Sydney Harbour Bridge Cycleway Northern Access

Traffic and Transport Impact Assessment

4 November 2022

Sydney Harbour Bridge Northern Cycleway

Traffic and Transport Impact Assessment

1/11/2022

Our Ref:

30119208

Wendy Hu

Transport Planner

Bailey Byrnes

Principal Transport Planner

Nicole Vukic

Business Leader – Transport Planning

Prepared By:
Arcadis
Level 16, 580 George Street
Sydney NSW 2000
Australia
Tel: (02) 8907 9000

Prepared For:
Transport for NSW
231 Elizabeth Street
Sydney NSW 2000
Tel: (02) 8202 2200

Version Control

Revision No.	Date Issued	Description	Author	Approver
0.1	30 March 2022	First draft	WH	NV
0.2	20 April 2022	Second draft	WH	NV
0.3	20 October 2022	Final Draft	WH/YW	BB
0.4	4 November 2022	Final	BB	NV

We acknowledge the Gadigal people of the Eora Nation as the Traditional Custodians of the Country on which our Sydney office sits. We pay our respects to Elders past, present, and emerging, and extend that respect to all First Nations people.

Contents

Tables

Figures

Acronyms and Abbreviations

Acronym	Definition
ABS	Australian Bureau of Statistics
CBD	Central Business District
CCN	Central Coast and Newcastle Line
COVID-19	Coronavirus Disease
CTMP	Construction Traffic Management Plan
DECCW	Department of Environment, Climate Change and Water
DoS	Degree of Saturation
LGA	Local Government Area
LPCTCC	Local Pedestrian, Cycling and Traffic Calming Committee
NSITP	North Sydney Integrated Transport Program
REF	Review of Environmental Factors
SHB	Sydney Harbour Bridge
TfNSW	Transport for NSW
TMC	Traffic Management Centre
TGSs	Traffic Guidance Schemes
VMS	Variable Message Boards

Executive Summary

Transport for New South Wales (Transport) is proposing to upgrade the existing cycleway connection between the Sydney Harbour Bridge Cycleway and the bike network in Milsons Point. The cycleway connection would interface with a new cycle path along Alfred Street South (the proposal).

The Sydney Harbour Bridge Cycleway provides the only cycling link between Sydney CBD and North Sydney CBD, which are the largest and third largest commercial centres respectively in NSW. It provides a vital connection between the existing Kent Street cycleway in Sydney CBD and the lower north shore. Access at the northern end of the Sydney Harbour Bridge Cycleway is currently via 55 steps that connect with Bradfield Park at Milsons Point. The steps create a bottleneck, present a safety hazard and deter people from cycling. Currently there is also limited separation of bike riders, pedestrians and motorists on Alfred Street South. The proposal focuses on clear aims to increase mode shift, reduce crashes and falls, protect heritage and open space, provide equitable access, and deliver design excellence.

The proposal aims to:

- Improve access to the Sydney Harbour Bridge Cycleway
- Achieve a high-quality urban design and heritage outcome
- Release latent capacity on the Sydney Harbour Bridge Sydney Harbour Bridge Cycleway
- Improve safety for bike riders, pedestrians and motorists
- Support future growth in bike riders travelling between the Sydney CBD and the lower north shore
- Provide a cycleway facility that sensitively fits in with the:
  - Context of the location including the potential visibility of the structure
  - Heritage values of the area
  - Architectural qualities of the Sydney Harbour Bridge.

Key features of the proposal would include:

- A design-led approach to the integration of new cycling infrastructure with its existing important open space and heritage setting
- A new elevated linear bike ramp, with deck mostly about three metres wide, and about 200 metres in length between the Sydney Harbour Bridge Cycleway and Bradfield Park North including:
  - Steel ramp structure with deck incorporating Designing with Country motifs, and balustrade with integrated lighting
  - Precast columns carefully sited within Bradfield Park North and Central
  - Provision of a bike riders rest area next to the Sydney Harbour Bridge Cycleway connection
  - A gathering space, lighting, seating and cycle path within Bradfield Park North connecting the elevated linear bike ramp and the proposed Alfred Street South cycle path
- Alfred Street South pedestrian and cycle path upgrade including:
  - New 2.5-metre-wide two-way cycle path on Alfred Street South from the ramp landing, linking to the existing bike network in Middlemiss Street. The cycle path would be located on the east side of Alfred Street South between the ramp landing and the new crossing near 110 Alfred Street South. On the west side of Alfred Street South the cycle path would be located between the new crossing and Lavender Street
  - Replacement of the existing pedestrian refuge crossing at the north end of Alfred Street South with a pedestrian and bike rider crossing located at 110 Alfred Street South and an upgrade to the pedestrian crossing at Lavender Street

- Low speed shared path and verge widening on the north side of Lavender Street
- Adjustments to the Lavender Street roundabout
- New street tree planting, shrub planting and footpath paving
- Relocation of an existing bus stop on Alfred Street South near Lavender Street about 60 metres to the south of its current location
- Permanent removal of up to 15 metered parking spaces along Alfred Street South.

The proposal, would also include, but not be limited to:

- Kerb and pavement work, and line marking
- Drainage and utility adjustments
- Street furniture adjustments
- Changes to street parking, parking meter locations and regulatory signage.
- Minor lighting upgrades to Bradfield Park North and in other locations where required to meet safe lighting standards.

This Traffic and Transport Impact Assessment Report has been developed to support the Review of Environmental Factors (REF) which provides an environmental impact assessment of the proposal. This report documents the construction and operational impacts of the proposal on the transport environment in Milsons Point.

Construction of the proposal would take around 18 months and, subject to planning approval, is expected to commence mid-2023. The construction would be completed in stages, and it is currently proposed that the ramp construction and cycle paths works would be undertaken simultaneously.

Construction impacts include:

- No significant changes to pedestrian and cycle connections, however slight diversions may be made as necessary
- Multiple temporary road closures along Alfred Street South which are anticipated to occur outside standard construction hours.
- Two-way vehicle movements would be maintained on Alfred Street South during commuter peak hours, and a temporary reduction in lane widths and travel speeds are expected during the construction period
- During the construction of the bike ramp, temporary road closures would be required to the Burton Street tunnel car park. Outside of the project footprint, Burton Street would continue unimpacted
- Temporary road closures would be required on Lavender Street and Middlemiss Streets during the installation of the pedestrian crossings.
- No changes are expected to bus routes or service frequencies. However, one bus stop on the western side of Alfred Street South would be relocated
- Trains may be impacted in the case of crane lifts adjacent to the Sydney Harbour Bridge requiring temporary rail closures and would be managed to occur on weekends and alongside trackwork possessions where possible to minimise impacts on the rail network
- 24 parking spaces along the east side, and eight car spaces and six motorbike spaces on the west side of Alfred Street South would be closed for a duration of six months during construction
- Nine car spaces and two motorbike spaces on Burton Street, within the tunnel car park, will be impacted for a duration of up to 18 months during construction.

The proposal includes changes to the road and cycle network, which would result in the following operational impacts:

- The removal of the existing pedestrian refuge on Alfred Street South and installation of a raised pedestrian and cyclists priority crossing 70 metres further south would provide safety benefits to road users due to an increased sight distance at the crossing
- The proposed raised pedestrian and cyclist priority crossing may result in queueing along Alfred Street South. Further traffic modelling is recommended to identify any adverse impacts on the connecting road network
- The adjustments to the roundabout connecting Alfred Street South and the Bradfield Highway with textured surfaces would communicate to motorists of the change in road environment, facilitating lower vehicle travel speeds
- The relocation of one bus stop on Alfred Street South would result in minimal impacts around timetabling, access, and wayfinding for public transport users
- However, the proposed configuration of the relocated bus stops on Alfred Street South may result in adverse operational impacts on the wider road traffic network, the extent of which should be assessed after traffic surveys are conducted on the road network
- The bus stop of Lavender Street opposite Cliff Street is located directly west of the proposed raised pedestrian crossing upgrade, posing potential safety issues around pedestrian visibility. This may result in the relocation of the bus stop further west
- The removal of about 15 parking spaces, which would need to be managed through consultation with key stakeholders including local businesses and the Local Pedestrian, Cycling and Traffic Calming Committee (LPCTCC)
- Both new connections linking the Sydney Harbour Bridge to Bradfield Park North, and the new crossing at Alfred Street and Lavender Street would result in a risk of collision between cyclists and pedestrians at the street level. This risk would be managed through speed management during detailed design, sight line assessment, signage and speed warnings for cyclists disembarking the ramp.

1 Introduction

1.1 Proposal background

Transport for NSW (Transport) is proposing to upgrade the existing cycleway connection between the Sydney Harbour Bridge Cycleway and the bike network in Milsons Point. The cycleway connection would interface with a new cycle path along Alfred Street South (the proposal).

The proposal is located on Cammeraygal land and is in Milsons Point, within the North Sydney Local Government Area (LGA). The proposal is bounded by Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the south and Alfred Street South to the west.

The proposal would consist of an approximately three-metre-wide elevated linear bike ramp that extends approximately 200 metres from Bradfield Park North, near Burton Street, interfacing with the Sydney Harbour Bridge Cycleway south of the existing stair access. The ramp would connect to a new cycle path which would extend along the east side of Alfred Street South, between Middlemiss Street and Burton Street, and include a new street crossing on Alfred Street South. The two-way cycle path would be 2.5 metres wide and connect to the existing bike network in Milsons Point.

The proposal aims to:

- Improve access to the Sydney Harbour Bridge Cycleway
- Achieve a high-quality urban design and heritage outcome
- Release latent capacity on the Sydney Harbour Bridge Cycleway
- Improve safety for bike riders, pedestrians and motorists
- Support future growth in bike riders travelling between the Sydney CBD and the lower north shore
- Provide a cycleway facility that sensitively fits in with the:
  - Context of the location including the potential visibility of the structure
  - Heritage values of the area
  - Architectural qualities of the Sydney Harbour Bridge.

The proposal would connect the existing shared paths around Milsons Point Station to the existing Sydney Harbour Bridge Cycleway on the western side of the Sydney Harbour Bridge to improve accessibility and connection between the Sydney Central Business District (CBD) and the lower north shore.

The study area includes Lavender Street, Alfred Street South, Burton Street, Middlemiss Street, the Bradfield Highway and Bradfield Park North. The extent of the proposal is indicated in Figure 1-1.

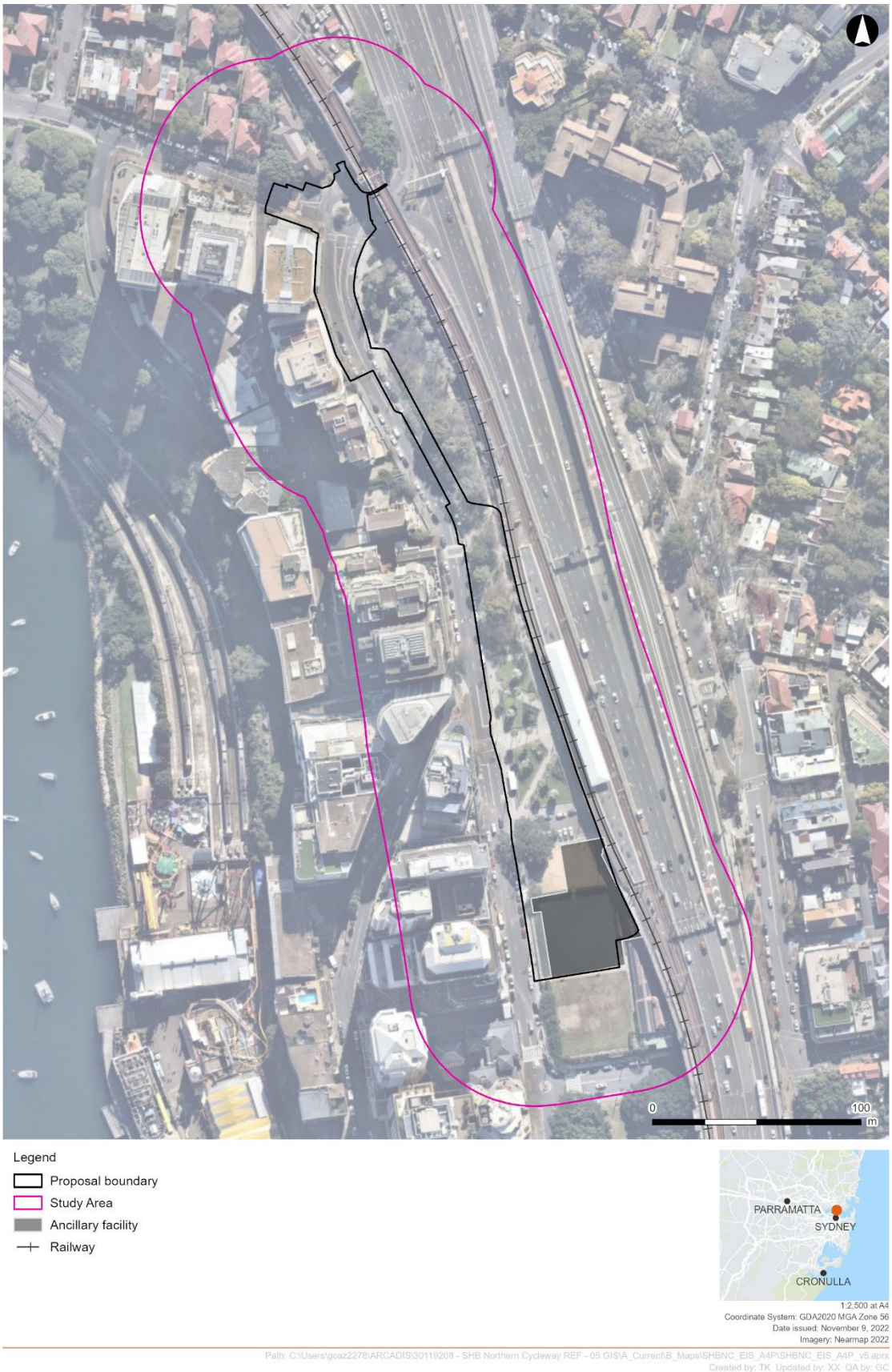

Figure 1-1 Proposed study area and proposal footprint

1.2 Purpose of this report

This Traffic and Transport Impact Assessment Report has been developed to support the Review of Environmental Factors (REF) which provides an environmental impact assessment of the proposal.

The purpose of this report is to:

- Review available documentation, plans, cyclist modelling and growth forecasts relating to the proposal
- Identify existing pedestrian and cycling facilities, traffic and parking conditions surround the proposal
- Assess the potential construction impact of the proposal during all stages of construction
- Assess the potential operational impact of the proposal
- Identify the issues and potential mitigation measures.

2 Existing conditions

2.1 Land use

Figure 2-1 shows the land use zoning around the study area. The area is generally surrounded by mixed use development consisting of the following:

- Commercial operations and residential premises at the west
- Public recreational facilities including Bradfield Park at the east and south
- Luna Park theme park near Lavender Bay
- Milsons Point Station located east of the study area
- Residential land uses and a neighbourhood centre east of the station.

These land uses are generally considered to be high intensity in terms of cycling demand generation. Cycling serves the short trips that people make around centres and local areas.

Figure 2-1 Land zoning of study area (source: North Sydney Council LGA interactive maps)

2.2 Journey to Work and mode of travel

A Journey to Work analysis has been conducted of the catchment surrounding the study area using publicly available data collected during the 2016 and 2021 Censuses, sourced from the Australian Bureau of Statistics (ABS) Census TableBuilder.

Figure 2-2 shows the extent of the travel catchment around the study area the Journey to Work Analysis was carried out.

