NSW GOVERNMENT

F6 Extension Stage 1

State Significant Infrastructure Assessment

(SSI 8931)

December 2019

Cover photo

F6 Extension Stage 1 President Avenue Tunnel Portal (Transport for NSW - Roads and Maritime Services)

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Executive Summary

Transport for NSW (Roads and Maritime Services) (the Proponent) proposes to construct the F6 Extension Stage 1 proposal (the project) which will form the first stage of the F6 Extension Motorway program which when complete will extend from the New M5 Motorway at Arncliffe to the Princes Highway at Loftus. The project involves the construction of twin motorway tunnels approximately four kilometres in length linking the New M5 at Arncliffe to President Avenue at Kogarah, including associated surface works to connect to the existing road network, motorway operation complexes and ventilation outlet facilities, and provision of new cycle and pedestrian pathways. It also involves the provision of a new power supply source from the existing Ausgrid Canterbury sub-transmission substation at Earlwood to the motorways operation complex at West Botany Street, Rockdale.

The F6 Extension Stage 1 is an important component of the government's transport infrastructure strategy which includes providing efficient road network links and improved connections for motorists and freight within the Sydney region. The project would improve connections and travel times between Sydney's south, west and the CBD hence promoting and supporting economic growth in areas to the south. In addition to traffic benefits, the project would deliver over three kilometres of new and upgraded pedestrian and cyclist facilities linking Kogarah and Monterey.

Overall, the potential environmental impacts associated with construction and operation would be acceptable subject to the implementation of appropriate mitigation and management measures. On balance, the project benefits of more efficient journeys to and from southern Sydney and improved connectivity for inter-regional traffic outweigh its potential negative impacts and it is therefore in the public interest that the project is approved and proceeds.

The Department has considered the Proponent's EIS, Response to Submissions Report, PIR, Response to Submissions on the PIR and submissions on the project and considers that there are a number of impacts that will need to be carefully mitigated and managed. These include construction and operation noise, construction and operation traffic, air quality, groundwater, biodiversity and place impacts. Consequently, the Department has recommended stringent conditions of approval regarding these matters.

The project would comply with the objects of the *Environmental Planning and Assessment Act 1979* (EP&A Act), including objects relating to the sustainable management of built and cultural heritage and to promote good design and amenity of the built environment. It would also comply with the principles of Ecologically Sustainable Development and can proceed in a sustainable manner.

The project is consistent with the Government's key priorities and transport planning framework including *Future Transport 2056, State Infrastructure Strategy 2018, A Metropolis of Three Cities - Greater Sydney Region Plan,* and the *Eastern City District Plan.*

The project is Stage Significant Infrastructure (SSI) and was declared Critical Stage Significant Infrastructure (CSSI) on 26 October 2018 because it is deemed essential for the State. The Minister for Planning and Public Spaces is the approval authority.

Engagement with the Community

The Environment Impact Statement (EIS) was publicly exhibited from Wednesday 7 November 2018 until Friday 14 December 2018 (37 days). Submissions were received from seven State government agencies, five councils and 487 community submitters. Most community submissions objected to the project. Key issues raised in the submissions included increased traffic noise, construction noise and vibration, increased traffic on President Avenue and local streets once the project is operational, impact of ventilation outlet emissions, health and safety impacts, property and land use impacts including subsidence and acquisitions, and loss of local recreational areas during construction and operation of the project.

The Department directed the Proponent to prepare a Preferred Infrastructure Report (PIR) to address the impacts on the local road network. The PIR was publicly exhibited from 17 April 2019 until 8 May 2019 (a total of 21 days). Submissions were received from 105 community submitters. A submission was also received from Bayside Council. Most submissions did not object to the changes to the local road network proposed under the PIR but provided comment.

The Department has undertaken and participated in stakeholder and community consultation as part of its assessment of the project. This included attendance at multiple community information sessions hosted by the Proponent prior to and during the exhibition of the EIS. The Department also initiated ongoing consultation with Bayside Council to discuss its concerns and recommendations and actively engaged with agencies throughout the assessment process. In addition, three site inspections were undertaken and two meetings were held with the Moorefield Estate F6 Committee. In addition, the Department responded to community enquiries from community members.

Key Assessment Issues

Traffic and Transport

The Department has considered traffic and transport impacts during the construction and operational stages of the project, including the advice and recommendations from an independent traffic and transport consultant.

The project will result in improvements to the reliability and safety of traffic movements by removing vehicles from surface roads into the tunnel system and freeing up capacity on the broader surface network for shorter trips. In addition, the project will connect with other motorways such as WestConnex New M5 and M4-M5 Link, resulting in improved travel times between south-western Sydney and the Sydney CBD, the North Shore, the Inner West and western Sydney.

Although the project will provide regional benefits, local traffic impacts are predicted to occur once the project is operational with increased traffic volumes forecast on the surface roads in the vicinity of the President Avenue/ tunnel intersection. In response to concerns raised by the Department, Bayside Council and the community, the Proponent amended the original project to provide improved access and egress arrangements into and out of the Moorefield Estate via President Avenue. Notwithstanding, the Department has recommended the preparation and implementation of a Road Network Performance Plan which will set out measures to manage local traffic impacts should traffic performance deficiencies be identified during operation.

The Department notes that construction traffic impacts can be appropriately managed through the implementation of a Construction Traffic and Access Construction Management Plan, Site Establishment Management Plan and Construction Parking and Access Strategy. Implementation of

these plans and strategy would ensure that traffic and access impacts are minimised, vehicular access to and parking in the vicinity of affected businesses and properties is maintained, spoil haulage occurs along approved routes and safe pedestrian and cyclist access is provided around construction sites.

Air Quality

The Department has considered air quality impacts during the construction and operation stages which included advice and recommendations from an independent air quality consultant, NSW Health, EPA and Office of the Chief Scientist and Engineer.

In line with the Government's reforms for the regulation of emissions from tunnel ventilation facilities, the NSW Chief Health Officer has provided a statement on the potential health impacts of the predicted emissions, stating that it considers that any potential air pollution-related health effects from the project are likely to be a result of changes in volumes of traffic on the surface road network and not a result of the tunnel ventilation outlets. The Advisory Committee on Tunnel Air Quality has also provided a statement indicating that the air quality assessment constitutes a thorough review of high quality.

Based on the outcomes of the air quality assessment, the operational air quality outcomes for the project (both in-tunnel and adjacent to the ventilation facilities) are considered acceptable, with improvements in some areas resulting from traffic moving from surface roads to underground. The Department has recommended limits on in-tunnel and ventilation outlet concentrations of key pollutants and for an Air Quality Community Consultative Committee be established comprising representative from the community and local councils. The Committee would have a consultative role on the siting of monitoring locations.

Noise and Vibration

Noise and vibration impacts to residents and other sensitive receivers are expected to occur throughout the construction phase of the project, particularly at surface road works and around the southern portal near President Avenue. The Department has recommended a number of conditions to manage the impact of construction noise and vibration including the provision of periods of respite and at-property acoustic treatments for properties identified as being highly noise impacted by the predicted regular out-of-hours works, and implementation of management strategies including scheduling of project and utility works.

To manage noise impacts once the project is operational, a combination of project controls and at-property treatments are proposed by the Proponent. These measures are supported by the Department and implementation of these measures as early as possible during construction to minimise construction noise impacts is required. The Department has also recommended the implementation of an Operational Noise and Vibration Review and the preparation of an Operational Noise Compliance Report to ensure that noise and vibration levels generated by the project comply with project specific noise criteria post operations.

Groundwater

The project alignment is located in an area of complex geological composition and aquifers and would likely result in impacts to the existing groundwater conditions through potential contamination from past and present land use practices (such as historic landfill and service station), drawdown and diminished groundwater quality as a result of saline intrusion. The Department engaged an

independent groundwater consultant to provide recommendations in managing the likely impacts of the project.

The Department has recommended the Proponent refine the groundwater modelling and monitoring and produce a Groundwater Modelling Report prior to finalising the detailed design of the project to further verify potential groundwater drawdown, tunnel inflows and saline water migration. The Department has also recommended the Proponent implement a Surface Water Quality Plan and Monitoring Program and a Groundwater Monitoring Program and 'make good' provisions for any impacted registered bores during construction and operation.

Contamination and Soils

Part of Rockdale Bicentennial Park is located on a historic landfill. The Department recognises the public health and safety concerns regarding exposure and removal of contaminated material from the historic council landfill. The Department has recommended a Soil Contamination Report be prepared prior to any excavation activities and requirements relating to remediation and auditing to ensure the site is suitable for the intended land use. The Department is satisfied the recommended conditions and the Proponent's environmental management measures would adequately reduce the risk of adverse environmental and human health impacts from exposure to contaminated materials.

Biodiversity

The project will impact on around 2.15 hectares of threatened ecological communities and five plantings of the endangered Magenta Lilly Pilly. The Department has required the Proponent offset the impacts by retiring credits in accordance with the offset rules of the *Biodiversity Conservation Act 2016*. Although no threatened fauna species were recorded during fauna surveys, there is the potential for the threatened bat species, Southern Myotis, to occur in the culvert which connects the Scarborough Ponds to the north and south of President Avenue. This culvert will be replaced as part of the project. Accordingly, the Department has recommended that bat boxes be installed, or suitable habitat provided in the replacement box culverts.

The continued use of the Arncliffe construction ancillary facility will defer its rehabilitation and restoration of Green and Golden Bell Frog foraging habitat. The delay in its restoration is unlikely to have an impact as the existing frogs were captured to establish a breeding population as a mitigation measure under the New M5 Motorway approval. The Department is satisfied that the construction impacts of the project can be addressed by the preparation and implementation of a Green and Golden Bell Frog Plan of Management.

Place and Urban Design

The Department acknowledges that the surface elements of the project would have an impact on visual amenity, including the Rockdale ventilation facility, the motorway operations complexes, surface road works along President Avenue and the President Avenue interchange with the F6 tunnel portal. Other visual impacts are a result of the removal of trees and parkland and changing land use. The Department has recommended the preparation of an Urban Design and Landscape Plan to ensure that the final design is sympathetic with the surrounding urban context and built form, and that opportunities to enhance visual amenity have been incorporated into the design.

The Proponent has proposed new active transport infrastructure through Rockdale Bicentennial Park and Scarborough Park, connecting with the local pedestrian and cyclist network and a shared overbridge across President Avenue linking the two parks. The Department considers that the active

transport network can be enhanced through replacing the proposed on-road portion of the active transport corridor between Bruce and England Streets at Brighton Le Sands to follow the existing F6 reserved corridor and has recommended a condition to this effect. The Department has also recommended that the Proponent investigate the feasibility of constructing an at-grade footpath along the northern side of President Avenue in the vicinity of the tunnel portal to provide a continuous east-west connection and, if feasible, to construct the path.

Land Use, Social and Economic

The acquisition of land is an unavoidable impact of delivering major road infrastructure projects in highly urbanised environments. Most of the land to be impacted by the project is within a designated road corridor and owned by the Proponent or other public agencies. Construction and operation of the project will require the temporary and, to a lesser extent, permanent acquisition of public open space in Rockdale Bicentennial Park, Kogarah Golf Course and Scarborough Park, as well as a limited number of residential (five full and three partial), commercial (one) and industrial (six) properties. The Department has recommended that a Recreation Facilities Replacement Plan be implemented to offset the impacts on the recreational facilities affected by the project. Facilities that offset impacts arising from the construction of the project must be open and functional prior to impacting on the existing facilities. The Department notes that discussions on the replacement recreational facilities between the Proponent and Bayside Council are in progress.

The Proponent will need to prepare a Residual Land Management Plan to manage the return of land acquired for construction but not need for the operation of the project, or future road projects.

There is the potential for damage to property and infrastructure to occur as a result of settlement induced by tunnelling and groundwater drawdown. The Department has recommended a suite of settlement-related conditions, including settlement criteria, the refinement of settlement impacts through a geotechnical model, pre-and post-construction building surveys, and requirements for rectifying any damage arising from settlement.

The Department considers that the recommendations for managing noise, air quality and traffic will reduce the project's construction and operational impacts on the local community, while the improvements to active transport will enhance community connectivity.

Other Issues

The assessment concludes that relevant impacts of other issues such as non-Aboriginal and Aboriginal heritage, waste management, water quality, flooding and greenhouse gas emissions can be appropriately managed through the implementation of mitigation measures and safeguards, as proposed in the EIS and PIR and through the conditions recommended by the Department.

Abbreviations

ACTAQ	Advisory Committee for Tunnel Air Quality
ADT	Average daily traffic
AEP	Annual exceedance probability
AHIMS	Aboriginal Heritage Information Management System
AIP	Aquifer interference policy
AWT	Average weekday traffic
BAM	Biodiversity assessment method
BC Act	Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BTEXN	Benzene, toluene, ethylbenzene, xylenes, naphthalene
CBD	Central business district
CEMP	Construction environmental management plan
CPTED	Crime prevention through environmental design
CSSI	Critical State significant infrastructure
Department	Department of Planning, Industry and Environment
dB(A)	Decibels (A-weighted)
DoI	(former) Department of Industry
DPI	(former) Department of Primary Industries
EIS	Environmental impact statement
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environment protection licence
ESD	Ecologically sustainable development
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007
ISCA	Infrastructure Sustainability Council of Australia
LGA	Local government area
LoS	Level of Service
ML	Megalitre
MLALC	Metropolitan Local Aboriginal Land Council
MOC	Motorway operations complex
NCA	Noise catchment area
NML	Noise management level
OEH	(former) Office of Environment and Heritage
PCT	Plant community type

PIR	Preferred infrastructure report
Project	F6 Extension Stage 1 project
Proponent	Transport for NSW (Road and Maritime Services)
RMS	Transport for NSW (Roads and Maritime Services)
RtS	Response to submissions report
RWR	Residential, worker and recreational (receptor)
SSI	State significant infrastructure
SSMPM	Sydney Strategic Motorway Project Model
UDLP	Urban design and landscape plan
UNSW WRL	Water Research Laboratory, University of New South Wales

Contents

1. Introduction

The F6 Extension Motorway program of works is a proposed motorway extending from the New M5 at Arncliffe to the Princes Highway at Loftus. Following a staging analysis, Transport for NSW (Roads and Maritime Services) (RMS – the Proponent) has decided to proceed with Section A - F6 Extension Stage 1 (the project). Once complete, the project would improve connections and travel times between southern Sydney and the Sydney CBD and improve connections for residents and business within the broader regional area. It would also promote and support economic growth in areas to the south such as Sutherland. **Figure 1** shows the location of the F6 Extension Stage 1 within the broader F6 Extension Motorway program.

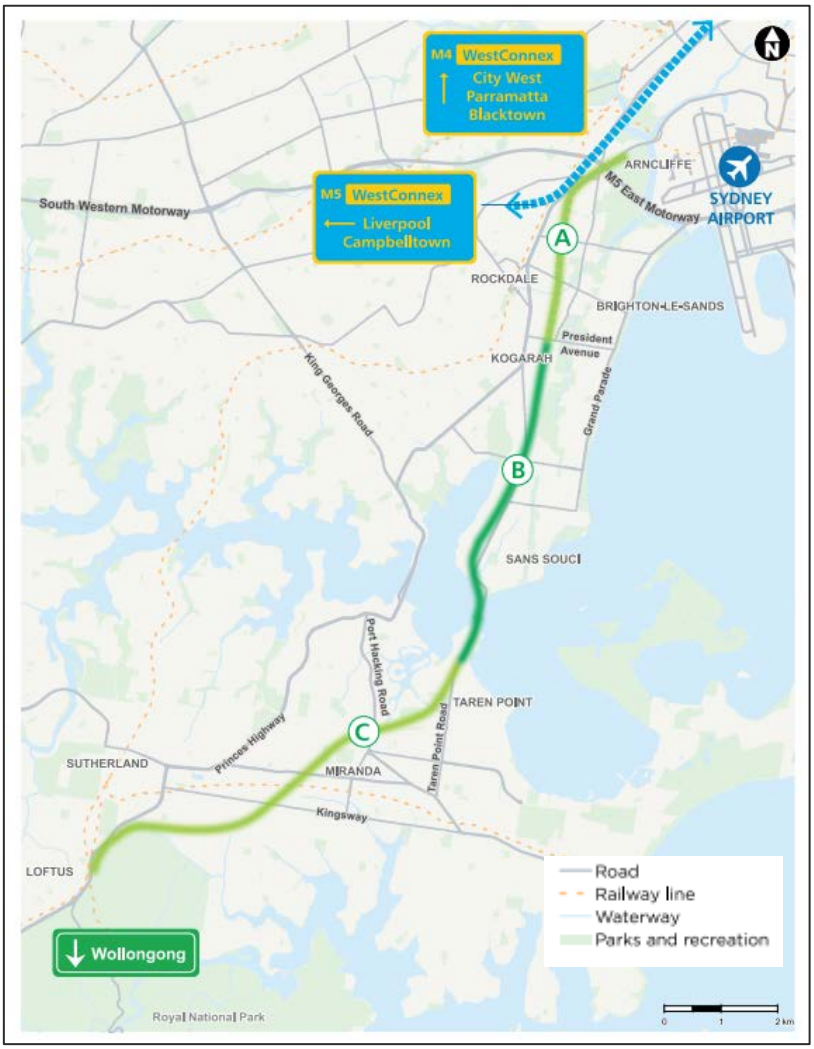


Figure 1 | F6 Extension overview (Source: EIS)

The project involves the construction of twin tunnels approximately 2.5 kilometres in length, linking the New M5 at Arncliffe to President Avenue at Kogarah, including associated surface works to connect to the existing road network (**Figure 2**), motorway operation complexes and ventilation outlet facilities. The project will also provide new cycle and pedestrian pathways. A new power supply source will also

be provided extending from the existing Ausgrid Canterbury sub-transmission substation at Hansen Avenue, Earlwood to the motorway operations complex at West Botany Street.

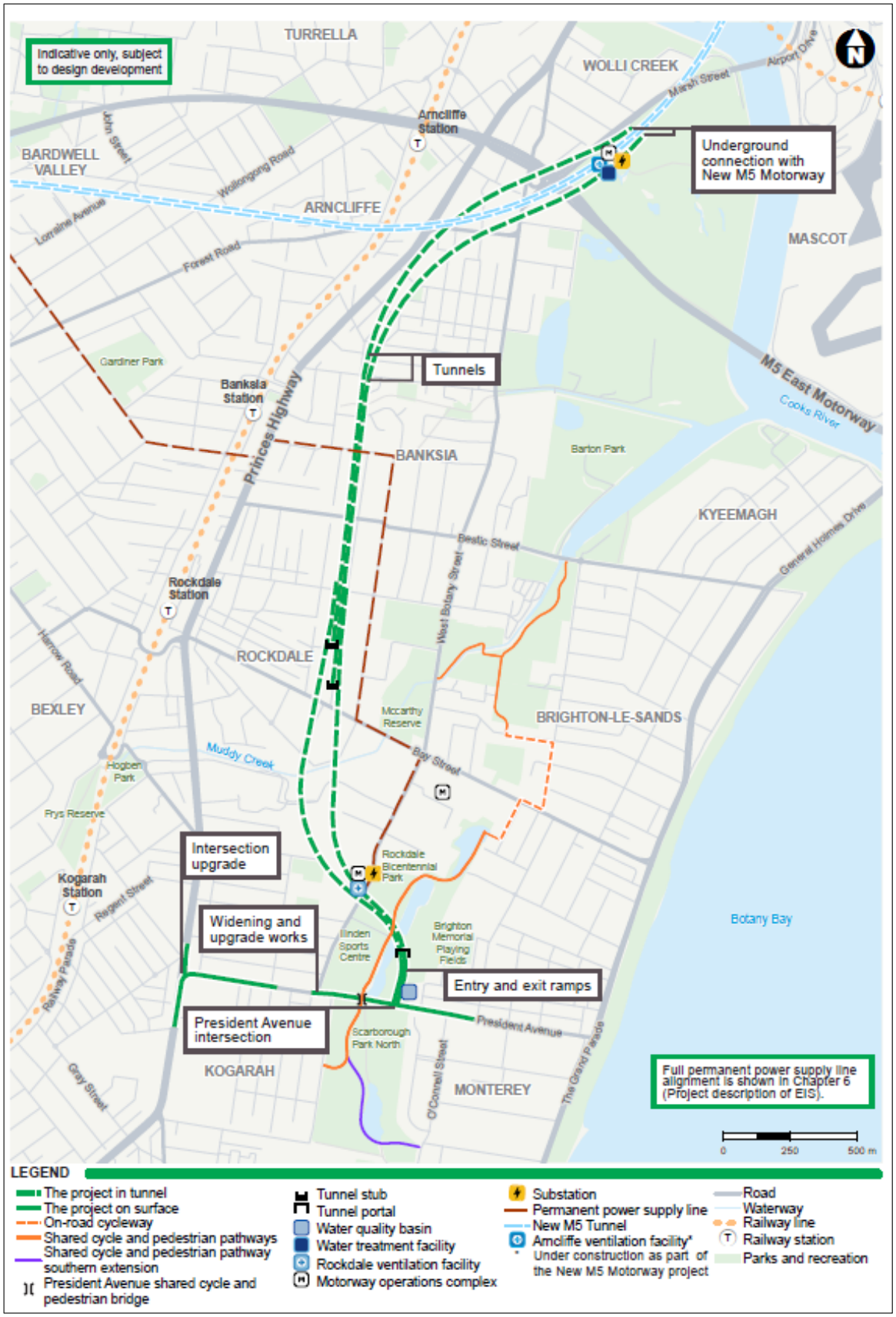


Figure 2 | Project location and design elements (Source: EIS)

The project components are in an urbanised area with the predominant land uses along the route alignment being low to high density residential developments, interspersed with educational facilities (including TAFE) and hospital facilities (St George Hospital at Kogarah). At the southern end of the alignment at Rockdale, the tunnel passes through a commercial/light industrial area and recreational area (Rockdale Bicentennial Park and Memorial Fields and Scarborough Park).

The key components of the project are primarily within the Bayside Council local government area (LGA) with the proposed route for the powerline spanning both the Bayside and Canterbury-Bankstown LGAs.

2. Project

2.1 Project Overview

The project involves the construction of twin tunnels of around 2.5 kilometres in length between the New M5 at Arncliffe and President Avenue at Kogarah, near Rockdale Bicentennial Park. Stub tunnels are being constructed as part of the New M5 project at Arncliffe to connect the F6 Extension Stage 1 to the New M5. In addition, the project will involve a change in the road marking from two to four lanes in the New M5 tunnel between the St Peters Interchange and where the F6 Extension Stage 1 tunnel joins the New M5 tunnel. Entry and exit ramps (approximately 1.5 kilometres in length) would be constructed to connect the mainline tunnels to President Avenue at Kogarah and comprise tunnels, a tunnel portal (open slot structure) and surface road ramps. Key components and operational features of the project are described in **Table 1**.

Table 1 | Main components of the project

Aspect	Description
Tunnels / Ramps/ Portal	• Approximately 2.5 kilometres of twin mainline tunnels between the New M5 at Arncliffe and President Avenue at Kogarah. Each tunnel is sized to accommodate three lanes in each direction but would be marked for two. • Approximately 1.5 kilometres of entry and exit ramps at President Avenue including a tunnel portal comprising an open slot structure. • Stub tunnels for the proposed connection to a future southern stage of the F6. • Tunnel depths from around 100 metres below ground to just below the surface near the tunnel portal. Average depth of 70m below ground. • Vehicular cross passage to allow traffic to be moved from one tunnel into another. • Pedestrian cross passages around every 120 metres. • Lane-marking of an additional two lanes in the New M5 tunnels, resulting in four lanes between the St Peters Interchange to where the project will join the New M5 tunnel at Arncliffe.
President Avenue and F6 Intersection	• Widening of sections of President Avenue to three lanes eastbound and westbound and provision of slip lanes. • Raising of President Avenue by about three metres.
President Ave / Princes Hwy Intersection Upgrade	• Upgrade from a two lane right turn from northbound Princes Highway to President Avenue to a three-lane signalised right turn. • Upgrade from three lanes southbound on Princes Highway to four lanes onto President Avenue.
Other surface road network changes	• Conversion of Lachal Avenue at President Avenue, Kogarah to one-way northbound. • Conversion of Traynor Avenue at President Avenue, Kogarah to one-way southbound.

	• Provision of an additional 60-metre southbound left turn bay at the existing signalised intersection at West Botany Street and President Avenue. • Installation of a signalised T-intersection at Civic Avenue, Kogarah. • Prohibition of right turn out of Cross Street, Kogarah into President Avenue. • Cul-de-saccing of O'Neill Street at President Avenue, Brighton Le Sands.
Ventilation	• Ventilation facility and outlet located within the Rockdale Motorways Operation Complex (south) (MOC3) on West Botany Street, Rockdale. • Mechanical and electrical fit-out of the F6 Extension Stage 1 component of the Arncliffe ventilation facility at Marsh Street, Arncliffe (being constructed as part of the New M5 project) (MOC1). • A longitudinal ventilation system (with no portal emissions) comprising series of jet fans in the mainline tunnels. • Ventilation tunnels connecting the mainline tunnels and ventilation facilities. • Air intake would occur at the entry portal.
Ancillary Infrastructure	• Two motorway operations complexes located in Rockdale (MOC2 and MOC3). • Deluge, fire, incident response and life safety systems. • Communication infrastructure including CCTV in the tunnel and approaches. • Vehicle cross passages for emergency use. • Pedestrian cross passages between the two main tunnel alignments. • Drainage infrastructure, including fit out of the New M5 water treatment plant at Arncliffe to treat groundwater collected from the F6 tunnels, and works within the Scarborough Ponds upstream of President Avenue. • Signage including traffic, locational, directional, warning and variable message signs. • Provision of a power supply line from the Hansen Avenue substation at Earlwood to the substations at the Rockdale Motorway Operation Complex (south) (MOC3).
Active transport facilities	• New pedestrian and cyclist facilities between Bestic Street, Brighton Le Sands to Civic Avenue, Kogarah and Chuter Avenue/O'Connell Street, Monterey. • Shared overpass over President Avenue.
Tolling infrastructure	• Tolling points at the President Avenue entry and exit ramps or the tunnel portal.

2.2 Physical Layout and Design

The physical layout and key elements of the project are shown in **Figure 3**, **Figure 4**, **Figure 5** and **Figure 6.** Landscaping and rehabilitation works will be provided at Rockdale Bicentennial Park and the President Avenue portal intersection. In addition, landscape plantings will be implemented at the motorway operation complexes.

Figure 3 | F6 Extension Stage 1 - Connection with the New M5
(Source: EIS)

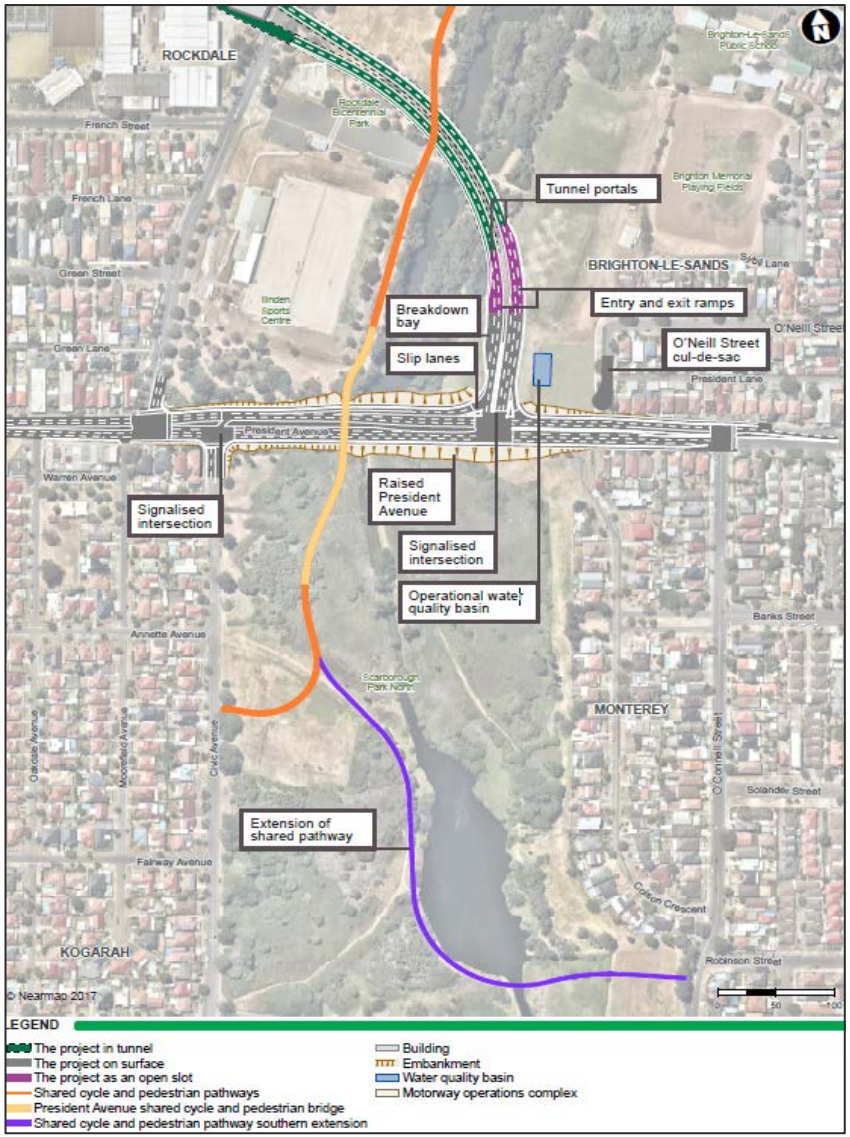


Figure 4 | Proposed President Avenue intersection layout
(Source: PIR)

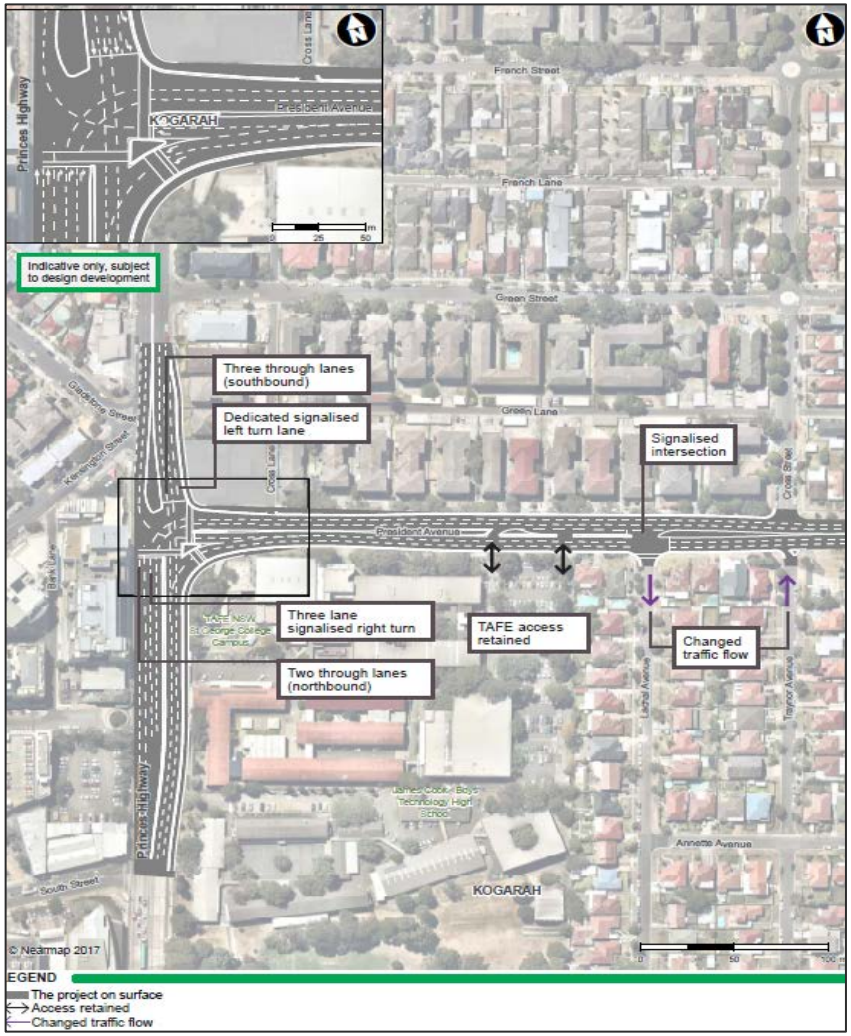


Figure 5 | President Avenue and Princes Highway operational layout
(Source: EIS)

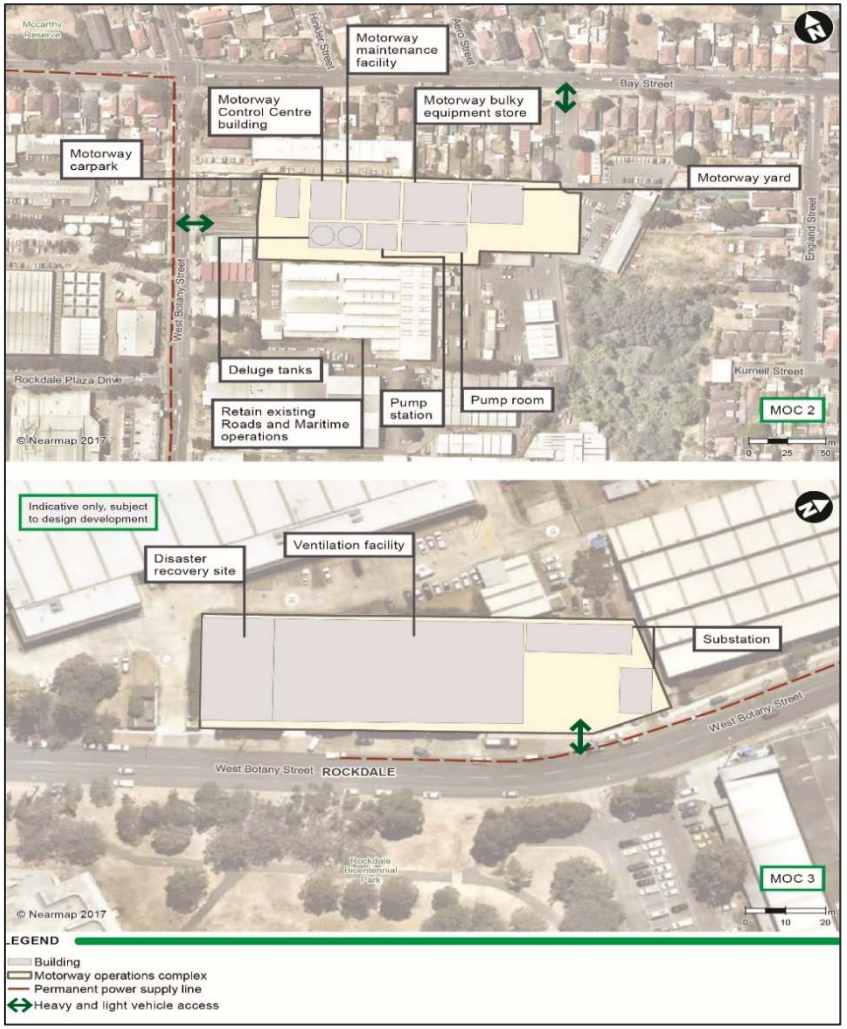


Figure 6 | Proposed motorway operational complexes, Rockdale
(Source: EIS)

2.3 Construction Works

The key construction works are summarised in **Table 2**.

Table 2 | Main construction components

Aspect	Description
Site establishment and enabling works	• Property acquisition, demolition and vegetation clearing • Traffic management changes and measures • Installation of safety and environmental controls • Establishment of construction ancillary facilities and access • Establishment of temporary pedestrian and cyclist diversions • Utility works
Tunnelling	• Construction of declines and shafts • Excavation of tunnels (including blasting) • Spoil management • Finishing works and provision of permanent tunnel services • Testing of plant and equipment
Surface earthworks and structures (including portals)	• Vegetation clearance and topsoil stripping • Excavation of new cut and fill areas • Construction of tunnel dive structures and tunnel portal • Stabilisation and excavation support works • Construction of retaining structures • Installation of utility infrastructure • Finishing works
Active transport works	• Temporary closure of pedestrian pathways • Construction of a new pedestrian and cycle paths including an overpass over President Avenue and watercourse crossing in Scarborough Park
Drainage	• Construction of new pits, pipes, drainage channels, detention tanks • Construction of new groundwater drainage systems • Connection of drainage to the existing network, and adjustments to the existing drainage infrastructure where impacted • Construction of water quality basins, constructed wetlands and bioretention facility • Demolition and removal of redundant drainage
Road upgrades	• Road upgrades kerb and guttering • Asphalting and finishing works
Operational ancillary facilities	• Ventilation systems and facilities • Motorway operations complexes • Electrical substations • Test plant and equipment
Finishing works	• Line marking of new road surface • Erect directional signage and roadside furniture such as street lighting • Erect toll gantries and other control systems • Reinstatement and construction of pedestrian and cycle paths • Landscaping and rehabilitation works • Reinstatement of Rockdale Bicentennial Park • Closure and backfill of temporary access tunnels (except where these are to be used for inspection and/or maintenance purposes)

The construction of the project would use six construction sites:

- Arncliffe construction ancillary facility C1 (currently being used for New M5 construction);
- Rockdale construction ancillary facility C2 (within RMS depot at West Botany Street);
- President Avenue construction ancillary facility C3 (north and south of President Avenue);
- Shared cycle and pedestrian pathways construction ancillary facilities C4, C5 (within the recreation area between West Botany Street and Francis Avenue); and
- Princes Highway construction ancillary facilities C6 (north-east corner of President Avenue and Princes Highway).

