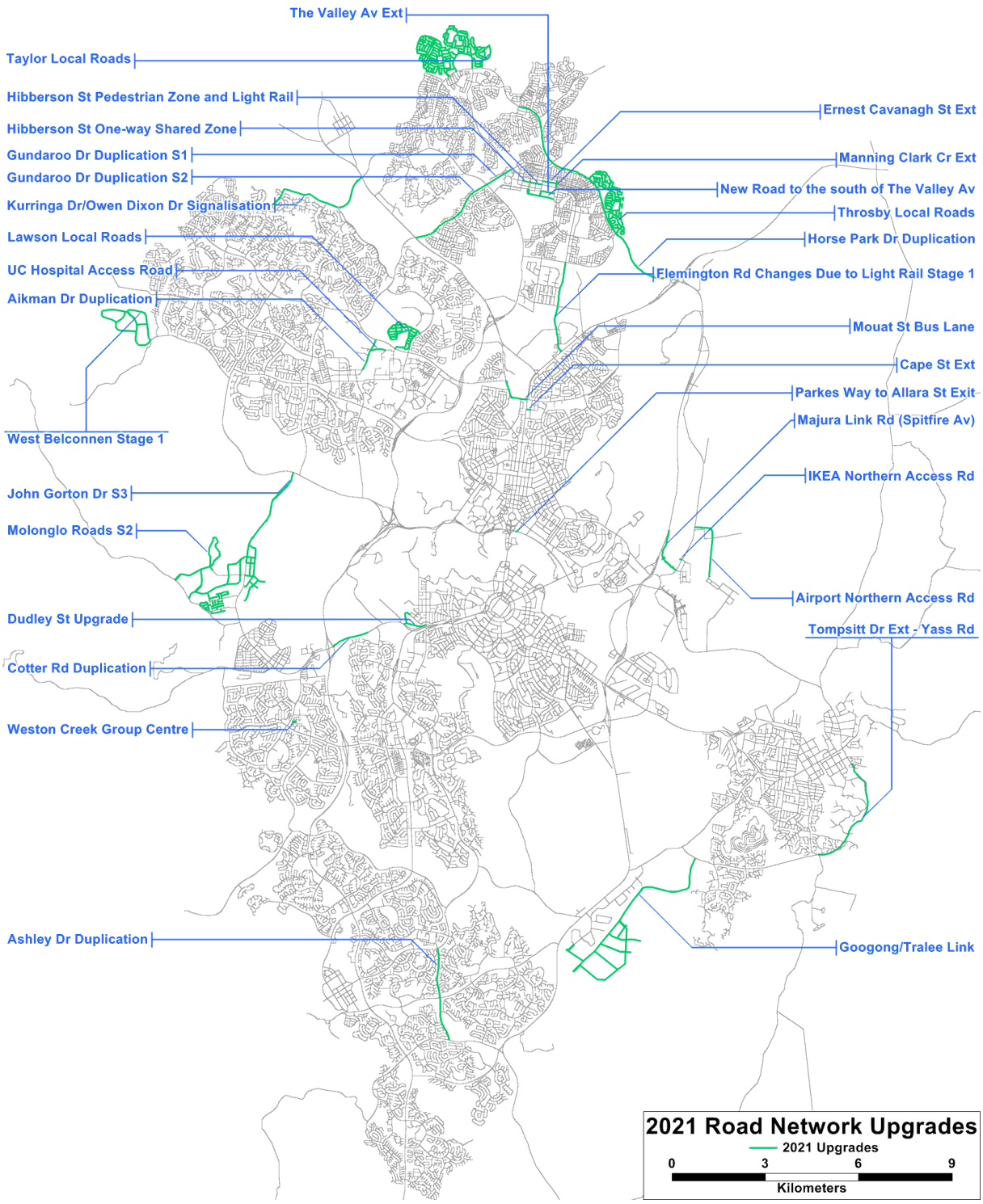
It is expected that the intersections of London Circuit with Farrell Place and University Avenue will be different in the future if LRS2 proceeds but the expected layout of these intersections is not yet known. They may operate at an acceptable LoS in in the LRS2 design.

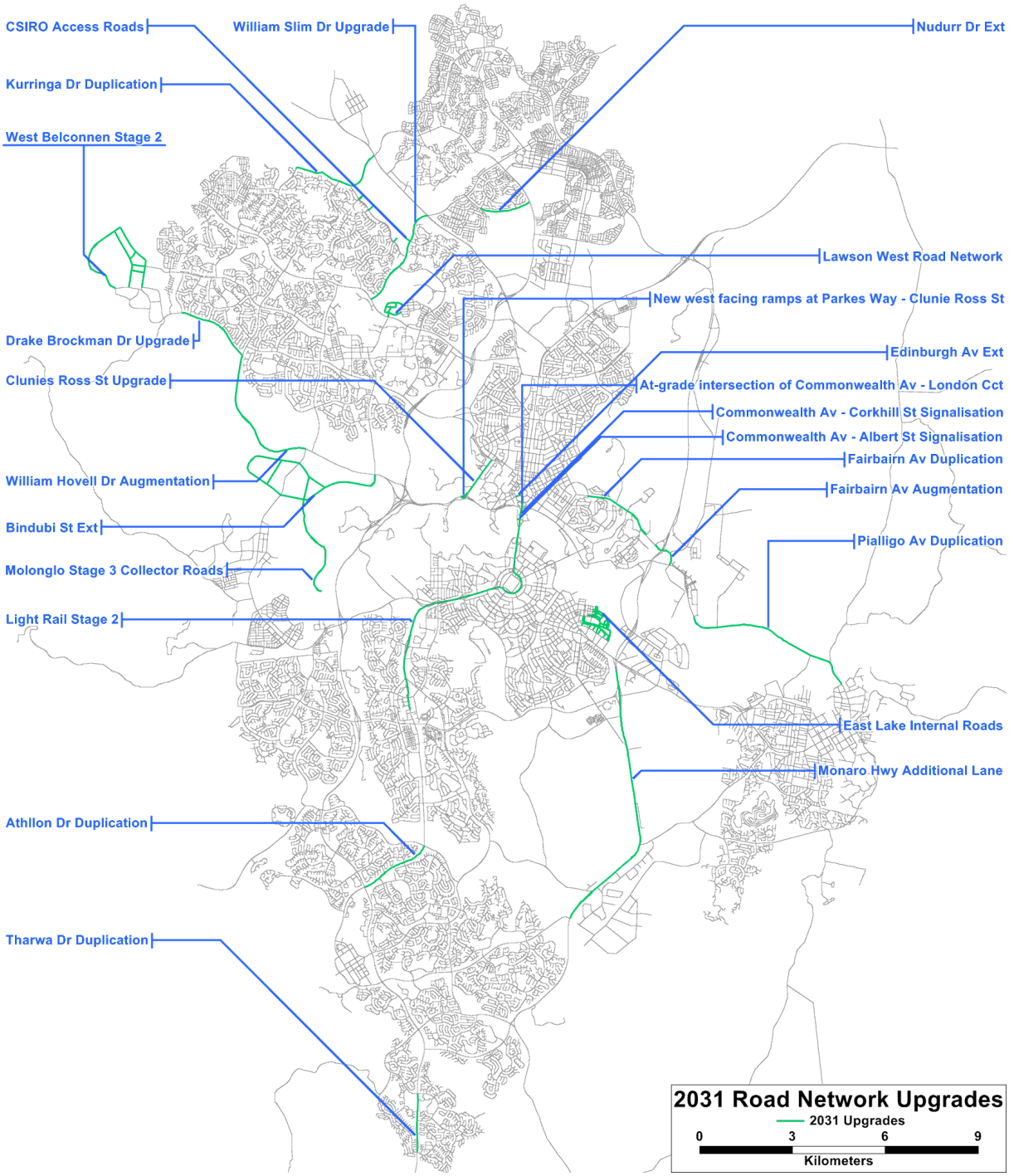
6.2 Recommendations

Based on the outcomes of the transport modelling and analysis, SMEC recommends the following:

- Allow two-way access on Knowles Place north so that vehicles leaving the existing law courts car park do not have to travel south on Knowles Place to access London Circuit.
- Include a continuous median on Edinburgh Avenue extension so that the intersection with Knowles Place extension operates as left-in, left-out only, noting that this will likely increase traffic volumes on London Circuit and the northern end of Knowles Place.

Appendix A Future Road Network Assumptions




CSIRO Access Roads
William Slim Dr Upgrade
Nudurr Dr Ext
Kurringa Dr Duplication
West Belconnen Stage 2
Lawson West Road Network
New west facing ramps at Parkes Way - Clunie Ross St
Drake Brockman Dr Upgrade
Edinburgh Av Ext
Clunies Ross St Upgrade
At-grade intersection of Commonwealth Av - London Cct
Commonwealth Av - Corkhill St Signalisation
Commonwealth Av - Albert St Signalisation
Fairbairn Av Duplication
William Hovell Dr Augmentation
Fairbairn Av Augmentation
Bindubi St Ext
Pialligo Av Duplication
Molonglo Stage 3 Collector Roads
Light Rail Stage 2
East Lake Internal Roads
Monaro Hwy Additional Lane
Athllon Dr Duplication
Tharwa Dr Duplication
2031 Road Network Upgrades
2031 Upgrades
0
3
6
9
Kilometers

Appendix B Intersection Turning Movement Volumes

Appendix C SIDRA Outputs

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Traffic Report

City Section 100 Traffic Study

Prepared for Spiire
13 September 2018

SMEC INTERNAL REF. 3002653.102

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Contents

Appendices

Tables

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1 Introduction

SMEC was commissioned by Spiire Australia Pty Ltd (Spiire) to conduct a traffic study for a proposed development in Section 100, Canberra City. The proposed development includes residential units, commercial space and retail space.

The Section 100 development is a redevelopment of the land currently occupied by a surface car park, which is accessed by the intersection at London Circuit and Gordon Street. The proposed development will provide publicly accessible parking to replace the existing surface parking available at the site.

This study includes traffic generation based on trip generation rates agreed with TCCS, traffic distribution using the Canberra Strategic Transport Model (CSTM) and networked intersection analysis using SIDRA Intersection.

1.1 Project Location

The context and study areas covered by this study are shown in Figure 1.

Figure 1: Context and Study Area

1.2 Objectives

The objectives of this study are to:

- Review existing traffic volumes
- Assess future traffic operations with and without the proposed development
- Provide recommendations about the appropriate intersection arrangements at the proposed development access points and the Edinburgh Avenue extension intersections with London Circuit and Vernon Circle

2 Existing Conditions and Proposed Development

2.1 Site Description and Existing Land Use

City Section 100 has a total area of approximately 25,000 m² and is zoned as a designated area under the National Capital Plan. The site is located in the City Hill precinct and is currently used as a car park, with 730 parking spaces (shown in Figure 1). Under the City Hill precinct controls, the site allows a range of land uses, including residential, retail and commercial.

2.2 Existing Road Network

Section 100 is currently bounded by the following roads:

- London Circuit
- Vernon Circle
- Knowles Place

Current access to Section 100 is via Gordon Street, into the large public car park, and Knowles Place, into the private AFP parking area. The Gordon Street access point is a four-way signalised intersection. Knowles Place operates one-way southbound so vehicles accessing the police car park, at the southern side of the police station, enter at the northern end of Knowles Place and then travel past the ACT Supreme Court to the car park.

Other key roads in the area include:

- Edinburgh Avenue
- Gordon Street
- Farrell Place
- University Avenue

The hierarchy of the roads around the study area is shown in Figure 2. The arterial roads, which allow high capacity travel between districts are Northbourne Avenue, Commonwealth Avenue, Constitution Avenue, Edinburgh Avenue and Parkes Way. Marcus Clarke Street and London Circuit are classified as major collectors, which are intended to connect the arterial network to local districts and should only carry traffic originating or terminating in the local area. University Avenue, McCoy Circuit and Ellery Crescent are classified as minor collectors, which link access streets to the major collector network. All other roads in the area are access streets, which should only carry traffic originating or terminating at land uses on those streets and should not carry any through traffic.

Figure 2: Road Hierarchy

2.3 Proposed Development Land Use

The proposed City Section 100 development includes the land use shown in Table 1.

Table 1: Proposed Section 100 Land Use

LAND USE	QUANTITY
Residential Units	700 dwellings
Commercial Floorspace	38,500 m²
Retail Floorspace	5,322 m²

An additional land use option containing no commercial space and 1,200 residential units was also provided. However, the option shown in Table 1 generates more traffic and has been analysed here to provide a more conservative assessment of the development's traffic impacts.

As noted previously, the existing public parking supply on Section 100 will be incorporated into the basement parking in the development and will remain publicly accessible.

2.4 Proposed Site Access and Internal Road Network

The Section 100 development will be accessible via both Knowles Place and the Edinburgh Avenue extension. The existing access point from the London Circuit – Gordon Street intersection will be removed. The provided public parking will be accessed from the corner of Knowles Place south of the Canberra City Police Station. Knowles Place will be

extended south of this point, connecting to the Edinburgh Avenue extension. This new road will provide midblock driveway access to basement parking for residents and tenants of Section 100.

There will not be any driveway access to the development from London Circuit, Edinburgh Avenue extension or Vernon Circle.

The layout of the development is shown in Figure 3.

Figure 3: City Section 100 Layout (Source: Spiire)

3 Traffic Generation

Traffic generated by the City Section 100 development has been calculated using traffic generation rates from the ACT Estate Development Code and the RMS Guide to Traffic Generating Developments. AM and PM peak proportions have been sourced from the RMS Guide to Traffic Generating Developments and the ITE Trip Generation Manual. Directional ratios for vehicles entering and exiting the development in each peak period have been sourced from the ITE Trip Generation Manual. The vehicle trip rates, directional splits and traffic generated by the development are shown in Table 2.

Table 2: Traffic Generated by Section 100

Land Use	Yield	Peak Period	Trip Rate	Peak Direction	Peak Split	Trips	Notes
Residential	700 units	AM	0.600 /dwelling	In	0.29	122	Rate: Estate Development Code, 10% in AM, ITE 223 Mid-rise Apartment for PM proportion Direction: ITE 223 Mid-rise Apartment
				Out	0.71	298	
		PM	0.756 /dwelling	In	0.59	312	
				Out	0.41	216	
Commercial	38,500 m²	AM	1.45 /100 m²	In	0.88	490	Rate: RMS Office and Commercial (daily rate), ITE 710 General Office Building (peak proportions) Direction: ITE 710 General Office Building
				Out	0.12	67	
		PM	1.39 /100 m²	In	0.17	91	
				Out	0.83	443	
Retail	5,322 m²	AM	6.26 /100 m²	In	0.48	160	Rate: RMS Shopping Centre (specialty shop component) Direction: ITE 826 Specialty Retail Centre
				Out	0.52	173	
		PM	4.60 /100 m²	In	0.56	137	
				Out	0.44	108	
Total		**AM**		**In**		**772**	
				Out		**538**	
				Total		**1,310**	
		PM		**In**		**539**	
				Out		**767**	
				Total		**1,306**	

Note: All trips generated in the table refer to vehicle trips

4 Strategic Transport Modelling

The trip distribution has been conducted using the Canberra Strategic Transport Model (CSTM), which was most recently updated in 2017 using the 2011 Census. This model contains a complete representation of the ACT's road network.