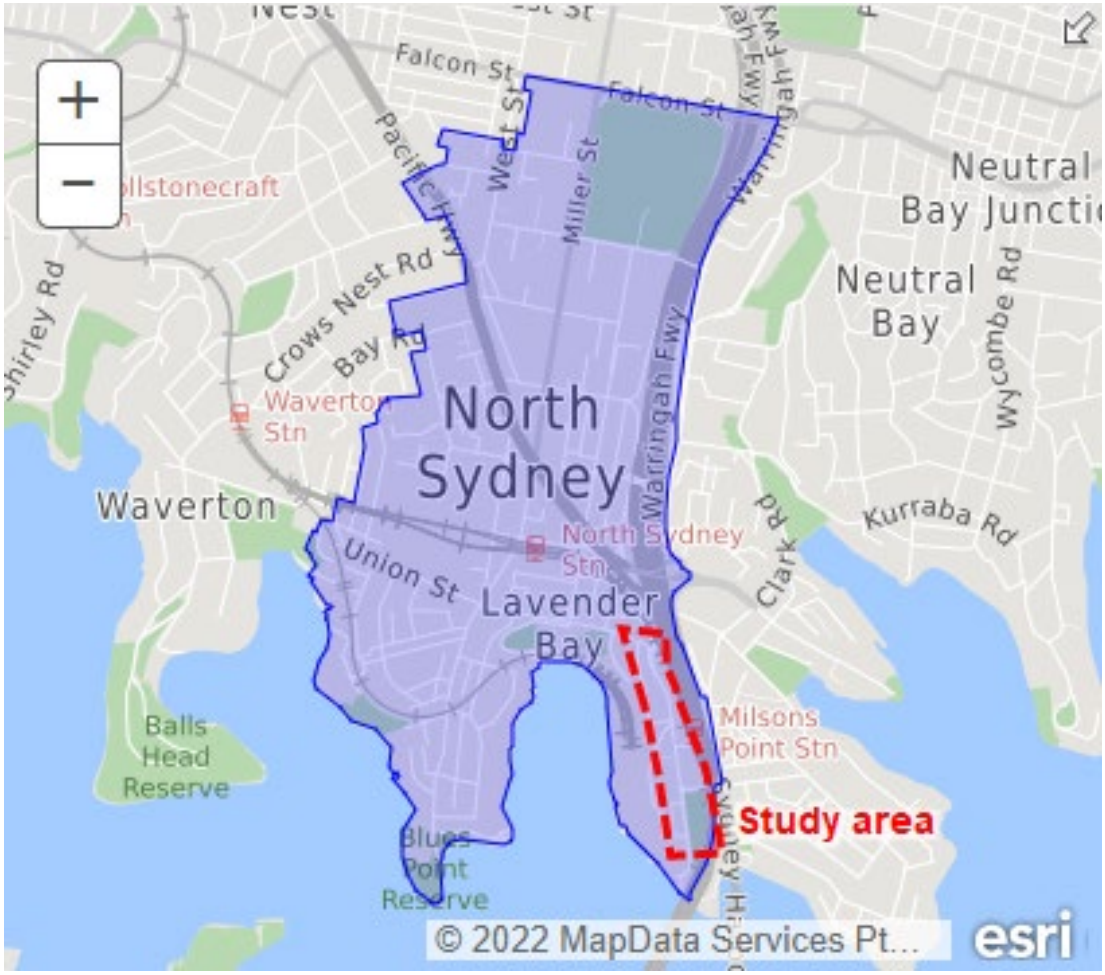

Figure 2-2 Assessed travel catchment around the study area (source: ABS Census Data)

2.2.1 Key employment locations of residents

Analysis based on 2021 data shows that 36 per cent of residents both live and work within the North Sydney LGA, and 42 per cent travel to Sydney City and the Inner South such as Botany and Marrickville for employment.

Table 2-1 shows the key employment locations of the residents of the travel catchment depicted in Figure 2-2.

Table 2-1 Key employment locations of catchment residents

Place of work (SA4)	Number of employees	Percentage of employees
Sydney City and Inner South	3,226	42%
North Sydney and Hornsby	2,745	36%
Ryde	337	4%
Sydney Eastern suburbs	170	2%
Parramatta	208	2%
Sydney Inner West	134	2%
Northern Beaches	162	2%
Others	540	7%
Total	**75,22**	**100%**

Source: ABS Census Data, 2021

The primary mode of transport to work for residents of North Sydney is via public transport such as train or bus, accounting for 5 per cent of all trips. Travel via private vehicle account for 9 per cent, followed by active transport modes such as cycling or walking at 4 per cent. It is recognised that during 2021 Census, the COVID19 pandemic substantially impacted existing travel patterns, with 42 per cent of residents recorded as working from home.

To demonstrate both pre- and post- COVID travel patterns, Table 2-2 shows the modal split of work trips from the travel catchment, based on both 2016 and 2021 Census data, within the travel catchment depicted in Figure 2-2.

Table 2-2 Modal split of work trips from catchment

Transport mode	Number of employees	Percentage of employees	Number of employees	Percentage of employees
	2016 Census data		2021 Census data	
Public transport	2,788	43%	567	5%
Vehicle	1,633	25%	1,164	9%
Active transport	1,127	18%	469	4%
Other mode	60	1%	37	0.2%
Worked at home or did not go to work	777	12%	5,335	42%
Mode not stated	31	1%	20	0.1%
Total	**6,416**	**100%**	**12,441**	**100%**

Source: ABS Census Data, 2016 and 2021

2.2.2 Key residential location of employees

Analysis based on 2021 data shows that 24 per cent of those who work within the catchment also live within North Sydney, followed by 10 per cent travelling from Sydney City and Inner South and eight per cent from Northern Beaches.

Table 2-3 shows the residential locations of the employees working within the travel catchment depicted in Figure 2-2.

Table 2-3 Key residential locations of catchment employees

Place of residence (SA4)	Number of employees	Percentage of employees
North Sydney and Hornsby	12,843	24%
Sydney City and Inner South	5,257	10%
Northern Beaches	4,343	8%
Sydney Inner West	4,131	7%
Sydney Inner South West	3,673	8%
Parramatta	4,339	6%
Sydney Eastern suburbs	3,131	6%
Others	16,597	31%
Total	**54,314**	**100%**

Source: ABS Census Data, 2021

As mentioned above, the COVID-19 pandemic impacted travel patterns recorded during the 2021 Census. Based on the 2016 Census data, the primary mode of transport for work commuters to North Sydney was by public transport, such as train or bus, accounting for 58 per cent of all trips. Private vehicle travel accounts for 26 per cent and active transport for six per cent of trips.

Table 2-4 shows both 2016 and 2021 modal split of work trips to the travel catchment depicted in Figure 2-2.

Table 2-4 Modal split of work trips to catchment

Transport mode	Number of employees	Percentage of employees	Number of employees	Percentage of employees
	2016 Census data		2021 Census data	
Public transport	28,487	58%	3,659	6%
Private Vehicle	12,956	26%	5,111	9%
Active transport	3,043	6%	839	1%
Other mode	215	1%	182	0.3%
Worked at home or did not go to work	3897	8%	46,498	82%
Mode not stated	378	1%	198	0.3%
Total	**48,976**	**100%**	**56,482**	**100%**

Source: ABS Census Data, 2016 and 2021

2.3 Cycling facilities

Figure 2-3 indicates the existing cycle network in the study area.

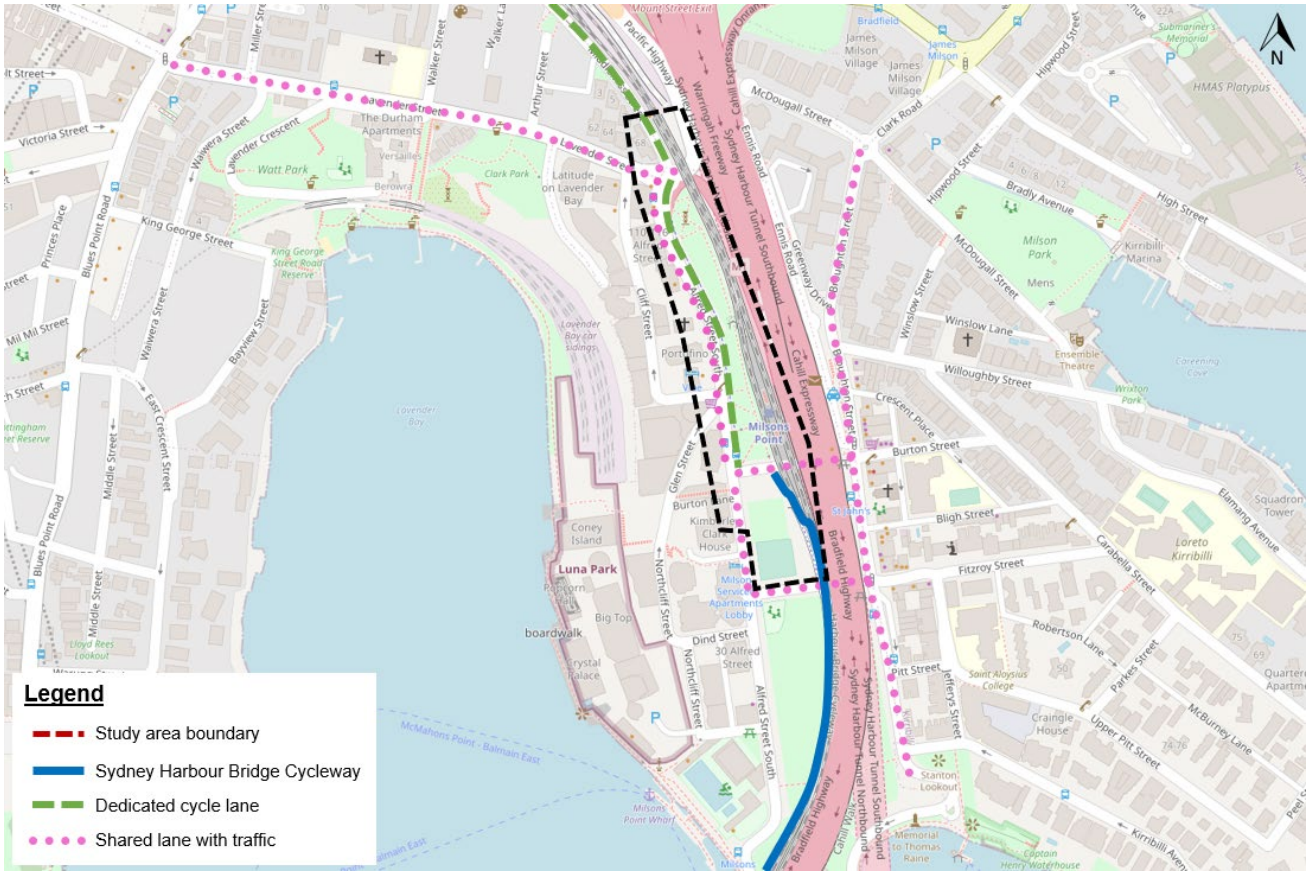

Figure 2-3 Existing cycle network within study area

The Sydney Harbour Bridge Cycleway is a two-way bicycle path separated from motor vehicle traffic, located on the western side of the Sydney Harbour Bridge. The cycleway is used by cyclists to travel between the Sydney CBD and the North Shore. The northern side of the cycleway is accessed by 55 steps that connect to Bradfield Park at Milsons Point. Cyclists need to disembark to travel between the street level and the Sydney Harbour Bridge cycleway.

An off-road pedestrian and cyclist shared path are currently provided on the eastern side of Alfred Street South, between Lavender Street and Burton Street. The vehicle lanes on the road are also marked to be shared with cyclists, as shown in Figure 2-4.

Middlemiss Street is a southbound one-way street for vehicles. Cyclists travelling in the southbound direction would share the lane with vehicles, while cyclists travelling in the northbound direction are provided with a contraflow bicycle lane on the road.

Cyclists travelling between Middlemiss Street and Alfred Street South have been observed during the site visit to either use the pedestrian crossing on Lavender Street or cycle through the roundabout, which provides the most direct route between the two streets.

Figure 2-4 Alfred Street South shared path and on-road shared lane

Bicycle parking racks are available at the Milsons Point Station along Alfred Street South as shown in Figure 2-5.

Figure 2-5 Bicycle parking racks at Milsons Point Station

2.4 Cycling demand

As reflected by the Northern Sydney Cycling Guide and Map created by North Sydney Council (refer to Figure 2-6) Lavender Street and Alfred Street South, within the study area, are part of current high bicycle use routes. The proposal connects the study area with the established Sydney Harbour Bridge cycleway, which constitutes the only eastern cross-harbour cycle route and is a critical link in the metropolitan Sydney regional bicycle network. As the access point to the cycleway is located within the study area on Burton Street, high cycling demand is expected in the study area.

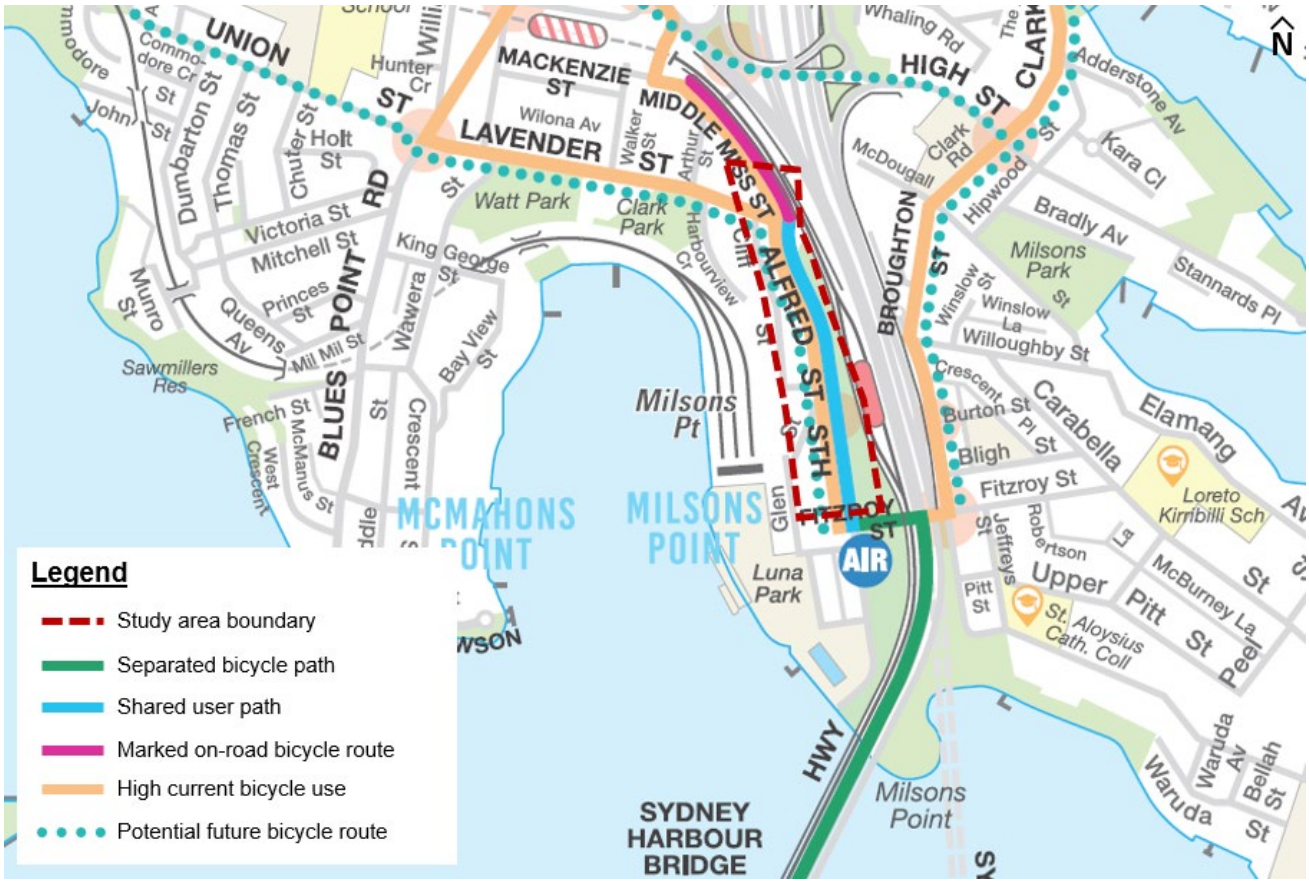

Figure 2-6 Northern Sydney Cycling Guide and Map (Source: North Sydney Council's Cycling Map)

Daily and hourly cyclist counts collected in 2017 at the Sydney Harbour Bridge cycleway near Upper Fort Street in The Rocks were provided by Transport for NSW for the purpose of this study.

