

MELBOURNE METRO RAIL PROJECT ENVIRONMENT EFFECTS STATEMENT
INQUIRY AND ADVISORY COMMITTEE

MMRA TECHNICAL NOTE

TECHNICAL NOTE NUMBER: 020
DATE: 10 August 2016
PRECINCT: Parkville, CBD South and Domain Station
EES/MAP BOOK REFERENCE: Not applicable

SUBJECT: Responses to issues raised by the peer review of the Transport Impact Assessment

NOTE:

1. This Technical Note has been prepared by AJM and responds to the issues raised by the peer review of the Transport Impact Assessment exhibited as Appendix D of the Melbourne Metro EES (TIA). The peer review is at Appendix G of the TIA.

PARKVILLE

Issue 1:

Suggestion from the Peer Reviewer in Section 3.1.1 of his report that further analysis and quantification should be made regarding the broader impacts on the network of the closure of Grattan Street during construction.

MMRA Response:

2. Further analysis of the Parkville Precinct construction transport model for the 2021 No Project and Construction scenarios has been undertaken on the modelled area. The results of this analysis is summarised below.

Existing flows and peak periods

3. As additional context, information is provided below in Figures 1 to 6 on the daily flows and peak periods for key roads in the Parkville area based upon data from VicRoads' Traffic Profile Viewer. In Figures 1 to 6, the horizontal axis represents hours of the day, commencing at midnight and finishing at 8PM. The vertical axis represents the total vehicles per hour. Each coloured line corresponds with a day of the week.

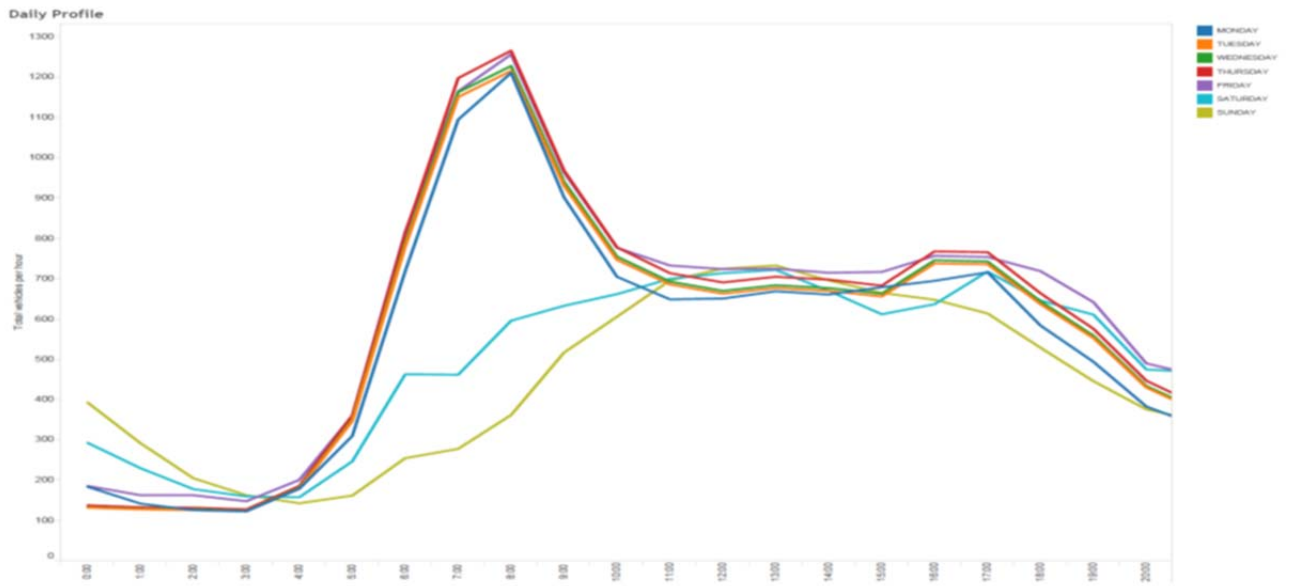


Figure 1: Royal Parade (S Bound) Between College Crescent and Grattan Street. The vertical axis extends from 0 to 1300 total vehicles per hour.

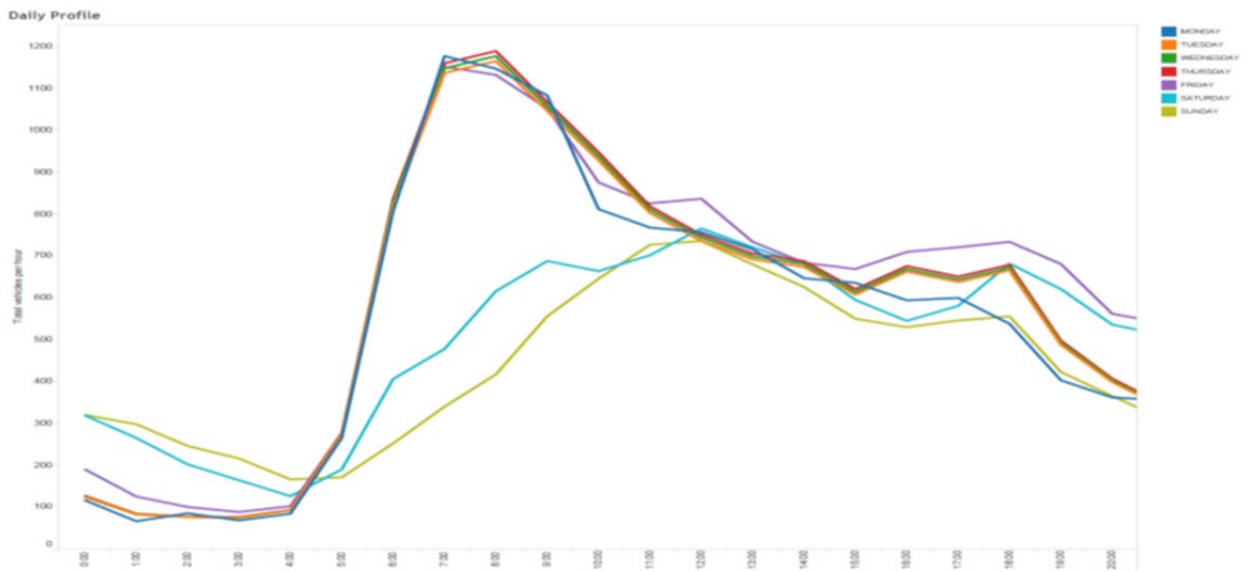


Figure 2: Flemington Road (SE Bound) Between Grattan Street and Peel Street. The vertical axis extends from 0 to 1200 total vehicles per hour.

