MOTT MACDONALD

Epping Bridge Concept Design

Transport Impact Assessment

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Project Background

The Australian and NSW governments are jointly funding the replacement of Epping bridge (the bridge) to ease congestion, improve connectivity, and improve safety for road users in North- West Sydney. The Epping Bridge Upgrade (the 'Proposal') would complement the Epping Town Centre (town centre) road and intersection upgrades completed by Transport for NSW (Transport) in 2018 to improve and alleviate traffic congestion in the area.

The Proposal will replace the existing Epping Bridge (the Bridge) with a new wider bridge. Key features of the Proposal include:

- Staged removal of the bridge
- Construction of a new bridge which would include:
  - an additional westbound traffic lane
  - an additional right turn lane eastbound from Beecroft Road onto Blaxland Road
  - a pedestrian and cyclist shared path
  - a raised central median, with widened eastbound and westbound lanes
  - installation of new safety screens on the bridge
  - installation of new traffic signals
  - installation of new streetlights
- Signalling and communications modifications
- Upgrade to approaches to the new bridge from Epping Road, Beecroft Road, and Blaxland Road

Purpose of this report

This report documents the Transport Impact Assessment for the proposed upgrade of Epping Bridge. This bridge is in the Parramatta local government area and is a Transport for NSW (Transport) asset operated and maintained by Sydney Trains. Epping Bridge spans the Northern Railway line South of Epping Station and connects to Beecroft Road and Carlingford Road.

Operational Impacts

The network performance analysis reveals the following operational benefits of the Epping Bridge upgrade:

- Average vehicle speeds are increased by 8.7% and 13.6% in the 2029 AM and PM peaks, respectively.
- Average vehicle delay is reduced by 8.8% and 20.0% in the 2029 AM and PM Peaks, respectively.

The intersection analysis reveals the following operational benefits of the Epping Bridge upgrade:

- Most of the benefits are localised at the intersection of Epping Road, Blaxland Road and Langston Place.
- Intersection performance in the AM peak is forecast to improve from level of service D to C in 2029 opening year and up to 10-years beyond.
- Intersection performance in the PM peak is forecast to improve from level of service D to C in 2029 opening year.
- Intersection performance at the Bridge Street left turn entry onto Beecroft Road in the PM peak, is forecast to improve from level of service D to A, at opening, and will remain at level of service C up to 10-years beyond.

A key benefit of the additional eastbound right turn lane on the Epping Bridge is the improvement in travel times across the precinct. A review of the north-south and east-west movements across the precinct revealed the following:

- A 47% (approximately 2 minute) saving in average southbound travel times between Beecroft Road and Blaxland Road during the 2029 AM Peak.
- An 81% (approximately 10 minute) saving in average southbound travel times between Beecroft Road and Blaxland Road during the 2029 PM Peak
- A 12% (approximately 1 minute) saving in average eastbound travel times between Carlingford Road and Epping Road in the 2029 PM Peak

The Project proposes a 4.5m wide shared path on the southern side of Epping Bridge to link the Epping Road shared path (3.5m) and the Bridge Street Shared path (4.6m). This addresses the missing link between the existing east-west shared paths approaching the bridge.

The Epping Bridge upgrade impacts the following bus stands at the Epping bus interchange:

- Bus Stand C is on the eastern side of Beecroft Road. Bus Stand C will be relocated to the northern side of the pedestrian overbridge bridge. This is currently an on-street parking bay up to 50m in length. It is also used for rail replacement bus operations during night-time or weekend rail closures.
- Bus stands G and H on the western side of Beecroft Road. Bus stands D, E and F will be relocated up to 48.5m further north along the western kerb of Beecroft Road, to accommodate G and H, north of the pedestrian overbridge.

TfNSW has raised concerns about sharing the new location for Bus Stand C with general bus services during rail replacement activities, particularly during weekend long closures. Strategies to deal with these operational issues will require further development with stakeholders during Detailed Design. This may include utilising bust stops on Cambridge St.

An alternate lane configuration in Beecroft Road was developed in the Concept Design phase that would permit retention of all northbound bus stands in their current configuration. Initial SIDRA traffic modelling suggest this would not impact on northbound traffic capacity. It is recommended that this option be developed further during Detailed Design to reduce project impacts on northbound bus operations.

The proposal is expected to impact up to 21 on-street parking spaces. A survey of parking within the precinct identified that during peak weekday parking demand (11:30am) there were at least 47 on-street parking spaces, 36 off-street parking spaces and at least 1-2 accessible spaces, available for use within 400m of Epping Station. Despite the loss, the survey suggests there is adequate parking supply in the precinct to offset any losses.

Construction Impacts

The existing speed limits are 60km/h in the project area and a 40km/h speed limit is proposed during construction. The estimated impact of this construction speed limit, to free-flow traffic speeds, ranges between 26 seconds and 29 seconds per vehicle throughout the area subject to a reduced speed limit.

The performance of the road network during the construction traffic stages was assessed using the VISSIM dynamic modelling software. The biggest impact on traffic performance is because of the construction speed limit reduction from 60km/h to 40km/h. Except for one of the construction stages, most stages maintain existing lane capacity. Stage 5 has the biggest impact on traffic operations. However, if this work is undertaken over the Christmas Break when traffic demand drops to 80% of normal flow, the performance results are consistent with, or better than, the 2023 Base Case.

Heavy and light vehicles will require access to the construction site and indicative construction compounds at 725 Blaxland Road and the rail corridor construction compound off High Street.

The number of light vehicles per construction stage ranges from 14 to 40vpd, while the number of heavy vehicles range per stage ranges from 4 to 60vpd. The highest number of vehicles is required during the bridge demolition stage due to the amount of material required to be removed form site. This stage will require access through the rail corridor on high street.

Light vehicle traffic is anticipated to increase within the range of 0.07% to 0.19% and heavy vehicle traffic is anticipated to increase within the range of 6.45% to 24% on haulage routes. This has potential to result in minor increases to wait times at local intersections. However, this is only anticipated to occur for a short period of time during the bridge demolition period.

A construction compound within the rail corridor is required to enable hi-rail plant to be delivered to site, enable haulage of the demolished bridge structure and delivery of construction materials. This access will only be used during rail possessions when a section of track is required for construction and trains cannot run. The compound will be accessed from High Street with heavy vehicles using High St, Chesterfield Road, Midson Road, Carlingford Road, Beecroft Road and M2 Motorway.

Access to this corridor will only occur during rail possessions during weekend and holiday periods. Due to the timing of the compound's use, the largest volume of additional traffic is expected during the bridge demolition stage.

However, disruptions are anticipated to be short term and residents will have sustained access to the road network and private properties throughout construction. Further, the anticipated volume of heavy vehicle movements is not considered likely to noticeably increase wait times at local intersections during relevant construction stages.

The required number of full-time equivalent workers on the Project will range from 20 to 80 workers per day, depending on the construction stage. It is estimated that throughout any of the construction stages, 25% of the workforce will arrive via public transport, 50% via carpool, and 25% as the sole driver of a private vehicle. To enable the workforce to access the construction site, a temporary parking area will be established at the compound area on Blaxland Road.

In the wider area, it is expected that the presence of workforce vehicles will cause minor increases in traffic volumes throughout the local road network. These increases are likely to impact the road network at specific times of the day when construction is starting or ending and during potential worker changeover. As such, impacts on residents is expected to be minor as arrival and departure would not interfere with regular peak traffic times.

Stand C for buses will be relocated to the existing rail replacement stop north of the pedestrian bridge during construction. Bus stands D, E and F will be relocated up to 48.5m further north along the western kerb of Beecroft Road, to accommodate G and H, north of the pedestrian overbridge. These relocations will occur during construction but will be maintained after the bridge is operational. No reduction in bus services is expected during construction.

Impacts to pedestrian access are expected to be minimal as access will be maintained throughout construction and diversions are available when access is impacted.

Excluding the three-week demolition period, pedestrian access to the shared path along the bridge will be maintained on at least one side throughout the construction stages. Diversions for pedestrians will occur through the train station entrances and overpass. The construction of the temporary bridge platform may also limit access to pedestrian footpaths on the rail corridor side of Beecroft Road and Langston Place. When these temporary impacts occur, pedestrians will also be diverted via the train station to maintain mobility.

The temporary bridge construction platform will require the partial removal of the opal bike shed for the duration of construction activity in this location. This will be determined during detailed design. This is anticipated to be approximately 18 months.

Management and Mitigation Measures

Many long-term and short-term impacts to traffic and transport would be addressed through the detailed design of the Proposal. For residual impacts of the Proposal that arise from engineering constraints or from construction activities that cannot be removed through the design, project-specific and standard mitigation measures have been developed. These measures aim to minimise or mitigate the potential traffic and transport impacts identified during construction and operation. These measures draw on best management practice, specialist knowledge, and government standards or guidelines.

Prior to the commencement of construction, a Traffic Management Plan (TMP) would be prepared as part of the Construction Environmental Management Plan (CEMP). Consultation with the relevant roads authorities would be undertaken during preparation of the construction TMP.

1 Introduction

This report documents the Transport Impact Assessment for the proposal to replace the Epping Bridge. This bridge is in the Parramatta local government area and is a Transport for NSW asset operated and maintained by Sydney Trains. Epping Bridge spans the Northern Railway line South of Epping Station and connects to Beecroft Road and Carlingford Road.

1.1 Proposal Overview

Epping Town Centre is a part of the NSW Government's Urban Activation Precincts Program, which aims to deliver more homes in places with access to infrastructure, transport, services and jobs. There has been a major investment in public transport in the centre to support growth. The NSW Government has previously announced the replacement of Epping Road Bridge as the third in a series of Epping Town Centre Road projects which aim to improve traffic flow and road safety and help reduce traffic delays and congestion.

Transport for NSW (previously Roads & Maritime Service, RMS) has undertaken these works in a staged approach in the sequence as follows:

- Stage 1: Upgrading the Beecroft Road and Carlingford Road intersection. (Completed)
- Stage 2: Widening Epping Road westbound between Blaxland Road and Essex Street including the upgrade of the intersection at Epping Road and Essex Street. (Completed)
- Stage 3: Epping Bridge Replacement

In May 2022 a joint announcement by the Federal and NSW Governments was made, which detailed an election commitment of a split 50:50 funding for the Epping Bridge Project stage.

The Proposal provides opportunities to achieve placemaking objectives, transport integration (active transport connections), network operation outcomes (improved operational, and safety outcomes), and reduce future costs (maintenance cost savings, and enable integration with future infrastructure). The upgrade will include:

- An additional westbound traffic lane
- An additional right turn lane southbound onto Blaxland Road
- A raised central median, with widened eastbound and westbound lanes
- A wider pedestrian and bicycle shared path
- Installation of new safety screens on the bridge

Mott MacDonald is working with Transport for NSW (Transport) to prepare and submit the development of a Preliminary Design Review (Concept Design) and Review of Environmental Factors (REF) for the replacement of the Epping Bridge.

1.2 Proposal Objectives

The Epping Bridge Proposal will:

- Support the Epping Town Centre Urban Activation by increasing road capacity for future growth and renewal.
- Improve safety and reduce traffic congestion across the Epping Road Bridge.
- Improve pedestrian and cyclist safety by providing a wider and protected footpath.
- Improve access to the town centre for the local community, road users and business.
- Increase westbound lane capacity through the Epping Town Centre.
- Provide for future cycle and pedestrian connectivity through the Epping Town centre.
- Provide a 'no regrets' investment that aligns with future road and rail plans.
- Provide a well-designed infrastructure element that makes a positive contribution to Epping Town Centre.

1.3 Proposal Scope

The Proposal will replace the existing Epping Bridge (the Bridge) with a new wider bridge. An overview of the Proposal is presented in Figure 1-1. Key features of the Proposal include:

- Staged removal of the bridge
- Construction of a new bridge which would include:
  - an additional westbound traffic lane
  - an additional right turn lane eastbound from Beecroft Road onto Blaxland Road
  - a pedestrian and cyclist shared path
  - a raised central median, with widened eastbound and westbound lanes
  - installation of new safety screens on the bridge
  - installation of new traffic signals
  - installation of new streetlights
- Signalling and communications modifications
- Upgrade to approaches to the new bridge from Epping Road, Beecroft Road, and Blaxland Road.

Figure 1-1 Epping Bridge Project Scope

1.4 Purpose and scope of this report

The purpose of this report is to demonstrate the impacts of the proposal on traffic and transport within the study area.

1.5 Structure of this Report

This report is structured as follows:

- Chapter 1 introduces the report and provides an overview of the scope of the Proposal and the structure of the report.
- Chapter 2 summarises the methodology used to assess the traffic and highway impacts of the proposed bridge re-design.
- Chapter 3 sets out the existing transport conditions within the study area.
- Chapter 4 covers the benefits and operational traffic and transport impacts of the Proposal.
- Chapter 5 addresses the impacts of bridge construction on the local transport network.
- Chapter 6 details the management and mitigation measures designed to address both potential and realised negative impacts resulting from this Proposal.

2 Methodology

This Chapter is focused on the methodology used to model traffic movements within the study area to understand the likely impact of the Proposal.

2.1 Data Sources

This methodology relies upon several data sources, including the following:

- Classified intersection traffic counts and intersection queue length surveys during AM and PM peak survey-periods, on Thursday 21st September 2023, at the following survey sites:
  - Epping Road and Essex Street
  - Epping Road, Langston Road and Blaxland Road
  - Epping Road, High Street and Bridge Street
  - Carlingford Road and Beecroft Road
  - Carlingford Road, Rawson Street and Ray Road
  - Bridge Street and Rawson Street
- Travel time data collected on the same day, to validate base case models, from two routes:
  - Beecroft Road, Epping Road, Blaxland Road (Northbound and Southbound)
  - Carlingford Road, Beecroft Road and Epping Road (Eastbound and Westbound)
- Sydney Traffic Forecasting Model (STFM) Base Case cordon matrices
- Sydney Coordinated Adaptive Traffic System (SCATS) detector Counts, SCATS signal data, SCATS History and Controller information for the same date
- Weekday peak hour pedestrian and cyclists counts undertaken in September 2023.

2.2 Assumptions

The peak hour analysis period was determined based on a review of 15-min cordon entry and exit flows, collected on 21 September 2023, during the AM and PM peak period. The demand profiles, expressed as Passenger Car Units equivalents (PCUs), are presented in Appendix B.

The VISSIM and SIDRA models have been set up to cover a single hour in both the AM and PM peak:

- 7:30am to 8:30am
- 5:00pm to 6:00pm

The Base Case matrices were developed for the following vehicle types:

- Cars
- Trucks
- Buses

Additionally, pedestrian and cycle movements at crossing points were included in the VISSIM and SIDRA models.

2.3 VISSIM & SIDRA Modelling

The modelling analysis for the Proposal will be undertaken using VISSIM (Version 2023.1.0.5) supported by SIDRA Intersection analysis (Version 9.0). Both software packages were used during the previous Reference Design phase. The extent of the modelling scope is presented in Figure 2-1.

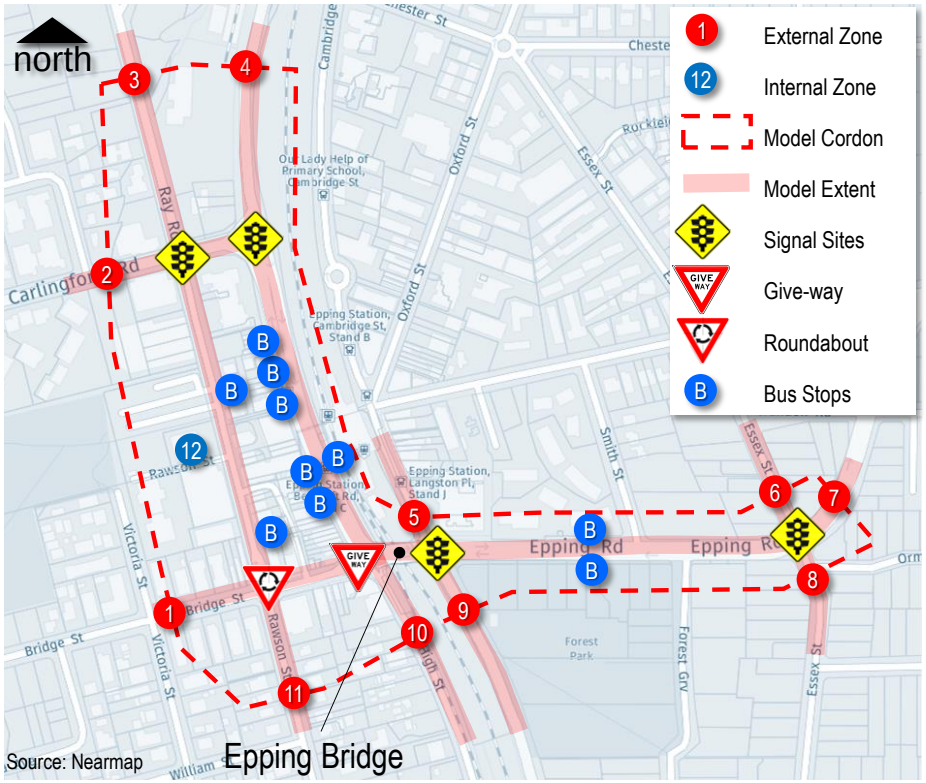


Figure 2-1 Proposed Traffic Model Scope

2.4 Model Calibration & Validation

Modelled turn volumes will be calibrated against:

- Core model tolerance criteria listed in Table 4 1.
- 100 per cent of observations to be within tolerance limits.
- R2 value of observed versus modelled plots to be >0.95
- Average modelled cycle time for each 1-hour period to be within 10% of observed SCATS cycle time for the same period
- Total green-time over each 1-hour period to be within 10% of observed SCATS equivalent for each phase

Table 2-1 Core Area Tolerance Limits

Flow	Criteria
<99	To be within 10 vehicles of observed
100-999	To be within 10% of observed
1000 to 1999	To be within 100 vehicles of observed
>2000	**To be within 5% of observed**

The model statistics for assessing calibration and validation will be based on a median run selected from five model seed values (560, 28, 7771, 86524 and 2849). An analysis of Vehicle Hours Travelled (VHT) and Vehicle Kilometres Travelled (VKT) results for the five seed values will be used to demonstrate model stability.

SIDRA models will be calibrated against:

- Observed traffic count data surveyed on 21/9/2023
- Observed queue length data surveyed on 21/9/2023
- Average modelled traffic signal cycle time for each 1-hour period to be within 10% of observed SCATS signal cycle time for the same period

- Total green-time over each 1-hour period to be within 10% of observed SCATS equivalent for each phase

VISSIM Model validation will be undertaken using observed travel time data. The objective will be to achieve modelled travel times within 15% of observed travels times, or within 1-minute, whichever is the highest.

2.5 Development of Traffic Growth Forecasts

The Proposal is an incremental improvement in road capacity. It is not aimed at accommodating unconstrained corridor traffic growth that may be forecast in a strategic land use model such as the Sydney Traffic Forecasting Model (STFM).

At some point, forecast traffic growth exceeds the capacity of the upgraded road network, which results in traffic delay. When this delay becomes excessive, it triggers traffic re-routing, mode shift or peak spreading behaviours and an equilibrium is then reached which balances travel utility.

This analysis is supported by historical data. Analysis of historical traffic growth rates in the precinct between 2007 and 2021, using permanent counter 74453 located on Epping Bridge, revealed the following:

- 10-year traffic growth in the peak directions remained relatively static or reduced, due to network constraints.
- 10-year traffic growth in the contra-peak directions grew 7-9%, where some capacity was available (refer Figure 2-2)

The following STFM 2-hour vehicle link flow plots and cordon matrices were supplied by TfNSW:

- 2026, 2031, 2036 and 2041 AM & PM Peak, vehicle link flow plots, for the project area; and
- 2026, 2031, 2036 and 2041 AM & PM Peak, vehicle cordon matrices, for the project area.

Analysis of the STFM forecast data suggests that growth in the peak flow directions is modest and more consistent with the historical patterns. Most of the traffic growth occurs in the contra-peak directions where more road capacity is available.

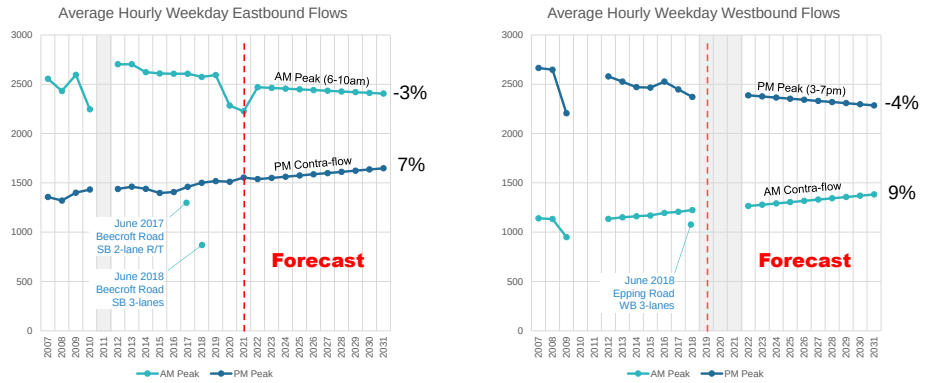


Figure 2-2 Average hourly weekday traffic flows – forecast to 2031

The STFM data was used to extrapolate forecasts for years 2023, 2029 and 2039 using linear regression.

A sample of the extrapolated STFM growth factors for key road links in the Epping precinct are presented in Table 2-2 and Table 2-3.

The development of growth forecasts is documented in the Options Testing Technical Note in Appendix B.

