Traffix Group

Traffic Engineering Assessment

Development Plan

Xavier College (Senior Campus) – 135 Barkers Road, Kew

Prepared for
Xavier College

August 2021

G28932R-02C

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Executive Summary

Context

Xavier College has three existing campuses, including the subject site, which currently operates as its Senior Campus (years 9-12). Recently the College announced that the Kostka Hall Campus is to close with all Year 7 & 8 students to be consolidated within the Senior Campus (subject site). The Development Plan has been prepared to respond to this change and to provide a plan to guide the development of the site across the next 30 years.

Proposal Summary

The proposed Development Plan incorporates an increase in staff and student numbers, buildings and works as well as modifications to car parking and vehicle access arrangements.

As a result of the Development Plan there is a proposed increase, relative to the 2006 Development Plan, in student numbers to 1,500 students (increase of 500 students) and staffing levels to 210 full-time equivalent staff (increase of 30 staff members).

We have been advised by the School that the movement of students between Burke Hall and the Senior School, as well as the intensity of before/after school sports and weekend sports, will remain generally consistent with current arrangements under the Development Plan. Specifically, year 7 & 8 students, who don't currently attend schooling at the Senior Campus, already attend sporting activities at the Senior Campus. The School has further advised that there may be a minor redistribution of the year levels who participate in sports/training on-site, however, the number of students participating is to remain generally consistent with existing conditions.

To facilitate these changes to the student/staff population and to provide improved facilities throughout the site, the following staged works are proposed:

- **Priority Project 1 - Year 7 & 8 Building & Chapel Oval Car Park**

  Works – The Year 7 & 8 Building is proposed to replace the existing basketball courts, including removing car parking located on the basketball courts. The Chapel Oval Car Park incorporates the provision of car parking underneath the existing Chapel Oval, with the oval also to be increased in size.

  Car Parking - Existing car parking on basketball courts to be removed. Rationalisation of car parking within the site with car parking to be removed from internal access roads. Provision of new Chapel Oval car park and retention of some existing on-site car parking.

  Vehicle Access - Removal of the north-south orientated internal road link which connects through to Gellibrand Street[1]. Proposed signalisation of the existing site access point to Barkers Road, subject to authority approval.

[1] Vehicle access to Gellibrand Street to be retained for maintenance vehicle and loading access only.

- **Priority Project 2 – Boarding House**

  This building is proposed within the existing tennis courts area within the north-western corner of the site. It is anticipated that minimal (if any) car parking[2] would be provided within this area.

- **Other Future Projects**
  - Specialist teaching and learning building
  - Sports Centre upgrade
  - New maintenance building

The above 'other future projects' would not result in a material change to car parking and traffic arrangements.

The Development Plan is shown below.

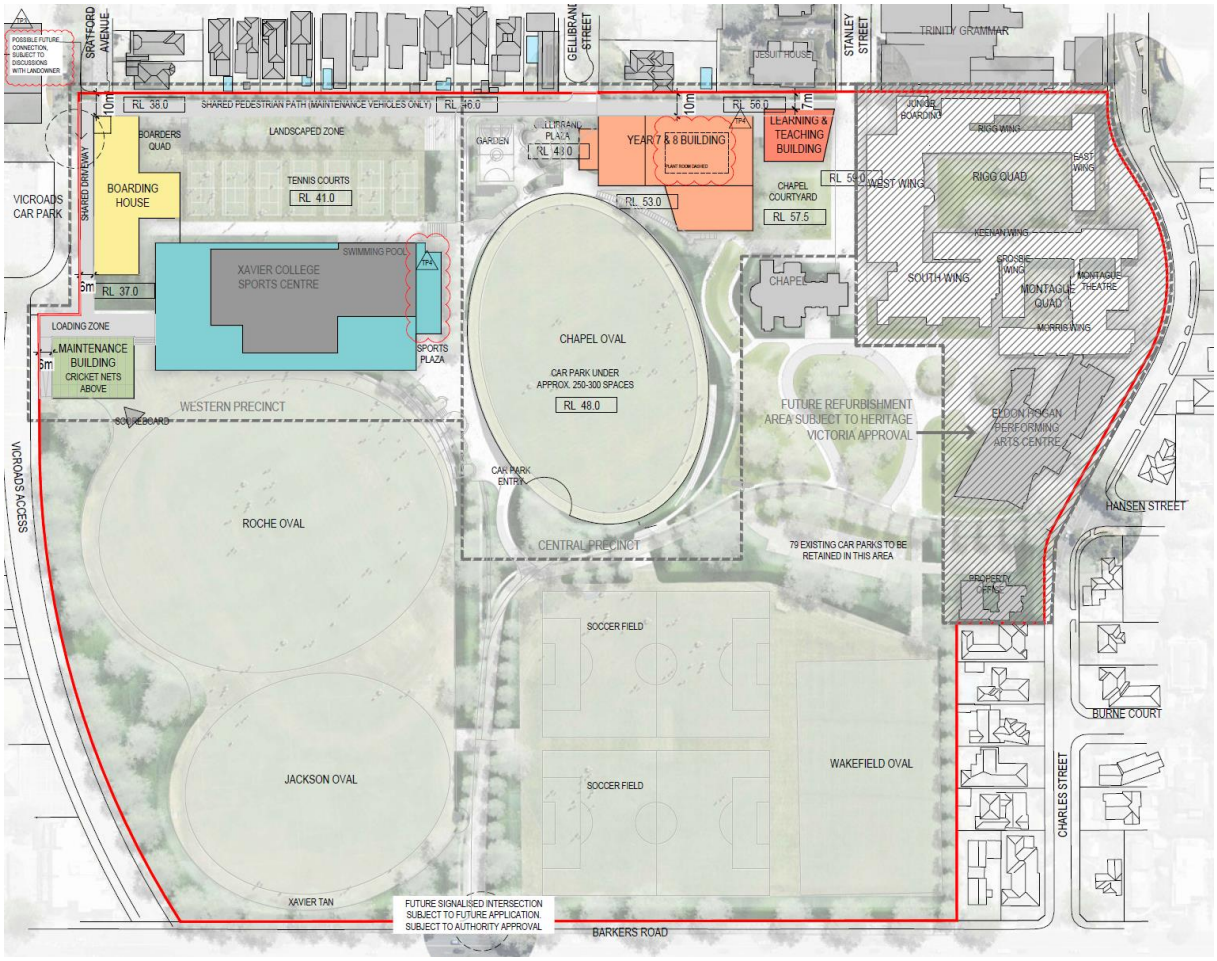

Figure A: Development Plan

[2] Any car parking would be for maintenance vehicles and/or boarding house staff.

Staff & Student Travel Behaviour

Traffix Group completed an online survey of staff and students to ascertain existing travel behaviours. Surveys were completed across February/March 2021 with a total of 617 responses received, comprising 130 staff and 487 parents/guardians of students.

We note that a small percentage of the parent/guardian responses were for students who board on campus and therefore do not travel to/from the school day to day. The responses of boarders have been excluded from our analysis/results.

The key results of the travel behaviour surveys are as follows:

- Staff – 94% travel to site via car, all park on-site.
- Students – 29% travel to the site via car. Of those who travel via car, 43% park on-site.

Car Parking

A summary of the existing on-site car parking, and that specified within the 2006 and proposed Development Plans, is presented within the below table.

Table A: Development Summary

	During School Hours	After School Hours
Existing Conditions	249 spaces	300 spaces
Development Plan (2006 Approved)	245 spaces	314 spaces
Development Plan (Proposed) [1]	351-401 spaces	351-401 spaces

[1] Exact car parking provision subject to detailed design of the Chapel Oval car park.

The Development Plan proposes a total of 351-401 on-site car parking spaces, both during and after school hours. This represents at least a 106 space increase during school hours and at least a 37 space increase to car parking after hours, compared with the 2006 Development Plan.

The Development Plan results in a statutory requirement to provide 36 additional car parking spaces during school hours and no additional car parking spaces after school hours. The proposed provision of on-site car parking exceeds statutory requirements.

The following figure has been prepared to illustrate the proposed location and provision of on-site car parking.

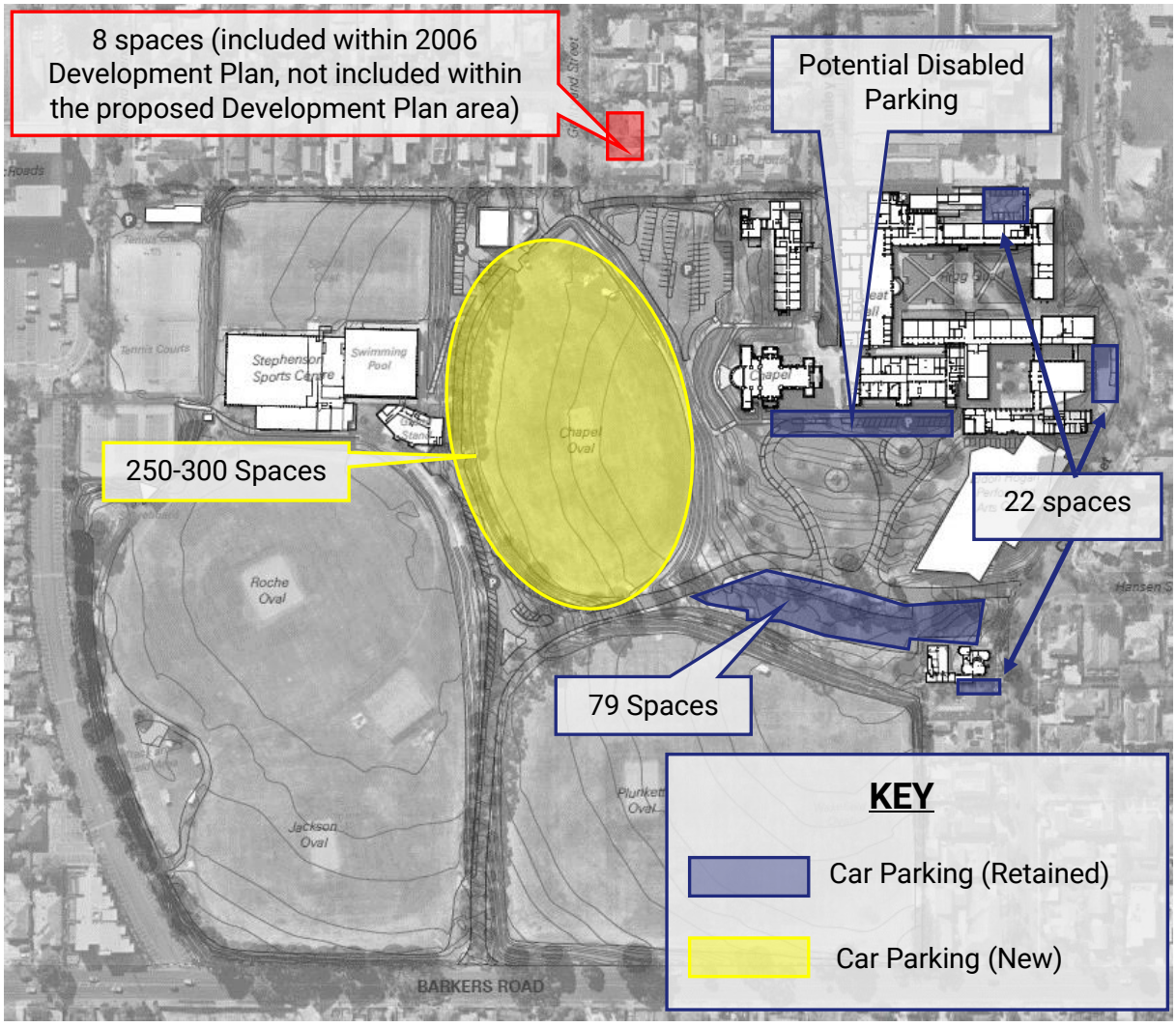

Figure B: Car Parking Areas –Development Plan

Statutory car parking rates are on the basis that schools are to accommodate staff car parking demands within the site itself and that the surrounding on-street road network is to be utilised for, and absorbs car parking demands associated with, pick-up/drop-off.

Increasingly, private schools are seeking to provide additional car parking within their sites to both allow for pick-up/drop-off, sporting, as well as other after-hours events. This is not a statutory imperative but rather an intent to provide increased convenience in accessing the site and to reduce the impact that their operations have on surrounding streets.

The increase in the student cohort by 50% will increase on-site demands as well as the demand for on-street car parking. It is difficult to quantify the exact extent to which on-street car parking demands will change as a result of the development proposal. Any increase in on-street car parking demands is anticipated to be limited to pick-up/drop-off periods with the Development Plan representing an increase to the on-site provision of car parking during school hours and after hours. It is noted that a dedicated pick-up/drop-off area is also proposed within the Chapel Oval Car Park.

Indeed, with respect to the above it is important to note that the use of on-site and on-street car parking surrounding schools typically reaches a natural equilibrium. This equilibrium is reached through parent's/guardian's understanding of the on-site/on-street car parking availability. Parents/guardians who commonly drive to the school understand the operation of the surrounding road network and on-site vs off-site car parking availability. This allows parents/guardians, along with their individual preferences and circumstances, to tailor both their trip timing and pick-up/drop-off location accordingly.

The above is considered an important frame of reference in viewing the proposed car parking arrangements. This is not to quantify the potential increase in on-street car parking demands, but rather to highlight that the majority (if not all) of on-site car parking spaces are likely to be utilised during pick-up/drop-off periods.

Vehicle Access

A rationalisation of staff/parent/visitor access points to a single location to both Barkers Road and Charles Street is proposed. Given this rationalisation, and the anticipated increase in vehicle movements associated with the provision of the Chapel Oval Car Park, signalisation of the Barkers Road / Site Access intersection is proposed.

Proposed vehicle access arrangements are illustrated within the following figure.

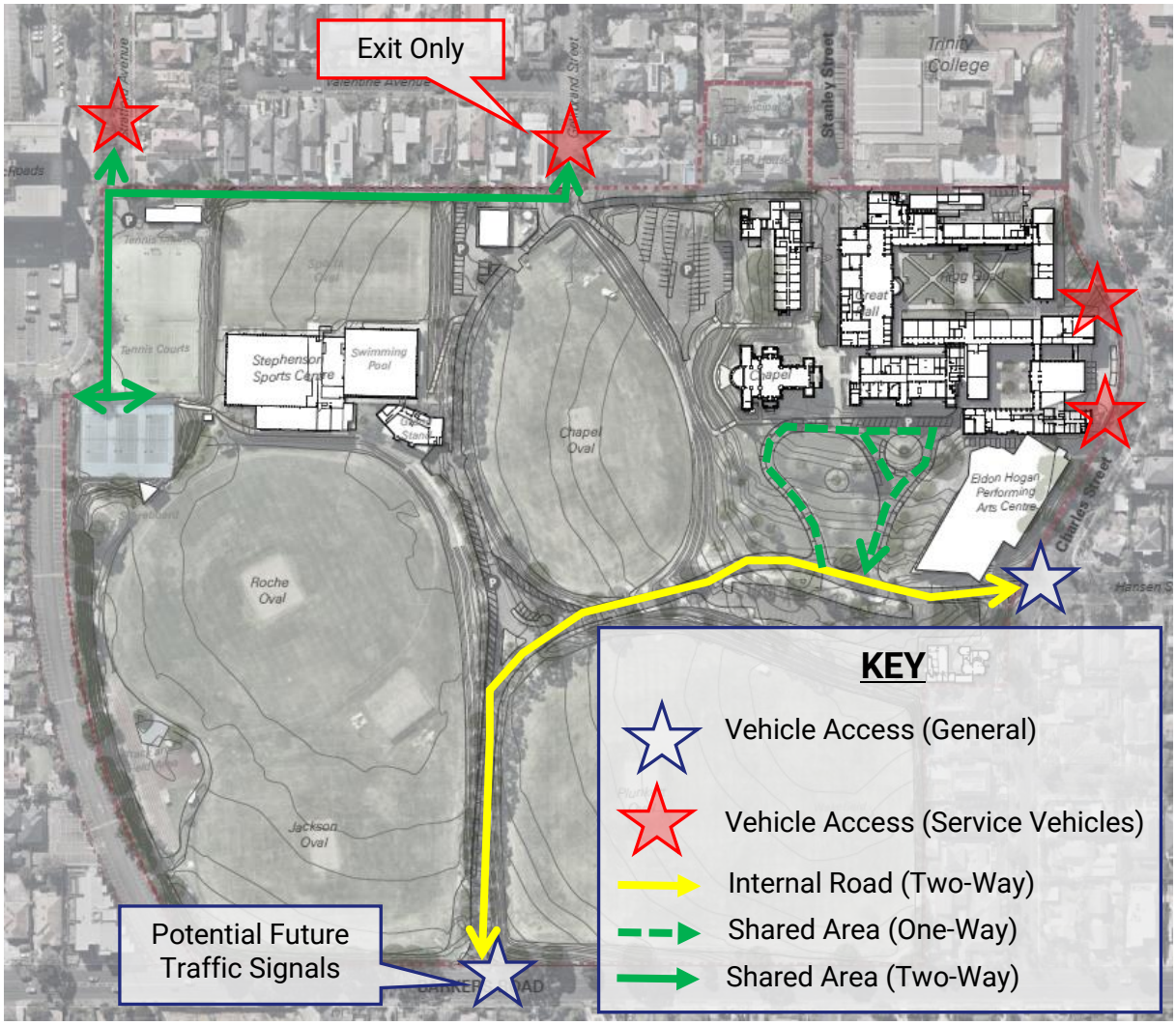

Figure C: Vehicle Access Arrangements & Internal Road Network – Development Plan

Traffic Volumes

Traffix Group commissioned traffic surveys of the key existing site access points in order to determine existing traffic volumes associated with the site. The surveys indicated three key peak hours, as follows:

- AM Peak – 7:40am-8:40am
- Early PM Peak – 3:20pm-4:20pm
- Late PM Peak – 4:30pm-5:30pm

Based on the travel behaviour survey results, and rationale outlined within the report, we identified the following post development site generated traffic volumes which will occur at the site access points.

Table B: Total Site Traffic Generation

Peak Period	Site Traffic Generation
AM Peak	460 veh/hr
Early PM Peak	416 veh/hr
Late PM Peak	368 veh/hr

*veh/hr Denotes vehicles per hour

As shown above we derive a total anticipated post development site generated traffic volume at the site access points of 460, 416 and 368 vehicles during the respective AM, Early PM and Late PM peak hours.

We note that no increase in traffic volumes, other than associated with staff movements (note: 30 additional staff proposed), is assumed during the Late PM peak hour as the Development Plan will not result in an intensification or increase in the number of students undertaking sports training on-campus.

Traffic Impact

Our traffic assessment is based upon the AM, Early PM and Late PM peak hours. No assessment has been provided of other peak periods, namely Saturday mornings, noting our understanding that the intensity of Saturday morning sporting activities is not to change as a result of the Development Plan.

Whilst this is equally true for the 'Late PM' peak hour, the Late PM peak hour also more closely aligns with the road network peak hour for the surrounding road network than Saturday morning sporting times. Despite no change to after school activities during the Late PM peak it has been assessed, noting that general site access to Gellibrand Street is to be removed, with an associated re-distribution of traffic to/from the site.

Charles Street / Hansen Street / Site Access

The Charles Street / Hansen Street / Site Access intersection currently operates within acceptable limits and is predicted to continue to do so post development, that is, degree of saturation well below acceptable limits.

The Development Plan is not expected to result in a significant deterioration in the operation of this intersection, with all post development queues and delays also considered to be within acceptable limits and existing lane lengths/capacities.

Barkers Road / Site Access

A functional layout plan illustrating the proposed signalised arrangements is included as Appendix B, with the design incorporating the following key characteristics:

- Retention of two east and westbound through traffic lanes on Barkers Road,
- A dedicated right-turn lane for vehicles entering the site,
- Separate left and right-turn lanes for vehicles exiting the site.
- Signalised pedestrian crossing of Barkers Road (eastern leg) and Site Access (northern leg).
- Signalised exit from the residential driveway of 150 Barkers Road[3].
- Retention of an existing 'A Grade' tree within the north-east corner of the intersection.

The proposal retains the existing carriageway width of Barkers Road (14.25m). We are satisfied that this is appropriate, also noting that such an arrangement generally matches that at upstream/downstream intersections of Barkers Road with Power Street/Denmark Street and Glenferrie Road.

The changes to on-street car parking as a result of the proposal would be subject to Council and Department of Transport (DoT) approval. Barkers Road currently has wide kerbside lanes (roughly 4.0m wide) which permit kerbside parking (subject to clearway restrictions) and accommodate on-road cycling (including line marking). It is our view that parking would need to be restricted, at a minimum, up to the point at which the kerbside traffic lane returns to 4.0m in width to retain the integrity of on-road cycling provisions.

Based on a review of on-street car parking the proposed signalisation of the Barkers Road / Site Access intersection would result in the loss of 29 on-street car parking spaces (14 and 15 spaces on the northern and southern sides of Barkers Road respectively). We re-emphasise that any changes to on-street car parking restrictions are subject to Council and Department of Transport approval.

Traffic modelling indicates that the Barkers Road / Site Access intersection is anticipated to operate within acceptable limits during all assessed peak periods.

Indeed, vehicle queuing associated with the proposed signalised intersection is not anticipated to extend back to or impact upon the operation of the Barkers Road / Denmark Street / Power Street or Barkers Road / Glenferrie Road intersections.

[3] Subject to DoT & property owner(s) consent.

We are satisfied that the additional traffic generated as a result of the Development Plan can be accommodated within the Barkers Road / Site Access intersection.

Gellibrand Street

Gellibrand Street is to be limited to loading and maintenance vehicle movements only. This will represent a significant reduction in site generated traffic utilising Gellibrand Street comparative with existing conditions as staff/parent vehicles won't be able to exit the site via Gellibrand Street.

Stratford Avenue

Stratford Avenue is to be limited to loading and maintenance vehicle movements only. Site generated traffic volumes are anticipated to be generally consistent or slightly lower than existing conditions, albeit the proportion of heavy vehicles associated with the site utilising Stratford Avenue is anticipated to increase.

Barkers Road / Denmark Street / Power Street

The intersection is effectively already operating near or above its capacity at peak times. The additional traffic volumes and impact to the operation of the intersection are expected to be relatively minor and we do not anticipate that there will be any material change to the operation of the intersection.

Bicycle Facilities

A total of 17 existing bicycle parking spaces are provided throughout the site, with all spaces to be retained following completion of the nominated works outlined within the Development Plan.

The Development Plan results in a statutory requirement to provide 102 additional bicycle parking facilities.

The travel behaviour surveys identified that currently only 1% of staff and 1% of students cycle to the site.

It is our recommendation that bicycle parking area(s) make a spatial allowance for bicycle parking commensurate with the statutory bicycle parking requirement.

It is further recommended that only part of the statutory bicycle parking requirement be provided initially with bicycle parking demands to be monitored and additional parking be provided as bicycle parking areas approach capacity.

Pedestrian Facilities

There are significant improvements proposed to the pedestrian network, including the following:

- The provision of direct pedestrian access between the Chapel Oval Car Park and on-site buildings.
- The provision of an east-west pedestrian spine located towards the northern edge of the site. This spine, along with a separate east-west service road for maintenance vehicles located at the northern boundary of the site, will separate pedestrians and vehicles.
- Removal of car parking and traffic movements, other than some potential disabled car spaces, within the loop road to the south of the Chapel and South Wing.

- Provision of signalised crossing points at the Barkers Road / Site Access intersection.

Bus Parking

Bus parking currently occurs within indented parallel bays within the internal loop road which connects Charles Street and Barkers Road. These arrangements are to be retained.

We have been advised by the School that they require pick-up/drop-off for up to four buses, of varying sizes, at any one time. The nominated area (approximately 52m in length) can accommodate four buses, also noting that there is potential to increase the length of this area (particularly to the west) through line marking modifications.

Loading, Maintenance & Waste Collection

A new maintenance building is ultimately proposed, as part of future works, within the north-western corner of the site. Once completed, maintenance vehicle access will be via Stratford Avenue (Gate 8) and Gellibrand Street (Gate 7). An east-west aligned service road is proposed along the northern boundary of the site linking these two gates.

Additionally, a north-south aligned service road is proposed along the western boundary of the site. This service road would provide access to the new maintenance building, the Xavier Sports Centre as well as loading area(s) of the new boarding house.

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1 Introduction

Traffix Group has been engaged by Xavier College to undertake a traffic engineering assessment of the proposed Development Plan for the Xavier College Senior Campus located at 135 Barkers Road Kew.

Xavier College has three existing campuses as follows:

- Kostka Hall (Brighton): Years 6 -8
- Burke Hall (Kew): Early Learning - Year 8
- Senior Campus (Kew, subject site): Years 9 - 12

Recently the College announced that the Kostka Hall Campus is to close with all Year 7 & 8 students to be consolidated within the Senior Campus (subject site). The Development Plan has been prepared to respond to this change and to provide a plan to guide the development of the site across the next 30 years.

The campus has an existing approved Development Plan, approved April 2006, pursuant to Clause 43.04 of the Boroondara Planning Scheme. Schedule 2 to Clause 43.04 Development Plan Overlay of the Boroondara Planning Scheme nominates the requirements for the Development Plan. Those requirements pertaining to traffic engineering considerations are as follows:

- *"Proposed circulation and access systems for both vehicles and pedestrians.*
- *Parking and traffic management measures, including the location of on-site parking drop-off and pick-up areas, preferred access routes and measures to address vehicle queuing."*

This report provides a traffic engineering assessment of the Development Plan, including an assessment of the above requirements.

2 Existing Conditions

2.1. Subject Site

The site is bounded to the south by Barkers Road, to the east by Charles Street, to the west by the DoT (VicRoads) head office and to the north partially by Trinity College and partially by residential properties. A locality plan of the subject site is presented at Figure 1.

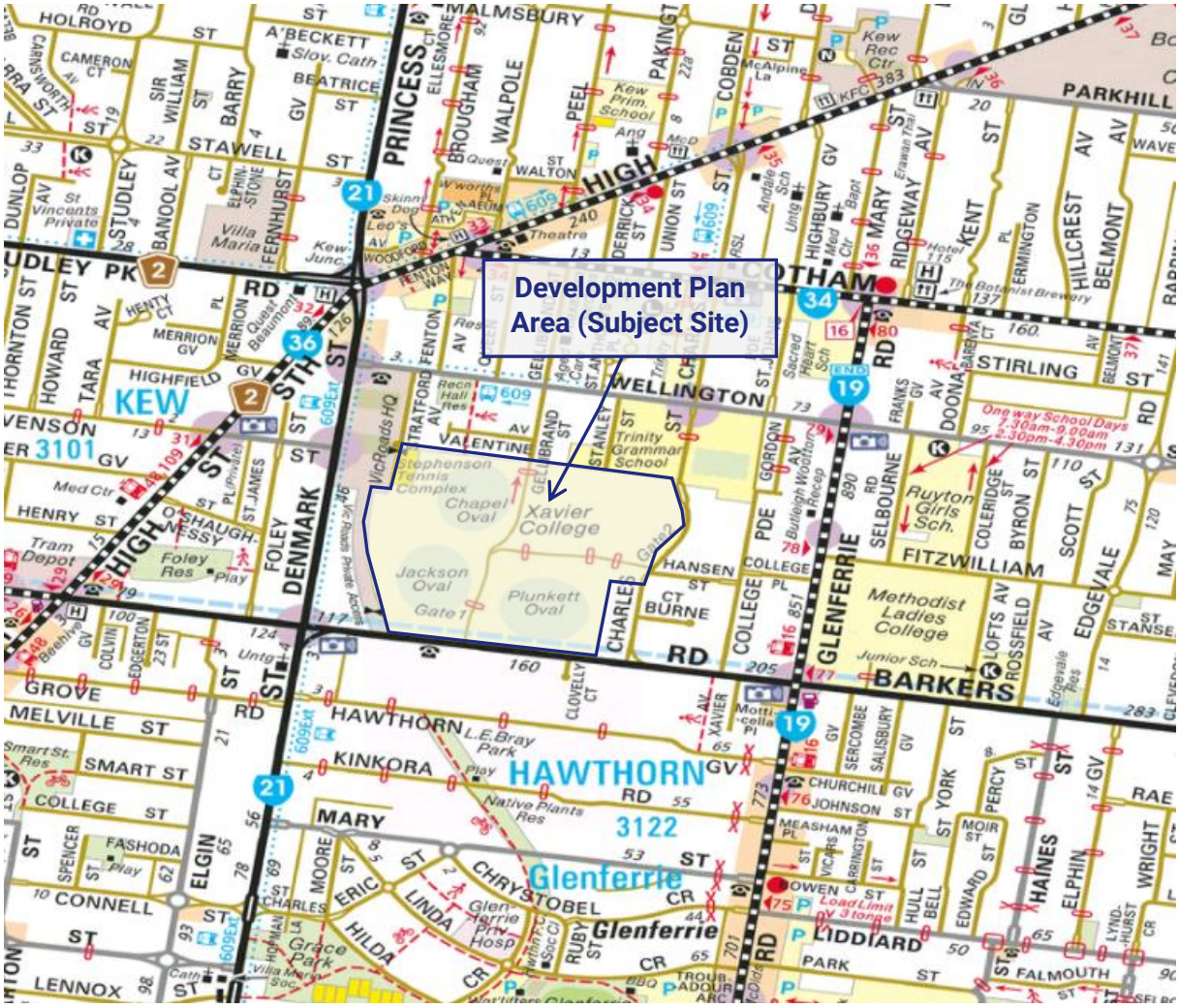


Figure 1: Locality Plan

The subject site has frontages to Barkers Road and Charles Street of approximately 330 metres and 270 metres respectively.

The site is zoned Neighbourhood Residential Zone 1 (NRZ1) as indicated in Figure 2 below. Surrounding land uses are primarily residential. Notable exceptions include Trinity Grammar School to the north-east and VicRoads head office to the west. Kew Junction shopping precinct is located further north-west of the site with Ruyton Girls School and Methodist Ladies College located to further east of the site.

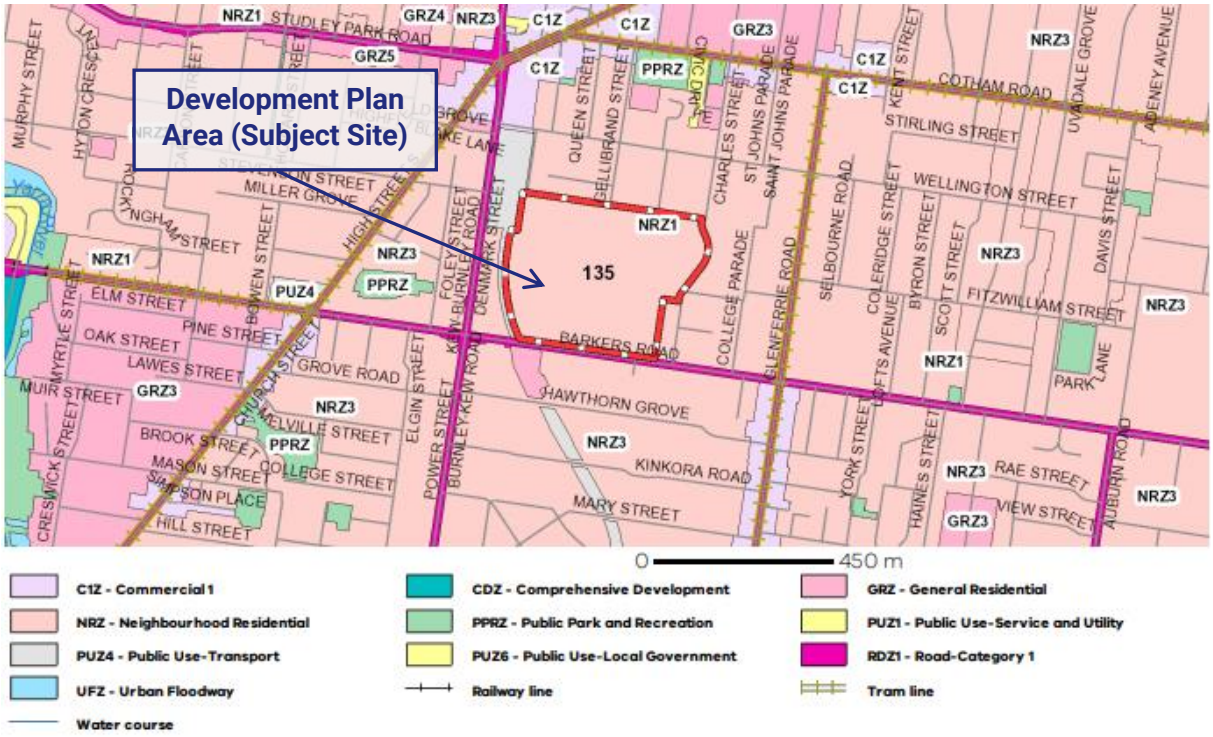


Figure 2: Land Use Zoning Map

The subject site is currently occupied by a number of education, sport, pastoral and performing arts facilities. The campus currently accommodates 990 students[4] (years 9-12) including 57 boarders. A total of 180 full time equivalent staff are understood to work within the site, consistent with the maximum requirements of the 2006 Development Plan.

[4] The Development Plan permits up to 1,000 students.

