Chapter 9

Operational traffic and transport

January 2020

9 Operational traffic and transport

This chapter considers the potential traffic and transport impacts arising from the operation of the Western Harbour Tunnel and Warringah Freeway Upgrade (the project) and identifies measures to address these impacts.

A detailed traffic and transport assessment has been carried out for the project and is included in Appendix F (Technical working paper: Traffic and transport).

The Secretary's environmental assessment requirements as they relate to operational traffic and transport and where in the environmental impact statement these have been addressed, are detailed in Table 9-1.

The proposed environmental management measures relevant to operational traffic and transport are included in Section 9.5.

Table 9-1 Secretary's environmental assessment requirements – operational traffic and transport

Secretary's requirements	Where addressed
Transport and traffic	
2. The Proponent must assess and model the operational transport impacts of the project including, but not necessarily limited to: a. forecast travel demand and traffic volumes (expressed in terms of total numbers and heavy and light vehicle numbers) for the project and the surrounding road, cycle and public transport network, including potential shifts of traffic movements on alternate routes outside the proposal area (such as toll avoidance) and impact of permanent street closures directly attributable to the SSI;	Operational traffic and transport impacts for the project and surrounding network are discussed in **Section 9.4.** Further details on forecast traffic volumes is provided in **Appendix F** (Technical working paper: Traffic and transport).
b. accessibility impacts in commercial centres within the vicinity of the project;	Accessibility impacts are discussed in **Chapter 21** (Socio-economics). Forecast 30-minute catchments by road for strategic centres in the vicinity of the project are provided in **Appendix F** (Technical working paper: Traffic and transport).
c. travel time analysis;	An assessment on impacts to travel time is provided in **Section 9.4**.
d. performance of key interchanges and intersections by undertaking a Level of Service analysis at key locations;	Interchange and intersection performance during operation is discussed in **Section 9.4**.
e. wider transport interactions (local and regional roads, cycling, public and freight transport), taking into account the Sydney City Centre Access Strategy and planned future urban	**Chapter 3** (Strategic context and project need) describes the relationship and/or integration of the project with existing and proposed public and freight transport services. **Section 9.1** outlines how the project

Secretary's requirements	Where addressed
release areas such as the Bays Precinct;	takes into account specific transport strategies. **Section 9.4** provides an assessment of future traffic and transport interactions. Bays Precinct has been put on hold for the foreseeable future. To date, engagement has been carried out with the relevant stakeholders and would continue as required when the project recommences.
f. induced traffic and operational implications for existing and proposed public transport (particularly with respect to strategic bus corridors and bus routes and permanent closure/relocation of bus stops) and consideration of opportunities to improve public transport;	Implications and impacts on public transport are described in **Section 9.4**.
g. impacts on cyclists and pedestrian access and safety;	Impacts on pedestrians and cyclists, including access and safety, are described in **Section 9.4**.
h. property and business access and on street parking; and	Road network changes and access arrangements are described in **Section 9.4**. Impacts to properties and businesses is detailed in **Chapter 21** (Social and economic).
i. an explanation for the scope of the modelled area, including justification of the nominated boundaries.	The assessment methodology is outlined in **Section 9.2.**

9.1 Strategic transport planning context

Details regarding the project's compatibility with key Commonwealth and State strategic planning and transport policies are provided in Chapter 3 (Strategic context and project need).

A summary of more specific transport strategies relevant to the project are provided below.

9.1.1 North Sydney Integrated Transport Program

The city-shaping multi-modal transport projects throughout the Western Harbour Tunnel and Beaches Link program of works (program of works) area present a major opportunity to develop an integrated, transport strategy that addresses a range of customer needs. The transport infrastructure investment in North Sydney is an unprecedented opportunity for the North Sydney CBD to realise place based improvements.

The *North Sydney Integrated Transport Program* (the North Sydney Program) is currently being developed by Transport for NSW in collaboration with North Sydney Council to guide transport

planning and investment in the North Sydney CBD and interconnected areas over the next 20 years and beyond. The North Sydney Program is being developed to support and facilitate the outcomes envisaged by the *Greater Sydney Region Plan* and *Future Transport 2056*. The timing for deliverables in the North Sydney Program would be cognisant of the program of works delivery timeframes.

The development of the North Sydney Program is ongoing. Consequently, the program of works has been designed to preserve opportunities for a future integrated and multi-modal transport network. Additionally, to minimise the impact of the program of works on the North Sydney precinct, planning and design to date has been developed to:

- Continue to provide motorway access only via existing major road corridors
- Focus on the utilisation of existing road space to maintain network efficiency and balance the needs of all road users while minimising road widenings
- Ensure operational impacts are minimised (and critical performance issues avoided), by spreading the demand generated by new infrastructure across multiple locations
- Provide network efficiencies and safer outcomes by simplifying network operations, prioritising strategic movements, and minimising conflicts
- Adopt 'movement and place' principles to help reprioritise access and support efficient connections for traffic, pedestrians, and other transport customers.

The proposed network integration works would result in a resilient network which can accommodate key road transport customers, while at the same time promoting walking, cycling and public transport access to and within the North Sydney CBD. In the event that road transport demand is lower – or demands otherwise differ as land use and transport developments mature – this approach would also provide flexibility to adjust the future transport network in response to customer needs.

Transport for NSW will continue to work with North Sydney Council and other stakeholders to investigate options to improve movement and place outcomes through the North Sydney Program, further leveraging the strategic benefits of the program of works.

9.1.2 Sydney City Centre Access Strategy

The *Sydney City Centre Access Strategy* (Transport for NSW, 2013a) is the NSW Government strategy to deliver a fully integrated transport network in Sydney's city centre that meets the growing demand for all transport modes. The strategy aims to prioritise and allocate road space for public transport, general traffic, pedestrians, cyclists, taxis and service vehicles.

The project addresses one of the key actions of the strategy, which is to establish traffic bypass routes to move traffic around the Sydney CBD. Bypass of the Sydney CBD by through traffic would result in reduced congestion in the Sydney CBD, reduced impact of traffic on other modes, increased reliability on designated bus corridors in the Sydney CBD and reduced likelihood of competition between different road users.

9.1.3 Sydney's Bus Future

Sydney's Bus Future (Transport for NSW, 2013b) presents a three-stage approach to improve service outcomes, focusing on improving customer experience, integrating bus services across Sydney and serving future growth. Proposed bus initiatives include bus rapid transit services for the Northern Beaches (B-Line) and Victoria Road to improve capacity and efficiency for bus users.

By reducing network congestion, improving network resilience and increasing reliability in peak periods, a new Harbour crossing would make bus routes on the Sydney Harbour Bridge a more attractive transport option, supporting and encouraging a mode shift to public transport. The project

would also create the opportunity for new public transport routes to be developed in response to diverse travel demands and future social and economic development.

The Northern Beaches (B-Line) began operation in 2017, providing more frequent and reliable services between the Northern Beaches and Sydney CBD. The project, including the Warringah Freeway Upgrade, would support the operation of the B-Line program, as it would facilitate connections to the future Beaches Link Tunnel and enable improved bus travel time along the Warringah Freeway and across the Sydney Harbour Bridge.

9.1.4 Sydney's Cycling Future

Sydney's Cycling Future (Transport for NSW, 2013c) identifies priority cycleways to improve connections to major centres for trips of up to five kilometres. The strategy also includes walking and cycling projects linking to public transport interchanges and stops.

The project would improve cycle connectivity along the fragmented Warringah Freeway corridor, where the current cycle facilities are a combination of off-road and on-road paths. There is a strong community desire to fill a perceived missing link in the cycleway networks in these locations. The project would also result in reduced congestion on surface roads, which would contribute to improved conditions for cyclists.

9.1.5 Sydney's Walking Future

Sydney's Walking Future (Transport for NSW, 2013d) is the NSW Government's long-term plan to promote walking as a transport mode throughout Sydney and an integral component in the planning of urban growth precincts and new transport infrastructure. The project would support the objectives of *Sydney's Walking Future* by providing pedestrian facilities to encourage this mode for local trips.

9.2 Assessment methodology

9.2.1 Overview

The assessment methodology for operational traffic and transport impacts considered four core components:

- Road traffic
- Public transport
- Pedestrian and cyclists (active transport)
- Maritime traffic.

The method and outputs of assessment for each of these components is summarised in Table 9-2.

Table 9-2 Overview of approach to the operational traffic and transport assessment

Project impacts	Method of assessment	Assessment output
Road traffic	Analysis of road network performance based on strategic traffic forecasting and operational traffic modelling.	Quantitative assessment of road network performance with and without the project.

Project impacts	Method of assessment	Assessment output
Public transport	Analysis of service accessibility (rail and road public transport modes) and service timeliness and efficiency (road public transport mode) based on operational traffic modelling.	Qualitative assessment of service accessibility and semi-quantitative assessment of service timeliness and efficiency (increase or decrease in number of stops or change in stop coverage).
Pedestrians and cyclists (active transport)	Analysis of pedestrian and cycle demands and changes to shared user paths, cycleways, footpaths and pedestrian crossings.	Semi-quantitative assessment of impacts on pedestrian and cyclist networks and accessibility.
Maritime traffic	Analysis of changes in water depths in Sydney Harbour with the immersed tube tunnels in place and the potential impact on maritime traffic.	Qualitative assessment of impacts on future waterway navigation and commercial and recreational usage.

The assessment methodology for road traffic is described in more detail below.

9.2.2 Road traffic assessment methodology

The potential impacts of the project on road network performance were assessed through strategic traffic forecasting and operational traffic modelling. The use of both regional and local scale modelling enabled existing and future traffic and transport conditions and road network performance to be characterised, both with and without the project. An overview of the modelling methodology used in the assessment of the project is provided in Figure 9-1, with further details provided in Chapter 8 (Construction traffic and transport) and Appendix F (Technical working paper: Traffic and transport).

Strategic Travel Model (STM)

- **General description**
  Forecasts travel patterns across the Sydney, Newcastle and Illawarra regions under various land use, multi-modal transport and transport pricing scenarios
- **Project context**
  Provides forecast road traffic demands for more detailed modelling using SMPM

Sydney Motorway Planning Model (SMPM)

- **General description**
  Forecasts strategic traffic patterns for Sydney motorway projects
- **Project context**
  Provides strategic road traffic forecasts to inform project definition and evaluation, and as an input into more detailed operational traffic modelling

Operational traffic modelling

- **General description**
  Provides detailed operational road network performance modelling for more complex local and regional components of the road network relevant to the project
- **Project context**
  Predicts road network performance with and without the project

Figure 9-1 Overview of transport modelling approach

Operational traffic modelling scenarios

Future year networks and traffic demand were developed for 2027 (year of opening) and 2037 (year of opening plus 10 years) to assess future traffic network performance. Future performance was assessed for the AM peak (7am to 9am on a normal working weekday) and PM peak (4pm to 6pm on a normal working weekday) for the following scenarios:

- Without the project ('Do minimum')
- With the project ('Do something')
- With the project and other planned or proposed projects ('Do something cumulative').

