SCENTRE GROUP

TRAFFIC REPORT FOR PROPOSED ELP & OFFICE TOWER, WESTFIELD LIVERPOOL SHOPPING CENTRE

DECEMBER 2018

COLSTON BUDD ROGERS & KAFES PTY LTD
ACN 002 334 296
Level 18 Tower A
Zenith Centre
821 Pacific Highway
CHATSWOOD NSW 2067

Telephone: (02) 9411 2411
Facsimile: (02) 9411 2422
Email: cbrk@cbrk.com.au

REF: 10445/3

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Colston Budd Rogers & Kafes Pty Ltd has been retained by Scentre Group to prepare the traffic report for the development application for the proposed Entertainment and Lifestyle Precinct and office tower on the roof of the existing Westfield Liverpool Shopping Centre. The site location is shown on Figure 1.

1.2. The shopping centre currently has some 83,414m^2 gross leasable area (including 7,800m^2 GLA cinemas) with some 3,498 parking spaces. It is proposed to increase this area by some 5,417m^2 with a new ELP on the roof. In addition, an office tower of some 11,174m^2 will also be constructed on the roof. The provision of the ELP and office tower will result in changes in the rooftop parking and a reduction in parking provision to some 3,300 spaces.

1.3. This report describes existing traffic conditions in Chapter 2. The report examines the traffic effects of the proposed ELP and office tower in Chapter 3. In addition to addressing the traffic effects, the report also reviews parking provision, access arrangements, internal circulation and service arrangements.

2. EXISTING CONDITIONS

Site Location

2.1. Westfield Liverpool shopping centre is located at the northern end of Liverpool CBD, as shown on Figure 1. It occupies most of the large block bounded by George Street, Elizabeth Street, Northumberland Street and Campbell Street. The sections of Macquarie Street and Northumberland Street (between Elizabeth Street and Campbell Street) have been closed to allow expansion of the shopping centre. Access to the shopping centre is provided from Bathurst Street (two locations), Campbell Street (two locations), George Street and the northern sections of Northumberland Street and Macquarie Street (service access only).

2.2. The balance of Liverpool CBD is located south of Elizabeth Street, generally between Bathurst and Bigge Streets. Macquarie Street has been closed between Elizabeth and Moore Streets to create Macquarie Mall. The area west of Bathurst Street and north of Campbell Street is predominantly residential in nature with some mixed use developments. Liverpool hospital is located to the east of Bigge Street.

2.3. Liverpool CBD is located in an area that is effectively bounded by the Hume Highway to the north and west, the railway line to the east and Terminus Street/Macquarie Street to the south. This area also includes a number of schools, hospitals and community facilities.

Road Network

2.4. The road network in the vicinity of the site includes Elizabeth Drive, Bathurst Street, George Street, Northumberland Street and Campbell Street. These roads are:

- generally four lane undivided roads with parking permitted clear of intersections; and
- provide for two way traffic flow except for George Street (one way southbound) and Northumberland Street (one way northbound) both between Elizabeth Street and Memorial Avenue/Scott Street.

2.5. Most intersections within the CBD are controlled by traffic signals, including the four intersections on the corners of the shopping centre (Elizabeth Street/Bathurst Street, Elizabeth Street/George Street, Campbell Street/Bathurst Street and Campbell Street/George Street), the intersection of Bathurst Street/Secant Street/site access, and the intersections of Northumberland Street with Elizabeth Street and Campbell Street. Pedestrian signals are provided at the intersection of Macquarie Street/Elizabeth Street. The intersection of Campbell Street/Macquarie Street is controlled by a roundabout.

Traffic Volumes

2.6. In order to gauge traffic conditions, updated counts were undertaken during Thursday afternoon and Saturday lunchtime peak periods in August 2018. The counts were undertaken at the following intersections:

- George Street/Elizabeth Street;
- George Street/Campbell Street;
- Campbell Street/Macquarie Street;
- Campbell Street/Northumberland Street;
- Campbell Street/Bathurst Street;
- Bathurst Street/Elizabeth Street;
- Elizabeth Street/Northumberland Street; and
- the site accesses on Bathurst Street, Campbell Street and George Street.

2.7. The results of the surveys are summarised in Table 2.1 and displayed in Figures 2 and 3.

Table 2.1 : Existing Two Way Peak Hour Traffic Flows (Vehicles Per Hour)		
Location	**Thursday Afternoon**	**Saturday Midday**
Campbell Street		
– east of George Street	560	425
– east of Macquarie Street	715	725
– east of Northumberland Street	1040	950
– east of Bathurst Street	930	1040
– west of Bathurst Street	635	765
Elizabeth Street		
– east of George Street	815	770
– east of Northumberland Street	1050	875
– east of Bathurst Street	1270	1095
– west of Bathurst Street	1955	1580
George Street		
– north of Campbell Street	465	285
– south of Campbell Street	725	510
– south of Elizabeth Street	645	555
Bathurst Street		
– north of Campbell Street	155	90
– south of Campbell Street	690	605
– south of Elizabeth Street	1350	1230
Macquarie Street		
– north of Campbell Street	600	455
Northumberland Street		
– north of Campbell Street	170	50
Site Accesses		
– Bathurst Street (north)	455	530
– Bathurst Street (south)	360	530
– Campbell Street (east)	410	385
– Campbell Street (west)	170	280
– Northumberland Street	655	755
– George Street	370	595