Table 2-2 AM Peak (7-9am) STFM Forecast Link Growth Factors

Road Link	Eastbound/Southbound (Peak)			Westbound/Northbound (Contra-peak)		
	2023	2029	2039	2023	2029	2039
Carlingford Rd (W)	1.00	1.01	1.02	1.00	1.06	1.16
Beecroft Rd (N)	1.00	0.99	0.97	1.00	1.02	1.05
Beecroft Rd (S)	1.00	1.00	0.99	1.00	1.04	1.12
Epping Bridge	1.00	1.00	0.99	1.00	1.05	1.13
Blaxland Rd (S)	1.00	1.02	1.05	1.00	1.02	1.06
Epping Rd (E)	1.00	1.00	0.99	1.00	1.06	1.16

Table 2-3 PM Peak (4-6pm) STFM Forecast Link Growth Factors

Road Link	Eastbound/Southbound (Contra-Peak)			Westbound/Northbound (Peak)		
	2023	2029	2039	2023	2029	2039
Carlingford Rd (W)	1.00	1.04	1.11	1.00	1.01	1.02
Beecroft Rd (N)	1.00	1.03	1.07	1.00	1.00	1.00
Beecroft Rd (S)	1.00	1.04	1.12	1.00	1.01	1.02
Epping Bridge	1.00	1.04	1.12	1.00	1.01	1.02
Blaxland Rd (S)	1.00	1.05	1.14	1.00	1.02	1.06
Epping Rd (E)	1.00	1.02	1.07	1.00	1.01	1.02

2.6 Development of Active transport Growth Forecasts

The observed active transport flows were grown in the forecast models, based on a review of population and employment growth forecasts, in the surrounding precincts.

Pedestrian growth will be estimated based on land use zones within 1.2km of Epping station. Cycling growth will be estimated based on land use zones within 5km of Epping Station. The estimated active transport growth factors are presented in Table 2-4. The population and employment data comes from official NSW government projections, the TZP22 forecasts are available on Transport's OpenData website.

Table 2-4 Active Transport Growth Factors

Year	Walking Catchment (1.2km)	Cycling Catchment (5km)
2023	1.00	1.00
2026	1.06	1.04
2031	1.11	1.10
2036	1.16	1.15
2041	1.21	1.22
2046	1.25	1.29

3 Baseline Transport Environment

3.1 Location

The Epping Road Bridge (the bridge) lies within the Epping Town Centre, as shown in Figure 3-1, connects several arterial roads allowing vehicles to travel across the railway corridor. The constraints of the rail corridor and the limited crossing opportunities create a unique dog-leg conjunction of roads.

The bridge is located next to Epping Station, which is a major interchange between Sydney Trains and Sydney Metro. As Epping continues to grow, there will be an increase in transport demand across Epping Road Bridge.

There have been several road upgrades undertaken in recent years. June 2018 – Beecroft Road southbound right turn into Carlingford Road was upgraded to two lanes. June 2018 – Beecroft Road southbound carriageway approaching to Carlingford Road was upgraded to 3-lanes and the Epping Road westbound carriageway approach to Blaxland Road was widened to 3-lanes.

Figure 3-1 Study Area

3.2 Land Use Context

The land use zoning within the Local Environmental Plan (LEP) for the Proposal area is presented in Figure 3-2.

The land uses within this study area are primarily residential, transportation and commercial. Key land uses include:

- Beecroft Road is mainly commercial along the northbound side and transportation along the southbound.
- Blaxland Road is predominately residential along the southbound. Along the northbound, consists of transportation.
- Carlingford Road is predominately residential.
- Epping Road is predominately residential.
- Langstone Place is local centre a mixed-use zone that includes high density residential and commercial uses.

Population and employment forecasts for the 1.2km and 5km land use catchments around the station are presented in Table 3-1.

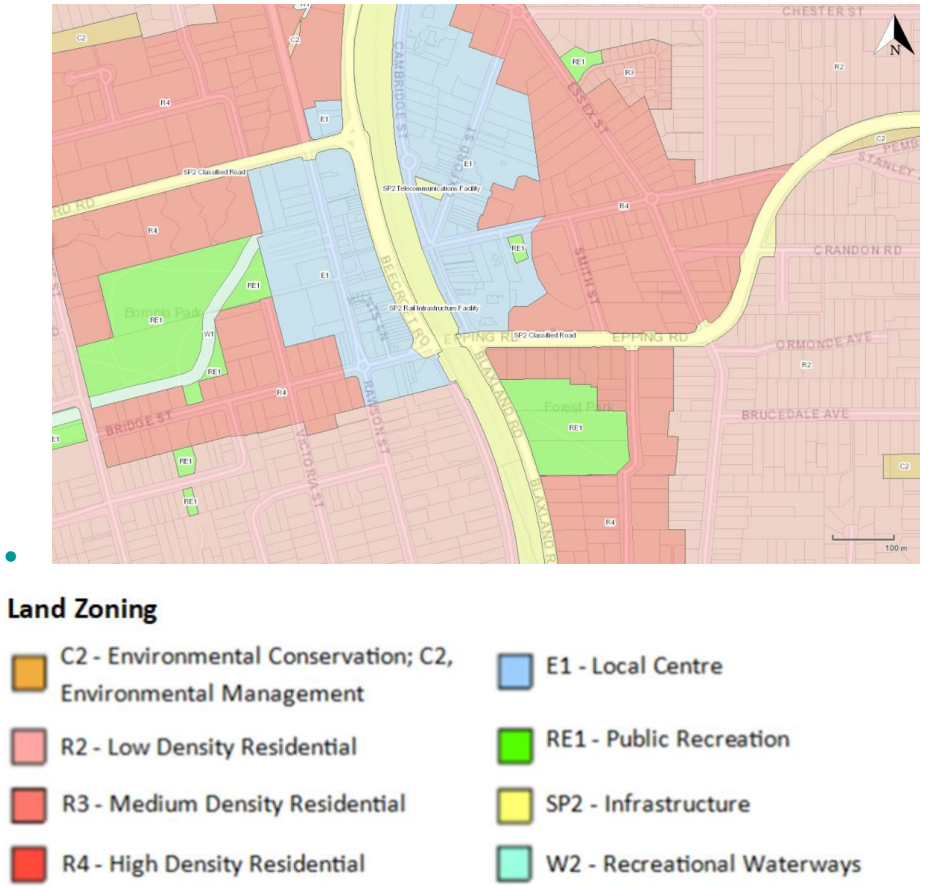


Figure 3-2 Epping Local Environmental Plan Map

Table 3-1 Land Use Forecasts for Walking & Cycling Catchments

		Walking Catchment	Cycling Catchment
Catchment Size	No TZ16 Zones	17	127
	Radius (km)	1.2	5
Employment (EMP)	EMP_2023	9,611	133,000
	EMP_2026	9,715	139,659
	EMP_2031	9,783	142,517
	EMP_2036	9,992	142,517
	EMP_2041	10,306	146,525
	EMP_2046	10,634	152,165
Estimated Residential Population (ERP)	ERP_2023	40,346	272,068
	ERP_2026	43,355	283,225
	ERP_2031	45,637	303,007
	ERP_2036	48,014	321,560
	ERP_2041	49,948	346,228
	ERP_2046	51,695	369,453

3.3 Mode Share

Analysis has been undertaken of 2016 and 2021 Australian Bureau of Statistics (ABS) Journey to Work trends for people residing and working in the Epping Station precinct (SA2, North Epping). There have been changes to mode share patterns in 2021 because of the Covid-19 pandemic. The pre-Covid data from 2016 has been provided to illustrate those changes.

3.3.1 Residents of Epping leaving for work

Table 3-2 shows the journey to work transport mode used by Epping North residents leaving for work in 2016 and 2021. The proportion of residents leaving for work by car dropped from 45% in 2016 to 23% in 2021. Public transport usage also dropped from 35% in 2016 to just 8% in 2021. Conversely, residents working from home climbed from 5% in 2016 to 53% in 2021.

3.3.2 Workers arriving at Epping for work

Table 3-2.2 shows the journey to work mode used by workers travelling to and from Epping for work in 2016 and 2021. The proportion of workers traveling to Epping for work by car dropped from 54% in 2016 to 27% in 2021. The proportion of workers arriving to work by public transport dropped from 16% in 2016 to 5% in 2021. Conversely, Epping residents choosing to work from home climbed from 11% in 2016 to 46% in 2021.

Table 3-2 Journey to Work Mode Share Patterns (2016 and 2021)

Method of Travel to Work	Residents Leaving for work (%)		Workers Arriving for work (%)	
	2016	2021	2016	2021
Train	32	7	14	4
Bus	3	1	2	1
Ferry	0	0	0	0
Tram/light rail	0	0	0	0
Taxi/ ride-share	0	0	0	0
Car, as driver	45	23	54	27
Car, as passenger	3	2	3	2
Truck	0	0	1	0
Motorbike/scooter	1	0	0	0
Bicycle	0	0	0	0
Walked only	2	1	4	3
Other Mode	0	0	0	0
Worked at home	5	53	11	46
Did not go to work	7	12	9	15
Not stated	1	0	1	0

Source: Australian Bureau of Statistics

3.4 Active Transport

The existing pedestrian network within this study area allows for adequate connectivity and accessibility around the precinct.

There is an existing 3.5m shared path facility along the southern footpath of Epping Road approach the Epping Bridge from the east. The eastern shared path is directed north, across Epping Road, to Langston place, at the Blaxland Road and Epping Road signalised crossing. Both pedestrian and cycle lanterns have been provided at this crossing point. On the western approach is another 4.6m wide shared path facility along the southern side of Bridge Street which starts west of High Street. These two shared paths approaching the Epping Bridge are part of a regional east-west off-road shared path link identified in the Parramatta Bike Plan 2023 (Refer Figure 3-3). The Epping Bridge link connecting these two sections of shared path is currently a 1.8m wide concrete footway.

Weekday peak hour pedestrian and cyclists counts undertaken in September 2023 at key crossing points are presented in Figure 3-4 and Figure 3-5. The existing 2-way demand on Epping Bridge southern footway in the 2023 AM and PM peaks was 31 pedestrians per hour. Cyclists represent less than 6.5% of this, or two cyclists per hour.

Most of the demand moving between Epping station and the eastern shared path, crosses Epping Road at the signalised crossing on the eastern approach of Epping Road and Blaxland Road. The flows on this crossing range between 160-200 pedestrians per hour. Cycle use of this crossing is very low (<2 cyclists per hour).

Apart from the east-west off-road shared path along Epping Road and Bridge Street, there are limited cycle facilities provided in the station precinct. It is also noted that the Epping Road shared path does not connect with the secure bike parking facilities, to the north, in Langston Place (34 parking spaces and 20 lockers).

Figure 3-3 Parramatta Bike Plan 2023 (Exhibition Draft)

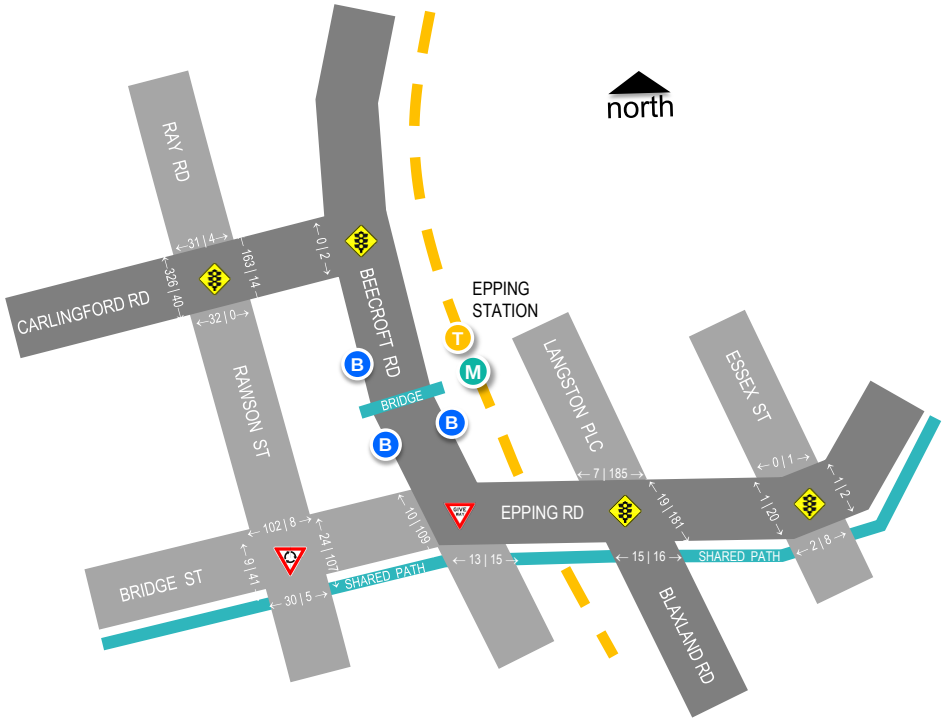


Figure 3-4 2036 AM Peak Hour Active Transport Trips

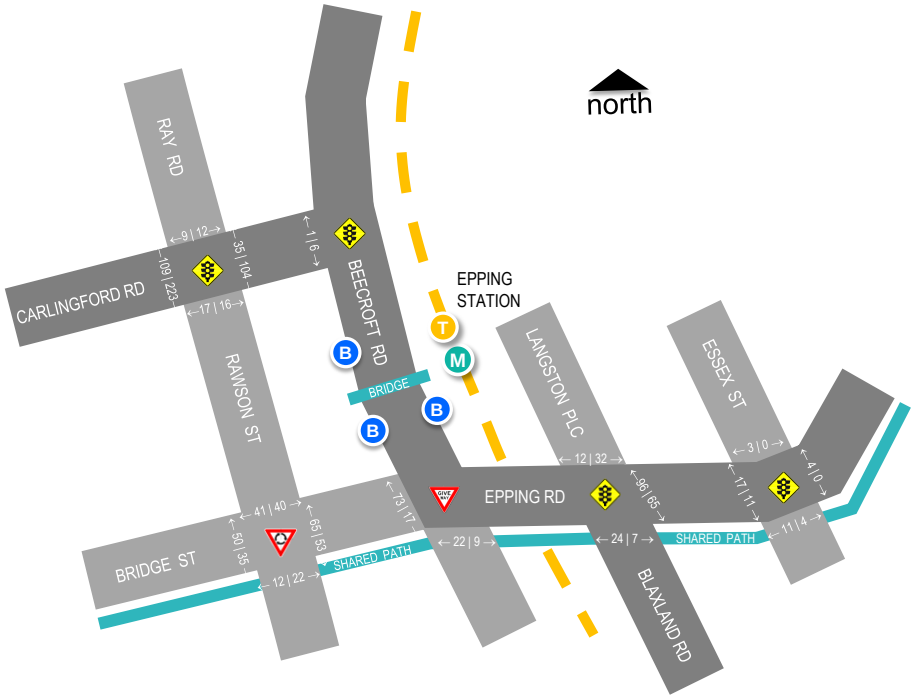


Figure 3-5 2036 PM Peak Hour Active Transport Trips

The Central River City Strategic Cycleway Corridors program has identified Epping as a strategic centre in the program, with connections to Castle Hill, Hornsby, Macquarie Park, Rhodes and Parramatta set out in the overview network for the Central River City (refer Figure 3-6).

The strategic cycleway corridors will initially focus on facilitating connections between key centres and places within the Central River City that will serve an important function in the future. As these centres and places continue to grow and change, the strategic network will evolve to meet these changing needs and ambitions, as stated in the Future Transport Strategy https://www.future.transport.nsw.gov.au/sites/default/files/2022-09/Future_Transport_Strategy_2.pdf .

Five connections within the strategic network are seen as immediate opportunities for investigation to progress as they will fill important gaps in the network. The ones most relevant to Epping are the Macquarie Park to Carlingford/ Sydney Olympic Park corridors. The desired outcome for these corridors are safe and direct connections in and around Macquarie park to support continuing growth in the area.

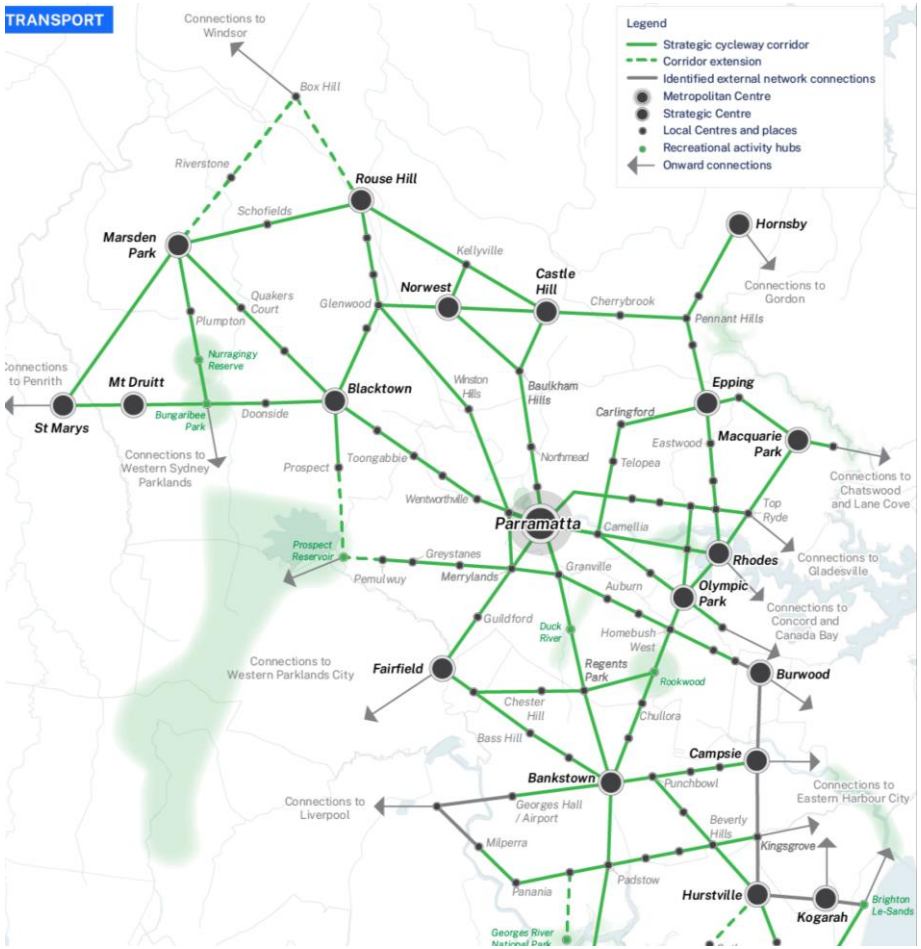


Figure 3-6 Central River City Strategic Cycleway Corridor network

Source: Transport for NSW (Cities and Active Transport)

3.5 Buses

There are 8 stands for bus interchange with Epping Station (refer Figure 3-7). They include:

- Bus Stands A and B, located in Langston place, outside the eastern station entrance.
- Bus stand C, located along the southbound side of Beecroft Road, south of the pedestrian overbridge, outside the western station entrance
- Bus stands D to H, located along the northbound side of Beecroft Road, north and south of the pedestrian overbridge.

A summary of peak hour bus services and frequencies is presented in Table 3-3.

There are relatively few bus services that currently use Epping Bridge, with one day service (550) and two night services (N80 and N92).

A summary of peak hour bus routes and service frequencies are presented in

Table 3-3. Bus services are provided by the following private bus operators:

- Busways
- Hills Bus

In addition to these day-to-day services, there is a stop located on the southbound side of Beecroft Road, north of the pedestrian overbridge, which is set aside for rail replacement services. This stand has space to accommodate up to two buses.

Route	Destination	Stand
288	City Erskine St Epping to City Erskine St	A
290	City Erskine St Epping to City Erskine St via Macquarie University & North Sydney	A
291	McMahons Point Epping to McMahons Point	A
295	North Epping Epping to North Epping (Loop Service)	B
541	Eastwood Epping to Eastwood	F

Route	Destination	Stand
546	Parramatta Epping to Parramatta via North Rocks and Oatlands	E
549	Parramatta Epping to Parramatta via North Rocks	E
550	Macquarie Park Parramatta to Macquarie Park via Epping	C
550	Parramatta Parramatta to Macquarie Park via Epping	D
630	Blacktown Epping to Blacktown	F

Route	Destination	Stand
651	Rouse Hill Station Epping to Rouse Hill Station via Castle Hill	G
N80	City Town Hall Hornsby to City Town Hall via Strathfield	C
N80	Hornsby City Town Hall to Hornsby via Strathfield	G
N92	City Town Hall Tallawong Station to City Town Hall	C
N92	Tallawong Station City Town Hall to Tallawong Station	G

Figure 3-7 Epping Station Bus Interchange

Table 3-3 Existing Epping Station peak bus services

Route	Destination	Stand	Frequency (number of service)	
			Weekday AM 7:00 am – 9:00 am	Weekday PM 4:00 pm – 6:00 pm
288	Epping to City Erskine St	A	3 (westbound) and 4 (eastbound)	5 (westbound) and 4 (eastbound)
290	Epping to City Erskine St via Macquarie University & North Sydney	A	Night service	
291	Epping to McMahons Point	A	3 (westbound) and 4 (eastbound)	4 (westbound) and 5 (eastbound)
295	Epping to North Epping (Loop Service)	B	8	9
541	Epping to Eastwood	F	3 (westbound) and 3 (eastbound)	3 (westbound) and 3 (eastbound)
546	Epping to Parramatta via North Rocks and Oatlands	E	4 (westbound) and 4 (eastbound)	5 (westbound) and 4 (eastbound)
549	Epping to Parramatta via North Rocks	E	6 (westbound) and 5 (eastbound)	5 (westbound) and 5 (eastbound)
550	Parramatta to Macquarie Park via Epping	C/D	9 (westbound) and 10 (eastbound)	10 (westbound) and 8 (eastbound)
630	Epping to Blacktown	F	3 (westbound) and 3 (eastbound)	5 (westbound) and 4 (eastbound)
651	Epping to Rouse Hill Station via Castle Hill	G	5 (westbound) and 5 (eastbound)	6 (westbound) and 4 (eastbound)
N80	Hornsby to City Town Hall via Strathfield	C/G	Night service	
N92	Tallawong Station to City Town Hall	C/G	Night service	

3.6 Rail

Epping Station is served by three rail lines:

- Sydney Trains T9 Northern Line
- NSW TrainLink Central Coast & Newcastle Line, and
- Metro North West Line (refer Figure 3-8)

The station has five platforms:

- two island platforms and one side platform on the ground level, and
- two underground platforms for the Metro North West Line.

