

1.7 CHESTER STREET, OAKLEIGH FEASIBILITY ASSESSMENT OF A TWO-WAY TRAFFIC CONCEPT FOR THE EASTERN END

Responsible Director: Peter Panagakos

RECOMMENDATION

That Council:

1. *Receives and notes the Chester Street, Oakleigh Feasibility Assessment undertaken by Quantum Traffic.*
2. *Notes that the majority of vehicles entering Chester Street from Hanover Street continue along Chester Street, with only approximately 27% of vehicles entering the Chester Street car park.*
3. *Notes that whilst changing the eastern end of Chester Street to a two-way traffic flow would reduce traffic volumes passing Eaton Mall, the traffic volumes would still be well above the threshold set by DoTP for the implementation of a Shared Zone.*
4. *Notes that given the minor reduction in traffic volume the change to a two-way flow would have limited pedestrian safety benefits at the Eaton Mall signalised pedestrian crossing and would likely introduce new pedestrian safety risks within the proposed two-way section of Chester Street.*
5. *Notes that this change would result in a range of other negative traffic impacts including the loss of 5 on-street parking spaces on the north side of Chester Street and potential traffic flow implications at Atherton Road / Hanover Street and the Hanover Street car park northern access.*
6. *Resolves not to pursue the two-way traffic concept at the eastern end of Chester Street at this point in time.*

INTRODUCTION

The purpose of this report is to present and discuss the findings of the feasibility assessment of changing the eastern end of Chester Street,

between Hanover Street and the Chester Street north car park, from westbound only to a two-way traffic flow. Refer Attachment 1

The report recommends that no change be made to traffic flow in Chester Street at this point in time.

BACKGROUND

Councillors have been expressing concern for some time with potential traffic conflicts between vehicles using Chester Street and pedestrians crossing at Eaton Mall as well as crossing elsewhere along the street and within the core Oakleigh Activity Centre in general.

At its meeting of 25 October 2022, Council resolved that it:

1. Notes that following the previous Council resolution at its meeting of September 2021, officers have provided advice that the Department of Transport would not support a shared zone at the intersection of Chester Street and Eaton Mall.
2. Notes that traffic counts indicate that the weekday volume of traffic in Chester Street is 3,498 vehicles.
3. Directs officers to commence a feasibility study for a trial of two-way traffic in Chester Street, Oakleigh between Chester Street Carpark and Hanover Street and that Council allocates \$10k for this work

DISCUSSION

In accordance with the 25 October Council resolution, a traffic engineering feasibility assessment was prepared by traffic engineering consultant Quantum Traffic. The feasibility utilised existing traffic volume information and undertook onsite counts of turning movements in the Chester Street east and Chester Street car park. This information was then used to assess the likely traffic redistribution, and the potential impacts of the two-way concept.

Two-Way Concept

Under the two-way concept, all vehicle movements exiting the northern Chester Street car park would be directed east to Hanover Street in an effort to reduce westbound traffic volumes in Chester Street across Eaton Mall.

Movements from the Chester Street south car park would be permitted to exit left (westbound) or right (eastbound).

This proposed arrangement is shown below.



Two-Way Arrangement

Traffic Volume Changes

Vehicle turning movement counts were undertaken on a typical weekday (Thursday 10/11/22) and typical Saturday (12/11/22) to understand the existing traffic flows along Chester Street east of Eaton Mall.

The surveys indicate that the majority of vehicles (approximately 73%) entering Chester Street from Hanover Street do not enter the northern car park but continue along Chester Street westbound and past Eaton Mall.

Based on the recorded turning movements, an estimate of the likely traffic volume along Chester Street, past Eaton Mall arising from the two-way concept is as follows: :

- Thursday (7am-7pm): 1,878 vehicles – a reduction of 741 vehicles (-28%)
- Saturday (7am-7pm): 2,080 vehicles – a reduction of 717 vehicles (-26%)

It is noted that the above volumes assume full compliance with the intended left out only restriction at the Chester Street car park exit at the eastern end. In practice, there would be likely be a level of non-compliance, which would result in higher traffic volumes travelling past Eaton Mall. On this basis, the quoted traffic volumes above represent the 'best case' scenario with 100% compliance with the revised Chester Street car park circulation.

Implications for Future Shared Zone on Chester Street at Eaton Mall

A key objective of the two-way concept is to reduce Chester Street traffic volumes to a level where a Shared Zone could be considered on Chester Street around the Eaton Mall intersection at some time in the future.

However, given the DoTP threshold for the introduction of Shared Zones is 1,000 vehicles between 7am-7pm, the estimated revised volumes of 1,878 remains much higher than permissible. Furthermore, peak hour volumes are also likely to continue to be greater than the DoTP threshold of 200 vehicles/hour.

Based on the above estimates, the two-way change alone would not reduce traffic volumes enough for the implementation of a Shared Zone on Chester Street at Eaton Mall.

Physical Implication of Two-Way Concept

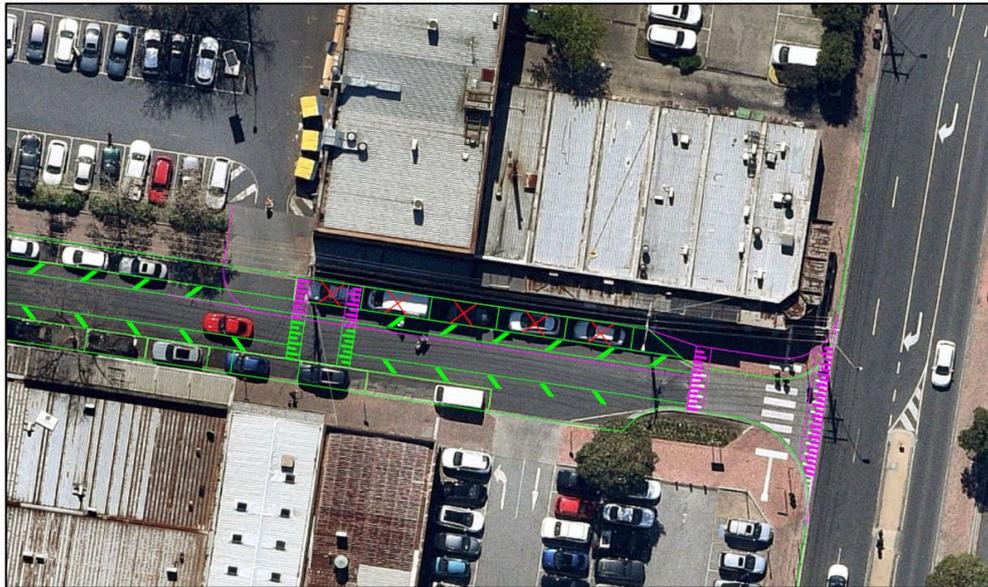
Converting the eastern end of Chester Street to two-way traffic would also require a number of changes to the allocation of road space and physical modifications to infrastructure.

The existing carriageway width between parking bays is approximately 5.6m wide, which is less than the typical minimum of 6m required for two-way operation. On this basis, the removal of parking bays would be required on one side of Chester Street. A review of the existing on-street parking indicates that parking loss is preferable on the north side, as an existing Loading Zone is located on the south side of the road. Overall, the concept would result in the loss of 5 parallel parking bays on the north side of Chester Street. This will most likely have a negative impact on customer access to the adjacent businesses as well as remove any opportunity for parklet trading. Any footpath trading would be alongside a moving traffic lane instead of parked vehicles.

The existing threshold treatment / zebra crossing at Chester Street / Hanover Street will also need to be widened to allow for two-way operation.

Comprehensive line marking and signage would be necessary to clearly define the entry and exit movements from the Chester Street northern car park. Furthermore, consideration should be given to a physical control (i.e. islands) to maximise compliance with left out only designation of the eastern car park exit.

For the purpose of analysing the feasibility of the concept, a functional layout could be achieved within the existing Chester Street carriageway to accommodate two-way operation between Hanover Street the Chester Street northern car park eastern access as shown on the plan below.



Indicative Concept – Two-Way Proposed Physical Changes

Traffic Flow Implications

Traffic modelling has also been prepared for the Hanover Street / Chester Street intersection to assess the potential impact of introducing left out movements from Chester Street to Hanover Street. The model indicates that the additional volumes will have a minor impact on intersection capacity / operation.

However, the proposed two-way operation will likely result in broader traffic flow implications in the local area, including:

- The volume of vehicles utilising the south leg of Atherton Road / Hanover Street is likely to increase and therefore likely to result in additional delays and queue lengths.
- Vehicles circulating for a car park are likely (due to the left out only restriction proposed at Chester Street / Hanover Street) to turn right into the Hanover Street car park northern access. This car park access overlaps with the Chester Street right turn in lane and is likely to result in operational confusion with additional delays / queueing.

Pedestrian Safety Implications

The proposed two-way operation at the eastern end of Chester Street is expected to have limited benefits for pedestrian safety at Eaton Mall.

Whilst the predicted traffic volume reduction will result in some reduction to pedestrian exposure to vehicles west of the Chester Street car park, it will only mean a limited pedestrian safety benefit at the Eaton Mall crossing because the existing signalised crossing already separates and controls pedestrian and vehicle movements.

This reduced exposure may also result in some pedestrian safety benefits along other sections of Chester Street, where pedestrians can cross the road in an uncontrolled manner.

At the eastern end of Chester Street, however the proposal is likely to result in increased pedestrian risk given:

- **Zebra Crossing at Hanover Street:** The existing zebra crossing threshold treatment will need to be widened and vehicles will approach from both directions. This arrangement has a number of disadvantages compared to the existing conditions including a longer walking distance and vehicles approaching from multiple directions.
- **Mid-Block Pedestrian Movements:** The introduction of two-way vehicle movements will have a negative impact on pedestrian safety for pedestrians crossing the road in an uncontrolled manner. Chester, Portman and Station Streets have operated as one-way roads for a very long time and pedestrians have an expectation of vehicles approaching from one direction only. Particularly in the initial stages, having vehicles approaching from both directions is a significant change to pedestrian expectations and behaviours and would require extensive notification and education of the changed conditions. In the worst case, pedestrians may not look for on-coming vehicles in both directions.

POLICY IMPLICATIONS

There are no policy issues arising from the recommendations contained in this report.

SOCIAL IMPLICATIONS

There are no social issues arising from the recommendations contained in this report.

HUMAN RIGHTS CONSIDERATIONS

There are no apparent human rights implications under the Charter of Human Rights and Responsibilities Act 2006.

GENDER EQUITY ASSESSMENT

A gender impact assessment has not been undertaken for this assessment.

CONSULTATION

No external consultation has been undertaken in preparing this report.

CONCLUSION

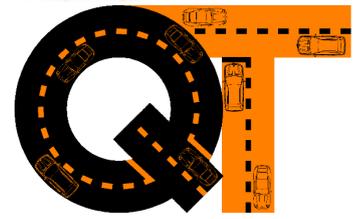
Officers have undertaken an assessment of the feasibility of two-way traffic movement in the eastern end of Chester Street, between the Chester Street car park and Hanover Street, Oakleigh.

Whilst the proposed change would result in some reduction in traffic volumes on Chester Street, the reduction does not reduce traffic volumes to the level required to designate the Eaton Mall, Chester Street precinct a Shared Zone. The proposed change is also unlikely to result in significant pedestrian safety benefits at the existing signalised Eaton Mall crossing.

Additionally the concept would require the removal of 5 existing on-street parking spaces and potentially add additional pedestrian safety risks in the two-way section and traffic flow issues at Atherton Road / Hanover Street & the northern access to the Hanover Street Car Park.