The model is an equilibrium model, in which travel decisions (origin/destination, mode choice, travel route etc.) are related to cost, where the cost of travel is minimised for every road user. As such, any changes to the model inputs and assumptions can have impacts far from where the change was made, with the severity of the change decreasing with distance, as the traffic adjusts and redistributes to minimise the average user cost.

The modelling was conducted for the AM and PM peak periods in the 2016 and 2031 model years. The strategic modelling outputs have been used to calculate growth and distribution of traffic volumes for the intersections surrounding the development.

4.1.1 Model Scenarios

Modelling was conducted for the following scenarios:

- **2018 Base Case**: Current land use and transport network assumptions for 2016, supplemented by SCATS traffic data supplied by TCCS
- **2031 Do Minimum**: All land use and network assumptions already in the CSTM for 2031 but with the Edinburgh Avenue extension included.
- **2031 Section 100**: All land use and network assumptions already in the CSTM for 2031 with the Edinburgh Avenue extension and proposed Section 100 land use and car park access locations included.

Each of these scenarios was tested for both the AM and PM peak periods.

4.2 Model Assumptions

4.2.1 Zone Structure

The City Section 100 development area falls within the existing CSTM Zone 16, as shown on the 2018 Base Case road network in Figure 4. The exact location of the development area is also shown. Zones 15 and 16 currently connect directly to the London Circuit – Gordon Street intersection.

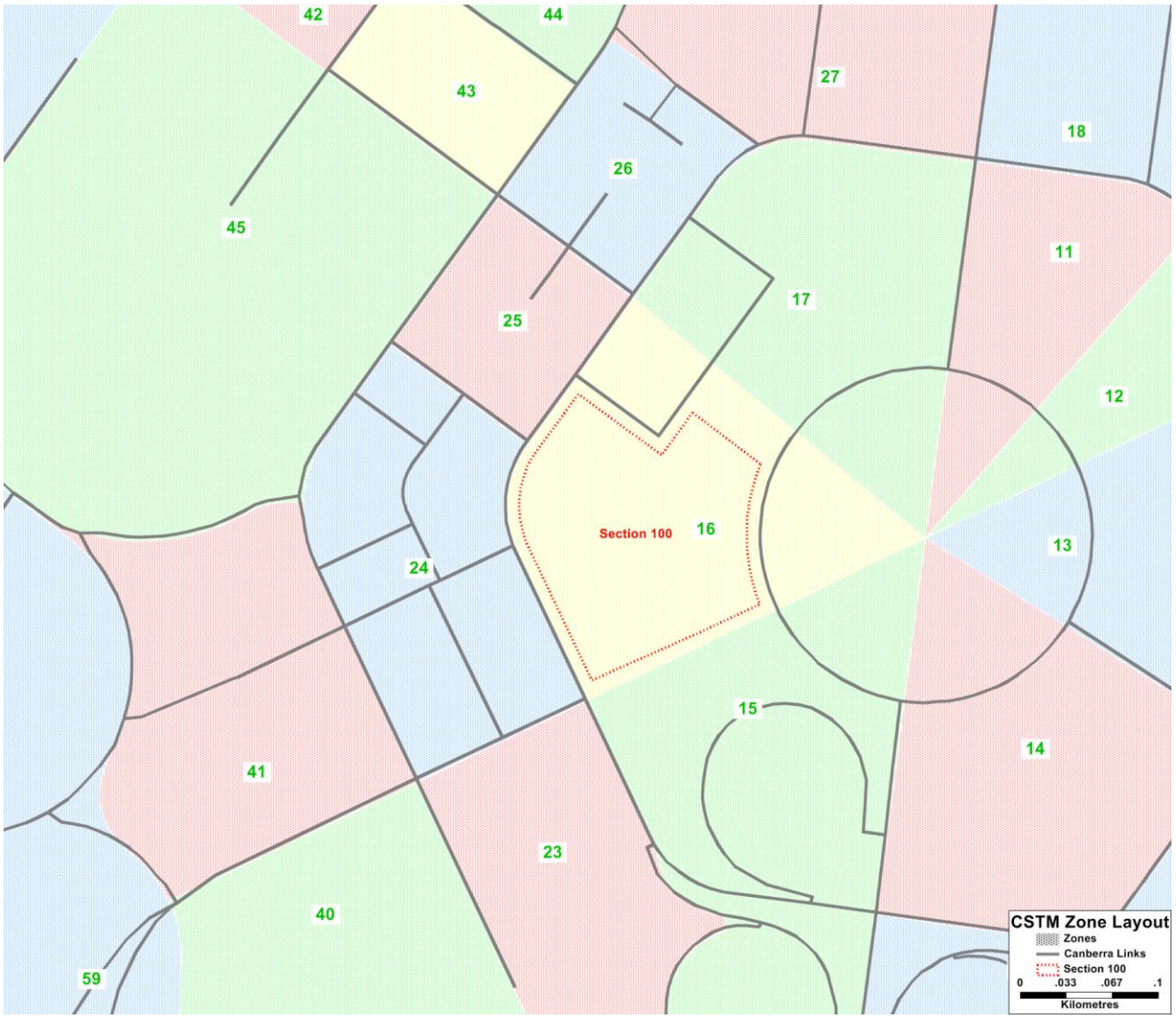


Figure 4: CSTM Zones in Development Area

In *2018 Base Case*, Zones 15 and 16 both access the road network by the intersection of London Circuit and Gordon Street.

In *2031 Do Minimum*, Zone 15 accesses the road network via a connection to Edinburgh Avenue extension, while Zone 16 remains connected to London Circuit – Gordon Street.

For the *2031 With Section 100* scenario, the proposed developments within Section 100 required the addition of a new zone (Zone 900) to the CSTM. The existing Zones 15 and 16 are shown in Figure 5 with the new connection for Zone 900 on Knowles Place extension. Zone 15 is now separated from Zone 16 by Edinburgh Avenue extension and connects to it directly. Zone 16 now represents the existing public parking capacity that is incorporated into the Section 100 development, so its connector has been moved to the corner of Knowles Place, south of the Canberra City Police Station, where the access driveway is expected to be located.

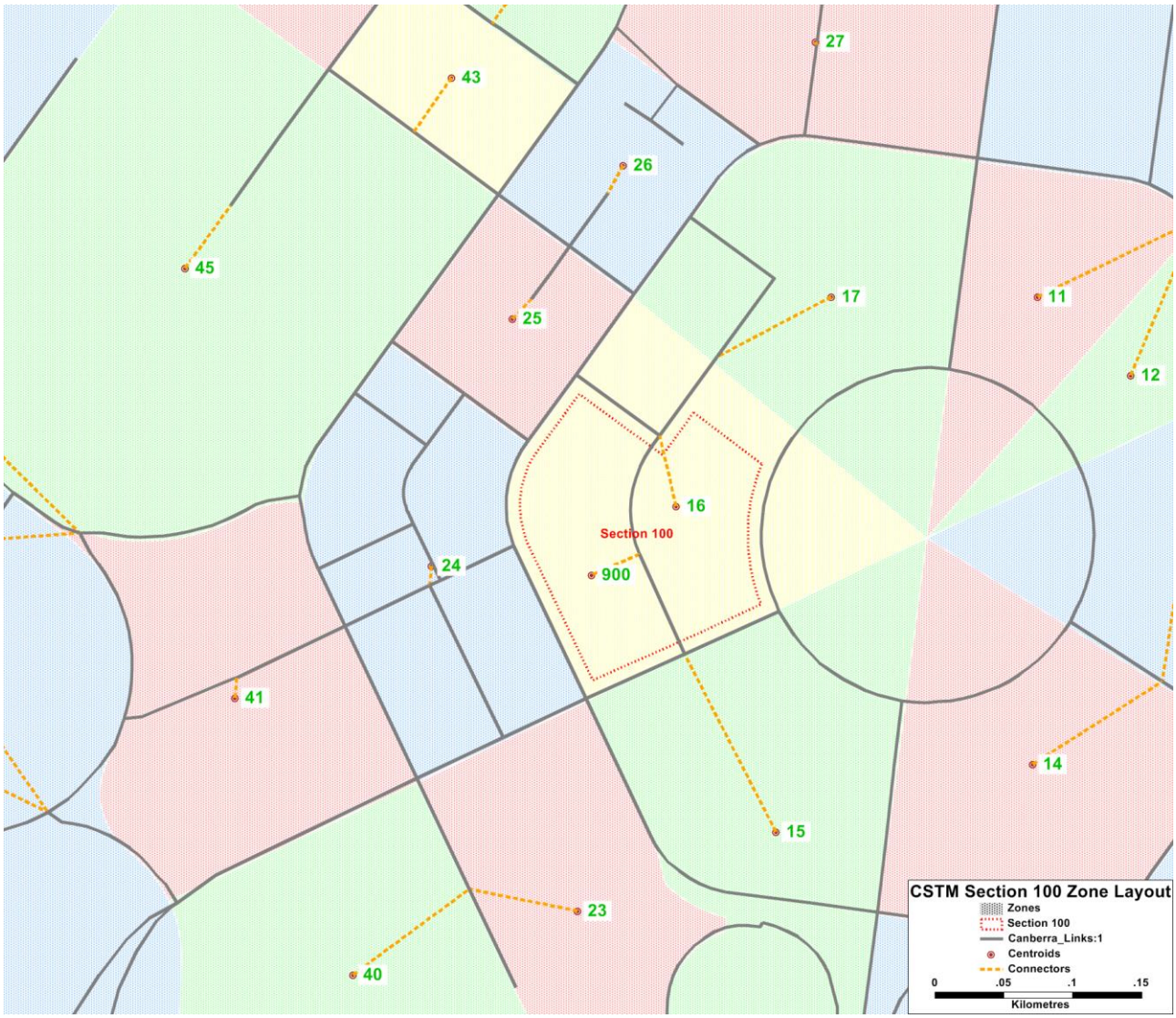


Figure 5: Updated Zone Connectors

4.2.2 Road Network

The road network infrastructure improvements assumed to be present in each year from 2016 to 2031 were confirmed with TCCS in 2017, when the current version of the CSTM was completed. Diagrams showing the upgrades in 2021 and 2031 are included in Appendix A.

Intersections are represented in the CSTM at a high level, with those that require vehicles to stop or give way being modelled through a reduction in capacity on the approaching roads. No discrimination is made by intersection control method.

4.2.3 Public Transport

The public transport network in 2021 onwards is based on ACTION's proposed Network 2018 provided to SMEC in March 2017, with the addition of Light Rail Stage 1 (LRS1) and the removal of bus routes operating along the LRS1 corridor. Stage 2 (LRS2) is added in 2031. Light Rail Stage 2 (LRS2) is included in the CSTM using broad assumptions made in 2017 about route, stop location and service frequency.

4.2.4 Parking Capacity

The CSTM contains parking capacity for each of the zones within the City, so that car trips to and from the City are distributed only to locations where parking is available. The existing parking capacity has been retained in zones 15 and 16. A new zone (Zone 900) was created for Section 100, which is not part of this parking distribution. As such, the traffic generated by Section 100 remains in Zone 900, while no other City traffic is moved into it.

4.2.5 Land Use

The base land use data was provided by TCCS and is dated 13 April 2017. The land use assumption for the *2031 Do Minimum* scenario is shown in Table 3. For this scenario, Zone 16 is assumed to be still operating as a surface car park with no development on the site.

Table 3: CSTM 2031 Do Minimum Land Use

Zone	Description	Population	Employment	Retail Space	School Enrolments	Tertiary Enrolments
15	City	350	500	0	0	0
16	City	0	0	0	0	0

For the *2031 Section 100* scenario, the base land use in Zones 15 and 16 is the same as in *2031 Do Minimum*. A new zone (Zone 900) was created to contain the Section 100 land use and to explicitly generate the number of car trips calculated in Table 2. Due to the way the CSTM operates, this modelled land use is not identical to the proposed land use in Table 2, but does generate the required number of car trips after the CSTM's specific trip generation and mode split calculations have been completed.

4.3 Strategic Transport Modelling Results

Diagrams extracted from the CSTM for each scenario are shown in the following sections. These show the hourly peak volumes and volume/capacity ratios, as well as peak volume differences between scenarios. The peak traffic difference (compared to the Base Case) are included for the 2031 With Section 100 scenario.

4.3.1 2016 Base Case

The *2016 Base Case* hourly flow diagrams for AM and PM are shown in Figure 6 and Figure 7, respectively.

In the 2016 AM peak period, most of the road network around the Section 100 site operates well, with a few roads operating near capacity. Edinburgh Avenue, west of McCoy Circuit, is over capacity. Marcus Clarke Street between Edinburgh Avenue and Gordon Street, the ramps between London Circuit and Commonwealth Avenue, Northbourne Avenue north of London Circuit and most of Vernon Circle operate very close to their capacity. London Circuit between Edinburgh Avenue and Northbourne Avenue operates below 70% of its capacity.

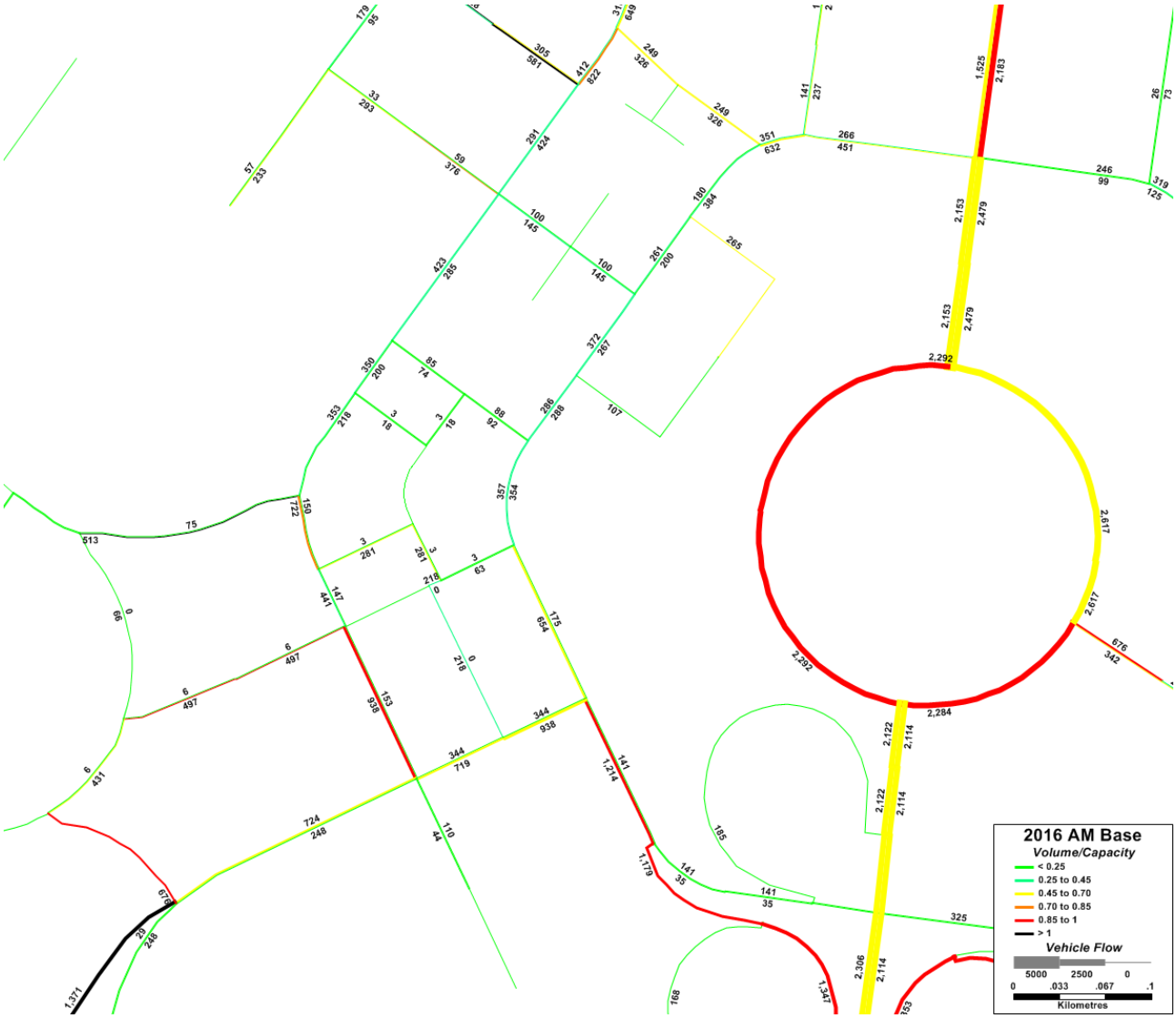


Figure 6: 2016 Base Case AM Hourly Flow and V/C

In the 2016 PM peak period, all of the local network operates well, except for Vernon Circle, which operates just over its modelled capacity, which is 2,300 vehicles per hour. The volume on Vernon Circle only increases by 15 vehicles per hour compared to the AM peak but crosses the capacity threshold.

