



Sydney Metro – Western Sydney Airport

Scoping Report

June 2020



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Preface

Sydney Metro - Western Sydney Airport.

This report refers to the new driverless metro railway line between St Marys and Bringelly, which will service Western Sydney International (Nancy-Bird Walton) Airport and the city's Greater West, being delivered by Sydney Metro.

This Scoping Report has been prepared in fulfilment of the requirements of Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (NSW). It has been written to support an application to the NSW Secretary for Planning, Industry and Environment for assessment and approval of Sydney Metro - Western Sydney Airport (the Project, referred to throughout this document by its former name Sydney Metro Greater West) as Critical State Significant Infrastructure (CSSI), in respect of those elements of the Project located outside of the Western Sydney International (Nancy-Bird Walton) Airport site.

The CSSI process does not apply to the Project within the Western Sydney International (Nancy-Bird Walton) Airport site. Assessment of the Project elements located within the airport site is subject to assessment and approval under the *Airports Act 1996* (Cth).

However, it is considered important that this report considers the Project in its entirety because, for example:

- The community and many other stakeholders will be interested in the Project as a whole and will not consider the distinction between the on-airport and off-airport regimes to justify separate reports for each part of the Project
- The document will provide important information to the assessment and approval bodies and other stakeholders within the airport site, notwithstanding that there is no equivalent statutory requirement for this form of report under that approval regime
- The Project components located within the airport, and their potential environmental impacts, are a relevant consideration in the assessment of the off-airport Project components, especially in relation to the cumulative impacts of the Project as a whole
- The Project components located outside the airport, and their potential environmental impacts, are likely to be relevant considerations in the assessment of the on-airport Project components under the *Airports Act*
- The Environmental Impact Statement for the Project will include assessment of both on-airport and off-airport components of the Project, and as such this Scoping Report creates the basis for this approach from the outset.

To enable delineation of the two Project components, this Scoping Report separately identifies the Project components, statutory approval regimes, existing environments and potential impacts for both the on-airport and off-airport components of the Project, and this delineation will also be provided in the subsequent Environmental Impact Statement.

Executive summary

Introduction and need

The population of Greater Sydney is projected to grow to eight million people over the next 40 years, with the population of the Western Parkland City to grow to over 1.5 million people, accompanied by significant employment growth. The *Greater Sydney Region Plan* sets the vision and strategy for Greater Sydney to become a global metropolis of three unique and connected cities, the Eastern Harbour City, the Central River City and the Western Parkland City.

The Western Parkland City includes eight local governments (Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly). It incorporates the future Western Sydney International (Nancy-Bird Walton) Airport (hereafter referred to as Western Sydney International) and Western Sydney Aerotropolis (hereafter referred to as the Aerotropolis).

A joint Australian and NSW Government *Western Sydney Rail Needs Scoping Study* was prepared to inform the rail connections needed to support development of the Western Parkland City. This study identified a north-south rail corridor connecting Tallawong Station in Rouse Hill with Macarthur via St Marys and Western Sydney International as critical to integrated land use and transport planning for the future of the Western Parkland City.

The Draft *North South Rail Line and South West Rail Link Extension Corridors Strategic Environmental Assessment* further investigated this corridor and proposed the protection of two rail corridors in Western Sydney for future rail infrastructure for passenger train services – the North South Rail Line (now known as Sydney Metro Greater West) and the South West Rail Link extension. Mass transit for the Western Parkland City is also identified as a key element in the *Future Transport Strategy 2056*, the *Greater Sydney Region Plan* and the *Western City District Plan*.

Sydney Metro proposes to construct and operate a new metro rail line (Stage 1 of Sydney Metro Greater West – the Project) with six new metro stations from the T1 Western Line at St Marys in the north to the Aerotropolis Core in the south.

The new railway line would become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service. The Project would enable the realisation of the vision for Western Sydney International and the Aerotropolis, by connecting people to employment, education, shops, services and recreation facilities. The Project would provide important access to Western Sydney International for airport workers and aviation travellers.

Once complete, the new high-capacity and high-frequency metro rail line would create passenger rail access to Western Sydney International and the Aerotropolis, and would help

optimise land use and development, creating precincts and places at station locations and helping stimulate economic activity and innovation through the co-location of industries.

Key features of the Project

The Project involves the construction and operation of a metro rail line, around 23 kilometres in length, with six new metro stations from the T1 Western Line at St Marys in the north to the Aerotropolis Core in the south. Station locations for the Project would include:

- a new metro station connecting to, and providing interchange with, the T1 Western Line at St Marys
- two new metro stations between the T1 Western Line and Western Sydney International; one at Orchard Hills and one at Luddenham within the Northern Gateway precinct
- two new metro stations within the Western Sydney International site; one at the Airport terminal and one at the Airport business park
- one new metro station within the Aerotropolis Core precinct, south of Western Sydney International.

The new metro railway line would:

- include a combination of tunnel, surface and viaduct sections
- interface with key roads including the Great Western Highway, M4 Western Motorway, Luddenham Road, the future M12 Motorway, Badgerys Creek Road and Elizabeth Drive
- include crossings of Blaxland Creek and Cosgroves Creek.

The Project includes works required to support its construction and operation, including all operational systems and infrastructure such as fresh air ventilation systems, signalling, communications, overhead wiring, rail corridor fencing and access tracks/paths.

A stabling and maintenance facility and operational control centre would be required to support operation of the Project. This infrastructure is subject to further design but is currently proposed in the area between the Warragamba pipeline and the M4 Western Motorway.

Project proponent

The proponent for the Project is Sydney Metro, a NSW Government statutory authority which has the responsibility for developing and delivering metro railways and managing their operation.

The Project is being delivered under the Western Sydney City Deal, a partnership between the Australian Government, NSW Government and eight Western Sydney local councils that sets out to deliver the vision for the Western Parkland City. The Australian and NSW Governments will be partners in funding the Project and have a shared objective to connect rail to Western Sydney International when the airport opens for passenger services.

Planning and assessment process

There are three principal statutory schemes that govern the planning and assessment process for the Project which relate to works that are located outside the footprint of Western Sydney International (off-airport) and works that are located within the footprint of Western Sydney International (on-airport).

The off-airport components of the Project are subject to assessment and approval under the provisions of both State and potentially the Commonwealth environmental planning requirements, being the *Environmental Planning and Assessment Act (EP&A Act)* (NSW), and the *Environment Protection and Biodiversity Conservation Act (EPBC Act)* (Cth) respectively.

The Project is State significant infrastructure under section 5.12 of the EP&A Act and a declaration would be sought to be critical State significant infrastructure under section 5.13 of the EP&A Act. Therefore, the Project is subject to assessment and approval by the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act.

For land north of the airport site, matters potentially requiring assessment and approval under the EPBC Act (including impacts of the Project on Matters of National Environmental Significance (MNES) and Commonwealth land) would be addressed through a referral to the Commonwealth Environment Minister under section 68 of the EPBC Act. If significant impacts are considered likely and the Project is determined to be a controlled action by the Commonwealth Environment Minister, an assessment of impacts would be undertaken in accordance with the assessment requirements issued by the Minister. If the Project is not determined to be a controlled action (i.e. if there is no significant impact on MNES or significant impacts are not considered likely), no further assessment or approval would be required.

For lands located south of Elizabeth Drive and outside of the Airport site, impacts of the Project on MNES and Commonwealth land have already been assessed under a strategic assessment completed in 2010 for the Sydney Growth Centres by the Department of Environment, Climate Change and Water and the Department of Planning. Approval under the EP&A Act and EPBC Act for impacts on MNES and Commonwealth land is not required for the on-airport elements of the Project. The on-airport elements of the Project, however, trigger requirements to vary the current Airport Plan for Western Sydney International under the *Airports Act 1996 (Airports Act)* (Cth). The Commonwealth Environment Minister has decided that environmental impacts will require further assessment in the form of preliminary documentation to enable Minister's advice on the variation of the Airport Plan.

Consultation

In June 2015, community and stakeholder consultation was undertaken on the corridor between Bringelly, Western Sydney International and St Marys, coordinated with the Outer Sydney Orbital consultation as well as the corridor between Bringelly, Leppington, Oran Park and Narellan.

The joint *Western Sydney Rail Needs Scoping Study* featured significant community and industry consultation between September and October 2016. This consultation focused on long-term rail options for servicing Western Sydney and the new airport, and considered a range of rail options for the region, including Sydney Metro Greater West. More than 1,000 responses were received through the consultation process, including around 120 written submissions. Results of the consultation informed and supported the outcomes of the Scoping Study.

Between March and June 2018, Transport for NSW delivered an extensive consultation and engagement program, inviting submissions from the community and stakeholders on the long term transport corridors in Western Sydney.

Between February and March 2020, the community was invited to participate in an online survey about the Project. More than 1,700 responses were received from the community and stakeholders. The feedback received will inform the design of future station precincts and broader strategic planning around transport needs for Greater Western Sydney.

Further engagement with the community, key stakeholders and government agencies will continue during design development and preparation of the Environmental Impact Statement for the Project.

Purpose of this report

This Scoping Report supports an application to the NSW Minister for Planning and Public Spaces seeking the Secretary's environmental assessment requirements for the Environmental Impact Statement which is to be prepared for the Project.

Information in this Scoping Report will be used to support a referral of the Project to the Commonwealth Environment Minister under section 68 of the EPBC Act.

This report has been based on the design developed to date. It is noted that the Project components, location and design would be subject to further refinement and changes as part of the ongoing design development and community consultation.

Key environmental issues for the Project

A preliminary environmental risk analysis for the Project has identified the following 'key' environmental issues:

- traffic and transport
- noise and vibration
- biodiversity
- non-Aboriginal heritage
- Aboriginal heritage
- land use

- social and economic
- flooding, hydrology and water quality
- landscape and visual impact.

A preliminary environmental assessment of the Project's potential impacts has confirmed that the above issues have the potential to result in a significant impact if not appropriately mitigated. The ongoing design development for the Project has considered the potential environmental and land use constraints associated with design options. This has assisted in avoiding or minimising potential environmental impacts of the Project.

Detailed assessment of these issues, and the other environmental issues identified, would be undertaken as part of the Environmental Impact Statement. As part of this assessment process, environmental mitigation measures would be developed to minimise the potential impacts of the Project during construction and operation.

Next steps

Following receipt of the Secretary's environmental assessments requirements and potentially any assessment requirements under section 87 of the EPBC Act, Sydney Metro would prepare and publicly exhibit an Environmental Impact Statement in accordance with the requirements of Division 5.2 of the EP&A Act. It is expected that the on-airport approval steps would proceed in parallel with the off-airport approval steps.

The Environmental Impact Statement would include:

- a description of the Project, including its components and construction activities
- the strategic context and justification for the Project
- an analysis of the strategic alternatives and options considered for the Project
- a description of the existing environment and an assessment of potential direct and indirect impacts on the key and other potential environmental issues during construction and operation of the Project, including cumulative impacts
- identification of measures to be implemented to avoid, minimise, manage, mitigate, offset and/or monitor potential impacts of the Project
- identification and consideration of issues raised by stakeholders and the community.

1 Introduction

1.1 Project overview

Transport for NSW provides a strategic focal point for transport coordination, policy, integrated transport service and infrastructure planning and delivery in New South Wales. The NSW Government's Sydney Metro Authority (Sydney Metro) is part of the NSW Government's transport cluster and has been tasked with developing and delivering metro railways and managing their operations.

Sydney Metro Greater West (the Project) is a key part of delivering an integrated transport system for the Western Parkland City, as envisaged in the *Future Transport Strategy 2056*. The Western Parkland City is part of the Greater Sydney Commission's vision for a metropolis of three cities, and incorporates the future Western Sydney International and the Aerotropolis, as well as the Penrith, Liverpool and Campbelltown-Macarthur urban areas.

The new railway line would become the city's transport spine, linking residential areas with job hubs and the nationally-significant Western Sydney International (refer to Figure 1-1).

The new metro railway would be a city-shaping project which would help optimise land use and development, creating precincts and places at station locations and helping stimulate economic activity and innovation through the co-location of industries. A fast, safe and easy metro rail service would connect communities with jobs and services, delivering better access to more employment opportunities, health and education services and leisure activities across the Western Parkland City and Greater Sydney. The Project would provide important access to Western Sydney International for airport workers and aviation travellers travelling from across the Western Parkland City.

The Project would provide a connection with the T1 Western Line at St Marys and two new stations within Western Sydney International. New stations would be provided at Orchard Hills and Luddenham, between the T1 Western Line and the northern boundary of the Western Sydney International site, and a new station would be provided within the Aerotropolis Core precinct, south of the Western Sydney International site. These stations would play a key role in the development of future precincts in the Western Parkland City.

The Project is being delivered under the Western Sydney City Deal, a partnership between the Australian Government, NSW Government and eight Western Sydney local councils that sets out to deliver the grand vision for the Western Parkland City. The Australian and NSW Governments will be partners in funding the Project and have a shared objective to connect rail to Western Sydney International when the airport opens for passenger services.

1.2 Project context and location

The Project is located within the Penrith and Liverpool Local Government Areas (LGAs), between the T1 Western Line in the north and the Aerotropolis in the south, via Western Sydney International. The Project's context and location are shown in Figure 1-2.

Potential future extensions to Schofields/Tallawong Station in Rouse Hill in the north and to Macarthur in the south are being investigated but are not included in the Project.

The following sections characterise the environmental study area into components that are located outside Western Sydney International (off-airport) and components that are located within Western Sydney International (on-airport), to align with their different planning approval pathways required under State and Commonwealth legislation (refer to Section 1.4.1 for further detail). The environmental study area adopted for this report is shown on Figure 1-1. This area is being investigated for the construction and operation of the Project and its associated enabling infrastructure.

1.2.1 Off-airport Project context

The topography of the environmental study area is relatively flat around St Marys, with higher ground towards Claremont Meadows. Elevations are generally flat towards Orchard Hills, with slightly lower lying areas occurring along Blaxland Creek. Through Orchard Hills, Badgerys Creek and Bringelly, the valley and floodplain of South Creek and its tributaries dominate the gently undulating topography. The topography to the east and west of the Project is more elevated.

The environmental study area is located within the Hawkesbury-Nepean catchment, and the South Creek sub-catchment. The South Creek sub-catchment encompasses the majority of the Cumberland Plain of Western Sydney. Watercourses and low-lying floodplain areas are primarily associated with South Creek and its tributaries. South Creek is a 400 square kilometre creek system that has its headwaters in the Camden area and flows 70 kilometres north to the Hawkesbury River. Tributaries of South Creek within the environmental study area include Ropes Creek, Blaxland Creek, Cosgroves Creek and Badgerys Creek (refer to Figure 8-8 which shows the key waterways in and around the environmental study area).

The environmental study area to the north of the M4 Western Motorway is characterised by low-density residential dwellings in St Marys, Claremont Meadows, Caddens and Kingswood, with some medium density residential development around the edges of St Marys Town Centre (including south of the Great Western Highway). The Penrith Health and Education Precinct contains wide open spaces between commercial buildings, particularly at Western Sydney University Penrith Campus, Nepean College of TAFE Allied Health Facility and Werrington Park.

The landscape to the south of the M4 Western Motorway is a mix of rural residential development and farm land, as well as undeveloped land in the northern and eastern parts of the Defence Establishment Orchard Hills site.

Farm land in Orchard Hills, Luddenham, Badgerys Creek and Bringelly comprises mostly rural industries, rural-residential properties and agricultural land, with native vegetation generally only remaining along the banks of creeks, low-lying areas and some roadsides.

South Creek forms a green north-south corridor through the environmental study area, particularly through St Marys where parks and recreational facilities are located next to the creek.

Some vulnerable and endangered vegetation listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cth) and the *Biodiversity Conservation Act 2016* (BC Act) (NSW) is located within the environmental study area, including on the northern side of the M4 Western Motorway in Claremont Meadows, within the Defence Establishment Orchard Hills site and between Pennard Crescent and South Creek at Luddenham.

Around Orchard Hills, Luddenham, Badgerys Creek and Bringelly, the environmental study area is characterised by a predominantly cleared and disturbed rural landscape with interspersed stands of native vegetation, mostly located around the riparian areas. Further details on the existing environment within the environmental study area are provided in Chapters 8 and 9.

1.2.2 On-airport Project context

The airport site for Western Sydney International is around 1,780 hectares. The on-airport environment is currently typified by a gently undulating landform within a highly modified landscape. The overall landscape character is open and rural with expansive views possible from surrounding hill tops and higher elevations to the west. Significant earthworks are required to prepare the site for development. As airport construction work has now commenced, the landscape in parts of the airport site is a construction site. Sensitive receivers located near the airport environment are limited to rural residential receivers adjacent to the on-airport environment.

Stage 1 of the development of Western Sydney International will include a single runway with associated aviation facilities for around 10 million passengers annually (impacting around 60 per cent of the airport site) (Commonwealth of Australia, 2016b). The airport will operate 24 hours a day, 7 days a week from its opening.

There is an Environmental Conservation Zone (ECZ) located along the south-east boundary of the site (which corresponds with the riparian corridor along Badgerys Creek), as well as minor parcels of land to the north and west of the site. Altogether, the ECZ makes up around seven per cent of the airport site.

Following the completion of construction of Western Sydney International Stage 1, the environment would be characterised by permanent airport infrastructure including a runway, taxi areas, car parking and buildings for terminal support and business development. Overflights would also represent a new visual element for the site and the surrounding environment.

Sources of night lighting would be introduced throughout the on-airport environment for the illumination of runways and security lighting around airport buildings and other infrastructure. The residual area located within the on-airport environment but outside of the Western Sydney International Stage 1 construction footprint (referred to in the Airport Plan as the Construction Impact Zone), consists primarily of cleared land and vegetation around Badgerys Creek.

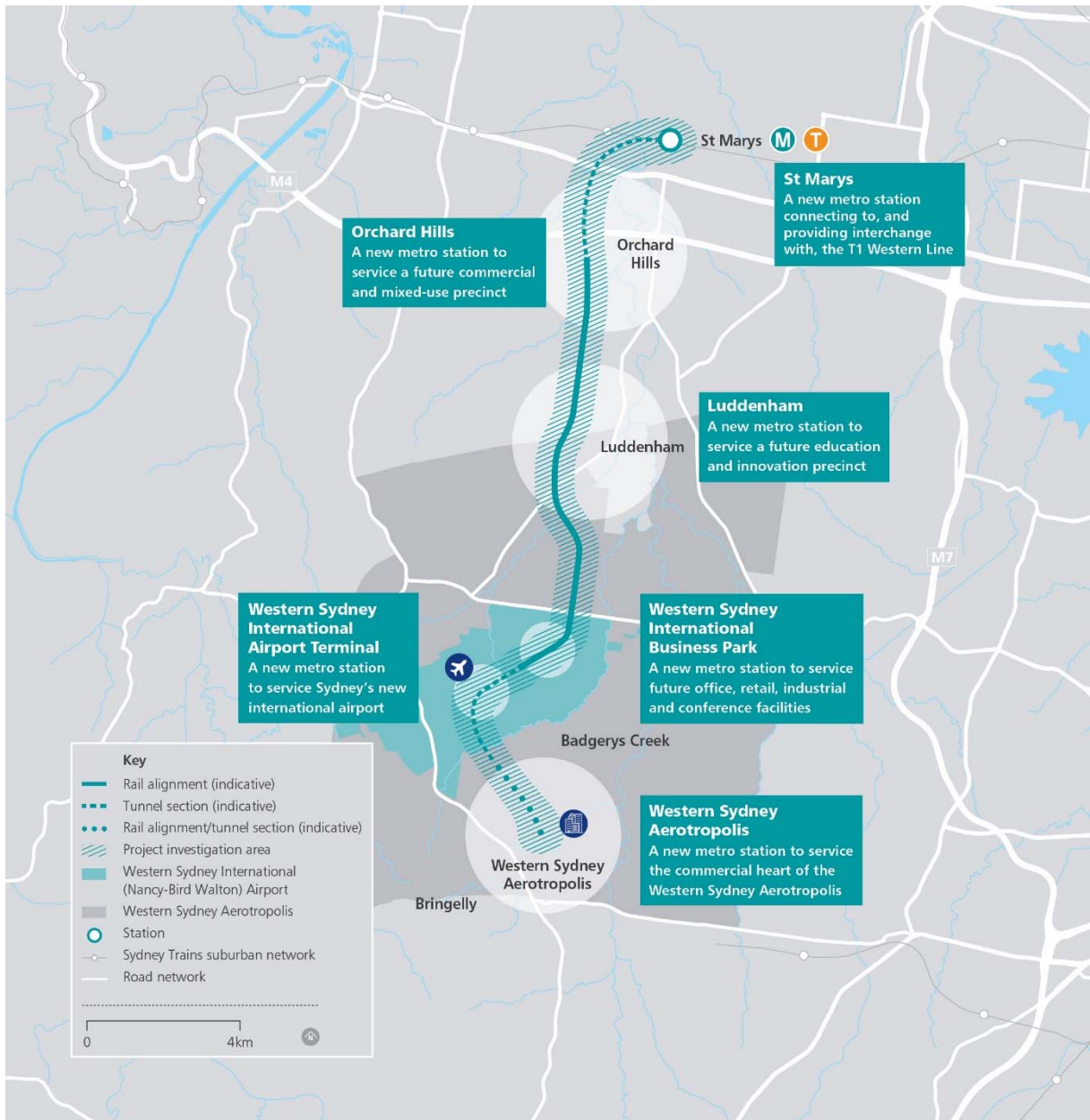
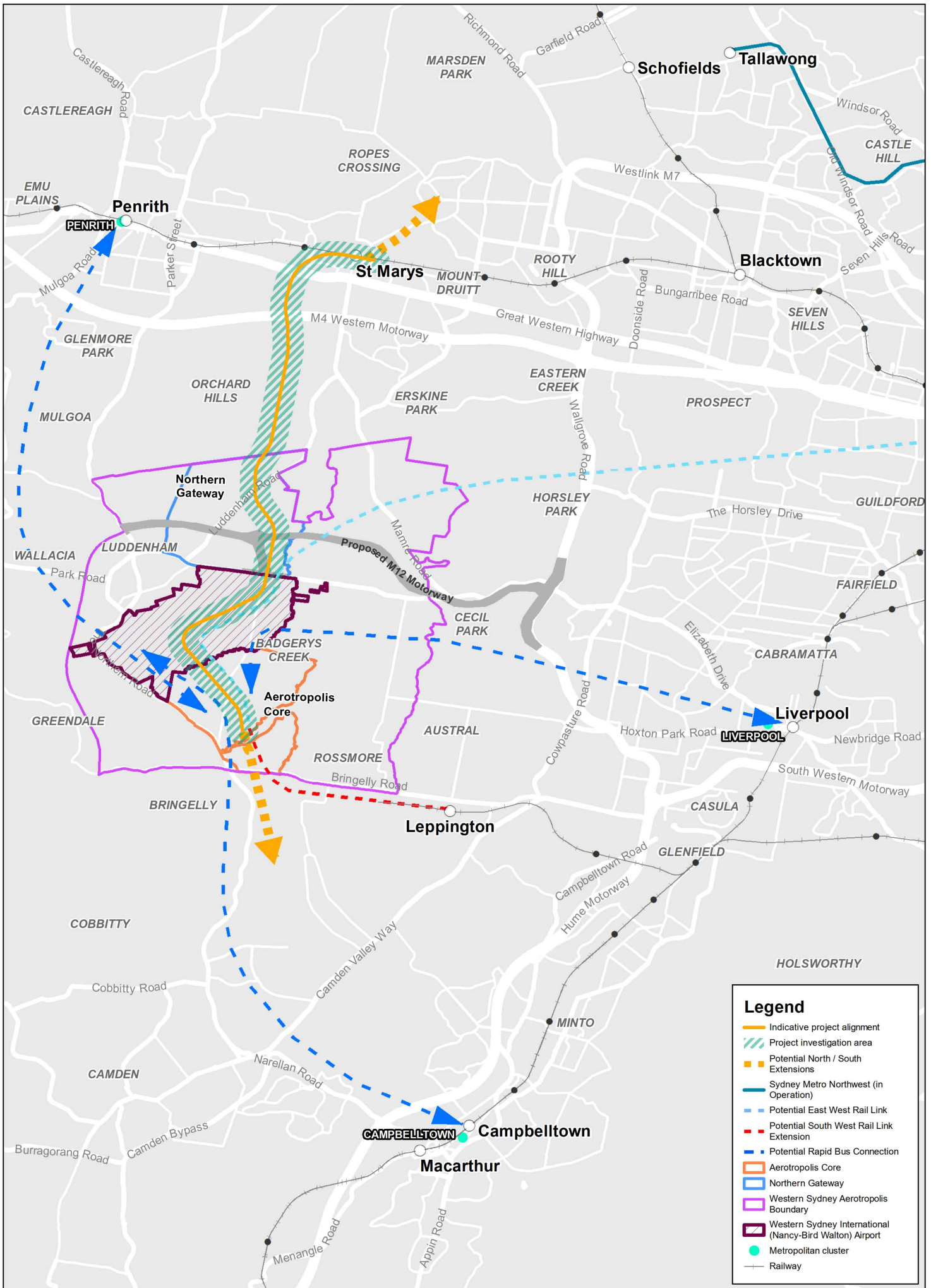
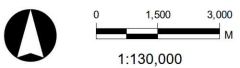


Figure 1-1 Overview of the Project



Sydney Metro Greater West
Figure 1.2: Project context and location



1.3 Key features of the Project

The Project involves the construction and operation of a metro rail line, around 23 kilometres in length (depending on final alignment), between the T1 Western Line at St Marys in the north and the Aerotropolis Core in the south (refer to Figure 1-1). Station locations for the Project would include:

- a new metro station connecting to, and providing interchange with, the T1 Western Line rail at St Marys
- two new metro stations between the T1 Western Line and Western Sydney International; one at Orchard Hills and one at Luddenham within the Northern Gateway precinct
- two new metro stations within the Western Sydney International site; one at the Airport terminal and one at the Airport business park
- one new metro station within the Aerotropolis Core precinct, south of Western Sydney International.

The alignment of the new metro railway line would:

- include a combination of tunnel, surface and viaduct sections
- interface with key roads including the Great Western Highway, M4 Western Motorway, Luddenham Road, the future M12 Motorway, Badgerys Creek Road and Elizabeth Drive, as well as key utilities such as the Warragamba pipeline
- include crossings of Blaxland Creek and Cosgroves Creek.

The Project includes works required to support the construction and operation of the Project, including all operational systems and infrastructure.

A stabling and maintenance facility and operational control centre would be required to support operation of the Project. This infrastructure is subject to further design but is currently proposed in the area between the Warragamba pipeline and the M4 Western Motorway.

The Project is described in more detail in Chapter 4.

1.4 Project development within Western Sydney International

1.4.1 Planning approvals context within Western Sydney International

The Project traverses, and provides stations within Western Sydney International, on land owned by the Commonwealth and currently leased to Western Sydney Airport (the airport site) under an airport lease granted under the *Airports Act 1996* (the Airports Act) (Cth). Assessment and authorisation of the components of the Project located within the Western Sydney International site is governed by the Airports Act and is outside the scope of the State significant infrastructure process provided for under the *Environmental Planning and Assessment Act 1979* (EP&A Act) (NSW). The statutory approval and authorisation requirements within and outside Western Sydney International are discussed in Chapter 6, however to facilitate a clear understanding of those components of the Project that are

intended to be covered by the Airport Plan Variation, those elements and their relationship to the airport are described below.

1.4.2 The Western Sydney International project

Western Sydney International is currently under construction, with operations scheduled to start in 2026. The new airport will support growth of the international and domestic tourism markets, and the district's economy, by attracting visitors to the Western Parkland City.

The development of Stage 1 of the airport has been authorised by an Airport Plan determined by the then Minister for Urban Infrastructure on 5 December 2016 under the Airports Act. The Airport Plan sets out the vision for the development and operation of Western Sydney International and provides authorisation for Stage 1 of the airport (refer to Figure 1-3 for the airport site layout as set out in the Construction Plan). The construction of Stage 1 of the airport is scheduled to be completed to enable airport operations to commence in 2026 and will comprise a single runway, a terminal and other relevant facilities to accommodate around 10 million passengers annually as well as air freight traffic. As shown in Figure 1-3, a passenger rail corridor has been identified and protected on the airport site, as well as stations at the Airport business park and at the Airport terminal.

The Airport Plan also contains conditions that govern the construction phase of Stage 1 of the airport site including the requirement for a Construction Plan which describes construction activities and phases of construction, a series of Construction Environmental Management Plans (CEMPs) and a Community and Stakeholder Engagement Plan that amongst other matters incorporate relevant mitigation requirements from the Environmental Impact Statement that was prepared for the Airport prior to determination of the Airport Plan. The Airport Plan provides for CEMPs to be prepared on a phase by phase basis and be updated for each new phase of work.

These plans have been prepared and approved for the current phases of work and will be updated for new phases as they occur.

As demand grows over time and subject to future regulatory approvals, Western Sydney International is expected to include an expanded terminal, further supporting passenger and commercial facilities and ultimately a second runway. The Project would not preclude the subsequent development of Western Sydney International, including a second runway and other expanded airport facilities.

1.4.3 The Project on Western Sydney International

Rail access to Western Sydney International would support the success of the airport and the Western Parkland City, as it would support passengers' and workers' journeys, reduce road congestion and support the economic viability of the airport.

The proposed metro railway is intended to enter the airport site from the north. The line would then progress through the airport stations and across the airport site, before exiting the airport site beneath Badgerys Creek to the south of the airport site.

The Project would provide two new metro stations within the airport site. One would be provided at the Airport terminal and one at the Airport business park.

The Airport Business Park Station would support an agglomeration of different industries associated with airport operations. The station would offer opportunities to integrate office, retail, industrial, hotel and conference facilities within 1.5 kilometres of the Airport terminal.

The Airport terminal station would provide metro rail access to international and domestic passengers as well as staff and visitors.

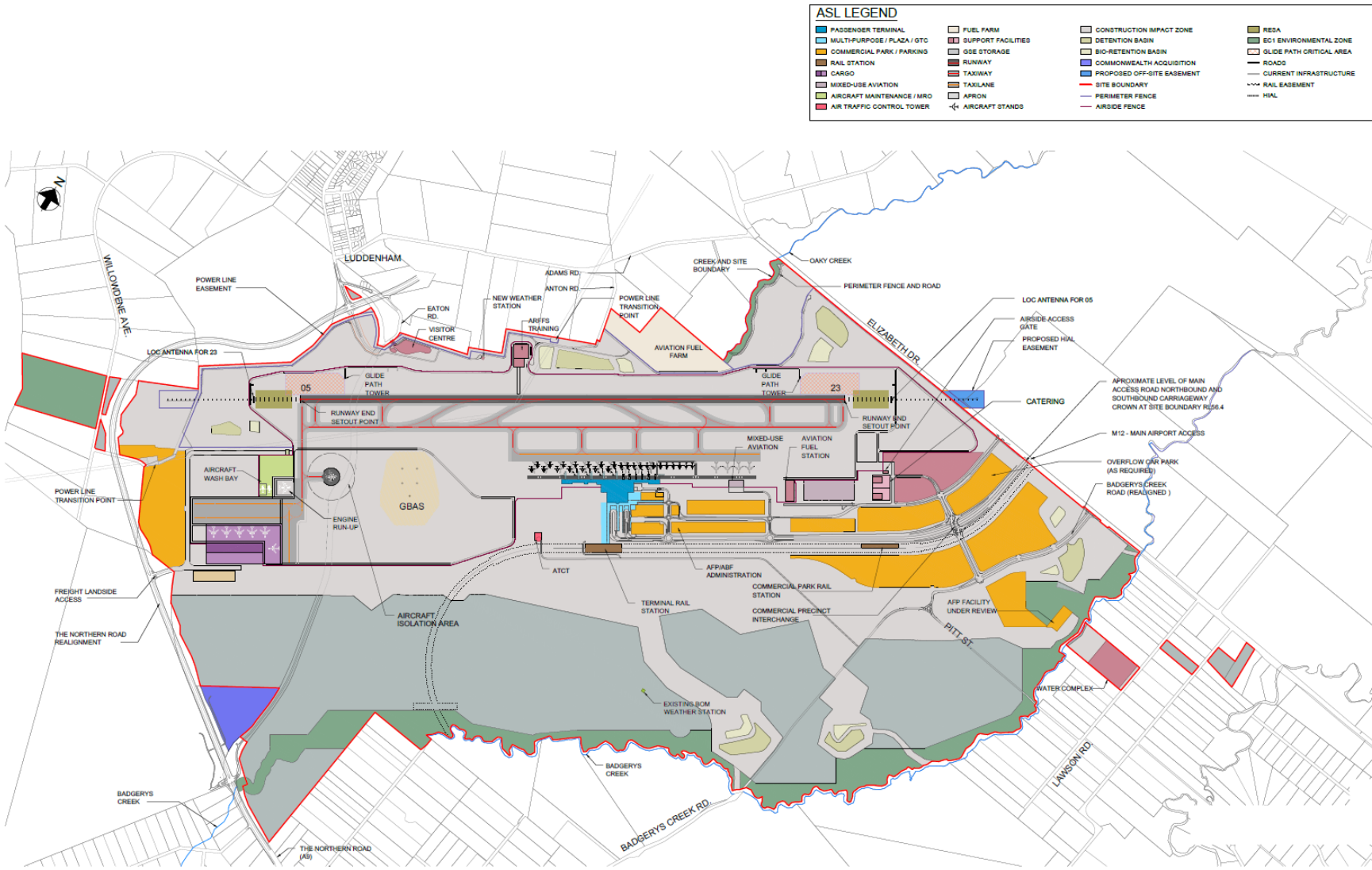


Figure 1-3 Western Sydney International Stage 1 airport layout (July 2019)

1.5 Background

1.5.1 Strategic planning context

The population of Greater Sydney is projected to grow to eight million over the next 40 years, with almost half of that population residing west of Parramatta. The *Greater Sydney Region Plan* (Greater Sydney Commission, 2018a) sets the vision and strategy for Greater Sydney to become a global metropolis of three unique and connected cities, the Eastern Harbour City, the Central River City and the Western Parkland City.

By integrating land use, transport and infrastructure across the three cities, most people in Sydney will have the opportunity of 30-minute access to jobs, schools, businesses and services. Critical in achieving these outcomes is a well-connected city with efficient transport options and interchanges.

The Project is a key element in the *Greater Sydney Region Plan* (Greater Sydney Commission, 2018a) and the *Western City District Plan* (Greater Sydney Commission, 2018b), providing a spine for a transport network that services the Western Parkland City and acting as a catalyst for sustainable development. Sydney Metro Greater West is also identified as an enabler for realising the vision of Western Sydney International and the Aerotropolis, by connecting people to employment, education, shops, services and recreation facilities. In addition, the NSW Government *Future Transport Strategy 2056* (Transport for NSW, 2018a) identifies Sydney Metro Greater West as a committed project connecting Western Sydney International and the Aerotropolis to the T1 Western Line.

A joint Australian and NSW Government *Western Sydney Rail Needs Scoping Study* was prepared to inform the rail connections needed throughout the Western Parkland City (refer to Section 2.2.5 for further details). That study identified a north-south rail corridor connecting Tallawong Station in Rouse Hill in the north with Macarthur in the south via St Marys and Western Sydney International as critical to integrated land use and transport planning for the future of the Western Parkland City.

A robust set of objectives have been developed to reflect the strategic context for the Project and are described in Section 2.3.

1.5.2 Sydney Metro

The proponent for the Project is Sydney Metro, a NSW Government statutory authority which has the responsibility for developing and delivering metro railways and managing their operation.

Sydney Metro is Australia's biggest public transport project and the largest urban railway infrastructure investment in the nation's history. Metro projects and the turn-up-and-go customer offering are at the heart of the NSW Government's *Future Transport 2056* vision for growing the public transport network and creating vibrant, integrated and sustainable places.

Sydney Metro Northwest started operations in May 2019, with services to 13 stations from Tallawong Station in Rouse Hill to Chatswood. Sydney Metro City & Southwest will extend metro rail into Sydney's central business district (CBD) and beyond in 2024, from

Chatswood, under Sydney Harbour, through new underground stations in the CBD and beyond to Sydenham and Bankstown.

Planning is also underway for Sydney Metro West, to provide an underground metro railway linking Greater Parramatta to the Sydney CBD and communities along the way. The Project would form part of this growing Sydney Metro network, illustrated in Figure 1-4.

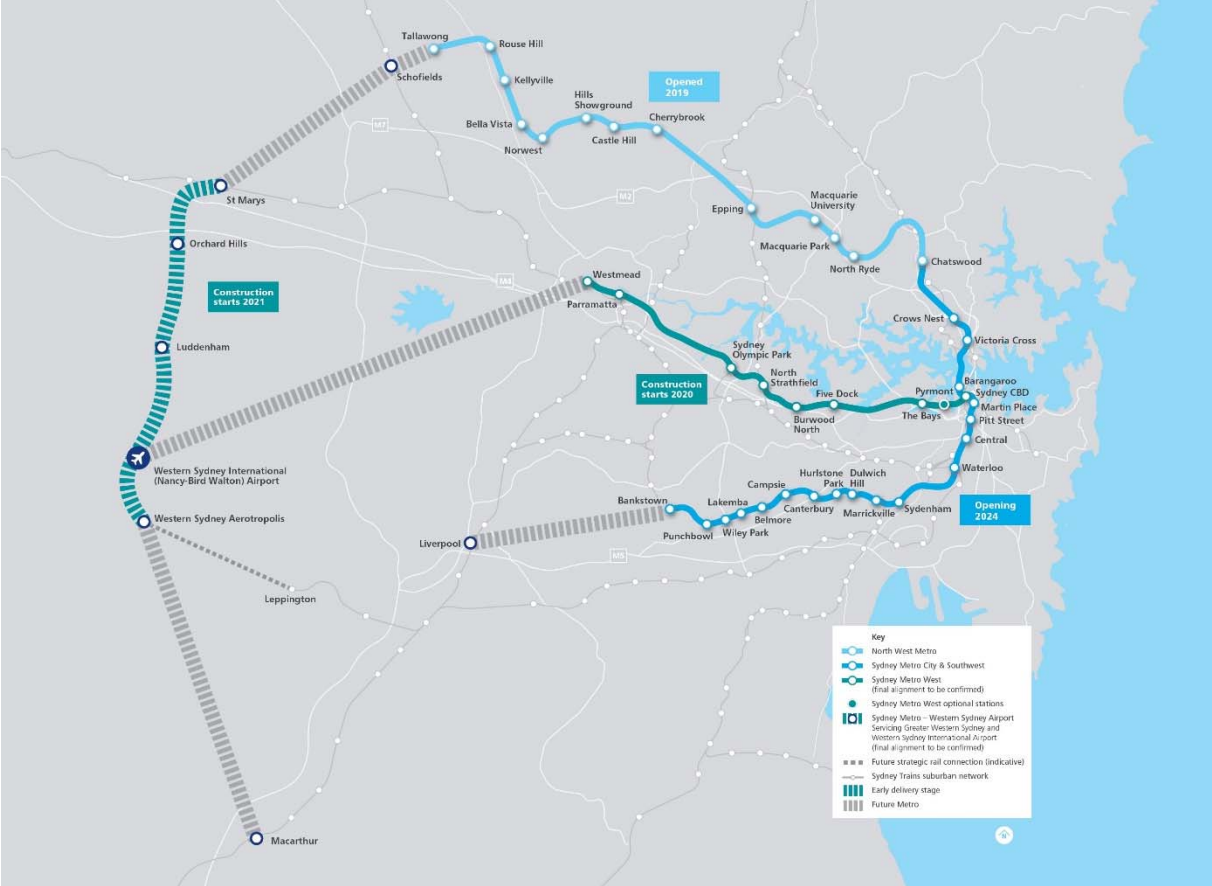


Figure 1-4 The Sydney Metro network

When customers arrive at Sydney Metro stations, there would be safe interchange whether they are walking, cycling, catching the bus, taxi, or being dropped off. Clear signage and intuitive station design directs customers to platforms, other modes of transport and destinations around the stations.

Key features of Sydney Metro include:

- no timetable – customers can just turn up and go
- Opal ticketing – fares are the same as the rest of Sydney
- customer service assistants at every station and moving through the network during the day and night

- Australian-first platform screen doors improving customer safety and allowing trains to get in and out of stations much faster. These doors run the full length of all metro platforms and open at the same time as the train doors
- continuous mobile phone coverage throughout the metro network
- operational performance requirements that include 98 per cent on time running and clean platforms and trains
- multi-purpose areas for prams, luggage and bicycles
- wheelchair spaces, separate priority seating and emergency intercoms inside trains
- safety benefits including security cameras on trains and the ability for customers to see inside the train from one end to the other
- video help points at platforms, connecting directly with train controllers – an Australian first
- level access between the platform and train for faster loading and unloading
- heating and air-conditioning in all metro trains
- on-board real time travel information and live electronic route maps.

As Australia's first fully-automated railway, customer safety is a priority of Sydney Metro. At all times, a team of expert train controllers monitors the system, making sure everything runs smoothly.

1.6 Purpose and structure of this report

The off-airport components of the Project are subject to assessment and approval under the provisions of both State and Commonwealth environmental planning requirements, being the EP&A Act and the EPBC Act.

This document supports an application to the NSW Minister for Planning and Public Spaces seeking the Secretary's environmental assessments requirements for the Environmental Impact Statement for the Project.

This report has been prepared for the purpose of informing the preparation of the Secretary's environmental assessment requirements, and the information in this Scoping Report will also be used to support a referral of the Project to the Commonwealth Environment Minister under the EPBC Act. Relevant information from this report was also used to support the referral process to the Commonwealth Environment Minister in relation to the proposed variation to the Airport Plan for the on-airport component.

It is noted that the Project components, location and design would be subject to change as part of ongoing design development and community consultation and clarifications may be made during the environmental impact assessment process.

The Airports Act applies to development on the airport site to the exclusion of State environmental and planning legislation. As part of the on-airport authorisation process, an

amendment (variation) to the current Airport Plan is proposed to be made to authorise the development of the Project within Western Sydney International.

The structure and content of this report are outlined in Table 1-1.

Table 1-1 Structure and context of this report

Chapter	Description
Chapter 1 Introduction	Provides an overview of the Project and the strategic planning context.
Chapter 2 Strategic context	Provides an overview of the strategic context of the Project and the justification and need for the Project.
Chapter 3 Project development and alternatives	Describes how the Project was developed and reviews the strategic alternatives and options considered to date.
Chapter 4 Project description	Identifies the key physical infrastructure anticipated for the Project and provides an overview of how the Project may be constructed.
Chapter 5 Consultation	Outlines the consultation undertaken to date and the consultation that would occur during the preparation and exhibition of the Environmental Impact Statement.
Chapters 6 Planning and assessment process	Provides information on the statutory framework and approval pathway for the Project for both on-airport and off-airport components.
Chapter 7 Preliminary environmental risk analysis	Provides a preliminary environmental risk analysis taking into account the current scope of the Project.
Chapter 8 Key environmental issues	Provides a summary of the existing environment and a preliminary assessment of potential key environmental issues that may result during construction and operation of the Project, as well as the method of assessment proposed to be undertaken as part of the Environmental Impact Statement for the Project.
Chapter 9 Other environmental issues	Provides a summary of the existing environment and a preliminary assessment of other environmental issues that may result during construction and operation of the Project, as well as the method of assessment proposed to be undertaken as part of the Environmental Impact Statement for the Project.
Chapter 10 Cumulative issues	Provides a preliminary outline of how cumulative environmental issues that may result during construction and operation of the Project will be identified and assessed in the Environmental Impact Statement for the Project.

Chapter	Description
Chapter 11 Conclusion	Provides a summarised outline of the findings of this report.
Chapter 12 References	List those documents referred to in the preparation of this report.

2 Strategic context

2.1 State and regional planning framework

The *Greater Sydney Region Plan* sets the vision and strategy for Greater Sydney to become a global metropolis of three unique and connected cities, the Eastern Harbour City, the Central River City and the Western Parkland City.

The *Future Transport Strategy 2056* (Transport for NSW, 2018a), developed in concert with the *Greater Sydney Region Plan*, identifies a number of committed and potential projects which would assist in the success of the three cities vision by building an efficient transport network between and within the three cities.

The State Priorities were announced in 2015 and an update provided in 2018. These priorities include the delivery of infrastructure and creation of jobs.

2.1.1 Greater Sydney Region Plan 2056

Sydney is Australia's global city and will experience significant population and employment growth in the coming decades. The *Greater Sydney Region Plan* identifies that by 2056, Greater Sydney is envisaged to transform into a metropolis of three cities being (refer to Figure 2-1), with those cities being:

- the Western Parkland City
- the Central River City
- the Eastern Harbour City.

A Metropolis of Three Cities will help realise the vision where people live within 30 minutes of their jobs, education and health facilities, services and great places.

The population of the Western Parkland City is forecast to grow from 740,000 in 2016 to over 1.5 million by 2056.

By 2036, demand is forecast to require an additional 184,500 new dwellings and the creation of 200,000 additional jobs in Western Sydney as predicted in the Western Sydney City Deal (refer to Section 2.2.2).

