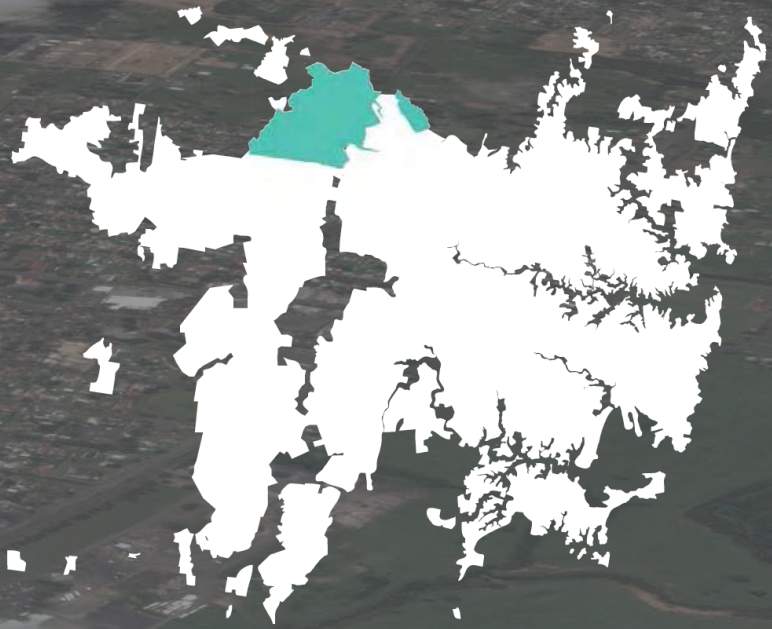

NORTH WEST PRIORITY GROWTH AREA

STRUCTURE PLAN REVIEW

Exhibition Draft Report - Integrated Transport + Land Use Planning

November 2016

NSW GOVERNMENT Planning & Environment

NSW GOVERNMENT Transport for NSW

JACOBS

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REVISION	DATE	DESCRIPTION	BY	REVIEW	APPROVED
A	12/05/2015	SUBMITTAL OF PRELIMINARY ANALYSIS REPORT	A. WEBER Y. ZHANG P. TRUONG	S. KONSTAS	S. KONSTAS
B	29/05/2015	SUBMITTAL OF DRAFT REPORT	A. WEBER Y. ZHANG P. TRUONG	S. KONSTAS	S. KONSTAS
C	22/06/2015	SUBMITTAL OF FINAL REPORT	A. WEBER Y. ZHANG P. TRUONG	S. KONSTAS	S. KONSTAS
D	13/05/2016	SUBMITTAL OF DRAFT REPORT	A. WEBER Y. ZHANG P. TRUONG	S. KONSTAS	S. KONSTAS
E	25/11/2016	SUBMITTAL OF DRAFT FOR EXHIBITION	P. TRUONG	S. KONSTAS	S. KONSTAS

Transport for New South Wales (TfNSW) is currently planning for the Outer Sydney Orbital (OSO) corridor. As and when the Department of Planning and Environment has a clear understanding of the final corridor, we will accordingly modify the North West Priority Growth Area maps in a subsequent revision of the Land Use and Infrastructure Strategy (LUIS).

EXECUTIVE SUMMARY

INTRODUCTION

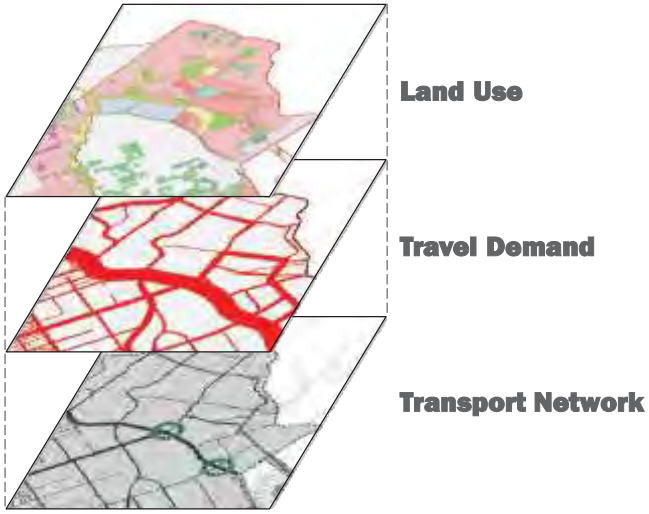
Following the release of *A Plan for Growing Sydney* in December 2014, which identified a number of significant infrastructure initiatives including the new Western Sydney Airport (WSA) at Badgerys Creek and investigations for an Outer Sydney Orbital (OSO), the Department of Planning and Environment (DPE) has committed to undertake a review of the North West Priority Growth Area (NWPGA) Structure Plan. Jacobs has been commissioned to undertake a preliminary review of the current Structure Plan for the NWPGA, in order to align the Structure Plan with the *NSW Long Term Transport Master Plan, 2012* (*LTTMP*), *A Plan for Growing Sydney* and other current transport and land use strategies, with particular emphasis on the following key strategic elements:

- Land Use and Transport Integration.
- Public Transport (Rail and Bus).
- Road Network.
- Freight Network.
- Active Transport Network.

The overall study will result in a revised structure plan for the NWPGA ensuring a coordinated and efficient approach to land use planning, environmental management and transport infrastructure investment that responds to *A Plan for Growing Sydney* and *LTTMP*.

AN INTEGRATED + BALANCED APPROACH

The Preferred Plan (the Plan) addresses both the local and regional transport needs with a particular focus on the NWPGA. The Plan has ensured that land use and transport have been integrated at every stage and in every aspect of the structure plan. The proposed land use, travel demand, transport network, and connections to the transport system outside of the NWPGA were reviewed. The network planning used all available information and was developed based on the location of land uses along key corridors, connections to key activity centres, and connectivity between other major transport systems. The planning and evaluation involved a multi-layered process as shown below.



PREFERRED PLAN – LAND USE + TRANSPORTATION WORKING AT ALL LEVELS

The NWPGA Structure Plan has adopted an approach that considers the transport network firmly within the context of the land use system and the demographic and demand drivers associated with it. The integrated transport plan has been structured relating to the five key themes

- Rail network.
- Bus network
- Road network.
- Active transport.
- Freight movement.

EXPANSION OF THE RAIL NETWORK

Sydney Metro Northwest (currently under construction) will have a station at Cudgegong Road, located near Schofields Road. Sydney Metro Northwest will connect NWPGA with key employment centres along the Global Economic Corridor including Rouse Hill, Norwest, Macquarie Park, Chatswood, St Leonards and Sydney CBD by providing high frequency services with two- to three-minute headways using high capacity single deck services.

A rapid transit corridor defined by Sydney Metro Northwest through the centre of the NWPGA will respond to emerging nodes within the centre and adjoining areas. It will be a catalyst to accommodate future network infrastructure and in the longer term, rapid transit services will provide an additional, more powerful attractor for transit users as well as stimulating further development. Sydney Metro Northwest and the future extension

of the rapid transit network will be a main transport route in the area and will serve and connect the major centres of Rouse Hill, Schofields and Marsden Park. A direct route with an interchange at Schofields Station (via the Richmond Line) could provide a higher capacity interchange at Schofields.

REFINEMENT OF THE BUS NETWORK

The bus network has been configured to serve centres and areas of higher density to maximise the public convenience of public transport use and encourage a shift away from use of the private car. Following the structure outlined in *Sydney's Bus Future* (TfNSW, December 2013), the proposed NWPGA bus network consists of three service types: rapid bus routes, suburban bus routes and local bus routes.

The rapid route (Rouse Hill – Marsden Park – Blacktown) takes advantage of the high levels of bus priority on Schofields Road. Richmond Road, south of Marsden Park would also need high levels of bus priority to support the Rapid Bus philosophy. The rapid route will provide a high quality bus link for east-west travel within the NWPGA and between the NWPGA and Blacktown.

The suburban bus network complements the rapid bus network by providing important links within the NWPGA, beyond the rapid route corridor. The two suburban routes connect with the rail network and rapid bus routes at six purpose built interchanges (including Riverstone). The suburban network will provide high quality links between each of the major interchanges. The two designated suburban routes are:

- Rouse Hill – Schofields – Marsden Park – Penrith.
- Rouse Hill – Box Hill – Riverstone – Marsden Park – Mount Druitt.

Public transport links and proposed bus corridors have been located in such a way that they run through the core of development areas within NWPGA. Two bus corridors have been proposed to pass through the area at:

- Garfield Road – linking the Box Hill area to Marsden Park via Riverstone and beyond to Mount Druitt and Penrith via South Street.
- Schofields Road – linking Rouse Hill Centre to Marsden Park via Schofields and beyond to Blacktown via Richmond Road, and Parramatta and Blacktown via the North West Transitway.

AN INTEGRATED ROAD NETWORK

The Plan for NWPGA is based on a clear road hierarchy which broadly aligns with the LTTMP and the NSW Road Plan currently under development from TfNSW. The street network layout has been planned in such a way that provides an interconnect grid network layout promoting connectivity, permeability and legibility. The proposed hierarchy results in optimal opportunities to be serviced by an integrated public transport network and has been planned and dimensioned integrally with the land use planning framework. This has ensured that each street and its position in the road hierarchy is appropriate to its role and the likely traffic demands placed upon it.

The primary access to NWPGA will be via M7 Motorway, Richmond Road and Windsor Road. Connected to these, Schofields Road, Garfield Road and Bandon Road form major access spines providing access to the wider local and regional road network. Both Schofields Road and Garfield Road are envisaged as a multi-purpose corridor providing vehicular and non-vehicular transit opportunities (pedestrians, cyclists and bus rapid, suburban bus). A series of sub-arterials roads have also been provided to distribute traffic from higher order road network throughout the NWPGA.
The NWPGA road network has been developed on the basis of promoting local access rather than regional traffic. The road hierarchy is compatible with the land use and range of roles that each street serves. This incorporates a grid of collector roads to distribute traffic within the NWPGA and each corresponding precinct. The collector roads provide local access within each precinct.

REGIONAL ACTIVE TRANSPORT CONNECTIONS

The strategic infrastructure planning on the Richmond Rail Line and in particular new road crossings proposed of the Richmond Line within the NWPGA will provide an opportunity to improve accessibility, safety and connectivity for walking and cycling. The proposed improvements to the role, location and configuration of road crossings of the Richmond Line will enhance safety along walking and cycling routes. These road improvements will entail grade separation across Richmond Line at Bandon Road, Garfield Road, Westminster Street and Schofields Road which can be used for walking and cycling.

The regional network will encourage bicycle trips into and through main centres for distribution of local bike trips and recreation. The regional cycle network and comprises the following key corridors:

- Windsor Road – Winston Hills, Riverstone, Box Hill and Richmond.
- Richmond Road - connecting Mount Druitt, Prospect Nature Reserve and UWS Hawkesbury Campus.
- Richmond Rail Line – connecting Western Sydney Parklands, M7 Motorway and Richmond.
- Bandon Road – connecting Vineyard, Marsden Park to St Marys and Wianamatta Regional Park.
- Garfield Road – connecting Scheyville National Park, Box Hill, Riverstone and Mount Druitt.
- Schofields Road – connecting North Kellyville, Rouse Hill, Schofields to Mount Druitt.

FREIGHT MOVEMENT

The Plan seeks to enhance the effectiveness and efficiency of freight movement within NWPGA and its surrounds. The aim is to support the development of a sustainable freight system that provides an appropriate balance between alternative transport modes, improves the utilisation of the transport resources deployed, and lowers the unit cost of freight based services.

The Plan promotes the strengthening of the primary freight transport network and the optimisation of this through high quality connections to Windsor Road, Richmond Road, M2 Motorway and M7 Motorway. An extension of the freight network to the Outer Sydney Orbital a multi-modal corridor which is currently under investigation will complement an already established freight network to the north, east and south of the NWPGA.

The multimodal aspects of the Outer Sydney Orbital (OSO) corridor in the longer term will also promote the case for the interchange of freight between alternative road and rail services, promoting broader freight transport connectivity across the Sydney Metropolitan Area. This may encourage a gradual shift from road based haulage to alternative rail services on this key north to south route for NWPGA.

PROTECTING AND RESERVING KEY REGIONAL TRANSPORT CORRIDORS

High population, employment and freight growth will require improving regional connectivity, transport improvements and protecting critical corridors. Major land use changes such as the Western Sydney Airport (WSA), Western Sydney Priority Growth Area (WSPGA), Western Sydney Employment Area (WSEA) and South West Priority Growth Area (SWPGA) will provide a focus for local and intraregional transit with the opportunity to offer improved transport connections within the NWPGA to these key employment and population centres.

This will enable enhanced accessibility between the NWPGA and primary employment centres and urban growth areas.

The key strategic transport corridors and desired lines that have been identified include:

- Penrith to Rouse Hill via Marsden Park
- Rouse Hill to Castle Hill.
- Parramatta to Rouse Hill.
- Rouse Hill to WSA via WSPGA and WSEA.
- Blacktown to Richmond via Marsden Park.

Other major transport initiatives currently under investigation which will enhance cross regional connections include:

- Outer Sydney Orbital (OSO) corridor to the western edge of NWPGA.
- Bells Line of Road – Castlereagh Connection corridor to the southern edge of NWPGA.
- Werrington Arterial Road Corridor providing direct connection from M4 Motorway to Richmond Road.
- Potential extension of Sydney Metro Northwest further west into Marsden Park and south to St Marys.

PROTECTING FUTURE TRANSPORT INTERCHANGES

Both the existing T1 Western Line and potential Sydney Metro Northwest extension to Marsden Park within the NWPGA support the creation of north-south and east-west transport corridors.

Opportunity exists to create a future transport hub at Schofields as this will be the location where the two major rail axes intersect. Schofields is generally located centrally within NWPGA and will enable effective synergies to be developed to influence land use, urban form and densities around this emerging node. The future extension of Sydney Metro Northwest will also enable Schofields Road to be transformed to a major transport corridor. Marsden Park is also identified as a future transport interchange that would serve the Marsden Park Strategic Centre and Marsden Park Industrial Area.

It is imperative that the above station locations and spatial requirements are reserved as development is likely to proceed at a rapid pace within NWPGA. Station locations would need to be finalised and adequate land purchased for future construction of both stations and interchanges.

EVALUATION OF THE PREFERRED PLAN

The Western Sydney Strategic Model (WSSM) was used to evaluate the relative merits of the Plan to reflect the key objectives and indicators established as part of the Structure Plan review. The model outputs show:

- The public transport mode share increases. The overall increase in public transport usage capitalises on the completion of the Sydney Metro Northwest (2019), complementing bus services on the North West Transitway and bus services incorporated within the NWPGA Structure Plan.
- The majority of road links in the NWPGA core areas will operate satisfactorily with spare mid-block capacity.
- As the car mode share reduces in the medium to longer term, the proportion of links where the VCR ratio exceeds 90% remains below the maximum 15% threshold.

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01 INTRODUCTION

1.1 BACKGROUND

Jacobs was commissioned by Transport for New South Wales (TfNSW) to provide strategic transport planning services to develop an integrated movement network, and to assist in the spatial distribution of public transport and road network as part of the North West Priority Growth Area (NWPGA) Structure Plan. This report details the outcomes of the analysis which formed the basis of the integrated transport and land use planning process as part of the NWPGA Structure Plan refinement.

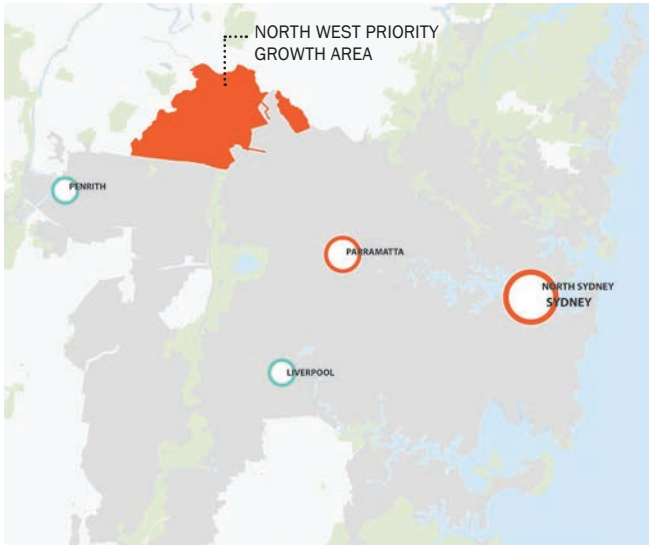


Figure 1: NWPGA

1.2 STRATEGIC CONTEXT

The NSW Government established the North West Growth Centre (NWGC and South West Growth Centre (SWGC)) in 2005 to sustainably plan Sydney's growth on its urban edge.

In October 2015 the NWGC was renamed as the NWPGA and a boundary adjustment was made to the SWGC and the Broader Western Sydney Employment Area to cater for strategic planning around the proposed Western Sydney Airport (WSA). The boundary adjustment resulted in three entities for planning purposes:

- South West Priority Growth Area.
- Western Sydney Priority Growth Area.
- Western Sydney Employment Area.

The aim of the Priority Growth Areas is to create attractive, sustainable communities for Sydney's growing population by linking land to key infrastructure, employment areas, parks, shops, services, public transport and health and education facilities.

In July 2006, *State Environmental Planning Policy (Sydney Region Growth Centres) 2006* ('the Growth Centres SEPP') was gazetted. The Growth Centres SEPP is the legal instrument that establishes the planning rules and objectives for the Priority Growth Areas. Consent authorities, such as local councils, must apply this policy when they make planning decisions about land within the Priority Growth Areas. Each Priority Growth Area precinct can be planned more quickly via the Growth Centres SEPP than would be achieved through a traditional rezoning process.

The NSW Department of Planning & Infrastructure prepared Structure Plans for the NWGC and SWGC in 2006 to guide the broad shape of their planning and development. The Structure Plans set a framework to guide urban development and inform the Precinct Planning process. Precinct Planning undertaken to-date has coordinated the planning and delivery of water, wastewater, recycled water, power, roads, transport and other services for new communities in the NWPGA. In this context, 11 precincts have been rezoned in the NWPGA and three are in the detailed planning phase.

The first land releases in the NWPGA and SWPGA occurred in June 2006 and construction on the first homes started in November 2007 (in the Colebee Precinct). Following *A Plan for Growing Sydney,* released in December 2014, which includes a number of infrastructure initiatives such as the new WSA at Badgerys Creek and Outer Sydney Orbital (OSO) investigations, the Department of Planning and Environment (DPE) has committed to review the NWPGA Structure Plan.