2.2. Vehicle Access & Internal Road Network

Existing site vehicle access and circulation arrangements are illustrated within Figure 3.

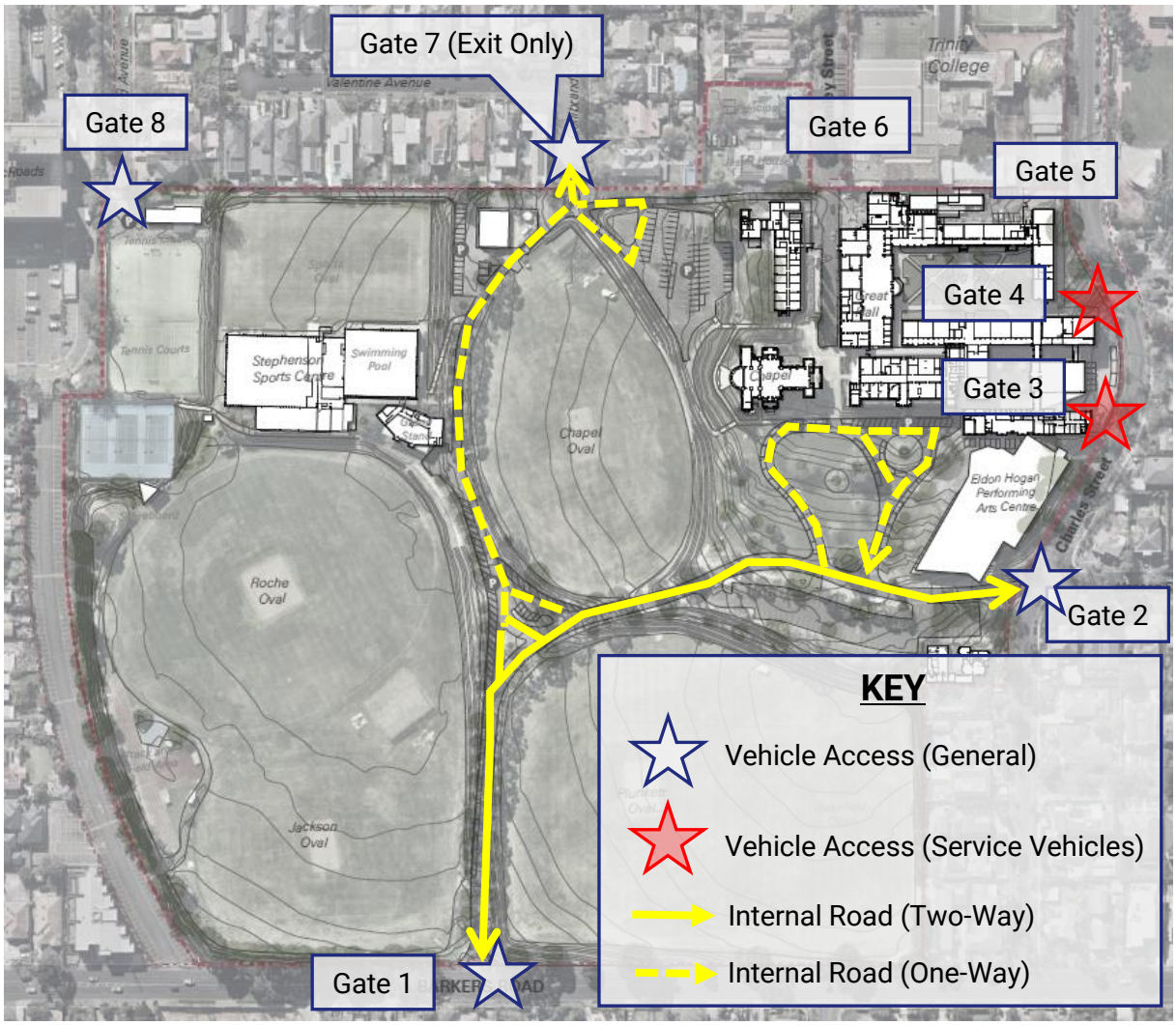


Figure 3: Existing Vehicle Access Arrangements & Internal Road Network

As shown within Figure 3 the School currently has four primary vehicle access points with all access points other than Gellibrand Street permitting full turning movements. The Gellibrand Street access point is controlled by a boom gate with exit movements only permitted from the College.

2.3. Road Network

Barkers Road is located within a Road Zone Category 1 (RDZ1), controlled by DoT, and provides an arterial road link between Burke Road, Hawthorn East and the Melbourne CBD via Victoria Street through Richmond. The road serves an important role providing a primary east-west road link.

In the vicinity of the site Barkers Road is a four-lane two-way road with parallel kerbside parking permitted in sections. Directly abutting the site frontage is a No Stopping restriction for approximately 30m either side of the site vehicle access. A clearway also operates between 6:30 and 9:30am (Monday to Friday) on the south side and between 4:00 and 6:30pm (Monday to Friday) on the north side.

A posted speed limit of 60km/h applies to Barkers Road along the site frontage, reducing to 40km/h from 8am-9:30am and 2:30pm-4pm on School Days.

Barkers Road, adjacent to the subject site, is presented at Figure 4 and Figure 5.

Figure 4: Barkers Road – View East

Figure 5: Barkers Road – View West

Charles Street is a local street that runs in a predominately north-south direction between Barkers Road and Wellington Street. Charles Street continues north of Wellington Street to High Street functioning as a collector road. The intersection of Charles Street and Wellington Street is signalised with a central median island in Charles Street providing two lanes on both the southern approach and departure side of the intersection in the immediate vicinity of the intersection (i.e. no parking permitted).

Charles Street is a two-lane two-way road in the vicinity of the site with a pavement width of around 7.9 metres. Traffic management towards the northern end of Charles Street includes speed humps and a raised school crossing combined with a slow point. Left-turn only access is permitted from Charles Street onto Barkers Road with regulatory signage and a traffic island restricting right-turn out movements at the intersection.

No Stopping restrictions exist on the west side of Charles Street in the vicinity of Gate 2. The No Stopping restrictions on the west side (along the college's frontage) span from midblock of the abutting property to the south of Gate 2 (i.e. Xavier College Property Office) to the pedestrian crossing further to the north (adjacent to Trinity Grammar). To the south of the Xavier College Property Office, kerbside parallel parking is permitted on the western side.

On the east side of Charles Street, along the College's frontage, there are No Stopping restrictions that span between midblock (No.18 Charles Street) to the pedestrian crossing to the north (adjacent to Trinity Grammar). To the south of the No Stopping restriction kerbside parallel parking is permitted on the eastern side.

Charles Street, adjacent to the subject site, is presented at Figure 6 and Figure 7.

Figure 6: Charles Street – View North

Figure 7: Charles Street – View South

Stanley Street is a local street which runs for a short distance to the south of Wellington Street and terminates as a dead-end. Gate 6 of Xavier College (pedestrian access only gate) is located at the dead-end section of the street. The carriageway is approximately 13.6 metres wide with restricted parallel kerbside parking on the west side and restricted kerbside angle parking on the east side.

Stanley Street is presented at Figure 8 and Figure 9.

Figure 8: Stanley Street – View North

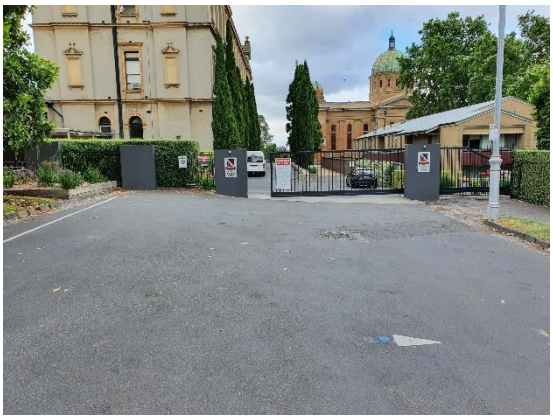


Figure 9: Stanley Street – View South of Gate 6

Gellibrand Street is a local street which runs for a short distance to the south of Wellington Street to a dead-end/Gate 7 of Xavier College (exit only gate). The road is approximately 9.5 metres wide with restricted parallel kerbside parking on both sides.

Gellibrand Street is presented at Figure 10 and Figure 11.

Figure 10: Gellibrand Street – View North

Figure 11: Gellibrand Street – View South of Gate 7

Stratford Avenue is a residential street which runs for a short distance to the south of Wellington Street to a dead-end/Gate 8 of Xavier College (exit only gate). The road is approximately 6.0 metres wide, widening in the vicinity of the Gate 8 access, with restricted parallel kerbside parking on the eastern side of the carriageway.

Stratford Avenue, adjacent to the subject site, is presented at Figure 12 and Figure 13.

Figure 12: Stratford Avenue– View North

Figure 13: Stratford Avenue – View South of Gate 8

2.4. Car Parking Conditions

The approved 2006 Development Plan incorporates a car parking plan of the site as shown within Figure 14 below.

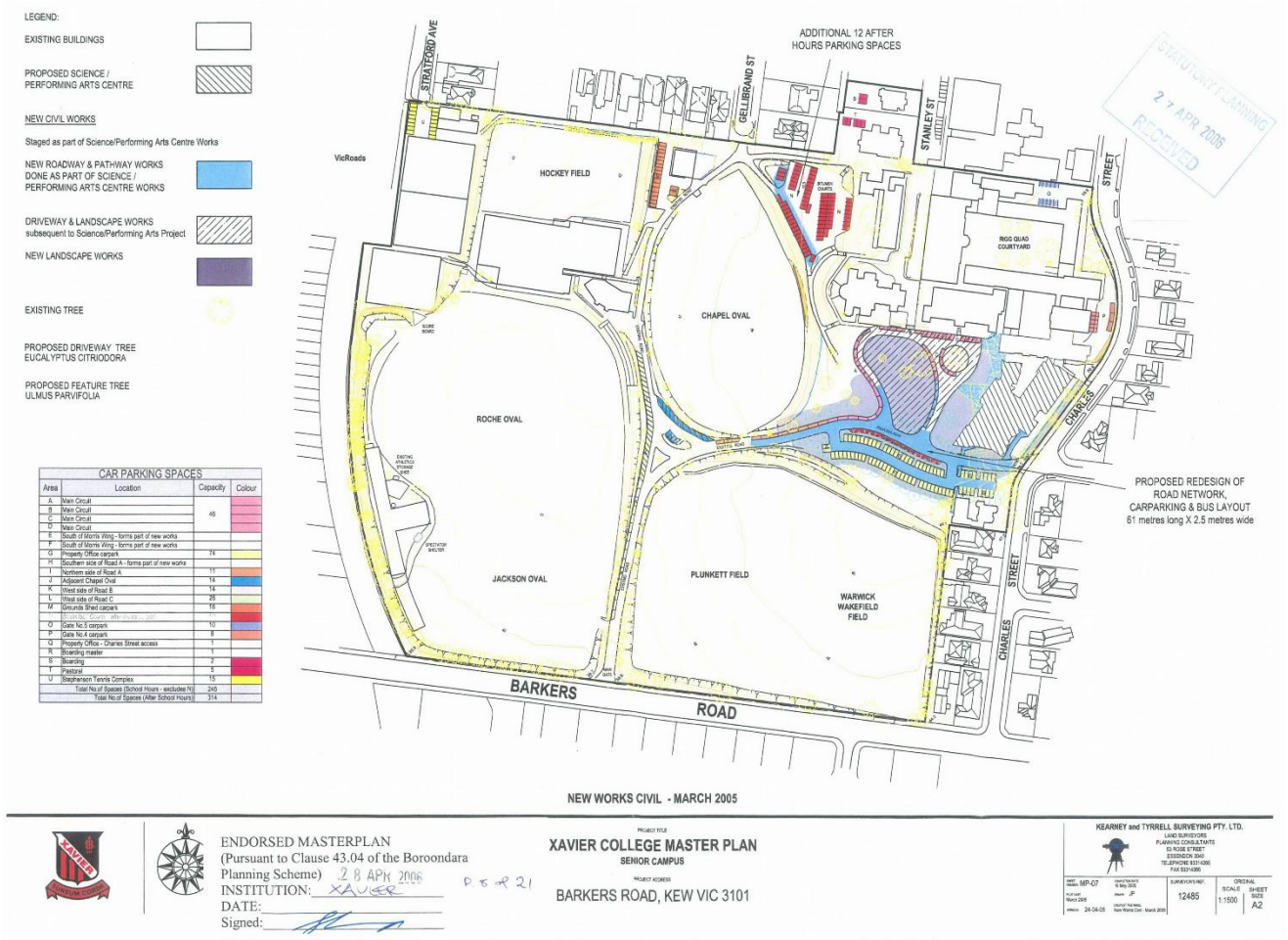


Figure 14: On-Site Car Parking Plan (2006 Development Plan)

The 2006 Development Plan, as shown within Figure 14, nominates a total of 245 on-site spaces during school hours and 314 spaces after school hours. The 69-space difference between the during and after school hours parking provision is due to basketball court parking (Area N). That is, the 2006 Development Plan only envisages car parking on the basketball courts outside of school hours, specifically, after 6pm.

Given that the 2006 Development Plan was approved some 15 years ago Traffix Group completed a detailed review of the current on-site car parking provisions in January 2021. Our car parking inventory recorded a total of 249 on-site spaces (during school hours) and 300 spaces (after school hours), with 51 spaces being provided on the basketball courts.

The provision of car parking is generally consistent with the 2006 Development Plan, noting that the key difference between current on-site conditions and the 2006 Development Plan is the basketball courts which have 18 fewer spaces than nominated within the 2006 Development Plan.

The current on-site car parking provision is inclusive of eight spaces at no.10 & 12 Stanley Street. These properties were included as part of the 2006 Development Plan, with the car parking provisions reflected within the 2006 Development Plan and our review of current on-site car parking. Whilst these properties are owned and utilised by Xavier College (including for staff car parking) these properties are not part of the proposed Development Plan area and the car parking within these properties has not been included within the proposed Development Plan.

Based on a detailed review of historical aerial images and anecdotal observations provided by the School we understand that on-site car parking is typically well utilised during school hours. Despite this strong utilisation we understand that there is lower utilisation of the Stratford Avenue car park and car parking along the western side of the internal access road in the vicinity of Barkers Road.

2.5. Traffic Conditions

Traffix Group commissioned traffic surveys of key site access points on Monday 22 February 2021 between 5:30am-9:30am and 2:00pm-6:00pm. Traffic surveys were completed at the following locations[5]:

- Site Access / Gellibrand Street
- Site Access / Charles Street / Hansen Street
- Site Access / Barkers Road

[5] Surveys were not completed of the site access point to Stratford Avenue. The on-site car park accessed via Stratford Avenue comprises a total of 15 car parking spaces with previous observations completed by Traffix Group indicating that this car park is not typically utilised for student pick-up/drop-off.

We have been advised by the School that the survey day represented a typical[6] school day with no on-site major events (or similar) and that attendance at before/after school extra-curricular activities was relatively consistent with most school days.

The School advised that on the survey day in the order of 200 and 330 students attended before and after school on-site sporting activities respectively. We understand that there were negligible parents/guardians who were on-site to watch the before school activities with approximately 30 parents/guardians watching after school swimming activities on the survey day.

Traffic data was collected in five-minute intervals with traffic distribution to/from the site summarised within Figure 15 and Figure 16.

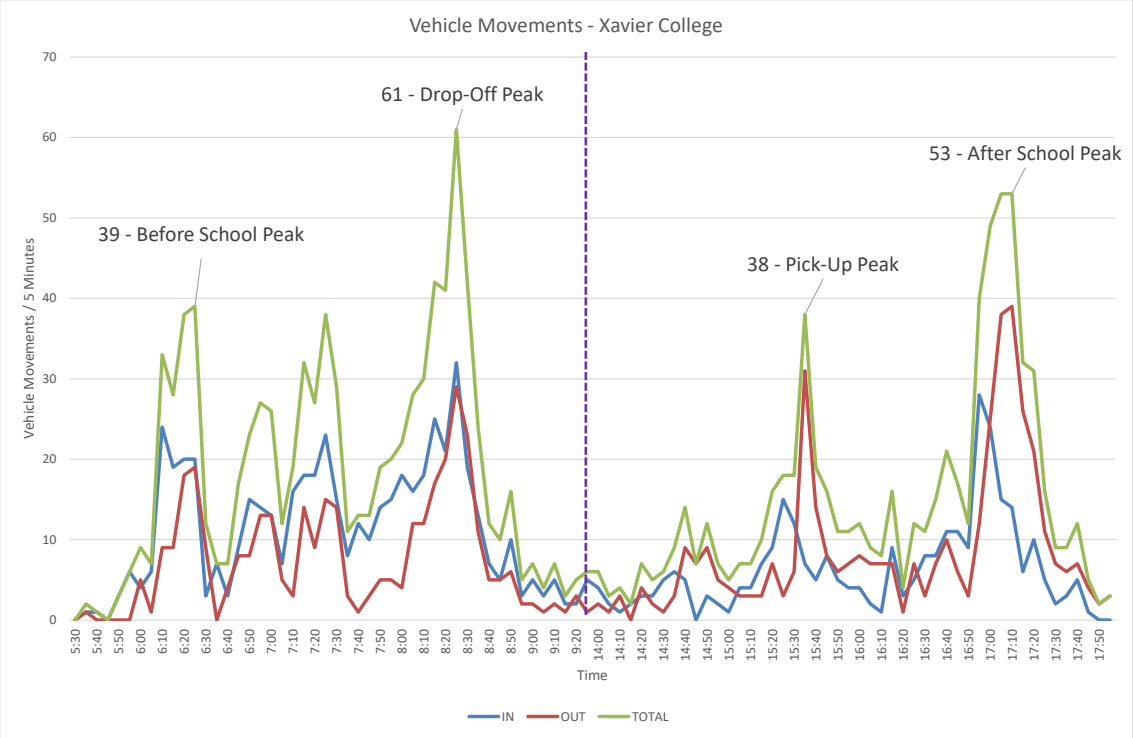


Figure 15: Traffic Movement Distribution (5 Minute Intervals)

[6] Whilst some broader covid-19 government restrictions were in place at the time of the traffic surveys, there were no restrictions on student/staff numbers and the general operation of the school (from a traffic engineering perspective).

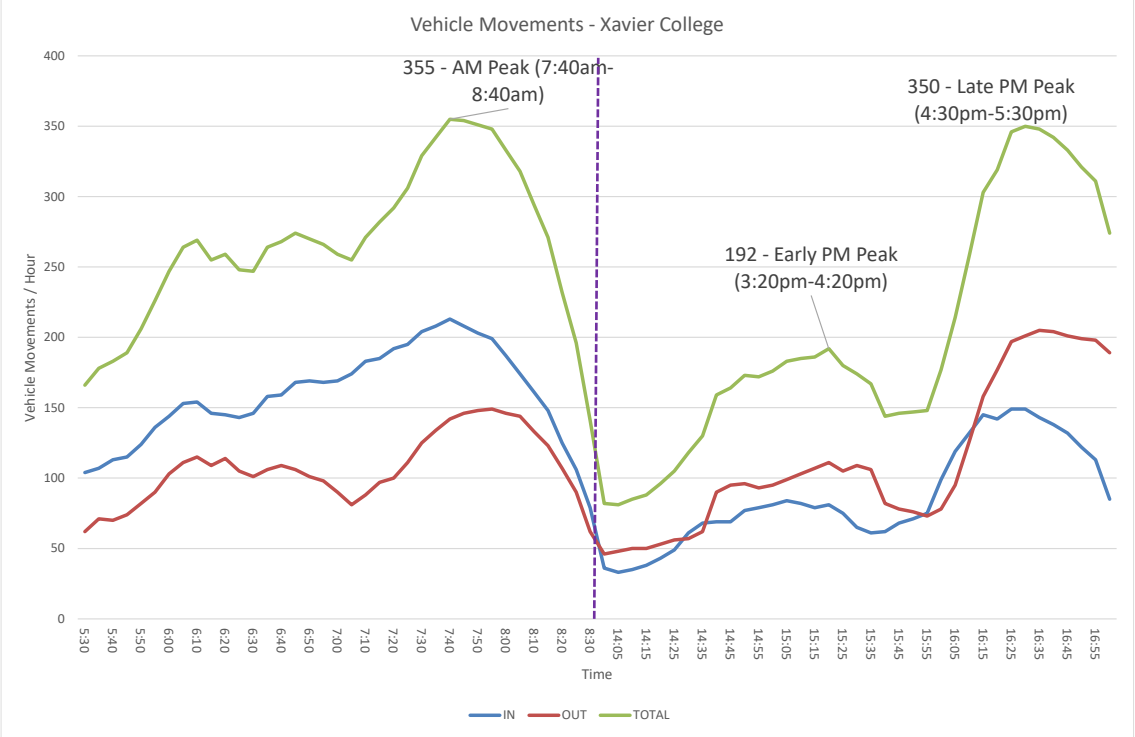


Figure 16: Traffic Movement Distribution (One Hour Intervals)

As shown within Figure 15 and Figure 16 there are a number of distinct traffic peaks which were recorded across the survey period. The academic school day starts at 8:40am and concludes at 3:30pm, which generally coincides with morning and afternoon traffic peaks.

The afternoon site traffic peak occurs at 4:30pm-5:30pm which we understand generally coincides with staff departures as well as the end of many after school extracurricular activities. For the purposes of reporting, herein, the afternoon peaks are referred to as the 'Early PM' (3:20pm-4:20pm) and 'Late PM' (4:30pm-5:30pm) peak periods.

Additionally, traffic data was sourced for the Barkers Road / Denmark Street / Power Street intersection on Monday 22 February 2021 and is outlined within Section 6.2 and subsequent sections of this report.

2.6. Staff & Student Travel Behaviour

2.6.1. Methodology

Traffix Group completed an online survey of staff and students to ascertain existing travel behaviours. Surveys were completed across February/March 2021 with a total of 617 responses received, comprising 130 staff and 487 parents/guardians of students.

We note that a small percentage of the parent/guardian responses were for students who board on campus and therefore do not travel to/from the school day to day. The responses of boarders have been excluded from our analysis/results.

The key results of the travel behaviour surveys are outlined below with the following sections.

2.6.2. Travel Mode

The travel mode split of students and staff is outlined in Figure 17 and Figure 18 respectively. The travel mode reflects the main method of travel to/from the site on a typical school day.

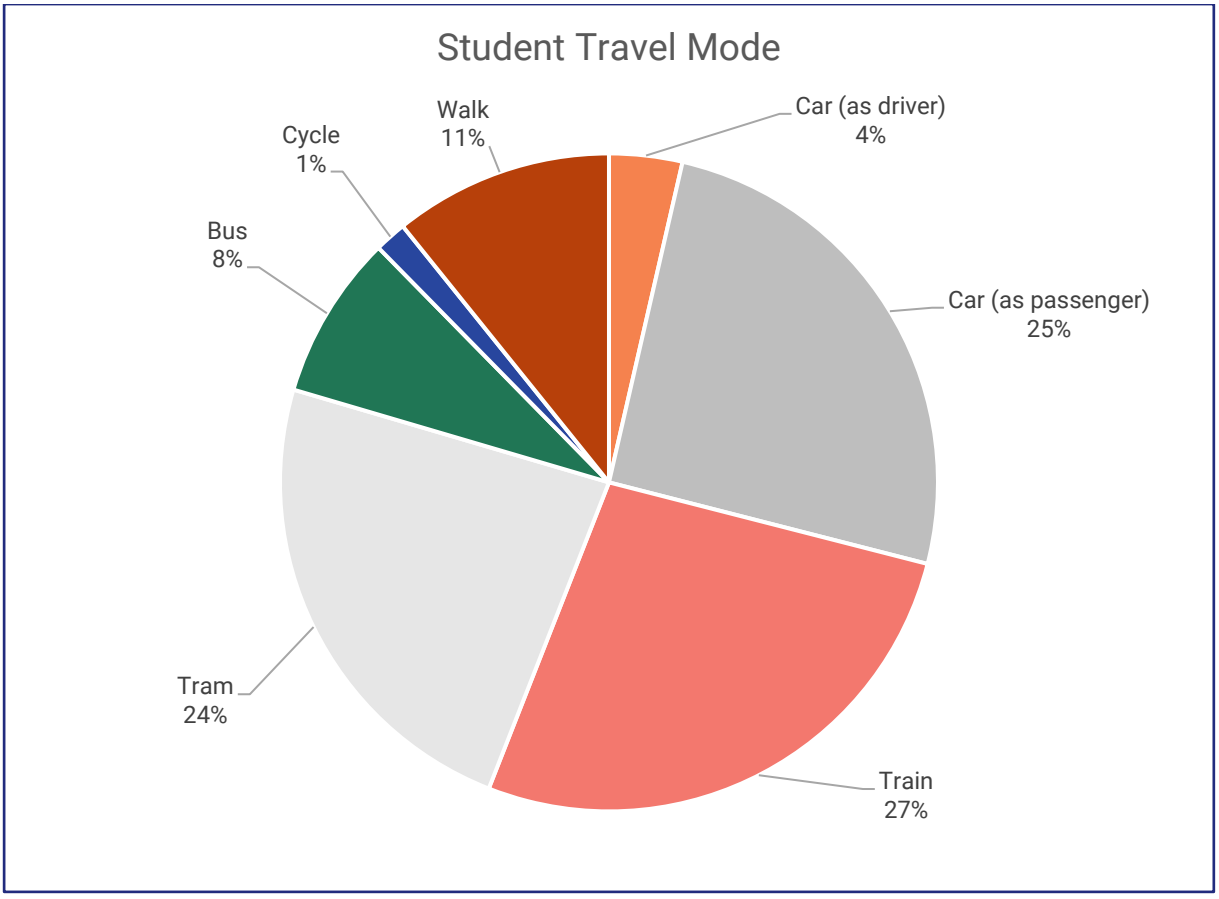


Figure 17: Student Travel Mode Survey Results

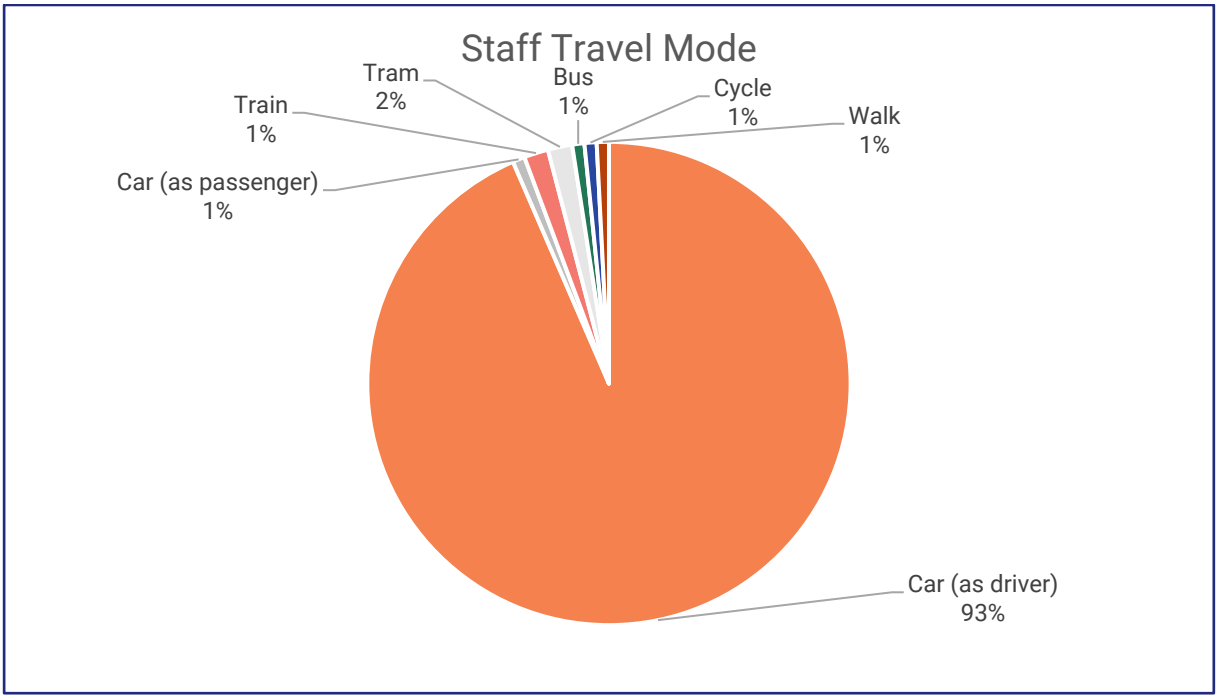


Figure 18: Staff Travel Mode Survey Results

2.6.3. Arrival & Departure Time

The proportion of students and staff who arrive/depart before, during and after the AM and Early PM peak hours is outlined in Figure 19. The summary only relates to those staff and students who travel to/from the site by car.

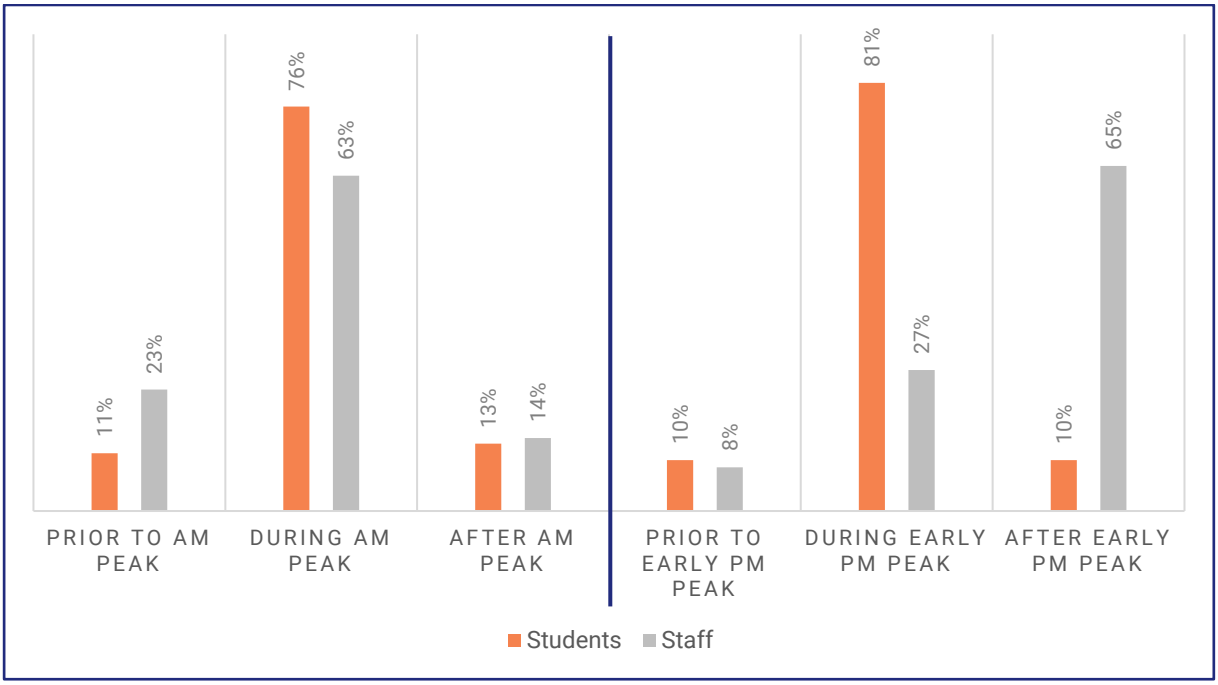


Figure 19: Arrival/Departure Distribution – Car (Driver or Passenger) as Mode of Travel

2.6.4. Parking Location

A summary of the parking locations for students who drove or were driven to School are outlined in Figure 20. We note that the survey indicated that 100% of staff who drove or were driven to School parked on-campus.

