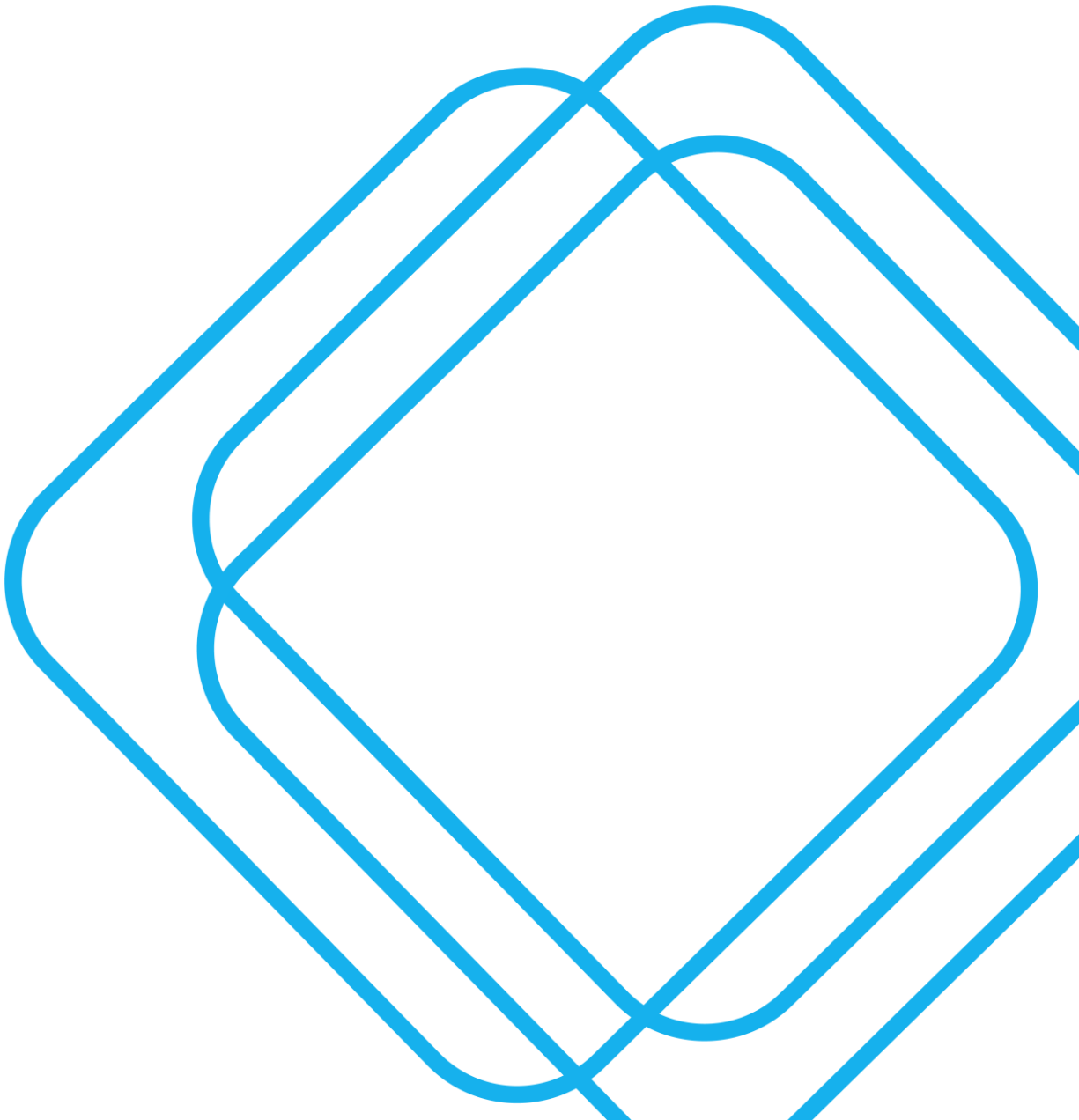
THE BELMORE ROAD PRECINCT

Traffic, Transport and Access Assessment

11 JULY 2022



Quality Assurance

Project:	The Belmore Road Precinct		
Project Number:	SCT_00149		
Client:	CKDI PTY LTD	**ABN:**	
Prepared by:	SCT Consulting PTY. LTD. (SCT Consulting)	**ABN:**	53 612 624 058

Quality Information	
Document name:	The Belmore Road Precinct
Prepared:	Shawn Cen, Senior Consultant Jonathan Busch, Associate Director
Reviewed:	Andy Yung, Director
Authorised:	Andy Yung, Director

Revision	Revision Date	Details
1.0	15 March 2021	Draft report
2.0	25 March 2021	Final report
3.0	9 April 2021	Updated Final report
4.0	14 June 2022	Updated final report (with revised ILP and yield)
5.0	11 July 2022	Updated final report (renaming of precinct)

Contents

Executive Summary

Purpose of the study

SCT Consulting was engaged by the CKDI Pty. Ltd. (CKDI) to undertake a traffic, transport and access assessment to support the planning proposal of the Belmore Road Precinct (previously known as South Creek West Bringelly Sub Precinct 2), located in the South West Growth Area (SWGA). The Belmore Road Precinct is bound by the old The Northern Road to the east, Greendale Road to the north, lot boundaries to the west and the planned Lowes Creek Link Road to the south. The Belmore Road Precinct, predominantly agricultural land use, is proposed to be rezoned into a community with ready access to employment, public transport, education and commercial facilities, and is well-positioned to be integrated into infrastructure development in the wider regional area.

The assumptions for the site were made during the planning of Lowes Creek Maryland (LCM), a Department of Planning and Environment (DPE)-led planning proposal to the south. Traffic modelling and transport assumptions were based on the work for this site.

Future planning context

The SCW Release Area where the site sits anticipates a capacity of 30,000 dwellings and 1,000 new jobs. Significant growth of employment and residents are expected in the vicinity of the site in the future. Western City District Plan establishes a housing target of 184,500 by 2036. Aerotropolis Core to the north of the site, as part of the Western Sydney Aerotropolis Plan, is estimated to have 50,000 to 60,000 jobs and 20,000 to 24,000 residents, while the residential dwelling target for the Oran Park Precinct to the south is 7,540 dwellings. This will be supported by several committed transport projects and projects under investigation to realise the vision of the 30-minute city and modal change to sustainable transport.

The planned rail corridor including North-South Rail Link / The South West Rail Link Extension and the provision of rapid bus service on The Northern Road could promote public transport use especially for commuting to/from Aerotropolis and Greater Sydney. The first stage of the North-South Rail Link has been committed, named as Sydney Metro - Western Sydney Airport between St Marys to Western Sydney Airport and Badgerys Creek Aerotropolis.

The potential Outer Sydney Orbital is identified approximately 2.5 kilometres to the west of the site and may have an interchange at Greendale Road, making it convenient to access from/to the site.

Existing conditions

The 2016 Method of Travel to Work data was analysed to determine current travel behaviour and patterns to and from the site during peak travel periods. The study area showed a higher proportion of car use in the local area, 73 per cent, in comparison to the 53 per cent of Greater Sydney. Train and bus usage was low at a total of nine per cent given the long commuting time to jobs by public transport, whereas Greater Sydney showed 22 per cent in total. Active transport use was low given limited employment opportunity in the vicinity and a gap of cycling infrastructure provision in the local area to connect to the regional network.

The road network around the site mainly includes The Northern Road, Bringelly Road which are now being upgraded by TfNSW. The Northern Road has been widened to four lanes two way and the wide median will allow for future six-lane configuration. A grade separate intersection has been provided at The Northern Road / Bringelly Road / Greendale Road intersection to provide enough capacity as part of the project upgrade. This tallies with the findings in the historical study where the existing intersection has shown poor performance and the mid-block traffic volumes have exceeded the road capacity during the commuting peaks.

The site is around seven kilometres to the west of Leppington Railway Station which is a terminal station that provides T2 Inner West & Leppington Line and T5 Cumberland Line services. It has a frequency of about seven services during AM peak hour. Bus service is only available on The Northern Road and Bringelly Road, with low bus frequency at the nearby bus stops. Given the rural nature and lack of urban development in the vicinity of the site, pedestrian and cycling accessibility are generally poor.

Proposed development

Key features of the Belmore Road Precinct Indicative Layout Plan are:

- Connections and continuity to Lowes Creek Maryland precinct, providing a seamless interface to the proposal to the south, including land use and road network elements (including walking and cycling connections)
- A town centre at the centre of the site, minimising the travel distance of residents to their local shops and hence encouraging residents to access the shops via sustainable and active transport means
- A school integrated with local open space and the town centre
- A riparian corridor oriented diagonally through the middle of the precinct, that facilitates off-road shared paths across the majority of the precinct with several connections across to connect with the town centre, the school, the playing fields as well as The Northern Road
- Density clustered around the town centre and dissipating to the edges of the precinct.

The yield of the Belmore Road Precinct ILP is shown in the below table.

Use	Yield[1]	Source
Low density residential	1,419 dwellings (average of high and low estimates)	Urbis revised final Rev B, dated 31 May 2022[2]
Medium density residential	1,118 dwellings (average of high and low estimates)	
High density residential	108 dwellings (average of high and low estimates)	
School	1 primary school	
Community uses	1,200 m^2 GFA	South Creek West Bringelly Precinct Urban Design Report, 2021
Supermarket	8,000 m^2 GFA	
Speciality Retailers	3,500 m^2 GFA	
Local employment (gym, childcare, medical centre, service station, fast food)	2,500 m^2 GFA	

The yield assumptions are in line with the types of uses anticipated in the LCM transport study.

Transport assessment

Intersection modelling was undertaken for 2031 and 2041, which forecast the following infrastructure would be required by 2041:

- A six-lane corridor for The Northern Road
- Triple right turn lanes (south to east) and additional left turn lane (east to south) for Greendale Road / TNR / Bringelly Road interchange
- Additional turning lane from the precinct on the side roads (up to two lanes) at multiple intersections on The Northern Road
- Widen Greendale Road to two lanes in each direction between the north-south sub-arterial road and the Greendale Road / The Northern Road / Bringelly Road interchange
- Ban right turn for the east approach of The Northern Road / Belmore Road
- Dual right turn lanes on The Northern Road.

A road hierarchy has been developed that provides sub-arterial connections through the site to reduce pressure on The Northern Road. All sub-arterial and collector roads are bus-capable to make sure that the entirety of the precinct can be serviced by buses when the network is defined.

[1] It is noted that the yields are the best and most realistic estimates at the time of preparing this version of the ILP and will continue to evolve as the ILP develops. Updates to the yield post and modelling of the maximum development potential will occur post gateway.
[2] A middle ground between the upper and lower estimates was selected for preliminary modelling pre-gateway. When the ILP is prepared in more detail post gateway that the traffic modelling would reflect the maximum yield of the zoning.

With footpaths proposed on both sides of all roads, active transport can be one of the most convenient modes for short-distance trips. The road network is grid-like in structure, providing numerous crossing opportunities and reducing travel distance between residential areas and the town centre.

Delivery of the planned Bringelly Metro Station is indicatively four kilometres north of the site. The new station and a bus network that could be delivered in connection with Sydney Metro could significantly change travel behaviour in the area. The current transport assessment does not account for this potential change to take a conservative approach. Understanding the potential mode shift will be important to confirm post gateway.

As such, there is merit for the site to proceed through gateway, after which further work can be done to refine the proposals based on consultation with TfNSW, Council and DPE.

Next Steps

The following next steps are proposed:

– Council and TfNSW provide comments as a part of the lodgement process with Council

– Council lodgement of the planning proposal, followed by DPE gateway determination

– It is proposed to convene a Project Steering Group with Council, DPE, TfNSW and the proponent to use as a means of resolving technical issues during the development of a Transport Mobility and Access Plan (TMAP)

– Following gateway approval, SCT Consulting will prepare a TMAP Scoping Note that agrees on the technical scope that would satisfy any relevant gateway conditions, for the approval of the steering committee.

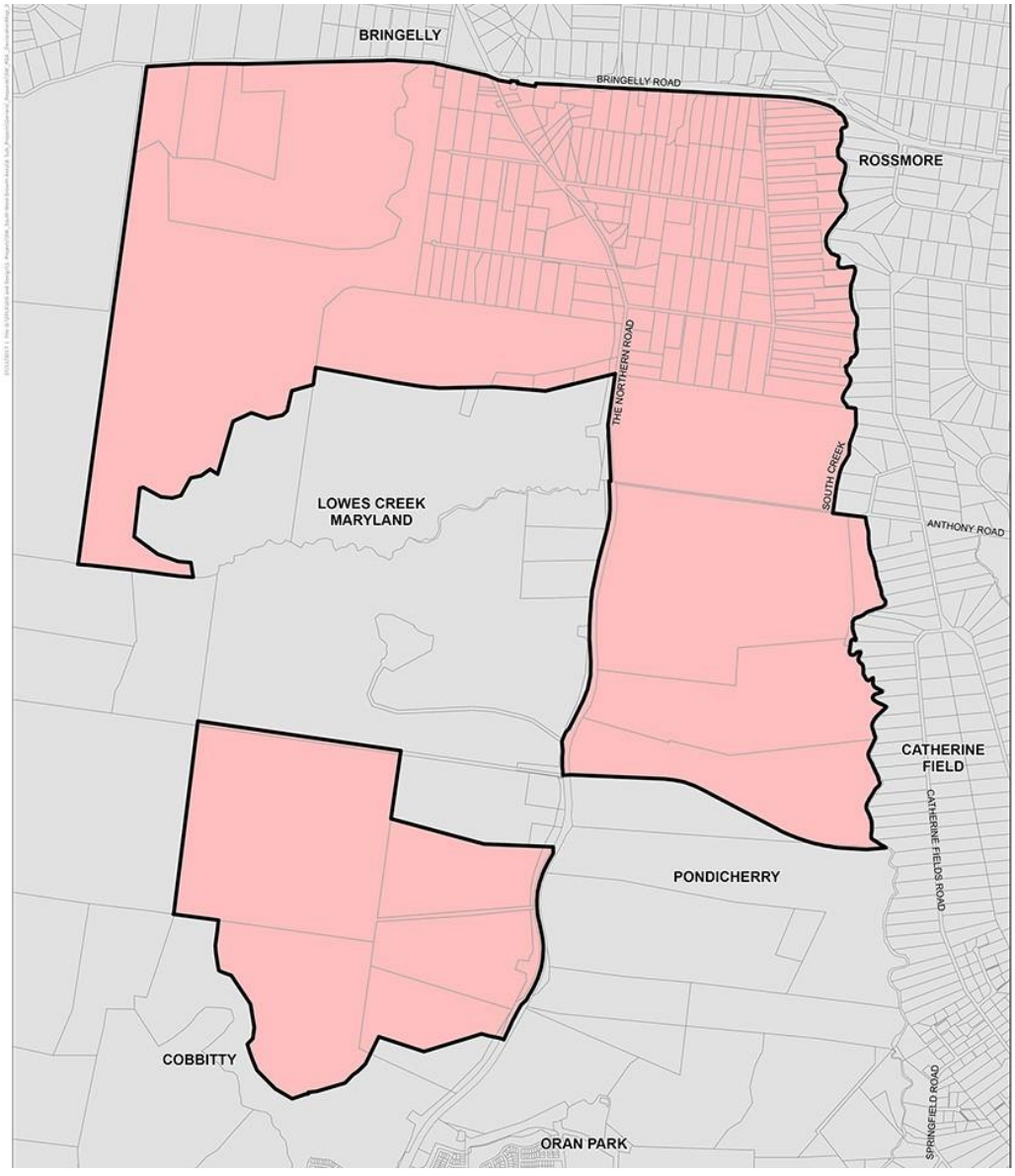
1.0 Introduction

1.1 Background

The NSW Government is working to deliver new sustainable, liveable and connected communities, improved transportation networks, and employment opportunities in the South West Growth Area (SWGA) to accommodate Sydney's growing population. The SWGA will be a vibrant, attractive and connected community, where people can access a range of jobs, public transport, education and community facilities, open space, shops and cafes. When fully developed, the SWGA will accommodate at least 155,000 homes, with a Green Grid linking growing suburbs, rehabilitating waterways, and providing recreation and community areas.

As part of this, the South Creek West Area was released in late 2017, along the newly upgraded The Northern Road corridor. The land was predominately used for agricultural purposes and the release will provide opportunities for the creation of new communities and future transport services within the Camden Local Government Area. In total, the South Creek West Release Area (as shown in **Figure 1–1**) will accommodate up to 30,000 dwellings and provide access to schools, employment, open space, parklands, and transportation corridors within proximity to the Western Parkland City and Western Sydney Aerotropolis.

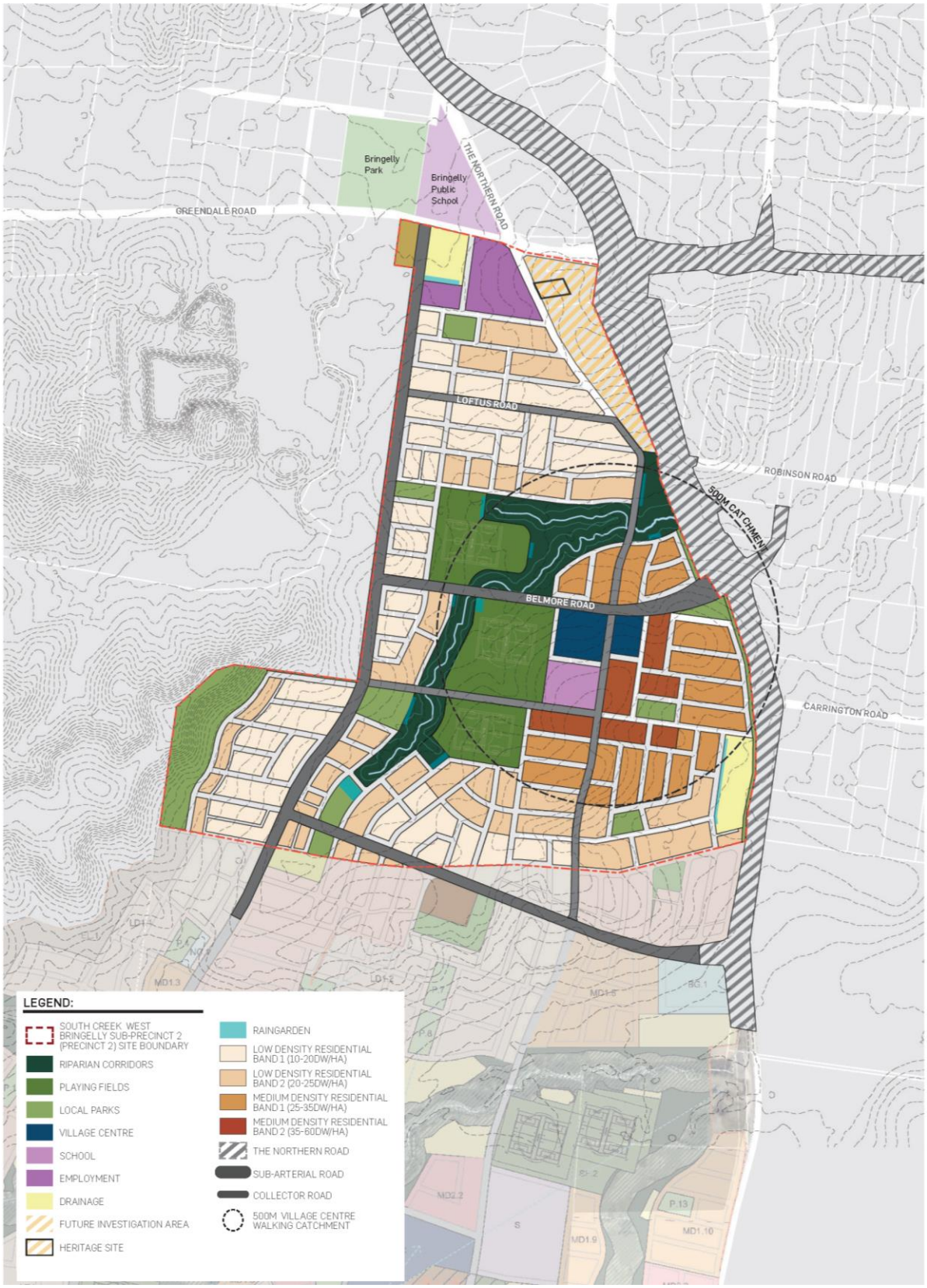
Figure 1–1 South Creek West release area



Source: NSW Department of Planning, Infrastructure and the Environment (DPIE), 2017

SCT Consulting was engaged by the CKDI Ptd Ltd (CKDI) to undertake a traffic, transport and access assessment to support the planning proposal of the Belmore Road Precinct, as shown in **Figure 1–2**.

Figure 1–2 The Belmore Road Precinct Indicative Layout Plan



Source: Urbis, 2022

The site is currently rural, covering a total area of 187.3 hectares. It is bound by the old The Northern Road to the east, Greendale Road to the north, the existing trail to the west, Lowes Creek Maryland precinct to the south. Greendale Road, Loftus Road and Belmore Road are the major street networks that could provide accesses to The Northern Road from the site.

The Belmore Road Precinct is expected to cater for an assumed average of 2,600 dwellings with a mix of low to high-density residential premises. There is a minimum and maximum yield which has been considered for the ILP through the urban design process. The dwelling yield range is 2,022 to 3,271 dwellings.

1.2 Purpose of report

The purpose of this traffic, transport and access assessment is to support the planning proposal based on the design of the proposed concept masterplan, including:

- Inform future planning controls to ensure a coordinated and efficient approach to land use planning, environmental management and transport infrastructure
- Provide an integrated approach to determining the optimal mix of land uses and density concentrations as a means of minimising (where possible) trip generation and transport-related demand
- Ascertain the cumulative and regional traffic and transport impacts associated with future land-based demands associated with the rezoning
- Maximise efficiency and safety of the existing/proposed transport systems in proximity to the subject site.

1.3 Scope and limitations

The scope of this study is to:

- Undertake a background information and documentation review
- Collate existing traffic and travel pattern data
- Review of existing traffic and transport conditions
- Understand the status of any planned and committed infrastructure upgrades
- Understand trip generation and trip distribution to understand likely implications of the proposed development
- Determine likely infrastructure upgrades required to cater for the proposed development
- Identify public and active transport measures and sustainable travel initiatives for the development, as well as the likely required parking provision.

All source of data used in this study has been carefully verified and checked by SCT Consulting. However, given the level of detail of the assessment, the modelling accuracy will be affected by any potential changes to the assumptions in the future.