The location of the construction ancillary facilities is shown in **Figure 7**. **Table 3** sets out the proposed activities to be carried out at each facility.

Table 3 | Proposed construction ancillary facilities and activities

Activities	C1 Arncliffe	C2 Rockdale	C3 President Ave	C4/C5 Shared Cycle/Pedestrian	C6 Princes Highway
Site offices	■	■	■		
Staff and workplace amenities	■	■	■	■	■
Stores and laydown	■	■	■	■	■
Workshop / maintenance	■	■	■		
Tunnel - launch and support	■	■			
Tunnel – spoil management	■	■	■		
Civil and surface works	■	■	■	■	■
Construction water treatment plant	■	■	■		■
Sedimentation pond	■	■	■		
Temporary ventilation plant	■	■			
Temporary substation	■	■			
Parking	■	■	■	■	■

Temporary facilities and the internal layout of permanent facilities may change when the construction contractor is engaged and detailed construction methodologies are developed. The permanent facilities being provided at the Arncliffe site, including the Arncliffe ventilation facility and water treatment plant, are being built on Kogarah Golf Course as part of WestConnex New M5. Fit-out works to prepare these facilities for use by the F6 Extension Stage 1 would be carried out as part of the F6 project.

The majority of above ground infrastructure is proposed to be constructed between 7:00 am and 6:00 pm weekdays and 8:00 am to 1:00 pm on Saturdays. However, some works would need to be undertaken outside of these hours for safety and operational reasons.

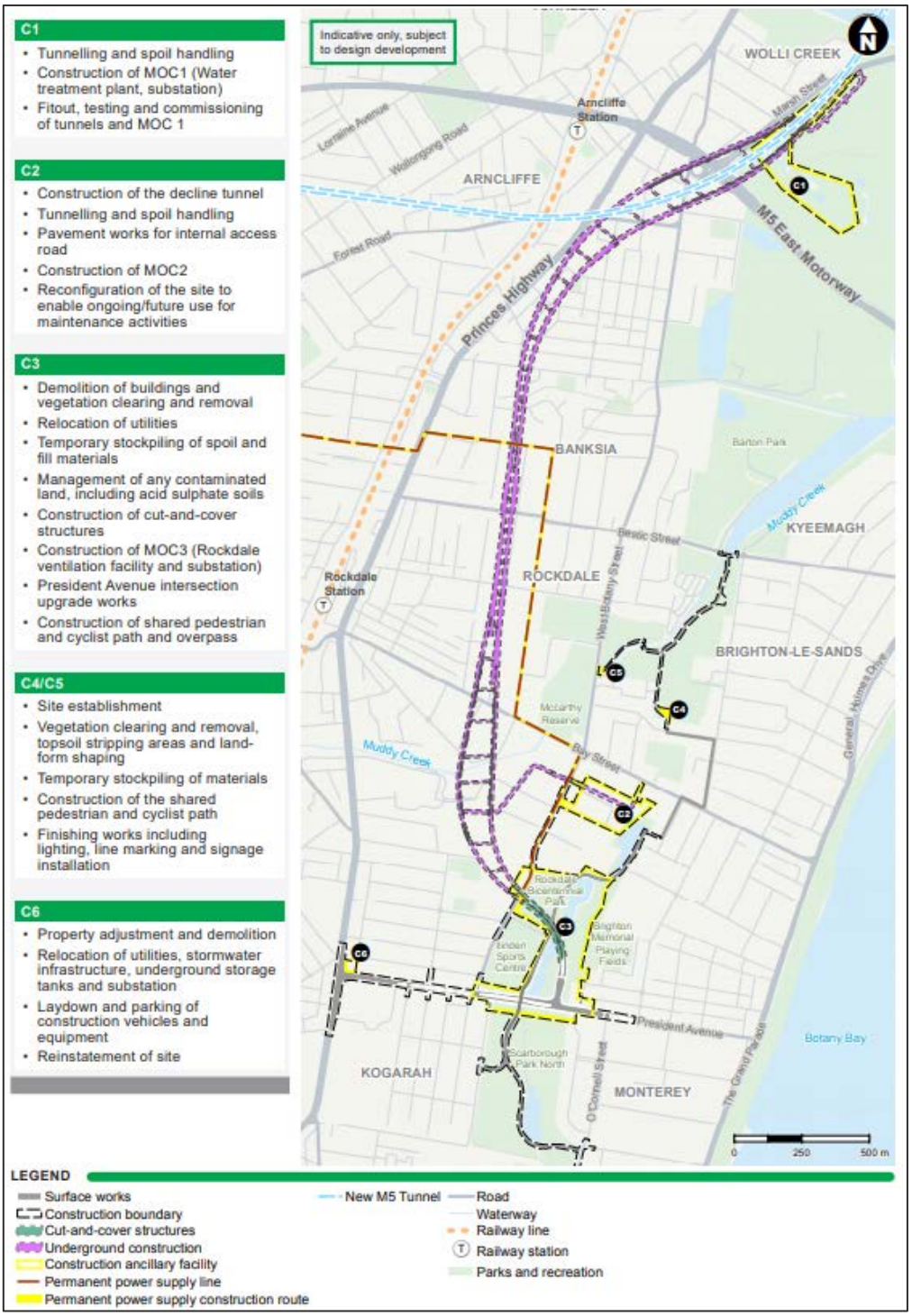


Figure 7 | Location of construction ancillary facilities (Source: EIS)

2.4 Timing

Construction of the project is anticipated to commence in late 2021 and expected to take approximately four years, including commissioning. **Table 4** sets out the indicative construction program.

Table 4 | Indicative construction program (Source: RMS)

Construction activity	Indicative construction timeframe																			
	2021				2022				2023				2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
C1 Arncliffe Construction Ancillary Facility																				
Site establishment				■	■															
Tunnelling works					■	■	■	■	■	■	■	■	■	■	■	■				
Construction of MOC1															■	■	■	■		
Landscaping																			■	■
C2 Rockdale Construction Ancillary Facility																				
Site establishment				■	■	■														
Tunnelling works					■	■	■	■	■	■	■	■	■	■	■	■				
Construction of MOC2															■	■	■	■		
Landscaping																			■	■
C3 President Avenue Construction Ancillary Facility																				
Site Establishment				■	■															
Cut-and-cover structure					■	■	■	■	■	■	■	■	■							
Landscaping													■	■	■					
Motorway Operations Complex 3 (surface Buildings)													■	■	■	■	■			
President Avenue utilities services				■	■	■	■													
President Avenue widening							■	■	■	■	■	■	■							
Landscaping												■	■	■						
Cycle and pedestrian bridge											■	■	■	■	■					
C4/C5 Shared Cycle and Pedestrian Pathway																				
Site establishment							■													
Cycle and pedestrian pathways								■	■	■	■	■	■							
Rehabilitation and landscaping														■						
C6 Princes Highway Construction Ancillary Facility																				
Property demolition, rehabilitation and adjustment							■	■	■											
Relocation of utilities,										■	■	■	■							
Pavement works														■	■	■	■			
Landscaping																		■		

3. Strategic Context

3.1 Project Justification

Within the next decade there will be an additional one million extra road users in Greater Sydney and twice as many freight movements by 2031 (*NSW Long Term transport Master Plan, 2012*). Sydney's road and motorway network supports economic growth across NSW by connecting people to jobs, facilitating trade between business and providing the infrastructure required for efficient freight movements. Efficient transport systems are becoming increasingly important in facilitating future population and economic growth.

The F6 Extension Stage 1 is identified as a committed initiative in the *Future Transport Strategy 2056* (Transport for NSW, 2018) and the supporting plan the *Greater Sydney Services and Infrastructure Plan* (Transport for NSW, 2018) as a means of managing congestion, improving capacity and optimising journey time on the established road network. The *State Infrastructure Strategy 2018-2038* (Infrastructure NSW, 2018) recognises the F6 as a priority for alleviating pressure on the existing arterial road network.

The key project benefits include:

- transport benefits - these would result from reduced travel time and better reliability for road users as well as improved road safety and better connectivity for active transport;
- productivity benefits – these would result from it being easier for people to get to jobs, for businesses to access their markets and for heavy vehicles to move more efficiently through southern Sydney; and
- city-shaping benefits - these would result from easier access for residents when through traffic is reduced from local centres and more certainty is provided around planning and investment.

There is currently no motorway between the existing M1 Princes Motorway south of Waterfall and the Sydney motorway network. All local and through traffic is currently required to use the arterial road network to travel between Waterfall and Sydney, principally the A1 Princes Highway, the A3 King Georges Road and / or the A6 Heathcote Road / New Illawarra Road. However, the potential for growth in traffic has long been recognised and in the 1950's a road reserve corridor was established between Arncliffe and Loftus to service future growth requirements.

The Princes Highway currently experiences heavy traffic congestion, slow speeds and unreliable travel times, particularly in peak traffic periods. Through a connection with the New M5 Motorway, the project would assist in providing more efficient and economic transport connections for freight vehicles, workers and other commercial operators travelling to Sydney Airport and other industrial and commercial areas in southern Sydney. The F6 project will facilitate improved connectivity for inter-regional traffic and facilitate more efficient journeys to and from southern Sydney by providing a motorway connection between Arncliffe and Kogarah. Local amenity and accessibility will also increase in some areas due to less congestion on the road network.

In addition to traffic benefits, the project would deliver over three kilometres of new and upgraded pedestrian and cyclist facilities between Bestic Street, Brighton Le Sands to Civic Avenue, Kogarah and Chuter Avenue/O'Connell Street, Monterey.

The F6 Extension Stage 1 is expected to create up to around 2,862 full-time construction jobs including:

- 812 full-time workers directly employed on the project; and
- 2,050 indirect full-time jobs.

Construction of the project is predicted to directly contribute around $775 million on average to the gross State product for each year of construction, with indirect effect of around $300 million, giving an estimated total contribution of $1,075 million on average for each year of construction.

3.2 Project Development and Alternatives

The Environmental Impact Statement (EIS) considered the merits of the project in the context of a number of alternative project options, including:

- do nothing/do minimum;
- rail infrastructure improvements;
- bus service improvements; and
- motorway option (development of the F6 Extension).

The assessment also addressed four corridor options and alternative designs within the project including the tunnel alignment, number of lanes, interchange connecting the existing surface road network with the southern end of the project, and intersection works. The assessment also looked at possible route options for the shared and pedestrian pathways. Other options considered included the design of the tunnel ventilation system and tunnelling methods.

Alternative 1 - Do nothing/do minimum

This approach would involve carrying out only currently planned and funded transport infrastructure improvements on the existing road network, such as routine road and intersection upgrades. These works would be undertaken over time to incrementally improve capacity where there are specific congestion issues.

The Department is satisfied that this is not a feasible alternative as the current road network would not support a growing population and the works would not meet forecast traffic needs. lt would also impact on the NSW economy through longer delivery and transport times, particularly for businesses and commuters travelling to and from the south.

Alternatives 2 and 3 - Rail and Bus Infrastructure Improvements

An issue raised in public submissions is that the NSW Government should provide further investment in public transport infrastructure as an alternative to constructing the F6 Motorway.The Proponent assessed the options of undertaking improvements to the existing T4 Eastern Suburbs and Illawarra Line and/or the provision of a new mass transit line servicing southern Sydney and the Illawarra, as well as improvements to bus services. However, improved public transport would only partially contribute to relieving congestion on arterial roads. In addition, these options would not address the needs of customers to access highly dispersed locations involving longer trips, nor would they provide the separation of inter-regional and intra-regional traffic movements.

The Department notes that the construction of the motorway does not preclude public transport infrastructure improvements from being undertaken. The existing corridor zoned special purpose infrastructure has been retained. In addition, the project does not represent the NSW Government's total investment in transport infrastructure planning and investment, with the Government investing in a number of public transport projects across the Greater Sydney region.

Alternative 4 – Motorway Option

The *State Infrastructure Strategy Update 2014* recommended that the WestConnex program of works include a connection to allow for a potential future southern extension. It stated that a southern motorway that connects the New M5 Motorway to the A1 Princes Highway would remove inter-regional traffic from the existing arterial road network, easing congestion and reducing travel times for journeys through southern Sydney and between Sydney and the Illawarra region. The Department acknowledges that the motorway option would improve journey times and reliability for road users and support future growth and productivity in southern Sydney by improving connectivity.

4. Statutory Context

4.1 State Significant Infrastructure

The F6 Extension Stage 1 is Critical State Significant Infrastructure (CSSI) pursuant to section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Minister for Planning and Public Spaces is the approval authority.

4.2 Permissibility

The project is for the purpose of a road or road infrastructure facilities and is characterised as development permitted without consent, in accordance with clause 94 of the *State Environmental Planning Policy (Infrastructure) 2007* (the Infrastructure SEPP).

4.3 Other Approvals

In accordance with section 5.22(2) of the EP&A Act, the only environmental planning instruments that apply to the project are the Infrastructure SEPP insofar as it relates to the declaration of development that does not require consent) and *State Environmental Planning Policy (State and Regional Development) 2011* as it pertains to the declaration of infrastructure as State significant infrastructure. There are no other environmental planning instruments that substantially govern the carrying out of the project.

The construction of the project will be subject to an environment protection licence (EPL) issued under the *Protection of the Environment Operations Act 1997*. Operation of the proposed ventilation outlets will be subject to an EPL.

4.4 Objects of the Environmental Planning and Assessment Act 1979

The determination must have regard to the objects of the EP&A Act. The Department has given consideration to the objects of the EP&A Act including:

- ecologically sustainable development (see **Sections 4.5** and **6**);
- social and economic welfare (see **Section 6**);
- protection of the environment, including in relation to biodiversity, traffic, noise and vibration, air quality, surface and groundwater hydrology, urban design, amenity and socioeconomic issues (see **Section 6**);
- sustainable management of built and cultural heritage, including Aboriginal cultural heritage (see **Section 6**);
- good design and amenity of the built environment (see **Section 6**);
- promote the sharing of the responsibility for environmental planning and assessment between the different levels of government (see **Section 5**); and
- community participation in the assessment of the project (see **Section 5**).

4.5 Ecologically Sustainable Development (ESD)

The EP&A Act adopts the definition of ESD found in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental consideration in decision-making process and that ESD be achieved through the implementation of:

a) the precautionary principle;
b) inter-generational equity;
c) conservation of biological diversity and ecological integrity; and
d) improved valuation, pricing and incentive mechanisms.

Project objectives which guide the delivery and operation of the project would contribute to the sustainability of the project and the meeting of ESD principles. In addition to the objectives, the Proponent has addressed the above principles directly in the EIS and has identified a broad range of mitigation measures to manage impacts associated with these issues.

The Department has also recommended conditions of approval requiring:

- the preparation of a Sustainability Strategy that will be implemented throughout construction and operation of the project; and
- the project to achieve a minimum "Excellent" 'Design' and 'As built' rating under the Infrastructure Sustainability Council of Australia infrastructure rating tool.

The precautionary principle is applied throughout the EIS and the Department considers the assessment and the range of mitigation measures adequately adopt the principle. The Department is also satisfied that the valuation and pricing of the environmental resources associated with the project have been adequately undertaken and internalised through the project design and mitigation measures.

5. Engagement

5.1 Department's Engagement

Under section 5.28(1)(c) of the Act, the Planning Secretary is required to make the EIS publicly available. The EIS (**Appendix A**) was made publicly available from Wednesday 7 November 2018 until Friday 14 December 2018 (37 days) on the Department's website and electronically at NSW Service Centres. The EIS was made publicly available at the following locations:

- Bayside and Bankstown Council Service Centres;
- Department of Planning and Environment (Pitt Street Office);
- Roads and Maritime (Head Office); and
- Libraries at Brighton-Le-Sands, St Peters/Sydenham, Rockdale, Kogarah, Bankstown, Campsie, Arncliffe, Miranda, and Sutherland.

The Department advertised the public exhibition in the Sydney Morning Herald, The Daily Telegraph, St George Leader, Inner West Courier and Canterbury Bankstown Express. The Department also notified State and relevant local government authorities of the exhibition.

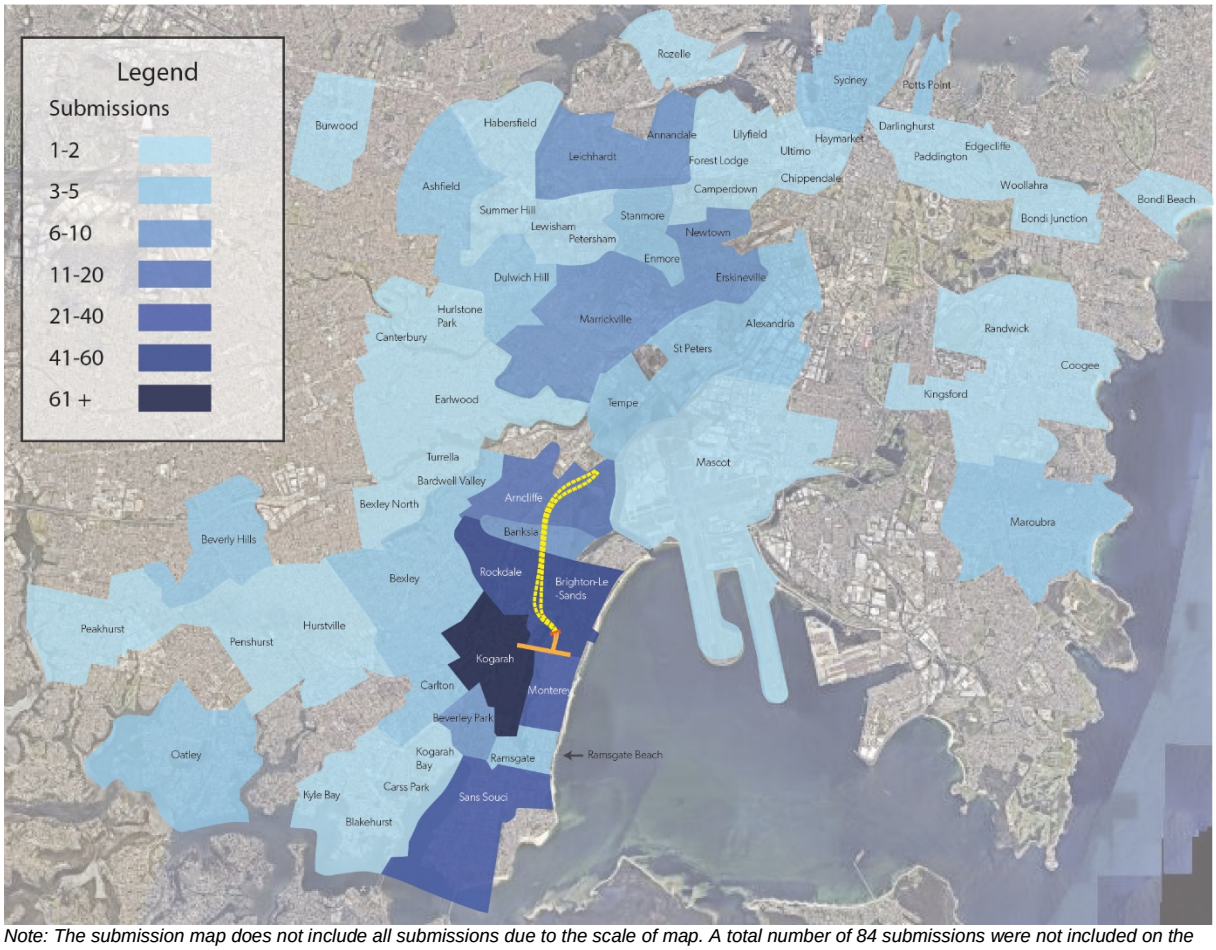
The Department undertook site inspections in September 2018, January 2019 and March 2019 to obtain an understanding of the surrounding environment, its sensitivities and issues raised in submissions. Representatives from the Department also attended community information sessions held by the Proponent before and during the exhibition period, and attended briefings to the councils by RMS.

The Department met with community representatives from Kogarah/Brighton Le Sands in January and July 2019. Issues raised included pedestrian and cyclist safety during construction and operation, biodiversity impacts, local traffic impacts particularly on residents in Moorefield Estate, and loss of recreational facilities.

The Department also met with Bayside Council in June and July 2019. The main issues raised were impacts on recreational facilities and their replacement, biodiversity impacts, and the location of the proposed pedestrian and cycle path.

5.2 Summary of Submissions

The exhibition of the EIS resulted in the receipt of submissions from seven State government agencies, five local government councils and 487 community submitters, including 16 special interest groups and organisations (**Appendix B**). The community submissions comprise submissions from individuals and community groups. A breakdown of community submitters based on location is shown in **Figure 8**. A list of the special interest groups/organisations is provided in **Table 5**.



Note: The submission map does not include all submissions due to the scale of map. A total number of 84 submissions were not included on the map, because these submitters were geographically located outside of the borders of the map.

Figure 8| Geographic analysis of submissions received

Table 5 | Special interest groups / organisations which provided submissions

Rockdale Ilinden Soccer Club	AshBUG	F6 Action Group
St George Bicycle Users Group	Rockdale Wetlands Preservation Society	St George District Netball Association
Walk Sydney	Action for Public Transport (NSW)	Bicycle NSW
Kogarah Bay Progress Association	BIKEast	St George Bicycle Users Group
The National Trust	Georges Riverkeeper	WestConnex Action Group
TAFE NSW		

5.3 Key Issues – Government Agencies

The **Environment Protection Authority** raised matters relating to the impact of water quality discharges on receiving waters, including the adopted species protection guideline values. The EPA indicated that further details were required on out-of-hours works, including potential noise impacts and justification for the works, and recommended that the Proponent prepare a Community Engagement Strategy so that the community has a clear understanding of the likely impact of construction.

The EPA raised a number of issues on air quality including the potential for odour impacts during construction and potential air quality impacts on elevated receivers during operation of the project.

The EPA indicated that further investigation was warranted to quantify the risks of contamination post approval and recommended the preparation of a Hazardous Materials Protocol, Remedial Action Plans where applicable and a Landfill Gas Management Plan.

The **NSW Chief Scientist and Engineer** commissioned a review of the EIS by two suitably qualified independent experts who advised that they considered the air quality assessment was of a high standard and that the benefit of exploring alternative approaches to the method of assessment would be questionable or marginal. The independent report also found the health risk assessment to be sound.

NSW Health recognised the potential for construction and operational noise to impact vulnerable receptors and indicated that it would be involved in the review of the construction and operational noise management plans. It also noted the potential for odour generation and that it would be involved in the review of the Construction Air Quality Management Plan.

The former **Office of Environment and Heritage** (now Environment, Energy and Science Group of the Department of Planning, Industry and Environment) stated that it was unable to comment on the accuracy of the Biodiversity Assessment Method (BAM) as the BAM calculator had not been finalised at the time of review and relevant spatial data have not been provided. OEH was satisfied that the impacts of flooding and flood risk had been adequately considered.

The Heritage Council noted that the project will result in potential impacts to the locally listed heritage items, Kings Wetland and Patmore Swamp. The Heritage Council advised that the proposed haulage route in the Kings Wetland should not damage remnant vegetation north of Kings Road. It also recommended that the Construction Heritage Management Plans should be submitted to it prior to finalisation and that the plan should commit to implementing a heritage interpretation strategy.

The former **Department of Industry** (now Regions, Industry, Agriculture and Resources Group of the Department of Planning, Industry and Environment) requested a meeting with the Proponent's groundwater consultants to discuss the groundwater modelling that had been undertaken. It also requested that the Construction Soil and Water Management Plan, Erosion and Sediment Control Plan and Operational Environmental Monitoring Plan be developed in consultation with the agency, with the former DPI Fisheries requesting consultation on the Construction Flora and Fauna Management Plan, Construction Soil and Water Management Plan and Acid Sulfate Soil Management Plan.

Fire and Rescue NSW recommended a number of conditions of approval relating to hazard reduction and fire and life safety systems, to ensure the tunnel adequately protects against fires.

Sydney Water noted many of its assets are within proximity to the tunnel and that consultation is required during all stages of the design process to ensure impacts to its assets are minimised.

5.4 Key Issues – Local Councils

Inner West Council indicated that it opposed Sydney's expanding urban motorway network and although not directly impacted by the project, Council was concerned that the project would move more vehicles into the Inner West. Council raised concern over the increased traffic in and around St Peters and Rozelle due to the project's link to WestConnex. It also raised concern over potential

community health impacts arising from the project due to private car dependency resulting in sedentary living in addition to reduced air quality, and increased traffic noise.

The Council also noted the potential for psychological distress created by property acquisitions and decreases in property values associated with the construction and operation of the project. The loss of local recreational land for road infrastructure was also raised as an issue and Council indicated that the final design should ultimately improve accessibility and deliver usable open space between neighbourhoods.

Canterbury Bankstown City Council proposed alternative routes for the supply of electricity to the project, including a new supply line running along the western side of Earlwood to the proposed power supply line to the east of Bardwell Park train station, and a new supply line from the New M5 Bexley motor operations complex.

Bayside Council raised the lack of strategic justification for the project and expressed concern that there is no commitment to Stage 2 of the F6 Extension and that the project does not provide a link to Port Botany. Council also raised concern over potential local traffic impacts, construction and operational noise, operational air quality impacts and the impact to Bicentennial Park as a result of the construction of the project, including potential impacts on groundwater dependent ecosystems.

Further, Council recommended modifications and augmentations to the proposed shared cycle and pedestrian pathways. Council requested that information on various key environmental issues be provided to it, including a copy of the flood management strategy, details on the impacts of settlement on council assets, and information on the treatment and reuse of groundwater. It also requested that it be consulted on the preparation of a number of management plans/protocols including the Community and Social Management Plan and Construction Fatigue Protocol proposed by the Proponent. Council also sought the installation of additional operational air quality monitoring stations.

Georges River Council raised concern over the potential increased pressure on the road network and expressed concern that the increased traffic volumes and exhaust emissions could impact the St George Private and Public Hospitals. Council also raised concerns with soil contamination associated with the removal of the service station on the corner of the Princes Highway and President Avenue, noise and vibration impacts, and potential adverse impacts on two local heritage items (St Paul's Anglican Church and Hall, and Shop and Residence).

Sydney City Council indicated that it was of the opinion that the project fails to contribute to the government's vision and objectives set out in *Future Transport 2056* and the State government's stated policy frameworks for connectivity through the provision of public transport and active transport. The Council also raised concern over the potential traffic impacts of the project and argued that the proposed ventilation outlets should include filtration.

5.5 Key Issues – Community and Special Interest Groups

A number of key issues were raised by the community and special interest groups and the key issues are listed below. Further details of the issues raised in submissions are provided for each of the key assessment issues in **Section 6**.

- Strategic context and project need
  - lack of demonstrated project need and justification
  - high project cost and no certainty on proposed tolling costs
  - timing and route of future stages of the F6 Extension

- Project development and alternatives
  - adequacy of strategic alternative assessment
  - suggested alternatives and options to the provision of the motorway, in particular, the provision of public transport
- Social and economic
  - adequacy of social and economic assessment
  - loss of value to residential properties
  - access impacts to businesses and industry during construction
  - loss of community open space
  - lack of adequate social and economic environmental management measures
- Health, safety and hazards
  - inadequate level and quality of health, safety and hazards assessment
  - human health impacts arising from construction and operational noise and emissions
  - social impacts on health from loss of open space
- Traffic and access
  - inadequate level and quality of traffic and transport assessment
  - construction traffic and transport impacts on local community
  - local traffic and transport network impacts during operation, especially for residents on streets connecting to President Avenue
  - local road and parking impacts during construction and operation
- Property and land use
  - inadequate level and quality of property and land use assessment
  - potential damage to properties from settlement
  - property acquisition
- Air quality
  - adequacy of air quality assessment
  - adverse construction (dust and odour) and operational air quality impacts (emissions from ventilation outlets)
- Climate change and greenhouse gas
  - greenhouse gas emissions during construction
  - climate change and greenhouse gases during operation
- Consultation
  - inadequate consultation prior to and during the public exhibition of the EIS
  - level of future community consultation during latter stages of the assessment process and after the application is approved

5.6 Response to Submissions

Following completion of the formal exhibition period, the Department directed the Proponent to prepare a response to the submissions received. The Proponent's Response to Submissions report (RtS – **Appendix C**) was made publicly available on the Department's website on 17 April 2019.

5.7 Preferred Infrastructure Report

5.7.1 Access to and from Moorefield Estate

Following the exhibition of the EIS, the Department directed the Proponent to prepare a Preferred Infrastructure Report (PIR – **Appendix D**) to address access to and from the Moorefield Estate as it was not satisfied that the access arrangements proposed in the EIS provided the best outcome for the

local community. Subsequent to the submissions received on the EIS and community consultation, the Proponent revised the access and egress onto President Avenue, including:

- conversion of Lachal Avenue from one-way northbound to one-way southbound;
- conversion of Traynor Avenue from one-way southbound to one-way northbound; and
- signalisation of the Civic and President Avenue intersection to facilitate safer access and egress to/from the Moorefield Estate.

The original and revised arrangements are illustrated in **Figure 9** and **Figure 10.**

5.7.2 Active Transport

The Proponent's consideration of submissions and consultations with Bayside Council led to a change in the proposed cycleway and this was also addressed in the PIR. The amended design involves extending the shared cycle and pedestrian pathway by around 600 metres from the connection to Civic Avenue in Scarborough Park North to Chuter Avenue/O'Connell Street, south of Robinson Street, in Monterey where it will connect with the existing on-road cycle network (refer **Figure 11** and **Figure12**). The proposed extension would consist of a three-metre wide boardwalk (or other low impact design) to minimise potential flooding impacts and generally follow existing informal walking/access tracks within Scarborough Park. A steel bridge structure is proposed where the pathway crosses the watercourse in the park. Further, there would be an upgraded pedestrian refuge at the connection point with the existing on road cycle network at Chuter Avenue/O'Connell Street.

5.7.3 Exhibition of PIR

The PIR was placed on exhibition from 17 April 2019 to 8 May 2019. A total of 105 community submitters commented on the project including four special interest groups (Bicycle NSW, BIKEast, Wollongong Neighbourhood Forum 5 and F6 Action). In addition, a submission was received from Bayside Council. The former Department of Industry wrote to the Department noting that it has no comments.

5.7.4 Key Issues

Bayside Council requested that a holding lane be provided in President Avenue for traffic turning right out of Civic Avenue. Council raised concern over potential impacts of the extended shared path on wetlands and endangered ecological communities in Scarborough Park. It also requested that the Proponent consider an amended design for the western connection to Civic Avenue/Annette Street.

Key issues raised in **community submissions** which were specific to the proposed changes presented in the PIR included:

- safety concerns over increased traffic on local streets being used as rat runs, particularly increased traffic volumes on O'Connell Street and Chuter Avenue, and the creation of a dangerous intersection at Marshall Street;
- concern over the configuration of the right-hand turning lane from President Avenue onto the Princes Highway and need for an additional right-hand turning lane to be installed;
- the increase of traffic lights from 5 to 8 along President Avenue, increasing congestion and travel times;
- the extension of the shared cycle and pedestrian pathway through Patmore Swamp which is a local heritage item; and
- potential adverse impacts on biodiversity in Scarborough Park, particularly the wetlands, and on Key Fish Habitat located 100 metres from the site.

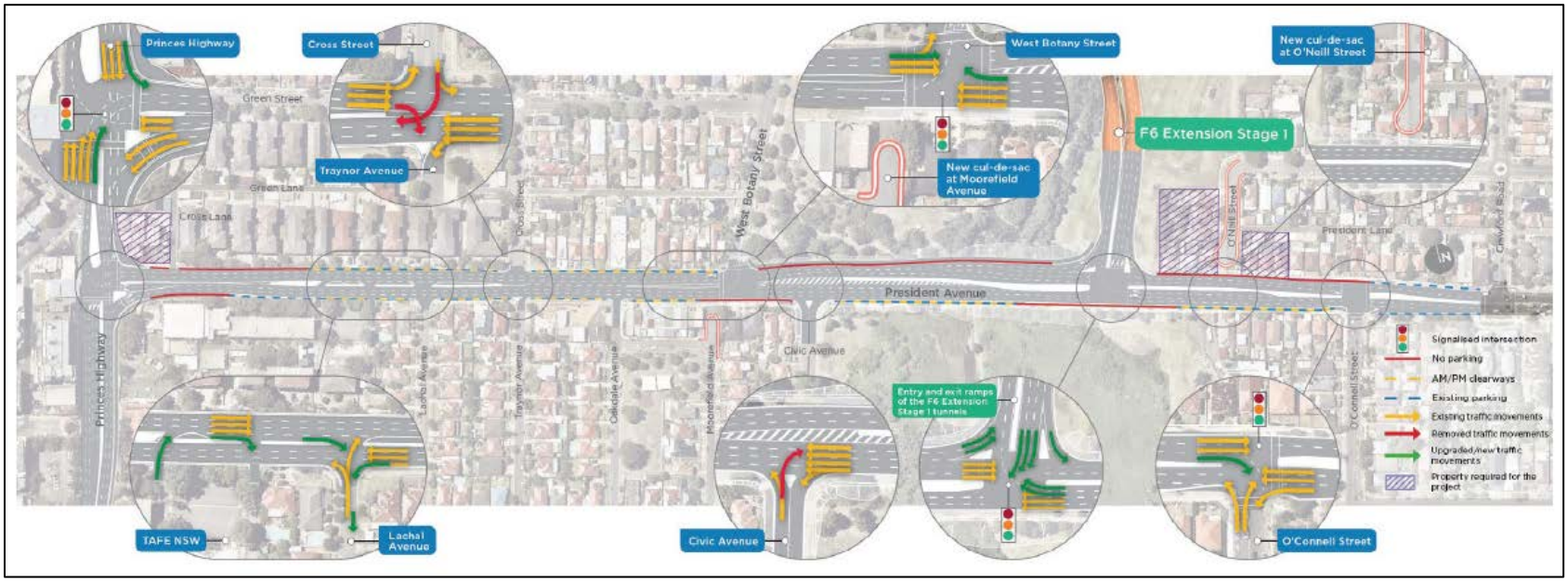


Figure 9 | Moorefield Estate access and egress arrangements proposed in the EIS (Source: PIR)

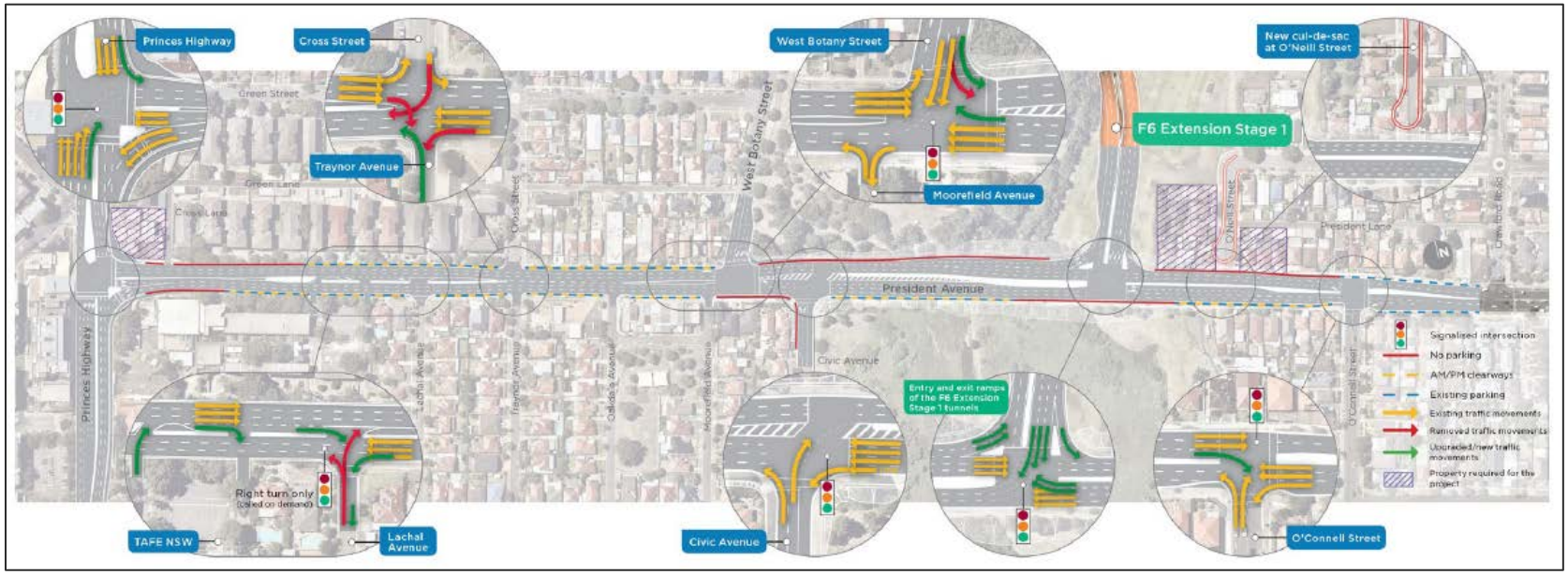


Figure 10 | Moorefield Estate access and egress arrangements proposed in the PIR (Source: PIR)