The Project would support the delivery and realisation of strategic transport and land use plans and policies by:

- providing rail access to Western Sydney International
- supporting planned growth in the Aerotropolis
- delivering an efficient connection to the T1 Western Line at St Marys (to provide a link to the Central River and Eastern Harbour cities)

- unlocking access to jobs, including along the Greater Penrith and Eastern Creek Growth Area (refer to Section 2.2.4), Western Sydney International and Aerotropolis
- supporting and shaping the sustainable growth of the Western Parkland City by enabling optimisation of land use around station precincts
- facilitating the development of the Western Parkland City and supporting future bus and rail connections, increasing mode shift to public transport.

Extensions to Schofields/Tallawong Station in Rouse Hill to the north and Macarthur to the south are identified as potential future projects. An east-west connection between the Western Parkland City and the Central River City, as well as an extension of the South West Rail Link from Leppington Station to North Bringelly, are identified as potential future projects.

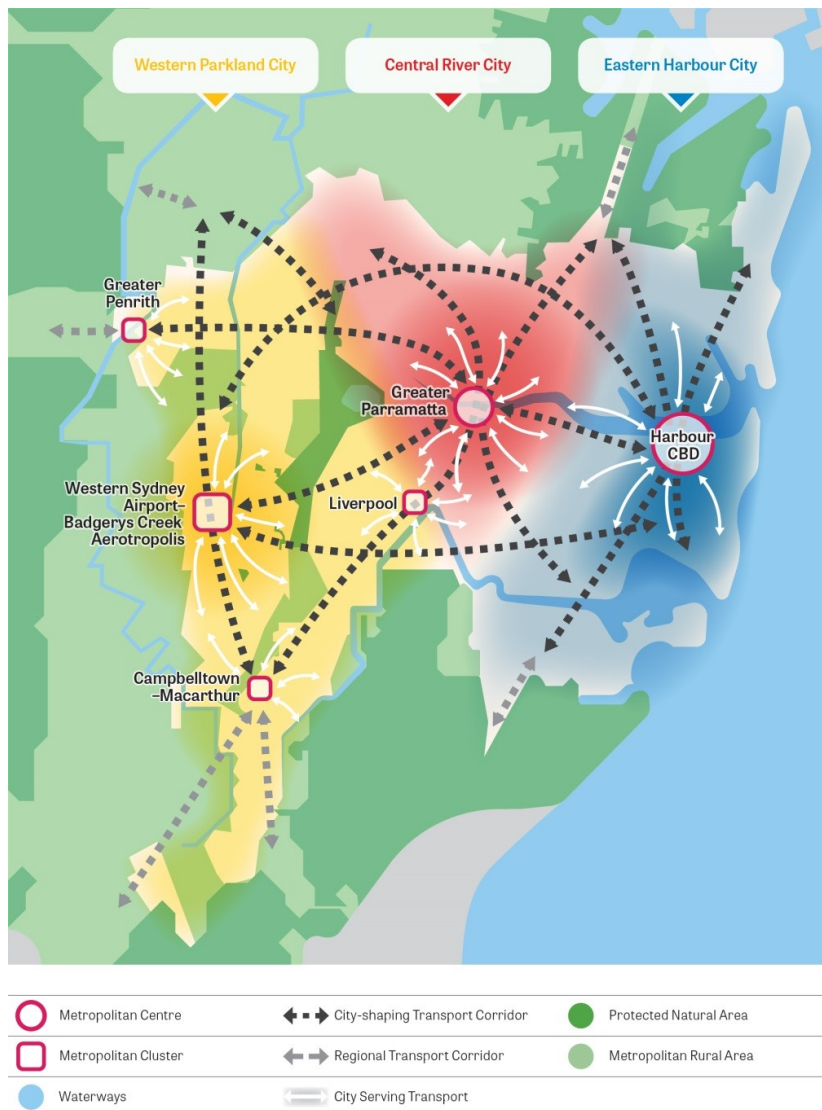


Figure 2-1 Greater Sydney Commission's vision for a metropolis of three cities

One of the objectives identified in the *Greater Sydney Region Plan* is the revitalisation of the South Creek corridor (objective 26). Infrastructure NSW, in collaboration with the Greater Sydney Commission, is leading a whole-of-government initiative for the South Creek corridor. The vision is that the South Creek corridor is the central element of the urban design and water management of the Western Parkland City.

Sydney Metro would work with Infrastructure NSW and the Greater Sydney Commission to ensure the design of the Project is consistent with, and supports, the South Creek urban design principles, being:

- orientate urban systems towards the creek corridor
- create a transect of creek-orientated place types and things to do
- build a network of everyday uses within a walkable creek catchment
- provide creek connections and encourage waterfront activity.

2.1.2 Future Transport Strategy 2056

Future Transport Strategy 2056 is a 40-year strategy to support growth and the NSW economy, focusing on customer needs and the technological, economic and social changes ahead. *Future Transport 2056* has investment priorities for Greater Sydney that will be guided by the vision of a metropolis of three cities.

The three-cities vision for Sydney will require a sustained and staged investment program to protect transport corridors and then develop a connected mass-transit network serving and linking the three cities. These multi-modal transport investments will provide improved connectivity, more flexible public transport, congestion management and urban renewal outcomes, unlocking capacity on existing road and rail corridors, and supporting renewal and walkability by drawing traffic away from centres.

Future Transport 2056 identifies Sydney Metro Greater West as a committed project connecting Western Sydney International and the Aerotropolis to the T1 Western Line. Investigation of an extension of the Project between St Marys and Tallawong Station in Rouse Hill (the westernmost station on Sydney Metro Northwest), and between the Aerotropolis and Campbelltown-Macarthur, is planned to be undertaken within the 0- to 10-year planning horizon.

2.1.3 State Priorities

In September 2015 the NSW Premier released 30 'State priorities', including 12 'Premier's priorities'. An update to the Premier's priorities was provided in 2019 with an aim to keep the economy strong, create jobs, deliver world class services, protect the vulnerable and ensure that all NSW citizens and communities share in the state's success. Key priorities relevant to the Project include achieving 'well connected communities with quality local environments' and maintaining a 'strong economy' through creating jobs. Over the next 15 years, NSW will require new infrastructure to be built that will support 40 per cent more train trips, 30 per cent more car trips and 31 per cent more households (NSW Government, 2015). Sydney Metro

Greater West is a key project in this infrastructure build which would help cater for increased trips in the Western Parkland City.

The Project would also contribute to economic growth by:

- improving access to jobs
- reducing congestion by encouraging road users to change the modes they use to move around the city
- helping move people between key centres more reliably and efficiently
- enabling housing and employment growth for the creation of a Western Economic Corridor.

A Western Economic Corridor will attract globally-significant defence and aerospace activities and contribute to a strong trade, freight, logistics, advanced manufacturing, health, education and science economy. This will produce knowledge-intensive jobs close to areas of high population growth and drive the development of the corridor and the metropolitan clusters of the Western Parkland City.

By delivering efficient and reliable transport along the Western Economic Corridor, the Project would encourage urban development around station precincts.

Bicycle facilities and accessibility provisions at station precincts could encourage walking and cycling and deliver health benefits by encouraging customers to walk and cycle to and from the station precincts.

In addition, through investment in infrastructure, such as the Project, new jobs and apprenticeships would be created for the construction sector.

2.2 Strategic planning framework for the Western Parkland City

The *Greater Sydney Region Plan* focuses on the redistribution of jobs and housing across the three cities (refer to Section 2.1.1), with a focus on unlocking employment areas in the Western Parkland City so that residents are able to work closer to home. The *Western City District Plan* (Greater Sydney Commission, 2018b) sets the strategy for implementing the Region Plan at a district level, being for the Western Parkland City.

Rebalancing economic and social opportunities is essential to leveraging this growth and to delivering the benefits more equally and equitably across Greater Sydney. The Project would help to meet this by providing access to employment areas in Western Sydney, including the Western Sydney Priority Growth Area.

The Western Sydney City Deal (Commonwealth of Australia, 2018a), as discussed in Section 2.2.2, is a key mechanism for the realisation of the objectives for the Western Parkland City.

The Draft Western Sydney Aerotropolis Plan (Western Sydney Planning Partnership, 2019) (Draft WSAP) has been prepared to inform land use and development principles in the area surrounding Western Sydney International.

2.2.1 Western City District Plan

The *Western City District Plan* sets the vision and strategy for the Western Parkland City to have efficient and easier access to jobs, and a range of housing and activities consistent with the overarching *Greater Sydney Region Plan*.

Infrastructure, businesses and knowledge-intensive jobs will be brought together through Western Sydney International and the Aerotropolis, which are envisaged as the heart of the Western Parkland City. Liverpool, Greater Penrith and Campbelltown-Macarthur are metropolitan clusters, strengthened through strong relationships, collaboration and reinforcement from the Aerotropolis.

The Western Parkland City will require a range of housing, public transport, schools, hospitals and community facilities to assist in realising this vision. The Western District Plan supports the creation of 200,000 additional jobs as envisaged in the Western Sydney City Deal (refer to Section 2.2.2 for more details).

This plan identifies the Project as being integral to achieving the vision of the Western Parkland City and significantly contributing to the Western Economic Corridor. The plan also notes that the Project would form the mass transit 'spine' of the Western Parkland City.

2.2.2 Western Sydney City Deal

The concept of 'City Deals' was announced in the Smart Cities Plan (Department of the Prime Minister and Cabinet, 2016), which focuses on leveraging Australian Government investments in infrastructure to ensure that projects prioritise broader economic objectives, maximise investment reach by facilitating alternative financing models, and increase overall infrastructure investment levels.

The Western Sydney City Deal (NSW Government, 2018) is a partnership between the Australian Government, NSW Government and eight Western Sydney local councils to:

- provide funding and policy support for the generation of economic growth
- jobs and housing
- reduce travel times
- improve environmental outcomes.

The eight local councils involved in the Western Sydney City Deal are:

- Blue Mountains City Council
- Camden Council
- Campbelltown City Council
- Fairfield City Council
- Hawkesbury City Council
- Liverpool City Council

- Penrith City Council
- Wollondilly Shire Council.

The Western Sydney City Deal provides a collaborative platform to develop the Western Parkland City and become one of the most connected places in Australia.

The Western Sydney City Deal is intended to complement land use decisions over the next 20 years and will focus on local job opportunities, connectivity and liveability.

A shared objective between the Australian and NSW Governments is to connect rail from St Marys to Western Sydney International and the Aerotropolis for when the airport opens for passenger services.

With connections to the T1 Western Line and the Aerotropolis, the Project is a key step towards achieving a vision for 30-minute city connections in the Western Parkland City. As part of the Western Sydney City Deal, the NSW Government will also establish rapid bus services from the metropolitan centres of Penrith, Liverpool and Campbelltown to Western Sydney International before its planned opening, and to the Aerotropolis.

2.2.3 Draft Western Sydney Aerotropolis Plan

The Aerotropolis (formerly known as the Western Sydney Priority Growth Area), encompasses 11,200 hectares of land within the Penrith and Liverpool local government areas.

The Draft WSAP was prepared to inform land use and development principles in this area and surrounding Western Sydney International. It has been prepared following feedback received through the exhibition of the Stage 1 Land Use and Infrastructure Implementation Plan (LUIIP) for the Aerotropolis. It presents the vision and planning framework for the Aerotropolis as Australia's next global gateway, becoming an 'inviting place to live, work and invest' and being situated within a 'cool, green and connected' Western Parkland City.

The Draft WSAP sets out an approach to precinct planning that will optimise investment in major infrastructure and create the impetus for early activation of the Aerotropolis. This includes the establishment of 10 precincts, six of which would be planned for early development (referred to as the initial precincts).

The Project would traverse the Northern Gateway and Aerotropolis Core initial precincts (refer to Figure 2-2):

- Aerotropolis Core – The central city at the core of the Aerotropolis activity associated with the Airport. The combination of uses, activities, development and places are reliant on and complementary to the operation of the global airport.
- Northern Gateway precinct – Located directly north of Western Sydney International, the Northern Gateway precinct is a key strategic centre that is complementary to the Aerotropolis Core. It will harness existing and emerging economic opportunities catalysed by the Airport to provide a variety of employment generating uses, including high

technology commercial enterprise, industry, warehousing and logistics, education and corporate offices.

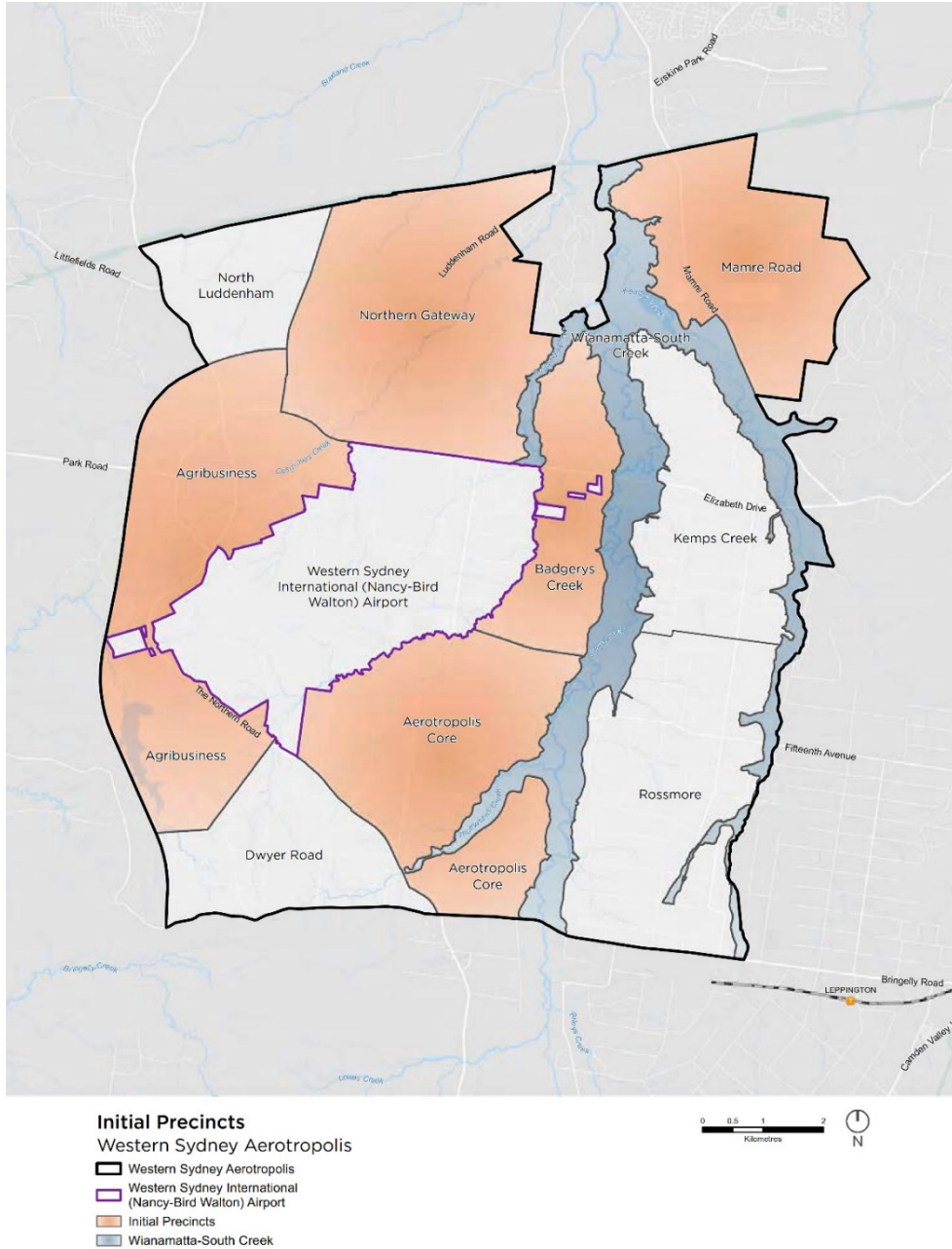


Figure 2-2 Western Sydney Aerotropolis initial precincts (Western Sydney Planning Partnership, 2019)

2.2.4 Greater Penrith to Eastern Creek Growth Area

The Western City District Plan identifies a Greater Penrith to Eastern Creek Growth Area, connecting the Penrith central business district and St Marys through to the M7 Motorway and Eastern Creek. This area will build on the opportunities created by the Western Economic Corridor and seeks to enhance the integration of land use and transport planning to guide redevelopment opportunities, as well as identifying the infrastructure required to support continued growth. Growth in appropriate locations can contribute to a connected, vibrant Western Parkland City with more homes, jobs, services and open space. The *Greater Sydney Region Plan* recognises that the Project would create opportunities for renewal and revitalisation along this Greater Penrith to Eastern Creek corridor.

The Greater Penrith to Eastern Creek Growth Area includes activity nodes such as the Penrith central business district and the Penrith health and education precinct, as well as the centres of St Marys, Mount Druitt and Rooty Hill. Investigations are currently being undertaken by the Australian and NSW Governments for this area and will build on the work undertaken for the Greater Penrith Collaboration Area, including strategies to promote tourism. It will consider opportunities to capitalise on the benefits of the potential development and expansion of health, education or other social infrastructure in these centres. Orchard Hills and Luddenham are two areas that form part of the Greater Penrith to Eastern Creek Growth Area, to the north of the Aerotropolis.

2.2.5 Western Sydney Rail Needs Scoping Study

The Australian and NSW Government prepared a *Western Sydney Rail Needs Scoping Study* to determine the long-term need, timing and service options for passenger rail to service the Western Parkland City and connect to Western Sydney International.

That study identified a preferred long-term rail network that provides a blueprint for expanding and enhancing rail services in Western Sydney over the coming decades. The study also identified a metro rail product as the preferred rail product, since it would deliver strong customer, land use and transport network outcomes.

Key components of the preferred network include:

- a North South Rail Line between Schofields and Macarthur, via Western Sydney International and the Aerotropolis (with the Project forming the first stage of this Line between St Marys and the Aerotropolis)
- potential future extensions between Schofields and Cudgegong Road (Tallawong Station in Rouse Hill)
- an East West Rail Link to connect Greater Sydney's 'three cities', providing rail connectivity between the Western Parkland City, the Central River City and the Eastern Harbour City (indicatively by a Sydney Metro West extension allowing connections to Parramatta and Sydney CBDs)

- rail links that could support the growth of Western Sydney and support access to Western Sydney International through additional rail connections (including a South West Rail Link extension)
- network upgrades and extensions across the existing rail network to increase public transport capacity between Western Sydney and Greater Sydney.

This recommended network for the future success of the Western Parkland City included the potential future link between Schofields and Macarthur as the connection to deliver the most city-shaping potential for the Western Parkland City. There would also be the potential for future extension from Schofields to Cudgegong Road (Tallowong Station in Rouse Hill).

The Draft *North South Rail Line and South West Rail Link Extension Corridors Strategic Environmental Assessment* (Transport for NSW, 2018c) investigated the corridor from St Marys to Macarthur further and the need to protect this corridor for future development (refer to Section 3.2).

2.3 Project objectives

A robust set of objectives have been developed to represent the outcomes to be achieved by the Project.

The Project objectives will underpin the options evaluation process and development of the Project and are listed in Table 2-1.

Table 2-1 Sydney Metro Greater West Project objectives

Objective summary	Objective
Safe and customer focused transport service	Deliver easy, safe and accessible transport services that meet the needs of our customers.
Successful airport and Western Parkland City	Support the long-term success of Western Sydney International and the Western Parkland City by optimising land use and development, transport and green infrastructure.
Attracting knowledge and internationally competitive jobs	Support Western Sydney's international competitiveness and productivity by supporting employment precincts and attracting knowledge-intensive jobs.
Realising the 30 minute city	Connect Western Sydney communities with an integrated transport network to maximise the 30-minute city catchment of the Western Parkland City.
Great places with an increased housing supply	Facilitate the development of the Western Parkland City to create liveable, vibrant and environmentally sustainable precincts and places with a diverse mix of new dwellings.

Objective summary	Objective
Delivering a value for money solution	Ensure a value for money, sustainable and deliverable solution to support long-term growth of the Western Parkland City.

2.4 Project justification and need

Sydney Metro Greater West is a new city-shaping transport project that would form part of an integrated transport solution for the Western Parkland City. The Project is needed to:

- service a growing population in the Western Parkland City
- provide rail access to the new Western Sydney International and the Aerotropolis
- reduce congestion by encouraging road users to change the modes they use to move around the city
- deliver an efficient connection to the T1 Western Line (to provide a link to the Central River and Eastern Harbour cities)
- unlock access to jobs, including in the Greater Penrith to Eastern Creek Growth Area, Western Sydney International and the Aerotropolis
- support and shape the sustainable growth of the Western Parkland City by optimising land use around station precincts.

The *Western Sydney Rail Needs Scoping Study* identified a metro rail product to be the preferred product to best meet the objectives of the Project. A metro rail product delivers strong customer, land use and transport network outcomes.

The Project would be the symbolic link for the western economic spine that joins the investments proposed under the Western Sydney City Deal and delivers on the visions from the *Greater Sydney Region Plan* and the *Future Transport 2056* strategy.

3 Project development and alternatives

This chapter describes the strategic alternatives to the Project, as well as the Project planning and design development process. It explains the Project options currently being considered as well as how the Project would integrate with future station precincts and the Western Sydney Airport Plan.

3.1 Strategic alternatives

Infrastructure for road, public transport and utilities and services are key to supporting future growth in the Western Parkland City and the success of Western Sydney International. This will require investment in the mass transit network to shape a sustainable urban form and grow jobs, and in the longer term support achieving 30-minute access for most people to metropolitan centres by public transport, a goal identified in the *Greater Sydney Region Plan*.

The need for a mass transport service for the Western Parkland City was identified in the *Future Transport 2056* strategy and *Greater Sydney Region Plan*. Investment in roads and buses forms only part of the solution to providing the mass transit capacity required to support the Western Parkland City. In addition, a joint Australian and NSW Government *Western Sydney Rail Needs Scoping Study* was prepared to inform the rail connections needed throughout the Western Parkland City (refer to Section 2.2.5). That study identified a north-south rail corridor connecting Tallawong Station in Rouse Hill with Macarthur via St Marys and the airport site as critical to integrated land use and transport planning for the future of the Western Parkland City.

The Draft *North South Rail Line and South West Rail Link Extension Corridors Strategic Environmental Assessment* investigated this corridor further and the need to protect it for future infrastructure development. This is discussed in Section 3.2. The Project predominantly follows the corridor identified in that strategic environmental assessment.

Western Sydney International would be serviced by a number of transport options and the Project would form part of an integrated transport solution for both the airport and the Western Parkland City. A number of road projects in the off-airport environment are being delivered as part of the Western Sydney Infrastructure Plan (WSIP). The objective of the WSIP is to deliver major road infrastructure upgrades to support an integrated transport solution for Western Sydney and capitalise on the economic benefits from developing Western Sydney International.

The Western Sydney Airport Plan identified that rail services will need to be provided at the airport at the right time in its development, as this would not only provide benefits to passengers and employees using the airport, but also to the broader Western Parkland City (Commonwealth of Australia, 2016a, Greater Sydney Commission, 2018a).

The Western Sydney Airport Plan identified that in the early years of operation, around 80 per cent of passenger demand at the airport would involve regional and domestic travel (Commonwealth of Australia, 2016b). Domestic demand is likely to be focused on travel between capital cities, including Melbourne, Brisbane and Perth, as well as the Gold Coast.

While recognising the delivery of passenger rail access to Western Sydney International by the commencement of operations is a key imperative, the Australian and NSW Governments are also investing in a range of new transport connections through the \$4.1 billion WSIP. This includes the future M12 Motorway, providing a connection to Sydney’s motorway network, and upgrades to Elizabeth Drive. There would also be regular bus services linking the airport to local and city centres.

In addition, as part of the Western Sydney City Deal, the NSW Government will implement rapid bus services from Campbelltown, Liverpool and Penrith to link to Western Sydney International and the Aerotropolis Core. The Outer Sydney Orbital and Western Sydney Freight Line would also establish a transport structure for the Western Parkland City, providing for future road and freight movements.

Airport operations are proposed to commence with a capacity of around 10 million passengers annually and will increase to 82 million passengers annually by 2063. Although the analysis undertaken in 2016 indicated that the package of road upgrades would initially be adequate to support anticipated airport demand for around a decade after opening (Department of Infrastructure and Transport, 2012), the Australian Government recognises that rail could provide a benefit not only to passengers and employees using the airport, but also to the broader Western Sydney region.

Passengers arriving and departing Western Sydney International will use various modes of travel. The Western Sydney Airport Environmental Impact Statement assumed rail would be provided some time after the Stage 1 development of Western Sydney International, and therefore was not included in the assumed transport mode split for the airport at opening. Without rail access, the land transport mode split would be as shown in Table 3-1. The Project would provide an important alternative to the dependence on private vehicles for most trips and contribute positively to the ongoing management of congestion on Sydney’s road and rail networks as well as supporting travel across the Western Economic Corridor.

Table 3-1 Western Sydney International Stage 1 operations assumed land transport mode split

Mode	Western Sydney International Stage 1 operation assumed mode split			
	Domestic		International	
	Drop-off	Pick-up	Drop-off	Pick-up
Kiss and fly	30%	30%	40%	40%
Park and fly	35%	35%	30%	30%

Mode	Western Sydney International Stage 1 operation assumed mode split			
	Domestic		International	
	Drop-off	Pick-up	Drop-off	Pick-up
Taxi	20%	20%	20%	20%
Shuttles	5%	5%	5%	5%
Bus	10%	10%	5%	5%

Source: Commonwealth of Australia. 2016b. *Western Sydney Airport Environmental Impact Statement*.

Around 24 per cent of passengers use rail services to access Sydney (Kingsford Smith) Airport (Sydney Airport Corporation Limited, 2019) and, depending on the attractiveness of rail to Western Sydney International passengers (i.e. transit time, cost and ease of access), it is expected rail would attract similar percentages in the immediate term, if available. These figures are consistent with international experience that indicates a global average of around 20 per cent rail mode share for airports with a well-connected airport rail link, where people are already accustomed to using public transport (Transport Associates Pty Ltd, 2015).

A strategic merit test report was prepared by Sydney Metro for the strategic alternatives to the Project. The outcomes of that report are summarised in Table 3-2.

Table 3-2 Strategic alternative transport options

Option	Effectiveness at meeting Project objectives
Metro (rail mass transit) along the North South Rail Line (now referred to as Sydney Metro Greater West) corridor	<p>Preferred option – Strong performance against Project objectives (refer to Section 2.3):</p> <ul style="list-style-type: none"> would include high frequency services to serve key activity centres with fast travel times potential to catalyse the development and success of activity centres and shape the Western Parkland City with high levels of transport amenity and capacity to realise the 30-minute city ability to form the north-south spine of a fully integrated, multi-modal network potential to catalyse and serve key residential development areas with high transport amenity and capacity.

Option	Effectiveness at meeting Project objectives
Dedicated airport rail with no or limited intermediate stations	<p>Not preferred for the initial rail service to the airport (but options preserved for a future second service) – Limited performance against some Project objectives:</p> <ul style="list-style-type: none"> • serves the airport’s specific customer market with a direct service • limited potential to the success of the Western Parkland City with very limited opportunity to serve other key activity centres with new stations • limited opportunity to integrate with other modes and an airport-only service is also restricted in its potential to develop liveable and vibrant precincts.
Light rail along the North South Rail Line (now referred to as Sydney Metro Greater West)corridor	<p>Not preferred – Limited performance against Project objectives:</p> <ul style="list-style-type: none"> • light rail is a city-serving transport service and functions as a distributor. The city-shaping objectives for the Project could not be supported with a light rail solution • relatively limited capacity and travel times compared to a metro rail mass transit option • should the Project be extended to Schofields/Tallowong Station in Rouse Hill in the north or Macarthur in the south, the light rail service may not be the appropriate transport solution for this length of alignment • supports some multi-modal interchange and transport connectivity benefits.
Bus priority or on road bus	<p>Not preferred – Bus priority and on-road buses are a city-serving transport service and function as a distributor. The city-shaping objectives for the Project would only partially be met with a bus priority or on-road bus solution as there would not be sufficient capacity to safeguard long-term growth.</p>
Transport demand management (for example road pricing subsidising public transport cost)	<p>Not preferred – Very limited performance against most of the objectives. Does not support the development of the Western Parkland City or the 30-minute city concept.</p>

3.2 Planning for the rail corridor

Given the rapid expansion in the Western Parkland City, early protection of transport corridors has been vital to ensure there is sufficient land available when the construction of railway infrastructure is required. By providing certainty about the location of this infrastructure, this helps to minimise property and land use impacts.

In December 2012, the NSW Government released the *Long Term Transport Master Plan* (Transport for NSW, 2012) (since superseded by the *Future Transport Strategy 2056*) for the

State's transport system to 2031. It identified a need for a corridor between Penrith and Campbelltown/Macarthur. It was identified as a key transport corridor in Western Sydney and one that is facing increased travel demand.

As discussed in Section 3.1, a joint Australian and NSW Government *Western Sydney Rail Needs Scoping Study* was prepared to inform the rail connections needed throughout the Western Parkland City. This study identified a north-south rail corridor connecting Tallawong Station in Rouse Hill with Macarthur via St Marys and Western Sydney International as critical to integrated land use and transport planning for the future of the Western Parkland City.

The Draft *North South Rail Line and South West Rail Link Extension Corridors Strategic Environmental Assessment* further investigated this corridor and proposed the protection of two rail corridors in Western Sydney for future rail infrastructure for passenger train services – the North South Rail Line and the South West Rail Link extension. The recommended North South Rail Line corridor is between the T1 Western Line near St Marys and the T8 South Line near Macarthur via Western Sydney International. The recommended South West Rail Link Extension corridor would extend from Leppington Station to the Aerotropolis, to potentially interchange with the recommended North South Rail Line corridor.

The Project would predominantly follow the recommended rail corridor identified in the strategic environmental assessment between the T1 Western Line and the Aerotropolis. Supporting infrastructure such as the stabling and maintenance facility, construction sites and operational systems may be located outside of the recommended corridor.

The strategic environmental assessment report provided an assessment of the strategic environmental impacts and benefits of protecting the two corridors. Corridor protection enables the land to be safeguarded from urbanisation, enables suitable controls to guide development on adjoining lands to be identified, and provides long term assurance in the strategic land use and transport planning for the region by providing certainty over the corridor alignment for transport infrastructure.

The recommended corridors were selected following a comprehensive process that has involved community consultation, exploration of multiple alignment alternatives and the input of a number of technical experts. Following investigations into existing natural and built constraints and opportunities in the environmental study area and the strategic land use planning objectives of the Western Parkland City region, as well as initial public consultation, the recommended corridors were selected to minimise environmental, social and economic impacts and facilitate the long term development of the Western Parkland City.

Refer to Section 6.1.2 for information on the corridor protection legislative process.

3.3 Project planning and design process

3.3.1 Key stages and program

The key stages and program for the planning and design process for the Project are shown in Figure 3-1.

Following the corridor investigation works undertaken by Transport for NSW since 2015, and consultation in 2018, the Project has progressed through to an early stage of design and is undergoing planning, options analysis and design development.

An interim project definition has been developed, on which this Scoping Report is based, and is a key reference point for the design development going forward. The Environmental Impact Statement would be based on an updated project definition.

The development of the interim project definition involved a strategic merit test (comparing design options against Project objectives) and a detailed multi-criteria analysis (analysis of short-listed options, with benefits and impacts). This framework is based on the *Australian Transport Assessment and Planning Framework* (Commonwealth of Australia, 2018b). The analysis of short-listed options also involved the assessment of station options against the preliminary design principles for metro stations (refer to Section 4.4.1).

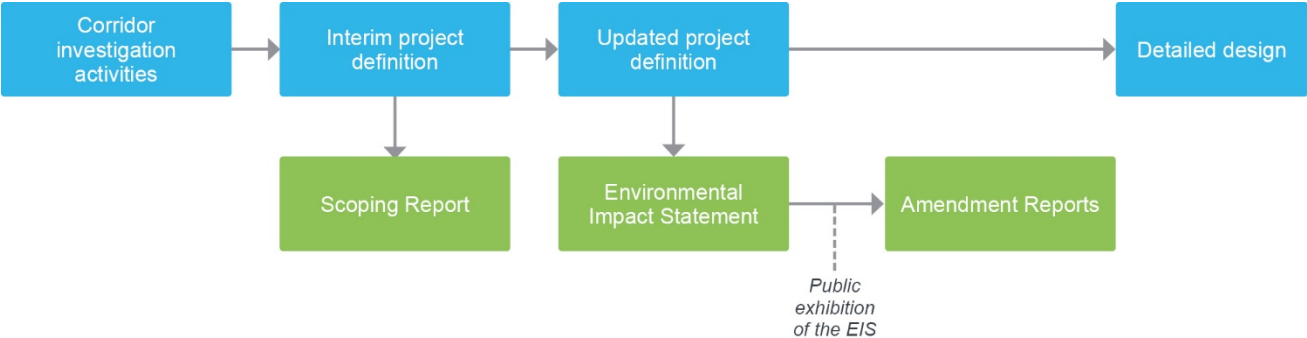


Figure 3-1 Planning and design stages

3.3.2 Environmental principles of Project development

The ongoing design development for the Project has considered the potential environmental and land use constraints associated with design options. This has assisted in avoiding or minimising potential environmental impacts of the Project.

Specifically, where feasible and reasonable, the design is being developed to:

- integrate with strategic transport and land use plans for the Western Parkland City
- minimise impacts to existing vegetation communities, in particular threatened ecological communities
- ensure impacts to non-Aboriginal and Aboriginal heritage items are avoided or minimised
- ensure construction methodologies minimise noise and vibration impact to sensitive receivers

- consider opportunities to provide engineering structures that maintain vegetation and fauna connectivity
- consider opportunities to minimise the footprint of the Project within the 100-year Average Recurrence Interval (ARI) flood zone, or ensure appropriate mitigation is provided in the design when located within the 100-year ARI flood zone.

3.3.3 Sustainability

Increased provision of public transport delivers a number of sustainability benefits relating to peoples' health, service amenity and cost of living, as well as urban development benefits with subsequent water, energy and greenhouse gas emission efficiencies.

A sustainability plan is being developed for the Project, which would build on the initiatives developed in the Sydney Metro Northwest and Sydney Metro City & Southwest project strategies. The sustainability plan will consider opportunities in relation to the following sustainability principles:

- investment made on a whole-of-life basis
- climate resilience
- local and global environmental responsibility
- protecting biodiversity and heritage
- social responsibility.

Specific sustainability outcomes would be identified to support these sustainability principles.

A Sustainability Plan (Western Sydney Airport, 2019) has been prepared for Stage 1 of Western Sydney International. The purpose of the Sustainability Plan is to provide an overall framework and objectives for incorporating sustainability into the development of Western Sydney International. It spans the design, procurement, construction and operation phases of Stage 1 development of Western Sydney International. Sydney Metro would continue to consult with Western Sydney Airport in regard to works and sustainability objectives within the airport site.

3.3.4 Process for integration of environment and sustainability in design

Design development has included a focus on avoiding and/or minimising the potential for impacts during all key stages of construction and operation. The indicative construction methodology and design of the Project described in the following chapters has been developed with consideration given to the environmental constraints and issues identified during the early stages of the design and environmental assessment process.

3.4 Integration with future station precincts

As part of the design development process, Sydney Metro is working closely with the NSW Department of Planning, Industry and Environment (DPIE) on the Greater Penrith to Eastern Creek growth corridor, Penrith Council and Liverpool Council on its Local Strategic Planning Statement process, the Western City Planning Partnership on its precinct planning for the Northern Gateway and Aerotropolis, and the Western City and Aerotropolis Authority on its plans for the Aerotropolis Core.

The Project would support the realisation of strategic transport and land use plans by optimising land use around station precincts. Proposed stations for the Project are outlined in Section 4.4.2. Station precinct locations have been identified and evaluated based on alignment with the Project objectives and the following criteria:

- safe and customer-focussed transport service
- a successful airport and Western Parkland City
- attracting knowledge and internationally competitive jobs
- realising the 30-minute city
- great places with an increased housing supply
- delivering a value for money solution.

The project definition activities would continue to refine the Project and the station precinct locations to best meet the Project objectives (refer to Section 2.3), deliver the greatest customer outcomes, land use and transport network benefits, and support the success of the airport and Western Parkland City. Chapter 2 provides more information on how the Project supports the realisation of strategic transport and land use plans.

The delivery of the Project also provides the opportunity to plan for new growth within the Schofields to Macarthur corridor centred around the stations, major attractors, destinations and transport interchanges. This would be achieved through the creation of sustainable, well designed mixed employment, health and education, residential, recreational and civic precincts, connected by frequent rail services and other modes of transport. Most local residents would have public transport access to employment, education, services and open space within the Western Parkland City within 30 minutes.

3.5 Integration with the Western Sydney Airport Plan

The Western Sydney Airport Plan sets out the vision for the development and operation of Western Sydney International. The construction of the airport is expected to be completed so that operations can commence in 2026.

The Airport Plan identifies the need for the airport to be connected by high-quality transport, including passenger rail, the M12 Motorway and regular bus services. The design of the airport has included consideration of, and the protection of, an alignment for rail, as well as

stations at the Airport business park and Airport terminal, so that land is properly preserved to meet rail requirements.

The Project is proposed to enter the airport site from the north and would involve stations at the Airport business park and the Western Sydney International terminal. The rail line would travel through the airport, before exiting the airport site beneath Badgerys Creek in the south-west of the airport site.

Sydney Metro would continue to work with Western Sydney Airport during development of the Project.

3.6 Project design development

Various aspects of the Project are subject to ongoing design development and options analysis, which would continue throughout the project planning and design phases (as described in Section 3.3). Key Project aspects which are subject to ongoing development include:

- horizontal alignment of the Project (refer to Section 4.3.1)
- vertical alignment of the Project (including where the Project is in tunnel, cutting, at surface or elevated/viaduct) (refer to Section 4.3.2)
- station locations and their design (refer to Section 4.4)
- location, size and layout of the stabling and maintenance facility (refer to Section 4.5.2)
- transport integration components at station precincts, including provision for active transport, public transport and road infrastructure (refer to Section 4.4.4)
- construction site locations and construction methodologies (refer to Section 4.8)
- other ancillary operational infrastructure (refer to Section 4.5).

4 Project description

This chapter provides an overview of the Project and its key components. It describes the Project's key interfaces with other existing and planned transport infrastructure, as well as construction principles and activities.

4.1 Overview and key components

4.1.1 Project overview

The Project involves the construction and operation of a metro rail line, about 23 kilometres in length, between the T1 Western Line in the north and the Aerotropolis in the south (refer to Figure 1-1).

The key components of the Project include:

- a new metro station connecting to, and providing interchange with, the T1 Western Line at St Marys
- modifications to the existing Sydney Trains station and rail infrastructure (where required) to support interchange and customer transfer between the new metro station and the existing station on the T1 Western Line
- two new metro stations between the T1 Western Line and Western Sydney International:
 - one at Orchard Hills
 - one at Luddenham
- two new metro stations within Western Sydney International:
 - one at the Airport terminal
 - one at the Airport business park
- one new metro station within the Aerotropolis Core precinct, south of Western Sydney International
- active transport facilities, public transport and road infrastructure at the metro stations.

The horizontal and vertical alignment of the new metro line would be fit-for-purpose and would be designed to provide good precinct and customer outcomes. It would:

- include a combination of tunnel, surface and elevated/viaduct sections
- have grade separated interfaces with key roads including the Great Western Highway, M4 Western Motorway, Luddenham Road, the future M12 Motorway, Elizabeth Drive and Badgerys Creek Road

- be influenced by and be compatible with the site layout of Western Sydney International
- incorporate crossings of Blaxland Creek and Cosgroves Creek.

The Project would include works and facilities required to support the construction and operation of the Project, including operational systems and infrastructure.

A stabling and maintenance facility and operational control centre would be required to support operation of the Project. This infrastructure is currently proposed in the area between the Warragamba pipeline and the M4 Western Motorway.

The Project would be designed to safeguard for:

- potential future extensions of the rail line to the north of St Marys towards Schofields/Tallawong Station in Rouse Hill and to the south of the Aerotropolis towards Macarthur, through the provision of features such as stub tunnels (which would allow for minimal disruption of the operating line during construction of future extensions)
- a future rapid bus network connecting the Airport business park, Airport terminal and Aerotropolis Core stations with Campbelltown, Liverpool and Penrith.

The Project would also be designed to not preclude a future East West Rail Link to the airport or an extension to the South West Rail Link, which are separate projects subject to ongoing transport planning and investigation.

4.1.2 Project components within Western Sydney International

The Project is proposed to enter the airport site from the north and travel through the airport, before exiting the airport site beneath Badgerys Creek.

The Project would provide two stations within Western Sydney International. One would be provided within the Airport business park and one would be located at the Airport terminal. The stations within Western Sydney International site would be designed to be consistent with the plans for the Airport business park and Airport terminal areas.

Ancillary operational infrastructure such as ventilation, power supply, signalling, communications, water, sewerage and drainage systems would also be provided along the Project alignment and at the stations where required. Stabling and maintenance facilities would not be provided within Western Sydney International.

4.1.3 Urban design

Urban design principles would be developed for stations, station precincts, viaducts and bridges, as well as other infrastructure which has an interface with the public domain. These principles would be developed so that appropriate design quality is achieved for the Project to integrate it into the landscape and minimise visual impacts for receivers (e.g. the general public). The design principles would also consider relevant local council strategies and the integrated design policy for NSW, “Better Placed” by the NSW Government Architect, and would be described in the Environmental Impact Statement for the Project.

4.2 Operation of the Project

The fully automated Sydney Metro rail service would deliver a high capacity, turn-up-and-go service consistent with customer expectations. It would operate every day of the year and would stop at all stations along the metro line. Sydney Metro Greater West would operate independently from the existing suburban and intercity rail network and from the Sydney Metro Northwest, City & Southwest and Sydney Metro West lines.

The operational capacity of Sydney Metro Greater West would be for up to 20 trains per hour in each direction. The actual frequency at opening would be aligned with expected demand and would likely increase over time as demand increases. The operational capacity may further increase subject to future extensions to the north (to Schofields/Tallawong in Rouse Hill) and south (to Macarthur) becoming operational.

Operating hours for the Project are currently being considered and would ensure there is a transport service provision to respond to the operational requirements of the airport.

4.2.1 Train types

All trains would be new, single deck metro trains, similar to those that operate on Sydney Metro Northwest. These new generation trains would deliver a fast, safe and reliable journey for customers with high performance standards and good customer amenities including:

- air conditioning
- emergency help points
- provision of accessible priority seating for those with a disability or using a wheelchair or mobility device, the elderly or those travelling with a strollers and children or luggage
- ability to transport bicycles
- suitability for airport travellers providing under seat luggage storage for carry-on bags and level access between the platform and train
- no gap boarding and alighting
- multiple doors per side per carriage, allowing fast boarding and alighting
- efficient seating and standing arrangements for the journey
- uninterrupted data connectivity for mobile phones throughout the trip
- clear transport information whilst on board the metro.

Sydney Metro Greater West would be able to carry more passengers per hour than would be the case with double deck trains. This is because single deck trains allow customers to get on and off at stations more efficiently and faster than double deck trains which reduces dwell times (the time a train is stopped at a station). The modern signalling technology is also more efficient for running the trains by providing fully automated trains and less dwell times at stations, which increases the capacity of the metro network.

A photograph of the indicative type of train proposed is provided at Figure 4-1.



Figure 4-1 Photograph of a train operating on Sydney Metro Northwest

4.3 Track alignment

The track alignment for the Project would involve:

- track designed with fit-for-purpose vertical alignment including connection to a stabling and maintenance facility
- twin standard gauge tracks with one or more intermediate crossovers
- Communications Based Train Control system providing unattended train operations (i.e. fully automated and driverless operations)
- turn-back arrangements at the north and south end of the line
- design that safeguards for potential future extension of the line to the north and south.

The Project would not preclude development of a potential future East West Rail Link, and a South West Rail Link extension.

4.3.1 Horizontal alignment

The indicative horizontal alignment of the Project is shown in Figure 1-1, which would be subject to further refinement during design development. The horizontal alignment of the Project has been primarily guided by the location of the proposed metro stations and the transport corridor protection process.

The Project predominantly follows the recommended North South Rail Line corridor identified in the *Draft North South Rail Line and South-West Rail Link Extension Corridors Strategic Environmental Assessment* (refer to Section 3.2 for more details). The identified corridor has

made provision for rail alignments and track formation, however based on limited design information it was unable to contemplate ancillary facilities required to support either construction and/or operation of the Project (such as construction sites and a stabling and maintenance facility). As such, ancillary facilities and other supporting infrastructure may be located outside of the recommended North South Rail Line corridor.

The horizontal alignment of the Project would be defined by the functional requirements of a metro network, the specific constraints of station design and environmental constraints, namely:

- the location, depth and platform configuration of each of the proposed metro stations
- requiring appropriate curvature to accommodate train operating speeds. Tighter radius curves may be adopted at some locations for a variety of reasons, including avoiding surface and/or subsurface constraints such as areas of ecological sensitivity, flood prone land and other existing and/or proposed infrastructure.

