Brunswick Level Crossing Removal Project – Summary of Transport Provisions

Prepared for:
LXRP

03 October 2025

Prepared by:
Stantec

Project/File:
300303979

Stantec Australia Pty Ltd

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1 Introduction

1.1 Purpose of this Report

The purpose of this report is to present a summary of existing transport provisions to inform an assessment of the Project against the Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978.

1.2 Background

The North West Program Alliance (NWPA) consisting of the Level Crossing Removal Project (LXRP), Metro Trains Melbourne(MTM), John Holland Group (JHG) and Kellog Brown & Root (KBR, is undertaking due diligence assessment for the Project.

The Project is being referred under the Environment Effects Act 1978. As part of this process, potential environmental effects (including social effects associated with impacts to traffic and transport networks) are required to be assessed to determine if the project requires further assessment such as an Environmental Effects Statement (EES)

The Brunswick and Parkville Level Crossing Removal Project (the Project) is located approximately five kilometres north of Melbourne Central Business District (CBD) on the Upfield Line and approximately 150 metres west of Sydney Road, and extends from Royal Park, Parkville to Albion Street, Brunswick. The Project is proposed to occur within the Referral Project Area (RPA) which extends from south of Royal Park Station, Parkville, and north to Moreland Road, Brunswick.

The Project proposes to remove the following eight level crossings:

- Albion Street, Brunswick.
- Hope Street, Brunswick
- Victoria Street, Brunswick
- Albert Street, Brunswick
- Dawson Street, Brunswick
- Union Street, Brunswick
- Brunswick Road, Brunswick
- Park Street, Parkville

About 71,000 vehicles travel through these crossings each day, with the boom gates down for up to 30 minutes of the morning peak. The level crossings are located on the Upfield Line, between approximately three to five kilometres north of the Melbourne CBD within the municipalities of the City of Melbourne and City of Merri-bek.

The Project proposes an elevated rail bridge to separate the rail from the cross roads, beginning north of Royal Park Station and finishing at Tinning Street. The existing three stations, Jewell, Brunswick, and Anstey will be consolidated into two new stations. Jewell Station and Brunswick Station will be decommissioned, with the heritage listed buildings refurbished and remaining in place, while Anstey Station will be removed.

The new southern station will be located between the existing Jewell Station and Brunswick Station, and the new northern station will be located to the south of the existing Anstey Station. The Project will also deliver at-grade separated cycling and pedestrian paths and new open space.

More details on main components of the Project are provided below:

1. **Road works and Removal of Eight Level Crossings**

   The Project will consist of road works at each of the eight level crossing, including the removal of rail tracks, relevelling, asphalt works and construction of associated pedestrian crossing infrastructure. At Park Street minor road lowering will be required. The east west service road and footpaths on the north side of Park Street will remain at grade.

   Road closures are expected at each level crossing and on local streets adjacent to the rail corridor during the road works. The traffic disruptions will be planned and approved in consultation with the appropriate road authorities.

2. **Proposed new stations**

   The proposed new southern and northern stations will include landscaped forecourts for the community to gather, pick-up, drop-off (PUDO) areas, upgrade to the Upfield Bike Path to separated pedestrian and cycle paths, bicycle parking, station buildings and waste bin enclosures.

3. **Proposed new southern station**

   The new southern station will be located approximately 200 metres north of the existing Jewell Station, adjacent to RMIT (Brunswick Campus), between Union Street and Dawson Street, Brunswick. The station will comprise of elevated platforms, approximately 160 metres in length, with entrances at either end of the platforms. Lift and stair access will be provided at both entrances.

4. **Proposed new northern station**

   The new northern station will be located approximately 200 metres south of the existing Anstey Station, between West Street and Hope Street. The station will also have elevated platforms, approximately 160 metres in length, with entrances at either end of the platforms. Lift and stair access to platforms will be provided at both entrances.

5. **Pedestrian and cycling connections**

   The Project will transform the Upfield Bike Path by delivering separated cycling and pedestrian paths between Park Street and Albion Street. The paths will connect into the existing separated path network from Bell Street and integrate with east west streets. South of Park Street the paths will connect into the Upfield Bike Path and Capital City Trail. East-west pedestrian connections are provided along the corridor under the elevated rail bridge.

To construct the Project, land owned by state and local government, as well as private land, is likely to be required for temporary laydown. Temporary site offices, workforce car parking and storage will be located as close to the rail corridor as possible. Where possible, the rail corridor will be accessed from the surrounding existing roads, although access to the rail corridor will likely be required for the Project from surrounding roads into Royal Park.

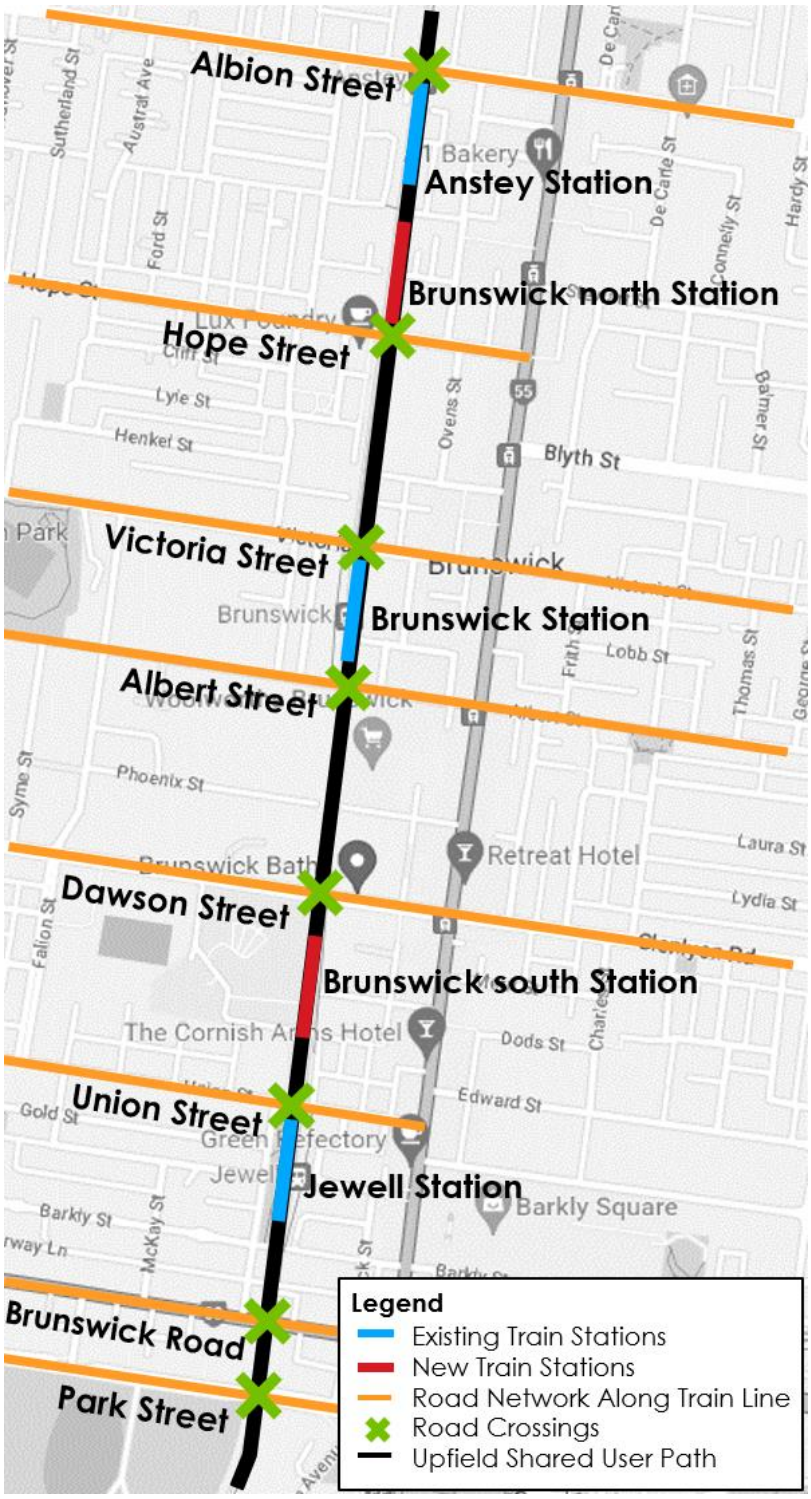
The locality is within a strategic renewal area undergoing rapid change and densification and requires a reliable and efficient transport network to support its growth.

The Project will improve safety and reduce travel time along the Upfield Line, improve safety and connections for pedestrians and cyclists, and reduce congestion and improve travel time reliability for vehicles through the removal of long boom gate closures. The Project will also improve the liveability of the local area by creating new landscaped open and public spaces and improving cross-corridor connections for local residents and other users, allowing for safer and more convenient access at multiple locations where none currently exist.

The Project will act as a catalyst for positive urban renewal that will reinvigorate and reconnect communities and create a lasting legacy – an innovative, liveable and high-quality urban design corridor.

A summary of this scope is shown in Figure 1-1

Figure 1-1: The Project Scope



1.3 Structure of this Report

This report provides a summary of the key findings and outcomes that have been derived as a result of the traffic and transport technical assessments undertaken for the project to date. This includes:

- The design outcomes at each new train station
- Transport elements to consider for each of the roads with a level crossing being removed
- The proposed crossing treatments at each of the eight road crossings
- Additional transport related works that are required as a result of the project
- The proposed detour routes and disruptions during construction

This report is structured as follows:

1. Report Introduction
2. Summary of proposed train stations
3. Assessment of walking and cycling crossing treatments
4. Identification of suitable crossing treatment at each road crossing for pedestrians and cyclists
5. Design Considerations
6. Summary of transport disruptions during construction
7. Conclusion

It is noted that this is a preliminary report based on preliminary designs of the project that have been prepared for the purpose of assessing construction impacts and to support the assessment against the Environmental Effects Act. This design will be subject to further design and development.

1.4 References

This report has been prepared to summarise the works completed to date.

In preparing this report, reference has been made to a number of background documents, including:

- an inspection of the site and its surrounds (dated 15/02/2023).
- Transport surveys as referenced throughout this memo (data obtained Wednesday 22/03/2023 and Saturday 25/03/2023).
- AS 1742.10-2009 Manual of Uniform Traffic Control Devices Part10: Pedestrian Control and Protection.
- VicRoads Supplement to AS 1742.10:2009 Manual of uniform traffic control devices: Part 10: Pedestrian control and protection – October 2015.
- Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management.
- VicRoads Road Design Note RDN 03-07: Raised Safety Platforms December 2019.
- Austroads Pedestrian Facility Selection Tool.
- Cycle Infrastructure Design, Local Transport Note 1/20, July 2020, Department of Transport (UK).

2 Executive Summary

2.1 Project Overview

A number of technical assessments have been undertaken and considered to review the most appropriate traffic and transport strategy and treatments to be delivered as part of the removal of the eight level crossings through Brunswick and Parkville.

The proposed design outcome is to construct a 'rail over' design, consisting of an elevated rail track commencing south of Park Street, Parkville and finishing at Tinning Street, Brunswick. This removes eight level crossings along the corridor, opening up the space underneath. The existing three train stations of Jewell Station, Brunswick Station and Anstey Station will be decommissioned and replaced by two new stations, evenly spaced along the rail corridor. The elevation of the rail line will therefore unlock land to be used for a separated north-south footpath and bicycle path, upgrading the heavily utilised Upfield Bike Path.

The Project will improve safety and reduce travel time along the Upfield Line, improve safety and connections for pedestrians and cyclists, and reduce congestion and improve travel time reliability for vehicles. The Project will also improve the liveability of the local area by creating a new open space and landscaped corridor, improved active travel outcomes and improve cross-corridor connections for local residents and users, allowing for safer and more convenient access at multiple locations where none existed previously.

LXRP is experienced in delivering similar projects around Melbourne such as the Bell to Moreland level crossing removal to the immediate north of this project. Bell to Moreland entailed the removal of four level crossings, with two new rail stations and an elevated rail line. This previous experience has yielded successful results across Melbourne and is being drawn upon to deliver the project. LXRP has designed the Project to maximise the transport opportunities presented by its context and ensure an appropriate response to any potential environmental impacts to pedestrians, cyclists public transport and vehicle movements.

2.2 Crossing Treatments Identified

To support the removal of eight existing level crossings and the installation of upgraded active travel facilities at ground level, work was undertaken to determine the appropriate design and nature of the new crossing facilities. This work consisted of analysis that included:

- Site inspections and review of existing conditions at each road crossing.
- A review of engineering design guidance and literature.
- A Movement & Place (M&P) assessment.
- A road safety review.
- Traffic modelling assessment.

Ultimately, a crossing treatment was identified based on the conclusion of each of the above assessments. It is noted that the outcome at each crossing is preliminary at this stage, and ongoing consultation with relevant councils and the Department of Transport & Planning (DTP) is required to

finalise the design. Interim road improvements or developments will need to be incorporated into future revisions of the design. The conclusion of this assessment is summarised in Table 2-1.

Table 2-1: Summary of Treatments

Crossing Location	Treatment	Justification
Albion Street	Signalised crossing	Signals to provide ease of crossing for bus routes Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Hope Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Albert Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Victoria Street	Signalised crossing	Signals to provide ease of crossing for bus routes Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Dawson Street	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Union Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Brunswick Road	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing.
Park Street	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.

The results of the assessments undertaken indicate that the proposed treatments can operate in a favourable manner that allows additional green time to be provided to the pedestrians and cyclists crossing, and not impacting the operation of Sydney Road. These arrangements are expected to be a significant improvement to through traffic when compared to the current level crossings, which result in lengthy delays to through traffic on each of the side roads.

2.3 Transport Disruptions During Construction

The construction methodology of the project will continue to be developed as the project evolves, however, it is likely that there will be a range of disruptions required to build the new rail bridge, new train stations and remove the existing level crossings.

Management of these disruptions will, at times, include detours to general traffic, buses, bike riders, and pedestrians. More information about disruptions and proposed management plans will be developed once the design and construction methodology is further progressed. The construction methodology will focus on minimising disruption to each transport mode and limiting impacts to the community where possible.

3 New Train Stations

3.1 Overview

The project extent from south of Park Street to Tinning Street encompasses three existing stations within the 2.5km length including Anstey Station, Brunswick Station and Jewell Station. The existing stations will be decommissioned and replaced with new stations in Brunswick's north and south.

3.2 New Northern Station

Brunswick north Station will be constructed approximately 510m to the north of the existing Brunswick Station and 210m to the south of the existing Anstey Station. The proposed station platforms will be approximately 160m in length. Entrances will be located at either end of the platforms with lift and stair access provided at both entrances.

The proposed location of the new southern station is shown in Figure 3-1.

Figure 3-1: New Northern Station Location

3.2.1 Walking & Cycling

Separated walking and cycling paths will be provided through the station precinct. The station precinct will be incorporated into all immediate road frontages, including Duckett Street, Bryant Street, West Street and Orient Grove.

The cycling path will likely be provided on the western side of the station and the footpath path will be provided through the station precinct or on the eastern side of the precinct.

Bicycle parking will be provided, however, further design development is to be undertaken to determine specific location, the number of spaces and arrangement.