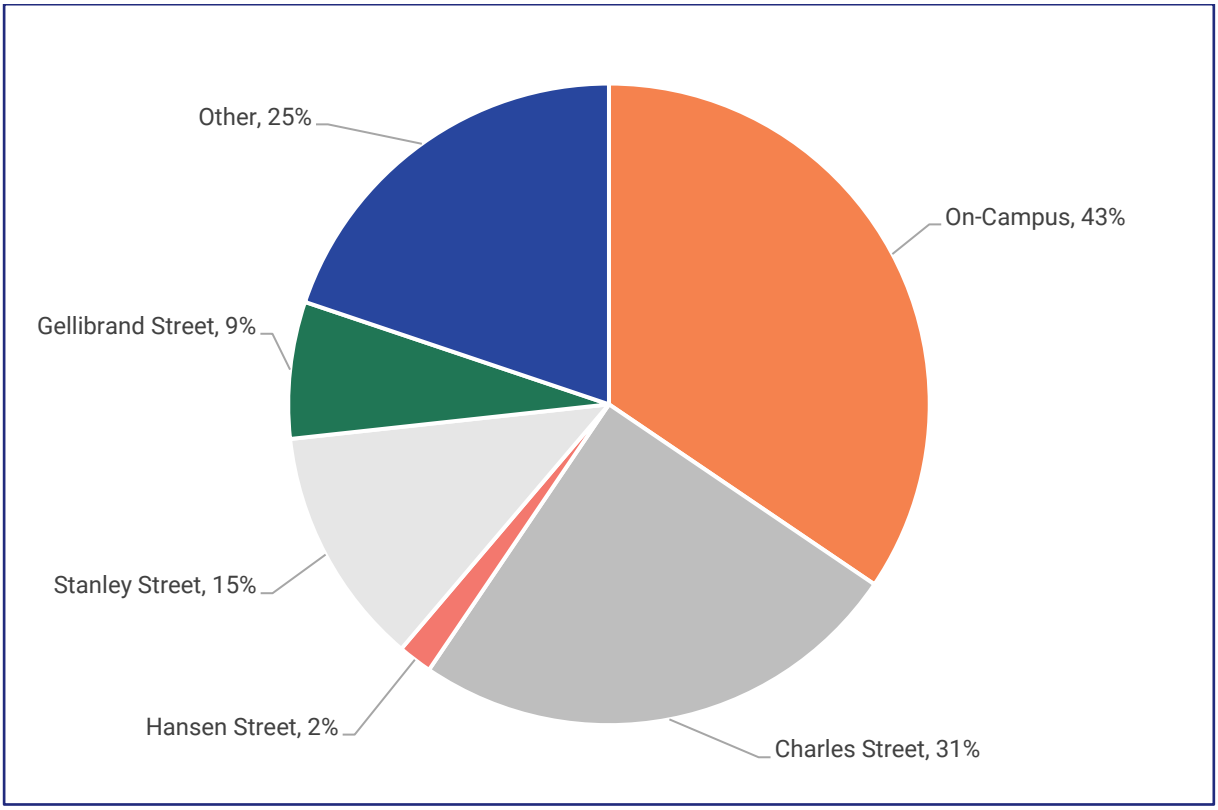


Figure 20: Student Parking Location Results

3 Development Plan

3.1. The Rationale

The Development Plan offers an opportunity to re-imagine various elements of the campus. In determining the future design of the site, the following key strategies were identified with respect to traffic engineering considerations:

- Connect the campus with a clear and accessible pedestrian spine,
- Prioritise pedestrians,
- Separate people from cars.

Based on the above strategies the following section outlines the Development Plan response to key traffic engineering considerations.

3.2. Proposal Summary

The proposed Development Plan incorporates an increase in staff and student numbers, buildings and works as well as modifications to car parking and vehicle access arrangements.

The Development Plan includes the following key staged works:

- **Priority Project 1 – Year 7 & 8 Building and Chapel Oval Car Park**

  The Year 7 & 8 Building is proposed to replace the existing basketball courts (which comprise 51 car parking spaces, available outside of school hours).

  The Chapel Oval Car Park project incorporates the provision of car parking underneath the existing Chapel Oval, with the oval also to be increased in size. Works involve the removal of the north-south orientated internal road link which connects through to Gellibrand Street[7]. Additionally, signalisation of the Barkers Road / Site Access intersection is proposed (subject to Authority approval).

  As part of these works there is a rationalisation of car parking with car parking to be removed from internal access roads. Car parking is proposed, as outlined within the Development Plan, as follows:

  – Chapel Oval Car Park (250-300 spaces[8])
  – Property Office Car Park (79 spaces)
  – Potential disabled car parking to the south of the Chapel and South Wing
  – Miscellaneous car parking (22 spaces) throughout the campus within staff and back of house areas, generally as per existing conditions.

[7] Vehicle access to Gellibrand Street to be retained for maintenance/loading access only.
[8] Approximate car parking provision. Exact provision subject to future detailed design.

- **Priority Project 2 – Boarding House**

  This building is proposed within the existing tennis courts area within the north-western corner of the site. It is anticipated that minimal (if any) car parking[9] would be provided within this area.

- Other Future Projects
  - Specialist teaching and learning building
  - Sports Centre upgrade
  - New maintenance building

The above 'other future projects' would not result in a material change to car parking and traffic arrangements. Notwithstanding, the new maintenance building will result in changes to maintenance vehicle access to/from the site, with the new maintenance building to be located to the west of the existing Sports Centre. An east-west service road is proposed along the northern boundary of the site to accommodate maintenance and loading vehicle movements.

The Development Plan is shown within Figure 21.

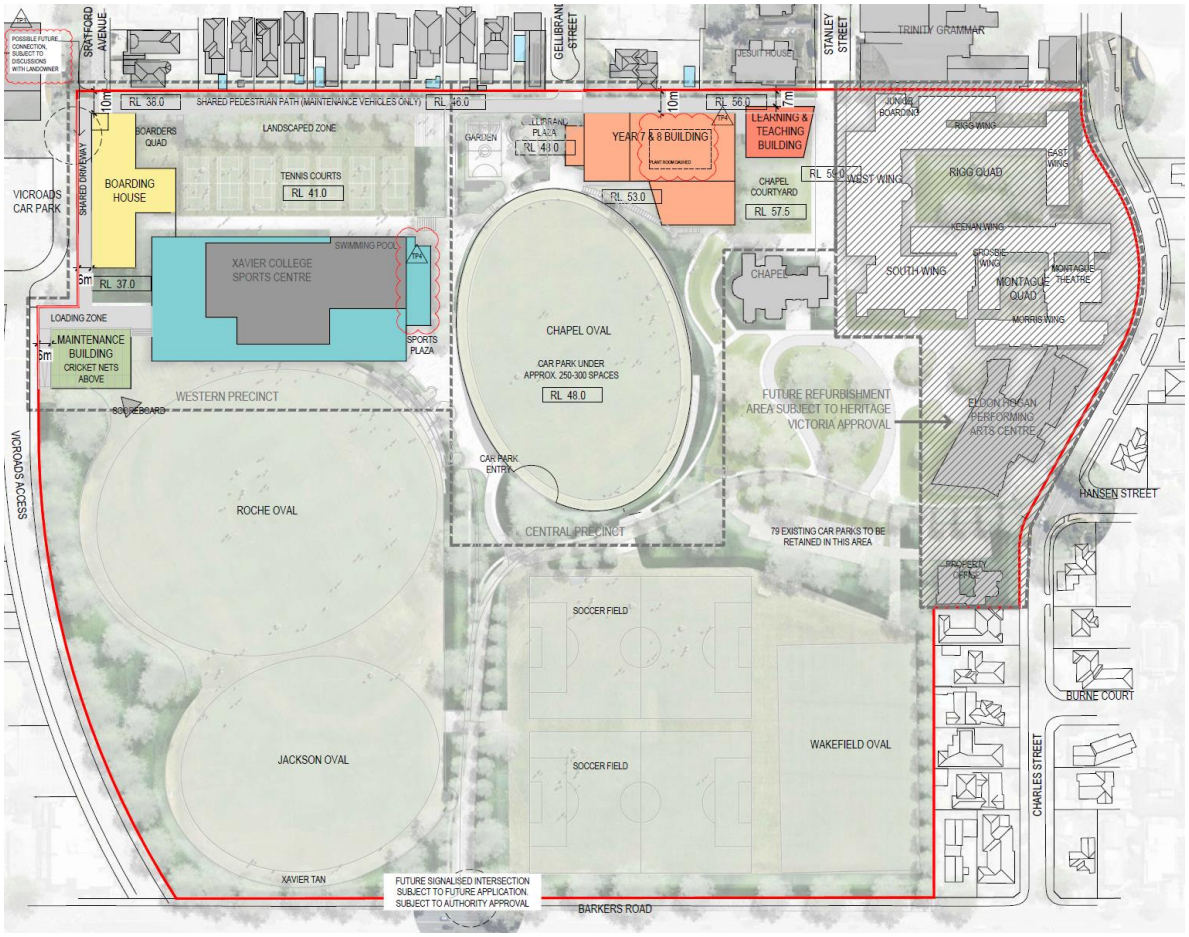


Figure 21: Development Plan

[9] Any car parking would be for maintenance vehicles and/or boarding house staff.

3.3. Student and Staff Numbers

A summary of the existing and proposed student (including boarders) and staff numbers is presented within Table 1.

Table 1: Comparison of Existing and Proposed Development Plan

	Development Plan		
	Existing 2006 Development Plan	Proposed Masterplan	Change
Students (including boarders)	1,000	1,500	+500 students [2]
Boarders	57	100	+43 boarders [2]
Staff [1]	180	210	+30 staff

[1] Full-time equivalent staff.

[2] Additional boarders are included within the 500-student increase. That is, 457 additional non-boarding students and 43 additional boarding students are proposed as part of the Development Plan.

As shown within Table 1, staff and student numbers are proposed to increase, along with the number of boarders.

The Development Plan will consolidate all year 7 & 8 students from the existing Kostka Hall and Burke Hall campuses within the subject site, forming a distinct Senior Campus.

It is important to note that the movement of students between Burke Hall and the Senior School, as well as the intensity of before/after school sports and weekend sports, will remain generally consistent with current arrangements under the Development Plan.

3.4. Car Parking

A summary of the existing on-site car parking and that specified within the 2006 and proposed Development Plans is presented within Table 1.

Table 2: Car Parking Summary

	During School Hours	After School Hours
Existing Conditions	249 spaces	300 spaces
Development Plan (2006 Approved)	245 spaces	314 spaces
Development Plan (Proposed) [1]	351-401 spaces	351-401 spaces

[1] Exact car parking provision subject to detailed design of the Chapel Oval car park.

As shown within Table 2 a total of 351-401 on-site car parking spaces are proposed. It is also noted that the Chapel Oval Car Park is proposed to incorporate a dedicated pick-up/drop-off area for students.

As nominated earlier the 2006 Development Plan includes eight spaces at no.10 & 12 Stanley Street. These properties and spaces are not located within the proposed Development Plan area and have not been included within the proposed car parking provisions.

In order to illustrate the proposed car parking arrangements, and further to Figure 14 (2006 Development Plan – Car Parking Plan), Figure 22 has been prepared to demonstrate key car parking areas.

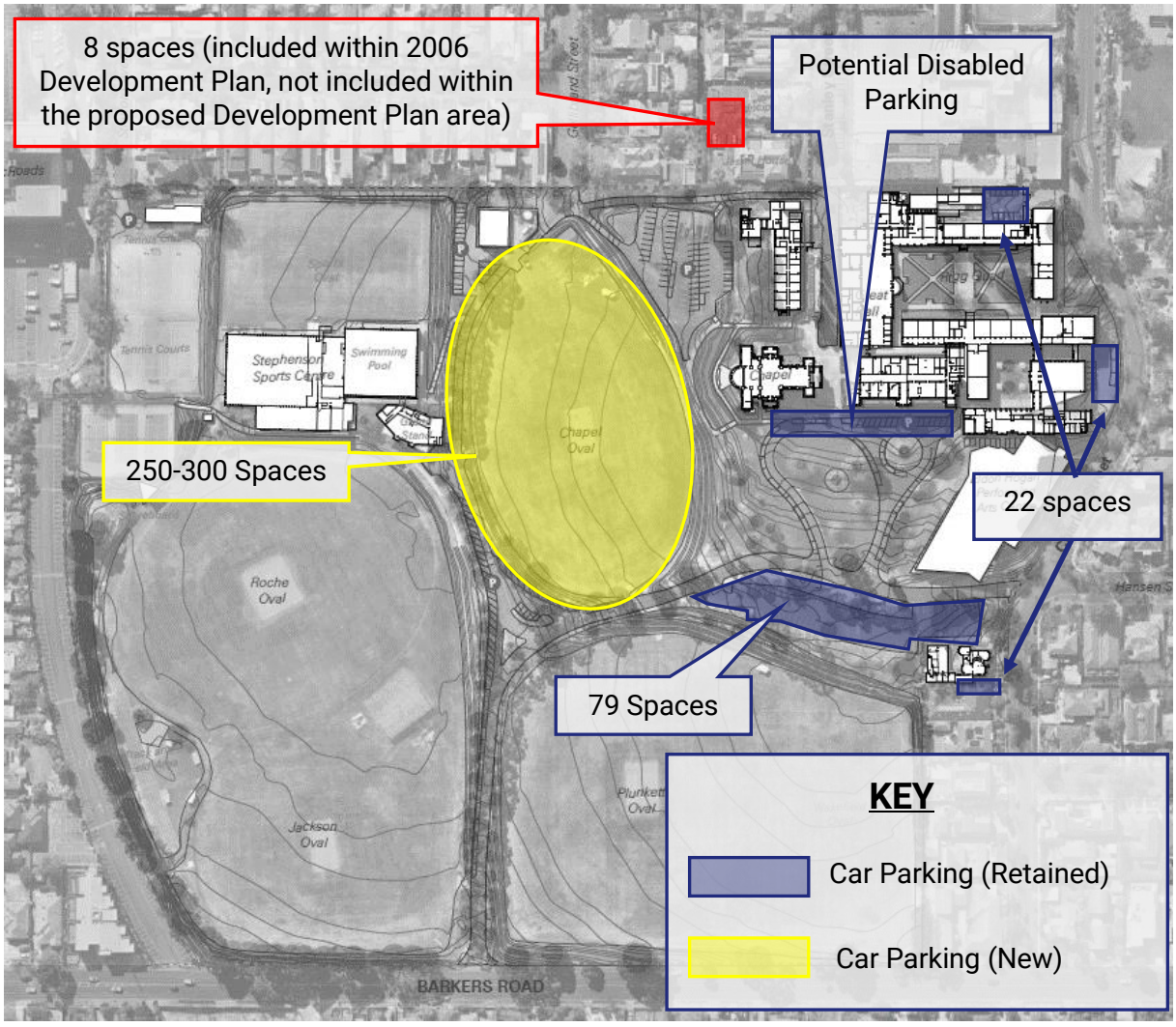


Figure 22: Car Parking Areas –Development Plan

3.5. Vehicle Access

Proposed vehicle access arrangements are shown within Figure 23.

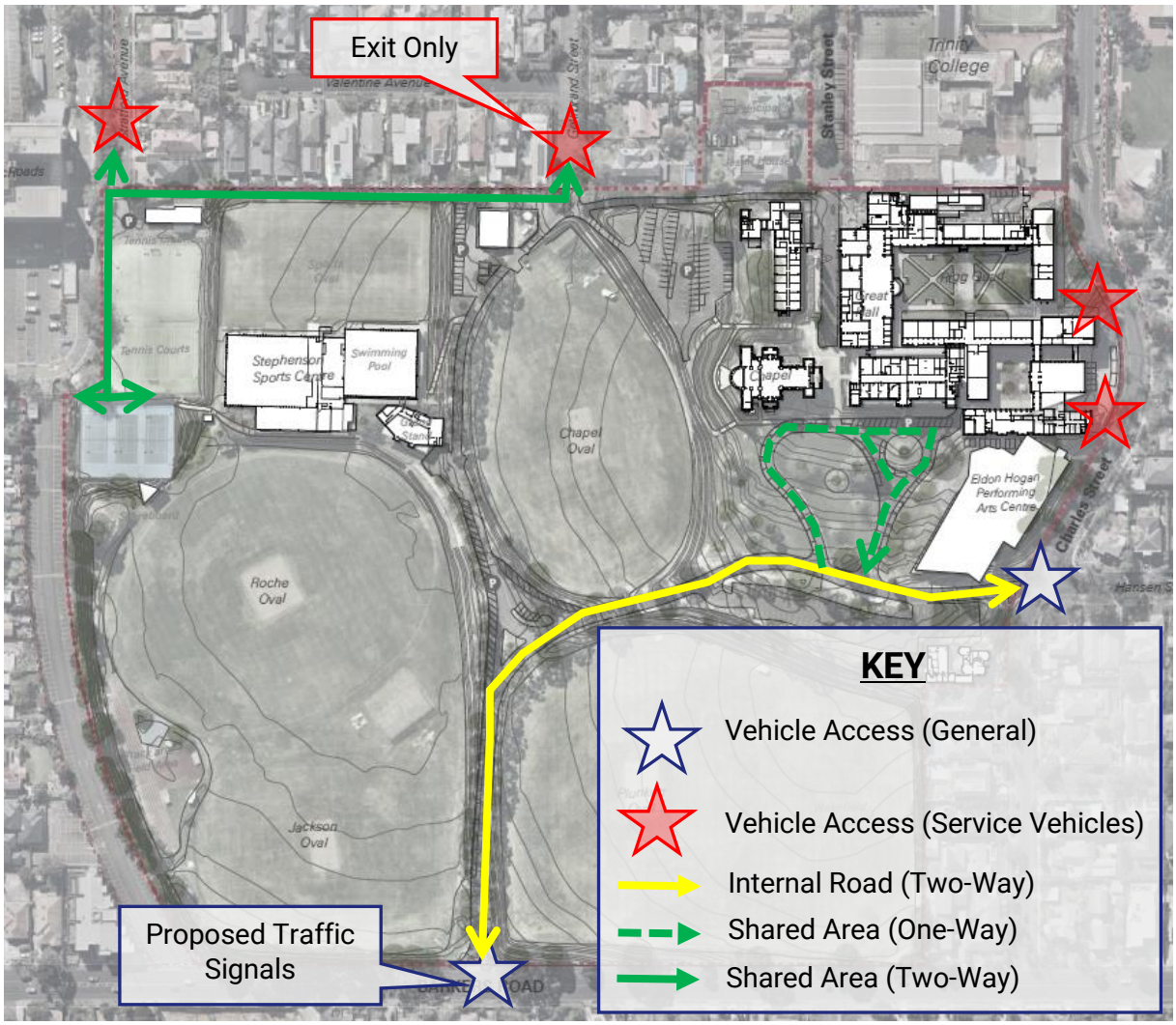


Figure 23: Vehicle Access Arrangements & Internal Road Network – Development Plan

As shown within Figure 23 a number of changes to vehicle access arrangements and internal vehicle circulation are proposed. A rationalisation of staff/parent/visitor access points to a single location to both Barkers Road and Charles Street is proposed. Given this rationalisation, and the anticipated increase in vehicle movements associated with the provision of the Chapel Oval Car Park (which is proposed to incorporate a dedicated pick-up/drop-off area) it is proposed to signalise the Barkers Road Site Access.

3.6. Bicycle Facilities

A total of 17 existing bicycle parking spaces are provided throughout the site. These spaces are located adjacent to the Montague Quad as well as at the Sports Centre. It is our understanding that all 17 existing spaces would be retained as a result of the Development Plan.

Details regarding the proposed provision of bicycle facilities and associated recommendations is outlined within Section 5 of this report.

3.7. Pedestrian Facilities

As part of the Development Plan there are significant improvements to the pedestrian network within the site, including the following:

- The provision of direct pedestrian access between the Chapel Oval Car Park and on-site buildings (i.e. students won't need to cross the main internal access road to be picked-up/dropped off).
- The provision of an east-west pedestrian spine located towards the northern edge of the site. This spine, along with a separate east-west service road for maintenance vehicles located at the northern boundary of the site, will separate pedestrians and vehicles. That is, students/staff will no longer need to cross the internal north-south road which links to Gellibrand Street in travelling between the Sports Centre and academic buildings.
- Removal of car parking and traffic movements, other than some potential disabled car spaces, within the loop road to the south of the Chapel and South Wing. It was observed by Traffix Group that pedestrians regularly use this road in travelling between car parking areas (including the property office car park) and the school buildings.
- Provision of signalised crossing points at the Barkers Road / Site Access intersection.

3.8. Bus Parking

Bus parking currently occurs within indented parallel bays within the internal loop road which connects Charles Street and Barkers Road. These arrangements are to be retained.

We have been advised by the School that they require pick-up/drop-off for up to four buses, of varying sizes, at any one time. The nominated area (approximately 52m in length) can accommodate four buses, also noting that there is potential to increase the length of this area (particularly to the west) through line marking modifications.

3.9. Loading & Maintenance Arrangements

A new maintenance building is proposed within the north-western corner of the site, to the south of the proposed new boarding house building. Once completed, maintenance vehicle access will be via Stratford Avenue (Gate 8) and Gellibrand Street (Gate 7). An east-west aligned service road is proposed along the northern boundary of the site linking these two gates.

Additionally, a north-south aligned service road is proposed along the western boundary of the site. This service road would provide access to the new maintenance building, the Xavier Sports Centre as well as loading area(s) of the new boarding house.

We have been advised that loading is to occur via the Barkers Road access point (as much as practical).

3.10. Waste Collection

Waste collection arrangements are to be confirmed within a Waste Management Plan. The mandate to prepare such a plan(s) could be included by way of an appropriately worded permit condition for any future permit(s) granted for buildings and works within the site.

We have been advised that waste collection is to occur via the Barkers Road access point (as much as practical).

4 Car Parking Considerations

4.1. 2006 Development Plan Context

Traffix Group were involved in the preparation of the 2006 Development Plan for the subject site. The 2006 Development Plan nominated differing car parking requirements during and after school hours. Within the 2006 Development Plan traffic report 'after hours' refers to being after 6pm.

For context Table 3 outlines the statutory car parking assessment[10] pertaining to the 2006 Development Plan.

Table 3: Statutory Car Parking Requirement (Clause 52.06) – 2006 Development Plan

Use	Statutory Parking Rate	Size		Statutory Parking Requirement	
		During School	After 6pm (After School)	During School	After 6pm (After School)
Secondary School	1.2 spaces / employee	180 staff	-	216 spaces	-
Place of Assembly (Eldon Hogan Performing Arts Centre)	0.3 spaces / seat	80 seats/persons	600 seats/persons	24 spaces	180 spaces
Xavier Sports Centre [1]	-	-	-		100 spaces
Total				**240 spaces**	**280 spaces**

[1] The Centre is understood to incorporate indoor basketball (2 courts), cricket and pool facilities with a specified rate not nominated within Clause 52.06 of the Boroondara Planning Scheme for all uses. A conservative car parking demand of up to 100 car parking spaces was adopted for the 2006 assessment.

The 2006 Development Plan nominates the provision of 245 and 314 on-site car parking spaces during and after school hours respectively. As such, and having regard to the

[10] The Clause 52.06 'Secondary School' and 'Place of Assembly' statutory car parking rates adopted for the 2006 Development Plan remain consistent with current statutory car parking rates for these uses.

statutory requirements specified within Table 3, the 2006 Development Plan nominates on-site car parking in excess of statutory requirements.

Further to Table 3 it is our understanding that the use of the Performing Arts Centre by external groups is limited to the following operational conditions:

- no more than 600 people in attendance after 6pm for an event held by external groups with no school events and normal operation of the Stephenson Centre, and
- no more than 80 people in attendance prior to 6pm for an event held by external groups when the school is fully operational i.e. 180 full time equivalent staff on-site.

Further to the above, it is our understanding that these existing arrangements are not sought to be amended as part of the Development Plan.

4.2. Statutory Car Parking Requirements

The land use category 'secondary school' will continue to apply to the site under Clause 73.03 of the Planning Scheme.

Clause 52.06-5 of the Planning Scheme states that where an existing use is increased by the measure specified in Column C of Table 1 for that use, the car parking requirement only applies to the increase, provided the existing number of car parking spaces currently being provided in connection with the existing use is not reduced.

As the Development Plan seeks to increase the existing provision of car parking the statutory requirements are only applicable to the increase in the statutory measure (number of staff).

Further to this, the Development Plan does not seek an increase in the capacity of on-site 'Place of Assembly' uses or an increase in the intensity of on-site sporting activities.

Based on the foregoing, the statutory car parking requirement for the Development Plan is outlined in Table 4.

Table 4: Statutory Car Parking Requirement (Clause 52.06)

Use	No.	Statutory Parking Rate	Statutory Parking Requirement
Secondary School	+30 staff	1.2 spaces to each employee that is part of the maximum number of employees on the site at any one time	+36 spaces

The Development Plan results in a statutory requirement to provide 36 additional car parking spaces during school hours and no additional car parking spaces after school hours, based on the methodology adopted for the 2006 Development Plan statutory assessment. No additional spaces are required after hours, noting that the statutory requirement applies to the secondary school use as opposed to the after-hours (after 6pm) use of facilities within the site.

The Development Plan proposes a total of 351-401 on-site car parking spaces, both during and after school hours. This represents at least a 106 space increase during school hours and at least a 37 space increase to car parking after hours, compared with the 2006 Development Plan. The proposed provision of on-site car parking exceeds statutory requirements.

Accordingly, we are satisfied that the proposed provision of car parking meets and indeed exceeds relevant statutory car parking requirements and those specified within the 2006 Development Plan.

4.3. Car Parking Arrangements

4.3.1. Preamble

The Development Plan meets and well exceeds the statutory car parking requirements specified within Clause 52.06 of the Boroondara Planning Scheme. Notwithstanding this, an assessment of the impact of, and relevant considerations associated with, the increased car parking demands, is outlined below.

4.3.2. Car Parking Arrangements

Clause 52.06 of the Boroondara Planning Scheme specifies a statutory car parking requirement of 1.2 spaces per staff member for a secondary school. This rate is slightly higher than that specified for a primary school of 1.0 spaces per staff member. In this regard, secondary school rates are slightly higher to allow for parking associated with some older students who are legally permitted to drive to/from school.

Fundamentally, these statutory car parking rates are on the basis that schools are to accommodate staff car parking demands within the site itself and that the surrounding on-street road network is to be utilised for and absorbs car parking demands associated with pick-up/drop-off.

Increasingly, private schools are seeking to provide additional car parking within their sites to both allow for pick-up/drop-off, sporting, as well as other after-hours events. This is not a statutory imperative but rather an intent to provide increased convenience in accessing the site and to reduce the impact that their operations have on surrounding streets.

The increase in the student cohort by 50% will increase on-site demands as well as the demand for on-street car parking. It is difficult to quantify the exact extent to which on-street car parking demands will change as a result of the development proposal. Any increase in on-street car parking demands is anticipated to be limited to pick-up/drop-off periods with the Development Plan representing an increase to the on-site provision of car parking during school hours and after hours. It is noted that a dedicated pick-up/drop-off area is also proposed within the Chapel Oval Car Park.

Indeed, with respect to the above it is important to note that the use of on-site and on-street car parking surrounding schools typically reaches a natural equilibrium. This equilibrium is reached through parent/guardians understanding of the on-site/on-street car parking availability. Parents/guardians who commonly drive to the school understand the operation of the surrounding road network and on-site vs off-site car parking availability. This allows parents/guardians, along with their individual preferences and circumstances, to tailor both their trip timing and pick-up/drop-off location accordingly.

The above is considered an important frame of reference in viewing the proposed car parking arrangements. This is not to quantify the potential increase in on-street car parking demands but rather to highlight that the majority (if not all) on-site car parking spaces are likely to be utilised during pick-up/drop-off periods.

4.4. Car Parking Design

As part of our involvement in this project, Traffix Group has provided design input into the development of the Development Plan.

The design of car parking areas, including their dimensions, would be confirmed as part of subsequent planning permit application(s).

New car parking areas should accord with the relevant requirements of the Planning Scheme and Australian Standards.

5 Bicycle Parking Considerations

The statutory bicycle parking requirements for the Development Plan are outlined under Clause 52.34 of the Planning Scheme and are summarised below; noting that these requirements are only applicable to the proposed increase in student/staff numbers, also noting that there is to be no reduction to existing bicycle parking provision (17 spaces) in connection with the Development Plan.

The statutory bicycle parking requirement for the Development Plan is outlined in Table 4.

Table 5: Statutory Bicycle Parking Requirement (Clause 52.34)

Use	No.	Statutory Parking Rate	Statutory Parking Requirement
Secondary School (Staff)	+30 staff	1 space to each 20 employees	+2 spaces
Secondary School (Staff)	+500 students	1 space to each 5 students	+100 spaces

The Development Plan results in a statutory requirement to provide 102 additional bicycle parking facilities. As fewer than five additional employee bicycle parking spaces are required, there is a zero requirement to provide additional shower/change room facilities for staff.

The provision and layout of bicycle parking area(s) is to be formalised as part of future planning permit application(s).

The travel behaviour surveys (outlined in Section 2.6.2) identified that currently only 1% of staff and 1% of students cycle to the site.

It is our recommendation that bicycle parking area(s) within the site make a spatial allowance for bicycle parking commensurate with the statutory bicycle parking requirement, however, that only part of the statutory bicycle parking requirement be provided initially. That is, bicycle parking be initially provided commensurate with the existing bicycle parking rates within the site (or above as appropriate). This is not to say that the School won't be aspirational with respect to encouraging cycling as a mode of travel but rather be realistic as to initial demands to avoid providing an over-abundance of bicycle parking (in the short-term).

Given this recommendation, the utilisation of bicycle parking areas will need to be monitored, and additional bicycle parking be provided (as/if required) over and above the initial provisions should bicycle parking area(s) be at or approaching capacity in order to promote cycling as a mode of travel.

We would recommend that student bicycle parking be provided utilising horizontal systems such as bicycle hoops. Staff bicycle parking may utilise either horizontal or vertical parking systems.

6 Existing Traffic Conditions

6.1. Preamble

Our traffic assessment is based upon the aforementioned AM, Early PM and Late PM peak hours. No assessment has been provided of other peak periods, namely Saturday mornings, noting our understanding that the intensity of Saturday morning sporting activities is not to change as a result of the Development Plan.

Whilst this is equally true for the 'Late PM' peak hour, the Late PM peak hour also more closely aligns with the road network peak hour for the surrounding road network than Saturday morning sporting times. Despite no change to after school activities[11] during the Late PM peak it has been assessed, noting that general site access to Gellibrand Street is to be removed, with an associated re-distribution of traffic to/from the site.

6.2. Existing Traffic Volumes

Traffix Group commissioned traffic surveys of key site access points on Monday 22 February 2021 between 5:30am-9:30am and 2:00pm-6:00pm. In addition, SCATS traffic volume data for the same day at the Barkers Road/Denmark Street/Power Street intersection (located approximately 250m west of the Barkers Road site access) has been sourced[12].

A summary of the recorded AM, Early PM and Late PM peak hours is provided within Figure 24, Figure 25 and Figure 26 respectively.

[11] Whilst there is understood to be no change to after school activities and associated traffic movements there will be a relatively minor increase in staff movements, which have been accounted for within our assessment.

[12] Shared through and left-turn lanes are provided on the north, south and west approaches at the Barkers Road/Denmark Street/Power Street intersection. Sample counts were undertaken of these lanes during peak periods to ascertain the movement split of these shared lanes. Furthermore, there is a discrepancy between Barkers Road traffic volumes recorded at the site access and those recorded by SCATS at the Barkers Road / Denmark Street / Power Street intersection. It is likely that SCATS detectors are under-recording some traffic movements at the Barkers Road / Denmark Street / Power Street intersection. Accordingly, our SIDRA results for existing conditions have been checked against on-site observations on the survey day.