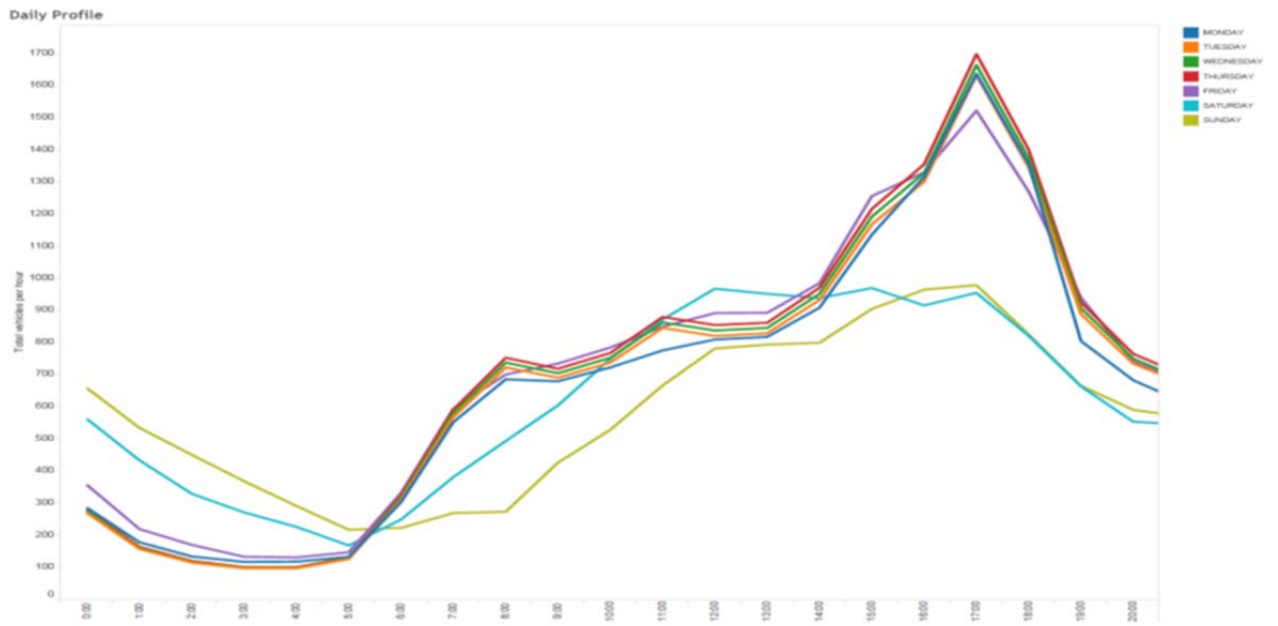


Figure 3: Royal Parade (N Bound) Between College Crescent and Grattan Street. The vertical axis extends from 0 to 1700 total vehicles per hour.

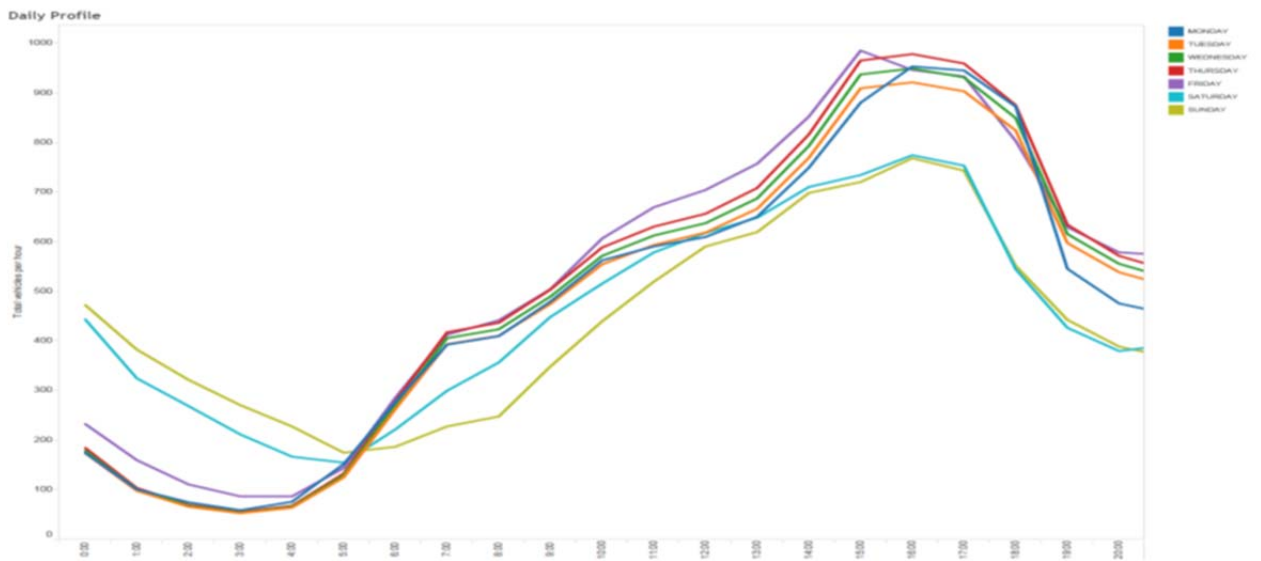


Figure 4: Flemington Road (NW Bound) Between Grattan Street and Peel Street. The vertical axis extends from 0 to 1000 total vehicles per hour.