3.2.2 Car Parking

The car parking along the eastern side of Orient Grove will be redesigned to accommodate the new station. This is expected to result in a minor loss of car parking spaces, noting this is subject to further design refinement.

The preliminary design indicates there will be a pick-up / drop-off (PUDO) facility provided on-street along Hope Street prior to the crossing on the northern side of the road. This space will be indented and designed in a manner so that the bays are accessible to people with disabilities. It is noted that this will not be a specifically marked DDA space, allowing the space to be used by everyone.

Five motorcycle parking spaces will be provided with specific location and arrangement yet to be resolved.

3.2.3 Buses

The following bus routes are within the vicinity of the new northern station:

- 503 (Albion Street)
- 508 (Victoria Street)
- 509 (Victoria Street)
- 951 (Victoria Street).

Where agreed with asset owner and key stakeholders, it is expected that the bus stops closest to the new train station, for the above routes, will be upgraded to an accessible stop with a seat and shelter. This will be further determined at a later stage of the design process, noting it will also depend on space constraints and final stop location.

Rail replacement bus stops will be on Sydney Road during construction and standard operations. Where possible, the stops will align with the closest tram stop to an operational station in order to make use of the tram stop infrastructure.

3.3 New Southern Station

The new southern station will be constructed approximately 200m north of Jewell Station and 490m to the south of Brunswick Station. The proposed station platforms will be approximately 160m in length. Entrances will be located at either end of the platforms with lift and stair access provided at both entrances.

The proposed location of the new southern station is shown in Figure 3-2.

Figure 3-2: New Southern Station Location

3.3.1 Walking & Cycling

Separated walking and cycling paths will be provided through the station precinct and connect to the frontage roads north and south. The cycling path will likely be provided on the western side of the station and the footpath will be provided through the station precinct or on the eastern side of the precinct. Bicycle parking will be provided, however, further design development is to be undertaken to determine specific location, the number of spaces and arrangement.

3.3.2 Car Parking

The station precinct is proposed to extend into state owned VicTrack land that is currently leased by RMIT University and utilised as off-street car parking. This car park contains ~155 parking spaces. This loss in car parking that is available to the University will encourage a mode shift away from the use of private vehicles.

The preliminary design indicates there will be a pick-up / drop-off (PUDO) facility located on-street on Union Street, prior to the crossing on the northern side of the road. This space will be indented and designed in a manner so that the bays are accessible to people with disabilities. It is noted that this will not be a specifically marked DDA space, allowing the space to be used by everyone.

At least five motorcycle parking spaces will be provided with specific location and arrangement yet to be resolved.

3.3.3 Buses

The following bus routes are within the vicinity of the new southern station:

- 504 (Brunswick Road)
- 506 (Dawson Street)
- 951 (Dawson Street).

Where agreed with asset owner and key stakeholders, it is expected that the bus stops closest to the new train station for the above routes will be upgraded to an accessible stop with a seat and shelter. This will be further determined at a later stage of the design process, noting it will also depend on space constraints and final stop location.

Rail replacement bus stops will be on Sydney Road during construction and standard operations. Where possible, the stops will align with the closest tram stop to an operational station.

4 Walking & Cycling Provisions Along the Rail Corridor

The elevation of the rail line unlocks land for open space and landscape opportunities and significant improvements for active travel along the rail corridor.

The Project will improve the liveability of the local area by creating improved amenity and cross-corridor connections for local residents, allowing for safer and more convenient access at multiple locations where none existed previously.

Active travel paths will be provided along the corridor underneath the new elevated rail bridge. These will be provided as separate paths for walking and cycling. Within the corridor, the pedestrian footpath will likely be located on the eastern side, and the cycling path on the western side. To match into existing path infrastructure, there will likely be two cross-over locations, one to the south between Park Street and Brunswick Road and one to the north of Albion Street.

From Park Street through to Albion Road, along the rail corridor, generous pedestrian path and cycling path widths will be provided, where possible, for the entire length. The current design adopts separated crossings for both pedestrian and cyclists at each of the road crossings.

The Upfield Bike Path from Moreland Road to Park Street currently extends approximately 2.6km in length and is located within the broader network discussed later in this report and illustrated in Figure 7-2.

5 Active Travel Road Crossings

5.1 Overview

With the removal of the eight level crossings the project includes an upgrade of the active travel infrastructure along the corridor, including the Upfield Bike Path. A body of work was undertaken to inform the nature of the crossing facilities suitable for this upgrade, with due consideration of the operational context of the corridor.

This assessment is outlined in Sections 5.2 to 5.6 with further consideration of design outcomes influencing each location discussed in Section 6.

As part of the assessment, a variety of crossing treatments were considered. Ultimately, the following three crossing types were considered the most likely outcomes and explored in detail:

1. **Signalised crossing**

   A typical signalised pedestrian crossing with separated pedestrian and bicycle paths and buttons.
2. **Signalised Crossing with cyclist optimisation**

   An ‘optimised signalling’ pedestrian crossing. This is similar to above, however, is fitted with advanced detectors along the bicycle lane, providing a predictive green light for approaching cyclists. This will increase instances where cyclists will be afforded uninterrupted movement along the route through the relevant crossings, minimising the need to stop at the crossing.
3. **Zebra and Cyclist Priority Crossing**

   This provides a separate unsignalised crossing for both pedestrians and cyclists with priority over vehicles. The zebra crossing for pedestrians and priority crossing for cyclists are provided side by side with a stop sign.

An example of these crossings are provided in Figure 5-1 & Figure 5-2.

In undertaking assessments at each of the crossing locations, the following activities were undertaken:

- A site inspection and review of the existing conditions of each road crossing. This included traffic volume surveys of all transport modes and a safety review.
- A literature review of standards and guidelines from Victoria, Australia and internationally to identify triggers and thresholds between different crossing treatments for pedestrians and cyclists.
- DTP's Movement & Place (M&P) hierarchy has been used to inform the selection of crossing types in order to prioritise the different transport modes.
- A modelling assessment of the proposed treatments at each crossing.

Ultimately, a crossing treatment was identified based on the outcome of each assessment. It is noted that the outcome at each crossing is preliminary at this stage, and ongoing consultation with relevant councils and DTP is required to finalise the design. Interim road improvements or developments will need to be incorporated into future revisions of the design.

Figure 5-1: Example of a Signalised Crossing Point with Pedestrian and Cycling Treatment Side by Side

Figure 5-2: Example of an Unsignalised Crossing Point with Zebra Pedestrian and Cycling Priority Crossing Side by Side

5.2 Existing Conditions Review

A review of the existing conditions was undertaken for each of the road crossings. This included a site inspection, transport surveys as well as a review of any existing road safety implications. The results of the surveys and site inspection is shown in Appendix A.

It is noted that a variety of existing crossing types exist along the corridor, with signalised crossings provided across Park Street, Brunswick Road, Dawson Street and various unsignalized crossing types across the other streets. These currently operate in a haphazard manner, with sporadic crossings occurring during gaps in traffic and between vehicles when queuing occurs. Many crossing movements occur alongside boom gate closures when trains are approaching. The removal of these boom gates represents an opportunity to significantly improve the safety of these crossings.

The safety review identified a number of features to consider when preparing future designs, such as adjacent buildings that impacted the sight lines between vehicles and crossing cyclists and pedestrians.

5.3 Literature Review

A review of standards and guidelines from Victoria, Australia and internationally was undertaken to identify triggers and thresholds between different crossing treatments for pedestrians and cyclists. In undertaking this exercise, the following documents were reviewed:

- AS 1742.10-2009 Manual of Uniform Traffic Control Devices Part10: Pedestrian Control and Protection.
- VicRoads Supplement to AS 1742.10:2009 Manual of uniform traffic control devices: Part 10: Pedestrian control and protection – October 2015.
- Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management.
- VicRoads Road Design Note RDN 03-07: Raised Safety Platforms December 2019.
- Austroads Pedestrian Facility Selection Tool.
- Improving Austroads Guidance for Cycling and Micromobility Planning, Austroads 2025.
- Cycle Infrastructure Design, Local Transport Note 1/20, July 2020, Department of Transport (UK).

It is noted that much of the literature reviewed in the above assessment has focussed on either a pedestrian crossing or a cyclist crossing, and not a combined crossing facility as proposed at the new crossings. The key findings from the literature review that will be considered as a part of this assessment are as follows:

- The provision of a zebra and cyclist priority crossing on roads with a posted speed limit of less than 50km/h is considered appropriate.
- Raised treatments can be provided for either a zebra and cyclist priority crossing or a pedestrian and cyclist operated signal. This can aid in lowering the travel speed for passing vehicles and improve safety for users.
- If there is more than a single lane in each direction, pedestrian signals will be given preference over a zebra and cyclist priority crossing. Noting, any more than two lanes on approach to a zebra crossing is generally considered a non-compliance.

- Adequate sight lines must be achieved for a zebra and cyclist priority crossing due to the need for motorists to stop based on their ability to see the crossing being used by a pedestrian or cyclist (as opposed to a red light).
- A vehicle volume of 8,000 vehicles per day was identified as a maximum threshold for a zebra and cyclist priority crossing based on the literature review. No guidance has been reviewed to indicate a maximum crossing volume of pedestrians or cyclists at zebra and cyclist priority crossings.

5.4 Movement & Place Assessment

The M&P Framework is a multi-modal tool used to understand how well current and proposed arrangements align with the aspirational future operational state of the transport network set by DTP. It does this by setting modal priorities and associated targeted Levels of Service (LoS) for individual links and interchanges across the network with consideration of various land use implications.

A M&P assessment has been undertaken for the project, with commentary made for each crossing location.

1. **Albion Street**

   Active transport modes are the priority modes at this crossing location. However, there are bus services and reasonable volumes of traffic which could lead to significant queuing and delays.
2. **Hope Street**

   Active transport modes are the priority modes at this crossing location and proximate the new station. However, there are reasonable volumes of traffic and bus services which could lead to significant queuing and delays.
3. **Victoria Street**

   Active transport modes are the priority modes at this crossing location. However, there are bus services and reasonable volumes of traffic which could lead to significant queuing and delays.
4. **Albert Street**

   Active transport modes are the priority modes at this crossing location with general traffic having a very low level of priority.
5. **Dawson Street**

   Active transport modes are the priority modes at this crossing location and proximate the new station. However, there are bus services and reasonable volumes of traffic which could lead to significant queuing and delays.
6. **Union Street**

   Active transport modes are the priority modes at this crossing location with general traffic having a very low level of priority.
7. **Brunswick Road**

   Active transport and general traffic are the priority modes, so need to balance their operations.
8. **Park Street Crossing**

   Active transport modes are the priority modes, however there are reasonable volumes of traffic which could lead to significant queuing and delays.

The following conclusions are made with regard to crossing treatments, with consideration of the above information that was identified at each location

- Where traffic volumes are low the provision of a separate raised zebra and priority crossing facility with suitable sightlines is appropriate to achieve delay and safety targets.

- Where traffic volumes are moderate, the provision of a separate raised zebra and priority crossing facility with suitable sightlines can be considered. If, given the traffic volumes, the traffic impact is too significant then a signalised crossing is appropriate. Signal timing and coordination should be appropriately allocated to active transport users along the corridor.
- High traffic volumes warrant a signalised intersection. Assessment needed to identify the requirements for coordination with adjacent signalised intersections (such as Sydney Road).
- For streets with bus routes, a signalised crossing is expected to help balance active transport and bus operations. Signal timing and coordination should be highly allocated to active transport users along the corridor.

5.5 Transport Modelling Assessment

Based on the results of the above assessment, a crossing treatment was identified for each of the road crossings. These treatments were identified for the purposes of a traffic modelling assessment to understand their operational performance.

The following proposed treatments have been assessed:

- **High Volume Traffic Roads**: Park Street, Brunswick Road and Dawson Street currently experience high traffic volumes, with daily volumes of over 13,000 vehicle movements two way at each crossing. These volumes were considered to be too high to provide a zebra and cyclist priority crossing, and therefore a signalised pedestrian and cyclist crossing has been assessed.
- **Low Volume Traffic Roads**: Hope Street and Union Street experience low traffic volumes, with less than 5,000 vehicle movements two way across a typical day. Both of these roads do not have bus routes at the crossing location. This traffic volume is akin to a residential street. A zebra and cyclist priority crossing has been assessed at these locations.
- **Moderate Volume Traffic Roads with Buses**: The two-way traffic volumes across Victoria Street and Albion Street are within the indeterminate range of whether a zebra and cyclist priority crossing is considered acceptable. The movement and place assessment has identified a signalised pedestrian and cyclist crossing given the presence of bus movements along the corridors, and this has therefore been assessed.
- **Moderate Volume Traffic Roads without Buses**: Albert Street has a similar indeterminate range traffic volume, with 7,500 vehicle movements. Given there are no bus routes that cross the crossing, both a zebra crossing and signalised pedestrian and cyclist crossing has been assessed.

The modelling assessment was undertaken using SIDRA INTERSECTION 9, a computer-based modelling package which calculates intersection performance. The modelling undertaken assessed the hourly traffic volumes collected on Wednesday 22/03/2023 and Saturday 25/03/2023 and identified in Appendix A. The results of the modelling analysis are outlined in Appendix B, with the following key conclusions summarised in Table 5-1.

Table 5-1: Summary of SIDRA Modelling

Road Crossing	Crossing Type Assessed	SIDRA Modelling Results Commentary
Park Street and Dawson Street	Pedestrian and Cyclist Operated Signal	• The busy side roads of Park Street and Dawson Street were found to perform favourably in the AM, PM and Saturday Peak. • A maximum average delay for vehicles of 8 seconds was found, indicating vehicles are not materially delayed by the new signals. • A maximum queue length of 73m on Park Street and 66m on Dawson Street was found at the eastern approach, indicating that the corridor between the crossing and Sydney Road queues to less than 50% of its storage capacity. • A maximum delay of 23 seconds was found for crossing cyclists and pedestrians. The above results identify that additional green time can be provided to crossing pedestrians and cyclists without detrimentally impacting the operation of Park Street / Dawson Street or Sydney Road.
Brunswick Road	Pedestrian and Cyclist Operated Signal	• The Saturday peak hour was identified as the busiest peak period, with the AM and PM peak hours performing with a marginally lower Degree of Saturation (DOS). • A maximum average delay for vehicles of 8 seconds was found, indicating vehicles are not materially delayed by the new signals. • A maximum queue length of 100m was found at the eastern approach, as defined in the following image.  • A maximum average delay of 23 seconds was found for crossing cyclists / pedestrians. The above results identify that a minimal additional green time can be provided to crossing pedestrians and cyclists without detrimentally impacting the operation of Brunswick Road or Sydney Road. It is not expected that Brunswick Road will be incorporated into the cyclist optimised signalling arrangement. These results demonstrate a small amount of additional queuing capacity beyond what has been assessed.