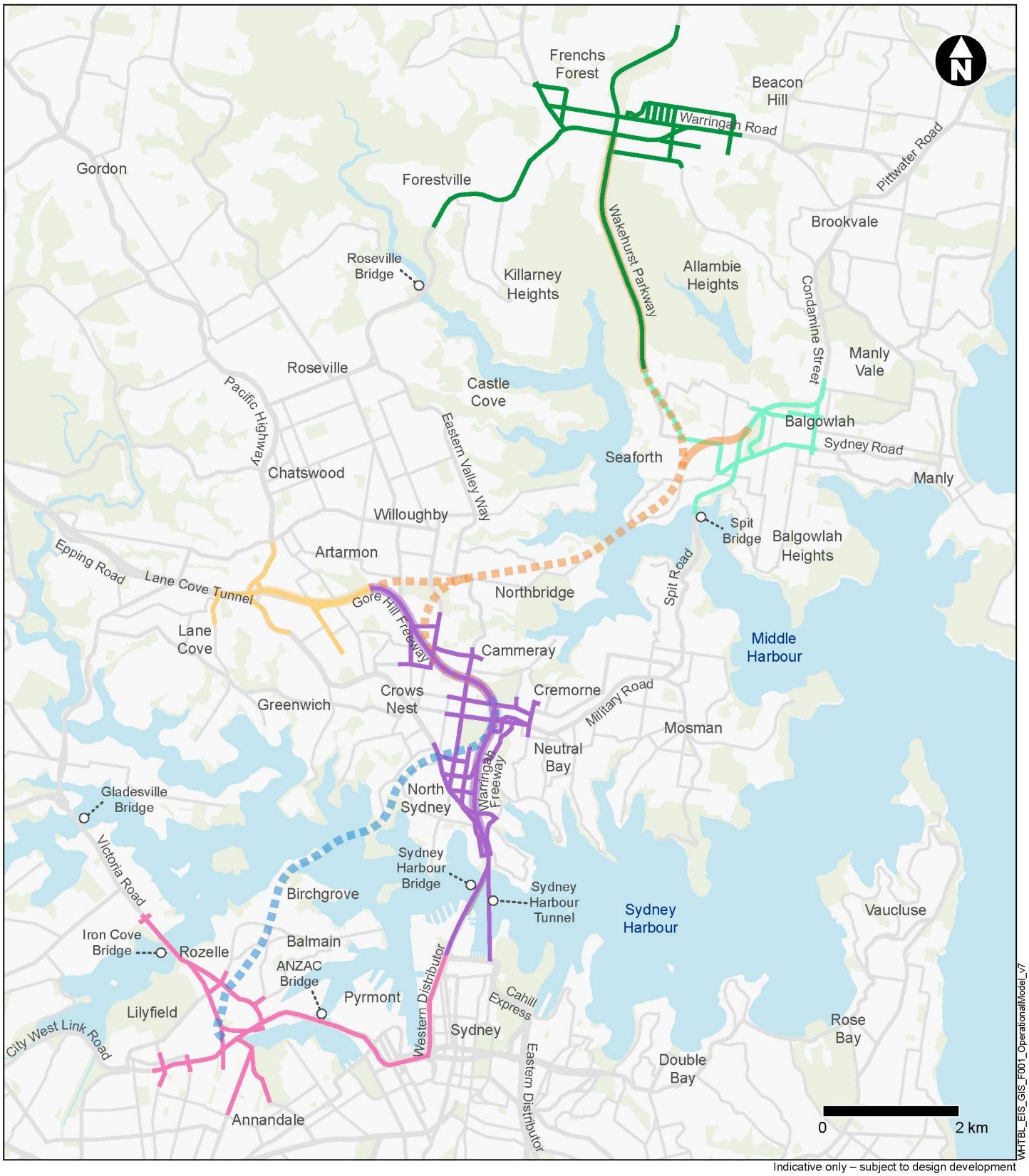
The scenarios assessed are summarised in Table 9-3.

Table 9-3 Operational road traffic modelling scenarios

Scenario	Description	2016	2027	2037
Base year	Developed for calibration purposes and quantification of existing network performance	✓		
'Do minimum'	Includes approved and under construction motorway projects (NorthConnex and WestConnex) but without Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and F6 Extension (Stage 1) projects. Also reflects operational effects of approved and under construction public transport projects (eg Sydney Metro City & Southwest).		✓	✓
'Do something'	Includes NorthConnex, WestConnex, Western Harbour Tunnel and Warringah Freeway Upgrade projects but without Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and F6 Extension (Stage 1) projects. Also includes Sydney Metro City & Southwest.		✓	✓
'Do something cumulative'	Includes NorthConnex, WestConnex, Western Harbour Tunnel and Warringah Freeway Upgrade, Beaches Link and Gore Hill Freeway Connection, Sydney Gateway and F6 Extension (Stage 1) projects. Also includes Sydney Metro City & Southwest.		✓	✓

A tunnel model (Western Harbour Tunnel) was used to assess the future year performance of the proposed road layout within the tunnelled carriageways, including merge and diverge locations and the impact of grades. Three surface interface models (Rozelle and surrounds, Warringah Freeway Upgrade and Gore Hill Freeway Connection) were used to assess 2027 and 2037 road network performance, both with and without the project.

Figure 9-2 shows the operational road traffic model areas for the project. Also shown in Figure 9-2 are the operational model areas associated with the Beaches Link and Gore Hill Freeway Connection project (Balgowlah and surrounds, Frenchs Forest and surrounds, and proposed Beaches Link component of the Beaches Link and Gore Hill Freeway Connection project – not used in this assessment).



Legend

Operational features

- Western Harbour Tunnel
- Beaches Link
- Warringah Freeway Upgrade
- Gore Hill Freeway Connection

Operational model areas

- Rozelle and surrounds
- Warringah Freeway and North Sydney
- Gore Hill Freeway and Artarmon
- Balgowlah and surrounds
- Frenchs Forest and surrounds

Figure 9-2 Operational road traffic model areas

9.2.3 Assessment criteria

The criteria used to assess road network performance were as follows:

- At a network and corridor level – traffic demand, average speed, number of stops (that is, the number of times vehicles within the road network are required to stop during peak periods) and general travel times
- At an intersection level – level of service (LoS) and average delay (expressed in seconds per vehicle).

The assessment criteria for network performance and intersection and midblock level of service is described in detail in Chapter 8 (Construction traffic and transport) and Appendix F (Technical working paper: Traffic and transport).

9.3 Existing environment

The existing traffic and transport environment for the project is described in Chapter 8 (Construction traffic and transport). The existing environment is described within the context of the broader strategic transport network, along with more detailed analysis of the following local areas:

- Rozelle and surrounds
- Birchgrove to Waverton (Sydney Harbour crossing)
- Warringah Freeway and surrounds
- Gore Hill Freeway and Artarmon.

9.4 Assessment of potential impacts

The operational traffic and transport impacts of the project are outlined below in the context of the broader road network, along with detailed analysis of local area impacts. Impacts are assessed for future year scenarios with the project ('Do something') compared to the scenario without the project ('Do minimum'), as well as the cumulative future year scenario with the addition of the Beaches Link and Gore Hill Freeway Connection project and other planned or proposed transport projects ('Do something cumulative') as described in Section 9.2.2.

9.4.1 Broader road network

Road network performance

'Do something' scenario

The project is forecast to substantially reduce traffic demands and improve travel times on the Sydney Harbour Bridge, the Sydney Harbour Tunnel, ANZAC Bridge, and connecting road corridors. It is expected to provide a particularly attractive alternative to the current Western Distributor and Sydney Harbour Bridge route, particularly for trips across Sydney Harbour between Rozelle, North Sydney and the Lower North Shore.

Travel times are expected to be reduced for trips via the Sydney Harbour Tunnel and from the eastern suburbs, primarily as a result of decreased congestion on this motorway corridor with longer-distance north-south trips transferring to the WestConnex-Western Harbour Tunnel corridor. The project would result in trips between strategic centres saving up to 15 minutes when crossing Sydney Harbour during peak periods.

Works for Western Harbour Tunnel and Warringah Freeway Upgrade includes provision for tolling gantries for northbound traffic should the government elect to introduce a northbound toll. The potential cost increase associated with the introduction of a northbound toll on the Sydney Harbour Bridge, the Sydney Harbour Tunnel and Western Harbour Tunnel may be offset by travel time savings created by the project. As a result, no substantial diversion of traffic to Victoria Road is predicted, with forecast traffic volumes on Gladesville Bridge and Victoria Road substantially unchanged across the day. Forecast travel times for key trips across the network in the AM peak and PM peak are shown in Figure 9-3 and Figure 9-4.

The general reduction in road vehicle congestion and travel times would result in improved travel times for buses and would increase the extent of equivalent public transport catchments and could be further extended if express buses operate through the Western Harbour Tunnel.

The project would substantially change the volume of traffic travelling on existing arterial roads at the metropolitan level. Trips through the Western Harbour Tunnel on the motorway network would be made on a higher standard of road than urban arterials; the number of crashes across the network are estimated to reduce by up to 375 incidents a year as a result of the Western Harbour Tunnel. A summary of the forecast growth at key locations for the 2027 and 2037 forecast years is provided in Table 9-4.

‘Do something cumulative’ scenario

The project combined with the proposed Beaches Link and Gore Hill Freeway Connection project would create a small increase in traffic demand across Sydney Harbour and some diversion of traffic from the Sydney Harbour Tunnel to the Western Harbour Tunnel as a result of changes to travel patterns to and from the Northern Beaches associated with Beaches Link. Traffic demand in both directions in the Sydney Harbour Tunnel would further reduce while traffic demand on the Sydney Harbour Bridge and Gladesville Bridge would not change substantially compared with the ‘Do something’ scenario.

The ‘Do something’ cumulative scenario would result in minimal changes to total heavy vehicle movements across Sydney Harbour when compared with the ‘Do something’ scenario, with the primary change being a switch from the Sydney Harbour Tunnel to the Western Harbour Tunnel as a result of direct access being provided between the Western Harbour Tunnel and Beaches Link.

The improvement in road vehicle travel times would also benefit travel times for public transport and would increase the size of equivalent public transport catchments, particularly if express buses operate through both the Beaches Link Tunnel and Western Harbour Tunnel, substantially increasing the catchment size for centres north of Sydney Harbour.

