# 12 Land use and property

This chapter considers the potential land use and property implications of constructing and operating the M4-M5 Link project (the project) and expands on the strategic context and justification for the project presented in **Chapter 3** (Strategic context and project need). It describes the framework for integrated land use and transport planning, and provides an assessment of the potential impact on land use and property as a result of the concept design for the project as described in **Chapter 5** (Project description).

The concept design would continue to be refined, where relevant, to improve road network and safety performance, minimise impacts on sensitive receptors and the environment, and in response to feedback from stakeholders and the community.

Potential impacts of the project on utilities, including relocation or adjustment of utilities during construction of the project, as well as measures to protect utilities, are identified in the Utilities Management Strategy that has been prepared for the project and included in **Appendix F** (Utilities Management Strategy). The Utilities Management Strategy identifies, and provides for the management of, potential land use and property impacts associated with the relocation, adjustment and protection of utilities.

The Secretary of the NSW Department of Planning and Environment (DP&E) has issued environmental assessment requirements for the project. These are referred to as Secretary's Environmental Assessment Requirements (SEARs). **Table 12-1** sets out the SEARs and the associated desired performance outcomes that relate to land use and property, and identifies where they have been addressed in this environmental impact statement (EIS).

Desired performance outcomes	SEARs	Where addressed in the EIS
3. Assessment of key issues Key issue impacts are assessed objectively and thoroughly to provide confidence that the project will be constructed and operated within acceptable levels of impact.	<ul><li>2. For each key issue, the Proponent must:</li><li>(b) describe the legislative and policy context, as far as it is relevant to the issue</li></ul>	The relevant legislative and policy context for land use and property is described in in <b>section 12.1.2</b> . The legislative policy context for other key issues is described in the relevant sections of the key issues chapters ( <b>Chapters 8</b> to <b>Chapter 25</b> ).
3. Health and safety	2. The assessment must:	
The project avoids, to the greatest extent possible, risk to public safety.	Assess the likely risks of the project to public safety, paying particular attention to:	
	<ul> <li>pedestrian safety</li> </ul>	Pedestrian safety during construction and operation is addressed in <b>Chapter 8</b> (Traffic and transport).
	subsidence risks	Subsidence risks are addressed in <b>section 12.3.4</b> and in <b>Chapter</b> <b>19</b> (Groundwater).
	bushfire risks	Bushfire risks are addressed in <b>Chapter 25</b> (Hazard and risk).
	<ul> <li>the handling and use of dangerous goods.</li> </ul>	The handling and use of dangerous goods are addressed in <b>Chapter 25</b> (Hazard and risk).

Table 12-1 SEARs - land use and property

Desired performance	SEARs	Where addressed in the EIS
outcomes		
9. Socio-economic, land	2. The Proponent must assess	Impacts on potentially affected
use and property The project minimises	operation on potentially affected	properties are addressed in section 12.3.
adverse social and economic impacts and capitalises on opportunities potentially available to affected communities. The project minimises impacts on property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.	property (including Crown lands), businesses, recreational users and land and water users, including property acquisitions/adjustments, access amenity, relevant statutory rights, and community severance and barrier impacts resulting from the project.	Impacts from construction and operation on Crown lands are assessed in <b>section 12.3.2</b> .
		An assessment of potential overshadowing from buildings and structures associated with the project is provided in <b>section</b> <b>12.4.13</b> . Shadow diagrams indicating the extent of overshadowing on properties that is currently expected as a result of permanent operational infrastructure are provided in <b>Appendix M</b> (Shadow diagrams and overshadowing). There may be changes to overshadowing as the detailed design progresses. Access amenity and relevant statutory rights are addressed in <b>section 12.4.8</b> and in <b>Chapter 8</b>
		(Traffic and transport). Impacts on businesses are addressed in section 12.3, section 12.3.4 and in Chapter 14 (Social and economic)
		Impacts on recreational users have been assessed in <b>section</b> <b>12.3.4</b> and in <b>Chapter 14</b> (Social and economic). Impacts on water users are described in <b>section</b> <b>12.4.9</b> .
		Community severance and barrier impacts are assessed in <b>section</b> <b>12.3.4</b> , and in <b>Chapter 8</b> (Traffic and transport) and <b>Chapter 14</b> (Social and economic).
	3. The Proponent must identify opportunities for local centre street revitalisation improvements, pedestrian and cyclist access and connectivity and provision of community and social facilities.	The project would deliver new areas of open space around Rozelle and Iron Cove including new and upgraded pedestrian and cyclist connections. A concept plan has been prepared for these locations and is presented in <b>Chapter 13</b> (Urban design and visual amenity). This concept plan identifies the ways that the project could deliver and/or facilitate local centre street revitalisation improvements and new community and social facilities. Further discussion is also included in <b>Chapter 3</b> (Strategic context and project

Desired performance	SEARs	Where addressed in the EIS
		need) and <b>Chapter 14</b> (Social and economic). Pedestrian and cyclist facilities that would be provided by the project are described in <b>Chapter</b> <b>5</b> (Project description). Impacts on pedestrian and cyclist facilities are assessed in <b>Chapter 8</b> (Traffic and transport). Potential opportunities for pedestrian and cyclist connections are also described in <b>Appendix N</b> (Technical working paper: Active transport strategy).
	4. The design and siting of project elements should be located in such a way that functional, contiguous areas of residual land are maximised. The design and siting must consider appropriate land use interfaces (ie White Bay) and the social and economic impacts of proposed land uses against alternate land uses.	The design and siting of project elements as described in <b>Chapter 5</b> (Project description) have had regard to maximising remaining project land opportunities, particularly around Rozelle and Iron Cove. The potential future uses for remaining project land at these locations are described in the concept plans in <b>Chapter 13</b> (Urban design and visual amenity) and <b>Appendix L</b> (Technical working paper: Urban design). The development of alternatives and options for project elements are described in <b>Chapter 4</b> (Project development and alternatives). Interfacing land uses have been considered in the design and siting of project elements as described in <b>Chapter 5</b> (Project description). An assessment of the land use impacts on interfacing projects is included in <b>section 12.3.4</b> and in in <b>Chapter 3</b> (Strategic context and project need). The social and economic impacts of proposed land uses is assessed in <b>Chapter 14</b> (Social and economic).
	5. Where air quality allows, residual land must be designed to positively contribute to additional community uses, public recreation uses and/or affordable or social housing. Passively landscaped areas should not be the default use for residual land.	The potential future uses for land that would be subject to urban design and landscaping and remaining project land are described in <b>section 12.3</b> and in <b>Chapter 13</b> (Urban design and visual amenity) and <b>Appendix L</b> (Technical working paper: Urban

Desired performance outcomes	SEARs	Where addressed in the EIS
	6 The Proponent must assess	design). The project would deliver new open space that could contain a variety of community and public recreation uses. These potential future uses would be determined through ongoing consultation with relevant councils, the community and other key stakeholders and would be documented in the Residual Land Management Plan and/or Urban Design and Landscape Plan that would be prepared for the project.
	potential impacts on utilities (including communications, electricity, gas, and water and sewerage) and the relocation of these utilities.	utilities are assessed in Appendix F (Utilities Management Strategy).
	7. Where the project is predicted to affect trunk utilities, the Proponent must undertake a utilities management strategy. The strategy must identify proposed management strategies, including relocations or adjustment of the utilities, and their estimated timing and duration. This strategy must be developed in consultation with the relevant utility owners or providers.	A utilities management strategy has been prepared for the project and is included in <b>Appendix F</b> (Utilities Management Strategy).

# 12.1 Assessment methodology

# 12.1.1 Overview

The assessment of impacts from the concept design of the project on land use and property has been carried out by undertaking the following key tasks:

- Providing an overview of the existing land use and zoning in the vicinity of the project (see section 12.2)
- Reviewing relevant strategic planning documents (see section 12.1.2)
- Identifying the existing properties and land uses that would be impacted by the project (see section 12.3 (property impacts) and section 12.3.4 (land use impacts))
- Identifying the potential future uses of land required for construction but not required for permanent operational infrastructure, including:
  - New open space, active transport connections and community or social infrastructure
  - Remaining project land that would be retained for future (separate) road infrastructure projects
  - Remaining project land that would be retained for future (separate) road infrastructure projects or considered for separate future development or use, both of which would be subject to the Residual Land Management Plan that would be prepared for the project

- Identifying planned future development that may impact on or be impacted by the project, including a review of recent development applications granted by City of Sydney Council, Inner West Council and DP&E in the vicinity of the project
- Identifying the extent of overshadowing on properties that is potentially expected as a result of permanent operational infrastructure (see **section 12.4.13**)
- Identifying mitigation measures (general and specific) that would assist in reducing land use and property impacts (see section 12.5).

# 12.1.2 Strategic land use and planning context

# Relevant plans, policies and strategies

The project aims to be consistent with and support the goals and objectives of NSW strategic planning and transport infrastructure policies, including:

- NSW Long Term Transport Master Plan (Transport for NSW 2012b)
- Sydney's Rail Future: Modernising Sydney's Trains (Transport for NSW 2012a)
- Sydney City Centre Access Strategy (Transport for NSW 2013)
- State and Premier priorities (NSW Government 2015)
- A Plan for Growing Sydney (NSW Government 2014a)
- *Rebuilding NSW: State Infrastructure Strategy 2014* (NSW Government 2014b)
- The Bays Precinct Transformation Plan (UrbanGrowth NSW 2015)
- Parramatta Road Corridor Urban Transformation Strategy (UrbanGrowth NSW 2016)
- Draft Central District Plan (Greater Sydney Commission 2016).

These strategic plans and policies provide goals and objectives for land use planning within the Sydney metropolitan area, including consideration of the role of transport infrastructure in accommodating the future housing, transport, employment and amenity needs of Sydney's growing population. Local plans and policies have also been considered in the development of the project. Further detail on relevant plans, policies and strategies and their interaction with the project is provided in **section 12.2.1** and in **Chapter 3** (Strategic context and project need).

The project presents opportunities to support Sydney's integrated land use and transport planning objectives by:

- Together with other WestConnex projects, creating motorway connections between key employment hubs and local communities, and providing links to population growth centres at Parramatta and western Sydney
- Providing a new underground motorway link between the M4 East at Haberfield and the New M5 at St Peters to assist in easing congestion on parts of existing north–south and east–west surface roads
- Providing connections between the extended M4 and M5 motorways and supporting connections to the proposed future Sydney Gateway project (via the St Peters interchange), ultimately improving access to Sydney's international gateways at Sydney Airport and Port Botany
- Facilitating future urban renewal in precincts adjoining the project, including along Parramatta Road (east of Haberfield) and Victoria Road (between Iron Cove Bridge and The Crescent). The urban design and landscaping works to be implemented as part of the project within the Rozelle Rail Yards and the Iron Cove Link surface works (as described in **Chapter 5** (Project description)) would assist in creating opportunities for improved connectivity to these possible future urban renewal projects, including improved connectivity and permeability for pedestrians and cyclists to locations such as The Bays Precinct
- Reducing travel times and improving reliability for bus services as well as, business, personal and freight journeys

- Improving local traffic movements, in particular north-south movements across the Parramatta Road corridor between Haberfield and Camperdown and north-south movements across Victoria Road and The Bays Precinct at Rozelle. These improvements to local traffic movements could facilitate the delivery of future public transport improvements, particularly along Parramatta Road and Victoria Road
- Upgrading and improving facilities for pedestrians and cyclists including the delivery of active transport links around permanent operational infrastructure. This would include two new bridges over City West Link connecting the communities of Rozelle, Balmain, Lilyfield, Glebe and Annandale, and an upgraded east-west connection between Lilyfield Road, the Rozelle Rail Yards, The Bays Precinct and Anzac Bridge
- Providing connections to the proposed future Western Harbour Tunnel and Beaches Link project to the north (via the Rozelle interchange) and to the proposed future Sydney Gateway project at St Peters (via the St Peters interchange) to assist in improving connectivity in Sydney's transport network. These proposed future projects would be subject to separate assessment and approval.

# 12.2 Existing environment

# 12.2.1 Regional context

The project is generally located in the inner west region of Sydney within the Inner West and City of Sydney local government areas (LGAs). The project traverses the suburbs of Ashfield, Haberfield, Leichhardt, Lilyfield, Rozelle, Annandale, Stanmore, Camperdown, Newtown and St Peters. A detailed overview of the project is provided in **Chapter 5** (Project description).

Existing land use and development within and around the project contains a mix of residential, commercial, industrial and open space uses including:

- Primarily low and medium density, with limited areas of high density residential land uses around Haberfield, Rozelle, Annandale, St Peters and areas close to public transport
- Open space as well as active and passive recreational uses, located around the project footprint. This includes areas of open space such as Reg Coady Reserve, Algie Park, Blackmore Park, Pioneers Memorial Park, Easton Park, Whites Creek Valley Park, the Bay Run around Iron Cove at Rozelle, King George Park, Callan Park, Camperdown Park, O'Dea Reserve, Bicentennial Park and Sydney Park. Continuous open space corridors, consisting of a series of smaller open spaces, are located along Whites Creek, Johnstons Creek and the Hawthorne Canal
- Industrial and commercial land concentrated in the suburbs of Ashfield, Rozelle, Leichhardt, Camperdown and St Peters. Commercial uses are typically concentrated along arterial roads (such as Victoria Road, Parramatta Road, Pyrmont Bridge Road, King Street, and the Princes Highway), some non-arterial roads (Darley Road and Lilyfield Road), at railway stations, and around medium and density residential areas
- Community facilities such as churches, schools, medical and veterinary centres, child care centres and aged persons homes surrounding the project footprint. These include Haberfield Public School, Rozelle Public School, Lilyfield Early Learning Centre, the University of Sydney Camperdown Campus and the Royal Prince Alfred Hospital and supporting educational and medical facilities at Camperdown.

There are several major transport corridors and other infrastructure located in or adjacent to the project footprint, including Victoria Road, City West Link, Parramatta Road, the Princes Highway, Sydney Trains' suburban railway network, and the Inner West Light Rail line corridor.

Several waterways and creeks are located adjacent or nearby to the project footprint including the Dobroyd Canal (Iron Cove Creek) at Haberfield, Hawthorne Canal at Leichhardt, Whites Creek and Johnstons Creek at Annandale and Lilyfield, Rozelle Bay and Iron Cove at Rozelle, and Alexandra Canal at St Peters.

Land use zonings within and around the project footprint are set by the following environmental planning instruments:

• Ashfield Local Environmental Plan 2013 (Ashfield LEP 2013)

- Leichhardt Local Environmental Plan 2013 (Leichhardt LEP 2013)
- Marrickville Local Environmental Plan 2011 (Marrickville LEP 2011)
- Sydney Local Environmental Plan 2012 (Sydney LEP 2012)
- Sydney Regional Environmental Plan No. 26 City West (SREP 26).

The regional land use zoning context of the project is shown in **Figure 12-1** and described in **section 12.2.2**. Detailed figures showing the project elements are also included in **Chapter 5** (Project description).



Figure 12-1 Project regional land use zoning context of the project

# Local and regional planning and development proposals

The following local and regional planning initiatives and development proposals that could affect or be affected by the project are proposed or underway within and around the project footprint, including:

- The Green Grid Creating Sydney's Open Space Network (NSW Government Architects Office 2015)
- Cooks River to Iron Cove GreenWay Master Plan and Coordination Strategy (Marrickville Council 2009)
- Lilyfield Road regional bike route separated cycleway (Inner West Council 2016)
- Leichhardt Bike Plan (Leichhardt Council 2016)
- Whites Creek, Johnstons Creek and Dobroyd Canal (Iron Cove Creek) naturalisation works (Creek naturalisations, Sydney Water 2017)
- Easton Park stormwater drain improvements proposed by Sydney Water
- King George Park Plan of Management (Leichhardt Council 2012).