Victoria Street and Albion Street	Pedestrian and Cyclist Operated Signal	• Results were found to be similar across the three peak periods. • A maximum average delay for vehicles of 7 seconds was found, indicating vehicles are not materially delayed by the new signals. • A maximum queue length of 43m for Victoria Street and 26m for Albion Street was found at the eastern approach. Both of these roads have ~190m of queueing capacity. • A maximum average delay of 22 seconds was found for crossing cyclists and pedestrians. The above results identify that additional green time can be provided to crossing pedestrians and cyclists without detrimentally impacting the operation of Victoria Street, Albion Street or Sydney Road.
Union Street and Hope Street	Unsignalised Zebra and Cyclist Priority Crossing	• The PM peak hour was identified as the busiest peak period, with the AM and Saturday peak hours performing with a marginally lower DOS. • A maximum average delay for vehicles of 10 seconds was found, indicating that despite the significant cyclist volumes, the unsignalized crossing will result in minimal delay to vehicles. • A maximum queue length of 9m was found, indicating that the queue is only a handful of vehicles at any given time. No delay was experienced by cyclists / pedestrians given this treatment gives full priority.
Albert Street	Pedestrian and cyclist Operated Signal & Unsignalised Zebra and Cyclist Priority Crossing	• The PM peak hour was identified as the busiest peak period, with the AM and Saturday peak hours performing with a marginally lower DOS. • For the pedestrian and cyclist operated signals, a maximum average delay for vehicles of 13 seconds was found, as well as a maximum queue length of 44m at the eastern approach • For the zebra and cyclist priority crossing, a maximum average delay for vehicles of 11 seconds was found, as well as a maximum queue length of 21m at the eastern approach • The above indicates that despite the significant cyclist volumes, the unsignalized crossing will result in a reduced delay and queue length when compared to the signals. • The unsignalized arrangement has a lower vehicular capacity in comparison to the signals. A maximum average delay of 21 seconds was found for crossing cyclists and pedestrians in the signalised arrangement. No delay was experienced by cyclists and pedestrians for the zebra and cyclist priority crossing given this treatment gives full priority.

The results of the above assessment indicate that the proposed treatments can operate in a favourable manner that allows additional green time to be provided to the pedestrians and cyclists crossing, and not impacting the operation of Sydney Road. These arrangements are expected to be a significant improvement to through traffic when compared to the current level crossings, which result in lengthy delays to through traffic on each of the side roads.

In order to add robustness to the capacity assessment, a gap analysis assessment has been undertaken. Gap acceptance surveys record the frequency and duration of gaps in the flow of cyclists that will be crossing the proposed zebra and cyclist priority crossing with full priority over vehicles. This assessment was undertaken to reflect the ‘real world’ operating conditions that are currently present to provide an additional analytical basis to ensure that there is adequate capacity between the significant cyclist volume for vehicles to cross.

The assessment was undertaken at the Union Street crossing, during the AM Peak hour as this contained the highest cyclist volume where a priority crossing or pedestrian and cyclist operated signal is proposed. The results of this assessment are outlined in Table 5-2.

Table 5-2: Gap Absorption Capacity Results – Union Street AM Peak Hour

Road Crossing	SIDRA Modelling Results Commentary
Critical Gap	5 seconds
Follow Up Headway	3 seconds
Total Gap Capacity	798 gaps
Average Time Between Gaps	8 seconds

The traffic surveys undertaken indicate that Union Street experiences 106 westbound and 182 eastbound vehicle movements in the AM peak hour. The results of this assessment demonstrate that there is more than adequate capacity at this location for gaps within the cyclist volumes. Moreover, the amount of gaps in the Union Street AM Peak hour is enough to accommodate the PM peak hour traffic volumes as well as the traffic volumes at Albert Street and Hope Street in all peak periods comfortably.

5.6 Crossing Treatments Identified

In light of the assessments provided in Sections 5.2 to 5.5, which consider a variety of performance measures, Table 5-3 provides an outline of the crossing treatments identified for each location.

Table 5-3: Summary of Treatments

Crossing Location	Treatment	Justification
Albion Street	Signalised crossing	Signals to provide ease of crossing for bus routes Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Hope Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Albert Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Victoria Street	Signalised crossing	Signals to provide ease of crossing for bus routes Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Dawson Street	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Union Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Brunswick Road	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing.
Park Street	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.

Further assessment will be undertaken to confirm the identified treatments above. This will have consideration for:

- Implementation of the ‘optimised signalling’ treatment, providing advanced detection on approach to each signalised crossing so vehicle traffic can be stopped when cyclists approach.
- Provision of raised treatments at the signalised crossings.
- Provision of appropriate sight lines between cyclists and vehicles at the unsignalized priority crossings to help inform urban design outcomes on approach and proximate to each crossing.

6 Road Design Considerations

6.1 Overview

The following is a summary of design considerations to inform future designs at each road crossing through future project stages.

6.2 Albion Street

Albion Street consists of a single carriageway providing one traffic lane in each direction. An eastbound on-road bicycle lane commences 5m east of the level crossing.

The current provision of traffic lanes will be maintained by the Project including footpaths along either side of the road. The arrangement of on-road bicycle paths will be determined at a later stage.

Access to property driveways immediately adjacent the Albion Street crossing could be impacted by road works or temporary traffic management required for road works. These will be managed on a case by case basis. Bus stops are to remain as per existing locations, providing a shelter with lighting and a seat.

6.3 Hope Street

Hope Street consists of a single carriageway providing one traffic lane in each direction.

The proposed treatment along Albion Street will provide a traffic lane in each direction, consistent with the existing arrangements. Footpaths will be provided along either side of the road. Access to property driveways immediately adjacent the Hope Street crossing could be impacted by road works or temporary traffic management required for road works. These will be managed on a case by case basis.

As stated in Section 3.2.2, two on-street pick-up / drop-off spaces have been considered in the preliminary design and are expected to be provided along Hope Street.

6.4 Victoria Street

Victoria Street consists of a single carriageway providing two traffic lanes one traffic lane in each direction. On-road bicycle lanes are provided for both eastbound and westbound.

The proposed treatment along Victoria Street will provide a traffic lane in each direction as well as on-road bicycle lanes, consistent with the existing arrangements. The existing central median islands to the north-east of the level crossing may be removed to accommodate the crossing. Footpaths will be provided along either side of the road.

Access to property driveways immediately adjacent the Victoria Street crossing could be impacted by road works or temporary traffic management required for road works. These will be managed on a case by case basis.

Bus stops are expected to remain as per existing locations, providing a shelter with lighting and a seat.

6.5 Albert Street

Albert Street consists of a single carriageway providing one traffic lane in each direction. On-road bicycle lanes are provided for both eastbound and westbound.

The proposed treatment along Albert Street will provide a traffic lane in each direction as well as on-road bicycle lanes, consistent with the existing arrangements. The existing central median islands to the north-east of the level crossing may be removed to accommodate the crossing. Footpaths will be provided along either side of the road.

6.6 Dawson Street

Dawson Street consists of a single carriageway providing one traffic lane in each direction. On-road bicycle lanes are provided for both eastbound and westbound.

The proposed treatment along Dawson Street will provide a traffic lane in each direction as well as on-road bicycle lanes, consistent with the existing arrangements. Footpaths will be provided along either side of the road.

Bus stops are expected to remain as per existing locations, providing a shelter with lighting and a seat.

6.7 Union Street

Union Street consists of a single carriageway providing one traffic lane in each direction.

The proposed treatment along Union Street will provide a traffic lane in each direction. The existing central median islands to the north-east of the level crossing may be removed to accommodate the crossing. Footpaths will be provided along either side of the road.

As stated in Section 3.3.2, two on-street pick-up / drop-off spaces have been considered in the preliminary design and are expected to be provided along Union Street.

6.8 Brunswick Road

Brunswick Road consists of a single carriageway providing one traffic lane and a kerbside parking lane in each direction.

The proposed treatment along Brunswick Road will provide a traffic lane in each direction with kerbside bicycle lanes. Footpaths will be provided along either side of the road.

Driveway access points immediately adjacent to the crossing along Brunswick Road are expected to be maintained, however access may be impacted at times during construction. These will be managed on a case by case basis.

Bus stops are expected to remain as per existing locations, providing a shelter with lighting and a seat.

6.9 Park Street

Park Street consists of a single carriageway with one traffic lane in each direction. On-road bicycle lanes are provided for both eastbound and westbound.

The proposed treatment along Park Street will provide a traffic lane in each direction with kerbside bicycle lanes. Footpaths will be provided along either side of the road.

The redesign of the Park Street crossing is expected to result in the loss of a number of on-street car parking spaces immediately adjacent to the road corridor. The number of spaces lost is to be determined as the design progresses.

It is noted that the design at Park Street may change through the design and construction methodology to occur in later stages of the project, given the more involved construction methodology that is occurring (lowering of the road).

7 Transport Disruptions During Construction

7.1 Introduction

The construction works required for the removal of the level crossings through Brunswick will require a range of disruptions and closures, impacting different transport modes. The ultimate design and construction methodology of the project is still under development, and therefore the disruptions are indicative. A detailed assessment will be undertaken as a part of the project development by a dedicated disruptions team.

Notwithstanding, a summary of potential transport disruptions that may occur during construction is outlined below.

7.2 Road Closure Disruption Summary

7.2.1 Proposed Road Closures

Due to the proximity of live traffic to the work zones, road closures will need to occur to remove the existing level crossings and to construct the new overhead rail line from Park Street to Albion Street. The duration of full road closures on roads with high traffic volumes (such as Brunswick Road, Park Street and Dawson Street) will be minimised.

Simultaneous road closures will be avoided where possible, particularly with heavily trafficked roads such as Park Street, Brunswick Road and Dawson Street. Simultaneous road closures may occur with less trafficked roads. These will be avoided on roads that are immediately adjacent to one another so that that the detour routes for both roads will not cross over.

Temporary traffic management will be used to implement the road closures and detours. The Project will consult with government agencies and the local public as a part of the stakeholder engagement process. The construction activities to be undertaken during road closures are outlined below:

- CSR (Combined Service Routes) installation
- Lowering of Park Street and relocation of the gas main at Park Street
- Elevated rail bridge construction including beam delivery, stitch pours, screen and handrail installation, overhead wire works
- Delivery of beams and large equipment
- Piling
- Road and pedestrian crossing works
- Relocation of utilities
- Works to heritage structures
- Building demolition
- Construction storage

Disruption periods are to be determined as the construction methodology is not confirmed.

Temporary lane closures will be implemented on arterial roads and local roads around the project area to facilitate construction activities before and during the project.

7.2.2 Traffic Detours

The project has developed some preliminary road closure detour plans for the closures at each of the eight level crossings. These have been designed to provide commuters with the most optimal route available and to minimise the overall network impacts. They also incorporate feedback provided on the road closures implemented on the Bell to Moreland level crossing removal project. These detours are subject to change after further consultation with key stakeholders like DTP, City of Melbourne Council, Merri-bek City Council and Public Transport Victoria to address their requirements.

The proposed detours are shown in Appendix C. The concurrent closure of major roads crossing the rail corridor will be minimised where possible.

7.3 Rail Disruption Strategy

Weekend rail occupations of the Upfield Line alongside closures of the three stations will be required in the lead up to a major rail occupation. Stations will have platform fencing changes with reduced widths to facilitate works behind the platform. Pedestrian access will also be changed to accommodate the construction works. Once the new stations are open, the station concourse will have areas hoarded off to enable the completion of the works at this level.

7.4 Bus Disruption Strategy

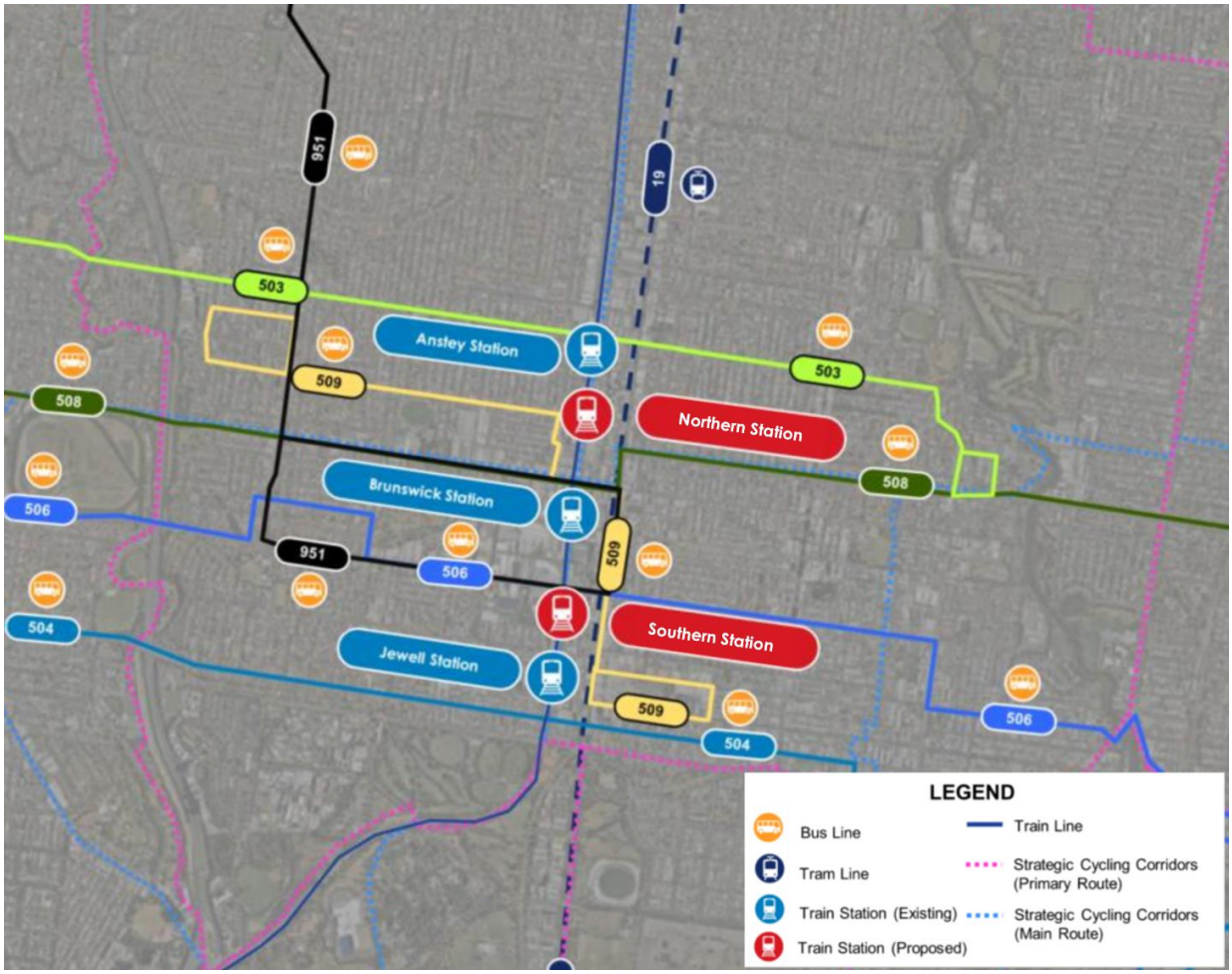
When the road closures are occurring, as outlined in Figure 7-1, detours are also required for bus services. The details of the required detours are outlined below.

7.4.1 Existing Stops & Services

The public transport network around the project area, as well as the immediately adjacent stops are shown in Figure 7-1. The key routes are outlined below:

- Brunswick Road occupies 1 bus route across the current rail crossing: bus route 504.
- Dawson Street occupies 2 bus routes across the current rail crossing: bus route 506 and 951 (night rider).
- Victoria Street occupies 3 bus routes across the current rail crossing: bus route 508, 509 and 951 (night rider).
- Hope Street occupies 1 bus route but does not cross the current level crossing: bus route 509.
- Albion Street occupies 1 bus route across the current rail crossing: bus route 503.