In view of the above limitations, it is recommended that Council does not pursue the two-way concept in Chester Street at this point in time.

Attachment 1 – Chester Street Feasibility Assessment – Two-way operation



QuantumTraffic

Quantum Traffic Pty Ltd

ABN 54617474370

ACN 617474370

T 1300 757 016

E admin@quantumtraffic.com.au

A 5 Murray Place
RINGWOOD VIC 3134

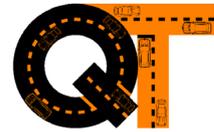
W www.quantumtraffic.com.au

Feasibility Assessment

Chester Street, Oakleigh

Two-Way Operation – Hanover Street to Car Park

19/12/2022



Feasibility Assessment

Chester Street, Oakleigh

Two-Way Operation – Hanover Street to Car Park

Prepared for: Monash City Council

Document Control

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QuantumTraffic

T
1300 757 016

E
admin@quantumtraffic.com.au

A
5 Murray Place
RINGWOOD VIC 3134

W
www.quantumtraffic.com.au

Quantum Traffic Pty Ltd

ABN: 54617474370

ACN: 617474370

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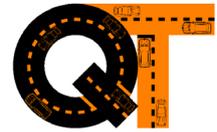
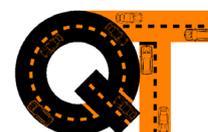


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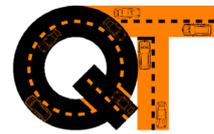
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1 Introduction

The following report reviews the feasibility of the introduction of two-way operation on Chester Street, Oakleigh between Hanover Street and the Chester Street public car park (north).

2 Existing Conditions

2.1 Subject Site

The subject site is located on Chester Street in Oakleigh. A locality plan and aerial photograph are provided in Figure 1 and Figure 2 below.

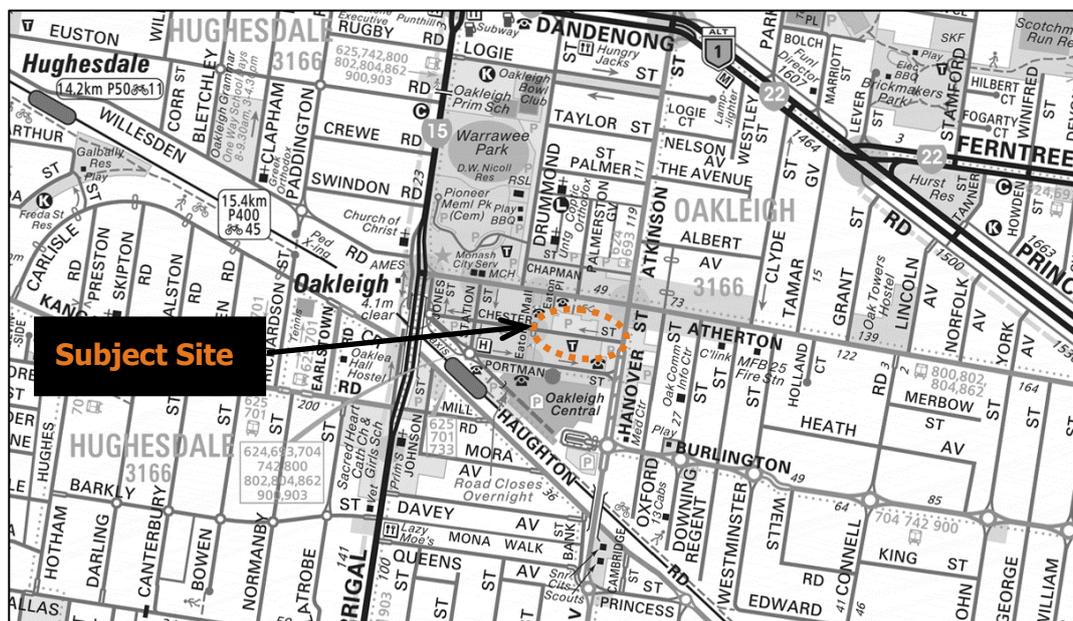
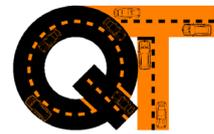


Figure 1: Locality Plan (Source: Melway Online)



Figure 2: Aerial Photograph (Source: Nearthmap)



2.2 Chester Street

Chester Street is classified as a 'collector' road under Council's road register, extending between Portman Street in the west and Hanover Street in the east.

Chester Street operates with a one-way restriction (westbound) along the whole length.

Chester Street typically provides a carriageway width of approximately 10m, including parallel parking on both sides of the road and a single traffic lane.

Access to the Chester Street car park (north) operates with 'entry' movements via the eastern crossover and 'exit' movements via the western crossover. Given the one-way operation of Chester Street, entry movements are limited to 'left in', whilst exit movements are limited to 'right out'.

The Chester Street southern car park is accessed via a single crossover that allows for 'left in' and 'left out' movements.

At the intersection with Hanover Street, a raised threshold treatment is provided across Chester Street, including a formal zebra crossing and kerb extensions narrowing the vehicle carriageway to a single lane.

In the vicinity of the subject site, on-street parking is generally subject to short term parking restrictions.

Chester Street is subject to a posted speed limit of 40km/h.

Photographs of Chester Street are provided in Figure 3 and Figure 4 below.



Figure 3: *Chester Street (view east)*



Figure 4: *Chester Street (view east)*

2.3 Historical Traffic Count

Council has previously undertaken a 3 day traffic count between Tuesday 25th February 2020 and Thursday 27th February 2020 (inclusive).

The traffic count was located outside #18 Chester Street, on the western side of the Eaton Mall crossing.

A summary of the traffic volumes recorded is provided in Table 1 below.

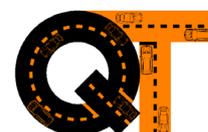


Table 1: Traffic Volumes Summary – Chester Street 3 Day Traffic Count

Location	Daily Volume	AM Peak Hour	PM Peak Hour
Average Weekday Volumes – All Vehicles			
Eastbound	31	3 (11am-12pm)	4 (12pm-1pm)
Westbound	3,467	259 (11am-12pm)	262 (12pm-1pm)
Combined	3,498	262 (11am-12pm)	266 (12pm-1pm)
Average Weekday Volumes – Heavy Vehicles			
Eastbound	0	0	0
Westbound	193	12 (10am-11am)	8 (12pm-1pm)
Combined	193	12 (10am-11am)	8 (12pm-1pm)

2.4 Turning Movement Counts

A series of turning movement counts were undertaken at the eastern end of Chester Street, to establish the existing turning movements at the key access points. A summary of the count locations is as follows:

- Location 1 – Chester Street / Hanover Street
- Location 2 – Chester Street / South Car Park Access
- Location 3 – Chester Street / North Car Park Entry (east)
- Location 4 – Chester Street / North Car Park Exit (west)

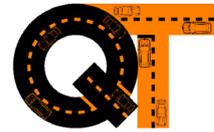
A summary of the count locations is provided in Figure 5 below.



Figure 5: Turning Movement Count Locations (Source: Nearmap)

The surveys were conducted on a typical weekday and Saturday, with the surveys times between 10am and 9pm to capture the general peak periods as follows:

- Thursday 10th November 2022 – 10am-9pm
- Saturday 12th November 2022 – 10am-9pm



A summary of the observed traffic volumes over the 10-9pm period (11 hours) is provided in Figure 6 below, with the overall peak hours shown in Figure 7.

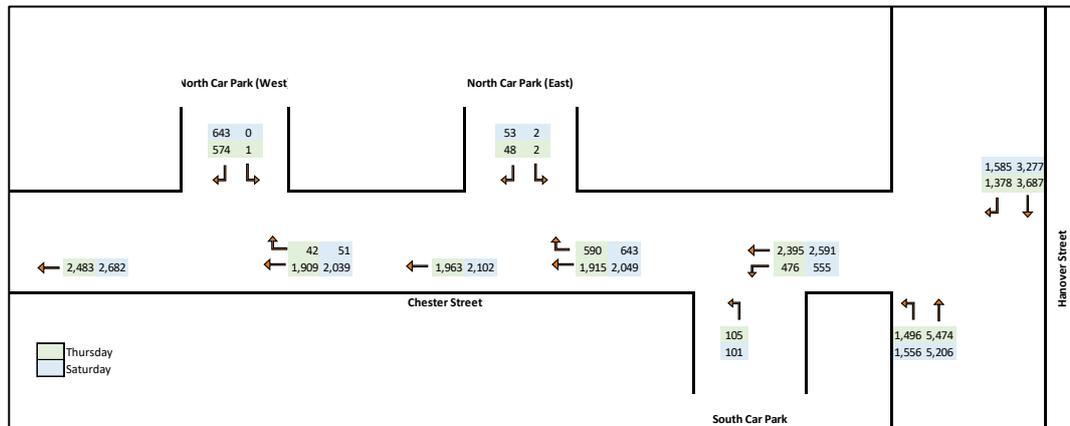


Figure 6: Turning Movement Counts Overall Volumes – 10am-9pm

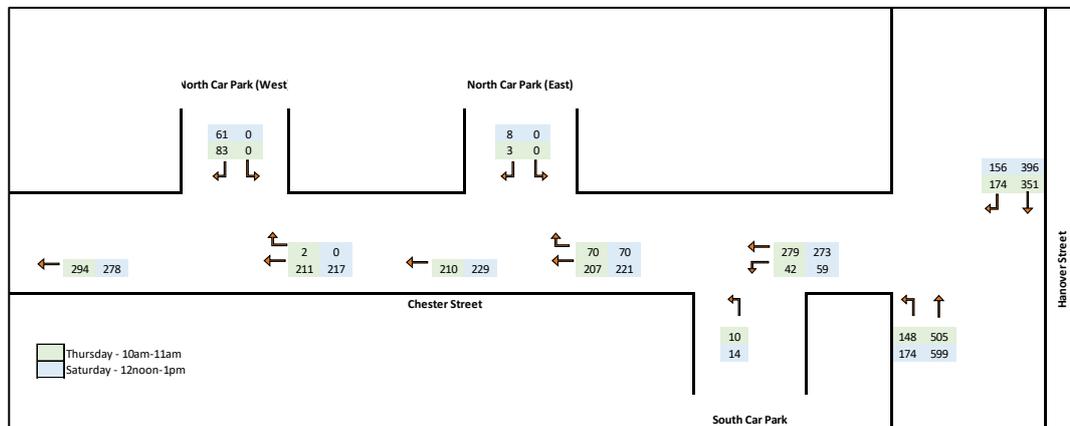


Figure 7: Turning Movement Counts – Peak Hour Volumes

It is noted that under the existing conditions that there are a number of vehicles not adhering to the existing turn restrictions at the Chester Street northern car park access points. In particular, 48-53 vehicles over the 11 hour count period were observed turning right out of the car park 'entry'. Furthermore, multiple vehicles were observed turning left out of the car park access point and therefore travelling the wrong way on Chester Street.



3 Background Information

3.1 Shared Zone Trial Assessment (September 2022)

In September 2022, Quantum Traffic completed a feasibility assessment of a potential shared zone trial on Chester Street at Eaton Mall.

The assessment reviewed the findings of a range of previous options considered for Chester Street including permanent road closures, part time road closures, reduced speed zones and speed management.