The Project design would aim to:

- avoid where possible known built-form constraints including existing buildings, utilities and infrastructure (including other rail and road infrastructure)
- minimise, as much as practicable, direct impacts on property
- minimise impacts on environmental or social features such as ecologically sensitive areas and heritage items.

A dive structure and tunnel portal would be required at any location where the rail line transitions from below ground to surface. Definition for the tunnel portal infrastructure is subject to design development and influenced by the horizontal alignment.

A dive structure would typically comprise an initial length of open trough, which would then transition to the tunnel, likely to be a cut-and-cover structure. A dive structure would be designed to be protected from the probable maximum flood level to avoid floodwater flowing into the tunnels.

Operational maintenance access would be required at locations along the rail corridor.

4.3.2 Vertical alignment

The track alignment for the Project would be a mixture of tunnel, elevated/viaduct, and surface (refer to Figure 4-2). The track would have a maximum vertical grade of 4.5 per cent and would be refined to ensure station platforms are located along a straight and level (i.e. zero per cent grade) section of track.

The vertical alignment would be influenced by a variety of constraints including creek crossings, flooding risks and major road and other infrastructure corridors, for example the Warragamba Dam pipeline to Prospect and Orchard Hills. Major road corridors which would be crossed by the Project include the Great Western Highway, M4 Western Motorway, Elizabeth Drive, the future M12 Motorway, Luddenham Road and Badgerys Creek Road.

The alignment would also be developed to support strategic transport and land use plans.

An overview of the vertical alignment options that may form part of the Project are shown in Figure 4-2.

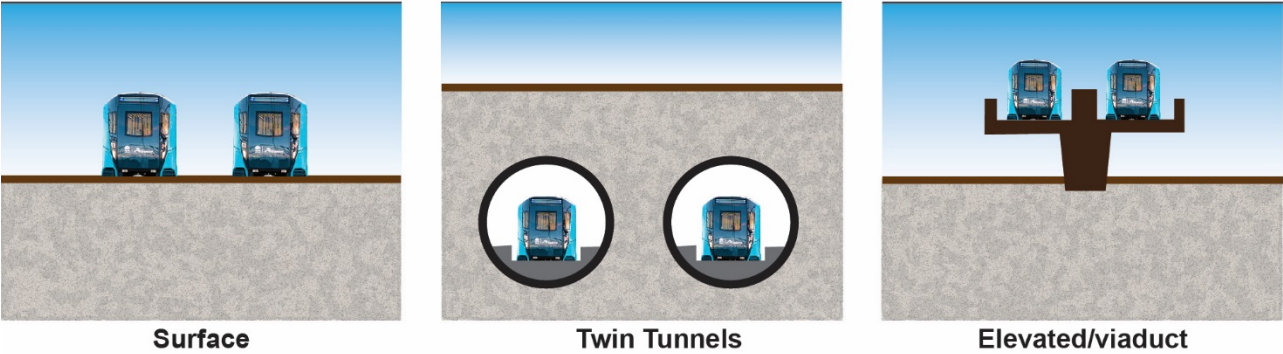


Figure 4-2 Vertical alignment options that may form part of the Project

Twin tunnels

The metro rail tunnels would have a circular cross-section with a clear internal lined diameter of about six metres to accommodate the typical metro train.

The tunnels would be lined with precast concrete segments to ensure the long-term life of the tunnels and to minimise groundwater ingress. The tunnels would provide space for the trains and tracks, and for other equipment and services including rail signalling, controls and communication, overhead traction power, fresh air ventilation, fire and life safety systems, lighting and drainage. The tunnels would also have cross passages at regular intervals to facilitate emergency egress.

An indicative cross-section of an underground tunnel is shown in Figure 4-3.

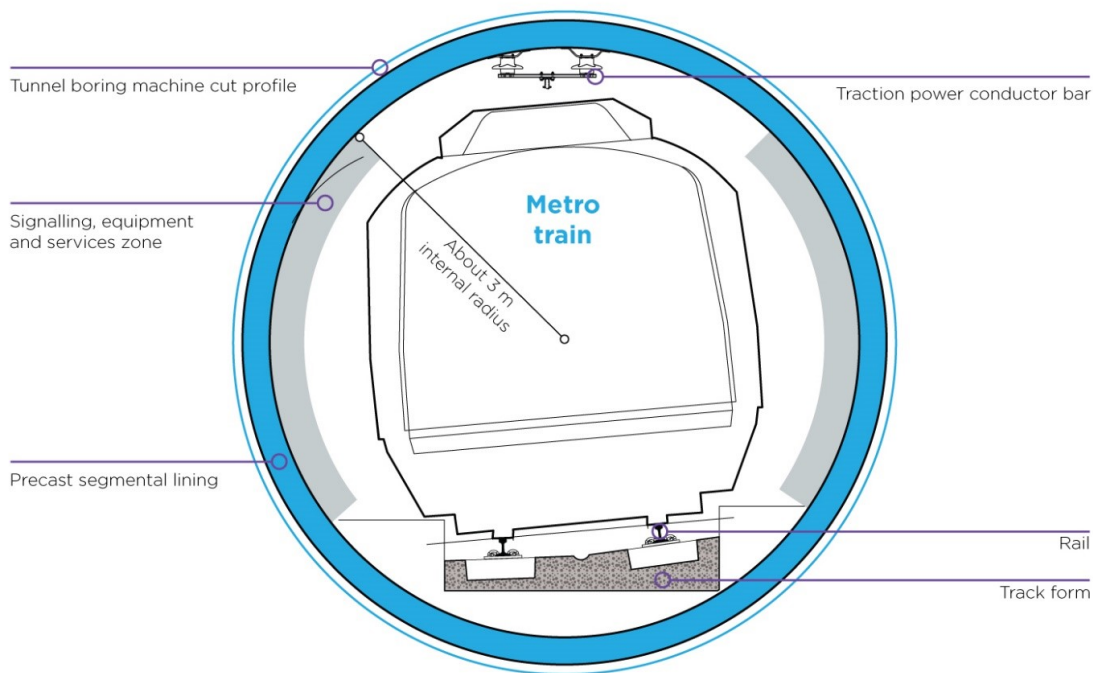


Figure 4-3 Indicative cross section of a metro tunnel

Surface

The surface tracks would generally consist of a slab track construction with concrete sleepers. Earthworks would be completed to construct a formation width sufficient for a twin track electrified railway.

A series of fill embankments and cuts would also be required along the length of the Project where it is at the surface due to the varying terrain and locational setting of the Project within the existing landscape. Batters for cuts and embankments would be designed to fit the surrounding landscape context, minimise property impacts and maintenance requirements and reduce urban design impacts.

Elevated viaduct or bridges

At locations where the track is an elevated viaduct or bridge, the form of the structure would be determined to respond to the specific requirements of the site. Viaduct sections may be constructed from cast in-situ concrete piles, columns and headstocks with concrete girders between the columns. The viaduct spans would vary in length (up to a maximum of around 45-50 metres) in order to avoid impacts to existing and/or proposed future infrastructure as well as watercourses.

There would be a number of bridges required to cross key infrastructure and watercourses.

The width of the viaduct or bridge structures would be designed to carry the twin track railway with provision for access walkways on both sides. The structure would likely feature a wider

section if it is required to support an elevated station or longer span section over floodplains and creek crossings.

4.4 Stations

4.4.1 Preliminary design principles for metro stations

The preliminary design principles to guide the design and location of the stations are shown in Table 4-1. The design principles would be further developed and identified in the Environmental Impact Statement.

Table 4-1 Preliminary station design principles

Station aspect	Design principles
Customer experience	<ul style="list-style-type: none"> • Escalators, platforms, passageways, mezzanines and concourses would be designed to accommodate maximum customer flows, and avoid and manage overcrowding and queuing during peak periods • Station and public access areas would be designed to include public art and landscaping (where appropriate) and maximise the use of natural daylight • The design would protect customers from weather (covered access paths, waiting shelters etc.) at stations and at interchange areas • Furniture on station platforms would include seating and standing spaces • Consideration of the airport as part of an intermediate step in the customer’s end-to-end journey is a key consideration for customer experience.
Customer information and wayfinding	<ul style="list-style-type: none"> • Sydney Metro would develop an easy, intuitive and consistent wayfinding system that facilitates efficient customer movements to, from and through stations • Customers would be provided with accurate, comprehensive, consistent and real-time multimodal information during multiple phases of their trip (i.e. before their trip, at the station and aboard the train) • Wayfinding would consider potential linguistic differences and orientation challenges for international customers.
Operations and system requirements	<ul style="list-style-type: none"> • Operations would be designed to meet the demand for services at each station • Ensure that crowding does not exceed an acceptable and safe level of service standard • Secure platforms and critical infrastructure spaces from public access when services are not operating.

Station aspect	Design principles
Safety and security	<ul style="list-style-type: none"> The safety of customers, staff and areas surrounding stations would be considered in station design in accordance with Crime Prevention through Environmental Design principles Well-designed and efficiently controlled lighting systems, visible closed circuit television (CCTV) surveillance and appropriate staffing levels would contribute to safe station environments Passive station design elements that promote safety would include clear visibility lines in and around stations and the use of natural daylight and adequate widths of paths to avoid blind spots.
Accessibility and functionality	<ul style="list-style-type: none"> Quick and efficient transfer between metro and other transport modes is critical to station design. The Sydney Metro network would be integrated into the Opal electronic ticketing system Station design would ensure accessibility for all, using 'priority of access' principles by key transport mode, with pedestrians and cyclists first, followed by public transport, taxis, 'kiss-and-ride', and 'park-and-ride' customers Station design would include emergency exit and access facilities, such as lifts, escalators and fire stairs to allow for customer evacuation and emergency services access.
Sustainability	<ul style="list-style-type: none"> Sustainability measures at stations would include (where feasible) the use of natural light; passive ventilation and shading; the use of durable and low maintenance materials; and energy-efficient lighting.
Place making and activation	<ul style="list-style-type: none"> The Project's stations and precincts would interface with the public realm and adjoining lands to promote the development of vibrant retail, community and other spaces Each station location would include space for future retail outlets that meet customer needs (e.g. café, newsagents, etc.) Line-wide principles would be applied at each station locality so that stations and station entries are designed to make a positive contribution to the local area.
Provision for integrated station development (subject to separate future approvals)	<ul style="list-style-type: none"> Infrastructure requirements for integrated station development may include structural support, provision of adequate space for building foyers and entrances, lift wells, and building service requirements. These infrastructure requirements would be defined further in the Environmental Impact Statement, while the integrated station development itself would be subject to separate future approvals.

4.4.2 Station locations

The following general locations for stations are required for the success of the Project:

- a station providing an interchange with the T1 Western Line at St Marys
- two stations between St Marys and Western Sydney International (at Orchard Hills and Luddenham)

- two stations in Western Sydney International (at the Airport business park and the Airport terminal)
- a station to support the Aerotropolis Core.

4.4.3 Key station elements

Station typology options include viaduct/elevated, cut-and-cover, in-cutting and surface.

The major elements of the stations would include:

- platform level – including seats and lean bars on the platform, help points to enable customers to obtain emergency assistance, real-time passenger information display screens and public address systems. Platforms would comply with the requirements of the *Disability Discrimination Act 1992* (i.e. be DDA compliant). This would include, but not be limited to, works such as ensuring that the platforms slope away from the tracks
- station mezzanine and/or concourse level – including ticket barriers and access to and from the platform level from street level via escalators, stairs and lifts. For open cut and elevated stations, direct access from street level to the concourse would likely be provided
- station entrances – to be provided at street level, concourse or mezzanine levels, potentially including a lobby and ticketing hall with ticket vending machines
- cross corridor connections to be provided across rail line cuttings at stations to ensure permeability
- emergency egress and access – to be provided at each station, allowing for passenger evacuation, access by emergency services personnel and to provide emergency egress from tunnel sections
- station ventilation systems (refer to Section 4.5.6).

4.4.4 Other station precinct elements

Building new metro stations would create opportunities to bring together international best practice and innovative urban thinking to shape and create vibrant and attractive places in the precincts surrounding each station.

The station precincts for the majority of the proposed stations would also include:

- transport interchange points (such as potential park and ride facilities, kiss and ride facilities, bus stops and bus priority measures, taxi ranks and cycle storage areas)
- station access walkways and cycle paths, access roads, modal priority infrastructure (bus lanes and access roads), road modifications and intersection treatments, stormwater infrastructure, and other ancillary facilities
- provision of space for retail and community activities to support the development of each station precinct

- landscaping and urban design features and land use interfaces.

The stations within Western Sydney International would be designed to be consistent with the master planning being developed for the Airport Business Park and Airport Terminal Station areas.

Station and precinct activation may also be achieved, in some circumstances, via strategic land acquisitions and Metro-led public domain or other development, including integrated station development. Precinct development plans would detail specific precinct interventions proposed by Sydney Metro.

4.5 Ancillary operational infrastructure

Ancillary operational infrastructure would be required to support the safe and efficient operation of the Project. This infrastructure is described below.

4.5.1 Infrastructure maintenance

Maintenance planning would generally allow routine and major periodic maintenance of infrastructure to be undertaken with a view to maximising service availability and minimising impacts on customers. Scheduled maintenance would generally occur during planned maintenance periods, when train services would not be in operation on parts of the line.

Rail maintenance vehicles would be able to use the network and the Project has been designed to allow access for maintenance crews. Service buildings would also be provided at stations.

The following types of maintenance activities would be required:

- scheduled maintenance – involving routine inspections and repairs to enable operation at prescribed levels of safety, reliability and service frequency; this type of maintenance would be performed on a regular and recurring basis at specified intervals
- non-scheduled maintenance – involving emergency repairs to address unexpected defects (such as signal failure), vandalism and breakage that would impact on prescribed levels of safety, reliability and/or service frequency; this type of maintenance would be performed as needed
- overhaul and repairs – involving the repair, replacement and testing of infrastructure that has been removed from its working location.

4.5.2 Stabling and maintenance facility

Trains would be stabled and maintained at a dedicated facility, which could provide:

- stabling roads to store the trains
- test tracks to undertake train commissioning and driver training
- maintenance facilities
- a train monitoring system

- a train wash facility
- wheel lathe and graffiti/bio wash facilities
- infrastructure maintenance sidings
- security and fire control
- an operations control centre
- a driver training facility
- a traction substation to provide power to the rail line
- workshops for the maintenance of railway infrastructure components
- offices, car parks, storage and pedestrian roads.

Subject to a number of considerations, including available space and location of the facility, the stabling and maintenance facility may be designed to safeguard for future expansion to support potential future extensions of the line to the north and south.

The size of the stabling and maintenance facilities would be informed by maximum fleet size, which would be influenced by the number of trains, train length (number of car sets) and ultimate frequency of the service.

The location of this infrastructure is currently proposed in the area between the Warragamba pipeline and the M4 Western Motorway. A number of criteria are being considered to inform development of the design of the stabling and maintenance facility, including:

- proximity to the Project alignment (for efficiency of access)
- vertical alignment of adjacent main line track
- future strategic planning and land use context
- flooding (generally above the 1:100 ARI flood level)
- value of land and uplift potential
- relationship with sensitive receivers
- minimising impact on significant biodiversity assets and heritage items.

4.5.3 Signalling system

The Project would use advanced signalling technology to improve the way trains accelerate and brake at stations to enable more trains on the line. The signalling system would keep each train within a safe braking distance of the train ahead, control speed between stations, and the opening and closing of train doors.

The integrated information control system would allow communication with passengers or staff members via audio and visual links at the station or on a train.

4.5.4 Power supply

Traction power supply for the Project would be provided through dedicated traction substations and supporting feeders. These would be co-located with other infrastructure (such as at train stations) where possible.

4.5.5 Drainage system

A new drainage system would be required for the Project. Where the Project includes a tunnel, water from the tunnel would likely be directed to a water treatment plant. The water treatment plants would likely be co-located with other ancillary infrastructure supporting tunnel operations where possible.

4.5.6 Tunnel ventilation system

A tunnel ventilation system would be required to allow natural ventilation and supplementary mechanical ventilation.

For the tunnel sections, fresh air tunnel ventilation would be generally provided at proposed stations and tunnel portals. However, additional facilities may be required. The service facilities would generally be located directly above the tunnel alignment. An aboveground building for mechanical, electrical and ventilation equipment may be provided, with a shaft to connect to the tunnels below.

4.6 Key interfaces with other existing infrastructure

It is a key objective of the Project to connect Western Parkland City communities to the rest of Greater Sydney with an integrated transport network. This will grow the 30-minute city catchment of the Western Parkland City and connect to the Central River City and Eastern Harbour City. Key interfaces provided by the Project to the existing and planned transport network in Western Sydney are outlined in the following sections.

4.6.1 T1 Western Line

A connection with the T1 Western Line is a key element of the Project. This would be provided through an interchange with the existing Sydney Trains St Marys Station and the new metro station at the northern extent of the Project. Detailed consideration of interfaces with a range of infrastructure, services and utilities is required at this location.

4.6.2 M4 Western Motorway and Great Western Highway

It is anticipated that the Project would travel underground beneath the two major arterial roads, the M4 Western Motorway and Great Western Highway.

The Great Western Highway is a State highway running from the southern fringe of the Sydney CBD to the Blue Mountains, and it merges with the M4 Western Motorway around Strathfield and west of Leonay. The Project is proposed to travel in tunnel beneath the Great Western Highway.

The M4 Western Motorway is a motorway between North Strathfield in the east to Glenbrook in the west, where it continues as the Great Western Highway. Stage 1 of WestConnex

involves the extension of the M4 Western Motorway in tunnels between Homebush and Haberfield via Concord, which opened in July 2019.

4.6.3 Elizabeth Drive

Elizabeth Drive is the main east-west corridor between Liverpool and surrounding suburbs. Elizabeth Drive, from the M7 Motorway to The Northern Road, is around 14 kilometres in length, and is predominantly a 2-lane undivided road with predominantly no formalised footpaths in the vicinity of the Project. It has a speed limit of 80 kilometres per hour.

With projected and planned future growth in the region including development of Western Sydney International, industrial and commercial precincts associated with the Aerotropolis, adjoining land releases for residential precincts and employment zones, there is a need to plan for increased capacity and to improve access and safety on Elizabeth Drive. Potential improvements to Elizabeth Drive are currently being investigated.

The Project would cross Elizabeth Drive just north of Western Sydney International.

4.6.4 Key interfaces with existing utilities

Sydney Metro has identified that the Project would interface with a number of existing utilities. Sydney Metro would consult with the relevant authority for each of these and agree a plan of management for these utilities. Key utilities which have already been identified include:

- crossing of TransGrid existing assets, 1 x 500kV, 2 x 330kV, 1 x 33kV transmission lines
- crossing of the Warragamba pipeline
- Sydney Water, Jemena Gas and Telstra/NBNCo/Optus assets.

4.7 Key interfaces with other planned transport infrastructure

4.7.1 M12 Motorway

The future M12 Motorway would provide direct access to Western Sydney International and connect to Sydney's motorway network. The corridor route is an east-west, 16 kilometre motorway between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham.

The future motorway would provide increased road capacity and reduce congestion and travel times in the future. It would also improve the movement of freight in and through Western Sydney and is expected to serve the Greater Penrith to Eastern Creek Growth Area.

The Project would cross the alignment of the future M12 Motorway to the north of Elizabeth Drive, before entering Western Sydney International. The Project's interface with the M12 Motorway is subject to further investigation however it is currently proposed that the Project would travel above the motorway.

4.7.2 More Trains More Services

The More Trains More Services program includes staged improvement works for the existing passenger rail network in Greater Sydney. Over the next 10 years, this program will transform Sydney's busiest train lines with more services through digital systems, infrastructure and technology upgrades to increase reliability and simplify operations, and more new trains.

In particular for the T1 Western Line, the More Trains More Services program may increase capacity and the number of train services, potentially increasing services to stations connecting with the Project.

4.7.3 Outer Sydney Orbital Stage 1

The Outer Sydney Orbital Stage 1 corridor is identified for a future motorway and freight rail connection between Richmond Road in the north and the Hume Motorway near Douglas Park in the south. A recommended corridor has been identified by Transport for NSW in collaboration with the Greater Sydney Commission and the Department of Planning and Environment (Transport for NSW, 2018c).

There are a number of interfaces between the North South Rail Line corridor (including the part of the Project) and the indicative alignment for the Outer Sydney Orbital Stage 1. There will be land use, design, construction and operation interfaces between these two corridors.

4.8 Construction principles

4.8.1 Construction activities

The key construction elements of the Project would include:

- site establishment and enabling works
- construction of tunnel dive structures and tunnel portals
- tunnel excavation and associated tunnelling support activities such as segment production, segment storage and spoil management
- station construction including excavation, fit-out and aboveground building construction
- rail bridge construction over waterways and major roads
- construction of viaduct structures
- track excavation and earthworks for surface components (at-grade and in-cutting)
- modifications at the existing Sydney Trains station to support the interchange with the Project
- precinct integration works including transport interchange points (e.g. park and ride facilities, kiss and ride, bus stops, taxi ranks, cycle storage areas), and provision of space for retail and community activities

- construction of operational ancillary infrastructure, potentially including:
 - excavation of shafts
 - ventilation systems
 - rail systems (e.g. overhead wiring, signalling, communications, power supply and cable containment structures) for Sydney Metro services
 - drainage systems and water treatment plant(s)
 - noise mitigation works such as noise walls (if required).
- construction of new temporary access roads for construction sites, and permanent access roads for the operational alignment
- construction of a stabling and maintenance facility and operational control centre
- new service utilities (including power supply and traction power substations) and modifications to existing service utilities
- tunnel and rail systems fit-out.

Table 4-7 provides an overview of construction activities.

Table 4-7 Construction activities

Construction activity	Overview of activity
Enabling works	<p>Enabling works are those activities that would typically be carried out before the start of substantial construction in order to make ready the key construction sites and provide protection to the public. Enabling works may include:</p> <ul style="list-style-type: none"> • demolition of buildings • utility supply including power and water • utility relocation, adjustments and protection • transport network modifications to roads, public transport, and pedestrian and cyclist facilities • construction of new temporary access roads for construction sites, and permanent access roads • heritage investigations, protection and archival recordings • additional geotechnical and contamination investigations.
Dive structure and tunnel portal construction	<p>Dive structure and tunnel portal construction would generally involve:</p> <ul style="list-style-type: none"> • cast in-situ concrete piling along the edge of the dive structure to form the walls • excavating below track level • placing of precast and cast in-situ concrete for the cut-and-cover section and to form the tunnel portal.

Construction activity	Overview of activity
Tunnel excavation for railway and stations	<ul style="list-style-type: none"> • tunnel excavation is likely to be carried out using tunnel boring machines (TBMs) with road headers used for stub tunnels. TBMs are likely to be used to excavate the majority of the tunnels as they operate at a quicker rate than road headers and excavate the desired circular tunnel profile • the tunnelling strategy for the Project is subject to further investigation, however it is anticipated TBMs would be launched and supported from sites adjacent to either the tunnel portal or from a station excavation • the sites would provide the necessary support for tunnelling activities including spoil storage and removal, fresh air ventilation, grout batching, water treatment and disposal, material storage as well as office facilities, worker amenities and parking • a concrete segment facility would be constructed to provide concrete segments for the tunnel lining • depending on the geology encountered, or to minimise ground-borne noise impacts, drill and blast or penetrating cone fracture techniques may also be used as part of tunnel excavation works • construction of cross passages at regular intervals to facilitate emergency egress • construction of the cut and cover structures would also require excavation works, piling, concrete works, the installation of diaphragm walls and installation of mechanical and electrical services • structural works for elements of underground stations, and underground pedestrian passages including piled walls where required.
Surface railway and station construction	<ul style="list-style-type: none"> • for locations where the track is at the surface (including at-grade and in-cutting), earthworks would be completed to construct a formation width sufficient for a twin track electrified railway with dedicated vehicular maintenance access points • minor earthworks would be required to construct the twin track electrified railway where it is located at-grade • structural works for elements of the at-grade and in-cutting surface stations.
Elevated/viaduct railway and station construction	<ul style="list-style-type: none"> • at locations where the track is elevated/viaduct, the pre-stressed box girder would be installed from a deck or installed on piers. The girder would support the deck, and the piers would support the girder • provision for access walkways on both sides would be made • structural works for elements of the elevated/viaduct stations.

Construction activity	Overview of activity
Precinct integration works	<ul style="list-style-type: none"> • transport integration works, including installation of active transport, public transport and road infrastructure such as park and ride areas, kiss and ride zones, bus stops, cycle storage areas • construction of station access walkways and cycle paths, access roads, road modifications and intersection treatments, stormwater infrastructure, including earthworks • provision of space for retail and community activities to support and safeguard for development of each station precinct • landscaping and urban design works.
Station fit out	<ul style="list-style-type: none"> • station fit-out would include mechanical, electrical, lighting and (as required) fresh air tunnel ventilation equipment, signage and wayfinding equipment and station furniture.
Rail bridge construction	<p>The rail bridge construction would generally occur in the following sequence:</p> <ul style="list-style-type: none"> • cast in-situ concrete piling for bridge abutments and piers • construction of bridge abutments and piers • placement of precast concrete elements for the bridge superstructure (girders between the piers) • cast in-situ concrete bridge deck • track and rail systems fit-out.
Operational ancillary infrastructure construction	<ul style="list-style-type: none"> • excavation of a vertical shaft to the tunnels below. This may be carried out using excavators and rock hammers; however, drill and blast or penetrating cone fracture techniques may also be used • lining and reinforcement of the shaft • building works for aboveground components • installation of electrical equipment including transformers and electrical switchboards • excavation of ventilation shafts and systems • construction permanent power supply and substations.
Stabling and maintenance facility construction	<p>Construction of the stabling and maintenance facility would involve:</p> <ul style="list-style-type: none"> • enabling works including protection or diversion of utilities and establishment of construction site access points • demolition of any structures on the site and clearance of vegetation • excavation for site levelling • import and placement of fill material • track and rail systems fit-out • construction of stormwater drainage system • construction of buildings including the operational control centre.

Construction activity	Overview of activity
Rail systems fit out	Rail systems fit-out works would include: <ul style="list-style-type: none"> • fresh air tunnel ventilation fit-out • track slab and rail fastening • rail installation, fixing and welding • cable and equipment installation including signalling, communications and electricity systems • overhead traction power supply installation for rolling stock • installation of other equipment including lighting (including emergency lighting), drainage works, and fire and life safety systems (including walkways connecting to emergency egress and fire hydrant systems).

4.8.2 Construction sites

Sites would be required to support the construction of the Project. This includes for tunnelling launch, support and retrieval, viaduct and earthworks support, station construction, bridge and viaduct construction, services facilities construction, materials laydown and storage areas, and concrete batching and precast facilities. Any construction site may have multiple functions.

Construction site access may need to be established prior to the commencement of construction works where necessary.

Spoil storage, handling and haulage would need to occur at some construction sites. Spoil haulage is expected to be carried out using heavy vehicles which would adopt haulage routes that minimise impacts on residential receivers, minimise use of local roads and accesses the arterial road network as efficiently as possible.

The location and size of construction sites would be considered further during design development.

The following factors would be considered when choosing construction site locations:

- proximity to watercourses and potential for flooding
- proximity to residential dwellings/sensitive receivers
- existing vegetation and whether clearing is required, particularly protected vegetation
- potential for impacts to heritage
- presence of contamination
- availability and proximity of safe construction vehicle access points and haulage routes
- minimising heavy vehicle movements on local roads
- ongoing needs of the existing rail corridor including for maintenance purposes

- construction traffic and transport strategy to minimise disruption to pedestrians, buses and trains.

Selection of construction sites would also take into account efficient interface with construction at the airport site.

4.8.3 Construction program and strategy

Construction of the Project is expected to commence in 2021, subject to planning approval, and take around five years.

Following early and enabling works in 2021, major civil and earthworks including any tunnelling is anticipated to commence in the first half of 2022. Following construction works, testing and commissioning would be undertaken prior to the expected opening of services, which is anticipated to align with when the airport opens for passenger services.

Emerging delivery options for the construction of the Project may include the delivery of the Project as a single package, or instead as separate tunnelling and civil packages.

The construction program and strategy, including timing for commencement of works on the airport site, would be developed to ensure efficient interface with construction at Western Sydney International.

5 Consultation

Consultation on the North South Rail Line/Sydney Metro Greater West has been underway since 2015. Further engagement with stakeholders and the community will continue during design development and preparation of the Environmental Impact Statement for the Project.

Key stakeholders for the Project include (but are not necessarily limited to):

- Commonwealth agencies (e.g. Department of Infrastructure, Transport, Regional Development and Communications (DITRDC); Department of Agriculture, Water and the Environment (DAWE))
- State agencies e.g. DPIE (incorporating the former Environmental Protection Authority (EPA) and Office of Environment and Heritage (OEH))
- Western Sydney Airport
- Local Councils including Blacktown, Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith, and Wollondilly)
- businesses and industry groups located near or relevant to the Project
- directly impacted communities
- the broader community.

This chapter describes the consultation activities undertaken for the Project to date, particularly in regard to the corridor and activities proposed during preparation of the Environmental Impact Statement.

5.1 Engagement objectives

Community and stakeholder engagement is a priority for Sydney Metro. The Sydney Metro communication objectives are to:

- communicate the rationale for the Project and broader benefits in delivering city-shaping rail that will support nationally significant growth in Western Sydney
- communicate the broader Sydney Metro product, projects and timing
- build community and key stakeholder relationships and maintain goodwill
- provide information about the planning approvals process and encourage community participation
- clearly communicate the corridor protection and property acquisition process.

The Project team has developed a comprehensive community and stakeholder engagement program to proactively engage with local communities, key stakeholders and government agencies during preparation of the Environmental Impact Statement.

5.2 Consultation undertaken for the rail corridor

As mentioned in Section 3.2, the *Long Term Transport Master Plan* (since superseded by the *Future Transport Strategy 2056*) identified a need for a transit corridor between Penrith and Campbelltown/Macarthur. It was identified as a key transport corridor in Western Sydney and one that is facing increased travel demand.

The North South Rail Line (now known as Sydney Metro Greater West) is one of Transport for NSW's proposed long term transport corridors, referred to as the Western Sydney corridors. Transport for NSW has undertaken extensive consultation exhibiting the North South Rail Line corridor, in conjunction with the South West Rail Link Extension, as part of a broader program of engagement on the Western Sydney corridors.

In June 2015, consultation was undertaken on the corridor between Bringelly, Western Sydney International and St Marys, coordinated with the Outer Sydney Orbital consultation as well as the corridor between Bringelly, Leppington, Oran Park and Narellan.

The joint *Western Sydney Rail Needs Scoping Study* included consultation between September and October 2016. Community consultation was supported by a discussion paper, a dedicated website, survey, and local events. A separate process was established for industry engagement, including a specific discussion paper for industry, and a briefing forum to stimulate discussion. A stakeholder reference group including representatives of local community organisations was also established to provide guidance and feedback to this early planning work. More than 1,000 responses were received through the consultation process, including around 120 written submissions.

Key themes from the consultation included:

- the current inability to travel easily and quickly between the growth precincts of Western Sydney is a deterrent to the use of public transport
- a lack of connectivity within the region and long journey times by public transport, which encourage many to use their private car on a daily basis to reach their destination
- support for establishing a north-south rail connection in Western Sydney, consistent with Sydney Metro Greater West. This includes 54 per cent of survey respondents who were asked to nominate a preferred first rail connection to the new airport.

Further community consultation on the rail corridors was held between 26 March 2018 and 1 June 2018. Residents, businesses, landowners and key stakeholder groups such as community groups, councils, and representative bodies, were asked to provide feedback and make formal submissions during this time.

The exhibited rail corridor incorporates the proposed Sydney Metro Greater West alignment, showing connections between the T1 Western Line at St Marys, Western Sydney International and the Aerotropolis at North Bringelly.

An indicative tunnel was identified between St Marys and Orchard Hills, subject to design development. The corridor alignment through Western Sydney International was not specified as it is subject to a separate planning process.

The exhibited corridor further showed the rail line continuing to Oran Park, Narellan and the T8 Airport and South Line near Macarthur, and the South West Rail Link Extension corridor extended from Leppington Station to the proposed station at the Aerotropolis Core to provide an interchange with Sydney Metro Greater West.

While community consultation undertaken was on the Western Sydney corridors, this summary of consultation will focus on feedback and issues raised relating to the scope of Sydney Metro Greater West.

5.2.1 Stakeholder consultation

Transport for NSW engaged with a range of stakeholders on the exhibited corridors.

Key stakeholder meetings

During and after the consultation and engagement period, meetings were held with key stakeholders including local councils, government agencies and local community action groups:

- Penrith Council
- Liverpool Council
- Wollondilly Shire Council
- Campbelltown City Council
- Fairfield City Council
- Camden Council
- Western Sydney Regional Organisation of Councils
- Others, including:
 - Bringelly Rural District Forum
 - Department of Education
 - Department of Housing
 - Department of Planning, Industry and Environment (incorporating the functions of the former Office of Environment and Heritage)
 - Airservices Australia

- University of Sydney.

5.2.2 Community consultation

Residents, businesses, and key stakeholder groups were asked to provide feedback and make formal submissions during community consultation on the rail corridors between March and June 2018.

Submissions continued to be accepted beyond the formal consultation period after 1 June 2018, due to the high level of interest shown throughout the consultation period.

Throughout the consultation period, Transport for NSW undertook the following consultation and engagement activities:

- advertised in local newspapers and posted messages on the Transport for NSW Facebook page
- distributed brochures to impacted properties, and emails and letters to stakeholders and directly impacted landowners
- attended key stakeholder and landowner meetings
- hosted community drop-in information sessions and public meetings.

Public information and engagement

Table 5-1 identifies the communications channels used during the consultation period.

Table 5-1 Community contact and information points

Activity	Detail
Community information line	1800 837 511
Community email address	corridors@transport.nsw.gov.au
Website	www.transport.nsw.gov.au/corridors
Postal address	PO Box K659, Haymarket, NSW 1240
Collaborative mapping tool	via the website, enabling location specific comments

Community information sessions

Five community drop-in information sessions were hosted by Transport for NSW for the rail corridors during the consultation and engagement period. These information sessions were in most cases shared with other corridors.

Table 5-2 provides a list of the community drop-in information sessions held by Transport for NSW, at which information on the rail corridors was provided.

Table 5-2 Community drop-in information sessions

Date	Location	Number of attendees (approximate)
7 April 2018	Holy Family Catholic School, Luddenham	200
10 April 2018	Camden Civic Centre, Camden	400
12 April 2018	Bringelly Community Centre, Bringelly	200
1 May 2018	Camden Civic Centre, Camden	250
14 May 2018	St Marys Memorial Hall, St Marys	150

At the sessions, corridor information and display materials including corridor maps were available. Technical specialists, including property consultants and representatives from the DPIE attended the sessions to answer questions from community members.

Notification about the community drop-in sessions was included in an information pack provided to potentially impacted landowners, emails to registered stakeholders, the Transport for NSW corridors webpage and advertisements in local newspapers.

Public meetings

Transport for NSW attended other publicly organised meetings, including:

- Rural District Forum – 10 April 2019 (Bringelly)
- meetings organised by community action groups and community resident groups.

Consultation with landowners

At the start of consultation, Transport for NSW doorknocked and/or distributed letters with details of community drop-in sessions to directly impacted landowners which included details about available channels to provide feedback during the consultation period.

One-on-one meetings were also offered to directly impacted landowners to allow an opportunity to provide direct feedback and ask questions about the exhibited North South Rail Line corridor.

5.2.3 Feedback received

There were several key themes gathered from the consultation feedback. Table 5-3 outlines the feedback received to date on the rail corridor and how this will be considered in defining the scope of the Environmental Impact Statement for the Sydney Metro Greater West Project.

Table 5-3 Feedback from the rail corridor consultation

Topic	Key issues raised	Environmental Impact Statement scope
Alternative options	<ul style="list-style-type: none"> • Consideration should be given to alternative alignments, upgrades to existing infrastructure, public transport projects, and tunnelling. • Request for stations at particular locations. 	<ul style="list-style-type: none"> • The Environmental Impact Statement would include a discussion of strategic alignment options, and a description of the preferred tunnel portal locations • The Environmental Impact Statement would include information on the station location option evaluation • Sydney Metro would consult with the community, government and key stakeholders in regard to the ongoing development of the Project design and consider feedback on potential station location and alignment options during preparation of the Environmental Impact Statement.
Local issues	<ul style="list-style-type: none"> • Connection to place, lifestyle and amenity, health and safety, division of communities, and proximity of the corridors to residents and vulnerable members of the community. 	<ul style="list-style-type: none"> • The Environmental Impact Statement would include information on the station location option evaluation taking into account the issues raised around amenity and connectivity • The Environmental Impact Statement would include a traffic, transport and access assessment of areas impacted by construction and operation of the Project • The Environmental Impact Statement would include a land use and property assessment, human health impact assessment and social and economic assessment which would assess community impacts such as the community severance, impacts to lifestyle, amenity and health and safety.
Corridor planning	<ul style="list-style-type: none"> • Need for, and the potential benefits of a corridor identification process including consultation activities, and suggested future staging of the protection investigations and corridors infrastructure • Questions around the southern tie-in of Western Sydney 	<ul style="list-style-type: none"> • The Environmental Impact Statement would include a discussion of strategic alignment options, together with details on the need for the Project and the benefits that it will provide • The Environmental Impact Statement would provide a discussion on the alignment through Western Sydney International.

Topic	Key issues raised	Environmental Impact Statement scope
	<p>International to the proposed rail alignment</p> <ul style="list-style-type: none"> Request to take the rail corridor through vacant blocks not homes and to better utilise the large lots in North Bringelly. 	
Property and acquisition	<ul style="list-style-type: none"> Compensation for affected and adjacent properties, the acquisition process and timing, and property values Property and local character impacts at Orchard Hills Request to put the rail line in the Outer Sydney Orbital corridor Request to extend the indicative tunnel southwards to minimise impacts on Orchard Hills. 	<ul style="list-style-type: none"> The Environmental Impact Statement would include an assessment of the potential property and land use impacts of the Project and proposed management measures to minimise potential impacts The Environmental Impact Statement would include an assessment of the potential landscape and visual impacts of the Project, including landscape character impacts The Environmental Impact Statement would include a discussion of strategic alignment options, and a description of the preferred tunnel portal locations The Environmental Impact Statement would include information on the station location option evaluation, taking into account the issues raised around amenity and connectivity Sydney Metro would consult with the community, government and key stakeholders in regard to the ongoing development of the Project design and consider feedback on potential station location and alignment options.
Business impacts	<ul style="list-style-type: none"> Impacts of the corridor on agricultural businesses and food production, local business and tourism. 	<ul style="list-style-type: none"> The Environmental Impact Statement would include a business impact assessment and community infrastructure assessment of areas impacted by construction and operation of the Project The Environmental Impact Statement would include an assessment of the potential property and land use impacts of the Project and proposed management measures to minimise potential impacts.

Further details on the feedback received to date on the rail corridor will be provided in the Environmental Impact Statement.

5.3 Consultation undertaken on Sydney Metro Greater West

5.3.1 Government agency consultation

Sydney Metro has undertaken extensive government agency consultation to date ensuring that:

- relevant government authorities are involved in the strategic planning process
- relevant agencies are consulted on planning approval requirements and the environmental assessment process.

Key stakeholder meetings

Consultation has occurred and would continue with the following stakeholders through regular meetings, presentations and phone calls.

Australian Government

- Department of Infrastructure, Transport, Regional Development and Communications (DITRDC)
- Department of Agriculture, Water and the Environment (DAWE)

State Government

- Department of Planning, Industry and Environment
- Department of Premier and Cabinet
- Western City and Aerotropolis Authority (jointly established with the Australian Government).
- Infrastructure NSW
- Greater Sydney Commission
- NSW Land and Housing Corporation
- Transport for NSW
- Western Sydney Planning Partnership.

Local Government

- Western Sydney City Deal Councils (Liverpool, Wollondilly, Campbelltown, Fairfield, Hawkesbury, Camden, Blue Mountains, Penrith and Blacktown).

Other key stakeholders

- Western Sydney Airport

Utility providers

- Endeavour Energy
- TransGrid
- Jemena Gas
- Sydney Water
- Water NSW
- Telecommunications, including Telstra, Optus, NBNCo, Nextgen, AARNet, PIPE Networks.

Western Sydney City Deal partnership

Sydney Metro has worked collaboratively with government agencies and councils within the framework of the Western Sydney City Deal partnership. Through this partnership, representatives from the DITRDC, and local councils are embedded in the project team and are part of the process for land use planning and project development.

Design Charrette

A design charrette facilitated by Sydney Metro was held on 5 and 6 February 2019 to workshop land use and precinct planning around the proposed Project alignment. Participants included stakeholders from DITRDC; Transport for NSW; NSW Land and Housing Corporation; Department of Planning, Industry and Environment; Greater Sydney Commission and local councils (Blacktown, Campbelltown, Liverpool, Penrith and Camden).

5.3.2 Industry consultation

An industry briefing session was held on 6 December 2018 at the Hilton Hotel, Sydney. Invitations to attend the briefing were included in:

- the Sydney Metro website
- advertisements in Australian and international newspapers
- direct invitations.

The briefing session detailed plans for Sydney Metro projects including an outline of the scope for Sydney Metro Greater West. The session was attended by approximately 700 industry representatives from Australian and international firms, who were provided with information on the process for industry to contribute to the Project and take part in its delivery. Attendees received a copy of the booklet – ‘Sydney Metro Industry Briefing, December 2018’.

Targeted industry engagement

An initial targeted engagement with industry was undertaken in December 2018. The purpose of engagement was to obtain market information that will inform development of project requirements and project definition of Sydney Metro Greater West. Through this

engagement, project delivery options were explored with participants and will be further tested with industry in later stages of engagement.

Further industry engagement was undertaken in May and June 2019, to refine delivery and procurement strategies for the Project. Participants across a broad section of relevant delivery market sectors were engaged during this process.

Industry engagement with landowners

Industry engagement with selected landowners along the Project corridor was undertaken in February and March 2019. The engagement focussed on identifying land development intentions of major landowners along the Project corridor to assist in planning of the design and delivery of Sydney Metro Greater West. During this engagement, information about opportunities to take part in the Project's delivery was also provided to participants.

5.3.3 Community engagement

The community was invited to participate in an online survey about the Project, to provide feedback about their transport priorities and preferences for facilities and services at future station precincts.

Invitations to participate in the survey were sent through the following channels:

- Project flyer distributed to approximately 16,000 properties along the Project alignment between St Marys and Bringelly
- Project email update sent to more than 2,500 project subscribers
- Project update sent to the Western Sydney City Deal Communications and Engagement Sub-committee (including agencies and local councils). Members were encouraged to send out information about the survey through their own communications channels to increase reach and participation in the survey.

The survey was open for five weeks between 17 February and 20 March 2020. More than 1,700 responses were received from the community and stakeholders. The feedback received will inform the design of future station precincts and broader strategic planning around transport needs for Greater Western Sydney.

5.4 Proposed ongoing activities

The project team will continue to consult with the community and stakeholders during the preparation of the Environmental Impact Statement. A number of activities are planned during this period to collect feedback from stakeholders and to inform the community on the investigations being carried out for the Project.

Key elements of this consultation are outlined in the following sections.

There are already separate communication and stakeholder management activities being undertaken in relation to Western Sydney International, through the Community and Stakeholder Engagement Plan for the airport. There would be ongoing consultation and coordination with Western Sydney International for areas surrounding the airport site.

5.4.1 Place managers

Place Managers would be a vital link in maintaining close and ongoing contact with local communities and stakeholders during preparation of the Environmental Impact Statement. They would seek to understand local issues and bring this feedback to the project team. Sydney Metro is also committed to working closely with homeowners during property acquisition to ensure they receive the support they need, and to make sure the process is as easy as possible.

5.4.2 Community contact and information

The community contact and information tools outlined in Table 5-4 would remain in place for the duration of the preparation of the Environmental Impact Statement and for the remainder of the planning approval process.

Table 5-4 Community contact and information points

Activity	Detail
Community information line (toll free)	1800 717 703
Community email address	sydneymetrowsa@transport.nsw.gov.au
Website	sydneymetro.info
Postal address	Sydney Metro Greater West PO Box K659, Haymarket, NSW 1240

5.4.3 Government agency consultation

As part of the Department of Planning, Industry and Environment planning process, a planning focus meeting with government stakeholders would be held to discuss the scope of the Environmental Impact Statement.

Sydney Metro will continue to focus on cross-agency integration and communication. Regular meetings would be held with a variety of government stakeholders to ensure key issues are appropriately addressed. Local councils would be consulted on impacts to council assets and infrastructure and provided with an opportunity to provide feedback on community issues and land use planning. Government asset owners and operators would be consulted on potential impacts to their assets.

5.4.4 Major stakeholder consultation

Sydney Metro’s project team would ensure local members of Parliament, peak bodies and industry groups are proactively engaged and informed about the Project. Regular briefings would be held to keep stakeholders informed and to ensure key issues raised are addressed.

Sydney Metro has established various subject matter-specific working groups, through which consultation is ongoing with relevant stakeholders to inform the project development and technical assessments.