Figure 7-1: Existing Public Transport Network and Stops around the Project Area



7.4.2 Impact to Bus Routes

Proposed bus detours have been identified for each road closure, and are outlined in Table 7-1, with the detour routes shown in Appendix D.

Table 7-1: Impact to Bus Routes

Road Closure	Impacted Bus Route	Proposed Detour
Albion Street	Bus Route 503	• Route 503 (eastbound) will be via Frederick Street – Hope Street – Sydney Road to get to Albion Street. • Route 503 (westbound) will be the same route in reverse.
Victoria Street	Bus Route 508	• Route 508 (eastbound) will be via Percy Street – Hope Street – Sydney Road to get to Blyth Street. • Route 508 (westbound) will be the same route in reverse.
	Bus Route 509	• Route 509 (eastbound) will be via Hope Street to get to Sydney Road. • Route 509 (westbound) will be the same route in reverse.
	Bus Route 951	• Route 951 (only westbound) will be via Sydney Road – Hope Street – Percy Street to get to Victoria Street.
Dawson Street	Bus Route 506	• Route 506 (eastbound) will be via Fallon Street – Union Street – Sydney Road to get to Dawson Street/Glenlyon Road. • Route 506 (westbound) will be the same route in reverse.
	Bus Route 951	• Route 951 (only eastbound) will be via Fallon Street – Union Street – Sydney Road to get to Victoria Street.
Brunswick Road	Bus Route 504	• Route 504 (eastbound) will be via Watson Street – Union Street – Sydney Road to get to Brunswick Road. • Route 504 (westbound) will be the same route in reverse.

7.5 Multimodal Train Replacement Strategy

LXRP projects in the past have used a mixed mode strategy. Through consultation with Yarra Trams, the project would seek support for the provision of additional tram services throughout the rail occupation. This will be developed as part of the detailed disruption strategy and will be dependent on fleet availability and construction staging.

During rail occupations, Metro Trains Melbourne (MTM) will operate the rail replacement bus services, through consultation with DTP, the existing rail replacement bus stops located on Sydney Road will be utilised. The rail replacement bus route travels north – south along Sydney Road, rather than using local roads to minimise further delay to commuters. Commuters will be required to walk to Sydney Road bus replacement stops.

Commuters unable to access these stops will be offered alternate transport arrangements. These will be provided for people with mobility requirements. Examples are low-floor taxis and mini buses. During previous closures of the Upfield Line, wheelchair accessible taxis were on standby from 6am to 9pm at major interchanges. Passengers could also call the closest premium station to organise an accessible taxi or alternatively, contact Public Transport Victoria (PTV) to book an accessible taxi in advance.

Cross line bussing (bus connections to the Mernda and Craigieburn lines) will also be further explored through later stages as the design and construction methodology are developed.

7.6 Driver Training & Rail Commissioning

At the completion of the rail occupation, the new rail corridor will need to be commissioned. During commissioning, test trains will run for a few days while the timings at the remaining level crossings between North Melbourne Station and Upfield Station will be confirmed for boom gate closures, train signalling, timetabling etc.

The test train will operate between 9am – 5pm. The project will provide traffic control at each level crossing to assist with the testing procedures which will require traffic to stop just prior to the train's arrival and be released as the train has departed. Level crossings impacted will be under traffic management control during this period.

This current proposal for commissioning is subject to change.

7.7 Temporary Car Parking

The project will require the temporary occupation of various commuter, trader and residential both on-street and off-street car parking to safely deliver the project. It should be noted, there is no dedicated train parking areas near the stations within the project area. Therefore, train commuters are likely to use the on-street and off-street parking.

To manage the temporary car parking disruptions, the project will work together with the community and government authorities to minimise and manage the affected parking areas.

7.8 Bicycle Disruption Strategy

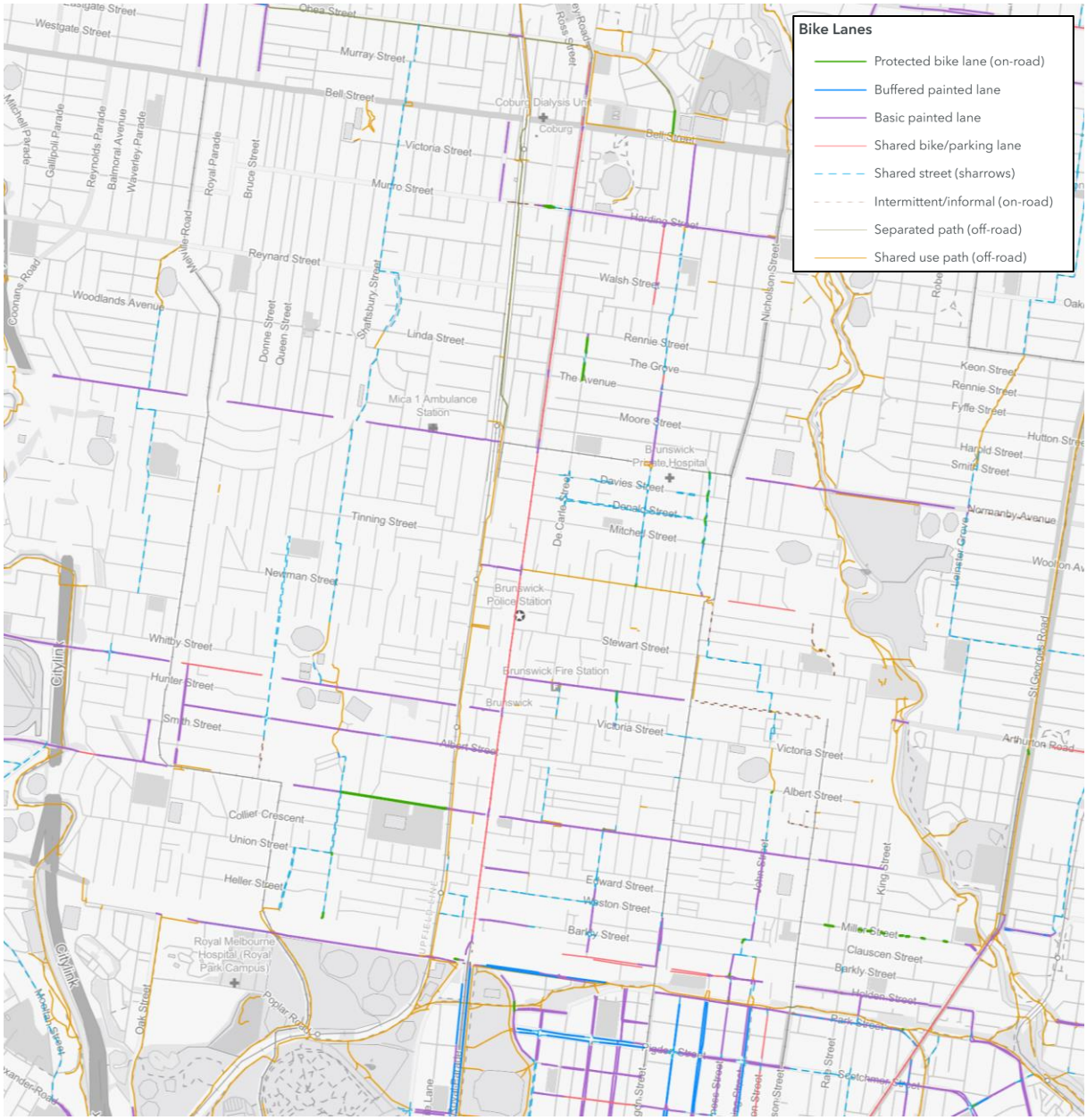
The project requires an extended closure of the existing Upfield Bike Path from Moreland Road to Park Street to safely accommodate works for the new CSR and main construction works. This closure is to allow for three separate work fronts to be undertaken simultaneously, reducing the overall length of time of construction works. Additional details, including the timing and duration of a temporary closure of the Upfield Bike Path, will be available following further development of the design and construction methodology. The bike path will be reopened upon the completion of the reinstated bike path.

Two proposed detours have been prepared as an alternative route during construction to the east and west of the Upfield Line.

7.8.1 Existing Bicycle Facilities

Figure 7-2 outlines the existing cycling infrastructure that is available within the project area. The use of the Upfield Bike Path from Moreland Road to Park Street is 2.6km in length.

Figure 7-2: Existing Bicycle Facilities Within the Project Area



Source: Transport Victoria Bicycle Infrastructure Network

7.8.2 Proposed Detour Routes

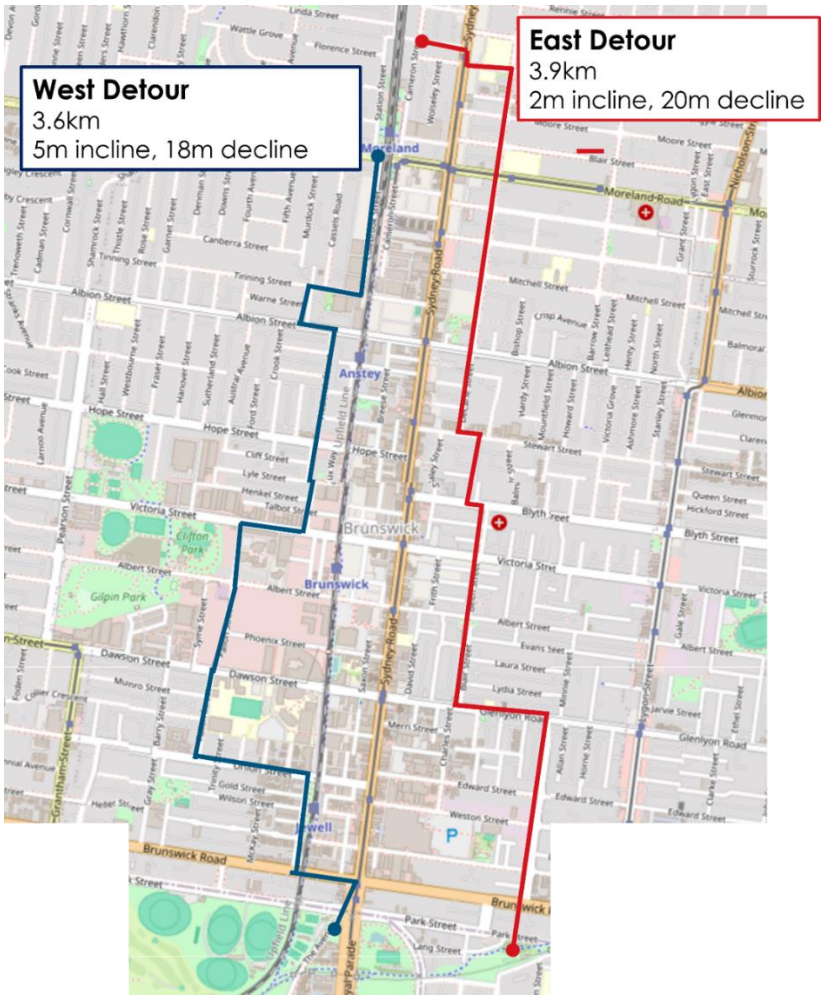
There are two proposed detour routes that have been prepared as alterative routes during construction. These are located to the west and east of the train line. These routes were determined based on the following principles:

- Utilise existing infrastructure
- Reduce the increase in travel length
- Provide additional connections to cyclists joining part way along the detour
- Utilise formal crossing points across busier roads
- Provide end connections to the broader cycling network

It is noted that these routes are expected to be further refined through the development of the construction methodology. It is expected that this will involve stakeholder engagement with DTP, Council, Bicycle Network and other community groups and interested parties. These disruptions will be communicated to the general public through a dedicated communications and engagement team.

These detour routes are identified in Figure 7-3 below.

Figure 7-3: Bicycle Detour Routes for Upfield Bike Path Closure



Incline / decline for southbound travel

7.8.3 Potential Bicycle Improvements

To further assist cyclists on alternative bicycle routes during the Upfield Bike Path closure, the following treatments will be considered where appropriate:

- Pop up bike lanes along diversion routes to provide separation from cyclists and live traffic.
- Road line marking (i.e., sharrows) & signage to provide clear directions of alternative bicycle routes.
- Bicycle activated warning signs to alert drivers of cyclists.
- Increase temporary bike parking located at or near stations for potential alternative transport options.
- Advocacy to local and state governments for temporary restricted parking to increase safety of cyclists.

7.8.4 Estimated Travel Time

By using Google Maps to estimate the approximate travel time for cyclists in terms of each proposed diversion route from Moreland Road to Park Street, the existing conditions was calculated and compared to the western and eastern connection within the table and maps below. This is shown in Table 7-2, with additional detail in Appendix E.

Table 7-2: Comparison of Estimated Ride Time for Each Route

Route	Estimated Time	
	Citybound	Outbound
Upfield Bike Path	13 minutes	14 minutes
Western Route	17 minutes	17 minutes
Eastern Route	20 minutes	21 minutes

7.8.5 East-west cycling

During construction, east-west cycling movements will be maintained at each level crossing, consistent with the vehicle closures. Access will be maintained where possible. During construction events where closures are required, cyclists will be detoured to the nearest east-west crossing point.

7.9 Pedestrian Disruption Strategy

As mentioned above, a long term closure of the Upfield Bike Path is required to undertake the main construction works. This is a full closure from Moreland Road to Park Street over an extended period of time. This closure impacts both pedestrians and cyclists alike travelling in the north-south direction, with pedestrian movements redirected to alternate north-south connections.

During construction pedestrians will be provided access points to cross the rail corridor. Pedestrians may also be able to cross at any of the level crossings, but during L-Beam installation and stitch pours, access will be restricted for safety and detoured via the closest east-west crossing points across the rail. The nature of how pedestrian crossings will be managed will be further identified and explored as the construction methodology is further progressed. It is noted that impacts to pedestrian access will be minimised wherever possible.

Barkly Street and Tinning Street pedestrian crossing are required to be temporarily closed for approximately 2-3 months to facilitate construction activities (i.e., plant/vehicle movements, elevated rail bridge, landscaping works) within the rail corridor.

In addition to the above, the pedestrian footbridge at Phoenix Street will need to be demolished to allow for construction works of the elevated rail bridge and piers along the train line.

Appropriate detours will be in place for all closures.

8 Summary

The North West Program Alliance (NWPA) consisting of the Level Crossing Removal Project (LXRP), Metro Trains Melbourne(MTM), John Holland Group (JHG) and Kellog Brown & Root (KBR, is undertaking due diligence assessment for the Project.

The Project is being referred under the Environment Effects Act 1978. As part of this process, potential environmental effects (including social effects associated with impacts to traffic and transport networks) are required to be assessed to determine if the project requires further assessment such as an Environmental Effects Statement (EES).

This document has been prepared to summarise the key findings and outcomes that have been derived as a result of the traffic and transport technical assessments undertaken for the Brunswick and Parkville Level Crossing Removal Project.

The Project will ultimately improve safety, reduce congestion and improve travel times in the area, and improve connections for pedestrians and cyclists. Temporary construction impacts will be managed by the project by implementing appropriate mitigation and management measures.