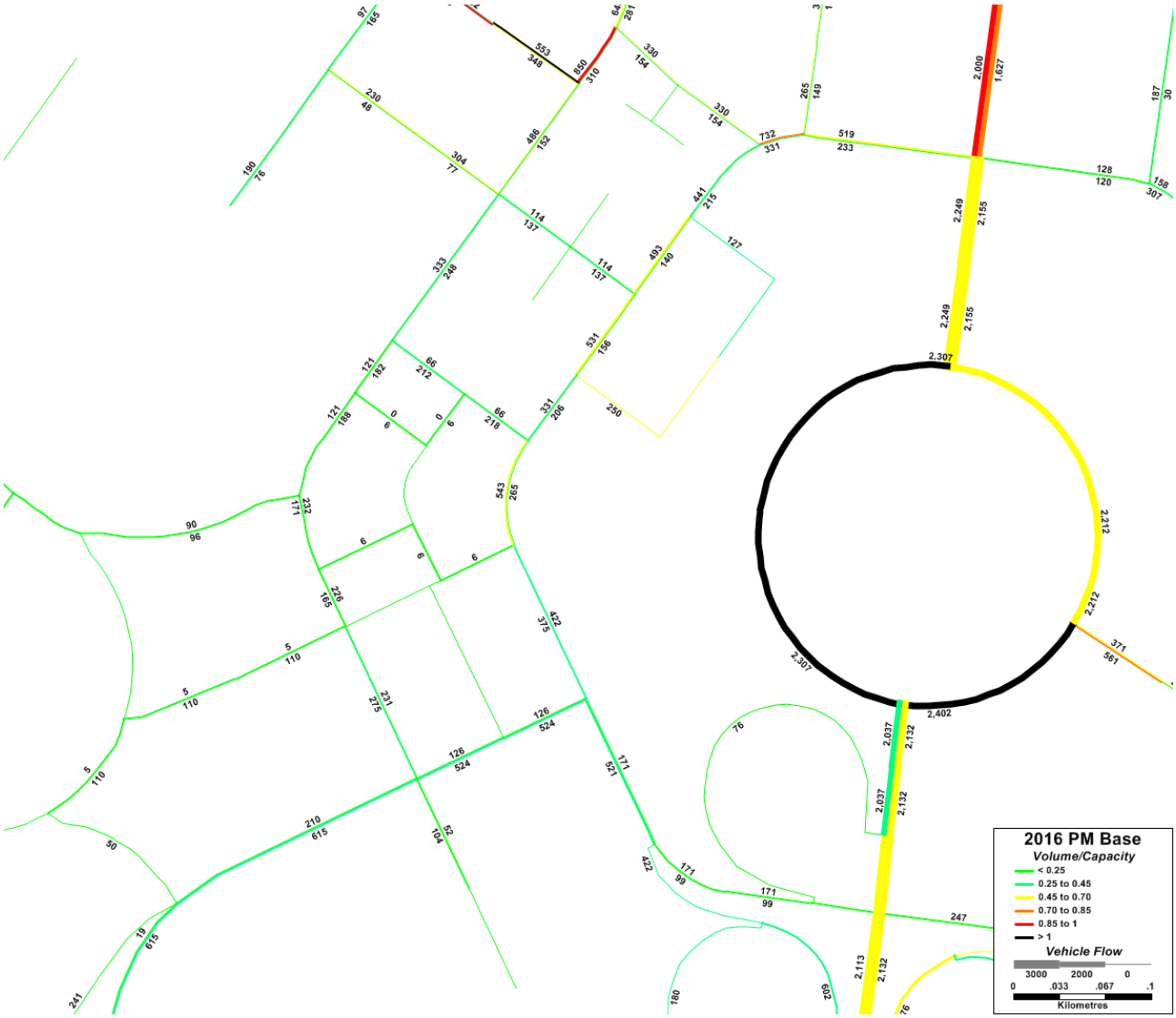


Figure 7: 2016 Base Case PM Hourly Flow and V/C

4.3.2 2031 Do Minimum

The *2031 Do Minimum* scenario includes the extension of Edinburgh Avenue from London Circuit to Vernon Circle, which leads to significant traffic redistribution around the study area.

There appears to be some travel from east to west from Constitution Avenue to Edinburgh Avenue via Vernon Circle. This movement requires many lane changes across a short distance and is likely to be unsafe.

Traffic volumes northbound on Commonwealth Avenue are lower than in 2016 due to the reduced capacity caused by intersections associated with West Basin and the conversion of the London Circuit grade separation to an at-grade intersection. Edinburgh Avenue, west of McCoy Circuit, McCoy Circuit, Gordon Street and Ellery Crescent are all over capacity. London Circuit is generally below 70% of capacity, with some sections near Northbourne Avenue operating below 85% of capacity.

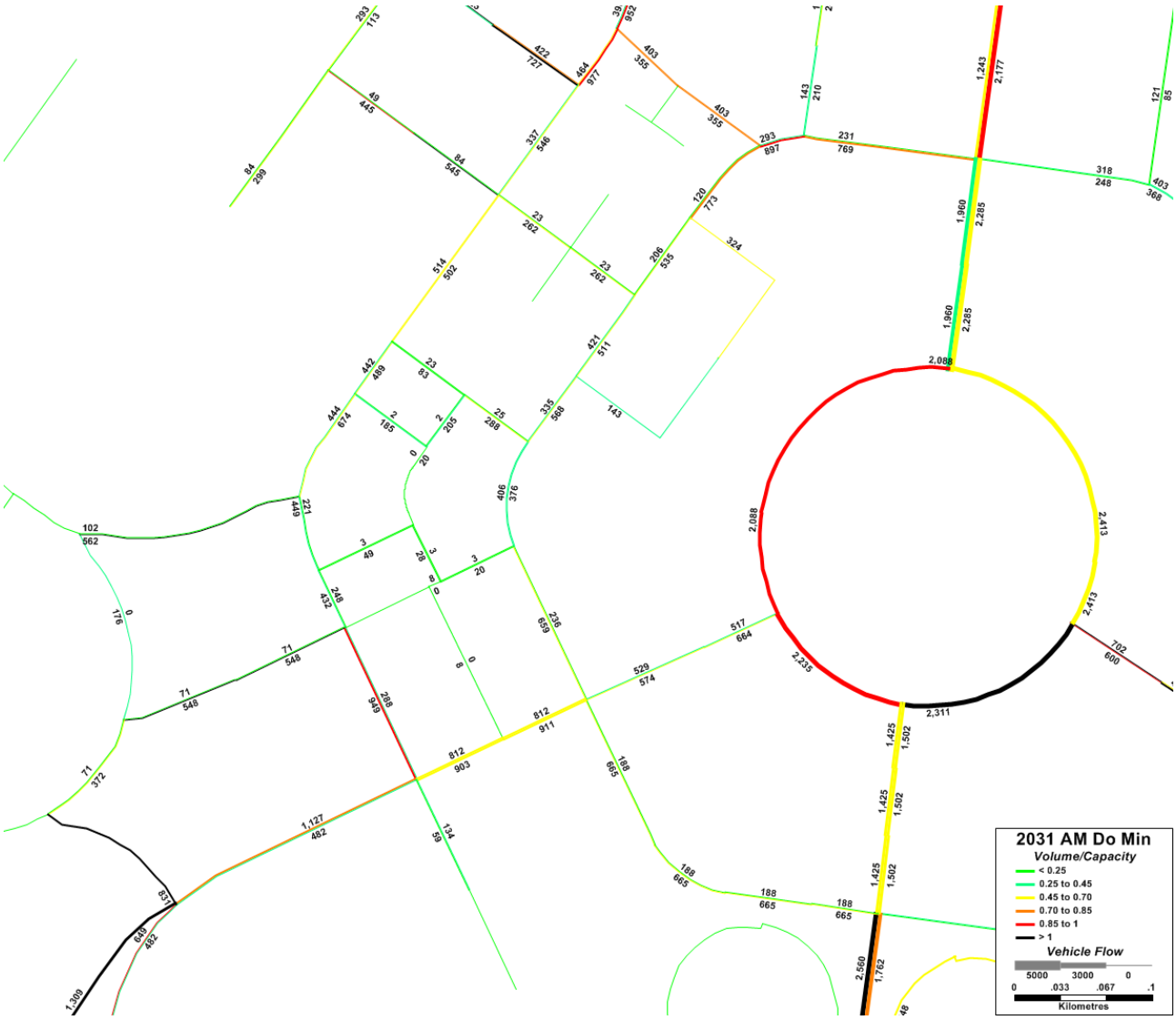


Figure 8: 2031 Do Minimum AM Hourly Flow and V/C

In the 2031 Do Minimum PM peak, Edinburgh Avenue, west of London Circuit operates between 45-85% of capacity, as does London Circuit, between Commonwealth Avenue and Knowles Place. The Edinburgh Avenue extension operates very well northbound and below 70% of capacity southbound. Vernon Circle, between Constitution Avenue and Edinburgh Avenue operates over capacity, while the section between Edinburgh Avenue and Northbourne Avenue operates above 85% of capacity.

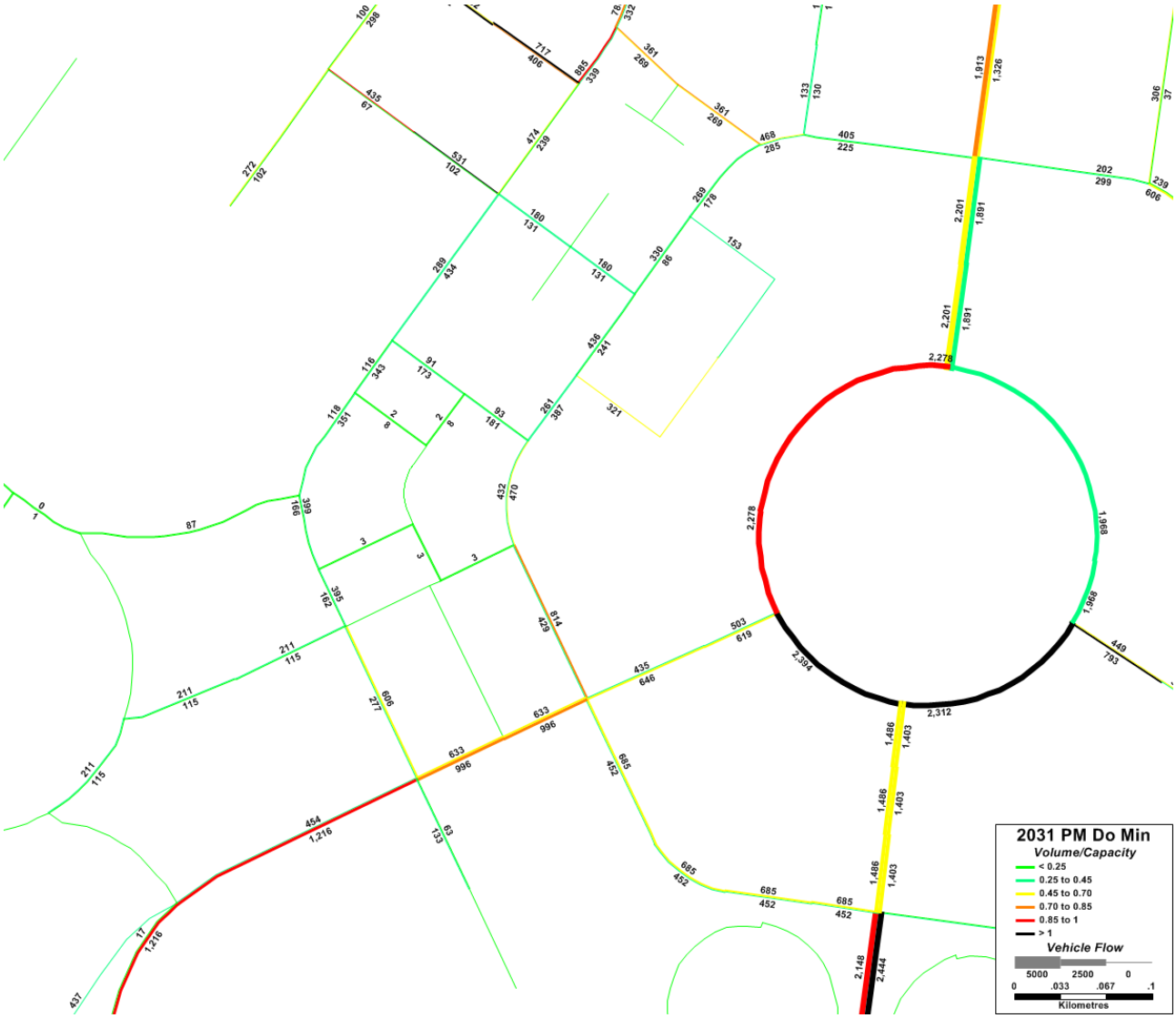


Figure 9: 2031 Do Minimum PM Hourly Flow and V/C

4.3.3 2031 Section 100

The *2031 Section 100* scenario includes the extension of Knowles Place to intersect the Edinburgh Avenue extension and converts the existing southern part of Knowles Place to two-way operation. Along with the Section 100 land use, there are substantial changes to the traffic volume and distribution in the area. The traffic volume differences between the 2031 Do Minimum and 2031 With Section 100 scenarios have also been included.