1.4 Report structure

This report has been structured into the following sections:

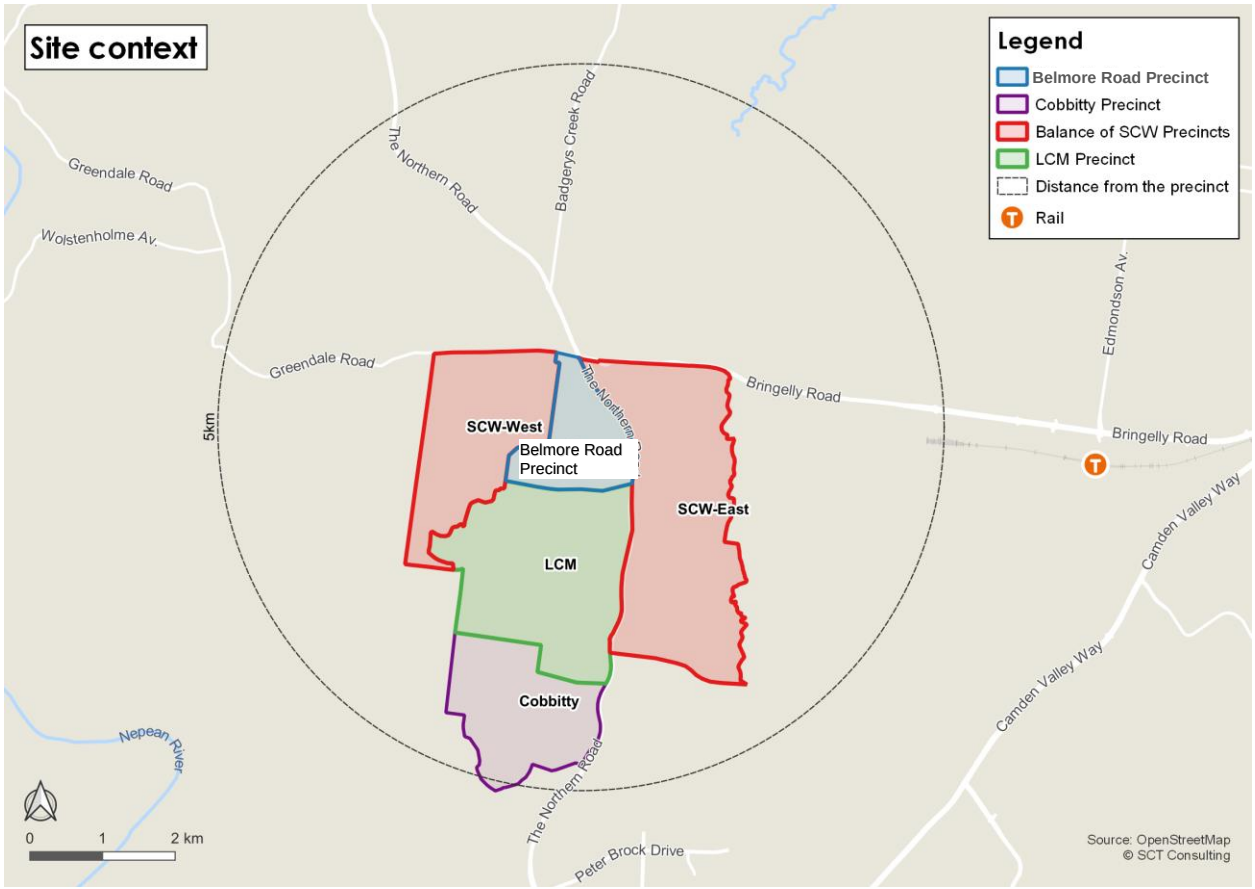
- **Section 2.0** provides a summary of the review of all relevant background documents
- **Section 3.0** describes the existing transport conditions for all modes of transport
- **Section 4.0** describes the proposed development, its access strategy and a review of parking and access requirements
- **Section 5.0** outlines the traffic and transport appraisal which describes the modelling undertaken, the likely trip generation, indicative impact as a result of the proposed development
- **Section 6.0** assesses the gateway risks
- **Section 7.0** summarises the report content and presents the conclusions.

2.0 Strategic Context

2.1 Site context

The Belmore Road Precinct is bound by the old The Northern Road to the east, Greendale Road to the north, the existing trail to the west, Lowes Creek Maryland precinct to the south as shown in **Figure 2–1**.

Figure 2–1 The Belmore Road Precinct in a regional context



The majority of the site is zoned as RU1 Primary Production and RU4 Primary Production Small lots with a small piece of Neighbourhood Centre in the northeast. Current land use to the north of the site includes Bringelly Community Centre and Bringelly Public School. Leppington Station is seven kilometres to the east of the site, providing connectivity to the Sydney Greater Metropolitan Area (GMA) through mass transit services.

As part of the SWGA, the site aims to be redeveloped into a community with ready access to employment, public transport, education and commercial facilities and is well-positioned to be integrated into infrastructure development in the wider regional area outlined in future details below.

2.2 Regional planning and land use context

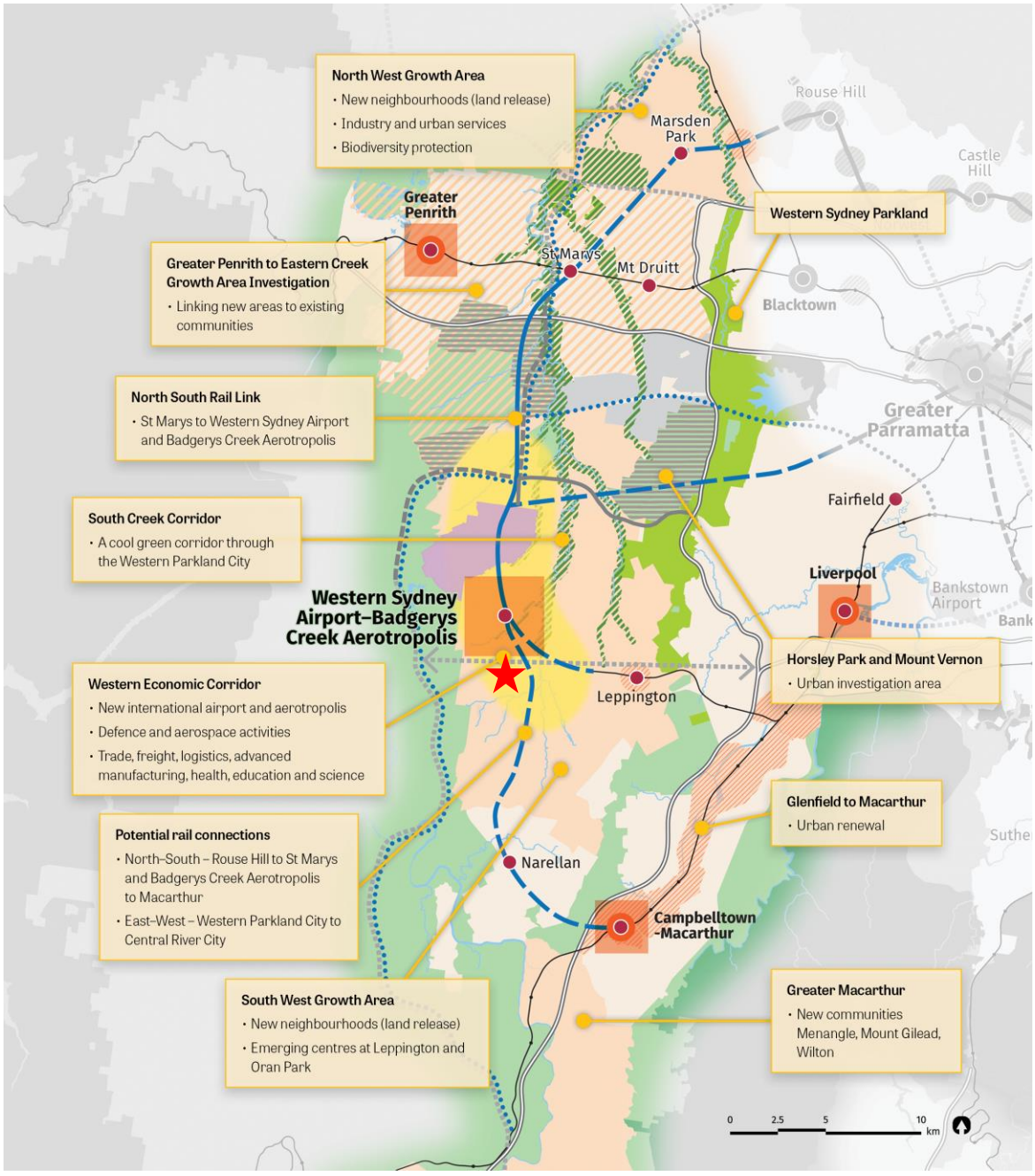
2.2.1 Greater Sydney Region Plan – A Metropolis of Three Cities

The Greater Sydney Region Plan, A Metropolis of Three Cities, is aiming at delivering three cities where most residents are within a 30-minute commute to employment, education, and health facilities, services, and great places. The vision seeks to develop Greater Sydney into a metropolis comprised of the Western Parkland City, the Central River City, and the Eastern Harbour City.

The site currently resides in what seeks to become the Western Parkland City which encompasses current and future centres of Greater Penrith, Western Sydney Airport – Badgerys Creek Aerotropolis, and Campbelltown – Macarthur.

Development projects, as shown in **Figure 2–2** that outline key growth areas and infrastructure upgrades envisioned to develop the Western Parkland City.

Figure 2–2 Western City Parkland Infrastructure Development



Source: Greater Sydney Commission, 2018

The vision of the Western Parkland City is to form new city-shaping transport and to introduce the airport that makes the city the most connected place in Australia:

– The Australian and NSW Governments will deliver the first stage of the North-South Rail Link from St Marys to the Western Sydney Airport and Badgerys Creek Aerotropolis

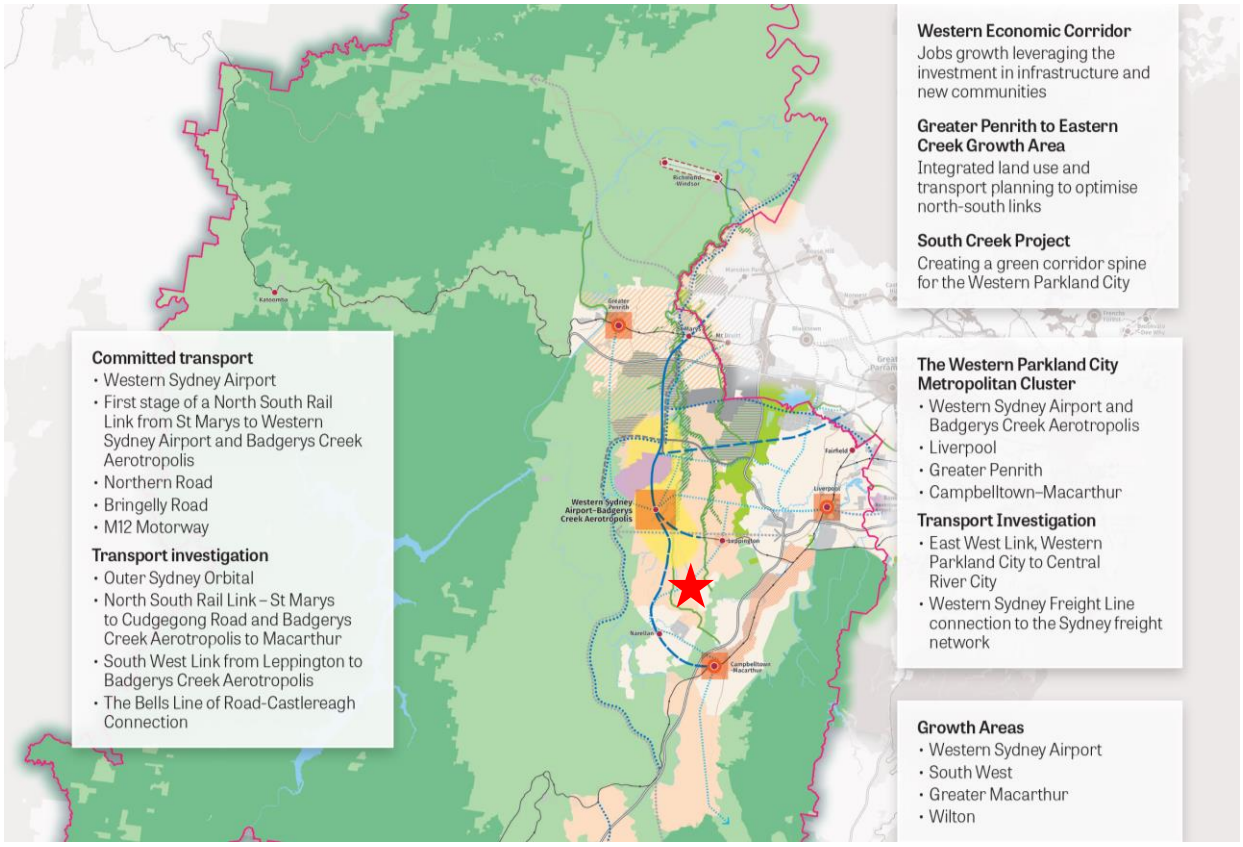
– A potential new east-west mass transit corridor will connect the Western Parkland City to the Central River City

– Potential Outer Sydney Orbital will provide the city with direct connections to Greater Newcastle, Wollongong and Canberra.

2.2.2 Western City District Plan

The Western City District Plan involves the local government areas of Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly. It aims to ensure future generations have excellent connections to local jobs, housing, services, and great places. Under the Plan, the site is located south of the Western Sydney Airport – Badgerys Creek Aerotropolis as shown in **Figure 2–3**.

Figure 2–3 Western City District Plan



Source: Western City District Plan, 2018

The Western Sydney Airport and Badgerys Creek Aerotropolis, located to the north of the site are expected to transform the Western City District, creating a once-in-a-generation economic boom for residents, bringing infrastructure, businesses and knowledge-intensive local jobs to residents.

The Plan establishes a housing target of 39,850 new dwellings by 2021 and 184,500 by 2036, with 11,800 additional dwellings in Camden LGA to accommodate this growth by 2021, the Draft District Plan outlines several overarching priorities and actions that will shape the future and guide policy decisions for this District. They include:

– Planning a city supported by infrastructure, including infrastructure that supports the new Western Sydney Airport and responds to growth

– Giving people housing choices by providing housing supply, choice and affordability, with access to jobs and services

– Designing places for people by creating and renewing great places and local centres, and respecting the district's heritage

– Developing a more accessible and walkable city by establishing the land use and transport structure to deliver a liveable, productive and sustainable Western Parkland City

– Creating the conditions for a stronger economy by actions including leveraging the industry opportunities from the Western Sydney Airport and Badgerys Creek Aerotropolis, planning and managing industrial and urban services land and growing investment, business opportunities and jobs in strategic centres

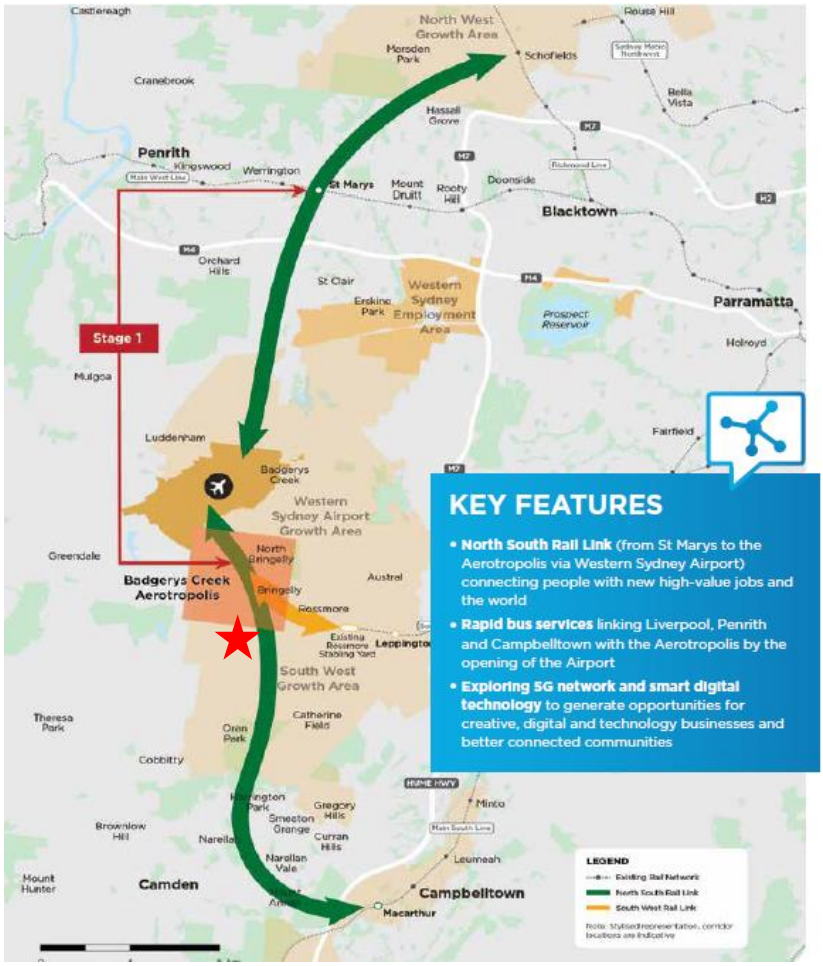
– Valuing green spaces and landscape by actions including creating a protecting and enhancing bushland and biodiversity Planning Priority, better managing rural areas and delivering high-quality open spaces.

2.2.3 Western Sydney City Deal

The Western Sydney City Deal is a partnership between the Australian Government, NSW Government, and local governments of the Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly, announced on 4 March 2018.

Of most relevance to this study are the committed improvements in connectivity through the Western Sydney City. The new Western Parkland City will be one of Australia's most connected cities. In an emerging 30-minute city, innovative public transport, aviation and digital infrastructure will bring residents closer to jobs, centres, education and the world. The key features of transport improvements of the Western Sydney City Deal are shown in **Figure 2–4**.

Figure 2–4 Key features of improved connectivity and public transport options



Source: Western Sydney City Deal, 2018

The Australian and NSW Governments jointly committed to delivering the first stage of the North-South Rail Link from St Marys to Badgerys Creek Aerotropolis via Western Sydney Airport, with a joint objective of having rail connected to the Western Sydney Airport in time for its opening.

Work will immediately commence on a thorough design and investment case for the North-South Rail Link (including the South West Rail Link) as part of an integrated planning and city-shaping approach. Both governments will contribute up to $50 million each to a business case process, in consultation with local government. This will include an investigation of integrated transport and delivery options for a full North-South Rail Link from Schofields to Macarthur and a South West Rail Link to connect Leppington to the Western Sydney Airport via an interchange at the Badgerys Creek Aerotropolis.

The NSW Government will establish rapid bus services from the metropolitan centres of Penrith, Liverpool and Campbelltown to the Western Sydney Airport before it opens in 2026, and to the Badgerys Creek Aerotropolis.

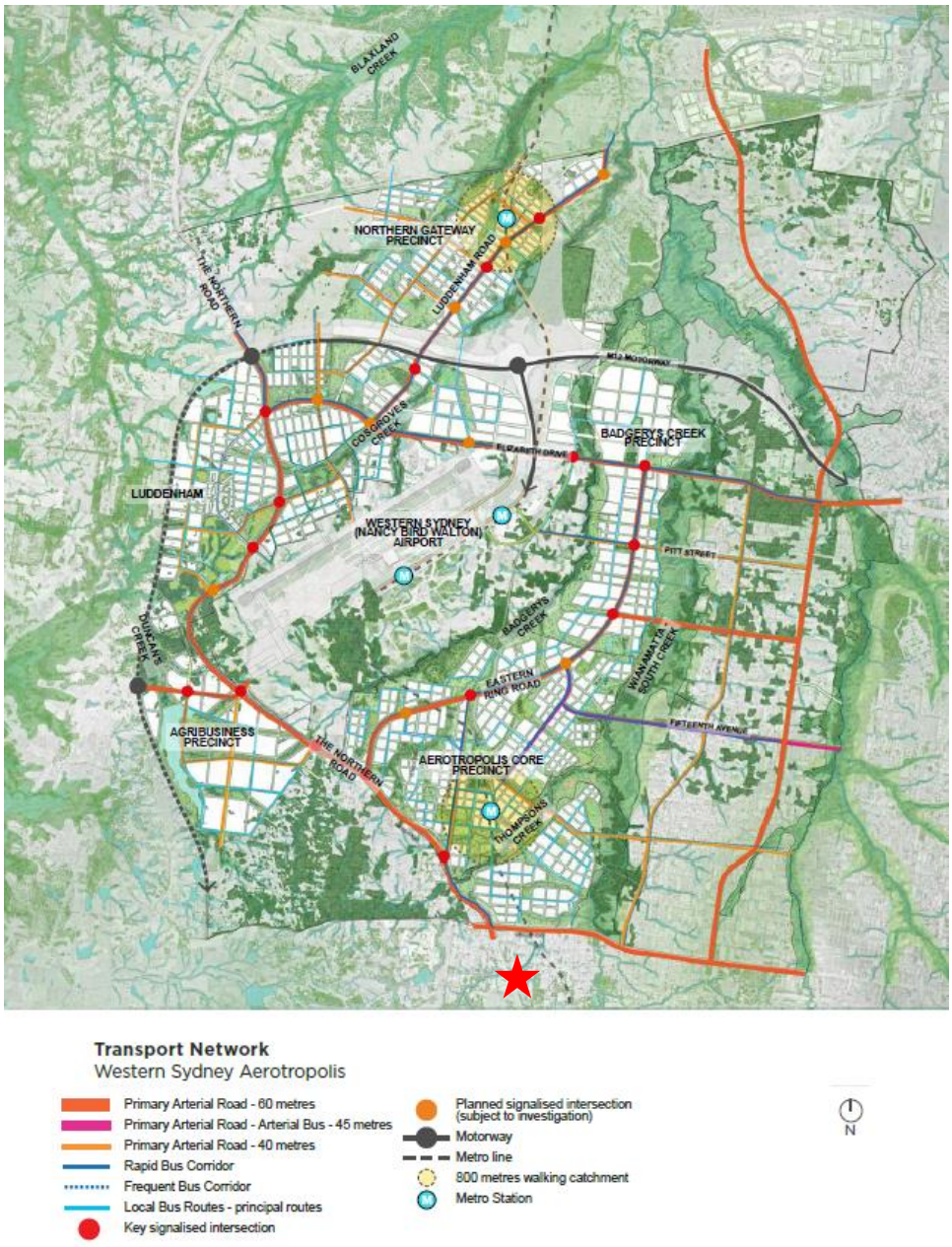
Implications for the site: The site will be developed to house residents who are envisioned to be employed mainly in the surrounding centres and Greater Sydney Metropolitan Area. As part of the vision for a 30-minute commute, the site will benefit from upgrades to roads, public transport, and active transport networks in the region including North-South Rail Link, Outer Sydney Orbital and rapid bus services.

2.2.4 Western Sydney Aerotropolis Planning Package

The Western Sydney Aerotropolis Plan outlines the plan to develop an 11,200-hectare site surrounding the future Western Sydney International Airport. The plan envisions a 24-hour metropolitan centre that is accessible, innovative and accommodates high-value jobs close to where people live. When complete, the Aerotropolis will be home to a potential of 34,000 residents and more than 100,000 jobs throughout its 10 precincts.

Aerotropolis Core Precinct in the immediate north of the site will become a diverse, dynamic and sustainable global airport city with attractive places for workers, residents and visitors accommodating 50,000 to 60,000 potential jobs and 20,000 to 24,000 potential residents.

Figure 2–5 Proposed transport network of Western Sydney Aerotropolis



Source: Western Sydney Aerotropolis Plan, 2020

As shown in **Figure 2–5**, the proposed transport network in and around the Aerotropolis includes:

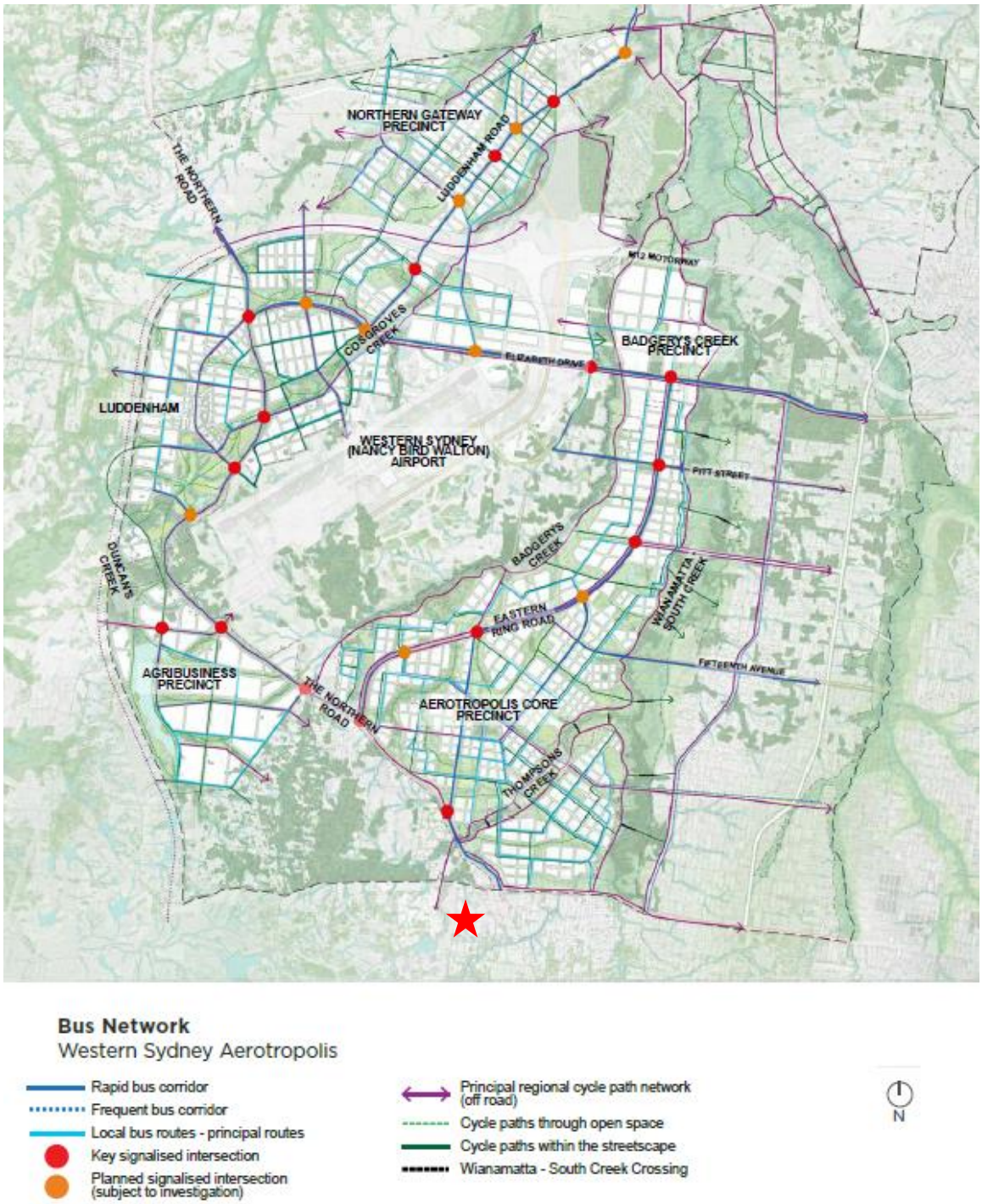
– The proposed Sydney Metro line and metro stations

– Rapid bus services proposed to link Liverpool, Penrith and Campbelltown with the Airport and Aerotropolis Core

– The proposed M12 Motorway to be the major access route to the Airport and connect to Sydney's motorway network

– The proposed Outer Sydney Orbital Corridor to be the major north-south transport corridor between Richmond Road in the north and the Hume Motorway in the south.