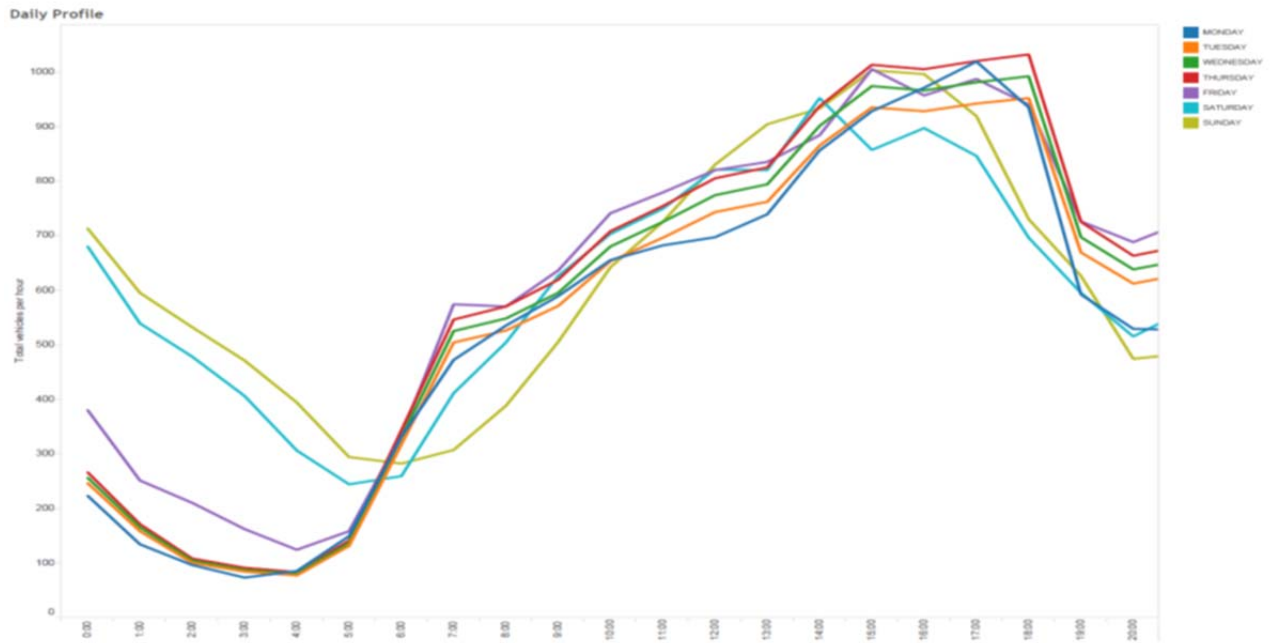


Figure 5: Elizabeth Street (N Bound) Between Victoria Street and Queensberry Street. The vertical axis extends from 0 to 1000 total vehicles per hour.

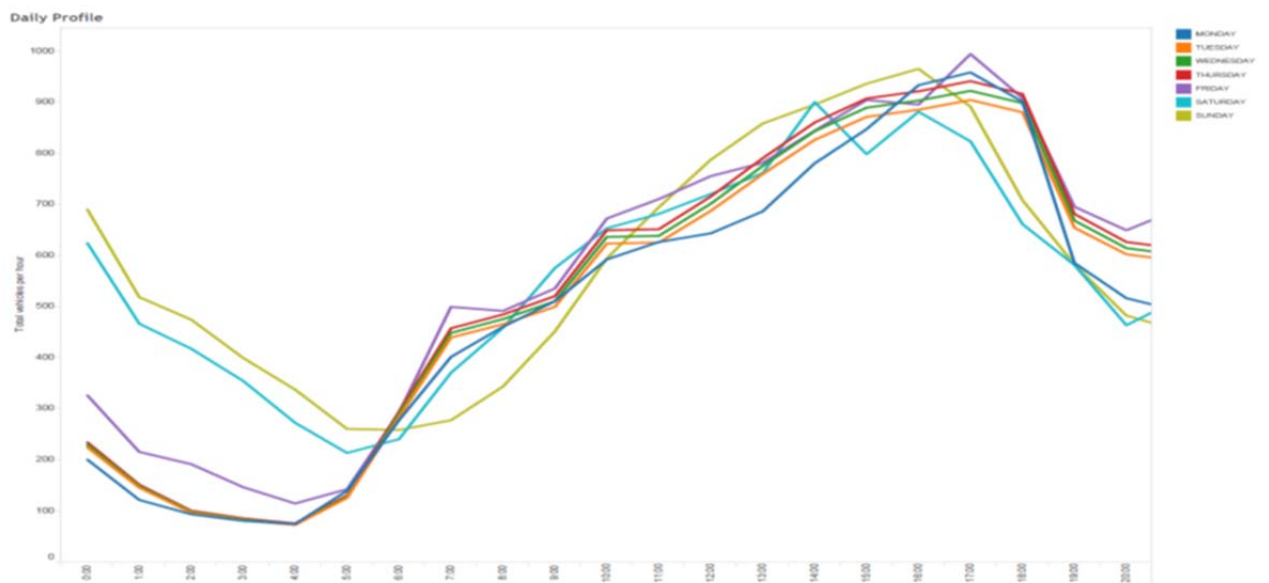


Figure 6: Peel Street (N Bound) Between Queensberry Street and Bedford Street. The vertical axis extends from 0 to 1000 total vehicles per hour.

4. The daily profiles clearly show a concentrated peak period in the morning from about 7am to 8.30am. After these times, traffic volumes drop quickly.
5. The evening profile is less spikey, with traffic volumes steadily rising in the late afternoon period to generally peak between 5pm and 6pm. After this time, traffic volumes drop rapidly.
6. These peaks are relatively short, especially compared to other major routes into the CBD, such as the Westgate Freeway. When compared to other

major cities such as Sydney, or major European cities such as London, the peak periods are very short, with little evidence of “peak spreading” where travellers start their journeys earlier or later to avoid the traditional peak periods. This indicates there is potential for trips to be undertaken through Parkville earlier or later when capacity is clearly available.