These are described in more detail in the following section. The impacts of the project on these, and of these on the project, are assessed as relevant in **section 12.3.4**.

Sydney's Green Grid is identified in *A Plan for Growing Sydney* (NSW Government 2014) and aims to make Sydney a great place to live, with a connected network of multipurpose green spaces. It also aims to ensure Sydney is a sustainable city that values and protects the natural environment and has a balanced and sustainable approach to land and resource use. The Green Grid project will deliver a connected network of walking trails, bike paths, picnic spots and conservation works to provide high-quality, well-connected greenspace areas for local communities and wildlife. The *Draft Central District Plan* (Greater Sydney Commission 2016) articulates a long term vision for Sydney's Green Grid including a number of priority projects such as the Iron Cove GreenWay and the Cooks River open space corridor.

The Cooks River to Iron Cove GreenWay documented in the *Cooks River to Iron Cove GreenWay Master Plan and Coordination Strategy* (Ashfield Council et al 2009) a five-kilometre-long corridor extending from the Cooks River at Earlwood to Iron Cove, in the Canterbury and Inner West LGAs. The corridor includes sections of the Inner West Light Rail line corridor between Dulwich Hill and Lilyfield.

The Leichhardt Bike Plan is an initiative of the former Leichhardt Council, and aims to guide the future development of the Leichhardt bicycle network and facilities, provide links to other modes of transport and improve the general safety of bike use. No updates or revisions to the Leichhardt Bike Plan have been made available following the formation of the Inner West Council.

Sydney Water is investigating the potential naturalisation of a section of Whites Creek at Annandale. The area being investigated is a 400 metre length of the creek corridor upstream of its outlet to Rozelle Bay. The concrete lined creek channel is in need of repair and the proposal would remove the deteriorated concrete banks and naturalise and rehabilitate the channel. A concept design for the works has been prepared by Sydney Water but at this stage, the design and construction timelines are not known. As part of the project, the section of Whites Creek between The Crescent and Rozelle Bay at Annandale would be naturalised consistent with Sydney Water's plans for the aforementioned upstream section. The design of these naturalisation works would be further developed during detailed design and in consultation with Sydney Water. A description of proposed naturalisation works at Whites Creek at Annandale is provided in **Chapter 5** (Project description).

Similar investigations are also underway by Sydney Water to rehabilitate about 600 metres of the concrete lined Johnstons Creek channel from the outlet at Rozelle Bay at Annandale, and about 200 metres of Dobroyd Canal (Iron Cove Creek) east of Ramsay Street at Haberfield, both of which are in need of repair. Sydney Water is looking to develop naturalising solutions where possible. The early concept design for the naturalisation of Dobroyd Canal (Iron Cove Creek) proposes features like creek banks made of rocks and native plants and some banks turned into salt marsh areas. A similar, final concept design for the Johnstons Creek channel has been prepared. The design and construction timelines for these works are still being investigated by Sydney Water.

Sydney Water is also preparing a proposal to implement drainage upgrades at Easton Park at Rozelle. This would involve diversion of an existing drain to a bioretention basin, designed to treat a portion of stormwater flows. The basin would remove a portion of pollutants generated by the urban catchment and may also provide the potential for re-use as irrigation for the park. The design for the project is understood to be prepared in 2017 with construction scheduled for 2018.

# 12.2.2 Local context

This section discusses the existing land use and planning controls for each of the proposed surface sites. The project has been designed such that the majority of transport infrastructure would be located underground within tunnels. As a result, surface sites are limited to locations where surface works are required to build temporary construction and permanent operational infrastructure (such as interchanges, surface road upgrades, infrastructure to support the operation of the project, such as ventilation facilities, substations and water treatment plants and temporary construction ancillary facilities).

This section describes the properties, land uses, planning controls and strategic planning context (where appropriate) within and adjacent to the project footprint around the following surface sites:

- The Wattle Street interchange surface works at Haberfield including within and surrounding the Wattle Street civil and tunnel site (C1a), Haberfield civil and tunnel site (C2a)/Haberfield civil site (C2b) and the Northcote Street civil site (C3a) during construction and permanent operational infrastructure
- Surface works within and surrounding the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) at Ashfield and Haberfield during construction
- The surface works at Darley Road including within and surrounding the Darley Road civil and tunnel site (C4) at Leichhardt during construction and permanent operational infrastructure
- The surface works at Lilyfield, Annandale and Rozelle including within and surrounding the Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and the Victoria Road civil site (C7) during construction and permanent operational infrastructure
- The Iron Cove Link surface works at Rozelle including within and surrounding the Iron Cove Link civil site (C8) during construction and permanent operational infrastructure
- Surface works within and surrounding the Pyrmont Bridge Road tunnel site (C9) at Annandale during construction
- St Peters interchange surface works at St Peters including within and surrounding the Campbell Road civil and tunnel site (C10) during construction and permanent operational infrastructure.

A detailed description of the activities that would occur during construction is provided in **Chapter 6** (Construction work). The permanent operational infrastructure that would be provided as part of the project is described in **Chapter 5** (Project description).

As described in **Chapter 6** (Construction work) the concept design considers two possible combinations for construction ancillary facilities around Haberfield and Ashfield. These are described and assessed in this EIS as Option A and Option B. The construction ancillary facilities that comprise these options have been grouped together and are denoted by the suffix a (for Option A) or b (for Option B) eg C1a Wattle Street civil and tunnel site.

The construction ancillary facilities that comprise these options have been selected to assist in informing the preferred combination of construction ancillary facilities that would be used to construct the project. The preferred combination would be determined during detailed design and would meet the environmental performance outcomes stated in the EIS and the Submissions and Preferred Infrastructure Report, satisfy criteria that would be identified in any relevant conditions of approval and manage environmental risks.

## Wattle Street interchange surface works

## Land use

Construction of dive structures, tunnel portals and surface road upgrades and modifications along Wattle Street are being carried out as part of the M4 East project. Substantial changes to land use within this area at Haberfield as a result of property acquisition, construction activities and the introduction of permanent operational infrastructure at the Wattle Street interchange have already been assessed and approved as part of the M4 East project.

Three construction ancillary facilities would be located at Haberfield to support the construction of the project, consisting of:

- Wattle Street civil and tunnel site (C1a)
- Haberfield civil and tunnel site (C2a)/Haberfield civil site (C2b)
- Northcote Street civil site (C3a).

The locations of these are shown in **Figure 12-2**. These construction ancillary facilities would be located on land at the surface and underground currently being used as construction ancillary facilities for the M4 East project and would not require any new temporary or permanent acquisition or leasing. Notwithstanding, potential land use impacts associated with these construction ancillary facilities are assessed in this chapter.

The area around the Wattle Street interchange consists of predominantly residential land uses, comprising attached and detached dwellings and some residential apartments. A mixture of commercial and light industrial land uses front onto Parramatta Road near the Haberfield civil and tunnel site (C2a)/Haberfield civil site (C2b) and Northcote Street civil site (C3a).

A place of worship is located on the western side of Wattle Street near the intersection with Parramatta Road, adjacent to the Northcote Street civil site (C3a). Haberfield Public School is located at Bland Street about 300 metres east of the intersection of Wattle Street and Allum Street. Dobroyd Point Public School is located about 200 metres east of the intersection of Dobroyd Parade and Loudon Avenue. There is a small group of commercial and retail properties on Ramsay Street, at the intersection with Alt Street, including a restaurant. Bunnings Warehouse is located on the corner of Parramatta Road and Frederick Street and The Infants Home (child care centre) is located on Henry Street behind the Bunnings Warehouse. Reg Coady Reserve is located to the north of Wattle Street, west of the intersection with Martin Street.

#### Planning controls

The Ashfield LEP 2013 defines the land use zoning surrounding the Wattle Street interchange surface works as a mix of the following zones: SP2 Infrastructure, R3 Medium Density Residential, R2 Low Density Residential, B6 Enterprise Corridor, RE1 Public Recreation and B1 Neighbourhood Centre.

The majority of the Wattle Street interchange surface works are on land zoned SP2 Infrastructure and R3 Medium Density Residential. The objective of these zones is to provide for transport infrastructure and related uses and the housing needs of the community within a medium density residential environment respectively.

A portion of the Haberfield civil and tunnel site and the Northcote Street civil site are located on land zoned B6 Enterprise Corridor and R2 Low Density Residential. The objective of these zones is to promote businesses along main roads and provide for the housing needs of the community within a low density residential environment respectively. Land use zoning surrounding the Wattle Street interchange surface works is shown in **Figure 12-3**.

#### Strategic planning context

Future development is proposed in the vicinity of the site in accordance with the *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016), including maintaining an employment focus along main roads, encouraging appropriately scaled residential development and providing increased connectivity for pedestrians and cyclists. The strategic planning context in the vicinity of the Wattle Street interchange surface works is shown in **Figure 12-3**.

Discussion on the opportunities for future land use and transport integration including opportunities to support the realisation of the *Parramatta Road Corridor Urban Transformation Strategy* is provided in **section 12.3.4**.





Project footprint Parramatta Road Urban Transformation Growth Precinct Ancillary facility

# Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b)

#### Land use

The Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) would be located on the western and eastern sides of Parramatta Road between around Alt Street and Bland Street at Ashfield and Haberfield. The site is primarily comprised of a car dealership that encompasses land on both sides of Parramatta Road, with several smaller commercial premises on the western side of Parramatta Road near Bland Street.

The area around the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) consists of predominantly residential land uses, comprising attached and detached dwellings and some residential apartments. A mixture of commercial and light industrial land uses front onto Parramatta Road north of the sites. South of Bland Street, a construction site is present on the western side of Parramatta Road being used to construct the Parramatta Road portals as part of the M4 East project.

Haberfield Public School is located on Bland Street about 100 metres east of the intersection of Parramatta Road and Bland Street. The Yasmar Juvenile Justice training facility is east of Parramatta Road south of Bland Street and the Guardian Early Learning Centre is located further south on the corner of Parramatta Road and Chandos Street. There is a small group of commercial and retail properties on Ramsay Street, at the intersection with Alt Street, including a restaurant. Bunnings Warehouse is located on the corner of Parramatta Road and Frederick Street to the north. The Infants Home (child care centre) is located on Henry Street behind the Bunnings Warehouse. A place of worship is located near the intersection of Wattle Street and Parramatta Road to the north. There is also a place of worship around 300 metres west of Parramatta Road along Alt Street.

### Planning controls

The Ashfield LEP 2013 defines the land use zoning surrounding the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) as a mix of the following zones: B6 Enterprise Corridor, SP2 Infrastructure and R3 Medium Density Residential. The Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) would be on land zoned B6 Enterprise Corridor. The objectives of this zone include to promote businesses along main roads and to provide a range of employment uses. Land use zoning surrounding the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) is shown in **Figure 12-5**.

## Strategic planning context

Future development is proposed in the vicinity of the site in accordance with the *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016) including maintaining an employment focus along main roads, encouraging appropriately scaled residential development and providing increased connectivity for pedestrians and cyclists. The strategic planning context in the vicinity of the Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b) are shown in **Figure 12-4**.

Discussion on the opportunities for future land use and transport integration, including opportunities to support the realisation of the *Parramatta Road Corridor Urban Transformation Strategy*, is provided in **section 12.3.4**.





Project footprint Parramatta Road Urban Transformation Growth Precinct

# Darley Road surface works

### Land use

The Darley Road surface works would include use of the Darley Road civil and tunnel site (C4) and minor modifications to the surrounding road network to facilitate access during construction and the Darley Road motorway operations complex (MOC1) during operation. The site is currently occupied by a commercial premise on land that is being leased from Transport for NSW. The majority of the works would be carried out on the land currently subject to the commercial premise, next to Leichhardt North light rail stop, between City West Link and Darley Road at Leichhardt.

Land use in the vicinity of the site includes road and light rail infrastructure and residential, recreational areas and local centres. Additional infrastructure related land uses in the vicinity of the Darley Road surface works include the light rail corridor immediately adjacent to the north, City West Link further to the north, the Hawthorne Canal to the west, a stormwater management basin between City West Link and Blackmore Park; and a transport depot near the corner of Balmain Road and City West Link. Other land uses in the vicinity of the site include the 'Canal Road Arts Precinct' (including the Canal Road Film Centre and other creative arts uses) west of the tunnel site, north of City West Link and to the west of Darley Road and medium density residential uses to the south of Darley Road and north of City West Link.

### Planning controls

The Leichhardt LEP 2013 defines the land use zoning surrounding the Darley Road surface works as a mix of the following zones: SP2 Infrastructure, B2 Local Centre, R1 General Residential and RE1 Public Recreation.

The Darley Road civil and tunnel site (C4) and the Darley Road motorway operations complex (MOC1) would be located on land zoned B2 Local Centre. The objective of the zone is to provide a range of retail, business, entertainment and community uses that serve the needs of people who live in, work in and visit the local area. Changes to the surface road network during construction would be carried out on land zoned SP2 Infrastructure. The objective of the zone is to provide for transport infrastructure and related uses.

Land use zones in the vicinity of the Darley Road surface works are shown in Figure 12-6.



## Rozelle surface works

### Land use

The Rozelle surface works would include use of the Rozelle civil and tunnel site (C5), The Crescent civil site (C6) and the Victoria Road civil site (C7) during construction including modifications to the surrounding road network. Permanent operational infrastructure would include new and upgraded transport infrastructure comprising the Rozelle interchange and surface road works, the Rozelle West and Rozelle East motorway operations complexes (MOC2 and MOC3) (including the Rozelle ventilation supply and exhaust facilities), drainage infrastructure, active transport links and new open space. The majority of the Rozelle surface works would be centred on the Rozelle Rail Yards and arterial roads to the south and east. Land use within the Rozelle Rail Yards primarily comprises redundant industrial and transport infrastructure that are being removed as part of the separate site management works project. The central business district (CBD) and South East Light Rail Rozelle maintenance depot is located at the western end of the Rozelle Rail Yards.

Roads and Maritime is carrying out site management works on part of the Rozelle Rail Yards site. The works are needed to manage the existing environmental and safety issues at the site and would also improve access to surface conditions, which would allow for further investigation into the location of utilities and the presence of contamination and waste. Works include removal of vegetation, demolition of buildings, site establishment, utility investigations, and removal of waste and rail infrastructure and site stabilisation. The site management works were subject to a separate environmental assessment. The works were assessed in an REF which was approved by Roads and Maritime under Part 5 of the EP&A Act in April 2017.

The local area is dominated by residential and industrial land uses with associated open spaces, recreational areas, public services and facilities, commercial areas and transport infrastructure. The industrial history of the area is also apparent in some of the maritime-related land use around Rozelle Bay and White Bay, as well as redundant industrial and transport infrastructure within White Bay Power Station.

Key transport infrastructure in proximity to the surface works includes City West Link and the Inner West Light Rail line Corridor to the north, Victoria Road and Anzac Bridge to the east and The Crescent to the south. There are a number of commercial and light industrial developments located on Lilyfield Road and Gordon Street to the north of Rozelle Rail Yards and also on Victoria Road to the east.

Public recreation areas and infrastructure in the vicinity of the Rozelle surface works include:

- Buruwan Park, south of Whites Creek between The Crescent and Bayview Crescent/Railway Parade at Annandale
- Easton Park on Denison Road to the north of the Rozelle interchange
- Whites Creek Valley Park and Cohen Park, which are south of the Rozelle interchange, adjacent to Whites Creek
- Bicentennial Park and Federal Park (about 280 metres and 430 metres south of the Rozelle interchange respectively)
- Several local centres are also close to the Rozelle interchange, particularly along Lilyfield Road and Catherine Street, which are north and south of the Rozelle Rail Yards respectively
- The White Bay Power Station, which is immediately east of Victoria Road
- Several waterways and water bodies are close to the Rozelle interchange, including Rozelle Bay and Whites Creek, which are about 65 metres to the southeast of City West Link, and the Easton Park stormwater canal which runs north–south through the Rozelle Rail Yards.