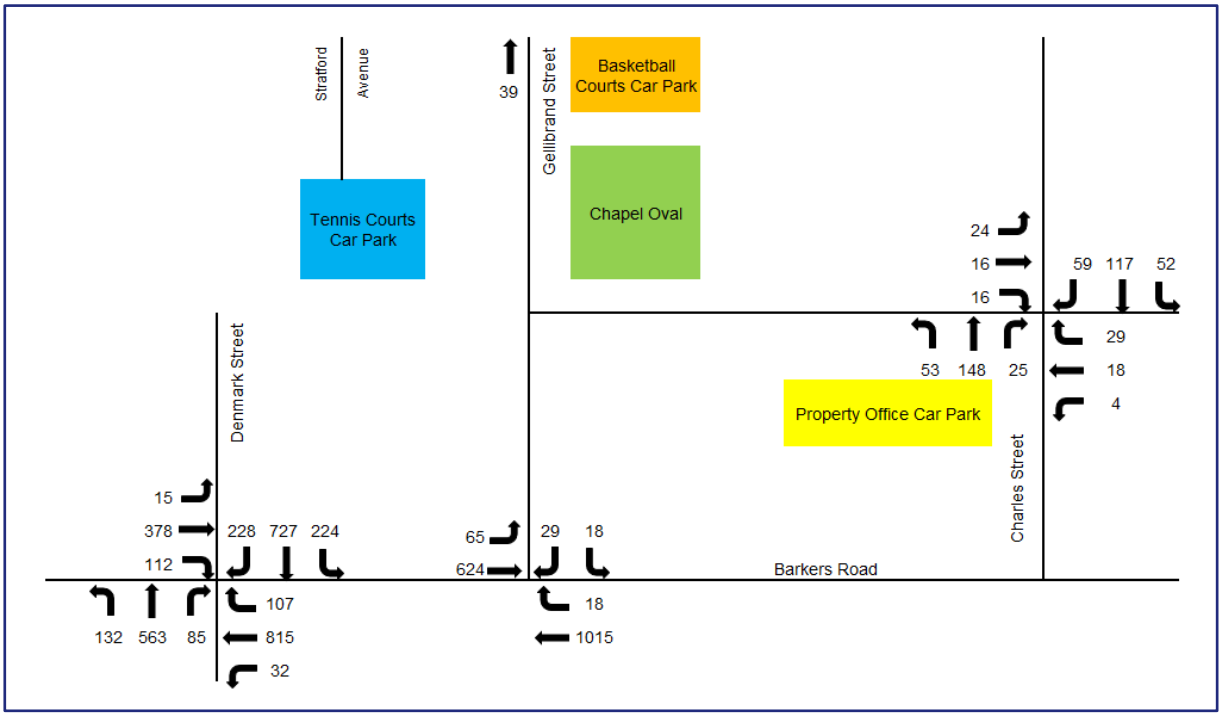


Figure 24: Existing Conditions - AM Peak Hour

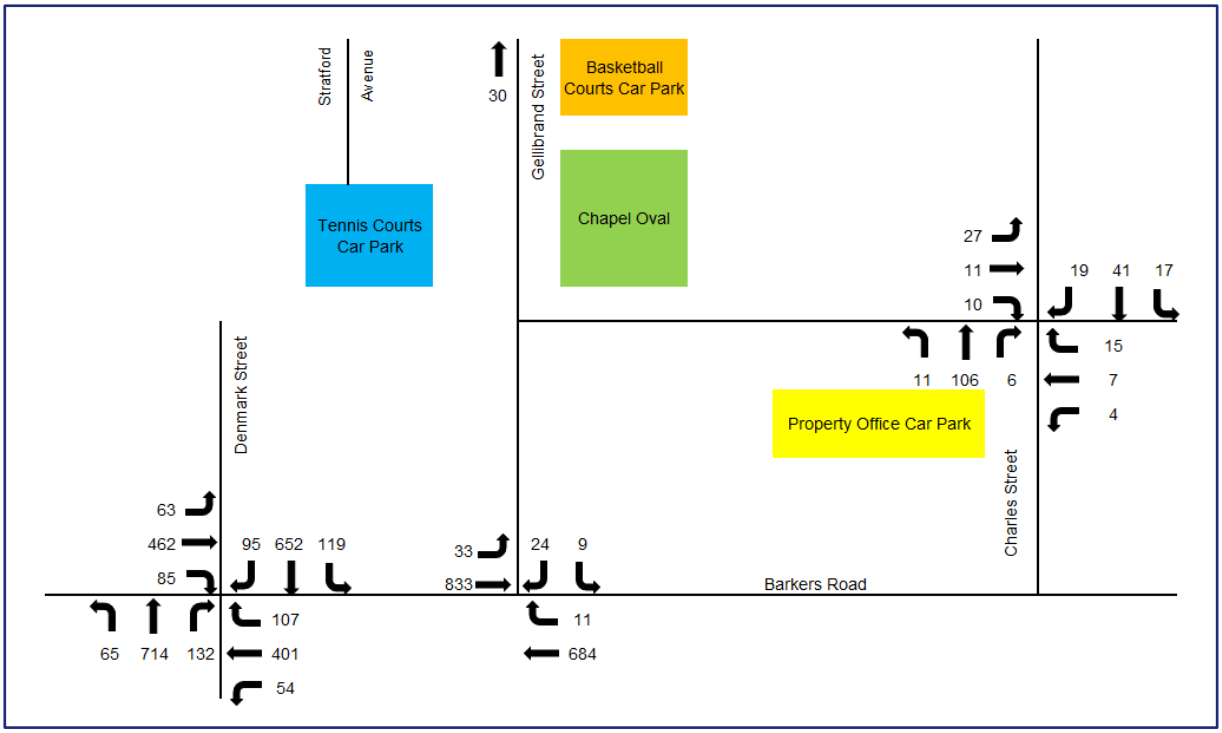


Figure 25: Existing Conditions - Early PM Peak Hour

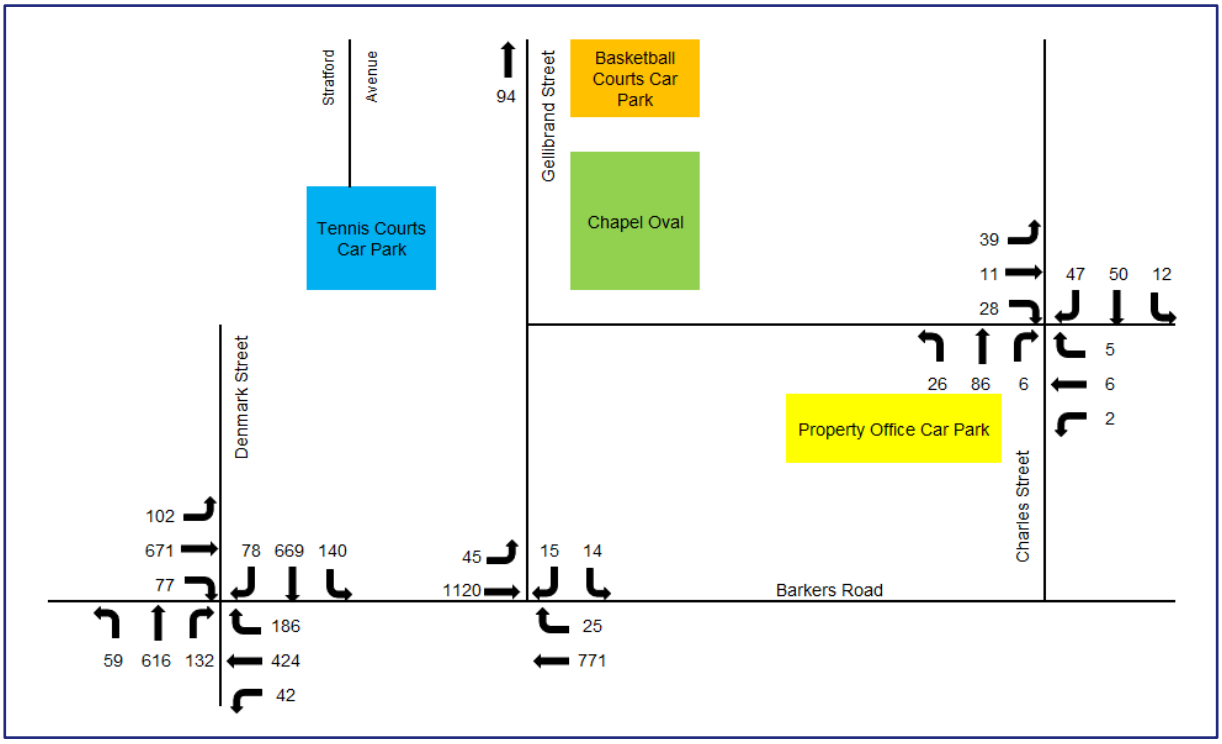


Figure 26: Existing Conditions - Late PM Peak Hour

6.3. Base Case & Calibration

The Department of Transport requires that traffic assessments consider a 10-year future growth scenario or 'base' case. A base case includes 10 years of traffic growth on the surrounding road network without the 'development'.

In this regard, Traffix Group has sourced[13] existing historical traffic volume data for key roads in the vicinity of the subject site, including:

- Barkers Road
- Denmark Street
- Wellington Street
- Glenferrie Road
- Charles Street[14].

A review of relevant historical traffic data for these roads showed that across the last available 15-year period that there has been negligible traffic volume growth on these roads, with a decrease in traffic volumes observed on a number of these roads.

[13] Department of Transport data.
[14] Historical traffic volume data only available for Charles Street to the north of Wellington Street.

By way of example, Figure 27 illustrates Barkers Road traffic volumes across the last available 15-year period (2001-2015). Traffic volumes were recorded between Glenferrie Road and Denmark Street, on a weekday (during school terms), with no growth in traffic volumes across the 15-year period.

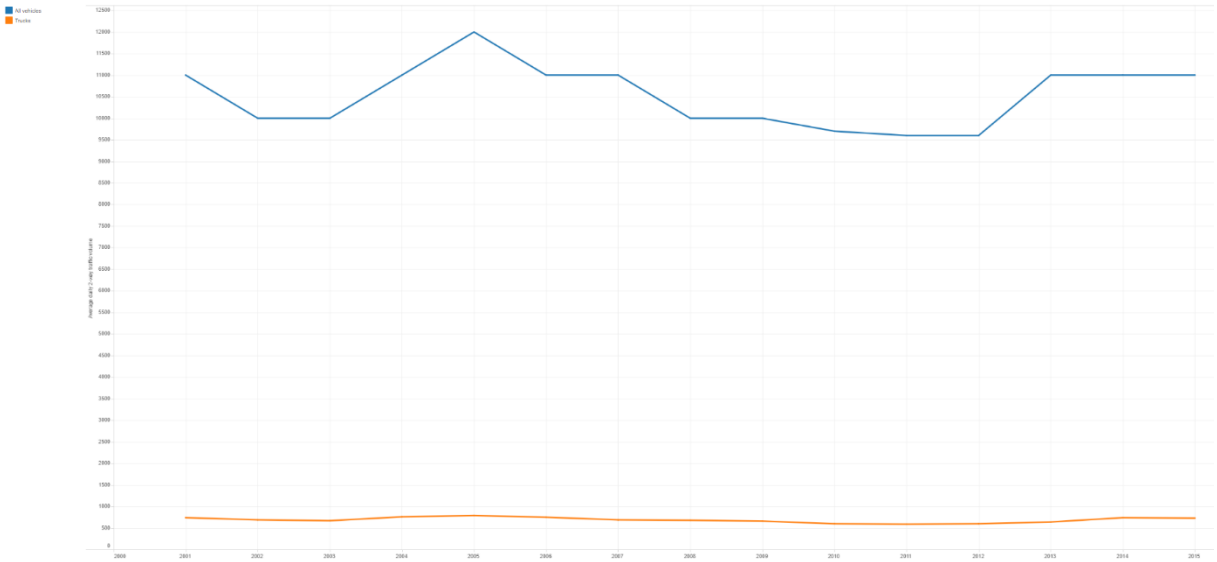


Figure 27: Barkers Road Traffic Volumes – Historical Trends

Given the above, no road network traffic growth has been adopted for the post-development scenario in reflecting a future 10-year scenario.

Additionally, whilst covid-19 related restrictions have resulted in changes to travel modes and activity on the metropolitan Melbourne road network, traffic volumes at the time of the traffic data collection had generally returned to 'pre-pandemic' levels. Additionally, anecdotal observations indicate that travel modes to/from schools via car are generally consistent, if not higher, than pre-pandemic levels (due to a shift from public transport in favour of private motor vehicles). No further calibration of the recorded 'existing conditions' traffic volumes is required in our view.

On the basis of the above, we are satisfied that the existing conditions traffic volumes both accurately capture existing conditions as well as base case conditions and are fit for purpose for our subsequent analysis.

6.4. Existing Distribution of Site Generated Traffic

A summary of the existing traffic distributions to/from the subject site for the three peak hours are provided within Figure 28 to Figure 30.

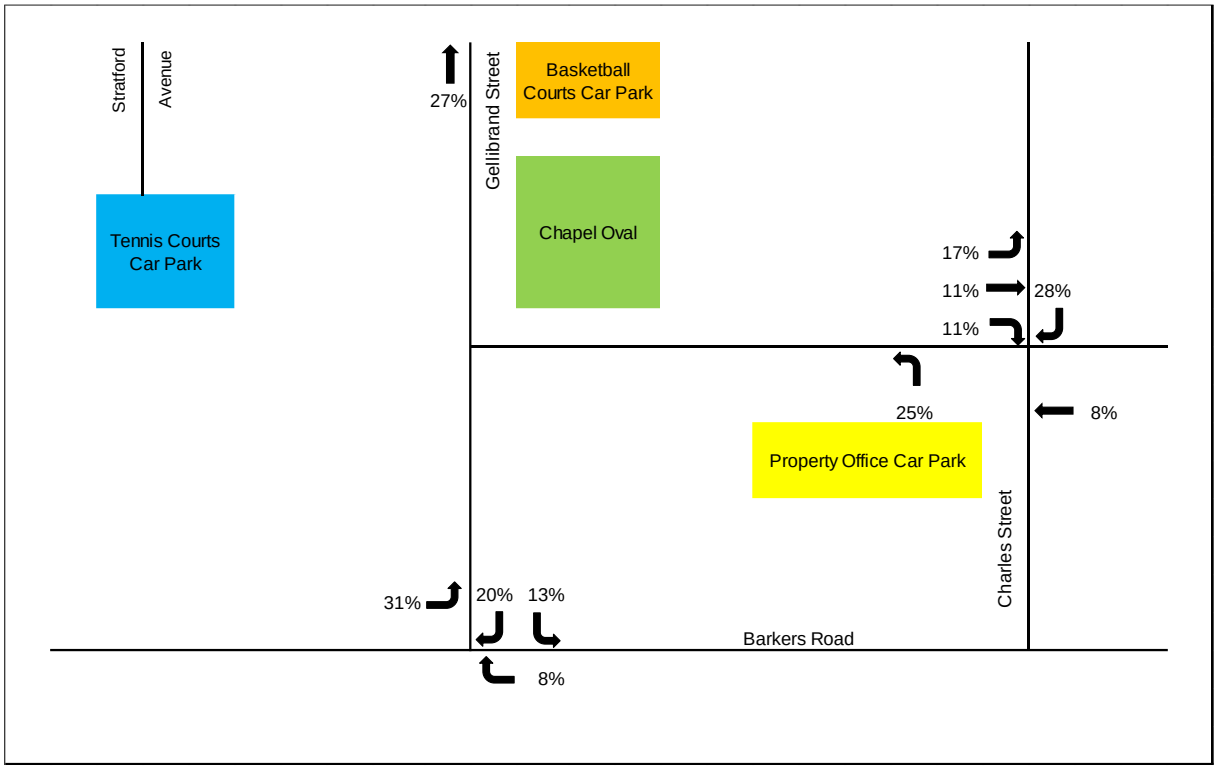


Figure 28: Existing Traffic Distribution - AM Peak Hour

Figure 29: Existing Traffic Distribution - Early PM Peak Hour

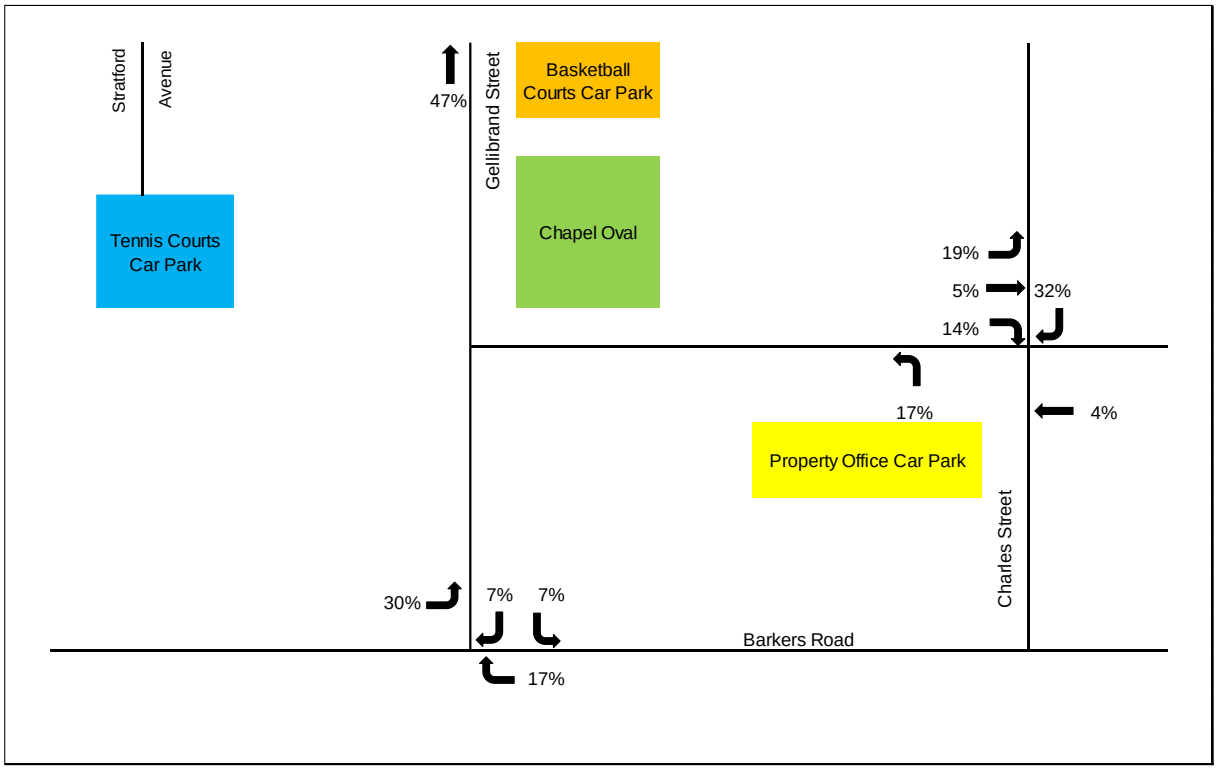


Figure 30: Existing Traffic Distribution - Late PM Peak Hour

7 Traffic Assessment – Development Plan

7.1. Preamble

Traffic volumes to/from the site are anticipated to change as a result of the increase in the on-site car parking supply, the consolidation of car parking facilities as well as the provision of a dedicated pick-up/drop-off area.

The Development Plan will result in significant changes to traffic distribution to/from the site. This is both as a result of the closure of the Gellibrand Street access to general traffic as well as the proposed provision of a signalised vehicle access to Barkers Road.

7.2. Barkers Road / Site Access – Traffic Signals

The site access to Barkers Road is proposed to be signalised. A functional layout plan illustrating the proposed arrangements is included as Appendix B, with the design incorporating the following key characteristics:

- Retention of two eastbound and two westbound through traffic lanes on Barkers Road,
- A dedicated right-turn lane for vehicles entering the site,
- Separate left and right-turn lanes for vehicles exiting the site.
- Signalised pedestrian crossing of Barkers Road (eastern leg) and Site Access (northern leg).
- Signalised exit from the residential driveway of 150 Barkers Road[15].
- Retention of an existing 'A Grade' tree within the north-east corner of the intersection.

The proposal retains the existing carriageway width of Barkers Road (14.25m). We are satisfied that this is appropriate, also noting that such an arrangement generally matches that at upstream/downstream intersections of Barkers Road with Power Street/Denmark Street and Glenferrie Road.

The proposal includes allowance for a traffic signal lantern facing motorists exiting the 150 Barkers Road property. In other words, all exit movements from 150 Barkers Road would be completed under traffic signal control. We re-emphasise that these arrangements are subject to approval, including the property owner(s) of 150 Barkers Road, noting that below ground vehicle detector loops would need to be installed within the boundary of this property.

The design also limits the impact on the tree protection zone (as much as practical) of an existing 'A Grade' tree which is to be retained on the north-eastern side of the intersection.

The changes to on-street car parking as a result of the proposal would be subject to Council and Department of Transport (DoT) approval. Barkers Road currently has wide kerbside lanes (roughly 4.0m wide) which permit kerbside parking (subject to clearway restrictions) and accommodate on-road cycling (including line marking). It is our view that parking would need

[15] Subject to DoT & property owner(s) consent.

to be restricted, at a minimum, up to the point at which the kerbside traffic lane returns to 4.0m in width to retain the integrity of on-road cycling provisions.

On this basis, Figure 31 and Figure 32 have been prepared to illustrate existing and proposed on-street car parking extents along Barkers Road in the vicinity of the subject intersection.

Figure 31: Barkers Road On-Street Car Parking Extents (Existing)

Figure 32: Barkers Road On-Street Car Parking Extents (Post Development - Proposed)

Based on a review of on-street car parking[16] the proposed signalisation of the Barkers Road / Site Access intersection would result in the loss of 29 on-street car parking spaces (14 and 15 spaces on the northern and southern sides of Barkers Road respectively). In part, the loss of on-street car parking is required to retain the integrity of on-road cycling provisions (as previously noted).

We also note that the spaces to be removed are currently subject to weekday peak hour clearway restrictions. That is, the spaces are unlikely to be currently utilised for long-term resident car parking as residents would need to move their vehicle on weekdays during the times in which clearway restrictions apply.

We re-emphasise that any changes to on-street car parking restrictions are subject to Council and Department of Transport approval.

7.3. Site Generated Traffic

For the purposes of assessing the traffic generated by the site, we have relied on the travel survey data collected, which is outlined in section 2.6.

The AM and Early PM peak hour assessments are based on the total traffic to be generated by the site[17]. Conversely, the Late PM peak hour assessment considers existing vehicle movements as well as the addition of vehicle movements associated with staff, noting the student numbers/movements for after school sports are to be generally as per existing conditions.

7.3.1. Staff

The travel survey data indicated that 93% of staff currently drive to the site, with all staff parking occurring on-site. Additionally, of the staff that drive to the site, 63% arrive during the AM peak hour and 27% depart during the Early PM peak hour.

In deriving peak hour staff traffic generation rates, we have multiplied the percentage of staff who drive to the site (93%) by their movement spread across the AM peak (63% arrival) and Early PM peak (27% depart). On this basis, Table 6 has been prepared to show the anticipated post-development staff traffic volumes, based on a total of 210 staff members.

For the late PM peak hour, we have made an allowance for the additional 30 staff members on-site who may be departing during this period. We have multiplied the percentage of staff who drive to the site (93%) and conservatively assumed that all of the staff departing the site after the early PM peak hour (65%) may depart during the late PM peak hour.

[16] Assumes roughly 6m per car parking space, for example, where there is a parking area of 10-12m we have assumed two parking spaces. The provision of on-street car parking on the southern side of Barkers Road is a function of crossover locations.

[17] This methodology is considered appropriate, as opposed to calculating the increase in site generated traffic and adding this to existing volumes for these peak hours. This is primarily due to the disproportionate increase in staff vs student numbers as well as changes to the existing proportionality of on-site vs on-street car parking (due to the provision of a dedicated pick-up/drop-off facility).

Table 6: Staff Traffic Generation – Post Development

Peak Period	IN		OUT		Total
	Traffic Rate (movements/staff)	Traffic Generation (movements)	Traffic Rate (movements/staff)	Traffic Generation (movements)	Peak Hour Volume (movements/hour)
AM Peak	0.59	124	-	-	124
Early PM Peak	-	-	0.25	52	52
Late PM Peak [1]	-	-	0.60	18 (applied only to additional 30 staff)	18 additional staff vehicle movements / hour

[1] The Late PM peak hour nominated traffic movements reflect the anticipated increase in staff numbers/movements over and above existing conditions.

7.3.2. Students

Based on the travel survey data we can derive traffic generation rates to/from the School for students. We have multiplied the percentage of students who drive or are driven to school via car (29%) by the percentage who are anticipated to park on-site (55%, refer below discussion) and their movement spread across the AM peak (76% arrival) and PM peak (81% departure). For the purposes of our analysis, we have assumed that a peak hour movement includes both an entry and exit movement[18]. It is emphasised that these traffic generation rates are solely for on-site movements (i.e. traffic generation at the site access points) and do not reflect on-street pick-up/drop-off activities.

We do not anticipate that travel mode splits or the arrival and departure times will materially change. Nevertheless, given the provision of the Chapel Oval Car Park, providing consolidated parking facilities, a greater quantum of on-site car parking and a dedicated pick-up/drop-off facility, it is likely that there would be an uplift in the proportion of parents/students parking on-site relative to on-street.

We have allowed for a 25% increase in the proportion of student related on-site car parking vs on-street parking, compared with existing conditions. As such, we assume that in the order of 55% of students (currently 43%) who drive or are driven to the site will park on-site during the AM and Early PM Peak Hours. No changes are anticipated to the split of on-street vs on-site

[18] This is considered to retain a small element of conservatism as not all movements associated with students will have an entry and exit movement within the same peak hour. For example, students who park on-site will only have an entry movement during the AM peak, not an entry and exit movement.

car parking during the Late PM peak hour, nor the number of vehicle movements, noting the student numbers/movements for after school sports are to be generally as per existing conditions.

On the basis of the above methodology and calculations, student traffic generation rates and volumes are outlined within Table 7. The post-development traffic generation estimates are based on a student population of 1,400 students (i.e. 1,500 students minus the 100 boarders).

It is re-emphasised that the travel survey data reported above excludes results associated with boarders and that no additional student related vehicle movements are anticipated during the late PM peak hour (hence this peak hour has been excluded from Table 7).

Table 7: Student Traffic Generation – Post Development

Peak Period	IN		OUT		Total
	Traffic Rate (movements/student)	Traffic Generation (movements)	Traffic Rate (movements/student)	Traffic Generation (movements)	Peak Hour Volume (movements/hour)
AM Peak	0.12	168	0.12	168	336
Early PM Peak	0.13	182	0.13	182	364

7.3.3. Total

Based on the above, the anticipated level of site generated traffic that will utilise the Barkers Road and Charles Street access points is outlined in Table 8. We note that there will still be some movements associated with Gellibrand Street and Stratford Avenue, however, these will be limited to maintenance/loading activities.

We note that the late PM peak hour volumes outlined below are the sum of the existing volumes and additional staff movements expected outlined in Table 6.

Table 8: Total Site Traffic Generation – Post Development

Peak Period	IN	OUT	Total
AM Peak	292 veh/hr	168 veh/hr	460 veh/hr
Early PM Peak	182 veh/hr	234 veh/hr	416 veh/hr
Late PM Peak [1]	149 veh/hr	219 veh/hr	368 veh/hr

[1] The Late PM peak hour nominated traffic movements reflect the anticipated increase in staff numbers/movements over and above existing conditions.

7.4. Site Generated Traffic Distribution

Significant changes to the site's access arrangements are proposed, namely the closure of the Gellibrand Street exit and the signalisation of the Barkers Road access. These amendments to the site's access arrangements will impact the distribution of site generated traffic entering and exiting the site at each access point.

We believe that the majority of traffic currently exiting the site via Gellibrand Street is generally travelling to a northerly or western destination. Moreover, the provision of traffic signals at the site's Barkers Road access is also expected to attract a higher proportion of entry and exit movements, given the increased capacity.

Having regards to the above, and other relevant factors, the following key assumptions have been made in assessing the redistribution of site generated traffic:

- Gellibrand Street - 40% of existing exit traffic to turn right-out at Barkers Road.
- Gellibrand Street - 60% of existing exit traffic to turn left-out at Charles Street.
- Charles Street – 50% of existing exit right-turn traffic to turn left-out at Barkers Road.
- Charles Street – 50% of existing entry left-turn traffic to turn right-in at Barkers Road.
- Hansen Street – 50% of existing exit traffic to turn right out at Barkers Road.

Furthermore, the distribution of site generated traffic at the Barkers Road / Denmark Street / Power Street intersection is assumed consistent with existing movements at the intersection.

Based on these assumptions, when applied to existing distributions, the anticipated site generated traffic distribution to/from the site in the AM, Early PM and Late PM peak hours is outlined in Figure 33 to Figure 35 respectively.

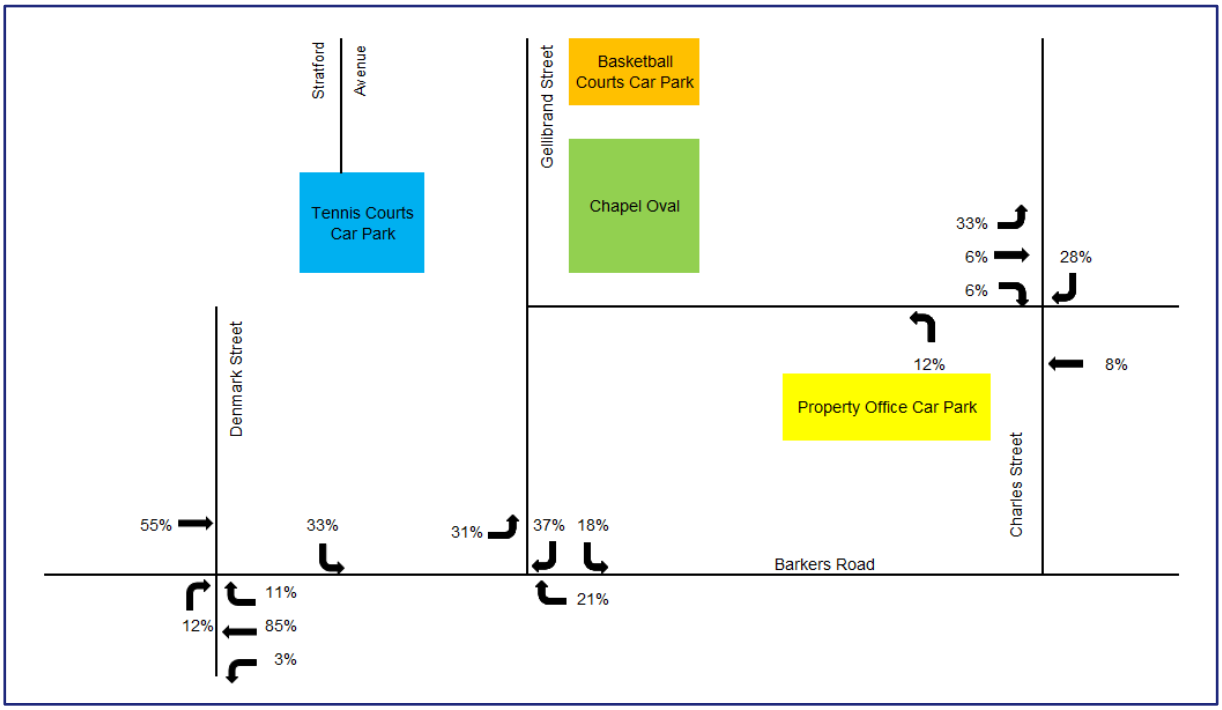


Figure 33: Site Generated Traffic Distribution - AM Peak Hour (Development Plan)

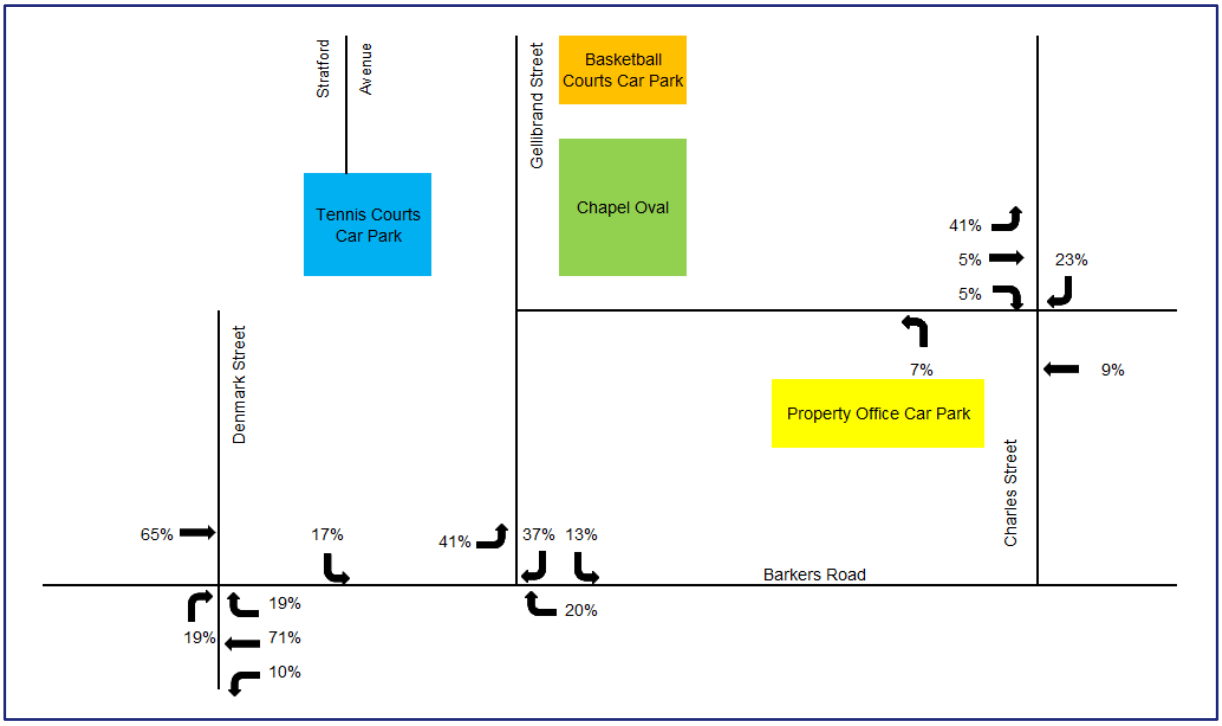


Figure 34: Site Generated Traffic Distribution - Early PM Peak Hour (Development Plan)

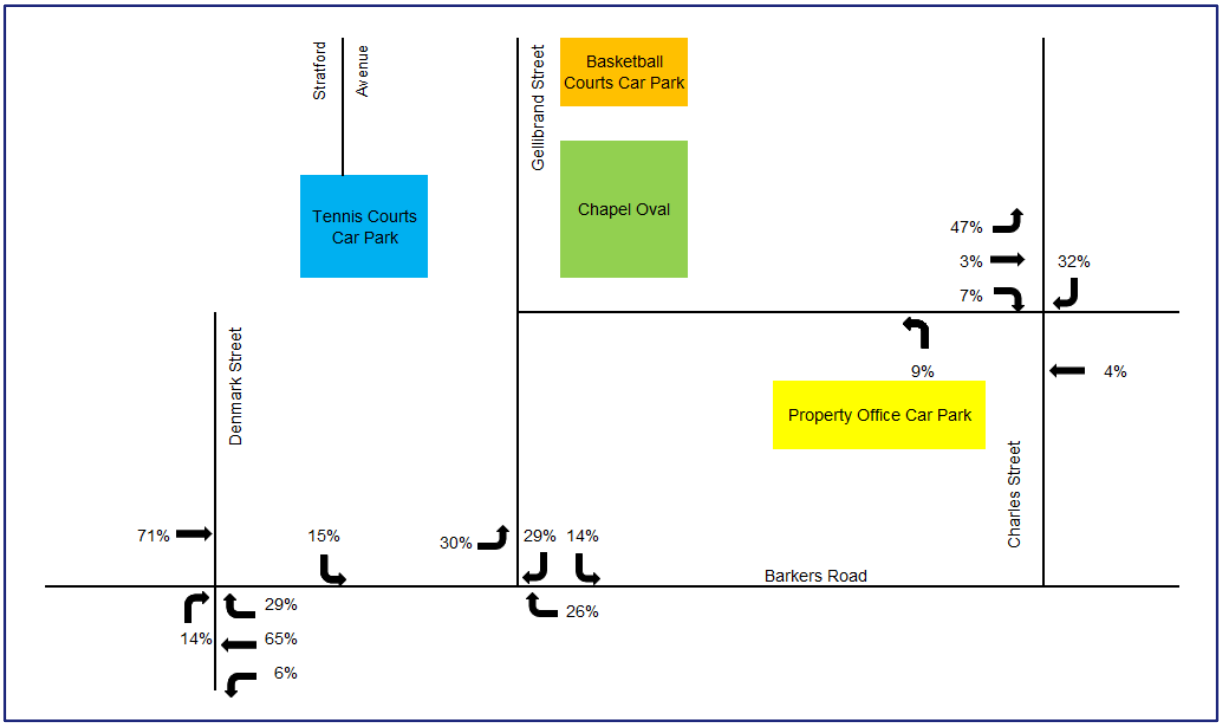


Figure 35: Site Generated Traffic Distribution - Late PM Peak Hour (Development Plan)

7.5. Traffic Volumes

7.5.1. Site Generated

Based on the above distribution assumptions and site generated traffic volumes Figure 36 to Figure 38 have been prepared to demonstrate the anticipated AM, Early PM and Late PM peak hour site generated traffic volumes[19].