5.5 Public exhibition of Environmental Impact Statement

The minimum statutory period for public exhibition of the Environmental Impact Statement is 28 calendar days, as stated in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (NSW) (EP&A Regulation). Due to the public exhibition requirements of the EP&A Regulation having flexibility once the minimum requirement of 28 calendar days has been met, exhibition requirements or expectations under both the EPBC Act and the Airports Act (in relation to the on-airport Project components) can also be accommodated.

Advertisements would be placed in newspapers to advise of the public exhibition and where the Environmental Impact Statement can be viewed, as well as details on proposed community consultation activities and information sessions.

Consultation activities during the public exhibition of the Environmental Impact Statement would include:

- Environmental Impact Statement summary document, and a digital Environmental Impact Statement
- media release
- information sessions (either in person or via online engagement tools, dependent on social restrictions at exhibition time as a consequence of COVID-19)
- newsletter letterbox drop
- project website and online forums
- displays at local councils
- stakeholder meetings (either in person or via online engagement tools, dependent on social restrictions at exhibition time as a consequence of COVID-19).

The community and stakeholders will have an opportunity to provide submissions on the Project during the exhibition period.

5.6 Consultation during construction

Should the Project be approved, the project team would continue to consult with the community and key stakeholders during construction. In general, this consultation would involve:

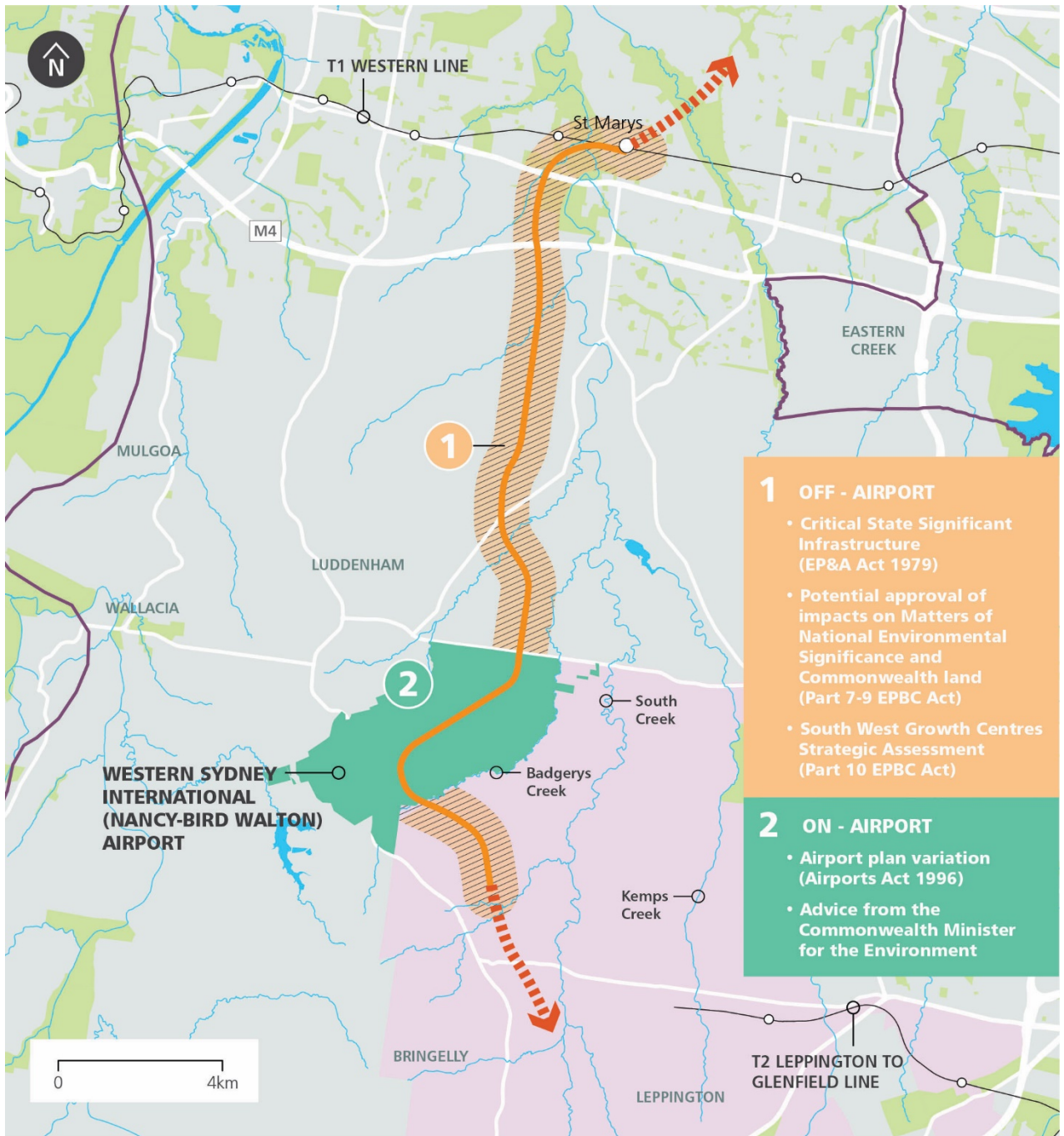
- ongoing consultation with key stakeholders, local councils and other government agencies
- provision of regular updates to the nearby community
- development and implementation of a community complaints and response management system.

6 Planning and assessment process

There are three principal statutory schemes that govern the planning and assessment process for the Project which relate to works that are located outside the boundaries of Western Sydney International Airport (off-airport) – discussed in Section 6.1; and works that are located within the boundaries of Western Sydney International (on-airport) – discussed in Section 6.2.

These statutory provisions are illustrated at Figure 6-1 and the approvals process is summarised in Figure 6-2.

Figure 6-2 provides details of the primary statutory approvals required for the construction and operation of the Project. There are, however, other pieces of legislation that apply to the Project (for example the NSW *Biodiversity Conservation Act 2016*, which defines the applicable biodiversity impact assessment methodology) that are discussed further in Section 6.1.3.



Key

- | | | |
|---|--|---|
| Sydney Metro Greater West Stage 1 alignment | Project investigation area | Proposed Western Sydney Strategic Assessment study area |
| Potential North/South extensions | Approved South West Growth Centre Strategic Assessment | |

Figure 6-1 Planning approval context

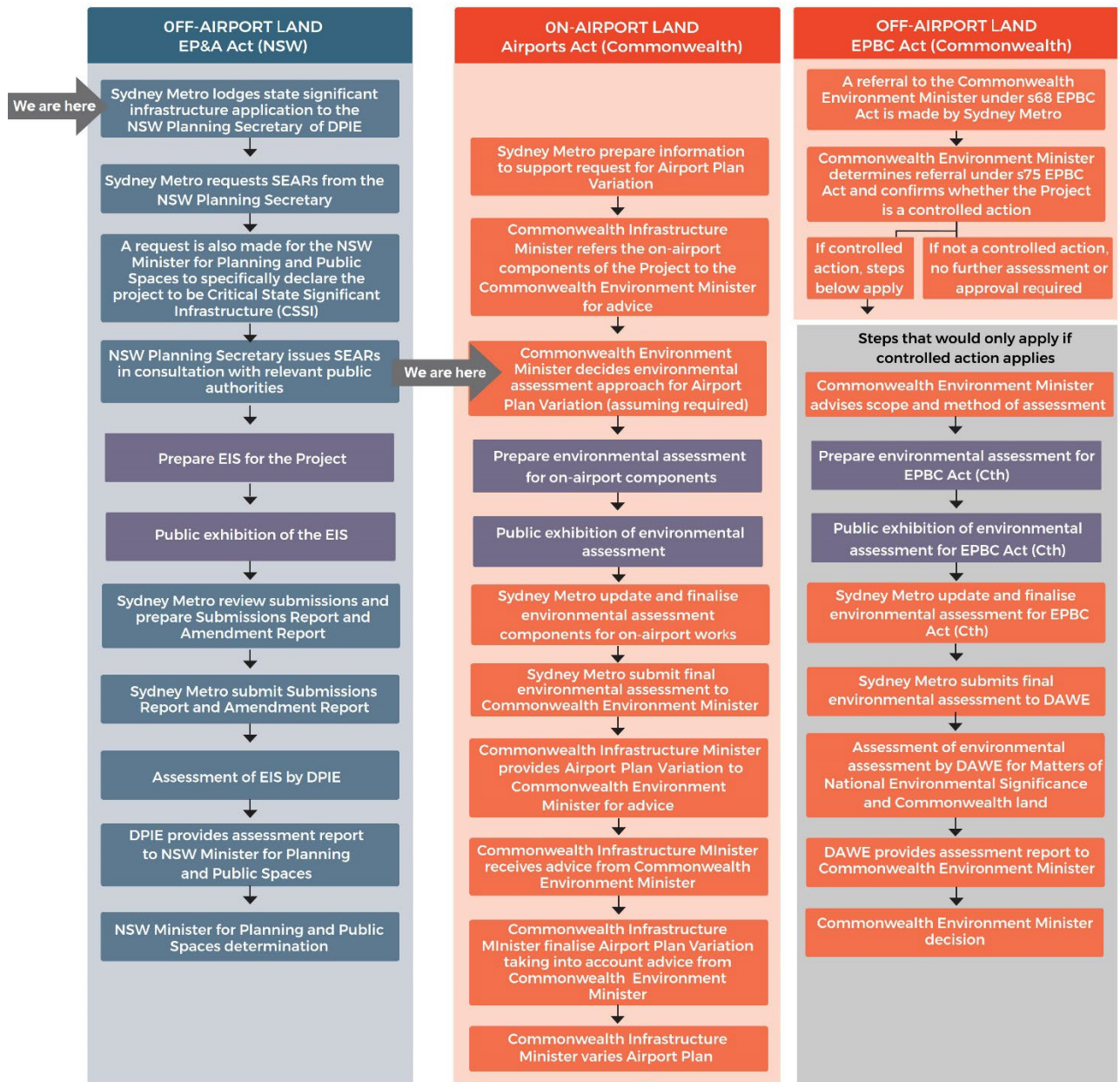


Figure 6-2 Planning and assessment process for the Project

6.1 Off-airport process

6.1.1 Overview of the planning and assessment process off-airport

The off-airport components of the Project are subject to assessment and approval under the provisions of both State and Commonwealth environmental planning requirements, being the EP&A Act (NSW) and the EPBC Act (Cth). Secondary environmental approvals under other NSW legislation would be required post approval but are largely integrated into the assessment and approvals process under the EP&A Act.

6.1.2 NSW Environmental Planning and Assessment Act 1979

The EP&A Act and the EP&A Regulation are the primary pieces of legislation regulating land use planning and development assessment in NSW. This legislation is supported by a range of environmental planning instruments including State environmental planning policies (SEPPs) and local environmental plans (LEPs).

Permissibility

The off-airport components of the Project are permissible without development consent under the EP&A Act by virtue of the operation of *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP). In particular, the Project is development for the purpose of a railway or rail infrastructure facility that would be carried out by or on behalf of a public authority (clause 79).

State Significant Infrastructure and Critical State Significant Infrastructure

In accordance with section 5.12 of the EP&A Act, the Project meets the criteria to have been declared State significant infrastructure under the EP&A Act by virtue of the provisions of clause 14(1)(b) of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). In particular, the Project is an activity for which Sydney Metro has formed the opinion that an Environmental Impact Statement would be required to be prepared under Part 5 of the EP&A Act (clause 1(1), Schedule 3).

Consistent with other major transport infrastructure projects and in accordance with the provisions of section 5.13 of the EP&A Act, the Project is also capable of being declared critical State significant infrastructure under the EP&A Act. A request for the Project to be declared critical State significant infrastructure would be made.

This Scoping Report has been prepared to support a request for the Secretary's environmental assessment requirements (SEARs).

State Environmental Planning Policies

Section 5.22 of the EP&A Act provides that environmental planning instruments (such as SEPPs and LEPs) do not, with some exceptions, apply to State significant infrastructure projects. Notwithstanding this, the environmental planning instruments that have been considered for consistency are summarised in Table 6-1.

Table 6-1 State environmental planning policies relevant to the Project

Planning instrument	Relevance to the Project
<i>State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP)</i>	The SRD SEPP identifies development that is State significant development, State significant infrastructure and critical State significant infrastructure. As discussed previously, the Project meets the criteria to be declared critical State significant infrastructure.
<i>State Environmental Planning Policy (Infrastructure) 2007(ISEPP)</i>	The Project is defined as a rail infrastructure facility under the provisions of clause 78 of the ISEPP. As a rail infrastructure facility to be carried out by or on behalf of a public authority, it is development that is permissible without consent under the provisions of clause 79 of the ISEPP.
<i>State Environmental Planning Policy No.55 Remediation of Land (SEPP 55)</i>	<p><i>State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)</i> provides a State-wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment. In accordance with Clause 7(1) of SEPP 55, a consent authority must not consent to the carrying out of development on any land unless:</p> <ul style="list-style-type: none"> • it has considered whether the land is contaminated. • if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or would be suitable, after remediation) for the purpose for which the development is proposed to be carried out. • if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land would be remediated before the land is used for that purpose. <p>Section 9.3 of this report considers contamination issues associated with the Project.</p>

Corridor protection for the North South Rail Line

The Draft *North South Rail Line and South West Rail Link Extension Corridors Strategic Environmental Assessment* included an assessment of the strategic impacts and benefits of providing future public transport infrastructure in the recommended corridors between St Marys and Macarthur via Western Sydney International (refer to Section 3.2). That assessment proposed to protect the land within these corridors so that it is available for future or potential rail infrastructure for passenger train services (e.g. for the Project), and to introduce planning provisions to ensure appropriate land use controls adjacent to the corridor. The corridor protection process provides a broader, more complete picture of the land use planning direction for the corridor and surrounding lands.

DPIE is currently working with Transport for NSW to protect the identified corridors for various transport projects in Western Sydney, including the North South Rail Line (refer to Section 3.2). The Project would predominantly follow the recommended rail corridor in the strategic environmental assessment for the North South Rail Line between the T1 Western Line and the Aerotropolis.

6.1.3 Other NSW approvals and licenses

NSW Biodiversity Conservation Act 2016

Prior to the introduction of the BC Act, strategic assessment and conservation planning, as part of *The Sydney Growth Centres Strategic Assessment: Program Report* (DECCW and DoP, 2010) was completed for the South West Growth Area, south of Elizabeth Drive (excluding the Western Sydney International site). For areas of the Project located south of Elizabeth Drive (but not within the Western Sydney International site), biodiversity impacts have already been largely assessed under that strategic assessment.

The strategic assessment did not include the Western Sydney International site, for which biodiversity impacts and offsets have been addressed as part of the Western Sydney Airport Plan.

Strategic conservation planning is currently being undertaken for the land north of Elizabeth Drive under the provisions of Part 10 of the EPBC Act and in accordance with the requirements of the BC Act (referred to as the Cumberland Plain Conservation Plan). As part of this, the strategic biodiversity certification under the BC Act will result in a series of biodiversity certified lands.

Once the certification process is complete, clearing of those biodiversity certified lands will be able to be carried out without further biodiversity assessment or separate approvals under the BC Act. However, based on the current program it is possible that the strategic assessment will not be endorsed prior to the approval timeframe required for the Project.

Therefore, for the land north of Elizabeth Drive an assessment of the impacts of the Project on biodiversity would be undertaken through a Biodiversity Development Assessment Report (BDAR) in accordance with the BC Act, which would be required to accompany the development application and would be included as part of the Environmental Impact Statement. Such an assessment is required to be undertaken by accredited assessors, in accordance with the requirements of the *Biodiversity Assessment Method Order 2017*. The BDAR would include information in the form detailed in the BC Act (section 6.12), *Biodiversity Conservation Regulation 2017* (section 6.8) and Biodiversity Assessment Method (BAM).

Other approvals that are not required or cannot be refused

Section 5.24 of the EP&A Act provides that certain authorisations which are required to carry out State significant infrastructure cannot be refused and must be consistent with the terms of any approval under Division 5.2 of the EP&A Act. In the context of the Project, these include:

- an environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997*
- a consent under section 138 of the *Roads Act 1993* to connect a road to a classified road and carry out a work in, on or over a public road. Approval is not required to be sought by Sydney Metro for works in, on or over an unclassified road under Schedule 2 Clause 5 of the *Roads Act 1993*.

Part 5.23 of the EP&A Act provides that certain environmental planning approvals do not apply to or in respect of approved State significant infrastructure. In the context of the Project, these include:

- a permit under sections 201, 205 or 219 of the *Fisheries Management Act 1994* e.g. for excavation works within key fish habitat
- approvals under Part 4 or excavation permits under section 139 of the *Heritage Act 1977*
- an Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*
- a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

6.1.4 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

As discussed in Section 6.1.3, *The Sydney Growth Centres Strategic Assessment: Program Report* (DECCW and DoP 2010) provided a strategic assessment and conservation planning for the South West Growth Area (refer to Figure 6-1), located south of Elizabeth Drive in accordance with the provisions of the EPBC Act. Accordingly, for the lands located south of Elizabeth Drive and outside of the Airport site, impacts of the Project on MNES and Commonwealth land have already been assessed under that strategic assessment.

As also noted above, DPIE is currently managing a process of strategic assessment and conservation planning for land in Western Sydney under Part 10 of the EPBC Act which includes the land within the proposed corridor for the Project north of Elizabeth Drive.

As the strategic assessment has not yet been endorsed, a Project specific assessment and approval under the EPBC Act would be sought (which would also be in accordance with the requirements of the BC Act (as discussed in Section 6.1.3)).

Therefore, for land north of the airport site, matters potentially requiring assessment and approval under the EPBC Act (including impacts of the Project on MNES and Commonwealth land) would be addressed through a referral to the Commonwealth Environment Minister under section 68 of the EPBC Act. If the Project is determined to be a controlled action by the Commonwealth Environment Minister, an assessment of impacts would be undertaken in accordance with the assessment requirements issued by the Minister. If the Project is determined not to be a controlled action, no further assessment or approval would be required under the EPBC Act.

While the strategic assessment will not be relied on for the Project, the Project-specific assessment will be undertaken consistent with DAWE guidance and relevant draft documents relating to the strategic assessment.

Sydney Metro will consult with DAWE throughout the project referral and assessment process (if required) in accordance with the guidelines and to ensure alignment with the strategic assessment where relevant.

6.2 Planning and assessment process – on-airport

The Airports Act 1996 (Cth) regulates certain Commonwealth owned airports, including the development of airport sites to the exclusion of state planning laws. The Airports Act contains a planning framework under which each airport is required to prepare a master plan for approval by the Commonwealth Infrastructure Minister. In addition, for major airport developments, a major development plan is required to be prepared and approved. For Western Sydney International, a transitional planning instrument called an Airport Plan has been developed to guide development on the site until a masterplan is put in place (Part 2) and also to authorise the first stage of airport development subject to conditions (Part 3).

The Airport Plan was determined by the Commonwealth Infrastructure Minister in December 2016 following preparation and exhibition of an Environmental Impact Statement, and incorporates the conditions specified by the Commonwealth Environment Minister. Those conditions include the requirement for preparation and approval of a Construction Plan and a number of Construction Environmental Management Plans prior to commencement of main construction works. Initial versions of those plans have been prepared and approved and main construction work on the airport commenced in September 2018.

It is intended that the development of the Project on the airport site will be authorised by the Commonwealth Infrastructure Minister varying the Airport Plan to include the rail development and any required conditions for the rail development taking account of the advice received from the Commonwealth Environment Minister. If the existing conditions in the Airport Plan for Western Sydney International Stage 1 require variation to accommodate the rail development, agreement from the Commonwealth Environment Minister would also be required. Separate approval of the rail development under the EPBC Act will not be required. The steps required to vary the Airport Plan are illustrated at Figure 6-2.

The Commonwealth Infrastructure Minister was required to refer the proposed variation of the Airport Plan to the Commonwealth Environment Minister as per section 96D(7) of the Airports Act and sections 160 and 161 of the EPBC Act. The Commonwealth Environment Minister has notified the Commonwealth Infrastructure Minister that advice is required under section 160 of the EPBC Act to support further assessment of the Project. The Commonwealth Environment Minister has also advised that the assessment approach should be in the form of preliminary documentation. It is intended that these requirements will be addressed in a single document package that addresses both the on and off airport environmental assessment requirements which for convenience is referred to as the Environment Impact Statement.

Developments on the airport site will also require building approvals issued under the *Airports (Building Control) Regulations 1996* (Cth), as well as a potential Part 13 permit under the EPBC Act.

7 Preliminary environmental risk analysis

7.1 Purpose

The purpose of this preliminary environmental risk analysis is to:

- identify the potential environmental and community risks and issues associated with the construction and operation of the Project to be considered and subsequently assessed in detail in the Environmental Impact Statement
- categorise each issue as a 'key issue' or an 'other issue'
- provide information to assist DPIE and other NSW Government agencies in the preparation of SEARs which will guide the preparation of the Environmental Impact Statement
- provide information which will be used to support a referral of the Project to the Commonwealth Environment Minister under section 68 of the EPBC Act.

While this Scoping Report has primarily been written to satisfy the NSW and Commonwealth statutory approvals process applicable to land outside the Western Sydney International, the evaluation of environmental risks has considered the Project holistically, including environmental risks within the airport site. This assisted the Commonwealth Infrastructure Minister when seeking the advice of the Commonwealth Environment Minister, as required under the Airports Act.

7.2 Project context

The environmental risk analysis has been prepared based on the interim project definition (refer to Section 4). This risk analysis will be re-examined as part of the Environmental Impact Statement as the design and other details of the Project are further developed.

Within the environmental study area there are a number of different environments including urban areas, semi-rural areas and the Western Sydney International. While the risk analysis aims to identify a 'worst case' scenario, risk levels will vary based on the relative environment and impact type.

As the Project would be located in a rapidly developing area of Western Sydney, the land use character and urban form within the environmental study area is likely to change considerably over time compared to the existing environment.

The Project would result in a number of benefits for Western Sydney and the broader Sydney region. These benefits are captured in the preliminary risk analysis for context, however these benefits do not change overall risk ratings.

7.3 Methodology

The environmental risk analysis was undertaken in accordance with the principles of the Australian and New Zealand standard *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines*.

This involved ranking the risks by identifying the consequence of the impact and the likelihood of each impact occurring. An environmental risk workshop was held with key members of the Project team to identify the potential impacts and set appropriate consequence and likelihood levels. As the purpose of the risk analysis at this stage of the Project was to categorise issues as ‘key’ or ‘other’, the following principles guided the risk process:

- risk ratings were considered at the broader issue level only (for example, construction noise and vibration)
- industry standard practice was considered in determining risk ratings. Project-specific mitigation (which would depend on the outcomes of the Environmental Impact Statement) was not applied
- a residual (post mitigation) risk rating will form part of the Environmental Impact Statement.

The first step in the risk analysis involved identifying the potential consequence and likelihood of impacts. The definitions of the consequence levels used for the assessment are provided in Table 7-1, and the definitions of likelihood are provided in Table 7-2. The resulting risk matrix is provided in Table 7-3.

Table 7-1 Risk analysis consequence definitions

Consequence level	Definition
Catastrophic	<ul style="list-style-type: none"> • Long-term (greater than 12 months) and irreversible large-scale environmental, social or economic impacts • Extended substantial disruptions and impacts to stakeholder(s) or customers.
Severe	<ul style="list-style-type: none"> • Long-term (6 to 12 months) and potentially irreversible impacts • Extensive remediation required • Severe disruptions or long-term impacts to stakeholder(s) or customers.
Major	<ul style="list-style-type: none"> • Medium-term (between 3 and 6 months) and potentially irreversible impacts • Considerable remediation required • Major impacts or disruptions to stakeholder(s) or customers.
Moderate	<ul style="list-style-type: none"> • Medium-term (between 1 and 3 months), reversible and/or well-contained impacts • Minor remedial actions required • Moderate impacts or disruptions to stakeholder(s) or customers.

Consequence level	Definition
Minor	<ul style="list-style-type: none"> Short-term (less than 1 month), reversible or minor impacts that are within environmental regulatory limits and within site boundaries Minor or short-term impacts to stakeholder(s) or customers.
Insignificant	<ul style="list-style-type: none"> No appreciable or noticeable changes to the environment Negligible impact to environment, stakeholder(s) or customers.

Table 7-2 Risk analysis likelihood definitions

Likelihood	Definition	Probability
Almost certain	Expected to occur frequently during time of activity or Project (10 or more times per year)	>90%
Likely	Expected to occur occasionally during time of activity or Project (1 to 10 times per year)	75-90%
Possible	More likely to occur than not occur during time of activity or Project (once per year)	50-75%
Unlikely	More likely not to occur than occur during time of activity or Project (once every 1 to 10 years)	25-50%
Rare	Not expected to occur during the time of activity or Project (once every 10 to 100 years)	10-25%
Almost unprecedented	Not expected to ever occur during time of activity or Project (less than once every 100 years)	<10%

Table 7-3 Risk matrix

Likelihood	Consequence					
	Catastrophic	Severe	Major	Moderate	Minor	Insignificant
Almost certain	Very high	Very high	Very high	High	High	Medium
Likely	Very high	Very high	High	High	Medium	Medium
Possible	Very high	High	High	Medium	Medium	Low
Unlikely	High	High	Medium	Medium	Low	Low
Rare	High	Medium	Medium	Low	Low	Low
Almost unprecedented	Medium	Medium	Low	Low	Low	Low

7.4 Environmental risk analysis

Using the framework described above, a preliminary environmental risk analysis for the Project is presented in Table 7-4. The risk analysis identifies an initial risk rating for each of the environmental issues. Further details regarding the existing environment and potential impacts associated with each environmental issue are provided in Chapter 8 and Chapter 9. The potential impacts are considered without mitigation.

This risk analysis aims to provide a conservative assessment of 'worst case' potential impacts at any location within the environmental study area to identify key environmental issues. The consideration of environmental issues at discrete locations including areas within and outside of the airport site is provided in Chapter 8 and Chapter 9 (refer to Section 8.1 for information regarding the delineation of environmental issues within the airport site).

Table 7-4 Preliminary environmental risk analysis

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Traffic and transport – construction				
<p>The Project would need to appropriately manage the following potential temporary impacts during construction:</p> <ul style="list-style-type: none"> • potential temporary worsening of traffic performance on surrounding road network due to construction vehicles, and temporary road closures or lane closures • temporary impacts to roads during the construction of rail overbridges or road overbridges • temporary loss of parking spaces or loading zones due to construction sites and temporary transport arrangements • potential temporary reduced pedestrian and cyclist access or flow due to construction • potential temporary delays or other temporary impacts on the reliability of public transport services • potential temporary impacts on customer travel during interface works at the T1 Western Line • temporary altered access to private property and public land • temporary traffic, pedestrian and cyclist safety issues. 	Major	Almost certain	Very high	<p>The key temporary traffic and transport risks for the Project are likely to be during construction in urban areas north of the M4 Western Motorway and would relate to both the road and public transport network.</p> <p>South of the M4 Western Motorway, the transport network is limited, and roads generally do not experience high levels of congestion and would have sufficient capacity for construction vehicles. Key traffic and transport risks in this area related to potential temporary impacts to roads during the construction of rail overbridges or road overbridges.</p>
Traffic and transport – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> • local traffic network impacts from private vehicle and public transport movements to and from stations (including from park and ride facilities if proposed) during the operation of the Project 	Likely	Minor	Medium	<p>During the operation of the Project, traffic and transport risks are considered to be medium. The Project would deliver transport benefits during operation by providing a reliable, efficient public transport option for the wider community in Western Sydney.</p>

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
<ul style="list-style-type: none"> potential permanent severance of local movement corridors as a result of the Project corridor potential permanent changes to parking or pedestrian and cyclist routes. <p>The Project is likely to result in the following traffic and transport benefits once operational:</p> <ul style="list-style-type: none"> reduced reliance on travel by motor vehicles improved accessibility in Western Sydney including to future key employment hubs such as Western Sydney Aerotropolis and Western Sydney International. 				
Noise and vibration – construction				
<p>The Project would need to appropriately manage the following potential temporary impacts during construction:</p> <ul style="list-style-type: none"> temporary localised airborne noise impacts to sensitive receivers from construction works during and outside of standard construction hours temporary perceived impacts to human health as a result of airborne noise potential temporary ground-borne noise impacts from tunnelling and other excavation activities, including blasting if required temporary noise from the movement of construction traffic via the road network potential vibration from construction works exceeding human comfort or structural damage criteria. 	Major	Almost certain	Very high	The key temporary noise and vibration risks for the Project are likely to be during construction in urban areas around St Marys where there is a high density of noise sensitive receivers and semi-rural areas where background noise levels are low.

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Noise and vibration – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> airborne noise impacts from the operation of train services airborne noise impacts from the operation of stations airborne noise impacts from fixed facilities such as the stabling and maintenance facility and substations potential ground-borne noise impacts from the operation of train services through tunnels. 	Possible	Moderate	Medium	<p>During the operation of the Project, noise and vibration risks are considered to be moderate. Potential operational noise impacts would be reduced where the Project is located in a tunnel or cutting.</p> <p>The land use and urban form of the environmental study area is likely to change over the next 10-15 years and it will be necessary for this future development to be considered with regard to potential operational noise impacts from the Project.</p>
Biodiversity – construction				
<p>The Project would need to appropriately manage the following impacts during construction:</p> <ul style="list-style-type: none"> potential impacts on endangered populations, threatened species and threatened ecological communities during construction potential impacts on riparian and aquatic habitats around watercourses including Badgerys Creek and South Creek and its tributaries potential impacts on groundwater dependent ecosystems indirect temporary impacts including light and noise impacts. 	Major	Almost certain	Very high	<p>Key biodiversity risks for the Project are likely to be impacts on endangered populations, threatened species and threatened ecological communities located in semi-rural areas during construction. Potential impacts to biodiversity should be considered in the context of the strategic assessment and conservation plans that have been completed or are underway (where these are being relied on for the Project) for the environmental study area as described in Section 6.1.3 and Section 6.1.4.</p>

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Biodiversity – operation				
<p>The Project would need to appropriately manage the following impacts during operation:</p> <ul style="list-style-type: none"> • restriction of fauna movement along key wildlife movement corridors. • potential impacts from spills and leaks of fuel, oils and other hazardous materials • indirect impacts including light and noise impacts. 	Minor	Unlikely	Low	Potential impacts to biodiversity during operation are considered to be minor.
Non-Aboriginal heritage – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> • direct impacts to the Commonwealth Heritage listed Orchard Hills Cumberland Plain Woodland • direct impacts to State listed heritage items, including St Marys Station • direct impact to local and section 170 register listed heritage items (including archaeological items) • indirect damage to heritage items from construction vibration including from ground-borne noise • direct impacts to unknown heritage items (e.g. archaeological items) during construction • indirect impacts to heritage items such as visual setting or settlement. 	Major	Likely	High	<p>The key non-Aboriginal heritage risks for the Project are likely to be to the State heritage listed St Marys Station during construction, given that the Project would likely connect to the existing station. The Commonwealth Heritage listed Orchard Hills Cumberland Plain is also located within the environmental study area.</p> <p>The design development of the Project would avoid or minimise direct impacts to Commonwealth, State and local heritage items where possible.</p>
Non-Aboriginal heritage – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> • indirect impacts to heritage items such as visual setting or settlement. 	Minor	Possible	Medium	Potential impacts to non-Aboriginal heritage during operation would primarily relate to how the Project sits within the visual setting of surrounding heritage items.

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Aboriginal heritage – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> • direct impacts on known Aboriginal heritage items • direct impacts to archaeologically sensitive landscapes including around creek lines which may contain unidentified Aboriginal heritage items • indirect impacts to Aboriginal heritage items such as visual setting or settlement. 	Major	Likely	High	Known Aboriginal heritage items have been identified as part of this Scoping Report, however a key risk for the Project would also be undertaking construction activities within archaeologically sensitive landscapes including around creek lines which may contain unidentified Aboriginal heritage items.
Aboriginal heritage – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> • indirect impacts to Aboriginal heritage items such as visual setting or settlement. 	Minor	Unlikely	Low	Potential impacts to Aboriginal heritage during operation are considered to be minor.
Land use and property – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> • temporary acquisition or leasing of properties • temporary land severance associated with the introduction of the Project corridor and construction sites • potential impacts on other infrastructure. The Project would potentially interface with: <ul style="list-style-type: none"> - T1 Western Line - Great Western Highway, M4 Western Motorway, Luddenham Road, Elizabeth Drive, Badgerys Creek Road and the future M12 Motorway corridor - Warragamba pipeline - utilities throughout the environmental study area. 	Moderate	Likely	High	<p>There are a number of key land use risks for the Project during construction including:</p> <ul style="list-style-type: none"> • property acquisition • impacts to other infrastructure • land severance associated with the introduction of the Project corridor.

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Land use and property – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> • compatibility of the Project with future land use around Western Sydney International • integration of the Project with future land use proposed as part of the Draft WSAP and the Greater Penrith to Eastern Creek Growth Area • future restrictions to development associated with the Project corridor • land severance and sterilisation associated with the Project corridor. <p>The Project is likely to result in land use benefits during operation including opportunities for integration with land use development around stations.</p>	Moderate	Likely	High	<p>There are a number of key land use risks for the Project during operation including:</p> <ul style="list-style-type: none"> • changes to land use • land severance associated with the project corridor. <p>The Project supports other land use changes as part of strategic planning for Western Sydney.</p>
Social and economic – construction				
<p>The Project would need to appropriately manage the following potential temporary impacts during construction:</p> <ul style="list-style-type: none"> • temporary amenity impacts on residential receivers and social infrastructure • potential impacts on community values and lifestyle • potential temporary impacts to agricultural assets such as dams • temporary access restrictions or changes resulting from construction sites and activities • potential temporary cumulative impacts associated with concurrent Project construction and construction of approved development considered as part of current strategic planning for the area 	Major	Likely	High	<p>The key social and economic risks for construction of the Project are likely to be potential impacts to local amenity, changes in land use character, community values and lifestyle for semi-rural landowners.</p>

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
<ul style="list-style-type: none"> social and economic impacts associated with property acquisition. 				
Social and economic - operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> potential amenity impacts to residential receivers and social infrastructure potential impacts on community values and lifestyle social impacts associated with the severance of the local road network as a result of the Project corridor. <p>The Project is likely to result in the following social and economic benefits:</p> <ul style="list-style-type: none"> reduced reliance on travel by motor vehicles and associated social and health benefits improved accessibility in Western Sydney including to future key employment hubs such as Western Sydney International and the Aerotropolis broader economic benefits for Western Sydney and the broader Sydney region. 	Major	Likely	High	The key social and economic risks for the operation of the Project are likely to be potential impacts to amenity, changes in land use character, community values and lifestyle for semi-rural landowners.
Flooding, hydrology and water quality – construction				
<p>The Project would need to appropriately manage the following potential temporary impacts during construction:</p> <ul style="list-style-type: none"> potential water quality impacts due to spills and erosion water quality impacts to watercourses from the potential discharge of water from temporary water quality basins temporary impacts to construction activities due to flooding potential impacts on flood-prone areas from temporary infrastructure (including at creek crossings). 	Major	Likely	High	The key flooding, hydrology and water quality risks for the Project are likely to be temporary water quality impacts, flooding impacts from temporary infrastructure and the potential for construction sites to be inundated during flood events.

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Flooding, hydrology and water quality – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> • potential water quality impacts due to spills • impacts on flood-prone areas from permanent infrastructure • potential flooding impacts on Project infrastructure • scour and erosion impacts at the discharge points of drainage infrastructure (both for new infrastructure or where the Project may increase the velocity of flows at an existing discharge point). 	Moderate	Possible	Medium	<p>Potential flooding impacts during operation would be minimised during the design development of the Project. Potential changes to the local flooding regime associated with future land use changes in the area would also need to be considered during the design development of the Project.</p>
Landscape and visual impact – construction				
<p>The Project would need to appropriately manage the following potential temporary impacts during construction:</p> <ul style="list-style-type: none"> • temporary, adverse visual impacts from the presence of construction activities and construction sites • temporary, adverse impacts on landscape character • temporary light-spill on sensitive receivers during night construction works. 	Major	Likely	High	<p>The vertical alignment for the Project would be varied, and would include a combination of surface (at-grade and in-cutting), tunnel and elevated/viaduct. Potential temporary landscape and visual risks during construction would be higher where the construction works for the metro line or stations are located at-grade or on a viaduct, lower where the line is located in a cutting and avoided where the line is located in a tunnel.</p>

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Landscape and visual impact – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> visual impacts associated with the introduction of new station buildings, a stabling and maintenance facility and other permanent infrastructure, including night-time lighting impacts changes to landscape character. 	Major	Likely	High	<p>The vertical alignment for the Project would be varied, and would include a combination of surface (at-grade and in-cutting), tunnel and elevated/viaduct. Potential landscape and visual risks during operation would be higher where the metro line or stations are located at-grade or on a viaduct, lower where the line is located in a cutting and avoided where the line is located in a tunnel. The land use and urban form of the environmental study area is likely to change over the next 10-15 years and it will be necessary for this future development to be considered with regard to potential operational visual and landscape impacts from the Project.</p>
Local business impacts – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> temporary disruption to servicing, deliveries and access during construction from potential traffic network impacts potential temporary impacts on business due to reduced visibility of businesses, changes to pedestrian and vehicle movements or reduction in amenity associated with construction sites loss of businesses due to property acquisition. 	Moderate	Possible	Medium	<p>The key local business risks for the Project would be during construction at urban areas, for example around St Marys.</p>

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Local business impacts – operation				
<p>The Project would likely result in the following benefits to (existing and primarily future) local businesses during operation:</p> <ul style="list-style-type: none"> local business opportunities as a result of the operation of the Project around stations improved access and connectivity supporting new business development in areas such as the Western Sydney Aerotropolis and Western Sydney International. 	Minor	Unlikely	Low	The operation of the Project would be associated with a number of opportunities for local businesses.
Air quality – construction				
<p>The Project would need to appropriately manage the following potential temporary impacts during construction:</p> <ul style="list-style-type: none"> temporary, localised impacts to local air quality due to dust generation during bulk earthworks temporary, localised impacts to local air quality due to the operation of construction plant and equipment temporary, localised impacts to local air quality due to increased vehicle movements associated with transport of construction materials. 	Minor	Likely	Medium	Potential temporary air quality risks are predominantly related to construction activities and are considered to be typical of a large infrastructure Project and would likely be managed through the implementation of standard mitigation measures for a Project of this scale.
Air quality – operation				
<p>Potential impacts during operation are considered to be negligible and would be managed by the implementation of standard mitigation measures. The Project is expected to result in benefits for local air quality, by encouraging mode shift from private vehicles to public transport.</p>	Minor	Rare	Low	Potential impacts to air quality during operation are considered to be negligible.

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Contamination – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> • potential disturbance of contaminated land and associated potential impacts to human and ecological receptors • potential contamination of land due to leaks and spills • encountering contaminated building structures or land during early works. 	Moderate	Possible	Medium	Potential contamination risks are considered to be concentrated around urban areas within the environmental study area. Notwithstanding there is the potential for contamination in semi-rural areas from historic agricultural activities. Potential contamination risks are considered to be typical of a large infrastructure project and would likely be managed through the implementation of standard mitigation measures for a Project of this scale.
Contamination – operation				
Potential impacts during operation are considered to be negligible and would be managed by the implementation of standard mitigation measures.	Minor	Unlikely	Low	Potential impacts during operation are considered to be negligible and would be managed by the implementation of standard mitigation measures.
Soils – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> • potential impacts to local waterways from erosion and sedimentation caused by construction activities • potential exposure of acid sulfate soils during excavation. 	Moderate	Possible	Medium	There is the potential for erosion and sedimentation from construction activities in proximity to waterways, including at creek crossings for the Project.
Soils – operation				
Potential impacts during operation are considered to be negligible.	Minor	Unlikely	Low	Potential impacts during operation are considered to be negligible and would be

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
				managed by the implementation of standard mitigation measures.
Hazard and risk – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> rupture of, or interference with, utilities, infrastructure and services during construction including Warragamba pipeline and existing and proposed road and rail infrastructure transport and storage of hazardous substances and dangerous goods. 	Severe	Rare	Medium	Hazards and risks associated with the Project are considered to be typical of a large infrastructure project. The Project would be designed to avoid or minimise impacts to major existing infrastructure during construction.
Hazard and risk – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> transport and storage of hazardous substances and dangerous goods aviation risks bushfire risks. 	Severe	Rare	Medium	Hazards and risks associated with the Project are considered to be typical of a large infrastructure project.

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Waste and resources – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> management of waste during construction including the management of tunnel spoil increased resource consumption. 	Moderate	Possible	Medium	<p>Waste and resource risks during construction are considered to be typical of a large infrastructure project. Measures would be implemented to minimise the quantity of waste to be sent to landfill.</p>
Waste and resources – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> management of waste during operation increased resource consumption. 	Minor	Unlikely	Low	<p>Waste and resource risks during operation are considered to be typical of a large infrastructure project. Measures would be implemented to minimise the quantity of waste generated and sent to landfill.</p>
Groundwater and geology – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> potential temporary impacts to construction activities for excavations in areas where groundwater levels are close to the surface potential temporary impacts to groundwater flows during excavation and tunnelling works potential temporary impacts to groundwater quality from spills or the disturbance of existing contaminated land temporary impacts to surface watercourses with groundwater connectivity potential temporary impacts to groundwater dependent ecosystems 	Moderate	Possible	Medium	<p>The key potential risks to groundwater or the Project would be during the construction of tunnels and other major excavation activities. Impacts are likely to be limited in duration during construction.</p> <p>Tunnel elements of the Project would be constructed to avoid or minimise groundwater inflows during operation.</p>

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
<ul style="list-style-type: none"> temporary groundwater drawdown associated with tunnels and station boxes. 				
Groundwater and geology – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> groundwater drawdown associated with tunnels and station boxes. 	Minor	Possible	Medium	<p>Potential impacts during operation are considered to be moderate.</p> <p>Tunnel elements of the Project would be designed to avoid or minimise groundwater inflows during operation.</p>
Greenhouse gas – construction				
<p>The Project would need to appropriately manage the following potential impacts during construction:</p> <ul style="list-style-type: none"> emissions of greenhouse gases from construction energy use, including embodied energy in construction materials. 	Moderate	Possible	Medium	<p>The Project would generate greenhouse gas emissions during construction, typical of a large infrastructure project.</p>
Greenhouse gas – operation				
<p>The Project would need to appropriately manage the following potential impacts during operation:</p> <ul style="list-style-type: none"> emissions of greenhouse gases from operational energy use. <p>The Project would be associated with the following benefits during operation:</p> <ul style="list-style-type: none"> benefits related to reduced greenhouse gas emissions compared to the emissions that would otherwise occur if the Project were not delivered. 	Minor	Unlikely	Low	<p>The operation of the Project would result in benefits related to reduced greenhouse gas emissions compared to the emissions that would otherwise occur if trips to and from Western Sydney International and other destinations within the environmental study area were made by car.</p>

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Sustainability – construction				
<p>The Project would need to appropriately consider the following during construction:</p> <ul style="list-style-type: none"> potential impacts of climate change on the Project including increased intensity, duration and frequency of rainfall events. <p>The Project would be associated with the following sustainability benefits:</p> <ul style="list-style-type: none"> opportunities to provide sustainable outcomes during design and construction. 	Moderate	Possible	Medium	Opportunities would be considered to provide sustainable outcomes during the design and construction of the Project.
Sustainability – operation				
<p>The Project would need to appropriately consider the following during operation:</p> <ul style="list-style-type: none"> potential impacts of climate change on the Project including increased intensity, duration and frequency of rainfall events potential impacts associated with contributing to the urban heat island effect. <p>The Project would be associated with the following sustainability benefits:</p> <ul style="list-style-type: none"> opportunities to provide sustainable outcomes during the operation of the Project sustainability benefits associated with public transport infrastructure relating to peoples' health and wellbeing, service amenity, cost of living, urban renewal and subsequent water, energy and greenhouse gas emission efficiencies. 	Moderate	Possible	Medium	The Project would result in a number of sustainability benefits associated with public transport and other sustainability features that will be incorporated as part of the Project.

Potential unmitigated impact	Consequence	Likelihood	Risk Rating	Discussion
Cumulative impacts – construction				
<p>The Project would need to appropriately consider the following potential cumulative impacts during construction:</p> <ul style="list-style-type: none"> • cumulative impacts from the construction of multiple Projects (including the construction of Western Sydney International and M12 Motorway) on traffic congestion, noise, visual amenity, air quality, land use, biodiversity, heritage and business impacts • cumulative flooding and water quality impacts. 	Moderate	Likely	High	There are a number of other planned infrastructure Projects within and in proximity to the environmental study area.
Cumulative impacts – operation				
<p>The Project would need to appropriately consider the following potential cumulative impacts during operation:</p> <ul style="list-style-type: none"> • cumulative impacts from the operation of multiple Projects (including Western Sydney International and M12 Motorway) on traffic congestion, noise, visual amenity, air quality, land use, biodiversity, heritage and business impacts • cumulative flooding and water quality impacts. <p>The Project would be associated with the following benefits during operation:</p> <ul style="list-style-type: none"> • cumulative benefits from the operation of the Project, Western Sydney International and strategic land use planning initiatives in Western Sydney. 	Moderate	Likely	High	There are a number of other planned infrastructure Projects within and in proximity to the environmental study area.