#### Planning controls

The SREP 26 and the Leichhardt LEP 2013 define the land use zoning surrounding the Rozelle surface works as a mix of the following zones: Port & Employment and Waterfront Use under the SREP 26, and B2 Local Centre, B7 Business Park, IN2 Light Industrial, R1 General Residential, RE1 Public Recreation and SP2 Infrastructure under the Leichhardt LEP 2013.

The majority of the Rozelle surface works would be located on land zoned Port & Employment under the SREP 26 and land zoned SP2 Infrastructure under the Leichhardt LEP 2013. There are a range of objectives for these zones including providing for ongoing rail, port, road and other related activities.

The Crescent civil site (C6) and works within the project footprint south of City West Link and along James Craig Road would occur on land zoned Waterfront Use under the SREP 26. The objectives of this zone include to provide for development and use of water-based commercial and recreational activities and to provide public access within and across the zone. The Victoria Road civil site (C7) is located on land zoned B2 Local Centre under the Leichhardt LEP 2013. The objective of this zone is to provide a range of retail, business, entertainment and community uses that serve the needs of people who live in, work in and visit the local area.

Works would be carried out within the Interim Metro Corridor (as protected under State Environmental Planning Policy (Infrastructure) 2007 for the CBD Metro. The CBD Metro project was approved in 2010 but did not proceed. Works for the M4-M5 Link project would be carried out in the following areas that are within the Interim Metro Corridor:

- Zone A Above ground including cut and cover tunnel, including stabling and maintenance depot (at the Rozelle Rail Yards)
- Zone B Tunnel (generally beneath Victoria Road and towards Anzac Bridge)
- CBD Station Extent (Rozelle and White Bay stations).

Development planned within the Interim Metro Corridor triggers a number of notification and consent requirements, including the requirement to obtain concurrence with Sydney Metro (the relevant rail authority) before development consent can be granted for the project. The project design has given consideration to the future provision of tunnels and stations at Rozelle and White Bay.

Land use zones in the vicinity of the Rozelle surface works are shown in Figure 12-7.

### Strategic planning context

The land uses and zoning provisions within and in the vicinity of the Rozelle Rail Yards are anticipated to undergo substantial transformation over the coming decades under a number of infrastructure and urban renewal projects, including the future development of The Bays Precinct in consideration of *The Transformation Plan: The Bays Precinct* (UrbanGrowth NSW 2015b) (The Bays Precinct Transformation Plan). The strategic planning context in the vicinity of the Rozelle surface works is shown in **Figure 12-8**.

Discussion on the opportunities for future land use and transport integration including opportunities to support the realisation of The Bays Precinct Transformation Plan is provided in **section 12.3.4**. These potential changes are also discussed in **Chapter 3** (Strategic context and project need).





# Iron Cove Link surface works

### Land use

The Iron Cove Link surface works would be located along Victoria Road near the eastern abutment of Iron Cove Bridge and within King George Park, adjacent to Manning Street at Rozelle and would include use of the Iron Cove Link civil site (C8) during construction and new and upgraded transport infrastructure, permanent operational infrastructure including the Iron Cove Link motorway operations complex (MOC4) (including the Iron Cove Link ventilation facility), landscaping, and a bioretention facility and improved car parking facilities during operation.

Land use north and south of Victoria Road consists of residential dwellings of varying densities; comprising primarily apartment buildings to the north and detached dwellings to the south. There are also commercial land uses to the south (eg car dealership, liquor store and retail stores) and north (eg car dealership, petrol station and mechanic). Land use south and east includes local centres and infrastructure concentrated around the intersection of Victoria Road with Darling Street and Balmain Road. Land zoned as infrastructure in this area is used for the purposes of education (including the Rozelle Public School), community facilities and a place of worship. There is an additional area zoned SP2 Infrastructure – Electricity Supply located south of Victoria Road associated with the electricity substation on Manning Street.

There is an area of light industrial use located north of Victoria Road, roughly bound by Terry Street and Wellington Street. In addition to existing industrial and commercial uses, medium-density and mixed-use redevelopment in this area is occurring. Areas of public recreation and open space are located on the southern bank of Iron Cove, including King George Park south of Iron Cove Bridge, and Bridgewater Park north of Iron Cove Bridge. North of Victoria Road, Rozelle Public School and St Thomas Child Care Centre are located on Darling Street and the Balmain Cove Early Learning Centre is located on Terry Street.

## Planning controls

The Leichhardt LEP 2013 defines the land use zoning surrounding the Iron Cove Link surface works as a mix of the following zones: SP2 Infrastructure, B2 Local Centre, IN2 Light Industrial, R1 General Residential, RE1 Public Recreation and SP2 Electricity Supply.

The majority of the Iron Cove Link surface works would be on land zoned as SP2 Infrastructure, R1 Residential and B2 Local Centre under the Leichhardt LEP 2013. The objective of these zones is to provide for transport infrastructure and related uses, the housing needs of the community and to provide a range of retail, business, entertainment and community uses that serve the needs of people who live in, work in and visit the local area, respectively.

Works would be carried out on a section of King George Park adjacent to the westbound carriageway of Victoria Road zoned RE1 Public Recreation under the Leichhardt LEP 2013. The objective of this zone is to provide a range of recreational settings and activities and compatible land uses. The works area for the bioretention facility and car park improvement works is partly zoned R1 General Residential and partly zoned RE1 Public Recreation under the Leichhardt LEP 2013. The objective of these zones is to provide for the housing needs of the community and enable land to be used for public open space or recreational purposes respectively.

Land use zones surrounding the Iron Cove Link surface works at Rozelle are shown in Figure 12-9.

## Strategic planning context

Land at the Balmain Leagues Club Precinct on Victoria Road between Moodie Street and Darling Street at Rozelle is zoned as a Deferred Matter under the Leichhardt LEP 2013, which means that the Leichhardt Local Environmental Plan 2000 continues to apply. Under the Leichhardt Local Environmental Plan 2000, the land is zoned Business, with additional provisions included for mixed use development. The project would not preclude potential future development of this site from occurring.



# Pyrmont Bridge Road tunnel site (C9)

### Land use

The Pyrmont Bridge Road tunnel site (C9) would be located near the intersection of Pyrmont Bridge Road and Parramatta Road, around Gordon Street and Mallett Street. The site is comprised of commercial and light industrial land uses including a storage warehouse, fitness facility, mechanic and retail stores.

Land uses in the surrounding area include a mix of light industrial, local centre, mixed use and special purpose infrastructure (educational) land uses fronting on to Parramatta Road, which predominantly consists of commercial properties and apartment buildings. A small number of terrace houses are immediately adjacent to the east of the site, fronting Pyrmont Bridge Road. A number of mixed density residential dwellings are located to the east on the northern and southern sides of Pyrmont Bridge Road.

The area north of Parramatta Road consists of light industrial land uses in the immediate vicinity of the Pyrmont Bridge Road tunnel site (C9) and extending to the north and northwest. There is an area of mixed use (primarily commercial properties and medium density residential dwellings) located immediately to the east along Parramatta Road and an area of public recreation along Johnstons Creek to the west. There are general residential areas located around 100 metres and 150 metres to the northeast and northwest respectively.

Commercial and residential properties are located on the southern side of Parramatta Road as well as an educational establishment directly south of the Pyrmont Bridge Road tunnel site (C9) (Bridge Road School). Camperdown Park and O'Dea Reserve are located around 100 metres and 300 metres to the south of Parramatta Road respectively. Other land uses south of Parramatta Road are primarily residential and light industrial.

The Royal Prince Alfred Hospital (RPA) and the University of Sydney are located around 700 metres southeast on Missenden Road and Parramatta Road respectively. Land use zoning surrounding the Pyrmont Bridge Road tunnel site is shown in **Figure 12-10**.

#### Planning controls

The Leichhardt LEP 2013, the Sydney LEP 2012 and the Marrickville LEP 2011 define the land use zoning surrounding the Pyrmont Bridge Road tunnel site (C9). These comprise:

- Leichhardt LEP 2013: IN2 Light Industrial, SP2 Infrastructure, B7 Business Park and RE1 Public Recreation
- Sydney LEP 2012: B4 Mixed Use, SP2 Infrastructure, R1 General Residential, SP2 Educational Establishment and RE1 Public Recreation
- Marrickville LEP 2011: SP2 Infrastructure, B2 Local Centre, SP2 Educational Establishment, R1 General Residential, R2 Low Density Residential, R4 High Density Residential and B4 Mixed Use.

The Pyrmont Bridge Road tunnel site (C9) is located on land zoned IN2 Light Industrial under the Leichhardt LEP 2013. The objectives of this zone are to provide a wide range of light industrial, warehouse and related land uses.

#### Strategic planning context

Future development is proposed in the vicinity of the site to be consistent with the *Parramatta Road Corridor Urban Transformation Strategy* including upgrades to pedestrian and cyclist infrastructure along Pyrmont Bridge Road and urban revitalisation along Parramatta Road and Mallett Street. The strategic planning context in the vicinity of the Pyrmont Bridge Road tunnel site is shown in **Figure 12-11**.



Figure 12-10 Pyrmont Bridge Road tunnel site (C9) at Annandale - existing land use zoning



Project footprint Parramatta Road Urban Transformation Growth Precinct

# St Peters interchange surface works

### Land use

Integration works to connect the M4–M5 Link with the St Peters interchange would be carried out within the approved New M5 project footprint and would include the Campbell Road civil and tunnel site (C10) during construction, and new transport infrastructure and permanent operational infrastructure, including the Campbell Road motorway operations complex (MOC5) (including the Campbell Road ventilation facility). The existing land use around the St Peters interchange surface works is undergoing change due to the construction of the New M5 project. This is as a result of property acquisition and construction of permanent operational infrastructure including the St Peters interchange and upgrades and modifications to the local road network.

Existing land uses in the immediate vicinity of the St Peters interchange include a commercial enterprise corridor along the Princes Highway, general industrial lands, local and arterial roads, Sydney Park to the north and Alexandra Canal to the east. Surrounding land uses include the residential neighbourhoods of Newtown, Sydenham and St Peters, as well as general residential and industrial areas of Alexandria to the east. There are general residential land uses (primarily apartment buildings) on the north side of Campbell Road adjacent to the east of the works area north of Barwon Park Road.

St Peters Public School and the St Peters Church of England are located around 150 metres to the west of the St Peters interchange. Nearby public recreation areas include Sydney Park north of the St Peters interchange, Simpson Park north of Campbell Street, May Street Reserve on the corner of May Street/Unwins Bridge Road/Campbell Street and Camdenville Park north of Bedwin Road and west of May Street. A commercial enterprise corridor is present along the Princes Highway, immediately west of the St Peters interchange. Other significant areas of commercial activity include those around the Bourke Road/Bourke Street/Gardeners Road intersection, and areas associated with the Sydney Airport.

Land use surrounding the St Peters interchange surface works is shown in Figure 12-12.

## Planning controls

The Marrickville LEP 2011 and the Sydney LEP 2012 define the land use zoning surrounding the Campbell Road civil and tunnel site (C10) as a mix of the following zones:

- Marrickville LEP 2011: IN1 General Industrial, IN2 Light Industrial, SP2 Infrastructure, R2 Low Density Residential and R1 General Residential
- Sydney LEP 2012: RE1 Public Recreation, R1 General Residential, SP2 Infrastructure and IN1 General Industrial.

The St Peters interchange surface works would be primarily carried out on land zoned IN1 General Industrial, IN2 Light Industrial and SP2 Infrastructure under the Marrickville LEP 2011. The objectives of these zones are to provide for a range of industrial and warehouse land uses, and to provide for infrastructure and related uses. A portion of the works would be carried out on land zoned SP2 Infrastructure under the Sydney LEP 2012. The objective of this zone is to provide for infrastructure and related uses.

#### Strategic planning context

A range of future developments are proposed for the area surrounding the St Peters interchange surface works including surface operational infrastructure for the New M5 to the west, south and east, and construction ancillary facilities for the Sydney Metro project to the northwest (at Marrickville/Sydenham). Development is also occurring around Mascot and Green Square, south of the Alexandra Canal. These developments include the conversion of previously industrial and commercial land uses to new areas of high and medium density mixed-use development (incorporating areas of residential and commercial development). These developments are changing the way people move, live and work in these areas, and will also influence potential future development and land use behaviours in neighbouring areas such as St Peters.



Figure 12-12 St Peters interchange surface works - existing land use zoning

# 12.3 Potential impacts - property

During construction, the main land use and property impacts would relate to property acquisitions, and demolition of acquired properties, as well as properties that are owned by the NSW Government that are being used for construction and/or operation of the project. Construction stage land use impacts would largely relate to amenity issues (ie visual, noise, air quality, traffic and social and economic impacts) which have been addressed in other chapters of this EIS.

The project has been designed and developed to minimise the need for surface property acquisition and occupation. The need to reduce these impacts has been balanced with maximising opportunities for beneficial re-use of the areas required for construction that would be remaining project land to the operational needs of the project. Notwithstanding this design intent, construction and operation of the project would result in temporary and permanent impacts on property.

Where land required for the construction and/or operation of the project is not currently owned by the NSW Government, discussions are being held with the affected landowners concerning the purchase, lease or licence of the land. As of August 2017, the project would require 51 total surface property acquisitions. These property acquisitions are summarised in **Table 12-2**. Roads and Maritime would also be required to manage a number of leases on land subject to acquisition.

Location	Land use (type)	No. of total surface acquisitions <sup>1</sup>
Wattle Street interchange surface works	Acquisitions were carried out	None <sup>2</sup>
	at this location as part of the	
	M4 East project	
Parramatta Road West site (Ashfield)	Mixed use	1
Darley Road surface works	Commercial	1
Rozelle surface works	Commercial/industrial	4
Iron Cove Link surface works	Residential	26
	Commercial/industrial	10
Pyrmont Bridge Road tunnel site	Commercial/industrial	9
St Peters interchange surface works	Acquisitions were carried out	None <sup>3</sup>
	at this location as part of the	
	New M5 project	

#### Table 12-2 Property acquisition requirement for the project

Notes:

<sup>1</sup> Multiple strata titles may exist within each parent lot to be acquired

<sup>2</sup> Refer to the M4 East EIS (September 2015) for acquisitions that occurred at this location

<sup>3</sup> Refer to the New M5 EIS (November 2015) for acquisitions that occurred at this location

All compulsory acquisition required for the project would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), the *Land Acquisition Information Guide* (NSW Government 2014) and the land acquisition reforms announced by the NSW Government in 2016 (NSW Government 2016), which can be viewed online at:

https://www.finance.nsw.gov.au/sites/default/files/NSW\_Government\_Response.pdf

Relocation and some other categories of expenses could be claimable under this Act and related policies.

The project would also use government owned land, including land already owned by Roads and Maritime. Where this land is not already in Roads and Maritime ownership and is required for permanent use, Roads and Maritime would enter into agreements with the relevant government departments – including acquisition or lease arrangements. Where government owned land not owned by Roads and Maritime is required temporarily, this would generally be established through a lease or a Memorandum of Understanding.

In addition to the properties affected by surface activities, land (or interests in land, such as easements) below the surface of the ground would be acquired. This is called subsurface (or substratum) acquisition and is discussed separately in **section 12.3.3**.

Disturbed areas adjacent to operational infrastructure would be landscaped. In addition, concept plans have been prepared for the substantial areas of landscaping around the Rozelle Rail Yards and around Victoria Road at Rozelle (near the eastern abutment of Iron Cove Bridge). These are presented in **Appendix L** (Technical working paper: Urban design) and **Chapter 13** (Urban design and visual amenity) and establish the framework from which detailed landscape plans would be prepared as part of the Urban Design and Landscape Plan (UDLP) for the project.