2.8. The results in Table 2.1 reveal that:

- Campbell Street carries some 425 to 1,040 vehicles per hour (two-way) in the peak periods. Traffic flows are highest in the sections between Macquarie Street and Bathurst Street;

- Elizabeth Street carries some 770 to 1,995 vehicles per hour (two-way) in the peak periods. Traffic flows are highest west of Bathurst Street;

- George Street carries some 285 to 725 vehicles per hour (two-way) in the peak periods;

- Bathurst Street carries some 90 to 1,350 vehicles per hour (two-way) in the peak periods. Traffic flows are highest south of Elizabeth Street;

- Macquarie Street carries some 455 to 600 vehicles per hour (two-way) in the peak periods; and

- The shopping centre generated some 2,420 and 3,075 vehicles per hour (two-way) in the peak periods. In addition the Macquarie Street access (loading docks) and Campbell Street loading dock generated an additional 50 and 75 vehicles per hour (two- way) in the peak periods.

Intersection Operations

2.9. The capacity of the road network is generally determined by the capacity of its intersections to cater for peak period traffic flows. The surveyed intersections have been analysed using the SIDRA 8 network program. SIDRA 8 network is designed to analyse a network of signal controlled intersections, roundabouts and priority intersections.

2.10. Based on average delay per vehicle, SIDRA estimates the following levels of service (LOS):-

- For traffic signals, the average delay per vehicle in seconds is calculated as delay/(all vehicles), for roundabouts the average delay per vehicle in seconds is

selected for the movement with the highest average delay per vehicle, equivalent to the following LOS:-

0 to 14	=	"A"	Good
15 to 28	=	"B"	Good with minimal delays and spare capacity
29 to 42	=	"C"	Satisfactory with spare capacity
43 to 56	=	"D"	Satisfactory but operating near capacity
57 to 70	=	"E"	At capacity and incidents will cause excessive delays. Roundabouts require other control mode.
>70	=	"F"	Unsatisfactory and requires additional capacity

- For give way and stop signs, the average delay per vehicle in seconds is selected from the movement with the highest average delay per vehicle, equivalent to following LOS:-

0 to 14	=	"A"	Good
15 to 28	=	"B"	Acceptable delays and spare capacity
29 to 42	=	"C"	Satisfactory but accident study required
43 to 56	=	"D"	Near capacity and accident study required
57 to 70	=	"E"	At capacity and requires other control Mode.
>70	=	"F"	Unsatisfactory and requires other control mode

2.11. It should be noted that for roundabouts, give way and stop signs, in some circumstances, simply examining the highest individual average delay can be misleading. The size of the movement with the highest average delay per vehicle should also be taken into account. Thus, for example, an intersection where all movements are operating at a level of service A, except one which is at level of

service E, may not necessarily define the intersection level of service as E if that movement is very small. That is, longer delays to a small number of vehicles may not justify upgrading an intersection unless a safety issue was also involved.

2.12. The SIDRA 8 network analysis found that:

- the traffic signal intersection of Elizabeth Street and Bathurst Street operates with average delays per vehicle of less than 40 seconds during the peak periods. This represents level of service C, a satisfactory level of intersection operation;

- the traffic signal controlled intersections of Elizabeth Street with George Street and Northumberland Street operate with average delays per vehicle of less than 30 seconds during the peak periods. This represents level of service B/C, a satisfactory level of intersection operation;

- the traffic signal controlled intersection of Campbell Street and George Street operates with average delays per vehicle of less than 30 seconds during the peak periods. This represents level of service B/C, a satisfactory level of intersection operation;

- the traffic signal controlled intersections of Campbell Street with Bathurst Street and Northumberland Street operate with average delays per vehicle of less than 25 seconds during the peak periods. This represents level of service B, a good level of intersection operation;

- the traffic signal controlled intersection of Bathurst Street with Secant Street and the site access operates with average delays per vehicle of less than 15 seconds during the peak periods. This represents level of service A/B, a good level of intersection operation;

- the roundabout controlled intersection of Campbell Street and Macquarie Street operates with average delays per vehicle of less than 15 seconds during the peak periods. This represents level of service A/B, a good level of intersection operation

- the intersections of the site accesses with Campbell Street, Bathurst Street and George Street operate with average delays per vehicle of less than 20 seconds during the peak periods. This represents level of service B, a satisfactory level of intersection operation.

Parking

2.13. The existing shopping centre provides some 3,498 parking spaces. Parking is controlled by a parking management system that directs drivers to areas where parking is available. With the parking management system, it is possible to determine the utilisation of the car park for each hour over the year. The shopping centre generally operates between 9.00am and 6.00pm each day. The 85th percentile parking demand is based on utilisation of the car park during these hours. Section 5.7.1 of the RMS Guide to Traffic Generating Developments (2002) notes that the 85th percentile level of parking demand should be considered for shopping centres. To provide a level of robustness in determining parking requirements, we have based our assessment on the 95th percentile level of parking demand. With a parking management system in place, parking should be provided at demand plus 5% (to allow for circulation within the car park).