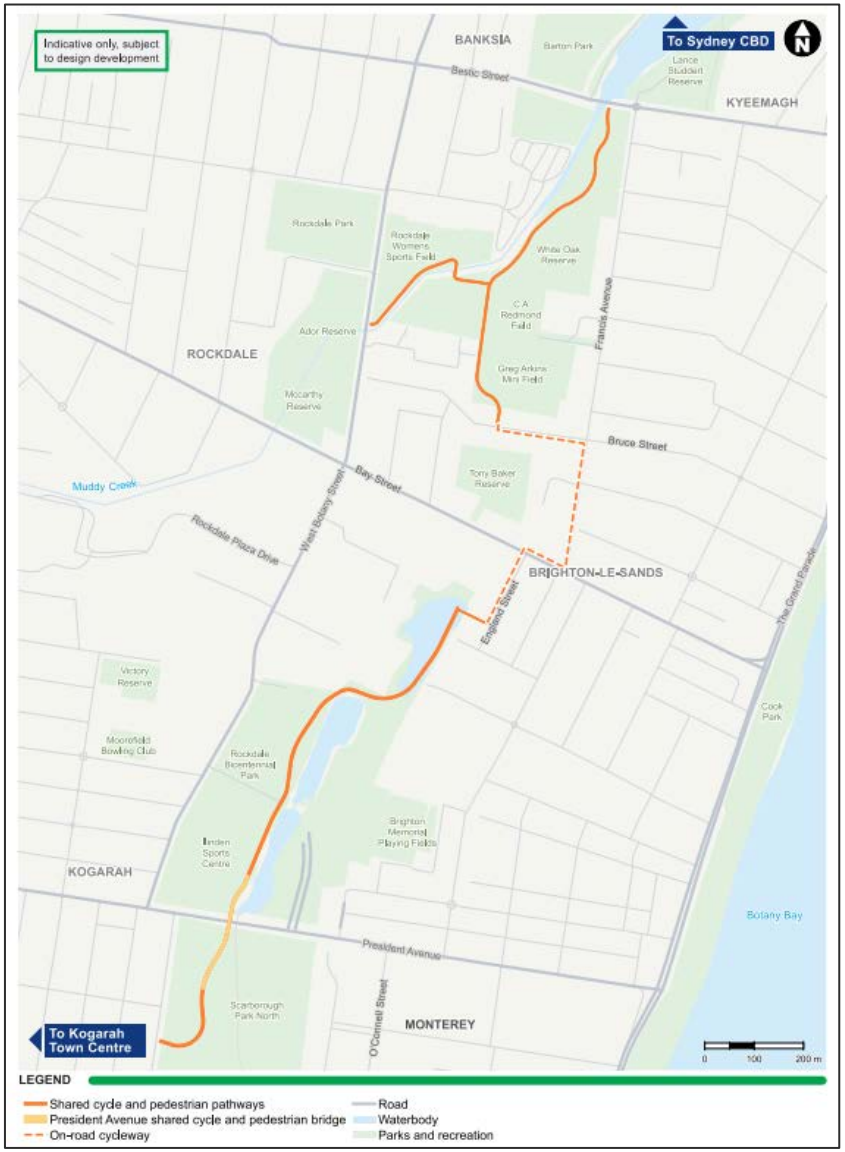


Figure 11 | Proposed active transport corridor route under the EIS
(Source: PIR)

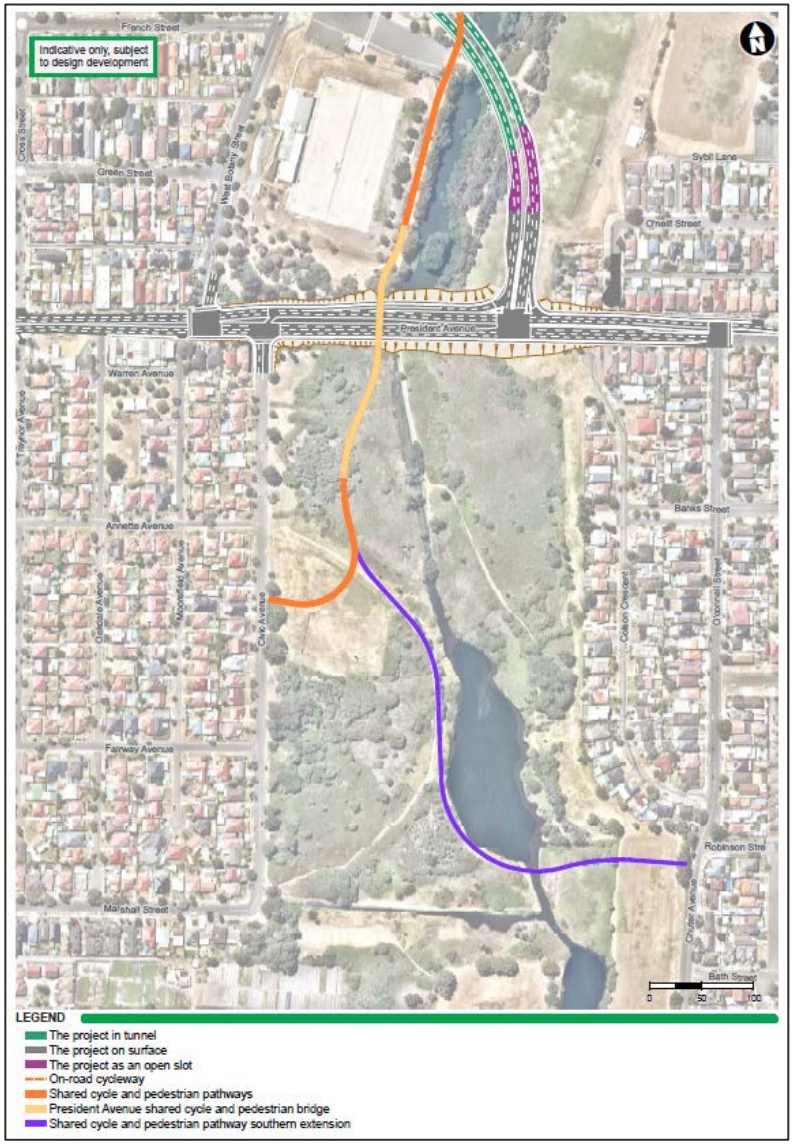


Figure 12 | Alignment of the proposed shared path extension
(Source: PIR)

5.7.5 Response to Submissions on PIR

Following completion of the public exhibition period, the Department directed the Proponent to respond to the submissions received (**Appendix E**). The Proponent's response was made publicly available on the Department's website on 3 July 2019.

6. Assessment

The Department in its assessment of the project, including the consideration of submissions received, identified the key issues as: Traffic and Transport; Air Quality; Noise and Vibration; Groundwater; Contamination and Soils; Biodiversity; Place and Urban Design; and Socio-Economic, Property and Land Use (**Sections 6.1** to **6.8**). Other issues are discussed in Section 6.9.

6.1 Traffic and Transport

Traffic Modelling Scenarios

An assessment of the existing and future traffic and transport environment and road network performance across the project area was undertaken by the Proponent as part of the EIS and PIR. The assessment addressed both construction and operational traffic and transport impacts utilising the traffic model '*Sydney Strategic Motorway Project Model' version 1* (SSMPM). The SSMPM is a network-wide model that outlines potential changes in travel patterns under different scenarios. These scenarios include assumptions on land use change, introduction of new transport infrastructure, induced traffic and traffic impacts with the project (being the 'do something' scenario) and without the project (being the 'do minimum' scenario). Furthermore, the SSMPM considers network changes resulting from the implementation of road tolls. The scenarios modelled as part of the traffic assessment are listed in **Table 6**.

The Department engaged an independent traffic specialist (Bitzios Consulting) to undertake a technical review of the Proponent's traffic and transport assessment. The specialist's report is provided at **Appendix F**.

Existing Traffic Volumes

The Proponent's traffic assessment focused on:

- the surrounds of the proposed intersection between the proposed southern portal of the project and President Avenue (referred to as the President Avenue Intersection);
- the future St Peters interchange; and
- the project corridor in between the President Avenue Intersection and the future St Peters Interchange.

With respect to the proposed project corridor and the proposed President Avenue Intersection and surrounds, roads running north-south experience higher traffic flows in the northbound city direction during the AM peak hour and in the southbound direction during the PM peak hour. With regards to the future St Peters interchange and surrounds, roads running east-west experience higher traffic flows in the eastbound direction during the AM peak and in the westbound direction during the PM peak.

Table 6 | Traffic modelling scenarios (Source: EIS)

Modelling scenario	Model year	Existing road network	F6 Extension Stage 1	Kogarah to Loftus	NorthConnex	WestConnex projects	Sydney Gateway	Western Harbour Tunnel	Northern Beaches Link	Impact measured
Base case	2014/ 2015	X								N/A
Construction	2021	X								Construction impacts on the existing road network.
Operation 'Do minimum'	2026	X			X	X	X			Consequence of not proceeding with the project on the existing network.
Operation 'Do something'	2026	X	X		X	X	X			Operational impacts associated with the completion of the project
Operation 'Do minimum'	2036	X			X	X	X			Consequence of not proceeding with the project on the existing network.
Operation 'Do something'	2036	X	X		X	X	X			Operational impacts associated with the completion of the project.
Operation 'Cumulative'	2036	X	X	X	X	X	X	X		Operational impacts associated with the operation of the project and proposed future motorway projects.

6.1.1 Construction Traffic

Issue

Construction works associated with the project have the potential to create congestion on the surrounding road network through the introduction of heavy and light construction vehicles and in particular those required to support tunnelling activities (primarily spoil haulage).

A total of six construction ancillary facilities are proposed (**Figure 7** and **Table 4**). The forecast daily light and heavy construction vehicle numbers accessing each of the construction ancillary facilities are shown in **Table 7**. All construction ancillary facilities would be accessed via arterial roads with the exception C4, where access and egress will be via a local road, Bruce Street. The proximity of arterial roads to each construction ancillary facility means construction traffic would avoid extensive travel through established residential areas.

Table 7 | Indicative construction vehicle numbers (Source: EIS)

Location		Daily vehicles		AM peak hour				PM peak hour			
		(two-way)		(7.00–8.00 am)				(5.00–6.00 pm)			
				Heavy vehicles		Light vehicles		Heavy vehicles		Light vehicles	
		Heavy vehicles	Light vehicles	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart
C1	Arncliffe construction ancillary facility	276	336	13	13	65	1	13	13	1	76
C2	Rockdale construction ancillary facility	274	352	12	12	47	1	11	11	1	52
C3	President Avenue construction ancillary facility.	178	642	6	6	53	1	15	15	1	114
C4	Shared cycle and pedestrian pathways construction ancillary facility	16	64	1	1	5	1	1	1	1	8
C5	Shared cycle and pedestrian pathways construction ancillary facility	26	88	1	1	7	1	2	2	1	10
C6	Princes Highway construction ancillary facility	20	176	1	1	7	1	1	1	1	25
-	Bestic Street	16	22	1	1	2	1	1	1	1	2

Notes: Vehicle numbers include the total movements to and from the site (i.e. two way) in the time period specified. Indicative construction vehicle numbers (daily and for the AM and PM peak hour) would vary based on the final construction methodology and program.

Spoil Haulage Routes

The EIS states that spoil haulage routes have been planned with the aims of: minimising the use of local or residential streets and maximising the use of arterial roads; minimising safety implications for pedestrians, cyclists and other road users; and minimising the cumulative use of roads accessing different construction sites. Spoil haulage from tunnelling activities would occur at the Arncliffe (C1), Rockdale (C2) and President Avenue (C3) construction ancillary facilities. The indicative spoil haulage routes from each of the construction ancillary facilities is set out in **Table 8.**

Spoil removal and haulage from tunnelling activities would occur 24 hours, seven days a week at C1 and C2 with the majority of haulage occurring between 7.00 am and 6.00 pm on weekdays and between 8.00 am and 1.00 pm on Saturdays and, where practical, spoil would be removed outside of peak periods. Spoil haulage from C3 would be undertaken during standard construction hours.

Table 8 | Indicative spoil haulage routes from construction ancillary facilities

Construction Ancillary Facility	Indicative Spoil Haulage Route
Arncliffe (C1)	Inbound: Via New M5 Motorway eastbound and Marsh Street Outbound: Via Marsh Street and New M5 Motorway westbound
Rockdale (C2)	Inbound: Via West Botany Street Outbound: Via West Botany Street
President Avenue (C3)	Inbound: Via Princes Highway and President Avenue Outbound: Via West Botany Street
Shared Cycle and Pedestrian Pathway (C4)	Inbound: Right-in from Bruce Street Outbound: Left-out onto Bruce Street Dependent on the destination/origin, vehicles would travel along Bruce Street to/from General Holmes Drive or West Botany Street
Shared Cycle and Pedestrian Pathway (C5)	Inbound: Via West Botany Street Outbound: Via West Botany Street

Intersection Level of Service (LoS) and Mid-Block Performance

Construction traffic impacts were assessed at the year 2021 as this is when peak works and spoil removal from tunnel excavation will occur. No overlap with the construction of the New M5 Motorway project is expected to occur as this project is expected to be operational in 2020.

The LoS assessment indicated that construction traffic will not have significant impacts on the existing road network. Although some intersections may experience a worsening in their LoS, the overall network still has capacity to cater for additional traffic.

Construction Workforce Parking

Car parking will need to be provided for the construction workforce with the Proponent committed to providing off-street parking at various construction ancillary facilities within the project area. The proposed number of off-street construction workforce parking spaces to be provided is outlined in **Table 9**. The Proponent anticipates that the proposed number of spaces will adequately meet forecast construction worker parking demand. Notwithstanding, construction personnel will be encouraged to use public transport, as all construction ancillary facilities are located approximately 15-minute walk from a train station.

Some construction workforce parking in adjacent local roads is expected. For example, on-street car parking may occur during site establishment while site entrances and car parking areas at construction ancillary facilities are being established. Further, certain construction ancillary facilities might not have enough parking spaces to cover the day- shift peak construction workforces at those construction sites and workers may consider it more convenient to park on the street rather than at other construction ancillary sites.

Public Transport, Pedestrian and Cyclist Movement

There are five bus stops on President Avenue and two bus stops at James Cook Boys Technology High School which are located within the project's construction boundary. The project may require the temporary and permanent relocation of some of these bus stops.

Table 9 | Parking demand and provision at construction ancillary facilities (Source: EIS)

Location	Approximate day shift peak construction workforce	Estimate of parking demand (0.7 spaces/staff)	Approximate proposed parking numbers	Surplus or Deficit
Arncliffe construction ancillary facility (C1)	65	46	140	+94
Rockdale construction ancillary facility (C2)	94	66	50	-16[1]
President Avenue construction ancillary facility (C3)	114	80	150	+70
Shared cycle and pedestrian pathways construction ancillary facility (C4)	10	7	10	+3
Shared cycle and pedestrian pathways construction ancillary facility (C5)	12	8	10	+2
Princes Highway construction ancillary facility (C6)	30	21	25	+4
Total	325	228	385	+157

[1] Opportunities to provide additional car parking within the Rockdale construction ancillary facility are being investigated and would be confirmed in the CTAMP

East-west active transport routes will be impacted by construction, including pedestrian movements along President Avenue and pedestrian and cycle movements across Rockdale Bicentennial Park and surrounding public open spaces. These existing routes provide the community convenient and safe access to the Memorial Fields and Brighton-Le-Sands Public School from the western side of the existing road reserve corridor.

Public Car Parking Spaces

Construction of the project will result in the temporary loss of around 60 car park spaces in the car park adjacent to the north-western corner of Rockdale Bicentennial Park.

Regarding on-street car parking spaces, construction works will result in the temporary removal of approximately 61 car parking spaces, comprising:

- 16 spaces on O'Neill Street next to Rockdale Bicentennial Park;
- 10 spaces on Civic Avenue (northbound) near President Avenue; and
- 16 and 19 spaces on West Botany Street (northbound and southbound respectively) between French Street and northern boundary of C3.

There is expected to be a temporary loss of around 99 on-street car parking spaces on President Avenue during non-peak times (as a result of temporary clear ways) of:

- 53 spaces on President Avenue (eastbound) between Princes Highway and Traynor Avenue; and
- 46 spaces on President Avenue (westbound) between Traynor Avenue and Princes Highway.

Submissions

Community and Special Interest Group Submissions

Key issues raised in community and public interest group submissions regarding construction traffic and transport included:

- frequency and management of construction vehicles in the existing road network;
- selection of spoil haulage routes;
- traffic management along President Avenue and West Botany Street;
- access in to and egress out of the Moorefield Estate;
- increased traffic volumes around construction ancillary facilities;
- construction workforce parking on local roads;
- temporary loss of parking due to construction work;
- longer travel times, traffic diversions and changed transport routes during construction,
- reduced reliability and access to public transport due to construction activities; and
- potential safety issues arising from construction activities on pedestrians and cyclists.

Government Agency and Council Submissions

Bayside Council raised concern regarding potential detrimental impacts to traffic, on-street parking, bus services and access caused by construction works and, in particular, those works around the Princes Highway (C6) and Rockdale (C2) construction ancillary facilities.

Inner West Council raised concern regarding the deterioration of conditions for walking and cycling due to construction, including increases in crossing times at widened intersections and connectivity issues due to road and active transport path closures.

Department's Consideration

Construction Traffic – Heavy Vehicle and Spoil Haulage Routes

The Department notes that construction ancillary facilities, with the exception of the shared cycle and pedestrian pathways construction ancillary facility (C4), will be directly accessible from the arterial road network and this network has the capacity to accommodate the forecast construction heavy vehicle movements.

Although access to C4 will be via a local road (Bruce Street), the Department accepts that construction vehicle traffic from this ancillary facility would be minimal (around two heavy vehicle movements per AM and PM peak hours) and spoil haulage from this facility will be limited to the spoil excavated for the purposes of creating parts of the shared pedestrian and cycle pathway through Rockdale Bicentennial Park. Consequently, the Department accepts the use of Bruce Street by construction vehicles associated with the shared path.

To address community and councils' concerns on spoil haulage, as well as traffic impacts on local roads, the Department has recommended:

- restrictions on heavy vehicles used for spoil haulage driving on local roads;
- spoil haulage vehicles associated with the project to be clearly identifiable to the public through signage;
- spoil haulage vehicles adhere to nominated haulage routes; and
- real time location-monitoring of all spoil haulage vehicles.

Construction Workforce Parking and On-street Public Parking

A key concern issue raised in community submissions was on-street parking by construction workers resulting in parking shortages for residents and their visitors. The peak day-shift construction workforce for the project is estimated to be around 325 personnel. To reduce the likelihood of construction workers using on-street parking, the Proponent is committed to providing a total of around 385 off-street car parking spaces at the various construction ancillary facilities. Moreover, the Proponent has committed to encouraging the construction workforce to use public transport (where feasible).

Although there is a significant surplus of proposed car spaces to construction worker numbers from an overall project perspective, the Department is concerned that during the early stages of the project, when site establishment works are being conducted at the various construction ancillary facilities, construction workers may park in local streets. Further, the Department is concerned that there may be shortfalls in car parking spaces at individual construction ancillary facilities during construction and without any on-street parking restrictions, construction personnel may seek to park on a street near their actual work site instead of further afield at a different construction ancillary facility where car spaces are available. Accordingly, the Department has recommended that the Proponent implement management measures to minimise these potential parking impacts, including managed staff parking arrangements, working with relevant council(s) to introduce parking restrictions adjacent to work sites, and the provision of shuttle bus services to transport construction workers in between sites.

A temporary loss of approximately 160 on-street parking spaces is predicted to occur. The temporary use of Rockdale Bicentennial Park as a construction ancillary facility will result in reduced parking demand for the park facilities. The construction workforce parking initiatives will also assist in addressing this temporary loss by maximising the availability of on street parking.

Pedestrian and Cyclist Movement

In response to council and community concerns regarding detrimental impacts to pedestrian and cyclist movements around construction areas, the Department has recommended that safe pedestrian and cyclist access must be maintained around all construction ancillary facilities and work sites at all times and where such access is restricted, an alternate route must be provided and sign posted.

Relocation of Bus Stops

The Department notes the Proponent intends to temporarily and permanently relocate some bus stops near the southern end of the project on President Avenue and the Princes Highway. The Department is satisfied that the relocation of these bus stops should not create unreasonable walking distances to adjacent or replacement bus stops. The Proponent has committed to consult with Transport for NSW and bus operators where changes to bus stops are proposed and advise the community of any potential changes in advance. Notwithstanding, the Department has recommended that any closure of stops must not occur until relocated bus stops of similar capacity and amenity are provided. The bus stops must be within a 400-metre walking distance of the existing bus stop which is to be removed. Wayfinding signage must be provided directing commuters to adjacent or relocated bus stops. Footpaths must be provided to any relocated bus stops such that accessibility standards are met. Prior to the commencement of operation of the project, all bus stops temporarily closed or relocated must be reinstated in consultation with relevant council(s) and they must provide equal or improved capacity, amenity and accessibility.

Access

In response to community and stakeholder submissions concerned with surface road works impinging on property access, and concerns by Sydney Water about construction restricting access to its assets, the Department has recommended that access to all utilities and properties must be maintained during construction, where practicable, unless otherwise agreed with the relevant utility owner, landowner or occupier. Further, the Department has recommended that any property access physically affected by the project must be reinstated to at least equivalent standard unless otherwise agreed by the landowner or occupier.

Conclusion

The Department acknowledges that impacts associated with construction traffic are unavoidable but that these impacts can be managed and reduced through implementation of the recommended traffic, parking and transport impact mitigation measures. These measures would ensure that spoil haulage occurs along approved routes, facilitate the safe movement of construction traffic to and from construction ancillary facilities as well as facilitate safe pedestrian and cyclist access around construction sites.

6.1.2 Operational Traffic

Issue

The project will provide a connection between the New M5 Motorway at Arncliffe and President Avenue in Kogarah. It aims to reduce surface traffic on Princes Highway and The Grand Parade. However, the project will increase traffic volumes on the New M5 Motorway and on surface roads near the President Avenue Intersection.

The Department's assessment takes into account the outcomes of the review by the Department's independent traffic specialist (Bitzios Consulting) whose technical review of the Proponent's traffic and transport assessment is provided at **Appendix F**.

Screenline Analysis

A screenline analysis involving traffic counts at theoretical boundaries was undertaken and compared the forecast average weekday traffic (AWT) volumes at each screenline location for the years 2026 and 2036, both 'do minimum' without the project and 'do something' with the project scenarios, and the 2036 cumulative scenarios which includes the latter stages of the F6 Extension project. Three screenlines were considered – the F6 Extension Stage 1, the Cooks River and the Georges River (**Figure 13**). A graphical illustration of the screenline volumes is shown in **Figures 14** to **16**.

The F6 Extension Stage 1 screenline analysis for the years 2026 and 2036 indicates that once the project is operational, traffic will shift into the motorway tunnels and traffic volumes on the arterial surface road links between Arncliffe and Kogarah will decrease. The greatest change is on General Holmes Drive where two-way AWT is forecast to reduce by more than 10,000 vehicles in both 2026 and 2036.

The Cooks River screenline analysis indicates that although there is a predicted reduction in two-way AWT traffic crossings on existing road links, there is an overall increase in two-way AWT traffic crossing the screenline due to more traffic using the New M5 motorway in 2026 and 2036. When comparing the 2036 'cumulative' scenario with the 2036 'do minimum' scenario, a similar pattern occurs due to the increased connectivity of the motorway network provided by further stages of the F6 Extension project and the Western Harbour Tunnel and Northern Beaches Link projects.

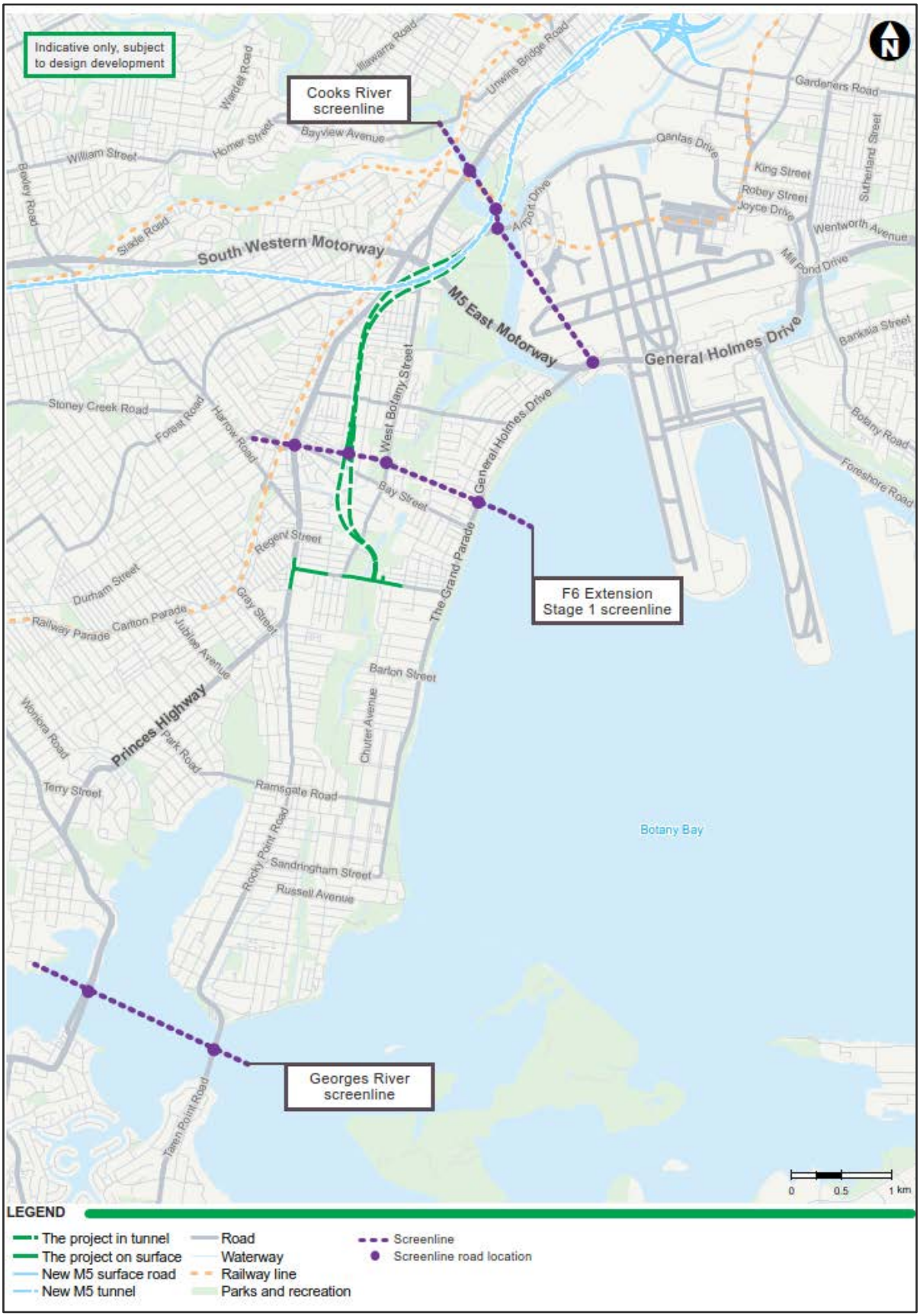


Figure 13 | Screenline locations (Source: EIS)

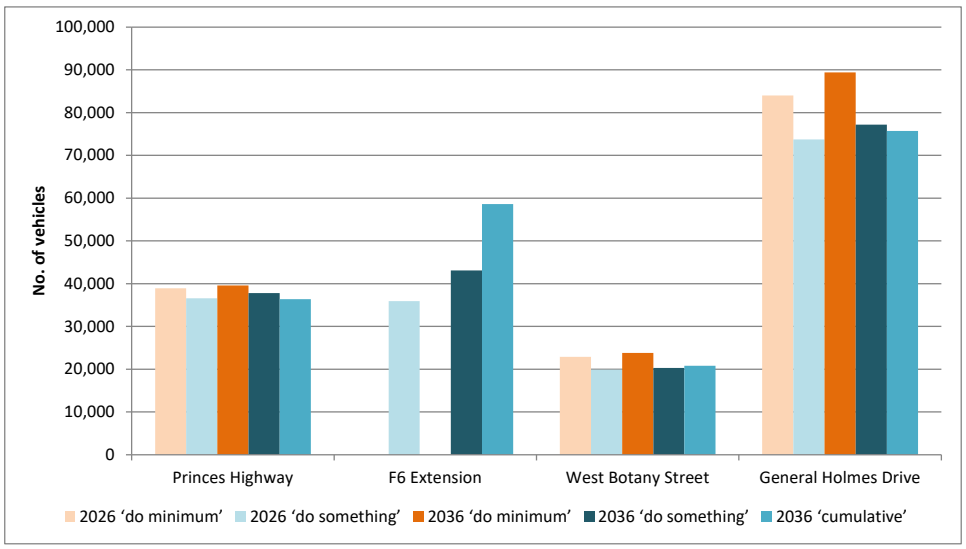


Figure 14 | F6 Extension Stage 1 screenline comparison of two-way AWT volumes (Source: EIS)

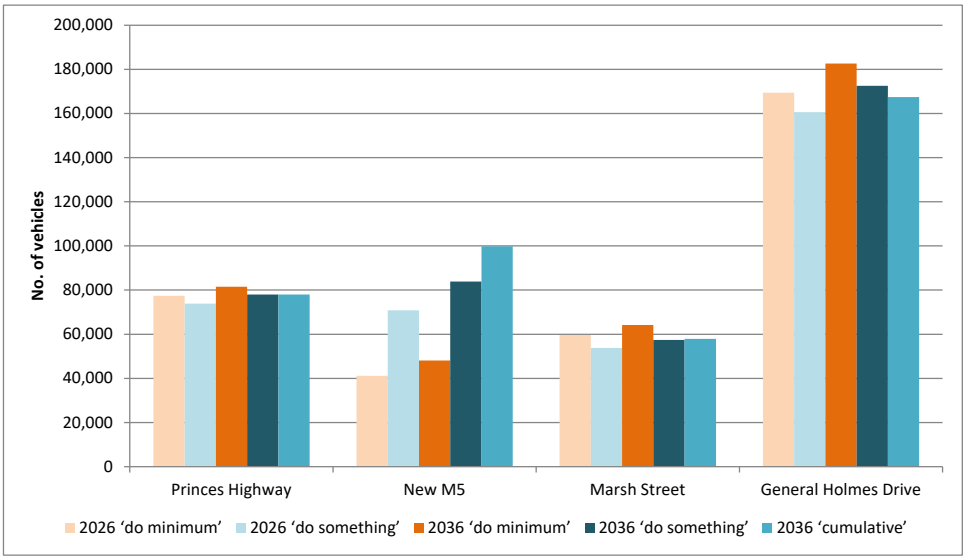


Figure 15 | Cooks River screenline comparison of two-way AWT volumes (Source: EIS)

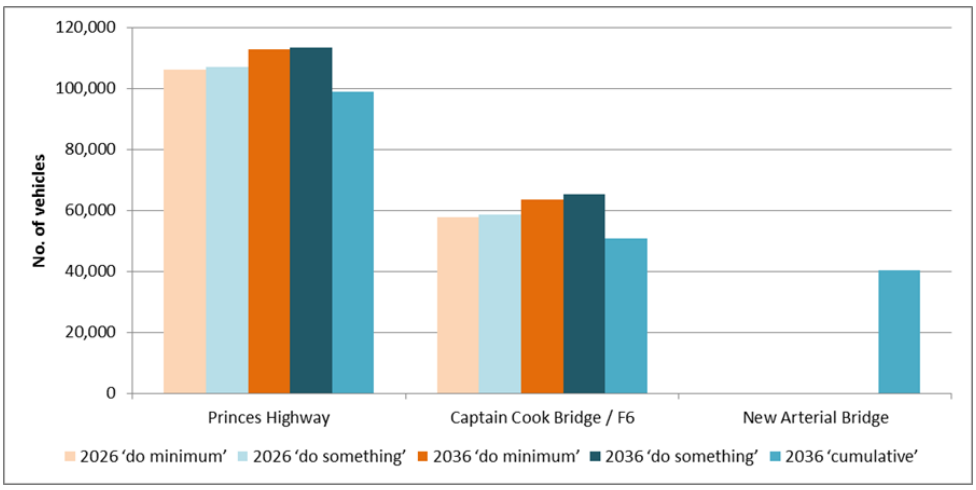


Figure 16 | Georges River screenline comparison of two-way AWT volumes (Source: EIS)

The Georges River screenline analysis predicts a shift in traffic from the arterial roads crossing the Georges River (being the Princes Highway/Tom Ugly's Bridge) onto the Captain Cook Bridge/Taren Point Road in both 2026 and 2036 in the 'do something' scenario. This is the result of the Captain Cook Bridge becoming part of the F6 Extension motorway at a later stage.

Intersection Levels of Service (LoS)

The screenline assessment indicates positive regional benefits in traffic movements, however there will be localised impacts at key intersections around the future St Peters interchange and the President Avenue Intersection, as traffic seeks to access the project's motorway tunnels southbound and northbound respectively.

Table 10 to **Table 12** outline the predicted intersection LoS along the President Avenue corridor, the intersection between the Princes Highway and President Avenue and surrounds, and the future St Peters interchange and surrounds for the 'do minimum' and 'do something' scenarios in 2026 and 2036. The modelling indicates that key intersections are generally forecast to experience similar or improved LoS with exceptions at:

- the Princes Highway/President Avenue intersection where LoS is predicted to fall from C to D due to the exiting of traffic from the southbound tunnels onto the surface road network;
- President Avenue/O'Connell Street intersection is expected to deteriorate in the 2026 AM peak hour from LoS B to LoS C due to a forecast increase in traffic on O'Connell Street;
- Princes Highway/Rocky Point Road intersection LoS is predicted to decline C to D due to the additional traffic on the surface road network from traffic exiting the southbound tunnels;
- the intersections of Ricketty Street/Kent Road, Campbell Road/Euston Road, Princes Highway/Sydney Park Road and Euston Road/Sydney Park Road under the 2026 'do something' scenario as traffic seeks access into and egress out of the northern end of the project; and
- the intersections of Gardeners Road/ O' Riordan Street, Princes Highway/Campbell Street, Princes Highway/May Street and Sydney Park Road/Mitchell Road under the 2036 'do something' scenario due to increased queuing into and out of the New M5 and the northern end of the project.

Travel Times

A comparison of the 'do minimum' with the 'do something' 2026 indicates that with the inclusion of the project, travel times during peak periods are predicted to decrease as follows:

- between Kogarah and Mascot, Kogarah and Macquarie Park and Kogarah and Parramatta, average travel times in the peak direction in the peak period are forecast to reduce by about 10 minutes – a 15-30 percent reduction; and
- between Kogarah and the Sydney CBD, average travel times in the peak direction in the peak period are forecast to reduce by around 5 minutes – a 10-15 percent reduction.

Comparing the 'do minimum' and 'do something' 2036 scenario, travel times during periods are predicted to be reduced by about 15 minutes between Kogarah and Mascot (15-35 per cent reduction) and by around 10 minutes (10-15 per cent reduction) between Kogarah and Macquarie Park and Kogarah and Parramatta, and Kogarah and the Sydney CBD.

However, relatively minor increased travel times (30 seconds) are forecast along President Avenue when comparing the “do minimum’ and ‘do something’ scenarios for 2026 and 2036 due to a predicted increase in traffic wanting to access the project. In addition, increased travel times of around 2 minutes are forecast in the AM peak southbound direction along the Princes Highway, West Botany Street and The Grand Parade in the 2036 ‘do something’ scenario due to more signal time allocation to the dominant traffic movements to the north. Travel times remain similar on the road network around the St Peters Interchange in the “do minimum’ and ‘do something’ scenarios for 2026 and 2036.