The following summarises the key design outcomes that have been determined at this stage:

- A ‘rail over’ design has been selected, consisting of an elevated rail track from Moreland Road to Park Street, through Brunswick and Parkville. This removes eight level crossings along the corridor, opening up the space underneath.
- The existing stations at Anstey, Brunswick and Jewell will be decommissioned and replaced with new stations in Brunswick's north and south.
- The works will involve the reconstruction of the Upfield Bike Path, which will be upgraded to include separated walking and cycling paths underneath the elevated rail bridge.
- Eight level crossings will be removed as a part of the proposed works. Each road is proposed to remain open upon completion of the project, and the most appropriate crossing treatments were assessed at each of the crossings. The following crossing treatments have been identified at this stage, as shown in Table 8-1.

Table 8-1: Summary of Treatments

Crossing Location	Treatment	Justification
Albion Street	Signalised crossing	Signals to provide ease of crossing for bus routes. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Hope Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Albert Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Victoria Street	Signalised crossing	Signals to provide ease of crossing for bus routes. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.
Dawson Street	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.

Union Street	Zebra and Cyclist Priority Crossing	Raised zebra / priority crossing to fully prioritise cyclist movements.
Brunswick Road	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing.
Park Street	Signalised crossing	Traffic volumes warrant a signalised crossing over a zebra / priority crossing. Further analysis is proposed to identify suitability of optimised signalling outcome for cyclists.

- The results of the assessments undertaken indicate that the proposed treatments can operate in a favourable manner that allows additional green time to be provided to the pedestrians and cyclists crossing, and not impacting the operation of Sydney Road. These arrangements are expected to be a significant improvement to through traffic when compared to the current level crossings, which result in lengthy delays to through traffic on each of the side roads.
- The implementation of the proposed treatments will result in the loss of some existing on-street car parking spaces at the road crossings and stations. Most notably, the new southern station precinct will utilise the off-street car park area currently used by RMIT.

The following summarises impacts associated with the construction of the project:

- Construction of the elevated rail bridge will result in various traffic disruptions, including road closures. Road closures on busy east-west roads will be minimised wherever possible. Traffic management on busy roads will be implemented outside of peak periods where practical.
- The Upfield Bike Path will have an extended closure during construction. Two alternative routes have been identified for cyclists during this period.
- All bus routes proximate to the project will be maintained, albeit with some detours in place to accommodate any temporary road closures.
- Pedestrians will be able to continue to cross the rail corridor during construction at specified and managed locations depending on the stage and location of the construction works.
- More detailed assessments, reports and strategies will be developed during the project's design phases to determine how the project will be delivered and what those impacts are during the construction stage. This will be achieved through the preparation of detailed Construction Traffic Management Plans and associated Traffic Guidance Schemes.

During the detailed design and construction stage of the project, consultation will be undertaken with stakeholder groups including DTP, City of Melbourne Council, Merri-bek City Council, Public Transport Victoria, Yarra Trams, Bicycle Network and the local community. This will ensure all requirements of each stakeholder are understood and considered throughout all stages of the project up until the works are delivered.

It is noted that the design is still under development, and subject to change throughout the progression of the design stage. This report details the known information as of the time of its writing.

Appendices

Appendix A Transport Survey Results

Table A- 1 Road Crossing Description

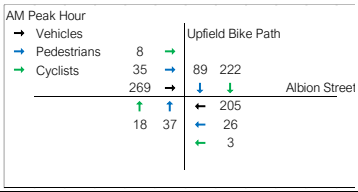
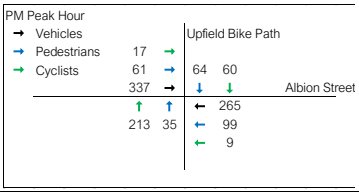
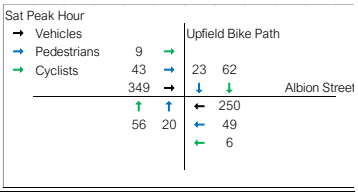
Road Name	Road Hierarchy	Authority	Daily Traffic Volume	Peak Hour Traffic Volumes	Description	Image
Park Street	Collector Road	Merri-Bek Council	13,200 vpd	• East-west Traffic Volumes – AM Peak 936 – PM Peak 1,148 – Saturday 1,163 • North-South Active Travel – AM Peak 304 – PM Peak 445 – Saturday 196	• 9m Crossing Distance • Single lane in each direction • Pedestrian operated signals • 50km/h speed limit • 33 km/h 85th percentile peak hour travel speed • No bus routes	
Brunswick Road	Primary Arterial Road	DTP	17,200 vpd	• East-west Traffic Volumes – AM Peak 1,070 – PM Peak 1,190 – Saturday 1,307 • North-South Active Travel – AM Peak 568 – PM Peak 502 – Saturday 252	• 8.5m Crossing Distance • Single lane in each direction • Pedestrian operated signals • 60km/h speed limit • 33 km/h 85th percentile peak hour travel speed • 504 bus route	

Union Street	Collector Road	Merri-Bek Council	4,200 vpd	• East-west Traffic Volumes – AM Peak 288 – PM Peak 450 – Saturday 349 • North-South Active Travel – AM Peak 635 – PM Peak 569 – Saturday 270	• 10.5m Crossing Distance • Single lane in each direction • Median pedestrian refuge • 40km/h speed limit • 33 km/h 85th percentile peak hour travel speed • No bus routes	
Dawson Street	Major Road	Merri-Bek Council	14,300 vpd	• East-west Traffic Volumes – AM Peak 930 – PM Peak 1059 – Saturday 1,093 • North-South Active Travel – AM Peak 506 – PM Peak 619 – Saturday 395	• 11m Crossing Distance • Single lane in each direction • Median pedestrian refuge • On road bicycle lanes • 50km/h speed limit • 34 km/h 85th percentile peak hour travel speed • 506 Bus Route	
Albert Street	Local Street	Merri-Bek Council	7,500 vpd	• East-west Traffic Volumes – AM Peak 498 – PM Peak 801 – Saturday 579 • North-South Active Travel – AM Peak 451 – PM Peak 532 – Saturday 311	• 7.5m Crossing Distance • Single lane in each direction • No crossing infrastructure • 50km/h speed limit • 38 km/h 85th percentile peak hour travel speed • No bus routes	

Victoria Street	Major Road	Merri-Bek Council	9,400 vpd	• East-west Traffic Volumes – AM Peak 725 – PM Peak 810 – Saturday 816 • North-South Active Travel – AM Peak 426 – PM Peak 473 – Saturday 285	• 10m Crossing Distance • Single lane in each direction • Median pedestrian refuge • 50km/h speed limit • 40 km/h 85th percentile peak hour travel speed • 508 Bus Route	
Hope Street	Collector Road	Merri-Bek Council	5,500 vpd	• East-west Traffic Volumes – AM Peak 300 – PM Peak 414 – Saturday 411 • North-South Active Travel – AM Peak 353 – PM Peak 404 – Saturday 190	• 6.5m Crossing Distance • Single lane in each direction • No crossing infrastructure • 50km/h speed limit • 35 km/h 85th percentile peak hour travel speed • 509 Bus Route – does not cross level crossing	
Albion Street	Major Road	Merri-Bek Council	8,600 vpd	• East-west Traffic Volumes – AM Peak 474 – PM Peak 602 – Saturday 599 • North-South Active Travel – AM Peak 366 – PM Peak 372 – Saturday 161	• 7m Crossing Distance • Single lane in each direction • No crossing infrastructure • 50km/h speed limit • 41 km/h 85th percentile peak hour travel speed • 503 Bus Route	

Table A- 2 Survey Results (collected Wednesday 22/03/2023 and Saturday 25/03/2023)

Road Name	AM Peak Hour	PM Peak Hour	Saturday Midday Peak
Park Street	8:00AM to 9:00AM	5:00PM to 6:00PM	12:00PM to 1:00PM
	AM Peak Hour Vehicles 606 Pedestrians 195 Cyclists 46 Upfield Bike Path: 19 262 Park Street: 330 / 28 / 5 34 25	PM Peak Hour Vehicles 561 Pedestrians 32 Cyclists 56 Upfield Bike Path: 36 61 Park Street: 587 / 44 / 20 327 21	Sat Peak Hour Vehicles 668 Pedestrians 59 Cyclists 45 Upfield Bike Path: 26 74 Park Street: 495 / 50 / 80 62 34
Brunswick Road	7:45AM to 8:45AM	5:00PM to 6:00PM	11:45AM to 12:45PM
	AM Peak Hour Vehicles 586 Pedestrians 7 Cyclists 42 Upfield Bike Path: 27 487 Brunswick Roa: 484 / 13 / 1 27 27	PM Peak Hour Vehicles 506 Pedestrians 4 Cyclists 16 Upfield Bike Path: 37 89 Brunswick Roa: 684 / 27 / 5 341 35	Sat Peak Hour Vehicles 588 Pedestrians 23 Cyclists 38 Upfield Bike Path: 38 107 Brunswick Roa: 719 / 52 / 108 69 38
Union Street	8:00AM to 9:00AM	5:00PM to 6:00PM	12:00PM to 1:00PM
	AM Peak Hour Vehicles 182 Pedestrians 1 Cyclists 99 Upfield Bike Path: 52 445 Union Street: 106 / 50 / 4 35 103	PM Peak Hour Vehicles 215 Pedestrians 2 Cyclists 111 Upfield Bike Path: 83 86 Union Street: 235 / 81 / 10 326 74	Sat Peak Hour Vehicles 165 Pedestrians 9 Cyclists 125 Upfield Bike Path: 68 113 Union Street: 184 / 69 / 7 64 25
Dawson Street	8:00AM to 9:00AM	5:00PM to 6:00PM	11:45AM to 12:45PM
	AM Peak Hour Vehicles 540 Pedestrians 19 Cyclists 59 Upfield Bike Path: 21 400 Dawson Stree: 390 / 78 / 12 44 41	PM Peak Hour Vehicles 572 Pedestrians 37 Cyclists 267 Upfield Bike Path: 128 71 Dawson Stree: 487 / 58 / 18 316 104	Sat Peak Hour Vehicles 562 Pedestrians 25 Cyclists 169 Upfield Bike Path: 114 116 Dawson Stree: 531 / 77 / 3 84 81
Albert Street	8:00AM to 9:00AM	5:00PM to 6:00PM	10:45AM to 11:45AM
	AM Peak Hour Vehicles 327 Pedestrians 3 Cyclists 52 Upfield Bike Path: 52 332 Albert Street: 171 / 74 / 12 46 21	PM Peak Hour Vehicles 412 Pedestrians 12 Cyclists 87 Upfield Bike Path: 63 92 Albert Street: 389 / 83 / 38 301 76	Sat Peak Hour Vehicles 286 Pedestrians 21 Cyclists 96 Upfield Bike Path: 81 98 Albert Street: 293 / 72 / 21 71 61
Victoria Street	7:45AM to 8:45AM	5:00PM to 6:00PM	11:30AM to 12:30PM
	AM Peak Hour Vehicles 418 Pedestrians 11 Cyclists 68 Upfield Bike Path: 63 307 Victoria Stree: 307 / 40 / 2 38 18	PM Peak Hour Vehicles 428 Pedestrians 29 Cyclists 89 Upfield Bike Path: 49 77 Victoria Stree: 382 / 84 / 10 268 79	Sat Peak Hour Vehicles 470 Pedestrians 17 Cyclists 129 Upfield Bike Path: 46 106 Victoria Stree: 346 / 109 / 9 85 48
Hope Street	8:00AM to 9:00AM	5:00PM to 6:00PM	11:00AM to 12:00PM
	AM Peak Hour Vehicles 157 Pedestrians 6 Cyclists 65 Upfield Bike Path: 15 291 Hope Street: 143 / 21 / 15 39 8	PM Peak Hour Vehicles 215 Pedestrians 16 Cyclists 42 Upfield Bike Path: 29 78 Hope Street: 199 / 48 / 13 266 31	Sat Peak Hour Vehicles 175 Pedestrians 9 Cyclists 232 Upfield Bike Path: 27 73 Hope Street: 236 / 184 / 10 65 25

	7:45AM to 8:45AM	5:00PM to 6:00PM	12:45PM to 1:45PM
Albion Street			

Appendix B SIDRA Modelling Results

B.1 Pedestrian Operated Signal Modelling Results

Table B - 1: Park Street Signalised Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.03	21 sec	2m	0.30	23 sec	23m	0.06	22 sec	4m
Park Street (E)	0.29	6 sec	34m	0.52	7 sec	73m	0.43	7 sec	57m
Upfield Bike Path (N)	0.24	22 sec	18m	0.06	21 sec	4m	0.07	22 sec	5m
Park Street (W)	0.53	7 sec	76m	0.49	7 sec	68m	0.59	8 sec	88m
Intersection	**0.53**	**10 sec**	**76m**	**0.52**	**11 sec**	**68m**	**0.59**	**9 sec**	**88m**

Table B - 2: Brunswick Road Signalised Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.03	21 sec	2m	0.32	23 sec	24m	0.06	21 sec	5m
Brunswick Road (E)	0.43	6 sec	55m	0.60	8 sec	92m	0.63	8 sec	100m
Upfield Bike Path (N)	0.45	23 sec	36m	0.08	22 sec	6m	0.10	22 sec	7m
Brunswick Road (W)	0.51	7 sec	72m	0.44	7 sec	59m	0.52	7 sec	73m
Intersection	**0.51**	**12 sec**	**72m**	**0.60**	**11 sec**	**92m**	**0.63**	**9 sec**	**100m**

Table B - 3: Dawson Street Signalised Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.04	20 sec	3m	0.25	21 sec	21m	0.07	20 sec	5m
Dawson Street (E)	0.34	7 sec	44m	0.42	7 sec	59m	0.46	7 sec	66m
Upfield Bike Path (N)	0.31	21 sec	28m	0.06	20 sec	5m	0.09	20 sec	8m
Dawson Street (W)	0.47	8 sec	68m	0.49	8 sec	74m	0.45	8 sec	71m
Intersection	**0.47**	**12 sec**	**68m**	**0.49**	**11 sec**	**74m**	**0.45**	**10 sec**	**71m**

Table B - 4:Victoria Street Signalised Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.03	20 sec	2m	0.21	21 sec	18m	0.07	20 sec	6m
Victoria Street (E)	0.26	7 sec	33m	0.33	7 sec	43m	0.30	7 sec	38m
Upfield Bike Path (N)	0.24	21 sec	21m	0.06	20 sec	5m	0.08	20 sec	7m
Victoria Street (W)	0.36	7 sec	48m	0.37	7 sec	50m	0.41	7 sec	56m
Intersection	**0.36**	**11 sec**	**48m**	**0.37**	**11 sec**	**50m**	**0.41**	**10 sec**	**56m**

Table B - 5: Albion Street Signalised Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.02	21 sec	1m	0.20	22 sec	15m	0.05	21 sec	4m
Albion Street (E)	0.18	5 sec	19m	0.23	6 sec	26m	0.22	6 sec	24m
Upfield Bike Path (N)	0.21	22 sec	16m	0.06	21 sec	4m	0.06	21 sec	4m
Albion Street (W)	0.24	6 sec	26m	0.30	6 sec	35m	0.31	6 sec	36m
Intersection	**0.24**	**11 sec**	**26m**	**0.30**	**11 sec**	**35m**	**0.31**	**8 sec**	**36m**