Figure 2–6 Proposed bus (and cycle paths) network of Western Sydney Aerotropolis



Source: Western Sydney Aerotropolis Plan, 2020

Figure 2–6 further identifies the principal regional cycle path network (off-road) in and around the Aerotropolis to support a target mode share for active transport at six per cent. This includes cycle paths on Bringelly Road, The Northern Road and an extension of the cycle path along Thompsons Creek.

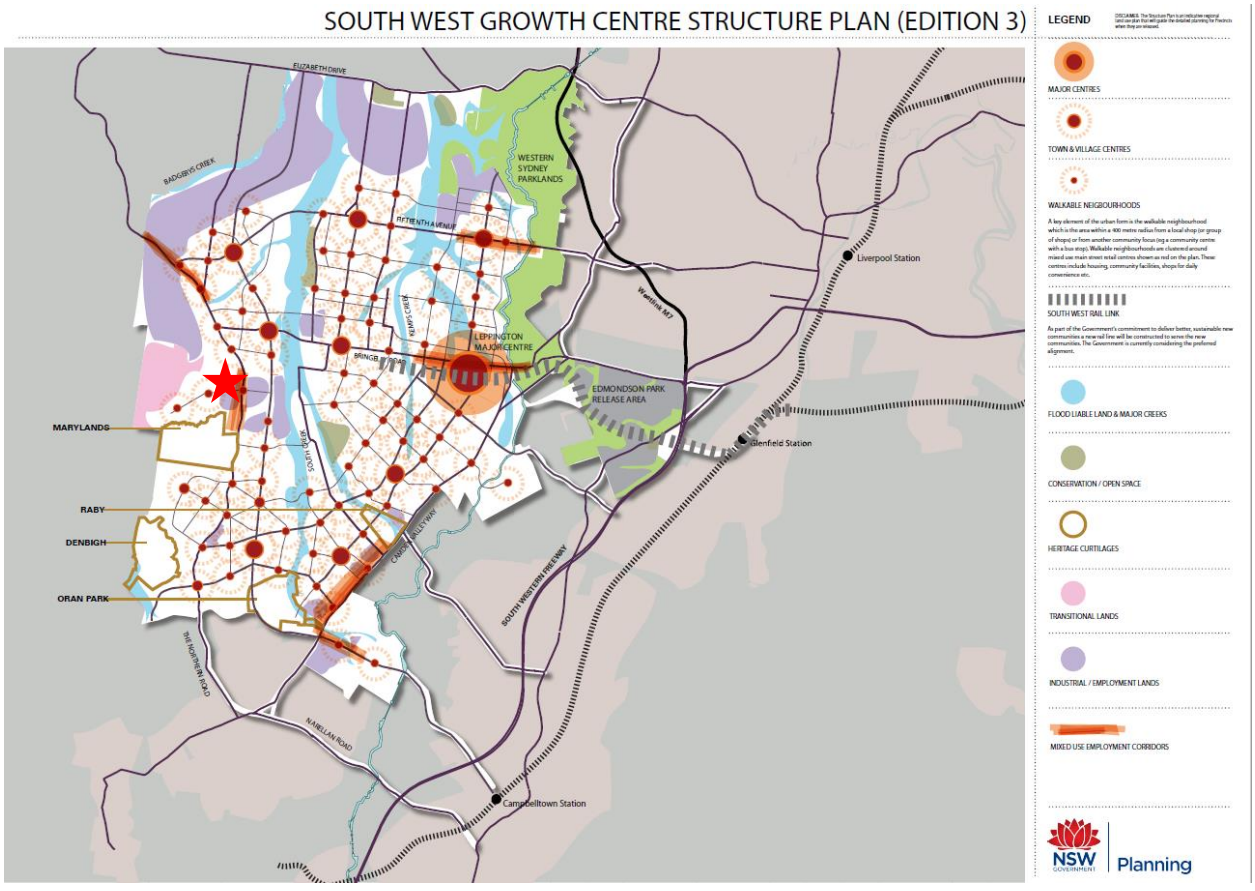
The Greater Sydney Commission notes on its website that it is delivering the Western Sydney Place-based Infrastructure Compact (PIC) program for the NSW Government, as part of the Western Sydney City Deal. A PIC is a highly collaborative model that looks holistically at a place to identify at a high level the most cost-effective sequencing for growth aligned with the provision of infrastructure over 10, 20 and 40 years. This will be one of the means of planning for the changes in the Western Sydney Aerotropolis Growth Area.

Implications for the site: This site is situated just below the southern boundary of the Aerotropolis and residents will likely be commuting to/from the Aerotropolis for work. With its advantage close to the Aerotropolis, the site should seek to maximise the ability for residents to commute to the Aerotropolis in 30 minutes, in line with the targets of the NSW Government and the Western Sydney Aerotropolis Plan. The site will benefit from the investment that the Aerotropolis brings into the area, including more frequent and reliable transport options.

2.2.5 South West Growth Centre Structure Plan

The South West Growth Centre Structure Plan (**Figure 2–7**) outlines prospected land use zoning and centres in the South West Growth Area.

Figure 2–7 South West Growth Centre Structure Plan (Edition 3)



Source: South West Growth Centre Structure Plan (Edition 3), 2019

The majority of the surrounding area within the SWGA will be developed into residential areas, with a high focus on walkability and public transport permeability. The site is situated adjacent to future industrial and mixed-use employment areas, as well as being located within “walking neighbourhoods” where residents are positioned within a walking radius of local shops or community focus areas.

2.2.6 Camden Local Strategic Planning Statements (LSPS)

Camden Local Strategic Planning Statements (LSPS), prepared in 2019, provides a 20-year land use vision for Camden and outlines directions for future growth and strategic planning. The LSPS sets short, medium, and long term-actions related to land use, transport and sustainability objectives, as well as other strategic directions related to the Greater Sydney Region Plan and the Western City District Plan.

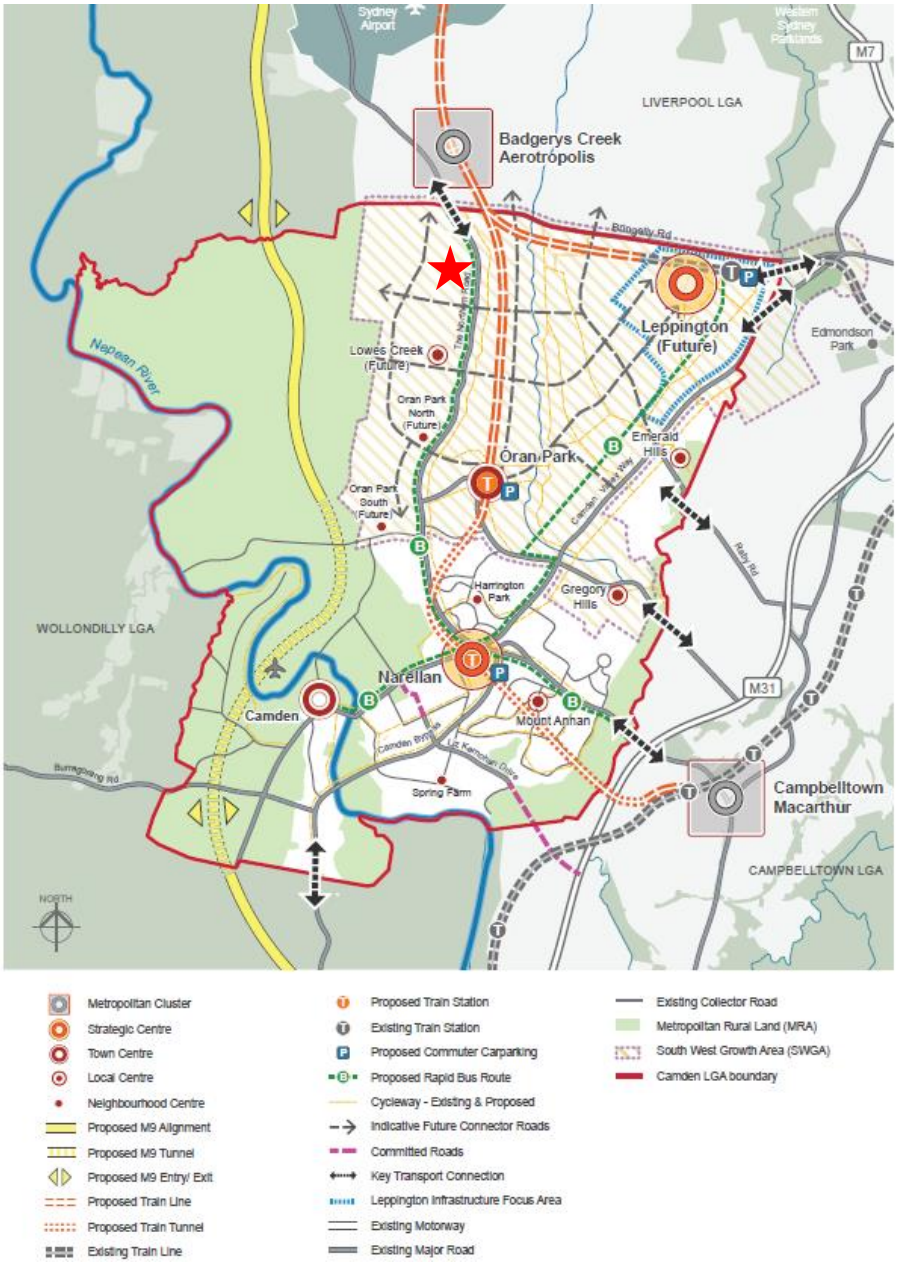
Transport objectives within the LSPS relate heavily to the 30-minute Western Parkland City envisioned by the Greater Sydney Region Plan, with a focus on sustainable transport including rail and rapid buses within Camden LGA and its surroundings. Key actions include:

– Advocacy for the delivery of the North-South Rail and South West Rail Link Extension

– Rapid bus service route to connect key Camden centres with the Western Sydney Airport and Aerotropolis (along The Northern Road)

– Outer Sydney Orbital with an alternative underground route and appropriate east/west connections within the Camden LGA.

Figure 2–8 Infrastructure and collaboration local priority



Source: Camden LSPS, 2019

Implications for the site: The site will benefit from public transport and road network upgrades associated with delivering a 30-minute city. With the development of adjacent strategic centres and local centres comes employment opportunities and access to health, education and community services. The expansion and integration of the public transport network will further benefit the site's connectivity to the wider region, its communities and place.

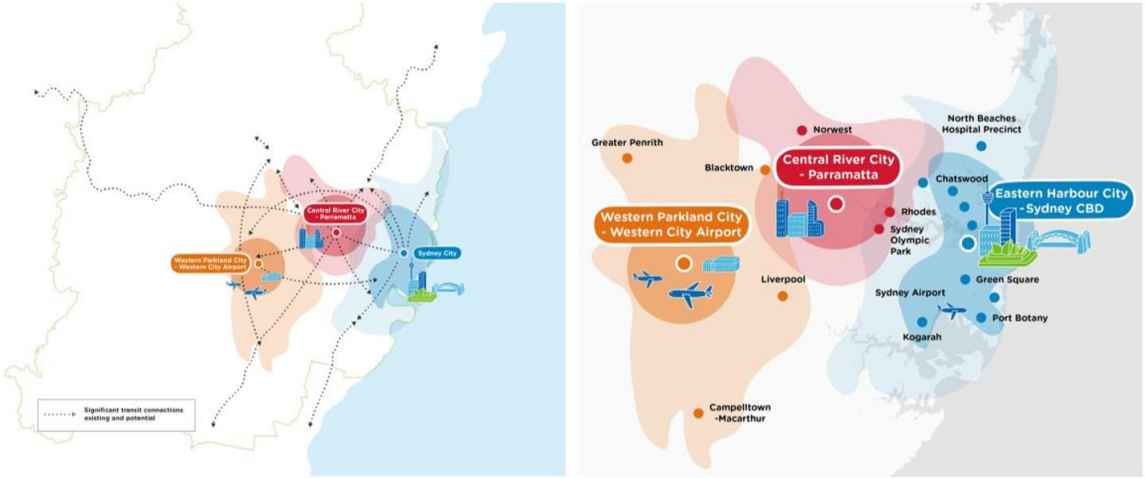
2.3 Future transport context

2.3.1 Future Transport 2056 Strategy

The Future Transport Strategy 2056 (NSW Government, 2018) is an update of NSW's Long-Term Transport Master Plan. It is a vision for how transport can support growth and the economy of New South Wales over the next 40 years. The strategy is underpinned by the Regional Services and Infrastructure Plan (NSW Government, 2018) and the Greater Sydney Services and Infrastructure Plan (NSW Government, 2018), as well as several supporting plans including Road Safety and Tourism.

The Future Transport Strategy 2056 sets out a vision for helping to guide many of the planning, investment and customer outcomes. Some of the key outcomes include faster, more convenient and more reliable travel times to major centres, as shown in **Figure 2–9**.

Figure 2–9 A future metropolis of three cities



Source: NSW Government Future Transport 2056 Strategy, 2018

Existing and potential transit connections, together with new technology and innovation, will make the network surrounding the site more responsive to demand and better able to manage congestion in the future. For the three cities identified, more specific outcomes listed as part of the Strategy which will benefit the site's transport context will include:

– 30-minute access for customers to their nearest Centre by public transport 7-days a week

– Fast and convenient interchanging with walking times no longer than five minutes between services

– Walking or cycling is the most convenient option for short trips around centres and local areas, supported by a safe road environment and attractive paths

– Fully accessible transport for all customers.

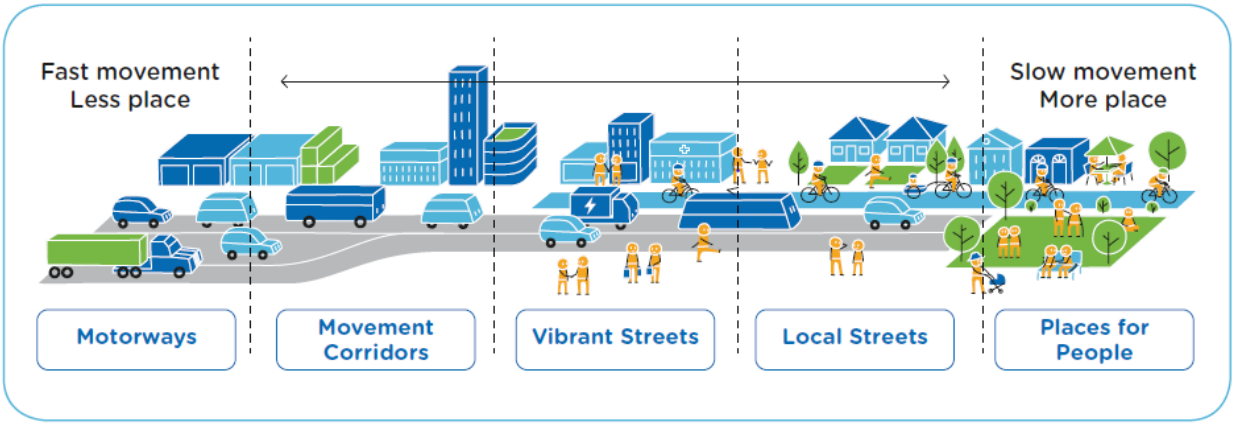
Implications for the site: Future transport initiatives are aimed at connecting people to jobs, goods and services in our cities and regions through increased permeability of public transport networks. This provides benefits to the site. The specific provision for pedestrian and cyclist activity and efficient interchanging contributes to a safe and comfortable walking environment, promoting an increase in sustainable transport mode share.

2.3.2 Greater Sydney Services Infrastructure Plan

The Greater Sydney Services and Infrastructure Plan is a 40-year plan for transport in Sydney. It is designed to support the land use vision for Sydney. Building on the state-wide transport outcomes identified in the Future Transport Strategy 2056, the Plan establishes the specific outcomes that transport customers in Greater Sydney can expect and identifies the policy, service and infrastructure initiatives to achieve these.

To support the liveability, productivity and sustainability of places for the transport network, a Movement and Place Framework was developed. The Framework acknowledges that transport networks have different functions and roles and serve as both a destination and as a means to move people and goods. The Movement and Place Framework will enable us to plan, design and operate the transport network to meet these different needs by providing greater transparency, supporting collaboration between those responsible for land use, transport and roads while also encouraging input from the community. Through the Framework, it is possible to design a future network that is better used and supports the safe, efficient and reliable movement of goods and the need for liveability of places along with it.

Figure 2–10 Different movement environments under the Movement and Place Framework



Source: https://future.transport.nsw.gov.au/wp-content/uploads/2018/plans/Greater_Sydney_Services_Infrastructure_Plan.pdf (2018)

2.3.2.1 City-shaping network

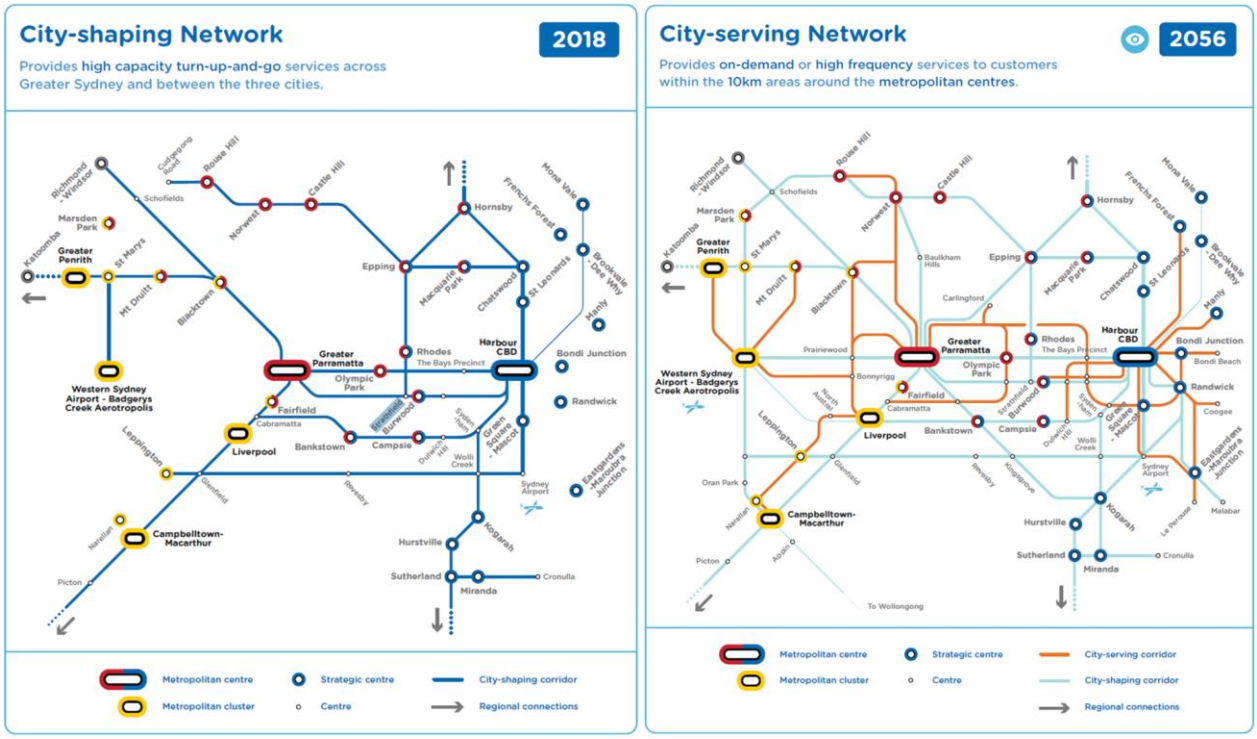
The city-shaping network includes higher speed and volume linkages between our cities and centres. The function of this network is to enable people living in any of the three cities to access their nearest metropolitan centre within 30 minutes and to be able to travel efficiently between these metropolitan centres.

As Greater Sydney transitions to a metropolis of three cities, the city-shaping network will need to expand to provide improved access to and between each metropolitan city/centre, particularly Greater Parramatta and centres in the metropolitan cluster in the Western Parkland City.

2.3.2.2 City-serving network

The city-serving network will provide high-frequency services within a ~10km radii of the three metropolitan cities/centres. This will support access within some of the densest land use in Greater Sydney where travel demand is most concentrated. As these inner urban areas in each of the three cities develop and become denser, the government will investigate the prioritisation of on-street public transport services and invest in higher frequency services.

Figure 2–11 Greater Sydney and 2056 transport network vision



Source: https://future.transport.nsw.gov.au/wp-content/uploads/2018/plans/Greater_Sydney_Services_Infrastructure_Plan.pdf (2018)

Implication for the site: The development of transport infrastructure both within and between metropolitan centres provides benefits to the site by providing accessibility to a wider community, providing connectivity to employment, education, recreation, and commercial spaces.

2.3.2.3 Principle Bicycle Network

Building on the existing network, an immediate focus is working with local councils to deliver committed Priority Cycleway projects to address key missing links around the Harbour CBD, Greater Parramatta, Greater Penrith, Blacktown and Liverpool, such as the Nepean River Green Bridge and Inner West Greenway. Council partnership programs are delivering local bicycle infrastructure. Bicycle parking is also being rolled out at interchanges.