Table 2-5 summarises the average cycling trips per direction. The data indicates that around 2000 bicycle trips are taken across the Sydney Harbour Bridge cycleway every weekday, with highest cyclist demand recorded from 7am to 8am in the morning and from 4pm to 5pm in the afternoon. When also considering weekend movements, a weekly daily average of about 1700 bicycle trips are taken.

Table 2-5 2017 average cyclist counts on Sydney Harbour Bridge cycleway

Direction	Northbound	Southbound	Two-way
7-day daily average	818 per day	888 per day	1707 per day
5-day weekday daily average	960 per day	1052 per day	2012 per day
Weekday AM peak average (7am – 8am)	116 per hour	286 per hour	402 per hour
Weekday PM peak average (4pm – 5pm)	248 per hour	99 per hour	347 per hour

Additional cycle counts to identify existing rider route choice (through park/shared path/road) have been collected on Thursday 10 March 2022 within the vicinity of the Sydney Harbour Bridge cycleway and Milsons Point Station. The counts were collected for eight locations as specified in Figure 2-7. The morning and afternoon peak hours were found to be from 7.30am to 8.30am and from 5.45pm to 6.45pm. Table 2-6 specifies the daily and peak hour volumes.

The data gathered from cyclist surveys conducted on the footpaths around Milsons Point Station indicates that the highest volumes were recorded in the pathway leading to Milsons Point Station from the cycleway, and along the Alfred Street South shared path. Some factors that would contribute to the differences between these volumes and the Sydney Harbour Bridge cycleway volumes recorded in 2017 should be noted, including:

- The volumes on the Sydney Harbour Bridge cycleway were recorded south of the bridge, near Upper Fort Street in The Rocks rather than in the walkways of Milsons Point
- Cyclist surveys of the road were not conducted, and the demand contributed by cyclists who prefer to cycle along Alfred Street South due to its more direct connection through to Lavender Street and Middlemiss Street were not recorded
- In 2022, less demand may be expected on the network transport overall when compared to 2017 due to ongoing COVID-19 impacts on travel patterns, as people continue to work from home
- The high amount of rainfall during the first few months of the year has resulted in fewer people looking to active transport as a reliable mode of transport, with 2022 being the wettest year on record for year-to-April rainfall totals.

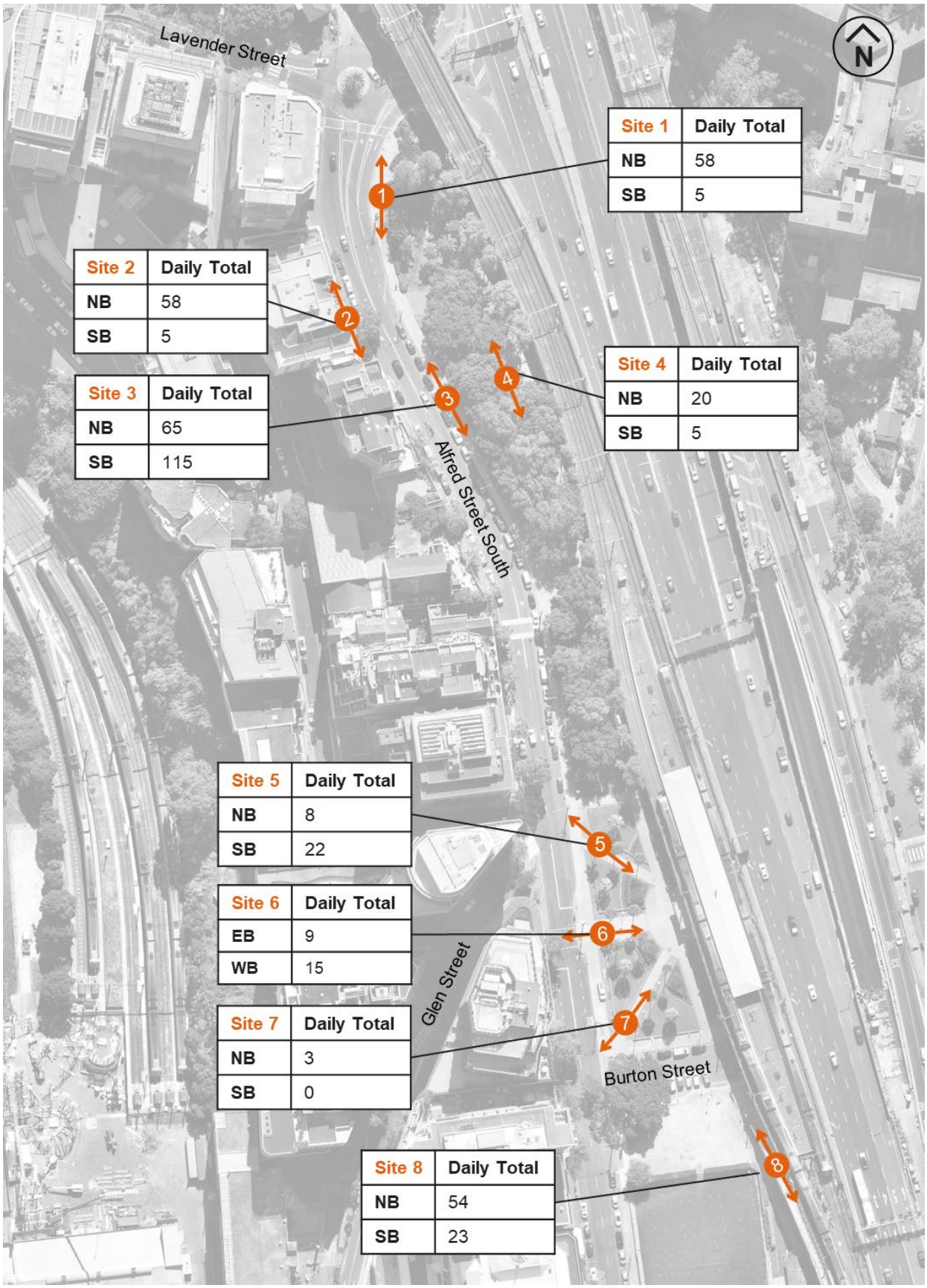

Figure 2-7 2022 Cyclist count locations

Table 2-6 2022 Cycling counts near Sydney Harbour Bridge cycleway

ID	Site Location	Direction	Cyclist Volumes		
			AM Peak (7:30am – 8:30am)	PM Peak (5:45pm – 6:45pm)	Survey Total (6am – 7pm)
1	Alfred Street South, east side south of roundabout	Northbound	13	10	58
		Southbound	0	0	5
2	Alfred Street South, west side near bus stop	Northbound	0	1	4
		Southbound	0	0	7
3	Alfred Street South, east side opposite #102	Northbound	17	19	65
		Southbound	48	10	115
4	Bradfield Park North, pathway adjacent to rail corridor	Northbound	1	3	20
		Southbound	0	0	5
5	Milsons Point Station, towards Glen Street	Eastbound	2	0	8
		Westbound	2	3	22
6	Milsons Point Station, towards Pedestrian Signals	Eastbound	3	2	9
		Westbound	3	2	15
7	Milsons Point Station, towards Burton St	Northbound	0	1	3
		Southbound	0	0	0
8	Sydney Harbour Bridge Cycleway	Northbound	4	8	54
		Southbound	6	2	23

2.5 Pedestrian facilities

Pedestrian footpaths are provided along both sides of all the roads within the study area, as well as the following road crossings:

- Raised pedestrian crossing on Lavender Street
- Two-stage pedestrian refuge on Alfred Street South near Lavender Street
- Traffic signals on Alfred Street South.

Figure 2-8 indicates the locations of the pedestrian crossings within the study area.

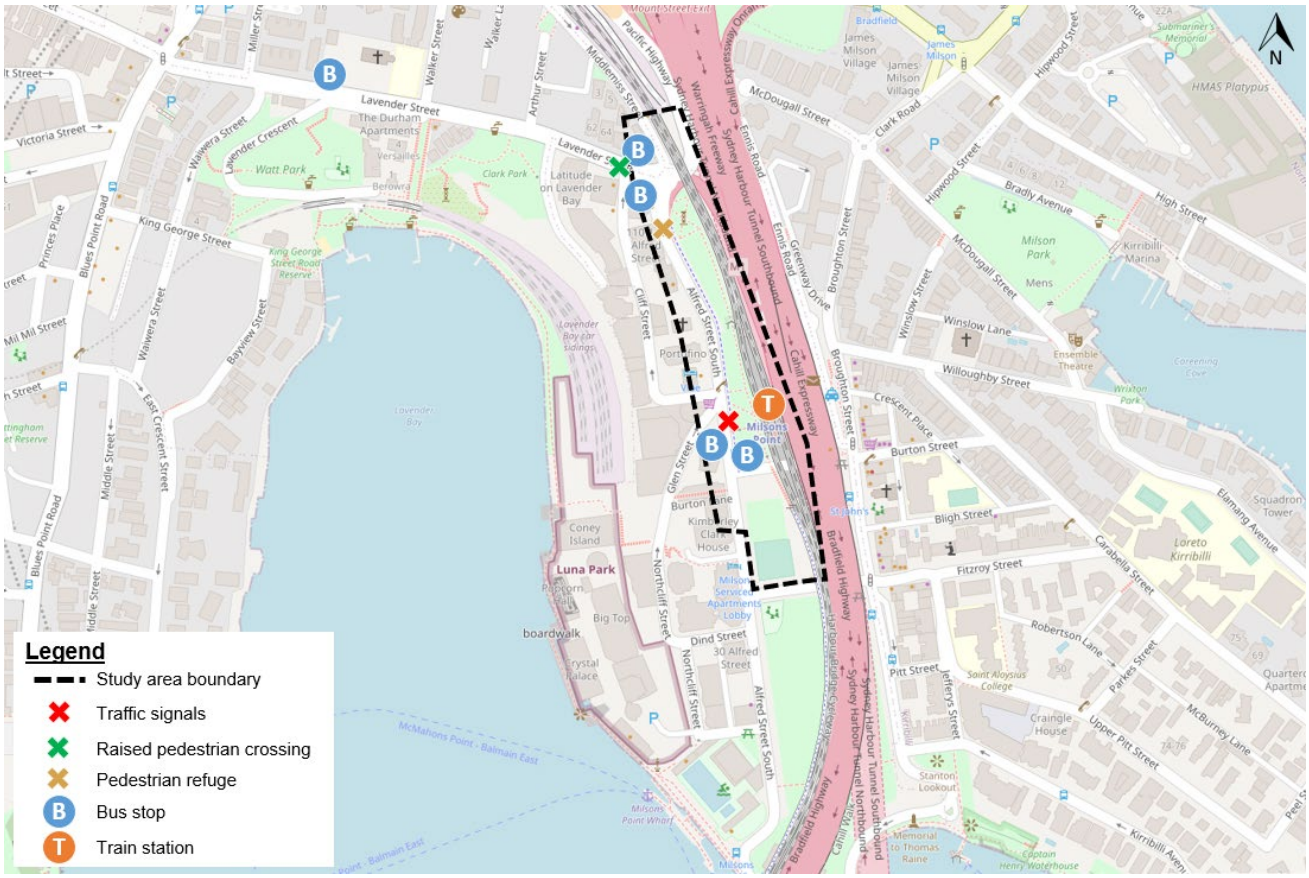

Figure 2-8 Pedestrian crossings within the study area

The two-stage pedestrian refuge on Alfred Street South near Lavender Street is proposed to be replaced by a raised pedestrian and cyclist priority crossing 70 metres further south as part of the cycleway upgrade works to improve the safety of the connection. The current crossing point consists of two pedestrian refuges, one of which crosses a slip lane that is used by motorists turning off the Bradfield Highway, a road with a posted speed limit of 70 kilometres per hour. This pedestrian refuge is non-compliant with the current standards, with insufficient width to allow safe storage of a bicycle or pram.

Figure 2-9 Existing pedestrian refuges at the north end of Alfred Street South

A walkway is provided at the eastern side of the Sydney Harbour Bridge for pedestrians to walk across the bridge from The Rocks to Milsons Point. Pedestrians can access the bridge via the stairs or elevator located on Cumberland Street for the southern side of the bridge, or via the stairs and elevator located on Broughton Street for the northern side of the bridge.

2.6 Pedestrian demand

Pedestrian counts were collected on Thursday 10 March 2022 for seven locations. Counts were taken from 6am to 7pm. These locations are illustrated in Table 2-7. The morning and afternoon peaks were determined to be 7.45am to 8.45am and 5.15pm to 6.15pm respectively. Table 2-7 specifies the daily weekday volumes and peak hour volumes.

The data indicates a high level of pedestrian movement within the area, which can be attributed to its close proximity to Milsons Point Station. However, whilst the data indicate that there are significantly higher pedestrian counts compared to cyclist counts, the pedestrian demand is not expected to increase as residential/commercial growth is not forecasted for the immediate area.