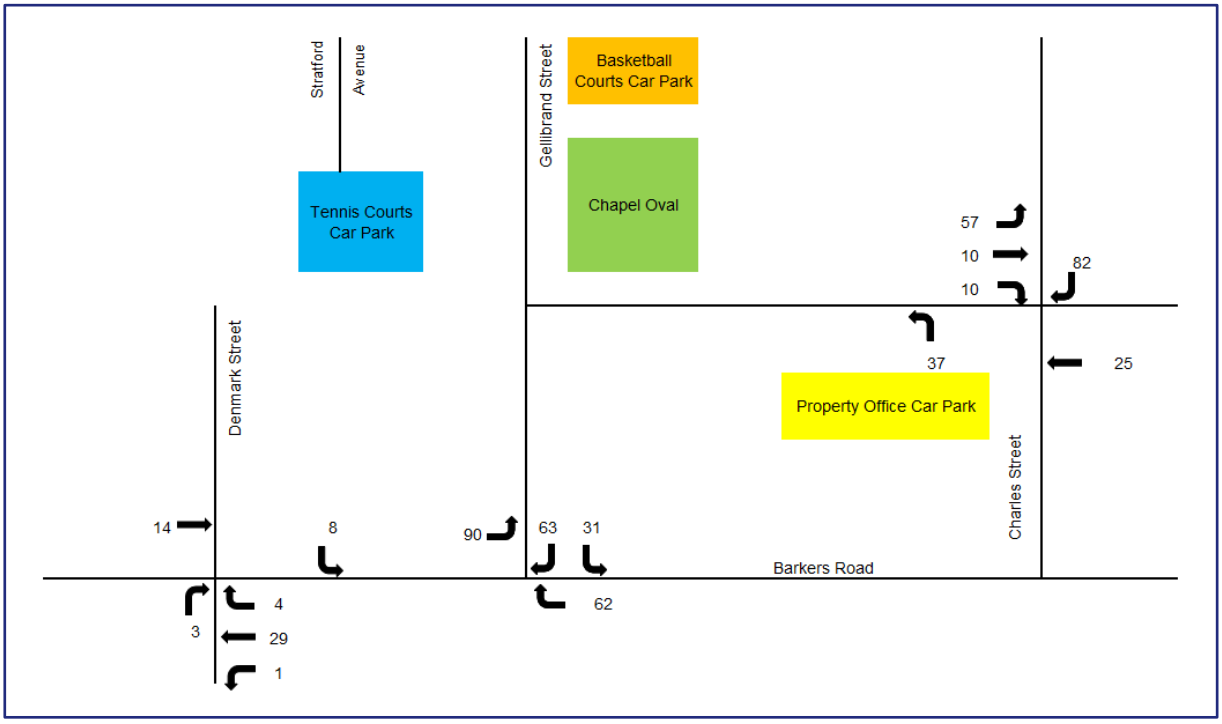


Figure 36: Site Generated Traffic Volumes - AM Peak Hour (Development Plan)

[19] Site generated traffic volumes at the Barkers Road / Denmark Street / Power Street intersection are based upon the anticipated increase (only) in traffic volumes. That is, the volumes presented at the Barkers Road / Denmark Street / Power Street intersection represent the assumed increase in site generated traffic relative to existing conditions. The approach for the Barkers Road / Denmark Street / Power Street intersection differs from that of the site access intersections where site generated traffic volumes represent the total anticipated site generated traffic movements (that is, not the increase). As a result, the 'site generated' volumes nominated at the Barkers Road / Site Access and Barkers Road / Denmark Street / Power Street intersection do not equate to each other.

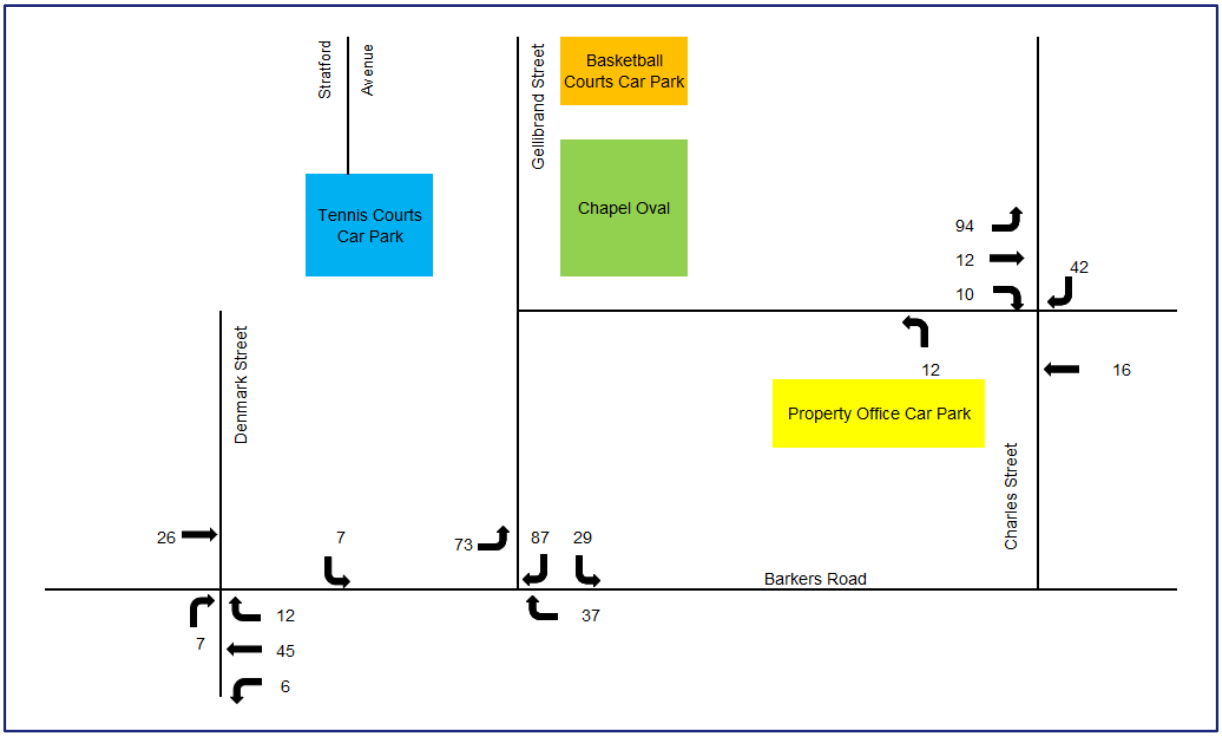


Figure 37: Site Generated Traffic Volumes - Early PM Peak Hour (Development Plan)

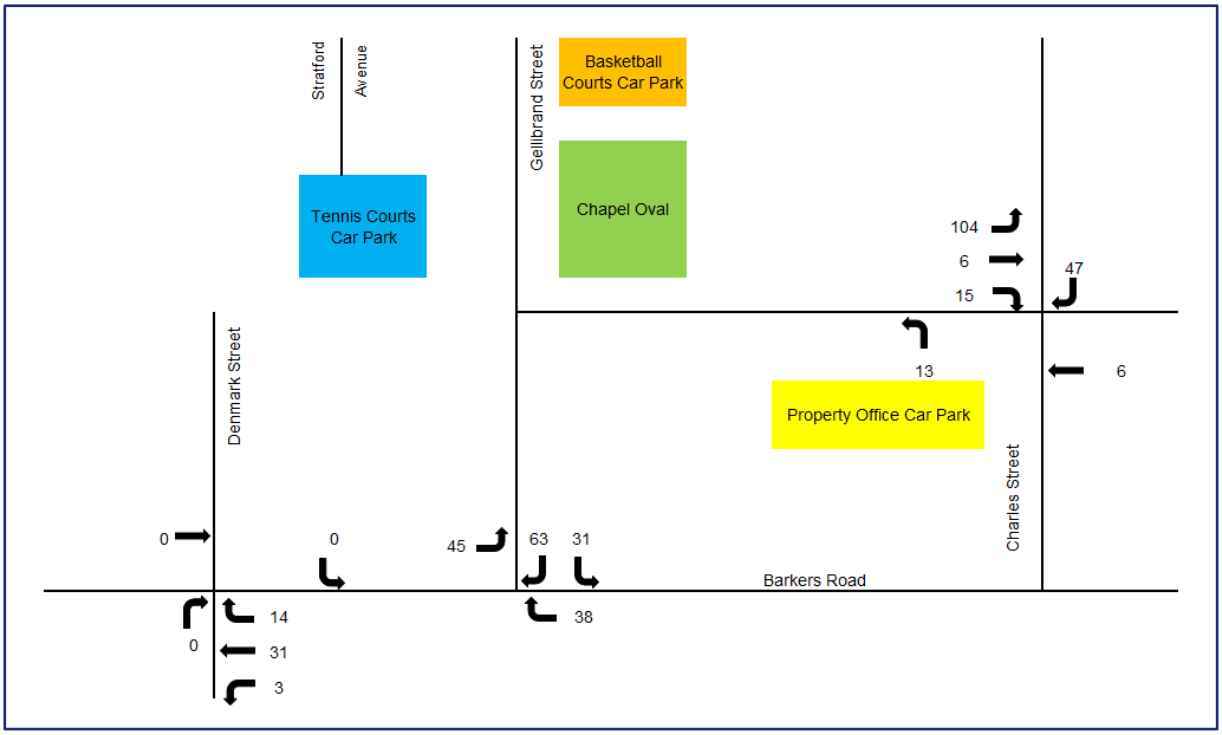


Figure 38: Site Generated Traffic Volumes - Late PM Peak Hour (Development Plan)

7.5.2. Post Development

By adding the anticipated site generated traffic volumes to existing traffic volumes[20] we can derive post development traffic volumes[21] for the AM, Early PM and Late PM peak hours as shown within Figure 39 to Figure 41.

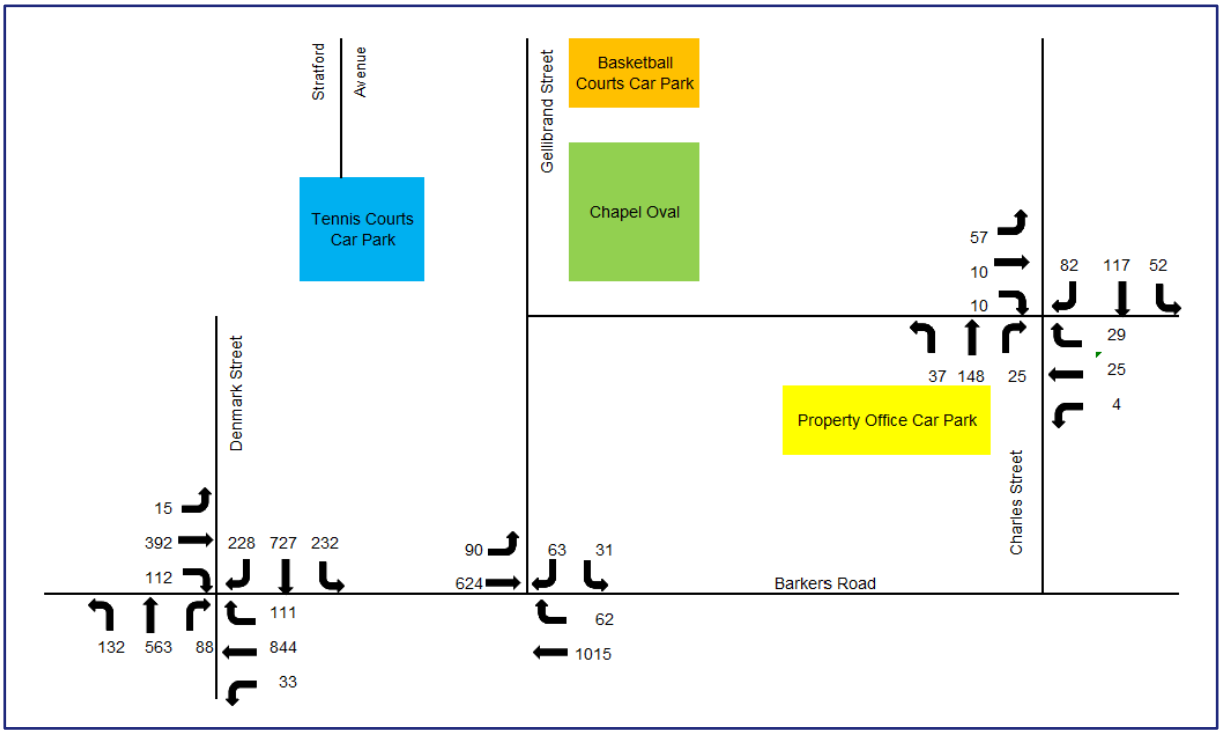


Figure 39: Post Development Traffic Volumes – AM Peak Hour

[20] Excludes existing traffic volumes to/from the subject site. It is emphasised that the site generated traffic volumes represent all site generated movements not just the increase relative to existing conditions (other than at the Barkers Road / Denmark Street / Power Street intersection as outlined previously).

[21] As nominated earlier within this report there is a discrepancy between Barkers Road traffic volumes recorded at the site access and those recorded by SCATS at the Barkers Road / Denmark Street / Power Street intersection for existing conditions. As a result, there is a discrepancy between traffic volumes nominated at the Barkers Road / Site Access and Barkers Road / Denmark Street / Power Street intersection. Given this, our SIDRA results for existing conditions have been checked against on-site observations on the survey day.

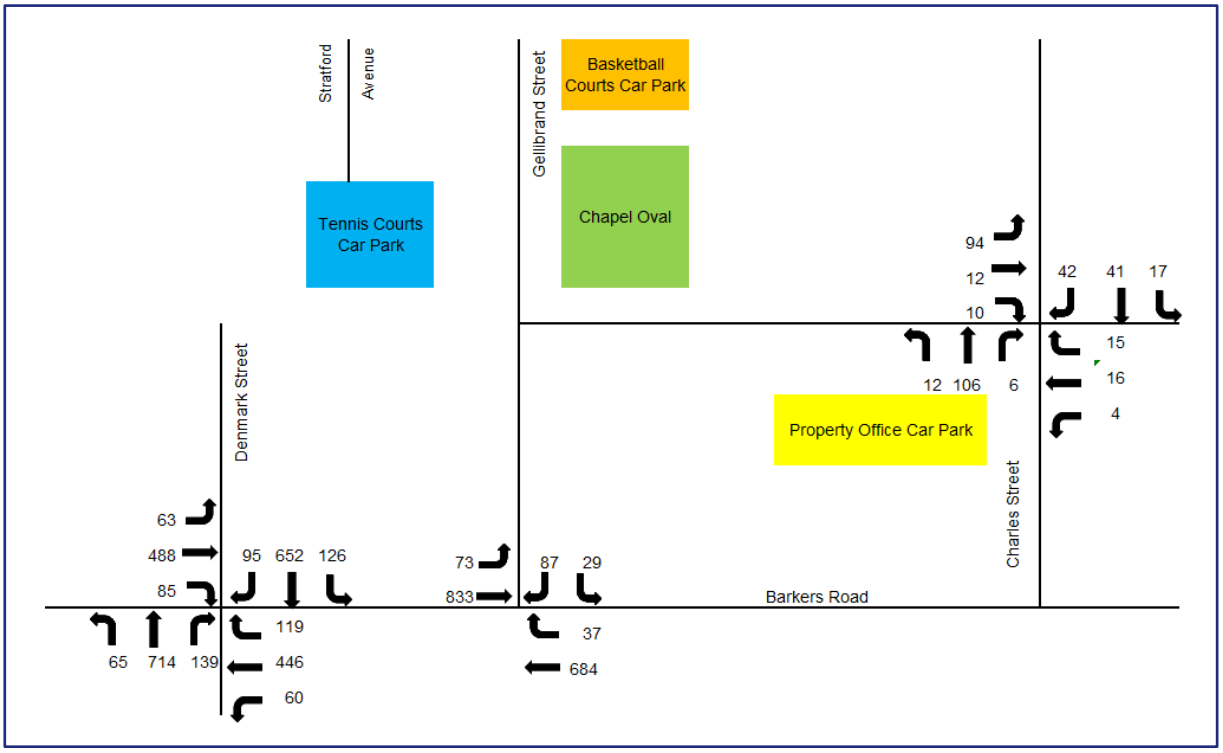


Figure 40: Post Development Traffic Volumes – Early PM Peak Hour

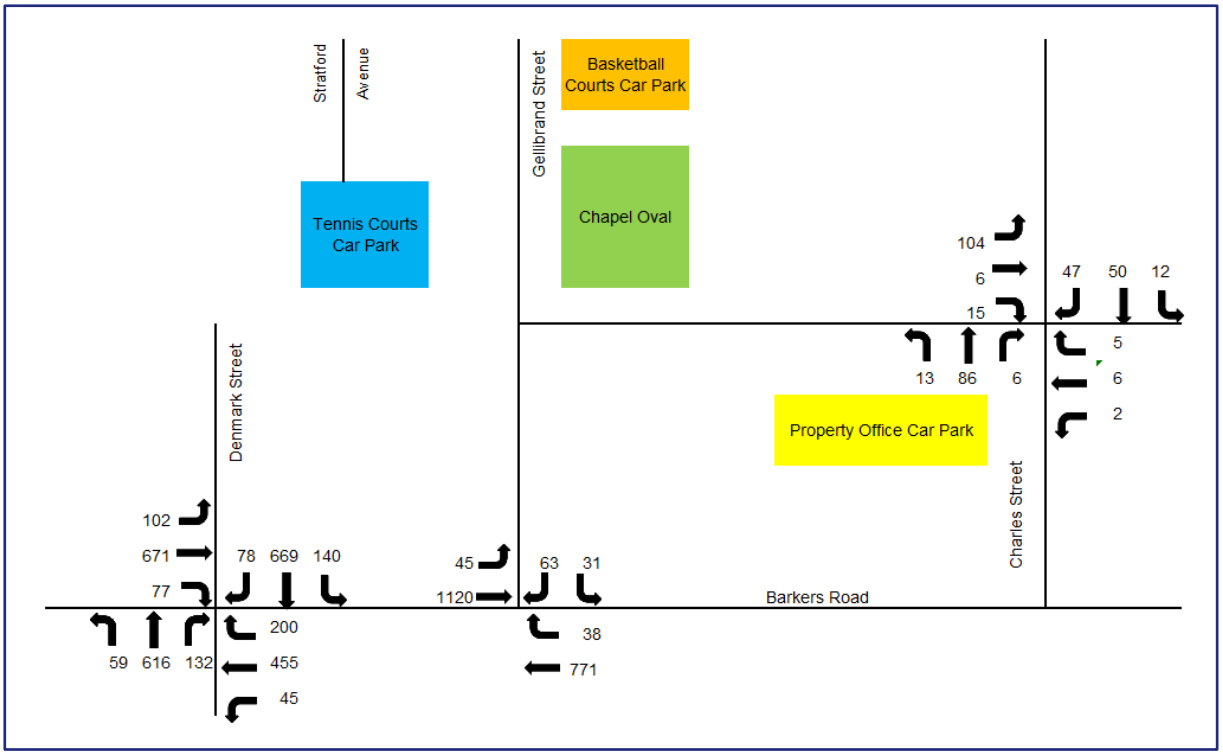


Figure 41: Post Development Traffic Volumes – Late PM Peak Hour

7.6. Traffic Assessment Method

We have utilised SIDRA Intersection 9 to undertake an assessment of the following intersections/locations:

- Charles Street / Site Access / Hansen Street.
- Barkers Road / Site Access.
- Barkers Road / Denmark Street / Power Street.

SIDRA is a computer simulation package which assesses the operating performance of intersections and road networks.

A summary of key SIDRA outputs is as follows:

- **Degree of Saturation (DoS)** – The ratio of traffic volume to maximum capacity for a particular turning movement.
- **Average Delay (Avg. Delay)** – The average delay in seconds for a vehicle making a particular turning movement.
- **95th Percentile Queue (95% Queue)** – The 95th percentile queue length is the length in metres which 95 per cent of all observed cycle queues fall below (or 5% exceed) during the peak analysis period.

Typically, a DoS of 0.95 and 0.90 for signalised and unsignalised intersection is considered as the typical 'acceptable limit' for intersection operation, beyond which queues and delays increase disproportionally with the addition of further traffic.

Given the proximity of the Barkers Road access to the Barkers Road/Demark Street intersection, these sites have been assessed utilising a SIDRA network model.

The proposed configuration of the Barkers Road / Site Access intersection is shown within Figure 42[22].

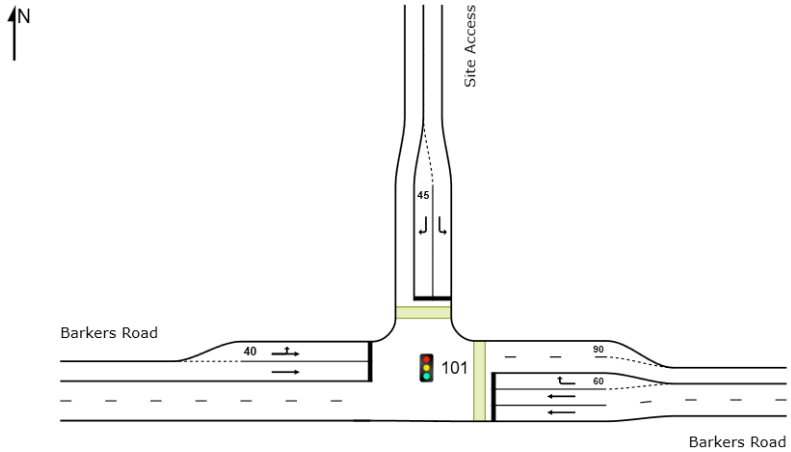


Figure 42: Barkers Road / Site Access Intersection – SIDRA Layout (Post Development – AM Peak)

[22] Note that the layout shown is for the AM peak period. The model does differ between peak periods when different clearway restrictions are in effect. The specific layout used to model each scenario is provided with the detailed SIDRA outputs at Appendix A.

7.7. Traffic Impact Assessment

7.7.1. Traffic Modelling Results

The key findings of our SIDRA assessment are summarised in Table 9 to Table 11 with full results provided at Appendix A.

For the purposes of this assessment, we have retained the existing signal phasing and timing[23] for the Barkers Road / Denmark Street / Power Street intersection. Additionally, we have assumed that the Barkers Road / Site Access intersection would operate at the same cycle time as the Barkers Road / Denmark Street / Power Street intersection.

In our experience it is likely that the Barkers Road / Site Access intersection phasing would be linked with that of Barkers Road / Denmark Street / Power Street and/or Barkers Road / Glenferrie Road intersection with associated traffic operation improvements at the Barkers Road / Site Access intersection expected as a result. In order to provide a conservative assessment, we have not allowed for favourable co-ordination between the networked intersections in SIDRA and the associated arrival/flow of traffic.

[23] Phasing and signal timing information provided by the Department of Transport.

Table 9: SIDRA Movement Summary - AM Peak

Intersection	Intersection Leg	Existing Conditions			Post Development		
		DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Charles Street / Site Access / Hansen Street	Charles St (South)	0.128	2.1	1.7	0.119	1.8	1.7
	Hansen St (East)	0.080	10.4	1.9	0.094	10.7	2.3
	Charles St (North)	0.136	3.2	3.6	0.152	3.5	4.6
	Site Access (West)	0.071	9.7	1.8	0.081	9.2	2.2
Barkers Road / Site Access	Barkers Rd (East)	0.292	0.5	3.6	0.459	8.1	65.4
	Site Access (North)	0.629	99.1	17.7	0.420	55.1	33.6
	Barkers Rd (West)	0.314	0.7	0.0	0.481	11.5	99.1
Barkers Road/ Denmark Street/ Power Street	Power St (South)	1.025	84.7	379.7	1.027	85.2	381.4
	Barkers Rd (East) [1]	0.854	47.0	198.2	0.884	50.8	216.3
	Denmark St (North)	0.855	33.3	183.9	0.855	33.4	185.9
	Barkers Rd (West)	0.581	37.0	84.3	0.599	37.2	87.8

[1] The Site Access / Barkers Road intersection is located approximately 250m east of the Barkers Road / Power Street / Denmark Street intersection. As such, if queuing on the Barkers Road (east approach) extended 250m (or more) at the Barkers Road / Denmark Street / Power Street intersection this would reach and impact on the operation of the Barkers Road / Site Access intersection. In this regard, we have completed a detailed review of video footage from the surveys at Barkers Road / Site Access intersection, during all peak hours assessed within this report, and confirm that at no time did the queue along Barkers Road (westbound traffic) extend back from Denmark Street / Power Street back to or past the Site Access intersection.

Table 10: SIDRA Movement Summary - Early PM Peak

Intersection	Intersection Leg	Existing Conditions			Post Development		
		DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Charles Street / Site Access / Hansen Street	Charles St (South)	0.068	0.8	0.4	0.068	0.8	0.4
	Hansen St (East)	0.031	8.7	0.7	0.043	9.1	1.1
	Charles St (North)	0.045	2.8	1.0	0.060	3.6	1.8
	Site Access (West)	0.047	8.6	1.2	0.104	8.6	2.9
Barkers Road / Site Access	Barkers Rd (East)	0.407	0.7	1.6	0.511	8.3	72.6
	Site Access (North)	0.305	46.3	2.8	0.542	54.4	43.8
	Barkers Rd (West)	0.394	0.6	0.0	0.602	9.9	112.9
Barkers Road/ Denmark Street/ Power Street	Power St (South)	0.891	37.0	106.8	0.895	37.4	264.1
	Barkers Rd (East) [1]	0.460	31.6	44.6	0.529	32.1	83.3
	Denmark St (North)	0.901	37.7	134.7	0.911	39.1	227.4
	Barkers Rd (West)	0.717	40.2	69.4	0.758	41.2	122.0

[1] The Site Access / Barkers Road intersection is located approximately 250m east of the Barkers Road / Power Street / Denmark Street intersection. As such, if queuing on the Barkers Road (east approach) extended 250m (or more) at the Barkers Road / Denmark Street / Power Street intersection this would reach and impact on the operation of the Barkers Road / Site Access intersection. In this regard, we have completed a detailed review of video footage from the surveys at Barkers Road / Site Access intersection, during all peak hours assessed within this report, and confirm that at no time did the queue along Barkers Road (westbound traffic) extend back from Denmark Street / Power Street back to or past the Site Access intersection.

Table 11: SIDRA Movement Summary - Late PM Peak

Intersection	Intersection Leg	Existing Conditions			Post Development		
		DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Charles Street / Site Access / Hansen Street	Charles St (South)	0.065	1.5	0.4	0.058	1.0	0.4
	Hansen St (East)	0.015	8.8	0.4	0.016	8.9	0.4
	Charles St (North)	0.065	3.3	2.0	0.065	3.2	2.0
	Site Access (West)	0.080	8.6	2.1	0.109	8.5	3.1
Barkers Road / Site Access	Barkers Rd (East)	0.501	2.6	15.1	0.466	8.1	86.8
	Site Access (North)	0.395	71.1	8.9	0.406	54.0	32.3
	Barkers Rd (West)	0.321	0.3	0.0	0.483	9.9	122.0
Barkers Road/ Denmark Street/ Power Street	Power St (South)	0.954	55.2	285.9	0.954	55.2	285.9
	Barkers Rd (East) [1]	0.840	29.7	68.9	0.903	32.2	75.6
	Denmark St (North)	0.729	35.6	166.1	0.729	35.6	166.1
	Barkers Rd (West)	0.782	42.6	169.3	0.782	42.6	169.3

[1] The Site Access / Barkers Road intersection is located approximately 250m east of the Barkers Road / Power Street / Denmark Street intersection. As such, if queuing on the Barkers Road (east approach) extended 250m (or more) at the Barkers Road / Denmark Street / Power Street intersection this would reach and impact on the operation of the Barkers Road / Site Access intersection. In this regard, we have completed a detailed review of video footage from the surveys at Barkers Road / Site Access intersection, during all peak hours assessed within this report, and confirm that at no time did the queue along Barkers Road (westbound traffic) extend back from Denmark Street / Power Street back to or past the Site Access intersection.

7.7.2. Charles Street / Hansen Street / Site Access

As shown in Table 9 to Table 11, the Charles Street / Hansen Street / Site Access intersection currently operates within acceptable limits (i.e. DoS less than 0.90 and low/moderate queues and delays) and is predicted to continue to do so post development. The Development Plan is not expected to result in any significant deterioration in the operation of this intersection, with all post development queues and delays also considered to be within acceptable limits and existing lane lengths/capacities.

7.7.3. Barkers Road / Site Access

As shown in Table 9 to Table 11, the Barkers Road / Site Access intersection is anticipated to operate within acceptable limits during all assessed peak periods.

Indeed, vehicle queuing associated with the proposed signalised intersection is not anticipated to extend back to or impact upon the operation of the Barkers Road / Denmark Street / Power Street or Barkers Road / Glenferrie Road intersections.

We are satisfied that the proposed signalised access arrangement to Barkers Road is appropriate.

7.7.4. Gellibrand Street

Gellibrand Street is to be limited to loading and maintenance vehicle movements only. This will represent a significant reduction in site generated traffic utilising Gellibrand Street, comparative with existing conditions.

7.7.5. Stratford Avenue

Stratford Avenue is to be limited to loading and maintenance vehicle movements only. Site generated traffic volumes are anticipated to be generally consistent or slightly lower than existing conditions, albeit the proportion of heavy vehicles associated with the site utilising Stratford Avenue is anticipated to increase.

7.7.6. Barkers Road / Denmark Street / Power Street

Based on the above results, the intersection is effectively already operating near or above its capacity. Notably, the changes to the operation of the intersection are negligible and as a result, we do not anticipate that there will be any noticeable change in the operation of this intersection.

8 Boroondara Council – Traffic Engineering Referral

Council's traffic engineer reviewed the proposed Development Plan and previous iteration of the Traffix Group report (dated 9 March 2021) and provided the following internal referral comments within email correspondence dated 4 May 2021.

We note that some comments refer to an interim and ultimate scenario. This is based upon a previous version and staging of the Development Plan, with no interim scenario now proposed.

Council findings are outlined below **(bolded)** with a response (as required) to each of these items following.

"It is proposed to provide an additional 73 on-site spaces within a temporary car park in the north-west corner of the site, to remain in place until such time as the Chapel sports oval car park is constructed. This increase in on-site parking via the temporary car park maintains an on-site parking capacity of 314 spaces at all times. This results in an increase of 69 spaces during school hours and maintaining the existing parking capacity at the site as per the existing Plan for after school hours. The proposed increase in on-site parking exceeds the statutory parking requirement of 48 spaces. On this basis, the on-site parking provision is considered appropriate in this instance."

Noted, further noting that the 73-space temporary car park (former interim scenario) is no longer proposed.

"It is stated that there is likely to be minimal increases in on-street parking demands as a result of the development plan is anticipated to be limited to pick-up/drop-off periods, The ultimate scenario includes the provision of additional on-site parking and a dedicated pick-up/drop-off facility. Any off-site parking demands would need to adhere to posted parking restrictions, with adjacent streets including parking restrictions prioritising residents and their visitors. The reliance on of-site parking availability should be avoided, where possible."

Noted. We also confirm that 100% of existing staff who drive to the site park on-site and this is anticipated to continue in the future.

"There is a statutory parking requirement, as per Clause 52.34, for the provision of 102 on-site bicycle parking spaces, based on the proposed increases to staff and students for the development plan. It is stated in the traffic report that it is preferred to allow adequate space to accommodate the full statutory provision of bicycle facilities, however only introduce the additional parking provision gradually and on an as needed basis, in response to bicycle parking demands of the school. Promotion of cycling as a travel mode and responding to any increases in demands should be mandated as part of any new development plan, should this implementation schedule be further considered."

Noted, refer to Section 5 for additional information regarding bicycle parking (including existing mode split information).