In 2024, the Sydney Metro City and South West line from Chatswood to Sydenham will be operational, extending the existing Metro North West line and providing an additional direct connection from Epping into the City.

The frequency of rail services is presented in Table 3-4.

Table 3-4 Current Rail Services and Peak Hour Service Frequency

Line	Direction	Frequency of services	
		Weekday AM 7:00am–9:00am	Weekday PM 4:00pm–6:00pm
T9 Northern	Hornsby to North Shore via City	24	19
	North Shore to Hornsby via City	17	21
Central Coast Line	Central via Strathfield	8	4
	Gosford and Newcastle via Hornsby	4	8
Metro	Chatswood to Tallawong	28	31
	Tallawong to Chatswood	31	31

Figure 3-8 Sydney Trains Network

Source: Transport for NSW

3.7 Road

The road network within Epping is generally local roads with a 50km/h speed limit and on-street parking on both sides. Approaching towards the town centre, the roads differ in characteristics; Beecroft Road, Blaxland Road, Carlingford Road and Epping Road all act as arterial roads with a speed limit of 60km/h.

Most of the roads that connect onto Epping Bridge are designated as State Roads. This includes Beecroft Road to the north, Carlingford Road to the west, Blaxland Road to the south, and Epping Road to the east.

3.7.1 Peak Hours

Classified intersection counts were undertaken at six key intersections in the precinct, on a weekday in September 2023. Based on traffic survey data, the following peak hours were identified:

- AM Peak Hour (07:30-08:30)
- PM Peak Hour (17:00-18:00)

3.7.2 Hourly and Daily Demand Profiles

Automatic traffic counters were also installed on Beecroft Road in October 2023, to survey hourly and daily vehicle classes and traffic demand profiles across a week (refer Figure 3-9).

The survey of vehicle demand across the week revealed the following:

- Southbound peak hour movements were highest during the AM peak, whilst northbound peak hour movements were highest during the PM peak.
- Average weekday daily traffic flows were 26,284 vehicles per day (vpd) and 28,118vpd in the northbound and southbound directions, respectively.

- Average weekend daily traffic flows were 23,572vpd and 25,970vpd in the northbound and southbound directions, respectively.

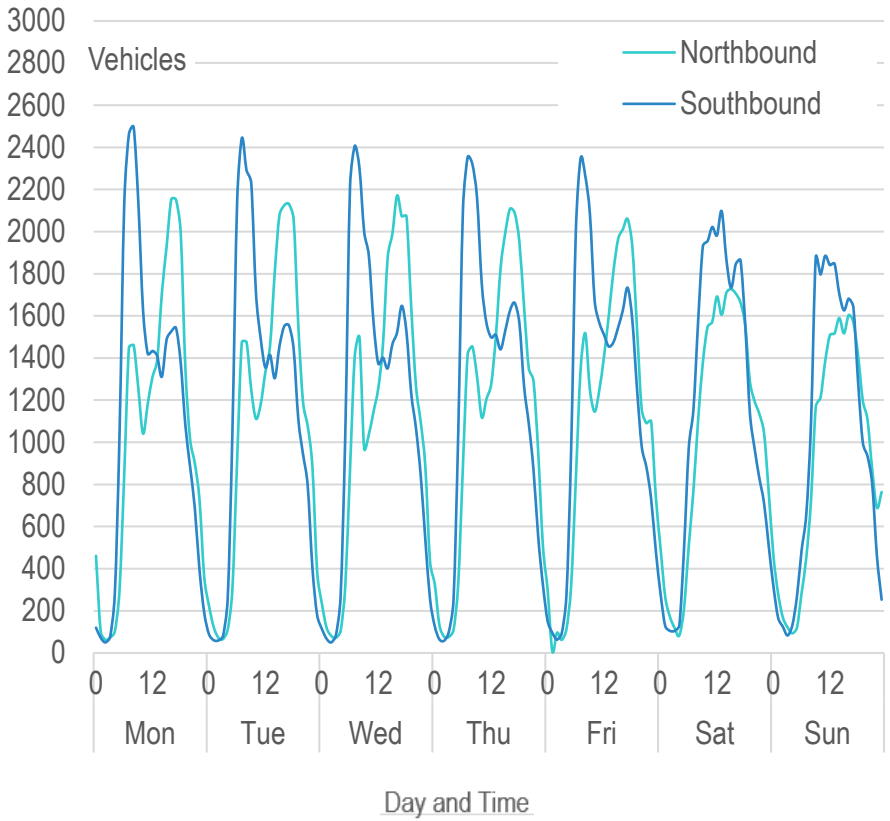


Figure 3-9 Hourly Vehicle Flow Profiles by direction (Oct, 2023)

3.7.3 Vehicle Type

The break-down of vehicle demand, on Beecroft Road, by Austroads class, across an average weekday is presented in

Figure 3-10.

The review of classified count data on Beecroft Road also revealed the following traffic patterns (refer Table 3-5):

- Light vehicles (Class 1-2) make up 93.2% of average daily vehicle flows on Beecroft Road
- Medium Vehicles (Class 3-5) make up 5.8% of average vehicles flows on Beecroft Road
- Heavy vehicles (Class 6-12) make up 1.1% of average daily vehicle flows on Beecroft Road.
- 86% of all average daily demand flows occur during day hours (7am-10pm)
- 14% of all average daily demand flows occur during night hours (10pm-7am)
- The average of AM and PM peak hours represent about 6.9% of the average daily flows.

Table 3-5 Day & Night Distribution of Vehicle Classes (Oct,2023)

Period	Light (Class 1-2)	Medium (Class 3-5)	Heavy (Class 6-12)	Total
Day (7am-10pm)	43,552	2,525	518	46,595
Night (10pm-7am)	7,131	617	59	7,807
Total	**50,683**	**3,142**	**577**	**54,402**

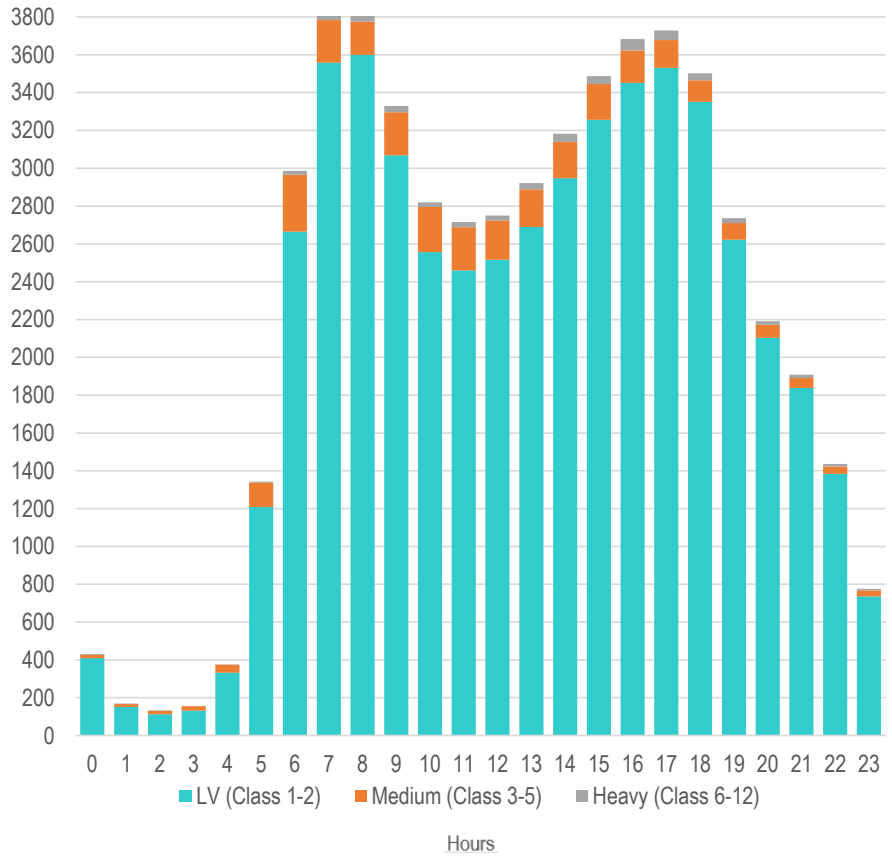


Figure 3-10 Average Weekday Vehicle Flows (Sep, 2023)

3.7.4 Daily Flows

The average daily 2-way link flows on key roads within the project precinct are presented in Table 3-6.

Table 3-6 Average Daily 2-Way Link Flows (Sep, 2023)

Road Link	LV	HV	Total
Beecroft Rd, North of Carlingford Rd	35,740	490	36,230
Carlingford Rd, west of Beecroft Rd	31,650	800	32,450
Epping Rd Bridge	62,060	970	63,030
High St, south of Beecroft Rd	1,810	30	1,840
Bridge St, West of Beecroft Rd	6,300	30	6,330
Blaxland Rd, South of Epping Rd	21,600	250	21,850
Epping Rd, East of Blaxland Rd	41,830	730	42,560

3.8 Road Network Performance

The performance of the existing road network was assessed using the VISSIM dynamic modelling software (Version 2023 SP02). This software creates a microsimulation (virtual model) of the Epping precinct traffic network. Each vehicle and pedestrian in that model is treated as an autonomous entity, and their interactions vary based on randomised parameters representing individual preferences and tendencies. For example, in these models, some drivers may be cautious and wait for large gaps before turning, while others might be more aggressive and accept smaller gaps.

The development, calibration, and validation of the 2023 Base Case VISSIM models is documented in a separate technical note in accordance with TTD2017/001 (refer Attachment A). The traffic models have been calibrated against observed data such as classified traffic counts, queuing surveys and travel time surveys.

Existing intersection performance has been assessed in terms of average vehicle delay (seconds) and Level of Service (LOS) based on the Transport criteria in Table 3-7.

Table 3-7 TfNSW Level of Service Criteria

LOS	Control Delay per Vehicle (sec)		Traffic Signals, Roundabout	Give Way and Stop Signs
	Low	High		
A	0	14	Good operation	Good operation
B	15	28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29	42	Satisfactory	Satisfactory, but accident study required
D	43	56	Operating near capacity	Near capacity and accident study required
E	57	70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>71			

The modelled intersection performance of the existing road network is presented in Table 3-8. A more detailed breakdown of delay and queuing, by approach, is presented in the Technical Note in Appendix A.

The key findings of the traffic analysis include:

- All the intersections perform satisfactorily at LOS D or better in both AM and PM peaks except Carlingford Road, Ray Road and Rawson Street intersection, in the AM peak
- The north approach at the Epping Road and Essex Street intersection is performing at LOS F in both peaks. However, the overall intersection performance remains LOS C in both peaks. See table 4.8 of Appendix A.

Table 3-8 2023 Base Case Intersection Performance

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec)	LOS	Delay (sec)	LOS
Carlingford Rd, Ray Rd & Rawson St	80	F	31	C
Beecroft Rd & Carlingford Rd	25	B	28	B
Bridge St & Rawson St	41	C	45	D
Beecroft Rd, High St & Bridge St (1)	12	A	26	B
Epping Rd, Blaxland Rd & Langston Plc	43	C	52	D
Epping Rd & Essex St	32	C	41	C

1. Level of Service of Worst Movement

3.9 Parking

In February 2024, a parking audit and utilisation survey of all on-street and off-street parking spaces within 400m of Epping Station, was undertaken, during a typical weekday. This was a roving survey, where parking availability in each section was recorded at regular 30-minute intervals across the day. The survey was undertaken outside public/School holidays to provide a “normal” representation of demand.

The audit identified the following parking capacity within the study area:

- 11 Accessible Spaces
- 152 Off-street Spaces
- 488 On-street spaces

A summary of the parking space capacity and utilisation within the study area is presented in Table 3-9.

Table 3-9 Weekday Parking Space Availability, Epping Station Precinct

Time	Accessible Spaces	Off-street spaces	On-street Spaces	Total Parking Spaces	Parking Space Availability
8:30am	8	127	90	225	35%
9:00am	5	79	59	143	22%
9:30am	5	75	68	148	23%
10:30am	4	39	60	103	16%
11:00am	3	30	56	89	14%
11:30am	3	34	47	84	13%
12:00pm	2	28	63	93	14%
1:30pm	4	41	81	126	19%
2:00pm	5	45	77	127	20%
2:30pm	4	41	86	131	20%
3:00pm	4	33	79	116	18%
4:00pm	10	32	88	130	20%
4:30pm	10	33	109	152	23%
5:00pm	8	30	136	174	27%
5:30pm	10	35	160	205	31%
Parking Capacity	**11**	**158**	**488**	**651**	

3.10 Safety

Crash data statistics for the project area was sourced from the NSW Centre for Road safety website (https://www.transport.nsw.gov.au/roadsafety). These reports provide information on casualties and crashes in NSW over a 5-year period 2018 to 2022.

A summary of the injury crashes is presented in Table 3-10 and a plot of the crash locations is provided in Figure 3-11.

Table 3-10 Summary of Casualty Crashes by Degree of Severity

Segment	Length (km)	Killed	Serious Injury	Moderate injury	Minor/Other Injury
Epping Road (E)	0.37	-	1	4	11
Beecroft Road (S)	0.35	-	2	2	1
Carlingford Road (W)	0.52	-	1	1	2
Beecroft Road (N)	0.65	-	-	3	-
Epping Bridge	0.06	-	-	-	-
Blaxland Road (S)	0.29	-	-	-	1
Total		-	4	10	15

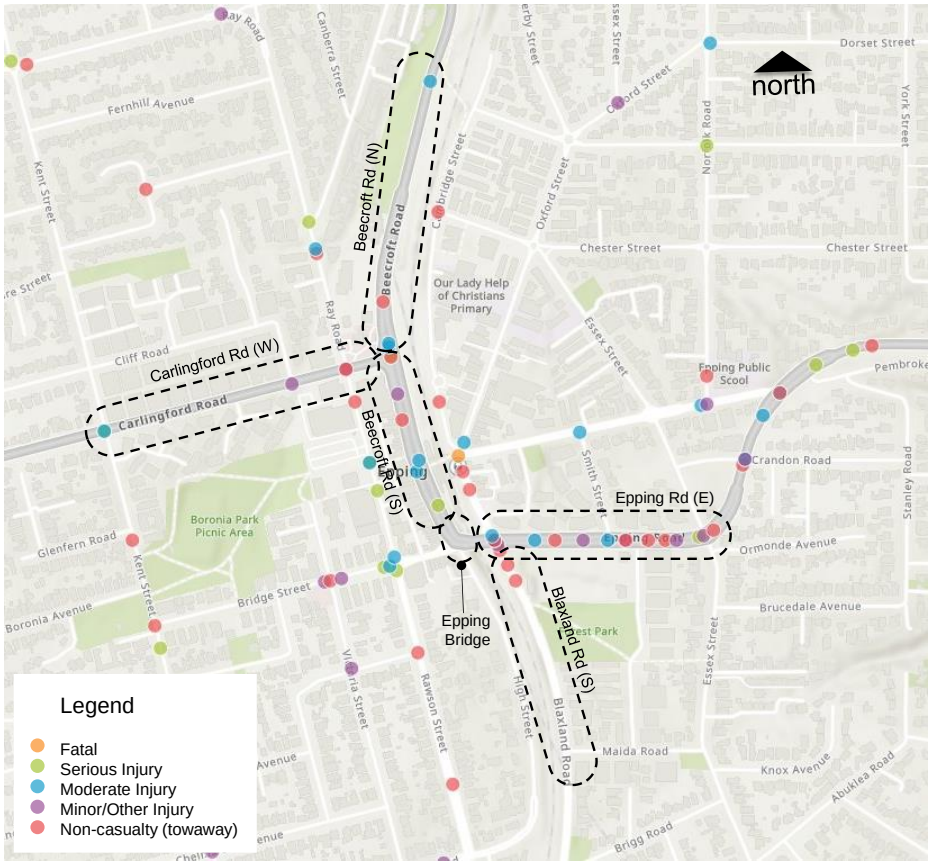


Figure 3-11 Crashes, by Severity, for 5-year Period Ending 2022

4 Benefits and Operational Impacts

4.1 Proposal Benefits

A first principles estimate of the potential benefits of the Proposal, in the AM Peak, has been undertaken. The assessment started with a review of existing theoretical capacity. This was calculated using the following high-level assumptions:

- 2021 AM Peak SCATS green-time allocations (%).
- 1800 vehicles per lane, per hour of green-time.
- 12 second lost-time in turning lanes due to pedestrian protection.
- 140 second cycle length.

The AM Peak analysis identified three potential capacity bottlenecks (Refer Figure 4-1):

1. Carlingford Road eastbound approaching Beecroft Road (-870vph).
2. Becroft Road eastbound approaching Blaxland Road (-970vph).
3. Carlingford Road westbound approaching Rawson Street (-1380vph).

The resultant constrained capacity is presented in Figure 4-2.

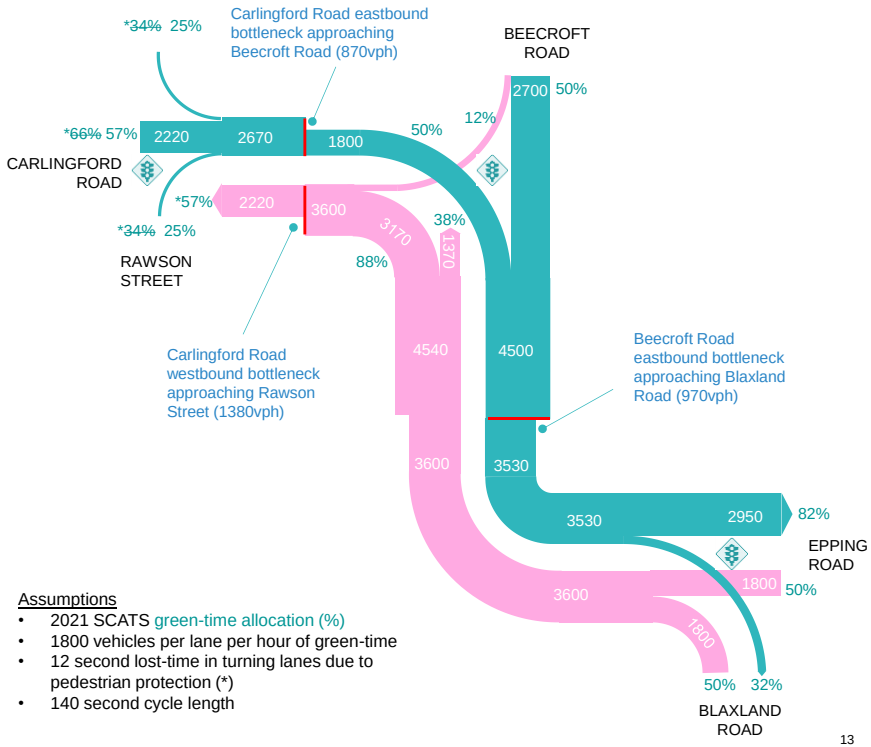


Figure 4-1 Existing Theoretical AM Peak Capacity

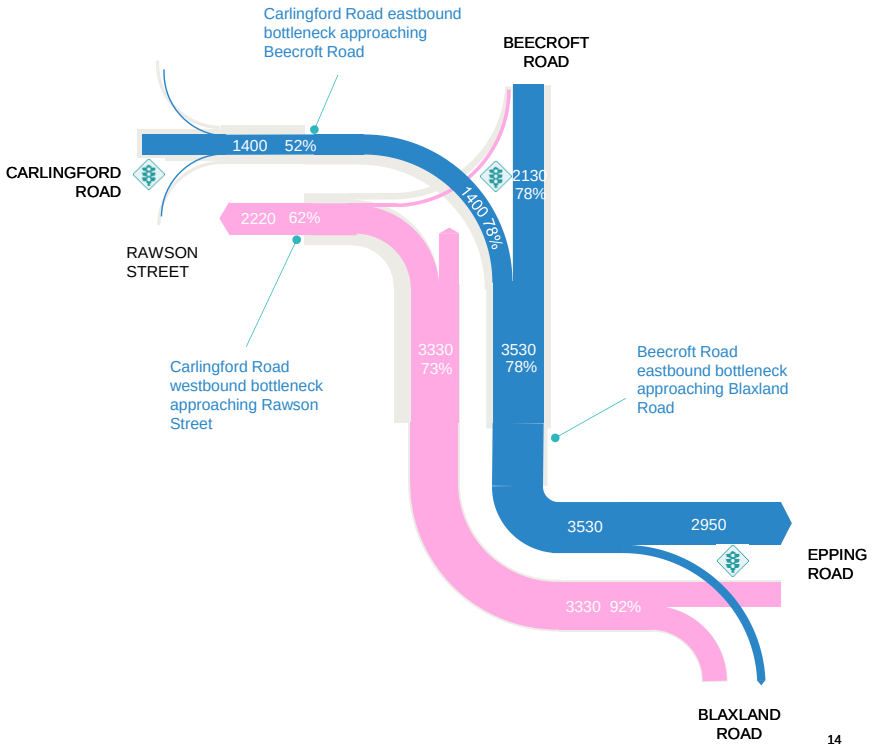


Figure 4-2 Existing Constrained AM Peak Capacity

The Proposal seeks to unlock this existing underutilised capacity in the precinct network, in the following ways (refer Figure 4-3):

- The upgrades on Epping Bridge unlocks additional eastbound capacity (+580vph) along Beecroft Road and Carlingford Road
- Increased eastbound capacity on Carlingford Road (+230vph) allows improved clearing of the queues between Rawson Street and Beecroft Road
- Clearing these queues increases the effectiveness of side-street phases at Rawson Street and allows potential transfer of green-time to westbound movements in Carlingford Road, thereby unlocking additional westbound capacity.