7. A review of historical Average Annual Daily Traffic data indicates that traffic volumes within the Parkville area has remained static or fallen over the last 10 years, as shown below.

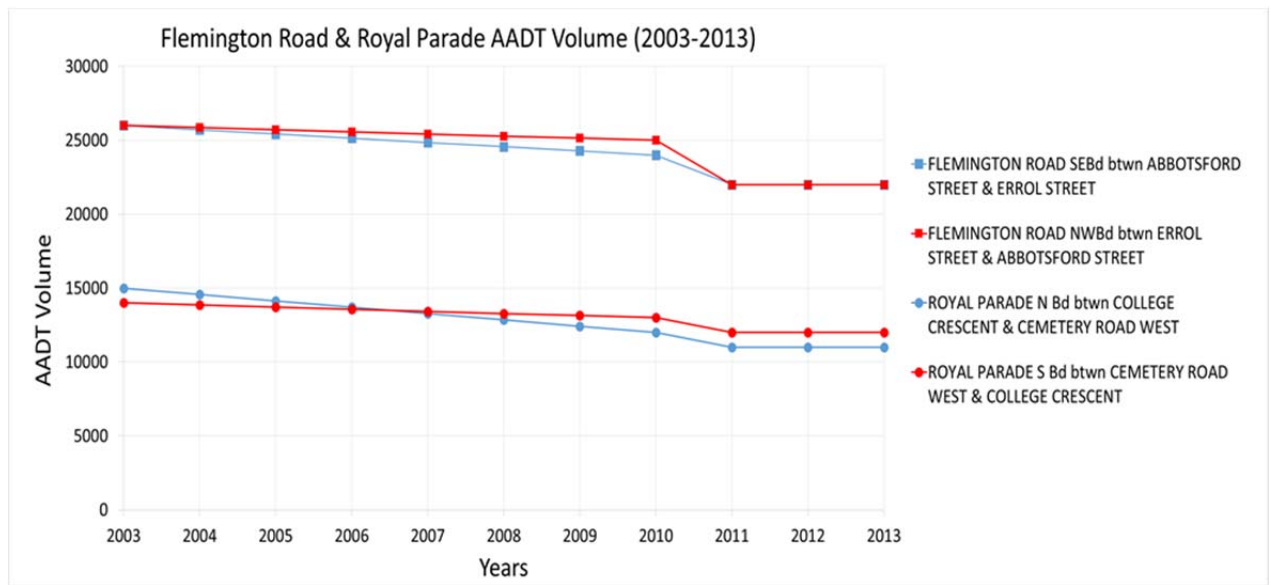


Figure 7: Flemington Road & Royal Parade AADT Volumes 2003-2013

Journey time analysis of critical routes

8. Bearing this in mind, a journey time analysis has been undertaken of three critical routes that were identified for further consideration:



Figure 8: Journey Routes

- Royal Parade/ Elizabeth Street (Route 1)
- College Crescent/ MacArthur Road (Route 2)
- Swanston Street (Route 3)

9. Total Route journey times (in seconds) for the AM and PM peaks for the 2021 No Project and Construction scenarios are summarised in Table 1 below.

Table 1: Summary of journey times for critical Parkville routes

		AM			PM		
		Base	Construction	Diff	Base	Construction	Diff
Royal Parade/ Elizabeth Street (Route 1)	Northbound	354	348	-6	358	478	120
	Southbound	354	348	-6	338	342	4
College Crescent/ MacArthur Road (Route 2)	Eastbound	191	476	285	213	268	55
	Westbound	267	626	359	360	659	299
Swanston Street (Route 3)	Northbound	58	75	17	52	106	54
	Southbound	65	165	100	65	68	3

10. For Route 1, the difference between the No Project and Construction scenarios for the northbound trip is two minutes, which is not a major

change given the highly urbanised nature of this location, and may be equivalent to one or two additional cycles at traffic lights.

11. For Route 2, the east-west movement is subject to the greatest change between the No Project and Construction scenarios, with increases of up to 6 minutes in the westbound AM peak and nearly 5 minutes in the PM. The model results suggest vehicle flow changes are not large, indicating sensitivities in the signal operations in the area and capacity constraints - see Table 2 below. This level of change therefore requires additional mitigation measures to reduce the impact on this Route.

Table 2: Eastbound journey times and volume for Route 2

Intersection	Distance (m)	Travel Time (s)		Volume (veh/hour)	
		Base AM	Construction AM	Base AM	Construction AM
Start	0	0	0	-	-
Brens Drive	251	16	16	1107	1170
Royal Parade	1420	117	191	1127	1078
Princess Park Drive	1682	146	328	1481	1290
Swanston Street	2006	168	453	1830	1739
End	2398	191	476	1622	1369

12. While the development of mitigation works is ongoing, a proposal has already been developed, for example, to ban right turn movements from Royal Parade into Macarthur Road, and drop in cycle time. It is considered these measures are likely to improve the east-west operations.
13. For Route 3, whilst it will experience an increase in journey times under the Construction scenario, the changes are low and well within daily variations.
14. This analysis assumes that all existing traffic continues to have the same origin and destination through the model at the same period of time. The analysis therefore does not take into account changes in journey patterns that could be expected as drivers seek to avoid congestion, by (for example) taking trips earlier or later to avoid peak periods. Nor does it take into account any potential mitigations on the road network.