In terms of the implementation of a shared zone, the assessment reviewed the key Department of Transport (DOT) requirements for the implementation of a shared zone. At a high level, a key limitation of the introduction of a shared zone was the traffic volumes on Chester Street, as follows:

- **Daily Traffic Volume** – 3,498 vehicles/day
- **7am-7pm Traffic Volume** - 2,613 vehicles (exceeds the hourly DOT threshold of 1,000 vehicles between 7am-7pm).
- **Peak Hour Volumes** - 262-266 vehicles/hour (exceeds the hourly DOT threshold of 200 vehicles/hour).

The other key consideration from the DOT guidelines is that shared zones should not be installed on roads with a history of vehicle speed problems. Whilst speeds on Chester Street were within acceptable limits, the historical 'hoon' behaviour was considered to be consistent with elements of high vehicle speeds.

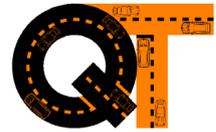
Overall the assessment concluded that a shared zone trial on Chester Street at Eaton Mall was not feasible. However, a range of alternative measures for Chester Street / Eaton Mall to address 'hoon' behaviour and improve pedestrian conditions were recommended as follows:

- **Hoon Behaviour Management** – Council commence dialogue with Victoria Police to establish a collaborative scheme to address hoon behaviour within the broader Oakleigh Activity Centre and Chester Street.
- **Traffic Signal Timing** – Council explore the modification of the signal timing at the Eaton Mall POS to introduce additional delays to vehicles (making the route less attractive for hoon behaviour).
- **Speed Zoning** – Council commence consultation with DOT confirm the suitability of the Oakleigh Activity Centre for a 30km/h trial and define the key components of the trial required.

3.2 Council Motion – 25th October 2022

At the October 2022 Council meeting, Councillors were presented with the results of the shared zone trial assessment outlined in Section 3.

Councillors expressed a view that the Chester Street northern off-street car park is a main traffic attracter to the street and to the inner section of the activity centre. Given that under the existing conditions all vehicles must travel west



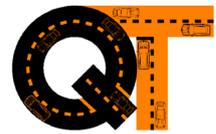
when leaving the car park, vehicle volumes along Chester Street are likely to include a significant contribution from vehicles exiting the car park.

In view of the above, a motion was put forward to ask Council officers to investigate the feasibility of two-way vehicle movements at the eastern end of Chester Street between the carpark entry/exit point, requiring vehicles leaving the car park to turn left only towards Hanover Street.

This proposal was suggested to have the following benefits:

"If the conditions were changed so that vehicles leave via a two-way section of Chester Street from the eastern end of the car park to Hanover Street, traffic volumes on Chester Street and across the activity centre would likely reduce, resulting in a much safer environment for both pedestrians and motorists alike. Should these benefits be realised, future options such as a shared zone in Chester Street could be revisited."

The current assessment seeks to address the above Council motion, specifically in relation to the feasibility of the introduction of two-way operation at the eastern end of Chester Street.



4 Two-Way Proposal Assessment

4.1 Proposal

The Council proposal seeks to introduce two-way vehicle movements into the eastern portion of Chester Street between the northern car park east access and Hanover Street.

Vehicle access to the Chester Street northern car park would be modified with 'entry' movements to occur via the western access and 'exit' movement to occur via the eastern access. All exit movements from the car park would be limited to left out only, resulting in all movements from the car park travelling east to Hanover Street.

Access to the Chester Street southern car park would also be modified, with right turn movements out of the car park permitted and left turns out of the car park retained.

Based on the above, exit movements would be re-introduced at the Chester Street / Hanover Street intersection, with these movements limited to left out only.

A high level schematic plan prepared by Council officers is shown in Figure 8 below.

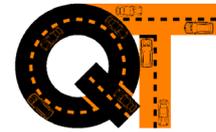


Figure 8: *Two-Way Operation Proposal*

4.2 Traffic Volume Assessment

An assessment of the likely traffic volumes as a result of proposed two-way arrangement has been undertaken utilising the available traffic data.

A summary of the key redistribution of traffic volumes is as follows:



- **North Car Park Entry Movements:**
 - Existing car park entry movements transferred from the eastern car park access to the western car park access.
- **North Car Park Exit Movements:**
 - All existing exit movements transferred to 'left out' movements at the eastern car park access.
- **South Car Park Exit Movements:**
 - All existing exit movements split 50%/50% between 'left out' movements and 'right out' movements

Figure 9 below summarises the likely traffic volumes between 10am-9pm as a result of the proposed two-way arrangement at the eastern end of Chester Street, whilst Figure 10 summarises the likely peak hour volumes.

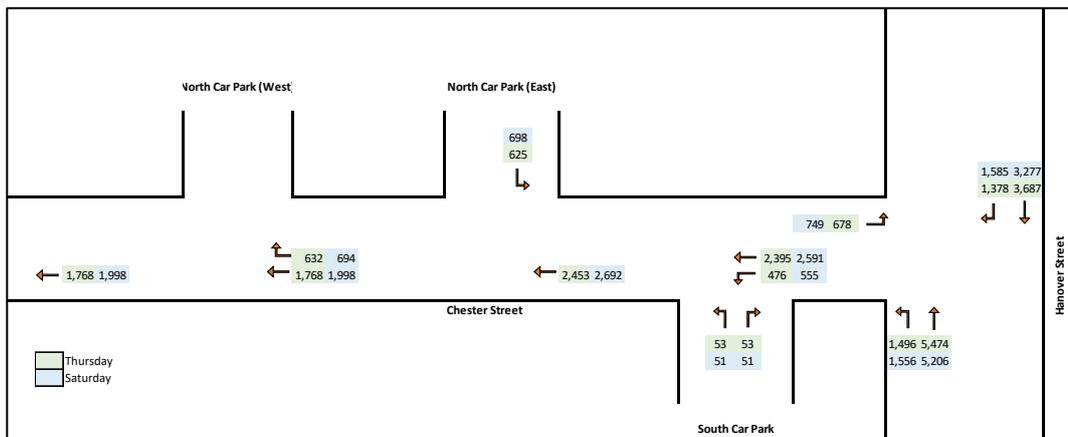


Figure 9: Post Two-Way Proposal Implementation Traffic Volumes – 10am-9pm

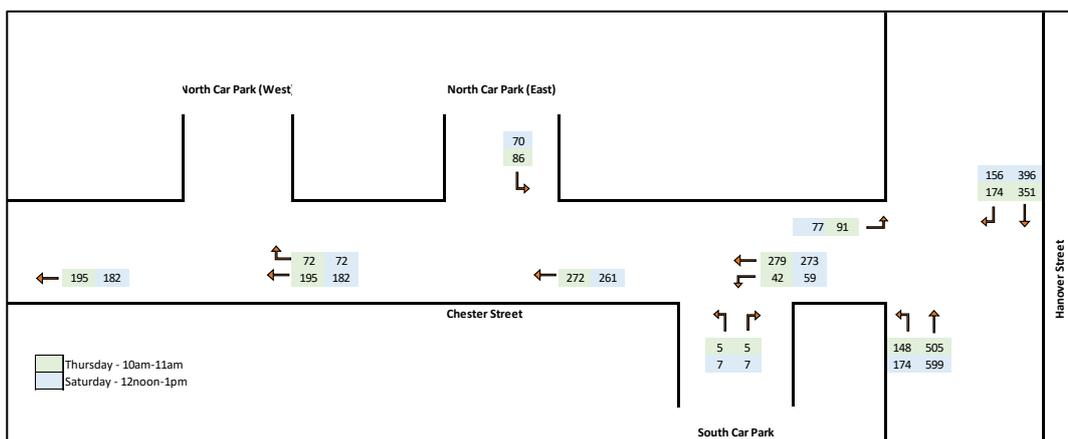
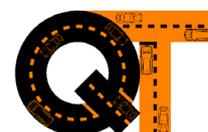


Figure 10: Post Two-Way Proposal Implementation Traffic Volumes – Peak Hours

4.3 Reduction of Chester Street Volumes

Based on the traffic redistribution discussed above, the likely traffic volume along Chester Street past Eaton Mall has been estimated.

Table 2 below shows the existing volumes, the likely post implementation volume and magnitude of change. We have considered the 12 hour 7am-7pm period to allow for comparison to the 'shared zone' thresholds provided by DOT.

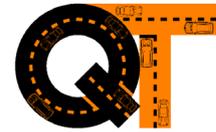


For the period between 7am-10am, the traffic volumes have been estimated based on the proportion of vehicles across from the historical traffic count presented previously in Section 2.3 (highlighted in 'grey' in the table below).

Table 2: Chester Street at Eaton Mall – Traffic Volumes

Period		Existing Volume	Post Implementation of Two-Way Proposal	Change
Thursday				
7:00am	8:00am	106	76	-30 (-28%)
8:00am	9:00am	188	134	-54 (-29%)
9:00am	10:00am	228	162	-66 (-29%)
10:00am	11:00am	294	195	-99 (-34%)
11:00am	12:00pm	242	167	-75 (-31%)
12:00pm	1:00pm	265	182	-83 (-31%)
1:00pm	2:00pm	229	153	-76 (-33%)
2:00pm	3:00pm	246	184	-62 (-25%)
3:00pm	4:00pm	187	141	-46 (-25%)
4:00pm	5:00pm	227	184	-43 (-19%)
5:00pm	6:00pm	204	161	-43 (-21%)
6:00pm	7:00pm	203	139	-64 (-32%)
TOTAL	7am-7pm	2,619	1,878	-741 (-28%)
Saturday				
7:00am	8:00am	114	86	-28 (-33%)
8:00am	9:00am	202	152	-50 (-33%)
9:00am	10:00am	248	184	-64 (-35%)
10:00am	11:00am	262	191	-71 (-37%)
11:00am	12:00pm	285	214	-71 (-33%)
12:00pm	1:00pm	278	221	-57 (-26%)
1:00pm	2:00pm	283	206	-77 (-37%)
2:00pm	3:00pm	245	173	-72 (-42%)
3:00pm	4:00pm	234	171	-63 (-37%)
4:00pm	5:00pm	210	152	-58 (-38%)
5:00pm	6:00pm	202	154	-48 (-31%)
6:00pm	7:00pm	234	176	-58 (-33%)
TOTAL	7am-7pm	2,797	2,080	-717 (-26%)

In view of the above, the traffic volumes along Chester Street are likely to reduce by approximately 28% (741 vehicles) between 7am-7pm on a typical weekday and reduce by approximately 26% (717 vehicles) between 7am-7pm on a typical Saturday.



4.4 Viability of Historical Shared Zone Proposal

A key component of the two-way proposal is to reduced traffic volumes to a level where a shared zone could be considered in the future.

The key DOT traffic volume requirements for the implementation of a shared zone are as follows:

"shared zones are inappropriate on streets that carry over 200 vehicles per hour in peak periods, or over 1000 vehicles between 7.00 am and 7.00 pm"

Based on the analysis in Section 4.3, the 7am-7pm volume on Chester Street is likely to be in the order of 1,878-2,080 vehicles past Easton Mall. On this basis, the 12 hour volumes are still significantly higher than the 1,000 vehicle 12 hour threshold.

From a peak hour perspective, the assessment indicated that there will still be numerous hourly periods on a Saturday that carry over 200 vehicles per hour. On the typical weekday, there are no hourly periods that carry over 200 vehicles/hour, however, there a numerous that carry between 180-200 vehicles / hour.

In view of the above, the whilst the two-way proposal would reduce traffic volumes on Chester Street, the volumes are still well above the thresholds set by DOT for the implementation of a shared zone. Therefore, the two-way proposal alone, would not reduce traffic volumes enough for the implementation of a shared area at Eaton Mall.