By 2056:

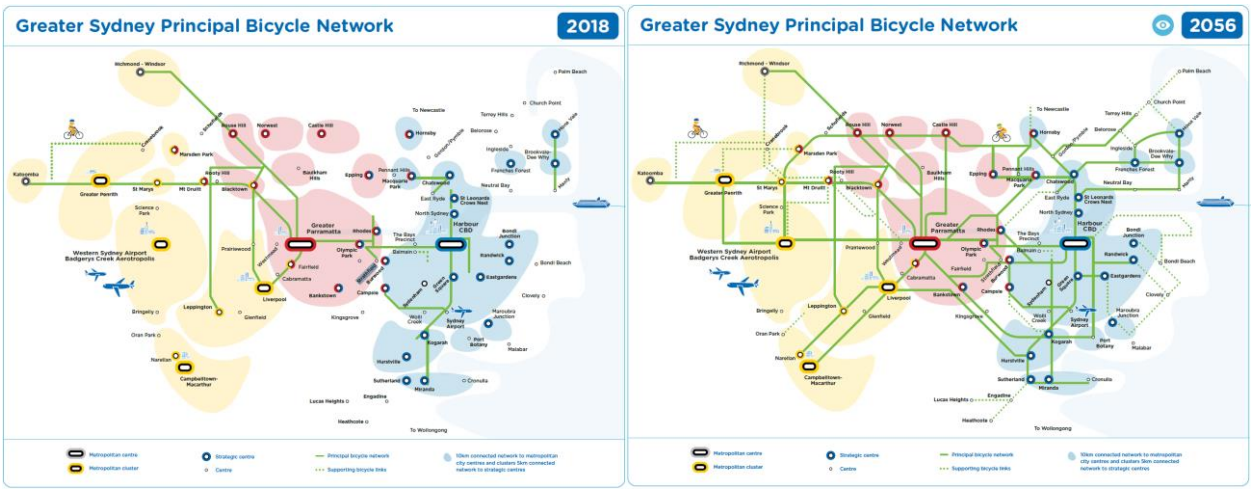
– Walking and cycling network coverage will be improved by using state held corridors for public transport, pipelines, waterways, crown land and service easements for bicycle network infrastructure

– All strategic centres have connected walking and cycling networks, including strategic centres across the Western Parkland City

– Further investment in connections to strategic centres and the Principal Bicycle Network will support walking or cycling being the most convenient option for short trips, improving health outcomes, safety and convenience for customers as well as boosting the productivity, liveability and sustainability of Greater Sydney.

Figure 2–12 shows the current/committed Greater Sydney Bicycle Network alongside the envisioned 2056 Bicycle Network.

Figure 2–12 Current/committed and 2056 Greater Sydney Principal Bicycle Network



Source: https://future.transport.nsw.gov.au/wp-content/uploads/2018/plans/Greater_Sydney_Services_Infrastructure_Plan.pdf (2018)

2.3.3 The Western Sydney Infrastructure Plan (WSIP)

The Western Sydney Infrastructure Plan (WSIP) is delivering major road infrastructure upgrades to support an integrated transport solution for the region and capitalise on the economic benefits from developing the Western Sydney Airport at Badgerys Creek. These high-quality road improvements will deliver significant, ongoing safety and congestion-relieving benefits for customers. The WSIP comprises the following projects, as shown in **Figure 2–13**:

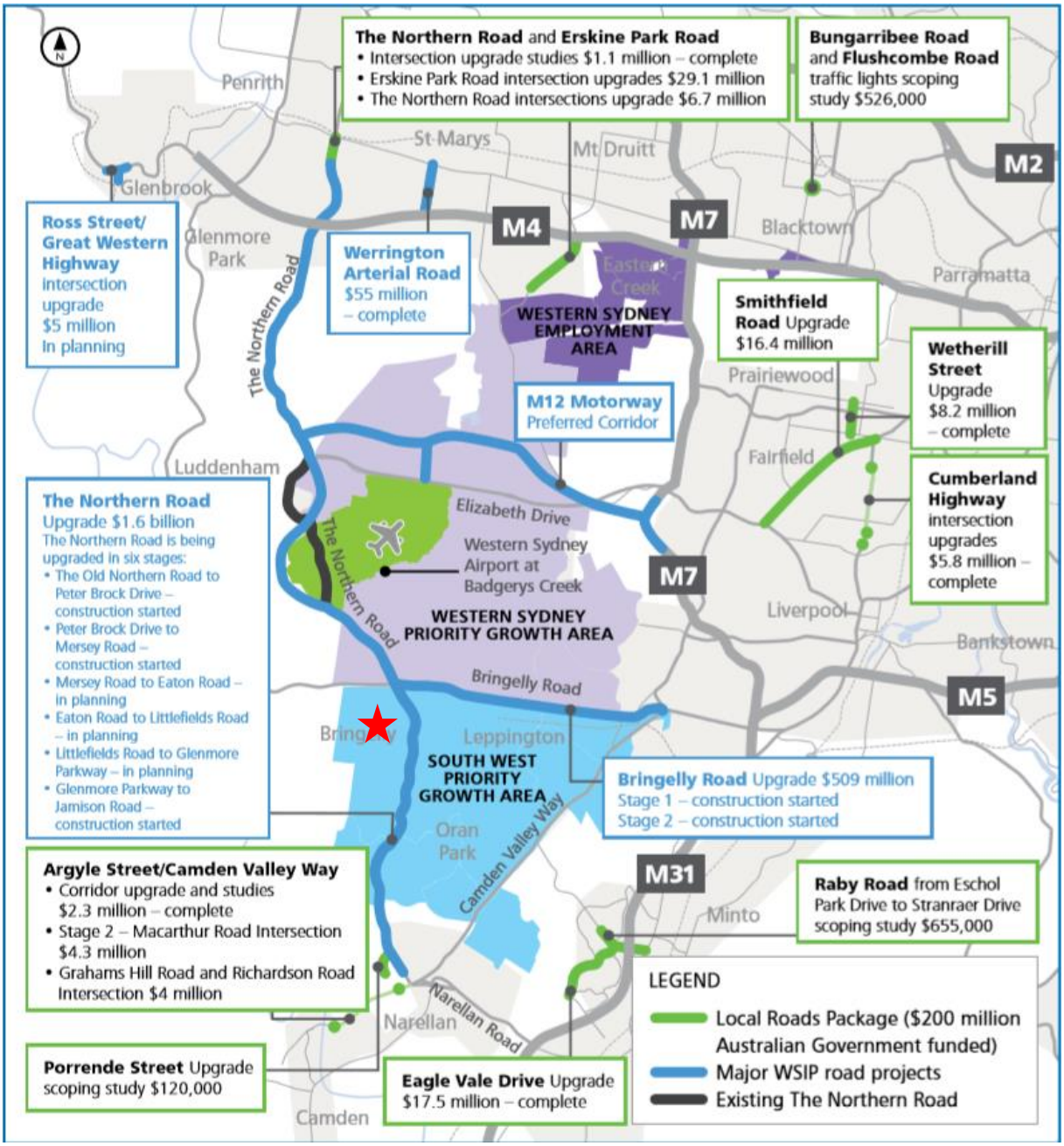
– The Northern Road upgrade project will upgrade approximately 35 kilometres of The Northern Road to a minimum of 4 lanes between The Old Northern Road, Narellan and Jamison Road, South Penrith (completed in 2020)

– The Bringelly Road upgrade involves the upgrade of approximately 10 kilometres of Bringelly Road between Camden Valley Way and The Northern Road (completed in 2020)

– The M12 Motorway project will provide an east-west link between the M7 Motorway and The Northern Road, while also providing a connection to the Western Sydney Airport

– The Local Roads package will enable a range of Western Sydney councils to complete minor road improvement works in the Western Sydney area.

Figure 2–13 The Western Sydney Infrastructure Plan projects



Source: The NSW Government (2017)

The WSIP road upgrades, particularly The Northern Road and Bringelly Road upgrades, are expected to improve accessibility to the site and are further described in the following sections.

2.3.4 Outer Sydney Orbital Corridor

TfNSW is currently identifying land for the Outer Sydney Orbital corridor, to be used to provide a future freight rail line and north-south motorway. It is planned to connect Box Hill in the north, and the Hume Motorway near Menangle in the south. The recommended corridor is designed to support population, housing, freight requirements and job growth across Western Sydney.

In the future, there will be further investigations to identify land to enable the Outer Sydney Orbital to provide connections between the Illawarra and the Central Coast. This development may not commence construction for many years, however by identifying and protecting the land now stakeholders and the community will know exactly where the infrastructure will be built in the future.

Figure 2–14 Recommended Outer Sydney Orbital Corridor

Source: Transport for NSW, 2018

Implication for the site: The Outer Sydney Orbital travels approximately 2.5 kilometres to the west of the site and may have an interchange at Greendale Road, making it very convenient to access from/to the site. It could offer medium to long term benefits especially reducing traffic loadings on The Northern Road, especially the longer distance regional trips.

2.3.5 North-South Rail Link / The South West Rail Link Extension

With the Western Sydney International (Nancy-Bird Walton) Airport and Aerotropolis at its centre, Western Sydney will have new economic and social opportunities, and be an exciting hub for new communities. The North-South Rail Line is a passenger rail line connecting St Marys with Macarthur, running from the Main West Line (T1 Western Line) to the Main South Line (T8 Airport and South Line). It will connect to the new Western Sydney Airport, Aerotropolis and surrounding business areas with the following key objectives:

– Provide a major transport link between the North West, Western Sydney, Greater Macarthur and South West Priority Growth Areas

– Provide transport options to support population, jobs and economic growth across Western Sydney and for the planned Western Sydney Airport

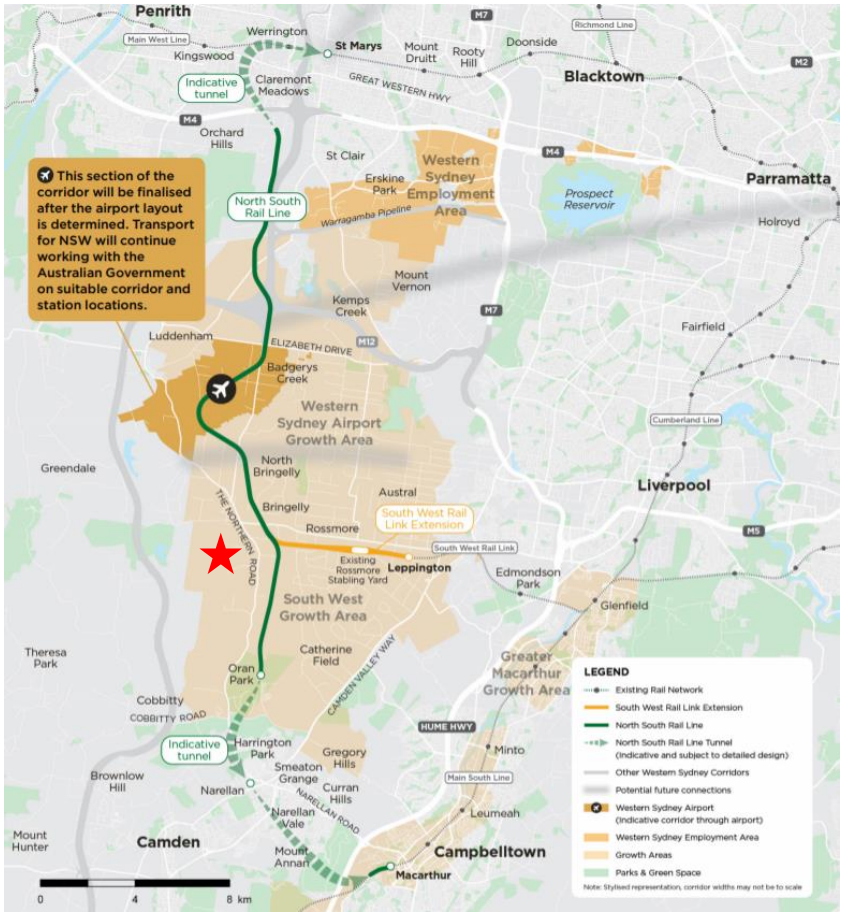
– Support future town centres to be designed and planned around transport infrastructure.

Over the next ten years, further impact assessments will be undertaken to allow the required infrastructure for the North-South Rail Link to be built. Currently, consultations are continuing to take place as part of future planning.

The South West Rail Link Extension Corridor project investigates how to provide transport infrastructure to support the proposed Western Sydney Airport and future urban development in Sydney's West. The proposed route is part of the Western Sydney Rail Needs Scoping Study and initial plans for the route are to connect Leppington to Bringelly.

Figure 2–15 shows the map of the North-South Rail Link / The South West Rail Link Extension.

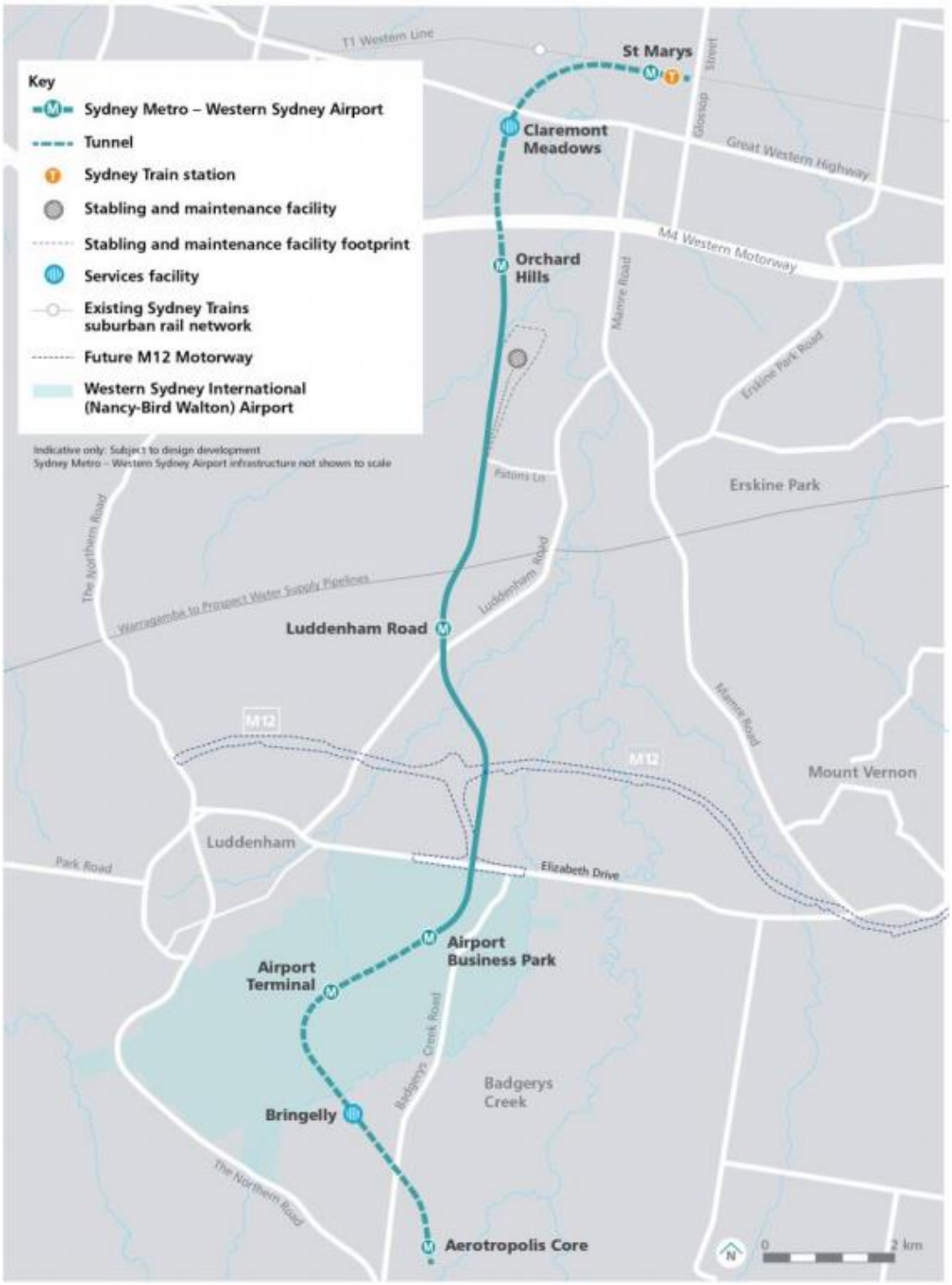
Figure 2–15 Planned North-South Rail Link and South West Rail Link Extension



Source: Transport for NSW, 2020

The first stage of the project has been committed, named Sydney Metro - Western Sydney Airport between St Marys to Western Sydney Airport and Badgerys Creek Aerotropolis. The 23-kilometre railway line will be a combination of tunnel, surface and viaduct sections. A total of six stations and two service facilities will be provided (**Figure 2–16**).

Figure 2–16 The alignment of Sydney Metro – Western Sydney Airport



Source: Environmental Impact Statement for Sydney Metro, Western Sydney Airport, 2020

Implication for the site: The rail link and potential stations in the vicinity of the site would improve rail access to the wider rail network of Greater Sydney, further reducing the reliance on private vehicles travel to the employment areas and activities.

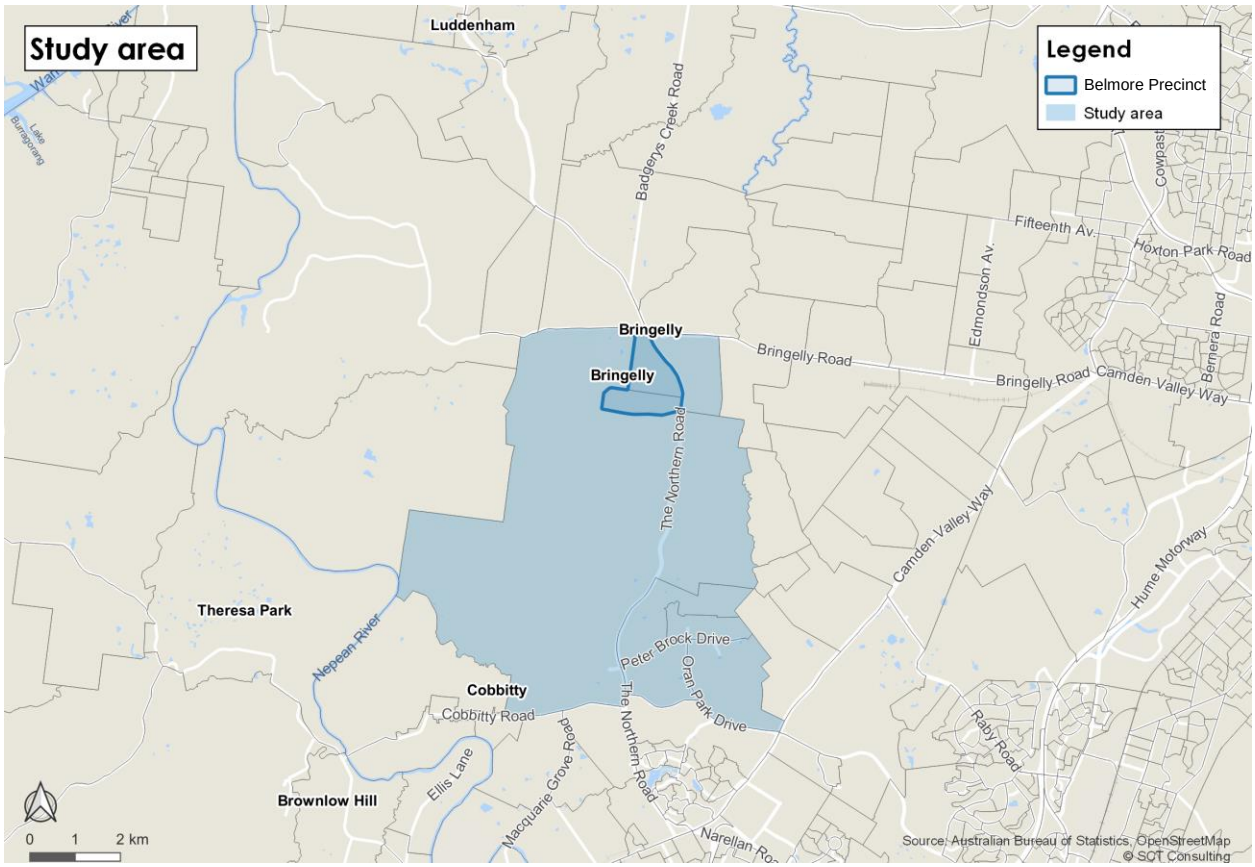
3.0 Existing Conditions

3.1 Travel behaviour

3.1.1 Method of Journey to Work data

2016 Method of Journey to Work (JTW) data from relevant statistical areas level one including Oran Park were analysed to determine travel behaviour of the existing residents in the vicinity of the site as shown in **Figure 3–1**.

Figure 3–1 Study area for the method of JTW analysis



At the time of the JTW data being collected in 2016, about 2,862 trip samples were included in the survey for the area. According to the Australian Bureau of Statistics, people in employment are those of working age who, during a short reference period, were engaged in any activity to produce goods or provide services for pay or profit.

The study area showed a higher proportion of drivers, 72 per cent, in comparison to the 53 per cent of Greater Sydney, showing a high dependency on private car use. Train and bus usage was low at nine per cent given the commuting time to jobs by public transport, whereas Greater Sydney showed a total of 22 per cent. Active transport use was very low, i.e. zero per cent for cycling and one per cent for walking, given limited employment opportunity in the vicinity and gap of cycling infrastructure provision to connect to the regional network. Around 20 per cent of the samples were working at home or other transport modes.

Of the 24,386 people who work in Camden Council Area, a large majority of workers (48 per cent) live in Camden LGA, followed by Campbelltown (17 per cent) and Wollondilly (14 per cent). Smaller origins include Liverpool (five per cent), and other origins across the Greater Sydney region each generating less than two per cent of work-related trips to Camden.

Around 30 per cent of the residents worked in the same Camden LGA followed by Campbelltown (16 per cent) and Liverpool (11 per cent). Other destinations of work-related trips were all below five per cent except the City of Sydney (seven per cent). Hence, the medium-long commuting distance to major employment tallies with the fact of high car use, which is relatively convenient and cost-effective in the transport context.

3.1.2 Household Travel Survey

The proposed site sits within the statistical area “Bringelly – Green Valley” as defined by the Australian Bureau of Statistics, 2017 / 2018 Household Travel Survey (HTS) as shown in **Figure 3–2**. For analysis, it was assumed that HTS data provides a suitable reflection of the travel characteristics during AM and PM peak hour periods on an average weekday, due to the high proportion of trips during this timeframe associated with the journey to work trips.

Figure 3–2 Study area for household travel survey analysis

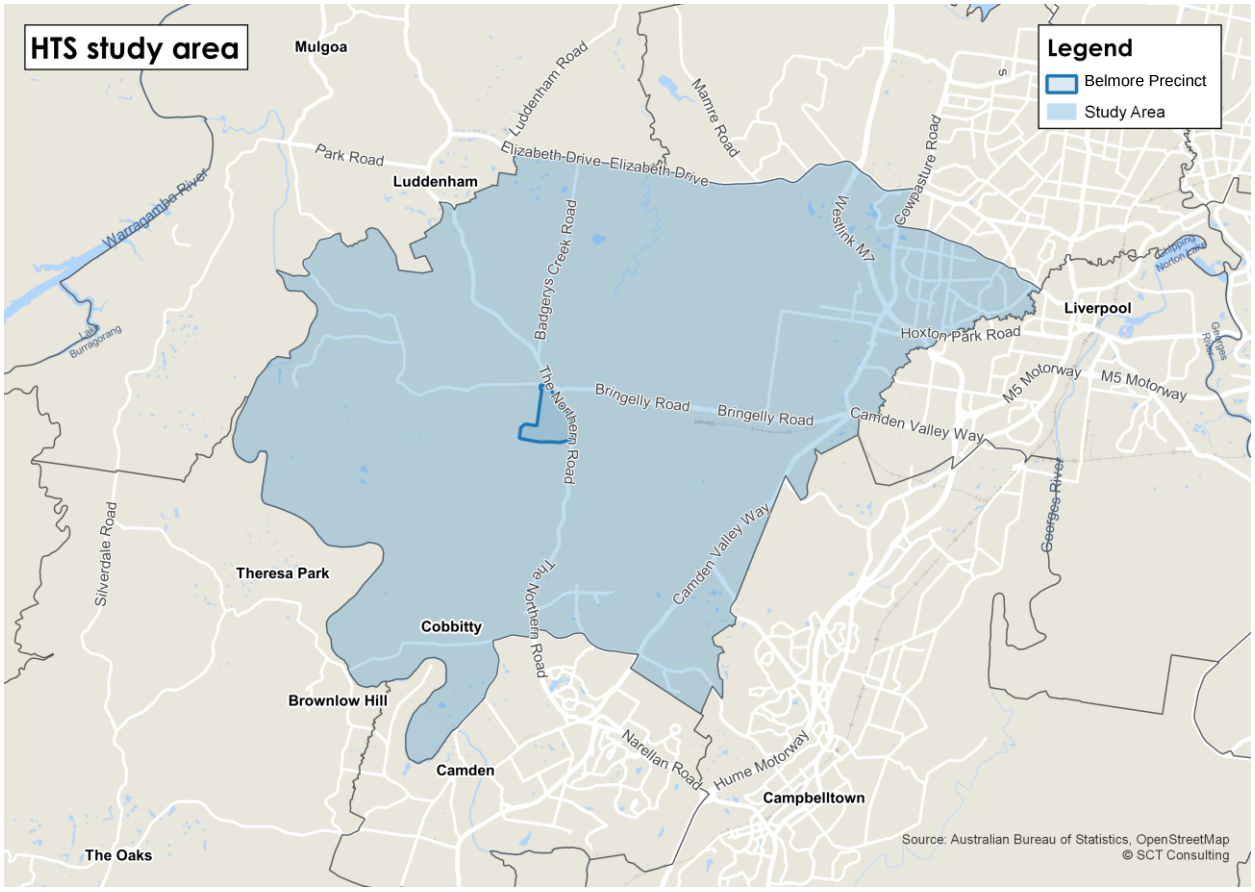


Table 3-1 and **Table 3-2** provide a summary of the overall mode choice and purpose of travel by residents of Bringelly – Green Valley against the Sydney average. The average travel distance for each category was also listed.