2.14. A review of the information provided by parking management system found that the 95th percentile parking demand for the year 2016/2017 (between the hours of 9.00am to 6.00pm) was 2,690 spaces. This equates to a parking demand of one space per 31m^2 GLA.

2.15. Liverpool CBD is a major focus for public transport in the region. Liverpool Station is located adjacent to the south eastern corner of the CBD. The station is located about 700 metres from Westfield shopping centre. The station accesses the South, Bankstown and Cumberland Lines.

2.16. The South Line connects Sydney Central to Campbelltown via Redfern, Burwood, Strathfield, Granville, Fairfield and Liverpool. The Bankstown Line connects Sydney Central to Liverpool via Sydenham and Bankstown. Finally the Cumberland Line connects Campbelltown to Blacktown via Liverpool, Fairfield and Parramatta.

2.17. The South Line provides services generally at about 5 to 25 minutes headways dependent on the time of day. The Bankstown Line provides services generally at 10 to 45 minute headways. Finally the Cumberland Line provides services generally at 15 to 45 minute headways. Weekend services are generally similar to weekday off peak services. The Centre therefore benefits from a high standard of rail service.

2.18. A bus interchange is located immediately adjacent to the station. It serves as a terminus for all bus routes serving the CBD and the Liverpool to Parramatta Transitway. It also caters for taxis and interstate buses. The CBD is serviced by 800 series private bus company routes (Interline Bus Services and Coach Services). The CBD is serviced by a total of 30 routes. Over 80% of these routes pass directly adjacent to Westfield shopping centre either on Elizabeth Street or George Street. The routes provide services at headways that vary from 5 minutes in peak periods to a limited number of services per day on some routes.

2.19. The availability of regular bus services, both from outside the CBD and between shopping centre and the station means that the centre has good access by public transport both bus and rail.

3. IMPLICATIONS OF PROPOSED DEVELOPMENT

3.1. The proposed development comprises a new Entertainment and Lifestyle Precinct (ELP) and office tower on the roof of the existing shopping centre. To accommodate these additional uses, the existing roof top car park layout will be modified (including provision of new level 4 car park deck – 122 spaces). These changes will result in an overall reduction in parking provision to some 3,300 spaces. The net increase in retail GLA as result of the ELP will be some 5,417m^2. The proposed office tower is some 11,174m^2 GFA. To improve access to the ELP/office tower, a speed ramp will be provided from the eastern Campbell Street access to the roof. Servicing of the office tower will be provided from the Bathurst Street loading dock and servicing of the ELP from Campbell Street. Secondary servicing of the ELP (by vans) will occur via the roof top car park.

3.2. This chapter examines the implications of the proposed development through the following sections:-

- public transport;
- parking provision;
- access and internal layout;
- servicing
- traffic effects; and
- summary.

<u>Public Transport</u>

3.3. The proposed development is located close to existing bus and train services within Liverpool CB. These provide links to surrounding areas. The proposed development will strengthen the demand for these services. The proposed

development will increase retail densities close to existing public transport services. This is consistent with government and Council policies to encourage people to reduce private car trips and increase walking. It is also consistent with planning principles of.

(a) improving accessibility to employment and services by walking, cycling, and public transport;
(b) improving the choice of transport and reducing dependence solely on cars for travel purposes;
(c) moderating growth in the demand for travel and the distances travelled, especially by car; and
(d) supporting the efficient and viable operation of public transport services.

3.4. To encourage travel by bicycles, both secure bicycle parking and bicycle racks will be provided on site.

3.5. As part of the proposed development, a kiss and ride zone is proposed on the Elizabeth Street frontage between Macquarie Street and Northumberland Street (three indented bays). This will require modifications to the existing bus stop in this location (bus stop would be located between the kiss and ride indented bays and Northumberland Street). Council has advised that this is practical because the existing bus stop is for one bus. With the kiss and ride, there is sufficient distance for two buses between the indented bays and Northumberland Street. The provision of the kiss and ride facility provides an area for people to be dropped off/picked up to access the office tower (for example by taxi's or ubers). The indented bay allows cars to wait without blocking traffic flow on Elizabeth Street.

Parking Provision

3.6. Liverpool LEP 2008 sets out car parking requirements within Liverpool CBD at the following rates:

- at least one car parking space is provided for every 200 square metres of any new gross floor area that is on the ground floor level of the building, and

- in respect of any other part of the building:
  (i) at least one car parking space is provided for every 100 square metres of any new gross floor area that is to be used for the purposes of retail premises, and
  (ii) at least one car parking space is provided for every 150 square metres of any new gross floor area that is to be used for any other purpose.

3.7. In addition the Liverpool DCP 2008 suggests the following for development within Liverpool CBD:

- motorcycle parking – 1 space per 20 parking spaces;
- 2% of parking to be allocated as accessible spaces; and
- bicycle parking – 1 space per 200m^2.