Potential mitigation measures

15. Irrespective of the limited impact of the journey time changes on most routes, a package of infrastructure measures is being developed to mitigate potential impacts on users of the road network, and provide greater flexibility to manage the road network during construction. These measures will provide further capacity and flexibility on strategic and local diversion routes around Parkville, and enable the road authorities to better manage their network and respond to network incidents.
16. The strategy under development provides for diversion routes based on two types of trips, these are:

- ‘Local’ destination trips – i.e. trips heading to destinations within 150m of Grattan Street. This primarily comprises Melbourne University and the Hospitals; and
 - ‘Strategic’ destination trips – i.e. trips to the wider network including into and out of the CBD.
17. The strategy for local destination trips is to use more local streets to accommodate movements with minor diversion routes in the immediate proximity of Grattan Street. These will include streets that are not particularly identified as “traffic routes” but do provide a local traffic function, albeit that their “strategic” role may be to prioritise the wider network movement of other modes. For instance, whilst Swanston Street is identified as a priority area for pedestrians and trams, it will continue to provide a local access route for traffic to the immediate Grattan Street area.
18. The strategic destination trip approach recognises that for some strategic trip routes, the Parkville Station works are unlikely to have a material impact on drivers’ travel choices. However, there are a number of routes that will be impacted by increased local traffic through the key strategic node of Haymarket Roundabout. These trips will be mainly movements between Melbourne’s northern suburbs and the CBD, and movements between north and north-eastern suburbs and Docklands - see Figure 10 below.

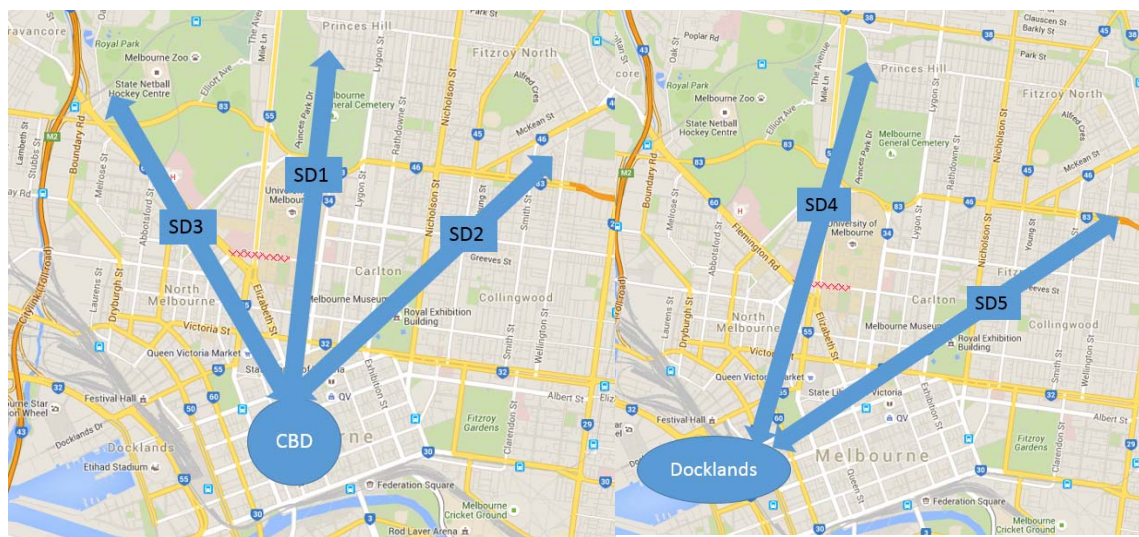


Figure 10: Strategic destinations

19. A series of improvements have been considered to improve network performance, operations, and resilience at both the local and strategic level.
20. At the strategic level this includes adjusting and coordinating traffic signal timings and controls, new CCTV at key intersections, and adjustments to intersection and lane layouts at a number of intersections. From a road network functionality perspective, the most important of these are:
- a. Swanston Street / Elgin Street intersection;

- b. Nicholson Street / Johnston Street intersection;
 - c. Flemington Road / Harker Street intersection;
 - d. College Crescent; and
 - e. Queensberry Street, between Elizabeth Street and Rathdowne Street.
21. In addition, traffic signal reviews looking at the signal equipment and signal timings will be undertaken to ensure their performance is optimized. This will include Haymarket roundabout and various surrounding intersections.

Issue 2:

Suggestion from the Peer Reviewer in Section 3.1.1 of his report that the predicted increase in travel time for bus routes 401 and 402 needs to be further explored

MMRA Response:

22. Since the EES was exhibited, Public Transport Victoria (**PTV**) has written to MMRA about the rerouting of buses in the Parkville precinct during construction of the station. The letter is at Attachment A. It describes options under consideration for rerouting bus routes 401 and 403, and advises that routes for the 402, 505 and 546 are still being considered.
23. Based on the findings of the TIA, the letter acknowledges the potential for increased travel time on these bus routes of 'a few minutes.'

CBD SOUTH

Issue 3:

Suggestion from the Peer Reviewer in Section 3.1.2 of his report that further modelling and analysis should be undertaken to explore and understand the network implications of cut and cover construction methods on Flinders Street. In addition, can construction staging be a potential means of reducing the traffic implications of this construction methodology?

MMRA Response:

24. The CBD South construction transport model has been used to assess the impacts of a full closure of Flinders Street, between Elizabeth Street and Swanston Street, to facilitate construction of the new pedestrian underpass between CBD South Station and Flinders Street Station. If undertaken, this full road closure could be for 6-12 weeks. Ideally, these works should be undertaken during school holidays to minimise impacts (and are presently envisaged for early 2019).