Table 9-4 Modelled daily traffic demands at key locations

Road	Location	Direction	'Do minimum 2027'	'Do something 2027'	'Do something cumulative 2027'	'Do minimum 2037'	'Do something 2037'	'Do something cumulative 2037'
Sydney Harbour Bridge	Bradfield Highway	Combined	159,500	131,500	130,500	172,500	144,500	145,000
Sydney Harbour Bridge	Cahill Expressway	Southbound	44,000	36,000	35,500	48,000	39,000	38,500
Sydney Harbour Tunnel	Sydney Harbour	Combined	111,000	88,500	77,000	120,500	96,000	85,500
Gladesville Bridge	Parramatta River	Combined	113,000	114,000	113,500	119,000	118,000	117,000
Western Harbour Tunnel	Birchgrove	Combined	N/A	67,000	87,000	N/A	83,000	106,500
ANZAC Bridge	Pyrmont	Combined	176,000	160,000	159,500	185,000	167,500	166,500
Western Distributor	Sydney CBD	Combined	109,000	68,000	67,000	117,500	74,500	73,500

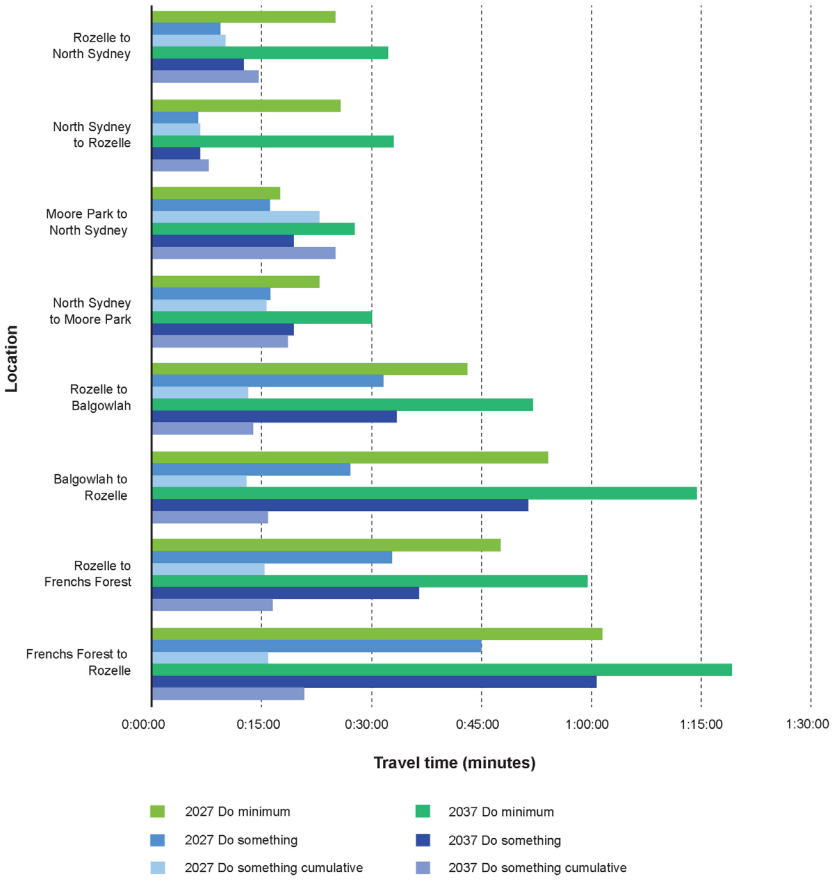


Figure 9-3 Forecast AM peak period (8am-9am) travel times along key corridors

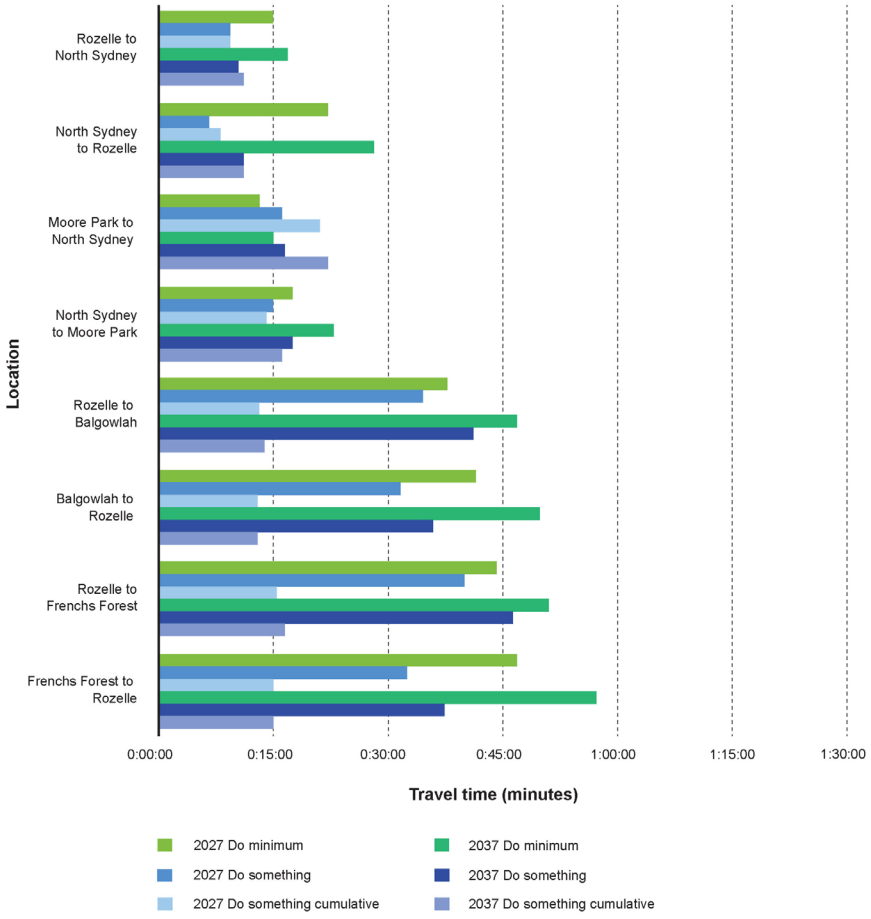


Figure 9-4 Forecast PM peak period (5pm-6pm) travel times along key corridors

Heavy vehicles and freight

Forecast heavy vehicle demands across Sydney Harbour under the 'Do something 2037' scenario shows:

- Peak period heavy vehicle demands across Sydney Harbour would increase by up to 15 per cent
- Daily heavy vehicle demands across Sydney Harbour would increase by 10 per cent

Peak period heavy vehicle demands under this scenario are predicted to decrease on the Sydney Harbour Bridge, Sydney Harbour Tunnel, ANZAC Bridge and Gladesville Bridge, with the largest peak period reduction being on Sydney Harbour Bridge (55 per cent and 28 per cent reductions in morning and evening peak periods respectively). This reflects the substantial travel time savings provided by the project, particularly for northbound trips during the morning peak, when tidal flow traffic conditions on the Sydney Harbour Bridge generally favour southbound trips at the expense of northbound trips.

The project would provide substantial travel time savings for freight vehicles, improving productivity and increasing the efficiency of the freight network, particularly for freight trips that currently use the Sydney Harbour Bridge. The movement of these trips from existing constrained corridors such as the Western Distributor and Bradfield Highway to a new high-standard motorway would also increase the safety of these trips by providing a route that has been specifically designed to meet the requirements of B-Double vehicles. This is consistent with the motorway network strategy established for the WestConnex program, which facilitates a strategic shift of freight movements from surface arterial roads to high-standard motorways. The Western Harbour Tunnel component would extend this concept of operation to the Sydney Harbour crossings and connect with motorway links north of Sydney Harbour.

9.4.2 Rozelle and surrounds

Road network performance

'Do something' scenario

Key outcomes of the road network performance assessment in Rozelle and surrounds, under the 'Do something' scenario include:

- Traffic demand through the Rozelle area is forecast to increase by up to 14 per cent as a result of the project. The project would also result in a greater amount of forecast demand being able to travel during AM and PM peaks
- Average travel speeds through the Rozelle area would improve by up to 60 per cent as a result of the project, despite the increase in demand. This is a result of the large volume of traffic that would be diverted from the ANZAC Bridge and Western Distributor to the Western Harbour Tunnel, substantially reducing delays on this part of the existing motorway network
- The number of stops through the study area would reduce by up to 40 per cent as a result of the reduction in demand and congestion on the ANZAC Bridge and Western Distributor.

Overall, forecast traffic conditions in Rozelle and surrounds would improve substantially as a result of the project due to the reduction in congestion along both ANZAC Bridge and the Western Distributor, with improved travel times and fewer delays.

'Do something cumulative' scenario

Key outcomes of the assessment of the Rozelle and surrounds area under the 'Do something cumulative' scenario (compared with the 'Do something' scenario) include:

- Forecast traffic demand would increase further, by up to eight per cent

- Average travel speeds would remain relatively unaffected in the AM and PM peaks
- The number of stops would not change materially in the AM peak but increase in the PM peak.

The cumulative scenario would result in higher traffic volumes through the Rozelle area when compared to conditions with the project only. In the AM peak, the introduction of Beaches Link and Gore Hill Freeway Connection project would reduce the traffic volumes travelling via Sydney Harbour Tunnel, with this traffic now travelling via the Western Harbour Tunnel instead. During the PM peak, the transfer of vehicles from the Western Distributor and ANZAC Bridge would result in diverted traffic exiting the Western Harbour Tunnel at The Crescent. Traffic demand on the Sydney Harbour Bridge would not change substantially compared with the 'Do something' scenario.

Traffic travel times

'Do something' scenario

Modelled travel times during AM and PM peaks for key routes through the Rozelle area are presented in Table 9-5.

The modelled travel times under the 'Do something' scenario show:

- Travel times along City West Link and Western Distributor would improve substantially as a result of the project in the eastbound direction during the AM peak. This is due to the transfer of traffic from the ANZAC Bridge and Western Distributor to the Western Harbour Tunnel, which would reduce the delays generated by merging and weaving of surface traffic through this section
- Travel times on Victoria Road in the northbound direction during the AM peak are forecast to increase as a result of the project. This could occur due to increased local traffic being able to access the corridor as a result of the reduction in congestion caused by through traffic in the area, following the transfer of through traffic to the Western Harbour Tunnel. Northbound Victoria Road traffic would also merge with traffic from the M4–M5 Link at the Victoria Road off ramp south of Iron Cove Bridge, contributing to the increased travel time
- Travel times on Victoria Road southbound would improve as a result of the project, due to the reduction in downstream congestion along the ANZAC Bridge and Western Distributor.

Overall, the project is expected to generally maintain or improve travel times due to reduced congestion along existing key routes through Rozelle, resulting from substantial changes in traffic patterns with regional trips using Western Harbour Tunnel in preference to ANZAC Bridge and Western Distributor.

'Do something' cumulative scenario

Modelled travel times (Table 9-5) indicate that there would be minimal change in speeds along the main routes of City West Link/Western Distributor and Victoria Road compared with the 'Do something' scenario. This is a result of traffic signals along these routes being optimised to maintain flows along the primary arterial roads.