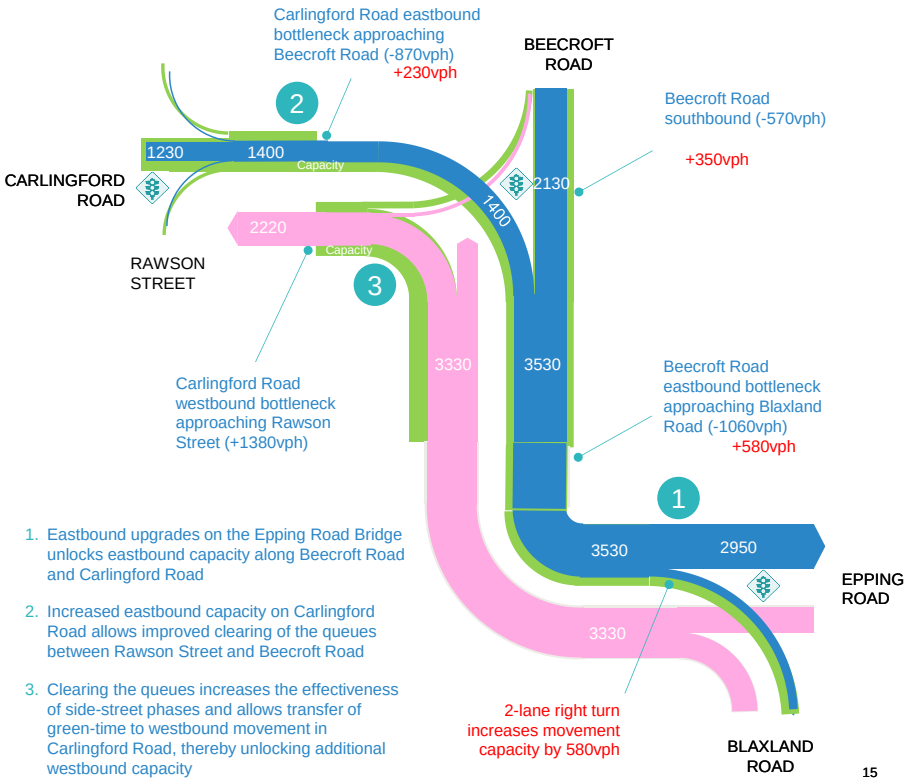


Figure 4-3 Proposal Unlocking AM Peak Capacity

4.2 Operational Impacts

The performance of the road network, with and without the proposal, was assessed using the VISSIM dynamic modelling software. The following end-state scenarios were modelled:

- 2029 Without Upgrade
- 2029 With Upgrade (Opening Year)
- 2039 With Upgrade (10-years after opening)

The comparative network performance statistics With and Without the Proposal is presented in Table 4-1.

The comparative intersection level of service with and without the Proposal is presented in Table 4-2. A more detailed breakdown of delay and queuing, by approach, is presented in the Options Testing Technical Note in Appendix B.

Table 4-1 Operational Performance With & Without the Proposal

Traffic Performance Parameters	AM Peak Hour			PM Peak Hour		
	2029 Without Proposal	2029 With Proposal	2039 With Proposal	2029 Without Proposal	2029 With Proposal	2039 With Proposal
Vehicle Kilometres Travelled (VKT)	9858	9844	10084	9894	9876	10060
Vehicle Hour Travelled (VHT)	449	421	416	447	427	662
Average Network Speed (km/h)	22	23	24	22	23	15
Average Network Delay (sec)	148.8	134.4	125.4	141.3	131.4	235.1
Completed Trips	6278	6268	6485	6528	6535	6763
Unreleased Trips	109	106	310	7	6	322
Average Number of Vehicle Stops	4.33	3.96	3.77	3.63	3.76	7.56

The network performance analysis reveals the following operational benefits of the Proposal:

- Average vehicle speeds are increased by 6.5% and 4.5% in the 2029 AM and PM peaks, respectively.
- Average vehicle delay is reduced by 9.7% and 7.0% in the 2029 AM and PM Peaks, respectively.
- It must be noted that 2039 modelling with proposal has decreased average network speed compared to 2029 without proposal in the PM peak and network delay will increase past the 2029 without proposal. However, this is subject to anticipated growth used in modelling. There is potential that future modal shift, public and active transport, would limit the delay increase.

Table 4-2 Intersection Performance With and Without the Proposal

Traffic Performance Parameters	AM Peak Hour			PM Peak Hour		
	2029 Without Proposal	2029 With Proposal	2039 With Proposal	2029 Without Proposal	2029 With Proposal	2039 With Proposal
Carlingford Rd, Ray Rd & Rawson St	F	F	F	F	F	F
Beecroft Rd & Carlingford Rd	B	B	B	C	C	C
Bridge St & Rawson St	E	E	F	D	C	D
Beecroft Rd, High St & Bridge St	B	A	A	D	A	D
Epping Rd, Blaxland Rd & Langston Plc	D	C	C	D	C	E
Epping Rd & Essex St	D	D	D	C	C	C

The intersection analysis reveals the following operational benefits of the Proposal:

- Most of the benefits are localised at the intersection of Epping Road, Blaxland Road and Langston Place.
- Intersection performance in the AM peak is forecast to improve from level of service D to C at 2029 opening year and up to 10-years beyond.

- Intersection performance in the PM peak is forecast to increase from level of service D to E from 2029 opening year to 2039 project year.
- Intersection performance at the Bridge Street left turn entry onto Beecroft Road in the PM peak is forecast to improve from level of service D to A at 2029 opening and will remain at level of service D up to 10-years beyond.

A key benefit of the additional eastbound right turn lane on the Epping Bridge is the improvement in travel times across the precinct particularly for southbound and eastbound movements (refer Table 4-3).

A review of the north-south and east-west movements across the precinct revealed the following:

- A 40% (~2 minute) saving in average southbound travel times between Beecroft Road and Blaxland Road during the 2029 AM Peak.
- An 76% (~8 minute) saving in average southbound travel times between Beecroft Road and Blaxland Road during the 2029 PM Peak
- A 12% (~1 minute) increase in average east 2029 bound travel times between Carlingford Road and Epping Road in the PM Peak

Table 4-3 Analysis of Travel Times With and Without the Project (min)

Route	AM Peak Hour		PM Peak Hour	
	2029 Without Project	2029 With Project	2029 Without Project	2029 With Project
Blaxland Rd to Beecroft Rd NB	02:20	02:18	02:52	03:25
Beecroft Rd to Blaxland Rd SB	04:19	02:37	10:45	02:34
Carlingford Rd to Epping Rd EB	07:09	07:02	06:45	07:33
Epping Rd to Carlingford Rd WB	03:12	03:10	03:17	03:16

4.3 Bus Services

The Proposal impacts the following bus stands at the Epping bus interchange:

- bus stand C on the eastern side of Beecroft Road.
- bus stands G and H on the western side of Beecroft Road.

Alternate bus stand locations have been identified following Transport consultation with bus operators (refer to Figure 4-4). The preferred option is:

- Bus Stand C will be relocated to the northern side of the pedestrian overbridge bridge. This is currently an on-street parking bay up to 50m in length. It is also used for rail replacement bus operations during night-time or weekend rail closures.
- Relocation of northbound bus stands D, E and F up to 48.5m further north along the western kerb of Beecroft Road, to accommodate G and H, north of the pedestrian overbridge.

Transport has raised concerns about sharing the new location for Bus Stand C with general bus services during rail replacement activities, particularly during weekend long closures. As there may not be sufficient stand capacity for the frequency of rail replacement bus services, which can arrive in a convoy of up to three buses at a time.

At present Transport has space for up to 5 buses along the eastern kerb in Beecroft Road, two north of the pedestrian and three south of the pedestrian bridge for use during rail replacement. After completion of the Epping Bridge upgrade, just two bus spaces will be available north of the pedestrian bridge. Additionally, footpath queuing and crowding is another concern. Transport will work with stakeholders during Detailed Design to develop a revised rail replacement bus operations strategy to complement the Epping Bridge upgrade. This may include a review of alternate rail replacement operations in Cambridge Street.

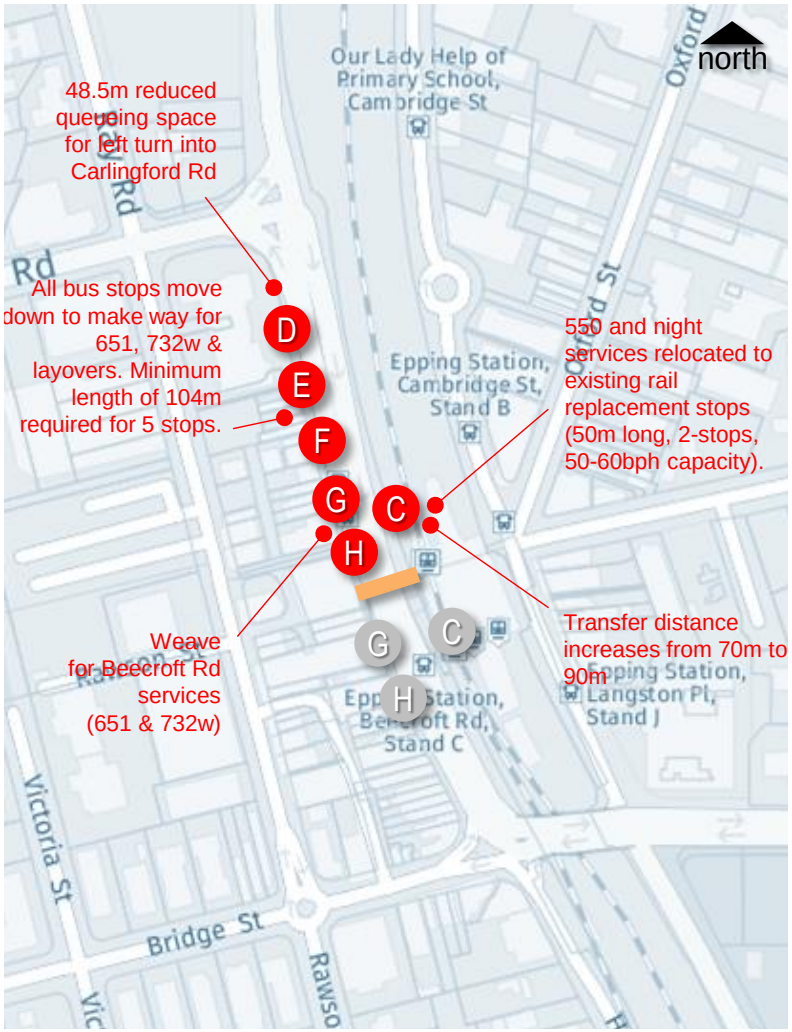


Figure 4-4 Revised Bus Interchange Configuration

During consultation, stakeholders expressed a preference to keep the existing bus stand D, E, F, G and H arrangements unchanged. During the late stages of the Concept Design, the design team identified a revised bus interchange and traffic configuration that would achieve this (refer Figure 4-5 and Figure 4-6).

Initial SIDRA analysis suggests that this lane configuration would not impact on the operational benefits of the Proposal. This primarily involves line marking and lane configuration optimisation of the proposed design that would minimise the project impacts on northbound bus operations. The side benefits of this arrangement are that it simplifies the exit from Epping Bridge into High Street and Bridge Street and facilitates bus access onto Beecroft Road.

This option could be developed further in consultation with stakeholders during the Detailed Design phase.

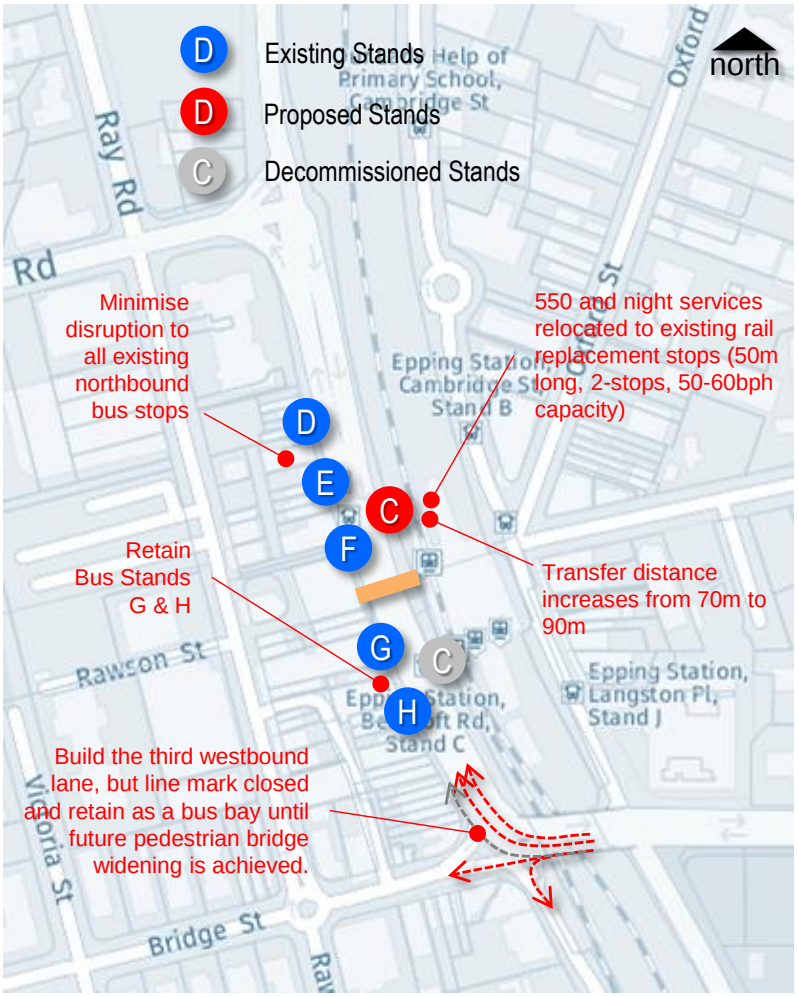


Figure 4-5 Alternate Northbound Bus Stop Arrangement

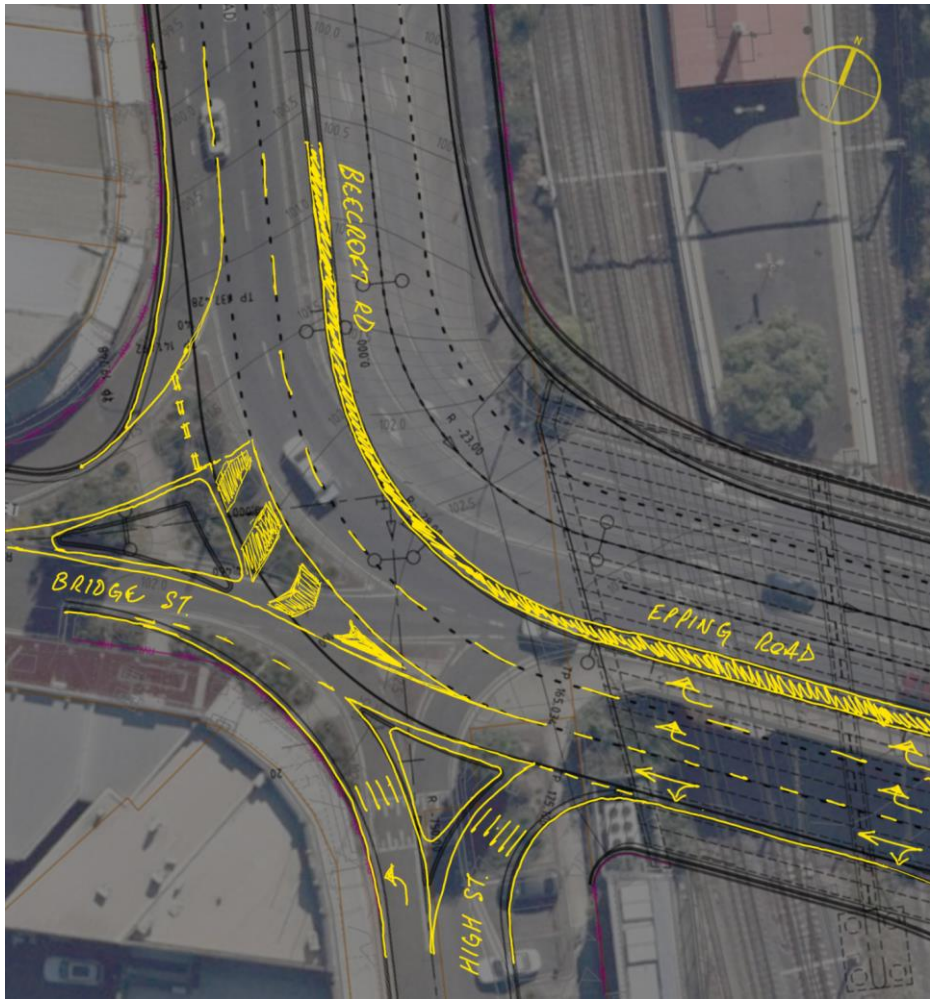


Figure 4-6 Alternate Northbound Lane Arrangement

4.4 Active Transport

The proposal requires changes to the layout of the pedestrian crossing at the intersection of Epping Road and Blaxland Road and Langston place. Discussion of the changes for this intersection are discussed in Section 4.4.1. All other pedestrian crossings will operate in the same function as the existing arrangement.

4.4.1 Staged Signal Crossing

A staged pedestrian crossing is proposed on the eastern approach to the signalised intersection of Epping Road and Blaxland Road and Langston place. The staged crossing mitigates the impacts of the long pedestrian crossing on the eastern approach of the Epping Road and Blaxland Road. The crossing, as proposed in the Definition Design was more than 32m long. Allowing for Walk and Pedestrian Clearance time, the C-phase for Langston place traffic movements would be unnecessarily extended up to 33 seconds by walk movements. During this time, traffic exiting Langston place is held up by the red arrow pedestrian protection requirements. This extension of the C-Phase for Langston Place traffic movements would be at the expense of more important traffic movements. The staged crossing arrangement will permit the C-Phase to be reduced by 17 seconds or 12% of the total cycle time.

In addition to the operational benefits to traffic, the staged crossing will have the following safety and accessibility benefits for active transport users:

- Improved visibility of crossing users. The southbound left turn traffic from Langston Place will be filtering across a very short (7.5m long) crossing, where most of the crossing movements are completed before the pedestrian protection is removed and traffic begins filtering across the crossing. Pedestrians, starting to cross from the median, are highly visible to drivers. Whereas with a long single crossing, the released left turn traffic is less likely to see a pedestrian that started their crossing 28.5m away, on the other side of a busy intersection environment and who are now trying to complete their long crossing.
- People with restricted mobility can rest and be less exposed with a staged crossing. When crossings exceed 25m in length, it is a design requirement to provide a median refuge area, with push-button, in case a slow walker fails to complete their crossing in the standard clearance time and becomes stranded. There is less likelihood of pedestrians being stranded with two shorter crossings.
- With a single crossing, active transport users can only start their crossing in the first part of C-phase. That is a short 6-second ‘Walk’ window in a total cycle time of 130 seconds. The staged crossing provides more windows of opportunity to cross, particularly in the northbound direction.
- There are phase overlaps in the staged crossing which provides similar crossing continuity as a single crossing. For example, the southbound crossing occurs first in C-phase and the second crossing in D-phase. The northbound movement can start in B-phase and the second crossing in the following C-phase.

4.4.2 Epping Bridge Shared Path

The Proposal includes a 4.6m wide shared path on the southern side of Epping Bridge to link the Epping Road shared path (3.5m) and the Bridge Street Shared path (4.6m). This addresses the missing link between the existing east-west shared paths approaching the bridge.

Intersection counts collected on 21 September 2023, revealed the following active transport demands using the southern footpath of the bridge:

- AM peak – 20 pedestrian per hour and 4 cyclists per hour.
- PM peak – 23 pedestrians per hour and 2 cyclists per hour.

Background pedestrian growth has been estimated based on land use growth forecasts within 1.2km of Epping station. Cycling growth has been estimated based on land use growth forecasts within 5km of Epping Station. The estimated active transport growth factors, up to 2041, are 1.21 and 1.22 for

pedestrian and walk trips, respectively. These rates are based on population and employment data from official NSW projections (TZP22).

The forecast 2-way flows along the Epping Bridge shared path, by 2041, could be less than 50 pedestrian per hour and 10 cyclists per hour, based on current active transport patterns. It should be noted that a lot of east-west shared path demand diverts up Langston Place, before the bridge, to access Epping Station and the pedestrian overbridge.

The proposed Epping Bridge shared path is consistent with the 3.5m available shared path width provided to the west on the southern side of Bridge Street and greater than the 2.4m available shared path width provided to the east on the southern side of Epping Road.

This arrangement is consistent with a Scenario E arrangement outlined in AUSTROADS, which is suitable for frequent and concurrent commuting and recreational uses (refer Figure 4-7).

This path arrangement could accommodate up to 100 pedestrians per hour and up to 200 cyclists per hour.