25. Alternatively, construction of the pedestrian underpass could be undertaken in two halves to enable car traffic to continue to travel in one direction along Flinders Street during the works. One carriageway could initially be closed, preferably the northern side which is wider with the hoarding/site boundary on the edge of the tramway, enabling westbound trams and traffic to run. Following completion of the piling and road reinstatement, the tram way and southern carriageway would be closed to allow for the second half of the underpass to be excavated.
26. Constructing the underpass in two halves would take about two weeks longer than building it in a single crossing. The extra time is required to allow for site establishment, time for concrete in the piles and roof slab to cure, and reinstatement of the road. However, constructing the underpass in two halves would also reduce the length of time of closures for trams and for traffic in each direction.
27. It should be noted however this does not allow for any other works to take place at the same time. PTV, Yarra Trams and City of Melbourne could take the opportunity to undertake other improvements in the local area, should they wish to do so.
28. Consideration has been given to facilitating two way operation throughout the works. The southern carriageway is only wide enough for a single lane due to tram infrastructure, so only one direction could operate. On the northern side, space is potentially available to allow for a one lane each way operation. However, due to the shortness of the link and complexity of the traffic switching sides at each end, this option would significantly impact on other movements at both Elizabeth Street and Swanston Street, and is not presently proposed.
29. The timing of these works, along with the closure of the westbound traffic lanes along Flinders Street between Swanston Street and Russell Street to facilitate the construction of the Federation Square entrance to CBD South Station, should also be considered. The potential for closing westbound traffic on Flinders Street to construct the Federation Square entrance to CBD South station is considered in Technical Notes 13 and 21.
30. A number of measures could be taken to mitigate the effects of these works, including traffic signal reviews to optimize performance on the main alternative routes and additional CCTV for VicRoads to manage traffic. This would also be supported by a Travel Demand Management strategy and package of measures, as well as advance communications and information to the public about the closures.

DOMAIN

Issue 4:

Suggestion from the Peer Reviewer in Section 3.1.3 of his report that a range of sensitivity tests should be undertaken for travel and delay on St

Kilda Road if less than 1000 vehicles per hour redistribute (to other routes) in 2021.

MMRA Response:

Further model refinements and reallocation of peak flows back to St Kilda Road

31. The VITM strategic model described in the TIA has reassigned up to 1,000 vehicles per hour away from St Kilda Road during the AM peak (and 950 in the PM peak).
32. VITM was subsequently used to assess the percentage of vehicles that could divert away from St Kilda Road based on the proposed reduction in lanes on St Kilda Road and the closure of Domain Road. These percentages were then applied to the flows in the 2021 Domain Precinct Construction microsimulation model. As this is a more detailed model and vehicle flows are based on survey data, the absolute numbers are not the same between the two models.
33. Once these percentages were applied in running the Precinct microsimulation model, it was found there was excess capacity in the road network, and in practice it can accommodate larger numbers than forecast in the VITM strategic model. Re-diverted traffic back to St Kilda Road, as a minimum, includes 240 vehicles in the AM, and 200 vehicles in the PM, which can be accommodated southbound.
34. The differences in vehicle flows on key approaches between the 2021 No Project and 2021 Construction scenarios are provided in Table 3 below for the AM peak (7:30-9:30).

Table 3: Differences in flows during the AM peak

Intersection	Approach	Movement	2021 Base	2021 Construction	Difference (rounded)
St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	Left	174	570	400
		Through	1771	1190	-580
		Right	19	18	0
	Toorak Road	Left	516	433	-80
		Through	576	390	-190
		Right	685	538	-150
	St Kilda Road South	Left	685	1212	530
		Through	3896	1960	-1940
		Right	300	318	20
	Kings Way	Left	74	45	-30
		Through	586	526	-60
		Right	752	844	90

35. A key point to note is that whilst the reduction of St Kilda Road to a single lane reduces capacity, the tram works on Toorak Road (west) also reduce capacity down to a single lane on that road.
36. In terms of the area through the construction works, the vehicle flows are shown in Table 4 below.

Table 4: Differences in flows in the AM and PM peaks

Location	AM (7:30-9:30)			PM (16:30-18:30)		
	Base 2021	Construction 2021	Diff	Base 2021	Construction 2021	Diff
St Kilda Road north of Bowen Crescent Northbound	4130	2220	-1910	2700	1710	-990
St Kilda Road north of Bowen Crescent Southbound	1820	1630	-190	2960	2160	-800

37. The information in Tables 2 and 3 suggest that there is sufficient capacity in the road network surrounding Domain to accommodate scenarios where fewer vehicles divert around the construction site than predicted by the TIA.
38. Applying the conservative redistribution information forecast by the VITM strategic model, MMRA has concentrated on developing measures to design road network enhancements that will improve capacity, reliability, and resilience along diversion routes to accommodate diverted traffic. This is not a traditional 'predict and provide' assessment, but it is a more strategic and proactive network management approach that seeks to align strategic network objectives with network resilience.
39. This network management approach includes a package of measures to improve capacity and reliability along Kings Way and Queens Road, the principal diversion routes. In addition, more CCTV cameras have been proposed to improve real time visibility of the network, and new variable message signs (VMS) on routes up to 5 km from Domain Station. This will help identify issues on the network sooner, and monitor the effectiveness of responses to resolve issues, and inform drivers. Traffic signal timings are also proposed to be reviewed in a wider area, and some modifications are being considered for alternative routes such as Canterbury Road and other routes in the locality.

Sensitivity analysis of the AM peak

40. Although a sensitivity analysis has not been undertaken of the whole model, a sensitivity test has been undertaken for the AM peak, this being the period when most demand is using St Kilda Road. This test has reduced the number of vehicles diverting from the main routes by 30%. New vehicle volumes passing the stop line on key approaches over the two hour AM peak are provided below.

Table 5: AM peak 7.30 – 9.30 AM flows

Intersection	Approach	Movement	2021 Base	2021 Construction - Sensitivity	Difference (rounded)
St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	Left	174	575	400
		Through	1771	1219	-550
		Right	19	18	0
	Toorak Road	Left	516	513	0
		Through	576	567	-10
		Right	685	558	-130
	St Kilda Road South	Left	685	1072	390
		Through	3896	2041	-1860
		Right	300	318	20
	Kings Way	Left	74	45	-30
		Through	586	786	200
		Right	752	846	90

41. It should be noted that additional demand was input into the model on St Kilda Road South (the northbound approach) through movement of more than 250 vehicles each hour. However, a proportion of this was effectively delayed by queuing on the approach, and did not pass the stopline during the main model period. This approach can cater for an additional 80 vehicles per hour increase above the original 2021 construction scenario outlined above in Table 2.
42. Analysis of the model provides the following network results are shown in Table 6.