As an integral component of this review process, Jacobs has been commissioned to undertake a preliminary review of the current Structure Plan for the NWPGA, in order to align the Structure Plan with the *NSW Long Term Transport Master Plan, 2012* (*LTTMP*), *A Plan for Growing Sydney* and other current transport and land use strategies, with particular emphasis on the following key strategic elements:

- Land Use and Transport Integration.
- Public Transport (Rail and Bus).
- Road Network.
- Freight Network.
- Active Transport Network.

1.3 REPORT PURPOSE

The purpose of this report is to provide details of the review and analysis of the current NWPGA Structure Plan, with the aim of achieving a workable integrated transport and land use solution for the NWPGA. The report also seeks to provide a basis for determining the inclusion of integrated transport and land use planning advice to assist in the refinement of the current NWPGA Structure Plan.

1.4 AIMS + OBJECTIVES

The overall study will result in a revised structure plan for the NWPGA that will ensure a coordinated and efficient approach to land use planning, environmental management and transport infrastructure investment that responds to *A Plan for Growing Sydney* and *LTTMP.*

The study aims to achieve a number of strategic objectives, including:

- **Engage** relevant stakeholders in the structure planning processes.
- **Provide** a necessary step in the overall planning process, by reviewing the existing structure plan in relation to providing a long term spatial framework to coordinate future planning and development of NWPGA.
- **Compile** land use and transport planning options and assess those options based on a common and accepted set of criteria.
- **Provide** the basis of spatial policy and activities for NWPGA and recognise and respond to policy and strategy opportunities at the local, regional and metropolitan levels.
- **Inform** the NWPGA structure planning process, and provide a more robust base for future stages.
- **Understand** the potential effects of modifications to key transport planning elements in the NWPGA and local precinct plans.
- **Ensure** that land use and transport have been integrated at every stage and in every aspect of the reviewing the existing structure plan.

1.5 OUR APPROACH

The objective of this strategic review was to analyse the existing NWPGA Structure Plan and corresponding documents to ensure that the proposed infrastructure investments align with the future land use and anticipated population and employment forecasts. The identification of key land use and transport planning gaps will form the basis for a revised NWPGA Structure Plan. Importantly, the review addressed the current structure plan in terms of its integration with land use and access at the regional, precinct and local level. The study, therefore, has involved input from transport engineers and planners, structure planners, urban planners, rail and bus planners and civil engineers.

In undertaking this review, the following steps were taken:

1. **Review** – existing land use, population, employment, housing and transport planning data and reports relating to the NWPGA and the larger Sydney metropolitan area.
2. **Define** – the core elements of the development context for NWPGA and Precinct Plans.
3. **Examine**– key opportunities and constraints of the current NWPGA Structure Plan.
4. **Establish** – themes, objectives and indicators to guide the generation and evaluation of structural options for future development.
5. **Organise** – a draft framework to guide NWPGA options for future development within the NWPGA.
6. **Identify** – opportunities for refinements to the current structure plan to enable TfNSW and DPE to review land use and transport planning issues and define strategic actions to address these.

It is anticipated that the findings presented in this report will enable TfNSW, DPE and the multi-disciplinary project team to review the identified planning issues and define strategic actions to address these opportunities to refine the NWPGA Structure Plan in the context of *A Plan for Growing Sydney*, *LTTMP* and current precinct planning work.

1.6 KEY ASSUMPTIONS + LIMITATIONS

The following key assumptions have been used in this review:

- For the purpose of this review, population and employment provided by DPE and TfNSW were adopted.
- Existing Indicative Layout Plans (ILPs) for the precincts within the NWPGA were reviewed in conjunction with the existing Structure Plan in order to understand the proposed transportation needs of the NWPGA.
- The centres 'hierarchy' adopted in the current NWPGA Structure Plan was assumed to align with the centre types identified in the *2005 City of Cities: A Plan for Sydney's Future* (Metropolitan Strategy) and the subsequent draft *North West Subregional Strategy*.
- Preparation of integrated transport planning options has been based on full build-out of NWPGA with a multi-decade development timeframe.

The following main limitations have been identified as part of this review:

- There is a predetermined number of location and configuration of road crossings of the Richmond Line within the NWPGA.
- The current Structure Plan is based upon assumptions of land use and population distribution across NWPGA that is currently being updated and may be subject to change.
- There are already established Precinct Plans (or ILPs) for NWPGA which remain fixed.
- Strategic modelling using the Western Sydney Strategic Model (WSSM) is the first and coarsest step of the transport modelling process. It is used to understand regional travel demand and patterns and is an input into more focussed, local transport projections.
- Transport demand using WSSM was modelled in an 'unconstrained' context, meaning that once the public transport system (routes, operating speed, etc.) was incorporated into the model, it was assumed to be capable of carrying whatever demand it attracted with no effect on the operation of the public transport or road network.
- There is incomplete knowledge regarding the location and alignment of Outer Sydney Orbital and Sydney Metro Northwest extension connecting Marsden Park to the Main Western Railway Line.
- The broad transport network structures identified or recommended in this report are indicative only, and have been prepared to reach a strategic understanding of network requirements only.
- Refinement and recommendations made in this report are indicative only, and may change following engineering investigation, consultation and environmental assessment.

1.7 REPORT STRUCTURE

The report is structured as follows:

1. Introduction – An overview of the Structure Planning Process.

2. Metropolitan + Regional Context – A high-level review of the strategic position of the NWPGA.

3. Structure Plan Review – A preliminary analysis of the current Structure Plan and identification of recommendations for further refinement of the plan.

4. The Preferred Plan – Sets out the preferred integrated transport plan for the NWPGA and outcomes from the strategic modelling process.

5. Conclusion – Summary of the key opportunities identified for NWPGA with respect to integrated transportation and land use planning.

02 METROPOLITAN + REGIONAL CONTEXT

2.1 INTRODUCTION

The North West Priority Growth Area (NWPGA) has been identified by the NSW Government in *A Plan for Growing Sydney* as a priority land release area to deliver greenfield housing supply (Action 2.4.1). Additional supply will provide Sydney's growing population with a range of housing choices to meet diverse budget and lifestyle requirements.

The NWPGA is strategically positioned to the north of the M7 Motorway at the top of the linear north-south growth corridor that includes the Western Sydney Employment Area (WSEA), Western Sydney Priority Growth Area (WSPGA), the proposed Western Sydney Airport (WSA and the South West Priority Growth Area (SWPGA, and is located approximately 35 kilometres north-west of the Sydney Central Business District and 15 kilometres north-west of Parramatta. Its strategic position at the northern end of this growth corridor provides the potential to capitalise upon economies generated by the movement of people, goods and information.

Key strategic centres and growth areas of Western Sydney that will significantly influence land use and travel in the Sydney Metropolitan Area include:

- **North West Priority Growth Area (NWPGA)**, a major greenfield growth area planned to accommodate approximately 260,000 residents at full development. *A Plan for Growing Sydney* identifies a future strategic centre at Marsden Park.

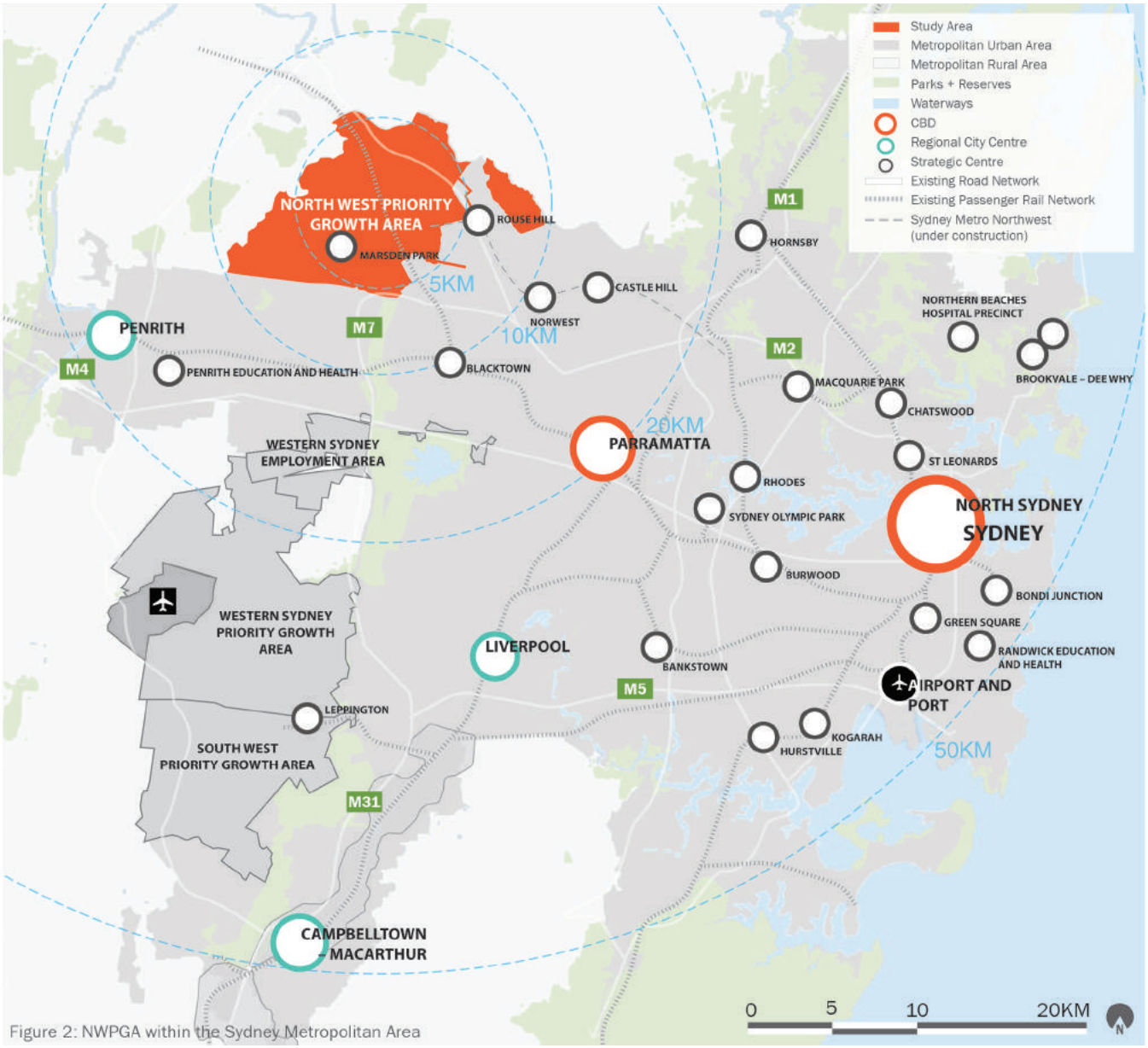


Figure 2: NWPGA within the Sydney Metropolitan Area

- **South West Priority Growth Area (SWPGA)**, a major greenfields growth area planned to accommodate more than 208,000 dwellings, 585,000 residents and 46,000 jobs at full development. It includes a planned strategic centre at Leppington.
- **Western Sydney Priority Growth Area (WSPGA) and Western Sydney Employment Area (WSEA)**, which are planned to be Sydney's largest new employment areas. These areas are expected to provide more than 57,000 jobs over the next 30 years and 212,000 jobs in the longer term that had previously been forecast. The WSPGA includes a planned transport gateway at Badgerys Creek, which has been chosen as the preferred location for Sydney's second airport by the Australian Government.
- **Western Sydney Airport (WSA)** – The WSA airport within WSPGA will be transformational for Western Sydney and a catalyst for investment, growth, and job creation. The WSA could commence as early as 2020 and potentially have 24-hour operation without curfew. The role, capacity, function and phasing of WSA will be dictated by the eventual airport ownership. The Western Sydney Infrastructure Plan, which is a joint Australian and NSW Government funded road investment program, supports development of WSA by announcing road upgrades for The Northern Road, Bringelly Road, Werrington Arterial Road and the proposed M12 Motorway (M7 Motorway to The Northern Road). The Australian Government has prepared a draft environmental impact statement, which is expected to be finalised by the end of 2017. The NSW Government proposes to prepare a Land Use and Infrastructure Strategy for the area to support growth around a future airport.
- **Penrith Regional City**, with 31,000 jobs planned to 2031 and envisaged to become a major employment, cultural and service hub for Western Sydney.
- **Parramatta Regional City**, Sydney's second CBD with 70,000 new jobs planned to 2031. Parramatta is a major cultural, commercial and service hub for Western Sydney.
- **Liverpool Regional City**, with 31,000 new jobs planned to 2031, a major commercial, services and transport hub.
- **Campbelltown-Macarthur Major Centre**, with 27,000 new jobs to 2031, a prime retail, commercial and service area.

Connectivity with higher order employment centres and growth areas within NWPGA, will ensure alignment with the broad planning and strategic directions and the anticipated land use and travel demand in the area.

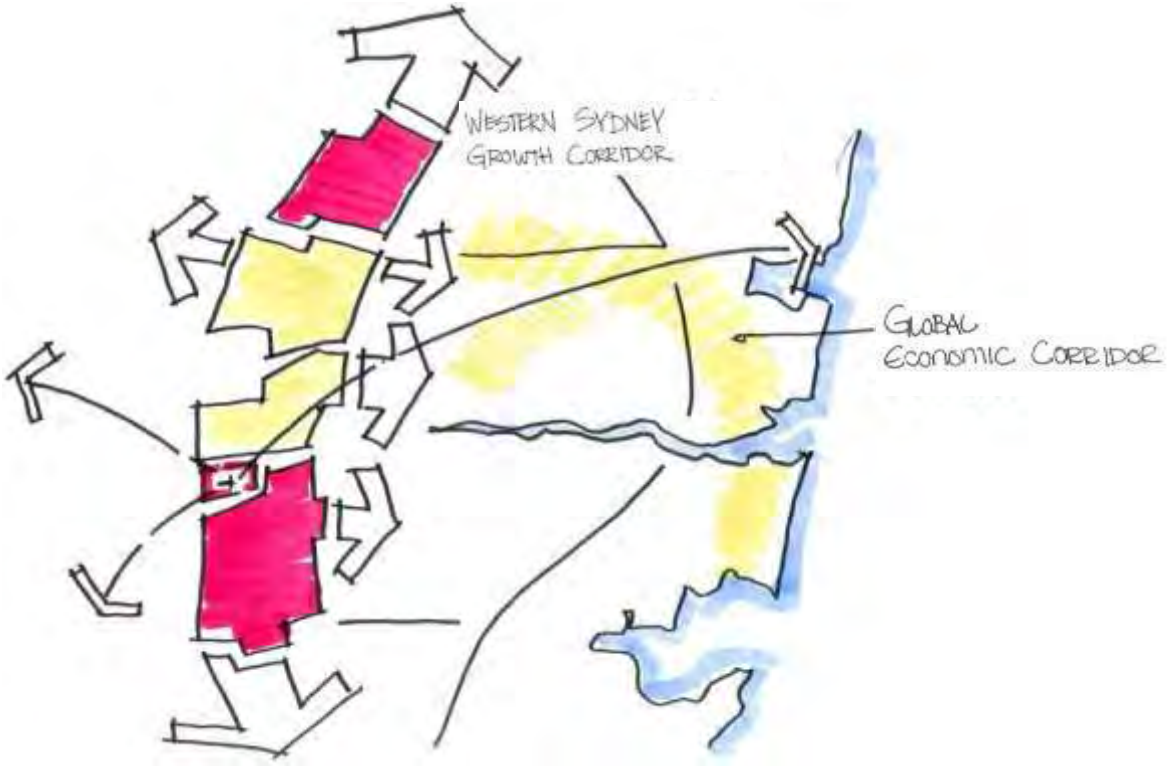


Figure 3: Western Sydney Growth Corridor

2.2 STRATEGIC POLICY CONTEXT

A review of all existing planning documents was conducted to determine the key objectives and outcomes with respect to the NWPGA. The vision and objectives of these studies, and their implications for the NWPGA were considered in the refinement of the Structure Plan. These documents and their implications to the NWPGA structure are summarised in the following table.

METROPOLITAN + REGIONAL PLANNING CONTEXT		
Document	**Date**	**Implications for NWPGA**
NSW Long Term Transport Masterplan	Dec 2012	The *LTTMP* key objective integrating transport with land use planning, identify corridors of demand and defining the performance required from the transport network. The plan identifies the following key transport corridors that will influence NWPGA: ■ The Outer Orbital Motorway Corridor providing a north-south connection on the western edge of NWPGA. ■ Bells Line of Road - Castlereagh Connection. ■ SMN extension from Cudgegong Road to Marsden Park (via Schofields). ■ Werrington Arterial Road Corridor providing a north-south connection at Schofields Road – South Street at the southern edge of NWPGA. ■ Marsden Park to Mount Druitt connections. ■ Marsden Park through the WSPGA and WSEA to Fairfield and Leppington providing a north-south connection from Leppington through the WSPGA and WSEA to the NWPGA.
State Infrastructure Strategy Update 2014	Nov 2014	Identifies key Infrastructure priorities for Greater Sydney, with regard to transport include: ■ Good roads for commuter, community and freight traffic. ■ Better public transport into key employment centres. The strategy also focuses on improving transit network efficiency and capacity such as extensions to the SMN within the NWPGA.
Premier's Priorities	Sep 2015	Incorporate the transport-related priorities, including: ■ Building infrastructure. ■ Improve road travel reliability. ■ Ensure on-time running for public transport. ■ Reduce road fatalities.
A Plan for Growing Sydney	Dec 2014	*A Plan for Growing Sydney* will guide future planning and investment decisions for housing, economic development, open space and transport. The strategy is focussed on delivering the right jobs, homes, transport and infrastructure where they are needed. Marsden Park and Rouse Hill have been designated as strategic centres within the NWPGA. The plan shows depictions of potential transit extensions of the SMN to the south between Werrington and Mount Druitt Stations. The Rouse Hill to Mount Druitt corridor is identified as potential extension for transit.