"A review of the traffic modelling presented for each of the proposed site accesses when including the additional post-development traffic volumes indicate that the Charles Street/Hansen Street/ site access intersection and the site accesses at Gellibrand Street and Stratford Avenue will likely operate within acceptable limits and that the anticipated traffic volumes may be accommodated without significant impact."

Noted.

"A review of the Barkers Road site access intersection indicates that there is currently limited capacity to undertake a right-turn exit movement from the site onto Barkers Road. Given this, there is an assumption that motorists wishing to turn right out and encounter significant delays may choose an alternate route out of the school that offers less resistance, thereby altering the traffic distributions at the site accesses. This redistribution may not always eventuate and there is a risk of lengthy delays at the Barkers Road site access without the regulation of traffic signals to create appropriate gaps for existing traffic.

While it is acknowledged that there are existing traffic signals at both Denmark Street and Glenferrie Road in this vicinity, given the volume of traffic generated from the site, particularly in the ultimate development scenario, the addition of traffic signals to assist this traffic movement is considered relevant, and may also serve to provide an additional pedestrian connection in proximity to the school on Barkers Road. Nevertheless, the nominated traffic distributions proposed for the interim scenario, which includes the assumption that no additional right turn movements from the site access onto Barkers Road as a result of the development plan, and the associated redistribution of these movements to other site access locations does indicate that there is adequate spare capacity at the Barkers Road site access to accommodate the additional traffic."

Noted, further noting that the unsignalised Barkers Road / Site Access (former interim scenario) is no longer proposed.

"Loading arrangements are maintained relatively consistent with current practices in the interim scenario, with new maintenance buildings proposed in the ultimate scenario with access provided via service-only accesses from Gellibrand Street and Stratford Avenue linked by an internal service road. Waste collection arrangements are yet to be confirmed."

Noted, noting that the former interim scenario is no longer proposed.

We have been advised that loading and waste collection is to occur via the Barkers Road access point (as much as practical).

Waste collection arrangements are to be confirmed within a Waste Management Plan. The mandate to prepare such a plan(s) could be included by way of an appropriately worded permit condition for any future permit(s) granted for buildings and works within the site.

9 Department of Transport – Request for Further Information

The Department of Transport (DoT) reviewed the proposed Development Plan and previous iteration of the Traffix Group report (dated 9 March 2021) and provided a Request for Further Information (RFI) dated 5 May 2021.

DoT RFI items are outlined below **(bolded)** with a response to each of these items following.

"Traffic data, analysis and designs that would be to the Department's satisfaction that presents a demonstrated need for an improved access arrangement in the form of a signalised treatment at the Barkers Road access. A proposal to signalise the upgrade to the Barkers Road school access would ideally be supported by an exclusive Right Turn Lane in Barkers Road for right turn traffic entering the college campus. Any data should take particular note of the marked 'AM and PM' peaks (for pedestrians and vehicles) that are typical for schools"

A detailed traffic analysis is included within Section 7 of this report. The proposed traffic signal layout also includes an exclusive right-turn lane, refer to Appendix B.

"The data and analysis is to include the nearby signalised Barkers Road/Denmark Street intersection, to understand the impact on this intersection, as a result of the expansion of Xavier College and the proposed signalised Barkers Road college entry"

This has been included within our analysis. Further to this, the Site Access / Barkers Road intersection is located approximately 250m east of the Barkers Road / Power Street / Denmark Street intersection. As such, if queuing on the Barkers Road (east approach) extended 250m (or more) at the Barkers Road / Denmark Street / Power Street intersection this would reach and impact on the operation of the Barkers Road / Site Access intersection.

In this regard, we have completed a detailed review of video footage from the surveys at Barkers Road / Site Access intersection, during all peak hours assessed within this report, and confirm that at no time did the queue along Barkers Road (westbound traffic) extend back from Denmark Street / Power Street back to or past the Site Access intersection.

"The analysis is to also consider the additional traffic volumes emanating from the redevelopment of the nearby 138 Barkers Road"

A Traffic and Transport Assessment was prepared by Cardno, dated 17 September 2020, for the development of 138 Barkers Road. This report identifies vehicle access via the western boundary of the site. A total of 50 dwellings are proposed which the report identifies is expected to result in the addition of 25 vehicle movements in a peak hour and 250 movements across a day.

In our view the addition of up to 25 vehicle movements in a peak hour, associated with the development proposal, is unlikely to materially change the performance of surrounding

intersections. In forming this view, we note that these volumes are within the day-to-day range of traffic volume fluctuation which occurs at surrounding intersections. Whilst no traffic from this development has been included within our analysis, we note that this is offset by conservative assumptions associated with our analysis. One such assumption is that all site generated traffic is new to the network, including distribution at the Barkers Road / Denmark Street / Power Street intersection, whereas site generated traffic currently utilises that intersection and is included within our existing conditions counts.

"A signalised upgrade to the Barkers Road access would ideally be supported by an exclusive Right Turn Lane in Barkers Road for right turn traffic entering the college campus"

An exclusive right-turn lane is proposed.

"Consideration of Movement and Place classifications within the immediate road alignment"

Movement and Place have been considered as part of the proposed signalised intersection design. Relevant key considerations are outlined as follows:

- Place – As discussed earlier within this report the following key strategies were identified for the Masterplan:
  - Connect the campus with a clear and accessible pedestrian spine,
  - Prioritise pedestrians,
  - Separate people from cars.

  The design, including the signalised intersection design, seeks to meet these strategies (as much as practical).
- Pedestrians – A signalised crossing of Barkers Road and the Site Access is proposed. This is an improvement to existing conditions with the Site Access crossing leading into the existing footpath which is located to the west of the internal vehicle access road.
- Cyclists – Barkers Road currently has wide kerbside lanes (roughly 4.0m wide) which permit kerbside parking (subject to clearway restrictions) and accommodate on-road cycling (including line marking). It is our view that parking would need to be restricted, at a minimum, up to the point at which the kerbside traffic lane returns to 4.0m in width to retain the integrity of on-road cycling provisions. This is as per our analysis/design and has consideration to maintaining on-road cycling provisions (as much as practical).
- Public Transport –The proposed design, which matches the lane widths at the Barkers Road / Denmark Street / Power Street intersection, does not preclude or fundamentally alter the current or future provision of public transport services along Barkers Road.
- Motorists – A SIDRA assessment identifies that the proposed Barkers Road / Site Access intersection is to operate satisfactorily post development. We note that the proposed design retains two through traffic lanes in each direction on Barkers Road.

"Consideration for an option to install Pedestrian Operated Signals (PoS), as a means of addressing the current and increased pedestrian activity, having regard to Education Facilities having specific 'AM' and 'PM' peaks"

A PoS option was investigated. Our analysis indicated that regardless of the PoS positioning (either east or west of the site access) that this option was unlikely to provide for adequate intersection capacity.

"Whether a PoS would create necessary gaps in traffic on Barkers Road, to manage the increase in on-site car parking"

Refer to above response.

"Merits for the option to signalise the Barkers Road/Charles Street intersection – Council input would be invited in this instance. Please undertake the necessary assessment and forward to the Department to allow for further review and assessment."

This option was also considered. Fundamentally, this option has not been proposed for the following reasons:

- As the School does not own either of the properties on the corner of the Charles Street / Barkers Road intersection there is less scope to allow for a suitable design. This both includes sight line splays and the ability to provide separate left and right-turn exit lanes onto Barkers Road.
- It is likely that provision of traffic signals would induce additional traffic (over and above that of Xavier College) associated with general north-south movements, right-turn movements to Barkers Road (noting that movement is currently banned) as well as nearby schools (principally Trinity Grammar)
- Would likely require restrictions to parking on one or both sides of Charles Street between the School Access and Barkers Road.
- Limited intersection sight distance (approximately 100m) to the west of the intersection.

10 Conclusions

Having undertaken a detailed traffic engineering assessment of the proposed Development Plan for the Xavier College Senior Campus located at 135 Barkers Road, Kew, we are of the opinion that:

a) Our report appropriate addresses relevant matters specified within Schedule 2 to Clause 43.04 Development Plan Overlay of the Boroondara Planning Scheme,

b) A total in the order of 351-401 on-site car parking spaces are proposed, representing an increase in the existing on-site car parking provision (both during and after school hours),

c) The Development Plan seeks a 30 staff and 500 student increase, resulting in a statutory requirement to provide 36 additional on-site car parking spaces (during school hours),

d) The proposed increase in the on-site car parking provision exceeds the statutory requirement and that specified previously within the Development Plan,

e) Any increase in on-street demands is anticipated to be limited to pick-up/drop-off periods with the Development Plan representing an increase to the on-site provision of car parking during school hours and after hours,

f) New car parking areas should be designed in accordance with the requirements of the Planning Scheme and/or relevant Australian Standards,

g) It is our recommendation that bicycle parking area(s) make a spatial allowance for bicycle parking commensurate with the statutory bicycle parking requirement,

h) It is further recommended that only part of the statutory bicycle parking requirement be provided initially with bicycle parking demands to be monitored and additional parking be provided as bicycle parking areas approach capacity,

i) The increase in student/staff numbers is anticipated to result in a totals of 460, 416 and 368 vehicle movements at the site access points during the respective AM, Early PM and Late PM school peak hours,

j) We have been advised by the School that the movement of students between Burke Hall and the Senior School, as well as the intensity of before/after school sports and weekend sports, will remain generally consistent with current arrangements under the Development Plan.

k) A total of up to 18 additional staff movements are anticipated during the Late PM peak with traffic movements during the Saturday morning peak hour anticipated to be generally as per existing conditions,

l) The Development Plan proposes signalisation of the Site Access / Barkers Road intersection, and

m) The additional traffic predicted to be generated by the proposal can be satisfactorily accommodated, from a capacity perspective, within the surrounding road network.

Appendix A

SIDRA Intersection Results

MOVEMENT SUMMARY

Site: 101 [Charles Street Access - AM - Existing (Site Folder: Xavier Development Plan Analysis)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Charles Street														
1	L2	53	1.0	56	1.0	0.128	5.8	LOS A	0.2	1.7	0.10	0.19	0.10	56.2
2	T1	148	1.0	156	1.0	0.128	0.1	LOS A	0.2	1.7	0.10	0.19	0.10	57.8
3	R2	25	1.0	26	1.0	0.128	6.1	LOS A	0.2	1.7	0.10	0.19	0.10	55.6
Approach		226	1.0	238	1.0	0.128	2.1	NA	0.2	1.7	0.10	0.19	0.10	57.2
East: Hansen Street														
4	L2	4	1.0	4	1.0	0.080	8.5	LOS A	0.3	1.9	0.43	0.95	0.43	50.6
5	T1	18	1.0	19	1.0	0.080	10.4	LOS B	0.3	1.9	0.43	0.95	0.43	50.4
6	R2	29	1.0	31	1.0	0.080	10.6	LOS B	0.3	1.9	0.43	0.95	0.43	50.1
Approach		51	1.0	54	1.0	0.080	10.4	LOS B	0.3	1.9	0.43	0.95	0.43	50.3
North: Charles Street														
7	L2	52	1.0	55	1.0	0.136	6.1	LOS A	0.5	3.6	0.22	0.26	0.22	55.1
8	T1	117	1.0	123	1.0	0.136	0.4	LOS A	0.5	3.6	0.22	0.26	0.22	56.7
9	R2	59	1.0	62	1.0	0.136	6.2	LOS A	0.5	3.6	0.22	0.26	0.22	54.6
Approach		228	1.0	240	1.0	0.136	3.2	NA	0.5	3.6	0.22	0.26	0.22	55.8
West: Site Access														
10	L2	24	1.0	25	1.0	0.071	8.7	LOS A	0.3	1.8	0.34	0.92	0.34	51.0
11	T1	16	1.0	17	1.0	0.071	10.4	LOS B	0.3	1.8	0.34	0.92	0.34	50.8
12	R2	16	1.0	17	1.0	0.071	10.5	LOS B	0.3	1.8	0.34	0.92	0.34	50.5
Approach		56	1.0	59	1.0	0.071	9.7	LOS A	0.3	1.8	0.34	0.92	0.34	50.8
All Vehicles		561	1.0	591	1.0	0.136	4.1	NA	0.5	3.6	0.20	0.36	0.20	55.2

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

MOVEMENT SUMMARY

Site: 101 [Charles Street Access - AM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Charles Street														
1	L2	37	1.0	39	1.0	0.119	5.8	LOS A	0.2	1.7	0.10	0.17	0.10	56.4
2	T1	148	1.0	156	1.0	0.119	0.1	LOS A	0.2	1.7	0.10	0.17	0.10	58.0
3	R2	25	1.0	26	1.0	0.119	6.1	LOS A	0.2	1.7	0.10	0.17	0.10	55.9
Approach		210	1.0	221	1.0	0.119	1.8	NA	0.2	1.7	0.10	0.17	0.10	57.5
East: Hansen Street														
4	L2	4	1.0	4	1.0	0.094	8.5	LOS A	0.3	2.3	0.45	0.96	0.45	50.4
5	T1	25	1.0	26	1.0	0.094	10.5	LOS B	0.3	2.3	0.45	0.96	0.45	50.2
6	R2	29	1.0	31	1.0	0.094	11.2	LOS B	0.3	2.3	0.45	0.96	0.45	50.0
Approach		58	1.0	61	1.0	0.094	10.7	LOS B	0.3	2.3	0.45	0.96	0.45	50.1
North: Charles Street														
7	L2	52	1.0	55	1.0	0.152	6.1	LOS A	0.7	4.6	0.25	0.29	0.25	54.9
8	T1	117	1.0	123	1.0	0.152	0.4	LOS A	0.7	4.6	0.25	0.29	0.25	56.3
9	R2	82	1.0	86	1.0	0.152	6.2	LOS A	0.7	4.6	0.25	0.29	0.25	54.3
Approach		251	1.0	264	1.0	0.152	3.5	NA	0.7	4.6	0.25	0.29	0.25	55.4
West: Site Access														
10	L2	57	1.0	60	1.0	0.081	8.7	LOS A	0.3	2.2	0.29	0.90	0.29	51.3
11	T1	10	1.0	11	1.0	0.081	10.6	LOS B	0.3	2.2	0.29	0.90	0.29	51.1
12	R2	10	1.0	11	1.0	0.081	10.7	LOS B	0.3	2.2	0.29	0.90	0.29	50.8
Approach		77	1.0	81	1.0	0.081	9.2	LOS A	0.3	2.2	0.29	0.90	0.29	51.2
All Vehicles		596	1.0	627	1.0	0.152	4.3	NA	0.7	4.6	0.22	0.39	0.22	54.9

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

MOVEMENT SUMMARY

Site: 101 [Charles Street Access - Early PM - Existing (Site Folder: Xavier Development Plan Analysis)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Charles Street														
1	L2	11	1.0	12	1.0	0.068	5.6	LOS A	0.1	0.4	0.02	0.08	0.02	57.5
2	T1	106	1.0	112	1.0	0.068	0.0	LOS A	0.1	0.4	0.02	0.08	0.02	59.2
3	R2	6	1.0	6	1.0	0.068	5.6	LOS A	0.1	0.4	0.02	0.08	0.02	56.9
Approach		123	1.0	129	1.0	0.068	0.8	NA	0.1	0.4	0.02	0.08	0.02	58.9
East: Hansen Street														
4	L2	4	1.0	4	1.0	0.031	8.2	LOS A	0.1	0.7	0.22	0.92	0.22	51.5
5	T1	7	1.0	7	1.0	0.031	8.7	LOS A	0.1	0.7	0.22	0.92	0.22	51.3
6	R2	15	1.0	16	1.0	0.031	8.8	LOS A	0.1	0.7	0.22	0.92	0.22	51.0
Approach		26	1.0	27	1.0	0.031	8.7	LOS A	0.1	0.7	0.22	0.92	0.22	51.2
North: Charles Street														
7	L2	17	1.0	18	1.0	0.045	5.8	LOS A	0.1	1.0	0.14	0.26	0.14	55.5
8	T1	41	1.0	43	1.0	0.045	0.2	LOS A	0.1	1.0	0.14	0.26	0.14	57.0
9	R2	19	1.0	20	1.0	0.045	5.8	LOS A	0.1	1.0	0.14	0.26	0.14	54.9
Approach		77	1.0	81	1.0	0.045	2.8	NA	0.1	1.0	0.14	0.26	0.14	56.2
West: Site Access														
10	L2	27	1.0	28	1.0	0.047	8.5	LOS A	0.2	1.2	0.24	0.90	0.24	51.7
11	T1	11	1.0	12	1.0	0.047	8.7	LOS A	0.2	1.2	0.24	0.90	0.24	51.4
12	R2	10	1.0	11	1.0	0.047	8.7	LOS A	0.2	1.2	0.24	0.90	0.24	51.2
Approach		48	1.0	51	1.0	0.047	8.6	LOS A	0.2	1.2	0.24	0.90	0.24	51.5
All Vehicles		274	1.0	288	1.0	0.068	3.5	NA	0.2	1.2	0.11	0.35	0.11	55.9

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

MOVEMENT SUMMARY

Site: 101 [Charles Street Access - Early PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Charles Street														
1	L2	12	1.0	13	1.0	0.068	5.6	LOS A	0.1	0.4	0.02	0.09	0.02	57.5
2	T1	106	1.0	112	1.0	0.068	0.0	LOS A	0.1	0.4	0.02	0.09	0.02	59.1
3	R2	6	1.0	6	1.0	0.068	5.6	LOS A	0.1	0.4	0.02	0.09	0.02	56.9
Approach		124	1.0	131	1.0	0.068	0.8	NA	0.1	0.4	0.02	0.09	0.02	58.9
East: Hansen Street														
4	L2	4	1.0	4	1.0	0.043	8.2	LOS A	0.1	1.1	0.25	0.94	0.25	51.3
5	T1	16	1.0	17	1.0	0.043	8.8	LOS A	0.1	1.1	0.25	0.94	0.25	51.1
6	R2	15	1.0	16	1.0	0.043	9.5	LOS A	0.1	1.1	0.25	0.94	0.25	50.8
Approach		35	1.0	37	1.0	0.043	9.1	LOS A	0.1	1.1	0.25	0.94	0.25	51.0
North: Charles Street														
7	L2	17	1.0	18	1.0	0.060	5.9	LOS A	0.3	1.8	0.20	0.32	0.20	54.8
8	T1	41	1.0	43	1.0	0.060	0.3	LOS A	0.3	1.8	0.20	0.32	0.20	56.3
9	R2	42	1.0	44	1.0	0.060	5.8	LOS A	0.3	1.8	0.20	0.32	0.20	54.2
Approach		100	1.0	105	1.0	0.060	3.6	NA	0.3	1.8	0.20	0.32	0.20	55.1
West: Site Access														
10	L2	94	1.0	99	1.0	0.104	8.5	LOS A	0.4	2.9	0.24	0.89	0.24	51.7
11	T1	12	1.0	13	1.0	0.104	9.0	LOS A	0.4	2.9	0.24	0.89	0.24	51.4
12	R2	10	1.0	11	1.0	0.104	9.0	LOS A	0.4	2.9	0.24	0.89	0.24	51.2
Approach		116	1.0	122	1.0	0.104	8.6	LOS A	0.4	2.9	0.24	0.89	0.24	51.6
All Vehicles		375	1.0	395	1.0	0.104	4.7	NA	0.4	2.9	0.16	0.48	0.16	54.7

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

MOVEMENT SUMMARY

Site: 101 [Charles Street Access - Late PM - Existing (Site Folder: Xavier Development Plan Analysis)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Charles Street														
1	L2	26	1.0	27	1.0	0.065	5.6	LOS A	0.1	0.4	0.02	0.16	0.02	56.9
2	T1	86	1.0	91	1.0	0.065	0.0	LOS A	0.1	0.4	0.02	0.16	0.02	58.5
3	R2	6	1.0	6	1.0	0.065	5.7	LOS A	0.1	0.4	0.02	0.16	0.02	56.3
Approach		118	1.0	124	1.0	0.065	1.5	NA	0.1	0.4	0.02	0.16	0.02	58.0
East: Hansen Street														
4	L2	2	1.0	2	1.0	0.015	8.2	LOS A	0.1	0.4	0.24	0.92	0.24	51.5
5	T1	6	1.0	6	1.0	0.015	8.8	LOS A	0.1	0.4	0.24	0.92	0.24	51.3
6	R2	5	1.0	5	1.0	0.015	9.0	LOS A	0.1	0.4	0.24	0.92	0.24	51.0
Approach		13	1.0	14	1.0	0.015	8.8	LOS A	0.1	0.4	0.24	0.92	0.24	51.2
North: Charles Street														
7	L2	12	1.0	13	1.0	0.065	5.9	LOS A	0.3	2.0	0.20	0.30	0.20	55.0
8	T1	50	1.0	53	1.0	0.065	0.2	LOS A	0.3	2.0	0.20	0.30	0.20	56.5
9	R2	47	1.0	49	1.0	0.065	5.8	LOS A	0.3	2.0	0.20	0.30	0.20	54.5
Approach		109	1.0	115	1.0	0.065	3.3	NA	0.3	2.0	0.20	0.30	0.20	55.4
West: Site Access														
10	L2	39	1.0	41	1.0	0.080	8.4	LOS A	0.3	2.1	0.23	0.91	0.23	51.6
11	T1	11	1.0	12	1.0	0.080	8.9	LOS A	0.3	2.1	0.23	0.91	0.23	51.3
12	R2	28	1.0	29	1.0	0.080	8.9	LOS A	0.3	2.1	0.23	0.91	0.23	51.1
Approach		78	1.0	82	1.0	0.080	8.6	LOS A	0.3	2.1	0.23	0.91	0.23	51.4
All Vehicles		318	1.0	335	1.0	0.080	4.2	NA	0.3	2.1	0.14	0.42	0.14	55.1

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

MOVEMENT SUMMARY

Site: 101 [Charles Street Access - Late PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Charles Street														
1	L2	13	1.0	14	1.0	0.058	5.6	LOS A	0.1	0.4	0.03	0.11	0.03	57.3
2	T1	86	1.0	91	1.0	0.058	0.0	LOS A	0.1	0.4	0.03	0.11	0.03	58.9
3	R2	6	1.0	6	1.0	0.058	5.6	LOS A	0.1	0.4	0.03	0.11	0.03	56.7
Approach		105	1.0	111	1.0	0.058	1.0	NA	0.1	0.4	0.03	0.11	0.03	58.6
East: Hansen Street														
4	L2	2	1.0	2	1.0	0.016	8.2	LOS A	0.1	0.4	0.24	0.92	0.24	51.4
5	T1	6	1.0	6	1.0	0.016	8.7	LOS A	0.1	0.4	0.24	0.92	0.24	51.2
6	R2	5	1.0	5	1.0	0.016	9.4	LOS A	0.1	0.4	0.24	0.92	0.24	50.9
Approach		13	1.0	14	1.0	0.016	8.9	LOS A	0.1	0.4	0.24	0.92	0.24	51.1
North: Charles Street														
7	L2	12	1.0	13	1.0	0.065	5.8	LOS A	0.3	2.0	0.18	0.30	0.18	55.1
8	T1	50	1.0	53	1.0	0.065	0.2	LOS A	0.3	2.0	0.18	0.30	0.18	56.6
9	R2	47	1.0	49	1.0	0.065	5.8	LOS A	0.3	2.0	0.18	0.30	0.18	54.5
Approach		109	1.0	115	1.0	0.065	3.2	NA	0.3	2.0	0.18	0.30	0.18	55.5
West: Site Access														
10	L2	104	1.0	109	1.0	0.109	8.4	LOS A	0.4	3.1	0.21	0.90	0.21	51.7
11	T1	6	1.0	6	1.0	0.109	8.9	LOS A	0.4	3.1	0.21	0.90	0.21	51.4
12	R2	15	1.0	16	1.0	0.109	8.9	LOS A	0.4	3.1	0.21	0.90	0.21	51.2
Approach		125	1.0	132	1.0	0.109	8.5	LOS A	0.4	3.1	0.21	0.90	0.21	51.6
All Vehicles		352	1.0	371	1.0	0.109	4.7	NA	0.4	3.1	0.15	0.48	0.15	54.7

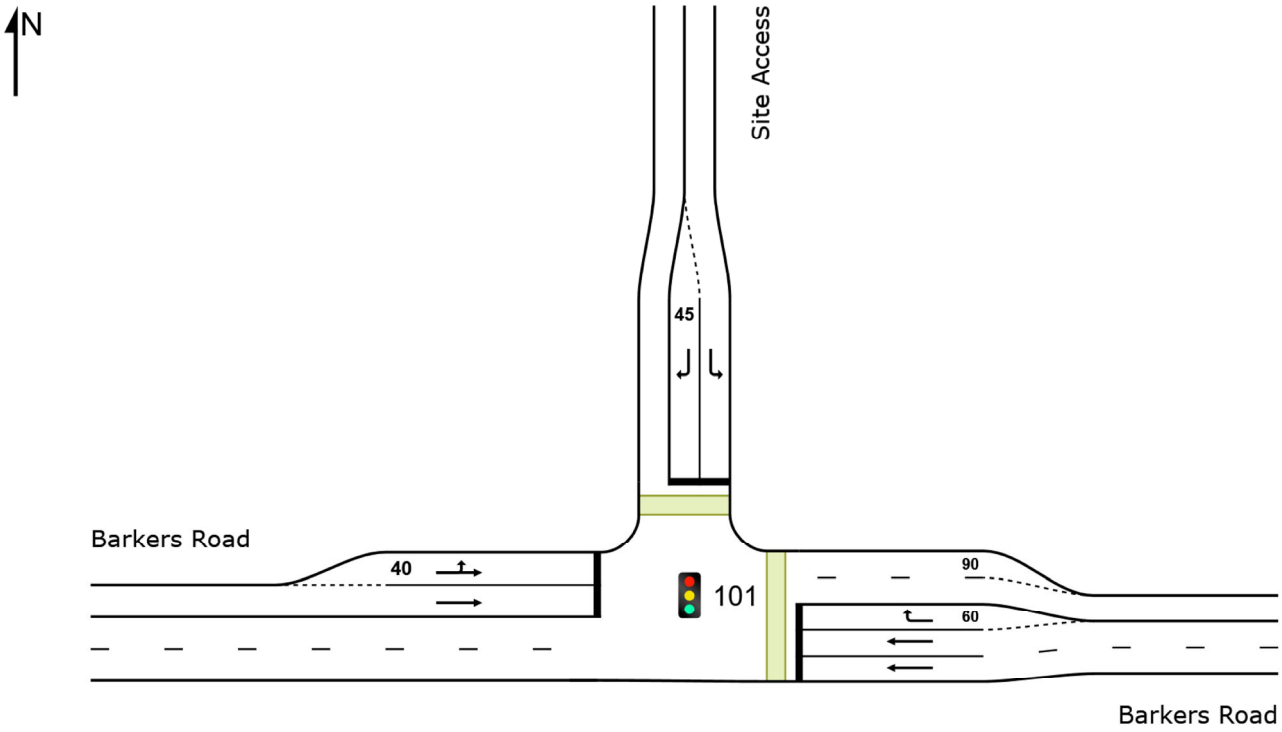
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and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

SITE LAYOUT

Site: 101 [Barkers Rd/Site Access - AM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

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

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



MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Denmark St - AM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [AM - Existing (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 121 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Power Street														
1	L2	139	5.0	139	5.0	0.279	34.7	LOS C	7.5	54.5	0.75	0.74	0.75	38.0
2	T1	593	5.0	593	5.0	* 1.025	104.5	LOS F	52.0	379.7	0.98	1.37	1.61	22.0
3	R2	89	5.0	89	5.0	0.361	30.6	LOS C	3.2	23.5	0.85	0.75	0.85	30.3
Approach		821	5.0	821	5.0	1.025	84.7	LOS F	52.0	379.7	0.93	1.20	1.38	24.2
East: Barkers Road														
4	L2	34	5.0	34	5.0	0.032	13.4	LOS B	0.6	4.3	0.39	0.63	0.39	47.2
5	T1	858	5.0	858	5.0	* 0.854	50.1	LOS D	27.1	198.2	0.98	0.98	1.14	28.7
6	R2	113	5.0	113	5.0	0.347	33.0	LOS C	4.5	32.7	0.83	0.76	0.83	34.1
Approach		1004	5.0	1004	5.0	0.854	47.0	LOS D	27.1	198.2	0.94	0.94	1.08	29.6
North: Denmark Street														
7	L2	236	5.0	236	5.0	0.573	31.8	LOS C	19.8	144.4	0.79	0.76	0.79	31.5
8	T1	765	5.0	765	5.0	0.674	28.4	LOS C	25.2	183.9	0.84	0.77	0.84	40.9
9	R2	240	5.0	240	5.0	* 0.855	50.5	LOS D	11.7	85.1	1.00	0.95	1.25	32.3
Approach		1241	5.0	1241	5.0	0.855	33.3	LOS C	25.2	183.9	0.86	0.80	0.91	37.5
West: Barkers Road														
10	L2	16	5.0	16	5.0	0.315	42.5	LOS D	7.8	57.2	0.82	0.69	0.82	37.0
11	T1	398	5.0	398	5.0	0.442	36.7	LOS D	11.6	84.3	0.84	0.71	0.84	27.6
12	R2	118	5.0	118	5.0	* 0.581	37.3	LOS D	4.7	34.3	0.98	0.79	0.98	36.5
Approach		532	5.0	532	5.0	0.581	37.0	LOS D	11.6	84.3	0.87	0.73	0.87	30.5
All Vehicles		3598	5.0	3598	5.0	1.025	49.4	LOS D	52.0	379.7	0.90	0.92	1.06	30.4

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Power Street											
P1	Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.1	0.98
East: Barkers Road											
P2	Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.1	0.98
North: Denmark Street											
P3	Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	220.8	215.9	0.98

West: Barkers Road										
P4 Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.1	0.98
All Pedestrians	211	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.0	0.98

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

MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Site Access - AM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [AM - Existing (Network Folder: AM Peak)]

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

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Barkers Road														
5	T1	1068	5.0	1068	5.0	0.292	0.3	LOS A	0.5	3.6	0.04	0.01	0.05	59.1
6	R2	19	1.0	19	1.0	0.292	11.1	LOS B	0.5	3.6	0.08	0.02	0.10	57.3
Approach		1087	4.9	1087	4.9	0.292	0.5	NA	0.5	3.6	0.04	0.01	0.05	59.1
North: Site Access														
7	L2	19	1.0	19	1.0	0.629	53.3	LOS F	2.5	17.7	0.64	0.98	1.02	22.9
9	R2	31	1.0	31	1.0	0.629	127.5	LOS F	2.5	17.7	0.64	0.98	1.02	14.5
Approach		49	1.0	49	1.0	0.629	99.1	LOS F	2.5	17.7	0.64	0.98	1.02	18.1
West: Barkers Road														
10	L2	68	1.0	68	1.0	0.071	5.6	LOS A	0.0	0.0	0.00	0.29	0.00	54.5
11	T1	657	5.0	657	5.0	0.314	0.2	LOS A	0.0	0.0	0.00	0.03	0.00	59.4
Approach		725	4.6	725	4.6	0.314	0.7	NA	0.0	0.0	0.00	0.06	0.00	58.9
All Vehicles		1862	4.7	1862	4.7	0.629	3.2	NA	2.5	17.7	0.04	0.05	0.05	55.2

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

PHASING SUMMARY

Site: 101 [Barkers Rd/Denmark St - AM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [AM - Existing (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 121 seconds (Site User-Given Phase Times)

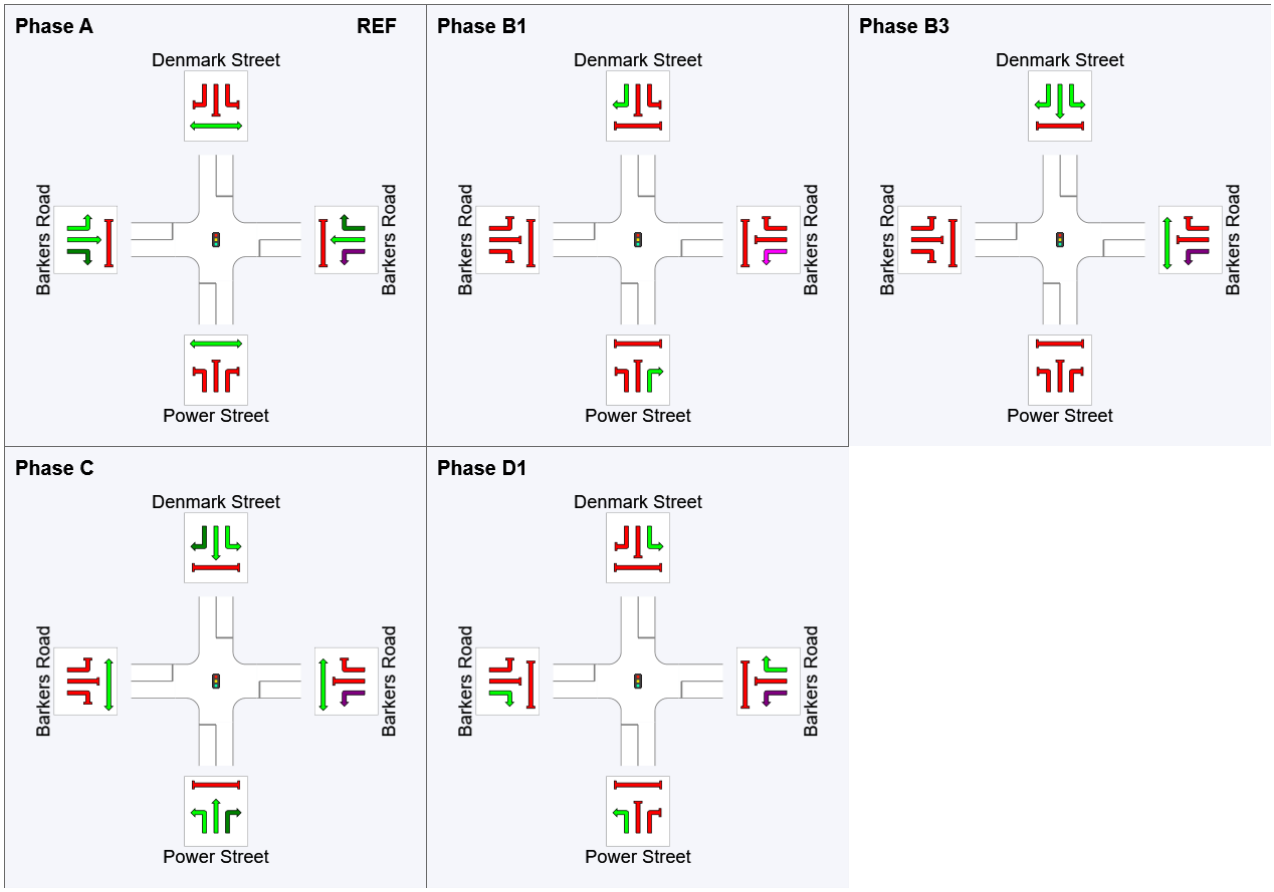
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B1, B3, C, D1
Output Phase Sequence: A, B1, B3, C, D1