Table 6: Network results

Parameters	2021 Base	2021 Construction	2021 Construction - Sensitivity
Average Speed	20.9 km/h	18.6 km/h	16.6 km/h
Average Delay per veh	76.1 s	82.8 s	98.4 s

43. The Sensitivity test provides for the following changes in flows alongside the works on the single lane section are shown in Table 7.

Table 7: Changes in flows

Location	AM (7:30-9:30)				
	Base 2021	Construction 2021	Diff	Construction 2021 - Sensitivity	Diff
St Kilda Road north of Bowen Crescent Northbound	4130	2220	-1910	2400	-1730
St Kilda Road north of Bowen Crescent Southbound	1820	1630	-190	1630	-190

44. There is an increase in queue lengths, as expected, at key points. Table 8 depicts the maximum queue length during the 2 hour peak period.

Table 8: Queue lengths

Approach	2021 Base	2021 Construction	2021 Construction - Sensitivity
St Kilda Road (south of Toorak Road West)	230m	405m	515m
Toorak Road West	260m	215m	505m
Kings Way	100m	130m	275m

45. Whilst the queues increase the delays, the consequent change in journey time is not in proportion as some of the signal timings would be adjusted to the new flows. Some of this adjustment in timing takes place in the model, but in practice further refinements can be made to the traffic signal timings to cater for the different distribution. The graphs below compare the journey times for the northbound and southbound trips.

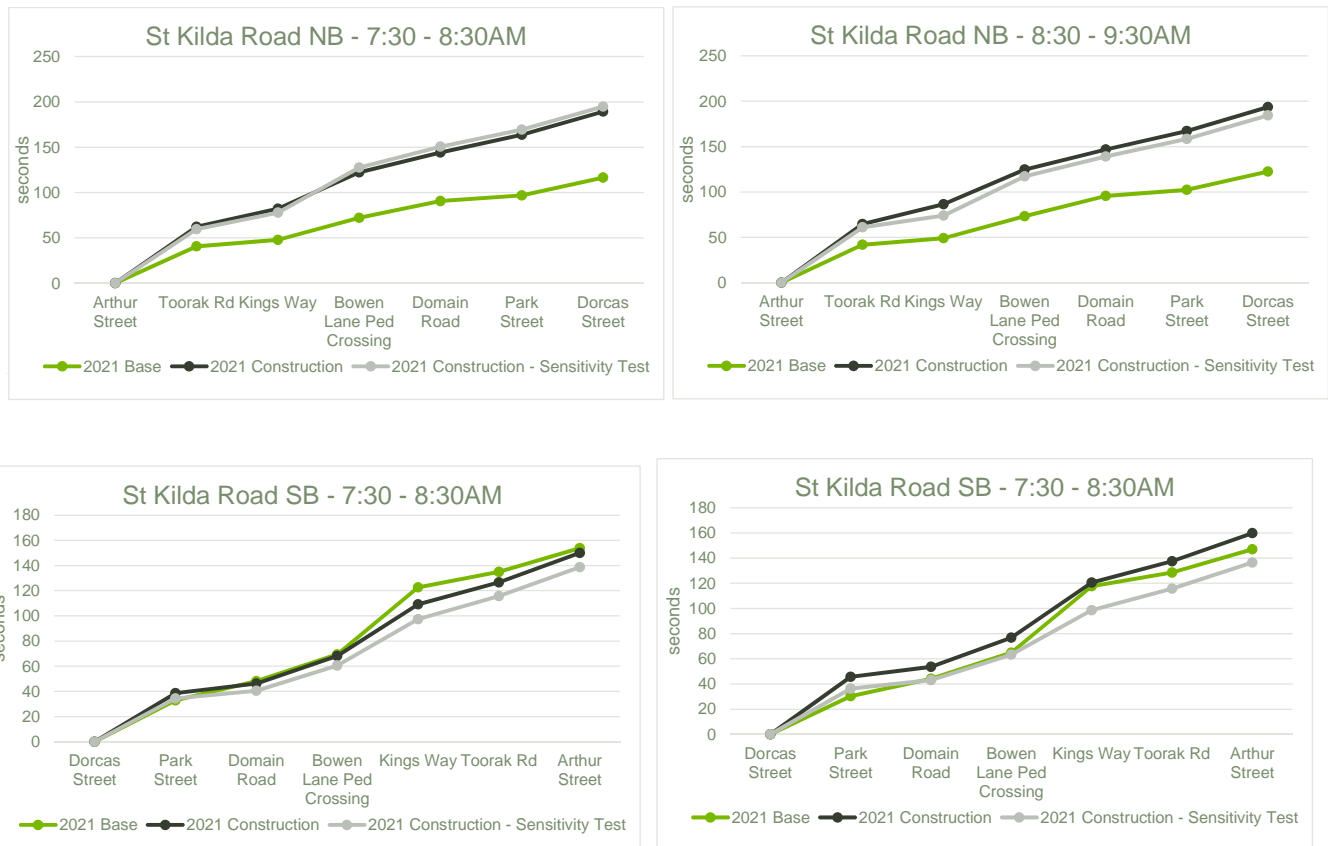


Figure 9: Comparison of journey times for northbound and southbound trips

46. This comparison of journey times is summarized in Table 9 below.

Table 9: Summary of northbound and southbound journey times

Time Period	Route	2021 Base	2021 Construction	2021 Construction – Sensitivity
7:30 – 8:30AM	St Kilda Road Northbound	117s	189s	195s
	St Kilda Road Southbound	154s	150s	139s
8:30 – 9:30AM	St Kilda Road Northbound	122s	194s	185s
	St Kilda Road Southbound	147s	160s	137s

47. Further review of the model operation in the sensitivity test also depicts the following:

- a. St Kilda Road South approach lane utilisation changes, including:
 - i. Left turn lane (vehicles turning into Kings Way) queuing back into the through approach.