3.8. Applying the LEP rates, the ELP would require 55 spaces and the office tower 74 spaces. 74 spaces will be provided for the office tower in a nested area on the roof, just to the west of the office tower. These spaces would be available for retail parking on weekends.

3.9. The existing shopping centre has a 95th percentile parking demand of 1 space per 31m^2. Applying this rate, the ELP would require 175 spaces. When added to the existing 95th percentile parking demand (2,690 spaces), this results in a requirement for 2,865 spaces. As noted previously, with a parking

management system, parking should be provided at demand plus 5% to allow for circulation within the car park. Thus with the ELP, the shopping centre would require 3,008 spaces. When the office tower parking is added, total parking required would be 3,082 spaces. This is satisfied with the proposed parking provision of some 3,300 spaces.

3.10. As part of the ELP and office tower the following motorcycle, bicycle and accessible spaces are required:

- 13 motorcycle spaces (4 for the office tower and 9 for the ELP);
- 6 accessible spaces (2 for the office tower and 4 for the ELP); and
- 83 bicycle spaces (56 for the office tower and 27 for the ELP).

3.11. The proposed development will provide motorcycle, accessible and bicycle parking in accordance with these requirements.

Access and Internal Layout

3.12. Car park access will be maintained from the existing access points on George Street, Campbell Street, Northumberland Street and Bathurst Street. Service access for the ELP and office tower will be provided via the existing loading dock accessed from Bathurst Street. To improve access, modifications to the Bathurst Street (south) and George Street accesses are proposed.

3.13. It is proposed to modify the existing traffic signal controlled Bathurst Street (south) access as follows:

- all egress to be left turn only (currently the volume of right turning traffic is low at some 10 vehicles per hour in peak periods). Due to the tightness of the approach to Bathurst Street vehicles turning right out of the site block vehicles turning left;

- relocate the existing pedestrian crossing from the southern side to the northern side of Bathurst Street; and
- modify the signal phasing to reflect the above changes.

3.14. The above changes would improve capacity of the intersection by reducing the number of phases for the traffic signals. The impact on the operation of the traffic signals of the above modifications is addressed in the section on Traffic Effects.

3.15. At the George Street access additional signage and line marking is proposed to address conflicts between vehicles accessing the shopping centre and the adjacent commercial development. These are shown in Figure 4.

3.16. The existing roof top car park will be modified to accommodate the ELP, office tower and new level 4 parking deck. The car parking area in the north western corner of level 3 will be reconfigured to improve circulation and allow for the column grid to support the new level 4 car park level. To improve access to the roof top car park, a new speed ramp will be provided from the eastern Campbell Street. Within the car park new parking spaces, aisles, ramps etc. will be designed in accordance with AS2890.1-2004.

Servicing

3.17. The new office tower will be serviced from the existing loading docks accessed from Bathurst Street. A service corridor and lifts will connect the dock with the ELP and office tower. The ELP will be serviced from the Campbell Street docks. Some secondary servicing for the ELP (by vans) will be provided via the roof top car park.

Traffic Effects

3.18. The existing shopping centre was found to generate some 2,520 and 3,140 vehicles per hour (two way) in the Thursday afternoon and Saturday midday peak hours. With the existing centre having some 83,414m^2 GLA, this equates to generation rates of 1 vehicle per hour (two way) per 33m^2 GLA and 26m^2 GLA in the Thursday afternoon and Saturday midday peak hours respectively. Using these rates the ELP, with some 5,417m^2 GLA, would generate some 165 and 210 vehicles per hour in the Thursday afternoon and Saturday midday peak hours respectively.

3.19. A generation rate of 0.3 vehicles per space for the office tower has been adopted as parking is constrained and the site has good access to public transport. Applying this rate, the office tower, with 74 spaces, would generate some 20 vehicles per hour in the weekday afternoon peak hour.

3.20. The additional traffic has been assigned to the surrounding road network based on existing traffic patterns. The additional traffic is summarised in Table 3.1 and displayed on Figures 2 and 3.

3.21. Examination of Table 3.1 reveals that:

- traffic flows on Campbell Street would increase by some 10 to 40 vehicles per hour (two way) in the peak periods;

- traffic flows on George Street would increase by some 5 to 20 vehicles per hour (two-way) in the peak periods;

- traffic flows on Elizabeth Street would increase by some 5 to 35 vehicles per hour (two-way) in the peak periods;

- traffic flows on Bathurst Street increase by some 5 to 40 vehicles per hour (two-way) in the peak periods;

- traffic flows on Macquarie Street increase by some 45 to 55 vehicles per hour (two-way) in the peak periods; and

- traffic flows at the site access points would increase by some 15 to 60 vehicles per hour (two-way) in the peak periods.