Table 10 | President Avenue: key intersection performance – 2026 and 2036 ‘Do Minimum’ and ‘Do Something’ scenarios (Source: EIS)

Key intersections	2014/15 ‘base case’		2026 ‘Do minimum’		2026 ‘Do something’		2036 ‘Do minimum’		2036 ‘Do something’	
	Ave delay (sec)	LoS	Ave delay (sec)	LoS	Ave delay (sec)	LoS	Ave delay (sec)	LoS	Ave delay (sec)	LoS
AM peak hour										
The Grand Pde/ President Ave	25	B	29	C	21	B	37	C	26	B
President Ave / Crawford Rd	10	A	11	A	18	B	19	B	18	B
President Ave / O’Connell St	32	C	23	B	41	C	44	D	43	D
President Ave / F6 Stage 1	-	-	-	-	27	B	-	-	34	C
President Ave/ West Botany St	16	B	32	C	38	C	18	B	28	B
Princes Hwy / President Ave	20	B	25	B	26	B	45	D	32	C
PM peak hour										
The Grand Pde/ President Ave	22	B	24	B	26	B	37	C	30	C
President Ave / Crawford Rd	14	A	15	B	12	A	18	B	10	A
President Ave / O’Connell St	14	B	15	B	22	B	15	B	20	B
President Ave / F6 Stage 1	-	-	-	-	31	C	-	-	33	C
President Ave/ West Botany St	26	B	28	B	16	B	24	B	19	B
Princes Hwy / President Ave	27	C	34	C	46	D	37	C	54	D

Table 11 | St Peters Interchange: key intersection performance – 2026 and 2036 'Do Minimum' and 'Do Something' scenarios (Source: EIS)

Key intersections	2014/15 'base case'		2026 'do minimum'		2026 'do something'		2036 'do minimum'		2036 'do something'	
	Ave delay (sec)	LOS	Ave delay (sec)	LOS	Ave delay (sec)	LOS	Ave delay (sec)	LOS	Ave delay (sec)	LOS
AM peak hour										
O'Riordan St / Bourke Rd	16	B	23	B	21	B	38	C	32	C
Gardeners Rd / O'Riordan St	43	D	66	E	59	E	>100	F	>100	F
Gardeners Rd / Bourke Rd	51	D	50	D	43	D	56	D	47	D
Gardeners Rd / Kent Rd			61	E	66	E	>100	F	>100	F
Ricketty Street / Kent Road	24	B	55	D	59	E	55	D	56	D
Campbell Rd / Euston Rd	1	A	48	D	59	E	70	E	>100	F
Princes Hwy / Campbell St	44	D	>100	F	>100	F	>100	F	>100	F
Princes Hwy / May St	89	F	61	E	64	E	76	F	77	F
Princes Hwy / Sydney Park Rd	23	B	28	B	34	C	41	C	42	C
Sydney Park Rd / Mitchell Rd	24	B	32	C	35	C	32	C	32	C
Euston Rd / Sydney Park Rd	8	A	50	D	58	E	58	E	56	D
PM peak hour										
O'Riordan St / Bourke Rd	19	B	13	A	13	A	14	A	14	A
Gardeners Rd / O'Riordan St	39	C	49	D	65	E	77	F	>100	F
Gardeners Rd / Bourke Rd	67	E	37	C	38	C	37	C	42	C
Gardeners Rd / Kent Rd			34	C	36	C	35	C	38	C
Ricketty Street / Kent Road	22	B	39	C	39	C	41	C	44	D
Campbell Rd / Euston Rd	1	A	54	D	63	E	67	E	69	E
Princes Hwy / Campbell St	25	B	57	E	58	E	60	E	89	F
Princes Hwy / May St	45	D	14	A	12	A	7	A	14	B
Princes Hwy / Sydney Park Rd	26	B	35	C	35	C	40	C	40	C
Sydney Park Rd / Mitchell Rd	2	A	39	C	52	D	51	D	72	F
Euston Rd / Sydney Park Rd	8	A	>100	F	>100	F	>100	F	>100	F

Table 12 | Intersection between President Avenue and Princes Highway and surrounds: key intersection performance – 2026 and 2036 'Do Minimum' and 'Do Something' scenarios (Source: EIS)

Key intersections	2014/15 'base case'		2026 'Do minimum'		2026 'Do something'		2036 'Do minimum'		2036 'Do something'	
	Ave delay (sec)	LoS	Ave delay (sec)	LoS	Ave delay (sec)	LoS	Ave delay (sec)	LoS	Ave delay (sec)	LoS
AM peak hour										
Princes Hwy / West Botany St	15	B	17	B	16	B	18	B	16	B
Wickham St / West Botany St	46	D	52	D	42	C	54	D	43	D
Princes Hwy / Wickham St / Forest Rd	48	D	67	E	58	E	68	E	67	E
General Holmes Dr / Bestic St	58	E	66	E	54	D	65	E	65	E
Princes Hwy / Bay St	33	C	44	D	44	D	66	E	54	D
Princes Hwy / Rocky Point Rd	32	C	33	C	30	C	30	C	44	D
West Botany St / Bay St	47	D	70	E	70	E	73	F	68	E
West Botany St / Bestic St	40	C	48	D	60	E	61	E	54	D
PM peak hour										
Princes Hwy / West Botany St	11	A	11	A	10	A	11	A	11	B
Wickham St / West Botany St	27	B	33	C	35	C	40	C	41	C
Princes Hwy / Wickham St / Forest Rd	68	E	78	F	68	E	85	F	78	F
General Holmes Dr / Bestic St	28	B	39	C	30	C	42	C	33	C
Princes Hwy / Bay St	44	D	55	D	50	D	68	E	64	E
Princes Hwy / Rocky Point Rd	18	B	19	B	20	B	21	B	21	B
West Botany St / Bay St	61	E	64	E	66	E	67	E	69	E
West Botany St / Bestic St	37	C	55	D	56	D	69	E	70	E

Permanent Street Modifications

The project proposes surface road works around and along President Avenue including:

- providing mid- carriageway turning bays to safeguard righthand turn movements to and from TAFE St George College campus on the eastbound side of the carriageway;
- widening of sections to three lanes both westbound and eastbound;
- raising of its height around the proposed President Avenue Intersection;

- upgrading the existing intersection between Princes Highway with President Avenue by adding turning lanes to increase the its capacity and performance;
- prohibiting righthand turn movements out of Cross Street;
- installing a cul-de-sac to close the existing intersection with O'Neill Street; and
- modifying access and egress into and out of the Moorefield Estate.

In addition, amendments are proposed to access and egress arrangements from local streets onto President Avenue to reduce potential access and traffic impacts on local residents and potential traffic conflicts onto President Avenue, and include:

- conversion of Lachal Avenue from one-way northbound to one-way southbound (inbound movements from President Avenue only). A right turn bay and traffic signals would be provided for the right turn into Lachal Avenue from President Avenue, to ensure safe vehicle movements. A pedestrian crossing would be provided across Lachal Avenue;
- conversion of Traynor Avenue from one-way southbound to one-way northbound. Only left turn movements out of President Avenue would be permitted. This change would allow Lachal Avenue and Traynor Avenue to continue to operate as a one-way pair; and
- a signalised intersection would be provided to allow for safer right turn movements from Civic Avenue into President Avenue. Available traffic movements would remain the same as the existing network configuration, with no right turns permitted from President Avenue into Civic Avenue. A pedestrian crossing would be provided across Civic Avenue.

Further, the revised design provides an additional 60 metre southbound left turn bay at the existing signalised intersection at West Botany Street and President Avenue. The President Avenue/Civic Avenue and the President Avenue/West Botany Street intersections would operate under one signal controller to allow better control of traffic movements at this section of the President Avenue corridor.

Loss of On-Street Parking

The project will result in the permanent loss of the following on-street car parking:

- six spaces along O'Neill Street as a result of its conversion to a cul-de-sac;
- 97 eastbound and 95 westbound spaces along President Avenue during peak periods; and
- around three spaces along the northbound Civic Avenue approach to the intersection with President Avenue due to a new signal.

Bus Services

The predicted reduction in traffic on key roads within the project area is expected to result in improved bus speeds and reliability for several regional bus services from one to six minutes. However, increases in traffic on the Princes Highway (south of President Avenue) and on President Avenue (west of the President Avenue intersection) would be expected to decrease travel times and reliability of a smaller number of regional and local bus routes.

Submissions

Community and Special Interest Group Submissions

Key issues raised in public submissions on operational traffic and transport include:

- access and egress from TAFE St George campus and the Moorefield Estate, Kogarah;
- road network performance deterioration;
- public transport impacts;

- accuracy of the traffic modelling;
- design of the surface works along President Avenue;
- integration of the President Avenue Intersection with the existing road network and concern that there will be congestion and backing up of traffic at the project portal;
- use of parallel routes and 'rat-running' due to drivers avoiding tolls or congestion; and
- parking impacts.

Government Agency and Council Submissions

Bayside Council raised concern that there is no commitment to construct further stages of the F6 Extension or a connection to Port Botany (for freight traffic) or Sydney Airport.

In raised concern over the proposed reconfiguration of traffic arrangements. In particular, Council did not support the access and egress arrangements into and out of Moorefield Estate proposed under the EIS and was concerned that the intersection at Marshall Street and Rocky Point Road would be less safe as a result of increased traffic. Further, Council did not support the extension of the clearway program on Princes Highway, Rocky Point Road and The Grand Parade.

With respect to the PIR changes, Council did not object to the revised arrangements to the Moorefield Estate from President Avenue but was concerned that the PIR did not demonstrate or mention the provision and/or the length of a holding lane in President Avenue for traffic that turns right out of Civic Avenue. Council advised that this holding lane is desirable to allow traffic from Civic Avenue to merge safely with traffic travelling in President Avenue.

City of Sydney objected to the project and advised that a public transport project would provide superior carrying capacity of people. Council indicated that the project was contrary to the Government's vision and the objectives set out in *Future Transport 2056* and emphasised that the answers to the issues and opportunities outlined do not lie in building more motorways but through the provision of sustainable transport solutions with a focus on public and active transport.

City of Sydney Council advised that the project would fail to reduce traffic volumes and would increase congestion. It raised concern that the operational traffic network impacts of the project have not been adequately addressed, especially around the future St Peters Interchange.

Further, City of Sydney Council believed that the project promoted a modal transport shift from public to private vehicles and that the active transport infrastructure component of the project was inadequate.

Council also indicated that the project would have a detrimental impact on the city's economy and that the financial viability of the project was too reliant on toll revenue and the construction of future stages of the F6 Extension.

Georges River Council advised that additional traffic from the project had the potential to increase pressure on the surrounding road network, increase congestion and delay times during peak hours, and increase travel times. Further, it indicated that the project, with traffic seeking to bypass the build-up of traffic on Princes Highway, would detrimentally impact on the safety and amenity of the pedestrian-oriented local streets of Kogarah Town Centre.

Inner West Council opposed the project stating that the expansion of Sydney's urban motorway network is contrary to the State Government's strategic vision. Council raised concern that the operation of the project would result in induced demand, leading to more traffic volumes and greater congestion and that the additional traffic generated by the project would funnel into local streets.

Council did not support the prioritisation of private car transport to address population growth instead of alternate solutions such as mass transport choices and coordinated demand management.

Department's Consideration

Local traffic impacts

The existing local road network has key traffic constraints along the Princes Highway, West Botany Street and Bestic Street. The wider road network is forecast to perform better with the project than without the project in 2026 and 2036 with improved average travel speeds. Although the project is predicted to reduce daily traffic volumes, on sections of the Princes Highway, West Botany Street and General Holmes Drive/The Grand Parade, it is acknowledged that the project would increase traffic volumes and some localised congestion along President Avenue (west of the President Avenue intersection with the F6 southern portal). To address potential local traffic impacts the Department has recommended that the Proponent prepare a Road Network Performance Plan prior to operation of the project. This will require the Proponent to review the predicted local traffic impacts as a consequence of the project and to implement mitigation measures to manage localised traffic impacts. The Plan is to be prepared in consultation with the relevant council(s).

The New M5 Road Network Performance Review Plan (required under the New M5 Motorway approval) and the M4-M5 Link Road Network Performance Review (required under the M4-M5 Link approval) will provide the Proponent with updated operational traffic data on the surrounding road network as these projects become operational. It is predicted that the first review at 12 months for each project will be completed by the time the F6 Extension Stage 1 is operational. The road network performance of these projects has ramifications for the F6 Extension Stage 1 as the northern portion of the project connects to WestConnex. Accordingly, the Department has recommended that the Road Network Performance Plan for the F6 Extension Stage 1 project incorporate the operational traffic modelling results from the M4-M5 Link and New M5 projects (including any Road Network Performance Plan or Operational Road Network Performance Review prepared).

In accordance with best practice the Department has also recommended that the Proponent undertake Operational Road Network Performance Reviews at 12 months, and again at five years after the commencement of operation, to confirm the operational traffic impacts of the project on surrounding arterial roads and major intersections.

Intersection performances

Although the project will provide benefits by reducing surface road traffic and improving overall travel times, it will have localised impacts on the traffic network at President Avenue (west of the President Avenue intersection), Princes Highway (south of President Avenue), Rocky Point Road and O'Connell Street, and the future St Peters interchange. These increases relate to vehicles exiting tunnels onto the surface network. The Department notes that the performance of intersections would likely improve if future stages of the F6 are built and traffic would continue along the motorway rather than exiting onto President Avenue. However, as these future stages do not have planning approval and to ensure impacts resulting from congestion at these intersections are managed, the Department has recommended that the Road Network Performance Plan and Operational Road Network Performance Reviews expressly take into account these potential 'pinch-points'.

St Peters Interchange

The traffic modelling indicates a deterioration in traffic network performance in the St Peters area regardless of whether or not the project is constructed. In the 'do something' 2026 and 2036 scenarios, the network is saturated with some intersections operating at capacity in peak periods. To

address this matter, the Proponent has committed to undertake a detailed review of key intersections for future upgrades. The Department supports this approach and considers it should form part of the recommended Road Network Performance Plan and has included it as a requirement of the Plan.

President Avenue and Moorefield Estate

The Department's independent traffic specialist identified that some intersections along President Avenue would be constrained based on the traffic arrangements into and out from the Moorefield Estate as proposed in the EIS. These concerns were echoed by the community, Bayside Council and local educational institutions in their submissions and in a meeting held by Bayside Council on 28 November 2018. As noted in **Section 5.7**, the Department directed the Proponent to prepare a PIR to address the unresolved issue of poor access and egress arrangements into and out of the Moorefield Estate.

The Department considers the amended access and egress arrangements under the PIR are a substantial improvement to those proposed in the EIS. Further, the amended arrangements provide an improvement to existing arrangements where there is no signalised access and egress into and out of the Moorefield Estate from President Avenue. The Department's independent traffic reviewer advised that overall the proposed changed arrangements were supported. However, the reviewer raised concern that there may be a potential exacerbation of traffic safety risks at the Oakdale Avenue/President Avenue intersection. Consequently, the Department sought to have this intersection further considered for restriction to left in/out movements only on traffic safety grounds. In response, the Proponent advised that the existing volume of traffic in and out of Oakdale Avenue is low and drivers are currently not making right turn movements out of Oakdale Avenue due to the high volume of traffic along President Avenue. With the changes proposed in the PIR, drivers would have enhanced opportunities to enter into the Moorefield Estate via Lachal and Civic Avenues, and exit via Civic Avenue, due to their signalisation and would seek to avoid using Oakdale Avenue at heavier traffic times.

In response to concerns raised by the community about westbound traffic congestion along President Avenue potentially leading to vehicles seeking alternative routes and 'rat running' through the Moorefield Estate, the Proponent has indicated that the project would be making improvements to the operation of President Avenue with clearways during peak times to maintain traffic flow. Notwithstanding, the Department recognises that some traffic would continue to use Civic Avenue and Marshall Street as a thoroughfare to Rocky Point Road, as currently occurs. To address this the Proponent, in consultation with Bayside Council, will implement traffic calming measures to reduce the attractiveness of this route to non-local traffic. The Department has recommended that this action be incorporated into the Road Network Performance Plan and the Operational Network Reviews.

Car Parking

The Department acknowledges that for traffic to flow efficiently, President Avenue will need to operate with clearway conditions during the AM and PM peal periods, west of O'Connell Street and that this will impact on on-street parking provision. However, this impact will be limited to the peak periods with on-street parking permitted in off-peak periods and at night as per the existing conditions excluding:

- eastbound between West Botany Street and O'Connell Street;
- westbound between O'Connell Street and the F6 intersection with President Avenue (about 20 spaces would be retained);

- westbound between the F6 intersection with President Avenue and West Botany Street (about 25 spaces would be retained); and
- eastbound along President Avenue from the Princes Highway for about 100-150 metres to accommodate the triple right turn from the Princes Highway into President Avenue.

The Department accepts that these parking spaces cannot be reinstated as they are required for the efficient flow of traffic on the arterial road network.

Conclusion

A key benefit of the project is the removal vehicles from surface roads into the tunnel system and to free up capacity on the broader surface network for shorter point-to-point trips. In addition, the project will connect with other motorways such as WestConnex New M5 and M4-M5 Link resulting in improved travel times between south-western Sydney and the Sydney CBD, the North Shore, the Inner West and Western Sydney.

Although the project provides a regional benefit to traffic mobility, localised impacts are predicted to occur as traffic volumes around the President Avenue Intersection, the St Peters interchange and on the surrounding road network are expected to increase. To manage these localised impacts, the Department has recommended that a Road Network Performance Plan be prepared prior to operation of the project. The Plan must identify mitigation measures to manage predicted localised traffic impacts. The Department has also recommended an Operational Road Network Performance Review to be undertaken to confirm the adequacy of the implemented mitigation measures and consider whether further measures may be required. The Department is satisfied the recommended conditions of approval would assist in the management and mitigation of impacts on the local road network as a result of the operation of the project.

6.2 Air Quality

Issue

The protection of local and regional air quality is an important issue for the community. Road traffic is an important influence on the level of atmospheric pollutants. The project has the potential to impact local air quality in the following ways:

- emissions from the tunnel ventilation outlets at Marsh Street, Arncliffe and West Botany Street, Rockdale;
- vehicle emissions within the tunnel affecting the health of tunnel users and driver visibility;
- vehicle emissions on roads and at interchanges;
- odour and gaseous emissions from the disturbance of a historical landfill site north of President Avenue and west of West Botany Street; and
- dust and vehicle emissions during construction.

The generation of fugitive dust emissions, landfill gases and odour are the main potential air quality issues during construction. The Proponent's assessment indicates that the potential for odour and gas impacts from the disturbance of the historic landfill site near Bicentennial Park is low risk and would be below the level of detection for hydrogen sulfide gas. The assessment also concluded that the risk of off-site dust impacts can be effectively mitigated using a range of management measures such as reusing waste water to supress dust and modifying or ceasing works during adverse weather conditions.

The operational air quality assessment considered vehicle emissions from the tunnel ventilation system and surface roads. Emissions from the tunnel would be vented through two ventilation outlets – one at Arncliffe and one at Rockdale. The ventilation outlet at Arncliffe is located within the New M5 ventilation facility adjacent to the Kogarah Golf Course with residential areas approximately 100 metres to the north west and 300 metres to the south west. The Rockdale ventilation outlet is located within an industrial estate approximately 50 metres from Rockdale Bicentennial Park with the closest residences located approximately 160 metres to the south west.

Key pollutants associated with vehicle emissions include oxides of carbon and nitrogen, particulate matter, ozone, polycyclic aromatic hydrocarbons and volatile organic compounds. Improvements in engine and fuel technology over the past 20 years has reduced emissions from individual motor vehicles. Road transport emissions are predicted to continue to improve, although particulate matter emissions are unlikely to reduce at the same rate. This improvement is tempered, however, due to the increase in numbers of motor vehicles (Climate Change Authority, 2012).

The operational assessment included consideration of possible travel routes through the project (such as adjoining tunnels through WestConnex) and future projects (such as the Western Harbour Tunnel) and concluded that the in-tunnel air quality is predicted to meet the air quality criteria.

While the project is expected to meet the relevant ambient air quality assessment goals, there is the potential for increases in ground level concentrations of pollutants on adjoining surface roads, and in particular President Avenue. Decreases are also predicted in areas with reduced traffic, such as Southern Cross Drive and The Grand Parade north of President Avenue. **Figure 18** and **Figure 19** illustrate the predicted change in annual mean NO_2 and $PM_{2.5}$ concentrations in the 2036 'do something' scenario.

Ambient air quality goals would be generally met with and without the project. Where they are exceeded this is primarily due to the occurrence of high background levels of pollutants and include:

- exceedances of the NSW 1-hour NO_2 criterion without the project were predicted at 12 receivers. The number of exceedances decreased with the project in 2036 (7 exceedances). The contribution to the maximum total 1-hour NO_2 concentration from the tunnel ventilation outlet was negligible at all community receptors;
- the PM_{10} annual mean criterion is predicted to be exceeded for the 2036-Do Something scenario at three receptors by 5 µg/m^3 (PM_{10} annual mean criterion is 25 µg/m^3). The contribution from the project is less than 12 µg/m^3 from the surface road and 0.5 µg/m^3 from the tunnel ventilation outlets;
- receptors exceeding the PM_{10} max 24 hour mean decrease slightly because of the project (from nine percent of receptors in the 2026-DM scenario to eight percent in the 2026-Do Something scenario). Tunnel ventilation outlets contribute 2-2.5 µg/m^3 or five per cent of the criterion. There is an increase in concentration of up to 2.6 µg/m^3 at between 29-45 per cent of receptors in the 2036-Do Something scenario;
- all receptors had a background $PM_{2.5}$ annual mean equal or greater than the criterion (8 µg/m^3). The largest surface road contribution was 7.1 µg/m^3 in 2036-Do Something scenario with the tunnel ventilation outlets contributing 0.33 µg/m^3; and

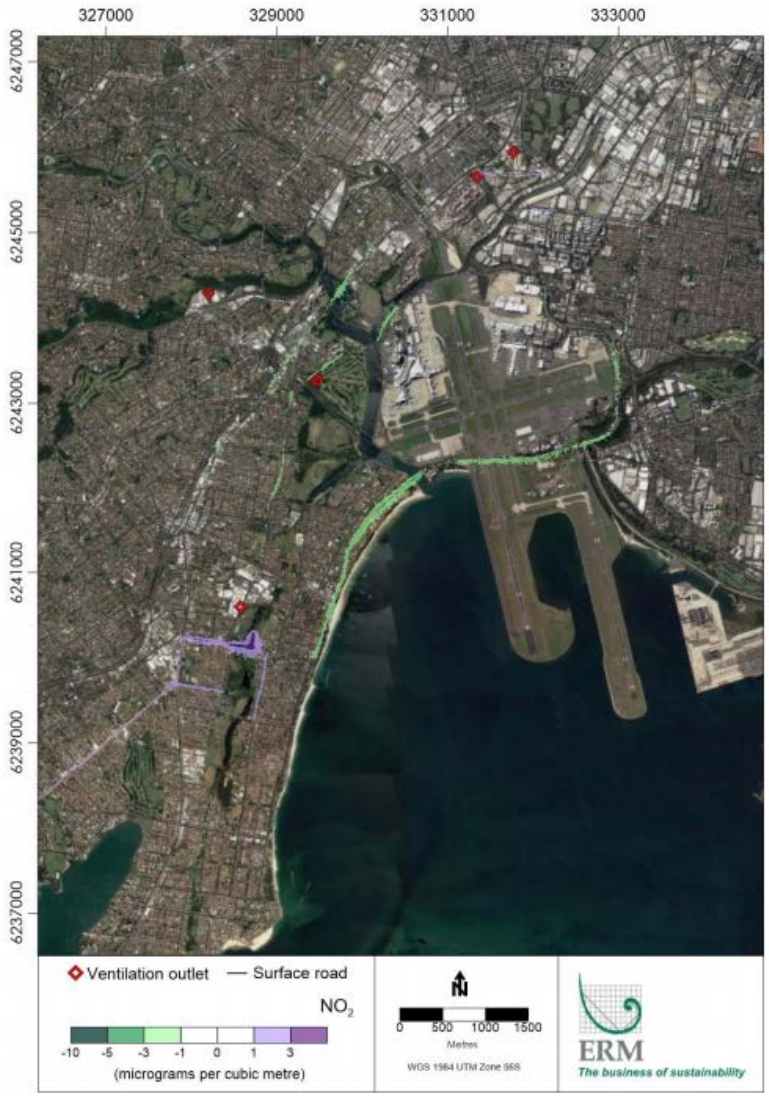


Figure 18 | Contour plot change in annual mean NO_2 concentration in the 'With the Project' in 2036 (Source: EIS)

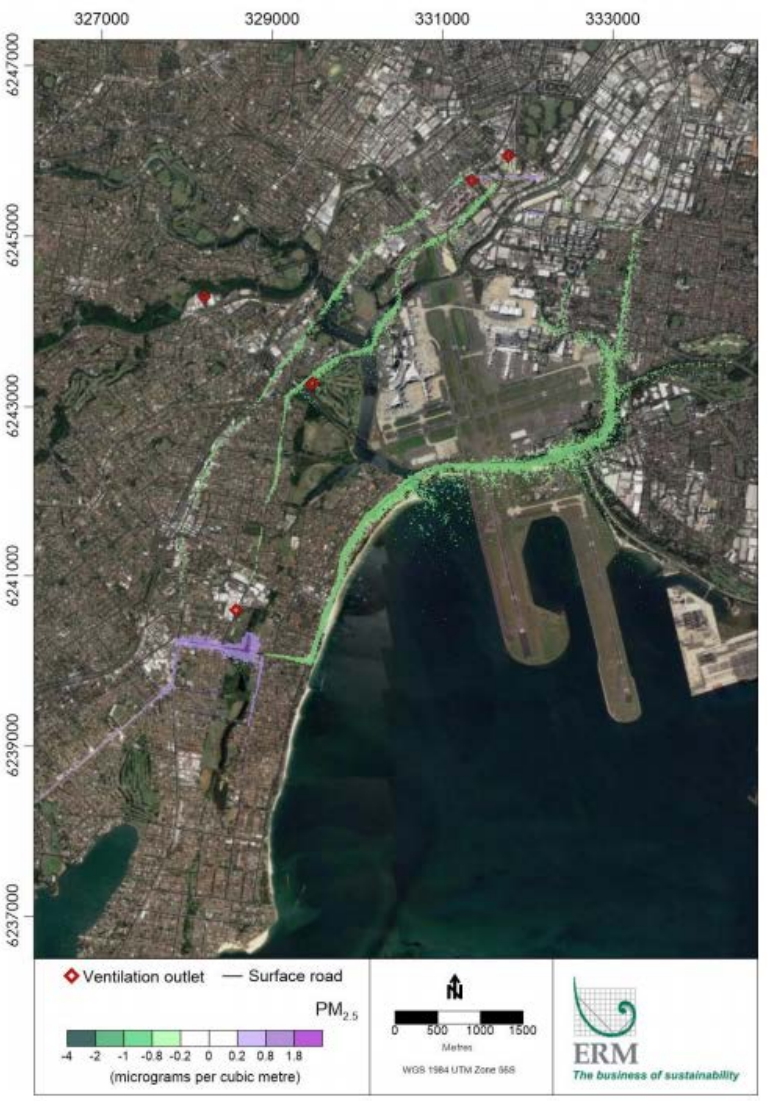


Figure 19 | Contour plot of change in annual mean $PM_{2.5}$ concentration 'With the Project' in 2036 (Source: EIS)

- the $PM_{2.5}$ maximum 24 hour mean (25 µg/m^3) is predicted to be exceeded at approximately 40 per cent of receptors due to high background levels. The maximum contribution from the tunnel ventilation outlets was 1.6 µg/m^3 in the 2036-Do Something scenario. The largest increase at any receptor was 1.5 µg/m^3 in the 2026-Do Something scenario with most receptors experiencing an increase of less than 0.5 µg/m^3.

Air toxics (which include benzene, formaldehyde, toluene, xylenes and benzo(a)pyrene and heavy metals) are predicted to comply with the NSW air quality impact assessment criteria. These pollutants have characteristics such as toxicity or persistence that make them a hazard to human health at elevated concentrations.

The health risk assessment indicated that potential health impacts, for all receptors, arising from the operation of the project are 'tolerable/acceptable' or better. The project is expected to result in an overall decrease in total pollutant levels due to traffic moving from surface roads to the tunnels.

Statement and Review of Tunnel Air Emissions

The NSW Chief Health Officer reviewed the air quality assessment and considered advice from the Office of the NSW Chief Scientist and Engineer and the Advisory Committee for Tunnel Air Quality (ACTAQ). ACTAQ advised that the methodology used to assess air quality impacts is logical and reasonable and that the air quality assessment is a high quality, thorough review. The NSW Chief Health Officer noted that any potential air pollution-related health effects would primarily be because of changes in traffic volumes on surface roads and not a result of tunnel ventilation outlets.

Submissions

Community and Special Interest Group Submissions

Air quality and health issues raised in public submissions included:

- reduced local air quality, amenity and health, particularly from unfiltered ventilation outlets and vehicle emissions on surface roads;
- dust, vehicle and odour emissions during construction activities; and
- adequacy of the air quality assessment, modelling and methodology used.

Government Agency and Council Submissions

NSW Health noted that all reasonable measures should be taken to minimise exposure to traffic related air pollution and reiterated that air pollutant related health impacts are likely to be due to changes in volumes of traffic on the surface road network and not the tunnel ventilation outlets. Further, hydrogen sulphide from the historic landfill has the potential to impact people with pre-existing respiratory conditions and generate public health and wellbeing complaints. NSW Health has committed to reviewing the Construction Air Quality Management Plan.

The **NSW Chief Scientist and Engineer** appointed two international experts to review the operational air quality assessment. The review noted that the assessment used methodology that is sound, represents best practice and fit for purpose. The NSW Chief Scientist and Engineer recommended that onsite odour measurements be used to determine site-specific emission rates.

The **Environment Protection Authority** made recommendations to address the uncertainty of the odour assessment from landfill excavation. It also recommended that the Proponent prepare management plans to minimise impacts and confirm the height of receptors close to ventilation outlets, pollutant emissions rates and air toxics. It also recommended the use of site-specific monitoring data in modelling.

Bayside Council raised concerns about construction and operational impacts on air quality, odour impacts, and ventilation emissions on residents, the community and nearby sports fields. The Council requested additional air quality monitoring stations be installed, for RMS to prepare a Development Control Plan amendment for Council's consideration addressing potential future development control around the ventilation outlets and details on what has been learnt from air quality monitoring for the M4 East and the New M5 projects.

City of Sydney Council objected to the F6 Extension sighting concerns about degraded amenity, including reduced air quality affecting the City and requested that ventilation tunnel outlets be filtered should the project proceed.

Inner West Council raised concerns about reduced air quality caused by increased traffic despite improvements in vehicle emissions.

Georges River Council raised concern about increased traffic growth leading to increased emissions and the potential for air quality to impact St George Private and Public Hospitals.

Department's Consideration

To assist in the consideration and assessment of air quality impacts and obtain independent expert analysis of the air quality assessment, the Department engaged Todoroski Air Services to undertake a specialist review. The review report is provided in **Appendix G**.

Construction

To manage the impacts on air quality during construction, the Proponent has committed to:

- implementing measures to monitor and manage dust generation from stockpiles and spoil handling, generator and vehicle emissions and works during unfavourable weather conditions which would be outlined in the Construction Air Quality Management Plan; and
- removing hazardous building materials prior to the commencement of general demolition.

The Department accepts the Proponent's conclusion that construction air quality impacts can be effectively managed to acceptable levels by implementing the above measures. To ensure that the Construction Air Quality Management Plan effectively mitigates construction air quality impacts, the Department has recommended a condition of approval requiring preparation of the Plan in consultation with NSW Health and relevant councils.

Landfill investigations have detected hydrogen sulphide concentrations exceeding human health and aesthetic (odour) criteria, elevated concentrations of methane and carbon dioxide gas, and carbon dioxide exceeding workplace exposure limits at the source. However, levels at the nearest receptor are predicted to be below the relevant criteria based on the levels detected even without mitigation.

Due to the uncertainty surrounding the assessment of odour impacts from the disturbance of a historical landfill site during construction and the Proponent has committed to:

- carry out on-site odour measurements to determine odour emission rates;
- minimise the amount of odorous material exposed at any one time; and
- treat odorous material immediately to reduce odour impacts.

The submissions from the EPA, NSW Health and the Chief Scientist and Engineer noted that further detailed modelling is unlikely to remove uncertainty and definitively characterise potential odour impacts and recommended the preparation of a management plan and consultation with potentially

affected receptors. The Proponent has committed to further detailed investigation and assessment to inform a management plan to minimise odours and gases to the surrounding area.

The Department has recommended that prior to construction within the area that may cause odour impacts, the Proponent must have in place systems to manage any potential odour impacts and gaseous emissions and that these measures be outlined in a Leachate and Landfill Gas Construction Environmental Management Plan. The Proponent must also have in place processes for engaging with the community in the event that nuisance odours emanate beyond the construction boundary.

Operation

Choice of Modelling Approach for Ambient (External) Air Quality

The Proponent modelled external air quality impacts using the GRAMM-GRAL model system. The approach was subject to detailed review by international air quality experts (on behalf of the NSW Chief Scientist and Engineer) and the Department's independent peer reviewer who advised that the approach used is adequate. The Department is therefore satisfied that the model provides suitable prediction levels of the likely air quality impacts during operation of the project.

Ambient (External) Air Quality

The assessment modelled various scenarios including a cumulative scenario comprising the project combined with traffic from the existing network, WestConnex projects, the Western Harbour Tunnel, Beaches Link, Sydney Gateway and future stages of the F6 Extension. The model predicted that air quality impacts would reduce in some areas due to reduced traffic numbers and congestion, and would increase in other areas due to increased traffic volumes. Emissions of all pollutants are predicted to decrease by approximately two to three per cent when comparing the 'do something' with the 'do minimum' scenarios for the year 2026. For the 2036 'do something' and cumulative scenarios, CO, NO_X, PM_{10} and $PM_{2.5}$ increase slightly compared to the 'do minimum' scenario. A summary of the predicted maximum increase in pollutant levels is summarised in **Table 13**.

The predicted one-hour NO_2 and 24-hour $PM_{2.5}$ concentrations are elevated at some receptors with the highest levels of one-hour NO_2 predicted along General Holmes Drive and around Sydney Airport (**Figures 20** and **Figure 21**) which currently experience elevated levels of vehicle emissions. This area also contains the largest decreases in one-hour NO_2 as a result of the project. For NO_2, the high predictions were described as due to overestimation by the model in the conversion of nitrogen oxides to NO_2 and from the combination of the highest background level with the highest increase from the project. The combination of conservative factors used in the assessment, including traffic volumes, vehicle emissions and background levels, has contributed to these high predictions and the Department accepts that such levels would be unlikely to occur. Similarly, the high 24-hour $PM_{2.5}$ concentrations are due to high background levels (which exceed maximum ambient air quality limits – see **Table 13**) and the conservative assessment approach.

The human health risk assessment indicates that the maximum increases to risk during operation of the project as a result of changes in ambient air quality are acceptable. The Department is satisfied that the project is unlikely to result in significant adverse impacts on ambient air quality or significant increases in health risks. The Department has recommended that ambient air quality monitoring be undertaken to enable the observation of any changes in air quality and to compare these changes with the EIS predictions. In addition, maximum air concentrations for key pollutants have been recommended consistent with the National Environmental Protection Measures for ambient air quality.

Table 13 | Summary of the Predicted Maximum Increase in Pollutant Levels

Pollutant	Air Quality goal	Time period	Highest concentration in any scenario	Maximum Project Contribution Surface Roads	Maximum Project Contribution Ventilation Outlet	Largest increase at any receptor in any scenario
Carbon monoxide	30 mg/m^3	1-hour	5.3 mg/m^3	2.17 mg/m^3 combined road and vent	<0.08 mg/m^3	0.5 mg/m^3
	10 mg/m^3	Maximum rolling 8 hour mean	3.7 mg/m^3	8 per cent	0 or negligible	0.06 mg/m^3
	Comment: No exceedances of the carbon monoxide air quality goal at community or RWR* receptors. An increase in carbon monoxide was predicted at 22 community receptors with the largest increase being 0.1 mg/m^3. An increase in concentration was predicted at 26-44% (depending on scenario) RWR receptors with the largest increase being 0.5 mg/m^3.					
NO_2	62 µg/m^3	Annual mean	43 µg/m^3	21 µg/m^3	0.5 µg/m^3	1.6 µg/m^3
	246 µg/m^3	Maximum 1-hour mean	**335** µg/m^3	(149 µg/m^3 combined road and vent)	N/A[1]	42 µg/m^3
	Comment: NO_2 Annual Mean goal not exceeded at any community or RWR receptors. A predicted increase at 16-40% RWR receptors (depending on scenario). Only 3% of RWR receptors had an increase greater than 0.5 µg/m^3. NO_2 maximum 1-hour mean air quality goal exceeded at a small number of RWR receptors (between 6-12 depending on the scenario). The project results in an overall reduction of the number of receptors experiencing an exceedance of the air quality goal. An increase in NO_2 was predicted at 24-40% of RWR receptors (depending on scenario considered), with an increase up to 42 µg/m^3 at 5.3% of receptors. No exceedance of air quality goal criterion.					
PM_{10}	25 µg/m^3	Annual mean	**30.9** µg/m^3 Variable background below criterion	12 µg/m^3	0.5 µg/m^3	5 µg/m^3
	50 µg/m^3	Maximum 24-hour mean	**72** µg/m^3 Background 43.6 µg/m^3	(28 µg/m^3 combined road and vent)	2.47 µg/m^3	3.6 µg/m^3
	Comment: PM_{10} annual mean goal exceeded at three RWR receptors only. Concentrations greater than 0.25 µg/m^3 predicted at less than 2 % of RWR receptors. PM_{10} Maximum 24-hour mean goal only exceeded at RWR receptors (8-10%) with an increase in concentration predicted at 28-45% of RWR receptors (depending on the scenario). Between 4-8 % of RWR receptors (depending on scenario) had an increase greater than 0.5µg/m^3.					
$PM_{2.5}$	8 µg/m^3	Annual mean	**16.3** µg/m^3 Background variable but above criterion	7.1 µg/m^3	0.34 µg/m^3	0.44 µg/m^3
	25 µg/m^3	Maximum 24-hour mean	**39.8** µg/m^3 Background 22.6 µg/m^3	(17.22 µg/m^3 combined road and vent)	1.6 µg/m^3	1.5 µg/m^3
	Comment: Background $PM_{2.5}$ concentrations exceeded the annual mean goal for all except 29 RWR receptors. An increase in concentration was predicted at 31-46% of RWR receptors (depending on the scenario considered). An increase greater than 0.1 µg/m^3 was predicted at 1.3-4% of RWR receptors. The $PM_{2.5}$ maximum 24-hour mean goal was exceeded at 35% of RWR receptors with the project, with 27-44% experiencing an increase of up to 1.5 µg/m^3. The number of RWR receptors exceeding the air quality goal reduced with the project.					