B.2 Zebra and Bicycle Priority Crossing Modelling Results

Table B - 6: Union Street Zebra and Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.01	0 sec	0m	0.06	0 sec	0m	0.01	0 sec	0m
Union Street (E)	0.15	10 sec	3m	0.32	10 sec	9m	0.21	9 sec	5m
Upfield Bike Path (N)	0.08	0 sec	0m	0.01	0 sec	0m	0.02	0 sec	0m
Union Street (W)	0.26	10 sec	7m	0.29	10 sec	9m	0.19	9 sec	5m
Intersection	**0.26**	**10 sec**	**7m**	**0.32**	**10 sec**	**9m**	**0.21**	**9 sec**	**5m**

Table B - 7: Hope Street Zebra and Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.01	0 sec	0m	0.05	0 sec	0m	0.01	0 sec	0m
Hope Street (E)	0.16	8 sec	4m	0.23	9 sec	6m	0.24	8 sec	6m
Upfield Bike Path (N)	0.05	0 sec	0m	0.01	0 sec	0m	0.01	0 sec	0m
Hope Street (W)	0.17	8 sec	5m	0.25	9 sec	7m	0.23	8 sec	7m
Intersection	**0.17**	**8 sec**	**5m**	**0.25**	**9 sec**	**7m**	**0.24**	**7 sec**	**7m**

B.3 Albert Street Modelling Results

Table B - 8: Albert Street Signalised Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.04	20 sec	3m	0.24	21 sec	20m	0.06	20 sec	5m
Albert Street (E)	0.15	6 sec	17m	0.34	7 sec	44m	0.25	7 sec	31m
Upfield Bike Path (N)	0.26	21 sec	23m	0.05	20 sec	4m	0.08	20 sec	6m
Albert Street (W)	0.28	7 sec	36m	0.35	7 sec	47m	0.25	7 sec	30m
Intersection	**0.28**	**13 sec**	**36m**	**0.35**	**11 sec**	**47m**	**0.25**	**10 sec**	**31m**

Table B - 9: Albert Street Zebra and Pedestrian Crossing SIDRA Results

Approach	AM Peak Hour			PM Peak Hour			Saturday		
	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)	DOS	Average Delay (sec)	95th %ile Queue (m)
Upfield Bike Path (S)	0.01	0 sec	0m	0.05	0 sec	0m	0.01	0 sec	0m
Albert Street (E)	0.20	9 sec	5m	0.50	11 sec	21m	0.33	9 sec	9m
Upfield Bike Path (N)	0.06	0 sec	0m	0.01	0 sec	0m	0.02	0 sec	0m
Albert Street (W)	0.39	10 sec	15m	0.53	12 sec	28m	0.33	9 sec	10m
Intersection	**0.39**	**10 sec**	**15m**	**0.53**	**12 sec**	**28m**	**0.33**	**9 sec**	**10m**

Appendix C Preliminary Traffic Detours

Figure C - 1: Park Street Traffic Detour

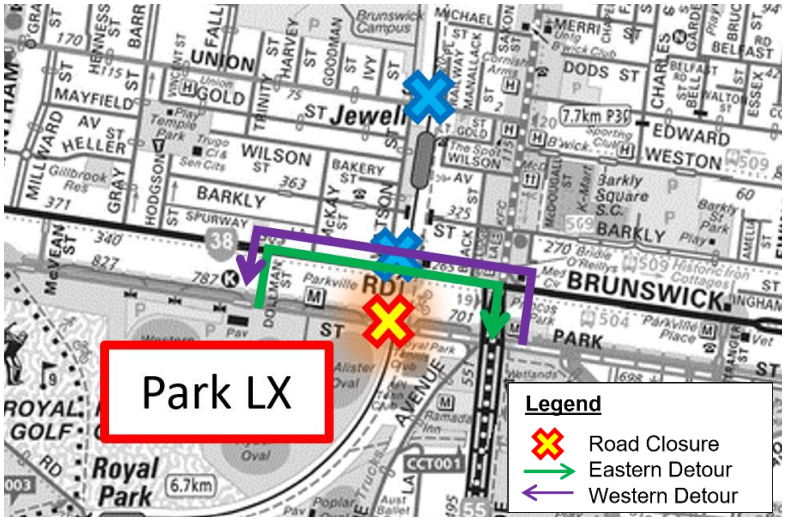


Figure C - 2: Brunswick Road Traffic Detour

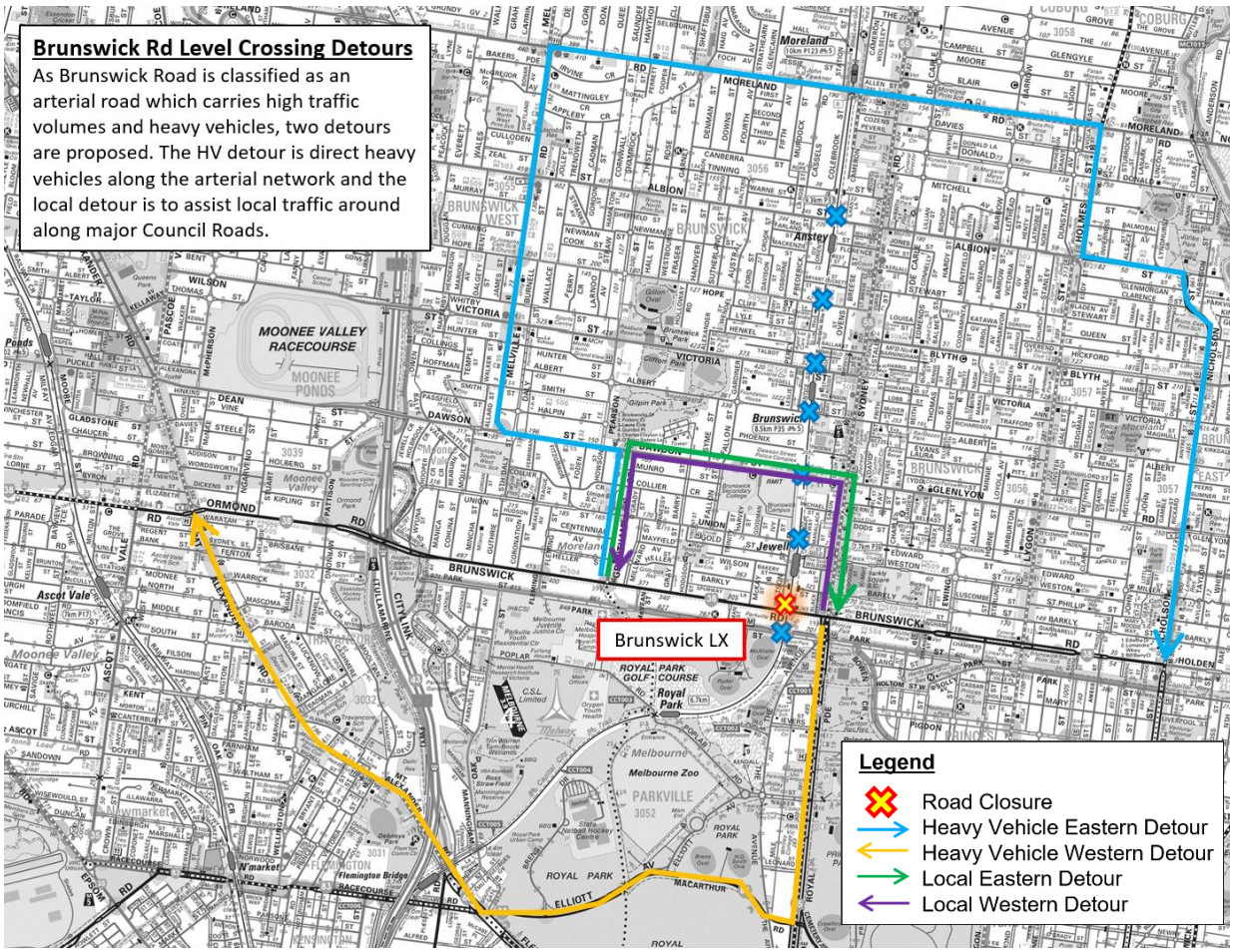


Figure C - 3: Union Street Traffic Detour

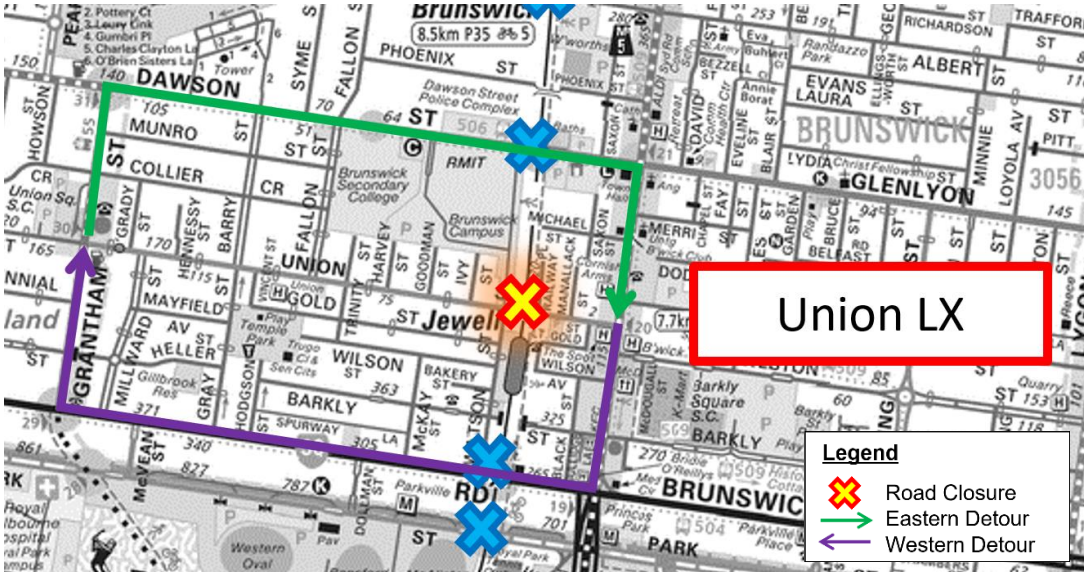


Figure C - 4: Dawson Street Traffic Detour

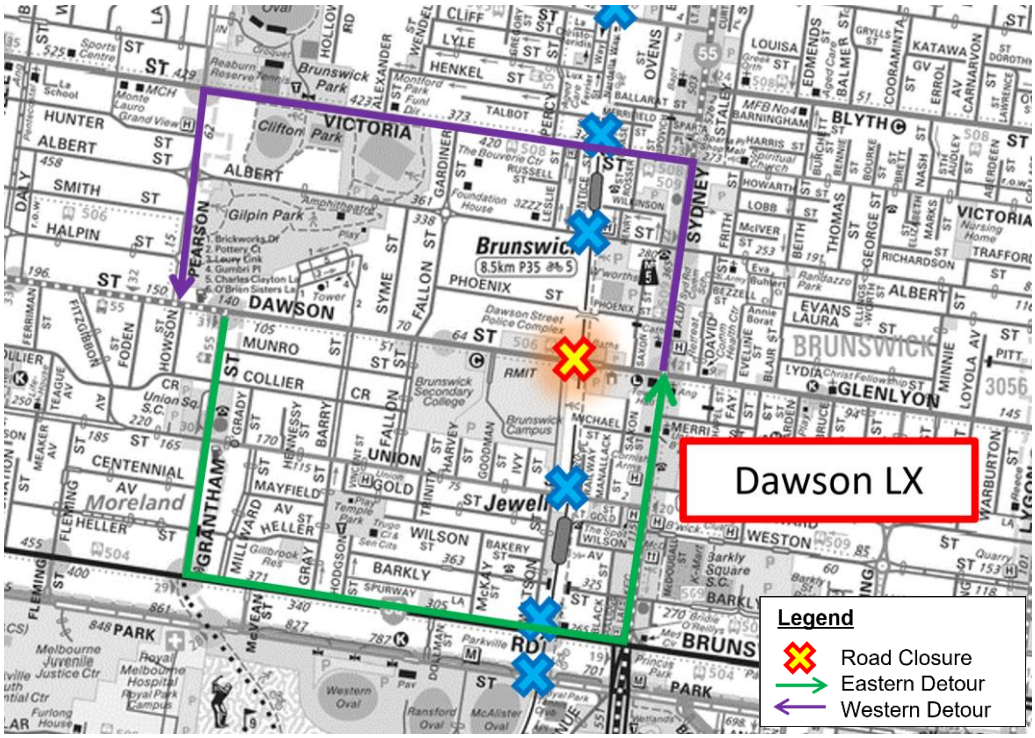


Figure C - 5: Albert Street Traffic Detour

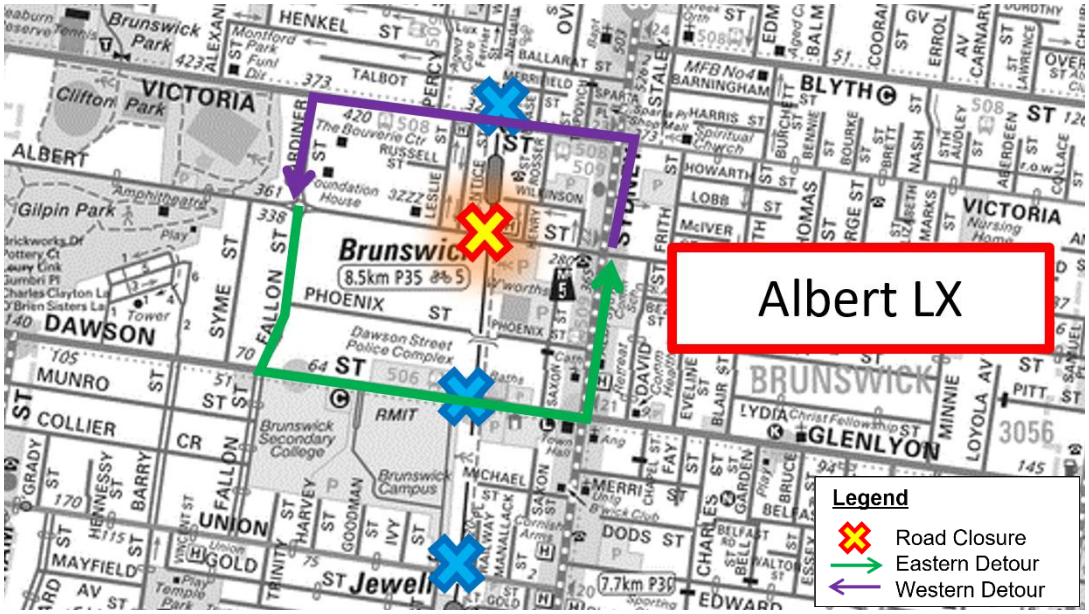


Figure C - 6: Victoria Street Traffic Detour

Figure C - 7: Hope Street Traffic Detour

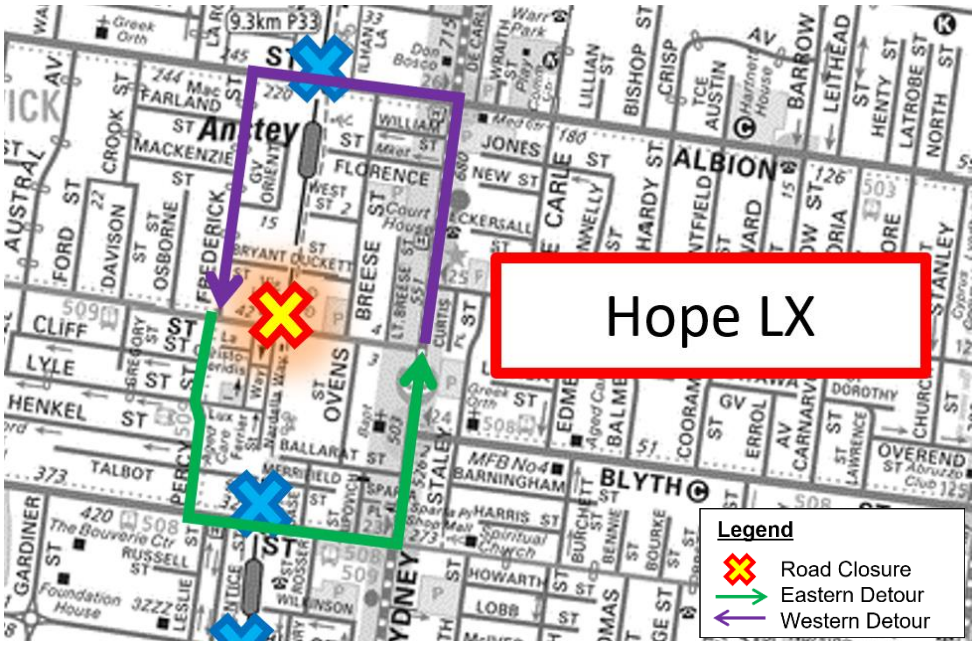


Figure C - 8: Albion Street Traffic Detour

Appendix D Preliminary Bus Detours

Figure D - 1: Proposed Bus Route 504 Detour when Brunswick Road Level Crossing is Closed