4.5 Chester Street / Hanover Street Capacity

The proposal to introduce two-way movement on Chester Street will result in exit movements from Chester Street to Hanover Street.

The Council proposal limits these movements to left out only, to minimise the impact of the additional traffic volumes.

We have prepared a SIDRA traffic model to review the capacity of the intersection to accommodate these additional traffic movements and to estimate the likely queuing on Chester Street.

The model has developed during the following periods:

- The 'overall' peak hours across all counts: Thursday (10am-11am) and Saturday (12pm-1pm).
- The Chester Street / Hanover Street peak hours: Thursday (3:15pm-4:15pm) and Saturday (12pm-1pm).

The layout of the intersection maintains the general existing conditions, with the inclusion of left turn movements from Chester Street into Hanover Street. A copy of the SIDRA model intersection layout is provided in Figure 11 below.

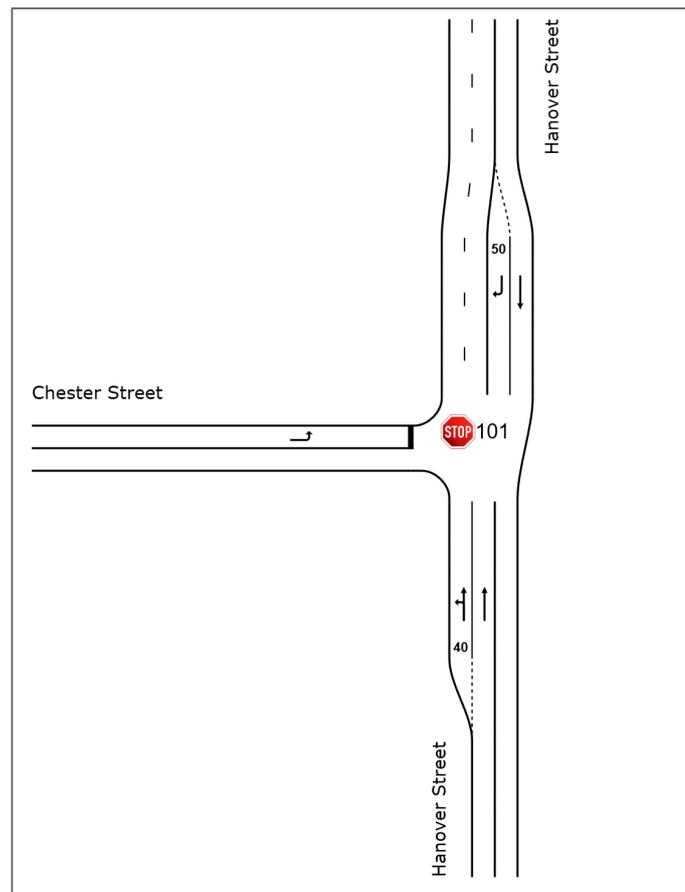
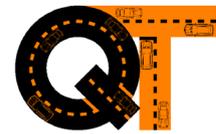
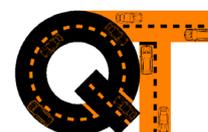


Figure 11: Chester Street / Hanover Street – SIDRA Layout

A summary of the SIDRA results for the key peak hours is provided in Table 3 below.

Table 3: Chester Street / Hanover Street - Two-Way Scenario Operation

Period	DOS	Average Delay	95 th %ile Queue
Thursday Peak - Overall (10am-11am)			
S: Left	0.18	6s	0m
S: Through	0.18	0s	0m
N: Through	0.20	0s	0m
N: Right	0.27	10s	5m
W: Left	0.01	9s	1m
OVERALL	0.27	3s	8m
Thursday Peak – Chester/Hanover Peak (3:15pm-4:15pm)			
S: Left	0.22	6s	0m
S: Through	0.22	0s	0m
N: Through	0.26	0s	0m
N: Right	0.19	11s	5m
W: Left	0.05	9s	1m
OVERALL	0.26	2s	5m



Period	DOS	Average Delay	95 th %ile Queue
Saturday Peak (12pm-1pm)			
S: Left	0.22	6s	0m
S: Through	0.22	0s	0m
N: Through	0.22	0s	0m
N: Right	0.29	12s	9m
W: Left	0.08	9s	2m
OVERALL	0.29	2s	9m

The SIDRA modelling indicates that the introduction of left turn movements from Chester Street to Hanover Street will have a minor impact on intersection capacity / operation.

Average delays for the left turn movements are predicted to be approximately 9 seconds, with 95th percentile queue lengths of less than 1 vehicle.

In view of the above, the Chester Street / Hanover Street intersection can accommodate the additional traffic volumes associated with the two-way proposal.

4.6 Chester Street – Modifications for Two-Way

The provision of the proposed two-way arrangement will require a number of physical changes along Chester Street to accommodate the proposed two-way operation.

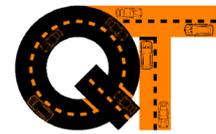
Under the existing conditions, the eastern end of Chester Street includes the following typical cross-section:

- Parking Lane (north) – 2.2m
- Chevron Off-Set – 1.3m
- Traffic Lane (One-way westbound) – 3.0m
- Chevron Off-Set – 1.3m
- Parking Lane (south) – 2.2m
- **TOTAL – 10m**

We understand that the chevron buffers have only been recently installed in the last 1-2 months. A photograph showing the general arrangement of the eastern end of Chester Street is shown in Figure 12 below.

Typically the minimum width required to accommodate two-way traffic operation is 6m (3m traffic lanes in each direction). The existing carriageway width between the parking lanes is approximately 5.6m, which is below the minimum requirement and doesn't provide any off-set to parked vehicles (as per the existing conditions). On this basis, the introduction of two-way operation is likely to require removal of on-street parking on one side of the road.

Removal of parking on the north side of the road will result in the loss of 5 x 1P parking spaces. Whereas removal of parking on the south side of the road will result in the loss of 4 x 1P spaces and 1 x Loading Zone. Given the critical



nature of the Loading Zone to the operation of the activity centre, parking on the north side would be removed.



Figure 12: Chester Street – Existing Cross-section at East End

The other key physical change will be at the Chester Street Hanover Street intersection. The current configuration is set up for one-way operation, with a single lane threshold treatment with a width of 4.5m. The introduction of exit movements will require re-design of the threshold treatment for two-way operation. This would be likely to include a reduction in the kerb extension and a resultant widening of the carriageway width.

An indicative diagram of general arrangement of the modification works required is shown in Figure 13 below.

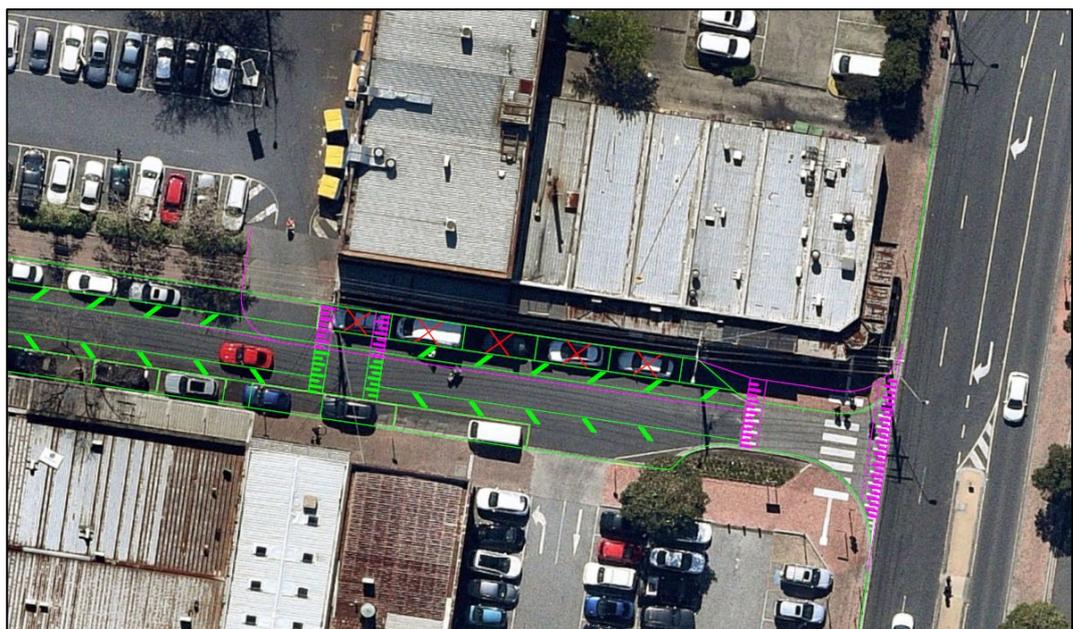
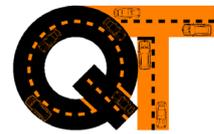


Figure 13: Indicative Diagram – Chester Street Reconfiguration (Aerial Source: Nearmap)



At a feasibility level, we are satisfied that layout could be achieved on Chester Street to accommodate two-way operation between Hanover Street the Chester Street Car Park (north) eastern access. In particular, the modifications could be limited to the existing carriageway and therefore there would be no impact behind the existing kerb (i.e. footpath, etc.).

Should Council wish to proceed with the proposal, we recommend that formal functional layout plan is prepared that considers the key design vehicles, swept path, existing features, underground services, etc.

4.7 Chester Street Car Park Access Points

A key component of the proposed configuration is the control of vehicle movements at the northern car park access point. The proposal seeks to have entry movements via the western crossover and exit movement (left out only) via the eastern crossover.

Whilst under the existing conditions entry movements are intended to occur via the eastern crossover and exit movements via the western crossover, this arrangement is only designated with arrow pavement markings. Photographs of the existing conditions at each access point are provided below.



Figure 14: Car Park Access – East Entry

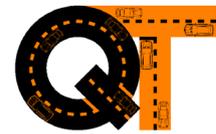


Figure 15: Car Park Access – West Exit

Based on the traffic data summarised previously in Section 2.4, there are a number of vehicles throughout the day that are travelling against the existing access controls.

To maximise the compliance with the proposed two-way configuration, we recommend that more comprehensive linemarking and signage is used if the two-way option is implemented. Furthermore, consideration should be given to a physical control (i.e. island) to reinforce the left out only designation of the eastern car park exit.

The traffic redistribution analysis undertaken in Section 4.2 has been undertaken on the basis that 100% compliance occurs with the proposed scheme. Given that westbound vehicle movements will still be permitted on Chester Street, the scheme relies on drivers following the left out restriction to achieve the numbers quoted. It is likely that there will be a level of non-compliance and it is unlikely



that Victoria Police would enforce the proposed left out only restriction. Therefore, the benefits of the two-way scheme (i.e. the reduction of traffic volumes on Chester Street past Eaton Mall) are unlikely to reach the 100% compliance numbers identified in Section 4.3.

4.8 Traffic Flow Implications

4.8.1 Atherton Street / Hanover Street Intersection

The two-way operation will result additional traffic volumes exiting left out from Chester Street at Hanover Street. On this basis, traffic volumes travelling northbound on Hanover Street will increase (noting that some existing volumes would already redistribute via Portman Street and exit the area via Hanover Street).

The majority of these vehicles will travel through the traffic signals at Atherton Street / Hanover Street. On this basis, we would expect increased delays and queue lengths on the south approach of the intersection (particularly during peak hours when capacity is most constrained under the existing condition). A summary of these movements is provided in Figure 16 below.



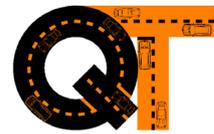
Figure 16: Additional Volumes at Atherton Rd / Hanover St (Aerial Source: Nearmap)

4.8.2 Vehicles Circulating for Car Parking

Under the existing conditions, if the Chester Street north car park is full, vehicles exit and travel westbound on Chester Street to search for other vacant car parking spaces.