Table 2-7 2022 Pedestrian volumes near Sydney Harbour Bridge Cycleway

ID	Site Location	Direction	Cyclist Volumes		
			AM Peak (7:45am – 8:45am)	PM Peak (5:15pm – 6:15pm)	Survey Total (6am – 7pm)
1	Alfred Street South, east side south of roundabout	Northbound	85	70	590
		Southbound	87	90	749
2	Alfred Street South, west side near bus stop	Northbound	115	159	1257
		Southbound	135	131	1231
3	Alfred Street South, east side opposite #102	Northbound	63	94	657
		Southbound	67	88	667
4	Bradfield Park North, pathway adjacent to rail corridor	Northbound	45	36	410
		Southbound	84	41	513
5	Milsons Point Station, towards Glen Street	Eastbound	68	66	534
		Westbound	26	70	427
6	Milsons Point Station, towards Pedestrian Signals	Eastbound	175	141	1244
		Westbound	129	131	1138
7	Milsons Point Station, towards Burton St	Northbound	56	78	522
		Southbound	47	54	457

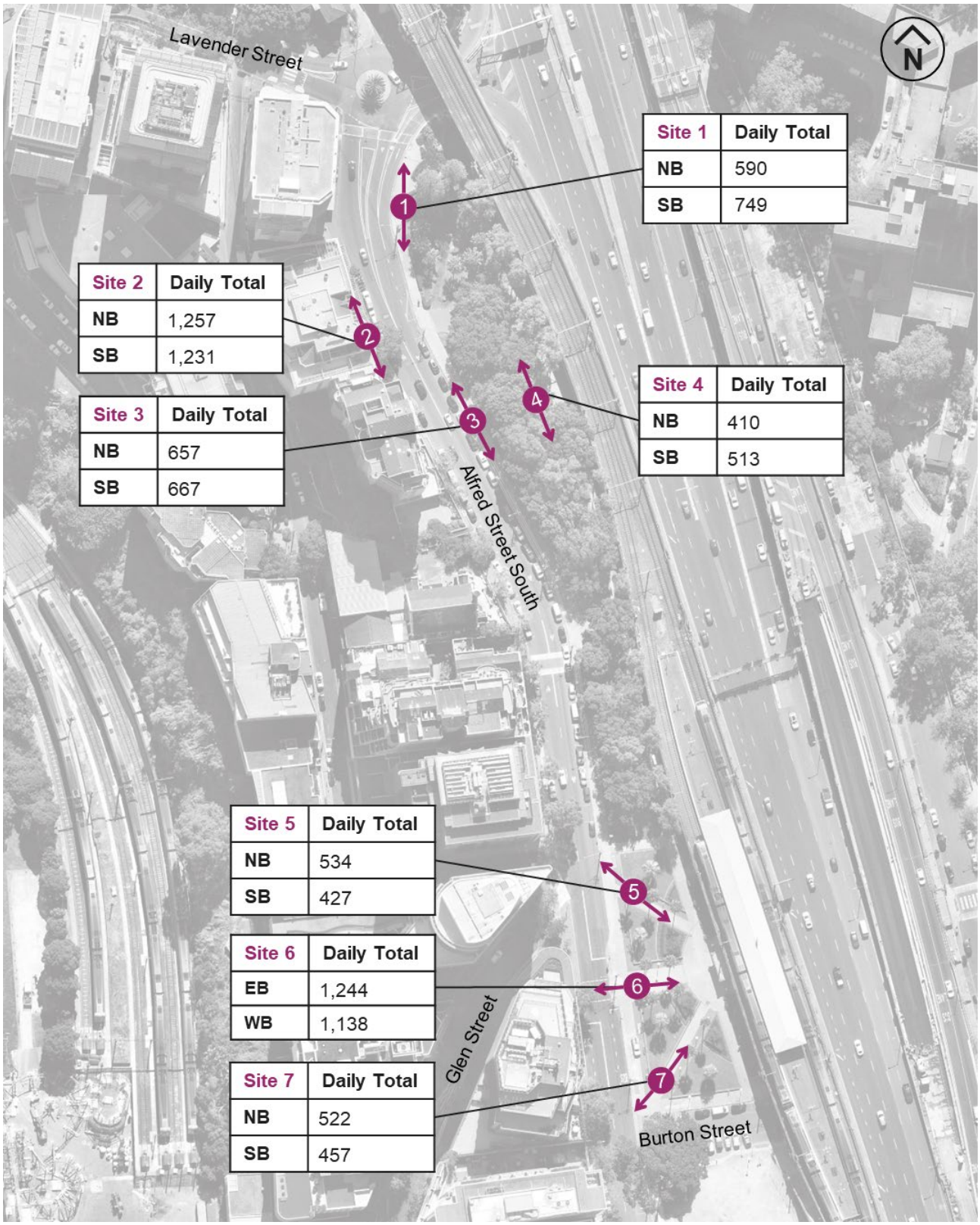

Figure 2-10 Pedestrian count locations

2.7 Motorist parking facilities

There are no commuter parking spaces provided at Milsons Point Station. Metered on-street parking is available nearby in the form of 90-degree angle and parallel parking spaces, provided at the end of Alfred Street South. These parking spaces are restricted to two hours within various time periods and are expected to be used by visitors of the town centre, Luna Park, North Sydney Olympic Pool, and Bradfield Park.

Lavender Street, Alfred Street South, Burton Street and Fitzroy Street have kerbside parking available with various parking restrictions up to four hours. Dedicated all day free parking spaces are provided for motor bikes.

During the period from 8.30am to 6pm, the section of Alfred Street South directly north of the traffic signals outside Milsons Point Station is designated as a No Parking zone, which allows vehicles to stop for up to two minutes provided the driver remains with the vehicle. This area is expected to be used by commuters as a pick-up and drop-off zone.

Table 2-8 summarised the details of existing on-street car parking along Alfred Street South between Lavender Street and Fitzroy Street.

Table 2-8 On-street car parking along Alfred Street South

Side of the street	Parking restrictions	Number of spaces
Eastern	2P restriction 8:30am – midnight (Monday to Saturday) 11am – midnight (Sunday and public holidays)	24
	2P restriction 8:30am – midnight (all days)	17
Western	2P restriction 8:30am – midnight (Monday to Saturday) 11am – midnight (Sunday and public holidays)	10
	½ P restriction 8:30am – 6pm (Monday to Friday) Permit holders excepted Accessible parking – 10am – 1pm (Saturday to Sunday)	3
	½ P restriction 8:30am – 6pm (Monday to Friday) 11am – 6pm (Saturday to Sunday and public holidays) 2P restriction 6pm – midnight (all days)	9
	2P restriction 8:30am – midnight (All days)	10
	Total number of car parking spaces	**73**

2.8 Public transport

2.8.1 Rail

Milsons Point Station is located near the intersection of Alfred Street South and Burton Street. The station has two platforms which are serviced by three lines including T1 North Shore and Western Line, T9 Northern Line and the CCN Central Coast and Newcastle Line.

Table 2-9 shows the frequency of rail services stopping at Milsons Point Station.

Table 2-9 Train services at Milsons Point Station

Rail service	Direction	Number of services in weekday AM peak (6:30am-10am)	Number of services in weekday PM peak (3pm-7pm)
T1 North Shore Line	Berowra to City via Gordon	53	64
	City to Berowra via Gordon	56	59
T1 Western Line	Emu Plains or Richmond to City	42	43
	City to Emu Plains or Richmond	37	48
T9 Northern Line	Hornsby to North Shore via City	14	16
	North Shore to Hornsby via City	16	16
CCN Central Coast and Newcastle Line	Newcastle Interchange to Central via Strathfield or Gordon	6	-
	Central to Newcastle Interchange via Strathfield or Gordon	-	6
	Total Northbound Services	107	129
	Total Southbound Services	117	123
	Total Services	**224**	**252**

Source: Transport for NSW trains lines timetable

2.8.2 Bus

There are four bus stops within the study area, located along Lavender Street and Alfred Street South and servicing public bus routes. These bus services provide connections to several town centres including train stations across Greater Sydney. The bus services are detailed in Table 2-10 and the locations of these bus stops are shown in Figure 2-8.

Table 2-10 Bus services within the study area

Bus Stop	Bus services
Lavender Street opposite Cliff Street (Stop ID: 206058)	Routes 150X, 154X, 209, 228, 229, 230, 286, 287 and 622
Alfred Street at Lavender Street (Stop ID: 206128)	Routes 150X, 154X, 203, 209, 228, 229, 230, 269, 286 and 287
Alfred Street South opposite Milsons Point Station (Stop ID: 206121)	Routes 150X, 154X, 203, 209, 228, 229, 230, 569, 286, 287 and 622
Milsons Point Station, Alfred Street South (Stop ID: 206123)	Routes 150X, 154X, 209, 228, 229, 230, 286, 287

Source: Google Maps

2.8.2.1 School bus routes

These four bus stops are currently serviced by several school bus routes operated by Busways Northwest and Keolis Downer Northern Beaches. The majority of these school bus routes run one service a day. Whilst these stops are contained within the bus routes, school services are subject to change without notice. The routes are specified in Table 2-11.

Table 2-11 School bus services within study area

Bus Stop	Bus services
Lavender Street opposite Cliff Street (Stop ID: 206058)	Routes: 587n, 589n, 594n, 681w, 707n, 773w, 774w, 775w
Alfred Street at Lavender Street (Stop ID: 206128)	Routes: 589n, 681w, 765n
Alfred Street South opposite Milsons Point Station (Stop ID: 206121)	Routes: 568n, 569n, 589n, 617n, 648w, 665w, 673w, 681w, 707n, 708n, 710n, 711n, 760n, 761n, 763n, 764n, 765n, 769n, 770w, 772w, 776w, 778w
Milsons Point Station, Alfred Street South (Stop ID: 206123)	Routes: 587n, 589n, 594n, 681w, 707n, 773w, 774w, 775w

Source: Transport for NSW trip planner

2.8.3 Ferry

Milsons Point Wharf is located south of the study area, about 400 metres from Milsons Point Station. Table 2-12 shows the frequency of ferry services stopping at Milsons Point Wharf.

Table 2-12 Ferry services at Milsons Point Wharf

Ferry service	Direction	Number of services in weekday AM peak (6:30am-10am)	Number of services in weekday PM peak (3pm-7pm)
F3 Parramatta River	Circular Quay to Parramatta River	-	12
	Parramatta River to Circular Quay	10	-
F4 Pyrmont Bay	Circular Quay to Pyrmont Bay	7	10
	Pyrmont Bay to Circular Quay	9	11

Source: Transport for NSW ferry service timetable

2.9 Road network

Figure 2-11 outlines the surrounding road network of the study area.

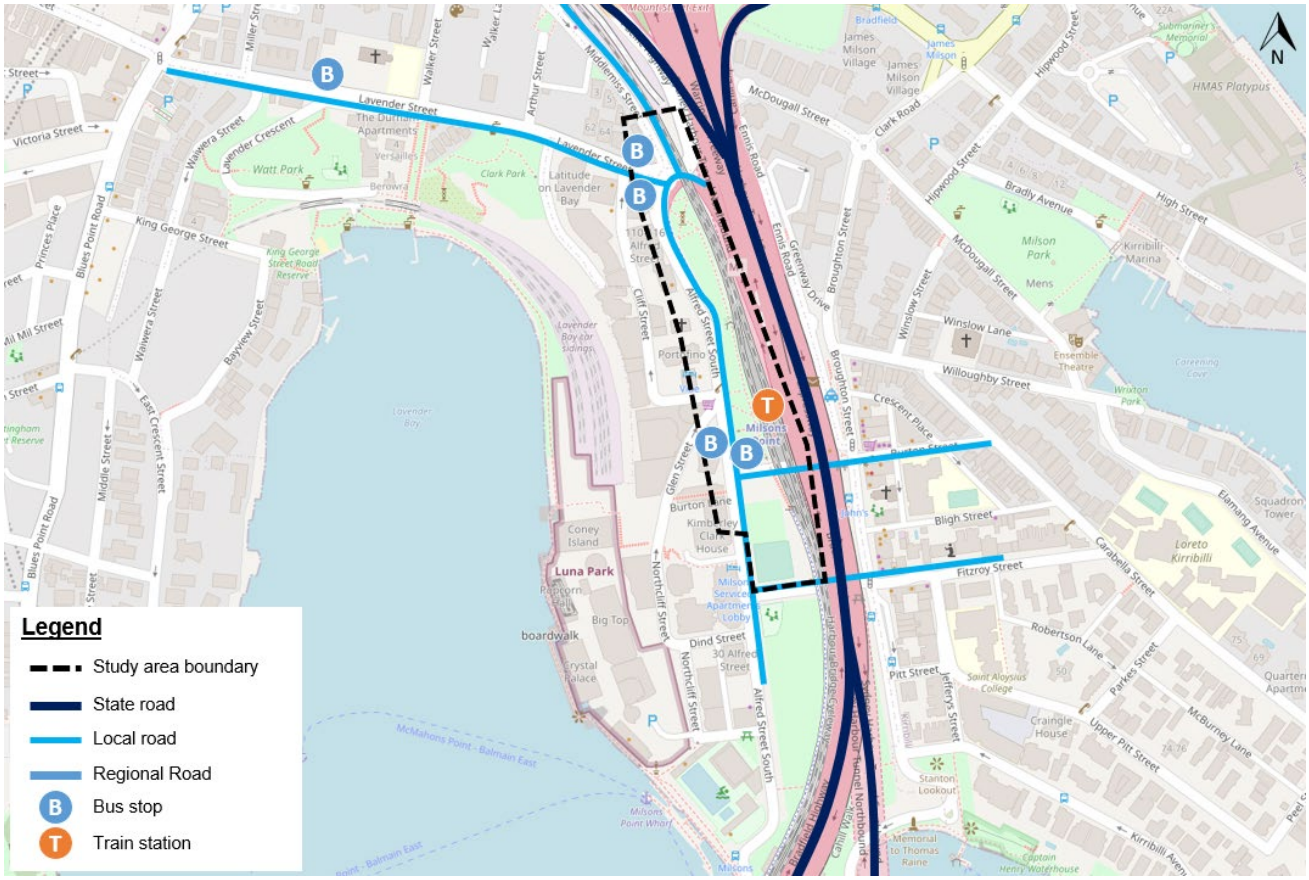

Figure 2-11 Proposal area road network (in accordance with Transport for NSW Schedule of Classified Roads and Unclassified Regional Roads)

Bradfield Highway

Bradfield Highway is a state highway, which connects the Sydney CBD with North Sydney via the Sydney Harbour Bridge. There are a total of eight lanes of traffic including one bus lane, two permanent northbound lanes, one permanent southbound lane, and four interchangeable lanes. The direction of these lanes changes

during the peak hour to accommodate for ‘reversible’ lane management system (Tidal Flow) arrangements and are indicated by the electronic signage above each lane. To the west of the Bradfield Highway there is a two-way cycleway running parallel to two railway lines, separated from motor vehicle traffic. On the opposing eastern side of the Bradfield Highway there a pedestrian walkway. The highway has a variable speed limit with a posted speed limit of 70 kilometres per hour in the event the sign is blacked out.

Alfred Street South

Alfred Street South is a two-lane and two-way street that is classified as a local road and extends from Lavender Street in the north to Olympic Drive in the south. Within the study area, it has a posted speed limit of 40 kilometres per hour and designated a high pedestrian activity area. There are pedestrian footpaths on both sides of the street, including a shared path with cyclists on the eastern side. An additional footpath passes through Bradfield Park North. The vehicle lanes on Alfred Street South are marked to as shared with cyclists.

There are two locations along Alfred Street South between Lavender Street and Burton Street that allow for formal pedestrian crossing point. One consists of traffic signals in front of Milsons Point Station and the other, a two-stage pedestrian refuge located south of Lavender Street. One of the pedestrian refuges crosses the slip lane used by vehicles exiting the Bradfield Highway.

There are two pavement marked bus zones in front of the Milsons Point Station and a bus stop at the north of the street. On-street car parking spaces are provided on both sides of the street, with various parking restrictions.

Lavender Street

Lavender Street is a two-lane and two-way street that is classified as a local road and extends from Union Street to Alfred Street South at the roundabout. It has a posted speed limit of 50 kilometres per hour and is the key pedestrian route connecting Milsons Point with North Sydney. There are pedestrian footpaths on both sides of the street. A signalised pedestrian crossing is provided at the western end of Lavender Street outside of the study area, and two zebra crossings are provided near Walker Street and at the Alfred Street South roundabout.

There are two bus stops located along the street. On-street car parking is provided on the northern side of the street, and a few parking spaces provided on the southern side in front of 55 Lavender Street. As there are no dedicated cycle lanes and cyclists on Lavender Street share the road with vehicles.

Burton Street

Burton Street is classified as a local road and connects Alfred Street South with Broughton Street via an underpass. However, as it is not a through road for motor vehicles, only pedestrians and cyclists can pass through. Multiple car parking spaces are provided in the underpass with various parking restrictions, accessed through Alfred Street South, referred to as the ‘Burton Steet tunnel car park’. Burton Street provides direct access to the Sydney Harbour Bridge cycleway via bridge stairs, and the underpass allows pedestrians to access the Sydney Harbour Bridge Cahill Walk at Broughton Street.

Fitzroy Street

Fitzroy Street is a two-lane and two-way street that is classified as a local road and connects with Alfred Street South and Carabella Street via an underpass. It has a posted speed limit of 40 kilometres per hour. On-street car parking spaces are provided both sides of the street with various parking restrictions. There is a bus zone that operates 2:30pm to 4:30pm from Monday to Friday only at the western end of Fitzroy Street.