Table 3.1 : Existing + Dev Two Way Peak Hour Traffic Flows (Vehicles Per Hour)

Location	Thursday Afternoon		Saturday Midday	
	Existing	+ Dev	Existing	+ Dev
Campbell Street				
– east of George Street	560	+10	425	+10
– east of Macquarie Street	715	+20	725	+15
– east of Northumberland Street	1040	+40	950	+30
– east of Bathurst Street	930	+30	1040	+40
– west of Bathurst Street	635	+30	765	+40
Elizabeth Street				
– east of George Street	815	+5	770	+10
– east of Northumberland Street	1050	+5	875	+5
– east of Bathurst Street	1220	+0	1095	+5
– west of Bathurst Street	1955	+35	1580	+30
George Street				
– north of Campbell Street	465	+10	285	+10
– south of Campbell Street	725	+5	510	+10
– south of Elizabeth Street	645	+10	555	+20
Bathurst Street				
– north of Campbell Street	155	+0	90	+0
– south of Campbell Street	690	+5	605	5
– south of Elizabeth Street	1350	+25	1230	+40
Macquarie Street				
– north of Campbell Street	600	+45	455	+55
Northumberland Street				
– north of Campbell Street	120	+0	50	+0
Site Accesses				
– Bathurst Street (north)	455	+35	530	+45
– Bathurst Street (south)	360	+30	530	+35
– Campbell Street (east)	410	+35	385	+25
– Campbell Street (west)	120	+15	280	+20
– Northumberland Street	655	+55	755	+60
– George Street	320	+20	595	+45

3.22. Thus once development traffic is distributed to the shopping centre access points and the surrounding road network, the increase in traffic flow is modest at some 5 to 55 vehicles per hour.

3.23. The surveyed intersections have been reanalysed with development traffic in place using the SIDRA 8 network model. The analysis found that:

- the traffic signal intersection of Elizabeth Street and Bathurst Street would continue to operate with average delays per vehicle of less than 40 seconds during the peak periods. This represents level of service C, a satisfactory level of intersection operation;

- the traffic signal controlled intersections of Elizabeth Street with George Street and Northumberland Street would continue to operate with average delays per vehicle of less than 30 seconds during the peak periods. This represents level of service B/C, a satisfactory level of intersection operation;

- the traffic signal controlled intersection of Campbell Street and George Street would continue to operate with average delays per vehicle of less than 30 seconds during the peak periods. This represents level of service B/C, a satisfactory level of intersection operation;

- the traffic signal controlled intersections of Campbell Street with Bathurst Street and Northumberland Street would continue to operate with average delays per vehicle of less than 25 seconds during the peak periods. This represents level of service B, a good level of intersection operation;

- the traffic signal controlled intersection of Bathurst Street with Secant Street and the site access (modified) would operate with average delays per vehicle of less than 15 seconds during the peak periods. This represents level of service A/B, a good level of intersection operation;

- the roundabout controlled intersection of Campbell Street and Macquarie Street would continue to operate with average delays per vehicle of less than 15 seconds during the peak periods. This represents level of service A/B, a good level of intersection operation; and

- the intersections of the site accesses with Campbell Street, Bathurst Street and George Street would continue to operate with average delays per vehicle of less than 20 seconds during the peak periods. This represents level of service B, a satisfactory level of intersection operation.

3.24. Thus the analysis has shown that the surrounding road network can accommodate the modest increase in traffic generated by the proposed development. Intersections would continue to operate at their existing levels of service with only minor increases in average delays per vehicle (around one second).

3.25. In pre-DA, advice Council raised concern that the proposed development could create additional traffic/pedestrian conflicts along Elizabeth Street and that additional traffic calming measures along Elizabeth Street would be considered favourable by Council. As can be seen from Table 3.1, the propose development would result in minimal traffic flows (0 to 10 vehicles per hour, two way) in the section of Elizabeth Street where pedestrian flows are highest (between Bathurst Street and George Street). In this section of Elizabeth Street there are four locations for pedestrians to cross the road (at the traffic signal controlled intersections with George, Macquarie, Northumberland and Bathurst Streets). Based on the above, no additional traffic calming measures on Elizabeth Street are required as part of the proposed development.

Summary

3.26. In summary, the main points relating to the development application are:-

(i) the site has good access to public transport;