Figure 4: Metropolitan + Regional Planning Context

METROPOLITAN + REGIONAL PLANNING CONTEXT		
Document	**Date**	**Implications for NWPGA**
NSW Freight and Ports Strategy	Nov 2013	The *NSW Freight and Ports Strategy* identifies key freight activity centres at Marsden Park, Box Hill and Riverstone West within the NWPGA. The Outer Sydney Orbital corridor will play a major role for both rail and road freight movement in the long term and is located on the western edge of NWPGA.
Sydney's Rail Future	Jun 2012	*Sydney's Rail Future* aims to deliver a three-tiered system to respond to challenging customer needs. The Sydney Metro Northwest (SMN) is planned as a rapid transit service with initially 12 trains per hour during peak period and will be operated with new generation single deck trains, advanced signalling and dedicated track. Further extension of the rail link beyond Marsden Park to connect to the Western Line at St. Marys has also been considered at a high level. The plan also aims to deliver a second harbour crossing which will allow services from the SMN to extend directly to the Sydney CBD and will enable major capacity increases on the Western Line.
Sydney's Bus Future	Dec 2013	*Sydney's Bus Future* recommends a three tier bus network hierarchy comprising 'rapid', 'surburban' and 'local'. The plan identifies the following 'rapid' routes that will impact on the NWPGA: ■ Rouse Hill to Blacktown via Marsden Park and Richmond Road and will be integrated with the delivery of the SMN. ■ Rouse Hill to Hurtsville via North West Transitway, Parramatta and Bankstown. The plan identifies the following 'suburban' routes that will impact on the NWPGA ■ Rouse Hill via Marsden Park to Penrith and Mount Druitt. ■ Marsden Park to Prairiewood via WSPGA, WSEA and Mount Druitt.
Sydney's Cycling Future	Dec 2013	*Sydney's Cycling Future's* overarching goal is to make "cycling a safe, convenient and enjoyable transport option for short trips". The plan looks at providing a connected cycle network and prioritising infrastructure within a 5km bike riding catchment around major centres and key destinations. The plan identifies the following bicycle networks that will impact on the NWPGA. ■ Completing links to the M7 cycleway. ■ New interchanges along the SMN will require bike parking and better local interconnected cycle networks. ■ Rouse Hill identified as a major activity centre and ell placed to accommodate enhanced cycling networks.

METROPOLITAN + REGIONAL PLANNING CONTEXT		
Document	**Date**	**Implications for NWPGA**
South West Rail Link Extension Public Transport Corridor Protection	Apr 2014	The *South West Rail Link Extension Public Transport Corridor Protection* document provides an overview of a future public transport corridor to serve Western Sydney, including the SWPGA, WSPGA, WSEA and WSA. The document is part of the first stage of protecting the future South West Rail Link Extension corridor, and supports the first stage of discussion and consultation with the community, councils and other stakeholders along the proposed South West Rail Link Extension corridor. The extension corridor is proposed to connect Leppington Station to Bringelly then head in two directions: north to the T1 Western Line near St Marys; and south to Narellan. TfNSW are also considering whether to extend the corridor further south to the existing T2 South Line. The northern section of the corridor between Bringelly and the T1 Western Line is being investigated together with planning for the Outer Sydney Orbital.
Outer Sydney Orbital and Bells Line of Road – Castlereagh Connection Corridor Preservation Studies	Jun 2015	As part of the initial planning process, TfNSW is undertaking community consultation for the corridor preservation investigations. The Outer Sydney Orbital is located on the western edge of NWPGA and would provide a north-south connection for a future motorway, freight rai land where practical a passenger rail line. The northern section of the South West Rail Link Extension between Bringelly and the T1 Western Line will be undertaken as part of the Outer Sydney Orbital study and consultation process. The Bells Line of Road – Castlereagh Connection is located on the southern edge of NWPGA and would provide an alternative route across the Blue Mountains. The investigation will identify a suitable corridor connecting Bells Line of Road east of Kurrajong with the Sydney Orbital Network.

PRECINCT + LOCAL PLANNING CONTEXT		
Document	**Date**	**Implications for NWPGA**
North West Growth Centre and Riverstone Corridor Traffic Study	RMS, Nov 2014	This study looks at short-, medium- and long-term options of potential road crossings of Richmond Line. The key recommendations that will influence NWPGA include: ■ Link Westminster Street with Garfield Road West to provide an alternative route. ■ Schofields Road extension to Richmond Road as a four-lane road. ■ Bandon Road underpass on alignment A2 to Richmond Road in the west. ■ Consider heavy vehicle restrictions through the Riverstone town centre, Garfield Road level crossing to remain open until grade separation can occur. ■ Construct a grade separated crossing of the rail line at Garfield Road.

Figure 5: Precinct + Local Planning Context

PRECINCT + LOCAL PLANNING CONTEXT		
Document	**Date**	**Implications for NWPGA**
The Growth Centres Road Framework	May 2008	The document establishes a broad framework to guide the appropriate development of the major roads in the NWPGA. The defined road hierarchy for the NWPGA included: ■ Schofields Road / South Street, a 'transit boulevard,' providing the main east-west link between Windsor Road, the future Schofields town centre, the Schofields train station, Richmond Road, the future Marsden Park town centre and beyond. ■ Garfield Road, also a 'transit boulevard,' linking the proposed Box Hill town centre to Riverstone town centre and train station, and Richmond Road.
Indicative Layout Plans, Precinct Plans and Development Control Plans for NWPGA	Various	A number of investigations within the NWPGA has already been undertaken involving environmental, urban form analysis, traffic and transport at the precinct level that will inform the identification of the development footprint and the development of ILPs. The traffic and transpo t studies for various precincts involved the development of transport proposals, review access and intersection arrangements, road upgrades, transport infrastructure with the consideration of all modes of transport, including public transport, heavy vehicles and walking and cycling. These plans have been used to inform the NWPGA Structure Plan Review.

2.3 DEMAND CORRIDORS

Within the context of Greater Western Sydney, the NWPGA is strategically located in proximity to a number of regional and strategic centres including Penrith, Parramatta, Blacktown and Castle Hill as well as WSPGA, WSEA and WSA. Changes in land use, population and employment across Western Sydney associated with the Priority Growth Areas and WSA, and associated economic growth and productivity, will create demand for new and reinforced transport connections between these centres. Capital investment in infrastructure will be critical to enable and support the efficient movement of people, goods and information between these centres.

Demand corridors that will connect the NWPGA to key activity centres in Greater Western Sydney include:

- Rouse Hill to Penrith via Marsden Park.
- Rouse Hill to Castle Hill.
- Blacktown to Richmond via Marsden Park.
- Rouse Hill to WSA via WSPGA and WSEA.
- Rouse Hill to Parramatta.

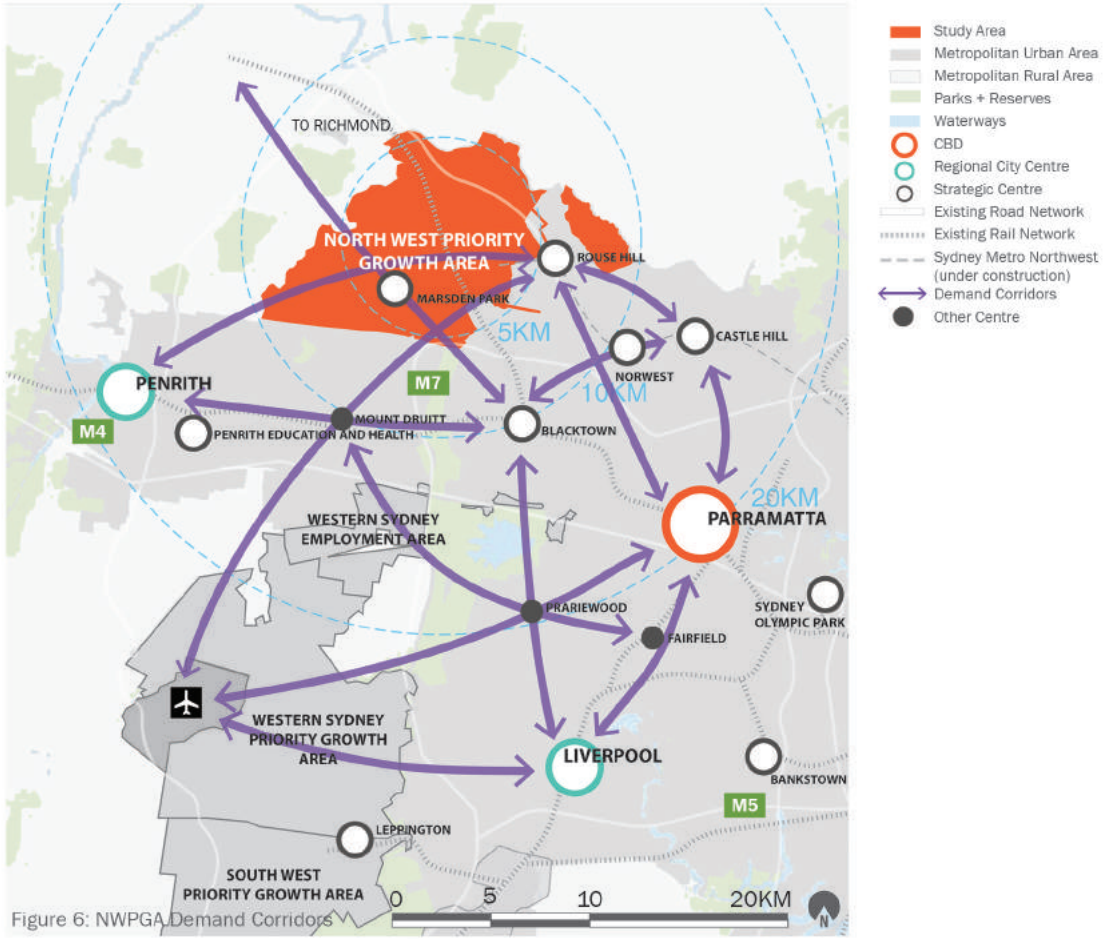


Figure 6: NWPGA Demand Corridors

2.4 TRANSPORT

The NWPGA's strategic positioning at the northern end of the WSEA – WSPGA – WSA – SWPGA corridor provides the potential to capitalise upon economies generated by the movement of people, goods and information. It benefits from direct accessibility and exposure to the higher order road and rail networks, facilitating significant regional movement opportunities between major centres. Connections to the existing Sydney Orbital Network, as well as preservation of the Outer Sydney Orbital (OSO) and Bells Line of Road – Castlereagh Connection corridors, provide strong links for economic growth. Road and (in the longer term) freight connectivity to WSA and Port Botany within a 10- to 50-kilometre radius of the NWPGA will allow for the movement of goods across these freight and economic growth corridors.

The location of NWPGA presents a number of strategic opportunities:

- Proximity to key city-shaping enabling infrastructure and economic capacity building projects (e.g. OSO, WSA, Sydney Metro Northwest).
- Positioned within a linear growth corridor linking WSEA, WSPGA, WSA and SWPGA.
- Significant regional movement opportunities between major and regional centres.
- Direct accessibility and exposure to the higher order road network by being in close proximity to the M2 and M7 Motorways.
- NWPGA is located on or in close proximity to key demand corridors to centres including Penrith, Parramatta, Blacktown, WSEA, WSPGA and WSA.

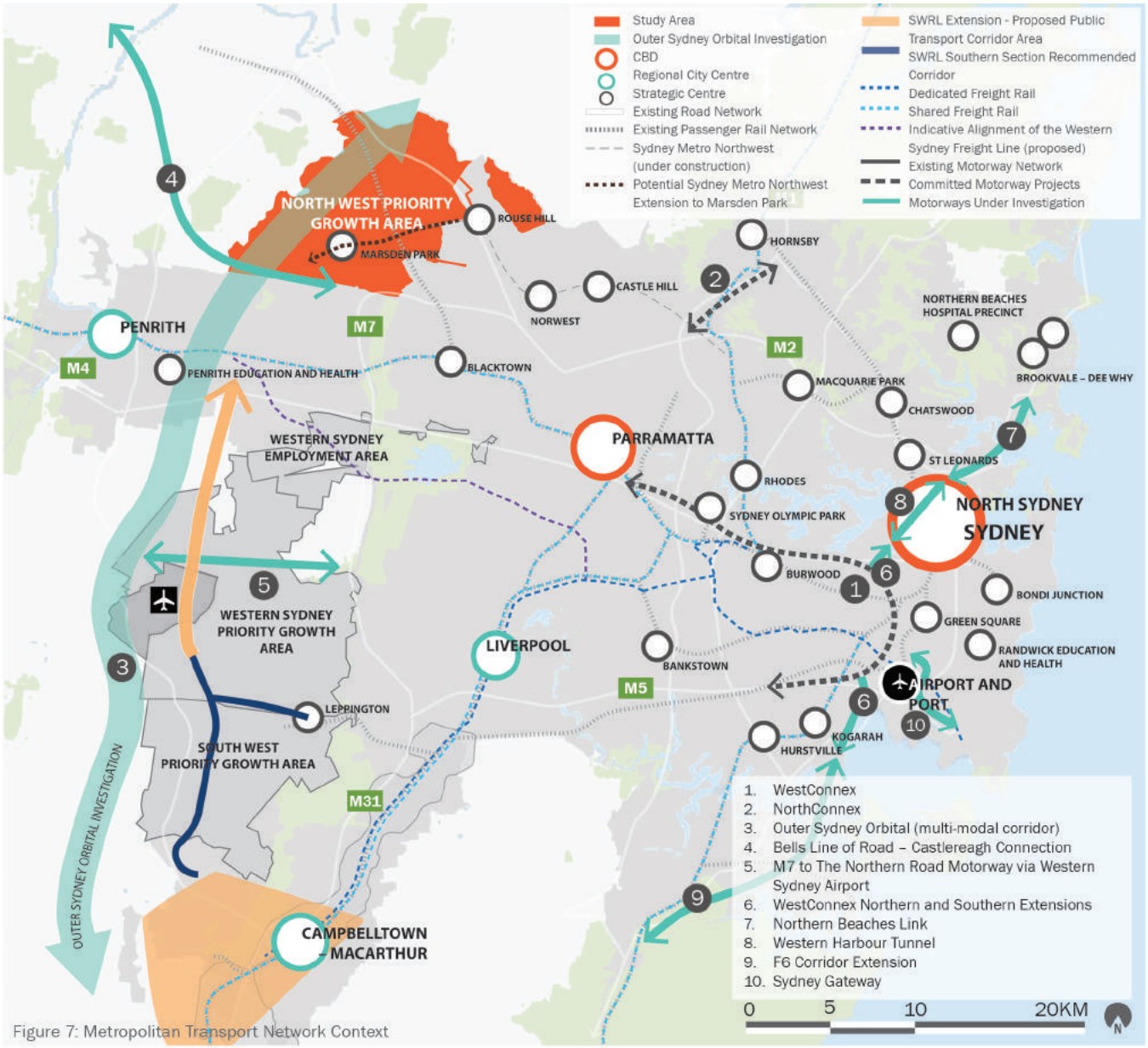


Figure 7: Metropolitan Transport Network Context

PASSENGER RAIL NETWORK

The existing and proposed rail network will play a pivotal role for NWPGA in consolidating and connecting transport modes to create a fully integrated and networked transport system. The key objective of the rail network is to connect to growth areas, and to extend access to the network to new areas of population growth to facilitate access to employment centres and services.

Existing Rail Service Provision

Within NWPGA, the T1 Western Line provides services between the NWPGA and the CBD, and through to the North Shore (terminating at Hornsby or Berowra) with five services per hour towards the CBD during the AM peak, two from Richmond Station and three from Schofields Station.

NWPGA is also serviced by the T5 Cumberland Line, which operates daytime half-hourly services in both directions between Campbelltown and Schofields via Parramatta. Currently, no rail services operate on the weekends on the T5 Cumberland Line.

The T1 Western Line has been duplicated between Marayong and Quakers Hill and then to Schofields Station. Majority of the remaining sections between Schofields Station and Richmond Station are single track sections with passing loops/ additional tracks provided at Riverstone, Mulgrave and Clarendon and Richmond Stations.

Key constraints and issues of T1 Western Line and T5 Cumberland Line that are relevant to NWPGA include:

- Rail service constraints caused by single track sections between Schofields Station an Richmond Stations.
- The flyover of the 'Down Richmond' track west of Seven Hills combined with long sections of single tracks and short distances between stations (2.5 kilometres on average) make it difficult to operate freight trains.
- Maximum 20 trains/hour of T1 CBD throughput also limit the number of Richmond line passenger services going into the CBD.
- Half hourly weekday daytime service between Schofields and Campbelltown via Parramatta (T5 Cumberland Line) is unlikely to meet the rail demand along this corridor in the future.

Sydney's Rail Future

Sydney's Rail Future: Modernising Sydney's Trains (SRF) was released in June 2012 and sets the long term strategy to increase the capacity of Sydney's rail network through investment in new services and upgrading of existing infrastructure. The key implications for the NWPGA include:

- Extensions of the network are already underway and will grow the network to meet demand in the North West and South West through delivery of SMN and the recently completed South West Rail Link (SWRL).
- These extensions to the rail network and subsequent connections to growth areas will provide NWPGA greater access for more people to economic opportunities in major employment centres such as WSEA, WSPGA, WSA and SWPGA and contribute to productivity growth.
- Sydney Metro will be part of the new rapid transit tier which will provide high frequency services utilising single-deck rolling stock.
- The Sydney Metro Northwest (SMN) corridor will be 'transformative' for NWPGA to facilitate urban renewal, accommodate significant population growth as part of a better networked system.

Stage 1 of Sydney Metro – Sydney Metro Northwest

SMN is the first stage of Sydney Metro and will link the NWPGA with Norwest Business Park, Castle Hill, Macquarie Park and Chatswood. Sydney Metro City and Southwest is the second stage of Sydney Metro and will eventually extend SMN services to North Sydney, Sydney CBD and beyond to Sydenham and Bankstown.

A new station located at Cudgegong Road and a stabling yard for the SMN located at Tallawong Road have been designed to safeguard a potential rail connection beyond the SMN.

The Sydney Metro services will operate separately from the wider Sydney Trains network, utilising single deck, high capacity trains. The 33-kilometre rail link will include eight new stations and provide services from Chatswood to Cudgegong Road Station that will complement the existing network. Investigation of a transport corridor beyond Cudgegong Road Station has been already undertaken with the preferred option being Cudgegong to Schofields and Marsden Park.