2.10 Crash history

This assessment is based on crash data available on the Transport for NSW interactive crash and casualty statistics report, for a five-year period between 2016 and 2020. Twelve crashes were recorded within the study area along Alfred Street South, between Lavender Street and Fitzroy Street. Figure 2-12 shows the location and severity of crashes within the study area.

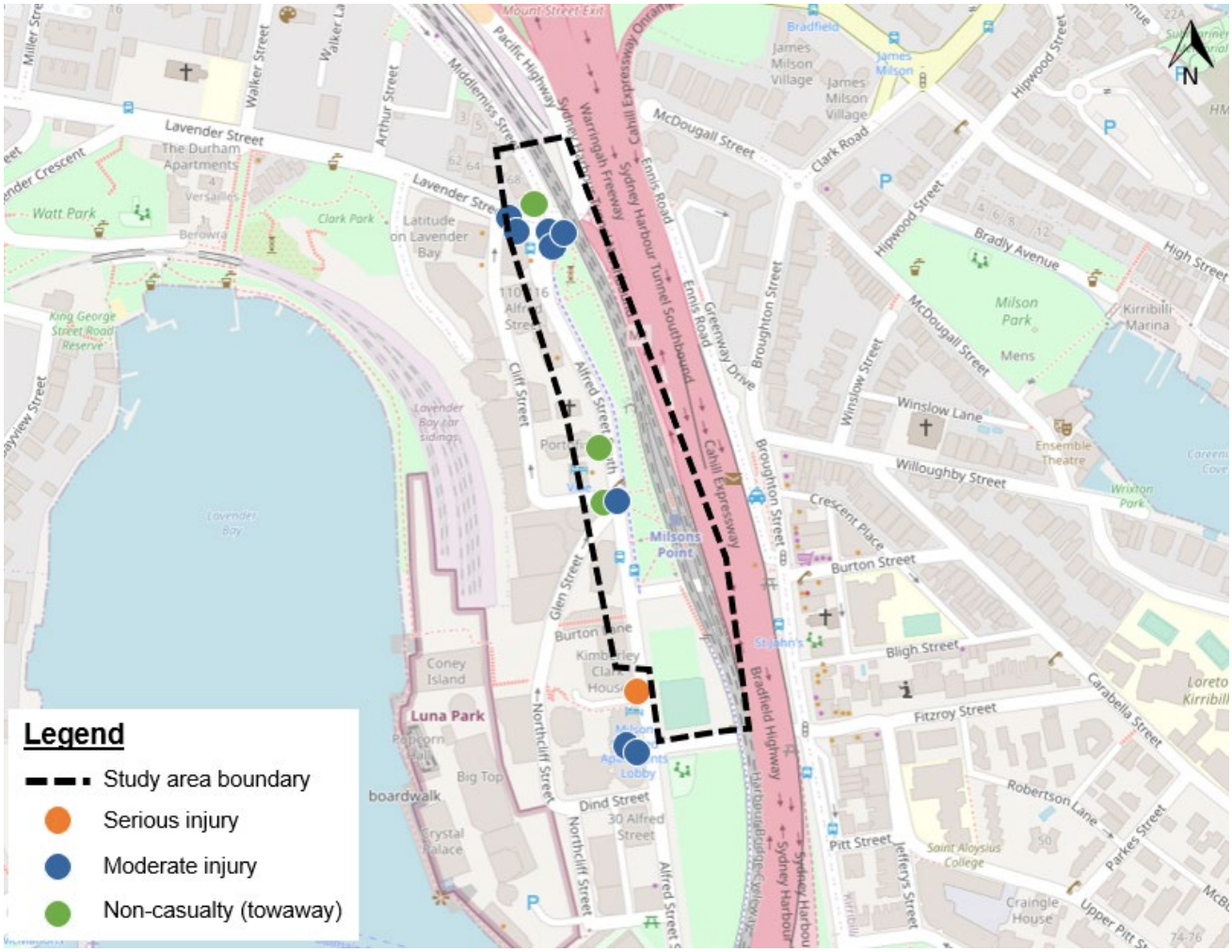

Figure 2-12 Crash map of the study area

Of these 12 crashes, eight crashes occurred at roundabouts, with the Lavender Street/ Alfred Street South roundabout recording the highest number of crashes. One recorded crash involved a pedestrian that resulted in serious injury, and eight crashes were resulted in moderate injury.

3 The proposal

Transport proposes to upgrade the existing cycleway connection between the Sydney Harbour Bridge cycleway and the cycle network in Milsons Point.

- A design-led approach to the integration of new cycling infrastructure with its existing significant open space and heritage setting
- A new elevated linear bike ramp, with deck about three metres wide and about 200 metres in length between the Sydney Harbour Bridge Cycleway and Bradfield Park North including:
  - Steel ramp structure with deck incorporating Designing with Country motifs, and balustrade with integrated lighting
  - Precast columns carefully sited within Bradfield Park North and Central
  - Provision of a bike riders rest area next to the Sydney Harbour Bridge Cycleway connection
  - A gathering space , lighting and cycle path within Bradfield Park North connecting the elevated linear bike ramp and the proposed Alfred Street South cycle path
- Alfred Street South pedestrian and cycle path upgrade including:
  - New 2.5-metre-wide two-way cycle path on Alfred Street South from the ramp landing, linking to the existing bike network in Middlemiss Street. The cycle path would be located on the east side of Alfred Street South between the ramp landing and the new street crossing at 110 Alfred Street South. On the west side of Alfred Street South the cycle path would be located between the new crossing and Lavender Street
  - Replacement of the existing pedestrian refuge crossing at the north end of Alfred Street South with a pedestrian and bike rider crossing located near 110 Alfred Street South and an upgrade to the pedestrian crossing at Lavender Street
  - Low speed shared path and verge widening on the north side of Lavender Street
  - Adjustments to the Lavender Street roundabout
  - New street tree planting, shrub planting and footpath paving
  - Relocation of the existing bus stop on Alfred Street South near Lavender Street,about 60 metres to the south of its current location
  - Permanent removal of up to 15 parking spaces along Alfred Street South.

The proposal, would also include, but not be limited to:

- Kerb and pavement work, and line marking
- Drainage and utility adjustments
- Street furniture adjustments
- Changes to street parking, parking meter locations and regulatory signage
- Minor lighting upgrades to Bradfield Park North and in other locations where required to meet safe lighting standards.

Construction of the proposal would take around 18 months and, subject to planning approval, is expected to commence mid-2023.

Figure 3-1 illustrates the key features of the proposal.

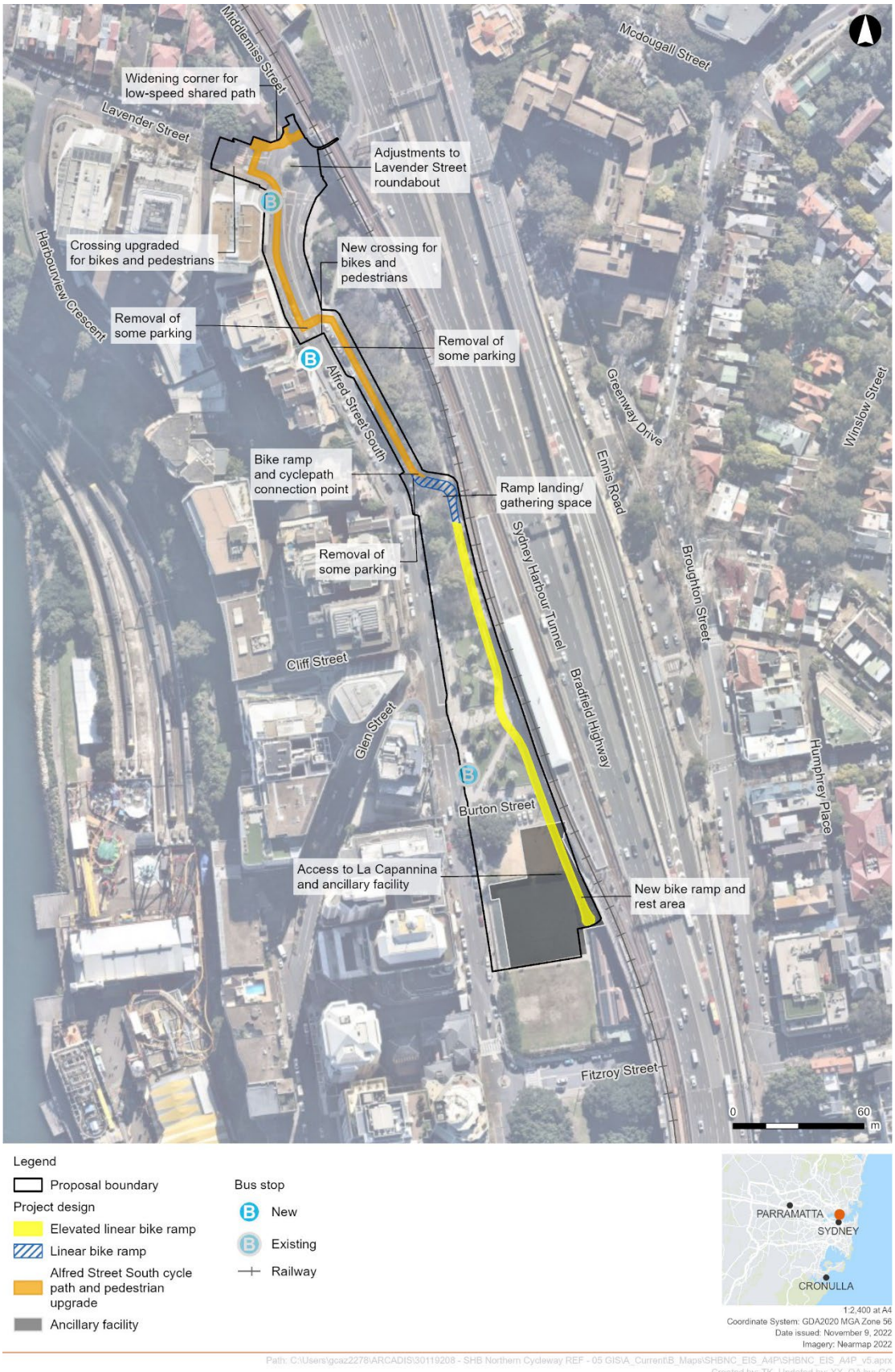

Figure 3-1 Key features of the proposal

4 Transport network impacts

4.1 Construction impact assessment

The proposal is expected to commence in early 2023 and be completed in 2024, taking approximately 18 months to complete.

The construction would be completed in stages, and it is anticipated that the ramp construction and cycle paths works would be undertaken simultaneously.

Hours would be in accordance with the standard construction hours as defined in the *Interim Construction Noise Guideline (*DECCW, 2009):

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturday
- No work on Sundays and public holidays.

Work outside standard construction hours would be required at times to minimise disruption to the transport network and manage the safety of pedestrian movements through Bradfield Park Plaza. Potential construction work that would be carried out outside of standard construction hours would include, but not be limited to:

- Prefabricated bike ramp sections will be delivered at night and stored on Burton Street
- Crane lifts adjacent to the Sydney Harbour Bridge
- Installation of bike ramp sections across Milsons Point Station entrance
- Installation of Lavender Street crossing requiring temporary lane closure of the one-way street
- Pedestrian crossing and roundabout works on Lavender Street and Alfred Street South.

Any work outside of standard construction hours would be undertaken in accordance with the *Interim Construction Noise Guideline* (DECCW, 2009), the *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016), any road occupancy licence requirements and the environmental management measures listed in Chapter 7 of the REF.

The local community would be notified a minimum of five days before any proposed work were carried out outside of standard construction hours in accordance with the proposal's community consultation strategy. They would be provided with work details and contact information. North Sydney Council should be consulted throughout the duration of the construction period to ensure minimal disruption to typical operations can be achieved.

The temporary ancillary facilities including the compound and storage areas are located at Bradfield Park Bowling Green on Alfred Street South and would comprise a portion of the boules piste next to Burton Street and one bowling green. The construction site access would be available via Alfred Street South and Burton Street. Pedestrian and cycling connections would be maintained in all scenarios.

4.1.1 Pedestrian and cyclist impacts

Sections of the footpaths along Alfred Street South are likely to require temporary closures during certain construction stages. During these potential closures, alternate pedestrian paths would be identified, and safe crossings of the road to access these alternate paths would be provided. During construction, separation of pedestrians from construction sites and vehicles would be maintained. South of Lavender Street, cyclists currently share the road with vehicles, with no formal separated bicycle path available. Pedestrian and cycle connections through Alfred Street South would be maintained at all times during construction.

The extension of the cycleway on Sydney Harbour Bridge would result in construction works being carried out at and around the existing staircase connection at Burton Street. Since Burton Street would be closed to pedestrians for a period of about three weeks during the installation of the bike ramp sections, slight diversions may be made as necessary as works progress.

The installation of temporary construction barriers along the side of the roadworks would result in some reduction in lane width for vehicles and bicycles alike, increasing the risk of collision.

A Construction Traffic Management Plan (CTMP) approved by Transport would be developed to manage the pedestrian and cyclist traffic near the site, with multiple Traffic Guidance Schemes (TGSs) potentially required to reflect separate staging works. The TGSs would maintain access for pedestrians and cyclists during the construction period to guide pedestrians and cyclists safely around the construction sites. During all construction stages, safe access would be provided for pedestrians and cyclists with separation of pedestrians from construction sites and vehicles to be maintained.

4.1.2 Public transport impacts

Construction would result in the relocation of one bus stop on the western side of Alfred Street South up to 60 metres further to the south. Additional relocations during the construction period may be required to enable the cycleway works. No impacts are expected to the bus services available to public transport customers at Milsons Point as a result of construction works.

The connection from Bradfield Park North to the Sydney Harbour Bridge cycleway would pass over the western access to Milsons Point Station, requiring construction work to be carried out around the station entrance. Pedestrian connections to Milsons Point Station from Alfred Street South would be maintained at all times, with minor diversions potentially required at certain stages of construction.

Trains may be impacted in the case of crane lifts adjacent to the Sydney Harbour Bridge, requiring temporary rail closures. These works would be undertaken during nights and on weekends during scheduled rail possessions and track shutdowns to minimise disruptions to the operation of the rail network.

4.1.3 Traffic impacts

It is anticipated that access to Burton Street would be changed during construction, with temporary occupation of the Burton Street tunnel car park being required for up to 18 months during the length of construction. As Burton Street, west of Milsons Point Station is not currently connected to the eastern side for traffic, vehicular through movements via Burton Street do not exist, which would limit any traffic routing or demand impacts as a result of the temporary closure.

Multiple road closures along Alfred Street South would be required to enable the delivery and installation of prefabricated bike ramp segments, anticipated to occur outside standard construction hours. Two-way traffic flow would be maintained during commuter peak hours throughout construction of the cycleway. Some reduction in lane widths may be expected during the construction period. To support this, a reduced speed limit would be implemented to facilitate road works, as well as to minimise the potential risk of conflicts between cyclists and vehicles. While the reduced speeds would decrease the vehicular throughput of the road, any travel time impacts on vehicles travelling along the road are expected to be minimal as the road is currently designated as a high pedestrian activity area with a low posted speed limit of 40 kilometres an hour.

The adjustments to the roundabout connecting Alfred Street South, Lavender Street, Middlemiss Street, and the Bradfield Highway would require temporary road closures, impacting movements on all connected roads. A critical movement is the connection to the Bradfield Highway, where vehicles travelling at a high speed would turn into the roundabout. The short sight distance around the corner exacerbates the risk of collision

with construction workers. Adjustment works at the roundabout are to be completed outside standard construction hours to minimise disruption to the traffic network. North Sydney Council and the Transport Traffic Management Centre (TMC) would be consulted to minimise disruptions and safety risks.