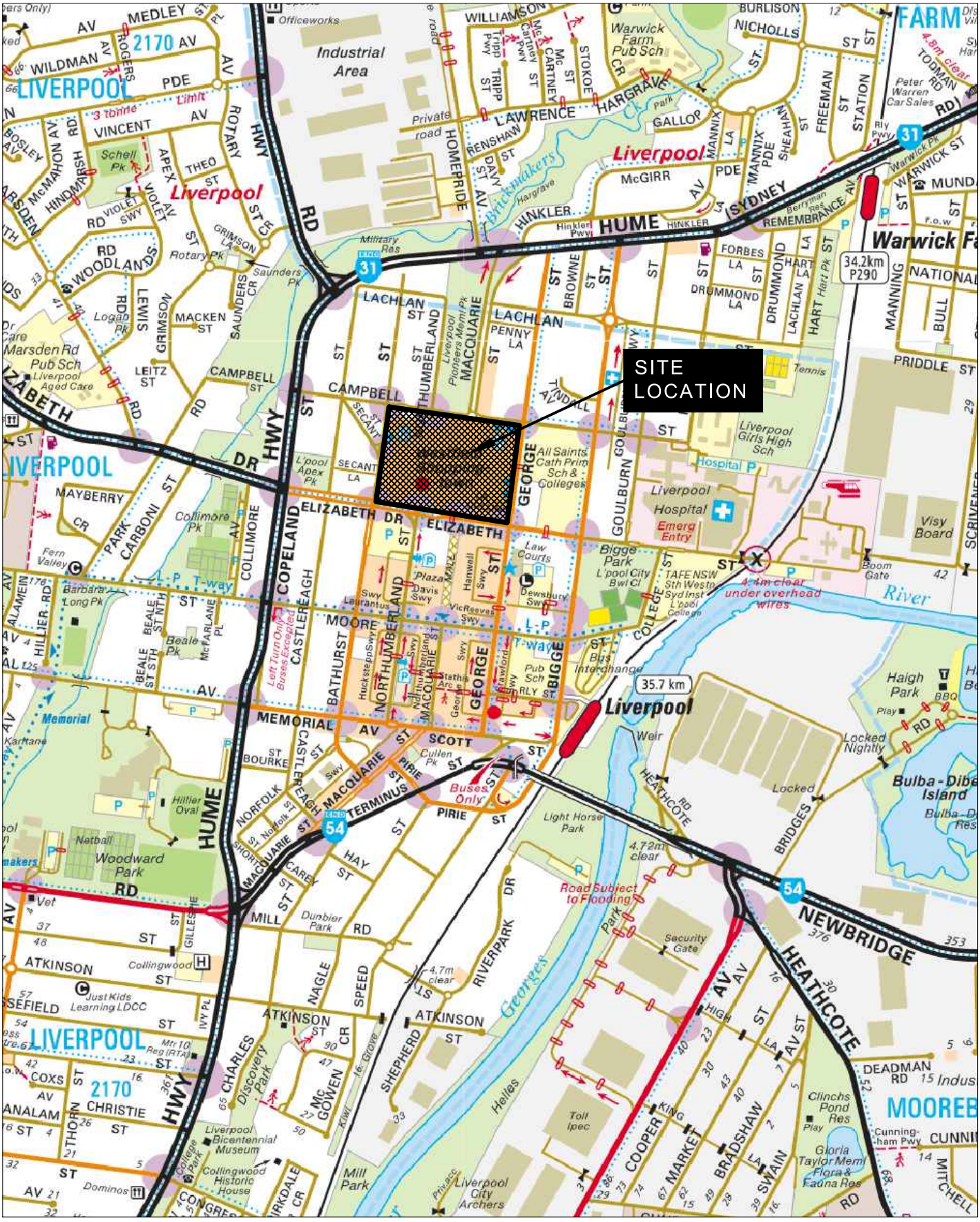
(ii) parking provision is appropriate;

(iii) parking layouts and internal circulation will be designed to comply with AS2890.1-2004;

(iv) access and servicing arrangements are appropriate;

(v) the proposed development will result in only a modest increase in traffic flows; and

(vi) the surrounding road network can cater for the traffic generated by the proposed development with intersections continuing to operate at their existing levels of service.