With the proposed two-way configuration, if the Chester Street north car park is full, vehicles would either access the Chester Street south car park or access the Hanover Street car park.

Given that the proposal directs all vehicle left out of Chester Street, vehicles circulating for a car park are likely to attempt to access the Hanover Street car



park via the northern access point (approximately 40m south of Atherton Road). A summary of this movement is shown in Figure 17 below.



Figure 17: Likely Circulation into Hanover Street Car Park (Aerial Source: Nearmap)

The above movement into the Hanover Street car park requires vehicles to cross two traffic lanes in the opposing direction and occurs without a dedicated turn lane and hence any delays will result in queuing on Hanover Street. Given the 'overlapping' nature of the right turns into Chester Street and the Hanover Street car park, it is possible that queuing in the right turn lane into Chester Street could block movements and vice versa.

4.9 Pedestrian Safety Implication

4.9.1 Eaton Mall Benefits

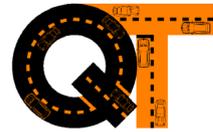
A key objective of the two-way option is to reduce traffic volumes travelling westbound on Chester Street past Eaton Mall.

Under the existing conditions the pedestrian crossing at Eaton Mall is controlled by traffic signals. On this basis, vehicle and pedestrian movements are controlled and separated.

The proposal will result in traffic volume reductions in the order of 700-750 vehicles in the 12 hour period between 7am-7pm. This will result in 7am-7pm traffic volumes reducing from 2,600-2,700 vehicles to 1,800-2,000 vehicles.

Whilst the above traffic volume reduction will result in reduction to pedestrian exposure to vehicles, we are of the view that there will be limited benefits at the Eaton Mall crossing (due to the existing signalised crossing).

The reduced exposure will result in pedestrian safety benefits along other sections of Eaton Mall, where pedestrian cross the road in an uncontrolled manner.



4.9.2 Implications at Hanover Street

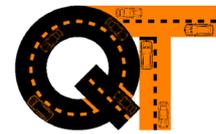
The proposal will introduce two-way vehicle movements between the eastern car park exit for the Chester Street north car park and Hanover Street. This will result in a range of pedestrian implications as follows:

- **Hanover Street Zebra Crossing:** The existing zebra crossing threshold treatment will be widened and vehicles will approach from both directions. This arrangement has a number of disadvantages compared to the existing conditions including a longer walking distance and vehicles approaching from multiple directions.
- **Mid-Block Pedestrian Movements:** The introduction of two-way vehicle movements will have a negative impact on pedestrian safety for pedestrians crossing the road in an uncontrolled manner. Whilst the complexity of these crossing movements is increased by having vehicles approaching from both directions, the key issue relates to pedestrian expectations. The majority of roads within the Oakleigh Activity Centre operate in a one-way configuration and have done so for a very long time (the 1966 Edition 1 of Melway shows the current one-way operation). On this basis, pedestrians are likely to have an expectation of one-way operation on the roads within the activity centre and may not expect vehicles to be operating in both directions. In the worst case, pedestrians may not look for on-coming vehicles in both directions.

4.9.3 Summary

From a pedestrian safety perspective, the proposed two-way operation at the eastern end is expected to have limited benefits at Eaton Mall given the existing signalised pedestrian crossing.

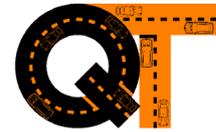
Whilst there will be benefits associated with reduced traffic volumes for pedestrians crossing mid-block on Chester Street (west of the proposed two-way operation), there will be increased pedestrian risk at the Hanover Street zebra crossing and potential for pedestrians crossing mid-block (in the new two-way section) to not be aware of the two-way operation.



5 Conclusions

Having undertaken an assessment of the feasibility of a two-way option on Chester Street, Oakleigh, the following conclusions are reached:

1. Council has proposed a two-way option on Chester Street between Hanover Street and the northern car park eastern access. All movements exiting the northern Chester Street car park will be directed east to Hanover Street in an effort to reduce westbound traffic volumes on Chester Street on Eaton Mall.
2. An assessment of the likely traffic volumes as a result of the two-way option has identified the following likely 7am-7pm traffic volumes westbound on Chester Street past Eaton Mall:
 - a. Thursday: 1,878 vehicles – Reduction of 741 vehicles (-28%)
 - b. Saturday: 2,080 vehicles – Reduction of 717 vehicles (-26%)
3. A key component of the two-way proposal is to reduced traffic volumes to a level where a shared zone could be considered in the future. A review of the Department of Transport (DOT) guidelines for the introduction of shared zones indicates that the likely volumes are still above the threshold of 1,000 vehicles between 7am-7pm. Furthermore, peak hour volumes of greater than 200 vehicles/hour are still expected. Therefore, the two-way proposal alone, would not reduce traffic volumes enough for the implementation of a shared area on Chester Street at Eaton Mall.
4. A SIDRA model has been prepared for the Hanover Street / Chester Street intersection to assess the impact of introducing left out movement from Chester Street to Hanover Street. The model indicates that the additional volumes will have a minor impact on intersection capacity / operation. Average delays for the left turn movement are predicted to be approximately 9 seconds, with 95th percentile queue lengths of less than 1 vehicle.
5. A review the physical modifications required for Chester Street to accommodate two-way operation has identified the following:
 - a. The existing carriageway width between parking is approximately 5.8m wide, which is less than the typical minimum of 6m required for two-way operation. On this basis, the removal of parking is likely to be required on one side of Chester Street.
 - b. A review of the existing on-street parking indicates that parking loss is preferable on the north side, as a Loading Zone is located on the south side of the road.
 - c. The existing threshold treatment / zebra crossing at Chester Street / Hanover Street will need to be modified to allow for two-way operation.
 - d. Comprehensive linemarking and signage is recommended for to clearly define the entry and exit movements from the Chester Street northern car park. Furthermore, consideration should be given to a physical



- control (i.e. islands) to reinforce the left out only designation of the eastern car park exit.
- e. At a feasibility level, a layout could be achieved on the existing Chester Street carriageway to accommodate two-way operation between Hanover Street the Chester Street northern car park eastern access.
 - f. Should Council wish to proceed with the proposal, we recommend that formal functional layout plan is prepared that considers the key design vehicles, swept path, existing features, underground services, etc.
6. The proposed two-way operation will result in broader traffic flow implications as follows:
- a. The volume of vehicles utilising the south leg of Atherton Road / Hanover Street is likely to increase and therefore likely to result in additional delays and queue lengths.
 - b. Vehicles circulating for vacant car park are likely to access the Hanover Street car park north access (due to the left out only proposal at Chester Street / Hanover Street). This car park access overlaps with the Chester Street right turn lane and is likely to result in additional delays / queueing.
7. A review of the broad pedestrian safety implication of the proposal has identified the following:
- a. The proposed two-way operation at the eastern end is expected to have limited benefits at Eaton Mall given the existing signalised pedestrian crossing.
 - b. Whilst there will be benefits associated with reduced traffic volumes for pedestrians crossing mid-block on Chester Street (west of the proposed two-way operation), there will be increased pedestrian risk at the Hanover Street zebra crossing and potential for pedestrians crossing mid-block in the new two-way section to not be aware of the two-way operation.

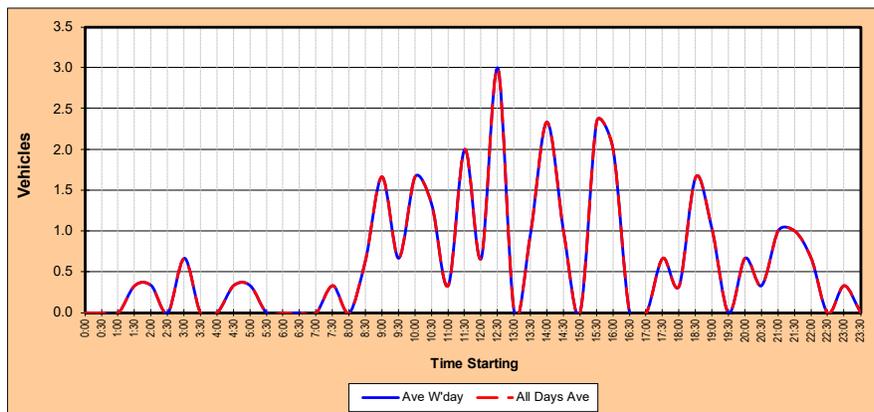


Appendix A

2020 Tube Count Data

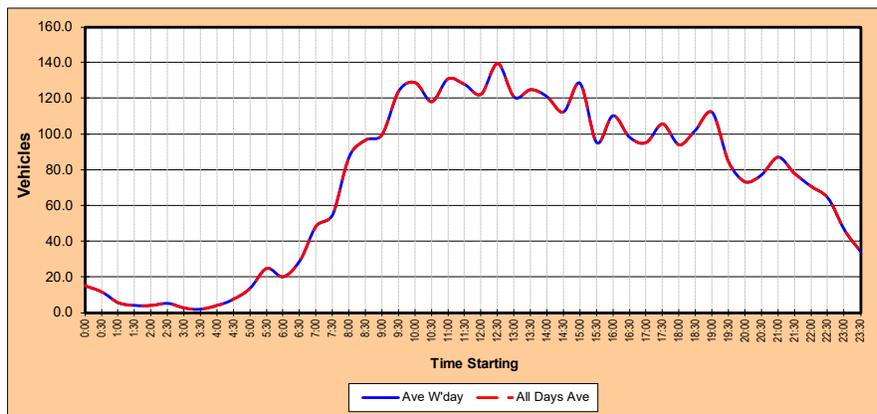
Road	18 Chester Street	Average Weekday	31
Location		All Day Average	31
Suburb	Oakleigh	Weekday Heavy's	0.0%
Site No.	599901	All Day Heavy's	0.0%
Start Date	Tuesday 25/02/2020		
Direction	Eastbound		

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue 25-Feb	Wed 26-Feb	Thu 27-Feb	Fri	Sat	Sun		
AM Peak		2	4	3					
PM Peak		4	5	3					
0:00		0	0	0			0	0	
0:30		0	0	0			0	0	
1:00		0	0	0			0	0	
1:30		0	0	1			0	0	
2:00		0	1	0			0	0	
2:30		0	0	0			0	0	
3:00		1	0	1			1	1	
3:30		0	0	0			0	0	
4:00		0	0	0			0	0	
4:30		0	0	1			0	0	
5:00		0	0	1			0	0	
5:30		0	0	0			0	0	
6:00		0	0	0			0	0	
6:30		0	0	0			0	0	
7:00		0	0	0			0	0	
7:30		1	0	0			0	0	
8:00		0	0	0			0	0	
8:30		1	0	1			1	1	
9:00		1	2	2			2	2	
9:30		0	2	0			1	1	
10:00		2	0	3			2	2	
10:30		0	1	3			1	1	
11:00		0	1	0			0	0	
11:30		0	4	2			2	2	
12:00		0	2	0			1	1	
12:30		4	4	1			3	3	
13:00		0	0	0			0	0	
13:30		0	1	2			1	1	
14:00		1	5	1			2	2	
14:30		0	1	2			1	1	
15:00		0	0	0			0	0	
15:30		2	2	3			2	2	
16:00		3	1	2			2	2	
16:30		0	0	0			0	0	
17:00		0	0	0			0	0	
17:30		1	0	1			1	1	
18:00		0	1	0			0	0	
18:30		3	1	1			2	2	
19:00		1	1	1			1	1	
19:30		0	0	0			0	0	
20:00		0	0	2			1	1	
20:30		0	1	0			0	0	
21:00		0	1	2			1	1	
21:30		2	0	1			1	1	
22:00		0	1	1			1	1	
22:30		0	0	0			0	0	
23:00		0	0	1			0	0	
23:30		0	0	0			0	0	
Total		23	33	36			31	31	
% Heavies		0.0%	0.0%	0.0%			0.0%	0.0%	