The installation of the pedestrian and cyclist crossing on Lavender Street would also result in temporary lane closures.

A CTMP approved by Transport would be developed to manage the traffic at and near the site, with multiple TGSs potentially required to reflect separate staging works and maintain access for general traffic throughout construction. These TGSs will detail the proposed traffic management measures (for example, traffic controllers, signage, delineation and barriers) to guide traffic safely around the construction site and minimise potential conflicts with construction vehicles and other road users.

4.1.4 Parking impacts

Parking along Alfred Street South and into Burton Street would be impacted during construction due to restrictions put in place by temporary construction/ exclusion zones.

Temporary parking loss during construction would include:

- Thirteen car spaces and two motorbike spaces on Burton Street for a duration of 9 months
- 15 car spaces on the east side of Alfred Street South for a duration of three months
- Eight car and six motorbike spaces on the west side of Alfred Street South for a duration of three months.

As the design would extend the Sydney Harbour Bridge cycleway connection over Burton Street, construction works would result in at least the partial closure of the Burton Street tunnel car park throughout the duration of construction, resulting in a reduction of parking available directly next to the station. As the Burton Street tunnel car park provides metered parking, agreement from Council would be required to confirm any alterations to parking arrangements.

During the construction period, up to 15 car parking spaces would be temporarily closed on Alfred Street South over the course of about six months to enable the installation of the cycleway. To minimise the immediate impact on parking availability, construction staging will be arranged to ensure only one-side of the street be closed at any one time, reducing the total parking loss for the duration of the works.

. This reduction in available on-street parking is expected to result in travel behaviour change during the construction period, as drivers adapt to alternative arrangements for parking or opt for another travel mode to access the study area. At the completion of construction, 17 of these 32 closed parking spaces on Alfred Street South would be reopened, resulting in the reduction of about 15 parking spaces compared to existing conditions, as described above.

4.1.5 Loading and delivery impacts

Restaurants and food retail storefronts located along the western side of Alfred Street South would continue to be serviced by the existing loading zone located on Alfred Street South directly north of the Cliff Street intersection, as shown in Figure 4-1. This would facilitate ongoing loading and delivery services to adjacent and nearby properties during construction.

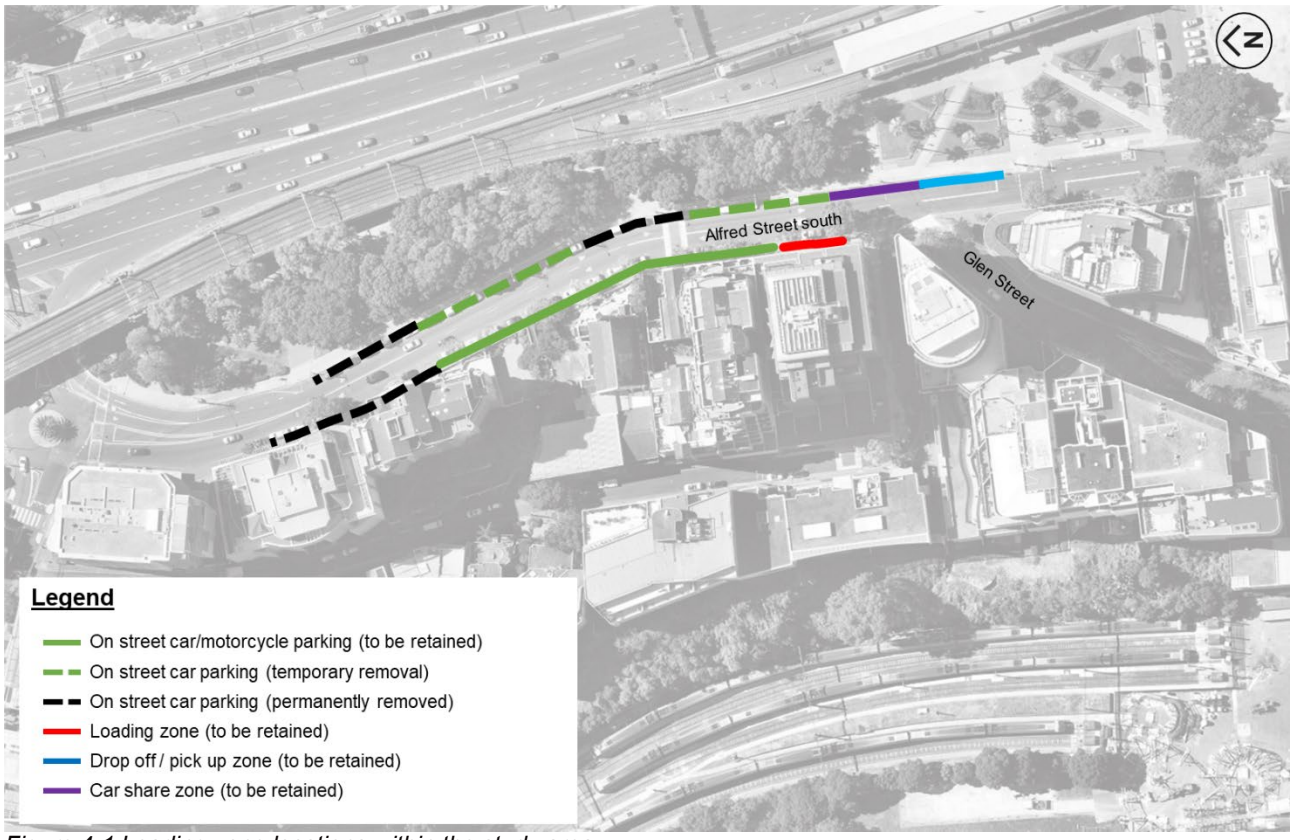

Figure 4-1 Loading zone locations within the study area

For the restaurant La Capannina (located east of Alfred Street South, with loading access both from Burton Street and Alfred Street South) the restaurants' access to loading zones would be subject to some change. During construction access to La Capannina for loading, deliveries and less mobile patrons would be provided on Alfred Street South via a driveway across the bowling greens. The main access to the restaurant for patrons would continue to be via the existing stairs.

The construction time periods would generally be from 7am to 6pm Monday to Friday and from 8am to 1pm on Saturdays. These time periods would coincide with some of the operational hours of the restaurants and food retail storefronts. While the existing loading zone is expected to be retained through the construction period, as work would be limited to the eastern side of the road, loading and deliveries should be planned beforehand to minimise the impact on traffic.

Deliveries to the construction site would be made at night or during off-peak hours where possible to mitigate the impact to traffic along Alfred Street South and adjoining streets. A CTMP would be required to outline the guidelines general requirements and procedures required to enable trucks and plant to enter and exit the site and minimise impacts to existing traffic arrangements.

4.1.6 Other impacts

The proposal would impact the Kirribilli markets which are held on the second Saturday and fourth Sunday of every month on the Bradfield Park Bowling Green on Alfred Street South. Discussions have been held with North Sydney Council and the market manager to agree on the temporary relocation of the impacted stalls to Ennis Road, located on the eastern side of the rail corridor and Warringah Freeway, for the duration of the works. Localised parking impacts are expected around Ennis Road on market days, which may require additional parking and/or traffic management measures to accommodate the redirected demand.

There are likely to be impacts on local events that currently use areas that have been identified as ancillary facilities and construction zones. Further consultation would be required with stakeholders to understand demands and impacts associated with events in Milsons Point, including any potential need for relocation of activities during the works.

4.2 Operational impact assessment

The proposal would result in several key changes to the existing conditions within the study area including:

- Widening of the corner of Lavender Street/ Middlemiss Street and new raised pedestrian crossing and low speed shared path
- Replacement of existing pedestrian refuges
- Adjustments to the Lavender Street roundabout
- Proposed relocation of bus stops
- Removal of parking spaces
- Linear bicycle ramp connecting Sydney Harbour Bridge cycleway to Bradfield Park North
- Separated bi-directional cycleway on Alfred Street
- Reallocation of road space.

4.2.1 Widening of the corner of Lavender Street/ Middlemiss Street and new raised pedestrian crossing

The corner of Lavender Street and Middlemiss Street would be widened to allow for the installation of a 2.5-metre-wide shared path. This expansion would result in the reduction in road width along the north-west corner of the roundabout, which would alter the corresponding approach and exit lanes. While the narrowing of these lanes poses the risk that vehicles of some classes or lengths would be unable to safely turn along that corner, a swept path analysis has been conducted to confirm that 12.5-metre-long rigid vehicles are able to safely make the turn. The central island concrete upstand and tree will be removed to further support vehicle turning movements at this location.

A new raised pedestrian and bicycle crossing is proposed to replace the existing marked pedestrian crossing on Lavender Street and would connect into the new shared path leading to Middlemiss Street. The raised section of road would improve the visibility of cyclists and pedestrians crossing the road, reduce vehicle speeds of cars driving over the hump, and create a more coherent connection with the existing bicycle lane on Middlemiss Street. This upgrade is proposed to facilitate a safer road crossing for both pedestrians and cyclists, who are currently observed to cycle through the Middlemiss Street/ Alfred Street South roundabout.

The bus stop on Lavender Street opposite Cliff Street services eastbound bus routes and is located directly west of the raised pedestrian and bicycle crossing. The short distance to the pedestrian crossing poses a potential for safety issues resulting from poor visibility to pedestrians waiting to cross on the northern side of Lavender Street. Visibility to pedestrians waiting to cross at this location would be improved by relocating the bus stop further to the west, to ensure that minimum clearances are provided to the pedestrian crossing.

Northbound cyclists are expected to continue to use the roadway in addition to the upgraded crossing on Lavender Street. The existing cyclist connection from the roundabout into the contraflow cycle lane on Middlemiss Street is located on the corner of the intersection. With the proposed widening of the shared path by extending the existing kerb, the existing cycle connection would potentially result in conflicts with shared path users. Additionally, should northbound cyclists be required to use the roadway to access the cycle lane on Middlemiss Street, it would create a potential conflict point for cyclists and southbound vehicles approaching the roundabout from Middlemiss Street. The widening of the shared path would improve the

safety of this connection and access for northbound cyclists to the contraflow cycle lane needs to be considered in the design.

4.2.2 Replacement of existing pedestrian refuges

There is an existing two-stage pedestrian refuge located on Alfred Street South directly south of the Lavender Street roundabout, which crosses the exit lane of the Bradfield Highway into Kirribilli. Bradfield Highway has a variable speed limit which is generally in the range of 70 kilometres per hour during commuter peak periods. While the posted speed limit of the exit lane is 15 kilometres per hour, vehicles exiting the high-speed highway can be expected to exceed those speeds, posing a safety risk to pedestrians and cyclists crossing at the roundabout. The pedestrian refuge is non-compliant with the current standards, with insufficient width to allow safe storage of a bicycle or pram. Poor sight distances exist for vehicles turning into Alfred Street South due to the alignment of the road, exacerbating safety issues at the crossing.

It is proposed to replace this pedestrian refuge with a new raised pedestrian and two-way bicycle crossing located 70 metres further south. The relocation of this crossing would also remove the conflict point on the Bradfield Highway exit lane, ensure sufficient distance for vehicles exiting Bradfield Highway to reduce travel speeds and improve sight distance to the crossing.

The new pedestrian and bicycle crossing is proposed to be raised, which would increase the visibility of the mid-crossing zone and prioritise pedestrian and cycling movements over the motorised traffic. The raised crossings would communicate to vehicles the pedestrianised environment of the town centre, reducing travel speeds and improving road safety for active transport users.

The replacement of the existing pedestrian refuge would also improve the linkage of the cycle route from Middlemiss Street in the north to the new two-way separated cycle path along the eastern side of Alfred Street South.

A high-level SIDRA analysis has been undertaken by Stantec of the future year 2036 to assess the operational impacts of the proposed new crossing, with traffic volumes sourced from strategic model outputs for the 2036 North Sydney Integrated Transport Program morning peak scenario. The reversal of traffic volumes was used to estimate afternoon peak volumes. Bicycle crossing volumes were based on existing 2021 data supplied by TfNSW, with a growth rate of five per cent per annum applied. Base pedestrian volumes were expected to be 100 pedestrians per hour, factored up at the same growth rate as cyclists under the sensitivity scenario.

Under the proposed layout, pedestrian and cyclist crossings would take priority over north-south traffic movements, resulting in some stops, delays and queuing for vehicular traffic. Pedestrian crossings were deemed to have a greater impact than cyclist crossings due to their slower movement speeds.

Three scenarios were assessed for the 2036 future year, as shown in Figure 4-2.

Scenario name	Alfred St mid-block crossing	2036 forecast traffic volumes [1]	Base pedestrian volumes [2]	Factored pedestrian volumes [3]	Existing bicycle volumes [4]	Future (2036) bicycle volumes [5]
Scenario 1	✓	✓	✓		✓	
Scenario 2	✓	✓	✓			✓
Scenario 3	✓	✓		✓		✓

[1] Based on SMPM outputs – refer Item 1 in 'Key assumptions'
[2] Assumed to be 100 pedestrians per hour in both directions
[3] Assumed to be 210 pedestrians per hour in both directions based on a growth rate of 5% p.a. – refer Item 5 in 'Key assumptions'
[4] Based on TfNSW data – refer Item 2 in 'Key assumptions'
[5] Based on a growth rate of 5% p.a. – refer Item 3 in 'Key assumptions'

Figure 4-2 SIDRA modelling scenarios (Source: Stantec, 2021)

Modelling results indicate that some queueing along Alfred Street South would occur during peak hours, with the Alfred Street South north approach to the proposed crossing being considered the critical approach given its proximity to the Lavender Street roundabout (about 55 metres).

The Alfred Street South southbound queues do not encroach into the roundabout in any of the assessed scenarios. However, under Scenario 3, which considered a five per cent per annum growth of existing bicycle and pedestrian crossing volumes, southbound queues would start to get close to the roundabout, reaching a length of about 50 metres. SIDRA modelling results are shown in Figure 4-3.

Metric		AM peak hour			PM peak hour		
		Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Overall DoS [1]		0.53	0.55	0.63	0.55	0.60	0.69
Overall average delay (seconds)		5	6	8	5	7	9
95% back of queue by approach (m) [2]	Alfred St South (south)	27	33	42	10	11	15
	Alfred St South (north)	10	10	12	31	39	50

[1] Degree of Saturation (DoS) is a measure of volume-capacity at the intersection
[2] Queues (and delays) on the pedestrian and bicycle crossing legs are '0' as they have priority of movement through the crossing

Figure 4-3 SIDRA modelling results (Source: Stantec, 2021)

4.2.3 Proposed relocation of bus stops

One bus stop on the western side of Alfred Street South is proposed to be relocated to accommodate the pedestrian crossing improvement works and operation of the new two-way separated cycle path. As shown in Figure 4-4, the existing bus stop near Lavender Street (Stop ID: 206128) would be relocated 60 metres south along Alfred Street South.

The relocated bus stop would be close to Milsons Point Station and accessible via safe pedestrian crossings of Alfred Street South. The provision of appropriate signage to support public transport customers in

wayfinding would result in minimal disruptions to bus journeys. As no changes have been proposed to the existing bus routes and services, minimal impact to public transport customers is expected as a result of the bus stop relocations.

The relocated northbound bus stop on Alfred Street South is proposed to be in-lane with a kerb build-out, which would potentially delay northbound vehicles, particularly during the commuter peak hours. However, opal demands suggest an overall low level of bus passenger activity at this stop, reducing the likelihood of delays caused by high passenger numbers boarding and/or alighting. Furthermore, in lane bus stops reduce dwell times at stops as they remove the need to pull in and out of a traffic lane, providing benefits to bus travel times and overall bus passenger experience.