7.5 Issue categorisation

Based on the consequence and likelihood definitions, 'key' issues are identified as those with a risk rating of high or very high, while 'other' issues are those with a risk rating of low or medium.

7.5.1 Key issues

As presented in Section 7.4, the key issues for the Project include:

- traffic and transport
- noise and vibration
- biodiversity
- non-Aboriginal heritage
- Aboriginal heritage
- land use and property
- social and economic
- flooding, hydrology and water quality
- landscape and visual impact.

Chapter 8 provides a preliminary assessment of the above issues and outlines the proposed scope of assessments to be undertaken for the Project as part of the Environmental Impact Statement.

7.5.2 Other issues

As presented in Section 7.4, the other issues for the Project include:

- local business impacts
- air quality
- contamination
- soils
- hazard and risk
- waste and resources
- groundwater and geology
- greenhouse gas
- sustainability.

The above issues are not expected to result in major environmental risks for the Project and/or are considered to be manageable through the implementation of standard mitigation measures and management strategies.

Chapter 9 provides a preliminary assessment of these issues and outlines the proposed scope of assessments to be undertaken for the Project as part of the Environmental Impact Statement.

Potential cumulative impacts are discussed in Chapter 10.

8 Key environmental issues

8.1 Delineation of on and off airport environmental issues

As described in Chapter 6, there are separate planning approval processes for the components of the Project that are located on and off the airport site.

The environmental impact assessment for the Project will be presented in a single document package that separately identifies the Environmental Impact Statement under NSW legislation, and any environmental impact assessment required to support the variation to the Airport Plan under Commonwealth legislation and any approval required under Part 9 of the EPBC Act.

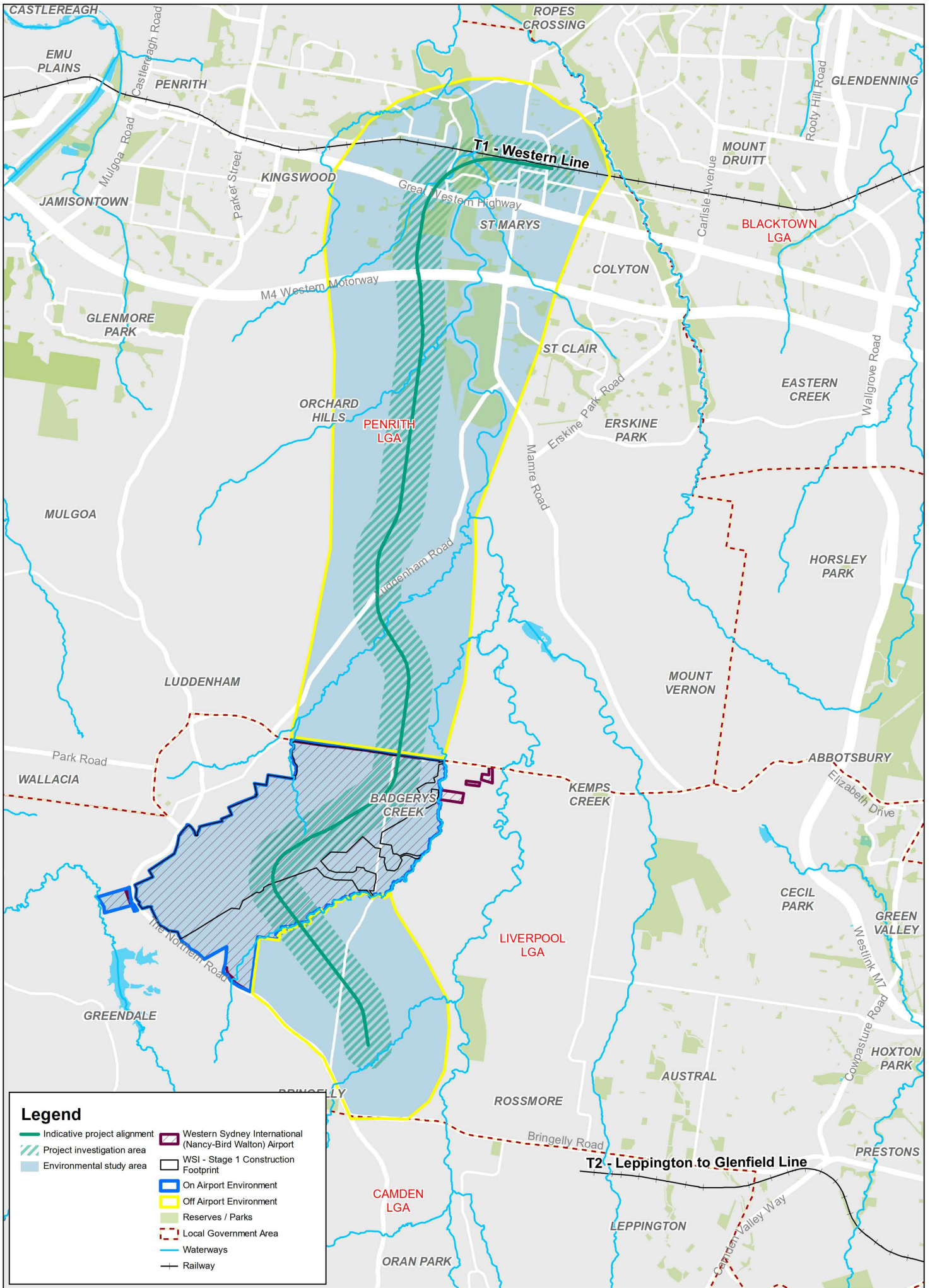
Environmental issues are discussed discretely within this chapter for land that is 'off-airport' and 'on-airport' under the broader headings of existing environment, potential environmental issues and the proposed method of assessment.

On-airport and off-airport land within the environmental study area is shown in Figure 8-1 and is referred to as the 'on-airport environment' and the 'off-airport environment' respectively.

This approach will help to identify the specific potential environmental issues and assessment requirements to be addressed in the Environmental Impact Statement under NSW legislation, any environmental impact assessment to support the variation to the Airport Plan under Commonwealth legislation and any assessment required under Part 8 of the EPBC Act.

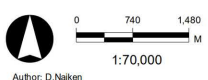
The development of Western Sydney International Stage 1 would clear the land within the Stage 1 construction footprint (referred to in the Airport Plan as the Construction Impact Zone) (shown in Figure 8-1) prior to construction activities for Sydney Metro Greater West. Therefore, any impacts from this direct disturbance, such as clearing of vegetation and direct impacts to heritage, would occur prior to construction of Sydney Metro Greater West.

Land outside the Western Sydney International Stage 1 construction footprint, generally to the south-east of the Airport site, would not be cleared prior to construction activities for Sydney Metro Greater West. Therefore, any impacts from direct disturbance in this area, such as clearing of vegetation and direct impacts to heritage, would occur as a result of construction of Sydney Metro Greater West.



Legend

- Indicative project alignment
- Project investigation area
- Environmental study area
- Western Sydney International (Nancy-Bird Walton) Airport
- WSI - Stage 1 Construction Footprint
- On Airport Environment
- Off Airport Environment
- Reserves / Parks
- Local Government Area
- Waterways
- +— Railway



Sydney Metro Greater West
Figure 8.1: On-Airport and Off-Airport Land within the Study Area

8.2 Traffic and transport

8.2.1 Existing environment

Off-airport environment

Overview

The existing transport network in the off-airport environment consists of the existing and planned road network, T1 Western Line, bus services and active transport facilities which are outlined below. Key elements of the traffic and transport network are shown in Figure 8-2.

Existing transport infrastructure is primarily located north of the M4 Western Motorway. South of the M4 Western Motorway the Project would be located in a predominantly semi-rural area with limited existing transport infrastructure.

Within the off-airport environment there is a high private vehicle mode share which is driven by a number of factors including:

- low-density land use with limited public transport outside the St Marys urban centre
- high availability of low-cost parking, and significant differences between private and public transport travel times in urban areas around St Marys
- existing public transport provision in urban areas around St Marys focused on providing peak commuter services to and from centres, and has limited capacity to cater for other trip types
- the inconsistent quality of the active transport network poses barriers for cycling and reduces active transport uptake.

Journey to work data for the Penrith and Liverpool local government areas shows that around 75 per cent of commuters travel to work by car, compared to 60 per cent for the Greater Sydney statistical area (Australian Bureau of Statistics (ABS) (2017), 2016 Census).

Active transport facilities within the off-airport environment

Active transport facilities within the off-airport environment are limited and generally located within the urban areas north of the M4 Western Motorway. There are off-road cycle paths on the Great Western Highway and Gipps Street (located between the Great Western Highway and M4 Western Motorway). There are no formal active transport facilities located south of the M4 Western Motorway.

Active transport facilities in the off-airport environment are anticipated to be improved alongside urban development as a result of the development of integrated active transport policies that are being developed as part of *Future Transport Strategy 2056* (Transport for NSW, 2018a).

Rail infrastructure

The Project would allow customer transfer with services on the existing T1 Western Line. The T1 Western Line crosses the northern extent of the off-airport environment and runs in an

east-west direction providing a link between Penrith, Blacktown, Parramatta and Sydney Central Business District. St Marys, Werrington and Kingswood stations are located on the T1 Western Line in the off-airport environment. The T1 Western Line is used by both passenger and freight trains. St Marys has a dedicated commuter car parking facility for public transport customers. A 600 space commuter car park is located to the north of St Marys Station.

Rail infrastructure upgrades and other potential extensions are being investigated in the off-airport environment to facilitate planned development in Western Sydney including the:

- South West Rail Link Extension which would extend from Leppington Station on the T2 Line to the Western Sydney Aerotropolis for future connections with the Project
- an East West Rail Link connection from Western Sydney International to the Sydney Metro West project
- Northern and southern extensions of the Project to connect with the North West Metro and existing T8 Airport and South Line.

As described in Section 4.7.2, the More Trains More Services program may increase capacity and the number of train services on the T1 Western Line, potentially increasing services to stations connecting with the Project.

Bus infrastructure

St Marys Station includes a bus interchange with bus services mainly operating to Penrith and Mount Druitt. Most of these bus services act as feeders to the rail network. Some destinations that bus services connect to include the Penrith Health and Education Precinct and Erskine Park employment area.

Bus services run from Kazanis Court, to Penrith and Cambridge Gardens via St Marys and Cambridge Park.

Bus services south of the urban areas of St Marys, Werrington and Kingswood are limited, consisting of north–south services between Penrith and Luddenham and east–west services between Bringelly and Liverpool.

Future Transport Strategy 2056 identifies plans for future rapid bus services linking Liverpool, Penrith and Campbelltown with the Aerotropolis to be established in time for the opening of Western Sydney International.

Road infrastructure

The M4 Western Motorway is the main road link between Inner Western Sydney and Western Sydney and is located in the north of the off-airport environment as shown in Figure 8-2. The motorway has an east-west alignment between Claremont Meadows and Orchard Hills. There is a motorway interchange located to the west at The Northern Road which provides a connection to South Penrith to the north and Glenmore Park to the south. The M4 Western Motorway is part of the broader strategic road network in and around the off-airport environment including the M5 Motorway, M7 Motorway and M31 Hume Highway.

The Great Western Highway is located to the north of the M4 Western Motorway and runs in an east-west direction. It provides a link between St Marys Town Centre and the Penrith Health and Education Precinct as well as the Parramatta and Penrith centres.

Other classified roads in the off-airport environment include:

- Mamre Road, which crosses the eastern side of the off-airport environment in a north-south direction and provides a link between St Marys Town Centre, Erskine Park and Kemps Creek
- Elizabeth Drive, which forms the northern boundary of Western Sydney International and connects between The Northern Road and M7 Motorway and runs further east to Liverpool. Elizabeth Drive experiences congestion in peak periods
- The Northern Road (currently being upgraded - refer to the section below), historically running within the airport site but subsequently relocated to facilitate development of the Airport site and located generally to the west of the off-airport environment. The Northern Road provides a north-south link between Penrith and Campbelltown Centres. The Northern Road experiences congestion in peak periods
- Bringelly Road located to the south of the off-airport environment is the key east-west road connecting Leppington with The Northern Road through Rossmore and Bringelly.

Luddenham Road is a regional road which runs generally north-south through the off-airport environment and provides a connection to classified roads as described above. Badgerys Creek Road is a regional road which is located within the southern extent of the off-airport environment and extends north into the on-airport environment. There are a number of internal access tracks within agricultural properties in Luddenham and Orchard Hills.

Future traffic environment

Significant road infrastructure upgrades are planned in the off-airport environment to facilitate planned development including Western Sydney International and Draft WSAP.

A number of road projects in the off-airport environment are being delivered as part of the WSIP. The objective of the WSIP is to deliver major road infrastructure upgrades to support an integrated transport solution for Western Sydney and capitalise on the economic benefits from developing Western Sydney International. Relevant projects as part of the WSIP include:

- the future M12 Motorway (in planning, refer below)
- upgrades to The Northern Road which are being delivered in six stages as follows:
 - Stage 1: The Old Northern Road to Peter Brock Drive: complete
 - Stage 2: Peter Brock Drive to Mersey Road: under construction
 - Stage 3: Glenmore Parkway to Jamison Road: under construction
 - Stage 4: Mersey Road to Eaton Road: complete

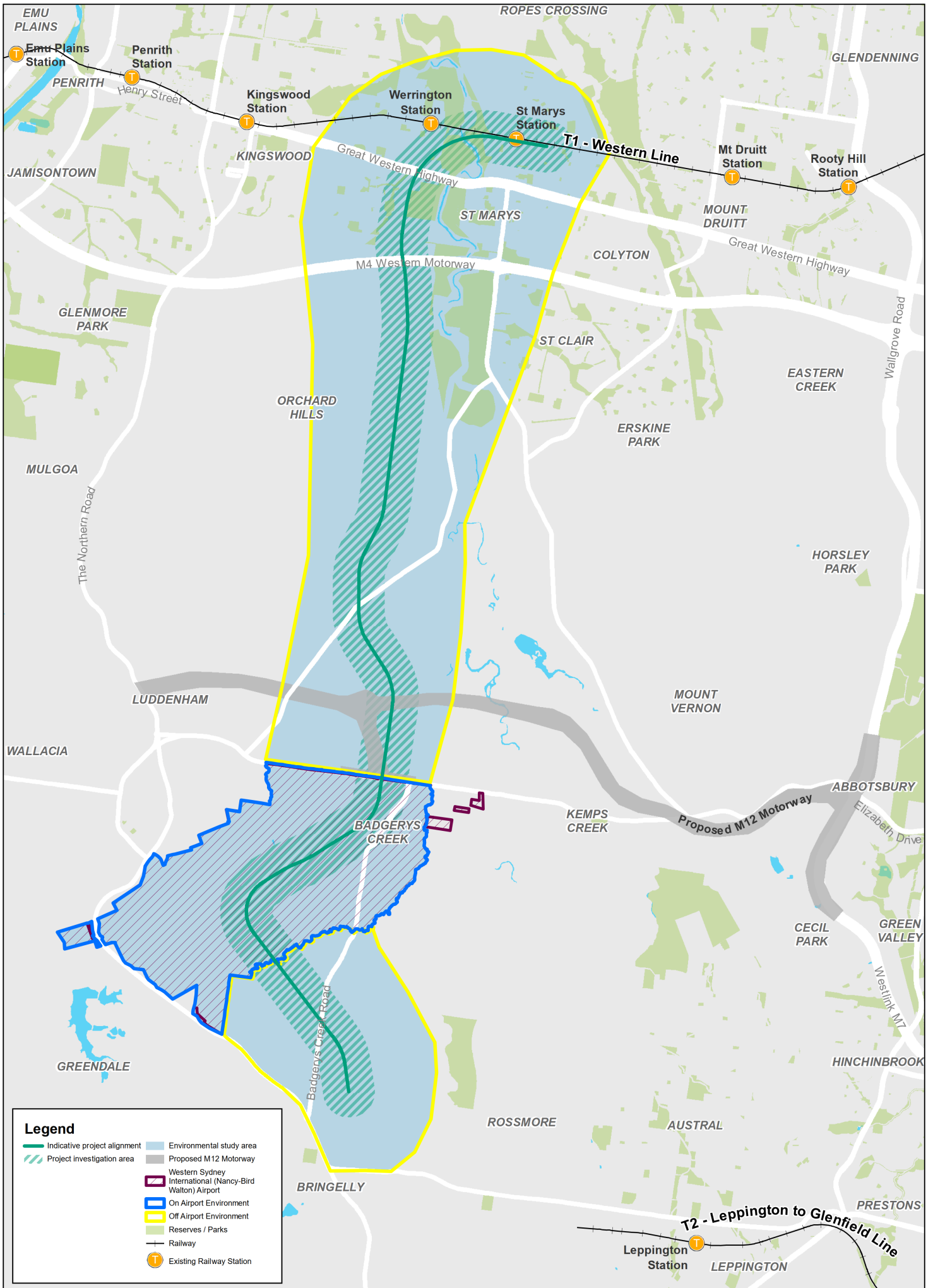
- Stage 5: Littlefields Road to Glenmore Parkway: under construction
- Stage 6: Eaton Road to Littlefields Road: under construction.
- upgrades to Bringelly Road (to be delivered in two stages which are under construction)
- upgrades to the intersections of local roads with The Northern Road.

The M12 Motorway would be about 16 kilometres long and connect the M7 Motorway, near Cecil Hills, to The Northern Road, near Luddenham. The future M12 Motorway corridor traverses east-west across the off-airport environment north of Western Sydney International and would connect to the M7 Motorway to the east, The Northern Road to the west and directly to the main Western Sydney International access road in the north of the airport site. The M12 Motorway would provide connection to the Airport business park and terminal. The M12 Motorway would include off-road pedestrian and cycle paths. The Project is currently in the design development and planning approval phase. Construction is anticipated to start in 2022 subject to planning approval.

Other relevant transport infrastructure projects within the off-airport environment include upgrades to Elizabeth Drive and Mamre Road. Investigations and early planning has commenced for improvements to Elizabeth Drive between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham, as well as Rickard and Hoxton Park roads. Planning has also commenced for the upgrade of Mamre Road between the M4 Western Motorway and Kerrs Road.

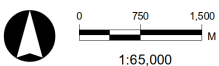
The indicative corridor for the Outer Sydney Orbital Stage 1 is also located within the off-airport environment. The Outer Sydney Orbital Stage 1 is a future north-south motorway and freight corridor currently being investigated by Transport for NSW. Within the off-airport environment the indicative corridor for the Outer Sydney Orbital Stage 1 includes connections to Elizabeth Drive, the future M12 Motorway and M4 Western Motorway. The Outer Sydney Orbital project is currently at a corridor assessment phase.

The operation of Western Sydney International Stage 1 is expected to result in approximately 21,500 vehicles movements to/from the airport each day and there would be a further increase in traffic movements to and from employment hubs including the Western Sydney International and Aerotropolis, and associated with broader planned growth including future residential and commercial development of the Western Parkland City.



Legend

- Indicative project alignment
- Project investigation area
- Environmental study area
- Proposed M12 Motorway
- Western Sydney International (Nancy-Bird Watton) Airport
- On Airport Environment
- Off Airport Environment
- Reserves / Parks
- Railway
- Existing Railway Station



Sydney Metro Greater West
Figure 8.2: Transport Network within the Study Area

On-airport environment

Road infrastructure within and immediately adjacent to the on-airport environment includes limited sections of Elizabeth Drive, Badgerys Creek Road and a number of other local roads. The Northern Road has been realigned to the west of the airport site (as part of Stage 4 of the Northern Road upgrade (Eaton Road to Mersey Road) to facilitate the development of Western Sydney International Stage 1. The Northern Road is now located outside of the airport site and the environmental study area.

The Northern Road and Elizabeth Drive experience congestion in peak periods.

There are four bus routes that currently traverse the on-airport environment via Badgerys Creek Road and Elizabeth Drive, with three routes to/from Liverpool and one route to/from Penrith. Pedestrian and cycling infrastructure in the area is limited, reflecting the predominantly rural character of the existing area.

Badgerys Creek Road is currently being realigned within the airport site. Most other existing local roads within the airport site have been closed. An internal road network will be constructed as part of Western Sydney International Stage 1.

The primary public access road to Western Sydney International will be from the future M12 Motorway (which is subject to separate planning and approval) and Elizabeth Drive. The road would connect to Western Sydney International from the north.

The operation of Western Sydney International Stage 1 is expected to result in approximately 21,500 vehicles movements to/from the airport each day (to cater for around 10 million flight passengers per year as forecast for 2031 (Department of Infrastructure, Regional Development (DIRD), 2016). Western Sydney International Stage 1 will generate additional traffic on Elizabeth Drive, The Northern Road, Luddenham Road and Mamre Road. Additional traffic volumes are not anticipated to substantially impact the operation of the surrounding road network given the planned upgrades proposed as part of the Western Sydney Infrastructure Plan (WSIP) and future M12 Motorway. The M12 Motorway project Environmental Impact Statement was on public exhibition in 2019. Construction is expected to start in the early 2022, subject to approval.

8.2.2 Issues for consideration

Off-airport

Construction

Potential issues for consideration during construction include:

- impacts to train services on the T1 Western Line where construction works for the Project interface with the existing rail line at St Marys
- impacts to the road network associated with the movement of construction vehicles for the Project to and from construction sites and construction works areas along the Project alignment

- impacts associated with the interface of the Project with key roads including the Great Western Highway, M4 Western Motorway, Luddenham Road, the future M12 Motorway, the Northern Road and Elizabeth Drive. Impacts may include:
 - physical modification to these roads as a result of the Project design interface (e.g. tunnel or grade separation)
 - temporary lane closures during construction
- severance of the local road network as a result of the Project corridor
- other temporary road closures or diversions where construction works interface with local roads
- impacts to access to private properties and public land
- impacts to availability of public parking (off-street and on-street) for construction sites located within urban areas
- impacts to the safety of motorists, pedestrian and cyclists due to potential conflicts with construction vehicles.

The key traffic and transport risks for the Project are likely to be during construction in urban areas around St Marys. Project construction vehicles would use arterial roads to access construction sites wherever possible however the use of the local road network is likely to be required for short distances. As described in Section 8.2.1, south of the M4 Western Motorway, the transport network is limited primarily to classified and regional roads such as Mamre Road, Luddenham Road and Bringelly Road that generally do not experience high levels of congestion and would have sufficient capacity for construction vehicles. These roads also provide connections to the M4 Western Motorway and Great Western Highway for the efficient movement of spoil haulage vehicles to spoil reuse or spoil management sites.

Operation

The Project would deliver transport benefits during operation by providing a reliable, efficient public transport option for existing and future residents in the corridor, customers and employees of Western Sydney International and associated business in the Western Sydney Aerotropolis.

Stations for the Project would include transport interchange facilities including potential commuter car parking (park and ride facilities), 'kiss and ride' facilities and provision for bus services. These would generate operational traffic movements to and from the stations.

The Project corridor would also potentially result in the severance of current and future potential local movement corridors to the north of Western Sydney International and south of Orchard Hills. Potential severance issues would be identified and mitigated as part of the development of the Project design.

Sydney Metro will work with Transport for NSW to mitigate any operational traffic impacts arising from the Project.

Other potential traffic and transport impacts related to the operation of the Project include permanent modifications to the road network, public transport facilities and the integration of active transport facilities around permanent infrastructure including stations. These would generally be positive impacts associated with facilitating the movement of customers to and from the stations and their ultimate travel destination.

On-airport

Construction

The construction of the Project would need to consider and avoid or mitigate potential direct impacts to internal access roads within the on-airport environment and consider impacts of off-airport traffic on the airport land.

Potential traffic and transport would be associated with the movement of Project construction vehicles within the on-airport environment and impacts to nearby intersections at Elizabeth Drive, The Northern Road and Mamre Road. Construction traffic planning for the Project would need to take into account and coordinate with construction vehicle movements, potential for traffic staging and access arrangements for construction of Western Sydney International Stage 1 and other construction projects in the vicinity of the on-airport environment, including potential construction of the M12 Motorway.

Operation

The operation of the Project would provide an additional travel option to and from Western Sydney International for airport customers and employees. The Project would not adversely impact the on-airport traffic and transport environment during operation. Active transport infrastructure would likely be included at the station at the Airport business park. The Airport terminal station would only serve as a means of access to and from the airport and would make no provision for use by commuters or other rail travellers. As such, it would generate negligible traffic. Active transport infrastructure would focus on providing direct access between the station and the Airport terminal.

8.2.3 Method of assessment

Off-airport

A traffic and transport technical report will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the report:

- *Guide to Traffic Management – Part 3 Traffic Studies and Analysis* (Austroads, 2007)
- *Guide to Traffic Generating Developments Version 2.2* (RTA, 2002)
- *NSW Bicycle Guidelines v1.2* (RTA, 2005).

The methodology for the assessment will include:

- background document and data review including:

- a review of background documentation relevant to the assessment, including traffic assessments for other committed and funded transport infrastructure projects with publicly available traffic assessment documents
- establishment of the current traffic and transport environment in the study area
- identify key traffic and transport metrics (e.g., road traffic volumes, mid-block and intersection levels of service)
- review existing baseline traffic data
- determine future year traffic and transport operating conditions with and without the Project (years 2026 and 2036)
- consultation with Transport for NSW and other relevant government agencies to confirm the approach to the assessment.
- an assessment of construction traffic impacts including:
 - determination of the transport impacts during the construction phases of the Project, including traffic, on-street parking impacts, bus operations, spoil movements, pedestrians, park & ride facilities and active transport
 - assessment of construction impacts of the Project on the surrounding road network for a peak construction year (2022 or 2023). This would include SIDRA intersection modelling at key existing intersections around the proposed construction sites during the AM and PM weekday peak hours
 - identification of the need to close, divert or reconfigure the road network to facilitate the construction of the Project
 - assessment of cumulative impacts of the construction of the Project with other major infrastructure projects in the study area.
- an assessment of operational traffic impacts including:
 - determination of future year traffic and transport operating conditions with and without the Project e.g. road layouts, kiss and ride facilities, park and ride facilities, connecting public transport (bus) services, pedestrian and cycle links
 - an assessment of the operational impacts of the Project on the surrounding road network for two future operational year scenarios including opening year (2026) and future year (2036). This would include undertaking SIDRA intersection modelling at key existing intersections around the station precincts and stabling and maintenance facility during the AM and PM weekday peak hours to determine the level of service. The future year assessments would take into consideration planned future road infrastructure affected by the operation of the stations where known
 - qualitative assessment of cumulative impacts of the operation of the Project with other major infrastructure projects in the study area

- identify pedestrian and cycle network standards to be incorporated into the station precinct designs.

On-airport

Traffic and transport impacts on the airport site of construction activities on and off the airport site are considered to be minor. Notwithstanding, the method of assessment of potential on-airport and off-airport impacts to traffic and transport on the airport site would be consistent with the method of assessment for off-airport impacts and would consider requirements of the Commonwealth Environment Minister and the existing Traffic and Access Construction Environment Management Plan that is in place for Western Sydney International Stage 1.

8.3 Noise and vibration

8.3.1 Existing environment

Off-airport

Background noise levels in the urban areas in the north of the off-airport environment are influenced by a range of noise sources. These include localised sources such as motor vehicles (including from the Great Western Highway and M4 Western Motorway), passenger and freight trains on the T1 Western Line, construction activities and some commercial and industrial activities.

Noise sensitive receivers throughout the northern section of the off-airport environment include existing residences, educational facilities, places of worship, aged-care facilities and other community facilities such as areas of open space used for recreation.

Background noise in areas within the off-airport environment around Orchard Hills, Luddenham, Badgerys Creek and Bringelly reflect noise levels associated with a semi-rural environment. Existing noise sources in these areas are generally localised and from motor vehicles and farming and agricultural activities. Noise sensitive receivers are primarily limited to rural residential properties.

Future noise environment

The planned urban development of land within the Greater Penrith to Eastern Creek Growth Area and Draft WSAP and the operation of Western Sydney International may increase background noise levels in these rural areas over time, including traffic noise associated with increased traffic volumes on the upgraded arterial road network to be delivered in accordance with the WSIP.

Aircraft noise from the operation of Western Sydney International may increase background noise levels to some degree over most of the off-airport environment.

On-airport

Historic background noise levels at the Western Sydney International site are indicative of the rural environment of Badgerys Creek and Luddenham. Primary noise sources include road traffic noise and local industry.

Construction of Western Sydney International has commenced, resulting in noise generation from earthworks and the construction of significant operational airport infrastructure.

During construction there are unlikely to be any noise sensitive receivers on the airport site since construction will coincide with airport construction activities. Operational noise sensitive receivers would be limited to commercial receivers associated with the airport. The background noise levels for commercial receivers would be influenced by high noise generating activities such as aircraft take-off and landing, aircraft engine maintenance testing and aircraft taxiing.

8.3.2 Issues for consideration

Off-airport

Construction

Construction of the Project in the off-airport environment may result in noise and vibration impacts on surrounding sensitive receivers including:

- airborne noise impacts from civil construction works along the Project alignment and at stations
- airborne noise impacts from construction activities within construction sites, including spoil management activities
- airborne noise impacts from utility protection, adjustment and relocations
- increase to road traffic noise from the movement of construction vehicles, including spoil haulage vehicles
- ground-borne noise and vibration impacts from tunnelling and underground station excavation.

The degree of construction noise and vibration impact on individual sensitive receivers would depend on the distance between construction activities and sensitive receivers, the nature of the works, the duration of the works and the time of day or night that the works take place.

The Project would potentially require some works (including tunnelling works) to be undertaken during weekends and at night, particularly in relation to the connection of the Project to the T1 Western Line where the highest concentration of existing sensitive receivers may occur. Works conducted outside of standard daytime construction hours (i.e. out of hours works) increase the potential for noise and vibration impacts on surrounding sensitive receivers due to lower background noise levels and the potential for sleep disturbance.

Operation

The Project has the potential to increase operational noise levels at surrounding sensitive receivers including:

- airborne noise from metro trains operating at the surface (at-grade and in-cutting) and elevated/viaduct sections

- airborne noise impacts from the operation of stations (including commuter traffic generation at stations)
- airborne noise from the operation of fixed facilities such as the stabling and maintenance facility (where rail movements and other activities could occur outside normal passenger rail operating hours) and substations
- ground-borne noise from the operation of metro trains within underground sections of the Project.

In existing semi-rural areas, the operation of metro trains, stations and fixed facilities would introduce a new noise source in an environment with low background noise levels. However, potential operational noise impacts would be avoided or reduced where the Project is located in a tunnel or cutting. Notwithstanding, as outlined in Section 8.3.1, background noise levels in currently rural areas of the off-airport environment are anticipated to increase as a result of the planned urban development of land within the Greater Penrith to Eastern Creek Growth Area, Draft WSAP, the operation of Western Sydney International and infrastructure upgrades as part of the WSIP and other transport projects in the region.

It should be noted that the assessment of aircraft noise for Western Sydney International has influenced land use planning such that large areas within planned development areas will not be used for residential land uses and noise sensitive receivers in many areas would be limited to commercial or industrial receivers.

It is assumed that the design and layout of future development that occurs on and off the airport after the approval of the Project would consider potential noise impacts associated with operation of the Project off-airport. The development of the Project would aim to minimise noise and vibration constraints to future development.

On-airport

Construction

Construction of the Project in the on-airport environment may result in noise and vibration impacts on sensitive receivers in Luddenham, Badgerys Creek and Bringelly including:

- airborne noise impacts from civil construction works along the Project alignment and at stations
- airborne noise impacts from construction activities within construction sites, including spoil management activities
- increase to road traffic noise from the movement of construction vehicles, including spoil haulage vehicles.

There are no noise sensitive receivers located in the on-airport environment. Background noise in the on-airport environment would be dominated by construction works for Western Sydney International Stage 1 including from earthworks and the construction of significant operational airport infrastructure.

Operation

The operation of the Project within the on-airport environment has the potential to result in operational noise impacts from:

- airborne noise from the operation of metro trains and stations
- ground-borne noise impacts from the operation of metro trains.

It is likely that the Project would primarily be located below the surface in the on-airport environment and integrated as part of Airport terminal. Airborne noise impacts are therefore likely to be negligible and would be limited to surface infrastructure components.

The on-airport environment will be a high-noise environment influenced by operational aircraft activities. The operational noise impact of the Project to sensitive receivers in Luddenham, Badgerys Creek and Bringelly in the context of the background noise of the airport is likely to be negligible. Sensitive receivers within the on-airport environment would be limited to commercial receivers (including potential hotel sites and incorporating passengers and employees) following the completion of Western Sydney International Stage 1.

8.3.3 Method of assessment

Off-airport

A noise and vibration technical report will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the report:

- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990)
- *Assessing Vibration: a technical guideline* (DEC, 2006)
- *Interim Construction Noise Guideline* (DECCW, 2009)
- *Noise Policy for Industry* (EPA, 2017)
- *Sydney Metro Construction Noise and Vibration Strategy* (Sydney Metro, 2018)
- *Rail Infrastructure Noise Guideline* (EPA, 2013)
- *The Transport for NSW Environmental Noise Management Manual 2001*
- *NSW Road Noise Policy* (DECCW, 2011)
- *Development Near Rail Corridors and Busy Roads – Interim Guideline* (DoP, 2008)
- *The Transport for NSW Noise Mitigation Guideline 2015*
- *The Transport for NSW Noise Criteria Guideline 2015*
- *German Standard DIN 4150-3: Structural Vibration – effects of vibration on structures*

- *Airports (Environment Protection) Regulations, 1997 Schedule 4—Excessive noise—guidelines.*

The methodology for the assessment will include the following:

- noise monitoring and site survey including:
 - review of the off-airport environment to determine the nearest noise sensitive receivers and define Noise Catchment Areas (NCAs)
 - undertake a combination of attended and unattended noise and vibration monitoring to establish background and ambient noise levels
 - identify noise receiver types, land use (including known, planned land use) and existing noise mitigation
- construction noise and vibration assessment including:
 - develop assessment criteria based on the background noise monitoring results
 - predict construction noise and vibration levels for major construction activities
 - assess noise and vibration levels in accordance with adopted assessment criteria
 - assess potential construction road traffic noise impacts
 - recommend mitigation strategies to control construction noise and vibration
 - a qualitative discussion on the potential cumulative construction noise impacts due to concurrent or subsequent construction on other committed major projects based on publicly available information.
- operational rail airborne noise assessment including:
 - determine noise trigger levels in accordance with relevant guidelines
 - develop an approach to consider future land use change and noise sensitive development that would be near the rail corridor
 - develop a 3D computer model in SoundPLAN (or equivalent) software of the existing and proposed noise environments
 - predict noise levels at sensitive receivers with and without the Project
 - assess the predicted noise levels at sensitive receivers and identify mitigation measures
 - a qualitative assessment of the cumulative impacts of rail operational noise with operational noise from other committed major projects based on publicly available information.
- Operational rail ground-borne noise and vibration assessment including:

- identify noise and vibration sensitive receivers including residential, heritage items, utilities and other sensitive structures in the Project area
- develop an operational rail ground-borne noise and vibration model
- predict and assess operational rail ground-borne noise and vibration levels
- where exceedances of the ground-borne noise and vibration criteria are identified, recommend appropriate mitigation measures
- identify residual impacts.
- operational noise and vibration assessment for stabling and maintenance facility, stations and substations including:
 - confirm the noise trigger levels applicable to the proposed fixed infrastructure based on relevant guidelines
 - identify a list of noise sources
 - develop a 3D computer noise model for the likely industrial noise sources associated with the fixed infrastructure
 - predict noise levels at sensitive receivers due to the proposed fixed infrastructure and assess the predicted noise levels at sensitive receivers against the established trigger levels
 - identify appropriate reasonable and feasible noise mitigation
 - identify residual impacts.
- operational road traffic noise assessment including:
 - where there are expected changes in road traffic noise due to the Project (and a road traffic noise assessment is triggered), a road traffic noise assessment will be undertaken. It is anticipated that this will occur for new park and ride facilities (and associated new roads), and in instances of road closures and diversions to accommodate the new rail
 - a road noise model will be generated in accordance with relevant guidelines
 - assessment of equivalent and maximum noise levels would be undertaken as required by the Road Noise Policy (RNP)
 - assessment of predicted road noise levels and reasonable and feasible mitigation.

On-airport

The method of assessment of potential noise and vibration impacts from on-airport elements of the Project would generally be consistent with the methodology outlined for the assessment of off-airport impacts described above and taking into account any requirements specified by the Commonwealth Environment Minister.

The provisions of the EPBC Act, Airports Act and its Regulation do not prescribe a methodology for the assessment of potential noise impacts. However, the *Airports (Environment Protection) Regulations 1997* provide the regulatory framework for noise generated at an airport site (other than noise generated by aircraft in flight, landing, taking off or taxiing). These regulations include specific limits for certain activities, including construction activities, at certain times of the day and provide other more general principles to avoid offensive noise that intrudes on individual community or commercial amenity.

Consideration would also be given to the Construction Noise and Vibration Environment Management Plan that is already in place for construction of Western Sydney International Stage 1.

8.4 Biodiversity

8.4.1 Existing environment

Off-airport

A desktop review of publicly available online environment databases was carried out to identify existing threatened flora and fauna species, populations and ecological communities listed under the NSW BC Act and MNES listed under the Commonwealth EPBC Act located in the off-airport environment. Relevant resources that were reviewed included:

- EPBC Act Protected Matters Search Tool
- NSW Bionet threatened species records for flora and fauna
- Office of Environment and Heritage (OEH) (now part of DPIE) Cumberland Plain vegetation mapping
- Atlas of Groundwater Dependent Ecosystems (Bureau of Meteorology).

Around St Marys, Werrington and Kingswood the off-airport environment is characterised by an urban landscape with areas of vegetation primarily limited to riparian areas adjacent to South Creek and Werrington Lakes as well as around open space areas.

Around Orchard Hills, Luddenham, Badgerys Creek and Bringelly the off-airport environment is characterised by a predominantly cleared and disturbed semi-rural landscape with interspersed stands of native vegetation, mostly located around the riparian areas at Claremont Creek, Blaxland Creek, Cosgroves Creek, South Creek and Badgerys Creek (only the southern riparian area of Badgerys Creek is part of the off-airport environment).

Mapped biodiversity within the off-airport environment is shown in Figure 8-3.

Threatened flora and fauna species

A total of 12 threatened flora species are predicted to occur within the off-airport environment. Of these, 12 are listed under the BC Act and 11 are listed under the EPBC Act.

A total of 37 threatened fauna species are predicted to occur within the off-airport environment. Of these, 32 are listed under the BC Act and 13 are listed under the EPBC Act. Fauna species previously recorded in the off-airport environment include:

- Swift parrot (*Iathamus discolour*) – listed as endangered under the BC Act and critically endangered under the EPBC Act
- Powerful Owl (*Ninox strenua*) – listed as vulnerable under the BC Act
- Square tailed Kite (*Lophoictinia isura*) – listed as vulnerable under the BC Act
- Eastern Bentwing-bat (*Miniopterus schreibersii*) – listed as vulnerable under the BC Act
- Cumberland Land Snail (*Meridolum corneovirens*) – listed as endangered under the BC Act.

Threatened ecological communities

The following ecological communities (listed under the BC Act, EPBC Act or both) were identified as potentially occurring within the off-airport environment:

- Cumberland Plain Woodland in the Sydney Basin Bioregion (listed as critically endangered under both the EPBC Act and BC Act). The desktop review identified the community as being present around St Marys, Werrington (also identified as being terrestrial groundwater dependent ecosystems at this location), Orchard Hills and Luddenham
- River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (listed as endangered under the BC Act). The desktop review identified the community as being present around St Marys, Orchard Hills and Luddenham
- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions (listed as endangered under the EPBC Act and BC Act). The desktop review identified the community as being present around St Marys, Werrington (also identified as being terrestrial groundwater dependent ecosystems at this location), Orchard Hills and Luddenham
- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (listed as critically endangered under the EPBC Act and BC Act). The desktop review identified the community as being present around Orchard Hills
- Shale Gravel Transition Forest in the Sydney Basin Bioregion (listed as critically endangered under the EPBC Act and BC Act). These areas are identified as being in a thinned condition. The desktop review identified the community as being present around Orchard Hills
- Shale Hills Woodland and Shale Plains Woodland (which are consistent with the Cumberland Plains Woodland community – being critically endangered under the EPBC Act and BC Act). The desktop review identified the community as being present around Badgerys Creek and Bringelly

- Alluvial Woodland (consistent with the River-flat eucalypt forest on coastal floodplains of the NSW North Coast, endangered under the BC Act). The desktop review identified the community as being present around Badgerys Creek and Bringelly.

Migratory bird species

A search of the Protected Matters Search Tool identified 15 migratory bird species as having the potential to occur in the environmental study area for the Project. Of the 15 species, four were identified as being known to occur within the off-airport environment including:

- Oriental Cuckoo (*Cuculus optatus*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Black-faced Monarch (*Monarcha melanopsis*)
- Satin Flycatcher (*Myiagra cynaleuca*).

On-airport

The on-airport environment features remnant patches of grassy woodland and narrow corridors of riparian forest with extensive areas of derived grassland, cropland, and cleared and developed land. The condition of native vegetation is generally poor and there is moderate to severe weed infestation throughout the site. The most extensive vegetation zone in the on-airport environment is exotic grassland which contains no overstorey or midstorey vegetation and less than 50 per cent of the ground cover vegetation is native (DIRD, 2016).

Notwithstanding the generally poor condition of the on-airport environment, the on-airport site has high conservation significance as a result of the presence of threatened species and ecological communities and the generally limited extent and quality of similar environments in the Western Sydney region. The following threatened ecological communities are located in the on-airport environment:

- Cumberland Plain Woodland in the Sydney Basin Bioregion (listed as critically endangered under the EPBC Act and BC Act)
- Shale Gravel Transition Forest in the Sydney Basin Bioregion (listed as critically endangered under the EPBC Act and BC Act)
- River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (listed as endangered under the BC Act).

The ecological communities listed above are located throughout the on-airport environment on mid and lower slopes in areas of shale or gravel derived soils and along the northern riparian corridor of Badgerys Creek.

Four flora species listed under the BC Act and/or the EPBC Act have been recorded in the on-airport environment:

- *Dillwynia tenuifolia* (vulnerable under the BC Act)
- *Pimelea spicata* (Spiked Rice-flower) (endangered under the BC Act)

- *Pultenaea pariviflora* (endangered under the BC Act and vulnerable under the EPBC Act)
- *Marsdenia viridiflora* subsp *viridiflora* (endangered under the BC Act) (DITCRD, 2018e).

Ten threatened fauna species listed under the BC Act and the Grey-headed Flying-fox (listed under the EPBC Act) have been recorded in the on-airport environment and an additional 19 species listed under the BC Act and/or EPBC Act may occur at the site (DIRD, 2016)

No waterways in the on-airport environment are mapped as being groundwater dependent ecosystems. However, most large patches of native vegetation in the on-airport environment are mapped as having a high potential for groundwater interaction (DIRD, 2016).

All biodiversity values within the Western Sydney International Stage 1 construction footprint will be cleared as a result of construction of that project. The remaining land and biodiversity values in the on-airport environment would not be affected by the Western Sydney International Stage 1 construction footprint (refer to Figure 8-3).