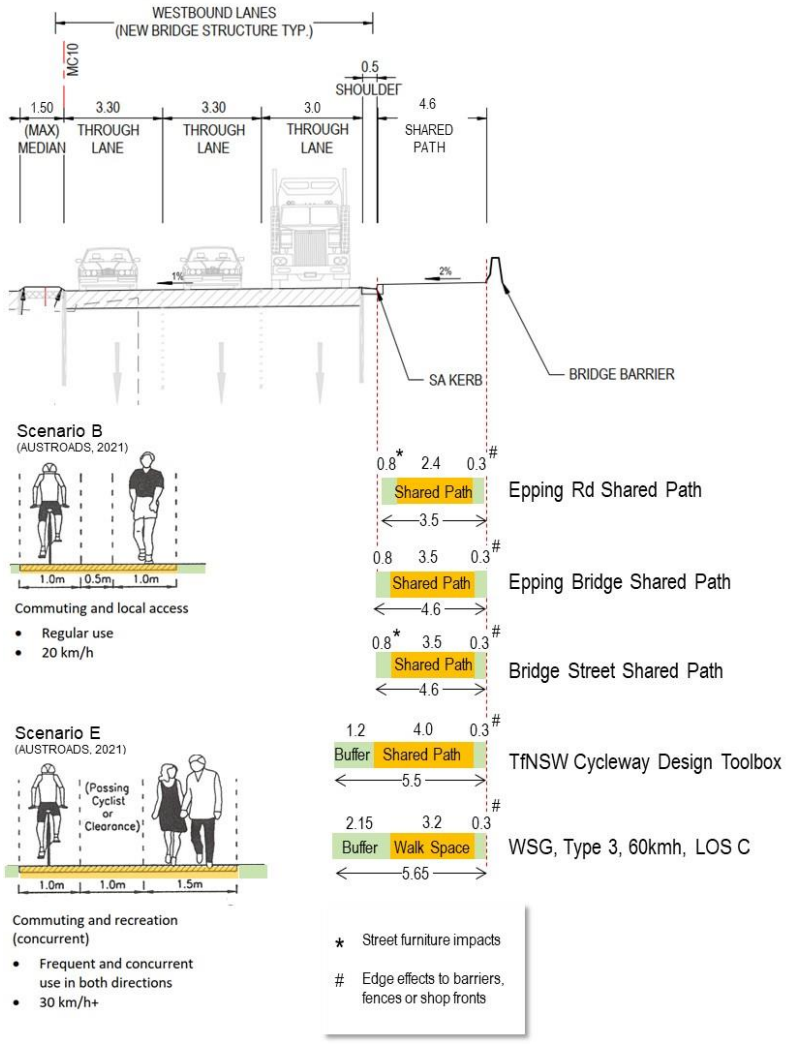


Figure 4-7 Comparison of Shared path Provisions

4.5 On-street Parking Impacts

The following on street parking will be impacted by the Proposal.

Table 4-4 Impacts on on-street Parking

Road	Location	Impact	Comment
Beecroft Road Southbound	South of Pedestrian overbridge	24m of on street parking will be removed which is approximately 4 spaces	
Beecroft Road Southbound	North of Pedestrian overbridge	50m of on street parking will be removed which is approximately 8 spaces	Removal subject to confirmation of Bus stop relocation option
Beecroft Road Northbound	North of Pedestrian overbridge	40m of on street parking will be removed which is approximately 6 spaces	Removal subject to confirmation of Bus stop relocation option
High Street Southbound	First three parks Southbound	First three car parks, one of which is an accessible space.	Removed to accommodate the new road alignment.

The parking surveys undertaken in February 2024 revealed that even during peak weekday parking demand (11:30am), there were at least 47 on-street parking spaces, 36 off-street parking spaces and at least 1-2 accessible spaces, available for use within 400m of Epping Station. The survey suggests that despite the loss of up to 21 parking spaces, because of the proposal, there is adequate parking capacity in the precinct to offset any losses.

5 Construction Impacts

The construction impacts of the Proposal are identified in this Chapter. Construction impacts on traffic and transport are associated with:

- Construction staging and lane closures
- Reduced speed limits
- Construction traffic generation
- Workforce access and parking
- Bus service relocations
- Reduced pedestrian access
- Reduce amount of secure bike parking

This chapter is indicative and may change once the detailed design methodology is finalised. The staging is also dependent on the Contractor's preferred methodology, program and sequencing of work.

5.1 Traffic Staging Strategies

The key strategies adopted to inform the traffic staging for the Proposal include:

- minimising speed limit reductions particularly when works are not occurring. The existing speed limits are 60km/h in the project area and a 40km/h speed limit is proposed during construction.
- Considering road user delays during construction and future maintenance works
- Including road user delay as a key input to the development of staging plans
- Maintaining community access, pedestrian, vehicular and public transport
- Maximising road capacity during peak periods.

5.2 Speed Limits

The indicative extent of 40km/h construction speed limits was identified on the main approaches to the project area. These are presented in Figure 5-1.

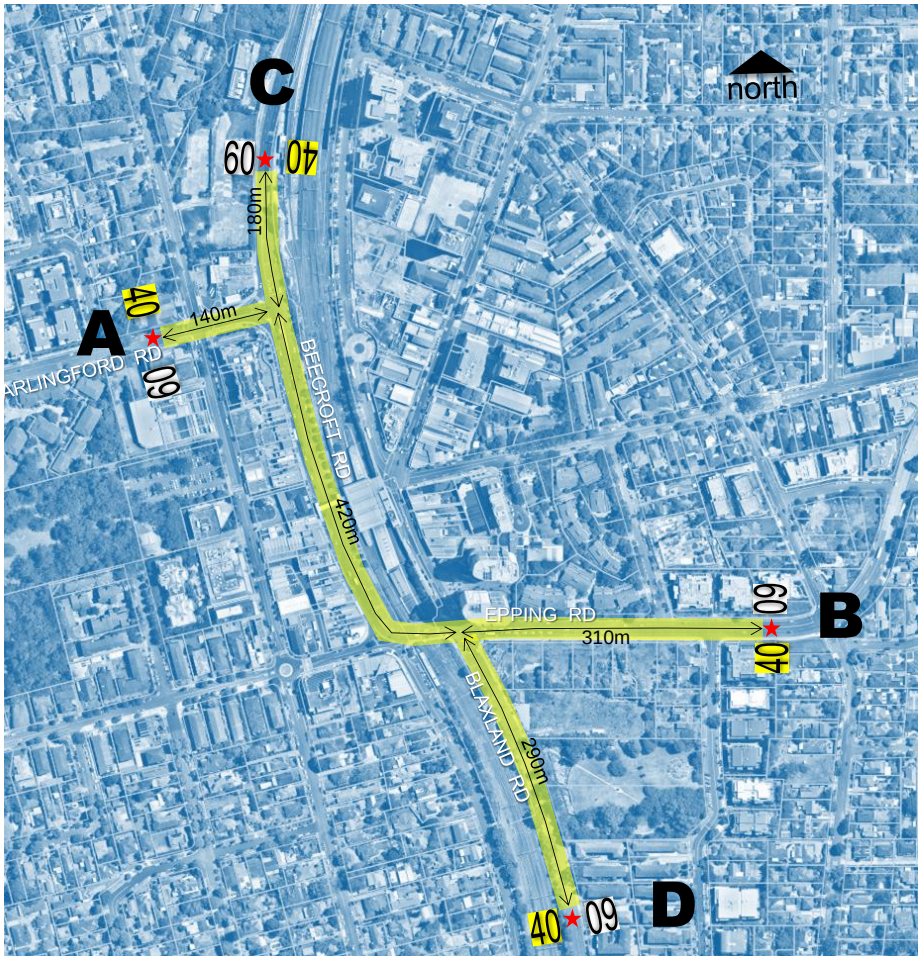


Figure 5-1 Extent of Construction Speed Zones

The estimated impact of this construction speed limit, to free-flow traffic speeds, ranges between 26 seconds and 29 seconds per vehicle (refer Figure 5-1).

Table 5-1 Free-flow delay of 40km/h Speed limit During Construction

O/D Pair	Travel Distance (m)	Delay per vehicle (sec)
A-B	870	26.2
C-B	910	28.3
C-D	890	27.7

5.3 Traffic Detours During Blaxland Road Closures

The current construction program includes a proposal to close Blaxland Road, over the 2027 Christmas break, to facilitate regrading and widening works in Blaxland Road. During this period, traffic demand drops significantly. A review of historical permanent count data for Epping Bridge indicated that flows in the area reduced to nearly 80% of normal demand over the 4-weeks commencing 18 December 2017 (refer Figure 5-2). A closure during this period would help minimise traffic impacts of the closure.

The diversion of light and heavy vehicle movements in Blaxland Road would add 5.3km and about 7-minutes to journey time and would be via the following routes:

- Balaclava Road and Epping Road to access Epping Road westbound.
- Epping Road, Balaclava Road to access Blaxland southbound

The diversion of B-doubles movements in Blaxland Road would add 3.7km and about 9-minutes longer and would be via the following routes:

- Lane Cove Road and Epping Road to access Epping Road westbound.

- Epping Road, Lane Cove Road to access Lane Cove Road westbound

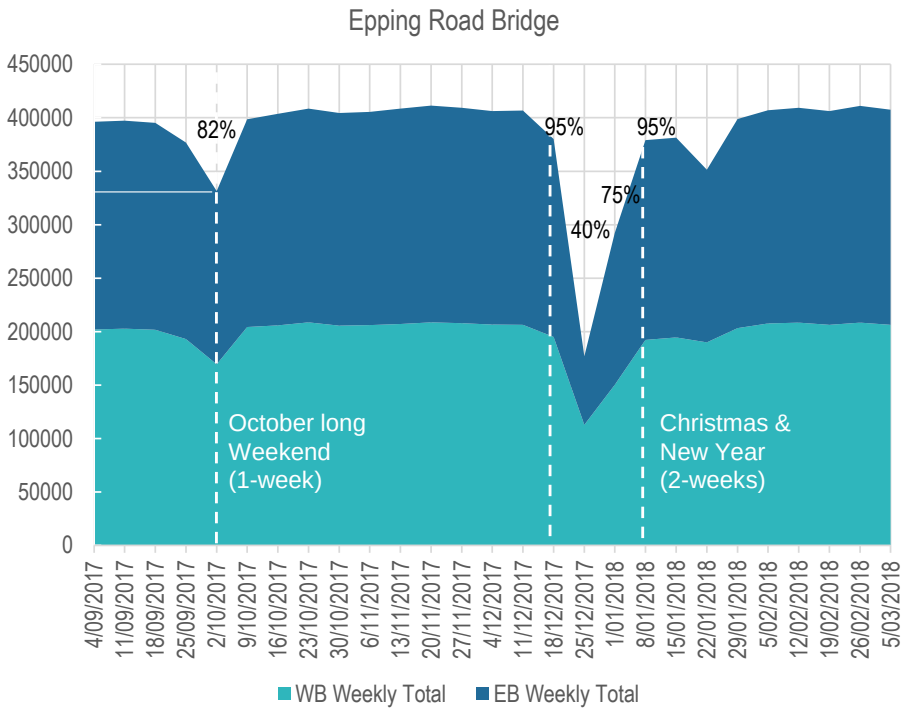


Figure 5-2 Review of Weekly traffic Flows on Epping Bridge (Dec 2017)

5.4 Overview of Traffic Staging

Traffic staging is broken down into nine separate stages, these stages are:

- 1A – The existing medians and splitter islands along Beecroft and Blaxland roads are to be demolished and replaced with temporary pavement prior to Stage 1 works. Following temporary traffic management in place, works are to be completed on the two westernmost northbound lanes of Beecroft Road including the retaining wall on the corner of Bridge Street. Blaxland Road retaining wall on the southbound verge is to be constructed in preparation for the closure and lifting of vertical road levels on Blaxland Road.
- 1B – Blaxland Road retaining wall on the northbound verge is to be constructed in preparation for the closure and lifting of road levels on Blaxland Road. Full closure weekend shutdown of High Street to perform the permanent road widening of the kerb return between High Street and Bridge Street, permanent pavement works and utility trenching in preparation for the new bridge construction.
- 2 - Temporary full closure of Blaxland Road to enable construction of the road to final surface levels including pavement, stormwater drainage and utility works. A local diversion will be in place whereby the travelling public will be diverted from Blaxland Road to Epping via Balaclava Road and Epping Road. This will be vice versa for southbound traffic travelling from Beecroft Road to Blaxland Road southbound.
- 3 – Permanent pavement foundation to be constructed on the corner of High Street and Epping Bridge following completion of bridge abutment works and in tandem with the bridge transition slab construction. A Temporary barrier will be placed in front of the existing kerb return between Epping Road and High Street to allow these works to be performed. These works are to be undertaken in sync with the Stage 1A bridge construction. It is likely that several parking restrictions will be required to ensure a laydown area is provided in close proximity to the bridge construction.
- 4A & 4B - Stage 4A involves level changes at the southern part of Epping Road bridge before adjusting the temporary alignment of the Beecroft Road approach to the bridge. The Blaxland Road, Epping Road and Langston Place intersection level changes are to be completed under traffic control. Staging allows the completion of the Stage 1B bridge works including the removal of the existing bridge parapet and inclusion of a temporary system to allow the switching of traffic under Stage 5.

- 5 - The number of operational lanes across Epping bridge is reduced to 4 over a Christmas shut down for approximately 3 weeks to accommodate the Stage 2 bridge slide. The 4 lanes of traffic are diverted onto the completed Stage 1B bridge. The replacement bridge is slid into place. The two southbound lanes on Epping Road are completed.
- 6 - The rest of Epping Road is raised to its final levels to tie into the new bridge alongside new kerb line and stormwater installation along the remaining median island to the eastern tie-in. These works are to be completed under night works. Langston Place pavement and median works are to be completed under night works.
- 7 - The remaining medians, splitter island and final line marking are completed under night-time lane closures.

Details of the anticipated impacts of each stage are discussed further in Section 5.5.

5.5 Program

The indicative construction program is presented in

Figure 5-3.

To avoid confusion, the bridge staging sequence is presented side-by-side with the equivalent traffic staging sequence. The bridge staging relates to the construction process of the bridge. Whilst the traffic staging provides space to allow for bridge construction on portions of the roadway whilst minimising impacts to the existing carriageway.

Below is a summary of traffic related observations on the traffic staging design and a description of indicative changes to the signal layout during each phase.

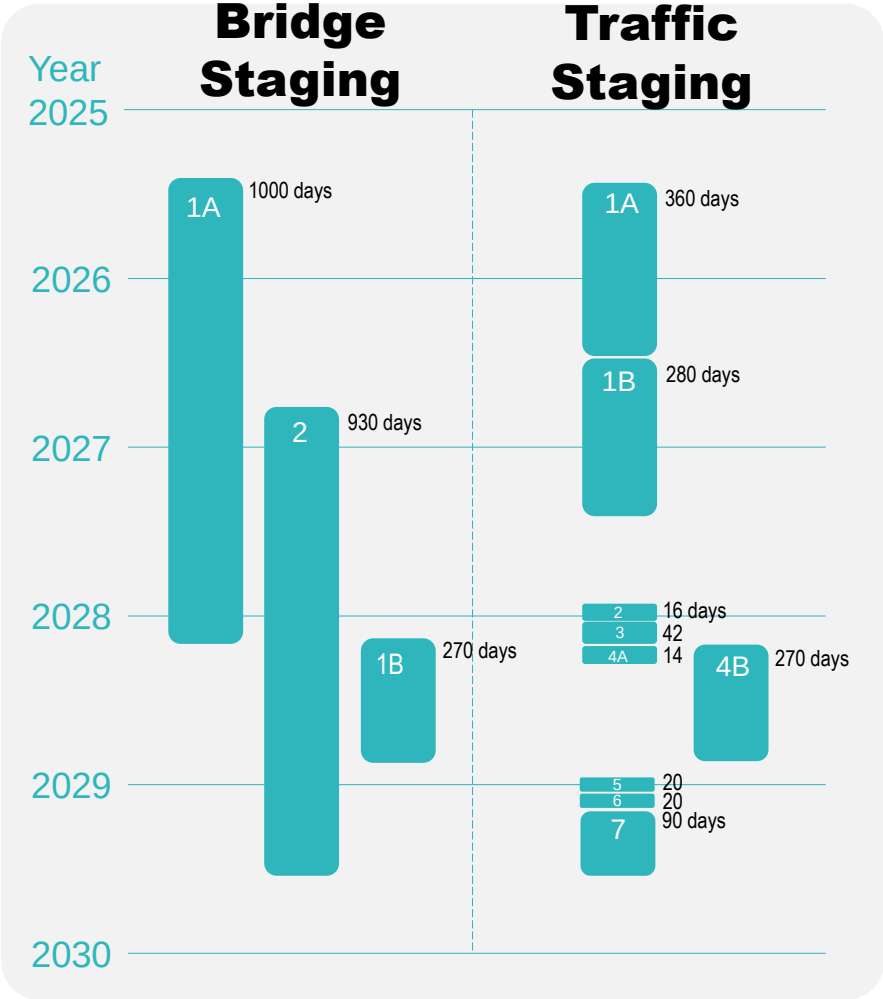


Figure 5-3 Indicative Bridge and Traffic Staging Duration & Sequence

5.5.1 Early Works

Early works may include the following:

- Relocation of northbound bus stands D, E and F 48.5m north to accommodate G and H, north of the pedestrian overbridge.
- Relocation of southbound bus stand C in Beecroft Road to its ultimate configuration north of the pedestrian overbridge and localised footpath widening at the base of the eastern stairs.
- Installation of 40km/h construction speed limits
- Removal of central median in Beecroft Road, south of the pedestrian bridge and installation of temporary pavement over the top.
- Removal of splitter island on Bridge Street and High Street and installation of temporary pavement over the top.
- Removal of central median on Blaxland Road and installation of temporary pavement over the top.

5.5.2 Stage 1A

During construction of the retaining wall on the south-east corner of the site three lanes will be maintained on the northbound Blaxland Road approach to TCS216. This will be achieved by shifting the three lanes east and reducing the southbound carriageway of Blaxland Road to a single lane. Traffic detector 6 will be decommissioned and the three detectors on this approach renumbered to reflect the new arrangement.

On the northern side of the intersection, the Langston Place approach will need to be reconfigured to a dedicated left lane and a single through lane. The alignment of the southbound movement from Langston Place to Blaxland Road may be problematic due to the reverse curves through the intersection. Capacity for through movements on the Langston Place approach will be reduced during this stage.

There are 2x80 HD PVC Conduits on the south-east corner feeding signal posts 2, 3, 4 and 5. These may be impacted by the road widening, footpath relocation and retaining wall works. These will need to be diverted/replaced into the ultimate configuration, where possible. It is understood that all signalised crossings will be maintained during this stage, however, the crossing on Blaxland Road may need to be temporarily realigned to avoid impact to the area under construction.

5.5.3 Stage 1B

Stage 1B involves the construction of the retaining wall on the south-west corner of TCS216. Like Stage 1A, three lanes will be maintained on the northbound Blaxland Road approach and the southbound carriageway of Blaxland Road will be reduced to a single lane.

In addition, a full closure shutdown of High Street over a weekend period is required to complete permanent road widening and pavement works except for the tie-in to the bridge.

It is understood that all signalised crossings will be maintained during this stage.

5.5.4 Stage 2

This is the temporary Christmas 2027 closure of Blaxland Road for a period of 2-3 weeks.

The closure of Blaxland Road is problematic for both northbound and southbound users. There are no convenient traffic diversions available with the only option being a long diversion along Epping Road and Balaclava Road. Consideration was given to keeping a single temporary southbound side track through the construction area. However, the vertical differences, between existing and future pavement levels, over an extended area, make a temporary side-track almost impossible to achieve.

The eastbound right turn lane on the bridge deck will be closed temporarily and traffic diverted eastwards along Epping Road. This represents a 1-lane reduction in capacity and is only acceptable during low demand periods over the Christmas and New year period.

Traffic detectors 6,7 and 9 will be decommissioned during this stage and a new Blaxland Road approach constructed for Stage 3.

5.5.5 Stage 3

The Epping Road and Blaxland Road intersection layout will return to the Stage 1A and 1B configuration.

New detectors 6, 7 and 9 will be installed at the higher pavement levels on the new Blaxland Road vertical alignment.

It is understood that all signalised crossings will be maintained during this stage.

5.5.6 Stage 4A & 4B

The Blaxland Road approach to TCS216 is shifted west into its ultimate configuration. The Langston Place approach is also changed to its ultimate configuration and the two departure lanes on Blaxland Road are re-opened.

The westbound Epping Road approach is realigned and A-detectors 2 and 3 relocated.

It is understood that all signalised crossings will be maintained during this stage.

5.5.7 Stage 5

Stage 5 reduces Epping Road eastbound capacity substantially and sees the bridge reduced to four lanes over a three-week Christmas shutdown.

The eastbound shared through and left lanes will be impacted by the closure of the left turn slip lane into Langston Place. Instead, this movement will be delayed by the left turn pedestrian protection.

The eastbound shared through and right lane will be blocked by right turn traffic in A-phase.

The only way to make this work efficiently and maximise the available capacity would be to operate Epping Road as split approaches phases.

All the eastbound left, through and right movements operate at the same time in a new A-phase and the Langston Place P2 crossing transferred to another phase. This avoids the pedestrian protection problem.

All the westbound through and left movements then operate in a new B-phase, at the same time. The Langston Place crossing is added to this B-phase. Given that there is no right turn conflict – it has little or no impact on the phase.

C-phase would operate as normal.

These signal modifications would help to minimise the impact and maximise the available lane capacities.

It is understood that all signalised crossings will be maintained during this stage.

5.5.8 Stage 6

The Blaxland Road approach is in its end-state configuration. The Langston Place approach is adjusted to its end-state configuration.