The UDLP would be the primary mechanism for identifying and describing the public open space uses (including active and passive recreation), community and social infrastructure and or other development that would be delivered as part of the project. Further information about where urban design and landscaping would be carried out as part of the project is provided in **Chapter 5** (Project description) and **Chapter 13** (Urban design and visual amenity).

A flowchart showing the process for identifying the future use of land not required for operational infrastructure is included in **Figure 12-13**. An indicative summary of where urban design and landscaping would be carried out as part of the project is presented in **Table 12-3**.

# 12.3.1 Remaining project land

Subject to future detailed design and the requirements of the project, parts of the project footprint not required for operational infrastructure and/or landscaping may be contemplated for separate future redevelopment. In some instances, areas of land may also be retained by Roads and Maritime for future (separate) road infrastructure projects. Where this is the case, the land would be rehabilitated and stabilised in preparation for the potential future use. This land is identified as remaining project land.

Remaining project land would be subject to the provisions of a Residual Land Management Plan that would be prepared in consultation with the relevant council and would identify (and consider), but not be limited to:

- Identification and illustration of all remaining project land, including the location, land use characteristics, size and adjacent land uses
- Identification of feasible uses for remaining project land including justification for the selected use
- Timeframes for implementation of the actions in relation to the identified feasible uses.

Future development would be subject to separate development assessment and approval. The project would not rezone or consolidate remaining project land and therefore there would be no changes to land use zoning for future development.

In addition, remaining project land around the Wattle Street interchange at Haberfield and the St Peters interchange at St Peters would be managed to be consistent with the M4 East and New M5 projects' respective Residual Land Management Plans and UDLPs, including the M4 East Legacy Project (as required by the conditions of approval for the M4 East and New M5 projects). The project would not impact on the implementation of these plans, but may impact the timing in which in the plans are carried out.



#### Figure 12-13 Process for identifying the future use of land not required for operational infrastructure

An indicative summary of the locations of remaining project land at the end of construction is presented in **Table 12-3**.

Plan	Urban design and landscaping	Remaining project land (subject to the Residual Land Management Plan)	
Location	(as outlined in UDLPs)	Retained for future road infrastructure projects	Future separate development and/or use
Wattle Street interchange surface works	As identified in the M4 East Urban Design and Landscape Plan, M4 East Residual Land Management Plan and/or the M4 East Legacy Project	Not applicable at this location	As identified in the M4 East Residual Land Management Plan
Parramatta Road West and East civil and tunnel sites	Not applicable at this location	Not applicable at this location	All land following construction
Darley Road surface works	Adjacent to permanent operational infrastructure	Not applicable at this location	Remaining land not required for permanent operational infrastructure
Rozelle surface works	Adjacent to permanent operational infrastructure Provision of new open	Adjacent to The Crescent at Annandale	Not applicable at this location
	space within the Rozelle Rail Yards		

Table 12-3 Indicative summary	v of land uses	s at the end of	construction
Table 12 e maleatre camma	<i>y</i> ei iaila acce		

Plan	Urban design and landscaping	Remaining project land (subject to the Residual Land Management Plan)	
Iron Cove Link surface works	Adjacent to permanent operational infrastructure South of Victoria Road, between around Springside Street and	Not applicable at this location	Not applicable at this location
	Byrnes Street at Rozelle Adjacent to disturbed areas within King George Park		
Pyrmont Bridge Road tunnel site	Not applicable at this location	Not applicable at this location	All land following construction
St Peters interchange surface works	Adjacent to permanent operational infrastructure Landscaping on the remaining site would be carried out consistent with the New M5 UDLP and conditions of approval	Not applicable at this location	Not applicable at this location

# 12.3.2 Potential impacts on Crown land

Two areas of Crown land would potentially be acquired for the project:

- Land required for the construction of the new bioretention facility and upgrades to the existing car park at King George Park at Rozelle, adjacent to Manning Street. This land is currently being used as an informal car park for users of King George Park
- Land within King George Park adjacent to Victoria Road and Byrnes Street at Rozelle for the widening of Victoria Road. This land consists of turf and a landscaped embankment.

These areas of Crown land are currently under the care and control of Inner West Council and fall within the boundary of the Draft Plan of Management for King George Park. It was further noted that the King George Park Draft Plan of Management referred to two 'incomplete land claims' lodged by Metropolitan Local Aboriginal Land Council. These land claims under the *Aboriginal Land Rights Act 1983* (NSW) do not necessarily denote Aboriginal cultural or scientific archaeological values. Land Councils are not required to establish cultural association with lands when making land claims under the *Aboriginal Land Rights Act 1983* (NSW). One of the two land claims referred to has, since preparation of the Draft Plan of Management, been determined by way of refusal. If necessary, the land to which the undetermined incomplete land claim applies would be avoided.

The acquisition and use of this land for the project would reduce the total area of Crown land available for use as community land within King George Park. However, this loss would be a minor impact as the area to be acquired would be minimal, at the margins of the park and adjacent to existing infrastructure. The project would improve a portion of the car park within King George Park adjacent to Manning Street. This would include sealing of a section of the car park surface and landscaping. This would be a benefit to the users of King George Park.

The permanent loss of an area of King George Park for widening of Victoria Road would be offset through the provision of new open space along Victoria Road between Springside Street and Byrnes Street at Rozelle, which would be connected to King George Park via an upgraded pedestrian and

cyclist connection. The potential land use impacts associated with the use of this land for the project are assessed in **section 12.4.5**.

# 12.3.3 Subsurface acquisition

In addition to the properties affected by surface activities, land (or interests in land, such as easements) below the surface of the ground would be acquired to accommodate the tunnels and entry and exit ramps. This is called subsurface (or substratum) acquisition and is illustrated in **Figure 12-14**.



Figure 12-14 Example of subsurface stratum acquisition

The Land Acquisition (Just Terms Compensation) Act 1991 (NSW) provides that compensation is not payable for the majority of subsurface acquisition of land or easements, unless specific circumstances as detailed in that Act apply. Appendix C of the Roads and Maritime Land Acquisition Information Guide (Roads and Maritime 2014) sets out in detail the compensation provisions of the Act relating to subsurface acquisition and the land acquisition reforms announced by the NSW Government in 2016, which can be viewed online at:

https://www.finance.nsw.gov.au/sites/default/files/NSW\_Government\_Response.pdf

This subsurface acquisition would be a stratum acquisition envelope around the tunnels, including any associated ground support that may be required. The introduction of the subsurface stratum, and the tunnel itself, has the potential to limit development above the alignment in some circumstances. The tunnel depth is generally shallowest at tunnel portals. Tunnel portal locations are described in **Chapter 5** (Project description).

In most cases, subsurface acquisition would not affect the future use of property at the surface. Subject to council regulations and approvals, landowners would generally be able to:

- Carry out improvements, such as installing a swimming pool
- Dig deeper foundations for a new building or second storey additions

• Undertake property development.

Where subsurface acquisition is required, Roads and Maritime would contact owners of directly affected properties at the relevant time. If private property is directly affected, Roads and Maritime has the authority to acquire the subsurface land, under the *Roads Act 1993* (NSW), by a compulsory acquisition process. Subsurface acquisition for the project would be confirmed during detailed design.

# 12.3.4 Ground movement

## Background

Ground movement may occur in some areas along the tunnel alignment induced by tunnel excavation. The ground movement anticipated is predominantly settlement, which is downward (also termed subsidence). Upward movement may also occur and is known as heave.

There are two causes of ground movement, which are:

- Tunnel excavation induced ground movement, which is the movement of the soil and rock into the tunnel excavation. This is a short term effect, which happens as soon as the tunnel is excavated and can cause heave and/or settlement
- Soil consolidation (soil shrinkage), which is the dissipation of water from the soil as the groundwater draws down, such as due to inflow into underlying tunnels. This is a longer term effect, which may take some time to occur and causes settlement only.

Tunnel excavation induced ground movement is anticipated to be the prevalent mechanism causing ground movement given that the proposed tunnels are primarily located within competent bedrock beneath thin residual soils that are not typically compressible or water saturated. In the area around the Rozelle Rail Yards where the tunnels intercept saturated alluvial soils, it is assumed that tanked structures are adopted which limit water ingress into the tunnels.

Areas most likely to be affected by settlement are usually where tunnelling is closest to the ground surface (shallowest), around the tunnel portals and entry and exit ramps, and where soils are more likely to be compressible and thus have more voids which can compress. This would include the estuarine and alluvial soils and fill within the palaeochannel underneath the Rozelle Rail Yards.

Induced ground movement due to the tunnel excavation would occur primarily during the construction phase and would typically be in the form of a settlement trough which develops ahead, above and behind the tunnel excavation face. Generally settlement would be greatest in magnitude directly above the tunnel centreline, reducing with increased distance from both the tunnel sides and ahead of the tunnel face. The ground settlement profile generated is typically concave in shape and termed a settlement trough as shown in **Figure 12-15**.

The shape, width and magnitude of the tunnel excavation induced settlement trough is dependent on a number of factors including:

- The depth and size (span) of the tunnel
- The distance between tunnels where multiple tunnels are proposed
- The geotechnical conditions, particularly the stiffness of the rock mass
- The excavation methodology, sequence and allowable advance before the installation of tunnel support
- The tunnel support design and actual performance.

The ground movement associated with a settlement trough can be both vertical and horizontal. Building damage associated with settlement can occur where the building is subjected to tensile strains. Tensile strain can depend on where the building is located with respect to the settlement curve and the shape of the curve itself.

The manner in which a building or structure responds to ground movement also depends on its size, design, materials, foundations and age. For instance a timber or steel framed structure may be flexible, deflecting as the ground moves whereas a masonry building if subject to similar ground
movement may behave differently. Other relevant factors may include the overall height (number of storeys) of the building and whether the building has basement levels.



#### Figure 12-15 Typical settlement profile

Source Technical Manual for Design and Construction of Road Tunnels - Civil Elements

Note - CL in Figure 12-15 refers to centre line

#### **Relevant criteria**

Settlement criteria have been specified in the conditions of approval for recent tunnelling projects in Sydney including the WestConnex M4 East and New M5 projects and the NorthConnex project. These criteria are summarised in **Table 12-4** and it is expected that they would be adopted for this project. The additional criterion of tensile strain is included, which addresses the cause of potential building damage.

Table	12-4	Settlement	criteria
-------	------	------------	----------

Beneath structure/facility	Maximum settlement	Maximum angular distortion	Limiting tensile strain (per cent)
Buildings – Low or non-sensitive properties (ie less than or equal to two levels and carparks)	30 mm	1 in 350	0.1
Buildings – High or sensitive properties (ie greater than or equal to 3 levels and carparks)	20 mm	1 in 500	0.1

Beneath structure/facility	Maximum settlement	Maximum angular distortion	Limiting tensile strain (per cent)
Roads and parking areas	40 mm	1 in 250	N/A
Parks	50 mm	1 in 250	N/A

Settlement criteria for individual utilities and infrastructure are determined in consultation with the relevant authorities prior to the commencement of any construction potentially affecting the individual utilities or infrastructure.

#### Existing environment

A description of the geotechnical conditions within the project footprint is included in **Chapter 15** (Soil and water quality) and **Chapter 19** (Groundwater). Geological long-sections of the mainline tunnels, the Rozelle interchange and the Iron Cove Link are included in **Appendix E** (Geological long-sections).

The project footprint is located within the Sydney Basin and is predominantly underlain by the Triassic rock formations, Ashfield Shale and Hawkesbury Sandstone which outcrop in topographically higher areas. In lower lying areas such as around Rozelle Bay, White Bay, Hawthorne Canal and Johnstons Creek the bedrock is overlain by fill and alluvium. The thickness of the alluvium is variable and may be up to 20 metres deep within the palaeochannels, such as beneath Rozelle Rail Yards and Hawthorne Canal.

The project footprint is located across established inner urban areas of Sydney. The tunnels are located below:

- Residential, commercial and industrial areas
- Watercourses including Hawthorne Canal, Whites Creek and Johnstons Creek
- Open space areas including Easton Park, Pioneers Memorial Park and O'Dea Reserve
- Major public transport infrastructure including the Inner West Light Rail line, the T2 Inner West and South railway line at Newtown, the T3 Bankstown railway line at St Peters, and the proposed Sydney Metro City and South West line at Newtown
- Major road infrastructure including Parramatta Road, City West Link, Victoria Road, King Street and Princes Highway and a number of other roads
- Major utility infrastructure including the Sydney Water Pressure Tunnel at Newtown and the Sydney Water City Tunnel at Newtown
- Listed heritage items and heritage conservation areas.

#### Refinements of the project design

Geotechnical and groundwater investigations have been carried out to inform the development of the concept design which has been assessed in the EIS and the assessment of potential settlement impacts. These investigations have included:

- Review of regional geology, topography and geotechnical information contained in historic investigations
- Geotechnical investigations carried out for the project including drilling boreholes, testing of soils and rock samples and televiewer imaging of rock stratigraphy within boreholes
- Installation of groundwater monitoring wells and regular measurement of groundwater levels and monitoring of groundwater quality to characterise the groundwater conditions.

As a result of these investigations, a number of refinements to the project design have been made to minimise potential ground movement and groundwater impacts. These include (but are not limited to):

• Altering the horizontal and vertical alignment of the tunnels so that they are located in competent bedrock and dive beneath the palaeochannels where feasible. Examples of where this has occurred include:

- The tunnels diving beneath the palaeochannels in the vicinity of Hawthorne Canal and Johnstons Creek to intercept competent bedrock (Hawkesbury Sandstone)
- Redesigning the Rozelle interchange so that it is predominantly located underground and in the competent bedrock (Hawkesbury Sandstone) located to the north and north west of the Rozelle Rail Yards
- Designing a range of different tunnel and tunnel portal cross sections having regard to the various ground conditions likely to be encountered. The indicative tunnel and tunnel portal cross sections are shown in **Chapter 5** (Project description)
- Reducing the extent of tunnelling within the estuarine and alluvial soils and fill, such as the within the palaeochannel underneath the Rozelle Rail Yards
- Designing some localised sections of tunnel to be tanked to avoid groundwater ingress where the alignment intercepts alluvial soils and poor quality rock around the Rozelle Rail Yards. The localised sections of tunnel which are assumed to be tanked to avoid groundwater ingress are shown in **Appendix T** (Technical working paper: Groundwater)
- Providing excavation support (retention systems), which act as barriers to groundwater ingress, in areas of fill, soft clay or water saturated soils. Options for retention systems include sheet pile walls, diaphragm walls and secant pile walls. Excavation support has been assumed for construction of cut and cover sections of tunnels within the estuarine and alluvial soils and fill at the Rozelle Rail Yards as shown in **Appendix T** (Technical working paper: Groundwater).

#### Potential impacts on buildings and open space

For the majority of the proposed alignment the tunnels are located at depths of greater than 35 metres below ground level and in competent bedrock. As a result the risk of ground movement is limited. However, at a number of locations where the tunnels are rising to meet the surface roads the tunnelling is shallower at depths of less than 20 metres below ground level. These shallower areas of tunnelling are generally located in the vicinity of:

- The entry and exit ramps to and from the Wattle Street interchange at Haberfield
- The three sets of tunnel portals for the Rozelle interchange at Rozelle and Lilyfield
- The tunnel portals for the Iron Cove Link at Rozelle
- The entry and exit ramps to and from the St Peters interchange.

A preliminary assessment has been carried out to assess the potential for ground movement and angular distortion as a result of the project. The method adopted to predict ground movement is the volume loss approach as described by Mair, Taylor and Burland 1996. The results of this preliminary assessment are presented as ground movement contours and angular distortion contours and are shown in **Figure 12-16** to **Figure 12-30**.