- ii. Left turning vehicles at times blocking both through lanes, as some vehicles try to avoid the left turn queue and merge at a point further north.
 - iii. The lane outside the median merges into a short 3 lane section, which eventually becomes the right turn lane into Toorak Road West. This causes issues with vehicles merging left to avoid entering the right turn lane.
 - b. Toorak Road West queues reduce during the second peak hour, whilst St Kilda Road south approach queues increase.
 - c. Traffic profile suggests that between 8:00 and 9:00, there is a heavy increase in volumes across all approaches.
48. Based on these results and observations, the following potential mitigation measures are being considered:
- a. Changes to the functional layout including:
 - i. Introducing the St Kilda Road (south approach) left turn lane towards Kings Way earlier (by approximately 100m to the south).
 - ii. Increasing the short three lane section to allow vehicles to have more room to merge into the correct lane without blocking other vehicles.
 - b. Potentially increase green time for St Kilda Road south approach in the second peak hour, and reduction in Toorak Road West green time.
49. Overall, the results of the sensitivity test, which reduces the amount of vehicles that divert away from St Kilda Road, indicates the following:
- a. There is a slight decline in network performance parameters, with a decrease of up to 4.3km/h in average speed and an increase of average delay by up to 22.3 seconds in comparison to the 2021 No Project scenario within the area of the Domain Precinct model.
 - b. Queues along St Kilda Road south of Toorak Road West, and along Toorak Road West itself, will increase by an additional 110m and 290m to the 2021 No Project and Construction Scenarios, respectively. Kings Way queue lengths will likely increase by up to 175m in comparison to the 2021 No Project Scenario.
 - c. Travel times suggest that there is little to no difference to the St Kilda Road southbound journey times, however, the

northbound journey times suggest an increase of up to 70 – 80 seconds in both construction scenarios.

- d. Further refinement of traffic signal timings to manage changes in flows, and enhancement to the road layout are required to ensure progression of northbound movements at the St Kilda Road/Kings Way/Toorak Road West intersection.

CORRESPONDENCE:

- A. Letter from Public Transport Victoria dated 9 August 2016

ATTACHMENTS: No attachments.

TRIM Ref: DOC/16/314728

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BY EMAIL: alister.campbell@melbournemetro.vic.gov.au

Alister Campbell
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Dear Alister,

BUS REROUTING IN THE PARKVILLE PRECINCT DURING CONSTRUCTION OF MELBOURNE METRO

We refer to our discussion of bus routes on 3 August 2016, and provide the following further information regarding the proposed rerouting of bus services during the construction of Melbourne Metro.

Buses will need to be diverted in Parkville during Melbourne Metro construction due to the closure of Grattan Street east of Royal Parade and the one-way operation of Grattan Street between Flemington Road and Royal Parade. Bus routes 401, 402, 403, 505 and 546 will be affected.

The 401 bus is Melbourne's busiest bus route, with buses every three minutes during peak times. Over 6,000 people a day use this route, with around 4,000 people a day using the 402 bus. Around 1,000 people a day use the 505 and 546 routes. The 403 is an off-peak service with approximately 80 people a day.

Bus Rerouting Options

A number of options are being considered for rerouting the 401 and 403 services. These include (but are not limited to):

- Travelling eastbound via Arden St, Wreckyn St, Grattan St West, **left** at Royal Parade and then an anti-clockwise loop back to rejoin the original route through Arden Street; or
- Travelling eastbound via Arden St, Wreckyn St, Grattan St West, **right** at Royal Parade, and then clockwise returning along Wreckyn Street, which could include passing through Haymarket roundabout.

The location of bus stops for the rerouted 401 and 403 is still being considered, but will be located as close as possible to allow access to the University and the hospital.

Likewise, multiple options for the rerouting of the 402, 505 and 546 buses are being considered.

Traffic conditions in the whole of the Parkville Precinct will be changed during Melbourne Metro construction. These altered conditions are very likely to cause some increases in travel time on bus services. Public transport will need to be given priority in MMRA's Travel Demand Management Plan. There will be travel time increases on buses, which the Transport Impact Assessment anticipates would be in the range of a few minutes, depending on the location and bus routes involved. In most cases this additional time will only be a very small proportion of a public transport user's entire journey from the point of origin. For example, many users travel to the Parkville Precinct and use the 401 bus as part of their journey from locations such as St Albans and Werribee.

The decision on which routes the buses will take has not yet been finalised due to the ongoing and developing work being undertaken on :

- Understanding traffic impacts;
- Finalising construction road closures;
- Investigations into maximising the capability of the Haymarket Roundabout;
- Feasibility of bus priority measures; and
- Community engagement.

The options for rerouting the buses will be further considered following completion of this work.

In determining the most appropriate alterations or diversion routes for these buses, regard will be had to the following general principles and factors:

- Minimise additional travel time for bus users compared to the regular timetable where possible;
- Minimise disruption to normal running of services;
- Allow route flexibility as construction assumptions and traffic conditions may change;
- Avoid areas of high congestion or unpredictable travel times where possible;
- Avoid areas of main construction activity;
- Consideration of local impacts;
- Ability to relocate bus stops near places of interest/existing stops;
- Maximise efficiency of diverted routes by not extending route length or travel time unnecessarily;
- Bus trafficability along the route and ride quality for public transport users;
- Need for temporary infrastructure works for the diverted route- consider impact on roads, kerbs and trees;
- Impacts on parking;
- Safety of pedestrians and other road users;
- Preference to run buses on main roads rather than local roads where possible;
- Ability to put bus priority on a route;
- Legibility of routes for public transport users; and
- Complementarity with other public transport services (tram, train, unaffected bus services).

The final routes for buses during construction of the Melbourne Metro will be chosen by PTV in consultation with MMRA based on a consideration of these principles and factors.

Yours faithfully,



Huw Millichip
General Manager, Network Development
Network Product Development

9/08/2016