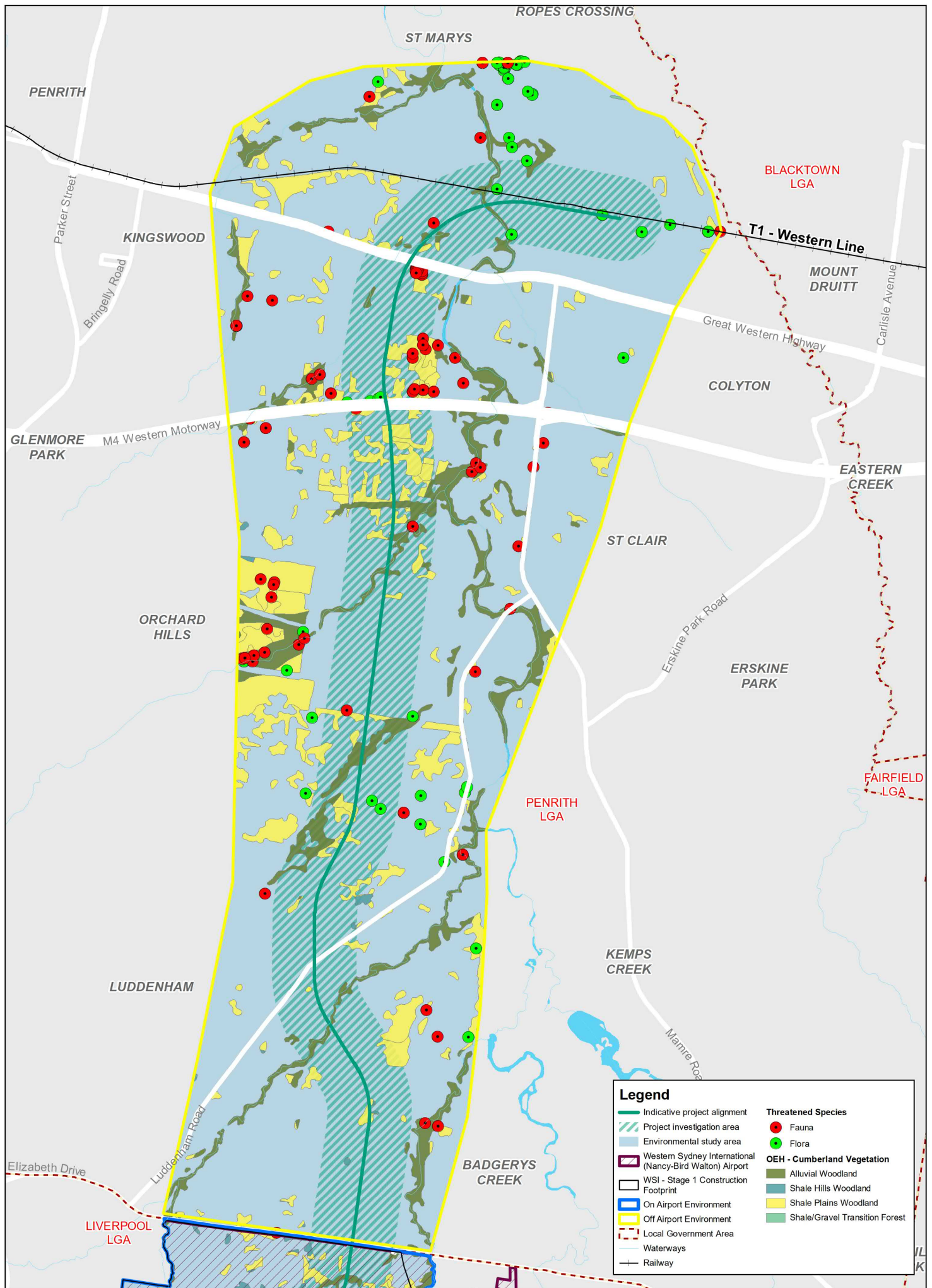
Offsets are required for the biodiversity impacts associated with the construction of Western Sydney International Stage 1. Offsetting obligations will be met via a number of mechanisms including through conservation of Orchard Hills Cumberland Plain Woodland at the Defence Establishment Orchard Hills.

Biodiversity values outside the Western Sydney International Stage 1 construction footprint of the on-airport environment would include the three threatened ecological communities (previously described above) in the following locations:

- the Cumberland Plain Woodland in the Sydney Basin Bioregion community is located generally to north of the Badgerys Creek riparian zone
- the River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions community is located generally within the Badgerys Creek riparian corridor
- there is a limited area of Shale Gravel Transition Forest in the Sydney Basin Bioregion located in the north eastern section of the on-airport environment (DIRD, 2016).

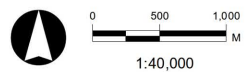
These three ecological communities provide habitat for a number of threatened fauna species which were recorded in this area, including:

- Grey-headed Flying-fox (*Pteropus poliocephalus*) listed as vulnerable under the BC Act and EPBC Act
- Cumberland Plain Land Snail (*Meridolum corneovirens*) listed as endangered under the BC Act
- Large footed Myotis (*Myotis marcupus*) listed as vulnerable under the BC Act
- Scarlet Robin (*Petrocia boodang*) listed as vulnerable under the BC Act
- A population of *Dillwynia tenuifolia* listed as vulnerable under the BC Act has been mapped in the north eastern extent of on-airport environment outside the Western Sydney International Stage 1 construction footprint.

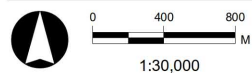
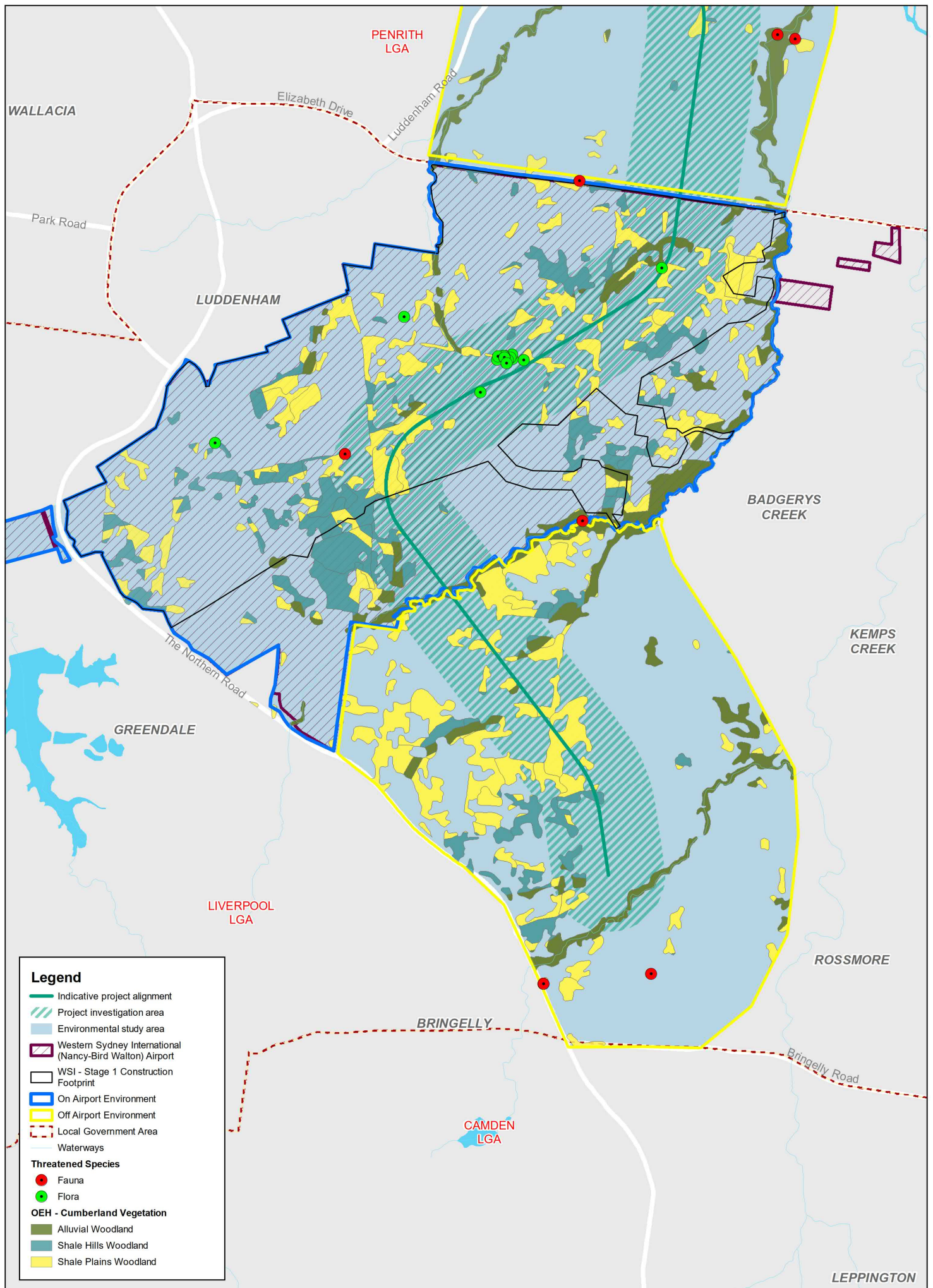


Legend

Indicative project alignment	Fauna
Project investigation area	Flora
Environmental study area	OEH - Cumberland Vegetation
Western Sydney International (Nancy-Bird Walton) Airport	Alluvial Woodland
WSI - Stage 1 Construction Footprint	Shale Hills Woodland
On Airport Environment	Shale Plains Woodland
Off Airport Environment	Shale/Gravel Transition Forest
Local Government Area	
Waterways	
Railway	



Sydney Metro Greater West
Figure 8.3a: Vegetation Types within the Study Area - North Section



Sydney Metro Greater West
Figure 8.3b: Vegetation Types within the Study Area - South Section

8.4.2 Issues for consideration

Off-airport

Construction

The Project is located primarily in a semi-rural area in the off-airport environment (with the exception of the urban area around St Marys) and would require ground surface disturbance along the alignment. The Project would partially be constructed above ground and partially within tunnels which would still require some ground surface disturbance for tunnel portals other operational infrastructure including ventilation and emergency accesses.

The off-airport environment is predominantly cleared and disturbed rural landscape with interspersed stands of native vegetation. The Project would be required to cross a number of watercourses and would have the potential to disturb riparian vegetation at Blaxland Creek and Cosgroves Creek.

The Project would be designed to avoid impacts to biodiversity where possible. Notwithstanding, key issues for consideration during construction would include the following:

- impacts to threatened ecological communities
- impacts to patches of vegetation comprising potential habitat for threatened flora and fauna species
- impacts to riparian and aquatic habitats associated with creek crossings
- impacts to local fauna connectivity movement as a result of the Project corridor.

Operation

Potential impacts during operation are considered to be minor and generally limited to the restriction of fauna movement across the rail corridor and potential impacts from spills and leaks of fuel, oils and other hazardous materials. There is also the potential for indirect impacts to biodiversity from operational light, noise and groundwater drawdown. These impacts would be managed through standard mitigation measures and through design development of the Project.

On-airport

Construction

Within the on-airport environment the Project would require surface disturbance along the proposed rail alignment, and in some areas outside of the Western Sydney International Stage 1 footprint to facilitate the construction of the Project. The Project would likely be in-tunnel where it leaves the Western Sydney International site under Badgerys Creek.

There will be no remaining biodiversity value within the Western Sydney International Stage 1 following clearing works for that project. While there would otherwise be a range of impacts associated with the Project (broadly similar to the impacts of the Western Sydney

International project itself), this Scoping Report assumes that biodiversity impacts within the Western Sydney International Stage 1 footprint are incurred as a result of the Airport Plan as initially determined, and so are excluded from consideration of the assessment for the Sydney Metro Greater West Project, other than when considering cumulative impacts where relevant.

There would be some surface disturbance outside of the Western Sydney International Stage 1 footprint to facilitate the construction of the Project. As described in Section 8.4.1, there are three mapped threatened ecological communities, habitat for *Dillwynia tenuifolia*, and potential habitat for a number of threatened fauna species in this area.

Operation

Potential impacts during operation are considered to be minor and generally limited to potential from spills and leaks of fuel, oils and other hazardous materials. There is also the potential for indirect impacts to biodiversity from operational light, noise and groundwater drawdown. These impacts would be managed through standard mitigation measures and through design development of the Project.

8.4.3 Method of assessment

Off-airport (south of the Elizabeth Drive)

As described in Section 6, strategic conservation planning has already been completed for the South West Priority Growth Area (refer to Figure 4-3), located south of Elizabeth Drive. Biodiversity impacts have therefore already been assessed under this strategic conservation planning, which covers off on the assessment requirements under the BC Act and the EPBC Act.

A biodiversity technical report will be prepared to assess potential impacts where the Project may affect land that has not been classified as 'certified' under the Biodiversity Certification Order. The following guidelines will be considered during the preparation of the report:

- *Biodiversity Certification Order (2007)*
- *Biodiversity Assessment Methodology (BAM) 2017*
- *NSW Biodiversity Offsets Policy for Major Projects (OEH,2014)*
- *Framework for Biodiversity Assessment (OEH, 2014)*
- *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013 (DPI, 2013)*
- *EPBC Act Significant Impact Guidelines (Department of Sustainability, Environment, Water, Population and Communities October 2009) and*
- *Environmental offset policy (Department of Sustainability, Environment, Water, Population and Communities October 2012).*

The methodology for the assessment will include:

- desktop searches and data review including:
 - a review of the potential threatened species, communities and/or populations that have the potential to occur
 - a review of the locally occurring broad scale vegetation mapping.
- biodiversity surveys (provided site access is available) with reference to relevant Commonwealth species survey guidelines and the BAM, including:
 - validation of existing broad-scale vegetation mapping and align vegetation types recorded with corresponding Plant Community Types (PCTs)
 - determination of the nature and condition of vegetation identified within the study area
 - random meanders to identify and/or assess the likelihood of threatened species likely to utilise the study area
 - opportunistic observations of animals and signs of animal activity (e.g. feeding signs, scats)
 - parallel field traverses targeting threatened flora species in winter and spring
 - targeted Anabat and nocturnal surveys in areas of potential fauna habitat
 - targeted Cumberland Plain Snail searches
 - vegetation integrity surveys in accordance with the BAM to assess native vegetation, threatened ecological communities, vegetation integrity, and habitat suitability for threatened species.
- preparation of a Biodiversity Development Assessment Report (BDAR) including:
 - calculation of the ecosystem credits and species credits that measure the impact of the development on biodiversity values
 - if required preparation of a Biodiversity Offset Strategy (BOS)
 - consideration of Condition 8 and 11 of the Sydney Region Growth Centres Biodiversity Certification Order (2007).
- an assessment of impacts of the Project on MNES and Commonwealth land under the EPBC Act via the usual referrals and approvals processes under the EPBC Act (refer to Section 6.1.4), including specific reference to the Commonwealth policy for Strategic Assessments Policy Statement for EPBC Act Referrals (*Department of Sustainability, Environment, Water, Population and Communities, 2013*).

Off-airport (north of the Elizabeth Drive)

As described in Section 6.1.3 and Section 6.1.4, DPIE is currently managing strategic conservation planning that includes land for the Project north of Elizabeth Drive.

As the strategic assessment has not yet been endorsed, a Project specific assessment and approval under the EPBC Act would be sought.

Therefore, for land north of the airport site, matters potentially requiring assessment and approval under the EPBC Act (including impacts of the Project on MNES and Commonwealth land) would be addressed through a referral to the Commonwealth Environment Minister under section 68 of the EPBC Act. If the Project is determined to be a controlled action by the Commonwealth Environment Minister, an assessment of impacts would be undertaken in accordance with the assessment requirements issued by the Minister. If the Project is determined not to be a controlled action, no further assessment or approval would be required under the EPBC Act.

While the strategic assessment will not be relied on for the Project, the Project-specific assessment will be undertaken consistent with DAWE guidance and relevant draft documents relating to the strategic assessment.

Sydney Metro will consult with DAWE throughout the project referral and assessment process in accordance with the guidelines and to ensure alignment with the strategic assessment where relevant.

On-airport

Assessment of potential on-airport impacts to biodiversity would be limited to impacts outside of the Western Sydney International Stage 1 construction footprint to facilitate construction of the Project, except where cumulative impact assessment is required.

The existing Biodiversity Construction Environment Management Plan includes an ecological assessment using methodologies in accordance with the Framework for Biodiversity Assessment (FBA) for the airport site, including land outside the Western Sydney International Stage 1 construction footprint, in accordance with the Airport Plan Conditions. The assessment for the Project will build upon this work and will incorporate assessments under the EPBC Act suitable for supporting a variation of the Airport Plan. The method of assessment will be confirmed with the Commonwealth Environment Minister, including offsetting requirements.

Consideration will also be given to the Western Sydney International Stage 1 Biodiversity Construction Environment Management Plan which includes measures for managing biodiversity both within and outside of the Western Sydney International Stage 1 construction footprint.

8.5 Non-Aboriginal heritage

8.5.1 Existing environment

Off-airport

A preliminary Non-Aboriginal heritage desktop assessment has been carried out, which included a search of relevant heritage databases and review of heritage listing within local environmental plans including:

- World Heritage Register
- National Heritage List
- NSW State Heritage Register
- Transport for NSW section 170 (s170) Heritage and Conservation Register
- Railcorp s170 Heritage and Conservation Register
- Sydney Water s170 Heritage and Conservation Register
- Ausgrid s170 Heritage and Conservation Register
- *Penrith Local Environmental Plan 2010* (Penrith LEP)
- *Liverpool Local Environmental Plan 2008* (Liverpool LEP).

A number of heritage items were identified within the off-airport environment and are shown in Figure 8-4.

Heritage items are generally concentrated within the northern section of the off-airport environment in proximity to the Great Western Highway. There are 51 locally listed items located within the off-airport environment.

There is one item on the Commonwealth Heritage List within the environmental study area, which is the 'Orchard Hills Cumberland Plain Woodland, The Northern Road, Orchard Hills'. The item includes land that incorporates the Defence Establishment Orchard Hills.

There are four items listed on the State Heritage Register in the off-airport environment (Mamre, St Marys Station, Rose Cottage and Kelvin Park Group) which are outlined in Table 8-1.

Table 8-1 State listed non-Aboriginal heritage items within the off-airport environment

Item name	Item number	Address	Significance
Mamre	00264	181–275 Mamre Road, Orchard Hills	State
St Marys Railway Station	01249	Corner Station and Queen Streets, St Marys	State
Rose Cottage and early slab hut	01392	Corner of Water Street and Tennant Road, Werrington	State
Kelvin Park Group	8	30 The Retreat, Bringelly	State

St Marys Station Group features a number of rare structures including the goods shed, the only brick example of its type in the state and the associated crane, one of a few remaining cranes in the Sydney area.

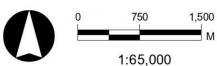
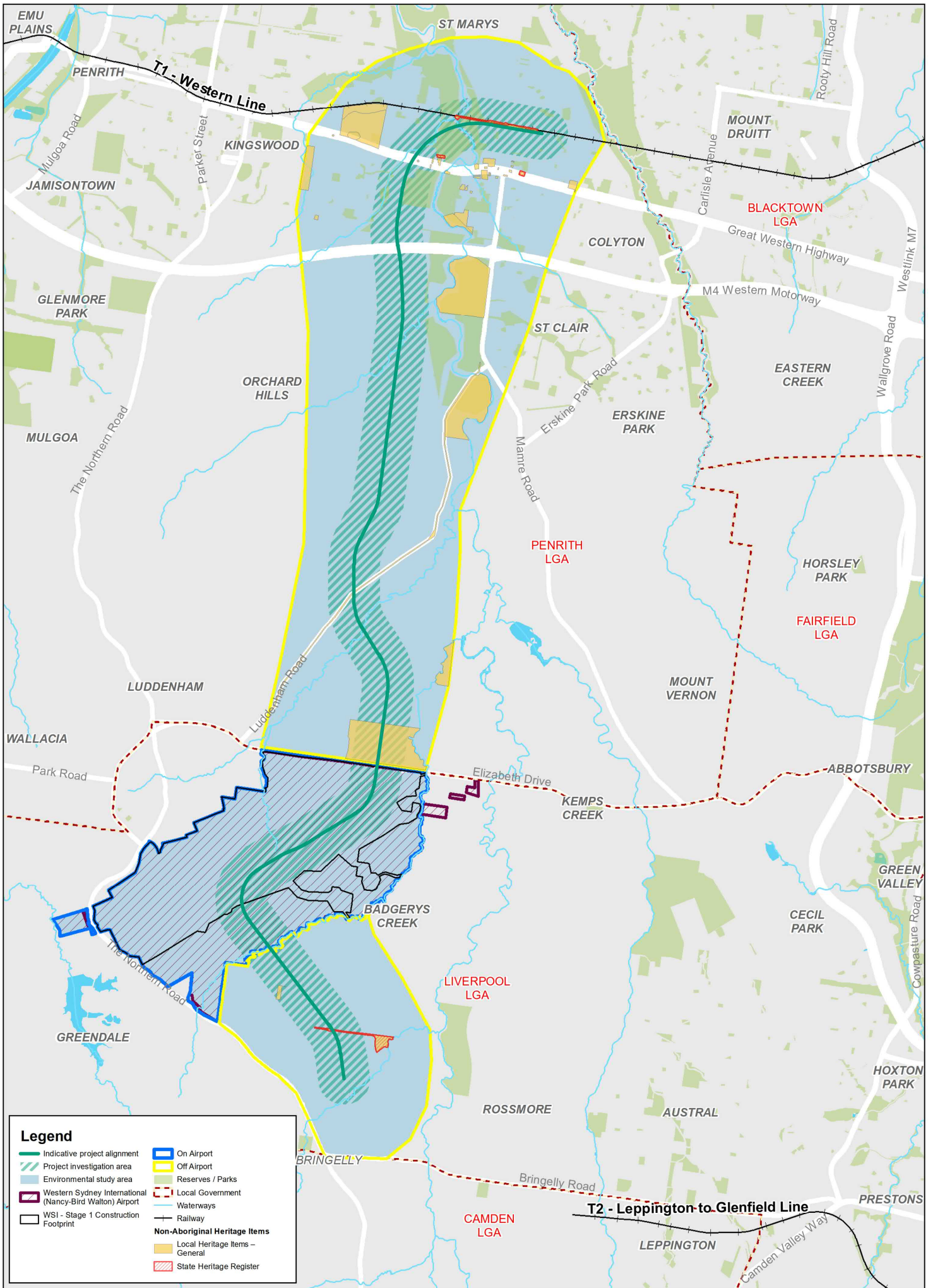
Sydney Water’s section 170 Heritage and Conservation Register includes one item within the off-airport environment which is the Orchard Hills Reservoir (register number 4575813).

There are no heritage conservation areas located within the off-airport environment. There are no World Heritage, National Heritage items located within or in proximity to the off-airport environment. The Blue Mountain World Heritage Area is located around 10 kilometres to the west of the off-airport environment.

The significance of all heritage items would be evaluated as part of the assessment of potential impacts to non-Aboriginal heritage. The assessment may attribute a lower or higher level of heritage significance to an item compared to its statutory listing and potential impacts would be managed accordingly.

On-airport

There are no Commonwealth listed non-Aboriginal heritage items located within the on-airport environment. The NSW Heritage Act does not apply to the airport site.



Sydney Metro Greater West
Figure 8.4: Non-Aboriginal Heritage Items within the Study Area

8.5.2 Issues for consideration

Off-airport

The Project has the potential to impact non-Aboriginal heritage including:

- undertaking construction activities within the curtilage of listed heritage items, including the state listed St Marys Station and Commonwealth listed Orchard Hills Cumberland Plain Woodland
- potential impacts to unlisted heritage items and archaeology
- potential construction vibration impacts to listed heritage items
- potential settlement and ground-borne noise and vibration impacts from tunnelling
- potential indirect impacts to the visual setting of heritage items during the construction and operation of the Project.

Ongoing project design development would seek to minimise potential impacts to non-Aboriginal heritage items.

On-airport

For this Scoping Report it has been assumed that non-Aboriginal heritage impacts within the Western Sydney International Stage 1 construction footprint have been assessed and approved as part of that project. The Airport Plan authorises the demolition of all heritage structures on the airport site, including outside the Western Sydney International Stage 1 construction footprint. As such, these impacts are excluded from consideration of the assessment for the Project. The potential impacts would therefore be limited to unlisted heritage items or previously unknown archaeological items.

8.5.3 Method of assessment

Off-airport

A non-Aboriginal heritage impact assessment will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the report:

- *Criteria for the assessment of excavation directors* (NSW Heritage Council 2011)
- *NSW Heritage Manual* (Heritage Office and Department of Urban Affairs and Planning, 1994)
- *Assessing Heritage Significance* (NSW Heritage Office, 2001)
- *Statement of Heritage Impact* (NSW Heritage Office 2009)
- *The Australia ICOMOS Burra Charter*.

The methodology for the assessment will include the following:

- desktop searches and background data review
- field survey (provided site access is available) including:
 - focused survey on listed items and areas of archaeological potential identified in desktop searches and data review
 - a preliminary assessment of significance of potential unlisted items based on visual observations.
- reporting including:
 - description of heritage items and assessment of significance (as per listings where relevant). A significance assessment under the NSW Heritage Council criteria and any requirements of the Commonwealth Environment Minister will be undertaken for unlisted items
 - preparation of an impact assessment including a preliminary archaeological impact assessment. Direct, indirect and cumulative impacts would be addressed
 - provision of mitigation measures to address residual impacts that cannot be avoided through project design development.
- input to project design development to avoid heritage impacts where possible.

On-airport

Potential non-Aboriginal heritage impacts would be limited to unlisted heritage items or previously unknown archaeological items outside the Western Sydney International Stage 1 construction footprint as all listed heritage items would be cleared as part of the construction of the airport. Mitigation measures would be developed to manage unexpected heritage items if discovered during the construction of the Project.

8.6 Aboriginal heritage

8.6.1 Existing environment

Off-airport

A search of the DPIE Aboriginal Heritage Information Management System (AHIMS) database was carried out on 13 March 2020. The search was centred on the environmental study area (refer to Figure 8-5), covering an area of approximately 23 kilometres by 9 kilometres. A total of 137 sites were identified within the off-airport environment. The sites are generally located around watercourses such as South Creek in the northern part of the off-airport environment and Badgerys Creek in the southern part of the off-airport environment.

As is typical for the Cumberland Plain, artefact scatters and isolated artefact sites with and without other forms of archaeological evidence were the most common site types

represented within the AHIMS search area. Other site types included six Potential Archaeological Deposits (PADs), three modified trees and three art sites.

There were 24 destroyed sites listed in the search results as well, referring to sites that have been removed under the conditions of a permit issued by the former OEH (now part of DPIE), usually for development works. The destroyed sites were all located in the northern portion of the off-airport environment, generally situated between St Marys and Claremont Creek. Further to this existing Aboriginal Heritage Impact Permits (AHIPs) have been identified covering impacts to specific sites at South Creek, on Clyburn Avenue, in Werrington and at Sydney Science Park.

Existing AHIMS data indicates that numerous Aboriginal archaeological investigations have been carried out within and around the off-airport environment over the past three decades. As with other parts of the Cumberland Plain, the majority of these investigations have been limited to survey. However, a number of investigations involving test and/or salvage excavation programs have also been undertaken.

The results of previous surface and subsurface investigations within and around the off-airport environment have identified that past Aboriginal occupation and land use was consistent with that of the Cumberland Plain as a whole. The occupation of the Cumberland Plain involved an emphasis on the occupation of elevated low gradient landforms adjacent to higher order watercourses, as well as an emphasis on the procurement, transport and pre-processing of silcrete as a primary raw material for artefact manufacture.

Consultation undertaken to date has resulted in the registration of 68 Registered Aboriginal Parties (including the two Local Aboriginal Land Councils).

There are no Aboriginal heritage items listed on the Commonwealth Heritage List within the environmental study area.

On-airport

The on-airport environment has been subject to a number of previous archaeological assessments dating back to 1978. A search of the AHIMS database carried out on 13 March 2020 identified 112 sites within the on-airport environment (refer to Figure 8-5).

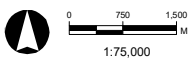
There is one artefact recording of a grinding groove site which consists of at least four grinding grooves on a series of small sandstone outcrops located on the edge of a hillside bench around 100 metres north of Badgerys Creek. The site is noted as a rare example of grinding grooves located on Minchinbury sandstone within the Cumberland Plain (DIRD, 2016).

Investigations carried out in 2016 on behalf of DIRD for the Western Sydney Airport Environmental Impact Statement, confirmed that areas of land within the on-airport environment represent archaeologically sensitive landforms including riparian corridors around drainage lines, ridges, spur crests, valley floors and basalt slopes. Archaeologically sensitive landforms have a high potential for artefact occurrences including subsurface archaeological deposits.

According to the Western Sydney Airport Environmental Impact Statement, at least 39 Aboriginal heritage sites would be impacted and removed during the construction of Western Sydney International Stage 1. Measures have been implemented to conserve, record and/or salvage these sites in the Aboriginal Cultural Heritage Construction Environment Management Plan for Western Sydney International Stage 1. For the purposes of this Scoping Report, it has been assumed that land within the Western Sydney International Stage 1 construction footprint would effectively be cleared land as a result of that project, with no Aboriginal heritage items remaining.

Aboriginal heritage sites that are located within the on-airport environment but that are not located within the Western Sydney International Stage 1 construction footprint (generally to the south around Badgerys Creek) would remain extant. Within the on-airport environment this would include a number of artefact scatter and isolated artefact sites as well as the grinding groove site described above. These sites are generally concentrated to the north and west of Badgerys Creek and are shown in Figure 8-5.

Removed from publication



8.6.2 Issues for consideration

Off-airport

The Project would be designed and constructed to minimise the potential for impacts to Aboriginal heritage where possible. Notwithstanding this, there remains the potential for direct and indirect impacts to previously recorded and unrecorded Aboriginal sites as a result of the construction of the Project.

There is the potential for direct impacts to Aboriginal heritage sites as a result of the construction of surface infrastructure including where the Project proposes bridge or viaduct piers, is located at surface (at-grade or in-cutting), or for other permanent at- or aboveground infrastructure proposed.

A preliminary assessment of the results of the search of the AHIMS database suggests there is a high concentration of recorded Aboriginal heritage sites including art sites and modified trees south of Badgerys Creek. However, surface impacts would be minimised in this area as the Project is proposed to be in-tunnel.

There is the potential for indirect impacts to Aboriginal heritage sites as a result of settlement (where the Project involves shallow tunnelling, for example where the alignment comes to the surface around Orchard Hills) or indirect visual impacts where surface infrastructure elements are located within the overall visual setting of Aboriginal heritage items or landscape values. Where the Project is located in-cutting, indirect visual impacts are likely to be minor.

The development of the Project design would seek to minimise potential impacts to Aboriginal heritage items where possible.

On-airport

Within the on-airport environment the Project would result in surface disturbance along part of the Project alignment which would generally extend south from Elizabeth Drive, connecting to proposed station at the Airport business park.

For this Scoping Report it is assumed that Aboriginal heritage impacts within the Western Sydney International Stage 1 footprint are incurred as a result of the authorisations contained in the Airport Plan as originally determined, and so are excluded from consideration of the assessment for the Sydney Metro Greater West Project on the airport site, other than in respect of cumulative impacts, where relevant.

There is the potential for direct and indirect impacts to Aboriginal heritage sites located within the on-airport environment located outside of the Western Sydney International Stage 1 construction footprint due to surface disturbance to facilitate construction of the Project (refer to Figure 8-5).

Previously recorded Aboriginal heritage sites in this area are generally limited to isolated artefacts and artefacts scatters, however there is a grinding groove site located around 100

metres north of Badgerys Creek. The Project would seek to avoid or minimise impacts to these sites where possible.

There is also the potential to impact unknown Aboriginal heritage sites. Mitigation measures would be developed to manage unexpected Aboriginal heritage items if discovered during the construction of the Project.

8.6.3 Method of assessment

Off-airport

An Aboriginal Cultural Heritage Assessment Report (ACHAR) will be prepared as part of the Environmental Impact Statement and, where relevant, the requirements of the Commonwealth Environment Minister. The ACHAR will identify further detail on both known and potential areas of Aboriginal heritage in relation to the Project and will outline the consultation undertaken during the preparation of the assessment. It will also identify heritage constraints and will recommend further site investigations (if required) and appropriate mitigation and management measures aimed at avoiding or minimising potential impacts.

The following guidelines will be considered during the preparation of the ACHAR:

- *Guide to investigating, assess and reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011)
- *Aboriginal Cultural Heritage Consultation requirements for proponents* (DECCW, 2010)
- *Code of Practice for archaeological investigation of Aboriginal objects in NSW* (DECCW, 2010)
- *NSW Skeletal Remains: Guidelines for Management of Human Remains* (Heritage Office, 1998)
- *Criteria for the assessment of excavation directors* (NSW Heritage Council, 2011)
- *NSW Heritage Manual* (Heritage Office and Department of Urban Affairs and Planning, 1994)
- *Assessing Heritage Significance* (NSW Heritage Office, 2001)
- *The Australia ICOMOS Burra Charter*.

The methodology for the ACHAR will include:

- desktop searches and data review including:
 - searches of the AHIMS database and other relevant heritage registers (including World, National, State, Commonwealth and Local Environmental Plans) to identify Aboriginal places and objects, as defined under the *National Parks and Wildlife Act 1974*, the *Standard Instrument – Principal Local Environmental Plan and the Heritage Act 1977*

- desktop review of relevant Aboriginal archaeological assessment reports relevant to the study area
- desktop review of the existing environment, with specific consideration to its Aboriginal archaeological implications.
- Aboriginal community consultation including:
 - A program of Aboriginal community consultation in accordance with the former OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents*. This will include identification, notification and registration of Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the study area
 - Presentation of information about the Project will be provided to all Registered Aboriginal Parties (RAPs) along with the draft assessment methodology, for comment and feedback.
- Targeted site inspections (provided site access is available) covering both known Aboriginal sites and areas of potential within the study area. Inspections will be undertaken by RAP representatives and two suitably qualified archaeologists. These works will be undertaken in accordance with section 1.6 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010)
- reporting and recommendations including:
 - completion of an ACHAR defining constraints through mapping of known site curtilages and areas of archaeological sensitivity, based on the results of desktop research and targeted site inspections
 - qualitative assessment of the cumulative impacts of the construction and operation of the Project in combination with other major projects in the vicinity of the environmental study area.

On-airport

The method of assessment of potential on-airport impacts to Aboriginal heritage would generally be consistent with the methodology outlined for the assessment of off-airport impacts described above and would take into account the requirements of the Commonwealth Environment Minister and Infrastructure Minister.

The heritage provisions of the EPBC Act, Airports Act and its Regulation do not prescribe a methodology for the assessment of potential impacts to Aboriginal heritage although the Airports (Environment Protection) Regulations contain requirements in relation to certain heritage matters. However, the Commonwealth legislative framework prescribes obligations for Commonwealth agencies to take all reasonable steps to assist in the identification, assessment and monitoring values and preparation of management plans for heritage values. The Aboriginal Cultural Heritage Construction Environmental Management Plan that

is approved for Western Sydney International Stage 1 would be considered in the assessment of potential Aboriginal heritage impacts for the Project.

8.7 Land use and property

8.7.1 Existing environment

Off-airport

The off-airport environment is located within both the Penrith and Liverpool LGAs. The regional zoning context within the off-airport environment is shown in Figure 8-7. Land use at key locations in the off-airport environment is described in the following sections.

St Marys Town Centre

St Marys is identified as a strategic centre in the *Western City District Plan* (Greater Sydney Commission, 2017). St Marys Town Centre is one of the two main retail/commercial centres in the Penrith LGA. The town centre is bounded by the T1 Western Line to the north and the Great Western Highway to the south. The Queen Street shopping strip forms the central spine of the town centre, with off-street car parking provided to the rear of the shops on both sides of the street. There are residential areas located adjacent to the town centre.

The town centre is described in the *St Marys Town Centre Strategy* (Penrith City Council 2006) and a more recent study by SGS Economics and Planning (2013) as an older style district-sized commercial centre with a total commercial and retail floor area of about 80,000 square metres. St Marys Station, including pedestrian access across the rail corridor commuter car parking and a bus interchange form a significant land use component of the town centre.

The south and east precincts of Dunheved Business Park are located on the northern side of the T1 Western Line at St Marys and comprise a mix of industrial premises.

Penrith City Council has released a Local Strategic Planning Statement (Penrith City Council, 2020), which includes strategic planning for St Marys Town Centre. The Local Strategic Planning Statement would be considered during the design development of the Project and in the Environmental Impact Statement.

Penrith Health and Education Precinct

The Penrith Health and Education Precinct, known as The Quarter, is located on the Great Western Highway extending between Werrington and Kingswood, interspersed with residential and local commercial, industrial and retail development. The precinct includes Nepean Hospital, Western Sydney University Penrith Campus and Nepean College of TAFE Allied Health Facility. Western Sydney University includes a 58,000 square metre business park, Werrington Park, which is in the early stages of being developed.

Primary and secondary schools in the vicinity of the precinct include Wollemi College, Penrith Valley Learning Centre and Kurrambee School.

Other land uses that adjoin the precinct include Cobham Juvenile Detention Centre and the Western Sydney Records Centre operated by State Records, which includes the Western Sydney Reading Room and Government Records Repository.

Caddens and Claremont Meadows

Caddens and Claremont Meadows are residential subdivisions bounded by the Great Western Highway to the north, South Creek to the east, the M4 Western Motorway to the south and Kingswood to the west. These suburbs are being developed in stages, with development of Caddens following Claremont Meadows.

The developed areas of both suburbs are typical of residential subdivisions in western Sydney and are characterised by detached dwellings on relatively small lots.

Orchard Hills

Orchard Hills extends from the M4 Western Motorway south to the Warragamba pipeline. The Penrith LEP provides planning controls to promote Orchard Hills as a rural landscape buffer area by protecting prime agricultural land and the scenic landscape quality of the area.

Areas of Orchard Hills north of Blaxland Creek comprise rural lifestyle properties that are typically characterised by large residential dwellings on landscaped lots, including The Vines subdivision. Land use between Blaxland Creek and the Warragamba pipeline is characterised by a mix of agricultural and rural residential land uses and also a waste management facility at a former quarry site.

Orchard Hills also includes the Defence Establishment Orchard Hills which is owned by the Department of Defence and is primarily used for munitions storage, maintenance and testing. The site is about 1,600 hectares in area and is bounded by The Northern Road to the west and the Warragamba pipeline to the south.

Luddenham, Badgerys Creek and Kemps Creek

Luddenham, Badgerys Creek and Kemps Creek are located to the north and east of the on-airport environment. Existing land use is predominantly agricultural and includes a few equine and poultry facilities and market gardens. There is a waste management facility on the eastern side of Badgerys Creek.

The University of Sydney owns and operates two commercial farms in Badgerys Creek and Kemps Creek that provide teaching and learning opportunities and generate funds to support education and research.

A rural residential estate, Twins Creek Estate, has recently been developed around the Twins Creek Golf Course and Country Club in the north-eastern corner of Luddenham.

Bringelly and Rossmore

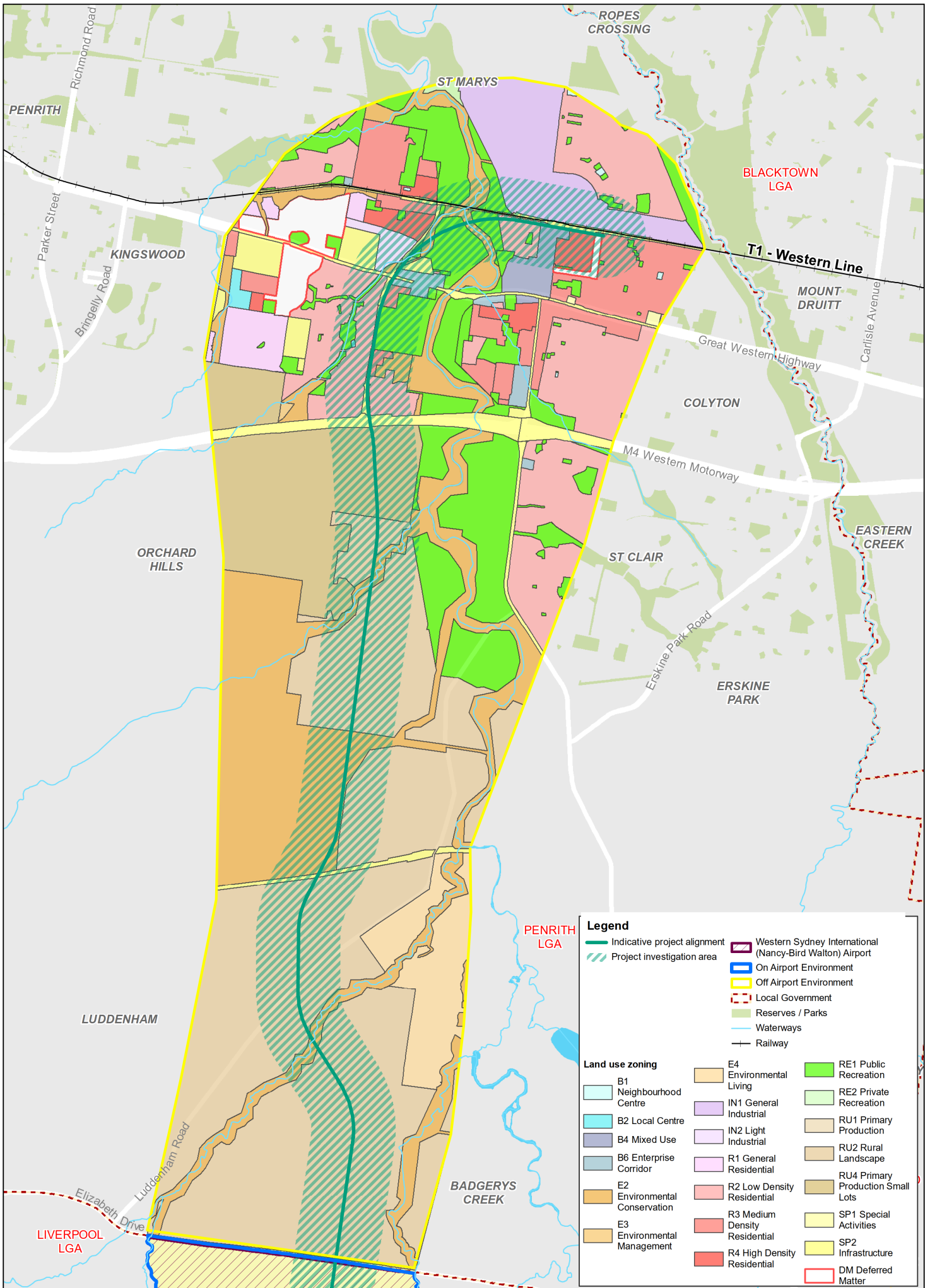
Around Bringelly and Rossmore existing land use is comprised of a mixture of market gardens, rural industries and rural-residential properties. Land use to the west of South Creek is predominantly rural in character, with a rural-residential subdivision at Kelvin Park

and Bringelly village (located at the intersection of Bringelly Road and The Northern Road) providing local retail facilities. There is also a small existing neighbourhood centre at Rossmore located north of Bringelly Road, and Rossmore Public School on the south side of Bringelly Road.

Other infrastructure and utilities

There is significant existing infrastructure located within the off-airport environment. The Project would interface with:

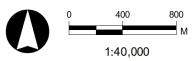
- T1 Western Line
- Great Western Highway, M4 Western Motorway, Luddenham Road, Elizabeth Drive, Badgerys Creek Road and the future M12 Motorway corridor
- Warragamba pipeline
- utilities throughout the environmental study area (concentrated in urban areas around St Marys).



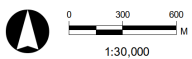
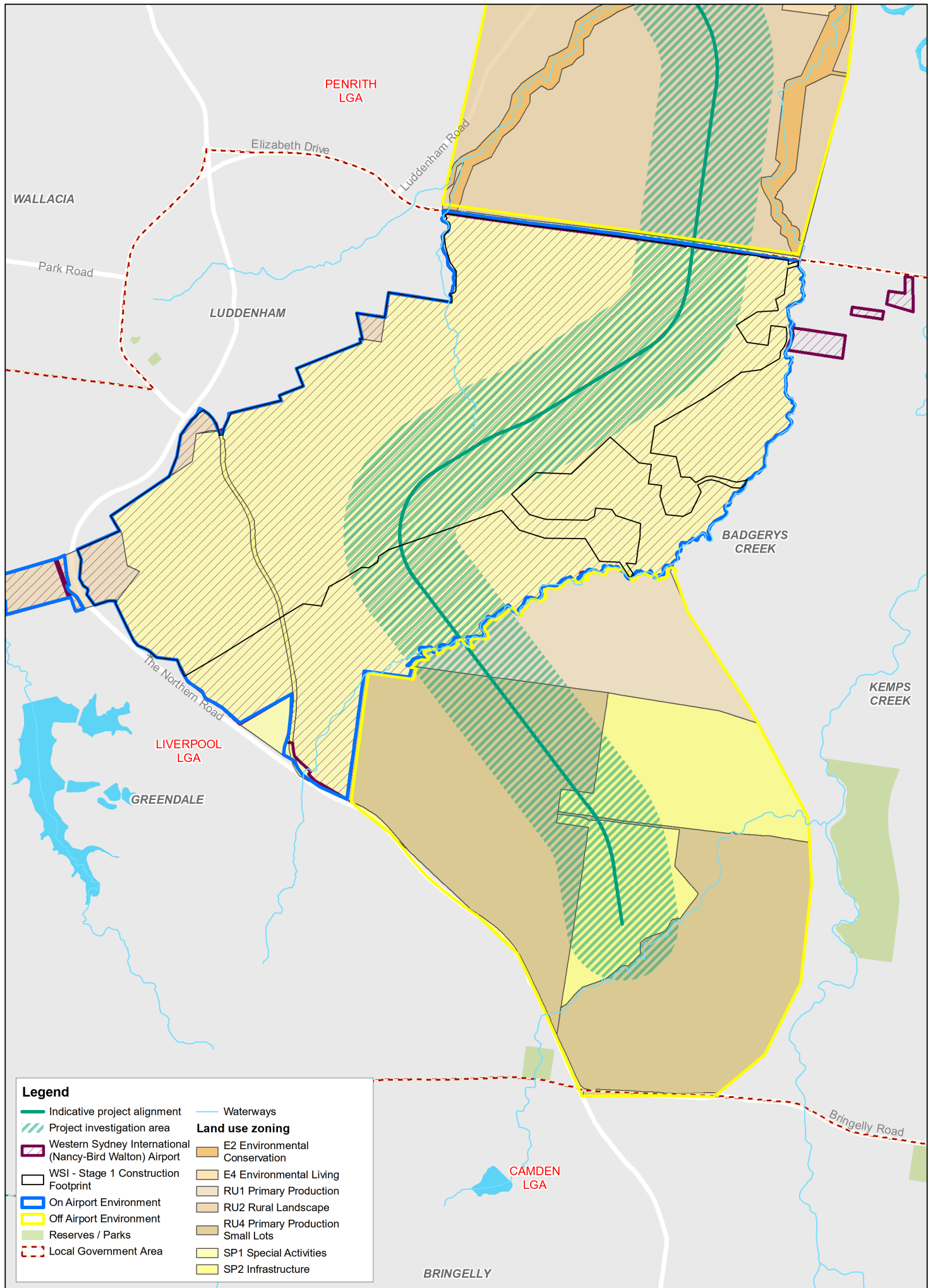
Legend

- Indicative project alignment
- Project investigation area
- On Airport Environment
- Off Airport Environment
- Local Government
- Reserves / Parks
- Waterways
- + Railway

<p>Land use zoning</p> <ul style="list-style-type: none"> B1 Neighbourhood Centre B2 Local Centre B4 Mixed Use B6 Enterprise Corridor E2 Environmental Conservation E3 Environmental Management 	<ul style="list-style-type: none"> E4 Environmental Living IN1 General Industrial IN2 Light Industrial R1 General Residential R2 Low Density Residential R3 Medium Density Residential R4 High Density Residential 	<ul style="list-style-type: none"> RE1 Public Recreation RE2 Private Recreation RU1 Primary Production RU2 Rural Landscape RU4 Primary Production Small Lots SP1 Special Activities SP2 Infrastructure DM Deferred Matter
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Sydney Metro Greater West
Figure 8.6a: Land Use Zoning within the Study Area - North Section



Sydney Metro Greater West
Figure 8.6b: Land Use Zoning within the Study Area - South Section

Off-airport – future land use environment

As described in Section 2, large areas of the off-airport environment form part of the Western Parkland City as envisaged by the *Greater Sydney Region Plan 2056*.