Phase Timing Summary

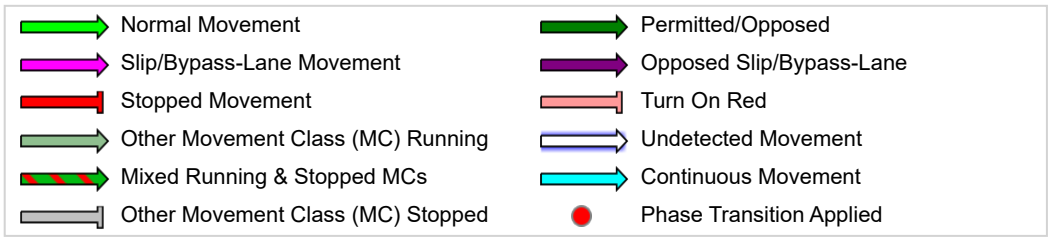
Phase	A	B1	B3	C	D1
Phase Change Time (sec)	0	42	52	63	107
Green Time (sec)	36	4	9	38	8
Phase Time (sec)	42	6	15	44	14
Phase Split	35%	5%	12%	36%	12%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Denmark St - AM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [AM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 121 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Power Street														
1	L2	139	5.0	139	5.0	0.279	34.7	LOS C	7.5	54.6	0.75	0.74	0.75	38.0
2	T1	593	5.0	593	5.0	* 1.027	105.5	LOS F	52.2	381.4	0.98	1.38	1.62	21.9
3	R2	93	5.0	93	5.0	0.378	30.7	LOS C	3.3	24.4	0.85	0.75	0.85	30.3
Approach		824	5.0	824	5.0	1.027	85.2	LOS F	52.2	381.4	0.93	1.20	1.38	24.1
East: Barkers Road														
4	L2	35	5.0	35	5.0	0.033	13.4	LOS B	0.6	4.4	0.39	0.63	0.39	47.2
5	T1	888	5.0	888	5.0	* 0.884	54.6	LOS D	29.6	216.3	0.99	1.03	1.20	27.4
6	R2	117	5.0	117	5.0	0.367	33.3	LOS C	4.7	34.0	0.84	0.76	0.84	34.0
Approach		1040	5.0	1040	5.0	0.884	50.8	LOS D	29.6	216.3	0.95	0.99	1.14	28.5
North: Denmark Street														
7	L2	244	5.0	244	5.0	0.577	31.9	LOS C	20.0	146.1	0.79	0.77	0.79	31.4
8	T1	765	5.0	765	5.0	0.680	28.5	LOS C	25.5	185.9	0.84	0.77	0.84	40.8
9	R2	240	5.0	240	5.0	* 0.855	50.5	LOS D	11.7	85.1	1.00	0.95	1.25	32.3
Approach		1249	5.0	1249	5.0	0.855	33.4	LOS C	25.5	185.9	0.86	0.80	0.91	37.5
West: Barkers Road														
10	L2	16	5.0	16	5.0	0.326	42.6	LOS D	8.2	59.5	0.82	0.69	0.82	37.0
11	T1	413	5.0	413	5.0	0.458	36.9	LOS D	12.0	87.8	0.85	0.72	0.85	27.5
12	R2	118	5.0	118	5.0	* 0.599	37.8	LOS D	4.7	34.4	0.98	0.79	0.99	36.3
Approach		546	5.0	546	5.0	0.599	37.2	LOS D	12.0	87.8	0.88	0.73	0.88	30.4
All Vehicles		3660	5.0	3660	5.0	1.027	50.6	LOS D	52.2	381.4	0.90	0.93	1.08	30.0

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Power Street											
P1	Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.1	0.98
East: Barkers Road											
P2	Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.1	0.98
North: Denmark Street											
P3	Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	220.8	215.9	0.98

West: Barkers Road										
P4 Full	53	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.1	0.98
All Pedestrians	211	54.8	LOS E	0.2	0.2	0.95	0.95	221.0	216.0	0.98

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

MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Site Access - AM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [AM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Barkers Road														
5	T1	1068	5.0	1068	5.0	0.366	3.9	LOS A	9.0	65.4	0.32	0.29	0.32	53.3
6	R2	83	1.0	83	1.0	* 0.459	62.6	LOS E	4.8	33.5	0.99	0.77	0.99	29.1
Approach		1151	4.7	1151	4.7	0.459	8.1	LOS A	9.0	65.4	0.36	0.32	0.36	48.0
North: Site Access														
7	L2	41	1.0	41	1.0	0.087	42.8	LOS D	1.8	12.9	0.79	0.72	0.79	35.1
9	R2	84	1.0	84	1.0	* 0.420	61.2	LOS E	4.8	33.6	0.98	0.77	0.98	20.1
Approach		125	1.0	125	1.0	0.420	55.1	LOS E	4.8	33.6	0.92	0.75	0.92	25.5
West: Barkers Road														
10	L2	120	1.0	120	1.0	0.236	15.0	LOS B	6.9	49.4	0.45	0.52	0.45	46.3
11	T1	657	5.0	657	5.0	* 0.481	10.9	LOS B	13.6	99.1	0.50	0.48	0.50	48.2
Approach		777	4.4	777	4.4	0.481	11.5	LOS B	13.6	99.1	0.49	0.49	0.49	47.9
All Vehicles		2053	4.4	2053	4.4	0.481	12.2	LOS B	13.6	99.1	0.45	0.41	0.45	45.4

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Barkers Road											
P2	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	220.6	216.3	0.98
North: Site Access											
P3	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	217.3	211.9	0.98
All Pedestrians		105	54.3	LOS E	0.2	0.2	0.95	0.95	218.9	214.1	0.98

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

PHASING SUMMARY

Site: 101 [Barkers Rd/Denmark St - AM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [AM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 121 seconds (Site User-Given Phase Times)

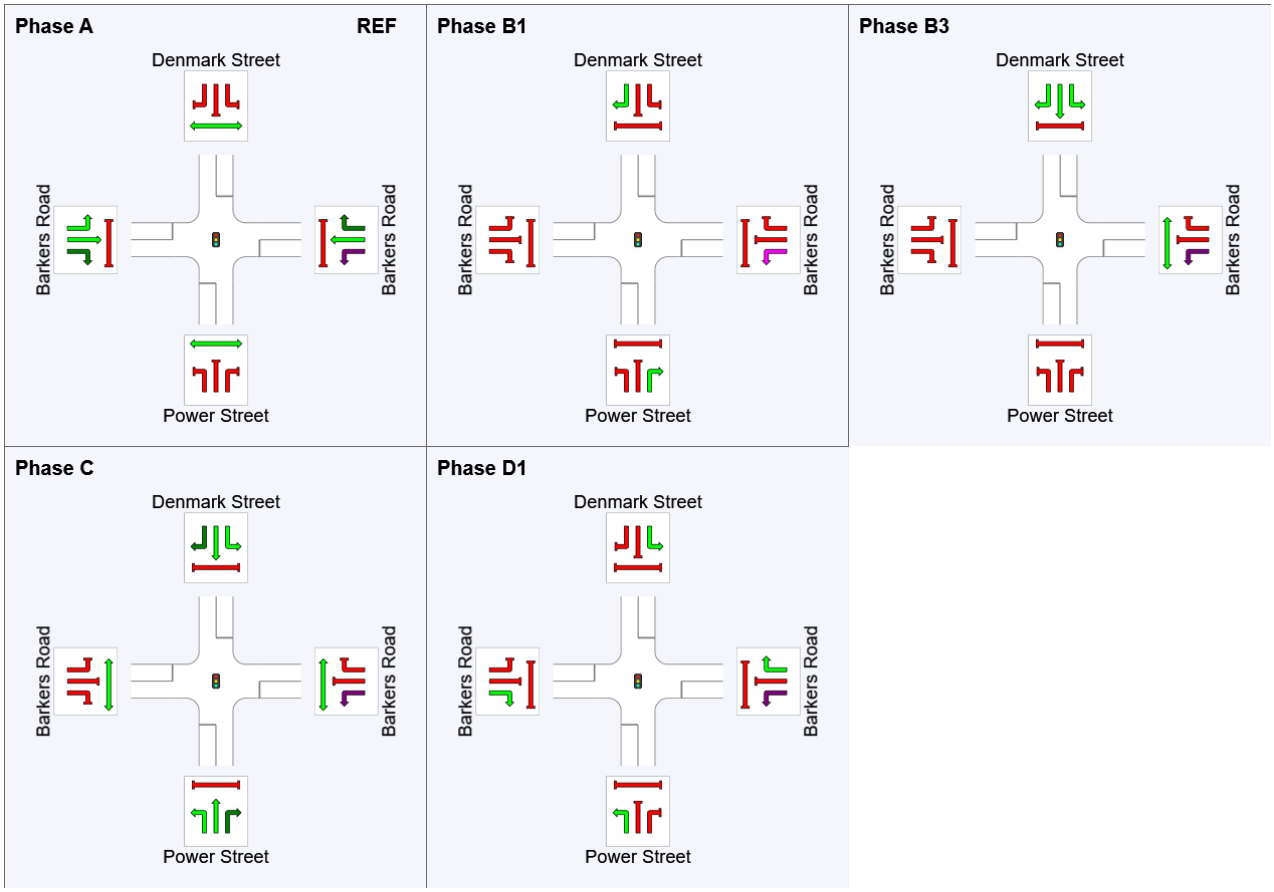
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B1, B3, C, D1
Output Phase Sequence: A, B1, B3, C, D1

Phase Timing Summary

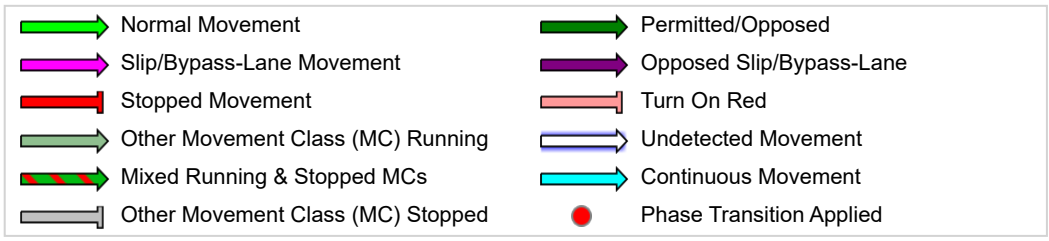
Phase	A	B1	B3	C	D1
Phase Change Time (sec)	0	42	52	63	107
Green Time (sec)	36	4	9	38	8
Phase Time (sec)	42	6	15	44	14
Phase Split	35%	5%	12%	36%	12%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



PHASING SUMMARY

Site: 101 [Barkers Rd/Site Access - AM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [AM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

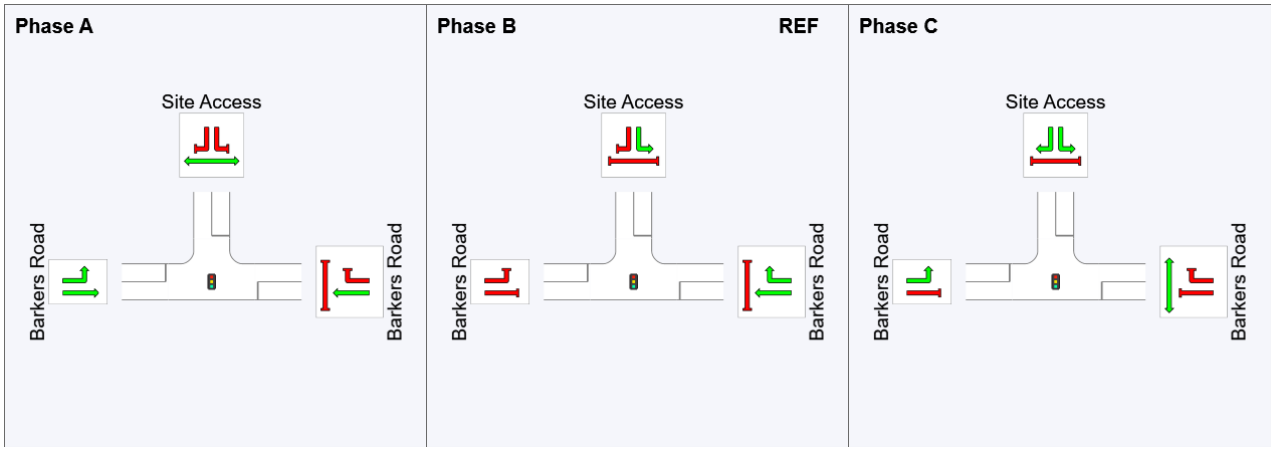
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

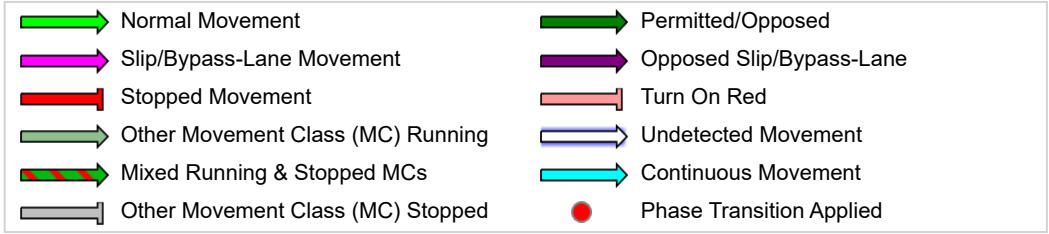
Phase	A	B	C
Phase Change Time (sec)	37	0	18
Green Time (sec)	77	12	13
Phase Time (sec)	83	18	19
Phase Split	69%	15%	16%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

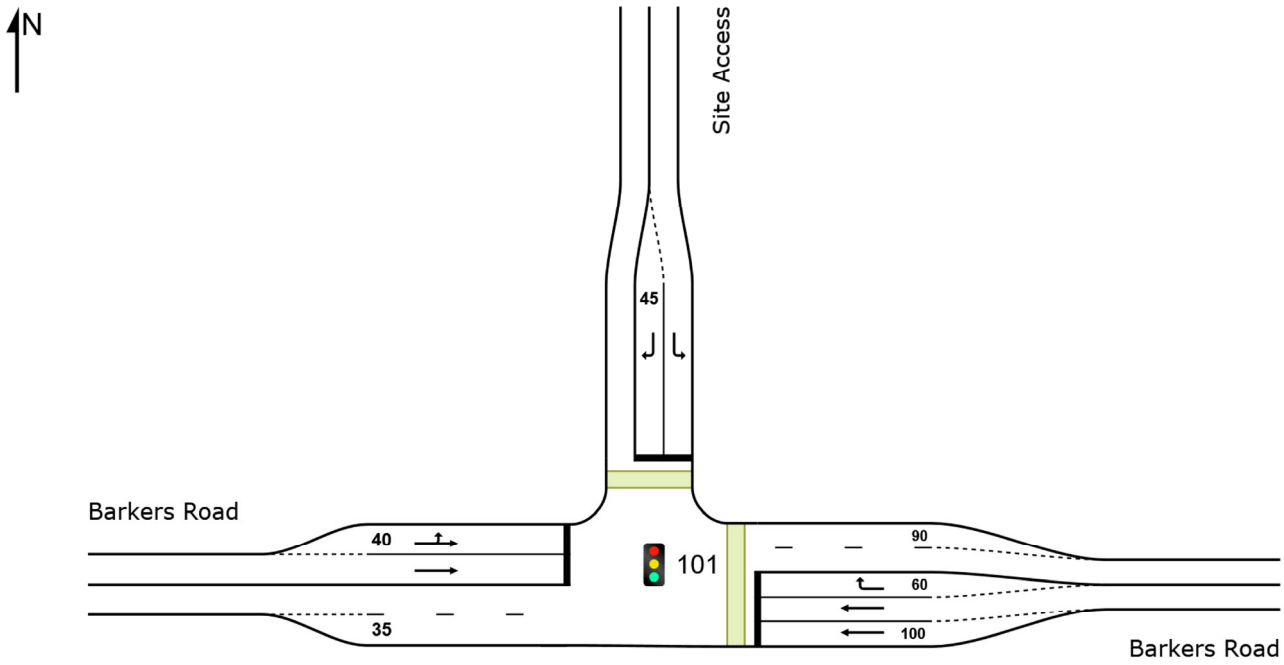


SITE LAYOUT

Site: 101 [Barkers Rd/Site Access - Early PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

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

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



Organisation: TRAFFIX GROUP PTY LTD | Licence: NETWORK / Enterprise | Created: Monday, 9 August 2021 8:18:32 AM
Project: P:\Synergy\Projects\GRP2\GRP28932\07-Analysis\SIDRA\Barkers Road Signalisation\Site Access Signalisation FINAL.sip9

MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Denmark St - Early PM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Early PM - Existing (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 112 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Power Street														
1	L2	68	5.0	68	5.0	0.243	26.8	LOS C	6.5	47.5	0.66	0.62	0.66	42.9
2	T1	752	5.0	752	5.0	0.891	39.6	LOS D	35.9	262.4	0.89	0.93	1.05	36.5
3	R2	139	5.0	139	5.0	0.562	27.6	LOS C	4.2	30.7	0.90	0.78	0.90	31.9
Approach		959	5.0	959	5.0	0.891	37.0	LOS D	35.9	262.4	0.87	0.89	1.00	36.5
East: Barkers Road														
4	L2	57	5.0	57	5.0	0.068	14.5	LOS B	1.0	7.4	0.49	0.66	0.49	46.1
5	T1	422	5.0	422	5.0	0.404	32.5	LOS C	10.0	72.8	0.82	0.69	0.82	35.3
6	R2	113	5.0	113	5.0	* 0.460	36.5	LOS D	4.6	33.4	0.92	0.77	0.92	32.7
Approach		592	5.0	592	5.0	0.460	31.6	LOS C	10.0	72.8	0.81	0.70	0.81	35.6
North: Denmark Street														
7	L2	125	5.0	125	5.0	0.358	28.5	LOS C	10.1	73.4	0.70	0.68	0.70	33.7
8	T1	686	5.0	686	5.0	* 0.901	40.5	LOS D	30.1	219.8	0.83	0.90	1.02	36.1
9	R2	100	5.0	100	5.0	* 0.468	29.6	LOS C	2.9	21.5	0.93	0.77	0.93	39.6
Approach		912	5.0	912	5.0	0.901	37.7	LOS D	30.1	219.8	0.82	0.86	0.97	36.2
West: Barkers Road														
10	L2	66	5.0	66	5.0	0.492	45.2	LOS D	11.1	81.0	0.90	0.77	0.90	35.9
11	T1	486	5.0	486	5.0	* 0.717	39.6	LOS D	15.5	113.3	0.92	0.80	0.94	26.3
12	R2	89	5.0	89	5.0	0.322	39.4	LOS D	3.8	27.7	0.85	0.79	0.85	35.8
Approach		642	5.0	642	5.0	0.717	40.2	LOS D	15.5	113.3	0.91	0.80	0.93	29.3
All Vehicles		3104	5.0	3104	5.0	0.901	36.8	LOS D	35.9	262.4	0.85	0.82	0.94	34.9

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Power Street											
P1	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.1	1.00
East: Barkers Road											
P2	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.1	1.00
North: Denmark Street											
P3	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.3	215.9	1.00

West: Barkers Road										
P4 Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.1	1.00
All Pedestrians	211	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.0	1.00

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

MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Site Access - Early PM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Early PM - Existing (Network Folder: AM Peak)]

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

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Barkers Road														
5	T1	720	5.0	720	5.0	0.407	0.5	LOS A	0.5	4.0	0.06	0.01	0.08	58.6
6	R2	12	1.0	12	1.0	0.407	15.9	LOS C	0.5	4.0	0.06	0.01	0.08	57.5
Approach		732	4.9	732	4.9	0.407	0.7	NA	0.5	4.0	0.06	0.01	0.08	58.6
North: Site Access														
7	L2	9	1.0	9	1.0	0.305	16.4	LOS C	1.0	7.1	0.76	0.93	0.87	34.2
9	R2	25	1.0	25	1.0	0.305	57.5	LOS F	1.0	7.1	0.76	0.93	0.87	24.7
Approach		35	1.0	35	1.0	0.305	46.3	LOS E	1.0	7.1	0.76	0.93	0.87	28.0
West: Barkers Road														
10	L2	35	1.0	35	1.0	0.089	5.6	LOS A	0.0	0.0	0.00	0.12	0.00	56.4
11	T1	877	5.0	877	5.0	0.394	0.4	LOS A	0.0	0.0	0.00	0.02	0.00	59.5
Approach		912	4.8	912	4.8	0.394	0.6	NA	0.0	0.0	0.00	0.02	0.00	59.4
All Vehicles		1678	4.8	1678	4.8	0.407	1.6	NA	1.0	7.1	0.04	0.04	0.05	57.8

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

PHASING SUMMARY

Site: 101 [Barkers Rd/Denmark St - Early PM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Early PM - Existing (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 112 seconds (Site User-Given Phase Times)

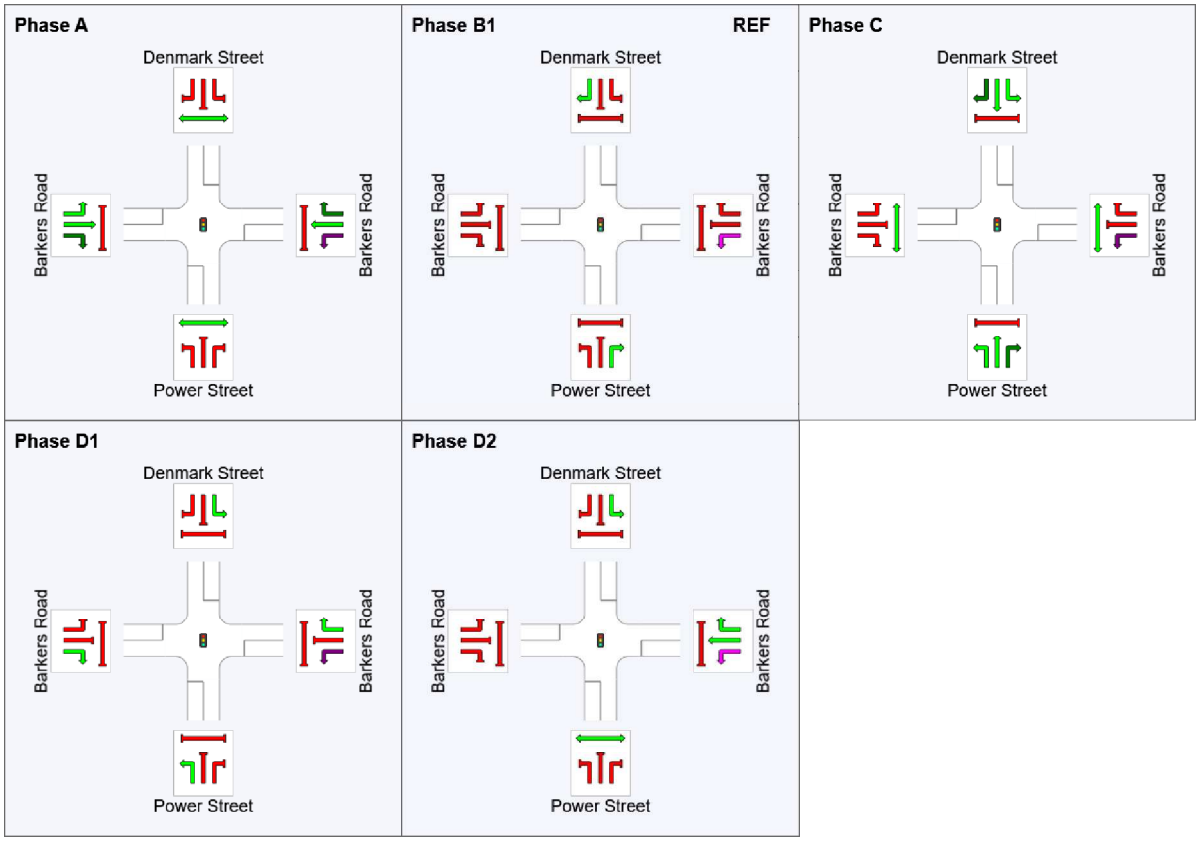
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Leading Right Turn
Reference Phase: Phase B1
Input Phase Sequence: A, B1, C, D1, D2
Output Phase Sequence: A, B1, C, D1, D2

Phase Timing Summary

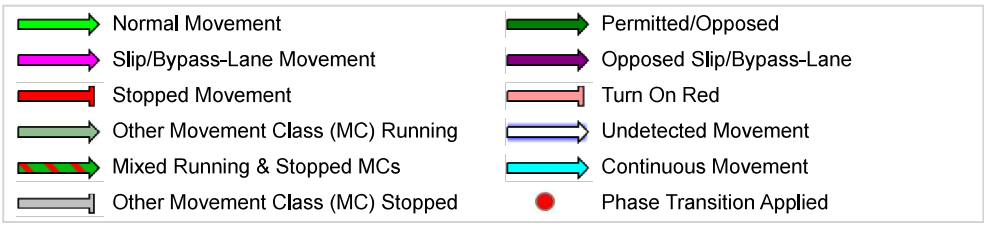
Phase	A	B1	C	D1	D2
Phase Change Time (sec)	79	0	12	66	75
Green Time (sec)	30	6	48	3	2
Phase Time (sec)	36	12	54	5	5
Phase Split	32%	11%	48%	4%	4%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Denmark St - Early PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Early PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 112 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Power Street														
1	L2	68	5.0	68	5.0	0.244	26.9	LOS C	6.5	47.7	0.66	0.62	0.66	42.9
2	T1	752	5.0	752	5.0	0.895	40.2	LOS D	36.2	264.1	0.89	0.93	1.05	36.2
3	R2	146	5.0	146	5.0	0.597	27.8	LOS C	4.5	32.5	0.90	0.79	0.90	31.8
Approach		966	5.0	966	5.0	0.895	37.4	LOS D	36.2	264.1	0.88	0.89	1.00	36.3
East: Barkers Road														
4	L2	63	5.0	63	5.0	0.077	14.7	LOS B	1.1	8.3	0.50	0.66	0.50	46.0
5	T1	469	5.0	469	5.0	0.453	33.1	LOS C	11.4	83.3	0.84	0.71	0.84	35.1
6	R2	125	5.0	125	5.0	* 0.529	37.1	LOS D	5.1	37.5	0.94	0.78	0.94	32.5
Approach		658	5.0	658	5.0	0.529	32.1	LOS C	11.4	83.3	0.82	0.72	0.82	35.3
North: Denmark Street														
7	L2	133	5.0	133	5.0	0.362	28.6	LOS C	10.2	74.5	0.70	0.69	0.70	33.6
8	T1	686	5.0	686	5.0	* 0.911	42.6	LOS D	31.2	227.4	0.83	0.92	1.05	35.3
9	R2	100	5.0	100	5.0	* 0.467	29.6	LOS C	2.9	21.5	0.93	0.77	0.93	39.6
Approach		919	5.0	919	5.0	0.911	39.1	LOS D	31.2	227.4	0.82	0.87	0.98	35.6
West: Barkers Road														
10	L2	66	5.0	66	5.0	0.521	45.6	LOS D	11.9	86.5	0.90	0.78	0.90	35.8
11	T1	514	5.0	514	5.0	* 0.758	40.9	LOS D	16.7	122.0	0.93	0.83	0.98	25.9
12	R2	89	5.0	89	5.0	0.348	39.7	LOS D	3.8	27.7	0.86	0.79	0.86	35.7
Approach		669	5.0	669	5.0	0.758	41.2	LOS D	16.7	122.0	0.92	0.82	0.95	28.8
All Vehicles		3213	5.0	3213	5.0	0.911	37.6	LOS D	36.2	264.1	0.86	0.83	0.95	34.5

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Power Street											
P1	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.1	1.00
East: Barkers Road											
P2	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.1	1.00
North: Denmark Street											
P3	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.3	215.9	1.00

West: Barkers Road										
P4 Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.1	1.00
All Pedestrians	211	50.3	LOS E	0.2	0.2	0.95	0.95	216.5	216.0	1.00

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

MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Site Access - Early PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Early PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 112 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Barkers Road														
5	T1	720	5.0	720	5.0	0.400	4.4	LOS A	9.9	72.6	0.33	0.30	0.33	53.0
6	R2	49	1.0	49	1.0	* 0.511	65.5	LOS E	2.8	20.0	1.00	0.74	1.01	28.5
Approach		769	4.7	769	4.7	0.511	8.3	LOS A	9.9	72.6	0.37	0.33	0.37	48.1
North: Site Access														
7	L2	39	1.0	39	1.0	0.094	44.4	LOS D	1.7	11.8	0.83	0.72	0.83	34.7
9	R2	116	1.0	116	1.0	* 0.542	57.7	LOS E	6.2	43.8	0.99	0.79	0.99	20.9
Approach		155	1.0	155	1.0	0.542	54.4	LOS D	6.2	43.8	0.95	0.77	0.95	24.8
West: Barkers Road														
10	L2	97	1.0	97	1.0	0.296	13.5	LOS B	8.2	59.3	0.44	0.47	0.44	48.2
11	T1	877	5.0	877	5.0	* 0.602	9.5	LOS A	15.5	112.9	0.49	0.47	0.49	49.8
Approach		974	4.6	974	4.6	0.602	9.9	LOS A	15.5	112.9	0.49	0.47	0.49	49.6
All Vehicles		1898	4.4	1898	4.4	0.602	12.9	LOS B	15.5	112.9	0.48	0.44	0.48	45.6

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Barkers Road											
P2	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	216.6	216.3	1.00
North: Site Access											
P3	Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	213.3	211.9	0.99
All Pedestrians		105	50.3	LOS E	0.2	0.2	0.95	0.95	214.9	214.1	1.00

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

PHASING SUMMARY

Site: 101 [Barkers Rd/Denmark St - Early PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Early PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 112 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Leading Right Turn
Reference Phase: Phase B1
Input Phase Sequence: A, B1, C, D1, D2
Output Phase Sequence: A, B1, C, D1, D2

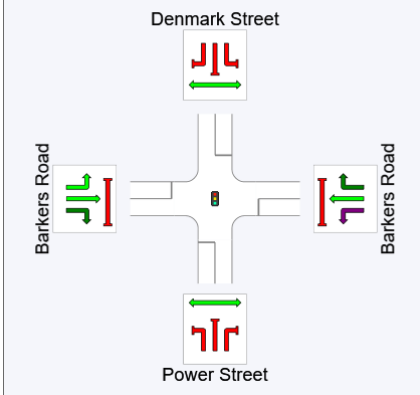
Phase Timing Summary

Phase	A	B1	C	D1	D2
Phase Change Time (sec)	79	0	12	66	75
Green Time (sec)	30	6	48	3	2
Phase Time (sec)	36	12	54	5	5
Phase Split	32%	11%	48%	4%	4%

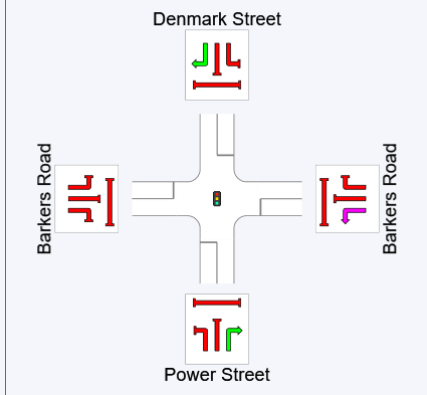
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