Table 9-5 Modelled AM peak (8am–9am) and PM peak (5pm–6pm) traffic travel times for key routes through the Rozelle area (minutes:seconds)

Route /Peak period	Direction	'Do minimum 2027'	'Do something 2027'	'Do something cumulative 2027'	'Do minimum 2037'	'Do something 2037'	'Do something cumulative 2037'
City West Link and Western Distributor (Balmain Road to Druitt Street Ramp)							
	Eastbound	21:59	12:03	12:21	21:33	14:28	13:09

Route /Peak period	Direction	'Do minimum 2027'	'Do something 2027'	'Do something cumulative 2027'	'Do minimum 2037'	'Do something 2037'	'Do something cumulative 2037'
AM peak	Westbound	04:59	05:31	04:03	05:29	05:47	05:46
PM peak	Eastbound	05:14	06:28	06:36	05:01	07:06	06:43
	Westbound	06:04	07:06	06:50	06:57	07:29	07:30
Victoria Road (Evans Street to ANZAC Bridge)							
AM peak	Northbound	02:15	07:08	04:32	02:18	07:04	06:27
	Southbound	05:38	01:57	01:49	05:58	01:48	01:44
PM peak	Northbound	02:57	02:54	02:53	03:02	03:02	03:03
	Southbound	02:00	01:59	02:02	02:07	02:07	02:08

Intersection performance

'Do something' scenario

Modelled intersection performance for key intersections in Rozelle and surrounds under the 'Do something' scenario are presented in Table 9-6, and indicate:

- The majority of intersections within the Rozelle area would perform better as a result of the project. This would be due to the substantial traffic that would be diverted from the ANZAC Bridge and Western Distributor into the Western Harbour Tunnel, which would reduce the delays generated by merging and weaving, and in turn reduce queues that would extend back to intersections
- The intersection of The Crescent and City West Link would experience relatively minor increased delays in the PM peak as a result of the project, due to the additional movements introduced by the inclusion of the Western Harbour Tunnel portal at this location
- Queuing at the intersection of City West Link and The Crescent would affect the intersections of City West Link with James Craig Road, Catherine Street and Balmain Road; however, these intersections would still perform acceptably with the project
- The intersection of Victoria Road and Darling Street would continue to perform at capacity resulting in LoS F in the AM peak both with and without the project
- The intersection of Johnston Street and The Crescent would perform substantially better with the project, due to the reduction in surface traffic and queuing in the area as a result of the project
- The intersection of Victoria Road and Robert Street would marginally improve as a result of the project; however, PM peak performance would remain at LoS F with demand exceeding capacity.

‘Do something cumulative’ scenario

Modelled intersection performance under the ‘Do something cumulative’ scenario is presented in Table 9-6. Overall, the operation of intersections in the AM peak would not materially change when compared to the ‘Do something’ scenario.

During the PM peak, the increased traffic volumes exiting the Western Harbour Tunnel at The Crescent would increase demand at intersections along The Crescent and City West Link, many of which would continue to operate at an unsatisfactory level of service. These increased traffic volumes would be managed via changes to intersection traffic signal timings, although some intersections would continue to operate at an unsatisfactory level of service.

Although traffic could be impacted by an increase in localised intersection delays due to increased traffic, compared with the ‘Do something’ scenario, modelling indicates that road users would still generally benefit from improved network capacity and substantial travel time savings on the broader network (via the Western Harbour Tunnel, ANZAC Bridge, and the Sydney Harbour Bridge). Consequently, road users who travel through the Rozelle area would still benefit from the proposed Western Harbour Tunnel and Beaches Link Tunnel program of works due to improved efficiency on the surrounding broader road network.

Table 9-6 Modelled intersection performance on Rozelle and surrounds area (AM peak (8am–9am) and PM peak (5pm–6pm) during operation in 2027 and 2037)

Intersection/ peak period	‘Do minimum 2027’ – LoS (average delay in seconds)	‘Do something 2027’ – LoS (average delay in seconds)	‘Do something cumulative 2027’ – LoS (average delay in seconds)	‘Do minimum 2037’ – LoS (average delay in seconds)	‘Do something’ 2037’ – LoS (average delay in seconds)	‘Do something cumulative 2037’ – LoS (average delay in seconds)
Victoria Road/Darling Street						
AM peak	F (>100)	F (>100)	F (>100)	F (>100)	F (83)	E (65)
PM peak	E (57)	D (50)	D (51)	E (62)	D (54)	E (58)
Victoria Road/Evans Street						
AM peak	C (33)	C (33)	C (33)	C (35)	C (33)	C (32)
PM peak	B (19)	B (19)	B (20)	E (58)	C (32)	D (43)
Victoria Road/Gordon Street						
AM peak	B (27)	B (27)	B (27)	B (27)	B (26)	B (25)
PM peak	B (16)	B (16)	B (16)	D (49)	C (37)	D (49)
Victoria Road/Robert Street						
AM peak	B (23)	B (21)	B (21)	B (27)	C (29)	B (28)
PM peak	B (28)	B (27)	B (28)	F (87)	F (75)	F (91)

Intersection/ peak period	'Do minimum 2027' – LoS (average delay in seconds)	'Do something 2027' – LoS (average delay in seconds)	'Do something cumulative 2027' – LoS (average delay in seconds)	'Do minimum 2037' – LoS (average delay in seconds)	'Do something' 2037' – LoS (average delay in seconds)	'Do something cumulative 2037' – LoS (average delay in seconds)
Victoria Road/The Crescent						
AM peak	B (28)	B (24)	B (24)	D (55)	C (39)	D (47)
PM peak	B (19)	B (27)	B (28)	C (37)	D (47)	D (49)
The Crescent/James Craig Road						
AM peak	C (29)	A (9)	A (9)	C (36)	B (17)	B 23)
PM peak	A (13)	B (16)	B (16)	B (28)	C (34)	C (42)
The Crescent/City West Link						
AM peak	D (43)	D (46)	D (50)	D (47)	D (46)	D (52)
PM peak	B (22)	C (41)	D (46)	B (22)	C (42)	E (58)
The Crescent/Johnston Street						
AM peak	F (>100)	B (17)	B (17)	F (>100)	B (20)	B (28)
PM peak	D (56)	B (19)	F (>100)	D (56)	B (19)	F (>100)
City West Link/Catherine Street						
AM peak	C (30)	B (25)	B (25)	C (34)	B (24)	C (29)
PM peak	C (33)	C (41)	C (38)	B (24)	D (43)	D (50)
City West Link/Balmain Road						
AM peak	D (55)	D (49)	D (47)	F (79)	D (53)	D (56)
PM peak	C (41)	C (41)	D (46)	D (46)	E (59)	F (80)
City West Link/M5 ramps						
AM peak	C (38)	B (24)	C (31)	D (51)	B (25)	C (35)
PM peak	B (20)	B (28)	C (30)	B (20)	C (30)	D (49)

Note: Cells shaded in grey denote an unsatisfactory LoS E or F

Road network changes and access arrangements

‘Do something’ scenario

Surface road access to the project would be provided from City West Link at its intersection with The Crescent. The connection to The Crescent would be constructed as part of the approved M4–M5 Link project, and the project would carry out the fit out and commissioning of this connection. An underground connection for the project would also be provided to and from the M4–M5 Link (constructed as part of that approved project).

‘Do something cumulative’ scenario

There would be no road network changes within the Rozelle area under the ‘Do something cumulative’ scenario beyond those implemented as part of the approved M4–M5 Link project.

Impacts on public transport

‘Do something’ scenario

Modelled bus travel times for key routes through the Rozelle area during operation indicate:

- During the AM peak, southbound (towards the Sydney CBD) bus travel times would improve with the project due to reduced congestion on the ANZAC Bridge and Western Distributor, which would reduce merging and weaving and reduce queues that would block access to the Druitt Street bus lane
- During the AM peak, counter-peak northbound (away from the Sydney CBD) bus travel times along Victoria Road are forecast to increase as a result of the project. This would be due to increased local traffic being able to access the corridor, joining from side roads and merging with M4–M5 link traffic exiting to Victoria Road south of Iron Cove Bridge. As there is currently no bus lane in the northbound direction until Iron Cove Bridge, general traffic delays would also impact buses
- In the PM peak, bus travel times on Victoria Road would not change substantially as a result of the project.

‘Do something’ cumulative scenario

Modelled bus travel times for key routes through the Rozelle area under the ‘Do something cumulative’ scenario indicate that bus travel times would not change substantially as a result of the introduction of the Beaches Link and Gore Hill Freeway Connection project and other motorway projects, when compared to conditions under the ‘Do something’ scenario only.

Impacts on active transport

‘Do something’ scenario

There would be no direct impacts on the active transport network within Rozelle and surrounds.

‘Do something cumulative’ scenario

There would be no changes to the active transport network within the Rozelle area under the ‘Do something cumulative’ scenario.

9.4.3 Birchgrove to Waverton (Sydney Harbour crossing – maritime traffic)

The project would not result in a reduction in water depth at the proposed harbour crossing, and would therefore have no impact on navigation given the current depth is typically around 15 metres below chart datum at the crossing location.

Moorings impacted during construction would be reinstated. All moorings would be reinstated as close as practical to their current locations.

With the reinstatement of access to the Birchgrove ferry wharf, there would be no operational impacts on maritime movements and activities as a result of the project.

9.4.4 Warringah Freeway and surrounds

Road network performance

'Do something' scenario

The assessment of the Warringah Freeway and surrounds area under the 'Do something' scenario indicates:

- Peak traffic demand through the Warringah Freeway and surrounds would increase as a result of the project by 10 per cent in the AM peak and six per cent in the PM peak by 2037
- Average travel speeds through the Warringah Freeway and surrounds would improve as a result of the project. This is due to the transfer of traffic to the Western Harbour Tunnel which would also result in reduced congestion on the Sydney Harbour Bridge and Sydney Harbour Tunnel
- The number of stops would decrease substantially as a result of the project due to the large shift in demand from the Sydney Harbour Bridge and Sydney Harbour Tunnel to the Western Harbour Tunnel, where traffic flows would be largely uninterrupted.

'Do something cumulative' scenario

Key outcomes of the assessment of the Warringah Freeway and surrounds area under the 'Do something cumulative' scenario (compared with the 'Do something' scenario) include:

- AM and PM peak travel demand through the Warringah Freeway and surrounds would increase by up to four per cent
- Average travel speeds through the Warringah Freeway and surrounds would further improve in both the AM and PM peak periods
- The number of stops would be generally unchanged in the AM peak but decrease in the PM peak.