RWR – residential, worker and recreational receptors

Note: Separation of ventilation outlet contribution to surface NO_2 could not be predicted. The EIS predicts the outlets would contribute a maximum of NO_x at any receptor was 54 µg/m^3 during the 2036-DS scenario. Due to the rapid decay of NOx to NO_2 in sunlight it is expected that the NO_2 contribution from the outlets would be minimal.

Figure 20 | Contour plot of maximum 1-hour NO_2 concentration 'With the Project' in 2036 (Source: EIS)

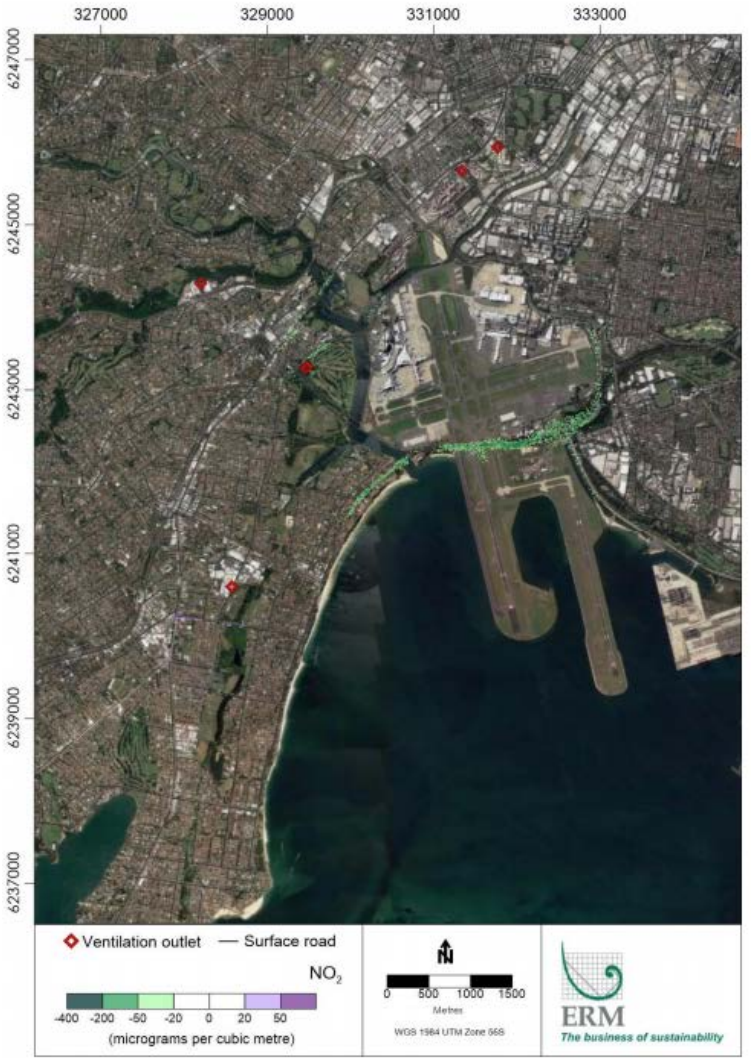


Figure 21 | Contour plot of change in maximum 1-hour NO_2 concentration 'With the Project' in the 2036 (Source: EIS)

Monitoring, Reporting and Response to Exceeding Standards

The Department has addressed the concerns raised by the public and local government councils regarding ambient air quality impacts through compliance-based conditions requiring the implementation of effective monitoring and reporting including:

- provision of real time air quality data recorded at air quality monitoring stations;
- independent external auditing and other quality assurance measures for monitoring data; and
- reporting to the Department and relevant agencies when external air quality goals are exceeded.

Consistent with other motorway tunnel projects, the Department has recommended the establishment of an Air Quality Consultative Committee comprising representatives from the community and relevant local councils. The Department considers that such participation would benefit the operation of the project. The Committee would provide comment on the location of the ambient air quality monitoring stations and review any air quality reports.

In-tunnel Air Quality and Tunnel Ventilation Design

The Proponent has committed to designing and operating the ventilation system to avoid portal emissions, reduce pollution concentrations within the tunnel and ensure air quality standards are met under all traffic scenarios. Further, the number and location of ventilation and emergency exhaust outlets, fresh air intakes and tunnel ventilation fans would be designed to ensure the air quality along the tunnel is maintained and the ventilation system would be automatically controlled based on real-time air velocity and air quality data.

To ensure these design outcomes are met, the Department has recommended in-tunnel air quality limits for the three parameters of concern – nitrogen dioxide, carbon monoxide and visibility. The recommended conditions also reinforce that the ventilation systems be designed, constructed and operated to only release emissions from ventilation outlets, not from portals or tunnel support facilities (except for in an emergency). The instrument of approval also sets out requirements for monitoring in-tunnel air quality and recommends notification and reporting requirements in the event that in-tunnel air quality limits are exceeded.

The Department has recommended that the Proponent prepare a Tunnel Ventilation, Traffic Incident Response and Traffic Management Systems Integration Protocol to demonstrate that the ventilation and traffic management systems would operate together to ensure the recommended conditions of approval are met. This protocol would be reviewed by an independent reviewer engaged to review the ventilation design of the project (Air Quality Independent Reviewer) to verify that it performs to the level predicted in the EIS.

The health assessment considered a range of tunnel travel distances, including from the F6 extension to M4 East (up to 19.7 km). The average NO_2 levels were predicted to comply with the NO_2 15-minute average of 0.5 ppm for the expected traffic and extreme congestion with the maximum predicted being 0.41 ppm. The assessment notes that pollutant concentrations within vehicles would be reduced with the windows closed and the recirculation mode used for the vehicle ventilation and for the F6 to M4 East an in-vehicle average NO_2 concentration of 0.12 is predicted for the same extreme congestion scenario.

NSW Health recommended that messaging signage be included at the entrance and in the tunnels to instruct tunnel users to close windows and turn on recirculated air to mitigate risks for tunnel users,

particularly those who are sensitive to NO_2. The Department concurs with this and has recommended a condition to this effect.

Ventilation Outlet Emissions

A large number of submissions received, including those from Bayside Council and the City of Sydney, raised concern over the potential for adverse health impacts from increased levels of pollutants being emitted from the ventilation outlets. The air quality assessment predicts that the maximum contribution from the ventilation outlets would be minimal during all likely traffic scenarios.

Elevated ventilation outlets result in more effective dispersal and dilution of air pollutants than through portal emissions and are key to achieving acceptable air quality at the surrounding receptors. Air from the tunnel is discharged into the atmosphere at height, where it mixes with atmospheric winds to reduce the concentration of pollutants at surrounding receptors. The resultant concentrations are consequently less than what would be experienced kerbside or near the surface road network.

The Department considers that the impacts are acceptable without the need for filtration and notes that emitting in-tunnel air pollutants through an elevated ventilation outlet, via a mechanical ventilation system, is best practice for managing major road tunnels worldwide. The Department has recommended a condition, similar to that for other major road tunnels, requiring the ventilation system to be designed to avoid emissions from the entry and exit portals, except in emergency situations and periodic testing.

In February 2018, the NSW Premier announced that all future road ventilation outlets would be regulated by the EPA, with requirements relating to emission concentrations, monitoring and reporting being included in an environment protection licence. The Department, has therefore, recommended conditions which allow for the licencing of the ventilation outlets by EPA in the recommended instrument of approval. These conditions require the Proponent to monitor ventilation outlet emissions and set strict limits on the emission of nitrogen oxides, particulate matter (solid particles), carbon monoxide and volatile organic carbons. The recommended conditions also include requirements for notification and reporting where emission levels exceed the recommended limits. The EPA has reviewed the worst-case scenario and is satisfied that the ventilation outlet emission limits proposed in the recommended instrument of approval are suitable.

The Department is satisfied that the predicted external air quality impacts are acceptable but considers that the Proponent should continue to review and refine its tunnel ventilation design to reduce the level and concentration of pollutants. The Department has therefore recommended that the design of the ventilation system allow for future modifications or retrofitting with minimal disruption should policies be introduced and/or strengthened that would require this. The Department has also recommended that the Air Quality Independent Reviewer review and endorse the adequacy of the in-tunnel and ventilation outlet air design.

Elevated Receptors

Concerns were raised in public submissions and submissions from the EPA and local government councils about air quality impacts on receptors in elevated locations and the potential for future higher density development surrounding the ventilation outlets.

Predicted increases in concentrations were generally at the height of 30 to 45 metres. $PM_{2.5}$ was predicted to have the largest increase at 45 metres whilst NO_x and air toxics were predicted to have the highest increase at 30 metres. All increases were predicted to be below the relevant criteria noting that the results for NO_2 was determined by assuming a NO_2/NO_X ratio leading to uncertainty in the

NO_2 prediction. It should be noted that he NO_x concentration at 30 metres high is expected to be lower than at ground level due to dispersion.

For the regulatory worst case (the theoretical maximum change in air quality for all potential traffic conditions), the largest increases are at 45 metres in height at the receptor RWR-11534 which is to the north-east of the Arncliffe ventilation outlet. Nevertheless, the increases are still predicted to be below the relevant criteria. The Department considers that all future medium and high-rise development adjacent to the ventilation facilities should consider the impacts from, and their impacts to, air dispersal from the ventilation outlets. The extent of the zone of affectation would need to be determined by modelling and this along with the imposition of development controls around the ventilation outlets is outside the scope of the project approval. Hence, the Department has recommended a condition requiring the Proponent to assist the relevant council in developing required air quality guidance to manage development around the ventilation outlets.

Conclusion

The Department's assessment of air quality impacts has been informed by the specialist advice from the Chief Health Officer, the Office of the NSW Chief Scientist and Engineer and the Department's independent air quality specialist. All of these specialists reports have confirmed the validity of modelling predictions.

The project would result in both improvements and reductions in air quality surrounding the project. The Department considers the reductions in air quality are within the range of variability in air quality in the area and would result in minor impacts to local air quality.

The Department is satisfied that the proposed construction and operational air quality outcomes would be acceptable and has recommended several conditions to manage air quality impacts and protect amenity and human health.

6.3 Noise and Vibration

Issue

The existing noise environment along the project corridor is dominated by road traffic noise from the surrounding road network, noise generated by planes on approach and departing Sydney Airport and nearby industry. Noise assessments were completed by the Proponent in accordance with NSW government noise guidelines and included the assessment of a worst-case noise scenario for 17 noise catchment areas (NCAs) (see **Figure 22** and **Figure 23**).

Surface construction activities are planned to be completed during standard construction hours (7:00 am to 6:00 pm Monday to Friday and 8:00 am to 1:00 pm Saturday) where possible. Construction works proposed to be completed outside of standard construction hours are summarised in **Table 14**.

Construction Road Traffic Noise

Heavy vehicles associated with spoil haulage will be the major contributor of construction road traffic noise. Most of the spoil removal and haulage is expected to be undertaken during standard construction hours avoiding peak periods with some night-time spoil haulage possibly required. The assessment considered tunnelling and tunnelling support work, including spoil haulage, being carried out on a 24-hour, seven day a week basis to limit the overall project duration.

Table 14 | Out-of-Hours Works

Work hours	Activity	Justification/Comment
24 hours per day and seven days per week.	• Tunnelling works and associated surface support works	Tunnelling works need to be undertaken continuously to limit the overall duration of the project.
	• Spoil handling, removal and haulage	Spoil would be trucked from the tunnel and stockpiled in acoustic sheds within construction ancillary facilities. Some night-time spoil haulage may occur to ensure stockpiles are effectively managed. However, most spoil haulage expected during standard hours outside of peak traffic.
	• Underground construction and tunnel mechanical and electrical fit out	Underground tunnel support works.
7:00 am to 8.00 pm (unless in exceptional circumstances when construction may run past 8.00pm due to unforeseen delays earlier in the day)	• Diaphragm wall construction	Construction of each section of the diaphragm wall cannot be stopped once commenced. As the works progress deeper (toward West Botany Street) each section of the diaphragm wall gets larger. It is possible that these larger sections could require works to continue until early evening.
Outside of standard construction hours	• Shared pedestrian and cycle path overpass	President Avenue is required to be closed to allow the construction of the overpass.
	• Utility relocation or protection works • Power supply works • Pavement and median works • Asphalt works and line-marking	Out of hours works required for activities to be completed near road traffic as they require either partial or full road closures to ensure a safe working environment.
	• Use of construction ancillary facilities to support out-of-hours works	Use of office space and vehicle movements to and from the sites to support out-of-hours works.
Anytime	• Delivery of oversized plant • Minor non-disruptive preparatory work, repairs or maintenance where the activities do not lead to an exceedance of the noise management level at receivers • Activities authorised by an Environment Protection Licence • Activities associated with an emergency or as directed by relevant authorities	Out of hours works as and if required including for activities to be completed near road traffic as they require either partial or full road closures to ensure a safe working environment. Such closures are only provided of an evening and night time to minimise disruptions to traffic.

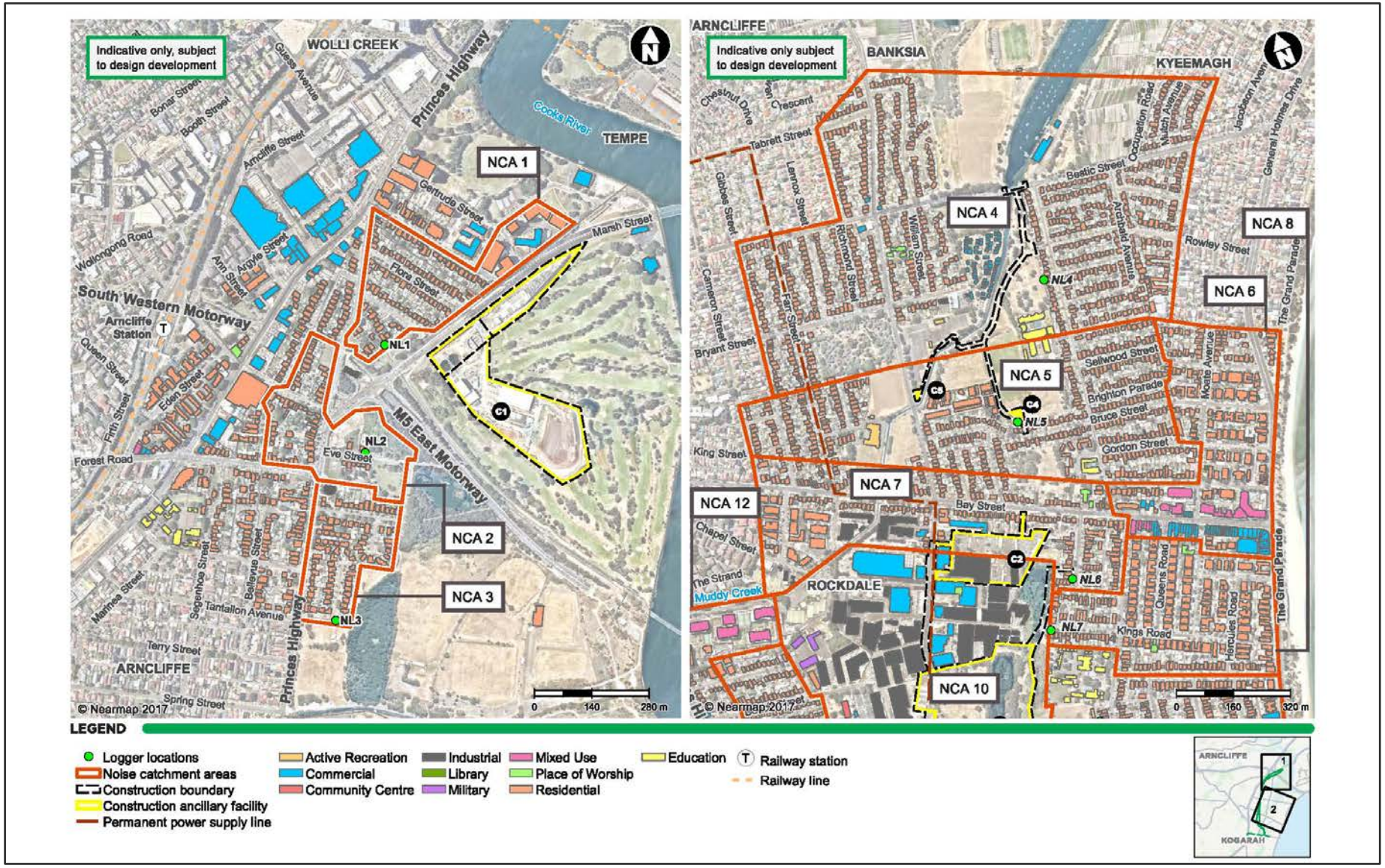


Figure 22 | Noise catchment areas (Source: EIS)

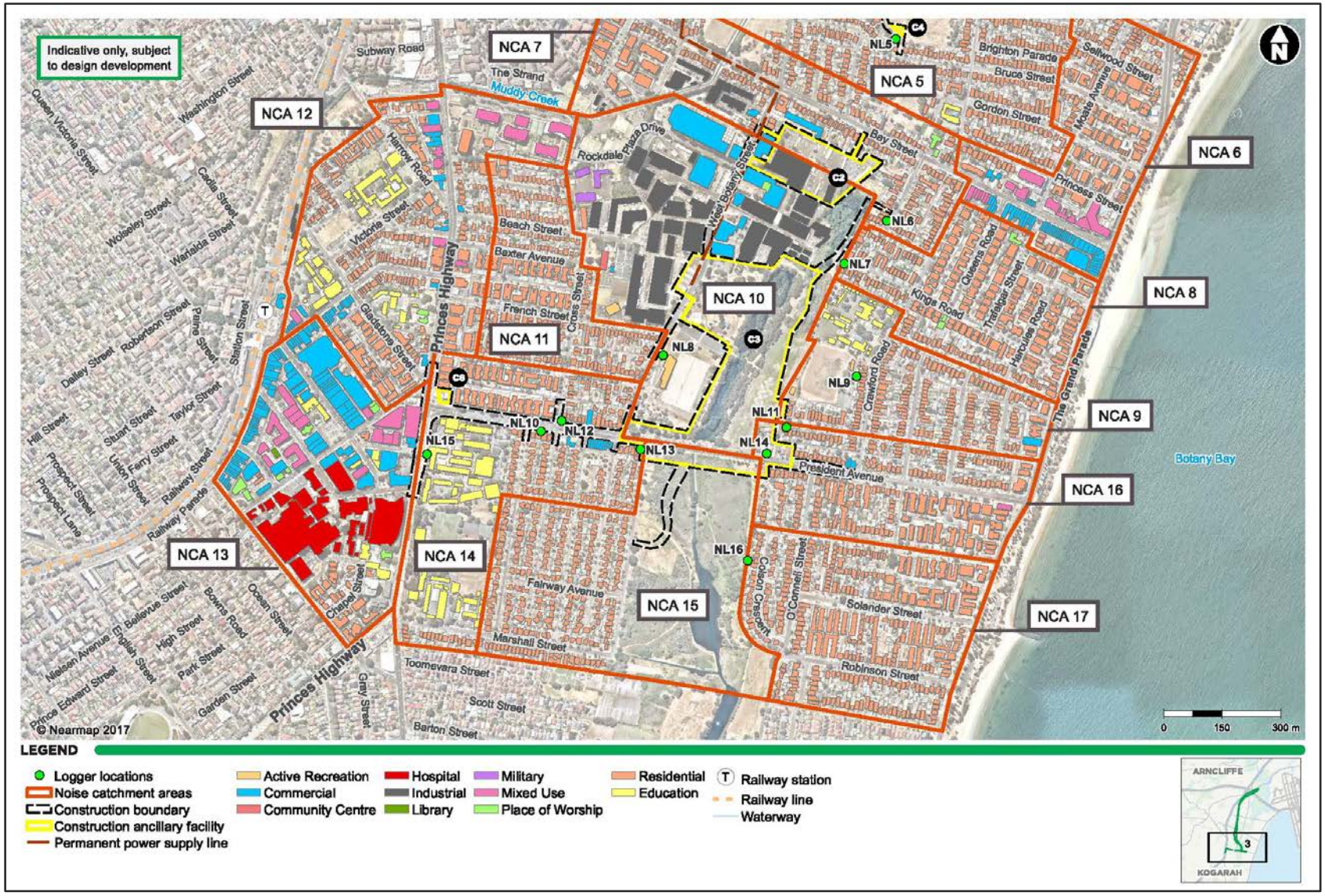


Figure 23 | Noise catchment areas (Source: EIS)

Increases in traffic noise would generally comply with the noise goal of no more than a 2 dB(A) increase during standard construction hours. However, construction traffic noise levels are predicted to exceed the noise goal in several locations including by up to 7 dB(A) at receivers near the Rockdale north facility (C2) at night should spoil haulage occur.

Airborne Noise

The noise assessment predicted that the Noise Management Levels (NML) would be exceeded during construction in a number of NCAs during the construction scenarios detailed in **Table 15**.

Table 15 | Number of NCAs with NML exceedances during construction (Source: EIS)

	Standard Construction Hours			Out-of-Hours		
	Number of NCAs with NML Exceedances	Duration of Exceedance	Worst-case noise level (dB(A))	Number of NCAs with NML Exceedances	Duration of Exceedance	Worst-case noise level (dB(A))
Arncliffe C1 Construction Ancillary Facility						
Surface Works	1	3 months	74			
Tunnelling and support				3	2 years	54
Rockdale C2 Construction Ancillary Facility						
Surface Works	2 to 5	3 months - 2 years	57 - 97			
Decline Tunnel	5	6 months	91	5	6 months	91
Tunnelling	1	2 years	57	4	2 years	57
President Avenue Construction Ancillary Facility C3 – Cut and Cover						
Cut and cover	2-8	3 months – 2 years	56 - 99	7- 8	9 -15 months	65- 67
Motorway Operations Complex	2	9 months	52			
President Avenue Construction Ancillary Facility C3 – President Avenue Intersection Works						
Surface Works	3-7	3 months – 1.5 years	55 - 107	9-12	9 months – 1.5 years	63 - 99
Princes Highway Construction Ancillary Facility C6						
Surface Works	1 - 3	3 – 15 months	86 - 103	4	15 months	86 - 96
Shared cycle and pedestrian pathway Construction Ancillary Facility C4 and C5						
Surface Works	3 - 8	3 – 6 months	75 - 105			
Power supply connection alignment						
Surface Works	6 - 8	Few weeks per receiver	90 - 93	11	Few weeks per receiver	90 - 93

Ground-borne Noise

Mainline tunnelling activities would be undertaken by road headers and blasting, both of which have the potential to generate ground-borne noise. Only one residential receiver (located on Aboukir Street, Rockdale) is predicted to exceed the ground-borne noise criterion and only by 1 dB(A) for up to two days. Blasting would be limited to between 9:00 am and 5:00 pm Monday to Friday and 9:00 am to 1:00 pm Saturdays and would therefore only generate ground-borne noise during the daytime period.

Sleep Disturbance

The current approach to assessing potential sleep disturbance impacts is to predict maximum noise levels and assess these against a screening criterion of 15 dB(A) above the rating background level during the night-time period (10:00 pm to 7:00 am). External noise levels below 65 dB(A) are unlikely to awaken people from sleep.

The sleep disturbance screening criterion would be exceeded for several NCAs during the following construction scenarios as set out in **Table 16**.

Sensitive receivers near the permanent power supply line that runs through Earlwood, Bardwell Park, Bardwell Valley, Banksia and Rockdale are also likely to be highly affected by works occurring at night. The Proponent proposes to implement a communication plan and noise management measures, such as temporary noise walls or hoarding and respite periods, to minimise the impacts.

Construction Vibration

Vibration intensive works include surface works, tunnelling and blasting. Construction vibration from tunnelling is not expected to exceed either the cosmetic damage or the human comfort criteria. Similarly, blasting is predicted to comply with the blasting vibration limits for blasts occurring at tunnel depths greater than 30 metres.

Construction vibration from surface works is likely should a large hydraulic hammer be used close to sensitive receivers. The assessment predicts that 97 sensitive receiver locations could exceed the cosmetic damage criteria and 257 could exceed the human comfort criteria. A further 25 sensitive receiver locations could exceed the cosmetic damage criteria and a further 653 could exceed the human comfort criteria during the construction of the power supply line.

Vibration impacts to heritage items (piped infrastructure and the Muddy Creek constructed channel) are unlikely. However, a detailed investigation is proposed to be completed to determine the structures sensitivity prior to any works causing vibration.

<u>Operational Noise</u>

Road Traffic

Road traffic noise impacts were modelled for the year 2026 and ten years in 2036 based on the following scenarios:

- ‘Do Minimum’ or ‘No Build’ scenario – this assumes ongoing improvements to the broader road and public transport network but not F6 Stage 1; and
- ‘Do Something’ scenario – this assumes the Do Minimum projects and the F6 Stage 1 are complete.

Table 16 | Summary of sleep disturbance impacts (Source: EIS)

Construction Scenario	NCAs exceeding the Sleep Disturbance screening criteria	Number of receivers to exceed the awakening reaction criterion
Tunnelling and spoil handling at Rockdale North Facility C2	NCA 7 (20 receivers)	0 receivers
Cut and cover road works at C3	NCA 7 (28 receivers), NCA 8 (12 receivers), NCA 9 (90 receivers), NCA 11 (28 receivers), NCA 15 (7 receivers), NCA 17 (9 receivers)	4 receivers in NCA 11
President Avenue road works during noisy activities (utility services)	NCA 9 (83 receivers), NCA 11 (22 receivers), NCA 14 (8 receivers), NCA 15 (159 receivers), NCA 16 (90 receivers), NCA 17 (164 receivers)	15 receivers in NCA 14 and 31 receivers in NCA 16
President Avenue road works (pavement works)	NCA 8 (5 receivers) NCA 9 (122 receivers), NCA 11 (30 receivers), NCA 14 (12 receivers), NCA 15 (168 receivers), NCA 16 (107 receivers), NCA 17 (199 receivers)	4 receivers in NCA 9, 23 receivers in NCA 14 and 42 receivers in NCA 16
President Avenue road works (final asphalt and line marking)	NCA 9 (52 receivers), NCA 11 (5 receivers), NCA 14 (11 receivers), NCA 15 (20 receivers), NCA 16 (96 receivers), NCA 17 (99 receivers)	16 receivers in NCA 14 and 48 receivers in NCA 16, 3 receivers in NCA 17
President Avenue road works (Shared cyclist and pedestrian overpass)	NCA 9 (23 receivers), NCA 11 (3 receivers), NCA 15 (69 receivers), NCA 16 (17 receivers), NCA 17 (52 receivers)	
Princes Highway Intersection works (utility relocations)	NCA 12 (6 receivers), NCA 14 (7 receivers)	13 receivers in NCA 12 and 10 receivers in NCA 14
Princes Highway Intersection works (excavation)	NCA 11 (46 receivers), NCA 12 (6 receivers), NCA 14 (31 receivers), NCA 15 (118 receivers)	14 receivers in NCA 12 and 52 receivers in NCA 14
Princes Highway Intersection works (stormwater and footpath)	NCA 11 (75 receivers), NCA 12 (10 receivers), NCA 14 (37 receivers), NCA 15 (162 receivers)	18 receivers in NCA 12 and 68 receivers in NCA 14
Princes Highway Intersection works (pavement)	NCA 11 (65 receivers), NCA 12 (7 receivers), NCA 14 (35 receivers), NCA 15 (135 receivers)	17 receivers in NCA 12 and 63 receivers in NCA 14
Princes Highway Intersection works (final asphalt)	NCA 11 (5 receivers), NCA 12 (1 receiver), NCA 14 (28 receivers), NCA 15 (26 receivers)	7 receivers in NCA 12 and 34 receivers in NCA 14

A cumulative scenario was also considered for the year 2036 which included the completion of the Harbour Tunnel and Beaches Link and future stages of the F6 between Kogarah and Loftus complete and open to traffic.

Road traffic noise in some locations is expected to reduce because of traffic being directed underground in tunnels including the Princes Highway north of President Avenue. Other areas, however, will experience higher noise levels such as along President Avenue near the portals. Operational traffic would result in either or both the day and/or night-time criteria being exceeded at

159 sensitive receivers in the Years 2026 and 2036. The affected receivers are located near the portals and surrounding road network in NCAs 9, 12,13,14 and 16 and are shown in **Figure 24**.

A total of 109 receivers are predicted to be eligible for at property mitigation (with 50 receivers exceeding more than one criterion) as follow:

- 19 receivers exceeded either the daytime and/or night -time criterion by more than 2 dB(A) and/or;
- 92 receivers exceeded the cumulative limit (daytime and/or night-time criterion + 5dB(A)); and/or
- 2 receivers experience acute noise levels during the daytime (noise levels of 65dB(A) or greater).

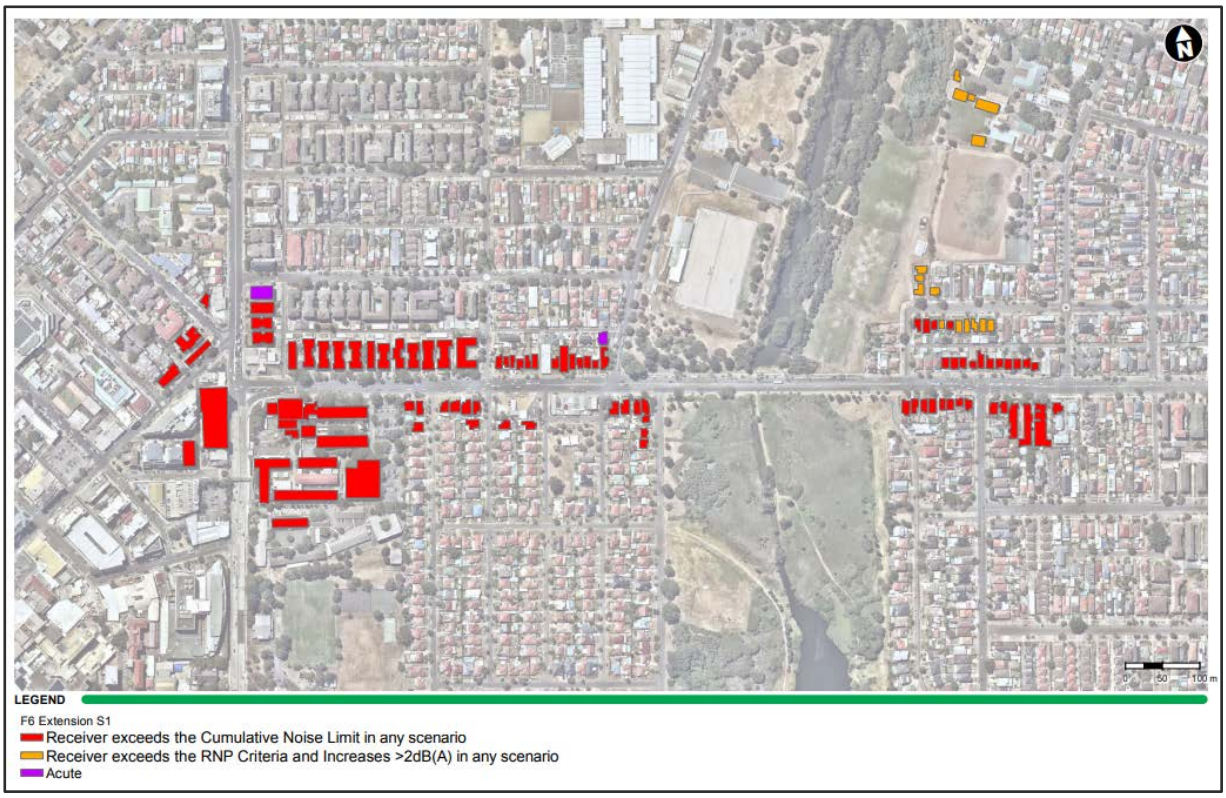


Figure 24 | Operational road traffic noise – receivers eligible for the consideration of noise mitigation (Source: EIS)

Parallel or Alternate Routes

The assessment predicts that both Civic Avenue, Kogarah and O'Connell Street Monterey would experience more traffic resulting in noise levels increasing by at least 2 dBA. The Proponent has proposed changes to the access arrangements at Morefield Estate and commits to implementing Local Area Traffic Management measures in consultation with Bayside Council to reduce traffic demand and hence traffic noise impacts. The Proponent has advised that the need for at-property noise mitigation at the affected receivers would be considered following monitoring and after the implementation of any Local Area Traffic Management measures for 600 metres down each road affected.

Submissions

Community and Special Interest Group Submissions

Key issues raised in the public submissions included:

- quality of the noise and vibration assessment;
- construction noise and vibration impacts on residents, schools, businesses and parkland including cumulative impacts, duration of impacts and out-of-hours works;
- property damage from tunnelling and blasting works;
- noise mitigation and management measures and the use of Environment Protection Licences to permit noisy out-of-hours activities;
- operational noise and vibration impacts on sensitive and vulnerable receivers; and
- noise-related health impacts and impacts to nearby fauna.

Government Agency and Council Submissions

The **Environment Protection Authority** requested further details on noise and vibration impacts including the identification, justification and management of impacts and out-of-hours works. The EPA recommended an assessment of the noise impacts associated with spoil removal during standard hours, that the Arncliffe construction facility be acoustically treated to manage construction fatigue and noise impacts, and the provision of a three-month rolling schedule of out-of-hours works clearly outlining likely impacts and management measures communicated to surrounding residents. The EPA also recommended that the benefits of blasting be outlined in the response to submissions.

NSW Health noted that high noise levels can impact on health and that management plans are required to manage the impacts. NSW Health has committed to reviewing the management plans.

Bayside Council raised concerns about noise and vibration during construction and operation, particularly at the Rockdale facility and the Kogarah Golf Course, preferring that the main spoil removal occur at Arncliffe. It recommended identifying noise mitigation for the construction phase for all affected sensitive receivers, establishing a process for requests for mitigation from affected receivers and the provision of regular updates to the community.

The **Georges River Council** was concerned that more properties than those listed in the EIS would experience noise and vibration impacts during construction and operation.

Department's Consideration

Construction Noise

Airborne Construction Noise

The Department considers the construction noise impacts and number of affected sensitive residential receivers to be significant if appropriate mitigation and management is not undertaken. The Department also recognises the requirement for some works to be completed 24 hours, seven days a week or at night increasing impacts to the surrounding community. While it is noted that construction impacts are unavoidable in highly urbanised areas, the Department notes and supports the Proponent's mitigation measures to reduce construction noise which include:

- use of temporary noise mitigation measures such as hoarding at site compounds;
- an acoustic shed at Rockdale tunnelling site;
- offers of at-property treatment prior to construction noise impacts for properties identified as eligible for at-property treatment due to predicted operational noise impacts; and

- standard mitigation measures which include selection of appropriate plant and equipment and respite offers in accordance with the document *Construction Noise and Vibration Guideline* (RMS, 2016).

Similar measures have been employed on other road and large infrastructure projects and can be effective in reducing noise impacts when appropriately applied.

The Department acknowledges that construction compounds are critical to the delivery of the project and would operate during the day and night time periods. Although the proposed temporary facilities include mitigation measures designed to reduce noise impacts, the Department considers that the impacts are more akin to operational impacts than temporary construction impacts due to the extended duration of construction works. As such, the Department has recommended conditions requiring at-property treatments and noise monitoring as discussed in the following subsections.

At-Property Mitigation

The Department is supportive of the Proponent's commitment to offer at-property noise mitigation prior to construction to all sensitive residential receivers predicted to also have an operational noise exceedance. The Department considers that where an offer of at-property nose mitigation has been accepted by the receiver where possible it should be installed prior to construction noise impact commencing. A condition has been recommended to this effect.

There are sensitive residential receivers who will experience large, prolonged and repeated exceedances of the NMLs but are not predicted to exceed the operational criteria. These receivers would not be eligible for the above at-property mitigation and are likely to experience poor amenity for the duration of construction. The most affected are the nearest residential receivers surrounding the Rockdale north ancillary facility in NCA 7. **Table 17** lists the predicted maximum noise levels and exceedance in NCA 7.

Table 17 | Examples of exceedances of the NMLs for noise catchment area 7 (Source: EIS)

Activity	**NML exceedance (dB)**	**Maximum noise level (dB)**	**Number of highly noise affected receivers (>75 dB during the day and >65 dB at night)**	**Duration**
Establishment of ancillary facility	46	97	21	6 months
Construction of decline tunnel	40 day 45 night	91	5 day 7 night	6 months
Tunnelling and spoil handling	6 day 11 night	57	0	2 years
Construction of the MOC/MCC	32	83	3	9 months
Shared Path construction	40	91	5	6 months
Powerline site establishment and trenching	39 day 44 night	90	31 day 44 night	Few weeks

The Department is concerned that impacts from construction would result in noise impacts and poor amenity for the receivers in NCA 7, particularly for the residents immediately adjacent to the Rockdale north ancillary construction facility. The Department also notes that there is the potential for construction traffic impacts to be underestimated where there are a lot of heavy vehicle movements due to the modelling method used.

For sensitive residential receivers on Civic Avenue, Kogarah and O'Connell Street, Monterey where construction noise levels are predicted to exceed operational noise criteria, the Proponent is proposing to implement at-property treatment at eligible locations after traffic control measures are investigated and implemented during detailed design phase and monitoring has confirmed the level of noise impact. While this approach is appropriate for considering the operational impact, it does not consider or mitigate the construction impacts that properties close to President Avenue would experience.