In the 2031 With Section 100 AM peak period, shown in Figure 10, there is an increase in congestion around the study area. Knowles Place and Knowles Place extension both operate over capacity. Congestion on the eastern side of Vernon Circle (southbound) has decreased but the section between Commonwealth Avenue and Edinburgh Avenue extension operates over capacity. Edinburgh Avenue extension, between Vernon Circle and Knowles Place extension operates above 85% of capacity.

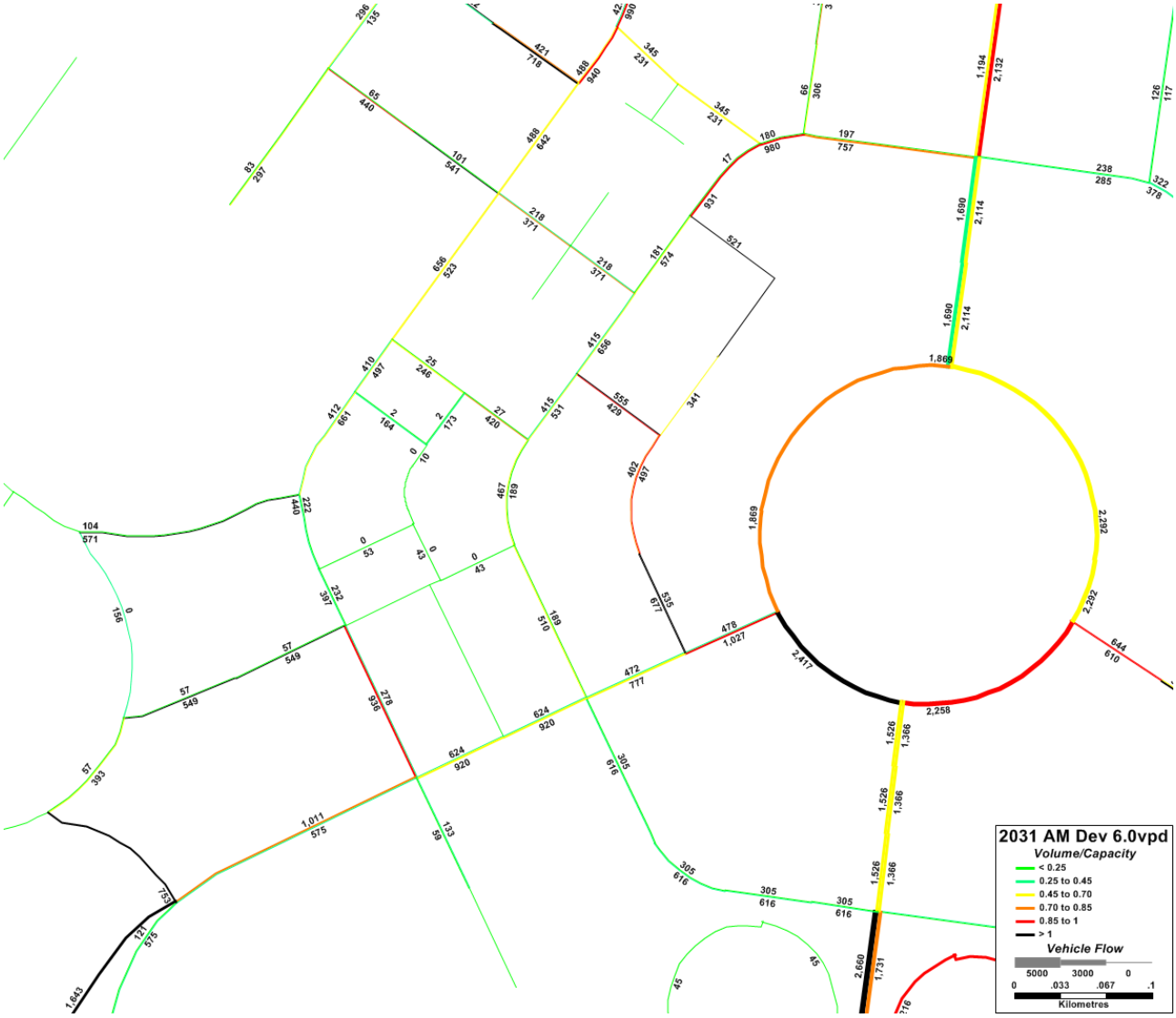


Figure 10: 2031 With Section 100 AM Hourly Flow and V/C

Figure 11 shows the flow differences between 2031 Do Minimum and 2031 With Section 100 in the AM peak period. There is a decrease in traffic on most of Vernon Circle and Northbourne Avenue, which is likely caused by the additional traffic on Commonwealth Avenue and Vernon Circle, south of Edinburgh Avenue, which is travelling to Section 100. There are increases to traffic volumes on Commonwealth Avenue northbound, part of Vernon Circle, Edinburgh Avenue extension, Knowles Place, Knowles Place extension, Farrell Place, University Avenue and parts of Marcus Clarke Street and London Circuit, likely from traffic travelling between Section 100 and Belconnen. Outside of the immediate area shown in Figure 11, volume changes on roads is less than 50 vehicles per hour.

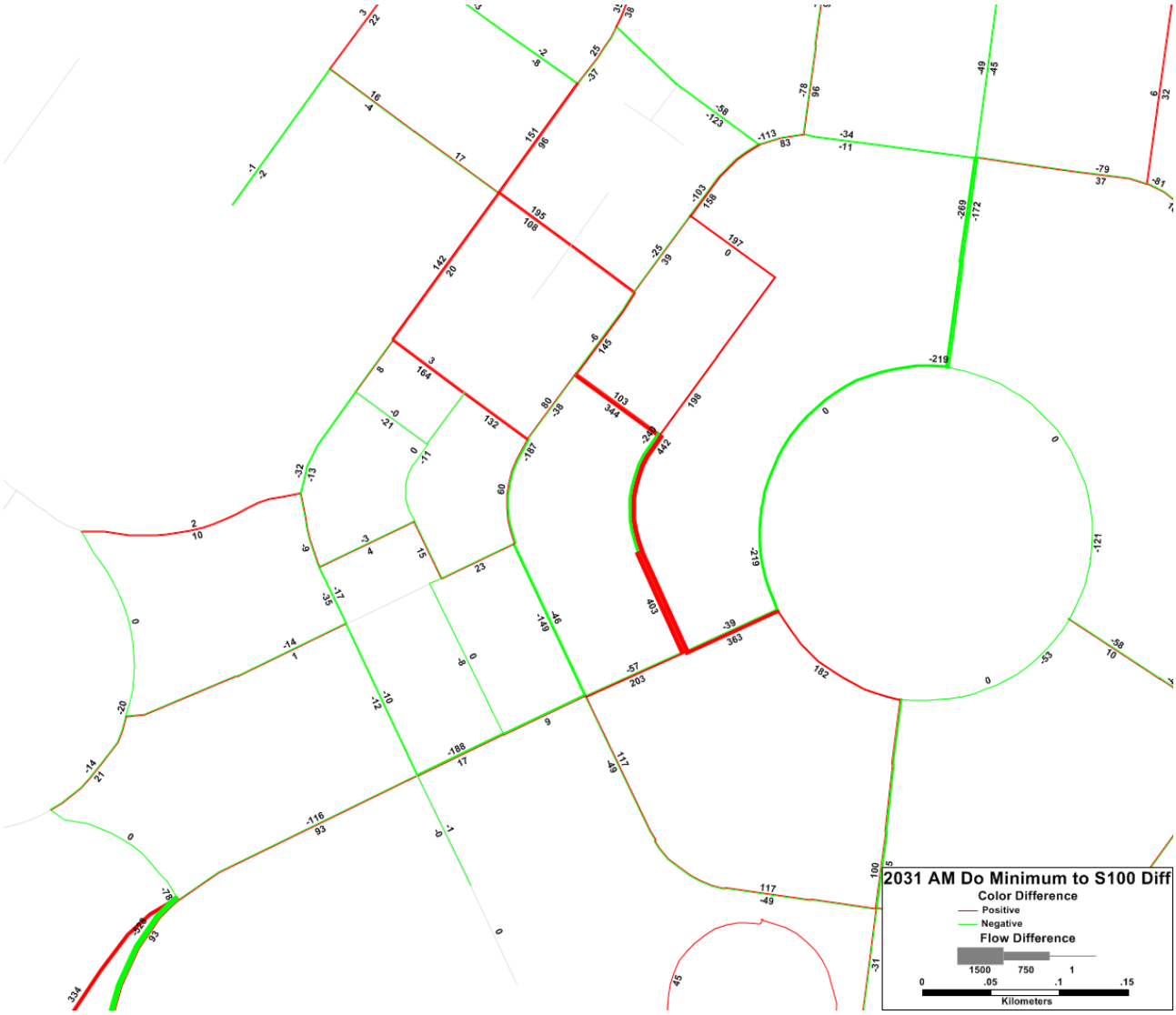


Figure 11: 2031 With Section 100 Compared to Do Minimum 2031 AM Hourly Flow Difference

In the 2031 With Section 100 PM peak period, shown in Figure 12, the western (northbound) section of Vernon Circle operates over capacity, as do parts of Knowles Place and Knowles Place extension. Edinburgh Avenue and London Circuit generally operate below 85% of capacity.

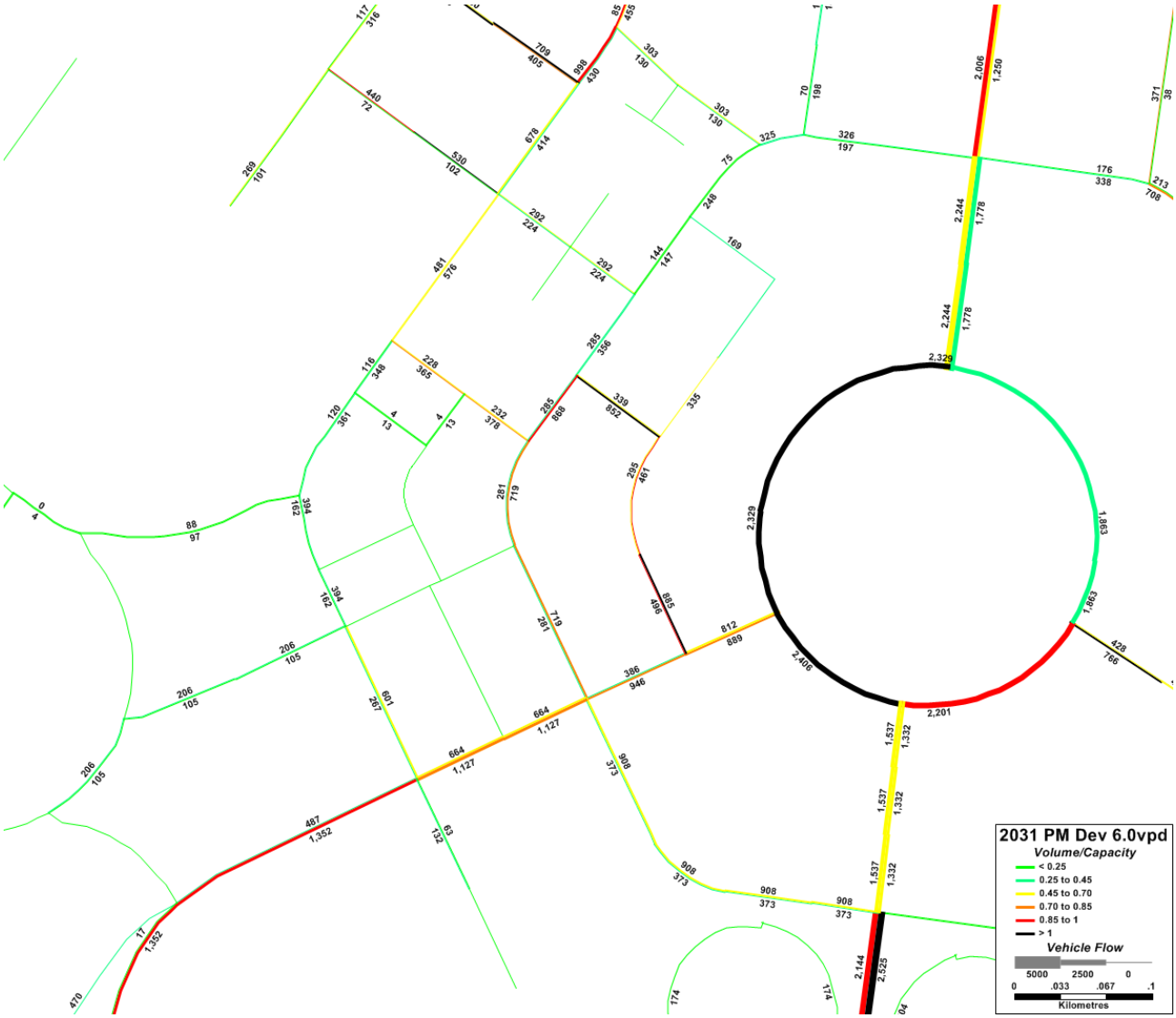


Figure 12: 2031 With Section 100 PM Hourly Flow and V/C

Figure 13 shows the traffic volume differences in the 2031 PM peak period with the Section 100 compared to the Do Minimum scenario. Volume differences are typically small, with growth on Knowles Place, Knowles Place extension, Edinburgh Avenue, Edinburgh Avenue extension, London Circuit, Farrell Place, University Avenue and Marcus Clarke Street. There is a reduction in southbound traffic on Northbourne Avenue and Vernon Circle, likely because of additional southbound traffic from Section 100 joining Commonwealth Avenue at London Circuit. The traffic volume changes suggest that the major origin/destination of traffic travelling to and from Section 100 is Belconnen. Outside of the immediate area shown in Figure 13, differences are less than 100 vehicles per hour.