#### Ground movement

The preliminary assessment shows that over the majority of the tunnel alignment predicted ground movement is less than 20 millimetres which would be consistent with the criteria. There are a number of discrete areas to the north and northwest of the Rozelle Rail Yards, to the north of Campbell Road at St Peters and in the vicinity of Lord Street in Newtown where ground movement above 20 millimetres is predicted. These discrete areas generally coincide with areas of shallower tunnelling and/or where multiple tunnels are located close to each other. They include:

- To the north of Lilyfield Road at Rozelle in the vicinity of Denison Street in an established residential area and Easton Park (open space area) where multiple tunnels are located and settlement in the range 20 to 35 millimetres is predicted
- To the south of Balmain Road at Leichhardt in the vicinity of Cook Street in an established residential area where multiple tunnels are located and settlement in the range 20 to 30 millimetres is predicted.
- To the north of Lilyfield Road at Rozelle in the vicinity of the City West Link to New M5 entry and exit ramps in an established residential area where settlement in the range 20 to 30 millimetres is predicted

- To the north of Campbell Road at St Peters in an established residential area where settlement in the range 20 to 50 millimetres is predicted
- In the area of Lord Street at Newtown in an established residential area close to St Peters railway station where settlement in the range 20 to 35 millimetres is predicted.

For low buildings of two storeys in height or less a settlement criterion of 30 millimetres is applicable. For high buildings of three storeys or more a settlement criterion of 20 millimetres is applicable. For roads a settlement criterion of 40 millimetres is applicable and for open space areas a settlement criterion of 50 millimetres is applicable.

A range of options are available to minimise settlement in areas where ground movement in excess of the relevant settlement limits are predicted. These are discussed below and in **section 12.5**.

There is also an area within Rozelle Rail Yards to the south of Lilyfield in the vicinity of the proposed M4 East/Iron Cove Link to Anzac Bridge entry and exit ramps where settlement of up to 40 millimetres is predicted. This area is located within the project footprint. Engineering design measures would be developed during detailed design for the project infrastructure that would be located in this area of the Rozelle Rail Yards site to address potential settlement impacts.

#### Angular distortion

Preliminary assessment of angular distortion has not identified any areas within the project footprint where the angular distortion is steeper than one in 500. The areas with the highest predicted angular distortion occur in the vicinity of the Wattle Street interchange ramps at Haberfield and the St Peters interchange ramps within Campbell Road at St Peters but in both locations the relevant criteria would be met.

#### Groundwater drawdown and cumulative impacts

The preliminary assessment does not include prediction of settlement as a result of groundwater drawdown (consolidation settlement). In contrast to predicting tunnel excavation-induced ground movement, which has a well-documented and accepted methodology, prediction of consolidation settlement relies on the prediction of induced groundwater drawdown, which is complex and subject to significant uncertainties.

Settlement that occurs due to groundwater drawdown is gradual and generally occurs at a slower rate (possibly over years). It can sometimes also be difficult to distinguish from settlement due to groundwater drawdown that may be naturally occurring; or occurring due to another influence; or occurring as a result of seasonal variations which can cause swelling or shrinkage of the soil. The extent of groundwater drawdown often occurs over a wider area beyond the location of the tunnels and results in a wider and shallower settlement trough which is less likely to result in tensile strain on buildings and building damage.

Cumulative settlement impacts include the combined impacts of settlement from tunnel excavation induced ground movement and groundwater drawdown. Tunnel excavation induced ground movement is anticipated to be the prevalent mechanism causing ground movement given that the proposed tunnels are primarily located within competent bedrock (Hawkesbury Sandstone and Ashfield Shale). Residual soil profiles developed on the weathered sandstone and shale bedrock are typically relatively thin, stiff and of low compressibility and as such would be less susceptible to ground settlement.

The risks associated with groundwater drawdown and induced settlement within the Ashfield Shale and Hawkesbury Sandstone is considered low because of the geotechnical properties of the rock. As water is removed from these rock types the structural integrity and strength of the rock remains due to its competent nature. As a result, cumulative settlement impacts are not anticipated to be an issue for tunnels excavated in the Hawkesbury Sandstone or Ashfield Shale.

In contrast, as groundwater drawdown occurs within the alluvium the structural integrity of the unconsolidated sediment is compromised resulting in more settlement than would be expected from the sandstone and shale. Cumulative settlement impacts in the alluvium would be minimised by including tanked tunnel sections through the alluvium or by aligning the tunnels beneath the palaeochannels thereby minimising groundwater leakage.

#### Detailed design phase

Further assessment including hydrogeological modelling would be undertaken during detailed design to determine the level of predicted settlement impacts. A range of options are available to minimise settlement in areas where ground movement in excess of the relevant settlement limits are predicted including:

- Review of the proposed tunnel design including:
  - The depth and alignment of tunnels
  - The proximity of multiple tunnels to each other
  - The proposed tunnel support system
  - The tunnel lining to manage groundwater inflows
- Rationalising the layout of the proposed ventilation tunnels particularly at the Rozelle interchange
- Review of the construction methodology such as the rate of tunnel advance and the tunnel support
- Consideration of ground improvement options.

It is anticipated that a combination of the abovementioned options would be sufficient to ensure that ground movement associated with the project is less than the relevant settlement criteria.







Figure 12-18 Preliminary settlement analysis (settlement contours) - Map 3





Mainline tunnel

Rozelle interchange tunnel Temporary access tunnel

Figure 12-20 Preliminary settlement analysis (settlement contours) - Map 5



Existing features M4-M5 Link tunnels Ancillary facility

--- Railway 

Mainline tunnel 

Underground substation

Railway station





Figure 12-23 Preliminary settlement analysis (settlement contours) - Map 8





--- Light rail

Light rail stop Remaining project land Land subject to UDLP

Figure 12-25 Preliminary settlement analysis (angular distortion contours) - Map 2



Figure 12-26 Preliminary settlement analysis (angular distortion contours) - Map 3





#### M4-M5 Link tunnels M4-M5 Link surface works

Mainline tunnel Remaining project land





Figure 12-30 Preliminary settlement analysis (angular distortion contours) - Map 7

#### Potential impacts on infrastructure

#### Sydney Water Tunnels

The mainline tunnels alignment crosses key Sydney Water utility services including the Pressure Tunnel and the City Tunnel. These tunnels supply water to residents of Sydney's eastern and southern suburbs and run from Potts Hill to Waterloo. The Pressure Tunnel is listed on the State Heritage Register and on Sydney Water's Heritage and Conservation Register under section 170 of the *Heritage Act 1977* (NSW) and is of State heritage significance. The City Tunnel is listed on the Sydney Water's Heritage and Conservation Register and is of local heritage significance.

The Pressure Tunnel was constructed circa 1930 and is described as having an excavated diameter of 3,800 millimetres and an internal steel lining of 2,480 millimetres diameter and is located at an approximate invert level of Reduced Level (RL) -35 metres Australian Height Datum (AHD). The M4-M5 Link mainline tunnel alignment passes above the Sydney Water Pressure Tunnel in the vicinity of Enmore Road and King Street at Newtown. This interface is shown in **Figure 12-31**. In this location, the base of the M4-M5 Link mainline tunnels are located about 12 metres above the obvert level for the Pressure Tunnel. The closest construction/access shaft for the Pressure Tunnel (shaft 14) is around 45 metres from the M4-M5 Link mainline tunnels.

The City Tunnel was constructed circa 1960 and is described as having an excavated diameter of 3,000 millimetres with cement lined steel pipe of 2,100 millimetres diameter and is located at an approximate invert level of RL-15 metres AHD. The M4-M5 Link mainline tunnel alignment passes below the Sydney Water City Tunnel in the vicinity of Princes Highway and Alice Street in Newtown. This interface is shown in **Figure 12-31**. In this location, the top of the M4-M5 Link mainline tunnels are located about 11 metres below the invert level for the City Tunnel.

In the unlikely event that settlement was to impact on a section of either of these water tunnels then this could result in water leaking through tunnel seals or joints and travelling through the geological profile to reach the surface, in turn impacting on property, buildings and infrastructure. Alternatively the leaking water could travel through the geological profile to intercept the motorway tunnels resulting in additional water inflows to the tunnels. Water leaks could result in a range of potential impacts including:

- Impact on customer service due to reduced water pressure
- Physical damage to property, buildings and infrastructure
- Physical damage to motorway tunnels
- Long delays to complete the necessary repairs to the water tunnels impacting on customer service
- Costs to repair the water tunnels and any properties, buildings and infrastructure impacted.

Due to the clearance achieved by the M4-M5 Link alignment relative to the Sydney Water tunnels, and the geological conditions in the areas where these cross over points occur, it is expected the Sydney Water assets would not be adversely impacted. Preliminary settlement assessments have predicted that both of the Sydney Water tunnels would experience minimal movement:

- Around two to five millimetres (upward heave) and maximum angular distortion of one in 3,000 for the Pressure Tunnel
- Around 10 to 16 millimetres (settlement) and maximum angular distortion of one in 2,000 for the City Tunnel.

The assessment was based on assumptions about the strength and stiffness of the water tunnels given that limited information about the design and condition of these assets was available.

Detailed surveys should be undertaken to verify the levels and condition of these Sydney Water assets. A detailed assessment would be carried out in consultation with Sydney Water to demonstrate that construction of the M4-M5 Link tunnels would have negligible adverse settlement or vibration impacts on these tunnels. A settlement monitoring program would also be implemented during construction to validate or reassess the predictions should it be required.

#### Sydney Metro City and Southwest rail tunnels

The M4-M5 Link mainline tunnel alignment passes beneath the approved Sydney Metro City and Southwest rail tunnels in the vicinity of Lord Street at Newtown. This interface is shown in **Figure 12-32**.

At this location it is understood that the Sydney Metro tunnels are located at a depth of around 20 metres below existing ground level. The Sydney Metro tunnels will be excavated by Tunnel Boring Machine and the two tunnels will each have a diameter of seven metres and a 13.9 metre centre to centre spacing. An eight metre exclusion zone applies around the proposed Sydney Metro tunnels (above, below and to each side of the tunnels). It is understood that the Sydney Metro tunnels are likely to be constructed prior to the M4-M5 Link tunnels although it is likely that they would not be in operation by the time the M4-M5 Link tunnel excavation was complete.

In this location, the M4-M5 Link tunnels (the mainline tunnels connecting to the New M5 and the ramp tunnels connecting to St Peters interchange) are at a depth varying between around 35 and 45 metres below ground level. On this basis, it is considered that there is adequate separation distance provided between the M4-M5 Link mainline tunnels and the Sydney Metro tunnels and the eight metre exclusion zone would not be impacted.

In the unlikely event that settlement was to impact on the Sydney Metro tunnels, it could result in structural damage to the tunnel linings potentially leading to delays in the construction program, costs to repair the damage and impacts on commuters if the opening of rail services is delayed. The preliminary assessment has predicted that construction of the M4-M5 Link mainline tunnels would cause maximum settlement of about 10 millimetres and maximum angular distortion of 1:1,700 to the Sydney Metro tunnels. It is not expected that this magnitude of settlement would adversely impact on the Sydney Metro tunnels.

During detailed design, an assessment would be carried out in consultation with Transport for NSW to establish appropriate technical criteria in relation to settlement and vibration and demonstrate that construction of the M4-M5 Link tunnels would have no adverse impacts on the Sydney Metro tunnels. A settlement monitoring program would also be implemented during construction to validate or reassess the predictions should it be required.

#### Inner West Light Rail line

The Inner West Light Rail line is a 12.7 kilometre route connecting Central Station and Dulwich Hill via 23 light rail stops, including stops at Rozelle Bay and Lilyfield in the vicinity of the proposed Rozelle interchange. The light rail line transports more than 9.7 million customers each year. It is assumed that the maximum speed on the light rail line is between 40 and 60 kilometres per hour.

The proposed M4-M5 Link tunnels cross below the existing light rail line in two locations in the vicinity of City West Link and Lilyfield Station. At the eastern location the preliminary assessment shows predicted settlement in the range five millimetres to 10 millimetres. At the western location the predicted settlement is in the range 10 millimetres to 15 millimetres and the angular distortion is greater than one in 2,000 (vertical to horizontal (V:H)).

The tunnels also cross below the CSELR maintenance depot which is currently being constructed in the area between the light rail line and Lilyfield Road. It is understood that the maintenance depot will commence operation in 2019. In this location, the predicted settlement is in the range of five to 10 millimetres and the angular distortion is in the range one in 1,500 to one in 2,000 (H:V). The assessment indicates that with appropriate engineering support in place, ground movement is not likely to be a significant issue for the light rail line or the maintenance depot in this area.

In the unlikely event that settlement was to impact on a section of the light rail line this could lead to safety issues for vehicles using the impacted section of track and short term closures of the line to allow for the necessary repairs. This in turn would potentially impact on the level of service for commuters. There would also be additional costs to repair any impacted section of track.

Discussions would be undertaken with RailCorp to establish appropriate technical criteria in relation to settlement and vibration and to determine the requirements for monitoring. A settlement monitoring program would also be implemented during construction to validate or reassess the predictions should it be required.



# SYDNEY WATER PRESSURE TUNNEL

## 41m Sydney Water City Tunnel

SYDNEY WATER CITY TUNNEL

Figure 12-31 Interface with Sydney Water Pressure Tunnel and Sydney Water City Tunnel

#### Sydney Metro West rail tunnels

Sydney Metro West would provide a direct connection between the CBDs of Parramatta and Sydney and would work with the existing T1 Western Line, effectively doubling rail capacity from Parramatta to the CBD. It is understood that the final number of stations and the alignment of the line will be finalised through community and industry consultation. Four key precincts to be serviced have been identified including Parramatta, Sydney Olympic Park, The Bays Precinct and Sydney CBD. The project is expected to be built largely underground and be operational in the second half of the 2020s.

Insufficient public information is available at this time regarding the alignment of the proposed Sydney West Metro rail tunnels to determine whether there is a direct interface with the M4-M5 Link project. Consultation will be undertaken with Transport for NSW regarding the potential interface of the two projects as the preliminary design for the Sydney West Metro project is developed and, if required, adjustments to horizontal and vertical alignments of the tunnels can be made during the detailed design phase.

#### Utilities

Utility services in areas within the M4-M5 Link project footprint, particularly where works are proposed close to the surface, should be managed to prevent adverse impacts. The Utilities Management Strategy (**Appendix F**) identifies the significant utility services within the project footprint that would either be:

- Avoided
- Retained and protected (if required)
- Relocated
- Removed.

Where necessary, consultation would occur with the relevant utility service provider regarding the utility works which are proposed. This would include establishing appropriate settlement and vibration criteria, carrying out further assessments of potential impacts and monitoring of impacts if required.

#### Interface agreements

Interface agreements would be agreed with the owners of infrastructure and utility services likely to be impacted by construction of the project. These agreements may typically include: establishing appropriate settlement and vibration criteria; carrying out further detailed assessments of potential impacts; and monitoring of settlement and vibration impacts if required.

#### Management of potential impacts

Prior to and during construction a range of management measures would be implemented to ensure that ground movement impacts are managed including:

- Ground settlement will be managed to comply with the accepted settlement, angular distortion and limiting tensile strain criteria
- Development of detailed predictive settlement models to guide tunnel design and construction methodology, including the selection of options to minimise settlement where required
- Preparation of building condition surveys for properties within the zone of influence of tunnel settlement (50 metres from the outer edge of the tunnels and within 50 metres of surface works)
- Preparation and implementation of a Settlement Monitoring Plan
- Where construction of the project is deemed the cause of cracking or property damage, the damage would be repaired at no cost to the owner
- An Independent Property Impact Assessment Panel, comprising of geotechnical and engineering experts, will be established prior to the commencement of works to independently verify building condition survey reports, resolve any property damage disputes and establish ongoing settlement monitoring requirements

• Preparation of agreements with utility owners and infrastructure owners identifying acceptable limits of settlement, settlement monitoring and actions in the event that settlement limits are exceeded.