The Epping Road eastern approach maintains two westbound lanes on the new alignment. The median lane provides a buffer to median construction works.

The Epping Road western approach maintains two through lanes and right turn lane on the new bridge approach vertical alignment.

5.5.9 Stage 7

Same as Stage 6.

5.6 Traffic Performance During Construction

The performance of the road network during the construction traffic stages was assessed using the VISSIM dynamic modelling software. The following construction traffic stages were modelled:

- Stage 1A
- Stage 4A
- Stage 5
- Stage 5 (80% Demand)
- Stage 6

These stages were selected for analysis, as they represented a substantial change in layout or capacity, compared to a previous stage. These four traffic layouts are presented in Appendix C.

Stage 5 was modelled with normal demand and haulage then again with 80% demand, to reflect the lower demand experienced over the Christmas and New Year shut-down periods.

A review of permanent count data (Site: 74453) on the Epping Bridge over Christmas 2017, revealed that daily traffic demand dropped to 80% of normal flow over the 4-week period commencing 18 December 2017.

The comparative traffic performance statistics for each of the construction staging layouts are presented in Table 5-2 and Table 5-3.The comparative intersection performance statistics for each of the construction staging layouts are presented in Table 5-4 and Table 5-5

The biggest impact on traffic performance is because of the construction speed limit reduction from 60km/h to 40km/h.

Stage 5 has the biggest impact on traffic operations, however, if this work is undertaken over the Christmas Break when traffic demand drops to 80% of

normal flow, the performance results are consistent with, or better than, the 2023 base case.

Table 5-2 AM Peak Hour Construction Staging Impacts

Traffic Performance Parameters	2023 Base	Stage1A	Stage4A	Stage5	Stage5 80%	Stage6
Vehicle Kilometres Travelled (VKT)	9651	9684	9601	9046	7755	9645
Vehicle Hour Travelled (VHT)	369	387	404	572	263	361
Average Network Speed (km/h)	26	25	24	16	29	27
Average Network Delay (sec)	111.9	102.9	113.2	217.2	71.3	89.4
Completed Trips	6119	6154	6073	5759	4901	6122
Unreleased Trips	5	3	5	300	0	4
Average Number of Vehicle Stops	3.12	3.04	3.51	7.54	2.14	2.67

Table 5-3 PM Peak Hour Construction Staging Impacts

Traffic Performance Parameters	2023 Base	Stage1A	Stage4A	Stage5	Stage5 80%	Stage6
Vehicle Kilometres Travelled (VKT)	9563	9610	9568	9579	7706	9570
Vehicle Hour Travelled (VHT)	345	376	383	365	254	370
Average Network Speed (km/h)	28	26	25	26	30	26
Average Network Delay (sec)	97.5	96.3	100.5	91.6	65.2	94.0
Completed Trips	6252	6305	6247	6246	5041	6266
Unreleased Trips	0	0	0	0	0	0
Average Number of Vehicle Stops	2.29	2.48	2.52	2.65	1.83	2.50

Table 5-4 AM Peak Hour Intersection Performance

Intersections	2023 Base	Stage1A	Stage4A	Stage5	Stage5 80%	Stage6
Carlingford Rd, Ray Rd & Rawson St	F	F	F	F	C	E
Beecroft Rd & Carlingford Rd	B	B	B	C	B	B
Bridge St & Rawson St	C	C	D	E	C	D
Beecroft Rd, High St & Bridge St	A	B	B	B	A	B
Epping Rd, Blaxland Rd & Langston Plc	C	C	C	E	C	C
Epping Rd & Essex St	C	B	B	B	B	B

Table 5-5 PM Peak Intersection Performance

Intersections	2023 Base	Stage1A	Stage4A	Stage5	Stage5 80%	Stage6
Carlingford Rd, Ray Rd & Rawson St	C	C	C	C	B	C
Beecroft Rd & Carlingford Rd	B	B	B	B	B	B
Bridge St & Rawson St	D	D	C	F	C	E
Beecroft Rd, High St & Bridge St	B	D	C	F	B	F
Epping Rd, Blaxland Rd & Langston Plc	D	D	E	D	C	D
Epping Rd & Essex St	C	C	C	C	B	C

5.7 Construction Traffic Generation

Heavy and light vehicles will require access to the construction site and indicative construction compounds at 725 Blaxland Road and the rail corridor construction compound off High Street. The location of these is presented in

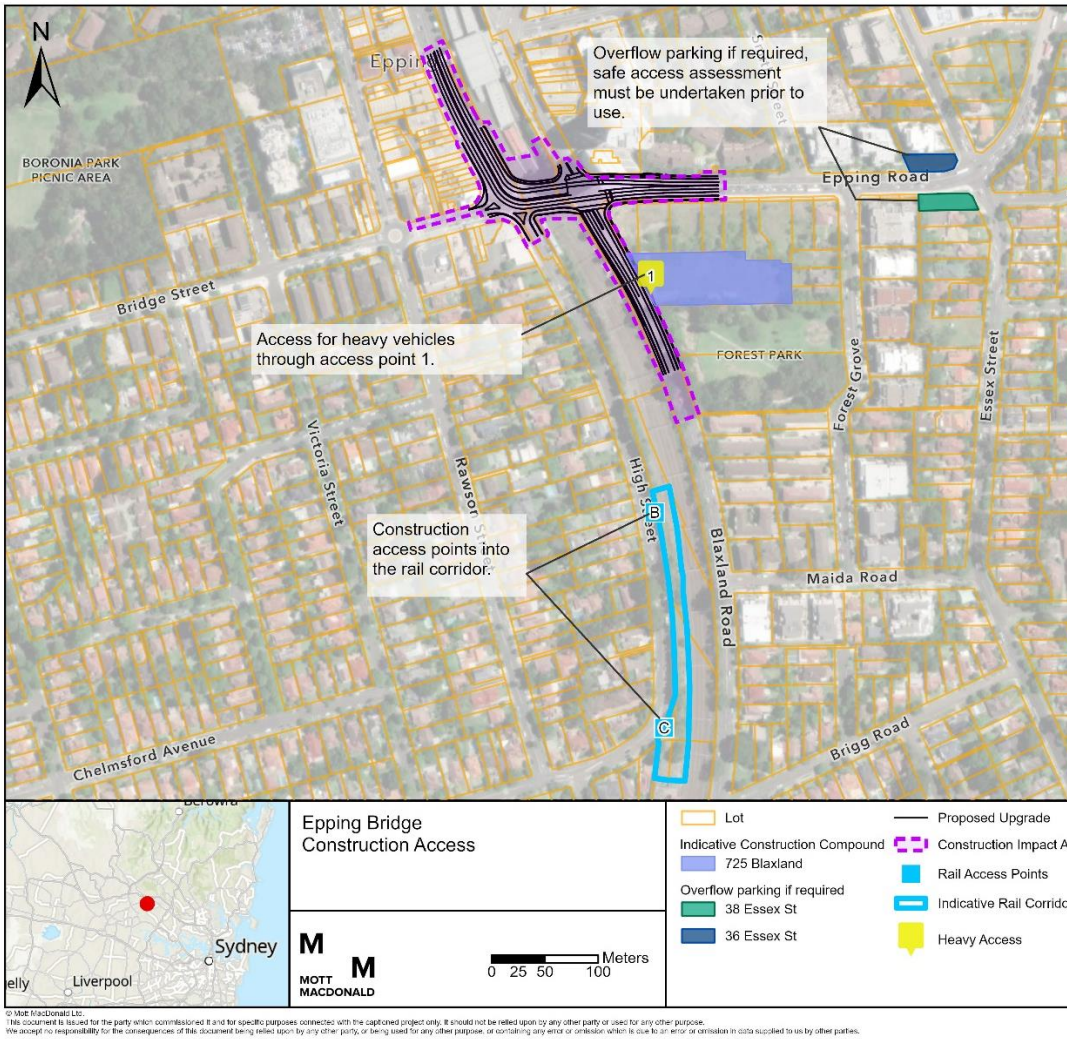


Figure 5-4. Estimates of light and heavy vehicle movements generated by construction activities is presented in Table 5-6.

The number of light vehicles per activity ranges from 12 to 40vpd, while the number of heavy vehicles range per activity ranges from 4 to 60vpd. The highest number of vehicles is required during the bridge demolition due to the amount of material required to be removed from site. This activity will require access through the rail corridor on High Street and is discussed in further detail in Section 5.8.

Indicative construction haulage routes for vehicles not accessing the rail corridor are presented in Figure 5-5, they will primarily use Epping Road, Blaxland Road, Beecroft Road and the M2.

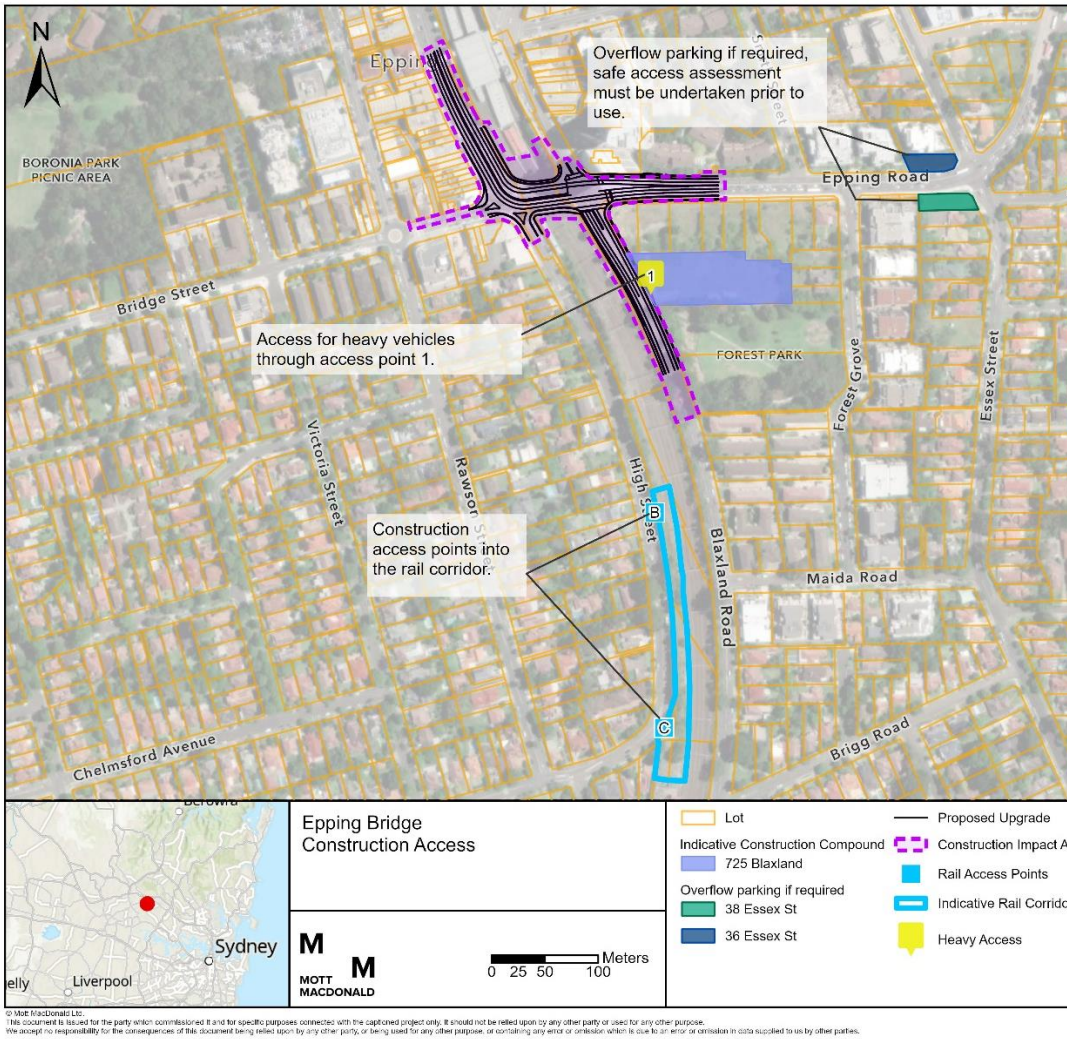


Figure 5-4 presents the access locations for these vehicles to enter construction compounds. The compound at 725 Blaxland Road will have one

access points, see

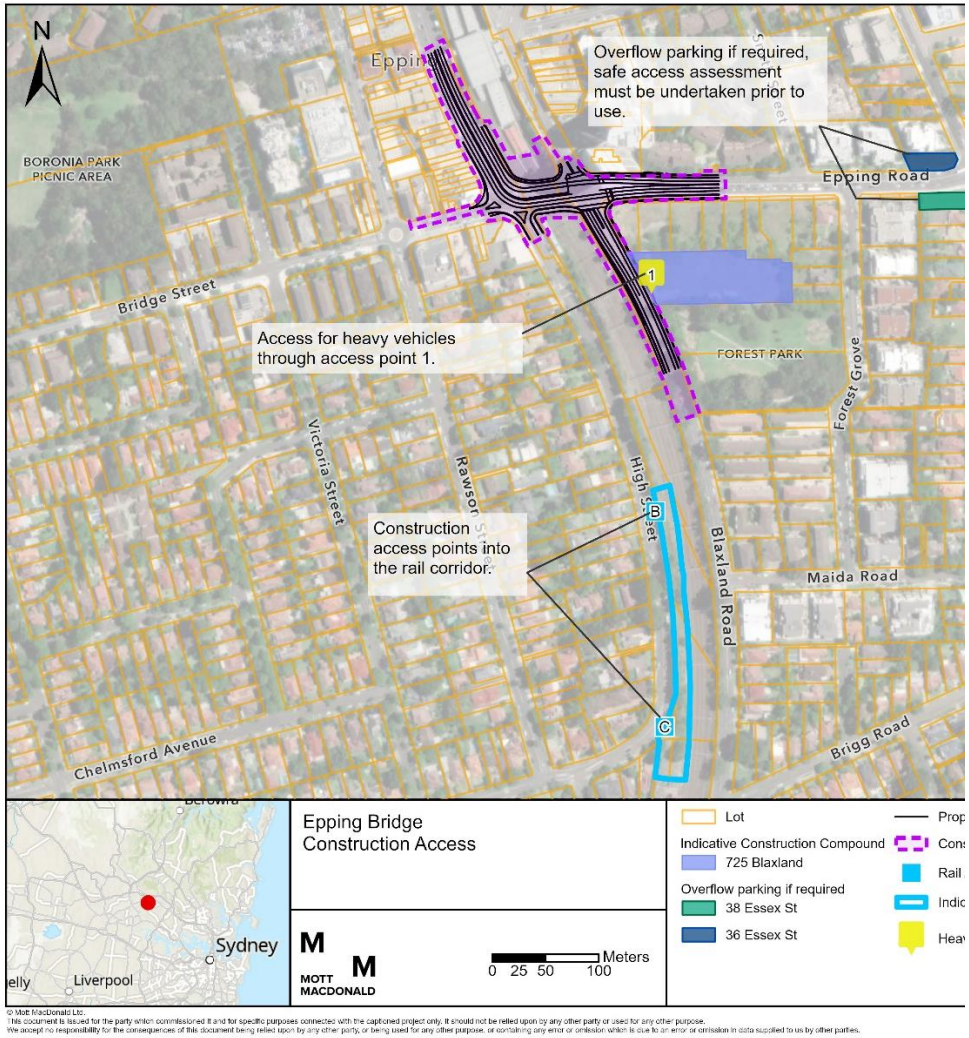


Figure 5-4, for light and heavy vehicles. All parking requirements for the

construction work force must be provided within compounds.

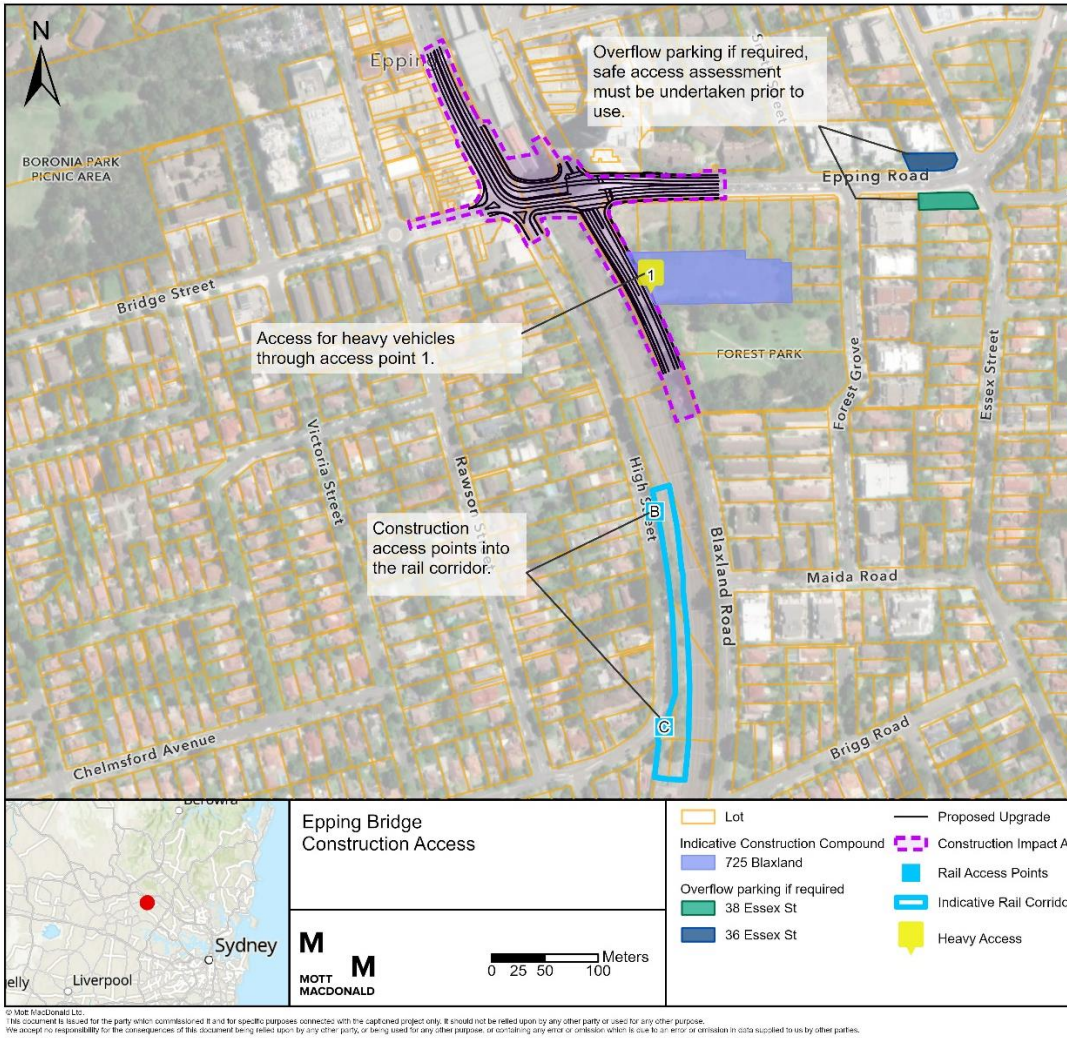


Figure 5-4 presents indicative locations for overflow parking. Safe access

assessments must be undertaken prior to using these locations for overflow parking.

Table 5-6 Traffic Generation

Construction activities	Vehicles Per Day	
	Light Vehicles	Heavy Vehicles
1. Site setup / enabling work	12	10
2. Demolition - Road	12	10
3. Demolition -Bridge	40	60
4. Piling	20	10
5. Earth works	20	40
6. Bridge construction	12	20
7. Road Works	20	20
8. Retaining Walls	12	10
9. Finishing works landscape	12	4

Traffic generated by the construction of the Proposal is anticipated to slightly increase traffic for portions of the construction period. Table 5-6 presents the worst-case scenario increase in traffic across all roads likely to be used for haulage. Light vehicle traffic is anticipated to increase within the range of 0.07% to 0.19% and heavy vehicle traffic is anticipated to increase within the range of 6.45% to 24% on haulage routes. This has potential to result in minor increases to wait times at local intersections. However, this is only anticipated to occur for a short period of time during the bridge demolition period.

To manage traffic impacts from construction traffic and haulage, a Traffic Management Plan (TMP) must be prepared by the construction contractor.

Table 5-7 Increase in traffic on haulage roads

Road Link	Background Flows in Daylight Hours (6am-6pm)		Construction Traffic in Daylight Hours (6am-6pm)		Percentage increase in Daylight Hours	
	LV	HV	LV	HV	LV	HV
Beecroft Rd, North of Carlingford Rd	25730	370	40	60	0.16%	16.22%
Carlingford Rd, west of Beecroft Rd	22790	610	40	60	0.18%	9.84%
Beecroft Rd, south of Carlingford Rd	42390	710	40	60	0.09%	8.45%
Epping Rd Bridge	44680	740	40	60	0.09%	8.11%
Blaxland Rd, South of Epping Rd	15550	190	40	60	0.26%	31.58%
Epping Rd, East of Blaxland Rd	30120	550	40	60	0.13%	10.91%

Table 5-8 Increase in traffic on High Street

Road Link	Background Flows in Daylight Hours (6am-6pm)		Construction Traffic (Daylight Hours)		Percentage increase in Daylight Hours	
	LV	HV	LV	HV	LV	HV
High Street, south of Beecroft Road	1300	20	40	60	3.1%	300.0%

5.8 Rail corridor construction compound Access and Haulage

A construction compound within the rail corridor is required to enable hi-rail plant to be delivered to site, enable haulage of the demolished bridge structure and delivery of construction materials. This access will only be used during rail possessions during weekend and holiday periods. The compound will be accessed from High Street with heavy vehicles using the following haulage route:

- High St to Chesterfield Road
- Chesterfield Road to Midson Road
- Midson Road to Carlingford Road
- Carlingford Road to Beecroft Road
- Beecroft Road to M2

This is presented in Figure 5-6. This route has been selected to keep heavy traffic off narrower tree lined local roads, reducing potential noise impacts on quiet streets and potential for collisions with low hanging branches. Traffic generated by the rail corridor compound is anticipated to increase traffic for portions of the construction period.