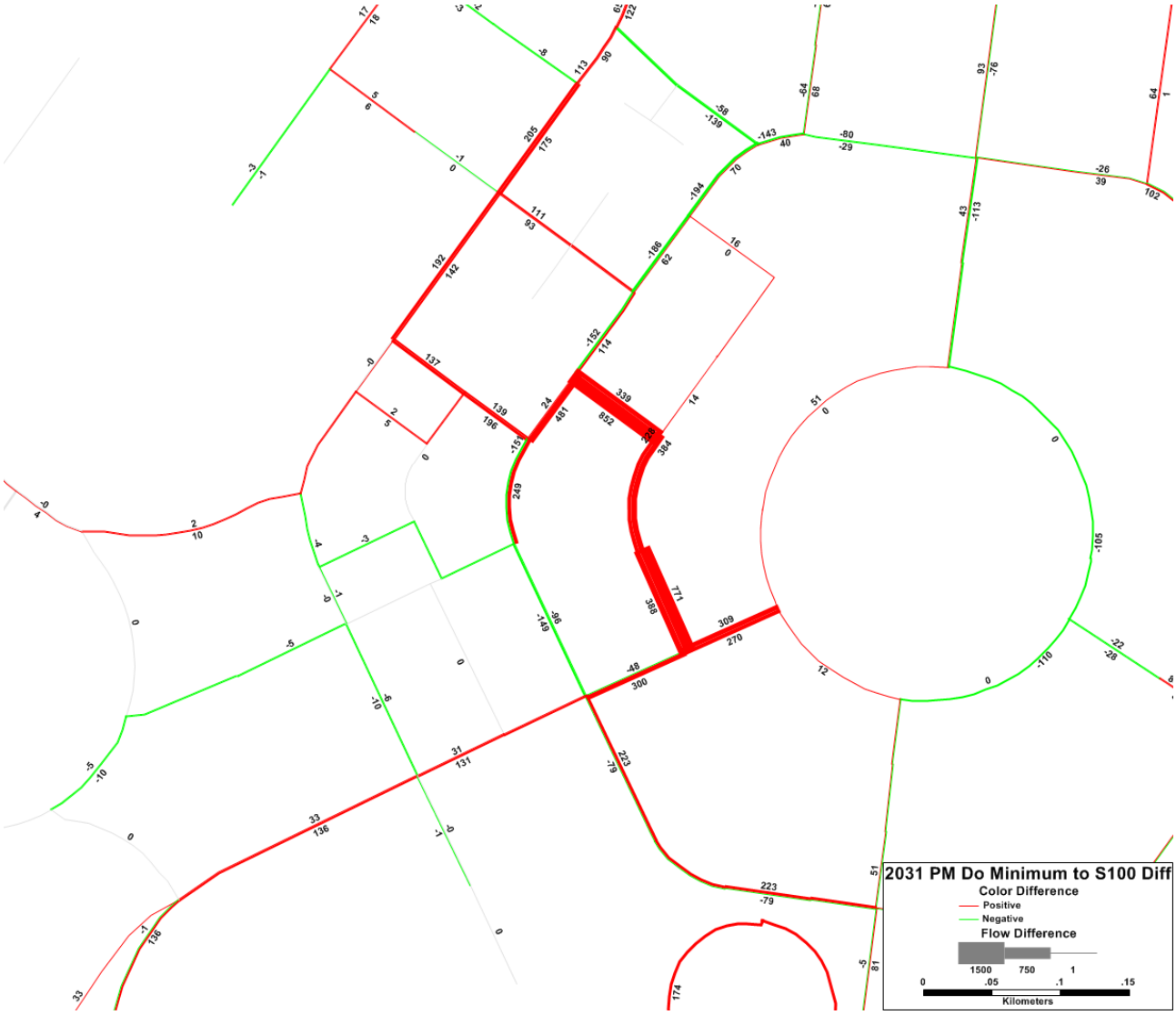


Figure 13: 2031 With Section 100 Compared to Do Minimum 2031 PM Hourly Flow Difference

4.3.4 Strategic Transport Modelling Summary

The strategic transport modelling carried out has shown the expected growth from 2016 to 2031 and the likely impact of the traffic generated by Section 100 on the local road network. Increased traffic volumes and delays on some roads, including Edinburgh Avenue, London Circuit and Marcus Clarke Street, has led to reductions in traffic on other roads connected to those roads, including Northbourne Avenue, Commonwealth Avenue and Constitution Avenue.

For most of the roads that are expected to have an increase in traffic, the additional traffic does not cause the roads to operate over capacity. However, the section of Vernon Circle between Commonwealth Avenue and Edinburgh Avenue and most of Knowles Place goes over capacity because of the Section 100 development in the AM peak in 2031. In the 2031 PM peak, the development of Section 100 causes the Knowles Place extension and the section of Vernon Circle between Edinburgh Avenue and Northbourne Avenue to operate over capacity. All other roads are expected to be able to cater for the additional Section 100 traffic without going over capacity.

5 Intersection Assessment

Turning movement counts from SCATS were obtained from TCCS for the following intersections:

1. London Circuit – Edinburgh Avenue
2. London Circuit – Gordon Street

These volumes were counted by the SCATS traffic signal control system for the seven days starting 25 July 2018. These volumes were combined with the CSTM turning volumes to synthesise demand for the following intersections:

1. London Circuit – Edinburgh Avenue
2. Edinburgh Avenue extension – Knowles Place extension (2031 only)
3. Vernon Circle – Edinburgh Avenue extension (2031 only)
4. London Circuit – Gordon Street
5. London Circuit – Farrell Place
6. London Circuit – Knowles Place (south)
7. London Circuit – University Avenue
8. London Circuit – Knowles Place (north)
9. Knowles Place – Knowles Place extension (2031 Section 100 only)

Details of the modelled turning movement volumes are included in Appendix B.

The intersection analysis has been conducted using the network functionality of SIDRA Intersection 8. This considers the impact of queuing, platooning, signal coordination and other interactions between intersections on the performance of each intersection in the network. The performance is measured by average delay in seconds, Level of Service (determined from average delay) and worst approach 95th percentile queue (measured in metres) with the approach on which that queue occurs. The analysis is discussed in the following sections and detailed outputs are included in Appendix C.

Table 4 shows the Level of Service (LoS) delay thresholds and colour code used in output figures presented later in this chapter.

Table 4: SIDRA Intersection Level of Service Criteria (Delay and HCM 2010 Method)

LEVEL OF SERVICE	GIVE-WAY / ROUNDABOUT	SIGNAL CONTROL	COLOUR CODE
A	D ≤ 10s	D ≤ 10s	
B	10s < D ≤ 15s	10s < D ≤ 20s	
C	15s < D ≤ 25s	20s < D ≤ 35s	
D	25s < D ≤ 35s	35s < D ≤ 50s	
E	35s < D ≤ 50s	55s < D ≤ 80s	
F	D ≥ 50s	D ≥ 80s or V/C ≥ 1	

5.1 2018 Base Case

The summary of SIDRA Intersection network results for the *2018 Base Case* scenario is shown in Table 5. The 2018 models indicate a good level of performance under current conditions.

Table 5: 2018 Base Case Intersection Performance Summary

INTERSECTION		AM PEAK			PM PEAK		
		DELAY	LOS	QUEUE	DELAY	LOS	QUEUE
1	London Circuit – Edinburgh Avenue	25.2	C	58 (S)	22.4	C	50 (S)
4	London Circuit – Gordon Street	20.3	C	48 (S)	15.7	B	29 (S)
5	London Circuit – Farrell Place	1.6 (16.0)	C*	2 (W)	2.1 (17.2)	C*	2 (W)
6	London Circuit – Knowles Place (S)	1.4 (13.4)	B*	3 (E)	3.3 (13.7)	B*	7 (E)
7	London Circuit – University Avenue	2.1 (15.9)	C*	1 (W)	1.8 (16.6)	C*	1 (W)
8	London Circuit – Knowles Place (N)	1.6 (4.1)	A*	2 (S)	0.7 (4.1)	A*	2 (S)

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead and the worst movement delay is also shown in parenthesis.

The SIDRA Intersection network layout and lane Level of Service diagrams for 2018 AM and 2018 PM are shown in Figures 14 and 15 respectively.

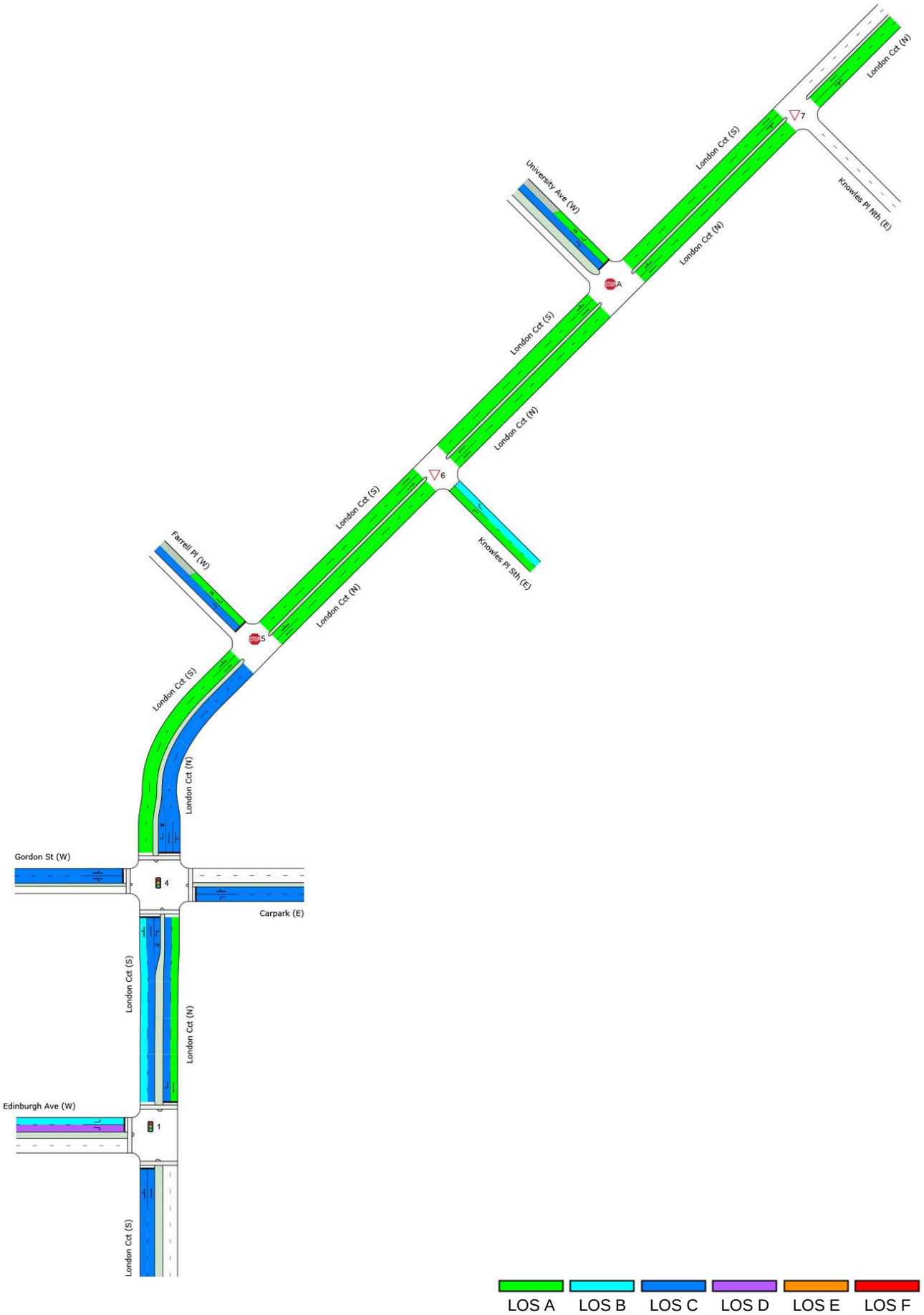


Figure 14: 2018 AM Base Case Network Level of Service

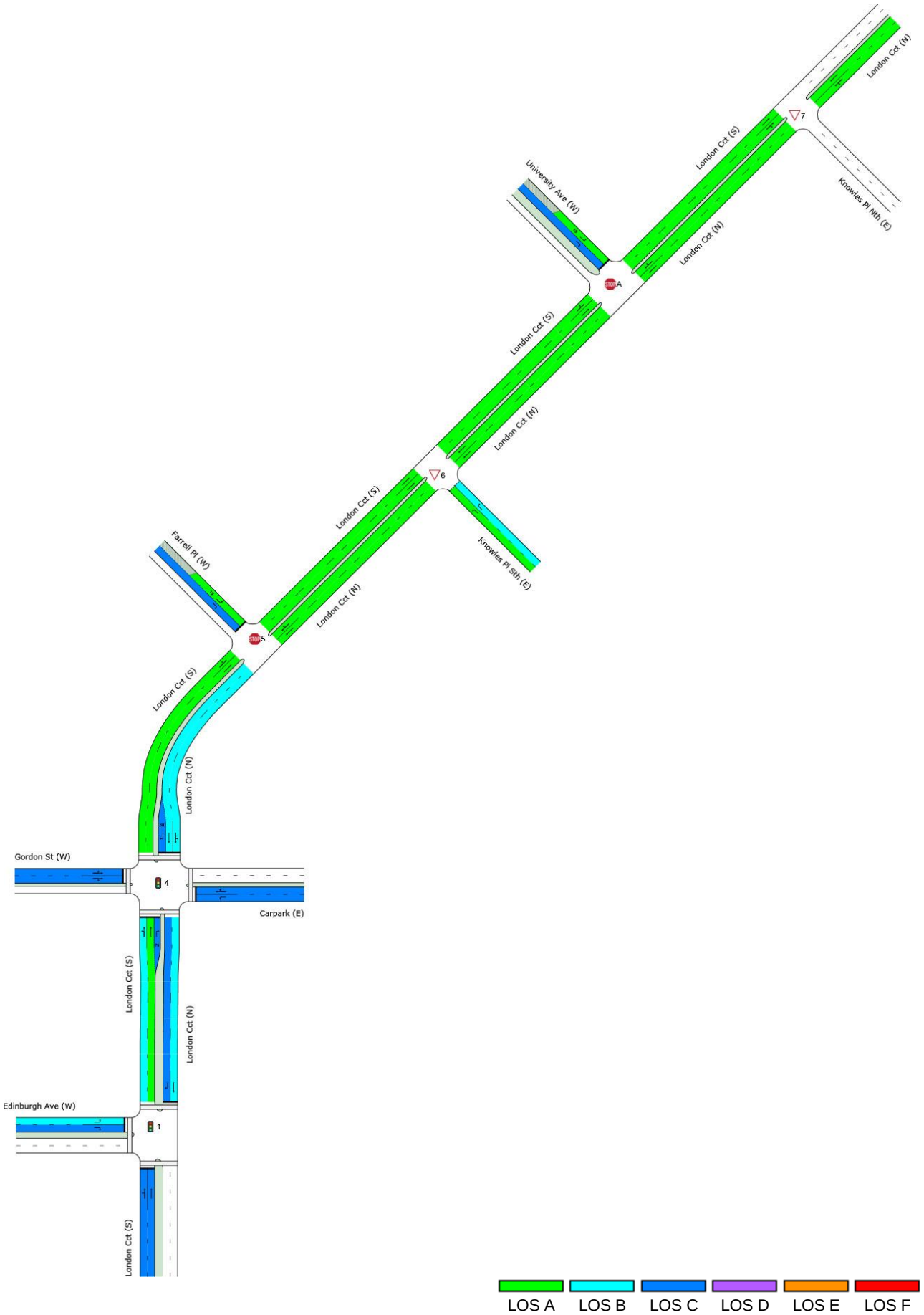


Figure 15: 2018 PM Base Case Network Level of Service

5.2 2031 Do Minimum

The SIDRA Network layout for 2031 Do Minimum scenario is shown in Figure 16. For this scenario, the Edinburgh Avenue extension has been included, with access to assumed developments on the southern side. Edinburgh Avenue has been modelled with a similar layout to the Constitution Avenue extension, with two lanes each way between London Circuit and Vernon Circle. There is an additional left turn lane from Edinburgh Avenue extension westbound to London Circuit southbound. To maximise pedestrian safety and accessibility, no left-turn slip lanes have been included and all left turns are signal controlled.