The modelled network performance under the 'Do something cumulative' scenario shows that the introduction of the Beaches Link and Gore Hill Freeway Connection project would not substantially impact overall network performance along the Warringah Freeway and surrounds. Changes to connectivity associated with the Beaches Link and Gore Hill Freeway Connection project would result in the following localised effects:

- *Beaches Link to Western Harbour Tunnel*: The introduction of this connection would reduce traffic volumes through alternative existing corridors including Falcon Street, Ernest Street/Ourimbah Road, Brook Street and Miller Street, which have limited capacity to accommodate forecast future traffic demand. The impact of this change would be greatest in the AM peak when the southbound demand to the Western Harbour Tunnel would be highest

- *Northbound on-ramp from Berry Street to Beaches Link*: This on-ramp would provide an alternative for travel to the Warringah Road or Pittwater Road corridors, which are currently accessible via existing corridors including Falcon Street, Ernest Street, and Brook Street/Willoughby Road
- *Beaches Link southbound off-ramp to Alfred Street North*: This connection would increase traffic exiting at Alfred Street North and utilising the new upgraded intersection of Alfred Street North and High Street, reducing delays at Falcon Street and Miller Street. The impact of this change would be greatest in the AM peak when the southbound demand into North Sydney is highest.

Traffic travel times

'Do something' scenario

Modelled travel times during AM and PM peaks for key routes through the Warringah Freeway and surrounds area are presented in Table 9-7.

The modelled travel times under the 'Do something' scenario show:

- Travel times for trips travelling along the Warringah Freeway between Gore Hill Freeway and Sydney Harbour Bridge and Sydney Harbour Tunnel are predicted to generally improve due to the reduction in demand for both crossings as a result of the project
- Travel times along Miller Street would experience localised delays in the PM peak of up to four minutes in the northbound direction due to changes in demands and traffic patterns
- Localised southbound travel times to the Sydney Harbour Tunnel from Falcon Street would increase marginally in the AM peak as a result of the project. This is due to changes to the configuration of the Falcon Street on ramp, which would be fed by an additional lane from the Falcon Street interchange with no additional outbound capacity
- Northbound travel times along Warringah Freeway to Falcon Street would generally improve as a result of the project. This is partially due to the increased capacity provided by the reconfiguration of the Falcon Street interchange to a diverging diamond configuration, which would reduce conflicts between traffic exiting the freeway and through-traffic on Falcon Street.

'Do something cumulative' scenario

Analysis of modelled travel times under the 'Do something cumulative' scenario (Table 9-7) indicates improved travel times along the Warringah Freeway due to the transfer of traffic from alternative routes, reducing congestion along the Warringah Freeway and its approaches. However, this would be accompanied by localised increases in travel times for some routes during the busiest peak periods as follows:

- Travel times for AM peak trips travelling along the Warringah Freeway between Gore Hill Freeway and the Sydney Harbour crossings are forecast to marginally increase in the southbound direction in some instances when compared with the 'Do something' scenario. This is due to the increase in peak direction demand for these crossings, with a greater demand for traffic travelling to the corridor from the Beaches Link Tunnel. Travel times would however be substantially lower than under the 'Do minimum' scenario
- Travel times along Miller Street would increase in the southbound direction in the AM Peak when compared with the 'Do something' scenario as a result of downstream changes to traffic demands around North Sydney (eg Pacific Highway and Berry Street) following the introduction of the Beaches Link.

Table 9-7 Modelled AM peak (8am–9am) and PM peak (5pm–6pm) traffic travel times for key routes through the Warringah Freeway and surrounds (minutes:seconds)

Route /Peak period	Direction	'Do minimum 2027'	'Do something 2017'	'Do something cumulative 2027'	'Do minimum 2037'	'Do something 2037'	'Do something cumulative 2037'
Sydney Harbour Bridge to Warringah Freeway/Falcon Street interchange							
AM peak	Northbound	04:40	03:39	03:33	04:51	03:31	04:12
	Southbound	04:03	04:09	04:07	04:02	04:07	04:06
PM peak	Northbound	04:02	03:23	03:25	07:51	04:12	03:28
	Southbound	06:09	04:35	04:37	05:02	04:33	04:33
Sydney Harbour Tunnel to Warringah Freeway/Falcon Street interchange							
AM peak	Northbound	03:55	03:43	03:31	04:08	03:28	04:27
	Southbound	04:03	04:33	04:27	04:02	04:22	04:26
PM peak	Northbound	03:57	06:43	03:24	07:36	03:52	03:31
	Southbound	14:54	05:28	05:28	14:59	05:37	05:35
Sydney Harbour Bridge to Gore Hill Freeway/Pacific Highway interchange							
AM peak	Northbound	06:13	05:27	05:26	06:16	05:26	05:29
	Southbound	13:35	06:59	08:02	15:22	07:36	07:54
PM peak	Northbound	05:35	05:20	05:21	06:45	05:22	05:24
	Southbound	13:56	06:08	06:10	17:31	06:07	06:10
Sydney Harbour Tunnel to Gore Hill Freeway/Pacific Highway interchange							
AM peak	Northbound	05:26	05:22	05:18	05:30	05:23	05:23
	Southbound	11:39	07:19	07:59	12:37	07:52	08:08
PM peak	Northbound	05:28	08:37	05:12	06:46	05:13	05:14
	Southbound	25:21	07:00	07:00	30:09	07:11	07:07
Berry Street to Amherst Street via Miller Street							
AM peak	Northbound	03:42	04:10	04:06	03:53	04:12	04:03
	Southbound	04:25	04:16	06:01	05:43	06:10	07:01

Route /Peak period	Direction	'Do minimum 2027'	'Do something 2017'	'Do something cumulative 2027'	'Do minimum 2037'	'Do something 2037'	'Do something cumulative 2037'
PM peak	Northbound	03:52	04:54	04:46	03:50	08:03	05:14
	Southbound	05:01	05:00	04:35	08:39	06:13	05:37

Intersection performance

'Do something' scenario

Modelled intersection performance for key intersections in the Warringah Freeway and surrounds area under the 'Do something' scenario is presented in Table 9-8 and indicates:

- The proposed phasing and access changes around the intersection of Miller Street and Berry Street would simplify the operation and increase the capacity of these roads to offset potential travel delays along these roads during the AM peak. During the PM peak, intersection performance would be poor under both the 'Do minimum' and ''Do something' scenarios at the Miller Street and Berry Street intersection
- Intersection performance along Brook Street in the vicinity of the Warringah Freeway would improve substantially during the AM peak as a result of the project. This would be due to reduced queuing and congestion on the Warringah Freeway, as well as the changes in access to Brook Street from the Warringah Freeway, which under the project would be limited to trips from the Sydney Harbour Bridge and Berry Street
- Intersections along the Pacific Highway would generally operate with higher delays as a result of the project. Due to the proposed removal of the right turn from Miller Street northbound into Berry Street eastbound, traffic would divert to turn right into Berry Street from the Pacific Highway, increasing delays at this intersection. The removal of a left turn lane from the Pacific Highway southbound into Berry Street would also result in increased delays on the northern approach of the Pacific Highway, which would extend past Bay Road in the AM peak
- The intersection of Ben Boyd Road and Military Road would operate with higher delays as a result of the project due to changes to access and travel patterns at the Ernest Street and Falcon Street interchanges.

Although the project would generally improve network performance for roads within and surrounding North Sydney, it would not resolve existing localised performance issues at a number of intersections. The proposed road integration works and resultant traffic performance in the North Sydney area have been developed in the context of the growing North Sydney CBD environment.

The works in the area proposed by the project seek to maintain an appropriate level of traffic movement while also preserving capacity and connectivity for other customers whose needs conflict with traffic, particularly pedestrians.

Options to further improve traffic performance at intersections throughout the area have been investigated. However, these alternative options would result in further impacts on other customers. The proposed works are therefore considered to provide the most equitable outcomes from the perspective of maintaining a balanced and integrated transport network through North Sydney.

Further refinements and changes to intersections with the North Sydney CBD may occur as part of the ongoing development of the North Sydney Program (see Section 9.1.1 for more information).

‘Do something’ cumulative scenario

Intersection performance in North Sydney under the ‘Do something cumulative’ scenario would be generally consistent with the ‘Do something’ scenario, albeit with increased localised demand and delays on routes that provide access to and from Beaches Link. Modelled intersection performance in the Warringah Freeway and surrounds area under the ‘Do something cumulative’ scenario is presented in Table 9-8 and indicates that some intersections would experience increased delays in some instances.

Although some traffic would be impacted by an increase in localised intersection delays, road users would still generally benefit from substantial travel time savings on the broader network (eg via Beaches Link, Western Harbour Tunnel, ANZAC Bridge and Sydney Harbour Bridge). Traffic impacted at individual intersections in the North Sydney area is therefore still anticipated to receive a net benefit due to the broader connectivity and efficiency improvements.

Table 9-8 Modelled intersection performance on the Warringah Freeway and surrounds area (AM peak (8am–9am) and PM peak (5pm–6pm) during operation in 2027 and 2037)

Intersection/ peak period	‘Do minimum 2027’ – LoS (average delay in seconds)	‘Do something 2027’ – LoS (average delay in seconds)	‘Do something cumulative 2027’ – LoS (average delay in seconds)	‘Do minimum 2037’ – LoS (average delay in seconds)	‘Do something 2037’ – LoS (average delay in seconds)	‘Do something cumulative 2037’ – LoS (average delay in seconds)
Willoughby Road/Gore Hill Freeway interchange						
AM peak	F (>100)	A (8)	A (9)	F (>100)	A (9)	A (10)
PM peak	C (38)	A (10)	A (11)	F (76)	A (9)	A (11)
Brook Street/Warringah Freeway on ramp						
AM peak	F (>100)	A (7)	A (8)	F (>100)	E (58)	E (64)
PM peak	B (14)	B (23)	A (<5)	B (17)	D (42)	B (25)
Brook Street/Warringah Freeway off ramp						
AM peak	E (61)	A (10)	A (9)	E (67)	D (49)	B (16)
PM peak	B (22)	B (18)	B (17)	B (20)	D (48)	C (29)
Brook Street/Merrenburn Avenue						
AM peak	F (>100)	B (28)	B (26)	F (>100)	D (44)	D (50)
PM peak	A (11)	D (45)	B (17)	A (13)	D (46)	C (39)
Amherst Street/West Street						
AM peak	A (5)	A (9)	D (50)	A (5)	F (>100)	F (>100)
PM peak	A (9)	F (75)	D (43)	A (14)	F (87)	F (73)