Table 5-8 presents the worst-case scenario increase in traffic on High Street and Chesterfield Road. Due to the timing of the compound's use, the largest volume of additional traffic is expected during the bridge demolition stage.

Disruptions are anticipated to be short term and residents will have sustained access to the road network and private properties throughout construction. Further, the anticipated volume of heavy vehicle movements is not considered likely to noticeably increase wait times at local intersections during relevant construction stages.

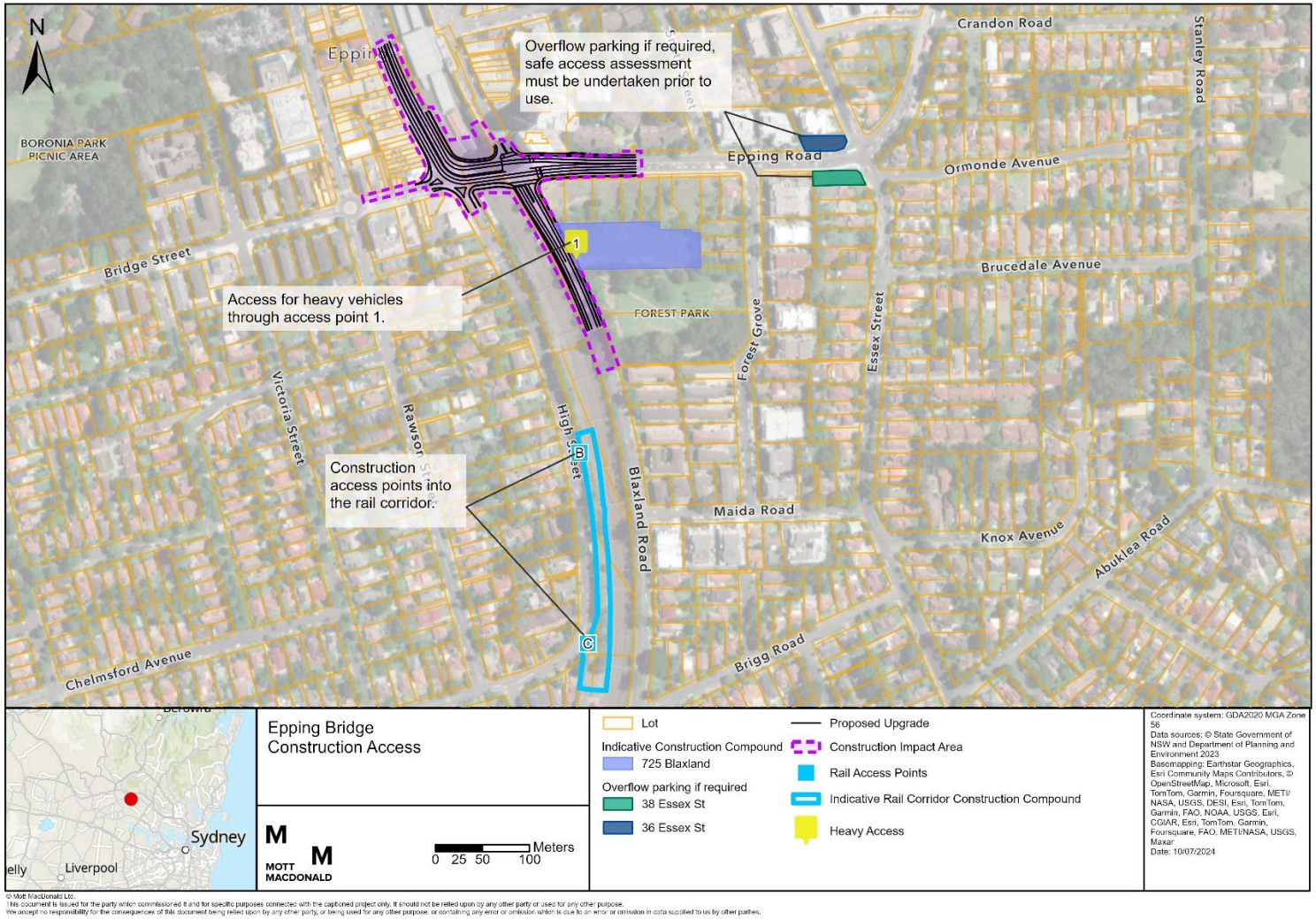


Figure 5-4 Construction site access and construction compound

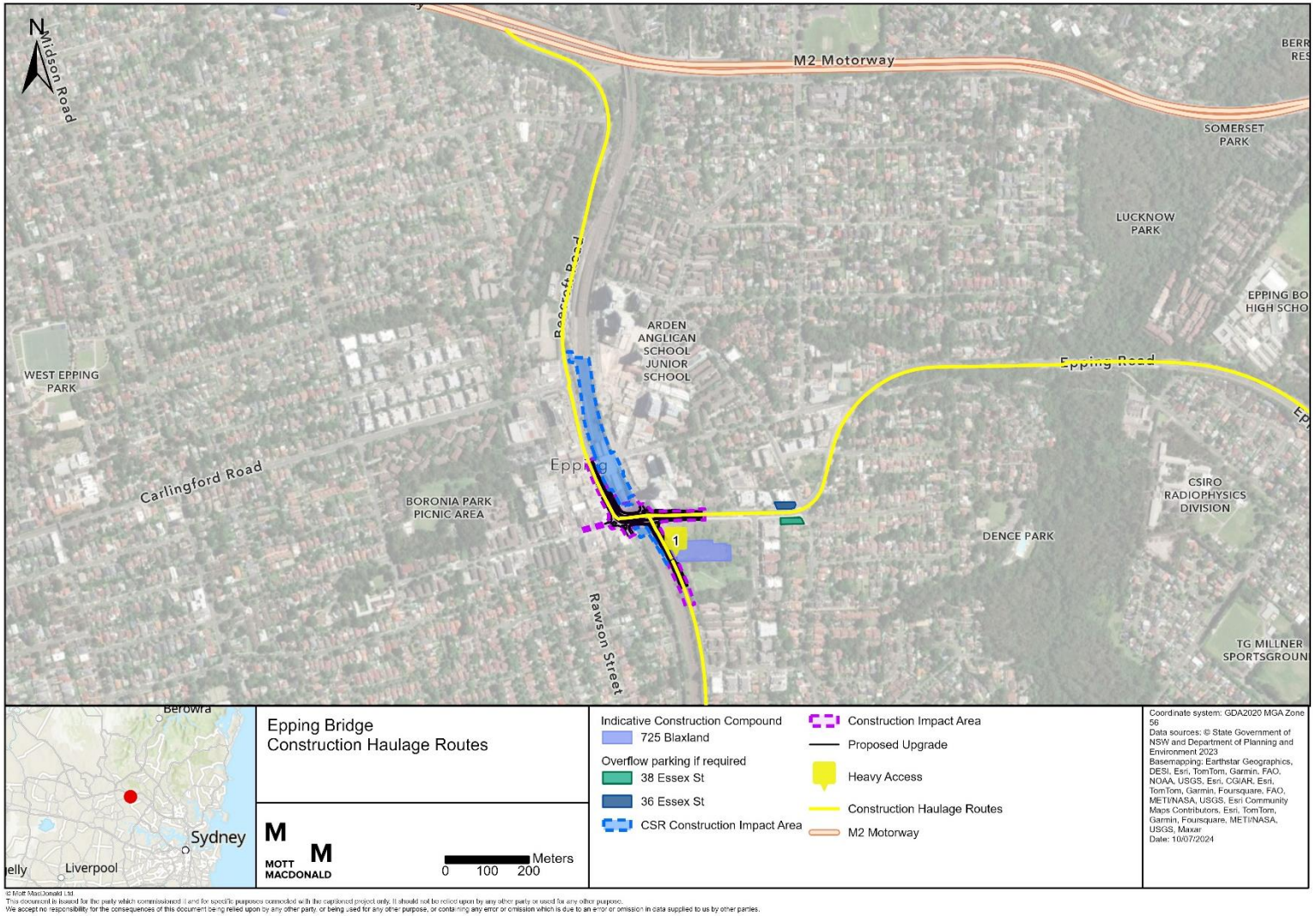


Figure 5-5 Construction haulage routes

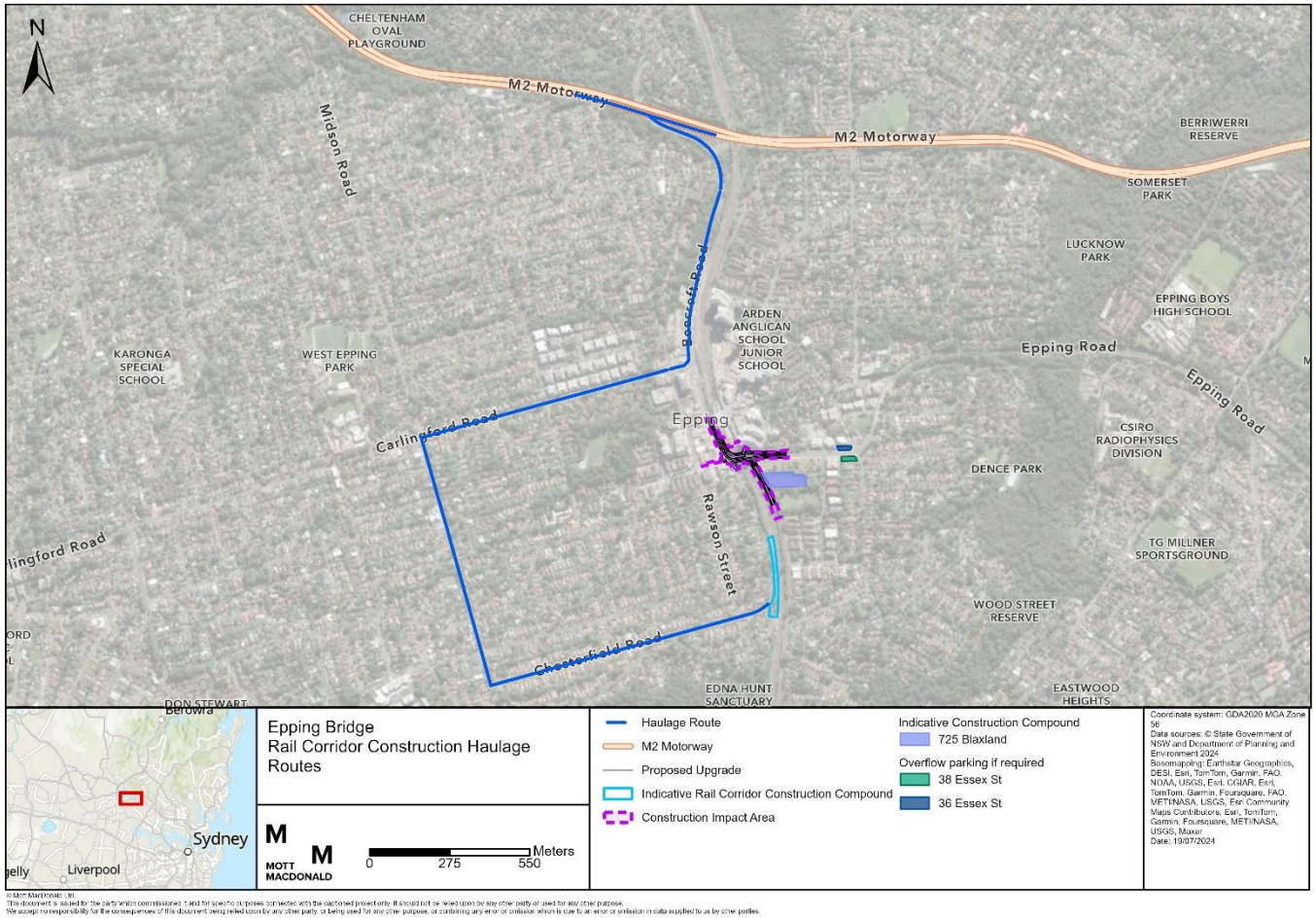


Figure 5-6 Rail corridor construction haulage routes

5.9 Workforce Access & Parking

Approximations of the required workforce suggest that the required number of full-time equivalent workers will range from 20 to 80 depending on the construction stage. Further, it is estimated that throughout any of the stages, 25% of the workforce will arrive via public transport, 50% via carpool, and 25% as the sole driver of a private vehicle. To enable the workforce to access the construction site, a temporary parking area will be established at the compound area on Blaxland Road.

To accommodate workforce parking, it is anticipated that the compound will need the capacity to hold 40 personal vehicles when the workforce is at a maximum during the bridge demolition stage. Personal vehicle access to the parking area will be available via Blaxland Road. This is not anticipated to significantly impact residents in the area due to the small increase in traffic on a road already subject to large traffic volumes.

In the wider area, it is expected that the presence of workforce vehicles will cause minor increases in traffic volumes throughout the local road network. These increases are likely to impact the road network at specific times of the day when construction is starting or ending and during potential worker changeover. As such, impacts on residents is expected to be minor as arrival and departure would not interfere with regular peak traffic times.

5.10 Bus Services Relocations

Stand C for buses will be relocated to the existing rail replacement stop. This relocation will occur during construction but will be maintained after the bridge is operational. No reduction in services is expected during construction as the shared stop location can accommodate up to 60 buses per hour, therefore there is adequate capacity to support both buses.

Bus stands D, E and F will be moved 48.5m north to accommodate the relocation of G and H, north of the pedestrian overbridge. This relocation will occur during construction but will be maintained after the bridge is operational.

Bus services will continue to run throughout the construction phase of the proposal.

5.11 Pedestrian Access

Impacts to pedestrian access are expected to be minimal as access will be maintained throughout construction and diversions are available when access is impacted.

Excluding the three-week demolition period, pedestrian access along the bridge will be maintained on at least one side throughout the construction stages. Diversions for pedestrians will occur through the train station entrances and overpass during the demolition period. The construction of the temporary bridge platform may also limit access to pedestrian footpaths on the rail corridor side of Beecroft Road and Langston Place. When these temporary impacts occur, pedestrians will also be diverted via the train station to maintain mobility. This impact is considered minor as these sections of footpath have limited catchments and other safe routes are available, primarily to link surrounding areas to the rail station.

There is potential that construction will require the southern side of Epping Road, extending to the intersection at Forest Grove, to be closed to pedestrians for portions of the construction program. This closure is expected to impact only a small catchment of residents at the northern extent of Forest Grove. Pedestrians will be diverted to the crossing at Epping Road and Essex Street or through Forest Park to maintain western movement along Epping Road.

Due to changes at the Blaxland Road intersection with Epping Road, the existing pedestrian footpath is to be removed and renewed with the proposed changes to the road. To maintain pedestrian access, a temporary path will be created at 2 Epping Road.

Accessible connections across the rail corridor are not anticipated to experience impacts as the elevators at the train station will be unaffected by

construction. Overall, pedestrian access is to be maintained and managed throughout the duration of construction. When pedestrian access is impacted, diversions are available to maintain mobility throughout the proposal area and surrounding locality.

5.12 Secure Bike Parking

The temporary bridge construction platform will require partial removal of the Opal bike shed for the duration of construction activity in this location associated to the temporary construction platform for the new bridge. It is anticipated that a portion of the shed will need to be removed reducing secure bike parking capacity. This is anticipated to occur approximately 18 months.

The detailed designs must ensure cyclist have partial use to the existing facility.

As such the proposal will impact on secure cycle parking with potential for a small decrease in secure parking spots available, however this impact will be temporary (18 months) and the entire opal bike shed will be reinstated as early as possible.

5.13 Trains and Metro Services

Train services would be affected during construction the Proposal during track possessions, although these are not specific to the project and would occur regardless. As such, impacts are not considered impacts arising from the Proposal.

Buses would replace trains during possession periods. Accordingly, any construction activities occurring during possessions must consider additional buses and users. This should be addressed as part of the TMP and Construction Environmental Management Plan (CEMP)

The Proposal is not anticipated to impact on the operation of the Sydney Metro services at Epping Station. The relocation of the chiller unit is part of enabling works and subject to a separate approval.

It should be noted that Sydney Metro will need to approve proposed works within the second reserve. An engineering assessment of the Proposal to demonstrate that induced effects on the underground rail infrastructure are acceptable to Sydney Metro, in accordance with the performance requirements outlined in Section 9 of Sydney Metro Underground Corridor Protection Technical Guideline must be prepared and submitted during detailed design.

6 Management & Mitigation Measures

Many long-term and short-term impacts to traffic and transport would be addressed through the detailed design of the Proposal. For residual impacts of the Proposal that arise from engineering constraints or from construction activities that cannot be removed through the design, project-specific and standard mitigation measures have been developed. These measures aim to minimise or mitigate the potential traffic and transport impacts identified during construction and operation. These measures draw on best management practice, specialist knowledge, and government standards or guidelines.

Prior to the commencement of construction, a TMP would be prepared as part of the CEMP and would include at a minimum:

- ensuring adequate road signage at construction work sites to inform motorists and pedestrians of the work site ahead to ensure that the risk of road accidents and disruption to surrounding land uses is minimised
- maximising safety and accessibility for pedestrians and cyclists
- ensuring adequate sight lines to allow for safe entry and exit from the site
- ensuring access to railway stations, businesses, entertainment premises and residential properties (unless affected property owners have been consulted and appropriate alternative arrangements made)
- managing impacts and changes to on and off-street parking and requirements for any temporary replacement provision
- parking locations for construction workers within the construction compound and ensuring no on street parking is impacted and how this would be monitored for compliance
- routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses
- details for relocating kiss and ride, taxi ranks and rail replacement bus stops if required, including appropriate signage to direct patrons, in consultation with the relevant bus/taxi operators. Particular provisions would also be considered for the accessibility impaired
- measures to manage traffic flows around the area affected by the Proposal, including as required regulatory and direction signposting, line marking and variable message signs and all other traffic control devices necessary for the implementation of the TMP
- construction activities occurring during possessions must consider additional buses (train replacement) and users when determining traffic control measures.

Consultation with the relevant roads authorities would be undertaken during preparation of the construction TMP. The performance of all proposal project traffic arrangements must be monitored during construction.

The following specific mitigation measures would also be implemented throughout the detailed design and construction phase of the Proposal:

- Communication would be provided to the community and local residents to inform them of changes to parking, pedestrian access and/or traffic conditions
- Road Occupancy Licences for temporary road closures would be obtained, where required.
- Where feasible, vehicles performing construction deliveries or haulage should utilise the predetermined routes for the relevant construction area or compound to minimise impacts on the wider road network and residents

- During construction, partial use of the opal bike shed on Langston Place is to be maintained. The existing bike shed is to be reinstated as early as possible.
- Pedestrian access across the bridge must be maintained at all times during construction, excluding the demolition. This includes the provision of a temporary pedestrian paths when footpaths are obscured and no convenient and/or safe diversions are available.
- A Road Safety Audit would be undertaken as part of detailed design and upon completion of construction, and design amendments made as required.
- Access to private properties is to be maintained throughout construction,
- Prior to the use of overflow carparking at the 36 and 38 Essex Street, a safe access assessment must be undertaken to ensure safety of workers, pedestrians, and other road users.
- Queuing on public roads will be avoided by the use of two-way radios to call up haulage trucks from layover areas on a ‘just in time’ basis.
- Access to bus stops will be maintained during construction in consultation with the bus operators where feasible and reasonable, relocations will be managed in accordance with the TMP.
- Construction deliveries and haulage will be timed to occur outside peak traffic times where feasible and reasonable to minimise impacts on the road network
- Sydney Metro will need to approve proposed works within the second reserve. An engineering assessment of the Proposal to demonstrate that induced effects on the underground rail infrastructure are acceptable to Sydney Metro, in accordance with the performance requirements outlined in Section 9 of Sydney Metro Underground Corridor Protection Technical Guideline must be prepared and submitted during detailed design.
- Transport will work with stakeholders during Detailed Design to develop a revised rail replacement bus operations strategy to complement the Epping Bridge upgrade.
- Further consultation with stakeholders will be undertaken during the Detailed Design phase to refine the traffic configuration with the aim of retaining the location of the existing bus stands, where feasible.