All other intersections remain as they were in 2018. The potential installation of light rail lines on London Circuit has not been considered.

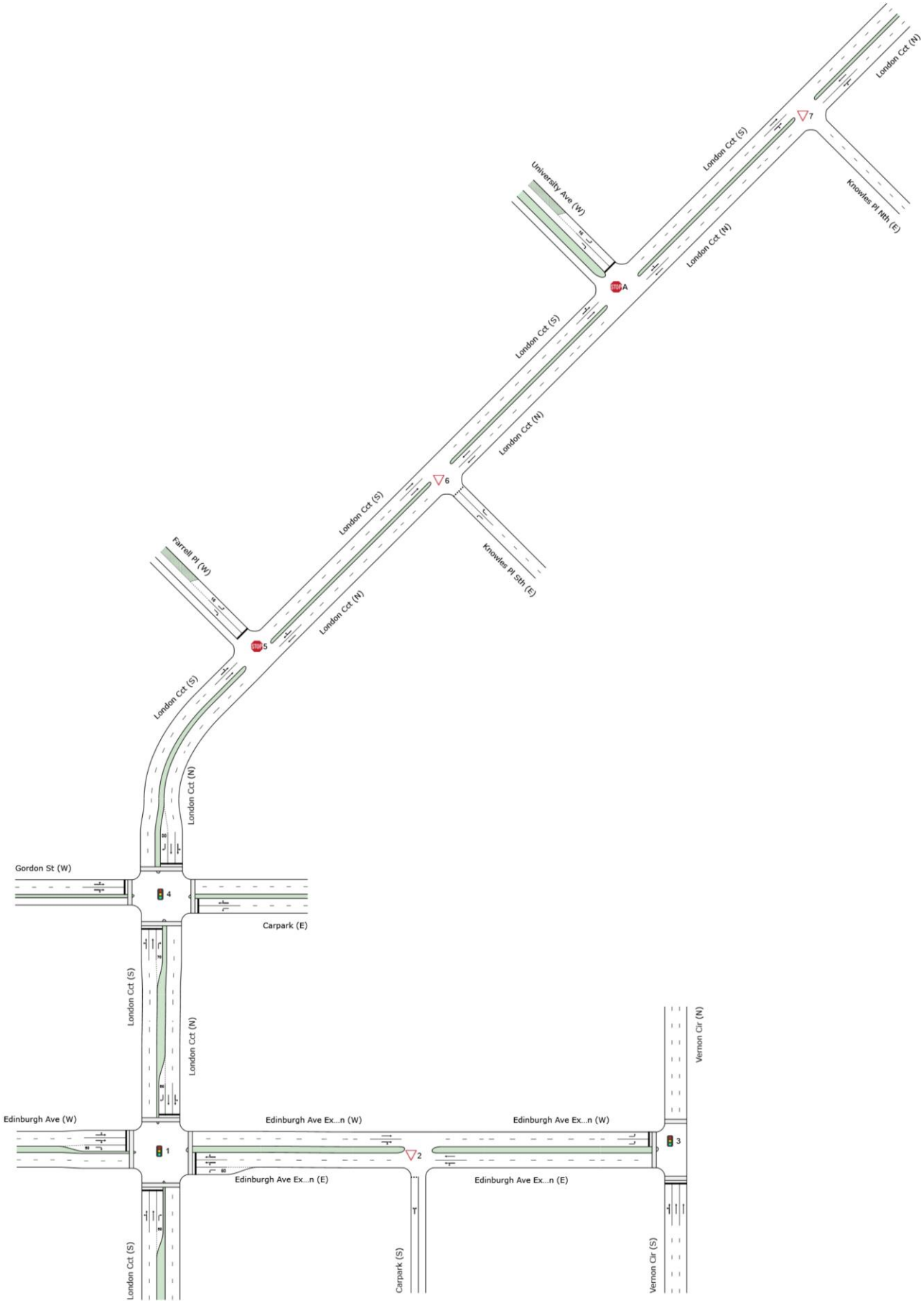


Figure 16: 2031 Do Minimum SIDRA Network Layout

The summary of SIDRA Intersection network results for the *2031 Do Minimum* scenario is shown in Table 6, which indicate that the network generally operates at an acceptable level with all intersections operating at LoS E or better. The intersection of London Circuit with Edinburgh Avenue operates very close to capacity with some individual movements operating at LoS F.

Gordon Street operates with longer average delays than in 2018, but remains at LoS C.

Many of the give-way intersections still have good average delay, however at Farrell Place the right turn out of the side street has performance issues, particularly in the PM peak, where it operates at LoS F.

Table 6: 2031 Do Minimum Intersection Performance Summary

INTERSECTION		AM PEAK			PM PEAK		
		DELAY	LOS	QUEUE	DELAY	LOS	QUEUE
1	London Circuit – Edinburgh Avenue	61.0	E	153.7 (W)	73.8	E	164.3 (S)
2	Edinburgh Avenue ext'n – Knowles Place ext'n	1.9 (20.6)	C*	34.9 (W)	3.7 (27.1)	D*	40.0 (E)
3	Vernon Circle – Edinburgh Avenue ext'n	24.7	C	134.8 (S)	21.6	C	137.0 (S)
4	London Circuit – Gordon Street	24.9	C	60.7 (S)	23.0	C	64.4 (E)
5	London Circuit – Farrell Place	2.3 (26.2)	D*	4.9 (N)	7.2 (82.0)	F*	14.9 (W)
6	London Circuit – Knowles Place (S)	1.9 (22.9)	C*	4.4 (E)	3.7 (20.7)	C*	8.8 (E)
7	London Circuit – University Avenue	1.8 (21.4)	C*	1.9 (N)	5.9 (26.1)	D*	11.3 (W)
8	London Circuit – Knowles Place (N)	1.6 (5.7)	A*	1.8 (S)	1.0 (4.0)	A*	1.9 (S)

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead and the worst movement delay is also shown in parenthesis.

The SIDRA Intersection network layout and lane Level of Service diagrams for 2018 AM and 2018 PM are shown in Figures 17 and 18 respectively.

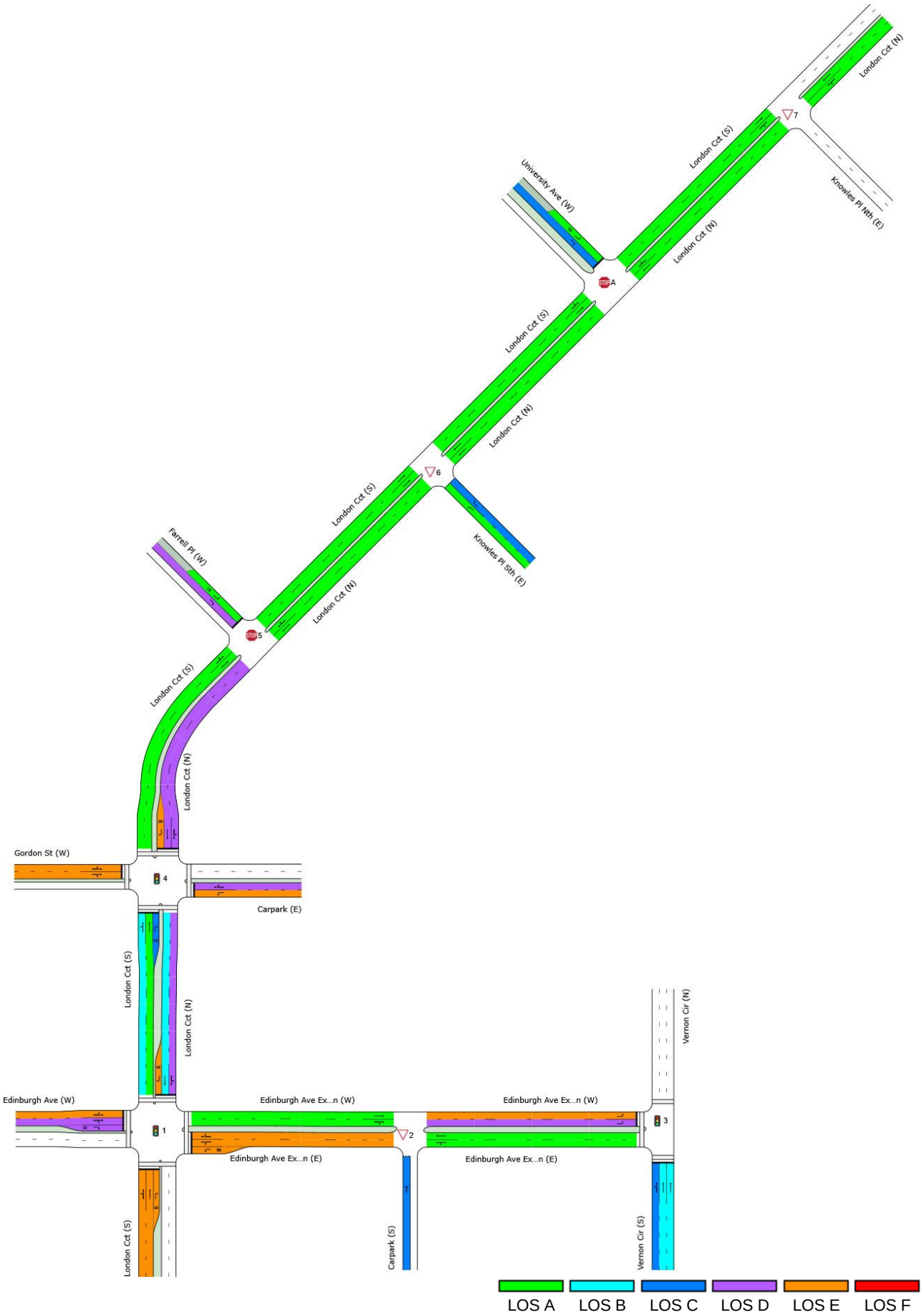


Figure 17: 2031 Do Minimum AM Network Level of Service

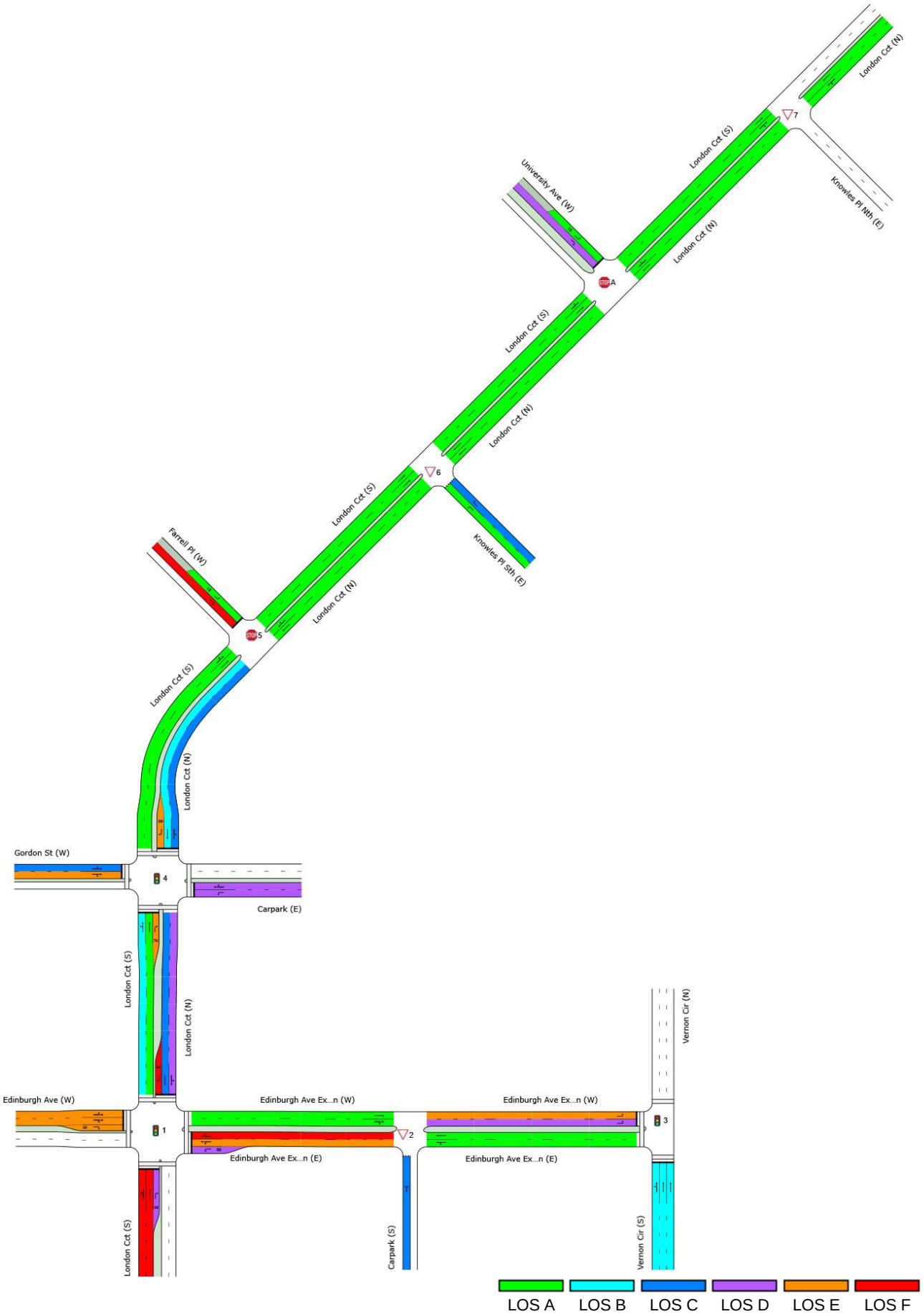


Figure 18: 2031 Do Minimum PM Network Level of Service

5.3 2031 Section 100

The SIDRA Network layout for 2031 Do Minimum scenario is shown in Figure 19. For this scenario, the Knowles Place extension to Edinburgh Avenue extension has been included, with full access to Edinburgh Avenue. Edinburgh Avenue has again been modelled with a similar layout to the Constitution Avenue extension, with two lanes each way for the entire length. There is an additional left turn lane from Edinburgh Avenue extension to London Circuit southbound. To maximise pedestrian safety and accessibility, no left-turn slip lanes have been included and all left turns are signal controlled. At the intersection of Knowles Place and Knowles Place extension (including Section 100 public carpark access,) priority is given to the major traffic movements, which are east-west, to and from the carpark. Knowles Place between London Circuit and Knowles Place extension operates two-way but has Left-In/Left-Out access only at London Circuit.

All other intersections remain as they were in 2018. The potential installation of light rail lines on London Circuit has not been considered.