Intersection/ peak period	'Do minimum 2027' – LoS (average delay in seconds)	'Do something 2027' – LoS (average delay in seconds)	'Do something cumulative 2027' – LoS (average delay in seconds)	'Do minimum 2037' – LoS (average delay in seconds)	'Do something 2037' – LoS (average delay in seconds)	'Do something cumulative 2037' – LoS (average delay in seconds)
Amherst Street/Miller Street						
AM peak	B (21)	C (38)	C (42)	B (20)	D (50)	D (44)
PM peak	C (29)	E (59)	D (43)	C (31)	E (63)	D (48)
Miller Street/Warringah Freeway on ramp						
AM peak	A (7)	A (6)	A (<5)	A (6)	A (9)	A (5)
PM peak	A (6)	A (7)	A (6)	A (6)	A (6)	A (7)
Miller Street/Warringah Freeway off ramp						
AM peak	A (12)	A (10)	A (8)	A (13)	A (10)	A (8)
PM peak	B (15)	A (9)	A (7)	B (15)	A (9)	A (8)
Miller Street/Ernest Street						
AM peak	B (25)	D (44)	C (42)	C (32)	D (44)	C (41)
PM peak	C (41)	C (42)	C (34)	D (43)	E (57)	C (39)
Miller Street/Falcon Street						
AM peak	C (35)	B (27)	C (30)	C (38)	C (41)	D (44)
PM peak	D (44)	E (65)	C (38)	D (49)	F (79)	D (48)
Ernest Street/Warringah Freeway on ramp						
AM peak	A (5)	B (19)	C (29)	A (5)	B (21)	C (36)
PM peak	B (15)	B (14)	A (13)	B (15)	A (14)	A (13)
Ernest Street/Warringah Freeway off ramp (off ramp in PM, on ramp AM)						
AM peak	A (5)	B (19)	B (28)	A (5)	B (21)	C (34)
PM peak	B (17)	B (23)	A (14)	B (17)	B (18)	B (15)
Falcon Street/Warringah Freeway ramps						
AM peak	C (29)	C (31)	C (42)	B (15)	D (47)	D (51)

Intersection/ peak period	'Do minimum 2027' – LoS (average delay in seconds)	'Do something 2027' – LoS (average delay in seconds)	'Do something cumulative 2027' – LoS (average delay in seconds)	'Do minimum 2037' – LoS (average delay in seconds)	'Do something 2037' – LoS (average delay in seconds)	'Do something cumulative 2037' – LoS (average delay in seconds)
PM peak	F (72)	F (79)	D (52)	F (>100)	F (89)	E (60)
Watson Street/Military Road						
AM peak	B (18)	B (27)	C (28)	B (26)	C (36)	C (30)
PM peak	D (46)	C (31)	C (37)	E (59)	C (40)	C (38)
Military Road/Ben Boyd Road						
AM peak	B (15)	E (64)	D (47)	B (23)	F (71)	D (43)
PM peak	D (54)	F (80)	D (55)	E (70)	F (86)	F (83)
Falcon Street/Merlin Street						
AM peak	B (24)	C (35)	C (39)	C (32)	F (81)	D (54)
PM peak	F (>100)	F (>100)	F (83)	F (>100)	F (>100)	F (88)
Berry Street/Walker Street						
AM peak	C (29)	D (48)	C (41)	C (39)	D (55)	D (50)
PM peak	D (44)	F (75)	E (69)	F (73)	F (76)	F (74)
Berry Street/Miller Street						
AM peak	D (55)	D (53)	E (58)	E (69)	D (55)	E (57)
PM peak	D (46)	D (56)	D (54)	F (70)	F (>100)	E (63)
Mount Street/Arthur Street						
AM peak	D (46)	B (27)	B (18)	E (59)	C (33)	C (33)
PM peak	D (49)	C (34)	B (21)	F (92)	E (63)	F (>100)
Mount Street/Walker Street						
AM peak	C (36)	C (35)	C (35)	D (48)	D (46)	D (43)
PM peak	C (32)	F (93)	F (78)	F (75)	F (>100)	F (96)

Intersection/ peak period	'Do minimum 2027' – LoS (average delay in seconds)	'Do something 2027' – LoS (average delay in seconds)	'Do something cumulative 2027' – LoS (average delay in seconds)	'Do minimum 2037' – LoS (average delay in seconds)	'Do something 2037' – LoS (average delay in seconds)	'Do something cumulative 2037' – LoS (average delay in seconds)
Pacific Highway/High Street/Arthur Street						
AM peak	B (19)	B (23)	B (18)	C (38)	B (25)	B (19)
PM peak	D (46)	B (16)	B (16)	E (61)	B (23)	B (21)
Pacific Highway/Walker Street/Blue Street						
AM peak	C (36)	C (38)	C (33)	E (65)	C (33)	C (32)
PM peak	D (40)	F (71)	D (54)	F (80)	F (70)	E (60)
Pacific Highway/Miller Street/Mount Street						
AM peak	C (38)	E (63)	E (62)	C (41)	E (65)	E (62)
PM peak	C (41)	E (63)	D (50)	E (58)	F (>100)	E (66)
Pacific Highway/Berry Street						
AM peak	E (56)	C (35)	E (60)	D (52)	E (61)	E (60)
PM peak	B (23)	F (97)	F (85)	E (56)	F (>100)	F (87)
Pacific Highway/Bay Road						
AM peak	D (55)	B (22)	D (42)	F (77)	F (89)	F (88)
PM peak	B (15)	D (50)	B (27)	C (41)	F (96)	C (33)
Miller Street/McLaren Street						
AM peak	B (23)	C (41)	E (56)	F (72)	D (50)	E (62)
PM peak	B (21)	C (41)	C (37)	D (55)	F (76)	D (50)
Miller Street/Ridge Street						
AM peak	C (38)	D (45)	E (63)	D (53)	E (66)	E (70)
PM peak	C (40)	B (18)	B (21)	F (91)	C (38)	C (39)
Miller Street/Carlow Street						
AM peak	A (13)	A (9)	B (15)	A (13)	B (24)	C (28)

Intersection/ peak period	'Do minimum 2027' – LoS (average delay in seconds)	'Do something 2027' – LoS (average delay in seconds)	'Do something cumulative 2027' – LoS (average delay in seconds)	'Do minimum 2037' – LoS (average delay in seconds)	'Do something 2037' – LoS (average delay in seconds)	'Do something cumulative 2037' – LoS (average delay in seconds)
PM peak	A (8)	A (7)	A (7)	B (19)	A (7)	A (7)
High Street/Clark Road						
AM peak	B (18)	C (32)	C (36)	D (55)	E (59)	C (38)
PM peak	E (61)	F (94)	D (56)	F (97)	F (82)	E (65)
High Street/Alfred Street						
AM peak	A (13)	B (18)	B (19)	E (62)	B (21)	B (18)
PM peak	F (>100)	E (58)	C (42)	F (>100)	D (53)	D (46)
Mount Street/Alfred Street						
AM peak	A (<5)	A (12)	B (14)	A (<5)	A (13)	A (14)
PM peak	A (12)	A (12)	A (12)	A (10)	A (11)	A (13)
Ernest Street/Ben Boyd Road						
AM peak	A (12)	B (17)	B (18)	A (12)	C (29)	B (26)
PM peak	D (44)	B (14)	A (10)	F (94)	D (46)	D (46)
Pedestrian crossing at Military Road						
AM peak	A (6)	A (6)	A (5)	A (5)	A (8)	A (6)
PM peak	B (27)	A (5)	A (<5)	C (34)	A (<5)	A (5)

Note: Cells shaded in grey denote an unsatisfactory LoS E or F

Road network changes and access arrangements

'Do something' scenario

In the 'Do something' scenario, the project would connect to North Sydney via an on ramp from Berry Street for vehicles travelling southbound and an off ramp to Falcon Street (westbound only) for vehicles travelling northbound. In addition, the tunnel would connect to the Warringah Freeway at Cammeray.

The Warringah Freeway Upgrade component of the project is proposed to substantially improve the efficiency of the motorway and arterial road interfaces. The Warringah Freeway Upgrade component would involve extensive upgrades to surface roads and existing connections (refer to Chapter 5 (Project description)) that would:

- Connect and integrate with the Western Harbour Tunnel
- Improve wayfinding and separate traffic based on trip function (through traffic, traffic for arterial distribution and traffic for local destinations).

The upgraded Warringah Freeway would simplify traffic flow and improve wayfinding by providing the following traffic lanes:

- A northbound outer carriageway which would comprise:
  - An outer western carriageway carrying northbound traffic from the Sydney Harbour Bridge to the proposed Beaches Link northbound on ramp and facilitating local distribution to local destinations such as North Sydney and Crows Nest
  - Inner western carriageways carrying northbound traffic from the Sydney Harbour Bridge and the Sydney Harbour Tunnel
- A central carriageway, carrying northbound and southbound motorway traffic between the Western Harbour Tunnel, Gore Hill Freeway and Willoughby Road
- A southbound outer carriageway which would comprise:
  - Inner eastern carriageways carrying southbound traffic to the Sydney Harbour Tunnel and facilitating distribution to local destinations such as Neutral Bay
  - An outer eastern carriageway carrying southbound traffic to the Sydney Harbour Bridge (both the Bradfield Highway and Cahill Expressway) and facilitating distribution to local destinations such as North Sydney and Kirribilli
  - A dedicated bus lane between Miller Street, Cammeray and the Sydney Harbour Bridge, which would carry southbound buses and other permitted bus lane vehicles.

Following the upgrade, connections between the upgraded Warringah Freeway and arterial road network would be provided at all existing interchange locations. However, changes to existing Warringah Freeway accesses as a result of the project would be as follows:

- The existing Falcon Street westbound off ramp from the Warringah Freeway would be converted to the northbound off ramp from Western Harbour Tunnel, thereby removing connectivity between the Warringah Freeway northbound and Falcon Street westbound. Adjacent interchanges north and south of Falcon Street would provide similar alternative connectivity
- Existing connectivity between the Sydney Harbour Tunnel in the northbound direction and Falcon Street (in the westbound direction only), and Miller Street and Brook Street would be removed. Alternative connectivity would be retained by providing a new northbound access between Sydney Harbour Tunnel and Ernest Street or Sydney Harbour Bridge/Cahill Expressway and Miller Street/Brook Street
- There would be no access from the Berry Street northbound on ramp to the Falcon Street eastbound off ramp (in addition to the Falcon Street westbound off ramp identified above) nor to the Warringah Freeway mainline. Connections to the Western Harbour Tunnel and the Miller Street and Brook Street off ramps only would be provided from the Berry Street northbound on ramp. Traffic would be required to travel via the North Sydney local road network to access the new High Street northbound on ramp, Falcon Street eastbound, or the Warringah Freeway via the Falcon Street interchange
- Access from the Falcon Street southbound on ramp to the Cahill Expressway would be removed. Access would be maintained from the Falcon Street southbound on ramp to the Sydney Harbour Bridge (Bradfield Highway) and the Sydney Harbour Tunnel, providing connectivity to the Sydney CBD and Western Suburbs, and the Eastern Suburbs, respectively
- Access between the ramps at Falcon Street and Brook Street via the Warringah Freeway would be removed. Traffic would be required to travel via the local road network to travel between these locations

- Access would be removed from the Alfred Street North southbound off ramp to Alfred Street North in the northbound direction. Traffic would be required to exit the Warringah Freeway at Falcon Street or continue onto High Street and travel via the local road network to access Alfred Street North.