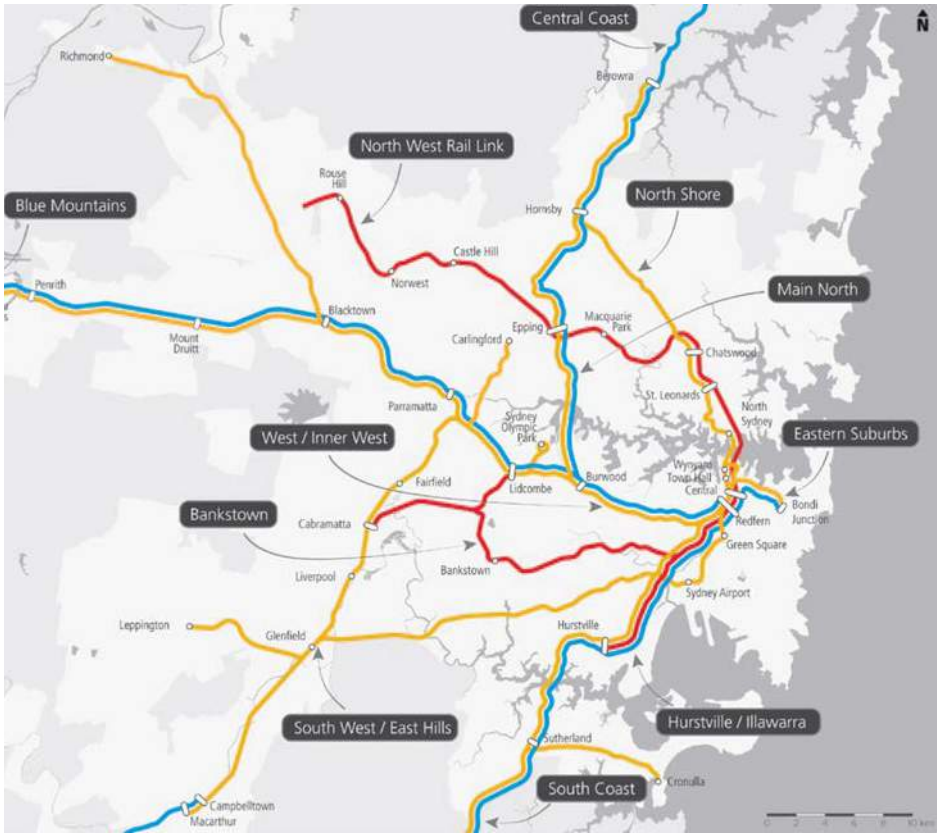


Figure 8: Sydney's Rail Future - Three-tiered System

Source: Sydney's Rail Future: Modernising Sydney's Trains

Rapid transit Network (Single Deck)
Suburban Network (Double Deck)
InterCity (Double Deck) and Regional Diesel

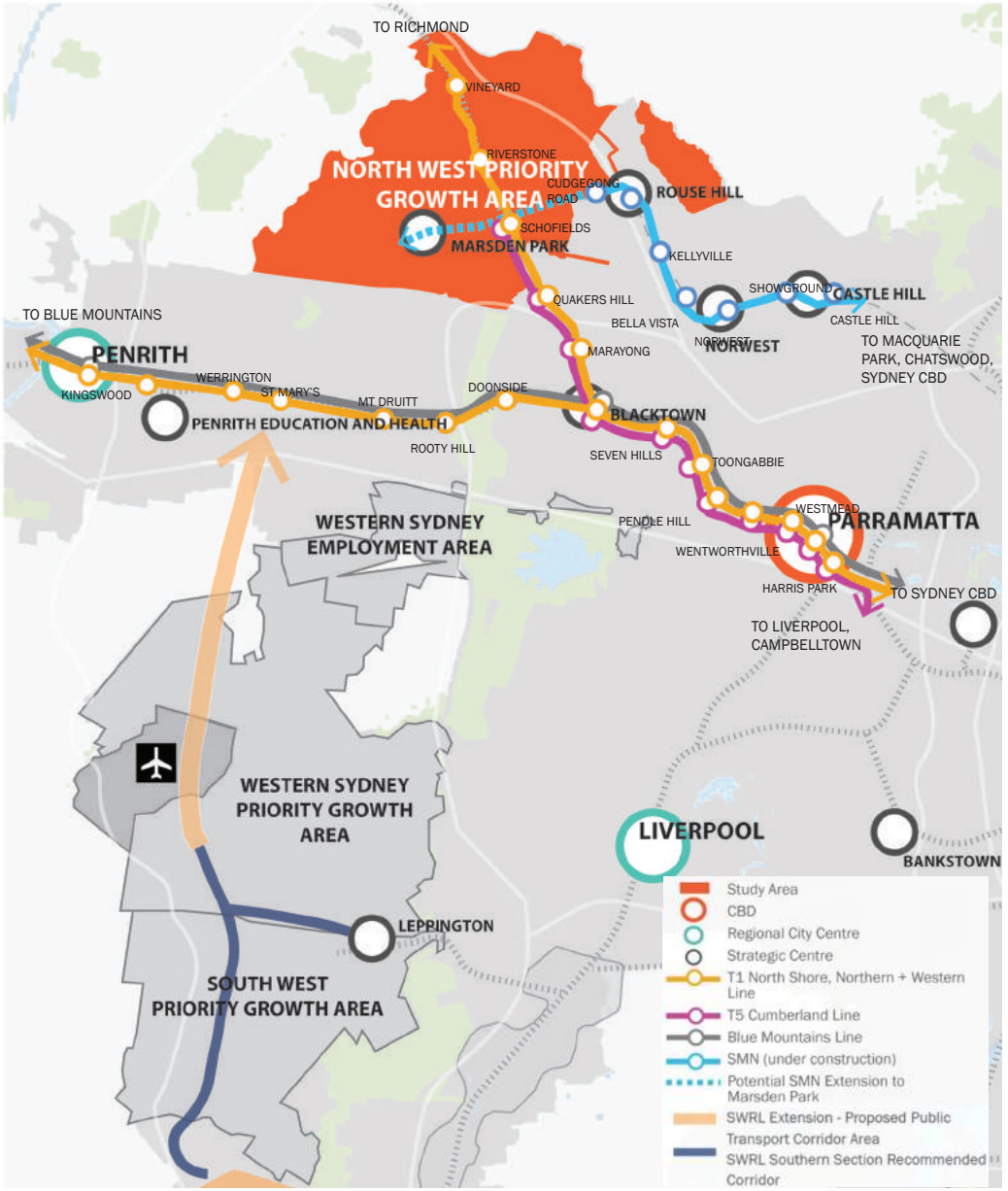


Figure 9: Regional Rail Connections

South West Rail Link (SWRL) and its Extension

The SWRL is an 11.4-kilometre link and extends from Glenfield to Leppington with two stations at Edmondson Park and Leppington. Both Edmondson Park and Leppington have park and ride facilities and interchange facilities.

Rail services within the SWPGA currently run as part of the T2 South Line between Leppington and Sydney CBD. The planned 2018 timetable will extend the T2 Airport and Inner West Line and T3 Bankstown Line services to Leppington in addition to the existing T2 South Line services. These rail services provide access to public transport for the people of south-west Sydney, providing a link to major employment centres including Liverpool, Parramatta and the Sydney CBD.

A potential corridor extension of the SWRL beyond Leppington to Badgerys Creek via Bringelly and to the T1 Western Line is under investigation. This would provide a significant opportunity in creating a rail link between NWPGA with SWPGA, WSEA and WSPGA including the WSA through the SMN extension and SWRL extension in the longer term.

The South West Rail Link Extension Public Transport Corridor Protection report has explored the provision of new cross-regional connectivity between the SWPGA, WSEA, WSPGA (including WSA) and the T1 Western Line, connecting to Parramatta, Penrith and potentially the NWPGA in the long term.

BUS NETWORK

The current mix and quality of transport services within the NWPGA are impacting on its liveability and economic activity, its potential for urban development and renewal. NWPGA is projected to experience significant g owth in the next 20 years. Of note:

- Peak hour bus trips are expected to increase to almost four fold by 2031, at a rate of about 19% growth in patronage per year.
- North-West Transitway patronage growth is expected to double by 2036.

The *LTTMP* envisages an extensive bus-based network in the NWPGA to:

"...extend the rail network catchment, provide public transport access to stations and ensure integrated, flexible public transport coverage for newly developed areas. Integrated planning of bus priority measures with new road infrastructure in growth areas will also be essential for providing competitive bus services and reducing car dependency over the longer term."

The *LTTMP* has also identified strategic routes of a restructured bus system for Sydney in 2031, representing the Mass Transit and Intermediate Transit levels for buses.

In addition, the LTTMP actions include a Bus Head Start Program to support the sustainable development of the NWPGA with bus priority measures and passenger infrastructure packages for major road corridors. This will provide integrated bus networks on road corridors as greenfield residential areas develop that provide access to urban centres or via interchange to heavy rail. New strategic bus corridors servicing the NWPGA will be developed as extensions to the Sydney strategic bus network.

Initiatives currently underway as they relate to Western Sydney include:

- **Sydney's Bus Future** – provides further detail on the proposed bus network developments. The core bus network is formed by the rapid bus network offering fast, reliable bus travel between major centres. The NWPGA is served by rapid routes linking Rouse Hill (interchange with the Sydney Metro Northwest) with Parramatta, Blacktown and (eventually) Marsden Park. The rapid network is supported by a suburban network of frequent bus services providing links to Mount Druitt and Penrith. Local bus services complete the network to provide access to local facilities and interchange with the rapid and suburban routes.

- **Sydney Metro Northwest (SMN) Bus Strategy** – a bus access strategy has been developed for the SMN, currently under construction. The crucial role of the bus network is to extend the catchment area for SMN and to encourage the use of non-car modes for station access. The Bus Access Strategy principles include a major bus-rail and bus-bus interchange at Rouse Hill, for buses serving NWPGA, Transitway services and the SMN. Rouse Hill would therefore be a major bus terminus. A minor bus interchange is also proposed at Kellyville within the NWPGA and only limited interchange is expected at the Cudgegong Road station.

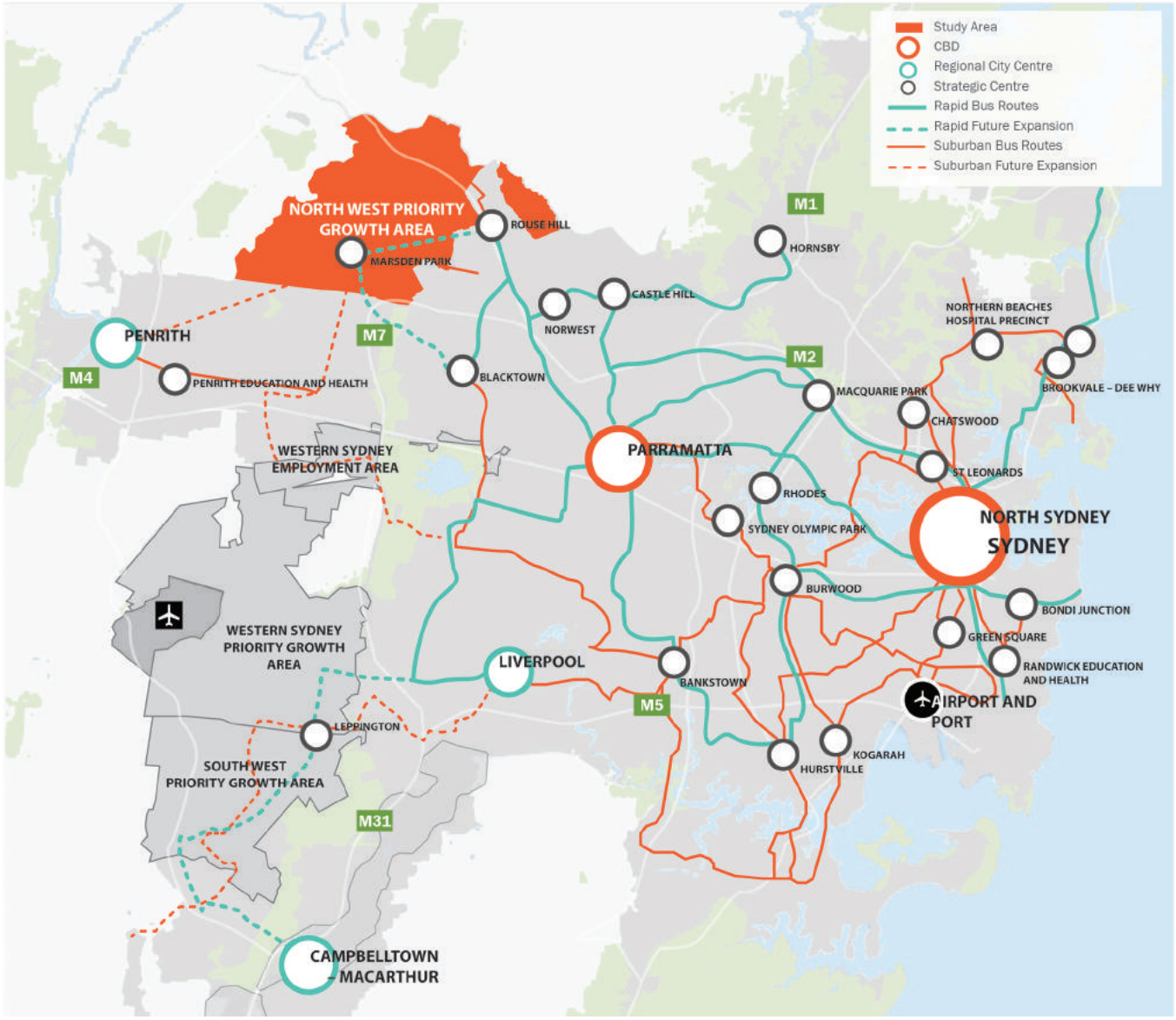


Figure 10: Proposed Rapid and Suburban Bus Network
Source: Sydney's Bus Future

FREIGHT NETWORK – ROAD AND RAIL

The NWPGA is strategically located in close proximity to the National Land Transport Network (NLTN), which is a defined national network of important road and rail infrastructure links and their intermodal connections. In the context of the NWPGA, the NLTN consists of the M2 / M7 Motorways and the Main Western Rail Line. The freight network is used to transport goods between Sydney, ports, other major centres, interstate and rural and regional NSW.

The existing metropolitan freight road network includes the western sections of the Sydney Orbital Network (M2, M4, M5 and M7 Motorways), major road connections into and out of the metropolitan area and sections of the urban road network that link to Sydney Airport, Port Botany and the Yennora, Chullora, Enfield and Minto intermodal terminals

The existing metropolitan freight rail network includes freight corridors to the north, south and west. It incorporates some dedicated freight lines, such as Southern Sydney Freight Line and the Northern Sydney Freight Corridor (currently under construction), but largely shares the metropolitan network rail infrastructure with passenger trains. Part of the rail network is shared by passenger and freight services.

As the road freight task continues to increase annual road freight movements are expected to increase by two-thirds over the next 20 years.

The capacity of the existing road network to accommodate this growth in the context of overall increased travel demand is a significant challenge. In addition, volumes of freight moved by rail for Western Sydney are expected to grow significantly in line with the development of the planned intermodal terminals within the WSPGA/WSEA and at Moorebank. It is estimated that 50% of all containerised freight by 2040 from Port Botany will be destined for Western Sydney.

The significance of the WSPGA, WSEA and WSA, combined with the planned intermodal terminals within the WSPGA /WSEA and at Moorebank, means that there needs to be strong freight linkages and transport corridors connecting these economic generators / strategic centres. Western Sydney's intermodal requirements are relevant to considerations around the new Western Sydney Airport. The new airport freight demand would complement land freight activity in Western Sydney, particularly WSPGA, WSEA and NWPGA along the planned multi-modal Outer Sydney Orbital corridor.

Under the *NSW Freight and Ports Strategy* (*FPS*) prepared by TfNSW in November 2013, there are several proposed freight activity centres along the Outer Sydney Orbital. There are three proposed freight activity centres within the NWPGA, including Marsden Park, Riverstone West and Box Hill. The *FPS* does not identify any intermodal terminals north of the Main West Rail Line nor within NWPGA.

In this context, it is highly desirable to increase freight density on selected high capacity corridors and reduce the propensity for freight operators to use multiple route options. Any new rail freight connections will need to separate rail freight movements from passenger rail movements to reduce conflicts with passenger rail operations and capacity.

The *LTTMP* commits to preservation of the Outer Sydney Orbital to the west of the NWPGA, indicatively through the WSPGA and SWPGA and continuing to the south. There has been some early consideration of the potential for a shared (road, passenger rail and freight rail) corridor. A key consideration will be the interfaces between this project / corridor and the NWPGA especially given the potential for a shared road/rail connection to the western fringe of the study area.

Of relevance to the current study is that the *FPS* identifies the Outer Sydney Orbital as enabling a potential dedicated rail freight line north from Sydney and beyond the current Northern Sydney Freight Corridor project and the reservation of a corridor for a new orbital road link.

The *LTTMP* and *FPS* commits to preservation of the Western Sydney Freight Line corridor to cater for growth in freight demand with dedicated freight infrastructure. TfNSW is leading investigations to preserve a corridor for the WSFL which is still under consideration. The *FPS* identifies the investigation of the WSFL, broadly between the Southern Sydney Freight Line (SSFL) and the Main West Rail Line and also identifies the need for an intermodal terminal connecting to the WSFL in the vicinity of Eastern Creek.

An important consideration for the planning of the freight network and the location of freight activity centres within the NWPGA will be appropriate land use planning to help support the mitigation of noise from freight operations, which is Action 3B-2 of the FPS. This action supports planning controls that appropriately locates sensitive land uses, transport corridors and freight hubs, which will ensure noise impacts are prevented at the early stages of planning rather than costly noise mitigation measures post-development such as noise walls or architectural treatments.