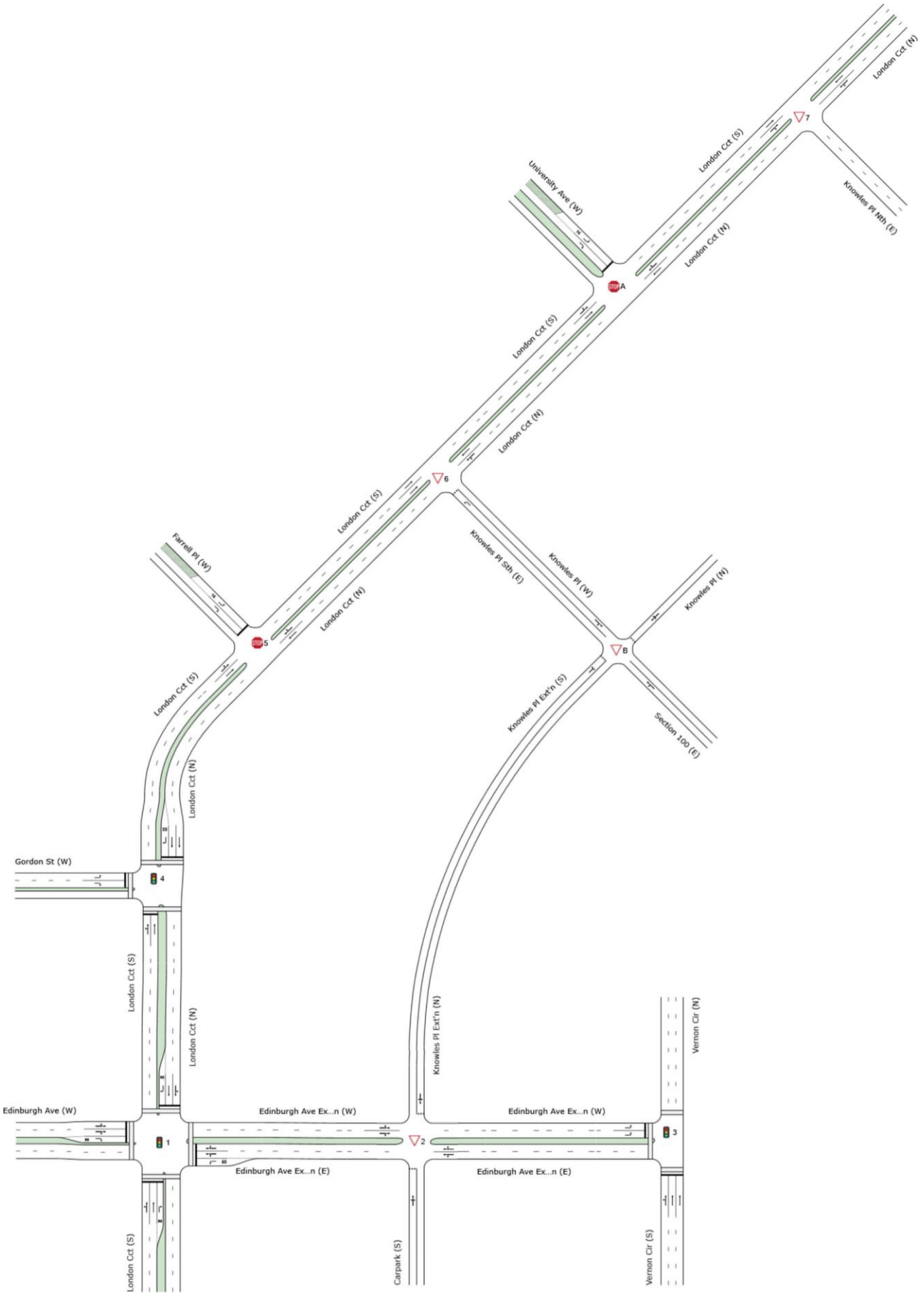


Figure 19: 2031 Section 100 SIDRA Network Layout

The summary of SIDRA Intersection network results for the *2031 Section 100* scenario is shown in Table 7. Two intersections along Edinburgh Avenue have performance issues. The poor performance at Edinburgh Avenue extension – Knowles Place extension is largely confined to the right turns out of Knowles Place extension. The queue generated along Knowles Place extension southbound then has knock-on effects further upstream. The average delay at London Circuit – Edinburgh Avenue has increased only slightly from *2031 Do Minimum*, however the queue that develops on Edinburgh Avenue extension westbound overflows and blocks the Knowles Place extension intersection.

These issues suggest some changes to the road network assumptions to improve performance:

- Provision of only Left-In/Left-Out (LILO) access between Knowles Place extension and Edinburgh Avenue. This would eliminate the right turn delays and the reduction in traffic entering Edinburgh Avenue extension would also reduce the effect of the queue on Vernon Circle. However, it should be noted that this would shift traffic and increase the demand on Knowles Place.
- Provision of two-way access at Knowles Place (north), to allow vehicles leaving the City Block 13 Section 63 car park (adjacent the law courts) direct access to London Circuit. Knowles Place along the front of the law courts can remain one-way. This will reduce traffic at the Knowles Place – Knowles Place extension intersection.

With the removal of the car park access from the London Circuit – Gordon Street intersection, it is now a three-way intersection and its performance has improved as a result.

The poor performance at University Avenue in the AM peak and Farrell Place in both peaks is dominated by the right turn out of each side street, being unable to find sufficient gaps in the flow on both directions of London Circuit. Management of or improvement to these intersections might need to be considered, for example coordinated signal control at University Avenue.

Table 7: 2031 With Section 100 Intersection Performance Summary

INTERSECTION		AM PEAK			PM PEAK		
		DELAY	LOS	QUEUE	DELAY	LOS	QUEUE
1	London Circuit – Edinburgh Avenue	77.7	E	207.4 (S)	57.7	E	131.0 (S)
2	Edinburgh Avenue ext'n – Knowles Place ext'n	>1,000 (>1,000)	F*	139.9 (N)	>1,000 (>1,000)	F*	193.3 (S)
3	Vernon Circle – Edinburgh Avenue ext'n	15.9	B	188.1 (S)	15.3	B	120.8 (S)
4	London Circuit – Gordon Street	9.4	A	52.2 (S)	9.8	A	35.3 (N)
5	London Circuit – Farrell Place	5.3 (55.7)	F*	13.4 (N)	428.7 (>1,000)	F*	410.5 (W)
6	London Circuit – Knowles Place (S)	2.0 (4.3)	A*	60.0 (N)	2.4 (4.3)	A*	60.0 (N)
7	London Circuit – University Avenue	73.5 (556.9)	F*	157.9 (W)	5.7 (16.8)	C*	60.0 (N)
8	London Circuit – Knowles Place (N)	3.1 (9.0)	A*	>1,000 (N)	1.7 (4.1)	A*	>1,000 (N)
9	Knowles Place – Knowles Place ext'n	191.8 (477.3)	F*	>1,000 (E)	214.8 (>1,000)	F*	521.0 (E)

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead and the worst movement delay is also shown in parenthesis.

The SIDRA Intersection network layout and lane Level of Service diagrams for 2018 AM and 2018 PM are shown in Figures 20 and 21 respectively.

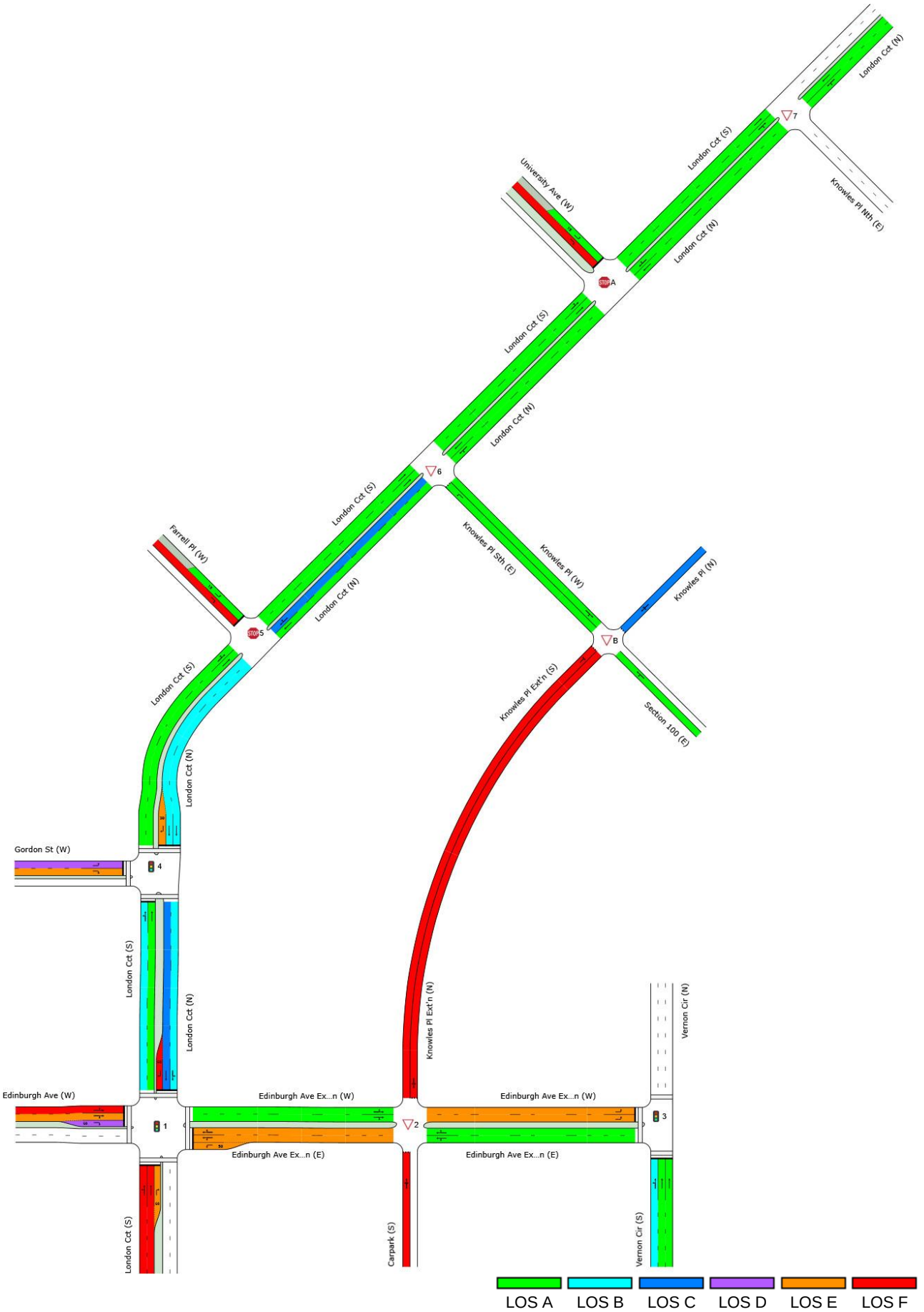


Figure 20: 2031 With Section 100 AM Network Level of Service

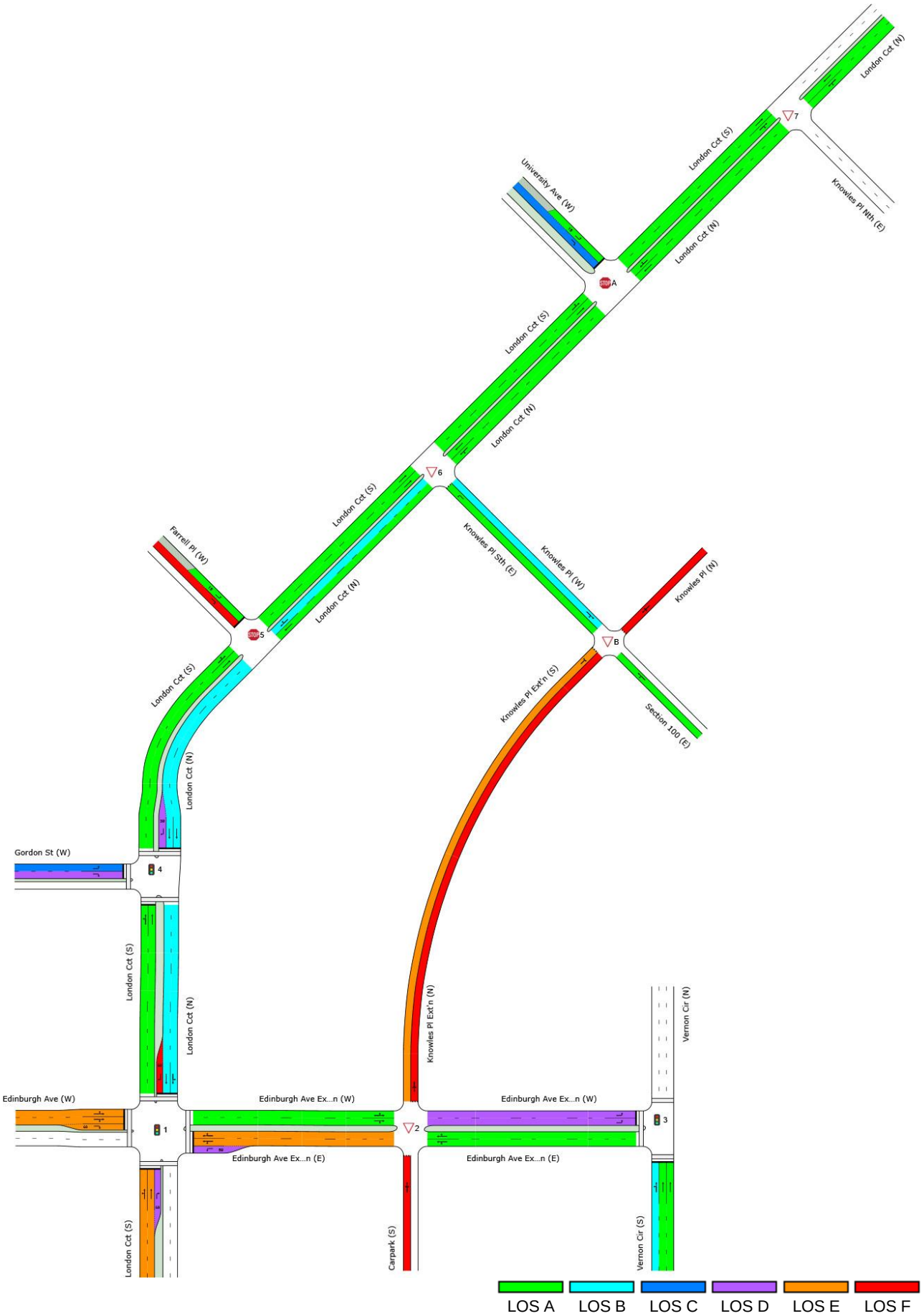


Figure 21: 2031 With Section 100 PM Network Level of Service

5.4 Intersection Modelling Summary

Table 8 shows a comparison of the 2031 Do Minimum and Section 100 intersection analysis results. In the 2031 Do Minimum scenario, the following intersections have performance issues:

- London Circuit – Farrell Place (PM peak right turn out of Farrell Place only)
- London Circuit – Edinburgh Avenue (operates close to capacity with some movements at LoS F)

The development of Section 100, using the trip generation rates and road network assumptions discussed earlier, would cause the following intersections to fall below an acceptable LoS:

- London Circuit – Edinburgh Avenue (AM Peak only)
- Edinburgh Avenue extension – Knowles Place extension (AM and PM peaks)
- London Circuit – Farrell Place (AM peak only)
- London Circuit – University Avenue (AM peak only)

The intersections of London Circuit with Farrell Place and University Avenue have been modelled as priority controlled, as per their current layout. It is possible that the construction of LRS2 will lead to changes to these intersections as it is unlikely that priority controlled vehicle movements will be permitted across the light rail route.