Table 3-1 Household travel survey – residents within Bringelly – Green Valley, travel by mode

Mode of travel	Bringelly – Green Valley		Greater Sydney	
	Percentage of total trips	Average distance	Percentage of total trips	Average distance
Vehicle Driver	52%	13 km	48%	10 km
Vehicle Passenger	31%	10 km	21%	8 km
Train	3%	31 km	6%	17 km
Bus	4%	10 km	5%	7 km
Walk Only	8%	1 km	17%	1 km
Other	1%	6 km	2%	6 km
Total	**100%**	**-**	**100%**	**-**

Source: https://www.transport.nsw.gov.au/data-and-research/passenger-travel/surveys/household-travel-survey-hts, 2020

The study area had more vehicle drivers and vehicle passengers at 52 per cent and 31 per cent compared to Greater Sydney's 48 per cent and 21 per cent. Higher vehicle occupancy was observed in the study area due to 10 per cent more vehicle passenger mode share. Comparatively, other modes of transport such as train and walking trips only halved the Greater Sydney average due to long distance to activities and relatively low-density development and jobs.

Table 3-2 Household travel survey – residents within Bringelly – Green Valley, travel by purpose

Trip purpose	Bringelly – Green Valley		Greater Sydney	
	Percentage of total trips	Average distance	Percentage of total trips	Average distance
Commute	12%	18 km	13%	12 km
Work related business	10%	20 km	6%	15 km
Education/childcare	14%	6 km	8%	4 km
Shopping	13%	7 km	14%	5 km
Personal business	4%	7 km	5%	6 km
Change mode of travel	8%	19 km	14%	12 km
Social/recreation	20%	11 km	22%	7 km
Serve passenger	18%	8 km	17%	6 km
Other	1%	11 km	2%	3 km
Total	**100%**	**-**	**100%**	**-**

Source: https://www.transport.nsw.gov.au/data-and-research/passenger-travel/surveys/household-travel-survey-hts, 2020

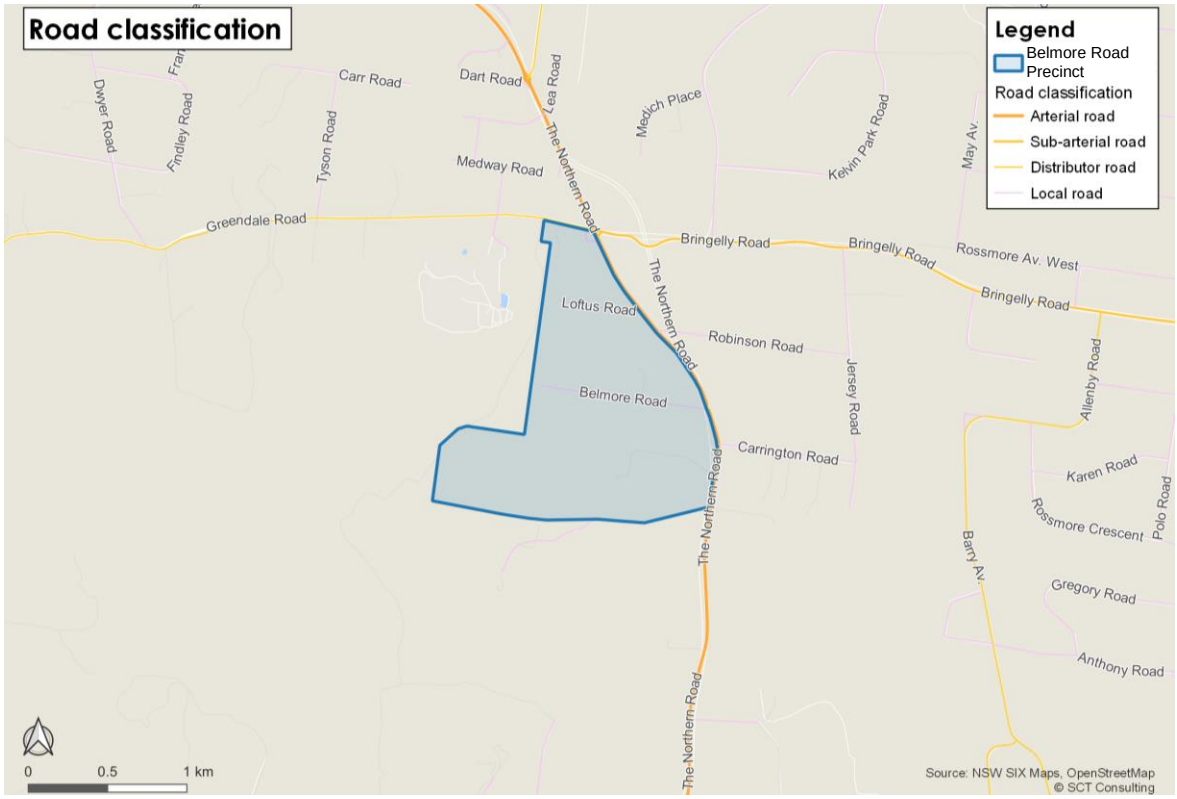
The main trip purpose in Bringelly – Green Valley was social/recreation at 20 per cent, followed by serve passenger at 18 per cent. This is similar to the Greater Sydney average. The percentage of change mode of travel, six per cent lower than the Sydney level is consistent with low public transport availability in the local area given mode changing usually relates to a journey leg by public transport.

The average distance travelled by all modes of transport and by trip purposes were both around 11 kilometres which were 40 per cent longer than Greater Sydney (eight kilometres). This can be attributed to the area's long distance to Sydney CBD, requiring residents to travel further to reach destinations. The average distance travelled by train exceeded 30 kilometres, reflecting that destinations worth travelling to by train are further away than jobs that are accessible by car. Trip purposes showed a further average distance travelled in comparison to the Greater Sydney such as work-related business and change mode of travel, which is likely related to jobs in Sydney CBD or other strategic centres. The low use of active transport also tallies with this increased distance.

3.2 Road network and classification

The major roads in the vicinity of the site include The Northern Road, Bringelly Road, Greendale Road and Belmore Road. The road network is shown in **Figure 3–3**.

Figure 3–3 Road network around the site



The characteristics of the key road network, surrounding the subject site are:

– **The Northern Road**, managed by TfNSW, forms part of the A9 Western Sydney Bypass. It is an arterial road running adjacent to the east of the subject site and connects Narellan Road to the south through to the Great Western Highway to the north. The Northern Road provides direct access from the site through to the Western Sydney, SWGA and Western Sydney Airport at Badgerys Creek, north of the site. The site can access The Northern Road via Greendale Road, Loftus Road and Belmore Road. The Northern Road has recently been upgraded by TfNSW from two lanes to a four-lane divided road (with dedicated bus lanes at intersection approaches). The provision of a wide median allows for six traffic lanes in the future. The Northern Road has a posted speed limit of 80 km/h. A dedicated off-road shared path runs along the eastern side of this corridor.

– **Bringelly Road** is a sub-arterial road, managed by TfNSW and connects The Northern Road at Bringelly, through to Camden Valley Way at Horningsea Park. It is approximately 10 kilometres in length and was an undivided carriageway with one lane in each direction. Bringelly Road is now being upgraded from two lanes to a six-lane divided road between the eastern side of Upper Canal Bridge and the western side of the Eastwood Road Intersection, through the future Leppington Town Centre. The rest of Bringelly Road will also be upgraded from two lanes to a four-lane divided road with a central median. The speed limit varied from 40 km/h to 80 km/h depending on different land use along the road.

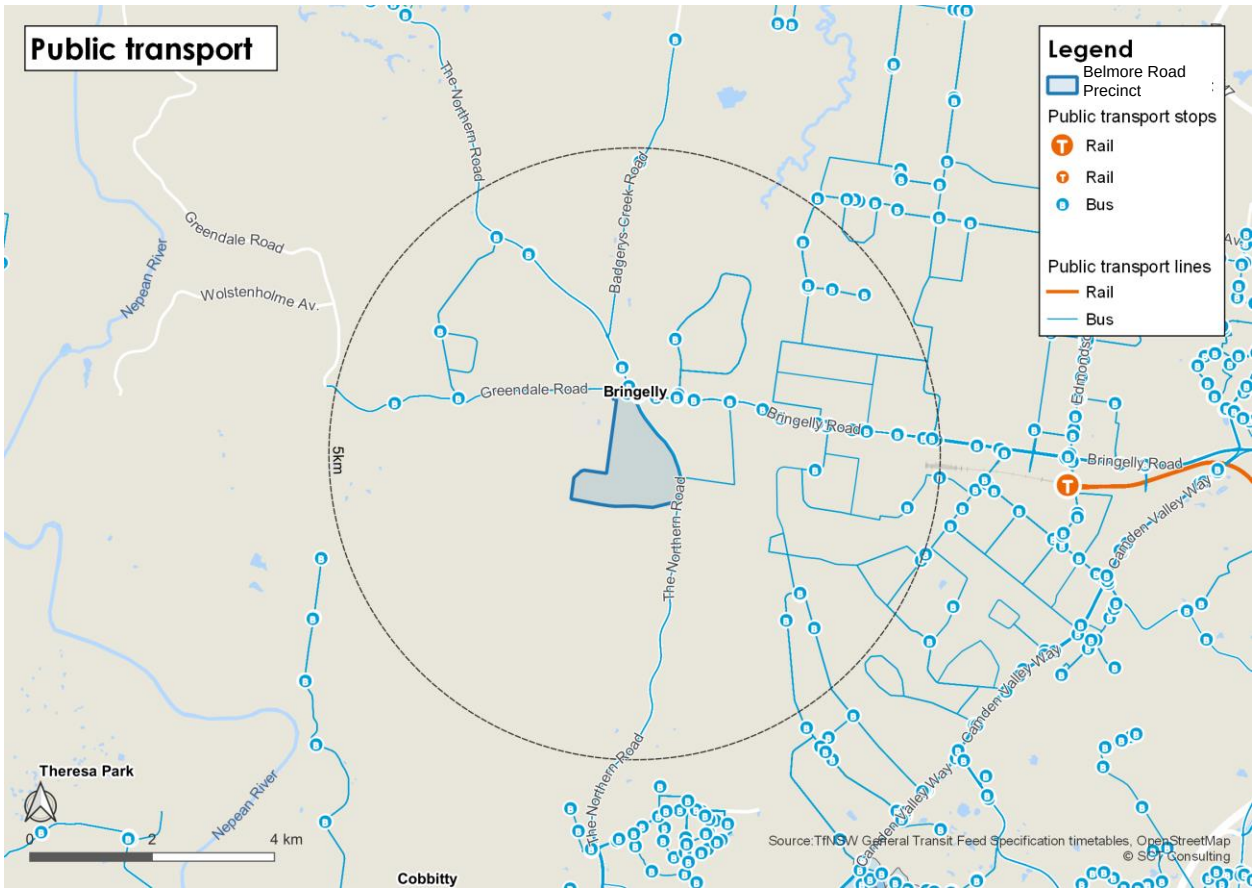
– **Greendale Road** is an undivided carriageway under the management of Liverpool City Council. It is 16 kilometres long and contains one lane in each direction with unsealed shoulders. It is a collector road that connects from Park Road at Wallacia to Bringelly Road where it intersects with The Northern Road signalised intersection. Greendale Road typically has a signposted speed limit of 80 km/h with residential precincts signposted at 60 km/h speed limit.

– **Belmore Road** is a local road that mainly services the residences and a local asphalt factory. It currently intersects The Northern Road as a roundabout but the intersection will be upgraded to a set of traffic signals as part of The Northern Road upgrade.

3.3 Public transport network

Public transport facilities around the site are shown in **Figure 3–4**.

Figure 3–4 Public transport around the site

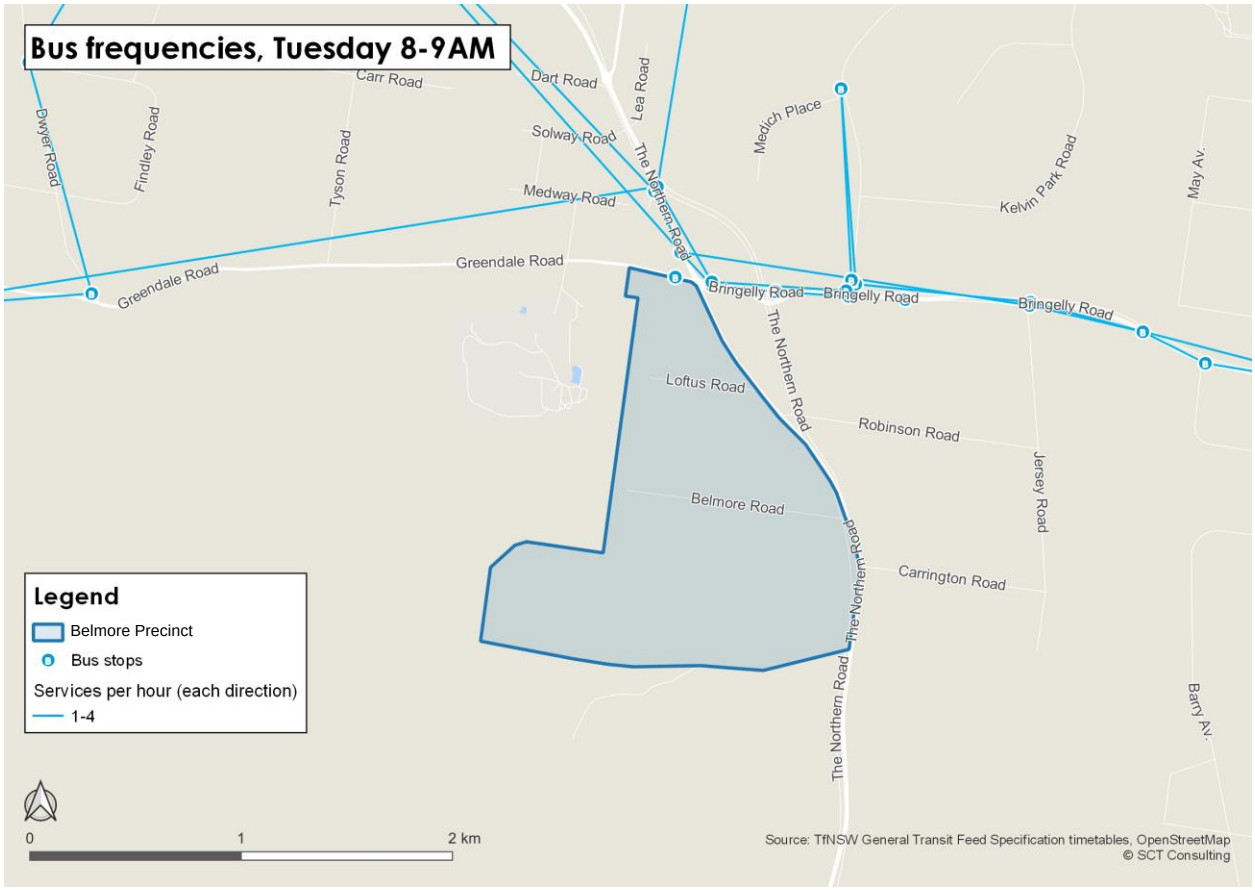


Leppington train station is the closest station (seven kilometres) from the site, which provides around seven services per hour during a typical morning peak hour. It is the terminal of T2 Inner West and Leppington Line and T5 Cumberland Line, which provide direct connectivity to several of Sydney's key commercial, and population centres including Liverpool, Parramatta, Strathfield, and Sydney CBD. The station provides new facilities, a park and ride service area and large commuter car parks.

There is bus route 856 on Bringelly Road and The Northern Road (north to the site), providing service between Bringelly to Liverpool via Leppington Station and Prestons. The frequency of the 856 buses is very low – about five to six services per day in each direction with most of the activity occurring during peak hour (**Figure 3–5**).

No other bus services operate on The Northern Road in proximity to the subject site. Public school students from Bringelly Public School and Rossmore Primary School are offered school bus services in the area.

Figure 3–5 Service frequency at the bus stops during a typical weekday AM peak hour



Based on the travel behaviour analysis of the study area identified in **Section 3.1**, due to the relatively long distance to major employment destinations and activities, public transport was not an attractive transport mode in the local area. The modal shift could take place when new development and public transport infrastructure are delivered in the vicinity.

3.4 Active transport

Given the rural nature and lack of urban development in the vicinity of the site, pedestrian and cycling accessibility are generally poor.

Concrete footpaths are available only on the north side of Greendale Road in proximity to the Bringelly Public School and Bringelly Community Centre and on the western side of The Northern Road in proximity to Bringelly Village shopping centre.

There are little cycling opportunities around the site as there are no cycleways along major roads. However, a dedicated off-road shared path will be running along the eastern side of The Northern Road corridor once the upgrade is completed.

Walking and cycling opportunities via dedicated infrastructure are currently very limited. However, the active transport mode share might increase after the delivery of the structure plan in the future and the connection to a wider cycle path network such as the shared path along The Northern Road.

3.5 Existing traffic conditions

Existing intersection performance has been derived from *Lowes Creek Maryland Traffic and Transport Exhibition Report* (GHD, 2018) to understand the existing traffic conditions in the proximity of the site. Turning movement surveys were undertaken on Wednesday 31 August 2016 at the following intersections:

– Greendale Road / Bringelly Road / The Northern Road

– The Northern Road / Loftus Road
– The Northern Road / Robinson Road
– The Northern Road / Belmore Road
– The Northern Road / Carrington Road

3.5.1 Intersection level of service

Intersection Level of Service (LoS) is a typical design tool used by traffic engineers to identify when roads are congested and require an upgrade. The Level of Service as defined in the Traffic Modelling Guidelines is provided in **Table 3-3**.

Level of Service	Average Delay per Vehicles (sec/h)	Performance explanation
A	Less than 14.5	Good operation
B	14.5 to 28.4	Good with acceptable delays and spare capacity
C	28.5 to 42.4	Satisfactory
D	42.5 to 56.4	Operating near capacity
E	56.5 to 70.4	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control methods.
F	70.5 or greater	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control methods.

Table 3-3 Level of Service definitions

Source: Roads and Maritime Services, 2002

Also, the following other measures of performance are included to complement the Level of Service:

– **Degree of Saturation (DoS):** a measure of the volume/capacity for the worst turning movement at the intersection. DoS 1 implies the turning movement is at capacity.
– **Queue:** the 95th percentile queue length, meaning that the queue length is less than or equal to this length 95% of the time. The 95th percentile rather than the maximum is typically used because intersections sometimes experience very large random queues that don't last for a long time. By treating these at outliers, queue lengths are less affected by random noise. This is reported as the worst approach at the intersection.

3.5.2 2016 intersection performance

The outcomes of the intersection performance are presented in **Table 3-4** based on a modelling assessment by SIDRA software.

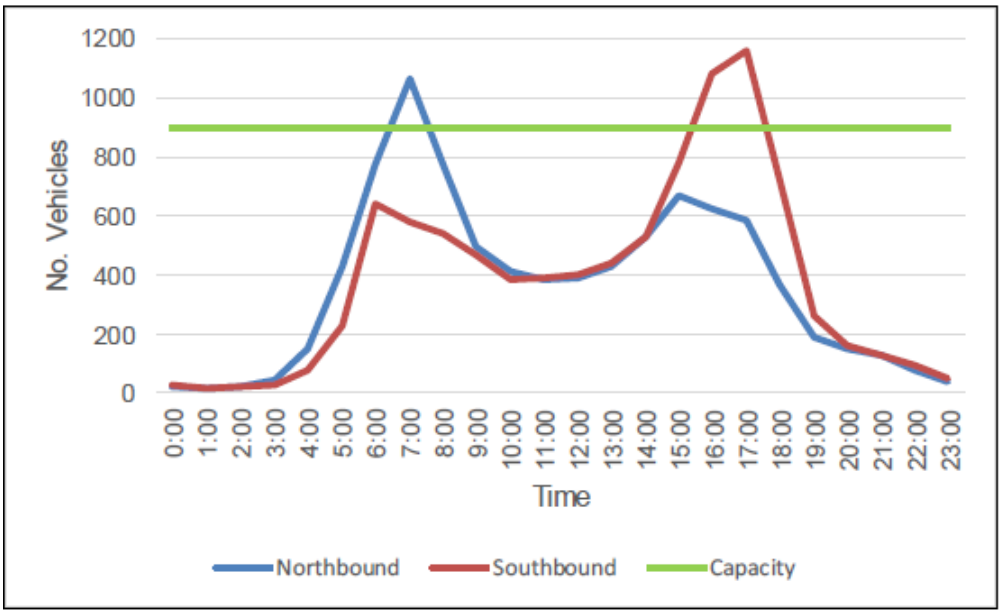
Table 3-4 2016 intersection performance in the proximity of the site

Intersection	AM peak hour				PM peak hour			
	Delay	LoS	DoS	Queue	Delay	LoS	DoS	Queue
Greendale Road/Bringelly Road/The Northern Road	27.6s	C	0.89	371m	44.8s	D	1.07	387m
The Northern Road/Loftus Road	0.3s	A	0.55	1.9m	0.2s	A	0.54	0.7m
The Northern Road/Robinson Road	0.2s	A	0.56	0.2m	0.4s	A	0.53	1.7m
The Northern Road/Belmore Road	0.2s	A	0.56	0.9m	0.1s	A	0.54	0.2m
The Northern Road/Carrington Road	1.2s	A	0.65	2.8m	1.2s	A	0.53	13.5m

Although the overall level of service is acceptable, the Greendale Road / Bringelly Road / The Northern Road intersection indicated a status approaching capacity and required mitigation measure which was consistent with TfNSW's proposal to a grade-separated intersection.

Figure 3–6 shows that The Northern Road experienced overcapacity for northbound during the AM peak hour and southbound during the PM peak hour in 2016.

Figure 3–6 Traffic profile of The Northern Road



Source: Lowes Creek Maryland Traffic and Transport Exhibition Report (GHD, 2018)

4.0 The Planning Proposal

4.1 The Belmore Road Precinct

4.1.1 Principles and objectives

CKDI is creating and delivering market-leading, quality residential and commercial communities where Australians live and work. CKDI has identified future dwelling demand in key growth corridors across southwest Sydney – in relation to projected population growth and proximity to the Western Sydney International (Nancy-Bird Walton) Airport and the greater Aerotropolis.

This region is further supported by a range of significant infrastructure committed by all levels of government, including, The Northern Road upgrade, the M12 Motorway, and Sydney Metro Western Sydney Airport.

Three principles and objectives are driving the master planning process for the site undergoing a rezoning process, ensuring that they strictly align with the objectives.

Table 4-1 describes the principles and objectives of the development.