These management measures are discussed further in **section 12.5**. Similar management measures have been successfully implemented to manage potential settlement impacts on a number of recent road and rail tunnelling projects in the Sydney metropolitan region.

Further details regarding ground borne noise and vibration including anticipated damage categories for reference buildings are provided in **Chapter 10** (Noise and vibration). Further details regarding predicted groundwater drawdown and associated settlement impacts are provided in **Chapter 19** (Groundwater). Further details regarding potential impacts of the project on utilities are provided in **Appendix F** (Utilities Management Strategy).



Figure 12-32 Interface with Sydney Metro City and Southwest Tunnels

#### 12.4 Potential impacts – land use

Land use changes as a result of the project would occur largely in response to the introduction of new construction and/or transport infrastructure at Haberfield, Ashfield, Leichhardt, Lilyfield, Rozelle, Annandale and St Peters. The project would not impact on land subject to development applications.

The following sections summarise the potential implication of the proposed transport infrastructure, landscaping, construction ancillary facilities and construction activities on existing land uses, land use zonings and the development potential of land. This section also describes potential impacts on water users and land use impacts associated with utility works. An overshadowing assessment of permanent buildings and structures which have the potential to result in overshadowing on neighbouring residential properties is also included in this section. Shadow diagrams indicating the extent of overshadowing on properties that is currently expected as a result of permanent operational infrastructure are provided in **Appendix M** (Shadow diagrams and overshadowing).

Potential indirect impacts as a result of changes to land use would predominantly relate to social and economic values. **Chapter 14** (Social and economic) and **Appendix P** (Technical working paper: Social and economic) provide details relating to these potential impacts. In addition, potential settlement impacts are discussed in this section and in **Chapter 10** (Noise and vibration) and **Chapter 19** (Groundwater).

#### 12.4.1 Wattle Street interchange surface works

#### **Direct land use impacts**

The Wattle Street interchange surface works would be temporary and carried out within the existing road reserve (Wattle Street) or on land being used as construction ancillary facilities for the M4 East project. These construction works would be consistent with the current and future use of the land as transport infrastructure, and would not adversely impact on land use or development potential. However, the use of this land for construction would extend the total period of time to which adjacent land users may be subject to potential impacts. Cumulative impacts, including impacts relating to extended construction durations are anticipated to be primarily related to issues of amenity such as construction noise and dust, access and changes to the road network and associated socio-economic impacts. These are assessed in **Chapter 26** (Cumulative impacts).

At the conclusion of construction, the site would be used for transport infrastructure (Wattle Street interchange). Remaining land on the site not used for transport infrastructure would be rehabilitated and landscaped consistently with the M4 East Residual Land Management Plan, the M4 East UDLP and/or the M4 East Legacy Project. These plans are being prepared and implemented as part of the M4 East project, in accordance with the relevant conditions of approval.

### 12.4.2 Parramatta Road West civil and tunnel site (C1b) and the Parramatta Road East civil site (C3b)

#### Direct impacts on existing land use

The use of this land during construction as construction ancillary facilities would change the land use temporarily from commercial to construction infrastructure. This would temporarily increase the total amount of land being used for construction in this area, as land south of Bland Street at Ashfield is also being used to support construction of the M4 East project until 2019.

The use of this site during construction would temporarily remove the potential for redevelopment of the site for commercial purposes (that may otherwise have been possible given its B6 Enterprise Corridor land use zoning) which, coupled with the use of land for construction of the M4 East project adjacent and to the south of Bland Street, would have a moderate impact on local land use. However, given the length of the Parramatta Road corridor and the number of similar potential commercial redevelopment sites, the project would have a minor, temporary impact on regional land use.

Following construction, the site would be rehabilitated to generally the existing ground level or as otherwise agreed with Roads and Maritime. Future development would be determined by Roads and Maritime, and would be subject to separate development assessment and approval and the restrictions of the relevant consent authority. The project would not rezone or consolidate remaining project land and therefore there would be no permanent changes to land use zoning for future

development. Further details on the potential development and/or use of remaining project land at this location would be outlined in the Residual Land Management Plan that would be prepared for the project.

Land uses of adjoining properties would not be directly impacted by the use of this land during construction. Potential indirect amenity impacts during construction to adjoining land uses are assessed separately including in **Chapter 8** (Traffic and transport), **Chapter 9** (Air quality), **Chapter 10** (Noise and vibration) and **Chapter 14** (Social and economic).

#### Land use/transport integration and opportunities

As the site is directly adjacent to Parramatta Road, there is potential for the construction of the project to have a short term impact on the realisation of projects that are associated with the *Parramatta Road Corridor Urban Transformation Strategy* (UrbanGrowth NSW 2016). However, given the temporary nature of the construction works, it is not anticipated this would have a long term or significant impact on future development potential of the site. When considering potential reuse opportunities for this land, Roads and Maritime would have regard to the objectives of the *Parramatta Road Corridor Urban Transformation Strategy*.

The project would act as a catalyst for the proposed urban transformation along Parramatta Road through a forecast reduction in traffic east of the M4 East entry and exit ramps (as detailed in **Chapter 3** (Strategic context and project need)).

#### 12.4.3 Darley Road surface works

#### Direct impacts on existing land use

The introduction of a construction ancillary facility at this location would result in a temporary change in land use from commercial to construction infrastructure.

A permanent change in land use would also occur at this location following the completion of construction, with around 0.2 hectares of the site to be used for the Darley Road motorway operations complex (MOC1), with the remainder likely to become remaining project land and therefore be subject to the Residual Land Management Plan that would be prepared for the project. The change in land use related to the use of a portion of the site for operational infrastructure would be inconsistent with the current land use zoning (B2 Local Centre under the Leichhardt LEP 2013). However, this change would be generally consistent and compatible with the land use in the immediate vicinity of the proposed motorway operations complex (transport infrastructure including the Inner West Light Rail line and associated Leichhardt North light rail stop). This change in land use would have a minor to moderate local impact on land use. However, the broader area contains a number of similar commercial premises and this change is therefore considered to be a minor regional impact on land use.

The indicative siting of operational project infrastructure (as shown in **Chapter 5** (Project description)) has been developed in consideration of maximising areas of land that would be available for potential future development (remaining project land). This has primarily been achieved by optimising the design to co-locate facilities, therefore reducing land-take. The siting of the operational project infrastructure at the western end of the site also allows for the remaining project land component to be located nearest to the Leichhardt North light rail stop. Future development would be determined by Roads and Maritime, and would be subject to separate development assessment and approval and the restrictions of the relevant consent authority. The project would not rezone or consolidate remaining project land and therefore there would be no permanent changes to land use zoning for future development. Further details on the potential development and/or use of remaining project land at this location would be outlined in the Residual Land Management Plan that would be prepared for the project.

#### 12.4.4 Rozelle surface works

To assess land use impacts at Lilyfield and Rozelle, the Rozelle surface works have been broken down into three areas:

Rozelle Rail Yards

- The Crescent and Whites Creek
- Victoria Road and Anzac Bridge approaches.

#### **Rozelle Rail Yards**

#### Direct impacts on existing land use

Construction activities in the Rozelle Rail Yards, including the establishment of a construction ancillary facility would result in a temporary change in land use from redundant industrial and transport infrastructure to construction infrastructure. This change in land use would be lessened due to the site management that would be carried out within the Rozelle Rail Yards in accordance with a separate environmental assessment and approval. A description of these site management works is provided in **Chapter 2** (Assessment process). This change in land use during construction would have a negligible impact on local and regional land use as the majority of the site is currently inaccessible and disused. The construction works along City West Link would not change the existing land use and would therefore have a negligible land use impact.

The urban design and landscaping concept for the Rozelle Rail Yards is described in **Chapter 5** (Project description) and shown in **Appendix L** (Technical working paper: Urban design). The siting of operational project infrastructure such as the ventilation facilities and tunnel portals and entry and exit ramps has been developed in consideration of maximising areas of land that would be available for future landscaping and/or provision of community and social infrastructure. This has included consideration of reservation of adequate space between operational elements of the project to enable separate future delivery of sporting fields and associated elements such as amenities blocks and car parking.

The concept plan for the urban design and landscaping outcome at the Rozelle Rail Yards would be further refined during detailed design and would have regard to identifying opportunities to deliver outcomes that support and connect existing neighbourhoods, complement and stimulate local economies and provide opportunities for growth across existing and future local industries along and around Victoria Road at Rozelle. This could include provision of community and social infrastructure such as sporting fields and other active recreational facilities, and would be determined through consultation with relevant stakeholders and the community. The process for finalising the urban design and landscaping outcome would be detailed in the UDLP that would be prepared for the project.

The Rozelle surface works would be undertaken within the Interim Metro Corridor (see **section 12.2.2**) at the Rozelle Rail Yards. This area was designated for the Rozelle stabling and maintenance depot as part of the CBD Metro project The provision of operational project infrastructure as well as land that would be available for future landscaping and/or provision of community and social infrastructure as part of the M4–M5 Link would conflict with the proposed use of this land for the CBD Metro project. Consultation will be undertaken with Transport for NSW regarding the potential interface of the two projects.

#### Land use/transport integration and opportunities

The Bays Precinct Transformation Plan identifies the Rozelle Rail Yards as providing an opportunity for mixed housing as well as public spaces and employment uses. The Bays Precinct Transformation Plan also identifies the potential for opportunities provided by the redevelopment of the Rozelle Rail Yards for integration and connection of communities to the north and south through the creation of public open space and improved connections between Lilyfield and the waterfront.

The NSW Government announced in July 2016 that the project would deliver up to 10 hectares of new open space/parkland and active transport links for the community. Further information on the provision of active transport links and open space is provided in **Chapter 5** (Project description).

While the project is consistent with The Bays Precinct Transformation Plan vision for the creation of new open spaces, provision of new pedestrian and cyclist links, and the acknowledgment of the rail heritage of the area, it is inconsistent with the Plan with respect to the development of the Rozelle Rail Yards for mixed housing. Should the project not proceed, the Rozelle Rail Yards would likely be developed in accordance with The Bays Precinct Transformation Plan, including the provision of public spaces, employment uses and mixed housing.

#### The Crescent and Whites Creek

#### Direct impacts on existing land use

The construction site adjacent to The Crescent (The Crescent civil site (C6)) is temporary and would only be required during construction. There would therefore be no permanent change to land use at this location. Following construction, the site's current land use would be retained through rehabilitation of the site to its pre-construction state (and function). Impacts on surrounding land uses would be negligible. Access to the businesses that use the Sydney Multihull Central Marina and associated parking would be protected and maintained during construction. Potential indirect amenity impacts during construction to adjoining land uses are assessed separately including in **Chapter 8** (Traffic and transport), **Chapter 9** (Air quality), **Chapter 10** (Noise and vibration) and **Chapter 14** (Social and economic).

Buruwan Park, which extends between The Crescent and Bayview Crescent/Railway Parade at Annandale, would be permanently acquired for use for road infrastructure, primarily to accommodate the realignment of The Crescent. This would be a direct loss of around 0.3 hectares of public open space at Annandale and would therefore impact directly on recreational users of this area. This change in land use from recreational land to infrastructure would have a moderate to high local impact on land use. Buruwan Park acts as a passive recreational for the community, and a pedestrian walkway that connects Bayview Crescent and The Crescent with the Rozelle Bay light rail stop. However, the provision of new open space within the Rozelle Rail Yards and new pedestrian and cyclist bridges and paths to provide connectivity is considered to be a beneficial outcome for the community, and the loss of Buruwan Park is therefore minor in the regional context.

As described in **Chapter 6** (Construction work) and **Chapter 8** (Traffic and transport), equivalent access would be provided during construction prior to the closure and removal of Buruwan Park. Under the permanent design, connectivity between Bayview Crescent, The Crescent and the Rozelle Rail Yards would be improved through the provision of a pedestrian and cyclist bridge that would span The Crescent and City West, including new pedestrian connections to the Rozelle Bay light rail stop. This new pedestrian and cyclist bridge is described in **Chapter 5** (Project description).

#### Land use/transport integration and opportunities

The design of new pedestrian and cyclist connections over City West Link linking the Rozelle Rail Yards with Whites Creek/Railway Parade and The Crescent at Annandale would support the realisation of The Bays Precinct Transformation Plan and provide for improved connectivity to the Rozelle Bay light rail stop. The realignment of The Crescent would also enable potential future development of waterfront land between The Crescent and Rozelle Bay by creating a larger contiguous land parcel than the relatively narrow area that is currently available. Potential future development of this land does not form part of the project and would be subject to separate planning processes by others.

#### Victoria Road and Anzac Bridge approaches

#### Direct impacts on existing land use

The Victoria Road civil site (C7) and reconstruction of Victoria Road would result in the loss of commercial and residential premises located on the western side of Victoria Road and the potential future redevelopment of this land for commercial and local centre uses in accordance with the land zoning.

This change in land use from commercial to transport infrastructure would have a moderate impact on local land use. However, the broader area surrounding the site on Victoria Road contains commercial uses and proportionately the loss of these commercial premises is minor in a regional context. Remaining project land at the site would be subject to landscaping in accordance with the UDLP to be prepared for the project.

Widening of Victoria Road on the approach to and from Anzac Bridge would extend into the White Bay Power Station Destination as identified in The Bays Precinct Transformation Plan. This would have a minor land use impact on the potential future development of this land for commercial and residential purposes.

#### Land use/transport integration and opportunities

The design of the new bridge at the Victoria Road/The Crescent intersection has included reservation of space below the bridge for an active transport connection between Anzac Bridge and the Rozelle Rail Yards. This connection would also be designed such that a future connection into the White Bay Power Station Destination and broader The Bays Precinct (being developed by UrbanGrowth NSW separate to this project) could be integrated.

The works proposed on the eastern side of the new bridge to connect motorists travelling from the Rozelle interchange to Anzac Bridge have been designed in consideration of proposed future development at the White Bay Power Station site. This has included optimising the design of the permanent operational infrastructure (including roads, active transport connections and utility works) at this location to minimise encroachment.

#### 12.4.5 Iron Cove Link surface works

To assess land use impacts associated with the Iron Cove Link surface works, the Iron Cove Link surface works have been divided into two areas:

- The area around the Iron Cove Link portals and entry and exit ramps along Victoria Road
- The bioretention facility and car park improvement works within King George Park, adjacent to Manning Street.

#### Iron Cove Link portals and entry and exit ramps along Victoria Road

#### Direct impacts on existing land use

The introduction of a construction ancillary facility at this location (the Iron Cove Link civil site (C8)) would result in a temporary change in land use from commercial to construction infrastructure. This change in land use would temporarily remove the development potential of the site for residential purposes given the land's R1 land use zoning under the Leichhardt LEP 2013.

The predominant change in land use at this site would be from residential and commercial to transport infrastructure and open space and/or community facilities. This change is associated with the acquisition of properties south of Victoria Road to accommodate road widening and the Iron Cove Link motorway operations complex (MOC4), including the Iron Cove Link ventilation facility, and the subsequent provision of urban design and landscaping of land not required for transport infrastructure.

The urban design and landscaping concept for the Iron Cove Link portals and entry and exit ramps along Victoria Road is described in **Chapter 5** (Project description) and shown in **Appendix L** (Technical working paper: Urban design). The siting of operational project infrastructure such as the ventilation facilities and tunnel portals and entry and exit ramps has been developed in consideration of maximising areas of land that would be available for future landscaping and/or provision of community and social infrastructure.

This has included siting the ventilation facility and substation at the eastern perimeter of the area that would be disturbed south of Victoria Road. By doing so, a contiguous parcel, albeit interrupted by Callan, Toelle and Clubb streets, would be provided to enable strong connections between Springside Street, King George Park and Iron Cove Bridge, supported by the provision of an improved active transport connection as part of the project. This approach also enables revitalisation of this section of Victoria Road through delivery of the urban design and landscaping outcome, as well as providing a template for potential future replication by others east along Victoria Road.