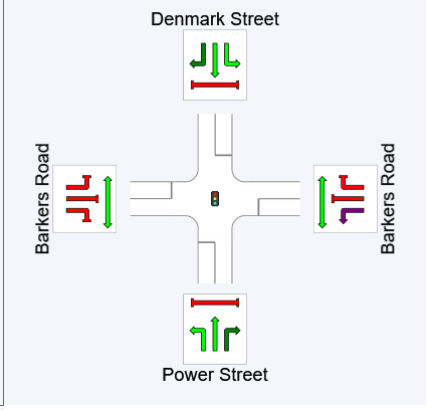
Phase A



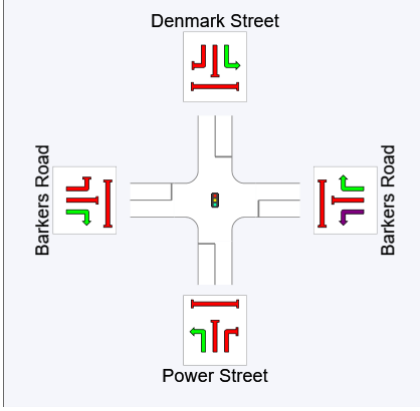
Phase B1 **REF**



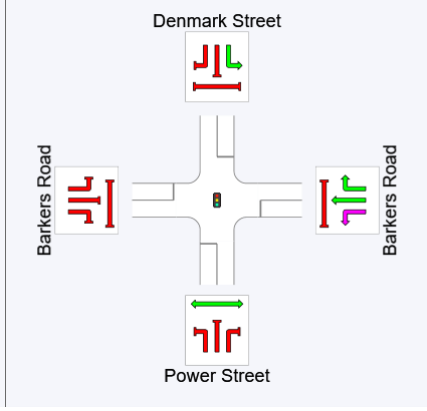
Phase C



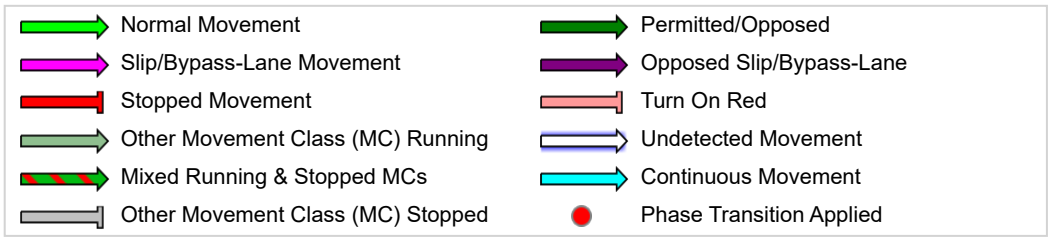
Phase D1



Phase D2



REF: Reference Phase
VAR: Variable Phase



PHASING SUMMARY

Site: 101 [Barkers Rd/Site Access - Early PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Early PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 112 seconds (Site User-Given Cycle Time)

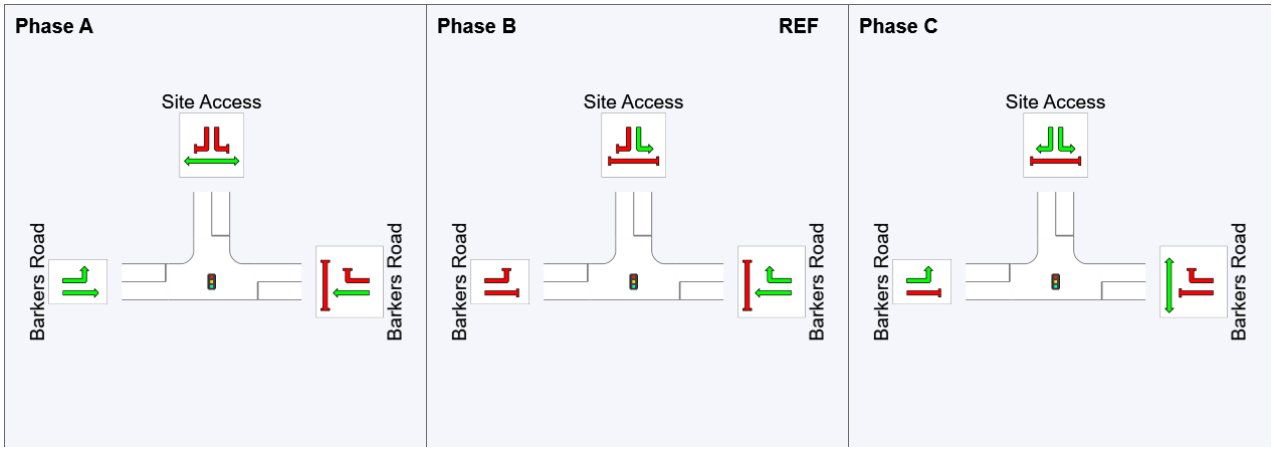
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

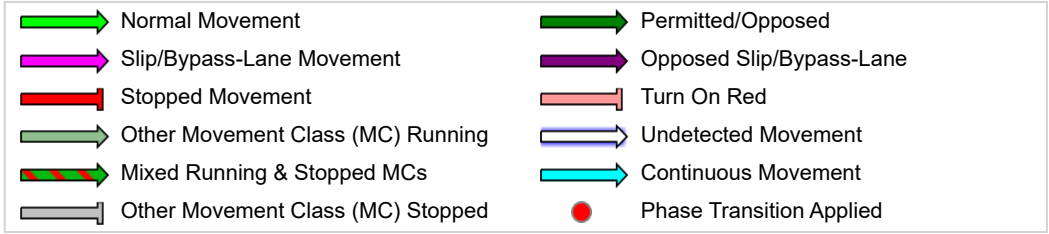
Phase	A	B	C
Phase Change Time (sec)	31	0	12
Green Time (sec)	75	6	13
Phase Time (sec)	81	12	19
Phase Split	72%	11%	17%

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

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

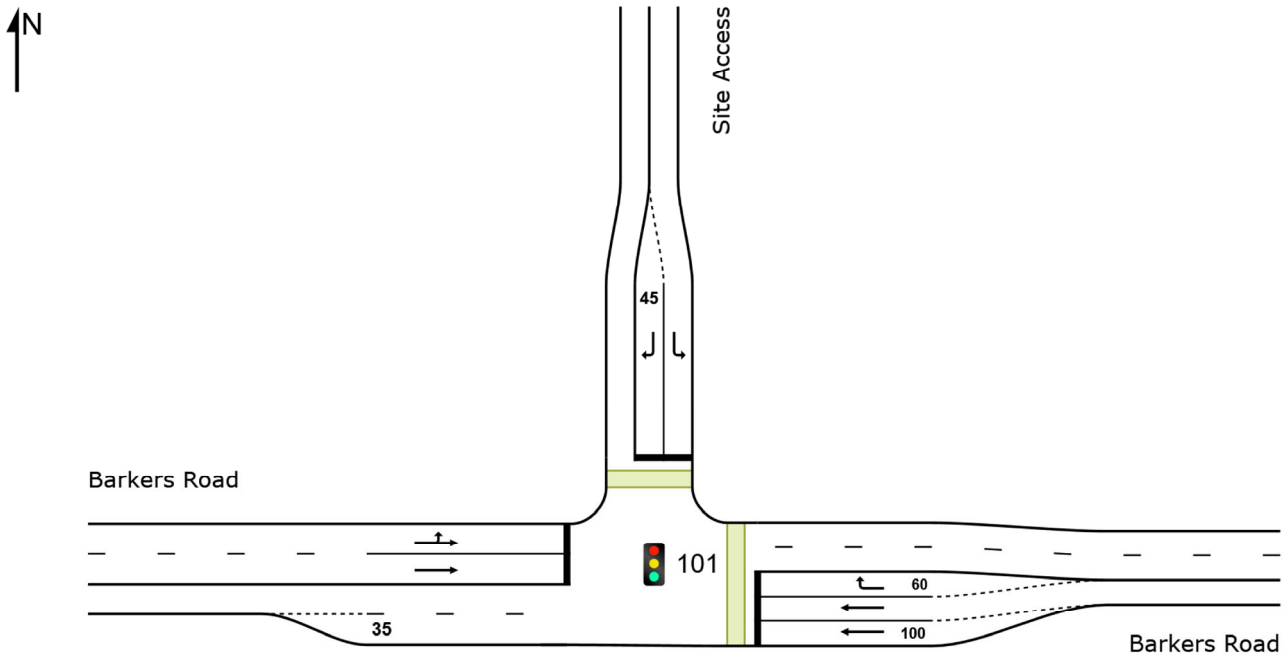


SITE LAYOUT

Site: 101 [Barkers Rd/Site Access - Late PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

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

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



MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Denmark St - Late PM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Late PM - Existing (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 116 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Power Street														
1	L2	62	5.0	62	5.0	0.260	34.2	LOS C	6.6	48.5	0.75	0.67	0.75	39.5
2	T1	648	5.0	648	5.0	* 0.954	62.1	LOS E	39.2	285.9	0.96	1.11	1.29	29.8
3	R2	139	5.0	139	5.0	0.591	32.3	LOS C	4.9	35.9	0.94	0.79	0.94	29.6
Approach		849	5.0	849	5.0	0.954	55.2	LOS E	39.2	285.9	0.94	1.03	1.19	30.4
East: Barkers Road														
4	L2	44	5.0	44	5.0	0.041	12.4	LOS B	0.7	5.4	0.32	0.62	0.32	47.6
5	T1	446	5.0	446	5.0	0.329	25.3	LOS C	9.4	68.9	0.72	0.61	0.72	38.9
6	R2	196	5.0	196	5.0	* 0.840	43.6	LOS D	8.7	63.4	1.00	0.93	1.27	30.2
Approach		686	5.0	686	5.0	0.840	29.7	LOS C	9.4	68.9	0.77	0.70	0.85	36.3
North: Denmark Street														
7	L2	147	5.0	147	5.0	0.620	38.3	LOS D	18.3	133.4	0.88	0.80	0.88	28.4
8	T1	704	5.0	704	5.0	0.729	35.2	LOS D	22.8	166.1	0.92	0.82	0.92	38.0
9	R2	82	5.0	82	5.0	* 0.387	33.4	LOS C	2.8	20.3	0.95	0.76	0.95	38.0
Approach		934	5.0	934	5.0	0.729	35.6	LOS D	22.8	166.1	0.91	0.81	0.91	36.9
West: Barkers Road														
10	L2	107	5.0	107	5.0	0.782	50.2	LOS D	23.2	169.3	0.98	0.90	1.04	34.3
11	T1	706	5.0	706	5.0	* 0.782	42.0	LOS D	23.2	169.3	0.96	0.88	1.03	25.3
12	R2	81	5.0	81	5.0	0.277	37.7	LOS D	3.2	23.7	0.81	0.79	0.81	36.4
Approach		895	5.0	895	5.0	0.782	42.6	LOS D	23.2	169.3	0.95	0.88	1.01	28.0
All Vehicles		3364	5.0	3364	5.0	0.954	41.2	LOS D	39.2	285.9	0.90	0.86	1.00	32.7

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Power Street											
P1	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.1	0.99
East: Barkers Road											
P2	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.1	0.99
North: Denmark Street											
P3	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.3	215.9	0.99

West: Barkers Road										
P4 Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.1	0.99
All Pedestrians	211	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.0	0.99

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

MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Site Access - Late PM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Late PM - Existing (Network Folder: AM Peak)]

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

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Barkers Road														
5	T1	812	5.0	812	5.0	0.501	2.0	LOS A	2.1	15.1	0.17	0.02	0.26	55.2
6	R2	26	1.0	26	1.0	0.501	22.9	LOS C	2.1	15.1	0.17	0.02	0.26	55.8
Approach		838	4.9	838	4.9	0.501	2.6	NA	2.1	15.1	0.17	0.02	0.26	55.3
North: Site Access														
7	L2	15	1.0	15	1.0	0.395	28.3	LOS D	1.3	8.9	0.91	1.04	1.11	27.7
9	R2	16	1.0	16	1.0	0.395	111.1	LOS F	1.3	8.9	0.91	1.04	1.11	18.5
Approach		31	1.0	31	1.0	0.395	71.1	LOS F	1.3	8.9	0.91	1.04	1.11	23.6
West: Barkers Road														
10	L2	47	1.0	47	1.0	0.321	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.1
11	T1	1179	5.0	1179	5.0	0.321	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.5
Approach		1226	4.8	1226	4.8	0.321	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.4
All Vehicles		2095	4.8	2095	4.8	0.501	2.2	NA	2.1	15.1	0.08	0.04	0.12	56.7

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

PHASING SUMMARY

Site: 101 [Barkers Rd/Denmark St - Late PM - Existing (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Late PM - Existing (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 116 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Leading Right Turn
Reference Phase: Phase B1
Input Phase Sequence: A, B1, C, D1, D2
Output Phase Sequence: A, B1, C, D1, D2

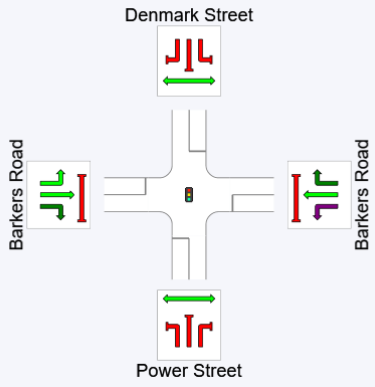
Phase Timing Summary

Phase	A	B1	C	D1	D2
Phase Change Time (sec)	75	0	14	60	68
Green Time (sec)	35	8	40	2	6
Phase Time (sec)	41	14	46	3	12
Phase Split	35%	12%	40%	3%	10%

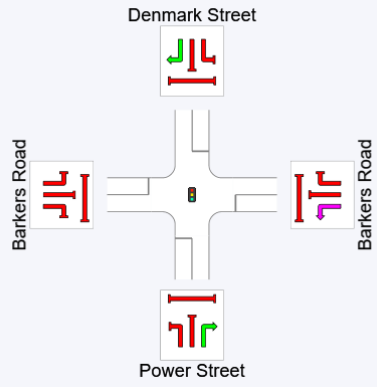
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

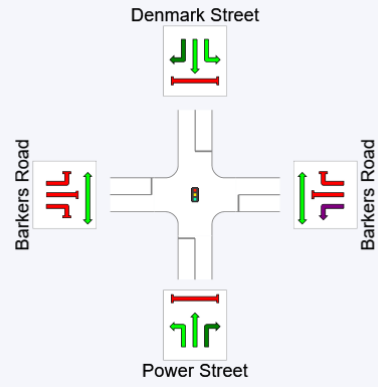
Phase A



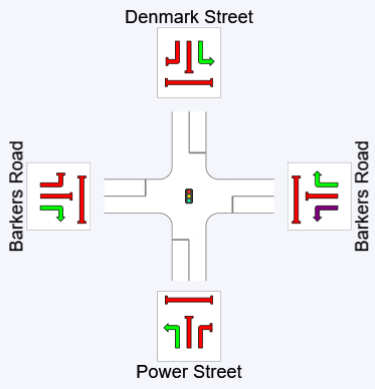
Phase B1 **REF**



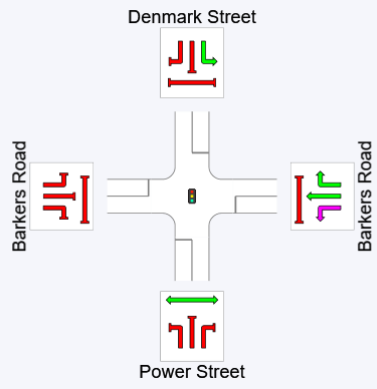
Phase C



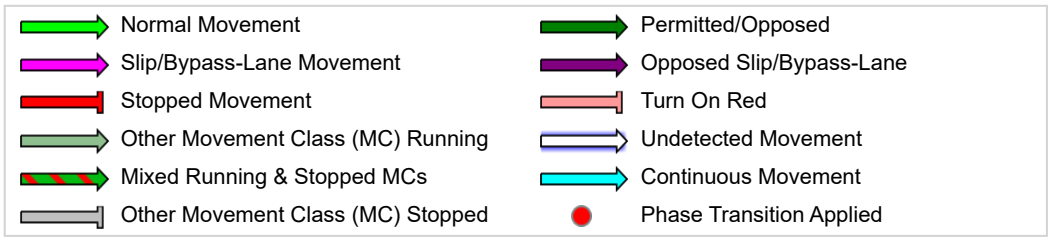
Phase D1



Phase D2



REF: Reference Phase
VAR: Variable Phase



MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Denmark St - Late PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Late PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 116 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Power Street														
1	L2	62	5.0	62	5.0	0.260	34.2	LOS C	6.6	48.5	0.75	0.67	0.75	39.5
2	T1	648	5.0	648	5.0	* 0.954	62.1	LOS E	39.2	285.9	0.96	1.11	1.29	29.8
3	R2	139	5.0	139	5.0	0.591	32.3	LOS C	4.9	35.9	0.94	0.79	0.94	29.6
Approach		849	5.0	849	5.0	0.954	55.2	LOS E	39.2	285.9	0.94	1.03	1.19	30.4
East: Barkers Road														
4	L2	47	5.0	47	5.0	0.044	12.4	LOS B	0.8	5.8	0.32	0.62	0.32	47.6
5	T1	479	5.0	479	5.0	0.353	25.6	LOS C	10.3	74.9	0.73	0.62	0.73	38.8
6	R2	211	5.0	211	5.0	* 0.903	51.9	LOS D	10.4	75.6	1.00	0.99	1.42	27.6
Approach		737	5.0	737	5.0	0.903	32.2	LOS C	10.4	75.6	0.78	0.73	0.90	35.2
North: Denmark Street														
7	L2	147	5.0	147	5.0	0.620	38.3	LOS D	18.3	133.4	0.88	0.80	0.88	28.4
8	T1	704	5.0	704	5.0	0.729	35.2	LOS D	22.8	166.1	0.92	0.82	0.92	38.0
9	R2	82	5.0	82	5.0	* 0.387	33.4	LOS C	2.8	20.3	0.95	0.76	0.95	38.0
Approach		934	5.0	934	5.0	0.729	35.6	LOS D	22.8	166.1	0.91	0.81	0.91	36.9
West: Barkers Road														
10	L2	107	5.0	107	5.0	0.782	50.2	LOS D	23.2	169.3	0.98	0.90	1.04	34.3
11	T1	706	5.0	706	5.0	* 0.782	42.0	LOS D	23.2	169.3	0.96	0.88	1.03	25.3
12	R2	81	5.0	81	5.0	0.284	37.7	LOS D	3.2	23.7	0.81	0.79	0.81	36.4
Approach		895	5.0	895	5.0	0.782	42.6	LOS D	23.2	169.3	0.95	0.88	1.01	28.0
All Vehicles		3415	5.0	3415	5.0	0.954	41.6	LOS D	39.2	285.9	0.90	0.86	1.01	32.5

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Power Street											
P1	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.1	0.99
East: Barkers Road											
P2	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.1	0.99
North: Denmark Street											
P3	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.3	215.9	0.99

West: Barkers Road										
P4 Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.1	0.99
All Pedestrians	211	52.3	LOS E	0.2	0.2	0.95	0.95	218.5	216.0	0.99

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

MOVEMENT SUMMARY

Site: 101 [Barkers Rd/Site Access - Late PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Late PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 116 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Barkers Road														
5	T1	812	5.0	812	5.0	0.447	4.5	LOS A	11.9	86.8	0.34	0.30	0.34	52.9
6	R2	51	1.0	51	1.0	* 0.466	66.1	LOS E	3.0	20.9	1.00	0.74	1.00	28.3
Approach		862	4.8	862	4.8	0.466	8.1	LOS A	11.9	86.8	0.38	0.33	0.38	48.3
North: Site Access														
7	L2	41	1.0	41	1.0	0.100	43.9	LOS D	1.9	13.1	0.83	0.72	0.83	34.3
9	R2	84	1.0	84	1.0	* 0.406	58.9	LOS E	4.6	32.3	0.97	0.77	0.97	20.6
Approach		125	1.0	125	1.0	0.406	54.0	LOS D	4.6	32.3	0.92	0.76	0.92	25.7
West: Barkers Road														
10	L2	60	1.0	60	1.0	0.483	15.1	LOS B	16.4	119.2	0.52	0.50	0.52	47.6
11	T1	1179	5.0	1179	5.0	* 0.483	9.7	LOS A	16.7	122.0	0.52	0.49	0.52	49.3
Approach		1239	4.8	1239	4.8	0.483	9.9	LOS A	16.7	122.0	0.52	0.49	0.52	49.2
All Vehicles		2227	4.6	2227	4.6	0.483	11.7	LOS B	16.7	122.0	0.49	0.44	0.49	46.5

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Barkers Road											
P2	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	218.6	216.3	0.99
North: Site Access											
P3	Full	53	52.3	LOS E	0.2	0.2	0.95	0.95	215.3	211.9	0.98
All Pedestrians		105	52.3	LOS E	0.2	0.2	0.95	0.95	216.9	214.1	0.99

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

PHASING SUMMARY

Site: 101 [Barkers Rd/Denmark St - Late PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Late PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 116 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Leading Right Turn
Reference Phase: Phase B1
Input Phase Sequence: A, B1, C, D1, D2
Output Phase Sequence: A, B1, C, D1, D2

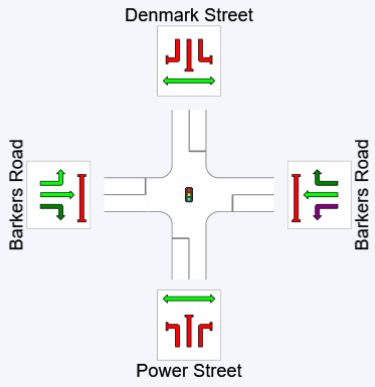
Phase Timing Summary

Phase	A	B1	C	D1	D2
Phase Change Time (sec)	75	0	14	60	68
Green Time (sec)	35	8	40	2	6
Phase Time (sec)	41	14	46	3	12
Phase Split	35%	12%	40%	3%	10%

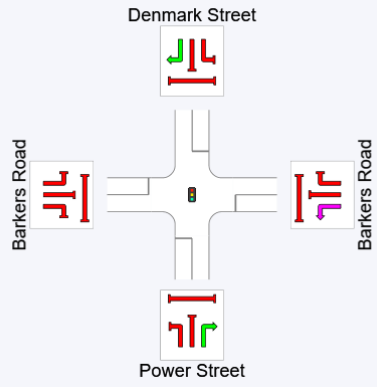
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified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

Output Phase Sequence

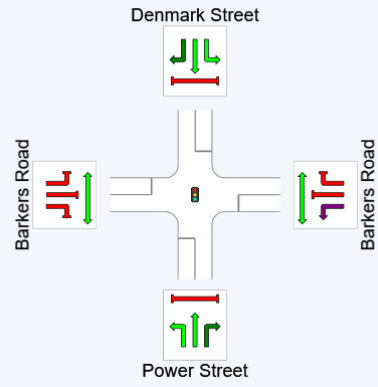
Phase A



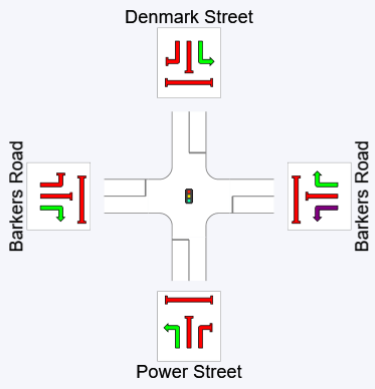
Phase B1 **REF**



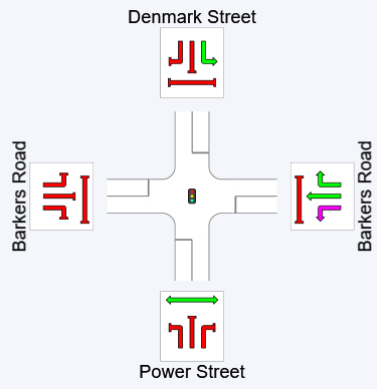
Phase C



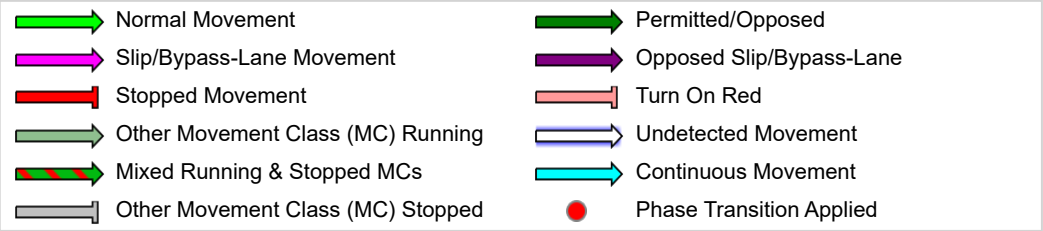
Phase D1



Phase D2



REF: Reference Phase
VAR: Variable Phase



PHASING SUMMARY

Site: 101 [Barkers Rd/Site Access - Late PM - Ultimate (Site Folder: Xavier Development Plan Analysis)]

Network: N101 [Late PM - Ultimate (Network Folder: AM Peak)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 116 seconds (Site User-Given Cycle Time)

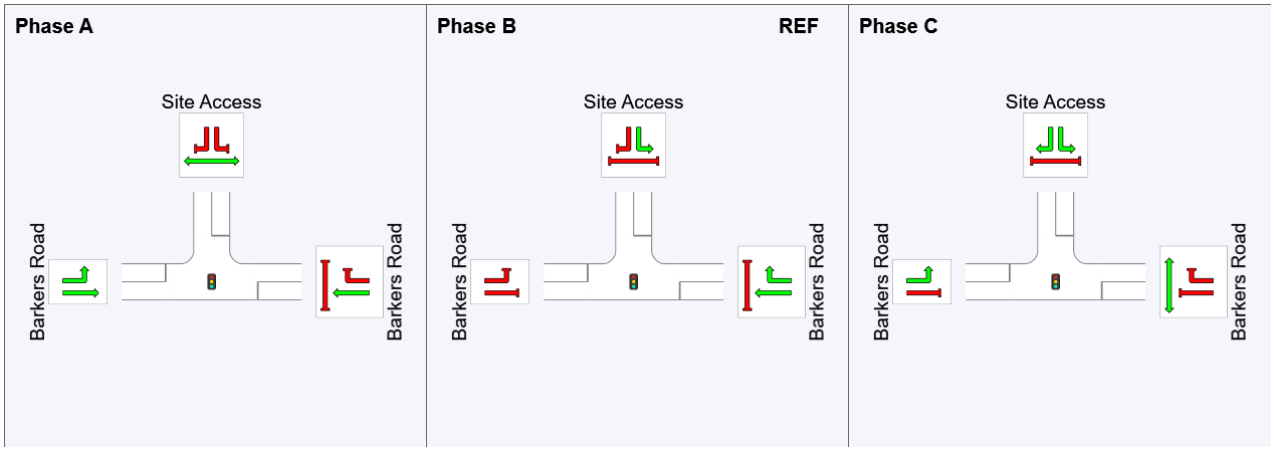
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

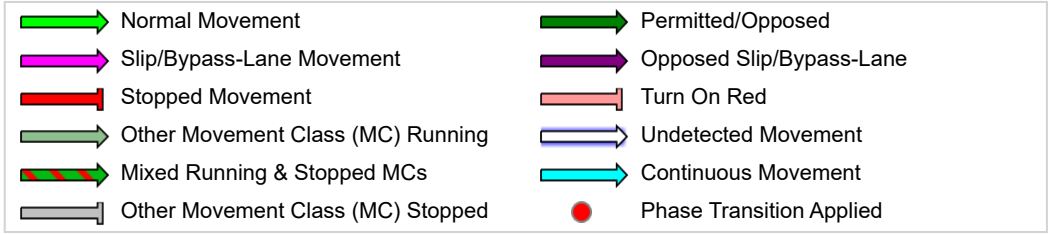
Phase	A	B	C
Phase Change Time (sec)	32	0	13
Green Time (sec)	78	7	13
Phase Time (sec)	84	13	19
Phase Split	72%	11%	16%

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

Output Phase Sequence

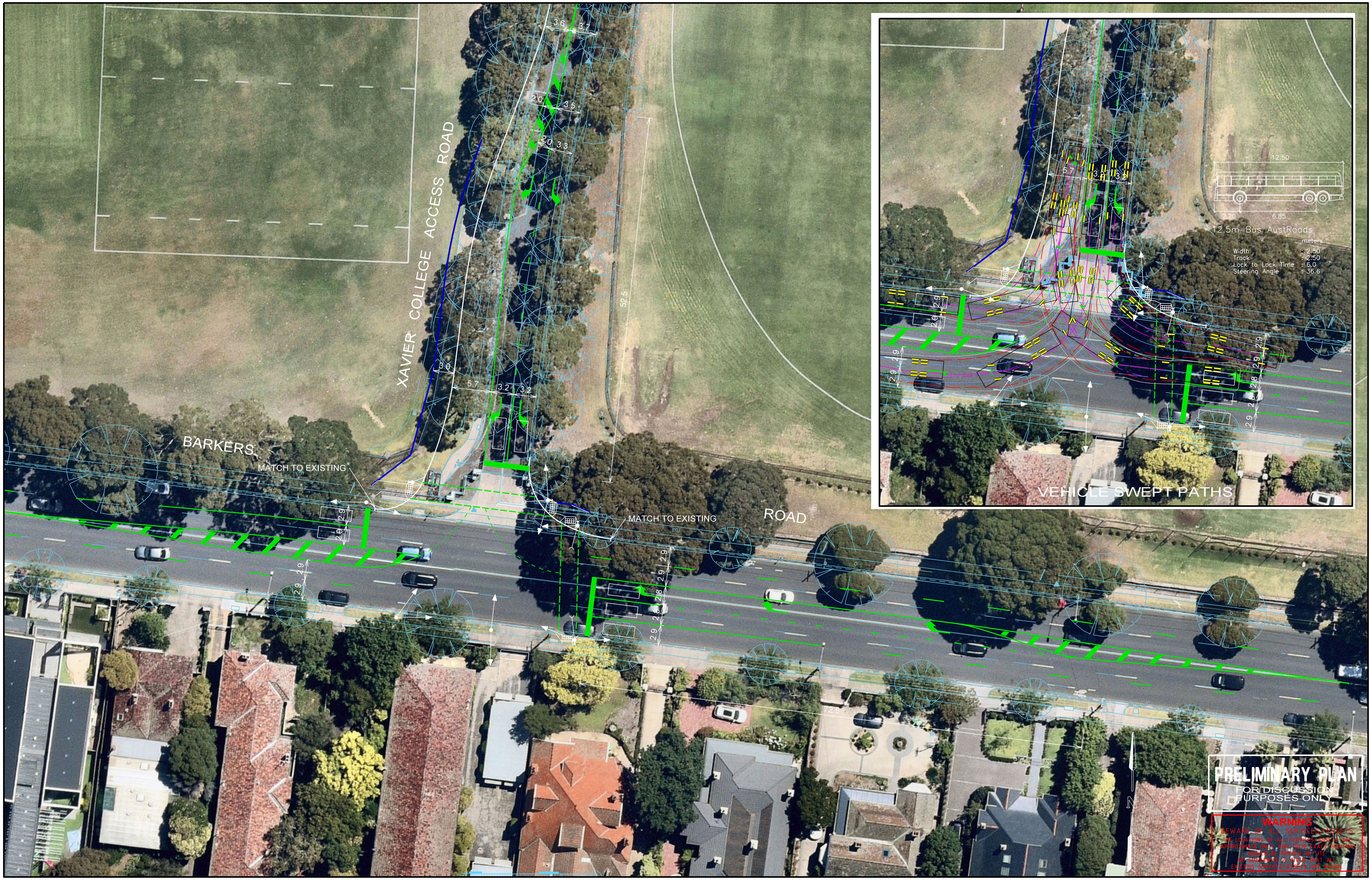


REF: Reference Phase
VAR: Variable Phase



Appendix B

Functional Layout Plan – Barkers Road / Site Access Intersection



ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	RIGHT TURN LANE (XAVIER COLLEGE ACCESS ROAD) ROAD EXTENDED - PLAN RE-ISSUED	23 JULY 2021
B	RIGHT TURN TAPER MODIFIED - PLAN RE-ISSUED	28 JULY 2021
C	RIGHT TURN TAPER MODIFIED AND DIMENSIONS UPDATED - PLAN RE-ISSUED	02 AUG 2021

GENERAL NOTES

1. BASE INFORMATION FROM SUPPLIED FEATURE SURVEY & AERIAL PHOTOGRAPH (SOURCE NEARMAP)
2. ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3. MAIN ROAD - BARKERS ROAD (SPEED ZONE 60km/h)
4. ALL PROPOSED FOOTPATHS AND PRAM CROSSINGS ARE TO BE CONSTRUCTED WITH TACTILE GROUND SURFACE INDICATORS TO DDA COMPLIANCE GUIDELINES REFER TO AS 1428.4 2009
5. TRAFFIC SIGNAL HARDWARE SHOWN FOR DISCUSSION PURPOSES ONLY

DESIGNED
G. RAKITA 08 JULY 2021

CHECKED/APPROVED
D. TROTTER 08 JULY 2021

FILE NAME
G28932-00-00.dgn

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BARKERS ROAD / XAVIER COLLEGE ACCESS
KEW

BOOROONDARA CITY

FUNCTIONAL LAYOUT PLAN

SCALE 1:500 (A3) 0 2.5 5 7.5 10

SHEET No.

DWG No. G28932-02-01