In addition, the new intersection between Knowles Place and Knowles Place extension is expected to operate at LoS F in 2031.

The new intersection of Edinburgh Avenue extension with London Circuit is expected to operate at LoS E in the Do Minimum scenario but will operate at LoS F in the AM peak if Section 100 is developed.

Table 8: 2031 Intersection Performance Summary Comparison

INTERSECTION		AM PEAK				PM PEAK			
		DO MINIMUM		SECTION 100		DO MINIMUM		SECTION 100	
		DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS
1	London Circuit – Edinburgh Avenue	61.0	E	77.7	E	73.8	E	57.7	E
2	Edinburgh Avenue ext'n – Knowles Place ext'n	1.9 (20.6)	C*	>1,000 (>1,000)	F*	3.7 (27.1)	D*	>1,000 (>1,000)	F*
3	Vernon Circle – Edinburgh Avenue ext'n	24.7	C	15.9	B	21.6	C	15.3	B
4	London Circuit – Gordon Street	24.9	C	9.4	A	23.0	C	9.8	A
5	London Circuit – Farrell Place	2.3 (26.2)	D*	5.3 (55.7)	F*	7.2 (82.0)	F*	428.7 (>1,000)	F*
6	London Circuit – Knowles Place (S)	1.9 (22.9)	C*	2.0 (4.3)	A*	3.7 (20.7)	C*	2.4 (4.3)	A*
7	London Circuit – University Avenue	1.8 (21.4)	C*	73.5 (556.9)	F*	5.9 (26.1)	D*	5.7 (16.8)	C*
8	London Circuit – Knowles Place (N)	1.6 (5.7)	A*	3.1 (9.0)	A*	1.0 (4.0)	A*	1.7 (4.1)	A*
9	Knowles Place – Knowles Place ext'n	-	-	191.8 (477.3)	F*	-	-	214.8 (>1,000)	F*

* SIDRA Intersection does not report Level of Service for sign-controlled intersections. The worst movement LoS is shown instead.

The SIDRA Intersection analysis of City Section 100 indicates the following:

- Performance in the area is quite good in 2018.
- There is a significant increase in delay at some intersections between 2018 and 2031, before considering any additional development in Section 100. Most intersections continue to operate reasonably well overall, however turning right out of some side streets would be difficult. In particular, the right turn out of Farrell Place in the PM peak operates at LoS F. The intersection of London Circuit with Edinburgh Avenue operates very close to capacity and some movements operate at LoS F.
- The addition of land use and Knowles Place extension in the *2031 Section 100* scenario will require careful thought regarding the network connectivity and the routes vehicles will be allowed to use to enter and exit the precinct. The London Circuit – Edinburgh Avenue intersection experiences an impact in the AM peak and operates at LoS F, while the additional traffic on Edinburgh Avenue extension means that the right turns out of both sides of Knowles Place extension operate very poorly. The queue from the right turn out of Knowles Place extension causes substantial queueing inside the Section 100 development area and may cause issues with driveway access to the basement parking areas.
- The traffic generated by Section 100 causes additional delays for traffic turning right out of University Avenue onto London Circuit, particularly in the AM peak, and the access arrangements at this intersection will need to be reviewed.
- Some possible improvements to the proposed *2031 Section 100* road network have been identified:
  - Allow only Left-In/Left-Out access to Knowles Place extension where it meets Edinburgh Avenue extension.
  - Allow two-way access on Knowles Place north so that vehicles leaving the existing law courts car park do not have to travel south on Knowles Place to access London Circuit.
  - Signal control at London Circuit – University Avenue to better control traffic and the intersection's performance.

6 Conclusion

6.1 Summary

SMEC was engaged by Spiire to undertake an assessment of the impact on the road network of traffic generated by a proposed development on Section 100, City. The proposed development includes residential, commercial and retail land uses. The development would be accessed via a new extension of Knowles Place, connecting the existing Knowles Place to the proposed Edinburgh Avenue extension to Vernon Circle. The existing car parking on the site, currently accessed via Gordon Street, would be accessed via Knowles Place.

SMEC generated traffic volumes in accordance with ACT and RMS published generation rates. The traffic was distributed using ITE published proportions. The generated traffic was assigned to the Canberra road network using the CSTM, which distributes trips across the whole urban area. This process allows the redistribution of trips caused by increased congestion or displaced trip ends to be accurately modelled.

The CSTM results showed that the increased traffic is confined to a relatively small area on the western side of Civic and Acton. The increased traffic causes the western part of Vernon Circle and the Knowles Place extension to operate over capacity. All other roads in the area do not operate over capacity after the proposed development.

The CSTM outputs were used in conjunction with SCATS traffic counts supplied by TCCS to conduct intersection modelling using SIDRA Network. SIDRA Network allows closely spaced intersections to be modelled by quantifying the effects of platoons and queues on adjacent intersections in the network.

Intersection layouts for the future scenarios were developed using the assumptions made at Constitution Avenue extension as a basis and emphasising pedestrian amenity by omitting left-turn slip lanes.

The SIDRA Network analysis showed that the local road network operates well in 2018 but degrades in 2031 Do Minimum and then degrades further with the proposed development at Section 100. In the 2031 Do Minimum scenario, the following intersection already operates at LoS F in at least one of the peak periods:

- London Circuit – Farrell Place (PM peak right turn out of Farrell Place only)
- London Circuit – Edinburgh Avenue (close to capacity with some movements operating at LoS F))

The proposed Section 100 development is expected to further worsen the performance of this intersection and would also cause four more intersections to operate at LoS F in 2031. These are:

- London Circuit – Edinburgh Avenue (AM Peak only)
- Edinburgh Avenue extension – Knowles Place extension (AM and PM peaks)
- London Circuit – Farrell Place (AM peak only)
- London Circuit – University Avenue (AM peak only)

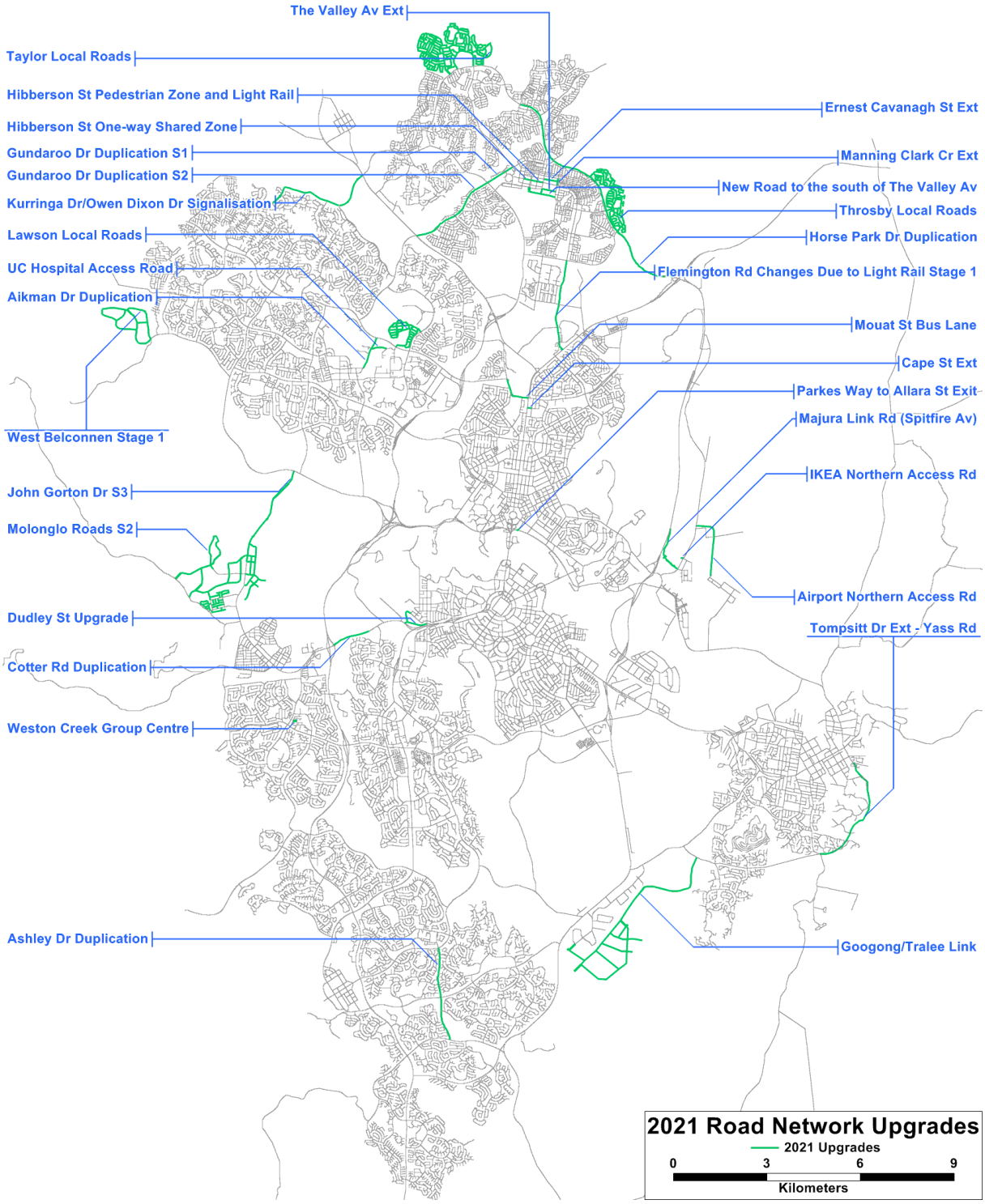
It is expected that the intersections of London Circuit with Farrell Place and University Avenue will be different in the future if LRS2 proceeds but the expected layout of these intersections is not yet known. They may operate at an acceptable LoS in in the LRS2 design.

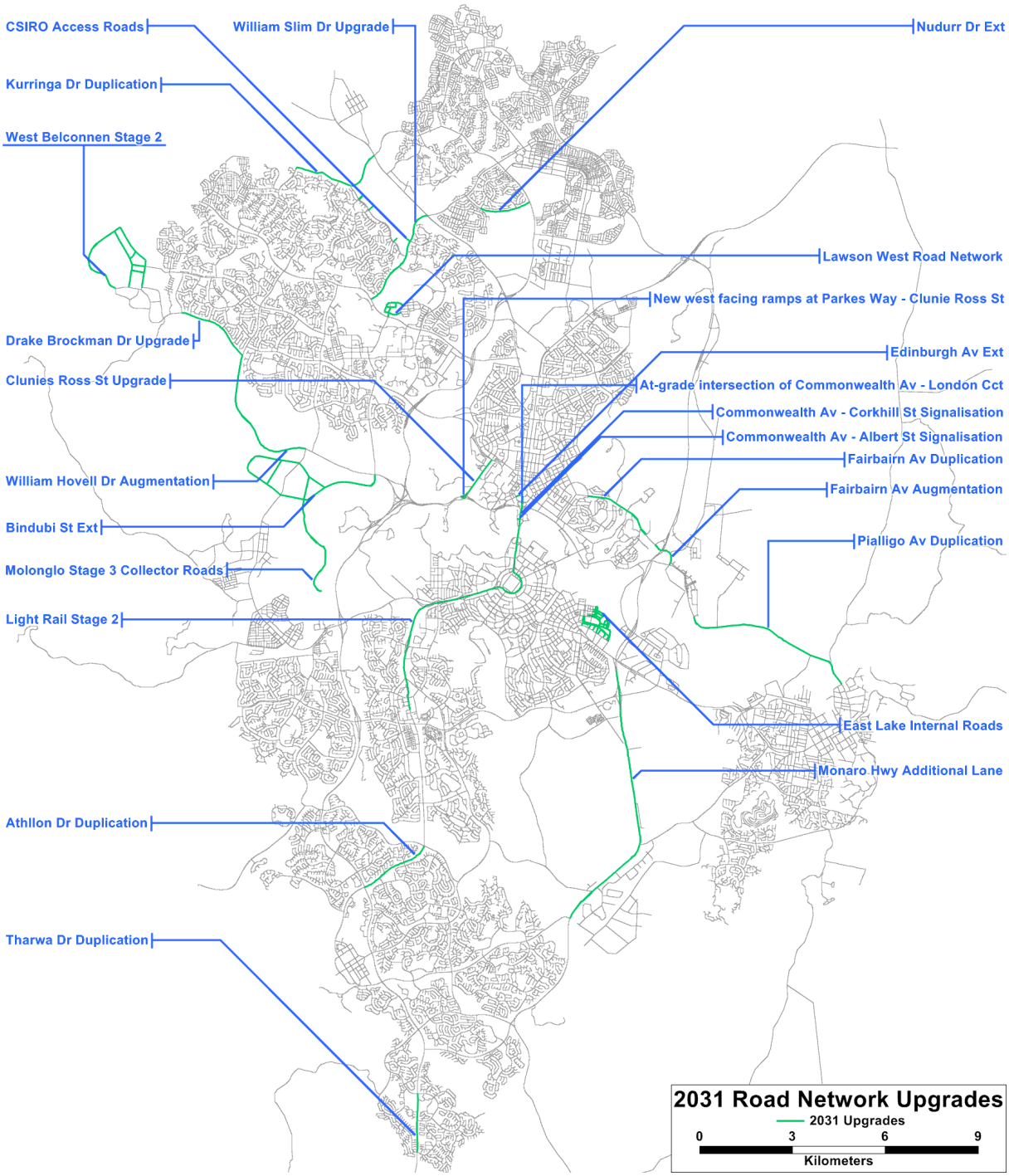
6.2 Recommendations

Based on the outcomes of the transport modelling and analysis, SMEC recommends the following:

- Allow two-way access on Knowles Place north so that vehicles leaving the existing law courts car park do not have to travel south on Knowles Place to access London Circuit.
- Include a continuous median on Edinburgh Avenue extension so that the intersection with Knowles Place extension operates as left-in, left-out only, noting that this will likely increase traffic volumes on London Circuit and the northern end of Knowles Place.

Appendix A Future Road Network Assumptions




CSIRO Access Roads
William Slim Dr Upgrade
Nudurr Dr Ext
Kurringa Dr Duplication
West Belconnen Stage 2
Lawson West Road Network
New west facing ramps at Parkes Way - Clunie Ross St
Drake Brockman Dr Upgrade
Edinburgh Av Ext
Clunies Ross St Upgrade
At-grade intersection of Commonwealth Av - London Cct
Commonwealth Av - Corkhill St Signalisation
Commonwealth Av - Albert St Signalisation
Fairbairn Av Duplication
William Hovell Dr Augmentation
Fairbairn Av Augmentation
Bindubi St Ext
Pialligo Av Duplication
Molonglo Stage 3 Collector Roads
Light Rail Stage 2
East Lake Internal Roads
Monaro Hwy Additional Lane
Athllon Dr Duplication
Tharwa Dr Duplication
2031 Road Network Upgrades
2031 Upgrades
0
3
6
9
Kilometers

Appendix B Intersection Turning Movement Volumes

Appendix C SIDRA Outputs

local people
global experience

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