Infrastructure, businesses and knowledge-intensive jobs will be brought to the Western Parkland City through the Western Sydney International and the Aerotropolis along with a range of housing, public transport, schools, hospitals and community facilities (refer to Chapter 2 for further information). Around 200,000 additional jobs are anticipated for the Western Parkland City as envisaged in the Western Sydney City Deal (NSW Government, 2018).

The plan identifies the following areas of growth over the next 20 years:

- Western Parkland City population is forecast to increase from 1,070,000 in 2016 to 1,534,450 by 2036, an increase of 464,450 people
- demand is forecast for an additional 184,500 new dwellings required by 2036.

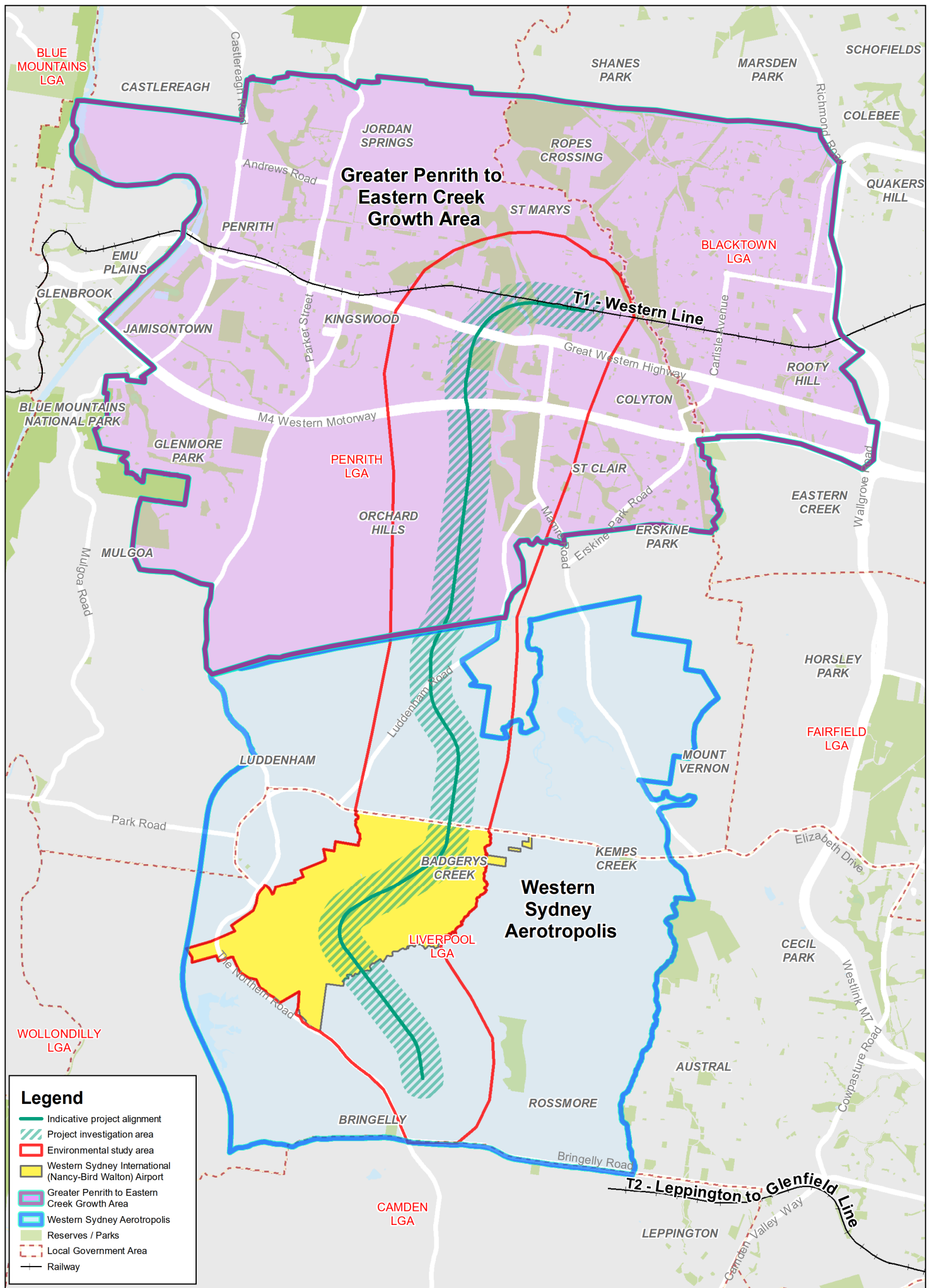
The vision outlined in the *Greater Sydney Region Plan 2056* and *Western City District Plan* for the Western Parkland City is being realised through a number of strategic planning initiatives including:

- Draft WSAP
- The Greater Penrith to Eastern Creek Growth Area.

The Western Sydney Aerotropolis area is located within the Western Sydney Priority Growth Area. The Western Sydney Aerotropolis is a planned economic hub centres on the Western Sydney International and is being developed through the Draft WSAP, which may impact land zoning in the off-airport environment once finalised. The Aerotropolis is planned to contribute 200,000 jobs including specialised jobs in defence and aerospace, agribusiness, health, education and tourism. The Aerotropolis will also include medium density residential land for terrace housing and modern low to medium-rise units. The precincts which would be the focus of initial planning for the Aerotropolis include the Aerotropolis Core and Northern Gateway (refer to Section 2.2.3).

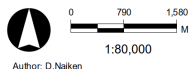
A new growth area for the Greater Penrith to Eastern Creek corridor has been identified. The Australian and NSW Governments will undertake land use and infrastructure planning for this growth area to ensure new housing can be planned, delivered and integrated with new infrastructure such as schools, health care and transport.

The development outlined above will be supported by upgrades to transport infrastructure as outlined in Section 8.2.1.



Legend

- Indicative project alignment
- Project investigation area
- Environmental study area
- Western Sydney International (Nancy-Bird Walton) Airport
- Greater Penrith to Eastern Creek Growth Area
- Western Sydney Aerotropolis
- Reserves / Parks
- Local Government Area
- Railway



Sydney Metro Greater West
Figure 8.7: Western Sydney Future Land Use Planning

Other regional land use planning policies relevant to the Project are described in Chapter 2 and other areas of proposed land use development in the off-airport environment are described below.

Project corridor protection

Transport for NSW has commenced the process of identifying and protecting the corridor for the Project, as well as land associated with the extension of the Project to the north and south, and the completion of the South West Rail Link extension to the west of Leppington. The process of corridor protection involves the creation of planning controls that preclude further urban development of the corridor, provides certainty regarding the location of future infrastructure and facilitates the timely delivery of infrastructure projects by preventing land from future development.

Transport for NSW consulted on the proposed corridor in early-mid 2018 (refer to Chapter 5).

St Marys Town Centre

St Marys is identified as a strategic centre in the *Western City District Plan* (Greater Sydney Commission, 2017). Penrith City Council has identified St Marys to be one of the two core centres within the Penrith LGA. Penrith City Council developed the *St Marys Town Centre Strategy* (2006) which identifies initiatives to support development and growth within the region as well as improve access to the town centre. Implementation of the strategy has commenced with the reclassification of some community land as operational land and with the introduction of mixed use and high density residential zones.

The Project would support the further implementation of the strategy by improving access and connectivity to the town centre, which would make it a more attractive destination and provide residents with easier access to future employment areas.

Orchard Hills to Badgerys Creek

Land between Orchard Hills and Badgerys Creek has been identified for future urban development as part of the Greater Penrith to Eastern Creek Growth Area and Northern Gateway precinct of the Draft WSAP.

Sydney Science Park, Luddenham

Sydney Science Park is located within the Northern Gateway precinct of the Draft WSAP. The planned research and development centre is set over 280 hectares on a site that is bounded by the Warragamba pipeline to the north, Twins Creek Estate to the east, and rural residential properties to the west. The proposed Outer Sydney Orbital Stage 1 corridor would run along the eastern boundary of the site.

The development of Sydney Science Park is focused on providing education, research and development facilities, science based companies and employment opportunities, and some mixed residential and student accommodation within the town centre (Elton Consulting, 2013).

Sydney Science Park has been rezoned for mixed use, business park and public recreation uses, infrastructure such as roads, services and the like, and landscaped open space, sporting fields and parks. Development of the land is subject to planning assessment and approval.

On-airport

The airport site is located in Badgerys Creek and Luddenham, in the Liverpool LGA. The land is Commonwealth land which was acquired by the Australian Government for the airport in the 1980's and 1990's. Previous land uses at the site included rural residential, agricultural, community and extractive industry land uses, however these land uses have since been removed as part of preparatory works for Western Sydney International Stage 1.

The Airport Plan includes a land use plan that sets out permitted uses for various areas of Western Sydney International. A rail corridor has been preserved through the airport site in developing the airport site layout.

8.7.2 Issues for consideration

Off-airport

Construction

Potential impacts to land use in the off-airport environment during construction would include:

- temporary and permanent acquisition or leasing of properties
- impacts on other infrastructure during construction including utilities and services
- ground movement and settlement due to excavations and tunnelling works during construction.

Operation

Potential impacts to land use in the off-airport environment during operation would include:

- integration of the Project with the future station precincts
- integration of the Project with future land use proposed as part of the Draft WSAP and the Greater Penrith to Eastern Creek Growth Area
- opportunities for integration with land use development around stations
- future restrictions to land use and infrastructure development associated with the Project corridor
- land severance and sterilisation associated with the Project corridor.

On-airport

An indicative transport corridor between Elizabeth Drive and the Airport terminal is shown in the Airport Site Layout at Figure 1-3. Sydney Metro is working with Western Sydney Airport

to integrate the Project with land use planning for the Airport business park and for effective passenger transfer at the Airport terminal.

The integration of the Project with land use and built form proposed for future stages of Western Sydney International would be considered.

8.7.3 Method of assessment

Off-airport

A desktop land use assessment will be undertaken for the Environmental Impact Statement for the off-airport environment. The assessment would consider the following:

- existing land uses
- current property ownership
- likely future land use based on review of the Draft WSAP, the Greater Penrith to Eastern Creek Growth Area and other strategic planning documents
- direct property and land use impacts during construction and operation
- positive impacts on land use and property including the facilitation of broader land use planning initiatives and potential opportunities for urban development around stations
- mitigation and management measures to minimise the impacts and maximise the benefits of the Project on property and land use.

On-airport

A desktop land use assessment will be undertaken for the Environmental Impact Statement for the on-airport environment. The assessment will outline the land use integration of the Project with the Western Sydney International Stage 1 development.

8.8 Social and economic

8.8.1 Existing environment

Western Sydney region

The Western Sydney region is diverse, with higher density, urbanised areas, as well as semi-rural, recreational and natural areas. The region is culturally diverse, with strong heritage values, cohesive communities, natural and recreational values and connections to employment hubs in Parramatta and the Sydney CBD.

Western Sydney is undergoing a transition to a more highly urbanised region which will be accelerated by the strategic planning initiatives discussed in Section 8.7.1. These strategic planning initiatives, along with Western Sydney International and the significant transport infrastructure investment proposed as part of the WSIP will result in significant changes to the social and economic environment of Western Sydney in the future. The Western

Parkland City population is forecast to increase from about 1,000,000 in 2016 to about 1,500,000 by 2036, an increase of about 500,000 people (NSW Government, 2018).

Off-airport

At the 2016 Census, there were about 40,000 people living in St Marys, Kingswood, Werrington, Claremont Meadows, Caddens, Mulgoa, Orchard Hills, Luddenham, Badgerys Creek, Bringelly and Rossmore (Australian Bureau of Statistics 2016). A majority of these residents resided in St Marys and Kingswood. Results of the 2016 Census demonstrated a 12 per cent increase in residents since the 2011 Census in the urban areas in the north of the off-airport environment, reflecting recent residential development occurring within the region.

Within the off-airport environment, 93 per cent of the total labour force was employed in 2016, which is relatively similar to the 94 per cent of the labour force employed in the Greater Sydney statistical area.

As described in Section 8.2.2, journey to work data for the Penrith and Liverpool local government areas shows that around 75 per cent of commuters travel to work by car, compared to 60 per cent for the Greater Sydney statistical area (ABS (2017), 2016 Census).

Western Sydney University is a significant employer and landowner in the off-airport environment. Western Sydney University includes a 58,000 square metre business park, Werrington Park, which is in the early stages of being developed.

The social and economic environment within the off-airport environment will continue to change in the future as a result of the social and economic benefits of the Western Sydney International and associated strategic planning initiatives as described in Section 8.7.1.

On-airport

The airport site is located within the social and economic context of Western Sydney as described above.

The construction of Western Sydney International Stage 1 would create around 3,180 full time equivalent (FTE) jobs directly and indirectly in Greater Sydney during the peak of construction activity. Approximately 84 per cent of these jobs would be created in Western Sydney including around 760 FTE direct onsite jobs in the peak year of construction (DIRD, 2016).

Western Sydney International is anticipated to bring significant benefits to the people and economy of Western Sydney related to economic development and employment opportunities for a variety of workers. Western Sydney International is anticipated to stimulate further development in existing and future regional and local centres within and outside of the off-airport environment, contributing to providing better quality social infrastructure, such as shops, health services, recreation and leisure services.

The operation of Western Sydney International Stage 1 (at day of opening) will create around 8,730 FTE direct onsite jobs and potentially generate an additional 4,440 FTE onsite jobs

within the business park on the airport site. The airport is anticipated to generate around \$77 million in value add for Western Sydney and around \$145 million in value add for the rest of Greater Sydney (DIRD, 2016).

8.8.2 Issues for consideration

Off-airport

Construction

Potential social and economic impacts in the off-airport environment during construction would include:

- potential amenity impacts on adjacent residents, businesses and social infrastructure during construction. These impacts may include traffic, noise, vibration, air quality and visual changes resulting from construction activities
- impacts on community values and lifestyle during construction
- potential impacts to agricultural assets such as dams
- temporary access restrictions or changes resulting from construction sites and activities. This may impact how people access social infrastructure, and how they travel in the areas surrounding the rail line
- cumulative social issues resulting from the potential for overlap with construction of other major infrastructure projects
- social and economic impacts associated with property acquisition.

Operation

Potential social and economic impacts in the off-airport environment during construction would include:

- potential amenity impacts on adjacent residents, businesses and social infrastructure during operation including noise, traffic, access and visual impacts
- impacts on community values and lifestyle during operation
- social impacts associated with the severance of the local road network as a result of the Project corridor
- social and economic benefits for the operation of the Project:
 - realisation of strategic planning for the Western Sydney region
 - reduced reliance on travel by motor vehicles
 - improved accessibility in Western Sydney including to future key employment hubs such as Western Sydney International and the Aerotropolis

- broader economic benefits for Western Sydney and the broader Sydney region.

On-airport

Potential social and economic impacts to the on-airport environment would be limited to economic benefits associated with the connection of the Project to Western Sydney International and Airport business park.

8.8.3 Method of assessment

Off-airport

A social impact assessment technical report will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the report:

- *Social Impact Assessment Guidelines* (DPE, 2017)
- The Transport for NSW *Impact Assessment Practice Note: Socio-economic Assessment 2013*.

The methodology for the assessment will include the following:

- desktop searches and background data review including:
 - review existing conditions in LGAs to establish a base case against which the potential impacts will be assessed
 - review relevant and best practice guidelines and policies for social impact assessment (refer above)
 - development of study areas (local precincts) based on ABS statistical data to capture areas of potential impacts, such as areas that community members would travel from to access stations during operations and construction zones that may result in impacts such as noise, vibration and traffic impacts
 - review community consultation that was carried out by Transport for NSW as part of the corridor protection process and consider ongoing feedback provided from consultation during the development of the Environmental Impact Statement for the Project.
- reporting including:
 - preparation of an assessment of potential impacts and opportunities associated with the Project during construction and operation. The impact assessment will include technical outputs such as traffic and transport, environmental impact such as air quality, visual and cultural heritage issues which have an impact on liveability. The assessment will determine business, economic and land use impacts for each LGA, with a general overview for the study area

- preparation of potential mitigation and management measures for each impact, that are practical the social environment in each local precinct.

On-airport

Social and economic impacts are considered to be minor for the on-airport environment. The Project would support airport passengers and workers journeys, reduce road congestion and support economic growth in the region. Notwithstanding, the method of assessment of potential on-airport social and economic impacts would take into account any requirements of the Commonwealth Environment Minister, is expected to be consistent with the method of assessment for off-airport impacts and would take into account existing plans in place under the Airport Plan where relevant.

8.9 Flooding, hydrology and water quality

8.9.1 Existing environment

Off-airport

The off-airport environment is located within the Hawkesbury-Nepean catchment. Watercourses and associated low-lying floodplain areas across the off-airport environment are primarily associated with South Creek and its tributaries. South Creek is a 400 square kilometre creek system that has its headwaters in the Camden area and flows 70 kilometres north to the Hawkesbury River.

Major tributaries of South Creek within the off-airport environment include Ropes Creek and Kemps Creek. Minor tributaries within the off-airport environment, include:

- Werrington Creek
- Byrnes Creek
- Claremont Creek
- Blaxland Creek
- Cosgroves Creek
- Badgerys Creek
- Thompsons Creek.

Watercourses within the off-airport environment are shown in Figure 8-8.

Hydrology and water quality

Water quality within South Creek has been considered in the following documents:

- Lower Hawkesbury-Nepean Nutrient Management Strategy (Department of Environment Climate Change and Water (DECCW), 2010). The South Creek catchment was found to be a significant contributor of nutrients (phosphorus and nitrogen) into the overall river

system. These nutrient loads were found to derive predominantly from grazing, runoff from urban areas and intensive animal production and horticulture land uses.

- Hawkesbury-Nepean Environmental Monitoring Program (DECCW, 2009). Results for the South Creek catchment indicated that the minimum recorded values for total phosphorus and total nitrogen generally did not achieve Australia New Zealand Conservation Council (ANZECC) water quality objectives.
- Water Management in South Creek Catchment (Cooperative Research Centre for Irrigation Futures, 2007). The study provided a detailed breakdown of the estimated sources of phosphorus in the South Creek catchment:
 - 44 per cent from agricultural land
 - 28 per cent from urban runoff
 - 18 per cent from unused or cleared lands
 - nine per cent from sewage treatment plants.

The report commented that while a number of nutrient abatement strategies have been implemented, these strategies have not been able to keep up with continuing urban development in the catchment.

Flooding

Flooding events have occurred in the South Creek catchment in the past as a result of local catchment runoff breaking out of the main channel and spilling into the surrounding floodplain. The Updated South Creek Flood Study (Worley Parsons 2015) identified that for a 100 year ARI flood event, the greatest extent of flooding within the off-airport environment occurs at the confluence of Blaxland Creek and South Creek on the southern side of the M4 Western Motorway in Orchard Hills. The Penrith LEP identifies a flood area associated with South Creek that extends up to about 600 metres across the floodplains within the off-airport environment.

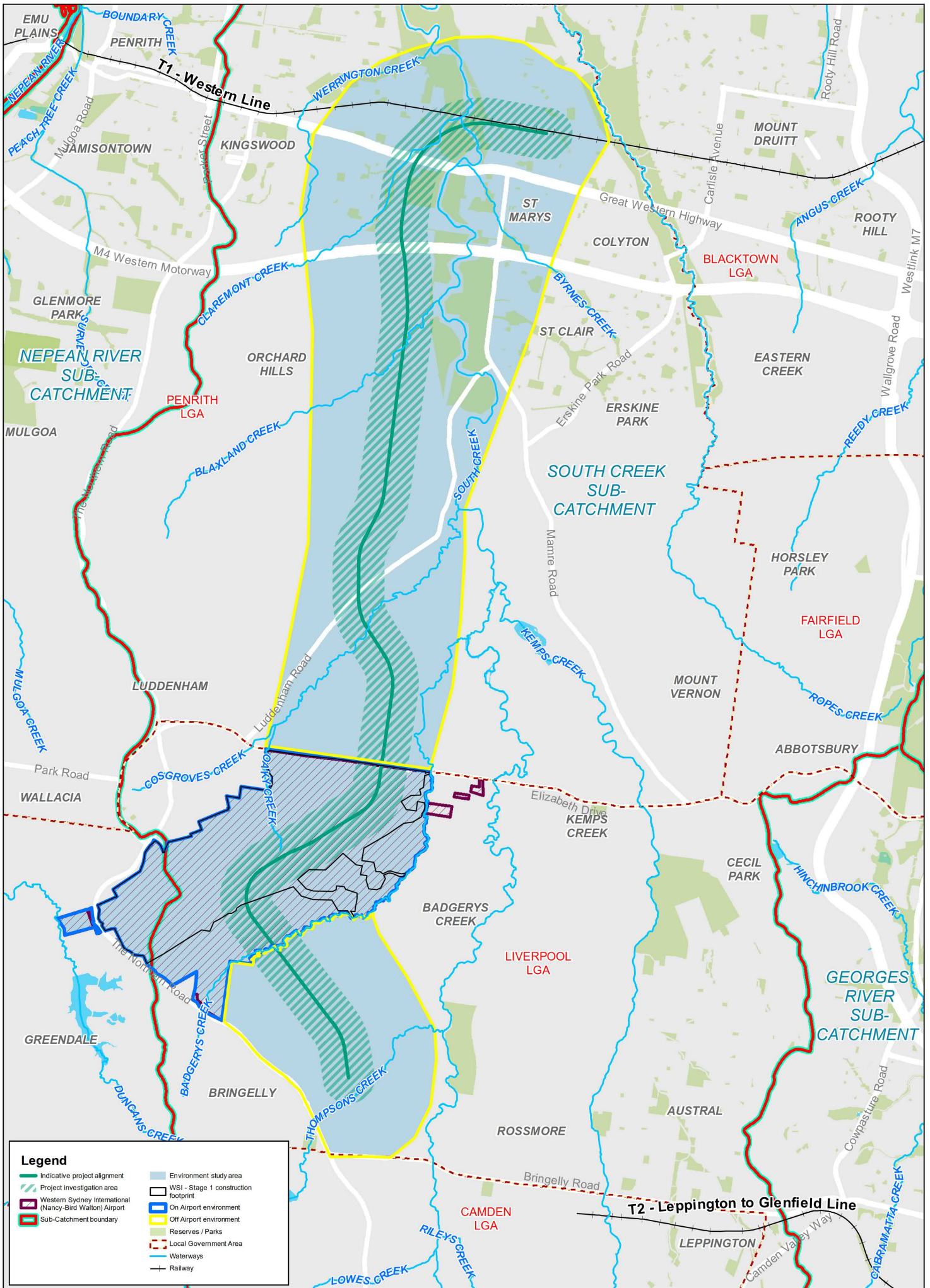
A number of large agricultural dams are located in the off-airport environment at Luddenham, Badgerys Creek and Bringelly, particularly in areas just north and east of the airport site.

On-airport

The on-airport environment is located within the Hawkesbury-Nepean catchment (refer above). Mapped watercourses and drainage lines within the airport site include tributaries of Cosgroves Creek and Oaky Creek. Badgerys Creek forms a significant boundary of the airport site.

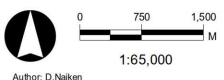
The construction of Western Sydney International Stage 1 would generally change the site from a rolling, vegetated landscape to a graded, primarily hardstand environment which would change the catchment areas within the airport site and increase runoff levels and the velocity of surface water flows.

The construction of Western Sydney International Stage 1 would result in a portion of the airport site that currently drains towards the Oaky Creek and Cosgroves Creek catchments to the north being diverted south towards Badgerys Creek, while a portion of the airport site that currently drains to Badgerys Creek would be diverted to Duncans and Oaky Creeks.



Legend

	Indicative project alignment		Environment study area
	Project investigation area		WSI - Stage 1 construction footprint
	Western Sydney International (Nancy-Bird Walton) Airport		On Airport environment
	Sub-Catchment boundary		Off Airport environment
			Reserves / Parks
			Local Government Area
			Waterways
			Railway



Sydney Metro Greater West
Figure 8.8: Watercourses and Sub-Catchments within the Study Area

Author: D. Nasken
 Date: 28/05/2020
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Hydrology and water quality

Water quality at the site is relatively degraded with high levels of phosphorus and nitrogen in surface water that is attributed to nearby agricultural land uses (DIRD, 2016). Turbidity and total suspended solids are generally within acceptable levels and dissolved oxygen levels are relatively low. Conductivity levels within the watercourses are high and above conductivity levels for typical lowland rivers.

Western Sydney International Stage 1 will include a water management system to control the flow of surface water and improve the quality of water prior to its release back into the environment. It is anticipated that the system would be generally effective in mitigating potential flooding and water quality impacts.

Flooding

During a one year ARI storm event, flooding is mostly confined to main watercourse channels and dams in the on-airport environment. During a 100 year ARI storm event, there is considerable overbank flooding of Badgerys Creek primarily on the western bank.

Detention and bioretention basins would be constructed adjacent to Badgerys Creek in the on-airport environment. The basins will allow controlled release of drainage run-off to the creek. The volume of discharge would be controlled by a bio-retention system which would mimic natural flow (DIRD 2016).

8.9.2 Issues for consideration

Off-airport

The Project would involve carrying out construction activities in proximity to a number of watercourses in the off-airport environment including activities to construct potential crossings at Blaxland Creek and Cosgroves Creek. The Project design would carefully consider creek crossings to ensure that potential impacts to watercourses and flood prone areas are avoided or minimised.

Construction

Construction of the Project would expose the natural ground surface and sub-surface through the removal of vegetation. Exposed soils and other unconsolidated materials (such as spoil, sand and other aggregates) could be transported from exposed areas into surrounding waterways via stormwater runoff and impact water quality. The construction of permanent infrastructure within or directly adjacent to watercourses for creek crossings would also result in the potential for direct sedimentation impacts to watercourses.

Construction activities would also have the potential to impact water quality via spills and leaks of fuel, oils and other hazardous materials as well as from the disturbance of existing contaminated land (refer to Section 9.3 for further information regarding potential contamination within the off-airport environment). Impacts would be managed through the implementation of standard mitigation measures.

It is likely that construction of the Project would require construction water treatment plants and controlled discharge to watercourses which would result in potential water quality impacts.

Construction activities may be carried out within the South Creek floodplain and/or the floodplain of other watercourses within the off-airport environment. There is the potential for the construction of the Project to impact on the local flooding regime including:

- increase in downstream flows due to an increase in impervious areas, flow diversions, or other construction activities
- localised flooding
- changes to the flood regime from the presence of in-stream works and the potential for scour downstream
- changes to flood storage due to works in the floodplain.

Operation

During operation potential impacts to water quality would be limited to impacts from spills and leaks of fuel, oils and other hazardous materials from trains, maintenance vehicles and other Project infrastructure. These impacts would be managed through standard mitigation measures.

Runoff from above ground Project elements (such as station buildings, stabling facilities and the metro line) also has the potential to be contaminated with sediments, fuel/oils (for example, from maintenance vehicles) and/or other pollutants (such as litter), which could enter the surrounding stormwater system. These impacts are considered to be minor and be managed through standard mitigation measures.

It is likely that the Project would require operational water treatment plants and controlled discharge to watercourses. Potential impacts would be minimised through the design of the water treatment plants. Potential impacts on surface hydrology and flooding during operation include the following:

- increases in total catchment impervious area
- changes to the flood regime from the presence of permanent in-stream structures and the potential for scour downstream
- flood impacts from changes in flood storage.

Increases in impervious areas could result in changes in surface water runoff and increased velocities. This could impact on localised flooding if not adequately catered for in the design development, and increase scouring of surface soil and downstream sedimentation.

The rail corridor has the potential to impact the local flooding regime. Potential flooding impacts would be minimised through the design of the Project which would include the development of appropriate drainage infrastructure.

On-airport

The potential water quality, hydrology and flooding impacts for the on-airport environment would be generally consistent with the impacts for the off-airport environment outlined above, however the potential for impacts would be primarily focused on Badgerys Creek. There is the potential for the localised water quality and flooding and downstream scour impacts described above at this location.

8.9.3 Method of assessment

Off-airport

A hydrology and flooding technical report will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the report:

- *Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia* (Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), 2016)
- *Floodplain Development Manual, the management of flood liable land* (NSW Government (Department of Infrastructure, Planning and Natural Resources (DIPNR), April 2005)
- *Review of Australian Rainfall and Runoff Design Inputs for NSW* (OEH, 2019)
- *Hawkesbury Nepean Valley Flood Risk Management Strategy* (Infrastructure NSW, 2017)
- *NSW Government, Floodplain Risk Management Guideline, Practical Considerations of Climate Change* (OEH, 2006)
- *New guideline and changes to section 117 direction and EP&A Regulation on flood prone land* (DPE, 2007)
- *Australian & New Zealand guidelines for fresh water quality* (Australian Government Initiative, 2018)
- *Guidelines for controlled activities on waterfront land* (DPI 2012).

The methodology for the assessment will include:

- desktop searches and background data review
- development of a detailed description of the existing flooding and hydrology environment including:
 - identification of floodplains and areas subject to floodplain management plans
 - identification of existing constraints and floodplain management practices, water quality management practices as well as future climate conditions

- development of a criteria to assess impacts in accordance with floodplain management guidelines and Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines.
- assessment of potential impacts and reporting including an assessment of the potential impact of the Project on flood behaviour, local hydrologic systems and water quality based on:
 - flood behaviour modelling and mapping
 - consideration of available water quality information
 - consideration of any impacts arising from the construction of Western Sydney International Stage 1
- development of site-specific mitigation measures.

On-airport

The method of assessment of potential on-airport impacts to flooding, hydrology and water quality would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister, Commonwealth Infrastructure Minister, relevant provisions of the EPBC Act, Airports Act and its Regulations (including the water quality criteria in Schedule 2 of the *Airports (Environment Protection) Regulations 1997*). The assessment would be focused on potential impacts to Badgerys Creek in the on-airport environment and would have regard to broader water management arrangements being implemented as part of Western Sydney International. The existing Soil and Water Construction Environment Management Plan for Western Sydney International Stage 1 would also be considered.

8.10 Landscape and visual

8.10.1 Existing environment

Off-airport

The off-airport environment is located on the fringe of metropolitan Sydney's urban development and includes both urban and semi-rural areas. The landscapes either side of the M4 Western Motorway differ due to the higher level of development to the north of the motorway relative to areas to the south of the motorway.

The landscape to the north of the M4 Western Motorway is characterised by low-density residential dwellings in St Marys, Werrington, Claremont Meadows, Caddens and Kingswood, with some medium density residential development around the edges of St Marys Town Centre including south of the Great Western Highway. The Penrith Health and Education Precinct has a campus style landscape with wide open spaces between commercial buildings, particularly at Western Sydney University Penrith Campus, Nepean College of TAFE Allied Health Facility and Werrington Park.

The landscape to the south of the M4 Western Motorway is a mix of semi-rural residential development and farm land, as well as undeveloped land in the northern and eastern parts of the Defence Establishment Orchard Hills site. Semi-rural residential development in the area comprises The Vines subdivision in Orchard Hills and Twins Creek Estate in Luddenham. These developments are characterised by large dwellings on landscaped lots.

The landscape of farm land in Orchard Hills, Luddenham and Badgerys Creek is mostly grazing land with native vegetation generally only remaining along the banks of creeks and low-lying areas and some roadsides.

The undeveloped areas in the northern and eastern parts of the Defence Establishment Orchard Hills include large areas of native vegetation. South Creek forms a green north-south corridor through the off-airport environment, particularly through St Marys where parks and recreational facilities are located next to the creek.

The existing landscape around Rossmore and Bringelly is predominantly semi-rural, characterised by existing farm land and semi-rural-residential dwellings. Land in Rossmore Bringelly and Orchard Hills forms part of the Draft WSAP (refer to Section 8.7) and is expected to be subject to future rezoning to provide for urban development that will transform the visual context and character of the landscape.

There is a variety of visual sensitive receivers throughout the off-airport environment including, semi-rural, low density and medium density residential receivers, commercial receivers and passive/recreational receivers at areas of open space.

On-airport

The on-airport environment is typified by gently undulating landform within a highly modified landscape. The overall landscape character is open and semi-rural with expansive views possible from surrounding hill tops and higher elevations to the west. As construction work has now commenced, the landscape in parts of the airport site is a construction site.

The visual character of the on-airport environment is defined by cleared agriculture land. Patches of remnant vegetation exist within the airport site, particularly along creek lines, road edges and near farm dams.

Sensitive receivers with views to the airport environment are limited to semi-rural residential receivers adjacent to the on-airport environment. There are currently no sensitive receivers on the airport site. For receivers located adjacent to the on-airport environment, views to the site are partially screened by vegetation around the perimeter of the site and the local topography.

During construction of Western Sydney International Stage 1, earthworks will level the site in preparation for permanent infrastructure. Following the completion of construction, the visual setting of the on-airport environment would be characterised by permanent airport infrastructure including a runway, aprons, hangars, terminal buildings, control tower, taxi areas, car parking and buildings for terminal support and business development. Overflights will also represent a new visual element for the site and the surrounding environment.

Sources of night-time lighting will be introduced throughout the on-airport environment for the illumination of runways and security lighting around airport buildings and other infrastructure.

The visual landscape within the area located outside of the Western Sydney International Stage 1 construction footprint will consist primarily of cleared land and vegetation around Badgerys Creek that would be retained. However, this landscape would be viewed in the overall context of permanent infrastructure for Western Sydney International Stage 1.

Visual sensitive receivers within the on-airport environment would include commercial (including hotels) and industrial receivers associated with the airport. There would also be sensitive receivers located adjacent to the on-airport environment with views to the airport (albeit partially screened by vegetation, local topography and airport infrastructure).

8.10.2 Issues for consideration

Off-airport

Visual and landscape impacts during construction and operation would be experienced by existing residential receivers and those who work, study, visit or access business and community facilities within the off-airport environment.

Project temporary construction and permanent operational infrastructure would be viewed in the context of a low to medium density urban environment around St Marys and a mix of semi-rural residential development and farm land south of the M4 Western Motorway and so the level of impact would vary throughout the off-airport environment.

Given the planned urban development throughout much of the off-airport environment, including the development of the station precincts and broader urbanisation, the future character of the off-airport environment will be an important consideration in the assessment of potential impacts.

Construction

The construction of the Project may cause temporary impacts on the landscape and views in the off-airport environment. Potential impacts may include:

- the establishment of construction compounds, worksites, temporary noise barriers, stockpiles, particularly adjacent to stations and tunnel portals
- removal of vegetation
- light spill from construction sites during any out-of-hours construction
- construction vehicle movements within construction worksites and along haulage routes, and parking, footpath diversions and relocations
- presence of construction equipment, including acoustic sheds where required
- elevated construction works such as viaduct construction
- access roads and work areas around utilities.

Operation

The operation of the Project may result in permanent impacts on the landscape and views in the off-airport environment. Potential visual and landscape impacts would be associated with the following key Project infrastructure:

- infrastructure located in-cutting (where potential visual impacts would be reduced compared to surface level infrastructure)
- surface level infrastructure, including potential noise barriers (if required to mitigate noise impacts)
- elevated infrastructure including viaducts (where potential impacts would be greater compared to surface level infrastructure)
- tunnel portals
- power supply upgrades and traction substations
- the stabling and maintenance facility
- light spill from stations, the stabling and maintenance facility and other permanent infrastructure.

On-airport

Within the on-airport environment, visual sensitive receivers would be limited to commercial receivers and industrial receivers associated with the proposed Airport business park. Potential visual sensitive receivers may also include nearby residential receivers with views to the on-airport environment.

Potential impacts during construction and operation would be generally consistent with the impacts described above for the off-airport environment, however temporary and Project infrastructure would be viewed in the context of significant permanent operational airport infrastructure.

8.10.3 Method of assessment

Off-airport

A landscape character and visual impact assessment technical report will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the landscape character and visual impact assessment:

- *AS4282-1997 Control of the obtrusive effects of outdoor lighting*
- *Better Placed, a strategic design policy for the built environment of NSW* (Government Architect NSW, 2017)
- *Creativity Guidelines for transport systems* (TfNSW 2016)
- *Crime prevention and the assessment of development applications* (DUAP, 2001)

- *Crime Prevention through Environmental Design (CPTED)* (Queensland Government, 2007)
- *Disability (Access to Premises – Buildings) Standards 2010*
- *Discussion Paper, Evaluating Good Design* (Government Architect NSW, 2018)
- *Good Urban Design, Better Placed* (Government Architect NSW, 2018)
- *Technical guideline for Urban Green Cover in NSW* (OEH, 2015)
- *Technical guideline for Urban Green Cover in NSW Healthy Urban Development Checklist* (NSW Health, 2009).

The methodology for the assessment will include:

- desktop searches and background data review, including:
 - identification of the existing visual environment
 - description of the desired future character of the off-airport environment based on strategic planning initiatives.
- assessment and reporting including:
 - identification of landscape character zones
 - consideration of relevant planning requirements and policies
 - identification of the landscape and visual sensitivity of the off-airport environment
 - assessment of potential landscape character impacts during construction and operation
 - identification of the sensitivity of specific views to the site
 - identification of representative views to the Project
 - assessment of visual impacts of the Project using representative viewpoints and photomontages
 - assessment of potential night time visual impact of the Project during construction and operation
 - identification of mitigation measures to reduce landscape character and visual impacts.

On-airport

The method of assessment of potential on-airport visual and landscape character impacts would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister and Commonwealth Infrastructure Minister. The Visual and Landscape Management Construction Environment Management

Plan for Western Sydney International Stage 1 would also be considered in the assessment of potential impacts.

9 Other environmental issues

9.1 Local business

9.1.1 Existing environment

Off-airport

There are a number of local businesses in the off-airport environment including clusters of businesses or similar business types in the following areas:

- St Marys Town Centre
- Penrith Health and Education Precinct
- Luddenham, Badgerys Creek, Bringelly and Rossmore.

St Marys Town Centre is one of the two main retail/commercial centres in the Penrith local government area. The Queen Street shopping strip forms the central spine of the town centre. The town centre has a total commercial and retail floor area of about 80,000 square metres. The main catchment area for the town centre is the suburbs of St Marys, Colyton, Oxley Park and Claremont Meadows, Erskine Park, Ropes Crossing and St Clair.

The Penrith Health and Education Precinct includes Nepean Hospital, Western Sydney University Penrith Campus and Nepean College of TAFE Allied Health Facility. The Sydney Medical School Nepean is at Nepean Hospital and is one of eight clinical schools of the University of Sydney.

Luddenham, Badgerys Creek, Bringelly and Rossmore are serviced by local businesses around St Marys and Penrith. There are local retail facilities at Kelvin Park and Bringelly village as well as a small existing neighbourhood centre at Rossmore located north of Bringelly Road. Rossmore Stabling Yard (for the South West Rail Link) is located east of Rossmore, and a 55 hectares brick and paver production facility is located around 750 metres to the west of Bringelly village. Near the airport site is a shale quarry and waste management facility on Badgerys Creek Road, as well as a number of intensive agriculture facilities, including chicken farms.

As described in Chapter 2, the operation of Western Sydney International in combination with strategic planning initiatives will be the catalyst for the establishment of a range of businesses related to the airport which are likely to be located in the Western Sydney Aerotropolis. The Aerotropolis is planned to contribute 200,000 jobs including specialised jobs in defence and aerospace, agribusiness, health, education and tourism. The Aerotropolis will also include medium density residential land for terrace housing and modern low to medium-rise units.

On-airport

The airport (at day of opening) is anticipated to generate around 4,440 full-time employee onsite jobs within the business park on the airport site.

9.1.2 Issues for consideration

Off-airport

Construction

Potential impacts to local businesses for the Project during construction would include:

- disruption to servicing, deliveries and access
- increased congestion and travel times as a result of additional construction traffic
- impacts on business due to reduced visibility of businesses, changes to pedestrian and vehicle movements or reduction in amenity (e.g. noise and air quality)
- potential impacts to customer car parking due to demand for construction worker parking
- loss of businesses due to property acquisition.

Project impacts to local businesses would be primarily around the St Marys Town centre given the concentration of businesses in this area.

Operation

Potential impacts to local businesses for the Project during operation would include:

- disruption to servicing, deliveries and access during operation
- impacts on businesses due changes to pedestrian and vehicle movements or reduction in amenity
- local business opportunities as a result of the operation of the Project, particularly around stations.

On-airport

The construction of the Project would coincide with the construction of Western Sydney International Stage 1. During this time there would be no businesses established in the on-airport environment.

For the operation of the Project potential impacts to businesses in the on-airport environment are likely to include benefits associated with a public transport option for the movement of employees of Western Sydney International and access to major employment hubs.

9.1.3 Method of assessment

Off-airport

A business impact assessment will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the assessment:

- *Social Impact Assessment Guidelines* (DPE, 2017)
- The Transport for NSW *Impact Assessment Practice Note: Socio-economic Assessment* 2013.

The methodology for the assessment will include:

- desktop searches and background data review
- identification of a study area based on ABS statistical data
- description of existing business environment characteristics
- review of relevant planning policies and major development applications to establish the future economic character of the environment
- review of community consultation undertaken to date and consider ongoing feedback provided from consultation during the development of the Environmental Impact Statement for the Project
- impact assessment and reporting including:
 - identification and analysis of the likely changes to the existing business environment
 - identification of direct and indirect impacts of the Project on businesses
 - assessment of the significance of impacts with consideration to consequence (duration, spatial extent and severity) and sensitivity.
- development of management and mitigation measures.

On-airport

The method of assessment of potential on-airport business impacts would be consistent with the method of assessment for off-airport impacts and any relevant provisions of the EPBC Act, Airports Act and its Regulations and take account of any requirements of the Commonwealth Environment Minister.

9.2 Air quality

9.2.1 Existing environment

Off-airport

Existing air emissions sources in the off-airport environment include:

- emissions from traffic on the State road network comprising the Great Western Highway, M4 Western Motorway, The Northern Road, Mamre Road, Elizabeth Drive and Bringelly Road – as well as emissions from traffic on regional and local roads. It is expected that traffic generated air emissions will increase with the increase in traffic forecast to occur as the Draft WSAP and Greater Penrith to Eastern Creek Growth Area is developed
- emissions from existing semi-rural industries – including quarries and waste management facilities. In the future it is expected that air emissions from semi-rural industries would reduce as these land holdings are developed in accordance with strategic planning initiatives for the area.

Existing sensitive receivers to the north of the M4 Western Motorway include low-density residential dwellings in St Marys, Claremont Meadows, Caddens and Kingswood, with some medium density residential development around the edges of St Marys Town Centre. Commercial receivers are located within the Penrith Health and Education Precinct including Western Sydney University Penrith Campus, Nepean College of TAFE Allied Health Facility and Werrington Park.

Existing sensitive receivers around Orchard Hills, Luddenham and Bringelly are generally limited to schools and residential dwellings. These areas are expected to be of substantially higher density in the future when development of the Draft WSAP and Greater Penrith to Eastern Creek Growth Area occurs.

On-airport

Background air quality in the existing on-airport environment would be generally consistent with the off-airport environment, with emission sources being primarily from road traffic and existing semi-rural industries and construction activities. Air quality sensitive receivers are currently limited to semi-rural residential properties outside of the airport site.

The operation of aircraft at Western Sydney International would result in emissions of nitrogen dioxide, particulate matter, carbon monoxide, sulfur dioxide and other pollutants and would impact both the on-airport and off-airport environment. Western Sydney International Stage 1 would provide capacity for around 63,000 annual air traffic movements. Emissions would generally be within relevant criteria and an air quality monitoring would be undertaken as part of airport operations (DIRD, 2016). On-airport air quality sensitive receivers would be limited to commercial receivers (including employees and passengers) at the airport and business park.