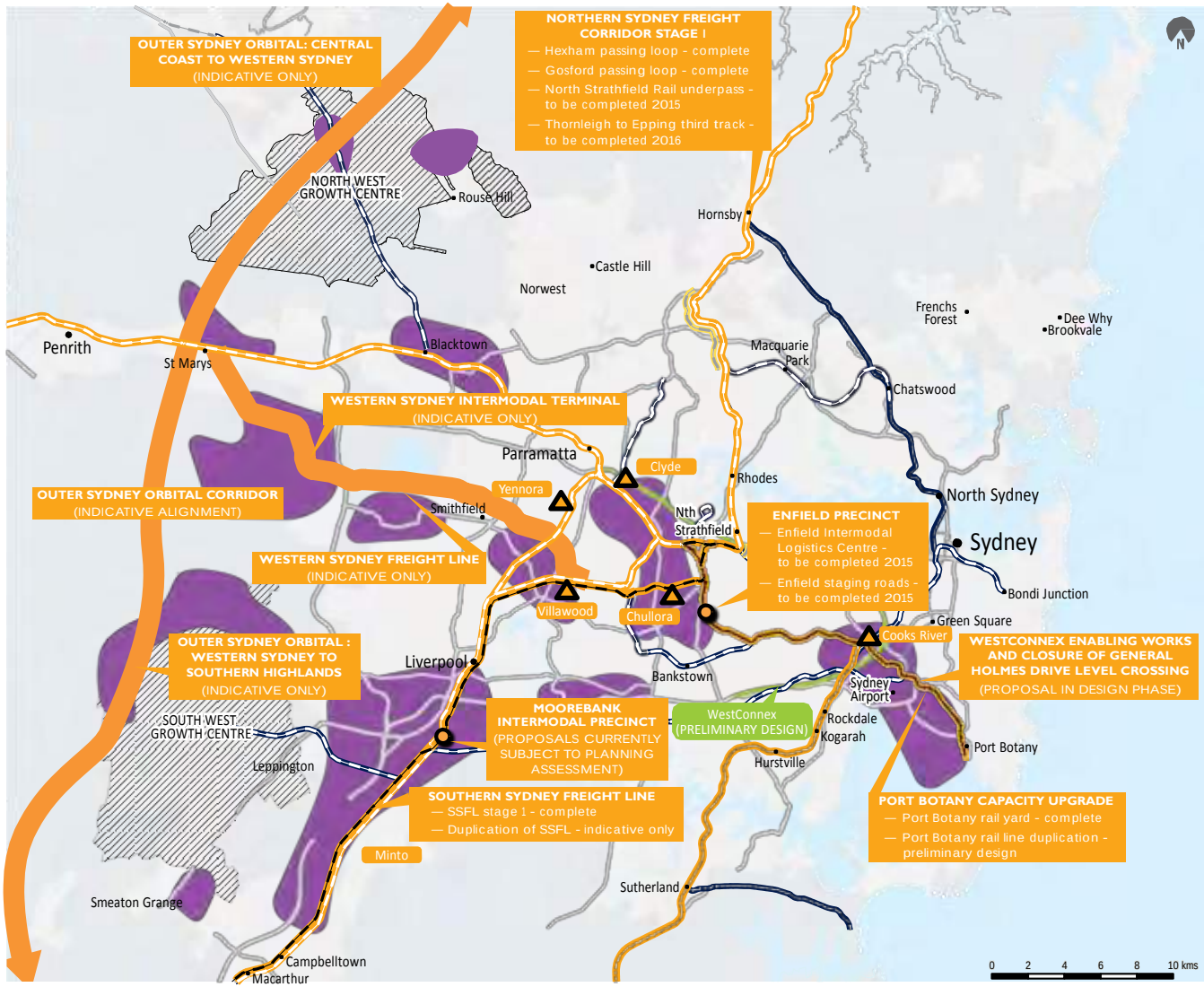


Figure 11: NSW Metropolitan Freight Precincts

Source: NSW Freight and Ports Strategy

ROAD NETWORK

The NWPGA will be well served by several key existing and proposed roads. The M7 Motorway is located on the southern edge of the NWPGA and provides a link to the existing Sydney Orbital Network via connections to the M2, M4 and M5 Motorways. Connections from the NWPGA to the M2 and M4 Motorways would be via the M7. This provides excellent access for road transport along the economic growth corridor to the south-west including the proposed WSA, WSPGA, WSEA and SWPGA, as well as to the south-east to Sydney Kingsford Smith Airport and Port Botany.

The majority of surface transport in the NWPGA is by private vehicles (79%), just over 12% for public transport and 9% by walking and cycling. The proportion of other trips (inclusive of walking and cycling) is lower in NWPGA compared to the Sydney average.

The existing motorway network (M2 and M7) is constructed to a high standard but is already reaching its operational capacity at peak times. The NWPGA currently shows a higher proportion of trips made by private car compared to Sydney as a whole.

Traffic modelling has demonstrated that peak hour trips in the NWPGA will increase almost five-fold between 2011 and 2031 and that if no improvements are made to the transport network, road capacity constraints will result in congestion.

Traffic growth during the 2031 AM peak on Richmond Road and Windsor Road, and other roads immediately surrounding the NWPGA, would result in increased delays and congestion on the arterial road network.

A key feature of the *LTTMP* is to plan and prepare for the long term by protecting and preserving our most important transport corridors. The *LTTMP* proposes corridor protection of the OSO and Bells Line of Road - Castlereagh Connection. It is anticipated that the OSO will form part of a future north-south motorway link to bypass metropolitan Sydney to the west, connecting the Hume Highway in the south with the M1 Motorway to the north. The OSO will be considered as a multi-modal corridor including rail and freight.

The key corridors that will influence movement to and from the NWPGA include:

- **Outer Sydney Orbital** – a north-south multi-modal corridor consisting of a motorway, freight rail and where practical passenger rail. The motorway would potentially connect the existing M1 Motorway north of Sydney with the M31 Hume Motorway south of Campbelltown, providing north-south access serving the NWPGA, SWPGA, WSPGA and WSEA. TfNSW are currently investigating a suitable corridor for preservation
- **Bells Line of Road – Castlereagh Connection** – a corridor that would provide a link from the Lower Hawkesbury to the Sydney Motorway Network, and provide an alternate route across the Blue Mountains. TfNSW are currently investigating a suitable corridor for preservation.
- **Old Windsor Road / Winsdor Road /Richmond Road** – are existing principal arterial roads servicing the NWPGA and provide direct connections to the M2 and M7 motorway.

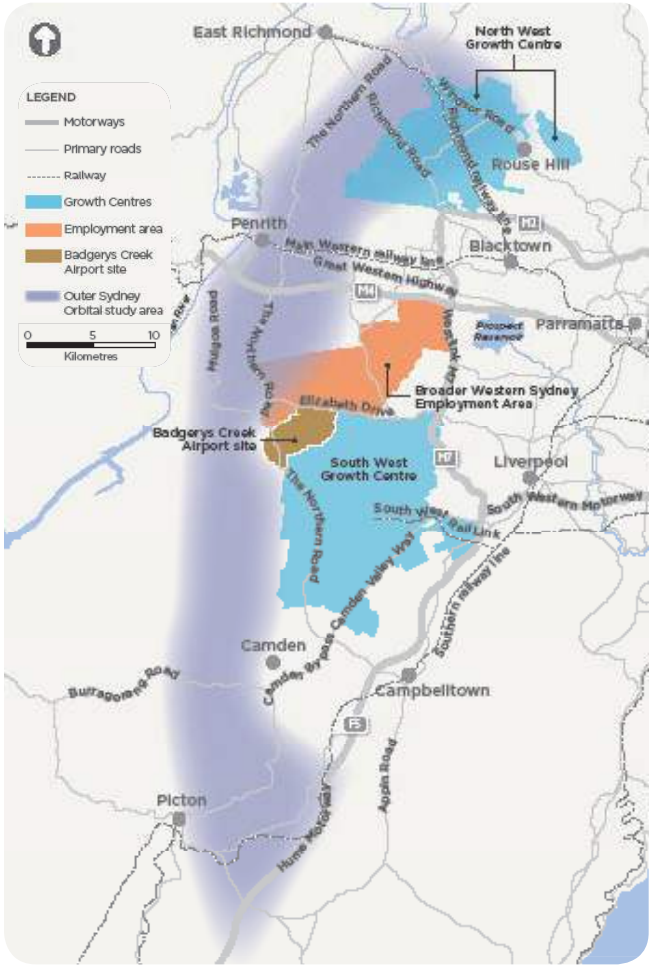


Figure 12: Outer Sydney Orbital Corridor Preservation Investigation Area

Source: Outer Sydney Orbital Corridor Preservation Newsletter June 2015

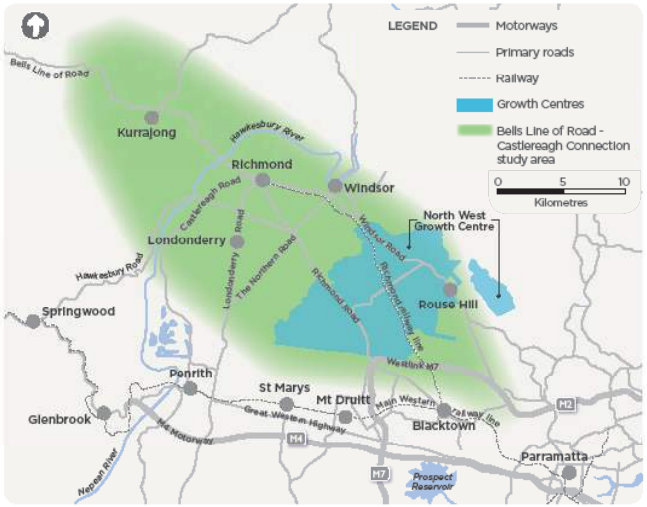


Figure 13: Bells Line of Road – Castlereagh Connection Corridor Preservation Investigation Area

Source: Bells Line of Road – Castlereagh Connection Lower Hawkesbury to the Sydney Motorway Network Corridor Preservation Newsletter June 2015

2.5 KEY THEMES + CHALLENGES

To achieve the goals established by TfNSW, six key themes were identified to guide the preliminary review of the current Structure Plan for NWPGA.

The themes were developed based on previous planning efforts, discussions with key governmental agencies and interaction with the broader NWPGA consultant team.

In order to ensure a holistic understanding of the study area each key theme identified challenges, objectives and initial indicators as shown in Figure 14.

KEY THEMES + CHALLENGES		OBJECTIVES	INDICATORS
INTEGRATE LAND USE + TRANSPORT	■ The current mix and quality of transport services within NWPGA are impacting on its liveability and economic activity, its potential for urban development and renewal, and ultimately its sustainability as a region. ■ Achieving residential and employment densities within NWPGA which are high enough to support attractive public transport.	■ Enable shorter travel times by providing multiple routing options. ■ Encourage transit-oriented development (TOD) and an urban form that fosters pedestrian-centred, denser mixed-use areas. ■ Encourage transport-supporting urban form at the localised planning level (i.e street connectivity) in order to minimise walking distances between any origin and a transit stop. ■ Optimise intensities of land uses that generate high public transport demand and create a quality (and highly legible) pedestrian environment. ■ Encourage a flexible framework to allow a mix of land uses and building typologies.	■ Focus high intensity land uses such that 90% of the potential passenger catchment is within 800m radius fi st tier public transport system (rail station/bus interchange/rapid bus stop/light rail stop). ■ Focus high intensity land uses such that 90% of the potential passenger catchment is within 400m radius second tier public transport system (suburban and local bus stop). ■ Provide first and second tier public transport through core development nodes/activity centres. ■ Number of major centres / minor centres / emerging centres connected. ■ Conventional minimums of 25-50 persons/ha (11-23 dwellings/ha for good levels of transit ridership). ■ Increase the current mode share by walking and support a target for increasing walking trips to 25% for local trips in activity centres.
DEVELOP A BALANCED MULTI-MODAL TRANSPORT SYSTEM *(IMPROVE MULTI-MODAL CONNECTIVITY + ACCESSIBILITY)*	■ Western Sydney's growth is outpacing the level of transport service. ■ Redefining NWPGA public transport system to serve population and employment growth.	■ Enhance multi-modal connectivity and integration between modes. ■ Ensure efficient movement of freight and goods. ■ Provide a clear hierarchy for each mode of transport (transit, vehicular, bicycle, and pedestrian). ■ Protecting key corridors to ensure transport system can develop in the future. ■ Ability for corridors to evolve to meet the needs of the future. ■ Provide appropriate capacity to serve the likely demand on a particular corridor(s). ■ Create east-west connections and improve north-south connectivity.	■ Public transport mode share for journeys to work. ■ Public transport mode share for all trips to/from NWPGA. ■ Number of interchanges connected. ■ Number of transfers between the first and second tier public transport system. ■ Increase the current bicycle mode share and support the target for doubling cycling trips.
FOCUS ON THE CUSTOMER EXPERIENCE	■ Mimimising travel times and increasing reliability of public transport for the West Central Subregion and NWPGA. ■ Improve the public transport system to provide services that enable customers to access a range of key locations quickly, reliably, comfortably and at different times of the day.	■ Provide an interconnected network of quality public transport nodes and services that are easily accessed and that respond to the needs of customers. ■ Provide a public transport service that is sufficiently attractive that customers choose to use it. ■ Provide a quality urban environment to meet the aspirations of people in terms of liveability and quality of life. ■ Deliver a transport outcome that will be attractive to customers and cater for growth.	■ Accessibility of services for all modes ■ Quality of service (including frequency, travel time, access distances). ■ Service reliability, including travel time reliability and on-time performance ■ Level of customer satisfaction ■ Customer perception of safety ■ Increased active transport mode share
ENHANCE PRODUCTIVITY	■ Slower travel times and worsening reliability arterial roads and motorways such as the M2, M7, Windsor Road, and Old Windsor Road. ■ By 2036, more than half of Sydney's population will live in Western Sydney. ■ By 2050, more than 50% of all imported containerised freight will be directed to Western Sydney than to the rest of Sydney combined. ■ Road freight traffic accounts for 15% of VKT in the Sydney Metropolitan Area; this is estimated to continue to grow.	■ Ensure higher order road network (arterials and motorways) have sufficient capacity to cater for expected growth in road freight traffic ■ Provide key access to freight activity precincts. ■ Provide access efficiency for both rail and road freight movement. ■ Separate rail freight from passenger rail within the congested metropolitan rail network. ■ Balance freight needs with community and environmental needs. ■ Improve overall capacity, speed and efficiency of transport system.	■ Travel time reliability for all transport modes ■ Load balancing provides a useful indicator of one aspect of network operations with a target ratio of peak to counter-peak loads of better than 60:40. ■ Connectivity to the higher order road network (M7 Motorway and Outer Sydney Orbital) and rail network ■ Increased proportion of freight traffic carried by rail ■ Appropriate location of sensitive land uses, transport corridors and freight hubs.
CREATE A SENSE OF PLACE	■ Enhance existing centres and provide new centres that respect the local context and history.	■ Organise transport hierarchy to allow for a mix of uses and building typologies. ■ Create a fin grained-street network at designated centres. ■ Encourage connectivity and accessibility over speed.	■ Provide a wide-range of land uses, building scales and housing choice. ■ Implement higher order transit in a five minute walk activity centres.
ENHANCE LIVABILITY + SUSTAINABILITY *(RESPECT THE NATURAL ENVIRONMENT)*	■ Large amount of land is constrained by fl od areas. ■ Preserve and respect the existing natural landscape. ■ Incorporation of natural features into development areas.	■ Respect the context. ■ Encourage and organise the transport system to frame large scale open space for public access. ■ Incorporate pedestrian and bicycle corridors into undevelopable land areas. ■ Prevent noise impacts through appropriate land use planning around transport corridors and freight hubs	■ Lower VKT resulting in a lower demand for car travel overall and a reduction in emissions of greenhouse gases – reduce VKT per capita from 2014 levels. ■ Identify key green corridors for pedestrian and bicycle thoroughfares. ■ % area (ha) of multi-functional public open space providing passive and active spaces – with 80% meeting this criterion. ■ Minimise impacts on areas of environmental significanc .

Figure 14: Key Themes + Challenges

03 STRUCTURE PLAN REVIEW

3.1 INTRODUCTION

This section provides an overview of the current NWPGA Structure Plan and identifies potential opportunities for further refinement. The analysis includes the identification of key recommendations as part of the structure plan refinement process.

The review of the current Structure Plan is detailed in the sections relating to the five key themes of:

- Land Use and Transport Integration;
- Public Transport (rail and bus);
- Road Network;
- Freight Movement; and
- Active Transport Network (pedestrians and cyclists).

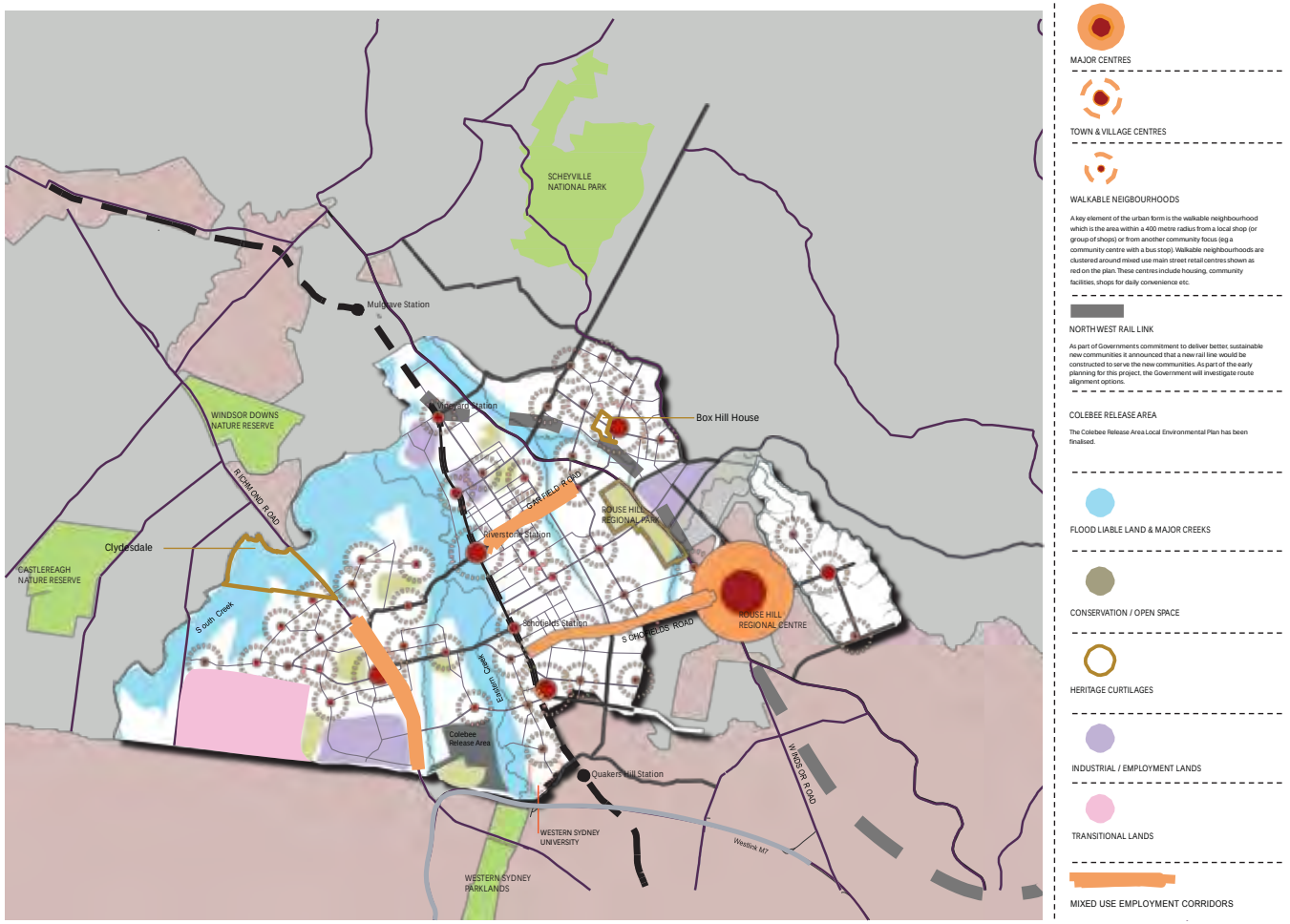


Figure 15: Existing NWPGA Structure Plan

3.2 NORTH WEST PRIORITY GROWTH AREA

The North West Priority Growth Area (NWPGA) comprises approximately 10,000 hectares of land encompassing the local government areas of The Hills, Blacktown and Hawkesbury. Development of the NWPGA to deliver additional housing supply follows significant land releases in surrounding areas – including Rouse Hill, The Ponds, Kellyville Ridge, Beaumont Hills and Stanhope Gardens – over the last 10 to 15 years.