The concept plan for the urban design and landscaping outcome around the Iron Cove Link portals and entry and exit ramps along Victoria Road would be further refined during detailed design and would have regard to identifying opportunities to deliver outcomes that support and connect existing neighbourhoods, complement and stimulate local economies and provide opportunities for growth across existing and future local industries along and around Victoria Road at Rozelle. This could include provision of community and social infrastructure such as passive recreational facilities, outdoor gyms and/or infill residential and would be determined through consultation with relevant stakeholders and the community. The process for finalising the urban design and landscaping context around the Iron Cove Link portals and entry and exit ramps along Victoria Road would be detailed in the UDLP that would be prepared for the project.

In addition, a small section of land currently used for public recreation within King George Park (immediately south of the eastern Iron Cove Bridge approach) would be used temporarily during construction. A portion of this land would then be permanently occupied for transport infrastructure purposes (including carriageways and pedestrian and cyclist paths) during operation. The remaining project land not required for operation would be rehabilitated and returned for use for public recreation purposes. This change would have a negligible permanent impact on recreational users as the land that would be occupied is at the periphery of the park and comprised predominantly of landscaping and an embankment. In addition, new landscaped areas to be provided on the southern side of Victoria Road to the east of this location would offset this loss.

The Bay Run connection between King George Park and Iron Cove Bridge would be maintained during construction. Diversions around the construction area within King George Park would be provided, including a temporary connection between King George Park and the shared path on Iron Cove Bridge. Following the completion of construction, the connection between the Bay Run and Victoria Road and Iron Cove Bridge would be reinstated in generally the same arrangement as existing.

#### Bioretention facility and car park improvement works

#### Direct impacts on existing land use

A bioretention facility and carpark improvement works would be constructed within an existing informal car park within King George Park, adjacent to Manning Street at Rozelle. The land is zoned for public recreation uses. This facility would treat stormwater run-off from Victoria Road to the north. The provision of pipes to convey this water is described in further detail in **Appendix F** (Utilities Management Strategy). Public recreation areas adjacent to the site would remain and would not be affected during construction.

The use of part of this land for car parking would be temporarily restricted during construction for a period of around three months. Around half of the car parking spaces would be retained. A detailed car parking strategy would form part of the Construction Traffic and Access Management Plan and would be developed in consultation with local councils and stakeholders associated with public facilities adjacent to project sites. Further, opportunities such as limiting construction at this location to weekdays and carrying out these works during periods when demand for parking at King George Park is lower would be investigated during detailed design.

At the completion of construction, the existing land use (an informal car park) would be reinstated in an enhanced form through the car park improvement works (to formalise the car park) and associated landscaping. The current zoning and use of King George Park for public recreation limits the potential for development of the site for other permissible uses. The potential for construction of the bioretention facility to significantly affect the development potential of the site would therefore be low.

There is potential for the project to temporarily impede upon plans to improve parking availability and amenity at King George Park as identified in the Draft King George Park Plan of Management (Leichhardt Council, 2012). However, the formalisation of around 30 car parking spaces would result in a beneficial land use outcome for this land. The formalisation of the carpark would improve the safety and efficiency of the carpark through the provision of marked crossing locations and delineated parking spots. This would be consistent with the King George Park Draft Plan of Management, which recognises that improvements to the ease of use, safety and capacity of the carpark are required.

#### 12.4.6 Pyrmont Bridge Road surface works

#### Direct impacts on existing land use

The Pyrmont Bridge Road tunnel site (C9) would be located between Parramatta Road and Pyrmont Bridge Road at Annandale on land that is currently used by commercial and industrial businesses. These uses would not be possible during construction, and closure of the existing commercial and industrial premises and demolition of the existing buildings would be required. The use of this site during construction would also temporarily remove the potential for redevelopment of the site for light industrial purposes (that may otherwise have been possible given it is IN2 Light Industrial land use zoning under the Leichhardt LEP 2013). This change would have a moderate permanent impact on land use as it would remove the existing commercial and light industrial uses. However, the wider area contains a number of similar light industrial and commercial premises and this change would have a minor regional impact on land use.

Following construction, the site would be rehabilitated to generally the existing ground level or as otherwise agreed with Roads and Maritime. Future development would be determined by Roads and Maritime, and would be subject to separate development assessment and approval and the restrictions of the relevant consent authority.

The project would not rezone or consolidate remaining project land and therefore there would be no permanent changes to land use zoning for future development. Further details on the potential development and/or use of remaining project land at this location would be outlined in the Residual Land Management Plan that would be prepared for the project.

#### Land use/transport integration and opportunities

As the site is directly adjacent to Parramatta Road, there is potential for the construction of the project to have a short term impact on the realisation of projects that are associated with the *Parramatta Road Corridor Urban Transformation Strategy*. However, given the temporary nature of the construction works, it is not anticipated this would have a long term or significant impact on future development potential of the site. When considering potential reuse opportunities for this land, Roads and Maritime would have regard to the objectives of the *Parramatta Road Corridor Urban Transformation Strategy*.

The project would act as a catalyst for the proposed urban transformation along Parramatta Road by facilitating a forecast reduction in surface road traffic along Parramatta Road, east of the M4 East entry and exit ramps (as detailed in **Chapter 3** (Strategic context and project need)).

#### 12.4.7 St Peters interchange surface works

#### Direct impacts on existing land use

The St Peters interchange is being constructed and delivered by the New M5 project. Integration works to connect the M4-M5 Link with the St Peters interchange and construction of the Campbell Road motorway operations complex would occur on the site. As this area is currently being used for the construction of the New M5 project, the ongoing use of this area for the construction of the project would be consistent with the current land use.

The remainder of the site would be landscaped and converted into public open space following the completion of the M4-M5 Link and the New M5 projects. Urban design and landscaping works would be carried out in accordance with the UDLP and consistent with the New M5 Residual Land Management Plan and the New M5 UDLP.

#### 12.4.8 Access impacts

#### Direct impacts on property access

Access to properties not acquired, leased or otherwise occupied for project purposes would generally be maintained at all times during construction and operation. Where temporary impacts on existing property access are unavoidable as a result of construction activities (eg footpath and pavement works), consultation would be carried out with the landowner and/or tenant to provide equivalent standards of access. Short-term changes to access during construction are described further in **Chapter 6** (Construction work).

Indirect, permanent changes to access resulting from road closures and/or modifications are discussed in the following section. The traffic and transport impacts from these changes are described in **Chapter 8** (Traffic and transport).

#### Indirect impacts on property access

#### Rozelle surface works

The Rozelle interchange would require the permanent closure of Gordon Street south of Lilyfield Road. This bi-directional road is a cul-de-sac at the boundary of the Rozelle Rail Yards and is used to access businesses along this short section of the road. The properties using Gordon Street for access would be acquired for the project and as a result, the closure of this road would not have permanent impacts on access to private property. No other local roads around the Rozelle interchange would be permanently impacted by the project.

#### Iron Cove Link surface works

The project would alter access and connectivity around the Iron Cove Link portals along Victoria Road via the introduction of permanent operational infrastructure and associated upgrades and modifications to the surface road network. Toelle Street and Callan Street would be reopened in the same traffic operational arrangement as existing. Clubb Street would be converted into a permanent cul-de-sac. Residents accessing Clubb Street could use Toelle Street or Callan Street via Manning Street to access from Victoria Road. The Byrnes Street cul de sac would be retained but would be moved a short distance to the southwest.

The closure of Clubb Street would require motorists, who currently use the left-in, left-out intersection with Victoria Road, to use an alternative route to travel between Clubb Street and Victoria Road. This would slightly increase travel times for motorists. However, the creation of a cul-de-sac at the northern terminus of Clubb Street would also provide opportunities for amenity improvements along this street, as through traffic would be reduced. These amenity improvements would be further supported by the integration of pedestrian paths along Clubb Street with the upgraded east–west active transport network that would be provided along Victoria Road.

There would also be permanent impacts on residential and business on-street parking provision. However, most of these parking spaces are adjacent to properties being acquired and so the impact of their loss is reduced. The final numbers would be confirmed during detailed design.

Changes to access and connectivity associated with the Iron Cove Link surface works are further described in **Table 12-5**. Impacts on property access due to changes in the road network are assessed in **Chapter 8** (Traffic and transport) and **Chapter 14** (Social and economic).

Location	Changes to access and connectivity
Byrnes Street	Modification to existing cul-de-sac to suit Victoria Road widening
Clubb Street	Closure at Victoria Road and creation of a cul-de-sac to suit Victoria Road
	widening
Toelle Street	Minor adjustments at intersection with Victoria Road to suit new road alignment
Callan Street	Minor adjustments at intersection with Victoria Road to suit new road alignment
Terry Street	Minor adjustments to the right-hand turn from Victoria Road southern
	(westbound) carriageway into Terry Street
Shared path along	Provision of upgraded shared path to suit new road alignment including
southern	integration with the Bay Run at King George Park
carriageway of	
Victoria Road	
Informal car park	Provision of formalised car park and bioretention facility. Existing access
within King George	arrangements at Manning Street would be maintained
Park, adjacent to	
Manning Street	

Table 12-5 Changes to access and connectivity for the Iron Cove Link surface works

#### Impacts on pedestrian and cyclist access

Temporary changes to pedestrian and cyclist access to facilitate construction of the project would be required. In most cases, footpath access for pedestrians along surface roads where works would be carried out would be maintained on at least one side of the road at all times. Where works would require pedestrians to use an alternative route for a short period of time to ensure the safety of pedestrians and construction workers, these alternate routes would be clearly delineated.

Closure of a section of footpaths on both sides of Northcote Street at Haberfield would be required during construction. This would be a continuation of the current closure of this section of footpaths along Northcote Street to facilitate construction of the M4 East project. Alternative access to Parramatta Road would be provided via Ash Lane and either Wolseley Street or Wattle Street at Haberfield.

The project would also require the removal of two pedestrian and cyclist bridges at Rozelle; the eastwest bridge that spans across Victoria Road near Lilyfield Road, and the north-south bridge that extends across Victoria Road, connecting to the southern side of The Crescent. The shared path along the southern side of Victoria Road between around Springside Street and Byrnes Street at Rozelle would also be closed during construction. These changes to existing pedestrian and cyclist infrastructure would require temporary diversions to be established during construction. These are described and assessed in **Chapter 8** (Traffic and transport) and may result in a minor increase in travel times for pedestrians and cyclists. However, these increases in travel times would be temporary and would ensure pedestrian and cyclist safety is maintained during construction.

The pedestrian and cyclist infrastructure that would be removed at Rozelle would be permanently replaced by:

- A new east–west underpass below Victoria Road that would link Anzac Bridge and the future The Bays Precinct with the Rozelle Rail Yards and Lilyfield Road
- Two new north–south connections that would extend across City West Link, linking the Rozelle Rail Yards with The Crescent and Railway Parade at Annandale.

Together with a network of internal pathways in the Rozelle Rail Yards, the pedestrian and cyclist connections that would be provided around the Rozelle and Iron Cove Link surface works would connect:

- Victoria Road and Anzac Bridge
- The future The Bays Precinct
- Lilyfield Road and Easton Park
- The Inner West Light Rail line Rozelle Bay light rail stop
- Federal Park
- Whites Creek Valley Park
- Bicentennial Park.

A detailed description of the pedestrian and cyclist connections that would be provided at the Rozelle interchange is included in **Appendix N** (Technical working paper: Active transport strategy). Impacts on pedestrian and cyclist access due to changes in the road network during construction and operation are discussed in **Chapter 8** (Traffic and transport) and **Chapter 14** (Social and economic).

#### 12.4.9 Impacts on water users

Potential impacts on water users would be limited to Rozelle Bay in proximity to The Crescent civil site (C6). Works at and around the site would involve the realignment of City West Link, the construction of the culvert below City West Link that would convey flows from the Rozelle Rail Yards to Rozelle Bay, upgrades to the Rozelle Bay outfall and flood mitigation works along Whites Creek between the light rail bridge and Rozelle Bay. These works would be likely to require construction equipment access from Rozelle Bay via barge or boat, and the establishment of coffer dams and/or other devices within the immediate vicinity of these construction areas.

Water users at Rozelle Bay in proximity to this construction ancillary facility include a maintenance barge wharf located immediately adjacent to the east of site, a wharf area (associated with a marine construction business) and the Sydney Superyacht Marina between James Craig Road and Rozelle Bay. Recreational water users may also use Rozelle Bay from time to time. Access to land-based water users including the Sydney Superyacht Marina and maintenance barge wharf would be maintained during the construction and operation of the project. Impacts on water users would be minor and temporary, constrained to the periods of time where barges or boats would need access and to the area of works around the confluence of Whites Creek and Rozelle Bay. These works would likely occur over a period of up to around 24 months, however water craft movements associated with these movements would be minimal. Construction works would be limited to an area of Rozelle Bay not typically used by water users, and minimal boat traffic would be required. The project would therefore have negligible impact on water users.

#### 12.4.10 Utility works

It is likely that utilities and services located within or close to the project footprint, including electricity, gas, telecommunications (including optic fibre cables), and sewer and water mains, would need to be protected, relocated or realigned as part of construction of the project. This is particularly the case around areas of surface or shallow soil disturbance.

A Utilities Management Strategy has been prepared for the project and is included in **Appendix F**. The Utilities Management Strategy provides information in relation to:

- Utility relocations and adjustments which are proposed within the project footprint. These have been assessed as part of the EIS and would be subject to a Utility Relocation Management Plan
- Utility relocations and adjustments which may be required in areas outside of the project footprint. The Utilities Management Strategy provides the framework for how these utility works would be assessed and managed including requirements for stakeholder and community consultation and further environmental assessment.

The utility services which have been considered in the strategy include: communications, gas, electricity, water, sewerage and drainage.

Potential land use and socio-economic impacts as result of the utility works could include:

- Impact on property access (eg driveways), noting that existing property access would be maintained other than for short periods during the works and in consultation with the property owner and/or lessee
- Impact on visibility of existing commercial businesses
- Impact on access to areas of public open space
- Amenity impacts on sensitive land uses such as schools, child care centres and medical facilities
- Amenity impacts on residential land uses adjacent to the work areas
- Temporary disruption to services such as power and water supply during the works
- Generating employment opportunities for workers during the construction phase
- Providing indirect economic benefits for some business during the construction phase.

These impacts can be managed by the proposed management measures identified in the Utilities Management Strategy in **Appendix F**, including preparation of a Communications Plan and providing prior notification to residential, business and other landowners that may be affected.

Potential amenity impacts on surrounding land uses as a result of utility works has been assessed in the relevant parts of this EIS, including **Chapter 8** (Traffic and transport), **Chapter 9** (Air quality, in particular **section 9.6**), **Chapter 10** (Noise and vibration), **Chapter 11** (Human health risk) **Chapter 13** (Urban design and visual amenity) and **Chapter 14** (Social and economic).

The project would also require connection to electricity, water and wastewater/sewer utilities. These connections are also described in detail in **Appendix F** (Utilities Management Strategy). The nature and extent of utility changes would be confirmed during the design development of the project, with appropriate relocation or replacement alternatives identified in accordance with the process identified in the Utilities Management Strategy.
#### 12.4.11 Ground level development

This section describes where in this EIS potential changes in amenity for ground level receptors have been assessed and potential future changes to the nature and scale of development around key project connections over time.

Potential changes in amenity for ground level receptors have been assessed in the relevant parts of this EIS, including **Chapter 8** (Traffic and transport), **Chapter 9** (Air quality, in particular **section 9.6**), **Chapter 10** (Noise and vibration), **Chapter 11** (Human health risk) **Chapter 13** (Urban design and visual amenity) and **Chapter 14** (Social and economic).