'Do something cumulative' scenario

In the 'Do something cumulative' scenario, the Beaches Link and Gore Hill Freeway Connection project would connect to the Warringah Freeway at Cammeray, north of the Ernest Street Bridge. These connections would include the following:

- On and off ramps providing direct connection between the Warringah Freeway and the Beaches Link and Gore Hill Freeway Connection project
- A northbound on ramp from Berry Street to the Beaches Link and Gore Hill Freeway Connection project, providing access from North Sydney
- A southbound off ramp onto Alfred Street North from the Beaches Link and Gore Hill Freeway Connection project, providing access to North Sydney.

Impacts on public transport

'Do something' scenario

In the 'Do something' scenario, the project would provide a dedicated southbound bus lane on the Warringah Freeway between Miller Street and the Sydney Harbour Bridge, with upgraded bus lane connections at Falcon Street and Mount Street. This would remove direct interaction between buses and general traffic on the approach to the Sydney Harbour Bridge, improving southbound bus operations.

Bus lanes at the Falcon Street interchange would be maintained as part of the diverging diamond configuration, which would support the Northern Beaches B-Line and other bus services.

The northbound bus only lane that operates during the weekday AM peak on Arthur Street would also be removed as part of the project, however bus services would have the ability to access North Sydney via High Street.

The project would also relocate existing bus layover facilities on the Warringah Freeway north of Ernest Street to a widened section of the motorway near Cammeray Golf Course and on the Cahill Expressway south of High Street. Similar layover space would be provided as per the existing arrangement.

Modelled bus travel times for key routes through the Warringah Freeway and surrounds area during operation indicates the following:

- Travel times for buses from Gore Hill Freeway to the Sydney Harbour Bridge would improve substantially, particularly southbound during AM and PM peak periods due to the reconfiguration of the southbound bus lane between Miller Street and the Cahill Expressway, which has been separated from the general traffic lanes, removing two existing weave movements between buses and cars. Buses would no longer be required to merge from left to right to access the bus lane from the north, and cars would no longer be able to cross the bus lane between Falcon Street and the Cahill Expressway
- Travel times for buses travelling to and from Falcon Street would improve as a result of the reconfiguration of the southbound bus lane, which removes the existing conflict with general traffic, and also as a result of the reduction in traffic demand to the Willoughby Road and Falcon Street ramps, which would otherwise block access to the northbound bus off ramp to Falcon Street
- Travel times on bus routes through North Sydney via Miller Street would generally be maintained, although some localised delays could occur during the busiest peak periods

- Travel times on bus routes through North Sydney from Pacific Highway would increase during peak periods. This is due to the increase in demand and congestion between Berry Street and Miller Street as a result of redirecting traffic from Miller Street (resulting from the removal of the existing right turn from Miller Street northbound to Berry Street eastbound).

'Do something cumulative' scenario

Under the 'Do something cumulative' scenario, the modelled bus travel times in the Warringah Freeway and surrounds area indicates the following (when compared with the 'Do something' scenario):

- Bus travel times through North Sydney and along the Warringah Freeway would not materially change as a result of the Beaches Link and Gore Hill Freeway Connection project
- Bus travel times for trips travelling between Warringah Freeway and Military Road would remain largely unchanged. The introduction of the Beaches Link and Gore Hill Freeway Connection project would not substantially change traffic conditions for these routes, which would retain the same level of priority.

Impacts on active transport

'Do something' scenario

Under the 'Do something' scenario, the following changes to the active transport network within the Warringah Freeway and surrounds area would be carried out as part of the project and are anticipated to result in improved active transport links:

- A new shared user path would be provided on the southern side of High Street bridge with signalised pedestrian crossings at the upgraded Alfred Street North/High Street intersection
- A new shared user bridge to the north of Ernest Street at Cammeray, connecting Cammeray Golf Course with ANZAC Park; this would provide the same pedestrian and cycle connectivity as the existing shared user path and cycleway on the Ernest Street bridge
- Replacement of the Ridge Street bridge with a wider structure with dedicated cycle lanes and a pedestrian path and replacement of the Falcon Street pedestrian and cyclist bridge with a new structure
- Consolidating pedestrian crossings into a central median shared user path at the Falcon Street interchange as part of the diverging diamond configuration
- Improved pedestrian crossings at the Falcon Street interchange ramp connections and increased pedestrian safety with fencing along the footpath
- A new dedicated cycleway on the eastern side of Warringah Freeway between Miller Street and Ernest Street.

The pedestrian and cycle underpass on the eastern side of the Falcon Street Bridge would be permanently removed. The alternative route via Military Road would result in users having to travel an additional 380 metres, increasing their travel time. However, existing pedestrian and cyclist volumes at this underpass are low and the overall impacts of the closure are expected to be minor.

'Do something cumulative' scenario

All changes to the active transport network would remain the same as the 'Do something' scenario.

9.4.5 Gore Hill Freeway and Artarmon

Road network performance

'Do something' scenario

Key outcomes of the assessment of the Gore Hill Freeway and Artarmon area under the 'Do something' scenario include:

- Peak period traffic demand through the Gore Hill Freeway and Artarmon area is forecast to increase in the AM peak by up to three per cent as a result of the project and remain generally unchanged in the PM peak by 2037
- Average travel speeds through the Gore Hill Freeway and Artarmon area would decrease in the 2037 AM and PM peaks as a result of the project. The AM peak average trip speed would decrease by around nine km/h to 30 km/h and the PM peak would decrease by around five km/h to 38 km/h. This would be as a result of the potential growth in traffic demand from the Pacific Highway to the Gore Hill Freeway and Warringah Freeway
- The capacity restriction of the Pacific Highway eastbound on-ramp to Gore Hill Freeway would result in increased queuing on the Pacific Highway if the increase in demand is realised.

Network performance measures for the Gore Hill Freeway and Artarmon area indicate that future demand from the Pacific Highway to Gore Hill Freeway eastbound would continue to exceed the capacity of this on ramp during peak periods, and that the inclusion of the project could further increase demands along the corridor under the 'Do something' scenario.

The traffic assessment carried out for the project assumes that all forecast traffic demand would be able to arrive at the desired time and location in the road network defined by the operational road traffic model. In other words, this demand would not be restricted by the existing capacity constraints of the broader metropolitan road network to reach the road networks represented by the operational traffic models.

However, it is recognised that in reality the growth in traffic demand along the Gore Hill Freeway corridor is constrained at either end at the Lane Cove Tunnel and the Warringah Freeway. These constraints would make realisation of the forecast demand used in modelling unlikely and the throughput would be expected to be lower than the forecast demand, leading to network performance under the project being more likely to be closer to the 'Do minimum' performance than the operational modelling would suggest. Although the forecast level of demand growth in the Gore Hill Freeway corridor is considered unlikely to be realised during peak periods without increases to broader metropolitan network capacity, it is reflected in the assessment results to represent a conservative scenario.

Road integration works associated with the Beaches Link and Gore Hill Freeway Connection could facilitate additional traffic travelling through the corridor at a generally similar or reduced level of delay than under the 'Do minimum' scenario. These works could be brought forward and carried out as part of the project scope to improve traffic conditions under the 'Do something' scenario. Consequently, a network condition monitoring approach would be carried out for this area to determine if and when the road network integration works proposed by the Beaches Link and Gore Hill Freeway Connection project should be delivered by Transport for NSW to maintain efficient road network operations in this area. Although considered unlikely, if the project did materially impact performance in this area during peak periods the conversion of existing T2 lanes to general traffic lanes along Gore Hill Freeway could be implemented over a short duration, supporting the proposed network condition monitoring approach.

'Do something cumulative' scenario

Key outcomes of the assessment of the Gore Hill Freeway and Artarmon area under the 'Do something' cumulative scenario (when compared with the 'Do something' scenario) include:

- Peak period traffic demand through the Gore Hill Freeway and Artarmon area would increase by up to 12 per cent by 2037 due to the additional connectivity provided by the Beaches Link tunnel
- The average travel speeds through the Gore Hill Freeway and Artarmon area during AM and PM peaks would improve by up to 56 per cent. This is a result of converting the eastbound transit lane on Gore Hill Freeway to a general traffic lane to improve utilisation. This has the greatest benefit in the AM peak when eastbound traffic demand would be highest
- Localised delays in the Artarmon area would increase, as the increased traffic volumes along the Gore Hill Freeway would require traffic signals at critical locations such as Longueville Road/Epping Road or Longueville Road/Pacific Highway to be optimised to manage throughput from the motorway, which would result in increased queues on lower order roads during peak periods.

Overall the results indicate that integration works associated with the Beaches Link Tunnel and Gore Hill Freeway connection project would facilitate additional traffic travelling through the corridor at a reduced level of delay than under the 'Do something' scenario.

Traffic travel times

'Do something' scenario

Modelled travel times during AM and PM peaks for key routes through the Gore Hill Freeway are presented in Table 9-9.

The modelled travel times under the 'Do something' scenario show:

- Eastbound travel times from the Lane Cove Tunnel and Longueville Road to Gore Hill Freeway would increase with the project during the AM peak due to the increased traffic volumes from both Longueville Road and the Pacific Highway to the Gore Hill Freeway. The existing lane arrangements from Longueville Road to Gore Hill Freeway currently force a diverge for eastbound traffic west of the Lane Cove Tunnel, with transit lane traffic diverging left and general traffic diverging right. This general traffic lane merges with general traffic from Pacific Highway further east, where the combined demand would exceed the capacity of this single lane
- PM peak eastbound travel times from Longueville Road to Gore Hill Freeway would increase slightly, although not to the extent of the AM peak
- Travel times for other trips along the Gore Hill Freeway would remain largely unchanged as a result of the project.

Reallocating the existing eastbound capacity at critical network locations by removing the transit lane, would allow excess traffic to rebalance across both lanes from Longueville Road and reduce the forecast delays. In addition, although eastbound traffic would be impacted by a localised increase in travel times approaching Gore Hill Freeway, modelling of the Warringah Freeway indicates that this traffic would generally benefit from substantial travel time savings on the Warringah Freeway and Sydney Harbour crossings. Consequently, traffic impacted on the Gore Hill Freeway is still anticipated to receive a net benefit due to downstream efficiency improvements delivered by the project.

'Do something cumulative' scenario

Analysis of the modelled travel times under the 'Do something cumulative' scenario shows:

- Eastbound general travel times would improve when compared to the 'Do something' scenario as a result of the removal of the transit lane from Lane Cove Tunnel and Longueville Road to Gore Hill Freeway. This would enable the improved utilisation of existing road space, benefitting all road users in the area

- Westbound general traffic travel times would remain largely unchanged under the 'Do something cumulative' scenario when compared to the 'Do something' scenario. The additional demand associated with the introduction of the Beaches Link Tunnel would not substantially change general traffic performance in the Gore Hill Freeway corridor.