The NWPGA has been divided into 16 'precincts' that are progressively being released and rezoned for sustainable urban development. The North West sector will be an area of intense development growth over the next 30 years and is one of two growth centres identified in *A Plan for Growing Sydney* released by DPE. Improvement and expansion of the transport network will be required to effectively serve the access and mobility needs of this emerging area.

The current NWPGA Structure Plan provides for a string of centres and towns located on either side of the existing T1 Western Line between Vineyard Station and Quakers Hill Station. The estimated dwelling yield for the North West Growth Centre is around 70,000 dwellings.

The core part of the growth centre is focussed on the T1 Western Line. In this area opportunities for new development have been identified in Vineyard, Riverstone West, Riverstone, Schofields, Marsden Park North and Alex Avenue. These centres have been structured to take advantage of the existing transport links and their central location in the growth centre.

The current NWPGA Structure Plan currently includes a number of road crossings of the Richmond Rail Line. The existing structure plan was examined to determine the most appropriate number and location of crossing and how these interact with and may affect future land use and transport in the area. The Richmond Rail Line, while providing an important north/south transport link through the NWPGA, will require provision for the grade separation of key east-west roads crossings if these are to function reliably.

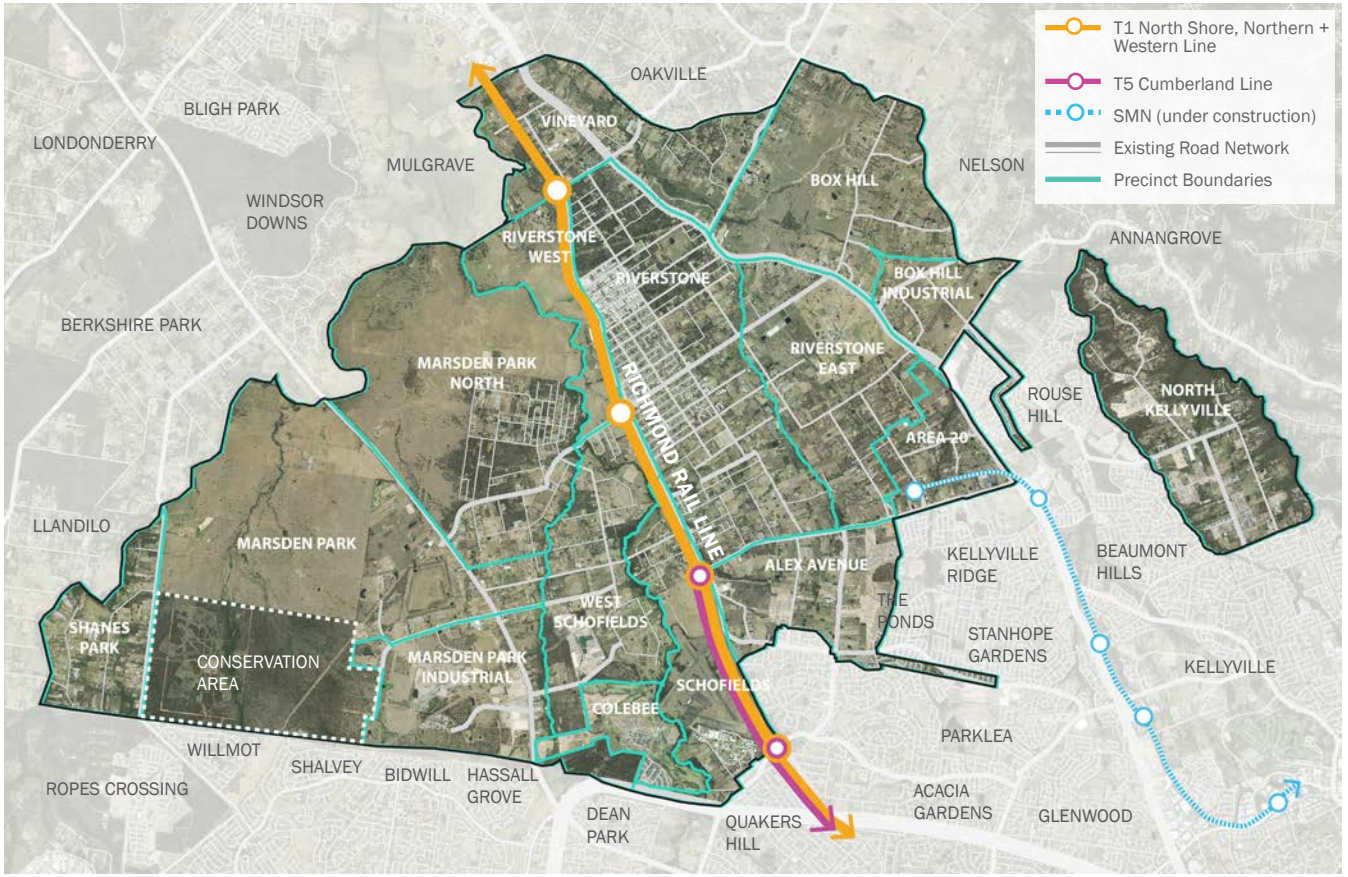


Figure 16: Existing North West Priority Growth Area

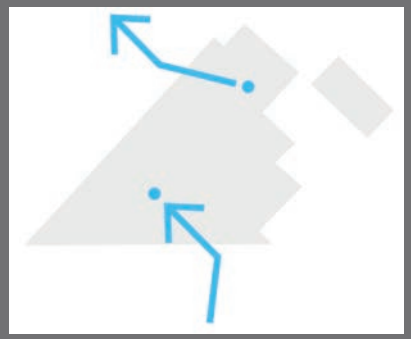
3.3 TRANSPORTATION + LAND USE

The NWPGA Structure Plan illustrates that the area will be well served by a hierarchy of transport options. Integrating infrastructure investments with thoughtful land use planning will ensure that these investments are maximised for transit ridership and community benefit.

Our holistic review of the NWPGA's Structure Plan, in conjunction with the Indicative Layout Plans, will identify opportunities to improve overall mobility by identifying centres and trip types that will improve community livability and mobility.

TRIP TYPE AND PURPOSE

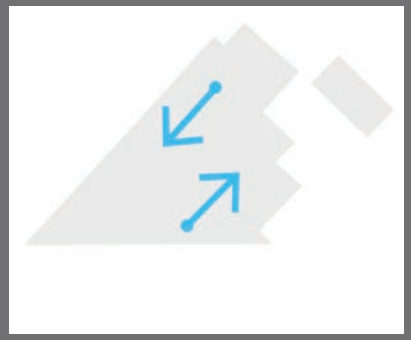
The NWPGA will have a range of trip types moving through and within the area. We have reviewed the existing Structure Plan focusing on matching the trip type to the trip purpose.



Local Travel

Make selective precisely targeted capacity improvements that are well coordinated with land use for trips beginning in (by residents of) and trips ending in (by visitors to) the NWPGA. Local travel should:

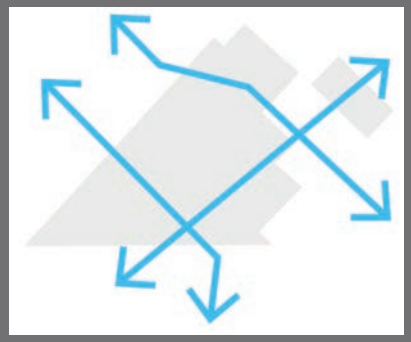
- Respect the context.
- Lower travel speeds.
- Provide open space access.
- Create connectivity.
- Encourage walking and biking as an alternative.



Internal Travel

Preserve the capacity and quality of local streets for travel made entirely within the NWPGA. Internal travel should:

- Respect the context.
- Provide open space access.
- Create connectivity.
- Encourage walking and biking as as priority.



Through Travel

For regional trips that begin and end outside of the NWPGA, travel should:

- Allow higher travel speeds.
- Control access.
- Limit connectivity.
- Encourage vehicular mode fi st.
- Use public transport as an alternative.

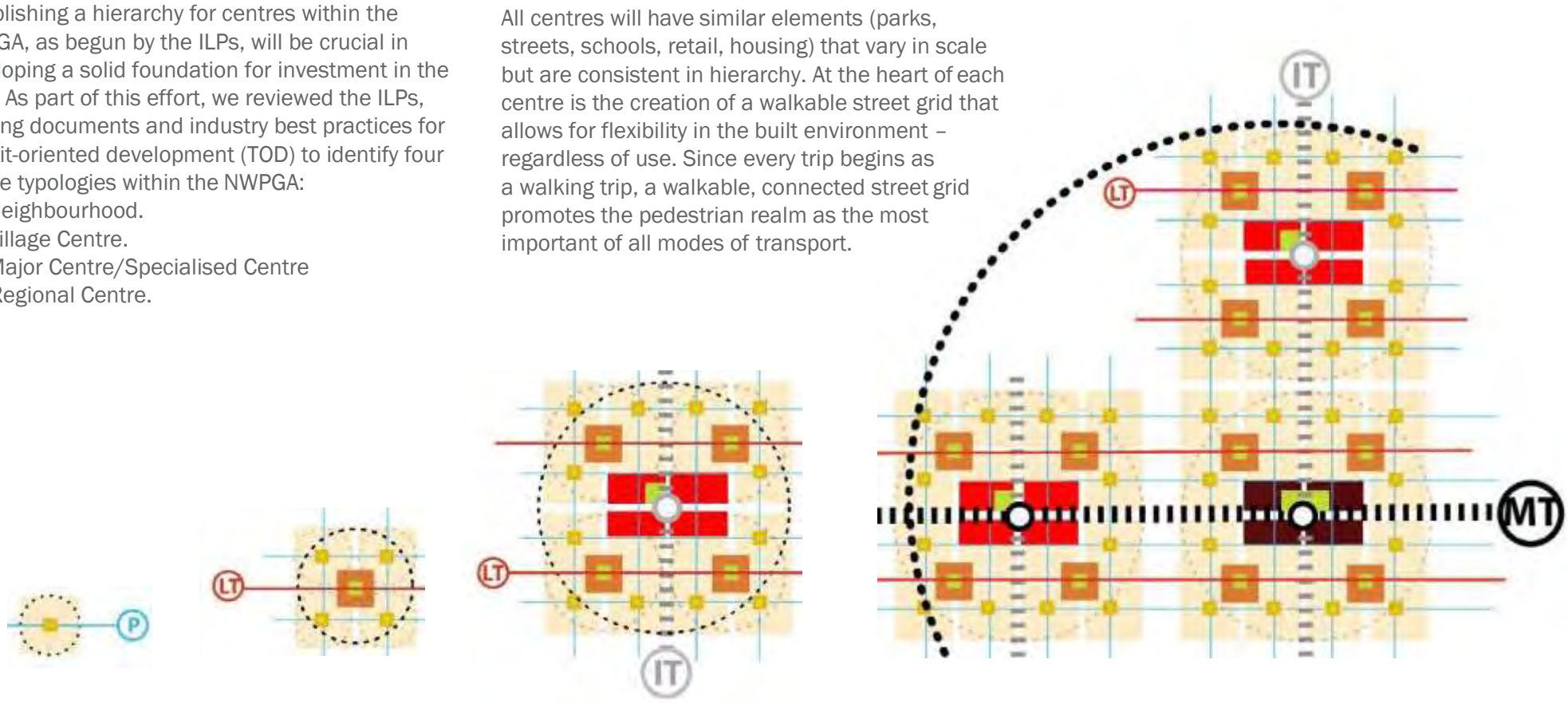
Figure 17: Trip Types

CENTRES

Establishing a hierarchy for centres within the NWPGA, as begun by the ILPs, will be crucial in developing a solid foundation for investment in the area. As part of this effort, we reviewed the ILPs, existing documents and industry best practices for transit-oriented development (TOD) to identify four centre typologies within the NWPGA:

- Neighbourhood.
- Village Centre.
- Major Centre/Specialised Centre
- Regional Centre.

All centres will have similar elements (parks, streets, schools, retail, housing) that vary in scale but are consistent in hierarchy. At the heart of each centre is the creation of a walkable street grid that allows for flexibility in the built environment – regardless of use. Since every trip begins as a walking trip, a walkable, connected street grid promotes the pedestrian realm as the most important of all modes of transport.



NEIGHBOURHOOD

VILLAGE CENTRE
10,000 - 15,000 Population
800m Capture

MAJOR CENTRE / SPECIALISED CENTRE
4,000 - 60,000 Population
1,600m Capture

REGIONAL CENTRE
60,000 Population
4,000m Capture

Figure 18: Hierarchy for Centres

LEGEND

- MT Mass Transit
- IT Intermediate Transit
- LT Local Transit Network / Key Pedestrian Connections
- Low-Density Residential
- Mid-Density Residential
- High-Density Residential
- Mid-Density Mixed Use
- High-Density Mixed Use
- Parks + Open Space

3.4 POPULATION + EMPLOYMENT

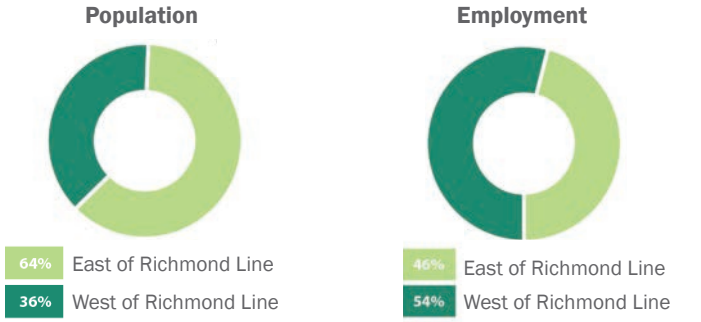
Projected population and housing figures vary across the various documents that have been prepared in relation to the NWPGA. However, based on the figures provided by DPE, the NWPGA will grow to have a population of approximately 260,000 with approximately 93,000 new dwellings and will accommodate around 44,000 employment opportunities in the next 20 to 30 years.

In addition, in March 2014, SGS Economics provided a forecast for the anticipated retail and employment floor space across the NWPGA precincts where Precinct Planning had been completed.

The Richmond Line, between Vineyard Station and Quakers Hill Station, divides the NWPGA into eastern and western sections. As outlined in the figure, higher distribution of residential population is expected to occur east of the Richmond Line (64% depending on the level of development). On the other hand, the majority of jobs (54%) are expected to be accommodated west of the Richmond Line.

An examination of land use and employment projections shows a higher density of development in the south becoming less dense in the northbound direction to Vineyard. This is reflected in the traffic projections for the area. The number and location of proposed crossings of the Richmond Line needs to reflect this change in density through the study area an understanding of the likely desire lines of people travelling within and through NWPGA.

The location of proposed strategic centre at Marsden Park (east of Richmond Road) appears to be located further away from higher distribution of residential population within Marsden Park.



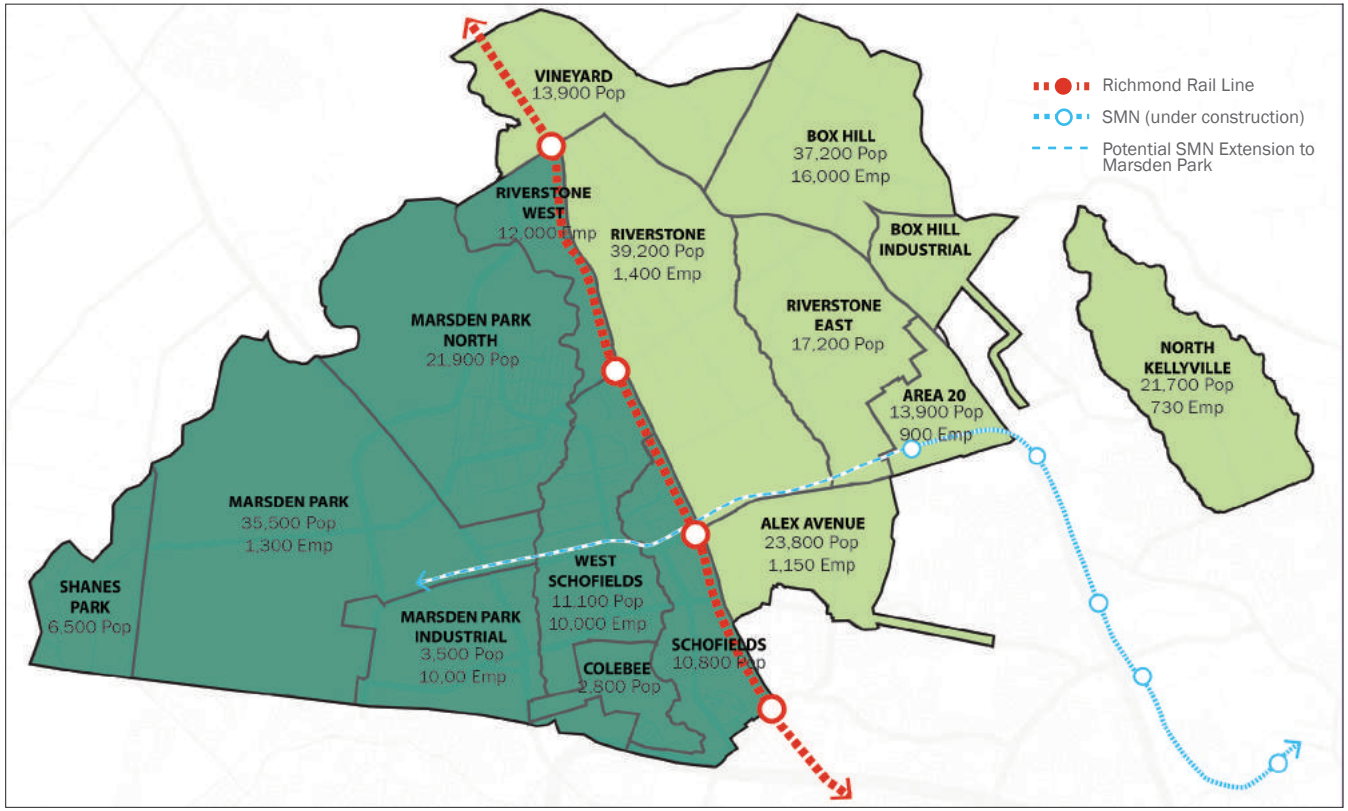


Figure 19: Distribution of Population + Employment West / East of Richmond Rail Line

LAND USE TO ENCOURAGE TRIP CONTAINMENT

It is unclear from the review of the current Structure Plan of the intention to achieve a balance between residential, business and employment opportunities within NWPGA as means of encouraging a degree of transport containment and supporting the creation of a self-sufficient live-work-study-play offer for future residents. This aim is considered to entail a number of important benefits for NWPGA, including the balancing of peak load journeys in and out (avoiding oversupply of transport or other infrastructure), minimisation of transport related energy demand and optimisation of convenience for future residents. It is recognised that achieving a 'perfect' balance will not be possible. However, the creation of conditions to foster this as much as possible is still likely to entail substantial long-term benefits

We understand that investigations are being undertaken by DPE to test the responsiveness and demand drivers regarding overall yields, mix of densities, land use mix and distribution within NWPGA.