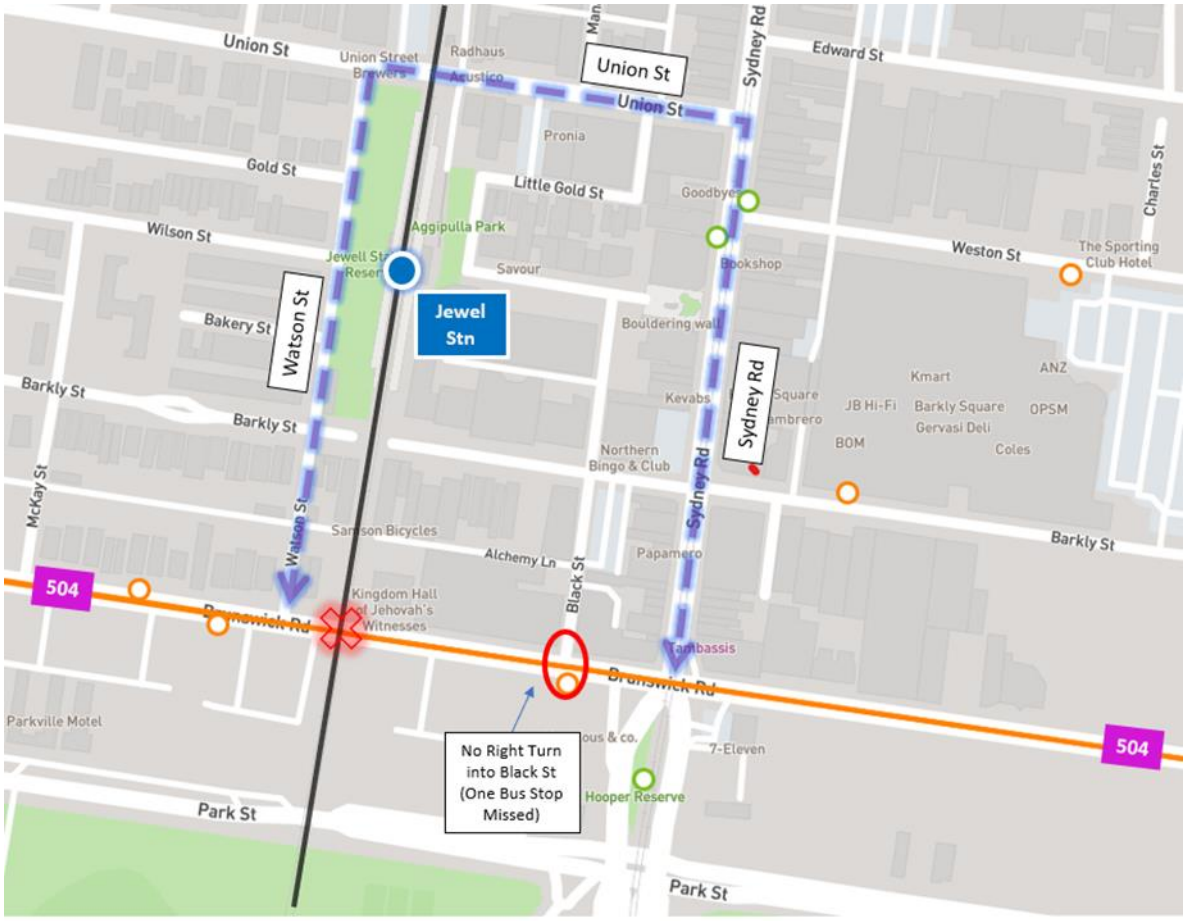


Figure D - 2: Proposed Bus Route 506 Detour when Dawson Street Level Crossing is Closed

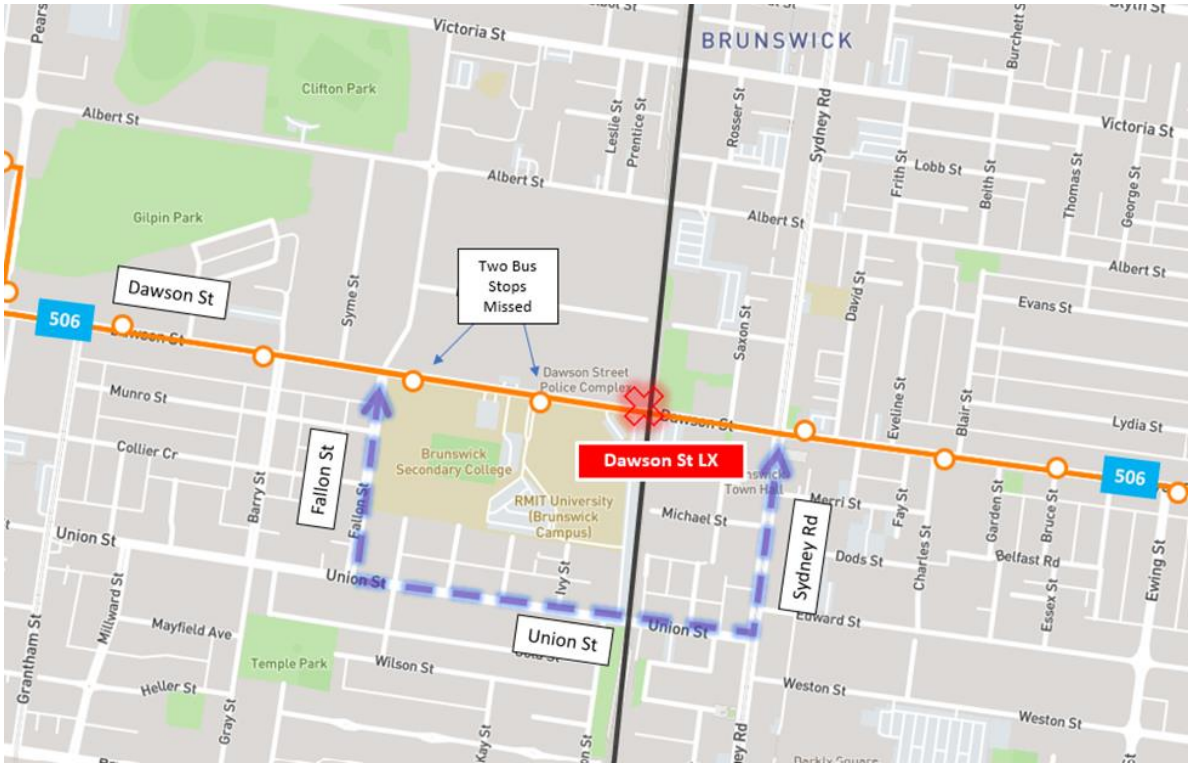


Figure D - 3: Proposed Bus Route 951 (Night bus) Detour when Dawson Street Level Crossing is Closed

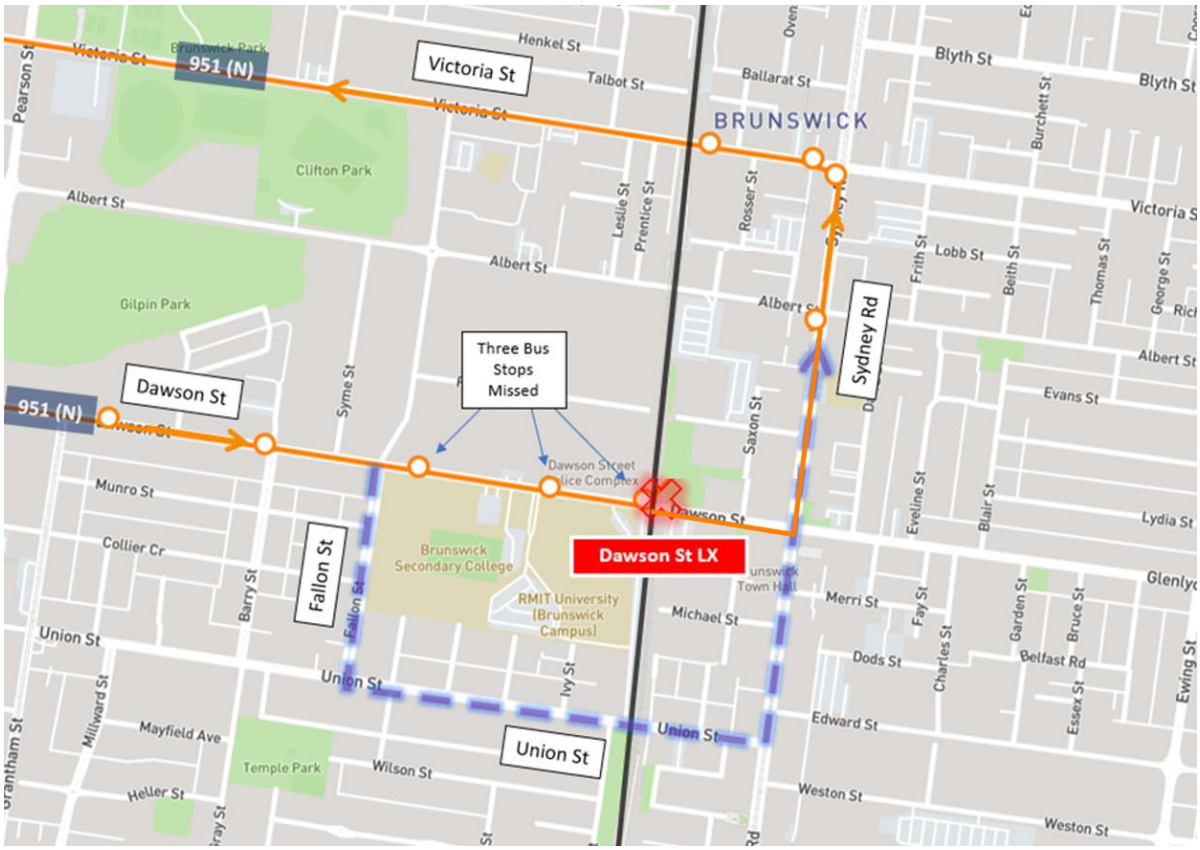


Figure D - 4: Proposed Bus Route 508 Detour when Victoria Street Level Crossing is Closed

Figure D - 5: Proposed Bus Route 509 Detour when Victoria Street Level Crossing is Closed

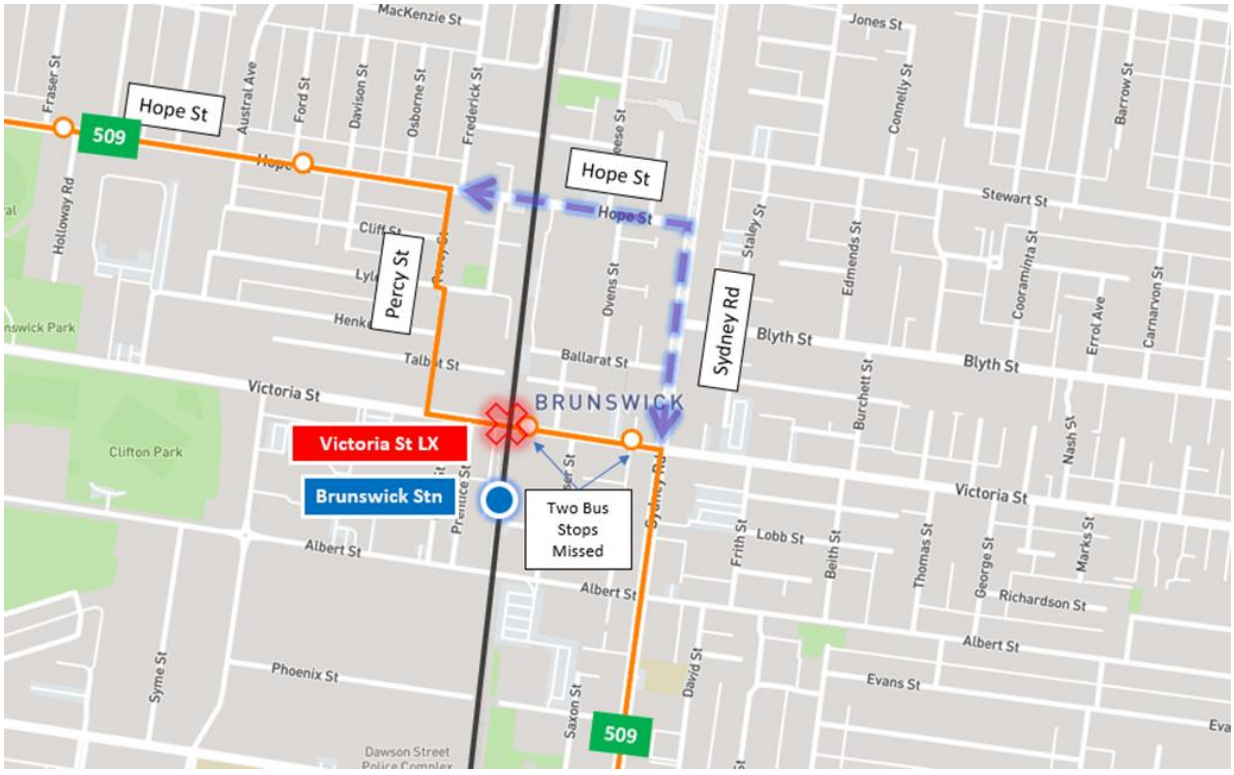


Figure D - 6: Proposed Bus Route 951 (Night Bus) Detour when Victoria Street Level Crossing is Closed