In each case, the impacts of the project on local amenity have been demonstrated as manageable within acceptable limits, subject to the application of appropriate mitigation and management measures and this EIS generally. These mitigation and management measures are outlined in each chapter, and summarised in a consolidated form in **Chapter 29** (Summary of environmental management measures).

The ventilation facilities for the project would be located as far from existing residential dwelling as practicable. The locations of these facilities have also been selected to minimise potential impacts (including air quality and visual amenity impacts) to nearby residential receptors and other sensitive receptors, achieve positive urban design outcomes and ensure the efficient operation of these facilities. The operation of the ventilation facilities would not prevent continued use or development of surrounding land in accordance with the existing land use zoning.

The potential air quality impacts and human health impacts associated with the ventilation facilities are discussed **Chapter 9** (Air quality) and **Chapter 11** (Human health risk). Potential visual amenity impacts are discussed in **Chapter 13** (Urban design and visual amenity).

The provision of a new motorway standard connection between Haberfield, Rozelle and St Peters, and the future connection to the proposed future Sydney Gateway and Western Harbour Tunnel and Beaches Link, is likely to change the desirability of residential, commercial and industrial developments, particularly around motorway access points. This improved connectivity may make some areas more desirable for living and working than is currently the case. Changes in desirability are likely to gradually affect the nature and scale of development around key project connection points over time.

#### 12.4.12 Elevated receptor locations

The project has the potential to influence development patterns for existing and future elevated receptor locations (for example, those receptors within multi-storey residential buildings) as a consequence of operation of the project's ventilation outlets. Elevated receptors have the potential to experience higher air quality impacts because emissions from the ventilation outlets have less time to disperse compared to potential impacts at ground level. **Chapter 9** (Air quality) includes an assessment of potential air quality impacts for ground level and elevated receptor locations.

The future development of land (including re-zonings) in the vicinity of the ventilation facilities that may involve multi-storey buildings would need to consider the air dispersion performance of the ventilation facilities. Roads and Maritime would assist local councils or the DP&E in determining any relevant land use considerations applicable to future development for inclusion in LEPs or development control plans, where required. This would include procedures for identifying the width and height of buildings that are likely to be either affected by the plume from the ventilation outlet or affect the dispersion of the plume from the ventilation outlet.

Potential impacts on elevated receptors are relevant around:

- The Rozelle ventilation facility. Development patterns and height restrictions for developments in this area are regulated under the Leichhardt LEP 2013 and the SREP 26. Land around the Rozelle ventilation facility in the Leichhardt LGA and the SREP 26 is not currently subject to a statutory building height limit
- The Iron Cove Link ventilation facility. Development patterns and height restrictions for developments in this area are regulated under the Leichhardt LEP 2013. Land around the Rozelle

ventilation facility in the Leichhardt LGA and the SREP 26 is not currently subject to a statutory building height limit

- The Campbell Road ventilation facility at St Peters. Development patterns and height restrictions for developments in this area are regulated under the Marrickville Local Environmental Plan 2011 and the Sydney LEP 2012. Current building height controls applying around the Campbell Road ventilation facility are:
  - Development around the ventilation facility and within the Sydney LGA (to the north and east) is generally industrial in nature and subject to an 18 metre building height limit. Some areas along the Alexandra Canal have building height limits up to 22 metres
  - There are no statutory building height limits that apply to Sydney Park
  - Most land immediately around the Campbell Road ventilation facility in the Marrickville LGA is not currently subject to a statutory building height limit. Residential development further to the west, between the Princes Highway and Unwins Bridge Road is limited to a building height of 9.5 metres, which is around two storeys plus a roof structure.

Refer to **Chapter 9** (Air quality) for further information regarding potential impacts on elevated receptors.

### 12.4.13 Overshadowing

The project includes permanent buildings and structures that have the potential to result in overshadowing on neighbouring residential properties. Shadow diagrams for mid-winter (21 June) have been prepared for these buildings and structures and can be found in **Appendix M** (Shadow diagrams and overshadowing). The shadow diagrams in **Appendix M** (Shadow diagrams and overshadowing) only show the shadows cast by the proposed infrastructure and do not factor in the existing situation (ie any other structures (eg existing buildings and vegetation) that would currently cause overshadowing impacts). The shadow diagrams are therefore considered to be worst case and are not reflective of design work that would be undertaken to ensure that the buildings and structures would be designed to avoid potential impacts.

No assessment has been undertaken of overshadowing from potential noise barriers as no noise barriers are proposed as part of the concept design. However, noise barriers may be investigated as a potential noise mitigation option in some areas of the project (refer to **Chapter 10** (Noise and vibration)). Analysis of overshadowing impacts associated with noise barriers, if they are proposed, would be undertaken during detailed design.

**Table 12-6** summaries the potential overshadowing impacts in mid-winter (21 June) expected as a result of permanent operational infrastructure.

# Table 12-6 Potential overshadowing impacts of project infrastructure during operation (mid-winter (21 June))

Location		Description of potential impacts
Darley Road motorway operations complex (MOC1) including:		Shadows from the water treatment facility and substation would fall within the site and/or into the adjoining Darley Road road reserve. There would be no impacts on nearby residential properties.
<ul> <li>Water facility</li> </ul>	treatment	
Substa	ation	

Lo	cation	Description of potential impacts
Rozelle West motorway operations complex (MOC2) and pedestrian and cyclist facilities including:		Shadows from the ventilation supply facility, fire pump room/deluge tanks and substation would fall within the Rozelle Rail Yards site. The areas within the site that would be impacted would include the western drainage channel and associated landscape planting areas. There would be no impact on nearby residential properties.
•	Ventilation supply facility Intake substation Fire pump room and tanks Pedestrian and cyclist bridge	Shadows from the pedestrian and cyclist bridge structure would predominantly fall within parts of the adjacent road corridor (City West Link), the Inner West Light Rail line corridor and vegetated areas between the light rail corridor and the north side of Brenan Street at Annandale. There would be no impact on nearby residential properties or areas of public open space.
Ro: ope (MC and incl	zelle East motorway erations complex DC3) and pedestrian d cyclist facilities uding:	Shadows from the three ventilation outlets and ventilation building would fall primarily within the Rozelle Rail Yards and the City West Link road reserve. The areas within the site impacted by overshadowing would include the tunnel portals to/from the proposed future Western Harbour Tunnel and Beaches Link, the western drainage channel and a limited area of the pedestrian and cyclist bridge.
•	facility Three ventilation	Shadows from the water treatment facility would fall within the Rozelle Rail Yards, on a driveway and carpark area associated with the water treatment facility and on the northern drainage channel.
•	Substation Water treatment facility	Shadows from the pedestrian and cyclist bridge structure would predominantly fall within parts of the adjacent road corridors (City West Link and The Crescent) and would also impact on limited sections of the western drainage channel.
•	Pedestrian and cyclist bridge	There would be no impact on residential properties or proposed public open space.
Iror ope (MC •	Cove Link motorway erations complex DC4) including: Ventilation facility Ventilation outlet Substation	Shadows from the ventilation outlet would impact on an adjoining residential property on the west side of Callan Street in the mid-morning. The shadows would be likely to affect habitable rooms and private open space of these properties for up to two hours in the worst-case shadow scenario (21 July). Shadows from the ventilation facility building would impact on an adjoining residential property on the eastern side of Callan Street in the mid to late morning. The impact is likely to affect habitable rooms and private open space of these properties for up to three hours in the worst- case shadow scenario (21 July). The habitable rooms and private open space are already likely to be impacted by overshadowing from existing buildings and structures along their northern boundary during at least part of this period.
		Shadows from the ventilation facility would also impact on a small number of adjoining residential properties on the west side of Springside Street in the mid to late morning and early afternoon. The impact is likely to affect habitable rooms and private open space of these properties for up to five hours. The habitable rooms and private open space are already likely to be impacted by overshadowing from existing buildings and structures along their northern boundary during at least part of this period.

Location	Description of potential impacts	
Campbell Road motorway	Shadows from the ventilation building and associated infrastructure would	
operations complex (MOC5) including:	fall within the St Peters interchange site, impacting on areas containing other operational infrastructure or proposed landscaping areas. There are	
<ul> <li>Ventilation supply facility</li> </ul>	no residential properties in the vicinity that would be affected by overshadowing.	
<ul> <li>Ventilation exhaust facility</li> </ul>	Areas of proposed open space being delivered by the New M5 project to the south east would not be impacted other than minor overshadowing	
<ul> <li>Four ventilation outlets</li> </ul>	the early to mid-afternoon.	
<ul> <li>Intake substation</li> </ul>		

Overall, residential properties affected by overshadowing from permanent operational components of the project would receive a minimum of three hours of direct sunlight in habitable rooms and in at least 50 per cent of principal private open space between 9.00 am and 3.00 pm on 21 June. The exception to this is the adjoining residential properties on the west side of Springside Street at Rozelle.

Where existing residential development currently receives less than this requirement, access to sunlight would not be unreasonably reduced. Detailed overshadowing analysis would be undertaken during detailed design to confirm the exact nature of any overshadowing impacts. This would include an analysis of dwelling layouts, levels and overshadowing from existing structures and to confirm the number of dwellings that would be affected.

Detailed design of the ventilation facility building at the Iron Cove Link motorway operations complex (MOC4) would include consideration of treatments to minimise overshadowing on properties south of Victoria Road. This may include reducing the height of the building and/or increasing building setbacks or recessing the building.

## 12.5 Management of impacts

Environmental management measures relating to land use and property are outlined in Table 12-7.

Impact	No.	Environmental management measure	Timing		
Construction					
Acquisition of property required for the project	PL1	Land acquisition for the project will be undertaken in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 (NSW) and the Roads and Maritime Services Land Acquisition Information Guide (Roads and Maritime 2014) and the land acquisition reforms announced by the NSW Government in 2016.	Construction		
Impacts on property access	PL2	The requirement for temporary changes to property access will be minimised during development of the detailed construction methodology. Affected landowners will be consulted when temporary, short-term changes to access to their property will occur. This will include advanced notification of relevant project schedules, construction works and changes to access arrangements.	Construction		

Table 12-7 Environmenta	al management measures	- land use and property
-------------------------	------------------------	-------------------------

Impact	No.	Environmental mana	igement meas	sure		Timing
Uncertain	PL3	A Residual Land Man	agement Plan	will be prepa	red in	Construction
future land use		consultation with relevant local councils and other key				
		stakeholders. The plan	n will:			
		<ul> <li>Identify and illustration</li> </ul>	ate all remaini	ng project lar	nd following	
		construction of the	e project, inclu	ding the phys	sical	
		location, land use	characteristic	s, size and a	djacent	
		land uses				
		<ul> <li>Identify of feasible</li> </ul>	e uses for remain	aining project	land	
		including justificat	ion for the sele	ected use		
		<ul> <li>Identify timeframe</li> </ul>	s for impleme	ntation of the	actions in	
		relation to the ider	ntified feasible	uses.		
Overshadowing	PL4	Existing residential pro	operties (and a	approved res	idential	Construction
of residential		developments) that ar	e affected by	overshadowir	ng from the	
properties		final detailed design o	f the project (i	ncluding any	noise	
		mitigation measures)	are to receive	a minimum o	f three	
		hours of direct sunligh	t in habitable	rooms and in	at least 50	
		per cent of the princip	al private oper	n space area	between	
		9:00 am and 3:00 pm	on 21 June. S	uch propertie	es must be	
		identified for further co	onsideration by	y the Propone	ent in a	
		Solar Access and Ove	ershadowing R	Report which a	addresses	
		compliance with these	e requirements	5:		
		Where existing res	sidential devel	lopment curre	ently	
		receives less than	the required	amount of so	lar access,	
		existing access to	sunlight durin	g operation s	hould not	
		be unreasonably r	reduced			
		<ul> <li>Where affected pr</li> </ul>	operties inclue	de dwellings	held under	
		strata or commun	ity title, these	requirements	must be	
		interpreted in relat	tion to individu	al units within	n those	
		properties.				
	PL5	Detailed design of the	ventilation fac	cility building	at the Iron	Construction
		Cove Link motorway c	perations con	nplex (MOC4	) will	
		include consideration	of treatments	to minimise		
		overshadowing on pro	perties south	of Victoria Ro	oad. This	
		may include reducing	the height of t	he building a	nd/or	
		increasing building se	tbacks or rece	ssing the bui	lding.	
Ground	PL6	Ground settlement wil	I be managed	to comply wi	th the	Construction
settlement		following criteria wher	e possible:			and
		Beneath "	Maximum	Maximum	Limiting	operation
		structure/facility	settlement	angular	tensile	
				distortion	Strain (per cent)	
		Buildings – Low or	30 mm	1 in 350	(per cent) 0.1	
		non-sensitive				
		properties				
		(ie less than or equal				
		to two levels and				
		Carparks) Buildings – High or	20 mm	1 in 500	0.1	
		sensitive properties	20 11111	1 11 300	0.1	
		(ie greater than or				
		equal to 3 levels and				
		carparks)				
		Roads and parking	40 mm	1 in 250	N/A	
		Parks	50 mm	1 in 250	Ν/Δ	
		I dino		1111200	11//	
L	1					

Impact	No.	Environmental management measure	Timing
Ground settlement	PL7	<ul> <li>Further assessment of potential settlement impacts, including numerical modelling, will be undertaken based on detailed design. In areas where ground movement in excess of settlement criteria are predicted, feasible and reasonable measures would be investigated and implemented to ensure predicted settlement is within the criteria. Measures that will be considered may include (but are not limited to):</li> <li>Review of the proposed tunnel design including: <ul> <li>the depth and alignment of tunnels</li> <li>the proposed tunnel support system</li> <li>the tunnel lining to manage groundwater inflows</li> </ul> </li> <li>Rationalising the layout of the proposed ventilation tunnels including the number, location and length of tunnels</li> <li>Review of the proposed construction methodology</li> </ul>	Construction
		<ul> <li>Consideration of ground improvement options.</li> </ul>	
	PL8	<ul> <li>A Settlement Monitoring Plan will be prepared that will provide details on:</li> <li>Settlement criteria and predictions</li> <li>Location of monitoring points</li> <li>Duration of monitoring</li> <li>Data collection and review</li> <li>Triggers and corrective actions.</li> </ul>	Construction
	PL9	Settlement monitoring will be carried out in accordance with the Settlement Monitoring Plan for the period starting prior to commencement of tunnel construction through to until all settlement has stabilised following completion of tunnel construction. The results of settlement monitoring will be compared to predicted settlement. Where actual settlement is greater than predicted settlement, the assessment and the proposed measures to reduce settlement will be reviewed. The revised measures will be implemented to ensure that settlement does not exceed the criteria.	Construction
	PL10	Building condition surveys will be offered to property owners within the zone of influence of tunnel settlement (within 50 metres from the edges of the tunnels and ramps). In the event that damage occurs to a property as a result of the construction of the project, the damage will be appropriately rectified.	Construction
	PL11	<ul> <li>An Independent Property Impact Assessment Panel, comprising geotechnical and engineering experts, will be established prior to the commencement of works with the potential to result in ground movement and settlement. The panel will be responsible for:</li> <li>Independently verifying building condition survey reports</li> <li>Resolving any property damage disputes</li> <li>Establishing on-going settlement monitoring requirements.</li> </ul>	Construction

Impact	No.	Environmental management measure	Timing
	PL12	<ul> <li>Interface agreements will be entered into with the owners of infrastructure and utility services likely to be impacted by construction of the project. The agreements will likely identify:</li> <li>Minimum separation distances and appropriate settlement criteria for utility infrastructure</li> <li>Settlement monitoring requirements during construction</li> <li>Contingency actions in the event that settlement limits are exceeded.</li> </ul>	Construction