A proactive approach should be applied to managing noise impacts particularly where there are large exceedances of the NML over a prolonged duration. Consequently, a condition is recommended requiring mitigation to be offered to receivers likely to experience large and prolonged noise impacts regardless of whether they qualify for mitigation for operational noise impacts. Any at-property or other mitigation should be implemented prior to the construction noise impacts to supplement standard mitigation measures including respite periods and respite offers.

Night and Evening Activities

Tunnelling activities, spoil handling and haulage and tunnel support activities are expected to occur up to 24 hours a day, seven days a week. Other activities proposed to be completed at night to reduce traffic impacts to the road network include utility relocations, shared path and road works. Works relating to the diaphragm wall, may, by exception, require works into the evening as more work is required as the sections of the wall get larger and cannot be stopped once commenced.

The project will be subject to an Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997* and most works occurring outside of construction hours will be subject to review by the EPA. The Department has recommended conditions requiring the assessment and management of any proposed out-of-hours works not subject to an EPL be submitted to the Secretary for approval. In addition, it has recommended a condition requiring an Out of Hours Works Protocol to facilitate the identification, mitigation and notification requirements for high and low risk works.

To address construction noise impacts, the Department has also recommended:

- the appointment of an independent Acoustics Advisor;
- a process for out-of-hours works; and
- provision of at-property treatment for properties identified as qualifying for construction noise treatment.

Further, the Department notes EPA's concern that the Arncliffe spoil handling shed would not be constructed as an acoustic shed. Noise impacts from the Arncliffe construction ancillary facility (C1) are predicted to comply with the NML at all sensitive receivers during site establishment and construction with the following exceptions:

- in NCA 1 during the establishment of temporary noise attenuation measures NCA 1; and

- in NCA 3 during the night where some sensitive residential receivers are likely to experience a 7 dB exceedance of the NML during tunnelling works and spoil handling with no potential for sleep disturbance.

The Department considers that given the background noise from adjacent roads and distance to the receivers, an acoustic shed at Arncliffe is unlikely to result in any additional noise reduction benefit. Furthermore, the Proponent has advised that the majority of complaints on the use of the Arncliffe site for the construction of the New M5 related to blasting, rock hammering and site set up including the construction of the tunnel decline, and not from activities within the spoil handling shed.

Vibration, Blasting and Ground-borne Construction Noise

There is the potential for cosmetic and structural damage and human discomfort from predominantly surface construction works. The Department notes the concern raised in submissions received about vibration impacts, including the Kirby Industrial Park, and is satisfied that the mitigation measures committed to by the Proponent are adequate. The Department supports the commitment to avoid or minimise the impact by maximising the safe working distances and where those distances are encroached, to select alternative equipment and undertake vibration monitoring.

Hours of Work

The standard hours for works are construction hours are 7:00 am to 6:00 pm, Monday to Friday and 8:00 am to 1:00 pm on Saturday. However, the Department considers that activities on a Saturday can conclude at 6:00 pm, which is reflective of current community attitudes and consistent with the hours of work permitted on other recent road projects, including WestConnex. As such, the Department has recommended that works on a Saturday be permitted until 6:00 pm. This will also allow for a full day of work to be scheduled on a Saturday with the potential of reducing out-of-hours work requests.

Operational Noise

Operation traffic noise is predicted to increase along President Avenue and surrounding streets. The Proponent has committed to offering at-property treatment to 109 receivers prior to construction commencing (refer **Figure 24**). The Department supports this commitment.

The Brighton-Le-Sands Public School is predicted to experience operational noise impacts from traffic resulting in noise levels increasing by more than 2 dB. The Proponent is proposing to consider architectural treatment should design changes not mitigate the noise impacts. To ensure that mitigation measures will be provided to all sensitive receivers identified as exceeding the operational traffic noise criteria, the Department recommends that the Proponent confirm operational noise impacts based on the detailed design, review the suitability of the noise mitigation measures identified in the EIS and where necessary identify any additional noise management measures required to achieve the noise criteria, as part of and Operational Noise and Vibration Review.

As noted above, at-property mitigation for sensitive residential receivers on Civic Avenue and O'Connell Street would be considered following the implementation of any traffic restrictions (developed in consultation with Bayside Council) and monitoring of operational noise to confirm the noise impacts. The Department notes that this may mean that receivers currently identified as being noise affected may no longer be impacted by increased operational traffic (and hence elevated noise levels) and therefore would not receive at-property noise mitigation.

Conclusion

The Department acknowledges that the construction of the project will have noise impacts at sensitive receivers and that this is a significant concern for the community.

The Department has recommended conditions that require the Proponent to improve its standard approach to mitigation and proactively manage works to address potential construction fatigue, amenity impacts and out-of-hours works. These conditions include provision of respite periods determined in consultation with the affected community, appointment of an Acoustics Advisor and the implementation of at-property noise mitigation for both the construction and operational phases of the project. The Department is confident that, through the implementation of the Proponent's commitments, standard mitigation measures and the recommended conditions, noise and vibration impacts can be minimised.

6.4 Groundwater

Issue

The construction of the mainline tunnels, entry and exit ramps, decline tunnel, and ventilation shaft at Rockdale is likely to intercept aquifers associated with Hawkesbury Sandstone, Botany Sands aquifer and Botany Sands alluvium geological units. As such, groundwater dewatering would occur during construction and operation. A three-dimensional numerical model was developed to simulate existing groundwater conditions and predict impacts on groundwater hydrology during construction and operation. The model included the M5 East, New M5 Motorway and the M4-M5 Link to predict cumulative impacts.

Groundwater inflow from the Hawkesbury Sandstone is expected to be the highest during construction as hydraulic gradients would be at their highest and would decline as equilibrium is reached. The groundwater model predicted inflows to the tunnels would range between 0.1414 megalitres (ML) per day and 0.55 ML/day during the course of construction in Hawkesbury Sandstone, with tunnel inflows from the Botany Sands aquifer ranging from 0.03 ML/day to 0.22 ML/day. Inflows from the Botany Sands alluvium to the Rockdale access decline and the Arncliffe access decline are predicted to be around 0.07 ML/day.

The EIS states that during construction, groundwater interception in the tunnels is predicted to have a maximum inflow rate of 1 L/s/km, except for the Rockdale tunnel decline where an inflow rate of 2 L/s/km is predicted. Intercepted groundwater would be pumped to temporary water treatment facilities located at the Arncliffe, Rockdale and the President Avenue construction ancillary facilities (C1, C2 and C3, respectively). The treated wastewater would be either reused (for purposes such as dust suppression, wheel washing, or plant washing) or discharged to receiving waters (Cooks River and Muddy Creek).

At the end of construction (2024) groundwater levels are predicted to drawdown as a result of the tunnel structures in the Hawkesbury Sandstone and the alluvium. The drawdown in the alluvium at Spring Street Drain is predicted to be about two metres, and 0.1 metres elsewhere within the Botany Sands aquifer (the northern and southern sections of the project). Within the Hawkesbury Sandstone the drawdown is predicted to be up to 24 metres at Arncliffe where the tunnel is deepest

(approximately 100 metres deep) and approximately 33 metres in the southern part of the mainline tunnel. The tunnels at President Avenue are undrained (tanked) to prevent water inflow from the Botany Sands, although groundwater from the Botany Sands may be hydraulically linked to the drained tunnels in the Hawkesbury Sandstone. This is restricted as the residual alluvial clay that separates the sands from the underlying bedrock forms a hydraulic seal or aquitard that would reduce vertical leakage restricting groundwater drawdown due to the project.

Long term drawdown (year 2100) within the alluvium at Spring Street Drain is 5.3 metres and 0.6 metres to the south (Muddy Creek and the Rockdale access decline). Within the Hawkesbury Sandstone the maximum drawdown is 33 metres decreasing to 30 metres at Arncliffe.

The NSW Aquifer Interference Policy (AIP) (DPI Water, September 2012) considers a maximum decline of two metres in water table levels and water pressure to have minimal harm. Impacts that result in drawdown of more than two metres impacts require make good provisions. The drawdown to the two-metre contour is predicted to extend to approximately 250 metres either side of the tunnel alignment.

The final mainline tunnels and part of the entry and exit ramps would be drained (untanked) tunnels and require continual management of groundwater. The Proponent would implement a design that would restrict groundwater flow rates during operation to up 1 L/s/km. To restrict groundwater inflow, the cut-and-cover sections and the decline tunnel located within alluvium and poor-quality sandstone (Botany Sands aquifer) would be constructed with an impermeable lining. The extent of the project with lined and unlined tunnels is shown in **Figure 25**. During operation, tunnel groundwater inflow will be collected and pumped to a new water treatment facility located at the Arncliffe motorway operations complex and discharged to the Cooks River.

The Proponent's groundwater assessment also assessed the potential for groundwater drawdown to result in ground movement (settlement). Potential settlement impacts and management measures are discussed in **Section 6.8** (Socio-economic, Property and Land Use).

The groundwater assessment also included analysis of groundwater quality which reported elevated concentrations of ammonia and nitrogen in groundwater at Rockdale Bicentennial Park, exceeding the assessment criteria and indicative of typical landfill leachate. Concentrations of heavy metals arsenic, lead and zinc were detected at concentrations slightly above the assessment criteria in groundwater within the fill. Concentrations of total recoverable hydrocarbon, BTEXN (benzene, toluene, ethylbenzene, xylenes, naphthalene), volatile organic compounds and semi-volatile organic compounds were detected above the limit of reporting but less than the assessment criteria. The treatment and discharge of groundwater is addressed in **Section 6.9.2** (Surface Water Quality).

Submissions

Community and Special Interest Group Submissions

Key issues raised in the public submissions included:

- groundwater drawdown impacts on the wetlands in Bicentennial Park and Scarborough Ponds and on groundwater dependent ecosystems;

- changes to salinity levels in groundwater resources;
- use of the Bureau of Meteorology's Groundwater Dependent Ecosystem Atlas to determine impacts to wetlands; and
- limited hydrogeochemical assessment of baseline data.

Figure 25 | Extent of drained and undrained tunnels (Source: EIS)

Government Agency and Council Submissions

Bayside Council raised several concerns regarding groundwater including settlement impacts to Spring Street Drain due to groundwater drawdown. Council requested monitoring of ground settlement of the drain and for RMS to undertake remediation action, if required. Council also requested monitoring of groundwater drawdown at the Rockdale/Scarborough ponds, Landing Lights wetland and Marsh St wetland. Council indicated support for the appropriate reuse of treated groundwater on sports field and open spaces.

DoI – Water and Natural Resources Access Regulator (DoI Water) raised significant concerns regarding the groundwater modelling including:

- the Rockdale tunnel access decline having an inflow of 2 L/sec/km, and questioned why this section is not being grouted or sealed to reduce the inflow to less than 1 L/sec/km; and
- the lack of detailed geological cross sections and long sections for both groundwater flow and groundwater modelling.

Further DoI Water requested revisions of the conceptual and numerical groundwater models be undertaken.

Department's Consideration

The Department engaged the Water Research Laboratory of the University of New South Wales (UNSW WRL) to undertake a specialist review of the Proponent's groundwater assessment (**Appendix H**). The Department's groundwater expert considered that there was a need to provide greater certainty in the predicted groundwater inflows during construction, noting that there were significant differences between the steady state EIS predictions and construction drawdown observations for the New M5 tunnelling project, given that the groundwater modelling approach for both the project and the New M5 were similar. In addition, the groundwater expert was concerned that the design operational inflow rate of 1 L/sec/km did not take into account inflows between driving the tunnel and adequate sealing of structures to reduce inflows and dewatering of access dives during construction. Consequently, the Department sought additional information from the Proponent on the existing geological conditions and additional modelling runs.

Groundwater Modelling

The Department is satisfied the groundwater model developed for the operation of the project is appropriate and relevant factors have been incorporated into the EIS model. Notwithstanding, the recommended conditions require the Proponent to undertake further groundwater modelling prior to finalisation of the detailed design of the tunnels to refine the predicted impacts and subsequent management measures. The detailed design groundwater model must be based on 12 months of continuous pre-construction groundwater monitoring data and provide predictions of groundwater drawdown and tunnel inflow.

Construction Impacts

The loss of groundwater due to inflows to the tunnels will result in localised groundwater drawdown. The inflow of groundwater during construction is dependent on a number of factors, including tunnelling progress and construction methodology (such as pre-grouting), fracture zones intersected and localised groundwater resources. The Proponent's assessment indicates that initial inflows can be large during tunnelling, however, measures, such as pre-excavation grouting, the installation of water proofing membranes or provision of undrained (tanked) lengths of tunnels will be employed as required.

Groundwater drawdown due to construction activities and temporary dewatering could impact the local water table and surface water features where there is hydraulic connectivity. As the majority of the tunnels are drained (untanked) structures, groundwater inflows could impact the natural groundwater system and potentially alter regional hydrogeological conditions.

As noted above, the Department requested the Proponent to undertake additional groundwater modelling to simulate short term potential high inflows during construction. This involved modelling of free draining inflows into the tunnel at commencement of construction, and for periods at three months and at 12 months after commencement of construction. A maximum groundwater inflow of 3.3 L/sec/km was predicted at the Rockdale access decline at three months after commencement of construction, which would result in a dewatering rate of 1,300 m^3/day. The maximum inflow along the mainline tunnel was estimated to be 2.1 L/sec/km at three months after commencement of construction near Arncliffe below the Cooks River paleochannel.

Drawdown is predicted to occur during construction at periods of peak groundwater. For example, borehole BH206 located above the entry ramp from President Avenue is predicted to show a short-term drawdown of approximately 18 metres in the 3 months scenario, and 20 metres in the 12 months scenario. However, groundwater levels are expected to recover and an operational drawdown of around 1.5 metres is predicted once measures are implemented to ensure a long-term operational inflow of 1 L/sec/km.

In light of the potential for drawdown, the Department has recommended that the Proponent implement make good provisions for groundwater users in the event the project results in a material decline in groundwater water levels, quality and quantity. The implementation of such provisions is consistent with the *Aquifer Interference Policy.*

The Department's groundwater expert considers that the additional groundwater modelling provides sufficient quantitative information to progress the detailed design, including the development of management and monitoring plans to avoid, minimise and mitigate the groundwater impacts of the project. Consequently, the Department is satisfied that construction impacts on groundwater resources have been adequately considered and risks identified. To ensure that construction of the project has minimal impact on groundwater, the Department has recommended conditions of approval which require the Proponent to undertake groundwater monitoring during construction and further groundwater modelling to finalise the detailed design.

Operational Groundwater Management

Groundwater inflow is typically highest during construction and steadily reduces as the cone of drawdown expands and an equilibrium of steady state conditions are reached. This equilibrium is reached when the tunnel inflow is matched by rainfall recharge via infiltration and/or surface water inflows. To ensure an acceptable level of impact, the Department has recommended that groundwater tunnel inflows do not exceed 1 L/sec/km during operation. This flow level was assumed in the groundwater impact assessment and the Proponent has indicated that it can be achieved through the implementation of design and management measures. The project has been designed to reduce groundwater inflows into the tunnels by diving beneath the Cooks River paleochannel and located in the less transmissive Hawkesbury Sandstone. In addition, the proposed use of grouting and the installation of waterproof membranes would reduce groundwater inflow to the tunnels. Inflow to the access divers, ventilations shafts and the cut and cover sections would be minimised by the construction of diaphragm walls and cut-off walls (or similar).

Assessment of the operational impact of the project on regional groundwater indicates that the long-term groundwater take of the project, represents 0.48 per cent of the Sydney Basin Central annual recharge in 2025, reducing to 0.47 per cent in 2100. This take level would not result in a significant adverse impact on regional groundwater resources.

Construction of drained tunnels beneath the water table is expected to induce localised groundwater drawdown along the project footprint during operation. Cumulative groundwater drawdown or inflows due to the New M5 and M4/M5 Link tunnel projects are not expected, as there is no overlap spatially but are adjoining and the total impacts are considered to be similar to that of a continuous tunnel. In acknowledgement of DPI's and the communities concerns that groundwater drawdown during operation could impact on local groundwater reserves, the Department has extended the requirement for groundwater monitoring and reporting into the operation of the project. Monitoring must be undertaken for at least five years after the completion of construction, with a review of future monitoring requirements at least one month prior to the end of the five year monitoring period. The recommendation to implement make good provisions to existing registered water supply bores where there is a material decline in water levels, quality or quantity also applies to the operation of the project.

There is the potential for saltwater intrusion from saline tidal water to occur along the shoreline and near saltwater water bodies due to groundwater level decline associated with tunnelling. There are no registered bores within the tidal fringe which may be impacted by saltwater intrusion and it is unlikely that saline groundwater would flow into the tunnel due to its distance from saline water bodies.

Conclusion

The construction and operation of the project will impact on groundwater, including reduced groundwater recharge, tunnel inflow and groundwater drawdown. In the longer term, groundwater drawdown is expected to occur at varying distances from the tunnel alignment, depending on the geological units traversed by the tunnel. Groundwater inflow and drawdown is expected to reach a steady state following the operation of the project.

The Department is satisfied sufficient quantitative groundwater information has been provided to inform the environmental assessment and to progress to the detailed design of the project. The Department is also satisfied that groundwater impacts can be acceptably managed through the Proponent's commitments including waterproofing of areas of tunnelling that have potential high inflow rates during construction. Further, the Department considers that its recommendations for groundwater monitoring to inform potential impacts and the implementation of remedial actions, along with make good provisions would reduce residual risks.

6.5 Contamination and Soils

Issues

A Stage 1 preliminary site investigation was undertaken by the Proponent to identify potential soil and contamination risks as a result of the project. The assessment focussed on areas where historical land use activities are known to have contaminated soil, sediment and groundwater and would require remediation and/or management during the construction and operation of the project.

Construction ancillary facility sites were identified as having a medium to high risk of soil (and potentially groundwater) contamination consequent to former uses of the sites as market gardens,

industrial uses, historical landfilling, and commercial uses. Contaminants of potential concern to human health include pesticides, herbicides, heavy metals, hydrocarbons, asbestos, polychlorinated biphenyls, polycyclic aromatic hydrocarbons and BTEXN. Potential contamination, with a medium level of risk, was also identified along the proposed permanent power supply alignment.

Previous investigations have confirmed the presence of uncontrolled fill at the Rockdale construction ancillary facility (C2). Results from soil investigations indicate that concentrations of polycyclic aromatic hydrocarbons, total recoverable hydrocarbons, heavy metals and asbestos in soil and fill materials above the assessment criteria at Rockdale Bicentennial Park, and portions of Rockdale Bicentennial Park East and Civic Avenue Reserve (C3) both of which were formerly used as a council landfill.

The service station which occupies the site of the proposed Princes Highway construction ancillary facility (C6) is currently under assessment for contamination. Petroleum and its characteristic contaminants are known to be present in the soil at concentrations above the relevant assessment criteria. The site is on list of NSW contaminated sites notified to the EPA as not requiring regulation under the *Contaminated Land Management Act 1997.*

Contamination at the Arncliffe ancillary facility (C1) is a result of historical land uses, including uncontrolled filling and use of herbicides and pesticides for former use as market gardens and a golf course. A site contamination assessment (completed for the New M5 Motorway Construction Compound and having the same foot print as the Arncliffe ancillary facility) identified asbestos in fill at one location, as well as concentrations of ammonia and methane that exceed the adopted assessment criteria. Although the contaminated material encountered during the establishment of the New M5 has been managed in accordance with the conditions of approval for that project, there may be a need for further excavations at the surface as part of the F6 Extension works and hence exposure of contaminated materials

In addition to soil contamination, there is a high potential for acid sulfate soils to be encountered, particularly around the low-lying areas surrounding Scarborough Ponds including Rockdale Bicentennial Park and Memorial Fields, Civic Avenue Reserve and AS Tanner Reserve. The EIS estimates an overall volume of approximately 110,434 m^3 of acid sulfate soils would be excavated, the majority generated through the cut and cover and trough structures within the President Avenue construction ancillary facility (C3). The Proponent intends to treat these soils on site at construction ancillary facility C3. The designated 'soil treatment area' is shown in **Figure 26**.

Submissions

Community and Special Interest Group Submissions

Key issues raised in public submissions included:

- impacts of contamination on surface waters and groundwater and wetlands;
- human health impacts resulting from exposure to contaminants during the disturbance and removal of contaminated land;
- the need for safe remediation and disposal of spoil;
- uncertainties of the extent and concentration of contamination;
- salinity impacts;
- adverse soil and water quality due to disturbance of acid sulfate soils; and
- poor asbestos handling procedures.

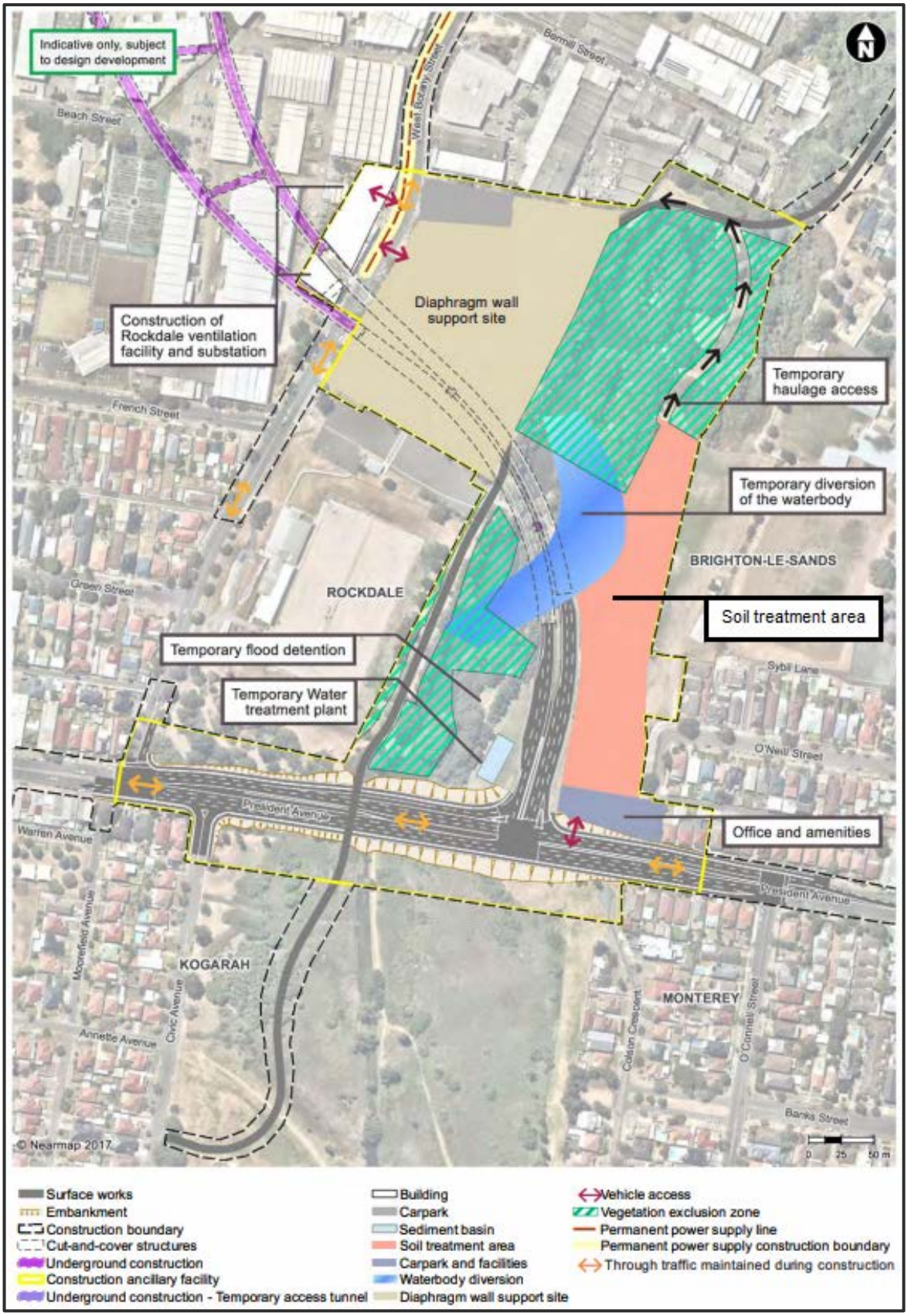


Figure 26 | Location of designated soil treatment areas (Source: EIS)

Government Agency and Council Submissions

Bayside Council requested detailed environmental reports and Remediation Action Plans in relation to any construction works involving the excavation of soil from contaminated areas. Council also noted risks associated with potential acid sulfate soils and requested to be forwarded the Construction Soil and Water Management Plan once available.

The former **Department of Industry (DoI) – Water and Natural Resources Access Regulator** requested that the Construction Soil and Water Management Plan, Erosion and Sediment Control Plan, and Operational Environmental Monitoring Plan be developed in consultation with their agency.

The former **DPI Fisheries** requested the opportunity to review and provide comment on the Construction Soil and Water Management Plan and the Acid Sulfate Soil Management Plan.

Environment Protection Authority indicated that further sampling and assessment is required to adequately characterise and manage contamination and that if additional contamination is found during detailed site assessment, that an EPA accredited site auditor be engaged to review the adequacy of future contamination assessments and management plans, as well as evaluate site suitability for the proposed uses including issuing a Validation and Verification Report. The EPA also suggested additional monitoring be undertaken along with the preparation of a number of management plans including an Unexpected Finds Protocol, Acid Sulfate Soil Management Plan, Remedial Action Plan, and a Hazardous Material Protocol.

Georges River Council noted that the service station site is assessed as high risk, as petroleum soil and groundwater contamination is known to be present at concentrations above the relevant assessment criteria. Council further noted that excavation of the underground storage tanks could pose a risk to people through exposure to dust, odour, contaminated groundwater and soil. Council raised concerns that a lack of monitoring and notification would have negative impacts on nearby receivers during construction.

NSW Health recommended communication with local communities about the potential risk and consequences of any bore water contamination.

Department's Consideration

Soil Contamination

The six construction ancillary facility sites have a medium to high risk of soil contamination and there is also the potential for soil contamination to be encountered along the length of the proposed power line route. If not managed correctly, the excavation, handling, disposal/ on-site management of the soils could pose health and safety risks as a result of exposure to contaminants such as heavy metals, asbestos and acid sulfate soils. The Department acknowledges the health and safety concerns raised by the community with regards to the removal and disposal of asbestos wastes and other contaminated material across the tunnel alignment, particularly within Rockdale Bicentennial Park and surrounds.

The Proponent acknowledges that additional investigation across the project area is necessary to refine the nature and extent of contamination and has committed to undertaking detailed site contamination investigations during detailed design, as recommended by the EPA. The Department supports the Proponent's commitment and has reinforced it in the recommended conditions of approval, requiring a Site Contamination Report be prepared documenting the outcomes of Stage 1

and Stage 2 contamination assessments. Measures to identify, handle and manage potential contaminated soils, materials and groundwater would be identified in the Site Contamination Report and incorporated into a Contamination Construction Environmental Management Plan where it is identified that a remediation strategy is not required. Should the report identify that a remediation strategy is required, a Remediation Action Plan must be prepared. If remediation is required, a Section A Site Audit Statement and Site Audit Report, must be prepared by a Site Auditor accredited by EPA under the *Contaminated Land Management Act 1997*. The Site Audit Statement and its accompanying Site Audit Report must verify that the site has been remediated to a standard consistent with the intended land use and be submitted to the Department and relevant local council.

The Department has also recommended that an Unexpected Contaminated Land and Asbestos Finds Procedure be prepared to manage contaminated soils and materials that may be uncovered in areas not identified in the Site Contamination Report, consistent with the recommendations of the EPA. The process of submitting a Site Audit Statement applies for unexpected finds should they require remediation.

The EIS identified several key contaminated sites, particularly associated with the former council landfill. The Department notes that in accordance with recent amendments to the *Protection of the Environment Operations (Waste) Regulation 2014*, EPA approval is required prior to the exhumation of waste from any current or former landfill. Notwithstanding, as noted in **Section 6.2**, the Department has recommended that the Proponent prepare a Leachate and Landfill Gas Construction Environmental Management Plan to manage leachate and odours from the former landfill site. It has also recommended that all wastes from the project area be classified and disposed lawfully in accordance with a Waste Construction Environmental Management Plan and that a waste tracking register be developed and implemented.

Acid Sulfate Soils

The Proponent has indicated that a suite of measures would be implemented to minimise erosion and sedimentation and ensure the effective handling, treatment, and disposal and/or reuse of acid sulfate soils including:

- preparation of an Acid Sulfate Management Plan, in accordance with the *Acid Sulfate Soils Assessment Guidelines* (ASSMAC, 1998) detailing processes to manage actual and potential acid sulfate soils disturbed during construction;
- management of acid sulfate soils in accordance with the *Guidelines for the Management of Acid Sulfate Materials* (Roads and Traffic Authority, 2005);
- engagement of a soil conservation specialist for the duration of construction to provide advice regarding erosion and sediment control; and
- works within watercourses or on waterfront land will be managed in accordance with the Controlled Activities on Waterfront Land guidelines (Department of Primary Industries, 2012) to minimise potential runoff from acid sulfate soils into waterways.

The Department considers that the risk to the environment from the exposure of acid sulfate soils can be effectively reduced and managed through the measures proposed by the Proponent.

Soil Salinity

The Proponent has committed to testing to confirm the presence of saline soils prior to ground disturbance in areas of very high potential of soil salinity, and if saline soils are encountered, manage these in accordance with *Site Investigations for Urban Salinity* (Department of Land and Water Conservation, 2002). The Department considers this measure in conjunction with the implementation of a Construction Soil and Water Management Plan are appropriate to ensure salinity impacts are adequately managed.

Conclusion

A number of known contaminated sites exist where surface works are proposed as part of the project, including a former landfill at Bicentennial Park, Rockdale. There is a risk of encountering further contaminated land during construction that has not been previously identified by the investigations. The Department considers the Proponent's proposed environmental management measures, the recommended conditions of approval and existing regulatory licences and approval requirements for contaminated land would adequately reduce the risk of adverse environmental and human health impacts arising as a result of the excavation, handling and disposal of contaminated materials.

6.6 Biodiversity

Issue

To assess the impacts of the project on ecological values, the Proponent undertook a biodiversity assessment which included desktop analysis and field assessments, using the Biodiversity Assessment Method (BAM) under the *Biodiversity Conservation Act 2016* (the BC Act) to assess the presence of native vegetation, habitat for threatened species and condition of ecological communities. The Proponent assessed the impacts to aquatic biodiversity and groundwater dependent ecosystems in the Biodiversity Development Assessment Report (BDAR).

Terrestrial flora

The biodiversity assessment identified three vegetation types which corresponds with three Plant Community Types (PCT) within the construction boundary. The PCTs are listed as threatened ecological communities under the BC Act. **Figure 27** and **Figure 28** show the location of the threatened ecological communities in the Rockdale Bicentennial Park and President Avenue construction ancillary facility (C3) and the southern extension of the shared cycle and pedestrian path from President Avenue through Scarborough Park North. The assessment also identified vegetation types: urban exotics and natives; and weeds and exotics within the construction boundary. However, the assessment stated that no PCTs could be reliably assigned to these vegetation types, and they were excluded from further assessment.

The project directly impacts 1.76 ha of threatened ecological communities, and biodiversity offsets would be required to be provided. These vegetation communities are not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threatened Species – Flora

The project area contains planted Magenta Lilly Pilly (*Syzygium paniculatum*), which is listed as endangered under the BC Act and vulnerable under the EPBC Act. Approximately 20 adult individuals were recorded at the Rockdale Bicentennial Park. Although these plants are within the natural range of the species, this site is not a known natural population of the species. Five of the individual plants would be removed to enable surface works at the Rockdale Bicentennial Park.

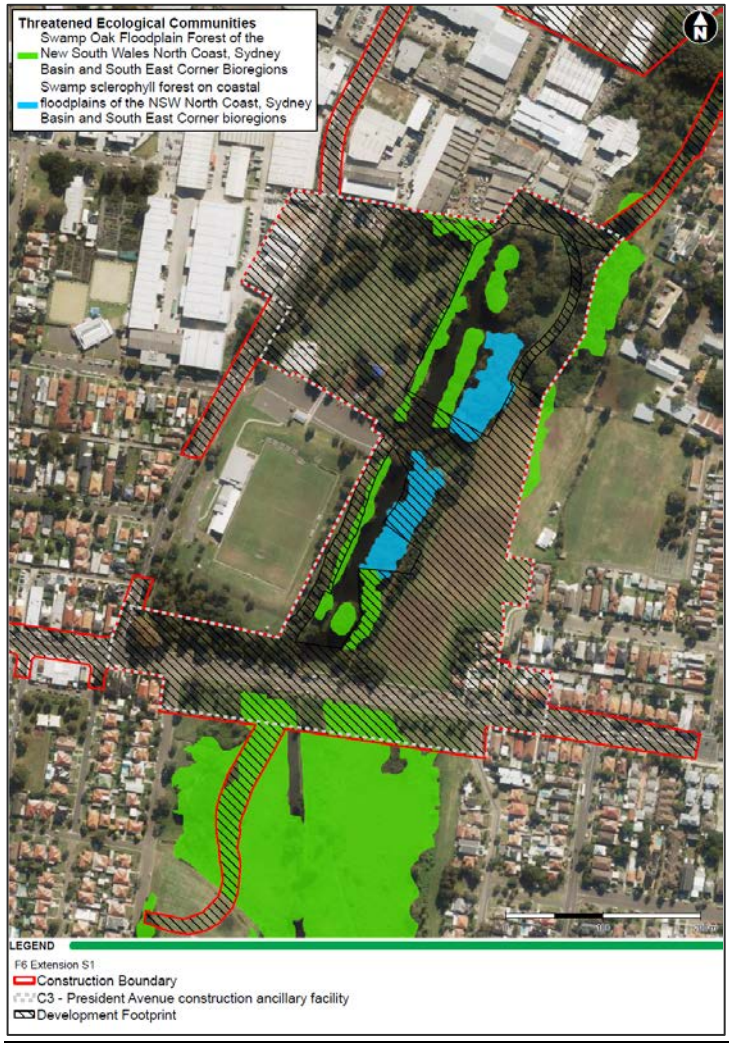


Figure *27* | Threatened ecological communities in the C3 project area (Source: EIS)

Figure 28 | Vegetation communities in the southern extension of the active transport corridor (Source: PIR)

Terrestrial Fauna

Ninety threatened fauna species were identified as potentially occurring within 10 kilometres of the project. Of these species, the BAM predicted 33 would likely be present within the construction boundary, however the fauna surveys carried out did not record their presence. Notwithstanding the absence of these species, targeted surveys were conducted for the Green and Golden Bell Frog and Southern Myotis, given their potential to occur in the study area. Similarly, the Grey-headed Flying-fox was also considered likely to forage in the study area.

The Green and Golden Bell Frog (*Litoria aurea*) is listed as endangered under the BC Act and vulnerable under the EPBC Act. A population of the Green and Golden Bell Frog is located at Arncliffe, adjacent to the Kogarah Golf Course. The population was relatively stable between 2003 and 2015, after which it appeared to be in decline. Eighteen adult frogs were captured in 2016 and 2017 for the New M5 Motorway's captive breeding program. No frogs were recorded during the targeted surveys undertaken in February 2018 for the project. The 2017/2018 monitoring surveys recorded one adult frog about 400 metres south-east of the Arncliffe construction ancillary facility (C1).

No Southern Myotis (*Myotis Macropus*) were recorded during the field surveys. A culvert beneath President Avenue conveys water from the Rockdale Bicentennial Park to Scarborough Park North, which may provide potential habitat for the Southern Myotis, listed as vulnerable under the BC Act.

The study area contains potential foraging habitat for the Grey-headed Flying-fox (*Pteropus poliocephalus*) which is listed as vulnerable under the BC Act and the EPBC Act. No Grey-headed Flying-fox roosting sites or breeding camps were recorded in the study area, with the nearest camp located three kilometres to the north-west at Turrella, however it has been recorded foraging in Rockdale Bicentennial Park adjacent to the construction boundary.

Aquatic Flora and Fauna

A desktop assessment was undertaken which identified 108 threatened species, populations and ecological communities within freshwater or estuarine habitat that are likely to occur within the study area. However, no threatened aquatic species or populations were recorded in the field surveys, and none were considered likely to depend on the habitat for survival. The study area does not contain valuable or specific habitat capable of supporting aquatic threatened species or populations.

A narrow strip of land (about 1.2 metres wide) above the concrete-lined Muddy Creek supports several saltmarsh species. Coastal saltmarsh is listed as a threatened aquatic ecological community under the *Fisheries Management Act 1994*. The saltmarsh is close to sections of the shared cycle and pedestrian path along Muddy Creek. Protected aquatic fauna listed under the *Fisheries Management Act 1994* are unlikely to occur in the study area due to lack of suitable habitat. Grey mangrove bushes were also observed in the Muddy Creek intertidal zone.

Groundwater dependant ecosystems

No groundwater dependent ecosystems were identified in the study area, however, some areas support vegetation that has a moderate potential to be dependent on groundwater (Kogarah Golf Course and the Rockdale Bicentennial Park).