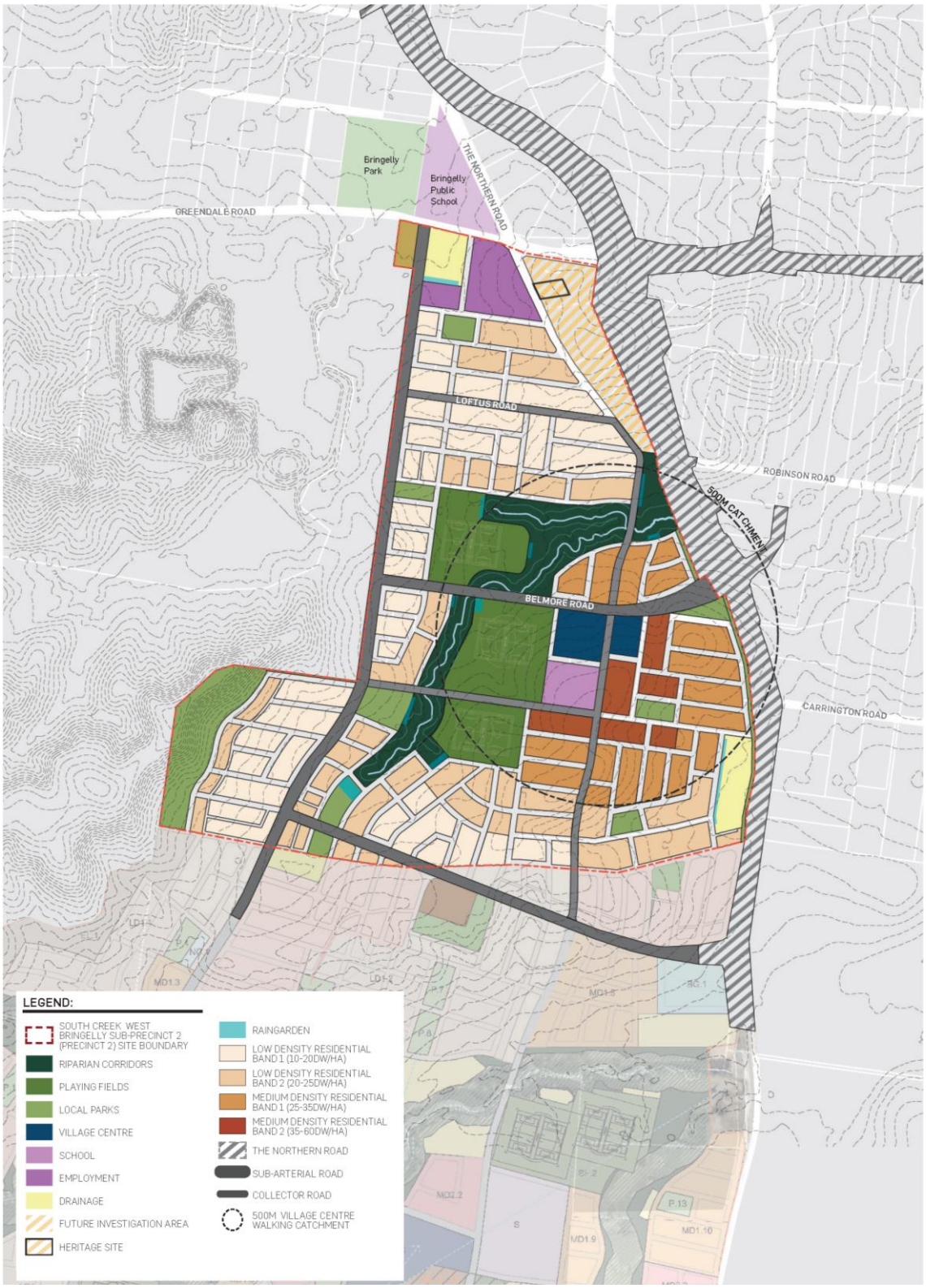
Table 4-1 Precinct principles and objectives

Precinct Objectives	Project Principles and Objectives	Project Delivery
Supporting residents with housing diversity and choices	– **Well-mixed products** to meet the various demand of home buyers. We are engaging market and economic consultants to closely monitor the housing demand in the area. – Commitment to delivering **affordable** land and housing products for more Australians to live. – Enough **flexibility** in the design and master planning process to ensure the project can meet the future housing demand. Considerations will be given to the delivery timeframe of infrastructure and employment opportunities for the assessment of housing demand.	– A diverse mix of density lots to meet various housing demand. – Future-proofed master plans to allow flexibility to meet increasing housing demand. Consideration will be given to the proximity to employment opportunities within the aerotropolis, adjacent to the northern boundary.
Building and supporting an integrated community	– **Social infrastructure** within the master plan area to promote social interaction. – A **shopping and recreational precinct** with amenities to promote community engagement and connection. – Providing well designed and high-quality residential precincts for workers from the Aerotropolis and Western Parkland City. – Recognising the cultural heritage of the area as it transitions to a new urban community.	– A school and an employment precinct to promote a sense of belonging. – A local centre to provide centralised shopping and amenities. – Enhance access to jobs and regional centres. – A network of open spaces to celebrate heritage (indigenous and agricultural).
Supporting residents to live active and healthy lives	– **Open spaces** including walking trails and outdoor fitness facilities to promote an active lifestyle. – An **accessible** and well-connected community to enhance health and wellbeing through increased physical activity and greater social interaction. – Significant **tree canopy** coverage to contribute to the liveability of the urban community. – Use design and systems to enhance outdoor lifestyles.	– Open spaces located along the western edge and riparian areas to promote an active lifestyle. – Centrally located parks for easy access of all residents. – Resilient and integrated green and blue grids to connect open spaces and playing fields for more liveability. – High quality versus high quantity open spaces.

4.1.2 Proposed land use (Indicative Layout Plan)

An Indicative Layout Plan (ILP) has been developed to enable the development of appropriate controls such as zoning, floor space ratio (FSR), and a site-specific DCP as well as to provide a richer picture of how the site is proposed to be laid out. The ILP of the Belmore Road Precinct is provided in **Figure 4–1**.

Figure 4–1 The Belmore Road Precinct ILP



Source: Urbis, 2022

Key features of the Belmore Road Precinct ILP are:

– Connections and continuity to Lowes Creek Maryland precinct, providing a seamless interface to the proposal to the south, including land use and road network elements (including walking and cycling connections)

– A town centre at the centre of the site, minimising the travel distance of residents to their local shops and hence encouraging residents to access the shops via sustainable and active transport means

– A school integrated with local open space and the town centre

– A riparian corridor oriented diagonally through the middle of the precinct, that facilitates off-road shared paths across the majority of the precinct with several connections across to connect with the town centre, the school, the playing fields as well as The Northern Road

– Density clustered around the town centre and dissipating to the edges of the precinct.

The yield of the Belmore Road Precinct is shown in **Table 4-2**.

Table 4-2 Proposed yield of the Belmore Road Precinct ILP (subject proposal)

Use	Yield[3]	Source
Low density residential	1,419 dwellings (average of high and low estimates)	Urbis revised final Rev B, dated 31 May 2022[4]
Medium density residential	1,118 dwellings (average of high and low estimates)	
High density residential	108 dwellings (average of high and low estimates)	
School	1 primary school	
Community uses	1,200 m^2 GFA	South Creek West Bringelly Precinct Urban Design Report, 2021
Supermarket	8,000 m^2 GFA	
Speciality Retailers	3,500 m^2 GFA	
Local employment (gym, childcare, medical centre, service station, fast food)	2,500 m^2 GFA	

4.2 Proposed transport network

The proposed transport network needs to cater for the travel characteristics of the proposed land uses as well as integrate appropriately with the surrounding network.

The majority of trips leaving the Belmore Road Precinct are expected to be by private vehicle, so the most important interface for the precinct is with the existing road network. Further, a critical component of the Precinct Acceleration Protocol is the identification of the full set of infrastructure required to release the precinct - so an appropriately designed road network is critical to the success of the precinct.

4.2.1 Road network and hierarchy

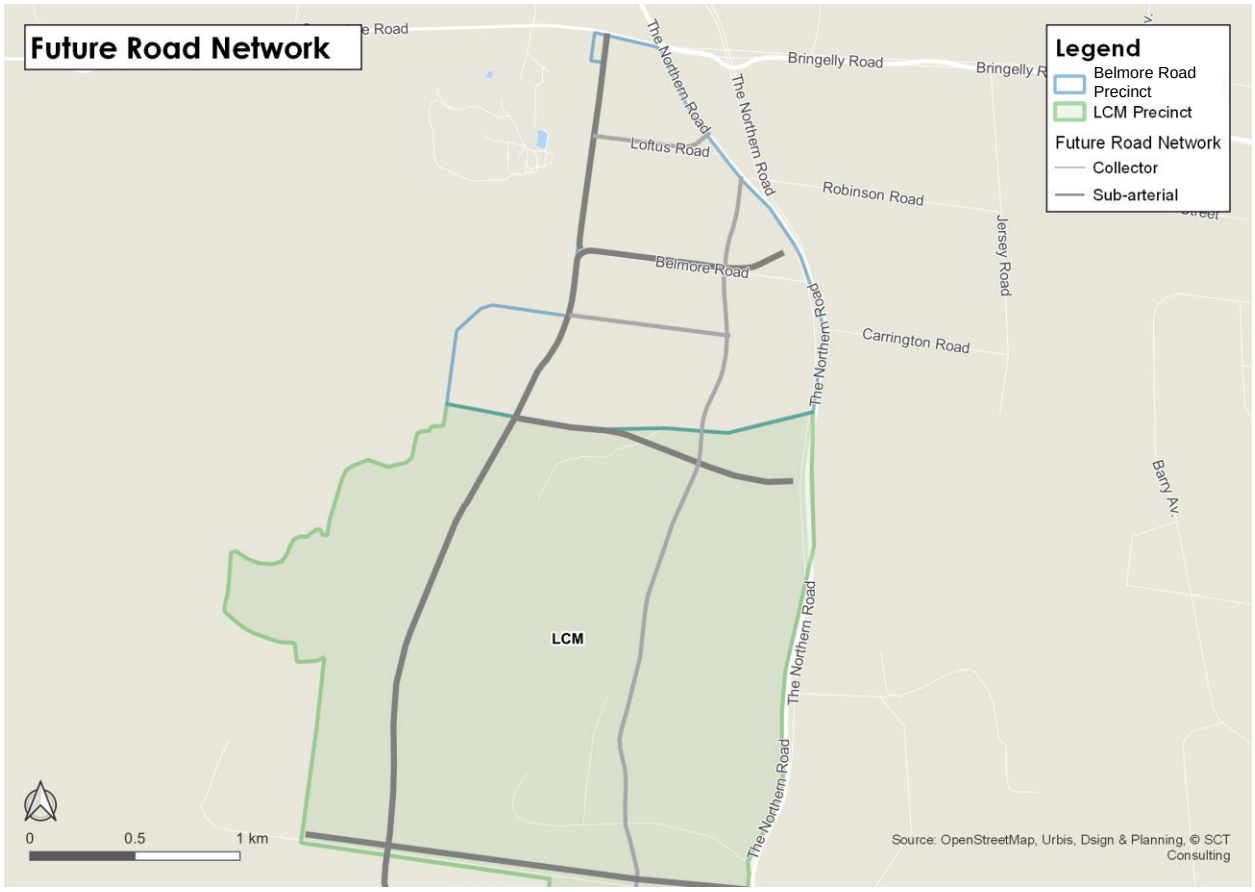
The Lowes Creek Maryland ILP identified a road network structure that extended beyond the precinct but connected up to Bringelly Road / Greendale Road and further south towards the Oran Park precinct. The Belmore Road Precinct ILP proposes to continue these north-south connections as they form legible alternatives to The Northern Road for travel between precincts as well as ensuring that vehicles can access the main intersections along The Northern Road.

The Northern Road upgrade has already identified several intersection works that have recently been constructed along with the corridor interfacing with the South Creek West Release Area, so the main role of the Belmore Road Precinct ILP is to connect in effectively with these intersections with the right hierarchy roads.

[3] It is noted that the yields are the best and most realistic estimates at the time of preparing this version of the ILP and will continue to evolve as the ILP develops. Updates to the yields post and modelling of the maximum development potential will occur post gateway.
[4] A middle ground between the upper and lower estimates was selected. It is proposed that when the ILP is prepared in more detail post gateway that the traffic modelling would reflect the maximum yield of the zoning.

Figure 4–2 below shows the future road network proposed as part of the Belmore Road Precinct ILP, focusing on sub-arterial and collector roads.

Figure 4–2 Future road network



Source: © OpenStreetMap contributors, Urbis, Design & Planning, SCT Consulting, 2020

Key features of the road network are:

– A north-south sub-arterial road that connects from the northern end of the Belmore Road Precinct at Greendale Road through Lowes Creek Maryland precinct to Oran Park and provides an alternative to The Northern Road south of Bringelly Road

– An east-west sub-arterial along Belmore Road as a branch from the north-south arterial road to provide a direct connection to The Northern Road

– A north-south collector road that bisects the precincts between the sub-arterial road and The Northern Road, enabling efficient distribution between all three north-south routes, especially for the local trips

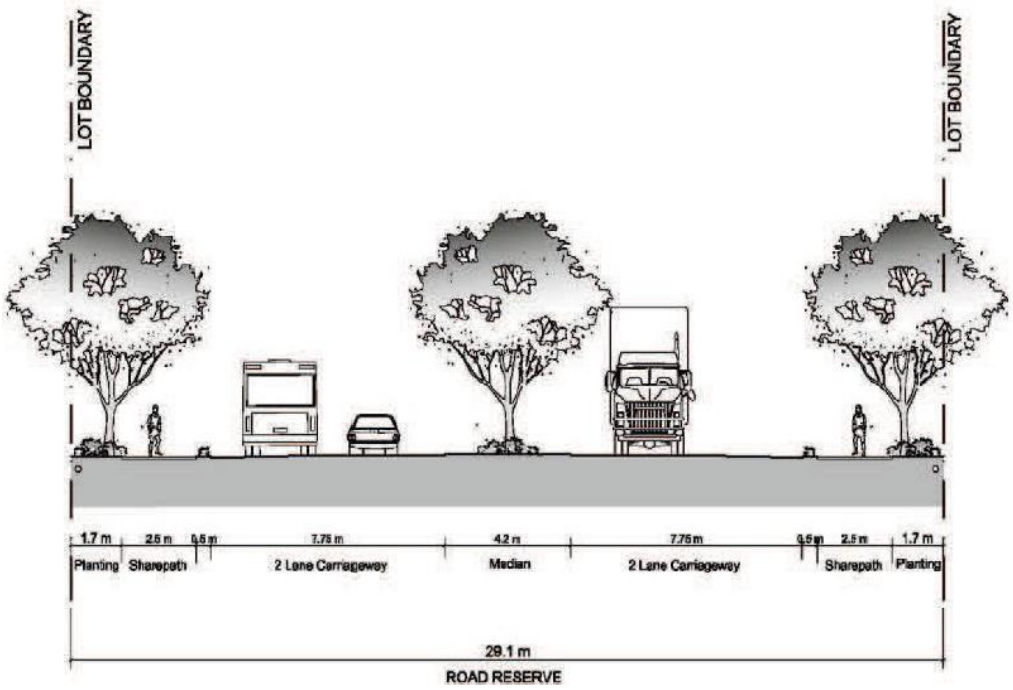
– Local roads divide up the blocks between the sub-arterial and collector roads

4.2.2 Proposed cross-section requirements

Cross-sections for the sub-arterial, collector and local roads are informed by the LCM proposed sections. Draft precinct specific cross-sections are to be prepared for the Belmore Road Precinct and are to be included in the draft site specific DCP.

Lowes Creek Maryland precinct does not have a cross-section for a sub-arterial road, however, the road reserve width for Maryland Entry Avenue is similar in width to a typical sub-arterial road. A 29.1 m road reserve is proposed based on the Camden Growth Centres DCP, which is considered the preferred cross-section. The width allows for bus capable travel lanes and segregated shared paths on both sides of the road, which supports public transport, walking and cycling access. The proposed cross-section is shown in **Figure 4–3**.

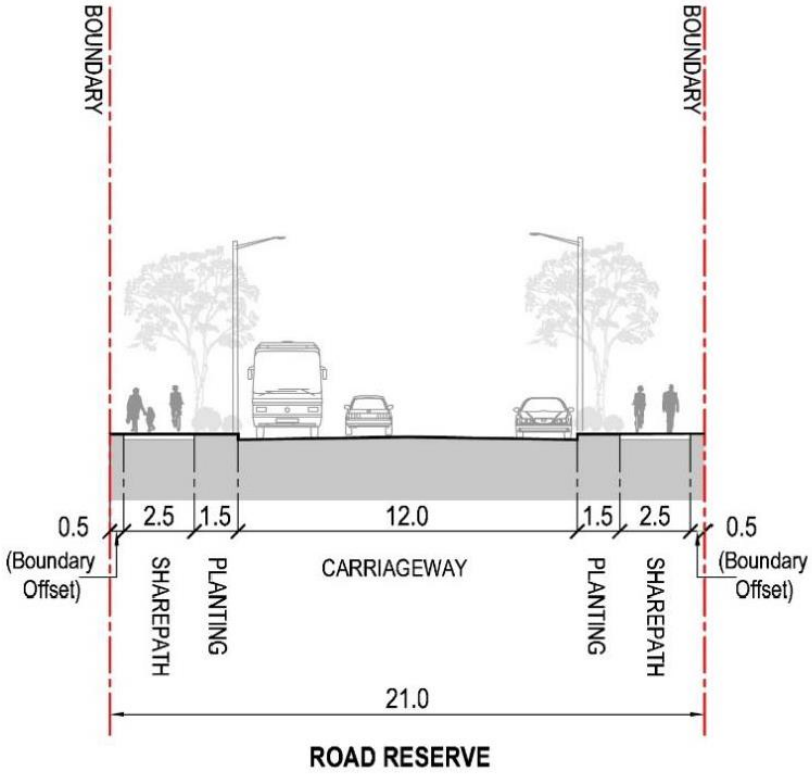
Figure 4–3 Proposed sub-arterial road cross-section



Source: Camden Growth Centres DCP

For collector roads, draft Schedule 6 of the LCM Precinct DCP provides a cross-section for a collector road reserve. It is proposed to be consistent with this draft proposal. The cross-section is replicated in **Figure 4–4** below. The width allows for bus capable travel lanes and shared paths on both sides of the road, which supports public transport, walking and cycling access.

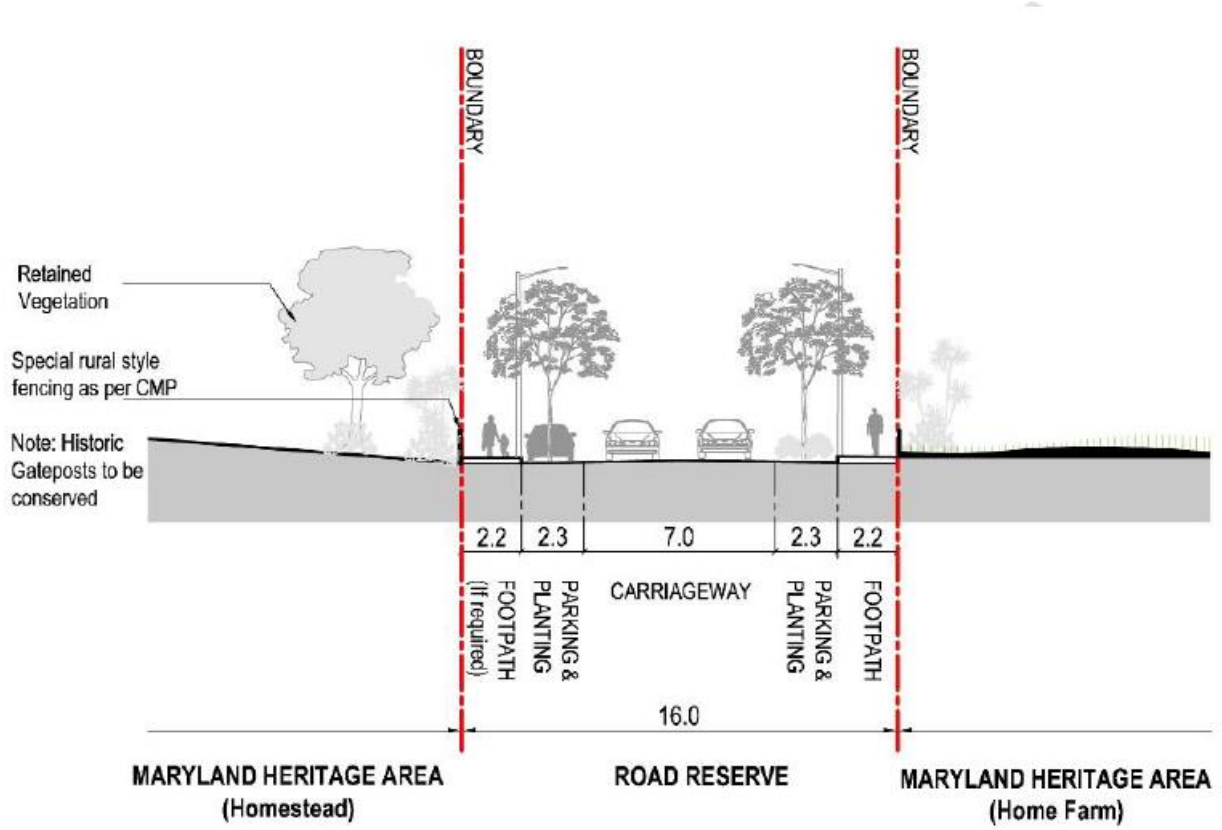
Figure 4–4 Proposed collector road cross-section



Source: Draft LCM Precinct DCP, 2018

Similarly, for local roads, the draft Schedule 6 of the LCM Precinct DCP provides a cross-section for a local road reserve. It is proposed to be consistent with this draft proposal. The cross-section is replicated in **Figure 4–5** below.

Figure 4–5 Proposed local road cross-section



Source: Draft LCM Precinct DCP, 2018

While the space allocated for the local road cross-section is perhaps generous with 16m of total road reserve width and a carriageway of 7.0m, the proposed cross-section enables both lanes to be bus capable. Adopting a cross-section of all roads that are bus capable within the Belmore Road Precinct avoids needing to resolve the bus network in this early stage of precinct planning.

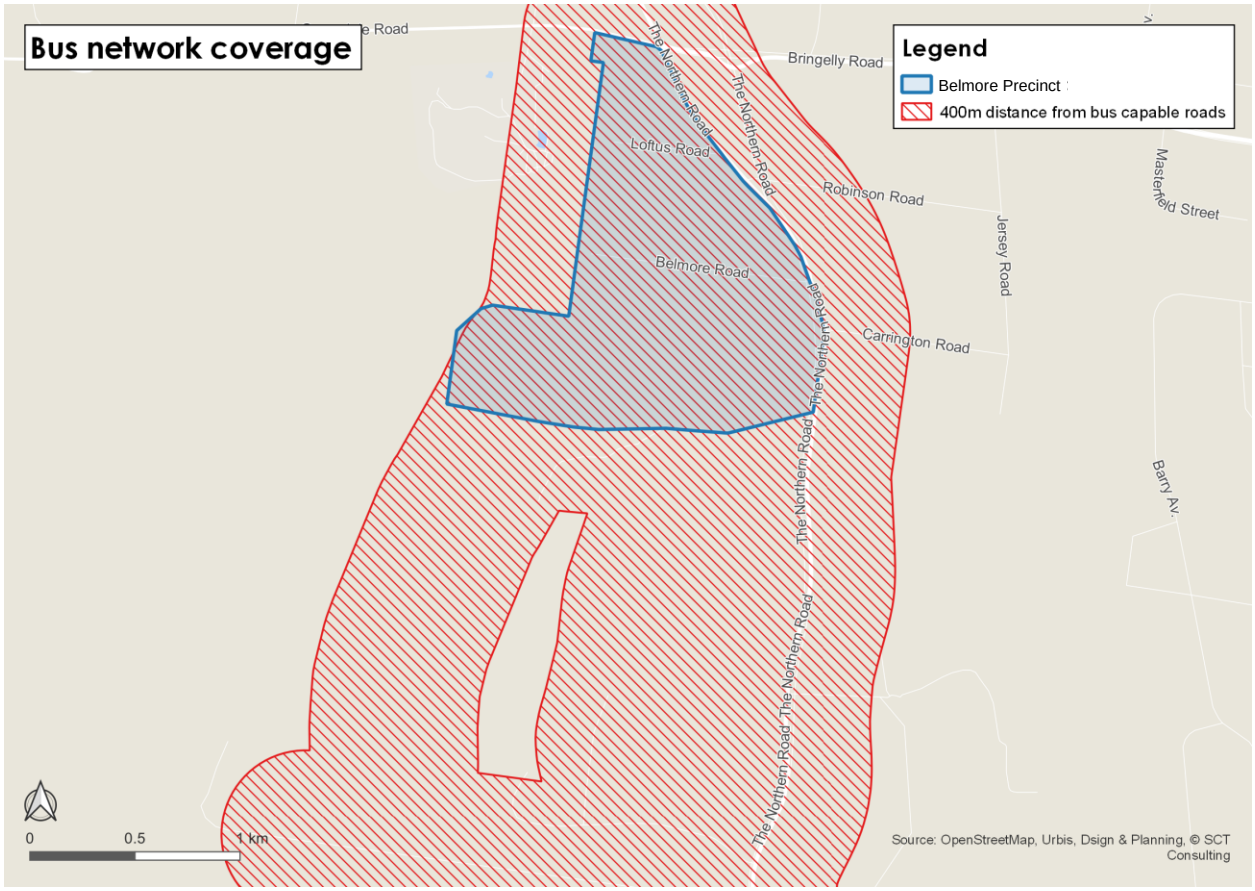
4.2.3 Public transport network

The bus network that would service the Belmore Road Precinct is not able to be resolved at this time due to the concurrent planning processes for Western Sydney Airport, the Aerotropolis, Sydney Metro – Western Sydney Airport as well as other land use changes and transport projects. Each of these projects has implications for the bus network at a strategic level, changing key destinations, route options and types of bus services required.