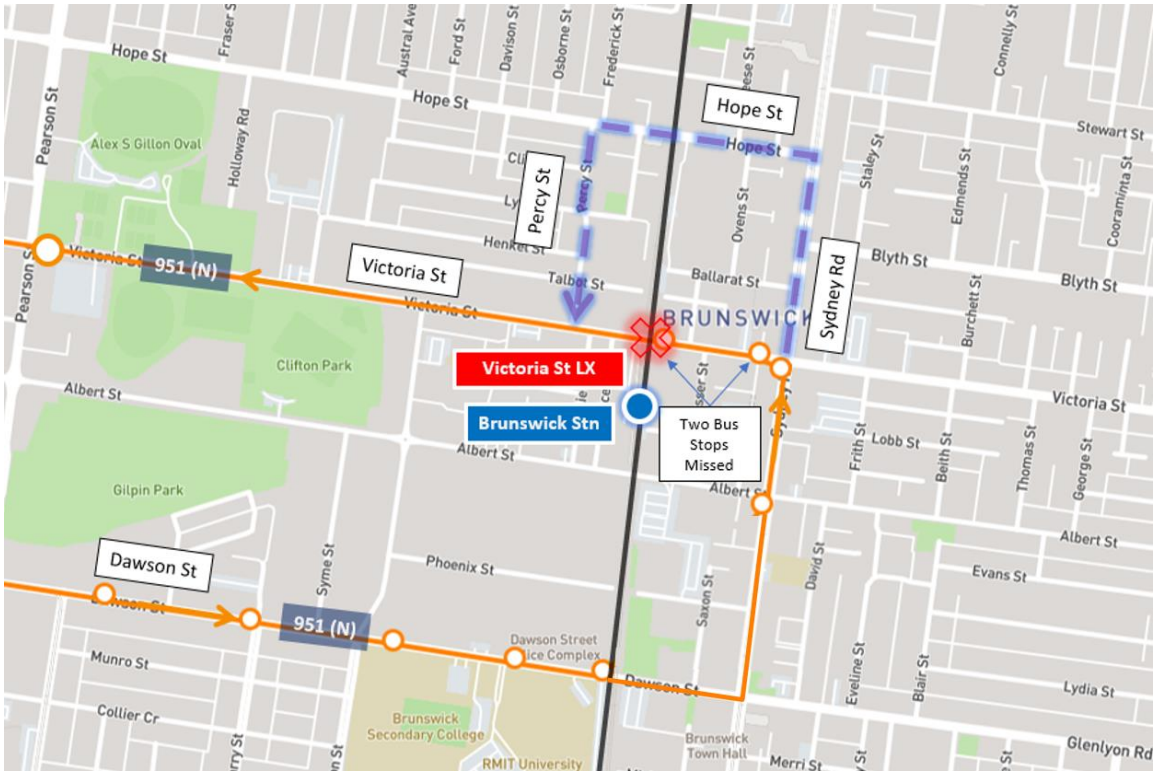
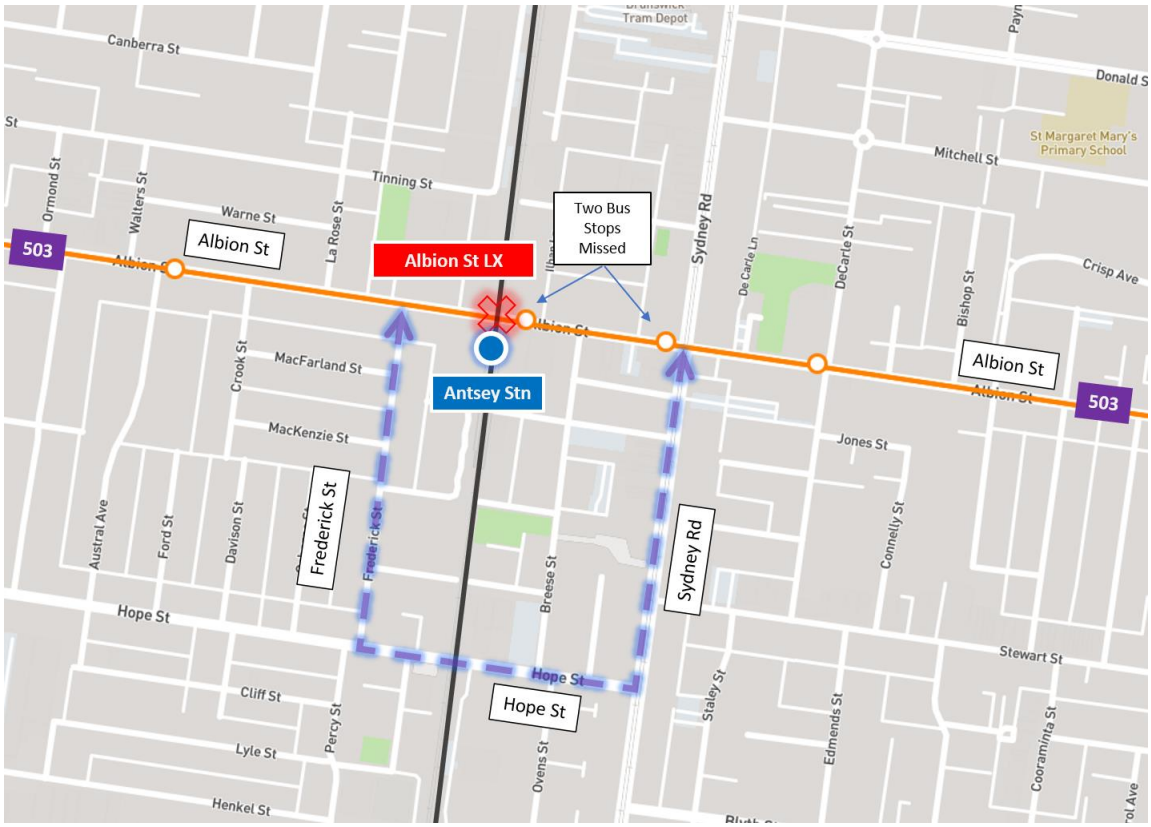


Figure D - 7: Proposed Bus Route 503 Detour when Albion Street Level Crossing is Closed



Appendix E Bicycle Travel Time Estimates

Figure E - 1: Upfield SUP Citybound Travel Time

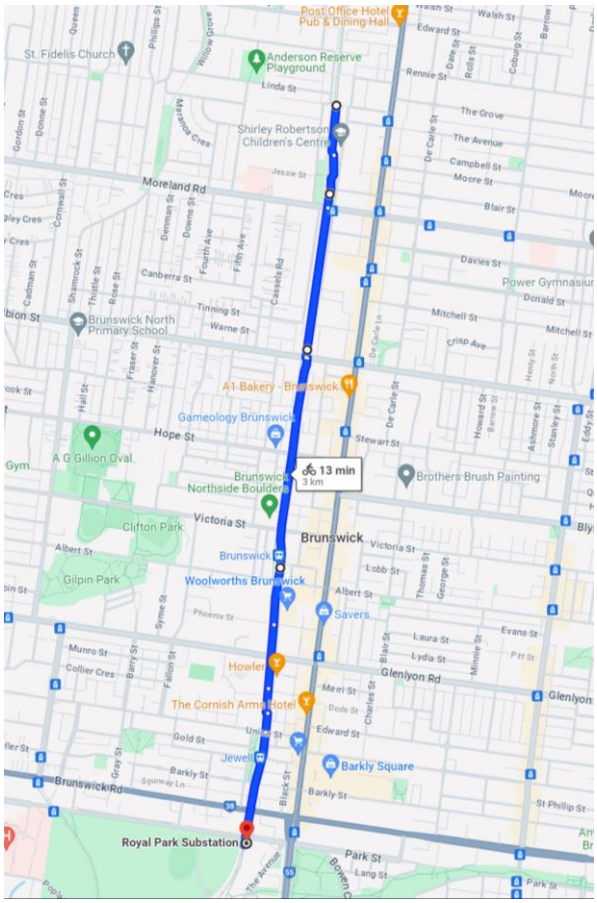


Figure E - 2: Upfield SUP Outbound Travel Time

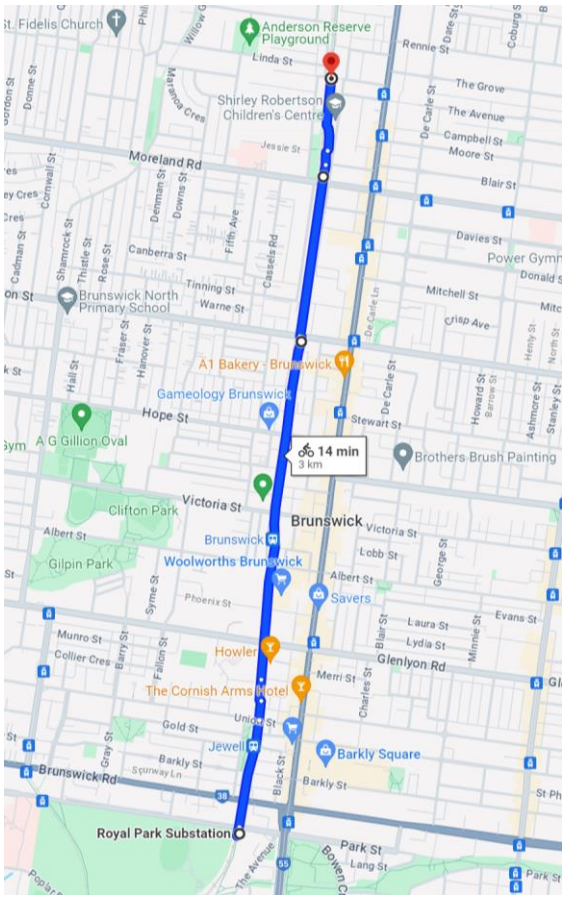


Figure E - 3: Western Route Citybound Travel Time

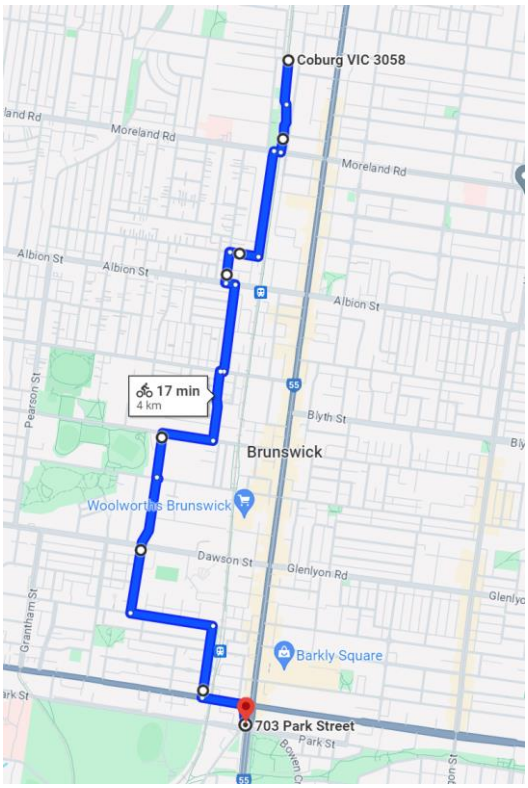


Figure E - 4: Western Route Outbound Travel Time

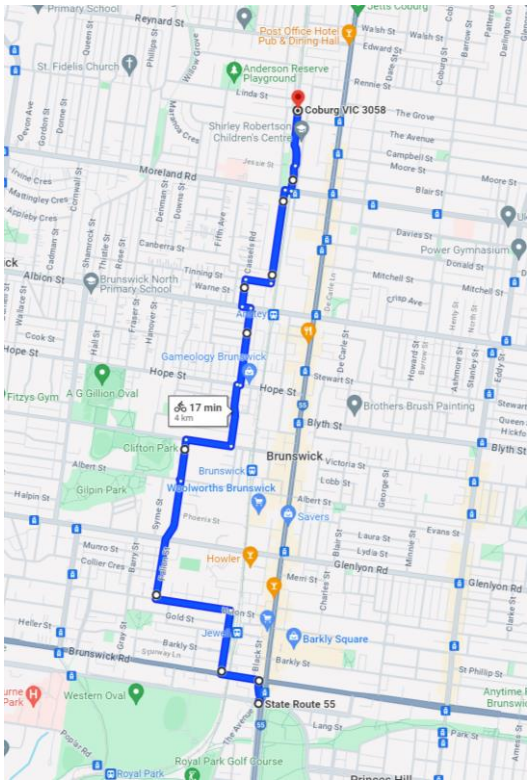


Figure E - 5: Eastern Route Citybound Travel Time

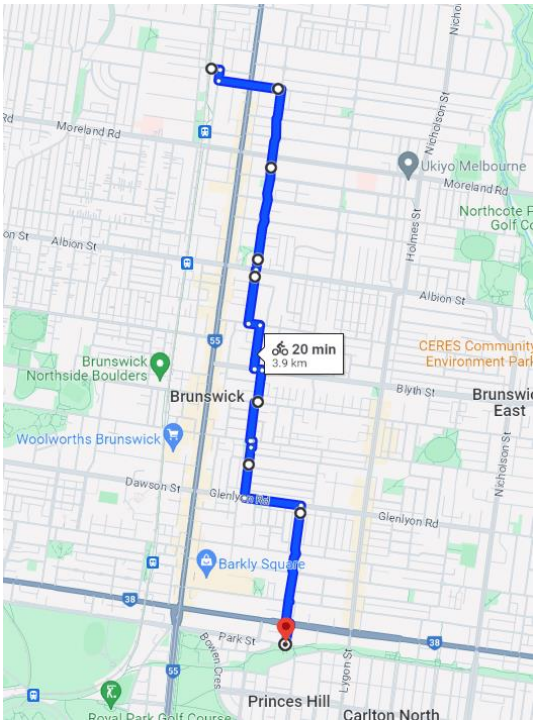
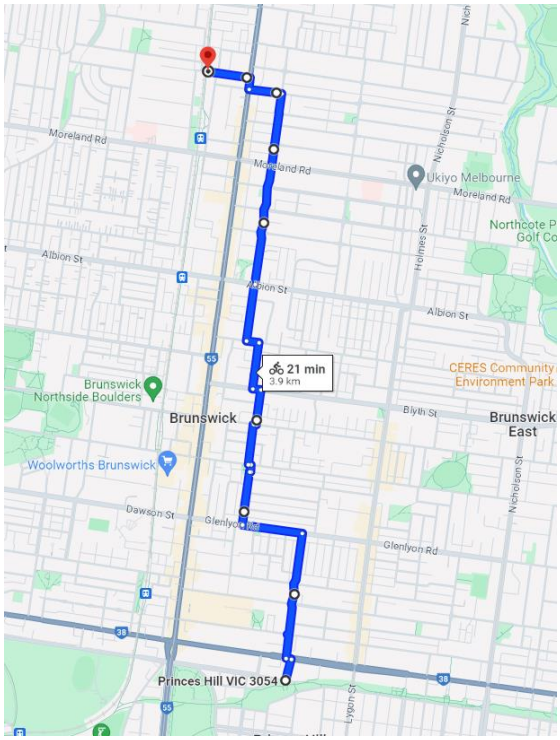


Figure E - 6: Eastern Route Outbound Travel Time



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Stantec Australia Pty Ltd
Level 28, 600 Bourke Street
Melbourne VIC 3000
AUSTRALIA
ABN 17 007 820 322
stantec.com