Submissions

Community and Special Interest Group Submissions

Submissions from the community and special interest groups raised concerns about biodiversity impacts during the construction and operation of the project. Concerns about the adequacy of the biodiversity assessment included:

- vegetation removal and retention;
- accuracy of identified groundwater dependent ecosystems, flora and fauna species;
- lack of consideration of ecological connectivity and migratory species; and
- the inadequate assessment of the permanent power supply connection and its construction.

Government Agency and Council Submissions

The former **OEH** noted that the BAM has been applied to quantify and describe the biodiversity values of the project area and the offsets required to address any unavoidable impacts. However, it stated that it was not able to comment on the accuracy of the BDAR as the BAM Calculator had not been finalised and relevant spatial data had not been provided.

The former **Department of Primary Industries – Fisheries** considered the project would have minimal impact on key fish habitat, and requested the Proponent consult it on the Construction Flora and Fauna Management Plan.

Bayside Council noted that the project has the potential to have an adverse impact on biodiversity values in the council area with the removal of trees (particularly hollow bearing trees) resulting in habitat loss for fauna species. Council was also concerned that the provision of biodiversity offsets does not take into account habitat fragmentation and does not prevent the ongoing decline of biodiversity values. Council recommended that the Proponent work with council on the design of the project and mitigation measures, including habitat replacement.

Department's Consideration

Assessment Methodology

The BDAR and PIR was reviewed by the former OEH following the receipt of spatial data and the BAM calculator. The former OEH considered that vegetation communites in the Rockdale Bicentennial Park and Scarborough Park were incorrectly identified and mapped and should be remapped as endangered ecological communities and an offset provided. The impacts to native vegetation as assessed by the BDAR and the former OEH's revision are shown in **Table 18**.

The former OEH also queried the survey effort for the Southern Myotis and considered that impacts to the threatened Magenta Lilly Pilly should be offset.

The Proponent has reclassified the vegetation in the construction footprint and agreed to apply offsets to the additional native vegetation and for the impacted Magenta Lilly Pilly plants. The former OEH has advised that it is satisfied with the outcomes.

Table 18 | Native vegetation impacts within the construction boundary

PCT ID	PCT Name	Threatened ecological community name	BC Act Status	Impacted Area – EIS (ha)	Impacted Area – PIR (ha)	Former OEH revision (ha)
1232	Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregions	Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered	0.47	0.02	0.37
1795	Swamp Mahogany / Cabbage Tree Plain – Cheese Tree – Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney Basin	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered	0.30	-	0.81
1808	Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline	Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered	0.77	0.20	0.97

Threatened Flora Communities and Species

The project would impact 2.15 hectares of threatened ecological communities. The Proponent states the project has been located and designed to avoid and minimise impacts on native vegetation and habitat by:

- locating a large portion of the project in areas where there are no biodiversity values – the project is mostly underground tunnel and 5.89 hectare of the 16.73 hectare surface impact area is located inside the gazetted F6 corridor. The Rockdale construction ancillary facility (C2) is located in an existing RMS maintenance depot; and
- locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition – reuse of areas already cleared, such as the Arncliffe construction ancillary facility (C1) which was cleared for the construction of the New M5 Motorway project and the informal managed tracks in Scarborough Park North for the southern extension of the shared cycle and pedestrian path.

The BAM noted the Swamp Oak floodplain swamp forest and Common Reed PCTs were in a disturbed condition with a high occurrence of weeds. Much of the Swamp Oak floodplain swamp forest community in the Rockdale Bicentennial Park is landscaped and there is regular pedestrian traffic through the area. The Swamp Mahogany / Cabbage Tree Palm – Cheese Tree – Swamp oak tall open forest PCT community is likely to have been reconstructed and planted as part of bush regeneration works at the Rockdale Bicentennial Park. Although 95% of the Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions threatened ecological community has been cleared, the Department does not consider that the loss of 0.49 hectare to be a significant

impact. The majority of this community within the construction boundary consists of landscaped areas in the Rockdale Bicentennial Park.

In regards to the Magenta Lilly Pilly, the Proponent has agreed to provide an offset for the five individuals that will be impacted by the project and this offset is reinforced in the recommended conditions of approval.

Bayside Council raised concern that the removal of trees, particularly with hollows, results in the loss of fauna habitat, and that the provision of biodiversity offsets does not take into account the fragmentation of habitat and ongoing decline of biodiversity values in the local area. The Proponent states that issues about fragmentation, connectivity and patch size would be considered in the offset calculations.

The Proponent has committed to preparing a Construction Flora and Fauna Management Plan to outline processes and responsibilities to avoid, manage and mitigate impacts on biodiversity during construction and this has been reinforced in the Department's recommended conditions of approval. In its submission, Bayside Council specifically requested that the Proponent work with it on the design of mitigation measures. In response to this request, the Proponent has committed to working with Council on the rehabilitation and restoration of the Rockdale Bicentennial Park. Consequently, the Department has recommended that both the Urban Design and Landscape Plan and Construction Flora and Fauna Management Plan be prepared in consultation with the relevant councils. The Department considers the recommended conditions of approval and Proponent's commitments are appropriate measures to manage the impacts on flora.

Threatened Fauna

The Department notes that while Grey-headed Flying-fox foraging habitat will be impacted by the clearing of potential food trees in the Rockdale Bicentennial Park, the impact on the species is unlikely to be significant as the targeted surveys did not record their presence in the construction boundary. The species has a wide foraging range and the nearest camp is located approximately three kilometres away at Turrella.

The Green and Golden Bell Frog population at Arncliffe was identified in the *Green and Golden Bell Frog Litoria aurea Draft Recovery Plan* (DEC, 2005) as one of eight Key Populations in Sydney. The New M5 Motorway was approved in 2016 and included a construction ancillary facility on part of the Kogarah Golf Course (Arncliffe construction facility). The approval for the New M5 Motorway required the development of a Green and Golden Bell Frog Plan of Management, the establishment of a captive breeding program to provide an insurance population and the establishment of new frog ponds near Eve Street, West Botany Street and Marsh Street. Prior to the establishment of the Arncliffe construction ancillary facility for the New M5 project, frogs were captured in the RTA Ponds and Kogarah Golf Course and relocated to the New M5 Motorway Green and Golden Bell Frog breeding facility.

The Arncliffe construction ancillary facility would be retained for the construction of the project. The Green and Golden Bell Frog Plan of Management developed for the New M5 Motorway project will continue to apply to the proposed use of the Arncliffe construction ancillary facility. This includes the provision of frog exclusion fencing on the Arncliffe construction ancillary facility, installation of erosion and sediment control measures and measures to minimise light spill from the ancillary facility onto the RTA ponds and the Kogarah Golf Course.

The Department and former OEH support the use of the New M5 Motorway Arncliffe construction ancillary facility for the project instead of constructing a new facility as no additional environmental impacts are introduced. However, its prolonged use means that the reinstatement of Green and Golden Bell Frog habitat would be deferred by 3-4 years. This deferral will have a low impact on the Green and Golden Bell Frog given that:

- frogs were captured in 2016 and 2017 to establish a breeding population and are in the care of frog specialists; and
- the requirements in the New M5 Motorway infrastructure approval relating to the captive breeding program and release of Green and Golden Bell Frog tadpoles and frogs to the new habitat ponds at Marsh Street continue to apply to and be implemented during the construction and operation of the New M5 Motorway project.

Notwithstanding, to ensure continuity between the two projects, the Department has recommended a condition requiring the Proponent develop and implement a Green and Golden Bell Frog Plan of Management for the Arncliffe construction facility which sets out species monitoring requirements and measures to reinstate habitat affected by the construction facility post construction.

In regards to the Southern Myotis (*Myotis Macropus)*, the Department is satisfied the targeted surveys for the species were consistent with the relevant guideline available at the time they were carried out and therefore are consistent with the requirements of the BAM. The Department is of the opinion that the removal and replacement of the existing culvert is unlikely to have a significant adverse impact on the species as the replacement box culverts will provide potential habitat for the species. This potential will be enhanced through the placement of bat boxes or microbat habitat within the culverts as recommended by the Department.

Both the Department and former OEH acknowledge the Proponent's commitment to implement the measures detailed in *Biodiversity Guidelines - Protecting and Managing Biodiversity on RTA Projects.* These measures include pre-clearing surveys, daily surveys and timing of works to avoid critical life cycle events such as breeding and the Department is satisfied that such measures would reduce the potential for adverse impacts to fauna.

Biodiversity Offsets

Following the BAM and the use of the BAM Credit Calculator, offset requirements have been identified for the project. Ecosystem credits have been calculated for the threatened ecological communities impacted by the project. The credit requirements, including the southern extension of the shared cycle and pedestrian path, to offset the direct impacts of the project are set out in **Table 19**.

The impacts to the Magenta Lilly Pilly at Rockdale Bicentennial Park will require the provision of 10 species credits.

The Department has recommended the Proponent retire all biodiversity credits prior to the commencement of any development that would impact the plant community types or species and provide a copy of the Credit Retirement Report to the Planning Secretary.

Table 19 | Ecosystem credits required

PCT ID	PCT Name	Vegetation formation	Direct impact (ha)	Credits required
1232	Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregions	Coastal Swamp Forest	0.37	6
1795	Swamp Mahogany / Cabbage Tree Plain – Cheese Tree – Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney Basin	Coastal Swamp Forest	0.81	27
1808	Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline	Freshwater Wetlands	0.97	49
TOTAL			**2.15**	**82**

Aquatic Impacts

The project has no direct impact on threatened aquatic vegetation. The greatest construction impact is the diversion of the waterway through the Rockdale Bicentennial Park to enable the construction of the cut and cover section of the ramps to and from the mainline tunnels. The existing pond will be bunded, dewatered and water flows diverted around the cut. Aquatic fauna dependent on the pond would be segregated into two populations for the duration of construction, however, the pond would be restored on completion of the cut and cover tunnel.

Concern was raised in community submissions that the assessment did not consider the Eastern Long-necked Turtle and eels. The Proponent stated the Eastern Long-necked Turtle was observed on the banks of the Rockdale Wetland, however the Murray River Short-neck Turtle was not observed and has not been previously recorded in the construction boundary. As these turtles are not listed as threatened species there is no requirement to survey for these species under the BAM. Impacts on aquatic fauna will be managed through the implementation of a Construction Flora and Fauna Management Plan, which will include specific management procedures to identify and remove fauna prior to vegetation or habitat clearance. This will include a process for dewatering and restoration of the Rockdale Wetland, including measures developed by an aquatic ecologist to handle and relocate aquatic fauna. To ensure the health of the wetland species is maintained, the Department has recommended monitoring of the health of aquatic and riparian flora and fauna species in Rockdale Bicentennial Park, including species density and diversity, and water quality monitoring during construction and operation. It has also recommended the development of trigger levels for responding to any monitored adverse changes in aquatic and riparian flora and fauna and water quality.

The water quality of the Rockdale Wetlands is variable and likely to be influenced by algal growth and waterbird activity. Notwithstanding, the Proponent has committed to implementing erosion and sediment control measures to minimise sediment laden runoff from construction areas entering waterways and adversely impacting aquatic flora and fauna.

Groundwater Dependent Ecosystems

The biodiversity assessment noted there were no groundwater dependent ecosystems in the study area that are highly reliant on groundwater. However, there are potential groundwater dependent

ecosystems in the wetlands in the Rockdale Bicentennial Park and Scarborough Park North which may have a moderate reliance on groundwater. These ecosystems are highly modified and consist of remnant and planted vegetation on the banks of the wetlands. The waterway is fed from surface flows and stormwater runoff and will be impacted by the construction of the cut and cover tunnel. The assessment predicted a potential groundwater drawdown of up to 0.32 metres at Rockdale Bicentennial Park and up to 0.12 metres at Scarborough Park North as a result of the project. The potential drawdown would be mediated from the inflow of stormwater and other overland flows and hence impacts to groundwater dependent ecosystems are not likely to be significant. The Department's recommended conditions for monitoring of wetland health and development of trigger levels will enable the Proponent to implement management measures should any adverse changes be observed.

Conclusion

The assessment of biodiversity impacts has generally been carried out in accordance with the BAM. The Department acknowledges the Proponent has minimised impacts through the design of the project, however, threatened ecological communities listed under the BC Act will be directly impacted. The impacts to these communities would be offset in accordance with the BAM.

The Department acknowledges that the project will temporarily reduce the Grey-headed Flying Fox foraging habitat in Rockdale Bicentennial Park. However, with landscaping of disturbed areas following completion of construction, there should be minimal long-term impact. Similarly, the replacement of the existing culvert crossing of President Avenue with three box culverts will temporarily reduce roosting habitat for the Southern Myotis, however, the installation of bat boxes in the replacement culverts will increase potential roosting habitat for microbats.

The continued use of the Arncliffe construction ancillary facility will defer its rehabilitation and restoration of Green and Golden Bell Frog foraging habitat. The delay in its restoration is unlikely to have an impact as the existing frogs were captured to establish a breeding population as a mitigation measure under the New M5 Motorway approval. Construction impacts of the project will be addressed by the preparation and implementation of a Green and Golden Bell Frog Plan of Management.

The Department considers the implementation of a Construction Flora and Fauna Management Plan will minimise impacts to flora and fauna, including native turtle species that utilise the Rockdale Wetlands. The monitoring of the health of potential groundwater dependent ecosystems in the Rockdale Bicentennial Park would ensure that adverse impacts are identified early and management measures are implemented.

6.7 Place and Urban Design

Issue

The Proponent undertook an assessment of the landscape character and visual impacts of the project based on a sensitivity analysis that compared the magnitude of change during both construction and operation to the sensitivity and number of receivers. The key areas impacted by the project, without mitigation, include areas within the vicinity of the Rockdale/Kogarah surface works, and are a result of the removal of trees and parkland, changing land use and built form outcomes.

Concept plans were presented in the EIS and PIR of the construction ancillary facilities and operational infrastructure along the project's alignment. The Proponent is committed to preparing an Urban Design and Landscape Plan (UDLP) that will detail built and landscape features of the project during operation.

Urban design objectives and principles will define the urban design aspirations and guide the detailed design of the project and include:

- application of various design criteria to ensure leading-edge environmental responsiveness;
- placemaking and promotion of connectivity and accessibility;
- creation of opportunities to improve urban amenity and liveability;
- provision of identity and a safe, enjoyable experience; and
- the establishment of a new quality benchmark for integrated infrastructure design and sustainability.

Rockdale Bicentennial Park and Scarborough Park North

This zone is considered to be of moderate sensitivity as it is locally valued for its high visual quality. The current landscape is generally low lying and flat and is associated with the Rockdale Wetlands. There are patches of dense vegetation and high retention value trees in the zone, enclosing views to the wetlands. There is open spaces and existing community infrastructure in the form of a children's play area, a skateboard ramp, sporting facilities, toilet facilities, car parking and active transport pathways. Kings Wetland in the northern part of this zone is a locally listed heritage landscape and Patmore Swamp in Scarborough Park North is a locally listed heritage landscape. To the west of the zone are industrial and commercial uses. To the east of the zone is coastal low density residential and the Brighton-Le-Sands Public School.

The proposed magnitude of change and impact on landscape character in the zone will be moderate to high during construction as a large part of Rockdale Bicentennial Park would be used as a construction site with activities including excavation, diversion of the existing waterway and construction of cut-and-cover structures (**Figure 29**). The most visible structural elements, due to their height, include cranes and storage silos for a bentonite plant.

During operation, this zone will be transformed to include the southern portal to the motorway tunnels, motorway operational infrastructure and the reinstated Rockdale Bicentennial Park with a mix of open space, trees and vegetation, community facilities and an active transport corridor. Some of the proposed urban design and landscaping elements are indicatively shown in **Figure 30**. The Proponent's visual impact assessment indicates that a number of high-moderate and moderate impact ratings are expected to surrounding properties and public areas as a result of the proposed operational infrastructure and changes to the open space areas in Rockdale Bicentennial Park and Scarborough Park.

The shared pedestrian and bicycle bridge over President Avenue will be approximately 5.5 metres above the roadway and will be highly visible from east and west along President Avenue. A photomontage of the proposed bridge as viewed from the President Avenue Intersection is shown in **Figure 31**.

West Botany Street Industrial and Commercial Area

The existing environment is generally flat and contains a mix of commercial, retail and light industrial developments with varied built form including contemporary commercial and retail development along West Botany Street and older sawtooth roofed industrial buildings. The Proponent maintains a maintenance depot to the south of Bay Street and the east of West Botany Street. This zone is a busy, local commercial precinct that attracts a variety of residents, workers and visitors.

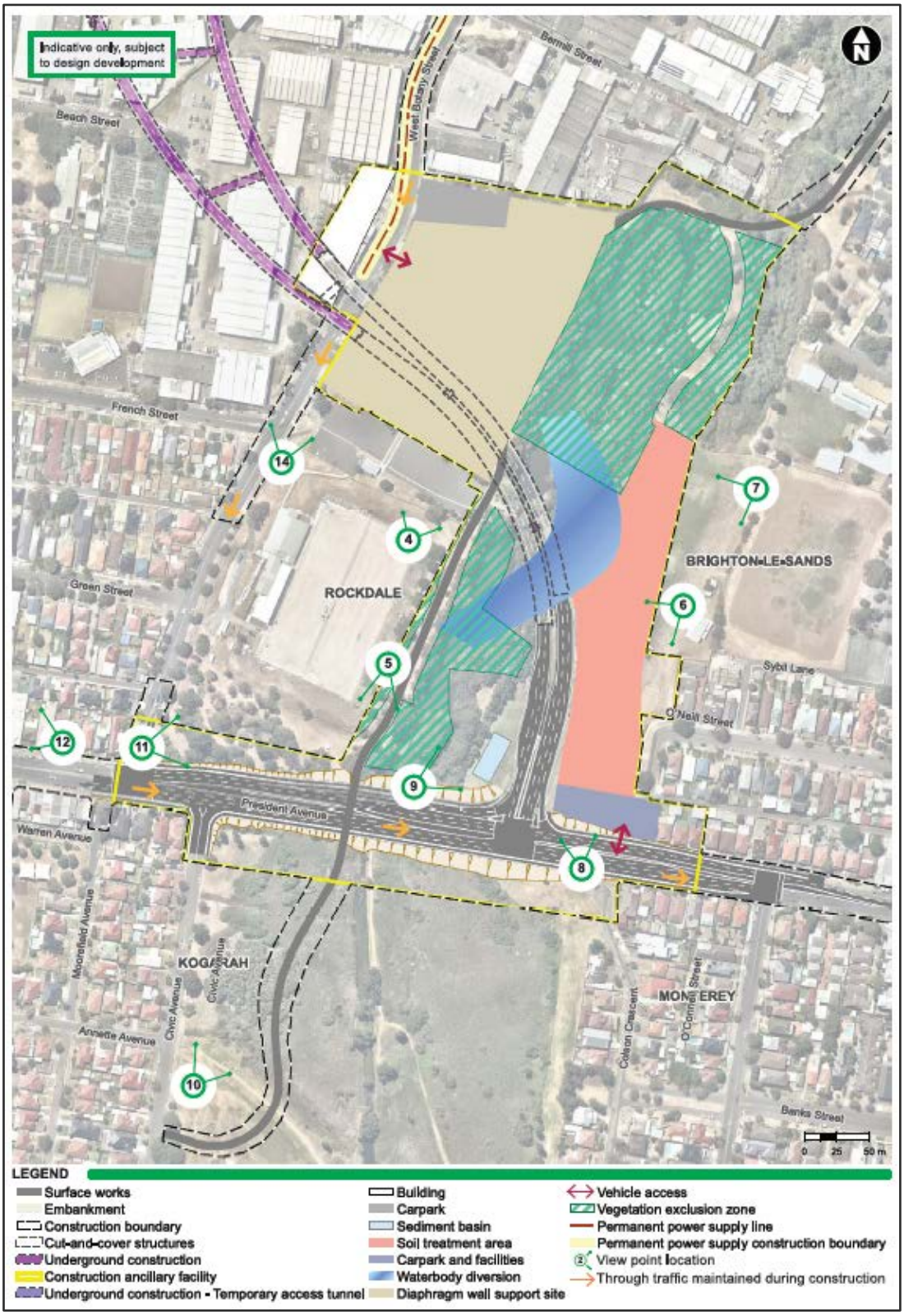


Figure 29 | Construction layout and viewpoints, southern surface works (Source: EIS)

Figure 30 | Preliminary concept plan for reinstated Rockdale Bicentennial Park (Source: PIR)

Figure 31 | View west along President Avenue – Artist's impression of shared pedestrian and bicycle bridge (Source: EIS)

Existing industrial and commercial properties would be acquired along West Botany Street opposite Rockdale Bicentennial Park for the Rockdale ventilation facility, a motorway operation complex and substation (MOC 3). MOC3 and the ventilation outlet would be visible from streets and buildings surrounding this site, north and south along West Botany Street and east across the Rockdale Bicentennial Park and beyond to the Rockdale Memorial Fields. **Figure 32** and **Figure 33** show the existing view and view during operation from West Botany Street looking northwards.

The Proponent proposes to use a portion of its maintenance depot to the east of West Botany Street/south of Bay Street as a construction ancillary facility (C2). In addition, a portion of the existing maintenance depot would be repurposed to construct a motorway operations centre (MOC 2). MOC2 would be largely enclosed by the surrounding built form and vegetation thereby limiting views from the adjacent industrial, commercial and residential properties, West Botany Street and Bay Street.

Active Transport Facilities

The project includes the delivery of a new active transport corridor from Bestic Street, Brighton-Le-Sands in the north to Chuter Avenue/O'Connell Street, south of Robinson Street, in Monterey where it will connect with the existing on-road cycle network (**Figure 34**).

The proposed corridor will comprise a dedicated shared pathway through the reinstated Rockdale Bicentennial Park as well as an on-road cycleway running on portions of Bruce Street, Francis Avenue, Bay Street and England Street in Brighton-Le-Sands. The proposed corridor also includes a new dedicated shared cycle and pedestrian bridge over President Avenue connecting Rockdale Bicentennial Park with Scarborough Park North and a connection to Civic Avenue.

Figure 32 | Existing view north along West Botany Street (viewpoint 14) (Source: EIS)

Figure 33 | View north along West Botany Street – Artist's impression during operation (Source: EIS)

The southern extension of the pathway in Scarborough Park would mainly consist of a three-metre wide boardwalk (or other low impact design) to minimise potential flooding impacts and would generally follow existing informal walking/access tracks within the park. A steel bridge structure is proposed where the pathway crosses the watercourse in the park. Further, an upgraded pedestrian refuge would be provided at the connection point with the existing on-road cycle network at Chuter Avenue/O'Connell Street.

Figure 34 | Alignment of the proposed shared cycle and pedestrian pathway (Source: PIR)

Pedestrian Movement along President Avenue

Presently, pedestrians and cyclists use the existing footpath along the northern side of President Avenue or the active transport pathways within Rockdale Bicentennial Park to access Brighton-Le-Sands Public School, the community facilities including Memorial Fields, Ilinden Sports Centre and Rockdale Skate Park. During construction, the project will impact on pedestrian connectivity due to

restrictions to pedestrian (and cyclist) access around surface construction works, particularly around President Avenue and through the Rockdale Bicentennial Park and adjacent open space areas.

When the project becomes operational, east-west pedestrian movement along the northern side of President Avenue between these streets would be diverted. Pedestrians would be required to access a new shared footpath on the southern side of President Avenue adjacent to Scarborough Park North by way of the new overland bridge (see **Figure 31**) or the remaining at grade pedestrian crossings at Princes Highway, West Botany Street and O'Connell Street. Alternatively, pedestrians would be required to head into and through the reinstated Rockdale Bicentennial Park and Memorial Fields via a new bridge over the tunnel portal.

Tree Management

Under the EIS, approximately 449 trees were identified within the construction boundary which may need to be removed for the project with the overwhelming majority of these trees located within the southern surface works area (**Figure 35**). These trees form a dominant component of the landscape within Bicentennial Park and surrounds and the streetscape and their removal during construction will affect visual amenity.

Submissions

Community and Special Interest Group Submissions

Issues raised in public submissions included:

- inappropriate, insufficient or poor assessment methodology and lack of details on the final urban design and landscaping;
- potential impacts on the visual amenity, landscape character, urban design and place making, connectivity and functionality of the local area including Bicentennial Park and Patmore Swamp;
- visual impacts during construction works around President Avenue,
- visual and landscape character impacts arising from a raised and widened President Avenue;
- visual impact of the Rockdale ventilation facility along West Botany Street;
- visual and landscape character impact of the proposed shared cycle and pedestrian pathway bridge over President Avenue and through Patmore Swamp;
- excessive tree removal resulting in reduced visual amenity;
- inadequate landscape treatments and urban design around President Avenue, the southern tunnel portal and the entry and exit ramps into and out of the tunnels;
- location of the active transport route through Patmore Swamp;
- extension of the active transport route further south to Barton Street and retention of the refuge and crossing point on Chuter Avenue/O'Connell Street at Robinson Street should be considered;
- the need to relocate the on-street portion of the active transport route to an off-street network; and
- potential light pollution during construction and operation.

Figure 35 | Potential tree removal – southern surface works (Source: EIS)

Government Agency and Council Submissions

The **Heritage Council of NSW** raised concerns regarding the construction and operational impacts of the project on Kings Wetland (in the northern section of Rockdale Bicentennial Park) and Patmore Swamp (in Scarborough Park). It recommended that a rehabilitation plan be prepared for the wetlands as well as a heritage interpretation strategy and a construction heritage management plan.

Bayside Council raised the following issues:

- a detailed scope, design and program for the reinstatement of Rockdale Bicentennial Park must be agreed with Council;
- design of the ventilation facilities on West Botany Street should be well integrated with the surrounding built form and streetscape;
- Council should be allowed design input on the design of President Avenue;
- scope and methodology of the landscape character and visual impact assessment should be expanded to include a visual impact analysis from other locations including Valda Street Reserve, Brighton Memorial Reserve Fields (and play space) and Brighton-Le-Sands Public School;
- excessive tree removal, inadequate tree replacement and adverse impacts on tree canopy cover in the local area;
- need for protection of retained trees during construction, particularly those within Rockdale Bicentennial Park, and for an independent arborist to prepare a tree management strategy for the project;
- supplementary tree planting and screening should be provided along President Avenue;
- future maintenance of landscape works to be considered in the design process to ensure ongoing maintenance is minimised; and
- provision of public art opportunities.

In addition, Council was of the view that there was insufficient prioritisation of cyclist, pedestrians and public transport which would reduce ongoing demand on roads, and that the design and route selection of the shared pedestrian and cycle pathway requires further development. Council requested that alternate public transport options be further explored and additional active transport route improvements be proposed, including secondary feeder paths connected to the main corridor, a separated cycleway that does not re-enter the road network between Bruce Street and England Street in Brighton-Le-Sands and the extension of the pathway further down to Sans Souci to the south and to the east. Council also raised concern regarding the potential impact of the extended shared pedestrian pathway through Patmore Swamp / Scarborough Park on biodiversity values, and recommended consideration extending the pathway further south.

Inner West Council requested that the process of preparing detailed project design include input from various stakeholders including councils. Further, Council advised that alternative approaches should be considered to allow variations to RMS design standards to minimise the visual impacts of roads / motorways and their associated infrastructure.

City of Sydney Council raised that more integrated land use and transport outcomes should be explored.

Department's Consideration

Construction Impacts

Visual impacts during construction would result from the introduction of construction ancillary facilities and works zones into the existing landscape, demolition of structures (including houses), removal of vegetation and excavation within open space areas. Moderate-high visual impacts will occur where residents have direct views of the construction works and facilities, in particular, around O'Neill Street at Brighton-Le-Sands and along President Avenue. The Proponent proposes to implement standard construction industry practices which include the installation of hoardings and perimeter fencing and treatments to minimise visual impacts. Lighting controls are also proposed to minimise light spill onto adjoining properties. The Department considers that these measures are appropriate for construction sites of this scale.

Place Making and Urban Design Strategy

The project's Place Making and Urban Design Strategy in the EIS provides an urban design framework for all elements of the project's design. This strategy adopted the Proponent's '*WestConnex Urban Design Framework'* as a starting point to deliver the urban design outcomes for the project before taking into account the objectives in *Better Placed* (Government Architect NSW, 2017), the drivers in the Proponent's *Beyond the Pavement – Urban design policy, procedures and design principles'* policy and the principles in Government Architect NSW's draft '*Greener Places'* policy (Greener Places). The Department considers the project's Place Making and Urban Design Strategy provides sound urban design objectives and principles for the project and achieves a good balance between broad contextual considerations and specific project and interchange design considerations.

Urban Design and Landscape Plan

The Department recognises there are a number of locations along the surface footprint of the project alignment that would experience landscape character and visual amenity impacts as a result of the project during operation. The more significantly impacted areas include those adjacent to President Avenue, and Rockdale Bicentennial Park and Memorial Fields. The Department has taken into account the issues raised in submissions from the public and Bayside Council in relation to visual impact, urban design and landscape of the operational infrastructure of the project. In particular, the Department acknowledges the issues raised in relation to lack of detail of proposed urban design and landscaping elements, the need for Crime Prevention Through Environmental Design (CPTED) audits of the design, consideration of water sensitive urban design principles, the need to improve the incorporation of heritage and surrounding built environment, and to provide more detail on built form textures and finishes.

The Proponent has committed to the development of an UDLP in consultation with Bayside Council and the community, to guide the urban design outcomes for the project. The Department supports this collaborative approach to preparing detailed built and landscape design.

Overall, whilst the Department acknowledges the level of detail for open space and built form element finishes in the EIS and PIR is relatively low, it considers the recommended UDLP would play a critical role in guiding the detailed design of the permanent built form and landscaping of project elements. In particular, the UDLP process would ensure high quality building and facility finishes of operational infrastructure are contiguous with their surroundings and sympathetic to the landscape character and its history.

Importantly, the UDLP process recommended by the Department provides further opportunity for the community to be involved during detailed design of permanent built and landscape components of the project through consultation during the UDLP development.

Active Transport Corridor

The Department considers green and open space to be critical assets to a growing city, particularly in areas where density is currently high or is increasing. In addition, the Department strongly encourages the connection of green and open spaces to improve their accessibility and use and to promote active forms of transport between areas.

The Department considers the provision of an enhanced active transport corridor through the existing F6 reserved corridor as a critical component of the project that benefit to the local community. Further, the provision of the shared cycle and pedestrian bridge across President Avenue is a strong design element that recognises the need to connect the reinstated Rockdale Bicentennial Park with Scarborough Park North. The Department considers this important connection will provide improved connectivity not only to recreational users but to residents and visitors who seek to connect via walking or bicycling from Kogarah and Monterey in the south with Rockdale and Brighton-Le-Sands in the north, whilst avoiding the six lanes of traffic on President Avenue.

The Department agrees with comments from Bayside Council and the community regarding the need for the new active transport corridor to be effectively integrated with the surrounding active transport network to ensure legibility for user groups and aid in wayfinding and general design continuity. As such, the Department has recommended the Proponent prepare a Pedestrian and Cycle Implementation Plan in consultation with the relevant council(s) and Bicycle NSW to ensure that the proposed infrastructure integrates efficiently with existing active transport infrastructure and council's future active transport plans.

Notwithstanding the overall strong support from the community and Bayside Council for additional active transport infrastructure in the project area, both the Council and community members raised concern over the on-road cycleway of the active transport corridor running on portions of Bruce Street, Francis Avenue, Bay Street and England Street in Brighton-Le-Sands (**Figure 36**), and the potential ecological and heritage impact of constructing any active transport infrastructure through Scarborough Park North, which includes the heritage-listed Patmore Swamp.

The Department supports a shared cycle and pedestrian pathway that has minimal interaction with the existing road network and separates pedestrians/cyclists and road vehicles, increasing safety outcomes.

The Department recognises that the relocation of the on-road portion of the active transport corridor to the existing F6 road reserve does not require the compulsory acquisition of property from third party owners. In fact, the cycle path's interaction with the existing road network could be minimised with the repurposing of RMS-owned properties along the road reserve corridor. The Proponent owns properties along Bruce Street and Bay Street as well as the maintenance depot off Bay Street. The Department believes the proposed active transport corridor should be realigned so that it passes through the properties owned by the Proponent which will limit interaction between cyclists and the existing road network to crossings on Bruce Street and Bay Street. Accordingly, the Department has recommended conditions requiring the on-road cycleway running on portions of Bruce Street, Francis Avenue, Bay Street and England Street in Brighton-Le-Sands be realigned to follow the existing F6 reserved corridor.

Figure 36 | Proposed on-road section of the shared cycle and pedestrian pathway (Source: EIS)

In regards to concerns raised by the community on the potential impact of the shared pedestrian and cycle path through Patmore Swamp on biodiversity and heritage values, the Department has recommended that the Proponent investigate the feasibility of an alternative alignment of the shared path over President Avenue and through Patmore Swamp. In particular, the assessment should investigate realigning the shared path to the eastern boundary of Patmore Swamp and relocating the southern landing of the shared path over President Avenue away from the swamp.

Pedestrian Movements along President Avenue

To provide efficient levels of service for traffic at the President Avenue Intersection, the Proponent advised that the project would not install a signalised pedestrian crossing point on the northern side of President Avenue. The Department is of the opinion that there are significant benefits in maintaining and east-west pedestrian connection along this portion of President Avenue. A pedestrian crossing at the President Avenue Intersection could be signalised to coordinate with the greenlight of eastward traffic along President Avenue. Accordingly, the Department has recommended a condition requiring the Proponent assess the feasibility of constructing an at-grade footpath along the northern side of President Avenue between West Botany Street to the west and O'Neill Street to the east to provide a continuous east-west connection along the northern side of President Avenue. If the review indicates that it is feasible to install the footpath, then the footpath must be constructed as part of the project and be completed prior to operation.

Lighting

The Department acknowledges the issues raised in submissions received from the public in relation to potential impacts derived from light pollution/spillage on surrounding properties during construction and operation. To ensure impacts from lighting are minimised, the Department has recommended the Proponent construct and operate the project in accordance with the Australian Standard 4282-1997

Control of the obtrusive effects of outdoor lighting and *AS/NZ 1158 – Lighting for Roads and Public Spaces.*

Further, given construction vehicle movements to and from the Rockdale construction ancillary facility may potentially occur 24 hours, 7 days a week, the Department also recommends a condition requiring the Proponent implement measures, in consultation with affected residents, to prevent headlights from vehicles exiting the Rockdale construction ancillary facility (C2) spilling onto residences in the vicinity of the access way to that facility on West Botany Street.

Tree Management

Council and community members have raised concern regarding the excessive removal of trees, the adverse impact on canopy cover due to the project, the lack of details of how retained trees will be protected during the construction period, and the lack of independence of any arborist appointed to undertake tree management associated with the project. The Proponent has committed to retaining and protecting existing trees within construction areas where reasonable and feasible and to replace removed trees removed in accordance with a tree management strategy for the project.

Given the significant number of trees proposed to be removed (around 449), especially the number of mature trees located in existing public spaces, and the lack of certainty and clarity regarding the Proponent's tree management strategy, the Department has recommended the following conditions:

- commissioning of an independent experienced and suitably qualified arborist independent of the design and construction of the project to prepare a comprehensive Tree Report prior to the removal of any street trees, with the report to be submitted and approved by the Planning Secretary prior to the removal of any trees;
- replacement plantings should target an increase in tree canopy and aim to enhance council's position in respect of the Sydney Green Grid; and
- replacement trees must be planted within and on public land and prioritised to within 500 metres of the construction boundary with the location of the replacement plantings determined in consultation with the relevant council.

Conclusion

The Department acknowledges that there are a number of locations along the surface footprint of the tunnel alignment that would experience changes in their landscape character and visual amenity. Accordingly, the Department has recommended the Proponent prepare and implement a UDLP in consultation with key stakeholders including councils which would include measures for minimising visual impacts and enhancing visual amenity.

The Department considers the key urban design benefits that would be achieved should the project be approved is the provision of a new active transport corridor between Bestic Street to the north and Chuter Avenue to the south and enhanced community infrastructure in the reinstated Rockdale Bicentennial Park, Memorial Fields and other public spaces (see **Section 6.8**).

With the conditions recommended above and the Proponent's committed environmental management measures, the Department is satisfied that the proposed project would have acceptable landscape character and visual impacts and achieve a high degree of design quality, function and value for the local community.

6.8 Socio-economic, Property and Land Use

Issue

The linear nature of the project would result in property and land use impacts to individuals, local communities, social infrastructure, open spaces and businesses consequent to acquisition and tunnelling. **Figure 37** and **Figure 38** show the land areas to be leased and acquired for the project. Impacts are greatest in the vicinity of surface construction works, operational infrastructure at Arncliffe, Rockdale and Kogarah and potentially in areas where tunnelling is close to the surface.

Of significant concern to the local community is the impact on Rockdale Bicentennial Park and its sporting fields which are used by local clubs and the Brighton Le Sands Public School, the skateboard ramp and children's play equipment area which includes a 'Liberty Swing' that offers persons in wheelchairs the opportunity to participate. As shown in **Figure 38**, a large portion of Bicentennial Park will be utilised for the construction and operation of the project. The local community is equally concerned about the impact of the shared path through Scarborough Park / Patmore Swamp and its impact on biodiversity values and use by bird watchers, as addressed in **Section 6.7**.

The project also has the potential to impact on local access, parking, and the acoustic and visual amenity of the community and these issues have been addressed in **Sections 6.1**, **6.3** and **6.7**.