Table 9-9 Modelled AM peak (8am–9am) and PM peak (5pm–6pm) traffic travel times for key routes through the Gore Hill Freeway area (minutes:seconds)

Route/ Peak period	Direction	'Do minimum 2027'	'Do something 2027'	'Do something cumulative 2027'	'Do minimum 2027'	'Do something 2037'	'Do something cumulative 2037'
Longueville Road to Gore Hill Freeway							
AM peak	Eastbound	01:28	06:24	01:29	01:24	05:33	01:29
	Westbound	01:24	01:26	01:23	01:28	01:28	01:23
PM peak	Eastbound	01:26	01:28	01:26	01:25	02:02	01:27
	Westbound	01:23	01:24	01:23	01:23	01:46	02:02
Lane Cove Tunnel to Gore Hill Freeway							
AM peak	Eastbound	01:18	04:42	01:16	01:24	05:55	01:17
	Westbound	01:17	01:18	01:18	02:16	01:18	01:18
PM peak	Eastbound	01:22	01:23	01:16	01:23	01:25	01:18
	Westbound	01:12	01:13	01:17	01:12	01:15	01:17

Intersection performance

'Do something' scenario

Modelled intersection performance for key intersections in the Gore Hill Freeway and Artarmon area under the 'Do something' scenario is presented in Table 9-10, and indicates:

- The Longueville Road and Epping Road intersection would operate at capacity during AM and PM peaks with signal phasing and timing that would maximise traffic throughput from the motorway and ensure that queues from this location would not substantially impact operation of the Gore Hill Freeway. This would result in delays through this intersection
- The intersection of Longueville Road and Pacific Highway would continue to operate at a poor level of service in the PM peak when compared with the 'Do minimum' scenario due to the impact of queues approaching Epping Road on the short weave from Pacific Highway to Longueville Road for trips turning right into Parklands Avenue. The difficulty of this movement during AM and PM peaks is likely to result in some of these trips taking alternative routes, for example via Burley Street or Norton Lane. Diversion to alternative routes would result in delays on Longueville Road being lower than indicated by traffic modelling
- Modification of the phase arrangements at the Reserve Road interchange would reduce delays at this intersection and improve the operation of adjacent intersections, particularly at the Reserve Road/Barton Road intersection during the AM peak.

The project would facilitate additional travel through the Gore Hill Freeway and Artarmon area without substantially increasing delays at most of the critical intersections. The one exception is the intersection of Epping Road and Longueville Road, where existing constraints do not allow any scope for intersection optimisation.

'Do something cumulative' scenario

Modelled intersection performance for key intersections in the Gore Hill Freeway and Artarmon area under the 'Do something cumulative' scenario is presented in Table 9-10, and indicates:

- Localised delays at the intersection of Longueville Road/Epping Road would increase when compared with the 'Do something' scenario, due to the increase in traffic through this intersection from the Beaches Link and Gore Hill Freeway Connection project, with the intersection continuing to operate beyond its capacity. The operation of this intersection would be optimised to manage traffic volumes from the motorway and ensure that queues from this location would not impact the operation of the Gore Hill Freeway
- The intersection of Longueville Road/Pacific Highway would continue to operate at a poor level of service in the PM peak by 2037, with average delays increasing by 10 seconds when compared with the 'Do something' scenario
- The Reserve Road interchange would operate with comparable delays to the 'Do something' scenario with off ramp delays managed during peak periods to ensure the efficient operation of the Gore Hill Freeway under the increased traffic demand of the cumulative scenario. This would increase localised delays at adjacent intersections along Reserve Road, with Dickson Road and Barton Road continuing to operate at an unsatisfactory LoS F during the PM peak.

Overall, intersection performance modelling under the cumulative scenario for the Gore Hill Freeway and Artarmon area shows that increased traffic demand through the area would result in some increased localised delays at intersections in the area.

Although traffic may be impacted by an increase in localised intersection delays, broader modelling indicates that road users would benefit from substantial travel time savings on the broader network (eg via Beaches Link and Gore Hill Freeway Connection project and improved efficiency of the Warringah Freeway and beyond).

Table 9-10 Modelled intersection performance on the Gore Hill Freeway and Artarmon area (AM peak (8am–9am) and PM peak (5pm–6pm) during operation in 2027 and 2037)

Intersection/peak period	'Do minimum 2027' – LoS (average delay in seconds)	'Do something 2027' – LoS (average delay in seconds)	'Do something cumulative 2027' – LoS (average delay in seconds)	'Do minimum 2037' – LoS (average delay in seconds)	'Do something 2037' – LoS (average delay in seconds)	Do something cumulative 2037' – LoS (average delay in seconds)
Epping Road/Longueville Road/Parkland Avenue						
AM peak	D (52)	D (51)	F (75)	F (83)	E (63)	F (77)
PM peak	F (80)	F (72)	F (81)	F (87)	F (97)	F (>100)
Longueville Road/Pacific Highway						
AM peak	C (40)	C (39)	C (39)	D (54)	D (45)	C (38)

Intersection/peak period	'Do minimum 2027' – LoS (average delay in seconds)	'Do something 2027' – LoS (average delay in seconds)	'Do something cumulative 2027' – LoS (average delay in seconds)	'Do minimum 2037' – LoS (average delay in seconds)	'Do something 2037' – LoS (average delay in seconds)	Do something cumulative 2037' – LoS (average delay in seconds)
PM peak	C (42)	C (37)	D (45)	D (49)	F (76)	F (86)
Pacific Highway/Howarth Road/Norton Lane						
AM peak	B (20)	B (25)	A (10)	B (28)	B (27)	A (11)
PM peak	A (13)	B (16)	A (11)	A (13)	B (24)	A (13)
Pacific Highway/Gore Hill Freeway interchange						
AM peak	B (29)	C (40)	B (25)	C (41)	C (39)	B (25)
PM peak	C (29)	B (22)	B (29)	B (23)	B (27)	B (29)
Reserve Road/Gore Hill Freeway interchange						
AM peak	E (61)	C (43)	D (52)	D (47)	D (53)	E (60)
PM peak	D (55)	C (30)	D (48)	E (57)	D (53)	D (51)
Reserve Road/Dickson Road						
AM peak	A (14)	B (17)	B (24)	B (19)	B (19)	B (27)
PM peak	F (73)	B (21)	F (87)	F (85)	C (39)	F (95)
Reserve Road/Barton Road						
AM peak	E (69)	A (10)	F (77)	F (>100)	F (>100)	F (85)
PM peak	D (49)	A (7)	F (>100)	E (66)	F (>100)	F (>100)

Note: Cells shaded in grey denote an unsatisfactory LoS E or F

Road network changes and access arrangements

Do something scenario

The Reserve Road interchange traffic signal phasing would require minor modifications to reduce queues and delays at this intersection and to improve operation of adjacent intersections.

'Do something cumulative scenario

Under the 'Do something cumulative' scenario, with the addition of the Beaches Link and Gore Hill Freeway Connection project, the following road network connections would be in operation:

- Eastbound on ramps to the Beaches Link and Gore Hill Freeway Connection project from Epping Road/Lane Cove Tunnel and Reserve Road, providing access from Artarmon and beyond
- Westbound off ramps from the Beaches Link and Gore Hill Freeway Connection project onto Reserve Road and Lane Cove Tunnel providing access to Artarmon and beyond.

Local road changes as part of the Beaches Link and Gore Hill Freeway Connection project would include:

- Dickson Avenue east of Reserve Road would be converted to a cul-de-sac, and property access from Reserve Road would be removed to accommodate the Beaches Link westbound off ramp onto Reserve Road. Access to properties would be provided via Hesky Lane and the surrounding road network, such as Taylor Lane, Cleg Street, Herbert Street and Waltham Street. Access to Dickson Avenue west of Reserve Road would be maintained
- The Reserve Road/Dickson Avenue intersection would be modified to accommodate the Beaches Link westbound off ramp
- Lambs Road would be disconnected from the road network between Punch Street and Cleg Street to facilitate the installation of tunnel support facilities. Lambs Road would connect directly onto Cleg Street at its northern end while a cul-de-sac would be installed on Punch Street at its eastern end. Vehicles would be required to use Punch Street and Herbert Street, which would not substantially increase travel time as the additional travel distance would only be up to 480 metres
- Signalisation of the Pacific Highway/Dickson Avenue intersection to increase safety and connectivity.

Additional capacity would be provided at the Reserve Road bridge, with the existing footpaths converted to traffic lanes and a new footpath constructed on the eastern side of the bridge. The T2 transit lanes on the Gore Hill Freeway in both directions would be removed and converted to general traffic lanes to improve lane utilisation.

About 10 on-street parking spaces for cars and six on-street parking spaces for motorcycles would be removed at the Pacific Highway/Dickson Avenue intersection. Beaches Link operational facilities including the Motorway Control Centre would provide sufficient off-street parking and would therefore avoid creating any additional on-street parking demand. Therefore, impacts on parking would not worsen once Beaches Link is operational.

Impacts on public transport

Modelled bus travel times indicate that the removal of the existing transit lanes (proposed as part of the Beaches Link and Gore Hill Freeway Connection project) would not be expected to result in a material increase in bus travel times. Overall, there would be no substantial change in bus travel times along key routes through the Gore Hill Freeway and Artarmon area under either the 'Do something' or 'Do something cumulative' scenarios.

A southbound bus stop on Pacific Highway would be permanently relocated once the Pacific Highway/Dickson Avenue is signalised (proposed as part of the Beaches Link and Gore Hill Freeway Connection project). The bus stop would be relocated within 50 metres of its existing location so only minor impacts are anticipated given the minor increase in travel distance.

Impacts on active transport

'Do something' scenario

There would be no changes to the active transport network within the Gore Hill Freeway and Artarmon area under the 'Do something 'scenario.

‘Do something cumulative’ scenario

As part of the Beaches Link and Gore Hill Freeway Connection project, a shared user path would be provided on the southern side of the Gore Hill Freeway between the North Shore Rail Line and Reserve Road, replacing and connecting to the existing path. Pedestrian fencing would also be installed along the northern side of the shared user path, thus improving the safety and quality of the active transport network.

9.5 Environmental management measures

Environmental management measures relating to operational traffic and transport impacts are outlined in Table 9-11.

Table 9-11 Environmental management measures for operational traffic and transport impacts

Ref	Phase	Impact	Environmental management measure	Location
OT1	Operation	Operational traffic	A review of operational network performance will be carried out 12 months and five years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections. The assessment will be based on updated traffic data at the time and the methodology used will be comparable with that used in this assessment.	WHT/WFU
OT2	Operation	Operational traffic	Conversion of transit lanes to regular traffic lanes along Gore Hill Freeway will be considered if there is a traffic performance requirement/benefit in peak times.	WFU

WHT = Western Harbour Tunnel, WFU = Warringah Freeway Upgrade

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