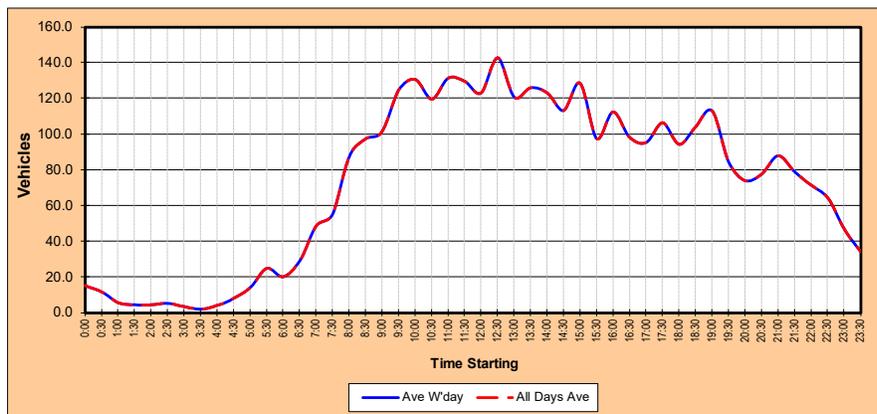
Road	18 Chester Street	
Location		Average Weekday 3467
Suburb	Oakleigh	All Day Average 3467
Site No.	599901	Weekday Heavy's 4.8%
Start Date	Tuesday 25/02/2020	All Day Heavy's 4.8%
Direction	Westbound	

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
		25-Feb	26-Feb	27-Feb					
AM Peak		130	148	142					
PM Peak		129	151	140					
0:00		9	16	20				15	15
0:30		12	11	12				12	12
1:00		3	7	7				6	6
1:30		3	2	7				4	4
2:00		6	3	3				4	4
2:30		5	9	2				5	5
3:00		2	1	5				3	3
3:30		2	2	2				2	2
4:00		3	4	5				4	4
4:30		6	9	8				8	8
5:00		7	15	19				14	14
5:30		26	18	30				25	25
6:00		17	21	23				20	20
6:30		22	26	39				29	29
7:00		47	51	48				49	49
7:30		57	51	57				55	55
8:00		77	106	80				88	88
8:30		89	103	98				97	97
9:00		94	102	103				100	100
9:30		130	136	106				124	124
10:00		121	124	142				129	129
10:30		114	103	138				118	118
11:00		112	148	133				131	131
11:30		130	141	112				128	128
12:00		106	135	126				122	122
12:30		129	151	139				140	140
13:00		109	113	140				121	121
13:30		115	130	130				125	125
14:00		117	117	129				121	121
14:30		119	111	107				112	112
15:00		126	134	126				129	129
15:30		88	91	107				95	95
16:00		101	112	118				110	110
16:30		95	95	105				98	98
17:00		92	92	102				95	95
17:30		108	95	114				106	106
18:00		76	90	116				94	94
18:30		76	98	134				103	103
19:00		114	97	125				112	112
19:30		93	41	120				85	85
20:00		90	5	125				73	73
20:30		82	76	74				77	77
21:00		70	95	96				87	87
21:30		76	65	93				78	78
22:00		75	73	64				71	71
22:30		52	63	78				64	64
23:00		42	36	62				47	47
23:30		28	40	34				34	34
Total		3273	3364	3763				3467	3467
% Heavies		5.2%	4.5%	4.7%				4.8%	4.8%



Road	18 Chester Street	
Location		Average Weekday 3497
Suburb	Oakleigh	All Day Average 3497
Site No.	599901	Weekday Heavy's 4.7%
Start Date	Tuesday 25/02/2020	All Day Heavy's 4.7%
Direction	Two ways	

Starting Time	Day of Week							Ave W'day	All Days Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
		25-Feb	26-Feb	27-Feb					
AM Peak		130	149	145					
PM Peak		133	155	140					
0:00		9	16	20			15	15	
0:30		12	11	12			12	12	
1:00		3	7	7			6	6	
1:30		3	2	8			4	4	
2:00		6	4	3			4	4	
2:30		5	9	2			5	5	
3:00		3	1	6			3	3	
3:30		2	2	2			2	2	
4:00		3	4	5			4	4	
4:30		6	9	9			8	8	
5:00		7	15	20			14	14	
5:30		26	18	30			25	25	
6:00		17	21	23			20	20	
6:30		22	26	39			29	29	
7:00		47	51	48			49	49	
7:30		58	51	57			55	55	
8:00		77	106	80			88	88	
8:30		90	103	99			97	97	
9:00		95	104	105			101	101	
9:30		130	138	106			125	125	
10:00		123	124	145			131	131	
10:30		114	104	141			120	120	
11:00		112	149	133			131	131	
11:30		130	145	114			130	130	
12:00		106	137	126			123	123	
12:30		133	155	140			143	143	
13:00		109	113	140			121	121	
13:30		115	131	132			126	126	
14:00		118	122	130			123	123	
14:30		119	112	109			113	113	
15:00		126	134	126			129	129	
15:30		90	93	110			98	98	
16:00		104	113	120			112	112	
16:30		95	95	105			98	98	
17:00		92	92	102			95	95	
17:30		109	95	115			106	106	
18:00		76	91	116			94	94	
18:30		79	99	135			104	104	
19:00		115	98	126			113	113	
19:30		93	41	120			85	85	
20:00		90	5	127			74	74	
20:30		82	77	74			78	78	
21:00		70	96	98			88	88	
21:30		78	65	94			79	79	
22:00		75	74	65			71	71	
22:30		52	63	78			64	64	
23:00		42	36	63			47	47	
23:30		28	40	34			34	34	
Total		3296	3397	3799			3497	3497	
% Heavies		5.2%	4.4%	4.6%			4.7%	4.7%	





Appendix B

2022 Turning Movement Count Data

North Car Park - West Access

Thursday 10th November 2022

Time		Car Park Exit		East - Chester Street		TOTAL	Hourly
Period Start	Period End	R	L	R	WB		
10:00	10:15	28	0	0	56	84	296
10:15	10:30	20	0	0	52	72	274
10:30	10:45	18	0	1	58	77	245
10:45	11:00	17	0	1	45	63	238
11:00	11:15	15	0	1	46	62	246
11:15	11:30	11	0	0	32	43	263
11:30	11:45	18	0	2	50	70	282
11:45	12:00	20	0	1	50	71	281
12:00	12:15	21	0	1	57	79	270
12:15	12:30	13	0	3	46	62	247
12:30	12:45	13	0	0	56	69	237
12:45	13:00	14	0	1	45	60	234
13:00	13:15	17	0	0	39	56	233
13:15	13:30	14	0	0	38	52	234
13:30	13:45	15	0	4	47	66	258
13:45	14:00	17	0	0	42	59	250
14:00	14:15	8	0	0	49	57	246
14:15	14:30	24	0	0	52	76	237
14:30	14:45	9	0	0	49	58	211
14:45	15:00	12	0	0	43	55	192
15:00	15:15	11	0	0	37	48	187
15:15	15:30	7	0	0	43	50	204
15:30	15:45	7	0	0	32	39	216
15:45	16:00	7	0	0	43	50	232
16:00	16:15	8	0	1	56	65	231
16:15	16:30	11	0	2	49	62	223
16:30	16:45	10	0	0	45	55	206
16:45	17:00	6	0	1	42	49	204
17:00	17:15	11	0	0	46	57	207
17:15	17:30	11	0	1	33	45	196
17:30	17:45	10	0	1	42	53	195
17:45	18:00	8	0	1	43	52	207
18:00	18:15	9	0	2	35	46	215
18:15	18:30	7	0	4	33	44	236
18:30	18:45	18	1	2	44	65	248
18:45	19:00	16	0	3	41	60	233
19:00	19:15	18	0	3	46	67	227
19:15	19:30	14	0	1	41	56	203
19:30	19:45	9	0	1	40	50	195
19:45	20:00	14	0	2	38	54	183
20:00	20:15	9	0	1	33	43	168
20:15	20:30	12	0	0	36	48	
20:30	20:45	10	0	1	27	38	
20:45	21:00	7	0	0	32	39	
TOTAL		574	1	42	1909	2526	

North Car Park - East Access

Thursday 10th November 2022

Time		Car Park Entry		East - Chester Street		TOTAL	Peak
Period Start	Period End	R	L	R	WB		
10:00	10:15	0	0	23	50	73	280
10:15	10:30	2	0	22	54	78	268
10:30	10:45	1	0	12	58	71	247
10:45	11:00	0	0	13	45	58	246
11:00	11:15	0	0	17	44	61	261
11:15	11:30	0	0	18	39	57	271
11:30	11:45	2	0	18	50	70	279
11:45	12:00	2	0	21	50	73	288
12:00	12:15	1	0	14	56	71	277
12:15	12:30	2	0	15	48	65	260
12:30	12:45	4	0	19	56	79	243
12:45	13:00	2	0	19	41	62	222
13:00	13:15	0	0	14	40	54	214
13:15	13:30	0	0	12	36	48	230
13:30	13:45	1	1	9	47	58	241
13:45	14:00	1	0	14	39	54	248
14:00	14:15	2	0	16	52	70	252
14:15	14:30	1	0	9	49	59	222
14:30	14:45	1	0	11	53	65	209
14:45	15:00	0	0	13	45	58	189
15:00	15:15	0	0	10	30	40	192
15:15	15:30	0	0	8	38	46	217
15:30	15:45	0	0	7	38	45	228
15:45	16:00	0	1	15	45	61	234
16:00	16:15	1	0	7	57	65	228
16:15	16:30	2	0	6	49	57	216
16:30	16:45	1	0	9	41	51	210
16:45	17:00	0	0	7	48	55	213
17:00	17:15	0	0	11	42	53	215
17:15	17:30	1	0	14	36	51	209
17:30	17:45	0	0	10	44	54	207
17:45	18:00	0	0	10	47	57	222
18:00	18:15	0	0	10	37	47	235
18:15	18:30	1	0	12	36	49	257
18:30	18:45	4	0	22	43	69	261
18:45	19:00	2	0	22	46	70	248
19:00	19:15	5	0	20	44	69	228
19:15	19:30	0	0	11	42	53	203
19:30	19:45	2	0	15	39	56	203
19:45	20:00	3	0	9	38	50	181
20:00	20:15	2	0	13	29	44	173
20:15	20:30	1	0	15	37	53	
20:30	20:45	1	0	9	24	34	
20:45	21:00	0	0	9	33	42	
TOTAL		48	2	590	1915	2555	