The critical contribution of this proposal is to maximise the potential for buses to service the precinct to ensure integration with any potential future schemes. The entirety of the sub-arterial, collector and local road network is proposed to be bus capable, ensuring full integration with any future scheme.

Figure 4–6 shows a 400 m distance from all bus capable roads – demonstrating that the entirety of the residential areas in the precinct is within 400 m of a potential route.

Figure 4–6 Bus network coverage



The network is also in a grid-like fashion, with the sub-arterial and collector roads forming north-south and east-west access ways. This enables higher-order bus routes, such as suburban bus routes, to operate efficiently within the precinct.

4.2.4 Active transport network

As the precinct is being designed from a blank slate, there are extensive opportunities for high-quality walking and cycling facilities.

All of the roads proposed in the precinct will have footpaths on both sides. The sub-arterial and collector roads are also proposed to have shared paths on both sides.

When paired with the shared path proposed on the eastern side of The Northern Road, cycling provision is extensive within the precinct. **Figure 4–7** shows the proposed cycle network.

Figure 4–7 Proposed cycle network

Source: © OpenStreetMap contributors, TfNSW Cycle Data, SCT Consulting, 2020

The grid-like cycling network enables cyclists to have high-quality facilities for longer distance trips, including connecting to the town centre.

4.3 Travel Demand Management measures

Sustainable transport and Travel Demand Management (TDM) strategies involve the application of policies, objectives, measures and targets to influence travel behaviour, to encourage uptake of sustainable forms of transport, i.e. non-car modes, wherever possible. TDM measures have proven to reduce congestion created by growth within urban areas and unlock urban renewal opportunities. They result in travel behaviour that uses less road space than single-occupant vehicle commute and takes advantage of spare transport capacity outside the morning and afternoon peaks.

TDM strategies generally guide all relevant customers (residents, employees and visitors) in changing the travel behaviour in the following ways:

– Reduce travel

– Re-mode (consideration of travel via alternative modes)

– Re-time (consideration of travel at alternative times)

– Re-route.

A Travel Plan should be developed and monitored for the Belmore Road Precinct to deliver best practice travel programs and initiatives to manage travel demand for the proposed development. Key initiatives and measures could be developed to:

– Reduce the need to travel

  - Planning for a range of uses are to be provided or integrated into the development to provide a range of services in a single location to maximise trip containment within or in the proximity of the site and encourage the use of active transport (walking and cycling) for short trips.
  - Encourage the use of the internet to reduce the need to travel such as Australia Post, parcel drop-off /pick-up facilities.
  - Encourage the use of the internet and technology to facilitate remote working via smart work hubs with high-quality facilities or working from home.
  - Develop and use of carpooling for wider precinct and community.

– Re-think the mode of travel

  - Walking and cycling:
    - A highly permeable and safe pedestrian network throughout the development.
    - Dedicated cycle routes that connect to the regional routes and major transport hubs.
    - Key design principles to integrate walking and cycling network and facilities into the planning and delivery of the development.
    - High quality, safe and accessible end-of-trip facilities (centralised cycle hubs that are integrated within the development at convenient locations, on-street secure bicycle storage located conveniently at end of cycle destinations, parking hubs for shared bikes, lockers and showers).
    - Free bicycles for residents, employees and visitors to travel within the site and nearby transport interchanges (to be agreed with Councils and TfNSW).
    - Promotion of bicycle initiatives – NSW bicycle week, cycle to work day, free bike check-up events.
    - Establishment of a Bicycle User / Consultation Group.
    - ‘Cycle Update’ newsletter.
  - Public transport:
    - Reimbursement of public transport costs such as giving out of Opal card with credits.
    - Early provision of frequent public transport services to establish a non-car travel behaviour.
    - Good quality public transport stops in the vicinity of the development.
    - Tailored information with clear mapping and walking catchments at public transport stop.
    - Provision of public transport information from home via television channel or community app.

- Parking measures as a mean to encourage alternative modes of travel:
    - Reduced parking rates with flexibility in parking arrangements such as decoupled parking, shared vehicles parking to accommodate the parking needs of all residents.
    - Parking spaces/stations dedicated to electric vehicles, with charging stations.
    - Parking spaces dedicated to car share scheme and community car-share vehicles, both on-street and incorporated in easily-accessed public car parks.

– Re-time and Re-route journeys:

- Development of specific community app/community engagement program to enable changing travel behaviour which includes:
    - Active and public transport maps
    - Personalised journey planner
    - Notifications to latest travel information
    - Shared vehicles information
    - Car-pooling opportunities
    - Other precinct-related information
- Real-time information embedded into development and public transport stop.
- Employers to promote and encourage flexible working hours and arrangements.

While it is important to develop a Travel Plan that is aimed at managing travel demand and reducing reliance on car travel, it is more important to monitor and evaluate the effectiveness of individual measures and the need to adjust the measures. The planning and implementation of a targeted Travel Plan with the above green travel initiatives/principles for the Belmore Road Precinct will provide significant opportunities for alternative travel options and reduce the need for car travel.

5.0 Traffic and Transport Impact Appraisal

5.1 Traffic modelling approach and assumptions

As part of the Department of Planning and Environment's (DPE) proposal for Lowes Creek Maryland precinct, GHD prepared a transport report (*Lowes Creek Maryland Precinct Traffic, Transport and Access Assessment,* 2018), which included:

– Intersection and tube count surveys along The Northern Road and Bringelly Road as well as travel time surveys conducted in 2016

– Calibration and validation of a 2016 base year Aimsun and seven SIDRA intersection models

– Strategic modelling using Sydney Traffic Forecasting Model (STFM) for 2015 to 2041 in five-yearly increments. The report does not detail the broader assumptions adopted in the model but notes that the SCW precinct was included in some model runs

– Aimsun mesoscopic modelling for 2021 – 2041

– SIDRA intersection modelling from 2021 – 2031.

Key findings of this study included:

– The Northern Road would likely need to be widened to six total lanes by 2036

– All intersections perform at Level of Service D or better during both the AM and PM peak period with the proposed upgrades.

At the commencement of the project, SCT Consulting requested permission from DPE to use the GHD models for this project. The models were not provided during the project but are recommended for use post-gateway to ensure consistency with other findings.

An alternative approach was adopted (**Table 5-1**), which sought to maintain consistency with the GHD modelling despite not having access to the models. The purpose of traffic modelling for the planning proposal (pre-gateway) is to understand the implications of the infrastructure requirements along The Northern Road, as a result of changes in land uses and yields of the Belmore Road Precinct since the LCM traffic modelling was undertaken. This approach has been in principle agreement with TfNSW for the pre-gateway traffic assessments.

Table 5-1 Traffic modelling methodology

Step	Details
Replicate GHD SIDRA models	Replication of 2031 Scenario A results in SIDRA using the same infrastructure and demands. The volumes, delays and degree of saturation were extracted from Appendix I of *Lowes Creek Maryland Precinct Traffic, Transport and Access Assessment (*2018) and the layouts were extracted from Appendix H of *Lowes Creek Maryland Precinct Traffic, Transport and Access Assessment (*2018). The main focus of this study was on the external intersections, with only limited consideration for internal ones. With the traffic volumes expected, these intersections can be modelled and designed post gateway. The key focus is to demonstrate the state road network can operate satisfactorily with development.
Extract turning volumes from GHD modelling for future years	Extracting turning volumes for 2031 and 2041 scenarios using Appendix G of *Lowes Creek Maryland Precinct Traffic, Transport and Access Assessment (*2018) for 2041 and Appendix I for 2031 volumes.
Update turning volumes based on the changed yield of Belmore Road Precinct	Calculation of the difference between the LCM assumptions on SCW and the latest Belmore Road Precinct assumptions using the same trip generation rates as LCM but with the updated yield for the Belmore Road Precinct. This generally resulted in trip reductions across the network, which were distributed based on the turning proportions observed in the LCM data.
Re-modelling of the 2031 and 2041 scenarios to identify infrastructure	Use of the models to update forecasted infrastructure and performance of the network with the updated volumes.

This approach ensured that the traffic modelling maximised the use of information within the GHD reporting to comment on the performance of the network with the proposal.

With the traffic modelling being conducted in 2016-17, many assumptions may have since changed for Western Sydney, particularly due to the Airport and Aerotropolis. Information on the travel demand implications and staging of these projects are not publicly available so have not been included.

It is noted that it is expected that more robust traffic modelling is expected post-gateway, which would be scoped in partnership with Council and TfNSW.

5.1.1 Modelling year

The future year of 2041 was selected as the key target year based on the staging identified in the GHD report, which had 2041 as the completion of the LCM precinct. 2031 was selected as an interim year to guide staging, particularly of The Northern Road widening.

5.1.2 Matching accuracy with GHD models

SCT Consulting used a matching process with the GHD models, extracting information such as the light and heavy vehicle volumes from the SIDRA outputs, attempting to match the infrastructure and calibrating the performance to match the GHD models as closely as possible. The results of the Belmore Road Precinct models are compared with the GHD models in **Table 5-2**.

Table 5-2 Comparison of the Belmore Road Precinct and GHD models

TNR Arrangement	Intersection	Level of Service		Delay (s)		Degree of Saturation	
		Belmore Road Precinct models	GHD	Belmore Road Precinct models	GHD	Belmore Road Precinct models	GHD
AM Peak							
TNR with 2 lanes in each direction	TNR / Bringelly Rd	D	D	43.4	51	0.48	0.89
	TNR / Belmore Rd	F	F	106.2	115.7	1.06	1.22
	TNR / Lowes Creek Rd	F	F	280.8	350.3	1.44	1.71
	TNR / Link Rd 3	C	C	33	30.3	0.79	0.96
	TNR / Link Rd 2	F	F	92.4	82.1	1.07	1.10
	TNR / Link Rd 1	D	D	53.5	54.8	0.91	0.93
TNR with 3 lanes in each direction	TNR / Bringelly Rd	D	D	54.9	52.1	0.63	0.89
	TNR / Belmore Rd	F	F	174.1	196	1.24	1.49
	TNR / Lowes Creek Rd	F	F	110.3	109	1.15	1.14
	TNR / Link Rd 3	B	B	27.8	23.6	0.58	0.96
	TNR / Link Rd 2	D	D	56.3	55.3	1.04	0.92
	TNR / Link Rd 1	D	D	51.3	53.1	0.83	0.91
PM Peak							
TNR with 2 lanes in each direction	TNR / Bringelly Rd	D	D	44.2	47	0.49	0.89
	TNR / Belmore Rd	B	B	19	19.7	0.78	0.78
	TNR / Lowes Creek Rd	C	C	32.1	29.4	0.78	0.82
	TNR / Link Rd 3	C	C	40.9	35.4	0.95	0.94
	TNR / Link Rd 2	C	C	33.8	33	0.76	0.90
	TNR / Link Rd 1	B	B	19.7	21.8	0.55	0.76

TNR Arrangement	Intersection	Level of Service		Delay (s)		Degree of Saturation	
		Belmore Road Precinct models	GHD	Belmore Road Precinct models	GHD	Belmore Road Precinct models	GHD
TNR with 3 lanes in each direction	TNR / Bringelly Rd	**D**	**D**	48.1	47.1	0.68	0.89
	TNR / Belmore Rd	**B**	**B**	26.6	22.6	0.55	0.78
	TNR / Lowes Creek Rd	**B**	**B**	28.5	27.8	0.60	0.76
	TNR / Link Rd 3	**C**	**C**	42	40.5	0.84	0.72
	TNR / Link Rd 2	**C**	**C**	31.1	28.3	0.65	0.90
	TNR / Link Rd 1	**B**	**B**	21.5	26.6	0.63	0.50

The results show that all intersections have the same level of service, with minor variations in delays between the models – usually less than 10 per cent. With the pre-gateway nature of the transport assessment, this is considered an appropriate level of matching for a gateway assessment.

5.1.3 Modelling scenarios

Modelling was only undertaken for the "with development" scenarios for 2031 and 2041. At this stage, questions of cost and apportionment are proposed to be deferred until post-gateway, when the broader regional growth is confirmed.

5.2 Trip generation and distribution

Trip generation assumptions were provided in the GHD report, which has largely been adopted in the preparation of this traffic assessment. **Table 5-3** details the assumption and source of trip generation assumptions used in this assessment.

Table 5-3 Trip generation assumptions and source

Activity	AM peak hour (In / Out proportion)	PM peak hour (In / Out proportion)	Source
Residential – low density	0.95 per dwelling (20% / 80%)	0.99 per dwelling (80% / 20%)	GHD, based on The Guide to Traffic Generating Developments Updated traffic surveys – Technical Direction TDT2013/04a.
Residential – medium density	0.65 per dwelling (20% / 80%)	0.65 per dwelling (80% / 20%)	SCT Consulting based on Guide to Traffic Generating Developments (2002)
Residential – high density	0.19 per dwelling (20% / 80%)	0.15 per dwelling (80% / 20%)	GHD, based on The Guide to Traffic Generating Developments Updated traffic surveys – Technical Direction TDT2013/04a.
Supermarket	0 per 100 m^2 GLFA (50% / 50%)	15.5 per 100 m^2 GFA (50% / 50%)	GHD based on Guide to Traffic Generating Developments (2002)
Specialty retail	0 per 100 m^2 GLFA (50% / 50%)	4.6 per 100 m^2 GFA (50% / 50%)	GHD based on Guide to Traffic Generating Developments (2002)
Assorted other uses (gym, childcare, medical centre, service station)	Assumed to be internal trips only		SCT Consulting

Activity	AM peak hour (In / Out proportion)	PM peak hour (In / Out proportion)	Source
Primary school	0.3 trips/student (60% / 40%)	0 trips / student	GHD based on ITE Trip Generation Manual (5th Edition)

The LCM reporting assumed that a proportion of trips within each precinct were internal trips based on the mixed-use nature of the proposal:

– Retail trips were assumed to be completely internal to the precincts only

– Primary schools have 88% internal trips based on research from the Association of Independent Schools of NSW

– Trips from residential uses are assumed to be completely external trips in the peak period.

These assumptions were kept consistent in the preparation of the trip generation model.

Moreover, the traffic modelling undertaken in the previous *Lowes Creek Maryland Precinct Traffic, Transport and Access Assessment, 2018* (GHD) considers the yield of not just the LCM precinct but the SCW precincts to the west of The Northern Road. It assumed a total of 5,750 dwellings in the Belmore Road Precinct and the land to its west and 4,200 dwellings in Cobbitty. Hence, an average of additional 3,150 dwellings is assumed in the land west to the Belmore Road Precinct for balancing the total trip generation for the Bringelly Precinct.

The total trip generation is shown in **Table 5-4**.

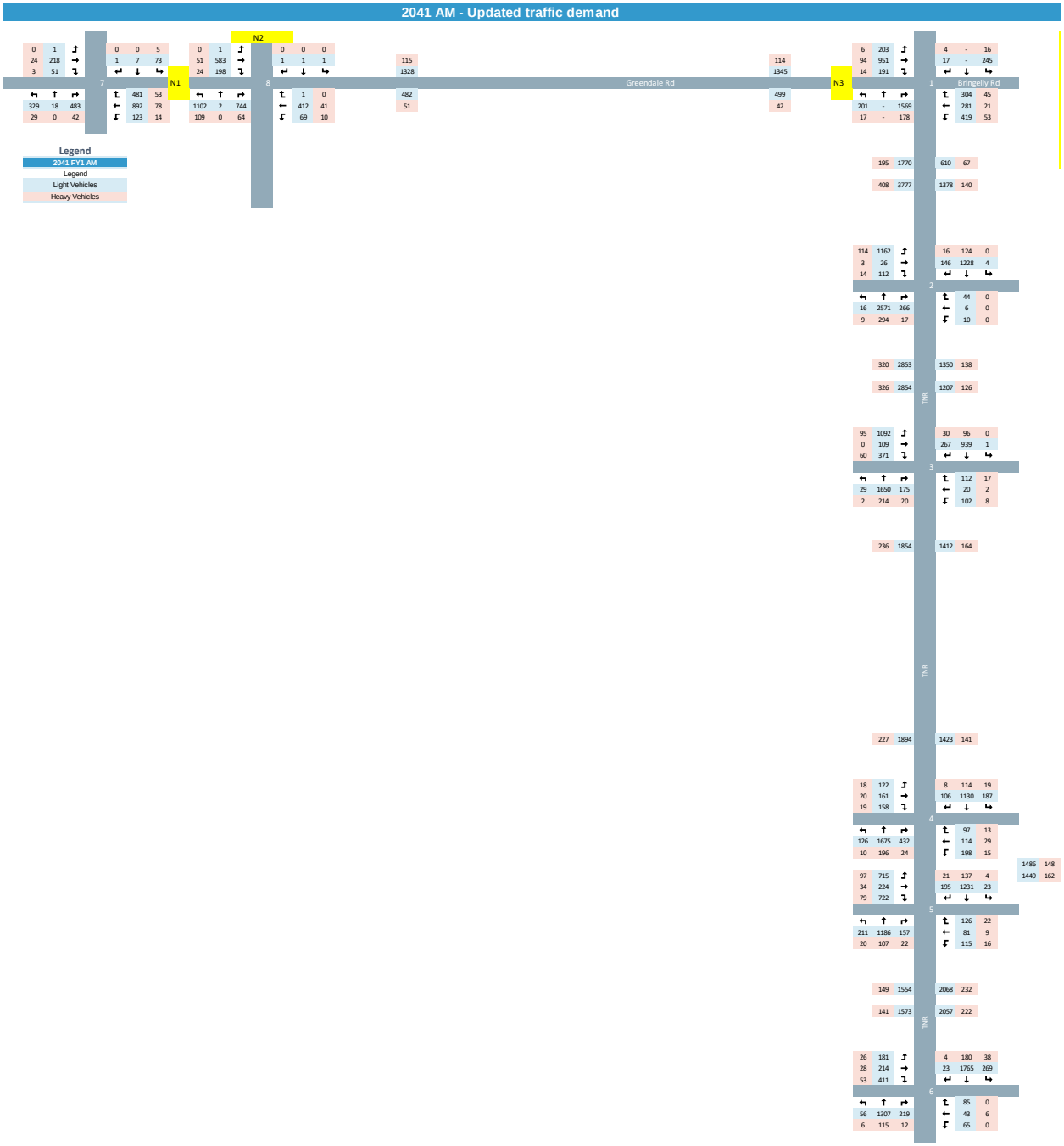
Table 5-4 Total trip generation for the Belmore Road Precinct

Activity	AM peak hour (In / Out proportion)	PM peak hour (In / Out proportion)	The Belmore Road Precinct		
			Yield	AM peak	PM Peak
Residential – low density	0.95 / dwelling (20% / 80%)	0.99 / dwelling (80% / 20%)	1,419 dwellings	1,348	1,405
Residential – medium density	0.65 / dwelling (20% / 80%)	0.65 / dwelling (80% / 20%)	1,118 dwellings	727	727
Residential – high density	0.19 / dwelling (20% / 80%)	0.15 / dwelling (80% / 20%)	108 dwellings	21	16
Supermarket	0 per 100 m^2 GLFA (50% / 50%)	15.5 / 100 m^2 GFA (50% / 50%)	8,000 m^2 GFA	0	930
Specialty retail	0 per 100 m^2 GLFA (50% / 50%)	4.6 / 100 m^2 GFA (50% / 50%)	3,500 m^2 GFA	0	121
Assorted commercial (gym, childcare, medical centre, service station)	Assumed to be internal trips only		2,500m^2 GFA	0	0
Primary school	0.3 / student (60% / 40%)	0 / student	1,170 students	351	0
			Total	**2,446**	**3,198**

Note the residential yields are averages. There is a minimum and maximum yield which has been considered for the ILP through the urban design process. The dwelling yield range is 2,022 to 3,271 dwellings.

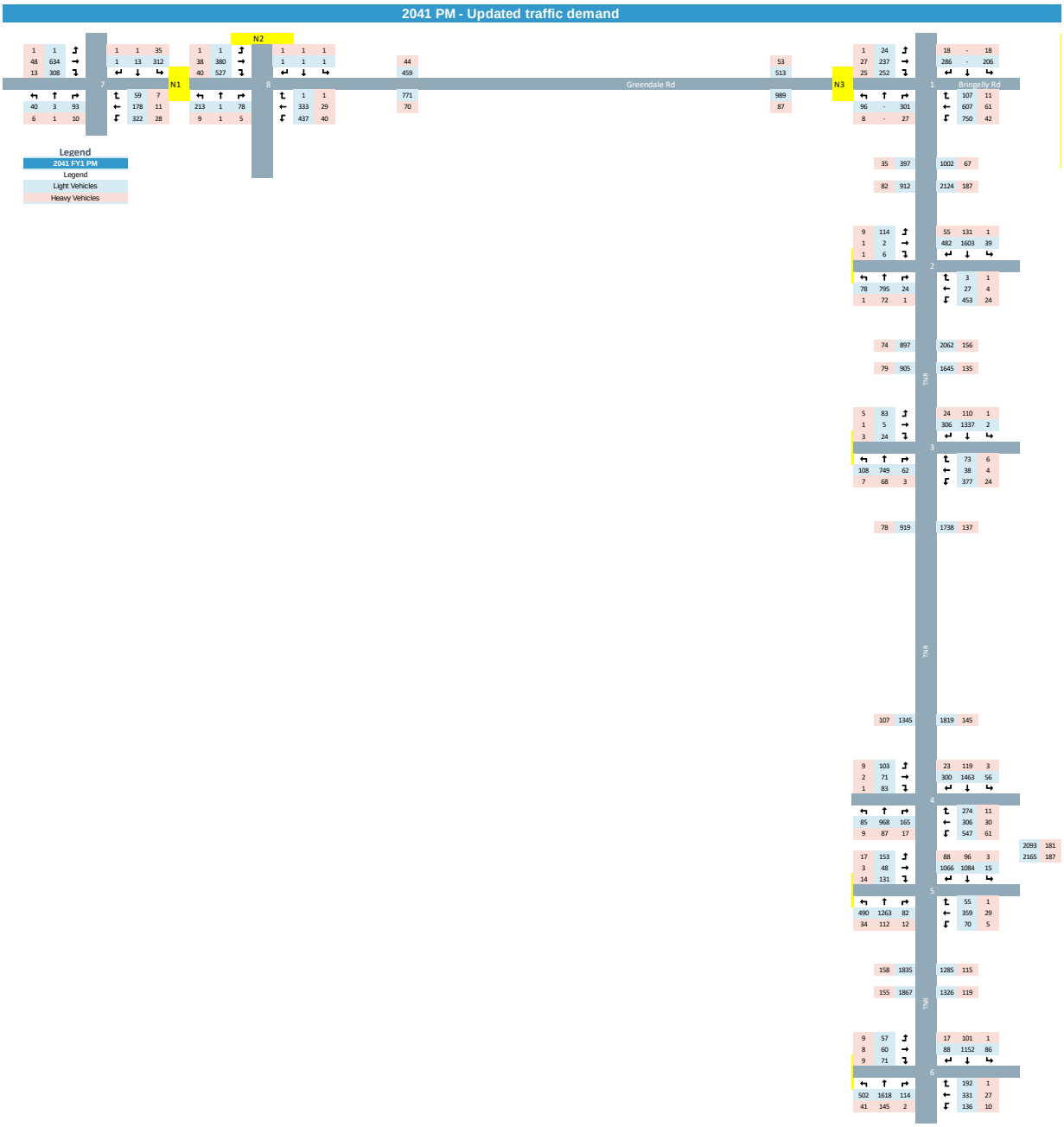
The distribution was adopted from the GHD traffic volume numbers by using the turning proportions at key locations in the network to scale the overall distribution in traffic. The updated turning flow diagrams for the 2041 AM and PM peak are provided in **Figure 5–1** and **Figure 5–2**, respectively.