9.2.2 Issues for consideration

Off-airport

Construction

The majority of air quality impacts would be associated with the generation of dust as a result of the following construction activities:

- excavation, handling, stockpiling, loading/unloading and transport of spoil
- demolition of buildings and other structures, and the handling, stockpiling and transport of demolition material
- transport, loading/unloading, stockpiling and handling of imported construction materials such as imported fill
- creation of exposed surfaces through the clearing of vegetation, stripping of topsoil and other overlying structures and for utility installation to construction sites
- movement of construction plant, vehicles and equipment along unsealed haulage routes and surfaces.

Without appropriate management of dust generation, the above activities could result in a reduction in local air quality and the deposition of dust on nearby sensitive receivers. The impacts resulting from the generation of dust for the Project are similar to those experienced on other large infrastructure projects. These impacts can be readily managed through the implementation of standard mitigation measures and would need to consider cumulative impacts on construction coinciding with the Western Sydney International Stage 1 construction works.

Gaseous emissions would generally be restricted to minor localised emissions of carbon monoxide, oxides of nitrogen, sulfur dioxide and volatile organic compounds. These pollutants would be generated during the combustion of fuel in construction plant, machinery and equipment, as well as from the handling and/or onsite storage of fuel and other chemicals.

Gaseous emissions during construction would be relatively minor and would be adequately managed with standard mitigation measures.

Operation

No significant air quality impacts are expected during operation. Only electric trains would operate as part of the Project.

On-airport

Potential impacts in the on-airport environment would primarily relate to dust generation and gaseous emissions during construction as described for the off-airport impacts above, with negligible impact during operation.

9.2.3 Method of assessment

Off-airport

An air quality assessment will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the assessment:

- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005)
- *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC, 2005)
- *Technical Framework - Assessment and Management of Odour from Stationary Sources in NSW* (DEC, 2006)
- *Guidance on the assessment of dust from demolition and construction, (UK Institute of Air Quality Management's (IAQM) 2014).*

The methodology for the assessment will include:

- desktop searches and background data review
- description of the background air quality environment
- identification of potential sensitive receivers likely to be impacted by emissions to air from the Project
- a qualitative assessment of construction air quality impacts in accordance with *Guidance on the assessment of dust from demolition and construction, (IAQM, 2014)*
- a qualitative discussion of operational air quality impacts
- consideration of cumulative construction air quality impacts
- recommendation of mitigation and management measures to minimise potential impacts.

On-airport

The method of assessment of potential air quality impacts from on-airport components of the construction and operation of the Project would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister. They would take account of any requirements of the EPBC Act and Airport (Environment Protection) Regulations, as well as the air quality framework established at Western Sydney International for on-airport construction activities through the Air Quality Construction Environment Management Plan.

9.3 Contamination

9.3.1 Existing environment

Off-airport

A desktop analysis of aerial photography has identified potential areas of soil contamination resulting from current or historical land uses. These areas include:

- Aimix Chemicals Pty Ltd – Chemical Plant, St Marys
- former Gipps Street Landfill, Claremont Meadows
- Erskine Park Quarry, Orchard Hills
- SUEZ Kemps Creek Resource Recovery Park – Recycling Centre and Waste Management Service, Luddenham
- SUEZ Elizabeth Drive Landfill, Kemps Creek.

It is likely that there would be other contaminated sites within the off-airport environment as a result of previous and current agricultural and light industry land uses as well as building demolition and the potential for illegal dumping of building and other waste.

There are no contaminated sites within the off-airport environment that are regulated by the NSW EPA under the *Contaminated Land Management Act 1997* (NSW). A former dry cleaning site located at 1-7 Queen Street, St Marys and St Mary's Shopping Village located at Charles Hackett Drive, St Marys are currently subject to assessment by the NSW EPA.

There are a number of sites within the off-airport environment that are licensed under the *Protection of the Environment Operations Act 1997* (POEO Act) (NSW). The sites are licensed for a range of activities including chemical storage and production, waste production, storage and recovery, livestock intensive activities, and extractive industries.

On-airport

Soil contamination investigations as part of the Environmental Impact Statement for Western Sydney International Stage 1 identified the following contaminants:

- lead, copper, nickel and zinc
- asbestos in soil and in fragments
- total and poly aromatic hydrocarbons.

The contamination is likely to be present due to prior agricultural and light industry land uses and building demolition (DIRD, 2016).

A remediation action plan (RAP) has been prepared for Western Sydney International Stage 1. The plan guides the remediation of contamination identified in the on-airport environment

to ensure that the land is suitable for its intended use prior to construction. The Project would consider this plan.

9.3.2 Issues for consideration

Off-airport

Construction

There is the potential for contamination to be encountered in the off-airport environment. Contaminants that could be encountered during excavation and other ground disturbing activities include contamination associated with:

- leaks and spills from fuel storage infrastructure (hydrocarbons and heavy metals)
- former and current agricultural and industrial land uses (hydrocarbons, heavy metals and metalloids, solvents, phenolics, pesticides, heavy metals and metalloids and asbestos in soil)
- demolished buildings and illegal dumping of material including asbestos.

The exposure of any contaminated materials during construction may increase the potential for contaminant mobilisation and may create additional exposure pathways to sensitive receptors including workers and the environment.

Operation

Potential contamination and soils impacts during operation would be limited to spills and leaks of fuel, oils and other hazardous materials from trains, maintenance vehicles and other Project infrastructure. Potential impacts associated with operation of the stabling and maintenance facility would be considered. These impacts would be managed through standard mitigation measures.

On-airport

The RAP for Western Sydney International Stage 1 presents the remediation requirements to ensure that the land is remediated so that it is suitable for its intended use prior to construction. Sydney Metro would be required to work closely with Western Sydney Airport to ensure that the RAP is implemented in relation to contamination issues and contamination management associated with the Project. Notwithstanding, construction activities within the on-airport environment would have the potential to result in contamination from spills and fuel leaks.

9.3.3 Method of assessment

Off-airport

A contamination assessment will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the assessment:

- *National Environment Protection (Assessment of Site Contamination) Measure* (National Environment Protection Council, 2013)
- *Managing Urban Stormwater – Soils and Construction* (referred to as the Blue Book) (Landcom, 2004)
- *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998)
- *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (Department of Environment and Climate Change, 2009).

The methodology for the assessment will include:

- desktop searches and background data review including:
 - a review of previous contamination assessments (where available)
 - a review of historical aerial photography of the Project area (to identify potential contamination sources along and/or adjacent to the Project).
- an assessment of contamination risk based on the source-pathway-receptor model to identify risks to human health and/or the environment
- identification of low, medium, high and very high risk sites including recommendations for additional investigations and/or management based on the site risk rating.

On-airport

The method of assessment of potential contamination and soils impacts in the on-airport environment would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister, relevant provisions of the EPBC Act and Airport (Environment Protection) Regulations. The existing RAP and Soil and Water Construction Environment Management Plan for Western Sydney International Stage 1 would also be considered.

9.4 Soils

9.4.1 Existing environment

Off-airport

Soils within the off-airport environment consist primarily of the Blacktown and South Creek soil landscapes. The Blacktown soil landscape consists of shallow to moderately deep (greater than one metre) sandy soils typical of eucalypt forests. The soils are characterised by seasonal waterlogging, moderately reactive subsoils and localised surface movement potential.

The South Creek soil landscape comprises the present active floodplain of many drainage networks of the Cumberland Plain and consists of deep layered sediments over bedrock including clays and loams. The soils are characterised by seasonal waterlogging, localised permanently high water tables, localised water erosion hazard and localised surface movement potential.

There are known areas of saline soils around Thompsons Creek and sections of Badgerys Creek and the northern tributaries of Cosgroves Creek. There is a high salinity potential for all watercourses in the off-airport environment (Department of Infrastructure Planning and Natural Resources, 2002).

The majority of the off-airport environment contains areas considered to have 'no known occurrence' of acid sulfate soils materials. Potential acid sulfate soils are generally limited to around dams and drainage channels.

On-airport

Soils in the on-airport environment are primarily from residual clays with areas of alluvial gravels, sands, silts and clays associated with Badgerys Creek.

9.4.2 Issues for consideration

Off-airport

Construction of the Project would expose the natural ground surface and sub-surface through the removal of vegetation. Exposed soils and other unconsolidated materials (such as spoil, sand and other aggregates) could be transported from the construction sites into surrounding waterways via stormwater runoff and impact water quality (refer to Section 8.9).

The exposure of acid sulfate soils during excavation could result in the generation of acid which would damage surrounding vegetation and drainage lines.

Potential soil salinity may impact the durability of steel and concrete structures for the Project.

On-airport

Construction activities for the Project in the on-airport environment would also result in the potential for impacts related to sediment and erosion and acid sulfate soils as described in the section above.

9.4.3 Method of assessment

Off-airport

A soils assessment will be prepared as part of the Environmental Impact Statement. The following guidelines will be considered during the preparation of the assessment:

- *Acid Sulfate Soils Assessment Guidelines* (Department of Planning, 2008)
- *Managing Urban Stormwater – Soils and Construction* (referred to as the Blue Book) (Landcom, 2004).

The methodology for the assessment will include:

- desktop searches and background data review
- an assumption of the use of standard methods for sediment management during construction in accordance with the Blue Book (Landcom, 2004)
- identification of the potential to disturb acid sulfate soils and the associated impacts
- Consideration of the potential impacts associated with erosion and sedimentation.

On-airport

The method of assessment of potential soils impacts in the on-airport environment would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister, relevant provisions of the EPBC Act and Airport (Environment Protection) Regulations. The existing Soil and Water Construction Environment Management Plan for Western Sydney International Stage 1 would also be considered.

9.5 Hazard and risk

9.5.1 Issues for consideration

Off-airport

Potential hazards during construction and operation of the Project in the off-airport would include:

- the onsite storage, use and transport of chemicals, fuels and materials during construction and operation
- the rupture of, or interference with, underground services during construction

- electric and magnetic fields associated with new substations during operation
- natural hazards including flooding and bushfire
- operation of the metro line in the rail corridor and at stations.

The hazards outlined above would be managed to comply with relevant legislative and other requirements including, *Work Health and Safety Act 2011*, *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and *draft Radiation Standard – Exposure Limits for Magnetic Fields* (Australian Radiation Protection and Nuclear Safety Agency, 2006).

On-airport

Potential hazards during construction and operation of the Project in the on-airport environment would be consistent with the impacts for the off-airport environment described above. The construction and operation of Western Sydney International would be associated with a number of hazards including the storage of dangerous goods (including fuel storage at a fuel farm) and risks associated with an operational airport (such as airspace obstruction) associated with above ground rail infrastructure. The Project would need to consider the potential to exacerbate these risks. It is likely that construction of both Western Sydney International Stage 1 and the Project would occur at the same time and therefore hazards include the concurrent construction and operation of the two projects respectively.

9.5.2 Method of assessment

Off-airport

A desktop hazard and risk assessment will be undertaken for the Project and mitigation measures will be proposed, where appropriate. The following guidelines will be considered as relevant during the preparation of the hazard and risk assessment:

- *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning, 2011)
- *International Standard (ISO/IEC 31010) Risk Management – Risk Assessment Technique*
- *Australian Code for the Transport of Dangerous Goods by Road and Rail (7th edition)* (National Transport Commission, 2007)
- *Code of Practice for the Safe Removal of Asbestos 2nd edition* (National Occupational Health and Safety Commission, 2005)
- *Storage and Handling of Dangerous Goods Code of Practice* (NSW WorkCover, 2005).

On-airport

The method of assessment of potential hazards and risk associated with the Project within the on-airport environment would be consistent with the method of assessment for off-airport impacts. The assessment for the on-airport environment would also include consideration of

potential hazards and risks associated with the operation of Western Sydney International including potential airspace obstructions from above ground structures and the proximity of the Project to dangerous goods storage areas at the airport. Aviation security considerations would also be taken into account.

9.6 Waste and resources

9.6.1 Issues for consideration

Off-airport

Waste generation - construction

A variety of solid and liquid waste would be generated during construction. The main waste generating activities are summarised in Table 9-1.

Table 9-1 Indicative types of waste generation during the construction of the Project

Waste generating activity	Waste material
Station and tunnel excavations, cuttings and general earthworks	Spoil comprising virgin excavated natural material and potential contaminated materials.
Precast concrete manufacture	Concrete slurry, concrete waste, timber formwork.
Demolition of buildings and other structures	Concrete, bricks, tiles, timber (treated and untreated), metals, plasterboard, carpets, electrical and plumbing fittings and furnishings (such as doors and windows), hazardous waste (including asbestos).
Dust suppression wash down of plant and equipment, and staff amenities at construction compounds	Sediment-laden and/or potentially contaminated wastewater, sewage and grey water, including groundwater inflows to station excavations.
Station and track fit out and general construction activities and resource use	Concrete waste, timber formwork, scrap metal, steel, concrete, plasterboards, cable and packaging materials.
Maintenance of construction plant, vehicles and equipment	Adhesives, lubricants, waste fuels and oils, engine coolant, batteries, hoses and tyres.
Clearing and grubbing of vegetation, landscaped and/or turfed areas	Green waste.
Construction workforce	Organic (putrescible) and non-organic waste.

The quantity of construction waste likely to be generated by the Project would be considered in the Environmental Impact Statement. The largest volumes of construction waste would be generated during excavation of tunnels and cuttings.

The quantity of waste would be comparable to similar infrastructure projects and would be adequately managed with standard mitigation measures.

Resource use - construction

Resources used during construction would include:

- electricity
- fuel
- concrete
- steel
- water
- paving materials
- glass
- timber
- embodied energy in construction materials.

The quantity of resources required would be considered in the Environmental Impact Statement. Mitigation measures would be developed to reduce the Project’s demand on resources. While the Project would increase demand on local and regional resources, it is unlikely that the Project would result in any resource becoming scarce or in short supply.

Waste generation - operation

A variety of waste types would be generated during operation. The main waste generating activities are summarised in Table 9-2. The overall impact of operational waste streams and volumes would be minimal.

Table 9-2 Indicative types of waste generation during the operation of the Project

Waste generating activity	Waste material
Disposal of general litter in station bins and cleaning activities associated with trains, stations and other infrastructure	General non-recyclable and putrescible waste (such as food waste from station rubbish bins), recyclable wastes such as plastics and aluminium cans, office waste including paper and plastics.
Infrastructure maintenance	Cable and conduit off-cuts from maintenance of track electrical infrastructure, solvents, paints, adhesives, cleaning fluids, greases, acids and alkali materials, and spent spill kit absorbent materials used to clean up accidental spills during

Waste generating activity	Waste material
	maintenance, waste water from cleaning of station facilities.
Stormwater ingress into stations and/or sections of the track	Sediment-laden and/or potentially contaminated wastewater.
Use of station customer facilities	Sewage and grey water.

Resource use - operation

Resources used during the operation of the Project would include:

- electricity
- water
- steel (during maintenance of rail infrastructure)
- concrete (during the maintenance of rail infrastructure)
- fuel, lubricating oil and grease
- cleaning chemicals.

Resource use during operation would primarily be associated with electricity to power the metro trains, signalling, lighting, closed-circuit television and communications systems, station facilities (including lifts), and other rail infrastructure and systems including the stabling and maintenance facility.

On-airport

The waste types and resources outlined for the off-airport environment would be consistent for the on-airport environment. However, the quantity of waste generated and resources used would be minor compared to the off-airport environment, given the shorter section of the Project to be constructed in the on-airport environment.

9.6.2 Method of assessment

Off-airport

A desktop waste and resource assessment will be undertaken as part of the Environmental Impact Statement. Relevant legislation and guidelines would include:

- *Waste Avoidance and Recovery Act 2001*
- *Waste Classification Guidelines* (EPA, 2014).

The methodology for the assessment will include:

- a review of the likely waste streams and volumes during construction and operation, including spoil, wastewater and demolition materials

- a review of the likely resources required during construction and operation, including energy, fuel and steel
- a review of the Project against the Project sustainability plan (once finalised)
- development of management strategies to adequately address waste and resource use during construction and operation. Measures would include:
 - managing construction waste through the waste hierarchy established under the Waste Avoidance and Recovery Act 2001 (i.e. avoidance of waste, resource recovery, disposal of waste)
 - establishing targets for the beneficial reuse of spoil, wastewater and other construction wastes in accordance with the Project’s sustainability plan
 - developing procedures for the assessment, handling, stockpiling and disposal of potentially contaminated materials and wastewater, in accordance with the Waste Classification Guidelines (EPA, 2014)
 - identifying opportunities to reduce the Project’s demand on electricity and other resources.

On-airport

The method of assessment of potential waste generation and resource use in the on-airport environment would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister. The existing Waste and Resources Construction Environment Management Plan for the airport would also be considered along with relevant provisions of the EPBC Act, Airports Act and its Regulation.

9.7 Groundwater and geology

9.7.1 Existing environment

Off-airport

The Penrith 1:100 000 Geological Map shows that the geology of the off-airport environment is characterised by Triassic sedimentary rocks of the Wiannamatta Group and Hawkesbury Sandstone. The Wiannamatta Group in this area comprises Bringelly Shale underlain by Ashfield Shale units. The Wiannamatta Group is underlain by Hawkesbury Sandstone.

The Narellan Lineament is the predominant geological feature within the off-airport environment. The Narellan Lineament is a north to south running surface expression of a deep seated, nearly vertical normal fault in the basement structure. It is comprised of fine-grained sand, silt and clay.

Other geological features in the off-airport environment include the Rossmore Syncline and the Luddenham Dyke.

There are two known main aquifer systems in the off-airport environment:

- an unconfined aquifer within localised quaternary alluvium deposits, located around main creeks and drainage features
- a confined aquifer that intersects the Bringelly Shale at around 20 metres below ground surface.

There is thought to be limited hydraulic connection between the unconfined and confined aquifers, as the porosity of the Bringelly Shale is low and likely hosts water in weathered interfaces. The local direction of groundwater flow is likely to be dictated by the local surface waterbodies and presence of alluvium.

Recharge of the groundwater is from rainfall infiltration, infiltration of stream runoff water in upper catchments and by inter-aquifer connectivity. Groundwater contributions to surface water are expected to represent a minor proportion of the overall surface water flows in the area.

The aquifer systems in the off-airport environment are used primarily for livestock, domestic, recreation, and minor irrigation and are not used as a drinking water source.

On-airport

The geology of the on-airport environment is characterised by Triassic sedimentary rocks of the Wiannamatta Group (comprising Bringelly Shale) and Hawkesbury Sandstone, consistent with the off-airport environment described above.

Aquifers within the on-airport environment include:

- an unconfined aquifer in the shallow alluvium of the main watercourses in the on-airport environment
- an intermittent aquifer in weathered clays overlying the Bringelly Shale
- a confined aquifer within the Bringelly Shale
- a confined aquifer within the Hawkesbury Sandstone.

The Bringelly Shale aquifers in the on-airport environment are considered to have limited conductivity.

Groundwater at the airport site is generally poor quality with limited beneficial use or environmental value (DIRD, 2016).

9.7.2 Issues for consideration

Off-airport

Potential impacts to groundwater and geology would include:

- impacts to groundwater flows and groundwater drawdown during excavation and tunnelling works during construction

- impacts to groundwater quality from spills or the disturbance of existing contaminated land
- impacts to surface watercourses with groundwater connectivity
- impacts to groundwater dependent ecosystems.

On-airport

Potential impacts to groundwater and geology in the on-airport environment would be consistent with the impacts described above.

9.7.3 Method of assessment

Off-airport

An assessment of groundwater and geology impacts will be prepared as part of the Environmental Impact Statement. The methodology for the assessment will include:

- baseline hydrogeological assessment including:
 - review of NSW Government legislation, standards and guidelines relevant to the Project
 - review of publicly available information relevant to the assessment of groundwater impacts
 - review of historic Project specific geotechnical and groundwater reports.
- production of a conceptual model and analytical assessment including a qualitative estimate of groundwater inflows and groundwater levels (the assessment would not include numerical modelling)
- qualitative assessment of potential hydrogeological impacts to receptors such as groundwater users, infrastructure, groundwater dependent ecosystems and groundwater quality
- recommendation of mitigation measures.

On-airport

The method of assessment of potential groundwater and geology impacts in the on-airport environment would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister, Commonwealth Infrastructure Minister, relevant provisions of the EPBC Act and Airports (Environment Protection) Regulation. The existing Soil and Water Construction Environment Management Plan for Western Sydney International Stage 1 would also be considered.

9.8 Greenhouse gas

9.8.1 Issues for consideration

Off-airport

Construction

Construction would result in the generation of greenhouse gas emissions. The volume of greenhouse gas emissions generated would depend on the type and quantity of construction materials used, construction methodologies and equipment used, and the overall design (for example, station and platform design). Activities that are anticipated to result in the largest quantities of greenhouse gas emissions include:

- combustion of fuel in construction plant, equipment and vehicles
- disposal of construction waste (indirect emissions would be generated by the decomposition of the waste material at waste handling facilities)
- use of construction materials with a high embodied energy - for example, construction materials (such as steel and concrete) require a considerable amount of energy to manufacture and transport.

It will not be possible to completely avoid the generation of greenhouse gas emissions during construction. However, opportunities to reduce the volume of greenhouse gas emissions will be identified in the Environmental Impact Statement and could include:

- minimising the quantity of fuel and electricity used by construction plant and equipment through the use of biofuels, electricity derived from renewable sources, and energy-efficient work practices (such as using fuel-efficient equipment and avoiding unnecessary idling of construction plant and equipment)
- minimising the quantity of fuel used in the transport of construction materials and spoil through sourcing materials from local suppliers and disposing of spoil at nearby waste handling facilities
- minimising the embodied energy of materials used by substituting materials with high embodied energy for a suitable material with a lower embodied energy (for example, using recycled concrete to reduce the volume of 'new' concrete required)
- minimising onsite electricity consumption by using electricity derived from renewable sources.

Operation

Greenhouse gas emissions during operations would be associated with the consumption of electricity to power the metro trains, signalling, lighting, closed-circuit television and communications systems, station facilities (including lighting and lifts), and other rail infrastructure and systems.

There would also be emissions from the disposal of waste and use of materials during rail maintenance activities (such as fuel, concrete and replacement of steel rails and structures).

Overall, the operation of the Project would encourage the use of large scale public transport in place of individual vehicles. This has the potential to reduce greenhouse gas emissions associated with road transport compared to the emissions that would otherwise occur if the Project were not delivered. Opportunities would be investigated to minimise the generation of emissions from operational electricity consumption through the use of renewable sources of energy where possible.

On-airport

The generation of greenhouse gas outlined for the off-airport environment would be consistent for the on-airport environment. However, the quantity of greenhouse gas generated would be minor compared to the off-airport environment, given the shorter section of the Project to be construction in the on-airport environment.

9.8.2 Method of assessment

Off-airport

A greenhouse gas assessment would be prepared for the Environmental Impact Statement. The following legislation and guidelines will be considered during the preparation of the note:

- *The National Greenhouse and Energy Reporting Act 2007*
- *NSW Climate Change Policy Framework* (OEH ,2016)
- *Environment and Sustainability Policy Framework* (TfNSW, 2013)
- *Environment and Sustainability Policy* (Sydney Metro, 2016).

The methodology for the assessment will include:

- a summary of sustainability initiatives and opportunities to reduce greenhouse gas emissions during design, construction and operation
- a summary of greenhouse gas calculation results from construction and operational energy consumption and associated greenhouse gas emissions of the Project.

On-airport

The method of assessment of potential on-airport impacts to greenhouse gas would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister, Commonwealth Infrastructure Minister and relevant provisions of the EPBC Act, Airports Act and its Regulations. The existing Air Quality Construction Environmental Management Plan for the airport would be considered.

9.9 Sustainability

9.9.1 Overview

Increased provision of public transport delivers a number of sustainability benefits relating to peoples' health, service amenity, cost of living and urban renewal, with subsequent water, energy and greenhouse gas emission efficiencies.

A sustainability plan is being developed for the Project, which builds on the success of the Sydney Metro Northwest and Sydney Metro City & Southwest projects, and will be further developed by the Project against the following five sustainability principles:

- investment made on a whole-of-life basis
- climate change resilience
- local and global environmental responsibility
- protecting biodiversity and heritage
- social responsibility.

The plan will apply to both the off-airport and on-airport components of the Project.

9.9.2 Method of assessment

Off-airport

A sustainability assessment would be prepared for the Environmental Impact Statement. The following legislation and guidelines will be considered during the preparation of the note:

- The National Greenhouse and Energy Reporting Act 2007
- NSW Climate Change Policy Framework (OEH, 2016)
- Environment and Sustainability Policy Framework (TfNSW, 2013)
- Environment and Sustainability Policy (Sydney Metro, 2016).

The methodology for the assessment will include:

- assessment of the Project against the current guidelines including targets and strategies to improve in use of water, energy and transport
- an assessment of potential impacts of climate change on the Project including increased intensity and frequency of rainfall events, and increase in extreme heat days
- a high level summary of sustainability initiatives and opportunities to improve sustainability during design, construction and operation
- consideration of how the Project would achieve a best practice level of performance using market leading sustainability rating tools (for example, Infrastructure Sustainability

Council of Australia (ISCA), Green Star, or equivalent) during design, construction and operation.

On-airport

The method of assessment of the sustainability of the Project would be consistent with the method of assessment for off-airport impacts and any requirements of the Commonwealth Environment Minister, Commonwealth Infrastructure Minister relevant provisions of the EPBC Act, Airports Act and its Regulations. The existing Sustainability Plan for Western Sydney International Stage 1 would be considered.

10 Cumulative impacts

10.1 Overview

Cumulative impacts are impacts that, when considered together, have different and/or more substantial impacts than a single impact assessed on its own. Cumulative impacts can result from the successive, incremental, and/or combined effects of an activity or project when added to other development activities.

The extent to which another development or activity could interact with the construction and/or operation of the Project would depend on its scale, location and/or timing of construction and/or operation. Generally, the largest cumulative impacts would be expected to occur in situations where multiple long-duration construction activities are undertaken close to, and over a similar timescale to, construction activities for the Project. The indicative timeframe for Project is for construction to commence in 2021 and take around five years to complete, with Project opening anticipated to align with when Western Sydney International opens for passenger services.

10.2 Proposed assessment approach

The cumulative impact assessment for the Project will consider the interaction of the Project's impacts with other known or planned development within or in the vicinity of the Project footprint. The assessment will consider the cumulative impacts of:

- developments or activities where construction has commenced and will continue during the construction period of Sydney Metro Greater West
- developments or activities that are approved under planning legislation but where construction is yet to commence
- proposed developments that are reasonably certain to progress (i.e. are under assessment for planning approval or have committed funding).

Potential project developments or activities for inclusion in the cumulative impact assessment will be identified from the following sources:

- a review of the Western Sydney International EIS and associated plans including construction plan
- a review of other major infrastructure project details on the NSW Government Major Projects website
- a review of relevant local council development application registers
- consultation with government agencies, relevant councils and other key stakeholders

- a review of strategic planning documents such as:
 - *Future Transport Strategy 2056*
 - Western Sydney Infrastructure Plan (WSIP).

The identification of relevant developments or activities will focus on projects of a similar scale or with similar impacts to the Project including other State significant development or State significant infrastructure projects.

Potential cumulative impacts arising from the interaction of identified developments or activities with the Project will be assessed in a qualitative or quantitative manner, as relevant.

The extent to which cumulative impacts are likely to be relevant for assessments under the EP&A Act, EPBC Act and Airports Act is summarised in Table 10-1.

Table 10-1 Consideration of cumulative impacts

Legislation	Discussion
EP&A Act	<p>The likely impacts of the Project, including off-airport site impacts of the Project, will need to be considered. Off-airport site impacts will encompass impacts of the on-airport components of the Project outside the airport site.</p> <p>Consideration will also be required of the cumulative impacts of the Project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have been recently completed.</p> <p>It is anticipated that the SEARs for the Project will require the Environmental Impact Statement to include an assessment of the above impacts.</p>
EPBC Act	<p>Consideration of impacts is limited to MNES, other than in the case of assessment of impacts on Commonwealth land which will involve consideration of potential environmental impacts.</p> <p>Accordingly, information in relation to other projects is relevant if those projects contribute, or would likely contribute to the consequences the Project would have, or would be likely to have, on the matter protected by each provision which was a controlling provision in relation to the Project.</p>
Airports Act	<p>The Commonwealth Environment Minister is to consider the impact the Project on the airport site would be likely to have on the environment. This includes an assessment of all impacts to the environment of the on-airport components of the Project and any relevant impacts outside the airport site from carrying out the Project on the airport site.</p>

10.2.1 Approved or proposed infrastructure developments

The following projects have been identified for further consideration of potential cumulative impacts with the Project:

- Western Sydney International Stage 1
- M12 Motorway.

This list of projects will be further considered utilising screening criteria as part of the environmental impact assessment process. The screening will criteria include:

- spatial relevance – does the development overlap with, is adjacent to, or in proximity to the project footprint?
- temporal relevance – is the timing of the construction or operation of the development concurrent with the timing of the construction and operation of the Project?
- is the information publicly available at the time of preparing the Environmental Impact Statement and have an adequate level of detail to allow for a robust assessment of cumulative impacts?

10.3 Potential cumulative impacts

Based on the available information on the scale and nature of the Project and its location, including the location of other nearby developments or activities that are approved or proposed, potential cumulative construction impacts would be largely related to air quality, noise and vibration, biodiversity, traffic and transport and social and economic impacts.

Cumulative biodiversity impacts would be further considered within the context of the provisions of the BC Act and EPBC Act taking into account the existing biocertification for the South West Growth Area and the strategic assessment and conservation planning currently underway for Western Sydney.

Potential cumulative operational impacts would be mainly associated with traffic and transport, noise and vibration, land use and social and economic impacts.

The concept of construction fatigue is also regarded as a cumulative impact. Construction fatigue is where the same sensitive receivers experience construction impacts from a number of developments over a long period of time with few or no breaks between construction activities. Construction fatigue could be experienced where the Project and another development or activity occur consecutively (i.e. back-to-back) or concurrently (i.e. at the same time). Construction fatigue will be discussed in the social and economic assessment of the Environmental Impact Statement.

11 Conclusion

The population of Greater Sydney is projected to grow to eight million over the next 40 years, with the population of the Western Parkland City to grow to over 1.5 million people, accompanied by significant employment growth. The *Greater Sydney Region Plan* sets the vision and strategy for Greater Sydney to become a global metropolis of three unique and connected cities, the Eastern Harbour City, the Central River City and the Western Parkland City.

A joint Australian and NSW Government *Western Sydney Rail Needs Scoping Study* was prepared to inform the rail connections needed throughout the Western Parkland City. This study identified a north-south rail corridor connecting Tallawong Station in Rouse Hill with Macarthur via St Marys and the Western Sydney International site as critical to integrated land use and transport planning for the future of the Western Parkland City.

The *North South Rail Line and South West Rail Link Extension Corridors Strategic Environmental Assessment* further investigated this corridor and proposed the protection of two rail corridors in Western Sydney for future rail infrastructure for passenger train services – the North South Rail Line (now known as Sydney Metro Greater West) and the South West Rail Link extension. Mass-rail transit for the Western Parkland City is also identified as a key element in the *Future Transport Strategy 2056*, the *Greater Sydney Region Plan* and the *Western City District Plan*.

Sydney Metro proposes to construct and operate a new metro rail line (the Project), about 23 kilometres in length (depending on final alignment) with six new metro stations from the T1 Western Line at St Marys in the north to the Aerotropolis Core in the south.

The Project is being delivered under the Western Sydney City Deal, a partnership between the Australian Government, NSW Government and eight Western Sydney local councils that sets out to deliver the grand vision for the Western Parkland City. The Australian and NSW Governments will be partners in funding the Project and have a shared objective to connect rail to Western Sydney International when the airport opens for passenger services.

The new railway would become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service. The Project would enable the realisation of the vision for Western Sydney and the Aerotropolis, by connecting people to employment, education, shops, services and recreation facilities. The Project would also provide important access to Western Sydney International for airport workers and aviation travellers.

The Project includes works required to support the construction and operation of the Project, including all operational systems and infrastructure such as fresh air ventilation systems, signalling, overhead wiring, rail corridor fencing and access tracks/paths.

A stabling and maintenance facility and operations centre would be required to support operation of the Project. This infrastructure is subject to further design but is currently proposed in the area between the Warragamba pipeline and the M4 Western Motorway.

Once complete, the new high-capacity and high-frequency metro rail line would create passenger rail access to the Western Sydney International, and would help optimise land use and development, creating precincts and places at station locations and helping stimulate economic activity and innovation through the co-location of industries.

There are three principal statutory schemes that govern the planning and assessment process for the Project which relate to works that are located outside the airport site (off-airport) and works that are located within the airport (on-airport).

The off-airport components of the Project are subject to assessment and approval under the provisions of both State and Commonwealth environmental planning legislation, being the EP&A Act (NSW), and the EPBC Act (Cth).

The Project is State significant infrastructure and a request for the Project to be declared as critical State significant infrastructure under sections 5.12 and 5.13 of the EP&A Act will be sought. Therefore, the Project would be subject to assessment and approval by the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act.

DPIE is currently managing strategic conservation planning that includes land for the Project north of the airport site. As the strategic assessment has not yet been endorsed, matters potentially requiring assessment and approval under the EPBC Act (including impacts of the Project on MNES and Commonwealth land) would be addressed through a referral to the Commonwealth Environment Minister under section 68 of the EPBC Act. If the Project is determined to be a controlled action by the Commonwealth Environment Minister, an assessment of impacts would be undertaken in accordance with the assessment requirements issued by the Minister. If the Project is determined not to be a controlled action, no further assessment or approval would be required under the EPBC Act. While the strategic assessment will not be relied on for the Project, the Project-specific assessment will be undertaken consistent with DAWE guidance and relevant draft documents relating to the strategic assessment.

Approval under the EP&A Act and EPBC Act is not required for the on-airport elements of the Project. The on-airport elements of the Project, however, trigger requirements to vary the current Airport Plan for Western Sydney International under the Airports Act. The Commonwealth Environment has decided that environmental impacts will require further assessment in the form of preliminary documentation to enable the Minister's advice on the variation of the Airport Plan.

This Scoping Report supports an application to the Minister for Planning and Public Spaces seeking the Secretary's environmental assessment requirements for the Environmental Impact Statement for assessment under the EP&A Act. This report will also provide information to support a referral to the Commonwealth Environment Minister under the EPBC Act, and relevant information has been used to support the referral process to the Commonwealth Environment Minister in relation to the proposed variation to the Airport Plan for the on-airport component. A preliminary environmental risk analysis for the Project has identified the following 'key' environmental issues:

- traffic and transport
- noise and vibration
- biodiversity
- non-Aboriginal heritage
- Aboriginal heritage
- land use and property
- social and economic
- flooding, hydrology and water quality
- landscape and visual impact.

A preliminary environmental risk analysis of the Project's potential impacts has confirmed that the above issues have the potential to result in a significant impact. The preliminary environmental risk analysis has been prepared based on the interim project definition. It is noted that the project components, location and design would be subject to further refinement and changes as part of the ongoing design development and community consultation, and clarifications may be made during the environmental impact assessment process.

Detailed assessment of these issues, and the other environmental issues identified, would be undertaken as part of the Environmental Impact Statement. As part of this assessment process, environmental mitigation measures would be developed to minimise the potential impacts of the Project during construction and operation.

Following the receipt of the Secretary's environmental assessments requirements, Sydney Metro will prepare an Environmental Impact Statement for public exhibition. The Environmental Impact Statement will include:

- a description of the Project, including its components and construction activities
- the strategic context and justification for the Project
- an analysis of the strategic alternatives and options considered for the Project

- a description of the existing environment and an assessment of potential direct and indirect impacts on the key and other potential environmental issues during construction and operation of the Project, including cumulative impacts
- identification of measures to be implemented to avoid, minimise, manage, mitigate, offset and/or monitor potential impacts of the Project
- identification and consideration of issues raised by stakeholders and the community.

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Glossary

Term	Meaning
Aboriginal cultural heritage	The tangible (objects) and intangible (dreaming stories, song lines and places) cultural practices and traditions associated with past and present day Aboriginal communities.
Aboriginal Heritage Information Management System	A register of NSW Aboriginal heritage information maintained by the NSW Office of Environment and Heritage.
Aboriginal object	Any deposit, object or material evidence (not being a handcraft made for sale), including Aboriginal remains, relating to the Aboriginal habitation of NSW.
Aboriginal place	Any place declared to be an Aboriginal place under section 94 of the <i>National Parks and Wildlife Act 1974</i> (NSW).
Acid sulfate soils	Naturally occurring soils, sediments or organic substrates (e.g. peat) that are formed under waterlogged conditions. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However, if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides react with oxygen to form sulfuric acid.
Alignment	The geometric layout (e.g. of a rail line) in plan (horizontal) and elevation (vertical).
Ancillary	A subordinate part of an element.
Aquifer	A groundwater bearing formation sufficiently permeable to transmit and yield groundwater or water bearing rock.
Arterial roads	The main or trunk roads of the State road network.

Term	Meaning
Average recurrence interval (ARI)	An indicator used to describe the frequency of floods. The average period in years between the occurrence of a flood of a particular magnitude or greater. In a long period of say 1,000 years, a flood equivalent to or greater than a 100 year ARI event would occur 10 times. The 100 year ARI flood has a 1 per cent chance (i.e. a one-in-100 chance) of occurrence in any one year. Floods generated by runoff from the study catchments are referred to in terms of their ARI, for example the 100 year ARI flood.
Background noise level	The ambient sound-pressure noise level in the absence of the sound under investigation exceeded for 90 per cent of the measurement period. Normally equated to the average minimum A-weighted sound pressure level.
Cut-and-cover	A method of tunnel construction whereby the structure is built in an open excavation and subsequently covered.
Detailed design	The stage of design where project elements are designed in detail, suitable for construction.
Drawdown	Reduction in the level of the water table caused by changes in the local environment.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
Erosion	A natural process where wind or water detaches a soil particle and provides energy to move the particle.
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. 'Feasible' relates to engineering considerations and what is practical to build. 'Reasonable' relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community expectations and nature and extent of potential improvements.
Flood prone land	Land susceptible to flooding by the probable maximum flood. Note that the flood prone land is also known as flood liable land.
Floodplain	Area of land which is inundated by floods up to and including the probable maximum flood event (i.e. flood prone land).

Term	Meaning
Greenhouse gas	Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. Water vapour (H ₂ O), carbon dioxide (CO ₂), nitrous oxide (N ₂ O), methane (CH ₄) and ozone (O ₃) are the primary greenhouse gases in the Earth's atmosphere (CSIRO and BoM 2015).
Groundwater dependent ecosystem	Refers to communities of plants, animals and other organisms whose extent and life process are dependent on groundwater, such as wetlands and vegetation on coastal sand dunes.
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
Heritage item	Any place, building or object listed on a statutory heritage register
Hydraulic conductivity	A characteristic of soil that describes how easily water moves through it. Low hydraulic conductivity would indicate poor water transmitting properties.
Hydrology	The study of rainfall and surface water runoff processes.
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
Infiltration	The downward movement of water into soil and rock. It is largely governed by the structural condition of the soil, the nature of the soil surface (including presence of vegetation) and the antecedent moisture content of the soil.
Landscape character	The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land – built, planted and natural topographical and ecological features.
Median	The central reservation which separates carriageways from traffic travelling in the opposite direction.
Motorway	Fast, high volume controlled access roads. May be tolled or untolled.
North South Rail Line	A north-south rail corridor connecting Tallawong Station in Rouse Hill with Macarthur via St Marys and the Western Sydney International, investigated as part of the joint Australian and NSW Government <i>Western Sydney Rail Needs Scoping Study</i> , prepared to inform the rail connections needed throughout the Western Parkland City. This rail line is now referred to as Sydney Metro Greater West.

Term	Meaning
Obstacle Limitation Surface	A series of surfaces that define the limits to which structures or objects may project into the airspace to ensure the safety of aircraft in visual flight conditions.
Overflight	The flight of an aircraft over a particular area
Pollutant	Any measured concentration of solid or liquid matter that is not naturally present in the environment.
Prescribed airspace	The airspace above any part of either an Obstruction Limitation Surface or a 'procedures for air navigation systems – aircraft operations' (PANS-OPS) surface for Western Sydney International. The obstacle limitation surface is a series of surfaces that define the limits to which structures or objects may project into the airspace to ensure the safety of aircraft in visual flight conditions.
Probability	A statistical measure of the expected chance or likelihood of occurrence.
Probable maximum flood	The flood that occurs as a result of the probable maximum precipitation on a study catchment. The probable maximum flood is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The probable maximum flood defines the extent of flood prone land (i.e. the floodplain).
Proponent	The person or organisation that proposes to carry out the project or activity. For the purpose of the Project, the proponent is Sydney Metro.
Risk	Chance of something happening that will potentially have an undesirable effect. It is measured in terms of consequence and likelihood.
Runoff	The amount of rainfall that ends up as streamflow, also known as rainfall excess.

Term	Meaning
Sensitive receiver	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation areas (including parks and sports grounds), commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, retail spaces and industrial premises).
Settlement	Refers to how ground can move due to the construction of new infrastructure.
Spoil	Surplus excavated material.
Stockpile	Temporary stored materials such as soil, sand, gravel, spoil/waste.
Stream order	A classification system which assigns an 'order' to waterways according to the number of additional tributaries associated with each waterway, to provide a measure of system complexity.
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape.
Sustainable development	Development which meets the needs of the present, without compromising the ability of future generations to meet their own needs (Brundtland 1987).
Urban design	The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.
Waste hierarchy	Approach of prioritising waste avoidance and resource recovery (including reuse, reprocessing, recycling and energy recover) before consideration of waste disposal.
Waterway	Any flowing stream of water, whether natural or artificially regulated (not necessarily permanent).
Wayfinding	This refers to navigational signage or roadway markers such as in the tunnels or at stations.

Abbreviations

Abbreviation	Meaning
ABS	Australian Bureau of Statistics
AHIMS	Aboriginal Heritage Information Management System
Airports Act	<i>Airports Act 1996 (Cth)</i>
AM peak hour	Unless otherwise stated, this refers to vehicle trips arriving at their destination during the average one hour peak period between 6am – 10 am on a normal working weekday.
ANZECC	Australian and New Zealand Environment Conservation Council
ARI	Average recurrence interval
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
AS	Australian Standard
AS/NZS	Australian Standard/New Zealand Standard
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BDAR	Biodiversity Development Assessment Report
CASA	Civil Aviation Safety Authority
CBD	Central business district
CCTV	Closed circuit television
CEMP	Construction Environmental Management Plan
CLM Act	<i>Contaminated Land Management Act 1997 (NSW)</i>
CNVMP	Construction Noise and Vibration Management Plan
CoPC	Contaminants of Potential Concern
CSSI	Critical State significant infrastructure
Cth	Commonwealth
dB	Decibel

Abbreviation	Meaning
dB(A)	A-weighted decibels. A-weighting is applied to instrument-measured sound levels in effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.
DAWE	Department of Agriculture, Water and the Environment (DAWE)
DECC	Former NSW Department of Environment and Climate Change (now DPIE)
DECCW	NSW Department of Environment, Climate Change and Water (formerly DECC, but now DPIE)
DIRD	Former Department of Infrastructure and Regional Development (Australian Government) (now DITRDC)
Dol	Former Department of Industries (NSW Government) (now DPIE)
DITCRD	Department of Infrastructure, Transport, Cities and Regional Development (Australian Government) (now DITRDC)
DITRDC	Department of Infrastructure, Transport, Regional Development and Communications (Australian Government) (formerly DITCRD)
DPE	Former Department of Planning and Environment (NSW Government) (now DPIE)
DPIE	Department of Planning, Industry and Environment (NSW Government) (formerly DPE)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i> (NSW)
EPA	Environment Protection Authority (NSW Government)
EPBC Act	<i>Environment Protection and Biodiversity Act 1999</i> (Cth)
EPL	Environment protection licence
FTE	Full-time equivalent
IAQM	Institute of Air Quality Management
ISCA	Infrastructure Sustainability Council of Australia
ISO	International Organisation for Standardisation
LALC	Local Aboriginal Land Council

Abbreviation	Meaning
LEP	Local Environmental Plan
LGA	Local government area
MNES	Matters of national environmental significance
NCA	Noise Catchment Area
NSW	New South Wales
OEH	Former Office of Environment and Heritage (NSW Government) – now part of DPIE
PAD	Potential archaeological deposits
PANS-OPS	Procedures for air navigation systems – aircraft operations
PM peak hour	Unless otherwise stated, this refers to trips travelling on the network during the average one hour peak period between 3pm–7pm on a normal working weekday.
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
RAP	Remediation Action Plan
RAPs	Registered Aboriginal Parties
RNP	Road Noise Policy
SEARs	Planning Secretary's environmental assessment requirements
SEPP	State Environmental Planning Policy
SMGW	Sydney Metro Greater West
SSI	State significant infrastructure
TBM	Tunnel boring machine
TEC	Threatened ecological community
TfNSW	Transport for NSW
WSAP	Western Sydney Aerotropolis Plan

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