The relocation of the bus stop on Alfred Street South, particularly near the roundabout, is likely to result in a reduction in lane width. The width of the traffic lanes is expected to be reduced to about 3.2 metres, in line with the existing widths along some sections of the road. The operational impact of lane width reduction in isolation is therefore assumed to be minimal and should not impact on traffic operations.

Figure 4-4 Bus stop relocation map

4.2.4 Removal of parking spaces

The purpose of the proposal is to improve the attractiveness and safety of cycling and walking along Alfred Street South as well as accessibility to the restaurants and storefronts. This would improve the facilities for active transport modes for people visiting the shops and surrounding area.

On completion of the proposed shared path on Alfred Street South, the loading zones would remain in place, located on the western side of Alfred Street South directly north of the Cliff Street intersection.

The proposal results in up to 15 parking spaces along Alfred Street South being removed in the proposed design. Providing parking alongside a road or footpath used by cyclists poses a potential safety risk through the movement of vehicles into the path of cyclists as they turn out of a parking space, as well as presents the risk of dooring. The removal of parking along the cycleway would provide substantial improvements to safety of active transport users and contribute to encouraging people to use the proposed cyclist connection. It also ensures compliance with required setbacks for pedestrian and cyclist crossings and traffic signals.

The removal of on-street parking to facilitate the proposal would be carried out in consultation with key stakeholders, local businesses and the Local Pedestrian, Cycling and Traffic Calming Committee (LPCTCC).

Given that the study area is well served by public transport, being located close to Milsons Point Station and bus stops, as well as active transport links, travelling by private vehicles to and from the area is not essential. On-street parking spaces with various parking restrictions are available on the adjoining streets such as Lavender Street, Cliff Street, Glen Street, Burton Street, Fitzroy Street and there is an off-street parking area at the southern end of Alfred Street South, which are within an acceptable walking distance of the study area.

4.2.5 Elevated bike ramp connecting to Bradfield Park North

The elevated linear bike ramp would connect the cycleway with Bradfield Park North. This bike ramp would provide a gradient that would enable cyclists to cycle without interruption between the bridge and the street level, which connects directly onto the cycleway along Alfred Street South. It would additionally allow cyclists to bypass the potential conflict point with vehicles on Burton Street for cyclists travelling north of Milsons Point Station.

In consideration of the cyclist speeds on the steeper part of the ramp, the gradient has been limited to five per cent maximum. Additionally, the break in gradient in the flat and curved section of the proposed ramp would facilitate both an easier journey for cyclists riding up the ramp in the southbound direction, as well as reducing speeds of cyclists travelling down the ramp in the northbound direction, see Figure 4-5.

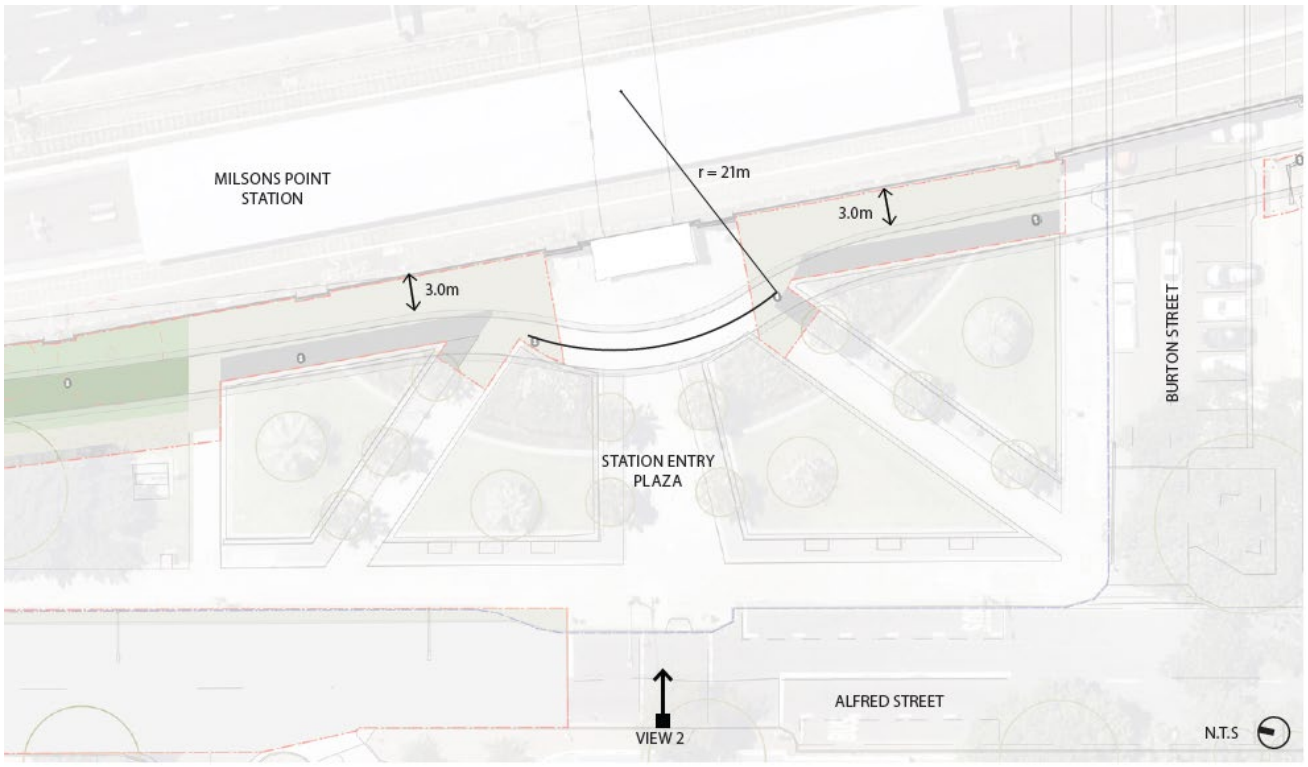

Figure 4-5 Concept design plan - Cycleway ramp arc at station entry (Source: ASPECT Studios)

The new connection would however provide potential for conflict with pedestrians walking along Alfred Street South and Bradfield Park North, particularly if cyclists do not slow down sufficiently while travelling down the ramp. To assist cyclist traffic flow and safety in the landing area, a cycle deceleration area is incorporated and a raised planted median separates the north and south bound cyclists at the landing and acts as a guide assisting cyclists to make the turn. A continuous paving surface would connect the ramp landing to the Alfred Street South cycle path with line marking and visual cues.

4.2.6 Alfred Street South cycle path

The Alfred Street South cycle path and pedestrian upgrade would involve a new cycle path from Burton Street to the existing bike network on Middlemiss Street. The cycle path would consist of a two-way separated path about 2.5 metres wide.

South of the ramp landing in Bradfield Park North, the existing shared cycle path to Burton Street would be retained. The existing kerb alignment from the landing to Burton Street would also be retained.

North of the bike ramp landing to the new pedestrian and bike rider crossing on Alfred Street South, the parking and travel lanes would be narrowed, allowing construction of a new footpath and cycle path. The footpath would be located next to the parking lane, allowing a safe and accessible space for motorists to enter/exit parked vehicles, with the cycle path located on the east edge of the path.

North of the new pedestrian and bike rider crossing on Alfred Street South, a new two-way cycle path would be located on the west side of Alfred Street South. The cycle path would be located to the east of the existing kerb alignment until meeting the new pedestrian and cyclist crossing at Lavender Street. A low-speed shared path would be constructed on the north side of Lavender Street with a new pedestrian crossing at Middlemiss Street. From this point the cycle path would integrate with the existing cycleway.

4.2.7 Reallocation of road space

The total width of the carriageway on Alfred Street South is currently 12 metres, with cyclists sharing the road with cars. Each vehicle lane is about 3.3 metres wide, and the parking lanes, along which loading bays are located, are about 2.5 metres wide.

The road space is proposed to be reallocated such that at the proposed Alfred Street South crossing:

- The width of the two-way cycle path is 2.4 metres
- The width of the pedestrian footpath is around 4.3 metres on the eastern side of the road, and 3.35 metres on the western side of the road
- The total width of the carriageway is around 8.9 metres.

Figure 4-6 shows the cross-section of Alfred Street South at the proposed crossing.

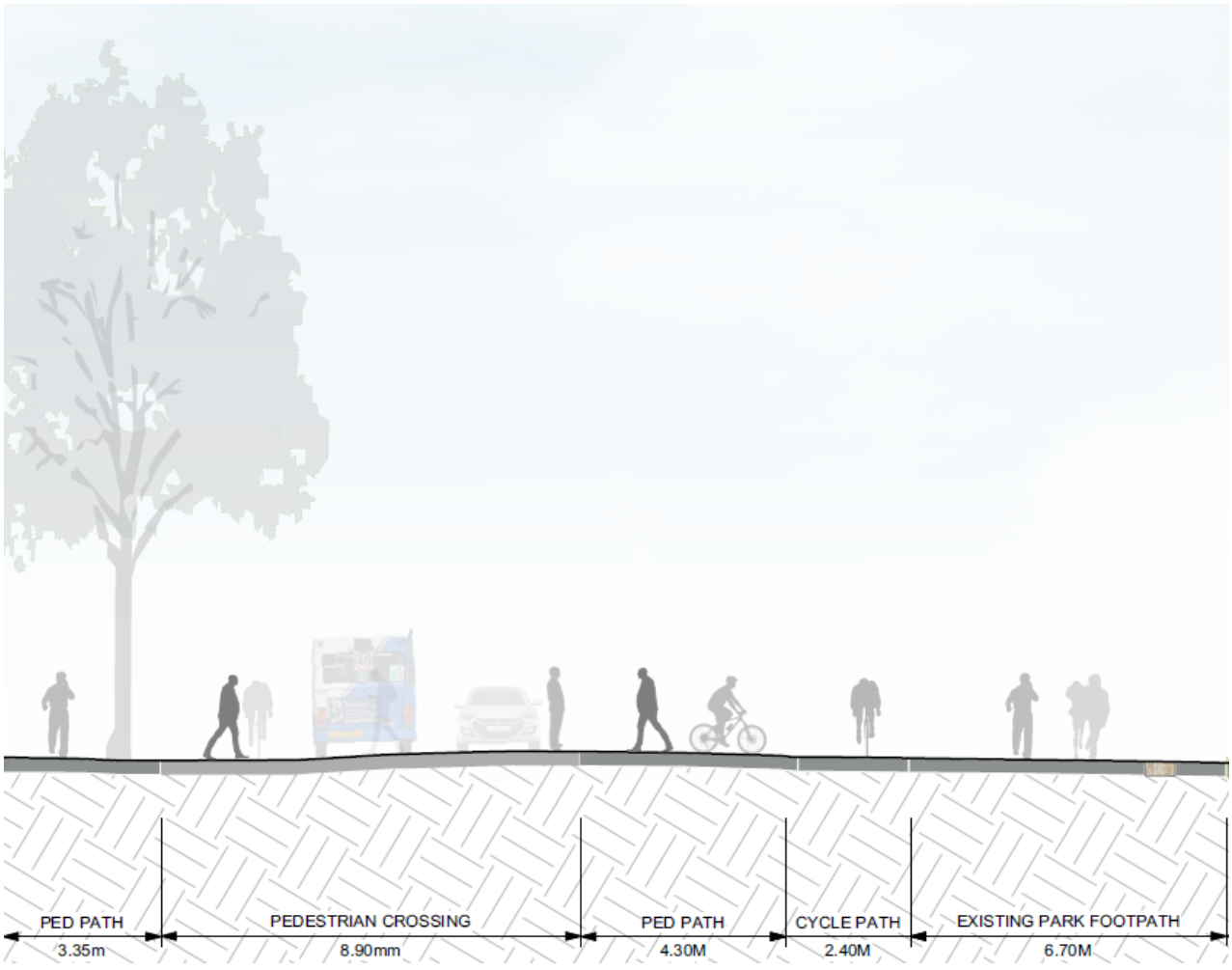

Figure 4-6 Cross section – Alfred Street South, at proposed crossing

South of the proposed Alfred Street crossing:

- The width of the two-way cycle path is 2.4 metres
- The width of the pedestrian footpath is around 2.25 metres on the eastern side of the road, separated from the carriageway by a 2.65 metre planting buffer from repurposed parking spaces. The pedestrian footpath is 3.7 metres on the western side of the road

- The Alfred Street South bus stop located directly south of Lavender Street in the existing condition is relocated south of the crossing, with 2.6 metres dedicated to the bus stop
- Vehicle travel lanes are around 3 metres wide.

Figure 4-7 shows the cross-section south of the proposed crossing.

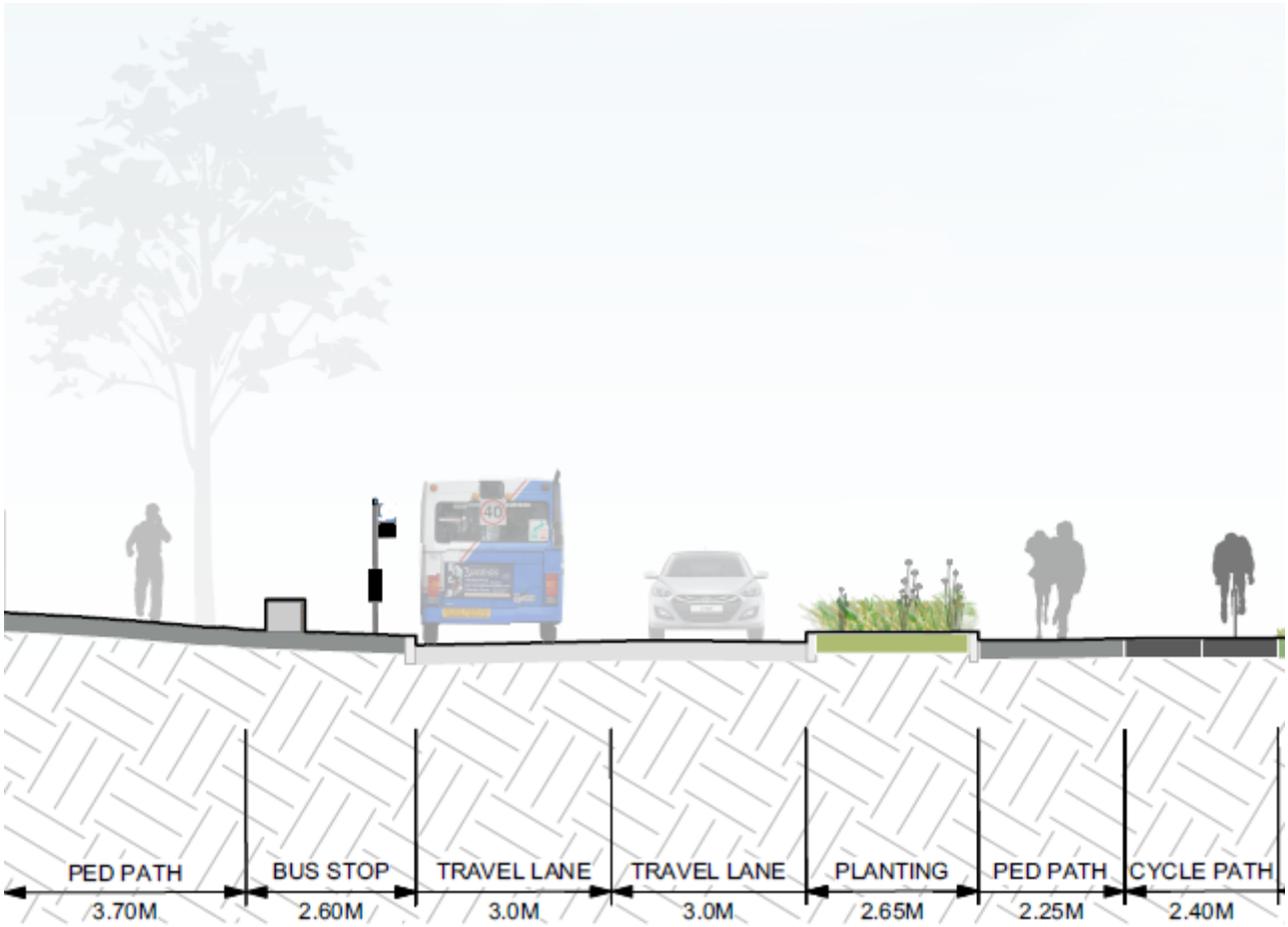

Figure 4-7 Cross section – Alfred Street South, south of proposed crossing

5 Mitigation measures

5.1 Construction impact management measures

5.1.1 Pedestrians and cyclists

Appropriate signage and wayfinding facilities relating to changes to pedestrian and cyclist access during construction would be developed and implemented. A Construction Traffic Management Plan (CTMP) approved by Transport for NSW would be developed to provide details on the specifics on managing active transport movements near the construction site, with multiple TGSs detailing traffic, pedestrian and cyclist management measures (such as signage, delineation, barriers and traffic controllers) potentially required to reflect separate staging works.