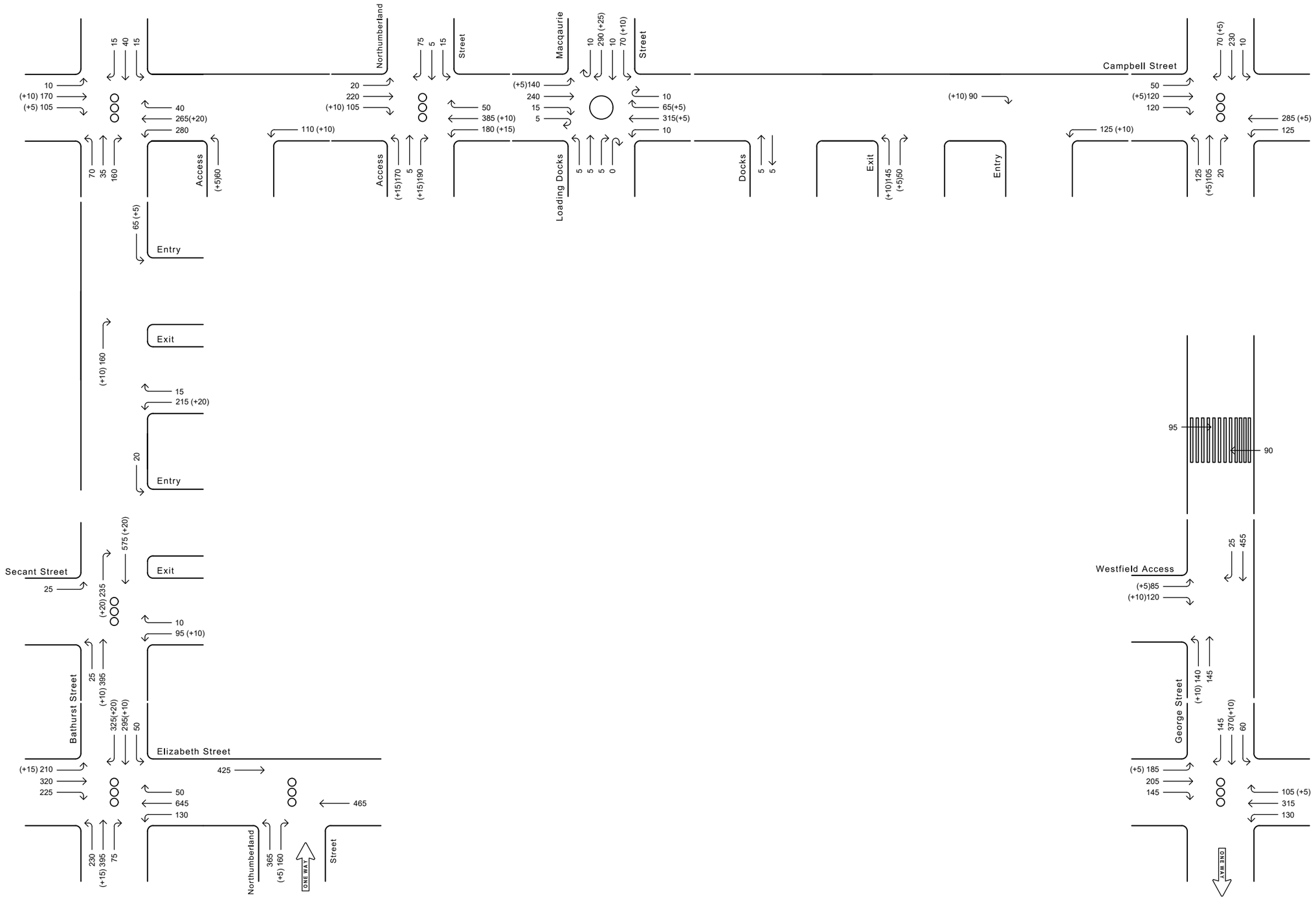


Location Plan

Colston Budd Rogers & Kafes Pty Ltd

DRAWN BY CBHK Pty Ltd_mc Ref: 10445 20.7.2018

Figure 1

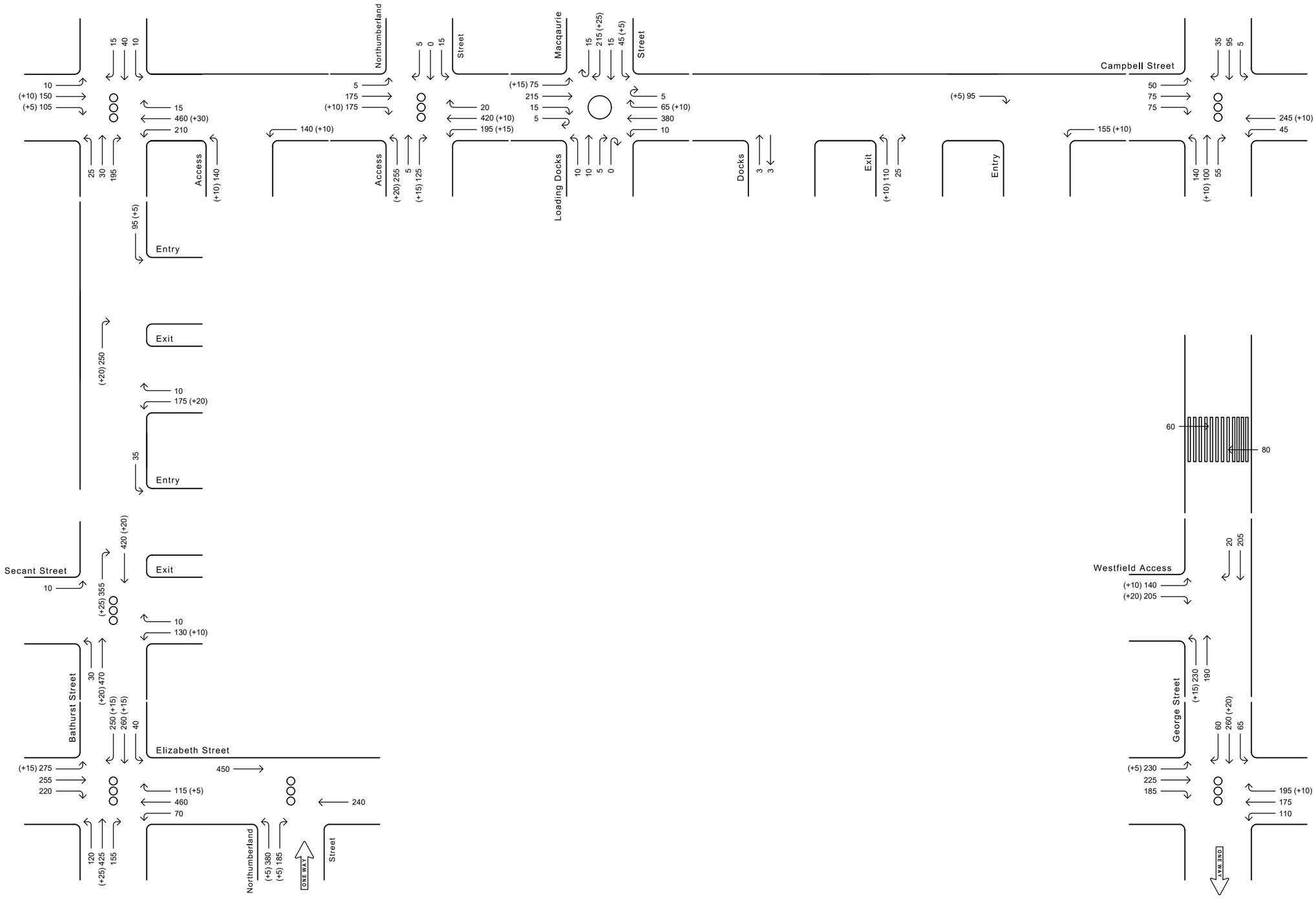


Existing Thursday afternoon peak hour traffic flows

Colston Budd Rogers & Kafes Pty Ltd