South Car Park Access

Thursday 10th November 2022

Time		East - Chester Street		Car Park Exit		TOTAL	Peak
Period Start	Period End	WB	L	L	TOTAL		
10:00	10:15	73	11	3	87	331	
10:15	10:30	74	7	3	84	318	
10:30	10:45	75	13	3	91	305	
10:45	11:00	57	11	1	69	297	
11:00	11:15	55	17	2	74	318	
11:15	11:30	54	12	5	71	323	
11:30	11:45	63	17	3	83	327	
11:45	12:00	74	14	2	90	331	
12:00	12:15	63	11	5	79	312	
12:15	12:30	57	15	3	75	302	
12:30	12:45	70	14	3	87	285	
12:45	13:00	54	14	3	71	268	
13:00	13:15	51	15	3	69	260	
13:15	13:30	43	13	2	58	266	
13:30	13:45	58	12	0	70	274	
13:45	14:00	53	10	0	63	274	
14:00	14:15	60	9	6	75	280	
14:15	14:30	52	10	4	66	255	
14:30	14:45	60	6	4	70	242	
14:45	15:00	56	12	1	69	228	
15:00	15:15	38	10	2	50	223	
15:15	15:30	43	6	4	53	244	
15:30	15:45	43	11	2	56	250	
15:45	16:00	58	4	2	64	249	
16:00	16:15	59	10	2	71	248	
16:15	16:30	54	4	1	59	240	
16:30	16:45	49	4	2	55	242	
16:45	17:00	51	10	2	63	250	
17:00	17:15	52	10	1	63	252	
17:15	17:30	47	11	3	61	261	
17:30	17:45	49	13	1	63	263	
17:45	18:00	59	6	0	65	276	
18:00	18:15	47	23	2	72	297	
18:15	18:30	49	13	1	63	301	
18:30	18:45	60	13	3	76	301	
18:45	19:00	64	16	6	86	290	
19:00	19:15	60	14	2	76	266	
19:15	19:30	50	12	1	63	239	
19:30	19:45	53	11	1	65	233	
19:45	20:00	48	13	1	62	207	
20:00	20:15	37	9	3	49	189	
20:15	20:30	50	4	3	57		
20:30	20:45	33	4	2	39		
20:45	21:00	40	2	2	44		
TOTAL		2395	476	105	2976		

Chester / Hanover

Thursday 10th November 2022

Time		North - Chester Street		South - Chester Street		Hourly Total	
Period Start	Period End	R	SB	NB	L	Hour	Peak
10:00	10:15	43	74	127	43	170	653
10:15	10:30	42	93	134	39	173	653
10:30	10:45	57	86	124	33	157	637
10:45	11:00	32	98	120	33	153	618
11:00	11:15	35	76	131	39	170	626
11:15	11:30	33	80	122	35	157	623
11:30	11:45	41	79	104	34	138	636
11:45	12:00	40	87	114	47	161	647
12:00	12:15	33	95	127	40	167	646
12:15	12:30	32	95	130	40	170	619
12:30	12:45	47	79	110	39	149	604
12:45	13:00	30	91	124	36	160	615
13:00	13:15	39	73	113	27	140	630
13:15	13:30	20	115	120	35	155	642
13:30	13:45	28	83	118	42	160	630
13:45	14:00	31	82	141	34	175	646
14:00	14:15	33	72	113	39	152	637
14:15	14:30	36	68	114	29	143	639
14:30	14:45	30	76	142	34	176	695
14:45	15:00	37	97	134	32	166	716
15:00	15:15	31	93	137	17	154	757
15:15	15:30	22	126	172	27	199	778
15:30	15:45	23	125	165	32	197	764
15:45	16:00	23	101	172	35	207	758
16:00	16:15	33	109	137	38	175	732
16:15	16:30	17	95	145	40	185	773
16:30	16:45	16	117	157	34	191	777
16:45	17:00	30	105	151	30	181	765
17:00	17:15	26	106	179	37	216	770
17:15	17:30	23	119	154	35	189	743
17:30	17:45	26	98	145	34	179	715
17:45	18:00	35	113	156	30	186	691
18:00	18:15	26	105	144	45	189	659
18:15	18:30	33	76	132	29	161	624
18:30	18:45	29	76	112	43	155	575
18:45	19:00	39	67	111	43	154	548
19:00	19:15	40	63	119	35	154	503
19:15	19:30	36	49	83	29	112	444
19:30	19:45	28	44	95	33	128	445
19:45	20:00	36	52	78	31	109	393
20:00	20:15	26	41	73	22	95	357
20:15	20:30	20	41	82	31	113	
20:30	20:45	17	30	59	17	76	
20:45	21:00	24	37	54	19	73	
TOTAL		1378	3687	5474	1496	6970	

Overall Volumes

Thursday 10th November 2022

Time		TOTAL	PEAK HOUR
Period Start	Period End		
10:00	10:15	531	2085
10:15	10:30	542	2032
10:30	10:45	539	1931
10:45	11:00	473	1873
11:00	11:15	478	1922
11:15	11:30	441	1968
11:30	11:45	481	2026
11:45	12:00	522	2055
12:00	12:15	524	2007
12:15	12:30	499	1914
12:30	12:45	510	1863
12:45	13:00	474	1818
13:00	13:15	431	1808
13:15	13:30	448	1836
13:30	13:45	465	1836
13:45	14:00	464	1846
14:00	14:15	459	1864
14:15	14:30	448	1821
14:30	14:45	475	1869
14:45	15:00	482	1879
15:00	15:15	416	1903
15:15	15:30	496	2005
15:30	15:45	485	1984
15:45	16:00	506	1984
16:00	16:15	518	1961
16:15	16:30	475	1964
16:30	16:45	485	1977
16:45	17:00	483	1965
17:00	17:15	521	1990
17:15	17:30	488	1954
17:30	17:45	473	1892
17:45	18:00	508	1889
18:00	18:15	485	1857
18:15	18:30	426	1841
18:30	18:45	470	1784
18:45	19:00	476	1685
19:00	19:15	469	1572
19:15	19:30	369	1401
19:30	19:45	371	1364
19:45	20:00	363	1227
20:00	20:15	298	1123
20:15	20:30	332	-
20:30	20:45	234	-
20:45	21:00	259	-
TOTAL		20092	-

North Car Park - West Access

Saturday, 12th November 2022

Time		Car Park Exit		East - Chester Street		TOTAL	Hourly
Period Start	Period End	R	L	R	WB		
10:00	10:15	14	0	2	44	60	269
10:15	10:30	15	0	3	39	57	277
10:30	10:45	18	0	2	56	76	295
10:45	11:00	23	0	0	53	76	289
11:00	11:15	13	0	1	54	68	288
11:15	11:30	18	0	0	57	75	300
11:30	11:45	16	0	1	53	70	279
11:45	12:00	19	0	1	55	75	282
12:00	12:15	15	0	0	65	80	278
12:15	12:30	12	0	0	42	54	266
12:30	12:45	20	0	0	53	73	293
12:45	13:00	14	0	0	57	71	288
13:00	13:15	21	0	0	47	68	285
13:15	13:30	18	0	1	62	81	276
13:30	13:45	16	0	0	52	68	261
13:45	14:00	18	0	1	49	68	263
14:00	14:15	16	0	2	41	59	252
14:15	14:30	18	0	2	46	66	250
14:30	14:45	17	0	1	52	70	260
14:45	15:00	11	0	2	44	57	244
15:00	15:15	14	0	0	43	57	238
15:15	15:30	21	0	2	53	76	240
15:30	15:45	11	0	1	42	54	214
15:45	16:00	16	0	1	34	51	216
16:00	16:15	16	0	0	43	59	214
16:15	16:30	12	0	0	38	50	208
16:30	16:45	16	0	2	38	56	204
16:45	17:00	10	0	2	37	49	201
17:00	17:15	12	0	2	39	53	214
17:15	17:30	6	0	2	38	46	218
17:30	17:45	13	0	2	38	53	233
17:45	18:00	7	0	6	49	62	238
18:00	18:15	16	0	1	40	57	238
18:15	18:30	9	0	3	49	61	247
18:30	18:45	16	0	0	42	58	244
18:45	19:00	19	0	0	43	62	253
19:00	19:15	14	0	1	51	66	254
19:15	19:30	11	0	1	46	58	234
19:30	19:45	12	0	2	53	67	219
19:45	20:00	19	0	0	44	63	214
20:00	20:15	12	0	2	32	46	203
20:15	20:30	12	0	0	31	43	
20:30	20:45	7	0	1	54	62	
20:45	21:00	10	0	1	41	52	
TOTAL		643	0	51	2039	2733	

North Car Park - East Access

Saturday, 12th November 2022

Time		Car Park Entry		East - Chester Street		TOTAL	Peak
Period Start	Period End	R	L	R	WB		
10:00	10:15	0	0	16	49	65	271
10:15	10:30	0	0	16	41	57	278
10:30	10:45	3	0	23	58	84	296
10:45	11:00	1	0	14	50	65	285
11:00	11:15	1	0	16	55	72	295
11:15	11:30	1	0	22	52	75	300
11:30	11:45	0	0	15	58	73	287
11:45	12:00	3	0	20	52	75	290
12:00	12:15	4	0	14	59	77	299
12:15	12:30	1	0	16	45	62	289
12:30	12:45	2	0	20	54	76	304
12:45	13:00	1	0	20	63	84	301
13:00	13:15	1	0	21	45	67	284
13:15	13:30	0	0	15	62	77	277
13:30	13:45	0	0	23	50	73	252
13:45	14:00	2	0	14	51	67	255
14:00	14:15	0	0	16	44	60	245
14:15	14:30	2	0	11	39	52	243
14:30	14:45	2	0	19	55	76	248
14:45	15:00	4	0	11	42	57	224
15:00	15:15	0	0	12	46	58	217
15:15	15:30	0	0	10	47	57	208
15:30	15:45	0	0	9	43	52	197
15:45	16:00	0	0	11	39	50	192
16:00	16:15	0	0	5	44	49	191
16:15	16:30	0	0	10	36	46	187
16:30	16:45	0	0	11	36	47	190
16:45	17:00	0	0	9	40	49	200
17:00	17:15	1	0	8	36	45	221
17:15	17:30	1	0	13	35	49	238
17:30	17:45	2	0	15	40	57	244
17:45	18:00	0	0	15	55	70	254
18:00	18:15	1	1	18	42	62	251
18:15	18:30	2	0	8	45	55	260
18:30	18:45	1	0	19	47	67	266
18:45	19:00	0	0	21	46	67	275
19:00	19:15	2	0	17	52	71	268
19:15	19:30	3	0	12	46	61	241
19:30	19:45	4	0	19	53	76	216
19:45	20:00	4	0	16	40	60	209
20:00	20:15	1	0	10	33	44	205
20:15	20:30	1	0	7	28	36	
20:30	20:45	1	1	14	53	69	
20:45	21:00	1	0	12	43	56	
TOTAL		53	2	643	2049	2747	

South Car Park Access

Saturday 12th November 2022

Time		East - Chester Street		Car Park Exit	TOTAL	Peak
Period Start	Period End	WB	L	L		
10:00	10:15	64	21	1	86	339
10:15	10:30	59	17	0	76	343
10:30	10:45	80	12	1	93	353
10:45	11:00	70	14	0	84	349
11:00	11:15	67	19	4	90	351
11:15	11:30	69	15	2	86	342
11:30	11:45	69	17	3	89	334
11:45	12:00	72	12	2	86	331
12:00	12:15	65	12	4	81	346
12:15	12:30	56	19	3	78	350
12:30	12:45	70	14	2	86	361
12:45	13:00	82	14	5	101	354
13:00	13:15	66	16	3	85	335
13:15	13:30	77	10	2	89	321
13:30	13:45	68	9	2	79	297
13:45	14:00	67	13	2	82	304
14:00	14:15	57	13	1	71	286
14:15	14:30	45	18	2	65	282
14:30	14:45	72	11	3	86	284
14:45	15:00	47	11	6	64	264
15:00	15:15	57	9	1	67	259
15:15	15:30	55	8	4	67	248
15:30	15:45	45	17	4	66	230
15:45	16:00	47	9	3	59	228
16:00	16:15	47	7	2	56	223
16:15	16:30	41	4	4	49	224
16:30	16:45	48	16	0	64	231
16:45	17:00	43	10	1	54	238
17:00	17:15	45	11	1	57	261
17:15	17:30	44	11	1	56	277
17:30	17:45	57	14	0	71	292
17:45	18:00	65	11	1	77	305
18:00	18:15	63	9	1	73	314
18:15	18:30	52	16	3	71	319
18:30	18:45	62	19	3	84	321
18:45	19:00	65	20	1	86	317
19:00	19:15	67	9	2	78	302
19:15	19:30	54	16	3	73	275
19:30	19:45	69	9	2	80	243
19:45	20:00	56	13	2	71	232
20:00	20:15	41	8	2	51	231
20:15	20:30	32	5	4	41	
20:30	20:45	62	4	3	69	
20:45	21:00	52	13	5	70	
TOTAL		2591	555	101	3247	