A. Base Case Model Calibration and Validation Technical Note

B. Option Testing Technical Note

C. Traffic Staging Drawings

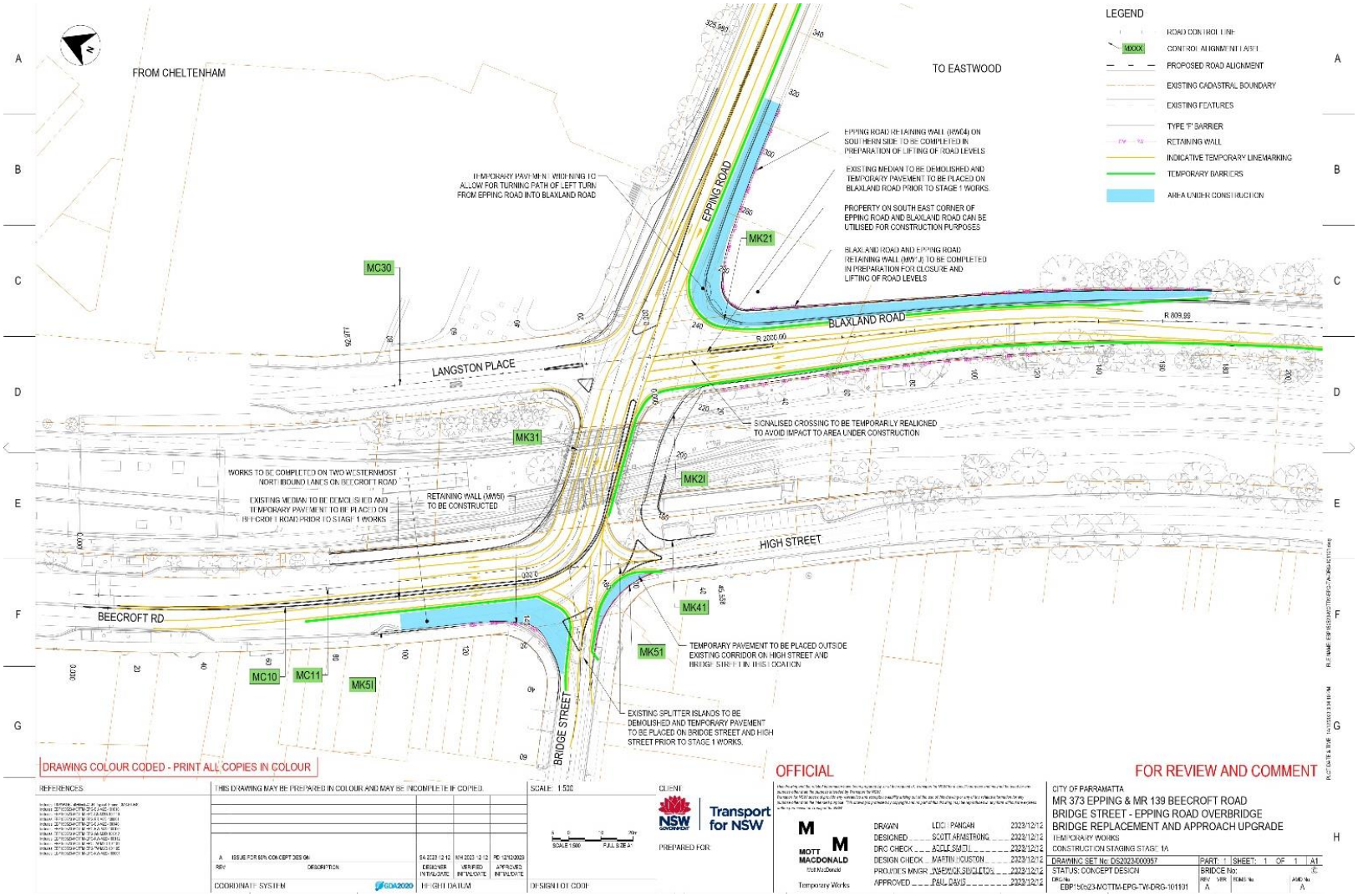
Stage 1A

Stage 4A

Stage 5

Stage 6

Stage 1A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EXISTING FEATURES
TYPE 'F' BARRIER
RETAINING WALL
INDICATIVE TEMPORARY LINEMARKING
TEMPORARY BARRIERS
AREA UNDER CONSTRUCTION
FROM CHELTENHAM
TO EASTWOOD
EPPING ROAD
BLAXLAND ROAD
LANGSTON PLACE
BEECROFT RD
HIGH STREET
BRIDGE STREET
MC30
MC10
MC11
MK5I
MK21
MK31
MK2I
MK41
MK51
TEMPORARY PAVEMENT WIDENING TO ALLOW FOR TURNING PATH OF LEFT TURN FROM EPPING ROAD INTO BLAXLAND ROAD
EPPING ROAD RETAINING WALL (RW04) ON SOUTHERN SIDE TO BE COMPLETED IN PREPARATION OF LIFTING OF ROAD LEVELS
EXISTING MEDIAN TO BE DEMOLISHED AND TEMPORARY PAVEMENT TO BE PLACED ON BLAXLAND ROAD PRIOR TO STAGE 1 WORKS.
PROPERTY ON SOUTH EAST CORNER OF EPPING ROAD AND BLAXLAND ROAD CAN BE UTILISED FOR CONSTRUCTION PURPOSES
BLAXLAND ROAD AND EPPING ROAD RETAINING WALL (MW'J') TO BE COMPLETED IN PREPARATION FOR CLOSURE AND LIFTING OF ROAD LEVELS
SIGNALISED CROSSING TO BE TEMPORARILY REALIGNED TO AVOID IMPACT TO AREA UNDER CONSTRUCTION
WORKS TO BE COMPLETED ON TWO WESTERNMOST NORTHBOUND LANES ON BEECROFT ROAD
EXISTING MEDIAN TO BE DEMOLISHED AND TEMPORARY PAVEMENT TO BE PLACED ON BEECROFT ROAD PRIOR TO STAGE 1 WORKS
RETAINING WALL (MW5I) TO BE CONSTRUCTED
TEMPORARY PAVEMENT TO BE PLACED OUTSIDE EXISTING CORRIDOR ON HIGH STREET AND BRIDGE STREET IN THIS LOCATION
EXISTING SPLITTER ISLANDS TO BE DEMOLISHED AND TEMPORARY PAVEMENT TO BE PLACED ON BRIDGE STREET AND HIGH STREET PRIOR TO STAGE 1 WORKS.
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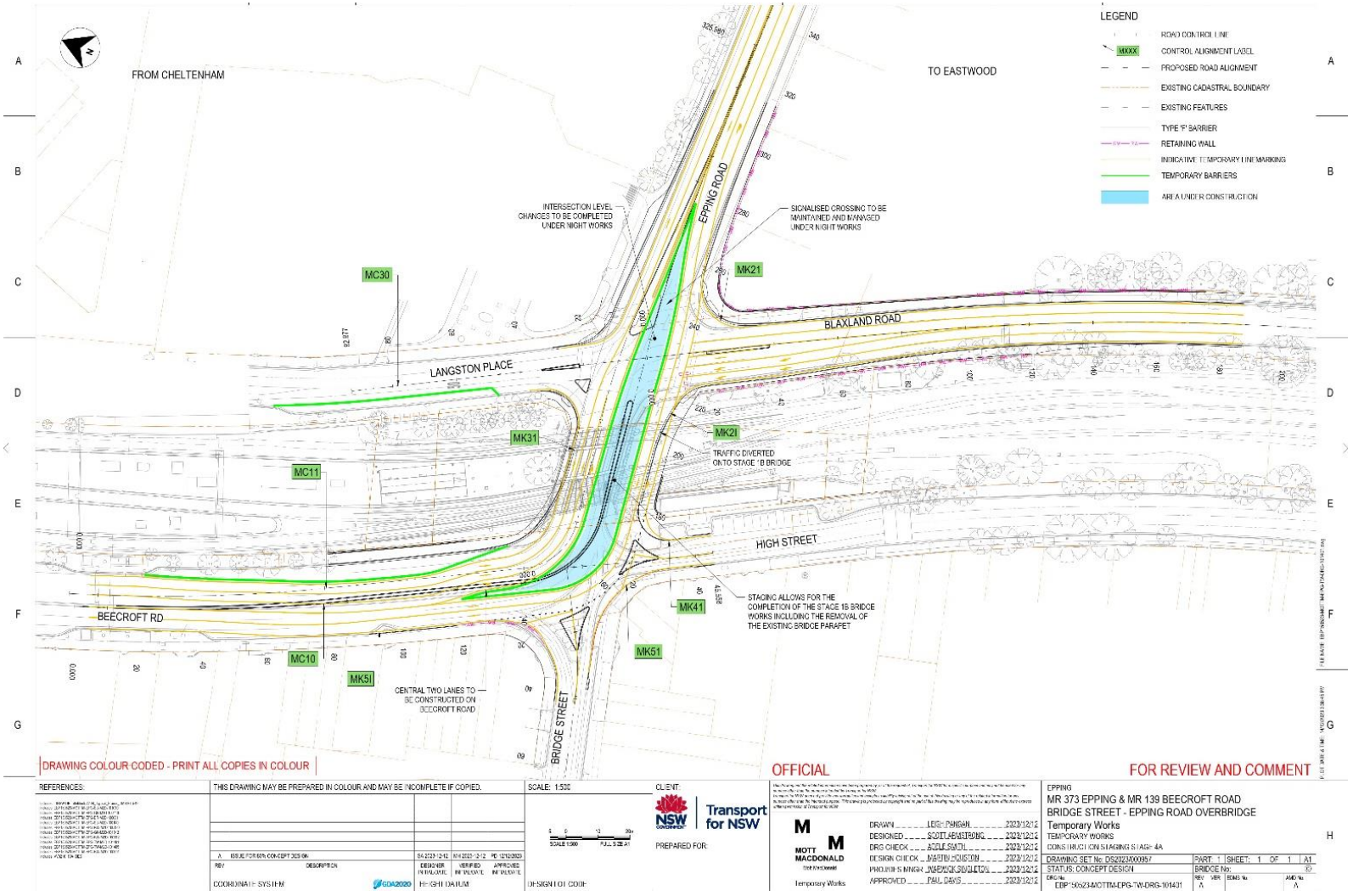
FOR REVIEW AND COMMENT
CITY OF PARRAMATTA
MR 373 EPPING & MR 139 BEECROFT ROAD
BRIDGE STREET - EPPING ROAD OVERBRIDGE
BRIDGE REPLACEMENT AND APPROACH UPGRADE
TEMPORARY WORKS
CONSTRUCTION STAGING STAGE 1A
Transport for NSW
MOTT MACDONALD

Stage 4A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RETAINING WALL
INDICATIVE TEMPORARY LINEMARKING
TEMPORARY BARRIERS
AREA UNDER CONSTRUCTION
FROM CHELTENHAM
TO EASTWOOD
EPPING ROAD
INTERSECTION LEVEL CHANGES TO BE COMPLETED UNDER NIGHT WORKS
SIGNALISED CROSSING TO BE MAINTAINED AND MANAGED UNDER NIGHT WORKS
MC30
MK21
BLAXLAND ROAD
LANGSTON PLACE
MK31
MK2I
TRAFFIC DIVERTED ONTO STAGE 1B BRIDGE
MC11
HIGH STREET
STAGING ALLOWS FOR THE COMPLETION OF THE STAGE 1B BRIDGE WORKS INCLUDING THE REMOVAL OF THE EXISTING BRIDGE PARAPET
MK41
BEECROFT RD
MC10
MK51
MK5I
CENTRAL TWO LANES TO BE CONSTRUCTED ON BEECROFT ROAD
BRIDGE STREET
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Transport for NSW
PREPARED FOR:
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DESIGNED SCOTT ARMSTRONG 2023/12/12
DRG CHECK ADELE SMITH 2023/12/12
DESIGN CHECK MARTIN HOUSTON 2023/12/12
PROJECT MNGR JASEMOCK SIVALETON 2023/12/12
APPROVED PAUL DAVIS 2023/12/12
EPPING
MR 373 EPPING & MR 139 BEECROFT ROAD
BRIDGE STREET - EPPING ROAD OVERBRIDGE
Temporary Works
TEMPORARY WORKS
CONSTRUCTION STAGING STAGE 4A
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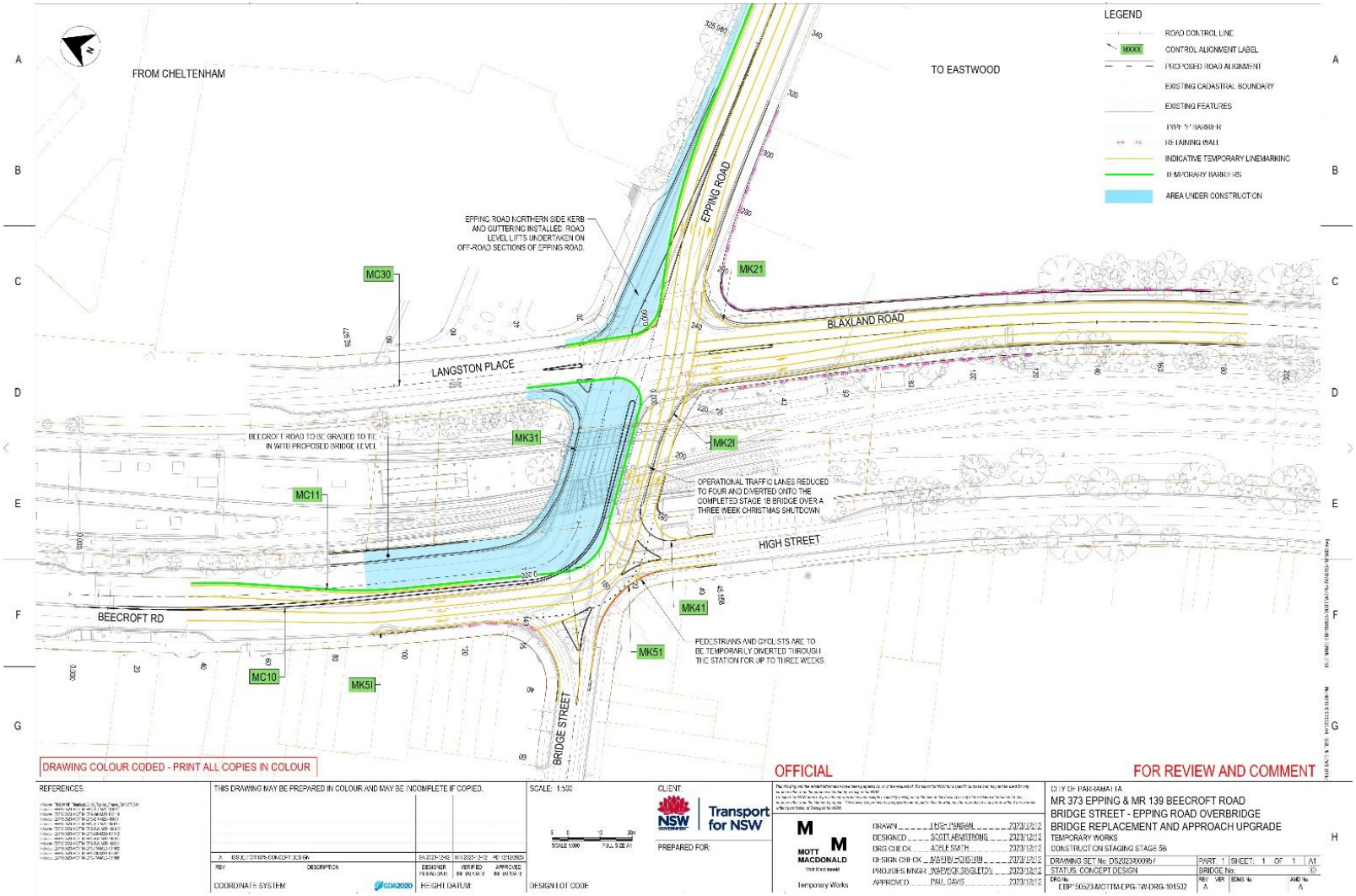
Stage 5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RETAINING WALL
INDICATIVE TEMPORARY LINEMARKING
TEMPORARY BARRIERS
AREA UNDER CONSTRUCTION
FROM CHELTENHAM
TO EASTWOOD
EPPING ROAD
BLAXLAND ROAD
LANGSTON PLACE
HIGH STREET
BEECROFT RD
BRIDGE STREET
EPPING ROAD NORTHERN SIDE KERB AND GUTTERING INSTALLED. ROAD LEVEL LIFTS UNDERTAKEN ON OFF-ROAD SECTIONS OF EPPING ROAD.
BEECROFT ROAD TO BE GRADED TO TIE IN WITH PROPOSED BRIDGE LEVEL
OPERATIONAL TRAFFIC LANES REDUCED TO FOUR AND DIVERTED ONTO THE COMPLETED STAGE 'B' BRIDGE OVER A THREE WEEK CHRISTMAS SHUTDOWN
PEDESTRIANS AND CYCLISTS ARE TO BE TEMPORARILY DIVERTED THROUGH TIC STATION FOR UP TO THREE WEEKS.
MC30
MC11
MC10
MK5I
MK31
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MK2I
MK41
MK51
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DESIGNED SCOTT ARMSTRONG 2023/12/12
DRG CHECK ADELE SMITH 2023/12/12
DESIGN CHK CK JASON HOUSTON 2023/12/12
PROJECT MNGR WARWICK SINGLETON 2023/12/12
APPROVED PAUL DAVIS 2023/12/12
CITY OF PARRAMATTA
MR 373 EPPING & MR 139 BEECROFT ROAD
BRIDGE STREET - EPPING ROAD OVERBRIDGE
BRIDGE REPLACEMENT AND APPROACH UPGRADE
TEMPORARY WORKS
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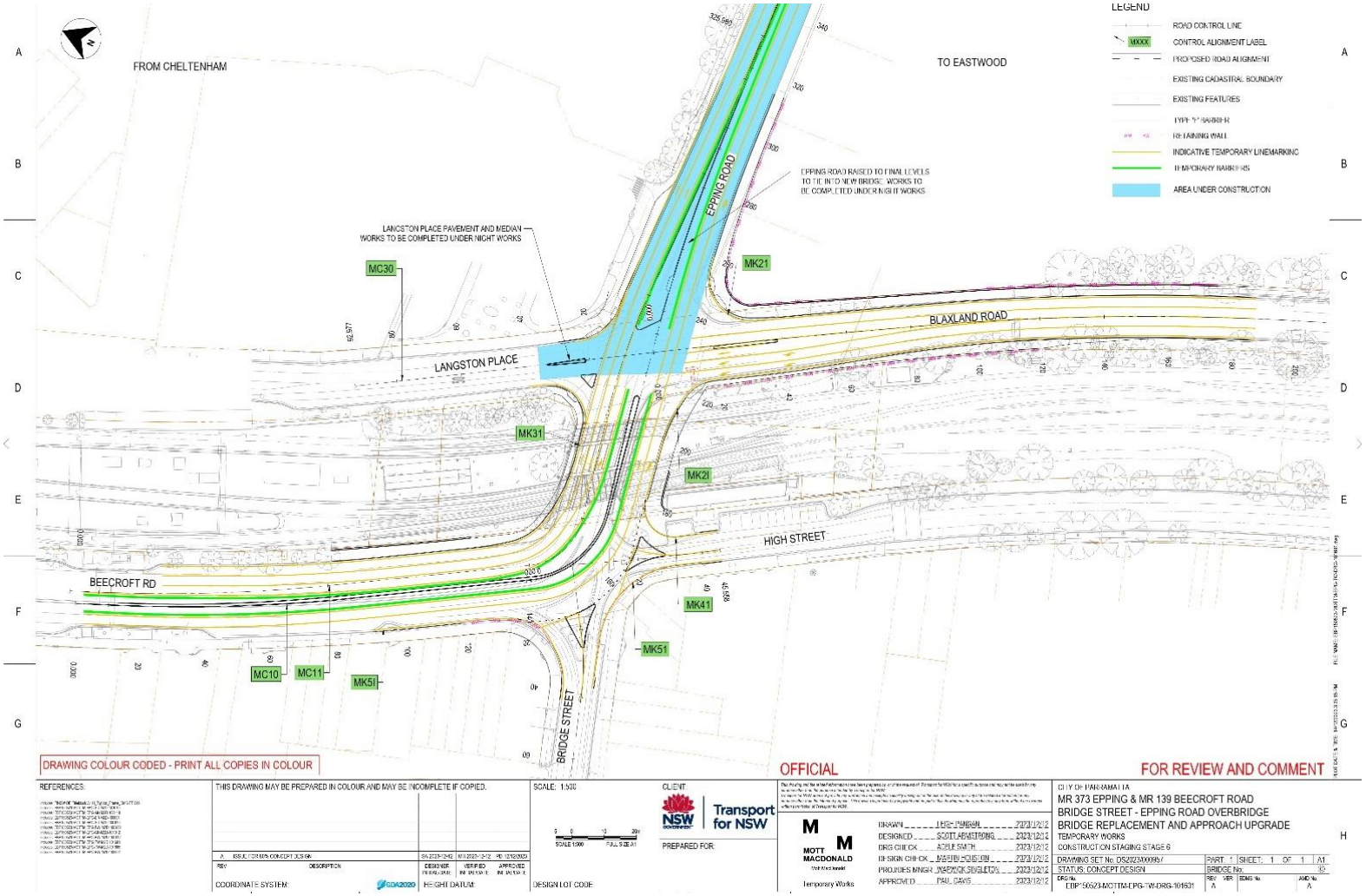
Stage 6


FROM CHELTENHAM
TO EASTWOOD
LEGEND
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PROPOSED ROAD ALIGNMENT
EXISTING CADASTRAL BOUNDARY
EXISTING FEATURES
TYPE 'F' BARRIER
RETAINING WALL
INDICATIVE TEMPORARY LINEMARKING
TEMPORARY BARRIERS
AREA UNDER CONSTRUCTION
EPPING ROAD RAISED TO FINAL LEVELS TO TIE INTO NEW BRIDGE. WORKS TO BE COMPLETED UNDER NIGHT WORKS
LANGSTON PLACE PAVEMENT AND MEDIAN WORKS TO BE COMPLETED UNDER NIGHT WORKS
EPPING ROAD
LANGSTON PLACE
BLAXLAND ROAD
HIGH STREET
BEECROFT RD
BRIDGE STREET
MC30
MC10
MC11
MK5I
MK31
MK2I
MK21
MK41
MK51
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CITY OF PARRAMATTA
MR 373 EPPING & MR 139 BEECROFT ROAD
BRIDGE STREET - EPPING ROAD OVERBRIDGE
BRIDGE REPLACEMENT AND APPROACH UPGRADE
TEMPORARY WORKS
CONSTRUCTION STAGING STAGE 6
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COORDINATE SYSTEM:
HEIGHT DATUM:
DESIGN LOT CODE