Figure 5–1 Turning flow diagram for 2041 AM peak hour



Source: GHD and SCT Consulting, 2020

Figure 5–2 Turning flow diagram for 2041 PM peak hour



Source: GHD and SCT Consulting, 2020

5.3 Road network impacts

5.3.1 2041 Network performance

The scenarios tested for 2041 AM and PM peak include:

– Updated 2041 traffic demand with planned The Northern Road upgrade (three lanes per direction)

– Updated 2041 traffic demand with further infrastructure upgrades to identify road upgrade schemes required to achieve acceptable performance.

Although a continuous slip lane for the side road could reduce the delays for vehicles turning left onto The Northern Road as they can merge with through traffic at the downstream lanes, it was not perceived as a safe design option. Continuous slip lanes would require some level of signalisation for pedestrians and with the high-speed design of the road curvature, could risk incidents. They also rely on short merge distances on an already congested road.

Hence, signalised slip lanes were considered across all side roads, which also complies with the intersection layout defined in *The Northern Road and Bringelly Road Upgrades*.

The performance of the traffic network for 2041 is shown in **Table 5-5**. A total of four intersections along The Northern Road record a Level of Service F and Degree of Saturation over 1.0 for AM peak hour including:

– The Northern Road / Belmore Road

– The Northern Road / Lowes Creek Road

– The Northern Road / Link Road 2

– The Northern Road / Link Road 1.

The PM peak performs better than AM peak where The Northern Road / Link Road 3 is the only intersection with LoS F or Degree of Saturation over 1.0.

The constraints of the network capacity led to the inability of the full demand to enter the network, making it necessary for further infrastructure upgrades. The proposed infrastructure upgrades are generally:

– A six-lane corridor for The Northern Road

– Triple right turn lanes (south to east) and additional left turn lane (east to south) for Greendale Road / The Northern Road / Bringelly Road interchange

– Additional turning lane from the precinct on the side roads (up to two lanes) at multiple intersections on The Northern Road

– Widen Greendale Road to two lanes in each direction between the north-south sub-arterial road and the Greendale Road / The Northern Road / Bringelly Road interchange

– Ban right turn for the east approach of The Northern Road / Belmore Road

– Dual right turn lanes on The Northern Road.

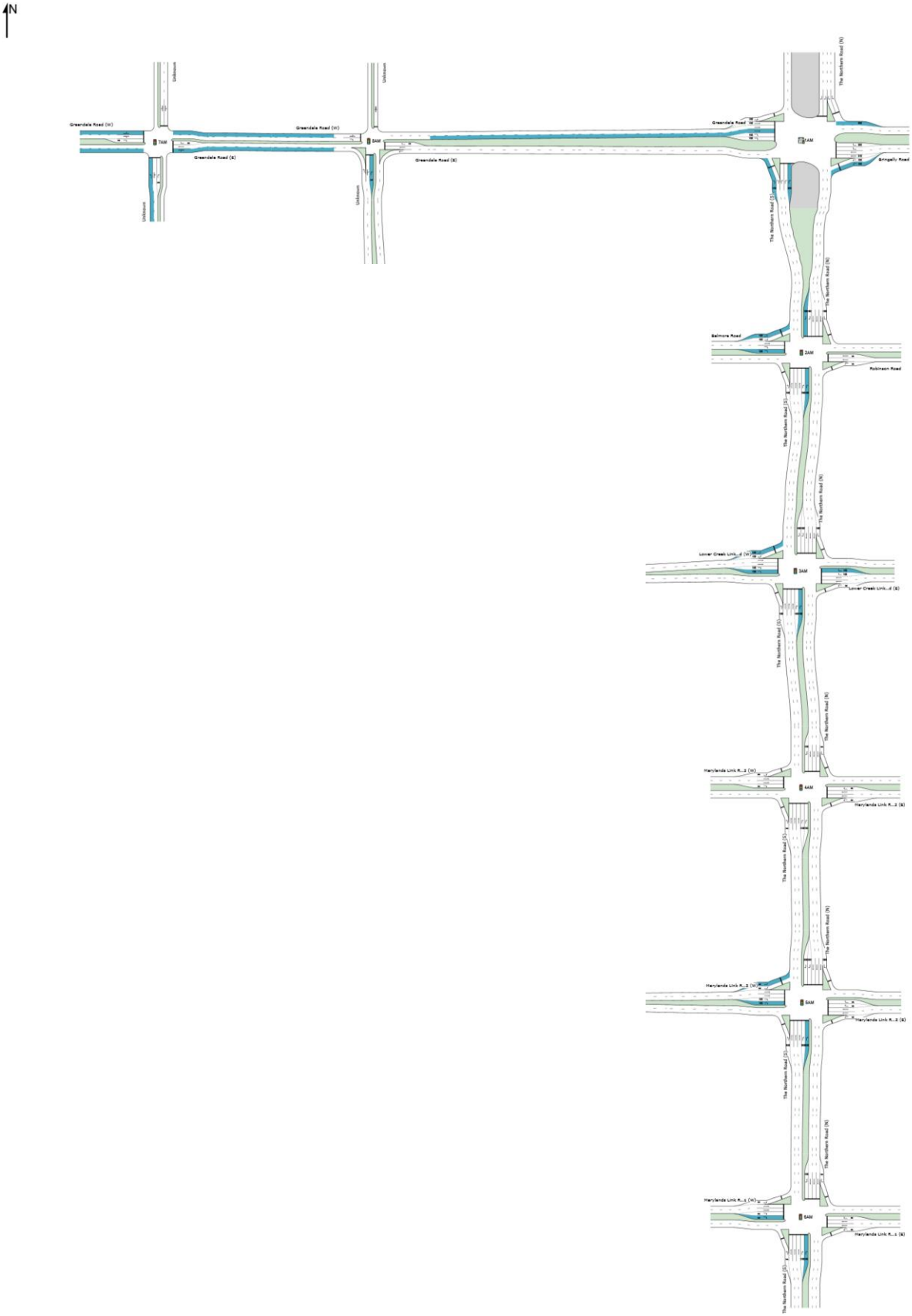
Phasing for side roads were adjusted to diamond or split to respond to the demands and infrastructure changes. Left turn traffic from the Belmore Road Precinct at The Northern Road / Belmore Road and The Northern Road / Lowes Creek Road were partially diverted (200 cars at each intersection for AM peak) to the north-south sub-arterial road and Greendale Road to balance the road network use, to account for redistribution that would likely occur in real life as drivers avoid congested route options.

Assignment across the network is expected to be a feature of the modelling post gateway with the use of the LCM Aimsun model proposed. This will remove the need for manual diversions and increase confidence in the infrastructure solution.

The network just operates satisfactorily after infrastructure upgrade and traffic redistribution in 2041 (with LoS E at the intersection of The Northern Road / Belmore Road for AM peak only). Intersection upgrades to achieve this are close to maximum scale typically seen in Sydney. Further optimisation post-gateway could address some of these issues.

Figure 5–3 highlights the infrastructure upgrades required to cater for the 2041 updated traffic demand.

Figure 5–3 2041 Infrastructure upgrades



Note: Blue sections represent the required infrastructure upgrades above the 6 lane corridor layout for The Northern Road

Table 5-5 2041 Intersection performance

No.^	Intersection	2041 AM Peak			2041 PM Peak			2041 AM Peak with infrastructure upgrade			2041 PM Peak with infrastructure upgrade		
		Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS
1	TNR / Bringelly Rd	49.6s	D	0.78	40.5s	D	0.61	50.1s	D	0.78	39.1s	C	0.42
2	TNR / Belmore Rd	253.2s	F	1.44	38.6s	C	0.71	69.3s	E	1.05	39.1s	C	0.73
3	TNR / Lowes Creek Rd	382s	F	1.70	31.7s	C	0.60	47s	D	0.94	38.4s	C	0.66
4	TNR / Link Rd 3	30s	C	0.67	100.7s	F	1.11	36.7s	C	0.78	55.1s	D	0.93
5	TNR / Link Rd 2	71.9s	F	1.11	47.5s	D	0.90	30.6s	C	0.70	46.9s	D	0.91
6	TNR / Link Rd 1	94.9s	F	1.06	31.6s	C	0.78	42.2s	C	0.82	44.2s	D	0.92
7	Greendale Rd / Unknown	175.5s	F	1.34	28.1s	B	0.91	21.8s	B	0.83	19.3s	B	0.70
8	Greendale Rd / Unknown	492.3s	F	2.04	16.3s	B	0.87	39.4s	C	1.00	10s	A	0.75

^ No. of each intersection is indicated in Figure 5-3

5.3.2 2031 Network performance

It is envisaged that the Belmore Road Precinct will be developed in stages. *Lowes Creek Maryland Precinct Traffic, Transport and Access Assessment, 2018* (GHD) assumed one third of the development completed in the 2031 model.

The scenario for the 2031 model adopts two lanes per direction for The Northern Road, as three-lane widening may not occur by 2031. While the network for PM peak performs at an acceptable level of service, three intersections on The Northern Road indicate LoS F for AM peak including (**Table 5-6**):

– The Northern Road / Belmore Road

– The Northern Road / Lowes Creek Road

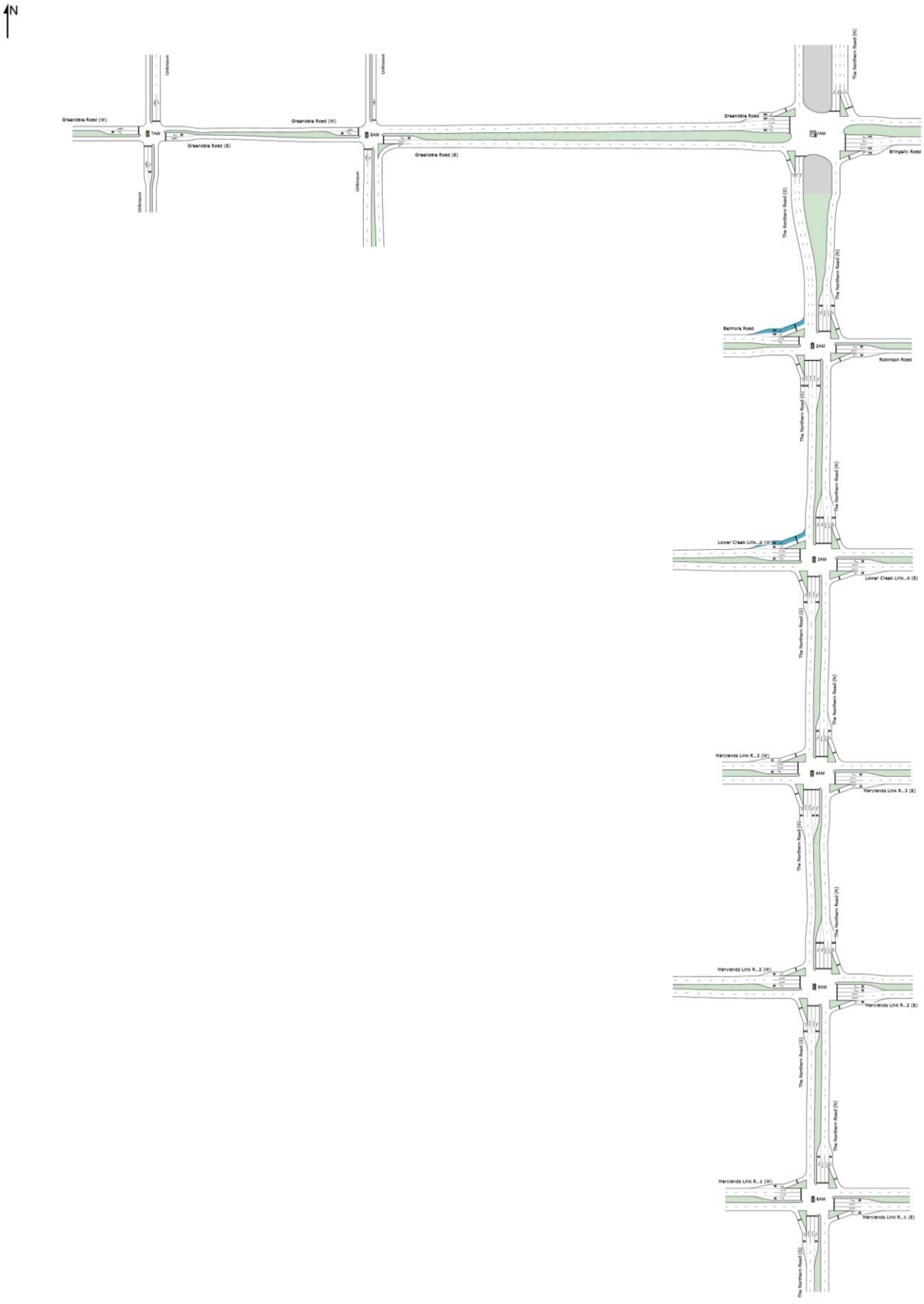
– The Northern Road / Link Road 2.

To achieve acceptable LoS for all intersections in 2031 for the two peak hours, infrastructure upgrades are required at intersections of The Northern Road / Lowes Creek Road and The Northern Road / Belmore Road by adding a left-turn lane from the precinct onto The Northern Road (**Figure 5–4**).

Left turn traffic from the Belmore Road Precinct at The Northern Road / Belmore Road and The Northern Road / Lowes Creek Road were partially diverted (300 and 200 cars, respectively for AM peak) to western internal road and Greendale Road to balance the road network use. Assignment across the network is expected to be a feature of the modelling post gateway with the use of the LCM Aimsun model proposed. This will remove the need for manual diversions and increase confidence in the infrastructure solution.

The network performance after the infrastructure upgrades is shown in **Table 5-6**.

Figure 5–4 2031 Infrastructure upgrades



Note: Blue sections represent the required infrastructure upgrades

Table 5-6 2031 Intersection performance

No.^	Intersection	2031 AM Peak			2031 PM Peak			2031 AM Peak with infrastructure upgrade			2031 PM Peak with infrastructure upgrade		
		Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS
1	TNR / Bringelly Rd	43.4s	D	0.48	44.2s	D	0.49	46.9s	D	0.60	43.6s	D	0.49
2	TNR / Belmore Rd	106.2s	F	1.06	19s	B	0.78	50.8s	D	0.88	18.8s	B	0.78
3	TNR / Lowes Creek Rd	280.8s	F	1.44	32.1s	C	0.78	50.8s	D	0.96	32.5s	C	0.78
4	TNR / Link Rd 3	33s	C	0.79	40.9s	C	0.95	30.6s	C	0.77	41s	C	0.95
5	TNR / Link Rd 2	92.4s	F	1.07	33.8s	C	0.76	45.7s	D	0.94	33.8s	C	0.76
6	TNR / Link Rd 1	53.5s	D	0.91	19.7s	B	0.55	56s	D	0.91	19.7s	B	0.55
7	Greendale Rd / Unknown	15.6s	B	0.50	15.1s	B	0.57	15.4s	B	0.51	15.1s	B	0.57
8	Greendale Rd / Unknown	19.3s	B	0.55	11.7s	A	0.75	19s	B	0.64	11.7s	A	0.75

^ No. of each intersection is indicated in Figure 5-4

5.3.3 Internal road network

The internal road network was not evaluated in SIDRA at this time, as the scale of traffic volumes are consistent with the two to four-lane roads. Optimisation of the road hierarchy and the form of intersections at key junctions would be evaluated post-gateway.

This assessment would include a warrant assessment for any intersections proposed to be signalised.

5.4 Public transport impacts

Delivery of the planned Bringelly Metro Station is indicatively 4km north of the site. The new station and a bus network that could be delivered in connection with Sydney Metro could significantly change travel behaviour in the area. The current transport assessment does not account for this potential change to take a conservative approach. Understanding the potential mode shift will be important to confirm post gateway.

At this time, the public transport network is not fully known. As stated above, all roads in the precinct are proposed to be bus capable, enabling the entirety of the area to be covered by bus services. The north-south sub-arterial and collector roads also provide an opportunity for services to travel through the precinct to Oran Park in the south where a station for Sydney Metro Greater West may be located in the future.

5.5 Active transport impacts

With footpaths proposed on both sides of all roads, active transport can be one of the most convenient modes for short-distance trips. The road network is grid-like in structure, providing numerous crossing opportunities and reducing travel distance between residential areas and the town centre.

The school is separated from the sub-arterial roads, located at the corner of two collector roads and surrounded by higher intensity residential development. The higher intensity of uses around the town centre will have an effect of slowing traffic speeds and enabling prioritisation of pedestrians around this area. The school is also located adjacent to local open space, removing the need for students to cross any roads to access playing fields.

6.0 Gateway risk assessment

6.1 Strategic risks

As a pre-gateway traffic assessment, SCT Consulting proposed to prepare the traffic assessment to understand the change in yield of the land uses proposed for the Belmore Road Precinct that were assessed as part of the *Lowes Creek Maryland (LCM) Precinct Traffic and Transport Assessment (prepared by GHD, 2018)*.

From a traffic modelling perspective, SCT Consulting proposed to update the LCM SIDRA models to reflect the changes in yield and trip generation of the land uses assumed in the Belmore Road Precinct. The revised SIDRA modelling has highlighted any potential issues and opportunities with the intersections along The Northern Road and the internal road network within the Belmore Road Precinct, as a result of more detailed planning of the Belmore Road Precinct.

Initial planning of the Belmore Road Precinct suggested that the updated yields are generally similar to those assumed in the LCM Precinct Traffic and Transport Assessment.

The approach of updating the SIDRA modelling to reflect the changes in the latest yields in the Belmore Road Precinct is considered appropriate by TfNSW for pre-gateway to determine the net changes in impacts. It was also agreed additional modelling may be required post-gateway and the scope of any additional modelling will be prepared in collaboration with TfNSW.

At the 25 March 2020 meeting, it was also agreed SCT Consulting will undertake a risk review of the changed strategic context since the LCM rezoning was prepared and their implications on the Belmore Road Precinct planning proposal. The identified risks will be used to inform all agencies in determining the future scope of traffic assessment and modelling post-gateway.

It is proposed that DPE work with TfNSW to establish appropriate gateway conditions to enable effective resolution of these matters if the gateway is granted.

Table 6-1 Gateway risks for the Belmore Road Precinct

No.	Category	Risk	Implications	Remarks
1	Land uses	The original LCM traffic study was based on the broader land use assumptions called “LU16”. Land use assumptions of South West Growth Area (SWGA) and the WSA has changed since land use assumptions “LU16”.	Forecast background traffic growth on the surrounding road network and the timing of infrastructure needs such as The Northern Road would change.	A significant amount of planning works are being undertaken by the Government to understand the strategic road network and transport needs based on the new land use assumptions. Opportunity to monitor the changes in the road network and work collaboratively with government agencies and other landowners towards an adaptive outcome.
2	Land uses	Change of travel patterns as a result of the WSA providing additional employment opportunities.	Change of peak travel directions and affects infrastructure requirements.	A significant amount of planning works are being undertaken by the Government to understand the strategic road network and transport needs based on the new land use assumptions. Opportunity to monitor the changes in the road network and work collaboratively with government agencies and other landowners towards an adaptive outcome.
3	Infrastructure	The strategic road network and transport package of works required such as Sydney Metro Greater West for the Western Sydney GIC are unknown.	Potential new roads and public transport infrastructure and services will not be known for the planning of the South Creek West Precincts. Alternative corridor(s) to The Northern Road could improve traffic conditions.	The LCM traffic modelling has considered the worst case where there are no new roads and public transport infrastructure and services such as Sydney Metro Greater West. If this new infrastructure is considered in the future, traffic loading on The Northern Road could be less than those considered in the LCM traffic modelling.
4	Infrastructure	Corridor preservation of major infrastructure such as Outer Sydney Orbital (OSO) and/or Sydney Metro Greater West may trigger land acquisition.	Either the main corridor or other supporting road networks may impact the precincts. None of the work to date indicates this is likely.	The known corridor of OSO is understood not to overlap with the SCW precincts and Sydney Metro Greater West is on the eastern side of The Northern Road. TfNSW to confirm corridor requirements. If the OSO or Sydney Metro Greater West is considered in the future, it is likely to relieve the traffic loading on The Northern Road and the traffic network being planned currently. This is considered a low risk.

No.	Category	Risk	Implications	Remarks
5	Infrastructure	Changes of interchange location of Outer Sydney Orbital will affect how traffic access the strategic road network.	Road hierarchy and trip distribution pattern may change and impact the infrastructure requirements of the surrounding road network.	The OSO is currently a corridor preservation project. Construction of this project is not likely to commence within the timeframe of this project delivery; hence the planning of the precincts should be based on current information available. Current planning decisions can be informed by potential interchange locations, but actual interchanges will need to respond to current planning decisions.
6	Infrastructure	There is no commitment to widening The Northern Road to six lanes.	The precinct plan and traffic assessment need to identify when six lanes are required on The Northern Road and contribution implications.	Before confirmation of GIC, traffic modelling could be undertaken pre-gateway and post-gateway to understand the staging implications on the road network including The Northern Road and identify the timing when six lanes are required on The Northern Road including to inform contribution planning. Any requirement to upgrade The Northern Road will be informed by progress on the broader Western Sydney transport network and infrastructure upgrades.
7	Traffic modelling	Aimsun modelling prepared for LCM are dated and could need re-work to be fit for the intended purpose.	Future year modelling for LCM is being reviewed as part of the Rezoning process for LCM. The Aimsun model future year scenarios need to be reviewed and updated for land use and infrastructure assumptions once rezoned.	Should Aimsun modelling be required for post-gateway traffic assessment for the CKDI project, SCT Consulting will scope out the appropriate land use and infrastructure assumptions and modelling requirements, in collaboration with TfNSW.

These risks are believed to be able to be mitigated with a program of work post-gateway that involves collaboration with TfNSW, Council and DPE.

7.0 Conclusion and Next Steps

7.1 Conclusion

This traffic study shows that the Belmore Road Precinct ILP is feasible and represents an improved proposal over assumptions made in the LCM reporting:

– The Belmore Road Precinct is comparable in scale to what was assumed in the LCM reporting in terms of the total number of trips for the precinct, showing a willingness to work with recent DPE planning for the area.

– A package of works is identified for 2041 that is considered feasible. Given the length of the time horizon, having a network that is operating appropriately in this year is considered a compelling solution.

– The package of works improves on the assumptions made in LCM by avoiding continuous left turn facilities along The Northern Road, improving safety for all road users.

– All sub-arterial and collector roads will be bus-capable, enabling all of the populated areas of the Belmore Road Precinct to be within 400m distance of a bus route.

– The study retains key assumptions from the LCM study such as traffic generation rates, showing a willingness to put forward reasonable and realistic assumptions for the future.

– A risk table has been prepared in line with TfNSW's request. This table shows that while there are several risks in the planning proposal, these can be mitigated by appropriate gateway conditions and a good working relationship with Government agencies post gateway.

7.2 Next Steps

The following next steps are proposed:

– Council and TfNSW provide comments as a part of the lodgement process with Council

– Council lodgement of the planning proposal, followed by DPE gateway determination

– It is proposed to convene a Project Steering Group with Council, DPE, TfNSW and the proponent to use as a means of resolving technical issues during the development of a TMAP

– Following gateway approval, SCT Consulting will prepare a Transport Mobility and Access Plan (TMAP) Scoping Note that agrees on the technical scope that would satisfy any relevant gateway conditions, for the approval of the steering committee.


SCT
Consulting