The following key principles would guide the development of safe active transport arrangements:

- Pedestrians and cyclists will be kept clear of work sites at all times. Construction areas will be defined by temporary pedestrian fencing or more substantial fencing in highly pedestrianised sections.
- Where crane lifts extend beyond construction boundaries, pedestrians will be actively managed by the appropriate measures
- Temporary footpaths will be adequately signposted to indicate the direction of the footpath, be of all-weather standard, consist of equivalent material and performance to adjacent footpath and have an unobstructed width at local constrictions no less than one metre (elsewhere at least two metres)
- Crossing facilities and associated signs will be maintained where possible. If access to an existing crossing cannot be provided, alternative facilities as close as possible to the established crossing are to be provided
- Traffic management in the form of lowered speed limits will be implemented to facilitate a safer environment for pedestrians who may have been displaced from the footpath as a result of construction work
- Where traffic is flowing temporarily in the opposite direction from normal, medians, refuges or other physical devices are required to separate lanes
- The installation of construction barriers along the side of the road may result in some reduction in lane width for vehicles and bicycles alike, increasing the risk of collision. The speed limit on Alfred Street South will therefore be reduced to minimise potential conflicts between cyclists and vehicles
- Cyclist needs and visibility will need to be considered in providing lighting at night where deemed necessary
- Roadworks signs will be positioned above the head height of cyclists
- Barrier boards will not be placed so that they direct cyclists away from allocated cycle paths
- Adjacent to the work site, pavement surfaces will be maintained in a clean smooth state to ensure cyclist comfort and safety. The edges of temporary surfaces will be ‘feathered’ to remove any hazardous edges.

5.1.2 Public transport

Wayfinding tools such as sign posting would be implemented in the event that pedestrians are required to be diverted from the Alfred Street South Milsons Point Station access. A detailed construction traffic and access assessment will be carried out before construction starts, when the detailed staging and work methodology has been developed.

5.1.3 Traffic and ancillary facility access management

A range of mitigation and management measures would be needed to manage the impacts to traffic and transport during construction. These include:

- A CTMP would be prepared and implemented in accordance with the *Traffic control at work sites, version 6.1* (TfNSW, 2022). The construction traffic management plan would enable the safe management of traffic, provide for the safety of construction personnel, and minimise impacts on the local community. The plan would include as a minimum:
  - Hours of construction activity and haulage, which do not impose on peak periods and school drop-off and pick-up times
  - Haulage routes, including the source locations and their access points for the site
  - Design and construction of access points in accordance with Transport for NSW and Council requirements
  - The design of temporary works required to accommodate the heavy vehicle movements along the short sections of local roads required for access to ancillary sites
  - Designated areas within the proposal area for heavy vehicle turning movements, parking, loading and unloading
  - On-site parking arrangements for construction, supervisory and management personnel
  - Sequence for implementing traffic works and traffic management devices (such as mobile variable message (VMS) boards
  - Safety principles for construction activities, such as speed limits around the site and procedures for specific activities
  - Induction requirements for construction, supervisory and management personnel
  - Procedures for inspections and record keeping for maintaining traffic control measures
  - Contact details of key proposal personnel.
- For each stage of construction, detailed TGSs would be prepared and implemented in accordance with the *Traffic control at work sites, version 6.1* (TfNSW, 2022) by suitably qualified personnel
- Dilapidation surveys of roads around the proposal area would be undertaken prior to their use for construction as well as after construction is complete. Any damage to roads will be repaired
- Direct access at the frontages would be provided with adequate sight distances relating to the posted road speed. This will allow vehicles on the main road to see vehicles emerging from the construction compound and will allow ample room to slow down and stop if necessary. Similarly, it will allow vehicles waiting to emerge from the site access, adequate sight distance to see approaching vehicles and determine acceptable gaps for them to enter the main road traffic
- The site would generally have traffic control at the site access to manage the vehicular traffic into and out of each site and to manage pedestrian movement across the access
- All vehicles accessing the site for the purpose of material delivery and construction works would be fitted with safety flashing lights located on the top of the vehicle and functioning reverse beepers. All operators will be licensed for the particular item of plant/ equipment, and will demonstrate competence in the use of the plant/ equipment as part of the site management and safety plan
- Ensuring all vehicles accessing the site are sized adequately to address clearance constraints such as the clearance over the Burton Street underpass, and powerlines and trees
- Only left-in/ left-out movements would be provided at the site access point

- Routes used for access and haulage during construction would be developed in consultation with relevant stakeholders upon confirmation of material source and disposal locations
- Appropriate construction speed limits would be implemented in consultation with Transport to facilitate safety of road users and construction personnel during construction
- Traffic management plans would specifically address night works safety issues to protect motorists and construction personnel
- Temporary accesses, entrances and exits, road works and other traffic management measures would be designed and operated to conform with relevant road safety and Transport for NSW requirements and will not impact upon the safety of the users of the existing road network
- Work outside standard construction hours would be required at times to minimise disruption to traffic, and disturbance to surrounding landowners and businesses. Potential construction work that would be carried out outside of standard construction hours will include, but not be limited to:
  - Prefabricated bridge sections will be delivered at night and stored on Burton Street
  - Crane lifts adjacent to the Sydney Harbour Bridge requiring temporary rail closures
  - Installation of bike ramp sections across Milsons Point Station entrance
  - Installation of Lavender Street crossing requiring temporary lane closure of the one-way street
  - Roundabout works on Lavender Street.

5.1.4 Parking

Parking spaces identified for removal will be removed progressively as construction works dictate, and works will be optimised to limit the impact on vehicle spaces outside of the necessary construction zone.

As the Burton Street car park provides metered parking, agreement from Council will be required to confirm any alterations to parking arrangements. Consultation with Council will be undertaken from an early stage of design to enable the proposed temporary reductions in metered parking arrangements throughout the construction period.

5.1.5 Loading and delivery

When developing a CTMP, it is desirable to maintain pedestrian and vehicle access to adjoining properties throughout the duration of the work.

Properties impacted during construction, such as the businesses located along the western side of Alfred Street South, will be notified prior to the commencement of construction and advised to schedule deliveries outside of work hours. Impacted store owners will additionally be consulted regarding temporary access arrangements to their properties where required.

Access would be maintained to La Capannina restaurant for patrons at all times. For the duration of construction works where direct access is unavailable, an alternative route will be provided via a driveway through the bowling green off Alfred Street South.

5.1.6 Construction worker parking

The construction workforce will comprise of trades and construction personnel, and engineering, functional and administration staff. Up to three parking spaces will be provided within the ancillary compound, with no additional parking expected to be provided for the construction workforce.

Noting the availability of public transport services to the project site, the construction workforce will be encouraged to use public transport to and from the work sites. Workers would be supported through providing information on available public transport services and other sustainable transport modes, along with other green travel initiatives.

A construction traffic management plan and green travel plan should be prepared to assess and identify the construction parking impacts, and green travel initiatives proposed to decrease the demand for car parking associated with the works.

5.2 Operational impact management measures

5.2.1 Widening of the corner of Lavender Street/ Middlemiss Street and new raised pedestrian crossing

The widening of the corner of Lavender Street and Middlemiss Street to allow for the installation of a 2.5-metre-wide shared path will result in the reduction in road width along the north-west corner of the roundabout, which will alter the corresponding approach and exit lanes.

The results of the swept path analysis indicate the proposed alignment of Middlemiss Street and Lavender Street after the widening will enable 12.5-metre-long rigid vehicles to safely make the turn. Minor adjustments will be made to existing kerbs to accommodate vehicle movements.

Northbound cyclists travelling into Middlemiss Street are expected to continue using the roadway in addition to the upgraded crossing on Lavender Street. To mitigate any potential conflict points between cyclists and vehicles that may result from the widening of the shared path, consideration for cyclist safety across this connection will be made when undertaking the concept design.

The short distance between the bus stop on Lavender Street opposite Cliff Street and the proposed raised pedestrian and cyclist crossing poses a potential for safety issues resulting from reduced visibility for eastbound drivers to pedestrians waiting to cross on the northern side of Lavender Street when a bus is stopped at this location. Relocating the bus stop further to the west, will increase the visibility to pedestrians and ensure minimum clearances to the pedestrian crossing are achieved, reducing the potential impact. Consultation with stakeholders with reference to relevant bus stop design guidelines should be undertaken to ensure the safety of the pedestrian crossing will be maintained.

5.2.2 Replacement of existing pedestrian refuges

Potential operational impacts to the traffic network resulting from the removal of the existing pedestrian refuges on Alfred Street South and construction of a new pedestrian and cyclist crossing 70 metres further to the south are expected to be minimal. SIDRA intersection modelling documented in Section 4.2.2, suggests that the traffic in the area would continue to operate at acceptable levels and queue lengths with the proposal.

While the greater distance between the Bradfield Highway to the crossing would allow more time for vehicles to slow down, given that the vehicles are turning from a high-speed road on approach to the proposed raised crossing still presents a potential safety risk that needs to be considered. Speed limit signage would be clearly displayed along Alfred Street South. The increased sight distance resulting from the relocation of the refuge would provide additional safety benefits to road users.

Pedestrian fencing may be required to be installed along Alfred Street South near the location of the existing pedestrian refuge to deter unsafe crossings near the roundabout after the completion of the raised pedestrian crossing.

5.2.3 Proposed relocation of bus stops

No changes to bus services are proposed, and the bus stops would be moved to new sites close to their existing locations. Impacts on public transport customers around timetabling, access and wayfinding are minimal under the proposal.

The relocated northbound bus stop on Alfred Street South, proposed to be in-lane with a kerb build-out, presents a potential risk of introducing delays and queuing for vehicles, particularly during the commuter peak hours. To assess this risk and the extent of potential queueing, traffic surveys will be conducted and an assessment of the proposed layout be carried out.

5.2.4 Removal of parking spaces

The operational impact of the removal of up to 15 parking spaces will be managed through consultation with impacted stakeholders, including North Sydney Council and adjacent property occupiers.

5.2.5 Linear bike ramp connecting to Bradfield Park North

The potential for conflict between cyclists and pedestrians at Bradfield Park North and along Alfred Street South is primarily contributed towards by the risk of cyclists exiting the ramp from the Sydney Harbour Bridge at high speeds. Signage warning cyclists of the potential for conflict and the need for lowered speeds would be implemented to mitigate this risk.

5.2.6 Other operational impacts

A Road Safety Audit would be conducted of the proposed cycleway upgrade and impacts on the surrounding road network by an independent party at each stage of design and implementation (concept design, detailed design, temporary works arrangement and pre-opening). Any potential safety issues identified through these audits would be addressed prior to progressing to the next stage of design or prior to opening the facility.

6 Conclusion and recommendations

Based on the analysis and discussions presented within this report, the following conclusions are made:

- The proposal would provide improved safety, accessibility and capacity of Sydney Harbour Bridge cycleway through delivering:
  - An elevated linear ramp connection between the Sydney Harbour Bridge cycleway and the on-road cycleway of Alfred Street South
  - New 2.5-metre-wide two-way cycle path on Alfred Street South from the ramp landing, linking to the existing bike network in Middlemiss Street
  - Traffic calming measures such as lane width narrowing, surface changes and priority crossings for active transport users.
- The construction of the proposal is expected to be completed in approximately 18 months and would be completed in stages
- There would be some impacts upon pedestrians and cyclists during construction. Hence, a CTMP will be prepared to manage and minimise any impacts to the transport network
- The only impacts on the public transport network would be the relocation of one bus stop to accommodate the active transport crossing improvements. The bus stop would have safe pedestrian crossings within its vicinity
- The relocation of the bus stops, particularly the proposed configuration of the northbound in-land bus stop, is unlikely to create delays and queueing on Alfred Street South due to the low passenger numbers
- The permanent reduction of up to 15 parking spaces would reduce the parking supply within the immediate area. However, as discussed in sections 2.7 and 4.1.4 of the report, the impact is expected to be minimal given the area is well-serviced by fully accessible public transport, and travel behaviour change that is expected to be induced by the removal of a greater number of parking spaces during the 15-month long construction period. Moreover, there are multiple on-street parking spaces in the surrounding streets
- Loading zones for local businesses is expected to be maintained at all times during construction and after the delivery of the proposed works. Alternative access will be provided to La Capannina restaurant for deliveries during construction periods where the existing access is not available.
- The proposed removal of the pedestrian refuges on Alfred Street South and construction of new pedestrian and cyclist crossing directly south of the Lavender Street roundabout would improve pedestrian and cyclist safety. By providing a new location for the proposed raised pedestrian and cyclist crossing, this would provide more sight distance for vehicles exiting Bradfield Highway and facilitate the reduction in vehicular speeds, in addition to the change in surface through the roundabout
- The proposed raised pedestrian and cyclist priority crossing may result in queueing along Alfred Street South. Further traffic modelling is recommended during detailed design to identify any adverse impacts on the connecting road network
- The widening of the corner of Lavender Street and Middlemiss Street would facilitate cyclist amenity and connectivity to North Sydney. To mitigate any potential conflict points between cyclists and vehicles that may result from the widening of the shared path, consideration for cyclist safety across this connection should be made when undertaking the concept design
- The short distance between the bus stop on Lavender Street opposite Cliff Street and the proposed raised pedestrian and cyclist crossing poses a potential for safety issues arising from pedestrian visibility, which may need to be addressed by relocating the bus stop further to the west and should be considered during detailed design

- A construction traffic management plan and green travel plan should be prepared to assess and identify the construction parking impacts, and green travel initiatives proposed to decrease the demand for car parking associated with the works.

7 References

In preparing this report, reference has been made to the following:

- Cyclists' surveys completed Thursday 10 March 2022 for eight locations as referenced in this report
- Pedestrian surveys completed Thursday 10 March 2022 for seven locations as referenced in this report
- Study area figures and maps issued 22 March 2022
- Transport for NSW interactive crash and casualty statistics report, for a five-year period from 2016 to 2020 (accessed February 2022)
- Transport for NSW public transport timetables (accessed February 2022)
- Transport for NSW Schedule of Classified Roads and Unclassified Regional Roads (accessed February 2022)
- *Interim Construction Noise Guideline* (DECCW, 2009)
- *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016)
- *Traffic control at work sites, version 6.1* (TfNSW, 2022)
- Other documents and data as referenced in this report.

Arcadis
Level 16, 580 George Street
Sydney NSW 2000
Australia
Tel: (02) 8907 9000

www.arcadis.com