The market demand drivers will play a pivotal role in determining the diversity of densities and products across the NWPGA. A target employment population that is 50–60% of the size of the stable residential population will encourage a degree of transport containment.

Figure 20: Land Use from Indicative Layout Plans

TRANSPORTATION SUPPORTIVE DENSITIES

Research by leading transportation planners (i.e. Cervero, Newman and Kenworthy) consistently cites minimum residential densities of 38 dwellings/ hectare (82 persons/ha) to support high-frequency public transport such as rail or bus rapid transit, at frequencies of 15 minutes or less. The minimum residential density needed to support public transport of any kind (i.e. low-frequency bus) is generally considered to be 15-20 dwellings/ ha (33-44 persons/ha). The current Structure Plan as advised by Department of Planning and Environment (DPE) has average densities ranging between 10-17 dwellings/ha (22-37 persons/ha).

In order to achieve the projected residential densities (and which are high enough to support attractive public transport), an integrated land use strategy will be essential. Encouraging Transit Oriented Development (TOD) and an urban form that fosters pedestrian-centred, denser mixed-use areas is particularly vital. In turn, providing the public transport to support these kinds of urban development is critical to achieving the desired long-range planning of both transit infrastructure and development is the key to achieving both sides of this equation at the regional level.

Population and employment data was analysed using the latest AEC Group and SGS Economics data at the precinct level. Alex Avenue and Area 20 have the highest population densities.
Employment will be focussed in Riverstone West, Marsden Park industrial and Box Hill Industrial.

Refinement of the current Structure Plan should look for opportunities to boost residential densities along the chosen route corridors (Schofields Road and Garfield Road) and around proposed rail station locations (Cudgegong Road, Schofields, Riverstone and Marsden Park). This will support the transit service and encourage trips by public transport rather than private vehicle.

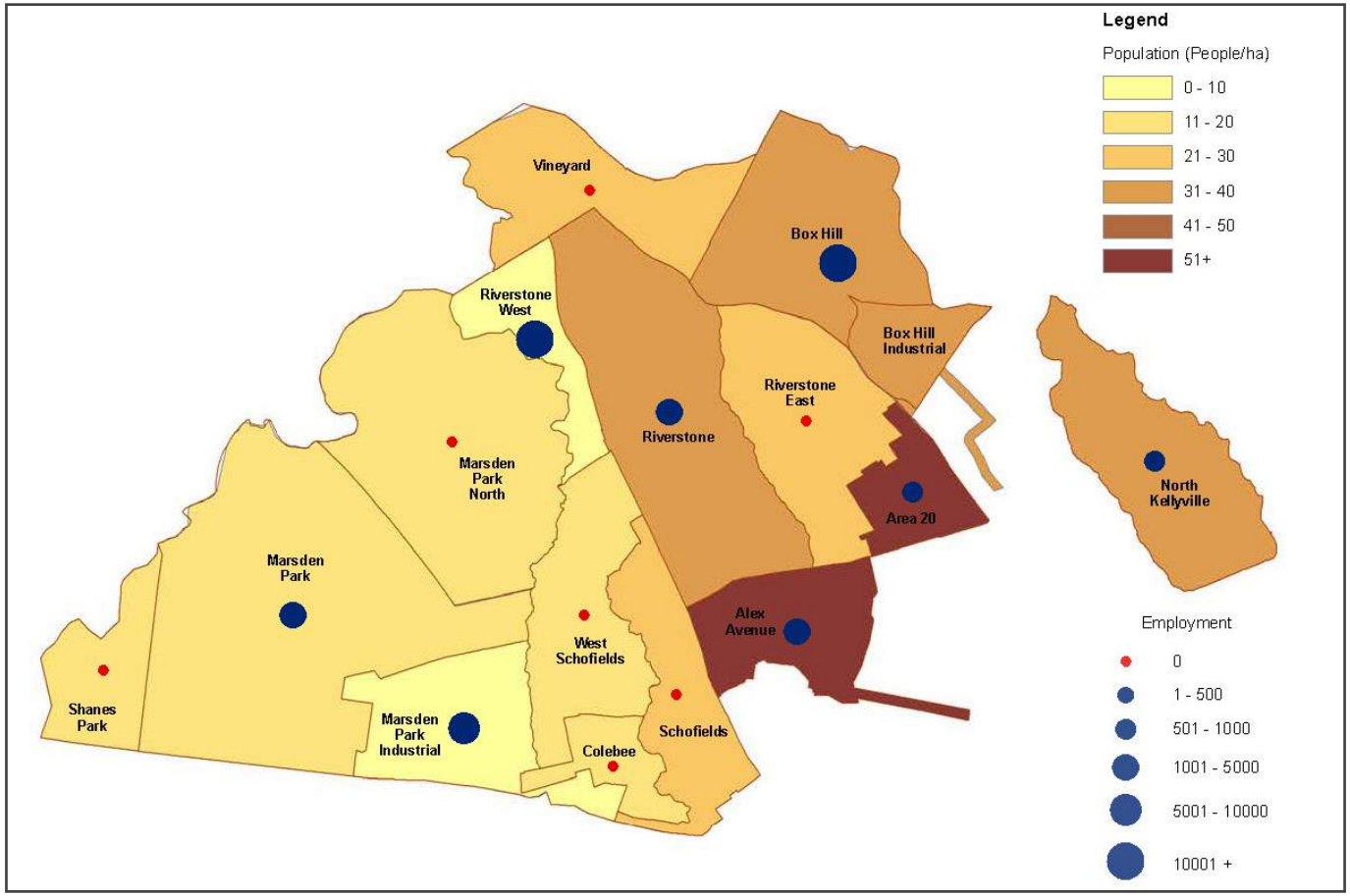


Figure 21: Planned NWPGA Population + Employment - Ultimate

RECOMMENDED REFINEMENTS

- Proposed number, location and configuration of crossings of Richmond Line to align with updated population and employment distribution for NWPGA.
- Integrated transport network and connections to align with proposed centres hierarchy once established.
- Concentration of higher densities in corridors and centres least constrained by topography and most accessible to primary transport (road and transit).
- Assess the ability of the structure plan to achieve the land use density projections and aims of integration of land use with public transport.
- Facilitation of primary and secondary mass transit infrastructure and the optimisation of this through support for highly accessible centres and high quality connections to adjoining activity centres.

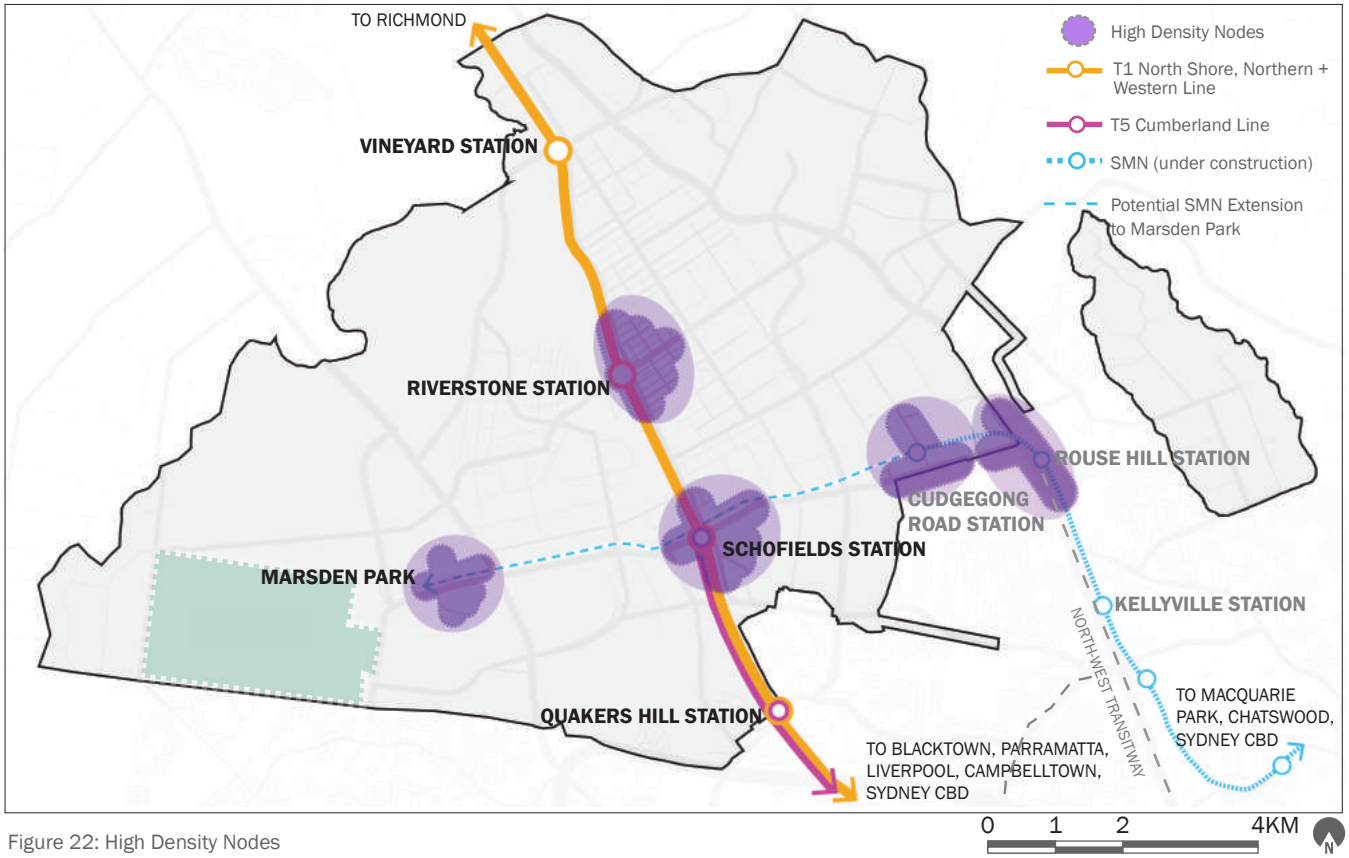


Figure 22: High Density Nodes

3.5 ENVIRONMENTAL SYSTEMS

There are a number of environmentally sensitive areas within the NWPGA that need to be taken into consideration in the Structure Planning process and corridors protected. The two major watercourses within the NWPGA are South Creek, which forms the western boundary of the NWPGA and Cattai Creek which forms the eastern boundary of the North Kellyville Precinct. There are also a number of minor creeks that run through the area, including Bells Creek and Eastern Creek to the west of the Richmond Rail Line and First Ponds Creek, Second Ponds Creek and Smalls Creek to the east. Protection of the riparian zones along these watercourses is environmentally important.

The South Creek and Eastern Creek, together with their respective floodplains, serve as large flood storage areas for the Hawkesbury-Nepean River system. As such, due to this flood risk, large areas of land within and adjacent to these floodplains are not suitable for urban development. This has a significant impact on net developable area, but also provides opportunities to incorporate active transport into these riparian corridors.

The State Emergency Service (SES) confirmed that North West Sydney has the potential for one of the largest possible flood events in Sydney. The majority of the flooding is to the north of the NWPGA and will result in the total flooding of towns such as Windsor and McGraths Hill. While most areas evacuate to the north some evacuate to the south and through the NWPGA. It is understood that flood evacuation routes include Richmond Road, Windsor Road, Old Pitt Town Road, Annangrove Road, Hamilton Street through Riverstone and Hambledon Road through Alex Avenue.

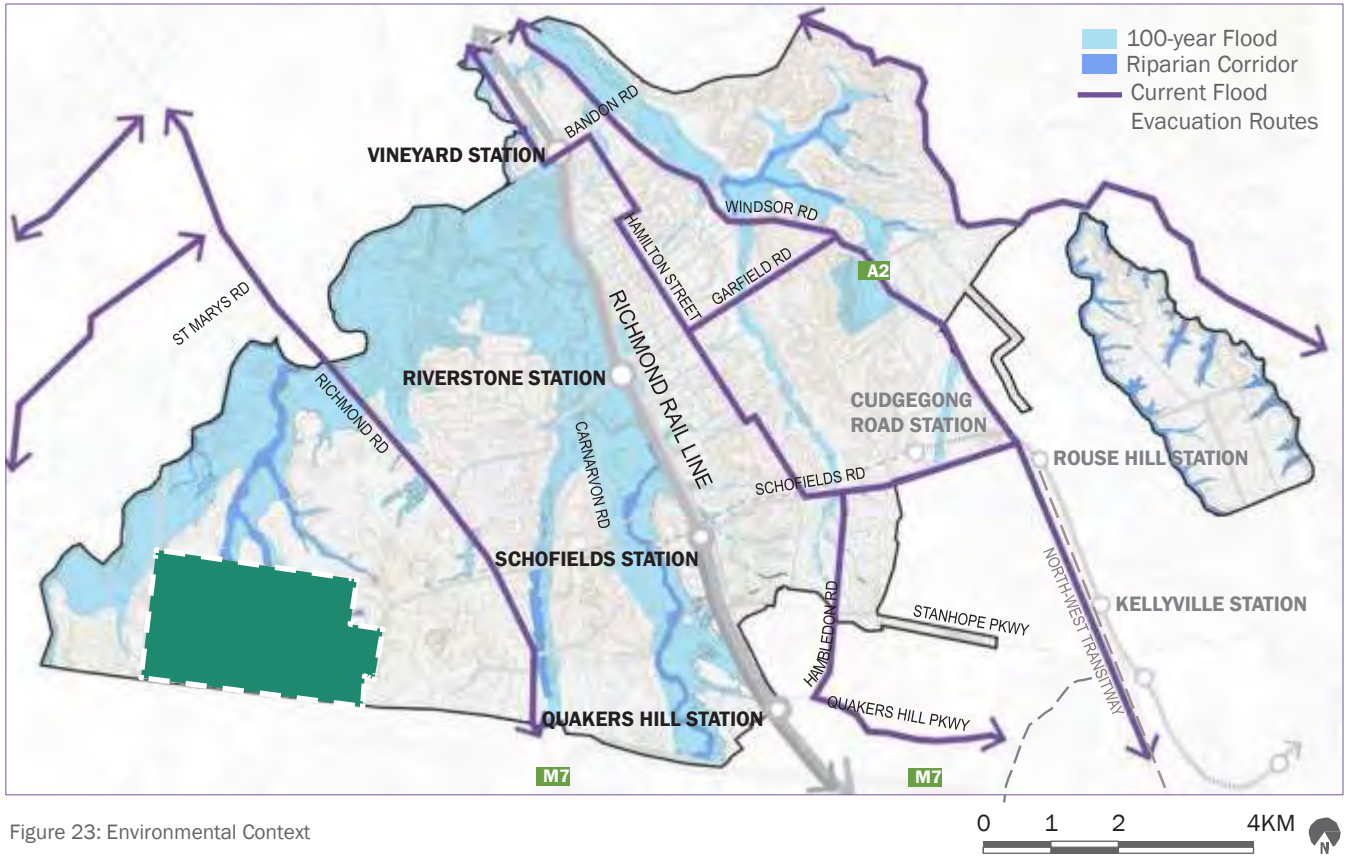


Figure 23: Environmental Context

Much of the original vegetation across the NWPGA has been removed. However, a number of ecologically significant stands of Cumberland Plain Woodlands remain. Flora and fauna are being protected in a strategic manner in the Priority Growth Areas through the biodiversity certification process, which is a tool for conserving biodiversity and protecting threatened species, populations and communities listed under the *NSW Threatened Species Conservation Act* 1995.

As described previously, throughout the NWPGA there are environmentally sensitive areas that have not been nominated for urban development due to environmental factors such as flooding, significant vegetation communities etc. These areas are primarily located along the South Creek and Eastern Creek tributaries, affecting the precincts of Riverstone West, Marsden Park North, Marsden Park and Shanes Park.

NSW HAWKESBURY NEPEAN FLOOD EMERGENCY SUB PLAN

The most effective means of evacuation is via road, using private vehicles allowing residents more control over their own evacuation, and public buses for those who do not have or are unable to use their own vehicles.

The designated regional road evacuation routes for flood operations are:

- The Windsor Road Route (closed at 13.5m AHD).
- The Pitt Town Road Route (closed at 16.0m AHD).
- The George Street Route (closed at 15.0m AHD).
- The Hawkesbury Valley Way Route (closed at 17.3m AHD).
- The Blacktown-Richmond Road Route (closed at 14m AHD).
- The Llandilo Road Route (closed at 23.8m AHD).
- The Northern Road Route.
- The Londonderry Road Route (closed at 18m AHD).
- The Castlereagh Road Route (closed at 20.2m AHD).
- The M4 Motorway Route.
- The Old Northern Road Route.