DRAWN BY CBRK Pty Ltd_hs Ref: 10445 14.08.2018

Figure 2

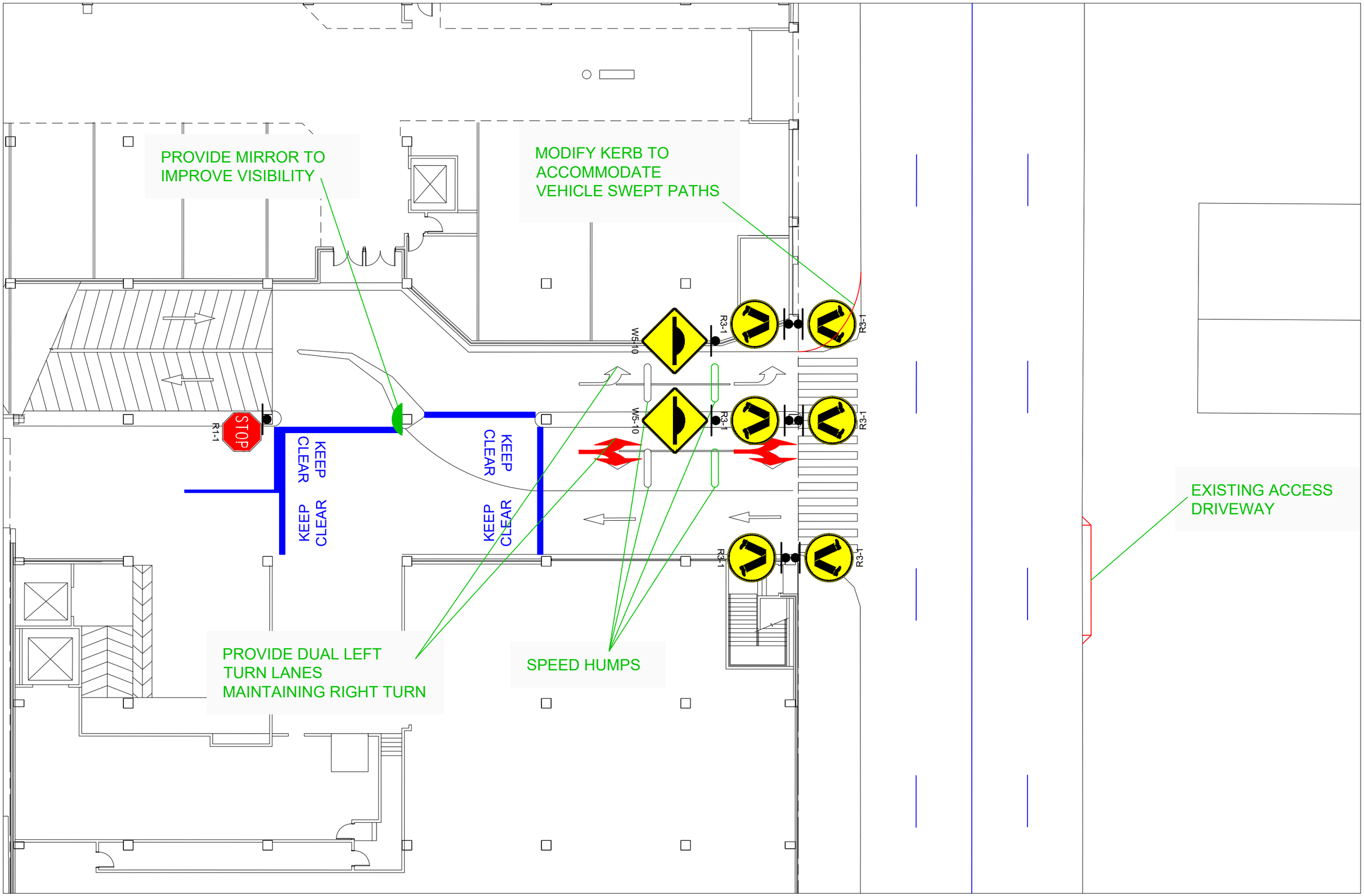


Existing Saturday midday peak hour traffic flows

Colston Budd Rogers & Kafes Pty Ltd

DRAWN BY CBRK Pty Ltd_hs Ref: 10445 14.08.2018

Figure 3



COLLINS LANE

DRAWN BY CBRK Pty Ltd_mr Ref: 10445 5 March 2018