Chester / Hanover

Saturday, 12th November 2022

Time		North - Chester Street		South - Chester Street		Hourly Total	
Period Start	Period End	R	SB	NB	L	Hour	Peak
10:00	10:15	38	74	126	48	174	667
10:15	10:30	40	80	128	33	161	667
10:30	10:45	40	92	115	51	166	678
10:45	11:00	39	89	122	44	166	683
11:00	11:15	47	87	135	39	174	684
11:15	11:30	40	76	129	43	172	702
11:30	11:45	40	96	126	45	171	717
11:45	12:00	44	119	129	38	167	751
12:00	12:15	42	117	154	38	192	773
12:15	12:30	37	95	150	37	187	757
12:30	12:45	40	93	161	44	205	752
12:45	13:00	37	91	134	55	189	733
13:00	13:15	42	94	136	40	176	726
13:15	13:30	46	88	142	40	182	713
13:30	13:45	41	94	149	37	186	695
13:45	14:00	36	93	137	45	182	683
14:00	14:15	30	83	123	40	163	666
14:15	14:30	34	79	136	28	164	667
14:30	14:45	37	80	132	42	174	671
14:45	15:00	30	80	137	28	165	672
15:00	15:15	29	67	127	37	164	674
15:15	15:30	24	91	130	38	168	650
15:30	15:45	33	64	147	28	175	649
15:45	16:00	27	80	137	30	167	621
16:00	16:15	32	70	118	22	140	601
16:15	16:30	22	84	145	22	167	612
16:30	16:45	31	83	112	35	147	587
16:45	17:00	27	64	121	26	147	594
17:00	17:15	24	92	117	34	151	579
17:15	17:30	28	64	115	27	142	562
17:30	17:45	38	68	120	34	154	560
17:45	18:00	38	75	92	40	132	540
18:00	18:15	43	57	104	30	134	534
18:15	18:30	42	57	115	25	140	530
18:30	18:45	53	61	104	30	134	510
18:45	19:00	54	59	94	32	126	504
19:00	19:15	36	53	90	40	130	496
19:15	19:30	37	61	88	32	120	464
19:30	19:45	37	48	85	43	128	434
19:45	20:00	29	42	80	38	118	387
20:00	20:15	27	39	77	21	98	362
20:15	20:30	17	23	68	22	90	
20:30	20:45	41	41	56	25	81	
20:45	21:00	36	34	63	30	93	
TOTAL		1585	3277	5206	1556	6762	

Overall Volumes

Saturday, 12th November 2022

Time		TOTAL	PEAK HOUR
Period Start	Period End		
10:00	10:15	497	2038
10:15	10:30	471	2079
10:30	10:45	551	2132
10:45	11:00	519	2120
11:00	11:15	538	2167
11:15	11:30	524	2218
11:30	11:45	539	2207
11:45	12:00	566	2241
12:00	12:15	589	2248
12:15	12:30	513	2191
12:30	12:45	573	2241
12:45	13:00	573	2209
13:00	13:15	532	2164
13:15	13:30	563	2098
13:30	13:45	541	1995
13:45	14:00	528	1977
14:00	14:15	466	1902
14:15	14:30	460	1878
14:30	14:45	523	1901
14:45	15:00	453	1822
15:00	15:15	442	1803
15:15	15:30	483	1767
15:30	15:45	444	1702
15:45	16:00	434	1686
16:00	16:15	406	1642
16:15	16:30	418	1658
16:30	16:45	428	1625
16:45	17:00	390	1638
17:00	17:15	422	1702
17:15	17:30	385	1706
17:30	17:45	441	1747
17:45	18:00	454	1763
18:00	18:15	426	1763
18:15	18:30	426	1771
18:30	18:45	457	1755
18:45	19:00	454	1734
19:00	19:15	434	1663
19:15	19:30	410	1534
19:30	19:45	436	1374
19:45	20:00	383	1301
20:00	20:15	305	1259
20:15	20:30	250	-
20:30	20:45	363	-
20:45	21:00	341	-
TOTAL		20351	-



Appendix C

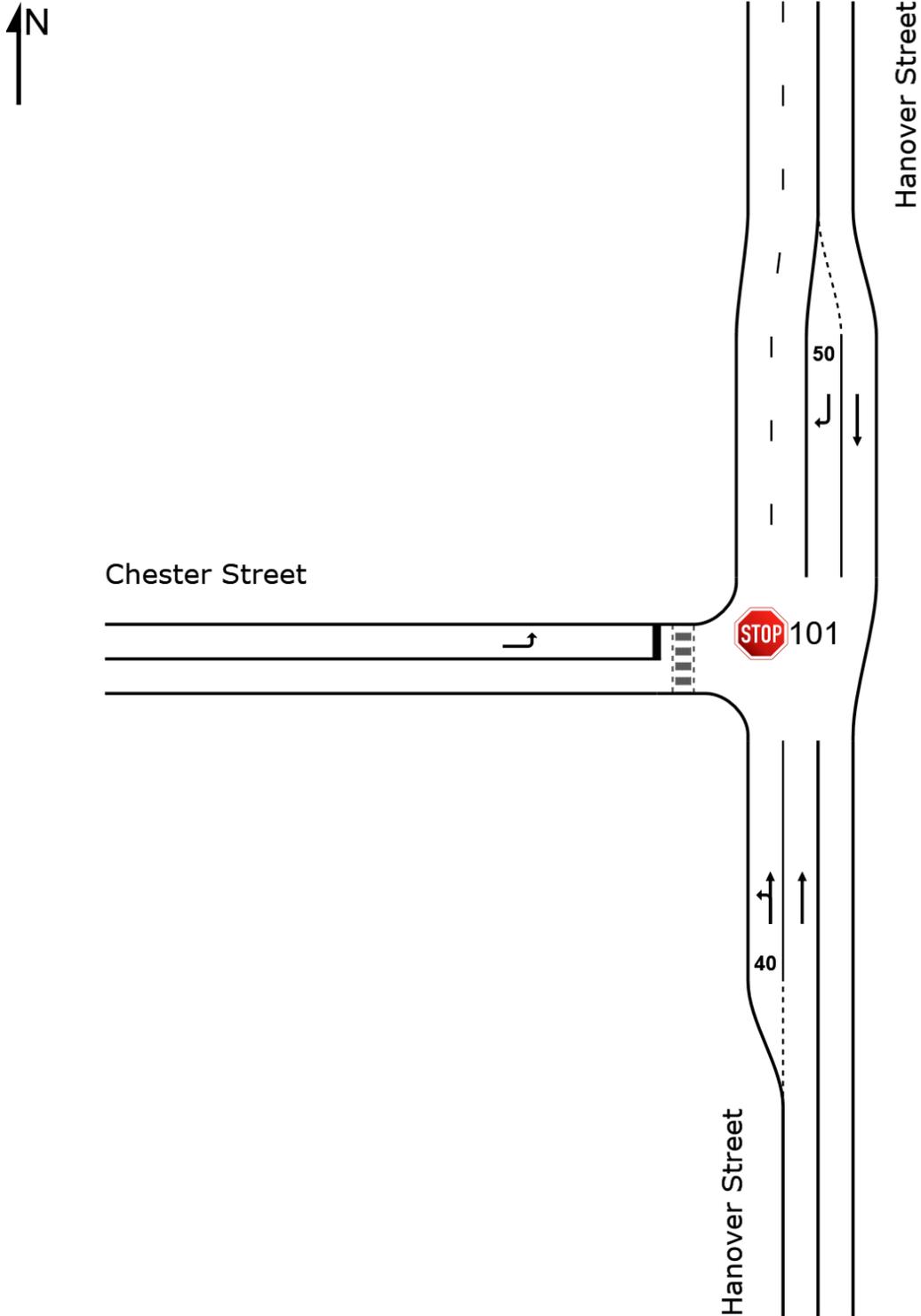
SIDRA Results

SITE LAYOUT

 Site: 101 [Thursday Hanover Peak Hour - 3:15-4:15pm (Site Folder: General)]

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

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



MOVEMENT SUMMARY

Site: 101 [Thursday Hanover Peak Hour - 3:15-4:15pm (Site Folder: General)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Hanover Street														
1	L2	132	0.0	139	0.0	0.217	5.6	LOS A	0.0	0.0	0.00	0.20	0.00	56.5
2	T1	646	5.0	680	5.0	0.217	0.1	LOS A	0.0	0.0	0.00	0.08	0.00	59.1
Approach		778	4.2	819	4.2	0.217	1.0	NA	0.0	0.0	0.00	0.10	0.00	58.7
North: Hanover Street														
8	T1	461	5.0	485	5.0	0.259	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	101	0.0	106	0.0	0.189	11.0	LOS B	0.7	5.0	0.66	0.86	0.66	49.4
Approach		562	4.1	592	4.1	0.259	2.0	NA	0.7	5.0	0.12	0.15	0.12	57.7
West: Chester Street														
10	L2	38	0.0	40	0.0	0.045	9.4	LOS A	0.2	1.1	0.36	0.88	0.36	51.3
Approach		38	0.0	40	0.0	0.045	9.4	LOS A	0.2	1.1	0.36	0.88	0.36	51.3
All Vehicles		1378	4.0	1451	4.0	0.259	1.7	NA	0.7	5.0	0.06	0.14	0.06	58.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 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 [Saturday Peak Hour - 12:00-1:00pm (Site Folder: General)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Hanover Street														
1	L2	174	0.0	183	0.0	0.216	5.6	LOS A	0.0	0.0	0.00	0.27	0.00	56.0
2	T1	599	5.0	631	5.0	0.216	0.1	LOS A	0.0	0.0	0.00	0.09	0.00	59.0
Approach		773	3.9	814	3.9	0.216	1.3	NA	0.0	0.0	0.00	0.13	0.00	58.3
North: Hanover Street														
8	T1	396	5.0	417	5.0	0.222	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	156	0.0	164	0.0	0.289	11.8	LOS B	1.3	8.8	0.68	0.90	0.80	48.9
Approach		552	3.6	581	3.6	0.289	3.4	NA	1.3	8.8	0.19	0.26	0.22	56.3
West: Chester Street														
10	L2	50	0.0	53	0.0	0.056	9.2	LOS A	0.2	1.4	0.33	0.88	0.33	51.4
Approach		50	0.0	53	0.0	0.056	9.2	LOS A	0.2	1.4	0.33	0.88	0.33	51.4
All Vehicles		1375	3.6	1447	3.6	0.289	2.4	NA	1.3	8.8	0.09	0.21	0.10	57.2

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.