Notwithstanding these impacts, the Proponent advises that the project would provide significant economic benefits during both construction and operation. Overall, the Proponent estimates that the project would create around 2,862 jobs during construction period and contribute approximately $775 million annually to the New South Wales economy across the four-year construction period.

Submissions

Community and Special Interest Group Submissions

Issues raised in public submissions included:

- property acquisition;
- management of residual land;
- impacts to property values particularly in proximity to construction and operational facilities;
- loss of public open space and community infrastructure during construction and operation;
- provision of appropriate replacement community facilities (e.g. sporting fields, skate parks and community gardens) during construction;
- property access during construction and operation; and
- settlement impacts, property damage and processes for property repairs.

Government Agency and Council Submissions

Sydney Water advised that ongoing access to Sydney Water assets needed to be maintained during both construction and operation of the project and stated that the Proponent should maintain ongoing consultation and discussion on works that may impact on Sydney Water assets.

Figure 37 | Proposed properties to be acquired and leased at Arncliffe (Source: EIS)

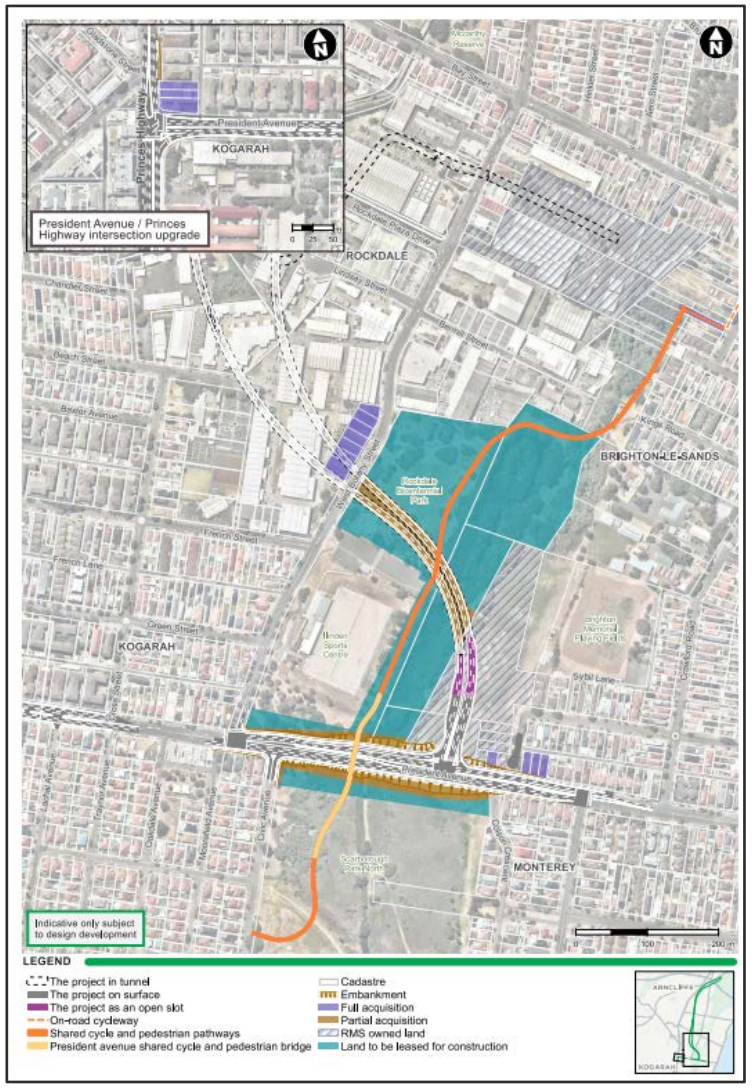


Figure 38 | Proposed acquisitions and leases at Rockdale, Kogarah and Brighton-Le-Sands (Source: EIS)

Bayside Council acknowledged the preliminary planning and consultation undertaken by the Proponent with Council and the community, including:

- establishment of the RMS Stakeholder Liaison Group and the RMS and Council Staff Technical Working Groups; and
- commencement of the RMS-funded Recreation Needs Analysis study for Bicentennial Park and Scarborough Park North Precinct in collaboration with Council, which will inform the temporary and permanent relocation of recreational assets and Council's negotiations with RMS for mitigation and compensatory actions.

However, Council raised concern over the impacts on Rockdale Bicentennial Park, the skate park and Brighton Memorial playing fields, Kogarah and Bardwell Park Golf Courses and other community open spaces, noting the need the relocation/replacement of community facilities to be completed prior to commencement of construction and for there to be certainty on the relocations. Council also questioned the future use of the open space in the F6 reserved corridor and potential future use of the Princes Highway construction facility land upon the completion of construction.

Further, Bayside Council has sought input in the preparation and review of documentation including the Community Consultation Strategy, Construction Fatigue Protocol, Site Establishment Management Plan and other management plans.

Department's Consideration

The Department acknowledges that social, property and land use impacts are inevitable for a project of this scale in an established urban environment. In particular, it acknowledges that construction and operation of the project would have traffic and access (including pedestrian and cyclists' access), acoustic, air quality and visual impacts and has discussed these matters in detail within this report. Land acquisition and changes to community infrastructure and changes to access all have an impact on communities, businesses, residences and services. Impacts would be greatest in the vicinity of construction and operational surface works and facilities.

The Department recognises that the location of motorway infrastructure along the length of the project corridor would result in an inequitable distribution of social impacts with the greatest level of impact occurring in the vicinity of the President Avenue / West Botany Street where there will be significant construction works and, once the project is operational, will include the tunnel entry and exit ramps and Rockdale Motorway Operations Complex (south) will be constructed, including a ventilation outlet. Significant construction will also take place at the Rockdale and Arncliffe construction ancillary facilities (C2 and C1, respectively). The Department considers the scale and scope of social impacts warrants the investigation of opportunities for the reuse of residual land and improvements in connectivity and open space.

The Department notes that the Proponent has committed to prepare a Residual land Management Plan to manage the return of land not required for the operation of the project or any future road projects. There is the potential for residual land to be created as a result of the realignment of the active transport corridor through the F6 corridor between England and Bruce Streets, Brighton Le Sands and the Department has recommended that any residual land created as a result of the realignment of the active transport corridor be incorporated as open space.

The Department accepts that there would be economic benefits experienced as a result of construction activities. Once the project is in operation, it is also anticipated that road efficiency gains

would improve freight and commuter transit times delivering additional operational economic benefits to the Sydney metropolitan region and the State.

Notwithstanding these benefits, the project may detrimentally impact on some local retail and business. During construction, there will be temporary alterations to business access and a reduction in on-street car parking adjacent to or in areas serving commercial and/or industrial land uses due to construction surface works and compounds. During operation, there may be a reduction in passing trade and on-street car parking along President Avenue due to imposed clearways.

The Department is supportive of the Proponent's proposal to prepare a Business Management Plan which details the process for identification and communication with businesses adversely affected by construction of the project. The Department seeks to reinforce this commitment and has recommended a condition requiring all reasonably practicable measures be implemented to maintain pedestrian and vehicular access to, and parking in the vicinity of, businesses.

Property Acquisition

The acquisition of land is necessary to provide significant infrastructure deemed critical to the State, particularly for linear transport infrastructure within highly urbanised contexts. The Department recognises that the Proponent has sought to minimise the amount of temporary and permanent property acquisition and limit land use changes by designing the project with the following considerations:

- locating a large proportion of the project's infrastructure underground;
- locating the tunnel portal to the southern end of the motorway within the existing F6 reserved corridor where the land is zoned 'SP2 – Infrastructure (Classified Road)';
- constructing entry and exit ramps as cut-and-cover structures in the existing F6 reserved corridor and through Rockdale Bicentennial Park, allowing the partial reinstatement of the park following construction;
- repurposing existing RMS depot land within an industrial area as the location for the Rockdale construction ancillary site (C2) and future motorways operations centre (MOC 2);
- adapting the Arncliffe construction ancillary facility (C1) currently being used as a construction site for the New M5 Motorway project at Arncliffe; and
- sharing the future motorway operations centre (MOC 1) currently being constructed as part of the New M5 Motorway project at Arncliffe.

Compared to other recent State significant infrastructure projects, particularly those in highly urbanised environments, the Department considers the number of properties to be acquired to be relatively low. Notwithstanding the revised environmental mitigation measures set out in the PIR, the Proponent has committed to establishing, prior to the commencement of works, and maintaining an acquisition assistance line for a period of up to six months following the completion of the final acquisition for the project. This assistance line is to provide ongoing dispute resolution, a counselling program and contact information for relevant services for relocated persons. The Department considers these measures to be a proactive response which aligns with the intent of conditions imposed on recent metropolitan road projects. The measures also respond to the concerns relating to the wellbeing of those being acquired, as raised by the community.

Public Spaces and Community Facilities

The Department recognises the importance of the existing public open spaces and community facilities in the project area. Rockdale Bicentennial Park is a green space that has a particularly active focus and contains sporting fields, a skateboard ramp and a children's play equipment area which includes a 'Liberty Swing' that offers persons in wheelchairs the opportunity to participate. Scarborough Park and the Kogarah Golf Course offer open space for, among other things, active recreational uses such as cricket and golf.

The Department has carefully considered the open space acquisition requirements proposed for the project including the temporary (6 hectares) and permanent (0.7 hectares) acquisition of parts of Kogarah Golf Course, the temporary (0.5 hectares) and permanent (0.5 hectares) acquisition of parts of Scarborough Park, as well as the temporary (7.5 hectares) and permanent (1.1 hectares) acquisition of the majority of Rockdale Bicentennial Park. The Department acknowledges that the project generally follows the existing alignment of the F6 reserved corridor and the majority of the open space to be acquired falls within this corridor. However, the Department considers that community facilities and public open spaces acquired for the purposes of the project should be replaced and that Bayside Council and the community are appropriately consulted.

The Proponent has commenced a Recreational Needs Analysis in consultation with Bayside Council. The study serves to identify the current assets (both open space and facilities) and uses, the temporary and long-term impacts of the project, future needs, temporary and permanent mitigation solutions to the project's impacts and alternate locations for replacement recreation facilities. The Department is supportive of the approach taken by the Proponent and encourages the continued collaboration between the Proponent, Bayside Council and community stakeholders.

The Proponent has committed to investigate during detailed design the provision of alternative sporting and recreational facilities to take account for the temporary loss of these facilities during construction. The Proponent has identified Ador Avenue Reserve and Rockdale Memorial Fields as locations where existing facilities could be upgraded and where new alternative facilities could be installed to allow for greater useability of these public open spaces. Further, the Proponent is committed to preparing a community and social management plan that details the process for the identification and implementation of permanent measures to offset community and social impacts associated with the operation of the project.

The Department supports these initiatives but remains concerned about the timing and implementation of a plan to replace recreation and community facilities impacted by the project. Consequently, the Department has recommended conditions that require the Proponent to ensure replacement facilities are completed, functional and open to the community prior to impacting the existing facilities; and to ensure impacted facilities that are proposed to be reinstated following completion of construction, are completed and open within 12 months of the project becoming operational. The reinstated and replacement facilities must meet the functionality of impacted facilities with consideration of, but not limited to capacity and accessibility from increased demand due to consolidation and intensification of uses (including footpaths and car parking). In October 2019, it was announced that construction of the project would be delayed by 12 months, if approved, to allow for the construction of new and upgraded community and sporting facilities before construction of the motorway commences.

Settlement and Property Damage

The Department recognises the concerns raised by the community in regard to potential settlement induced by the construction of the tunnel. Settlement can arise due to:

- tunnel excavation induced ground movement, which is the slight movement of the soil and rock around the tunnel as a result of the tunnel excavation removing material. This is a short-term effect which happens as soon as the tunnel is excavated and can cause heave and/or settlement; and
- soil consolidation (soil shrinkage) and rock compression due to groundwater drawdown due to inflow into the tunnels. This is a longer-term effect, which may take some time to occur.

The assessment by the Proponent estimates that surface settlement due to drawdown of groundwater is expected to be negligible along the tunnel alignment other than the paleochannels in the vicinity of the Spring Street in Arncliffe, Bay Street in Brighton Le Sands and President Avenue in Kogarah. The preliminary estimate of ground settlement (without mitigation) at these locations are 30 - 50 mm, 10 – 20 mm, and 2 – 5 mm, respectively.

The Proponent references the settlement criteria specified in the Minister's approvals for the NorthConnex, and WestConnex M4 East and New M5 motorway projects as being appropriate for managing potential impacts to structures and buildings associated with the construction and operation of the project. The proposed settlement criteria is summarised in **Table 20**. A comparison with the table indicates that settlement is predicted to exceed the proposed criteria in the paleochannel areas around Spring Street, Arncliffe.

Table 20 | Proposed settlement criteria (Source: EIS)

Surface and sub-surface structures	Maximum settlement (mm)	Maximum angular distortion (probability)	Limiting tensile strain (per cent)
Buildings – low or non-sensitive properties (i.e. less than or equal to two levels and car parks)	30	1 in 350	0.1
Buildings – high or sensitive properties (i.e. greater than or equal to 3 levels and car parks)	20	1 in 500	0.1
Roads and parking areas	40	1 in 250	N/A
Parks	50	1 in 250	N/A

The Proponent has proposed a number of measures to manage settlement in areas which have been identified as potentially being affected by settlement. Ground settlement would be monitored throughout construction and pre-construction condition surveys of property and infrastructure that could be impacted by settlement would be undertaken before the commencement of construction activities and post construction.

To ensure a proactive and conservative approach is adopted by the Proponent in managing settlement, the Department has recommended a suite of settlement-related conditions including the preparation of a geotechnical model which would be used to refine the settlement predictions, settlement criteria and settlement monitoring. The settlement-related conditions are inclusive of both groundwater and tunnelling induced settlement. This is similar to the approach adopted for the management of settlement risks for other large tunnelling projects (WestConnex and NorthConnex). In addition, the Department has recommended the establishment of an Independent Property Impact Assessment Panel with responsibility for resolving property damage disputes. The establishment of

the panel is consistent with the approach taken by the Department on the WestConnex M4-M5 Link project and adopted by the Proponent for other WestConnex projects.

Conclusion

Construction and operation of the project will require acquisition of residential and commercial properties, as well as open space. Impacts to amenity and community amenity are also expected adjacent to construction sites, operational surface infrastructure and adjacent to President Avenue which will intensify in use. In addition, there is the potential for property damage to arise due to settlement associated with tunnelling.

Although the land use and property impacts cannot be offset in their entirety, the Department considers that the recommended conditions of approval, which include offsetting of open space and recreational facilities required for construction and operation of the project, in conjunction with the Proponent's proposed management measures would assist in mitigating the impacts.

6.9 Other Issues

6.9.1 Flooding and Drainage

The project corridor traverses relatively flat urbanised land within the Cooks River, Spring Street Drain, Muddy Creek and Scarborough Ponds catchments, which all drain to Botany Bay. The stormwater drainage system in these catchments has limited capacity and currently experiences localised and mainstream flooding. Flood modelling indicates the project may increase flood levels and alter flooding behaviour, both temporarily and permanently in the vicinity of the surface works. Critical motorway operations infrastructure (motorway operations complexes and tunnel portals) would be located above the probable maximum flood level to prevent floodwaters entering the tunnel.

The shared cycle and pedestrian pathways would be located above the 1 EY (1-year ARI) flood event, however, in a 100-year ARI event, the depth of ponding would be approximately 0.5 metres. The flood assessment noted this depth of ponding would be classified as low provisional hydraulic hazard under the *Floodplain Development Manual.*

The Proponent has committed to prepare a Flood Management Strategy to manage the risk of flooding to the project and to mitigate the impact of the project on flood behaviour in the surrounding area during the construction and operation of the project.

Construction Impacts

The construction of the project potentially impacts flooding behaviour through the blocking effects of structures erected/installed for construction of the project. The greatest potential for adverse flooding impacts (afflux) to adjoining development is associated with the construction ancillary sites at Arncliffe, Rockdale and President Avenue, and the President Avenue intersection works.

At the Arncliffe construction ancillary facility, it was identified that the hoarding fence would cause adverse flood impacts on properties north of Marsh Street. In this area sixteen properties would be affected, of which eleven are subject to existing inundation in the 100-year ARI. It is noted that these are pre-existing flooding impacts associated with the establishment and operation of the Arncliffe construction facility for the New M5 Motorway project. The Proponent identified possible measures to address flooding impacts to these properties, including the provision of openings along the perimeter fence to allow overland flow that surcharges Marsh Street to enter the site and managing overland flow within the site through flood mitigation channels. The retention of the Arncliffe construction facility for the project prolongs the risk of potential flooding impacts to the Marsh Street area. However, the

Department is satisfied the proposed mitigation measures would manage the potential flood risks of the project.

The assessment indicated construction ancillary facilities and works at the President Avenue intersection and shared path may affect nearby residential and commercial/industrial properties, primarily from increased flood levels in the 100-year ARI event. Further investigations would be undertaken during detailed design and mitigation measures identified. The Department supports the Proponent's commitment to address potential construction flooding impacts in a Flood Management Strategy.

Operational Impacts and Drainage

The assessment predicted the Rockdale motorway complex (North) would increase flood depths at two residential properties on West Botany Street by 120 mm and the President Avenue intersection works would increase flood depths in the front yards of two residential properties to the east of the intersection by 20 mm. During detailed design floor level surveys would be undertaken to confirm the potential for above floor inundation and the level of mitigation required.

To ensure appropriate flood levels are achieved, the Department has recommended maximum flooding criteria to guide the design of the project, including inundation time and flood afflux (depth). Where these criteria are unable to be met, the Proponent must seek the approval of the Planning Secretary to implement alternative measures.

President Avenue between Colson Crescent and Civic Avenue has an existing flood immunity of about 50% annual exceedance probability (AEP) or 1.4-year ARI. The project would raise this section of President Avenue to provide a 100-year ARI immunity but would potentially cause diversions to overland flow to adjoining land without appropriate drainage. The widening and raising of President Avenue will require upgrades to existing drainage or the provision of new stormwater drainage systems. The assessment identified the need for scour protection and energy dissipation measures downstream of these stormwater systems and the implementation of these measures has been recommended by the Department. Other measures to improve peak water flows include regrading and lowering the ground level in the vicinity of the tunnel portals and south of President Avenue, to improve overland flow paths and/or provide floodwater storage.

6.9.2 Surface Water Quality

The study area is highly urbanised and lies within sub-catchments which form part of the larger Cooks River and Botany Bay catchments. Receiving waterways within the project area include Muddy Creek, Cooks River, Rockdale Bicentennial Park Ponds and Scarborough Park Ponds all of which are highly disturbed and of low to moderate sensitivity.

During construction, treated groundwater would be discharged from the Arncliffe construction ancillary facility (C1) to the Cooks River, with treated groundwater discharges from the Rockdale (C2) and President Avenue (C3) construction ancillary facilities entering Muddy Creek. During operation, collected groundwater would be pumped to the water treatment plant at Arncliffe where it would be treated prior to discharge to the Cooks River via the open drain through the Kogarah Golf Course. Surface runoff from the President Avenue intersection and ramps and portals, ancillary facilities at West Botany Street, and water quality basin in Bicentennial Park would discharge to Scarborough Ponds North.

A key concern raised in submissions from the public and Bayside Council was the discharge of treated groundwater into waterways and its impact on water quality and aquatic ecosystems. The EPA

questioned the proposed ambient water quality targets and raised concern that the potential risks of acute toxicity or bioaccumulation associated with construction wastewater discharges had not been adequately considered. Further, the EPA raised concern that discharge criteria were not proposed for all pollutants of concern potentially present in wastewater discharges.

The Proponent has identified discharge criteria for wastewater from the construction water treatment plants based on the existing water quality of the receiving waterway. The EPA has advised that construction of the project, including all treated wastewater discharges, will be regulated through an Environment Protection Licence (EPL). The Proponent has advised that it will seek an EPL for operational discharges. The Department has recommended that the project be designed, constructed and operated so as to maintain the *NSW Water Quality Objectives* where they are being achieved and contribute towards their achievement where they are not being met, unless an EPL contains different requirements.

The operation of the project would increase water discharges to the Cooks River and the Scarborough Ponds, from discharge of treated wastewater and overland stormwater flow from impervious surfaces. The Proponent considers the additional stormwater runoff generated by the project would have a negligible impact on the hydrological regime of Rockdale Bicentennial Park Pond and Northern Scarborough Pond through the implementation of a number of management measures including:

- installation of a biofiltration water quality basin to treat runoff from the tunnel portals at President Avenue;
- re-establishment of grass swale adjacent and south of President Avenue; and
- provision of new grass swales to convey runoff from batter slopes and diverted residential runoff to Rockdale Bicentennial Park Pond.

As part of the replacement of the existing President Avenue culverts, the weir upstream of the culverts and the existing trash rack on the stormwater outlet will be replaced. The Proponent has also committed to investigate measures to improve the pond water quality as part of the restoration of Rockdale Bicentennial Park Pond in consultation with Bayside Council and other stakeholders. The Department considers that the implementation of these management measures would be effective in reducing the impact of runoff from the project on the quality of receiving water bodies.

Although the Proponent states that the increase in the volume of stormwater runoff as a result of the project would be minimal in terms of the total catchment volume, the local impacts on the capacity of the receiving stormwater network could be more significant. Bayside Council has raised concern about the capacity of the existing stormwater system, noting that it has limited capacity and may not be able to effectively convey the additional stormwater generated by the increased impervious surfaces. The Department has similar concerns and has recommended a condition requiring the Proponent to undertake further hydrological and hydraulic modelling based on the detailed design to determine the ability of the receiving stormwater drainage systems to effectively convey pavement drainage.

6.9.3 Non-Aboriginal Heritage

The project directly impacts two locally listed heritage items local heritage significance – Kings Wetland and Patmore Swamp, located to the north and south of President Avenue respectively. One item of State Significance, the Bardwell Park Railway Station Group also has the potential to be directly impacted by the project.

Kings Wetlands

The proposed impact to Kings Wetland would include ground disturbances including the removal of trees to the east of Kings Wetlands where it borders Brighton -Le-Sands public school. The proposed tree removal allows for the construction of a haul road for construction purposes. Once the use of the haul road concludes, the area would be rehabilitated back to its original state.

Patmore Swamp

Patmore Swamp is expected to be directly impacted by the project. The project alignment means there would be a 30-metre strip of Patmore Swamp that would be acquired along President Avenue. The shared cycle and pedestrian bridge would be constructed over President Avenue and into Patmore Swamp and Scarborough Park. The shared cycle and pedestrian access to the south of President Avenue would be around 600 metres in length and up to 3 metres in width. The construction of the shared pathway would include the removal of the existing vegetation.

Bardwell Park Railway Group and Heritage Conservation Areas

The project's permanent power supply route is expected to pass through five heritage conservation areas and cross the curtilage of the Bardwell Park Railway Group heritage item. The proposed works would cause a temporary visual impact to the heritage conservation areas during construction which would be reversed once works are completed.

As the identified heritage values of these heritage conservation areas is vested in the houses and streetscape, no permanent heritage impacts are likely to occur from the installation of the underground powerline. With respect to Bardwell Park Railway Station Group, potential for direct impacts can be avoided with mitigation measures committed by the Proponent should works require egress through the listed curtilage.

Arncliffe Market Gardens, Wilson Farm House and Brighton-Le-Sands Public School, located near or above the proposed tunnel alignment, may be impacted by settlement due to tunnelling works. To ensure that settlement from construction is not excessive, the Department has recommended settlement criteria supported by detailed modelling and monitoring processes.

The Department recognises the potential direct and indirect impacts of the project to heritage items and heritage conservation areas within the project area and acknowledges the environmental mitigation measures committed by the Proponent to ensure that such impacts are minimised. Notwithstanding this, the Department has considered the Proponent's assessment and anticipates that the impact on Patmore Swamp is significant enough – given its heritage significance lies with its characters as a wetland reserve – to warrant an additional condition to preserve the significance of this local heritage item. As such, the Department has recommended a condition requiring the areas to be rehabilitated within Patmore Swamp, and planting and species, must be incorporated in the Urban Design and Landscaping Plan.

6.9.4 Aboriginal Heritage

The project falls within the country of the Eora people and the administrative boundaries of the Metropolitan Local Aboriginal Land Council (MLALC). The Aboriginal heritage assessment identified the local area as having cultural heritage value (social value) to the local Aboriginal community in general, however, no specific places of cultural heritage value were identified. A search of the Aboriginal Heritage Information Management System (AHIMS) concluded that no Aboriginal archaeological sites or Aboriginal places had been recorded or declared in the project area, with the closest registered site centre point to the project footprint being approximately 710 metres to the north.

The assessment by the MLALC representative stated that MLALC has no objection to the proposed development of the site but highlighted the likelihood of Aboriginal use of the general area in the past, particularly at Patmore Swamp and Kings Wetlands. MLALC recommended that if any unexpected Aboriginal objects are discovered that MLALC should be notified and present on site.

The Department agrees with the views of the MLALC and considers any unexpected heritage items found during excavation and construction works, must be managed in accordance with guidelines and standards prepared by the Environment, Energy and Science Group of the Department (formerly OEH) and has recommended a condition to that effect. Additionally, given the identification of the site's cultural heritage value, the Department has recommended a condition of approval in which the Proponent must prepare and implement an interpretive strategy to recognise the prior presence of Aboriginal people within and adjoining the project area, in particular Patmore Swamp and Kings Wetland.

6.9.5 Waste Management

Waste management for the project will follow the waste hierarchy approach of avoidance and re-use before consideration of waste disposal in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (NSW) and *Protection of the Environment Operations Act 1997* (NSW). The largest form of waste anticipated from the project would be spoil, with approximately 1.1 million cubic metres of spoil to be generated from the construction. Spoil would be re-used across the project and would be stockpiled at 5 construction ancillary facilities. Excess spoil would be sent to disposal sites in accordance with the conditions of approval and EPL's governing the sites.

The Department considers the impact of waste management activities to be minor and have a minimal risk to the environment or human health and has recommended standard CSSI waste conditions including the classification and lawful disposal of wastes and development and implementation of a waste tracking system which records the types and volumes of wastes removed from the site and their final destination.

6.9.6 Climate Change

The Proponent has considered the risks of climate change and identified extreme rainfall and sea level rise as an extreme risk to the project, and extreme heat and bushfires as a high risk as they have the potential to result in power and communication failures.

The Department has considered the adaptation measures that have been incorporated into the project design (including measures for flood immunity at tunnel portals and power redundancy) and accepts that these measures are adequate.

6.9.7 Sustainability

The Proponent has commitment to meeting the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability Rating Tool of 'excellent'. The Proponent has outlined several measures that will be undertaken during construction and operation that will enable the project to reach the 'excellent' rating of the IS tool.

To ensure that the ISCA rating of 'excellent' is achieved the Department has recommended conditions regarding the application of the ISCA rating tool.

7. Evaluation

The Department has reviewed the Environmental Impact Statement, the Preferred Infrastructure Report and Submissions to both the Environmental Impact Statement and the Preferred Infrastructure Report and has assessed the key issues arising from the construction and operation of the project. This has been undertaken with advice from relevant government agencies and councils, and in consideration of key strategic government policies and plans. The Department's assessment has also considered all the relevant matters and objects of the EP&A Act and the principles of ecological sustainable development.

The key issues associated with the project are:

- traffic and access;
- air quality;
- noise and vibration;
- groundwater;
- contamination and soils;
- biodiversity;
- place and urban design; and
- socio-economic, property and land use.

The Proponent has identified a range of environmental management measures which it has committed to applying to the project. Based on its assessment in this report, the Department recommends further conditions of approval aimed at improving the level of environmental management and reducing potential impacts.

The project is consistent with *2019 Infrastructure Priority List of Infrastructure Australia, State Infrastructure Strategy 2018-2038: Building Momentum, Future Transport Strategy 2056, A Metropolis of Three Cities – the Greater Sydney Region Plan, Eastern City District Plan* and *NSW Freight and Ports Plan 2018-2023* as it would;

- provide for more efficient and economic transport connections for freight vehicles, workers and other commercial operators travelling to Sydney Airport and other industrial and commercial areas in southern Sydney;
- facilitate improved connectivity for inter-regional traffic; and
- facilitate more efficient journeys to and from southern Sydney. Further, the project would improve local amenity and accessibility due to less congestion on the road network and deliver new and upgraded active transport infrastructure in the project area.

The project is in the public interest as it would relieve capacity constraints; improve accessibility; and respond to future growth and regional accessibility. The project is expected to create 2,862 full time construction jobs including 812 full time workers directly employed on the project and 2,050 indirect full time jobs. Construction of the project is expected to directly contribute around $775 million to the gross State product for each average year of construction, with indirect effect of around $300 million, giving an estimated total contribution of $1,075 million for each average year of construction.

The Department is satisfied that the issues raised in submissions have been appropriately considered and responded to by the Proponent and by the Department. Nonetheless, it is noted that there are residual impacts that are considered acceptable for the reasons outlined, but not imperceptible. These can be appropriately mitigated or managed through the implementation of the recommended conditions and the Proponent's commitments. Therefore, the Department considers the project is in the public interest and should be approved subject to conditions.

The project, subject to the recommended conditions, will provide replacement recreational facilities to offset the construction impacts of the project and provide enhanced facilities and public open space upon its operation; improved access and egress arrangements from local roads onto President Avenue for local residents; at-property noise treatment to mitigate excessive construction noise; and improved local pedestrian and bicycle connectivity with extended and enhanced off-road active transport links. These localised mitigations and improvements, coupled with the regional traffic benefits, has led to the Department recommending approval.

8. Recommendation

It is recommended that the Minister for Planning and Public Spaces:

- **considers** the findings and recommendations of this report;
- **accepts and adopts** all of the findings and recommendations in this report as the reasons for making the decision to approve the application;
- **considers** any advice provided by the Minister having portfolio responsibility for the project;
- **agrees** with the key reasons for approval listed in the notice of decision;
- **grants approval** for the application in respect of SSI-8931 as amended, subject to the conditions in the attached project approval; and
- **signs** the attached infrastructure approval and recommended conditions of approval.

Recommended by:

Glenn Snow
Director
Transport Assessments

Recommended by:

David Gainsford
Executive Director
Infrastructure

9. Determination

The recommendation is: **Adopted** / ~~**Not adopted**~~ **by:**

The Hon. Rob Stokes, MP

Minister for Planning and Public Spaces

Appendices

Appendix A – Environmental Impact Statement

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix B – Submissions

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix C – Response to Submissions Report (on EIS)

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix D – Preferred Infrastructure Report

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix E – Response to Submissions on PIR

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix F – Independent Traffic Review

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix G – Independent Air Quality Review

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix H – Independent Groundwater Review

https://www.planningportal.nsw.gov.au/major-projects/project/10441

Appendix I – Community Views

Issue	Consideration
Strategic Context and Project Need • Lack of demonstrated project need and justification • High project cost • No certainty on proposed tolling costs • Uncommitted timing or route of future stages of the F6 Extension • Suggested alternatives and options to the provision of a motorway, particularly, the provision of public transport	*Assessment* • The project is consistent with strategic land use and transport documents. *Conditions/Response* No conditions are required in relation to this matter.
Construction and Operational Noise • Construction noise associated with tunnelling, heavy vehicle movements and out-of-hour works • Operational traffic noise impacts to residents along President Avenue	*Assessment* • The construction noise assessment predicted exceedances of the noise management levels at sensitive receives adjacent to the CSSI. The closest receivers are predicted to exceed the Interim Construction Noise Guideline's highly noise affected noise management level. • Noise mitigation is required for construction and operation. Where residents are eligible for both construction and operational mitigation measures, early installation of operation mitigation measure must be considered. • Works required to be undertaken outside of construction hours will be subject to noise goals to minimise the chance of sleep disturbance criteria being exceeded. Respite periods must be developed and implemented. *Conditions/Response* • Preparation and Implementation of a Noise and Vibration Construction Environmental Management Plan (CEMP) Sub-plan, detailing how construction noise and vibration impacts will be minimised and managed. • At-property noise treatment must be offered to specified sensitive noise receivers through a Noise Insulation Program before commencement of works to minimise noise impacts. • An Operational Noise and Vibration Review must be undertaken to monitor whether the mitigation

	measures are achieving the desired outcome, asses compliance with the predicted noise levels and determine whether any additional mitigation measures are required to address non-compliances. • Restricted work hours when highly noise intensive work can occur and provision of periods of respite.
<u>Traffic and Transport</u> • Concern over the volume of heavy vehicles traversing through residential areas and increased traffic during construction • Operation of the project will increase traffic volumes on President Avenue and surround and increase rat running through local streets • Local traffic access issues in areas adjacent to President Avenue, Kogarah, especially for residents in Moorefield Estate • Pedestrian safety around construction ancillary facilities • Construction worker parking on local streets	*Assessment* • Heavy vehicle movements are largely restricted to arterial roads. • In response to Department, council and community concerns the access and egress arrangements to Moorefield Estate have been altered to provide improved access for residents. • The Department acknowledges there will be traffic impacts during construction however these impacts can be mitigated through the implementation of management measures. *Recommended Conditions/Response* • Provision of safe pedestrian and cyclist access around sites, access to bus stops, access to utilities and private property during construction. • Restrictions on the use of local roads by spoil haulage vehicles. • The infrastructure approval sets out requirements relating to road dilapidation surveys and repairs. • Preparation and implementation of a Construction Parking and Access Strategy to manage impacts from on- and off-street parking changes and construction worker parking. • Review of operational road network performance at 12 months and five years.
<u>Air Quality</u> • Adequacy of the air quality assessment • Adverse construction (dust and odour) • Adverse air quality impacts arising from the emission of exhausts through the ventilation outlets during the operation of the project	*Assessment* • A review of the air quality assessment was undertaken by the NSW Chief Health Officer and considered advice from the Office of the NSW Chief Scientist and Engineer and the Advisory Committee for Tunnel Air Quality. The Chief Health Officer noted that any potential air pollution related health effects would be primarily due to traffic on surface roads and not as a result of the tunnel ventilation outlets.

	• The Proponent has demonstrated that the in-tunnel, ambient and ventilation outlet air quality criteria can be achieved. • The modelled regulatory worst-case scenario for air pollutant emissions from ventilation outlets at ground level and at various elevated points is considered acceptable. • The EPA will be responsible for the regulation of the tunnel ventilation outlets. *Conditions/Response* • Imposition of limits to the level of air pollutants discharged from the ventilation outlets. • Imposition of in-tunnel air quality criteria and ambient air quality maximum concentrations. • Appointment of Air Quality Independent Reviewer to review and endorse the adequacy of the in-tunnel ventilation and ventilation outlet design, air quality monitoring design and air quality reporting. • Establishment of a regime of air quality monitoring and reporting with operating procedures, monitoring equipment and monitoring data reviewed by an independent auditor.
<u>Biodiversity</u> • Impacts on endangered ecological communities and threatened plant species • Impacts on wetlands and groundwater dependent ecosystems • Lack of consideration of ecological connectivity and migratory species	*Assessment* • Impacts on biodiversity were assessed in accordance with the Biodiversity Assessment Method (BAM) under the *Biodiversity Conservation Act 2016*. • The project will impact on three threatened ecological communities and one threatened plant species. The offset of impacts through the retirement of biodiversity credits prior to the commencement of construction is considered acceptable and in accordance with the BAM. *Recommended Conditions/Response* • The Proponent will be required to offset impacts to threatened ecological communities and species in accordance with specified retirement credits. • Pre-clearing surveys are required prior to construction along with other management measures specified in a Construction Flora and Fauna Construction Management Plan. • Monitoring of the status of wetlands is to be undertaken during construction and operation of the project.

Land Use and Place Making • Temporary loss of public spaces and recreational facilities including a playground and skate park in Rockdale Bicentennial Park during construction • Permanent loss of some public open spaces once the project is operational • Extent and location of the shared pedestrian and cycle pathway through Scarborough Park and the preference to relocate a portion of the cycleway off the street network	*Assessment* • In response to community feedback, the shared pedestrian and cycle pathway has been extended further south through Scarborough Park North. • The increase in active transport facilities is supported, however the Department considers that these facilities can be enhanced. • The Proponent has committed to provide offset recreational facilities prior to commencing construction. *Recommended Conditions/Response* • Preparation of a Recreation Facilities Replacement Plan to ensure that impacts to recreational and community facilities by the project are minimised. • Replacement recreational facilities must meet the functionality of the impacted facilities, with consideration of the capacity and accessibility from increased demand due to consolidation and intensification of uses. • The on-road portion of the active transport corridor must be increased to maximise the separation of the cycleway from the existing road network. • Provision of a net increase in the number of trees and target an increase in tree canopy. • The Proponent must investigate the feasibility of installing an east-west at-grade footpath along the northern side of President Avenue.
Consultation • Inadequate consultation prior to and during the public exhibition of the EIS • Concern regarding the level of future community consultation during latter stages of the assessment process and after the application is approved	*Assessment* • The Proponent has conducted an appropriate level of consultation prior to and during the application assessment process. • The EIS and PIR have been exhibited in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* and the Department's protocols. *Conditions/Response* • Preparation and implementation of a Communication Strategy to facilitate communication between the Proponent with the community, councils and government agencies. • Establishment of an ongoing Complaints Management System and Complaints Register. • Appointment of a Community Complaints Mediator.

Appendix J – Recommended Instrument of Approval

https://www.planningportal.nsw.gov.au/major-projects/project/10441