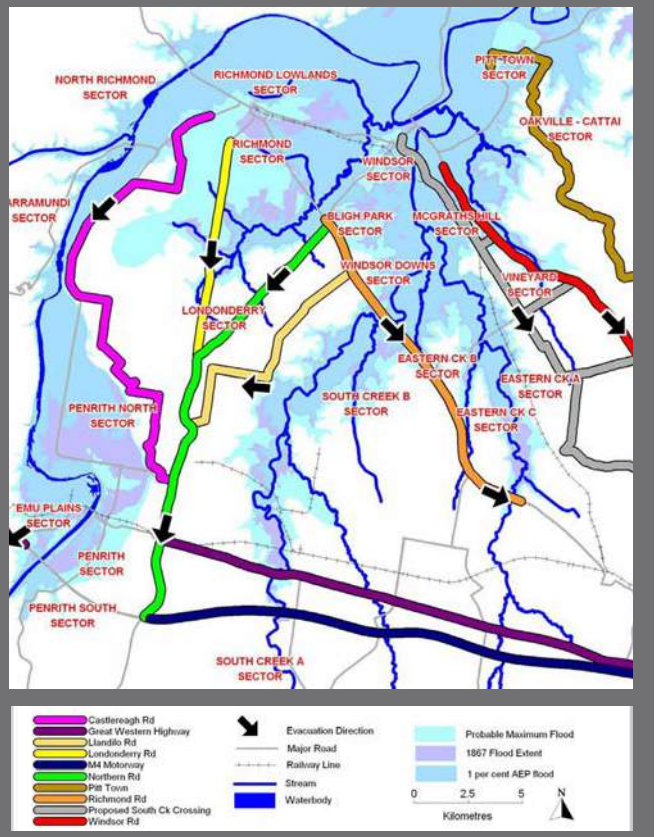


Figure 24: NSW Hawkesbury Nepean Flood Emergency Sub Plan

Source: NSW Hawkesbury Nepean Flood Emergency Sub Plan; Ministry for Police and Emergency Services, June 2014

Evacuation by rail for the flood island Sectors in the Hawkesbury LGA is limited since the Richmond railway line is effectively cut at around 12.5 to 13.5 metres near Vineyard.

3.6 INDICATIVE LAYOUT PLANS

The current Structure Plan for the NWPGA falls within the catchment of Rouse Hill, identified as a strategic centre under *A Plan for Growing Sydney*. Marsden Park has also been identified as a strategic centre in terms of its potential for a concentration of business and industrial activities, although this is not recognised under the current Structure Plan.

To date, 11 of the 16 precincts within the NWPGA have been rezoned. These include Colebee, North Kellyville, Riverstone West, Riverstone, Alex Avenue, Marsden Park, Marsden Park Industrial, Area 20, Schofields, Box Hill and Box Hill Industrial.

Precinct plans have been prepared for each of these precincts, providing details in relation to land use and densities and indicative subdivision patterns. Precinct Planning for a further three precincts is currently underway for Marsden Park North, Vineyard and Riverstone East. West Schofields and Shanes Park have yet to be released for Precinct Planning.

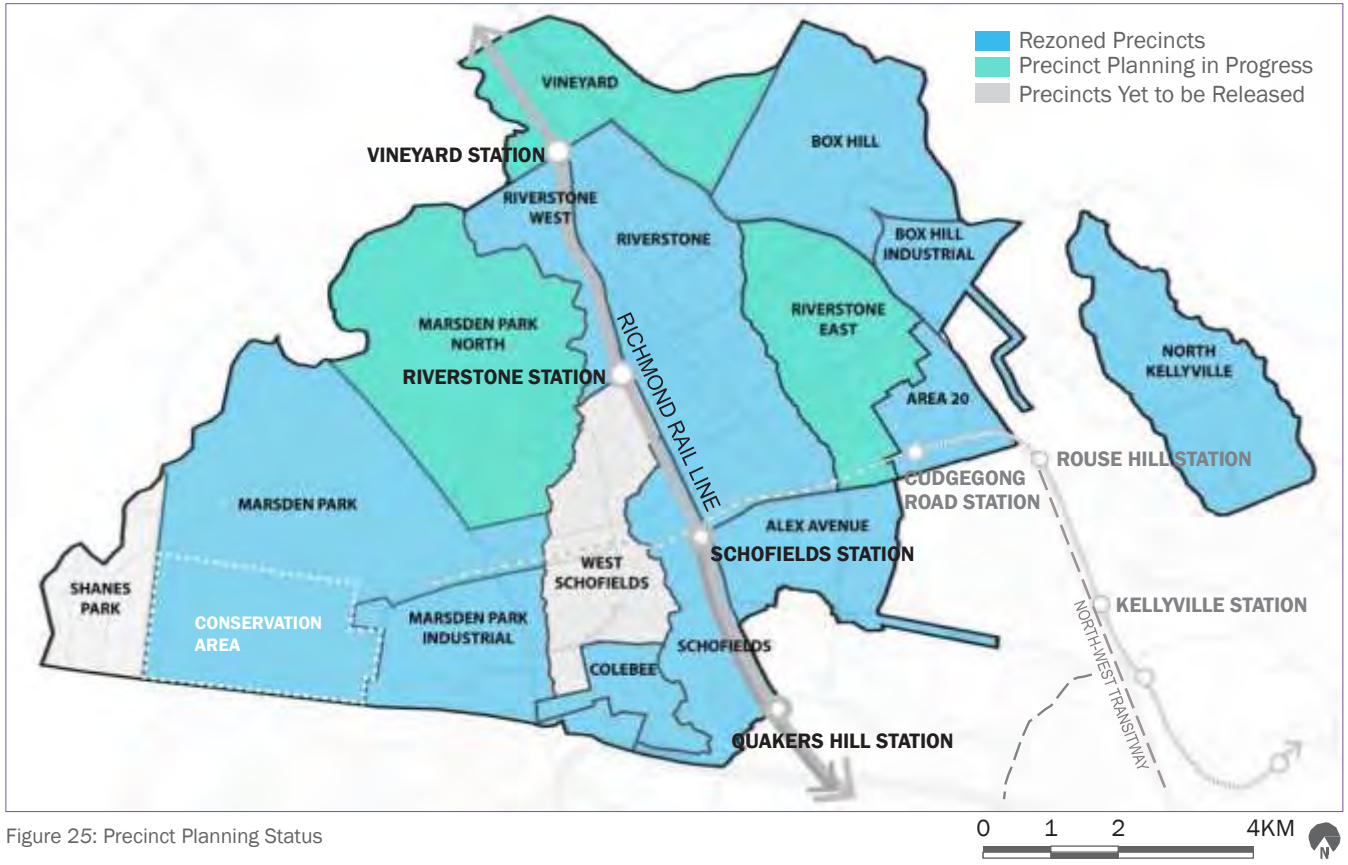


Figure 25: Precinct Planning Status

HEIRARCHY OF CENTRES

The 2006 Structure Plan for the NWPGA is based on a centre-type hierarchy derived from the draft North West Subregional Strategy established as part of the introduction of the Metropolitan Strategy (2005).

- **Major Centres – 1-kilometre radii –** Major shopping and business centre serving immediate subregional residential population usually with a full scale shopping mall, council offices, taller office and residential building central community facilities and a minimum of 8,000 jobs.
- **Town Centres – 800-metre radii –** Town Centres usually have one or two supermarkets, community facilities, medical centres, schools etc. Contain between 4,500 and 9,500 dwellings. Usually a residential origin rather than employment destination.
- **Village Centre – 600-metre radii –** A strip of shops and surrounding residential area within a 5 to 10 minute walk contains a small supermarket, hairdresser, take-away food shops. Contains between 2,100 and 5,500 dwellings.
- **Neighbourhoods – 150-metre radii –** One or a small cluster of shops and services. Contains between 150 and 900 dwellings.

Other land uses identified on the Structure Plan include:

- Employment areas;
- Mixed-use employment corridors; and
- Non-developable lands (environmentally sensitive).

To align with *A Plan for Growing Sydney*, it is proposed that the centre hierarchy illustrated in Section 3.3 be considered in the review of the designation of centres within the Structure Plan. The Structure Plan nominates eight Town/Village Centres and 19 neighbourhoods. Schofields is one of the eight nominated Town/Village Centres. However, the Schofields Centre is relatively central within the NWPGA and will benefit from the intersection of the Sydney Metro Northwest (SMN) and the Richmond Line forming a potential transport hub, presuming the extension of the SMN beyond Cudgegong Station. As such, it is considered that Schofields in the long term could be well suited to a higher designation within the centres structure as a potential strategic centre.

The proposed structure plan has revised the centre hierarchies. Both Rouse Hill and Marsden Park have been nominated as strategic centres. The strategic centres have been collocated with proposed Sydney Metro Northwest stations and interfacing with the Richmond Line.

The development of a central spine of strategic centres served by both primary and secondary transit and with direct relationship to the Sydney Metro Northwest along Schofields Road. The proposed structure plan also incorporates the building of lateral transit corridors to support the strategic centres and linked to emerging nodes within NWPGA such as Riverstone, Schofields, Vineyard and beyond.

Figure 26: 2006 Structure Plan

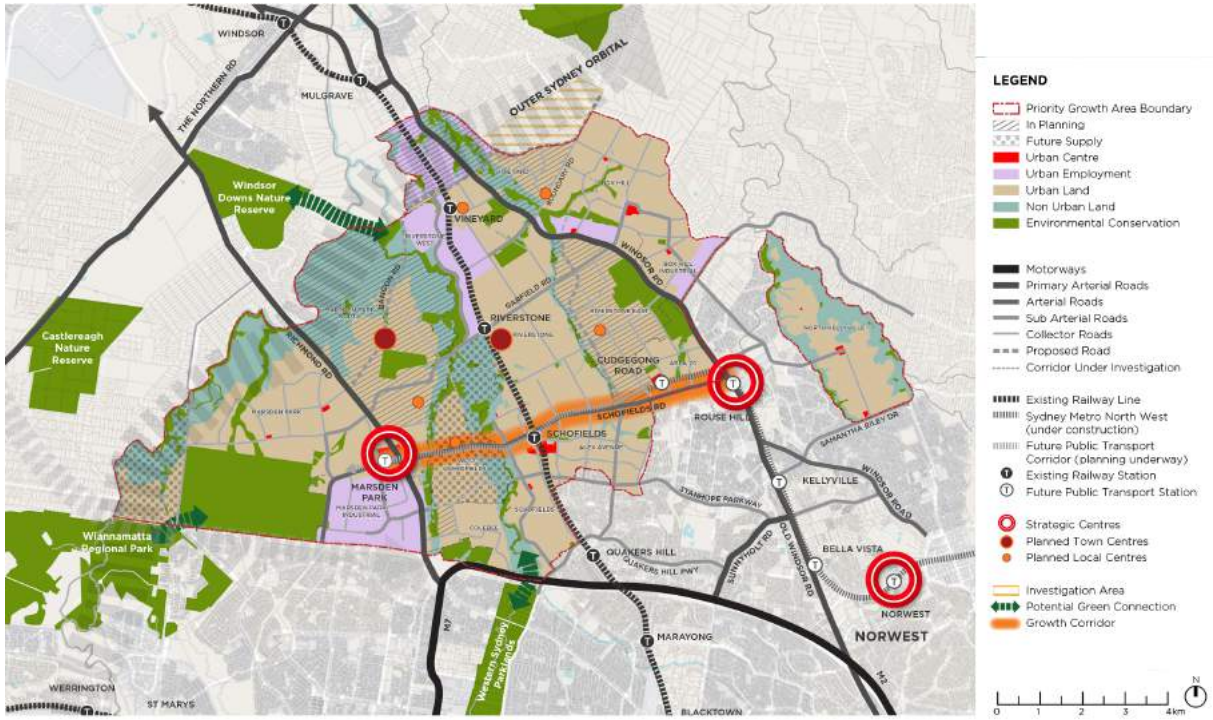


Figure 27: 2016 NWPGA Land Use and Infrastructure Strategy

RECOMMENDED REFINEMENTS

- Re-designate both Marsden Park and Schofields to strategic centres to enable the development of a transport network to support proposed land use at these key locations.
- Complete missing ILPs to allow the transport network to be established at a finer grain network.
- Define the centre hierarchy for Schofields in line with its potential future role as a major transport hub in the longer term.
- Align key centres with the identification of the latest transportation initiatives including preservation of a transport corridor from Marsden Park to the south.

3.7 TRANSPORT

The current Structure Plan in 2006 was undertaken based on a primary and secondary public transport system that has changed significantly based on the *LTTMP*. As a result, there are significant opportunities to improve the land use – transport system to maximise the value to be captured in terms of Transit Oriented Development (TOD) along key corridors, centres and transit nodes.

The transport planning review has ensured that land use and transport have been integrated at every stage and in every aspect of the Structure Plan Review.

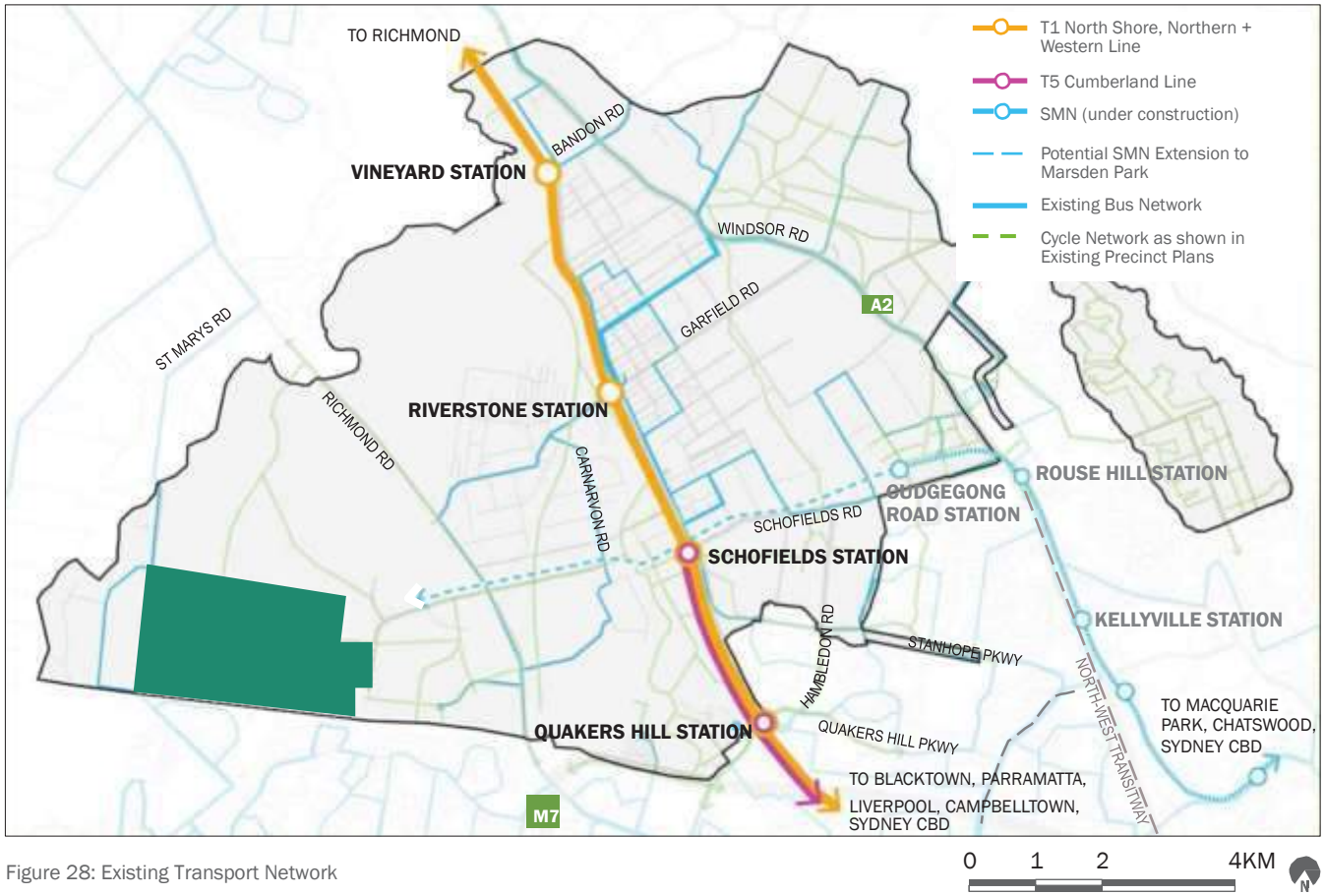


Figure 28: Existing Transport Network

PUBLIC TRANSPORT

There are a number of challenges facing the delivery of a public transport (bus and rail) network throughout the NWPGA and connecting into the wider regional network. The existing lack of appropriate public transport infrastructure and lack of services that provide attractive levels of access to key destinations does not meet the needs of most customers and results in increased car dependence.

Due to the relatively limited infrastructure, the current usage of the public transport network for journey to work is much lower than in other parts of Sydney. On average weekday, 79% of trips by NWPGA residents are made by private vehicles, just over 12% by public transport and 9% by walking or cycling. The NWPGA currently show a higher VKT per person than Sydney as a whole. This indicates that residents of the area drive further than most Sydney residents.

Travel times on the Richmond Line from Riverstone to Wynyard range from 64 to 74 minutes. Travel times from Schofields to Wynyard range from 64 to 68 minutes.

As land use evolves and intensifies within NWPGA, and travel demand increases and continues to expand to reflect a more connected, network scenario, the existing structure and service offering of the public transport system will be increasingly out of step with customer expectations. The result will be worsening levels of customer satisfaction and the subsequent inability to effectively meet the transport demand with public transport.

A major challenge facing the public transport system within the NWPGA will be to encourage public transport usage in an area where the existing network is very limited and mode shares are low. It will be important to establish an attractive public transport network from the outset so that new residents coming into the area can make considered mode choice decisions. Earlier introduction of public transport services, rather than relying on passenger demand to grow in the absence of an attractive service is preferred.

Overall Public Transport Hierarchy

We recognise that by locating Rouse Hill on the SMN and transitway network, the NSW Government has provided a critical element of sound integration of transportation and land use. This integration will be significantly strengthened by the extension of the Sydney Metro Northwest to Schofields and then Marsden Park.

Movement is the key in the ongoing ordered growth of the NWPGA. Public transport accessibility can be enhanced by the introduction of a hierarchy of transport systems and the better distribution of land uses and densities. The definition of movement corridors and the integration of public transit for NWPGA will ensure that a pattern of urban development will occur which will allow residents to have access to functions of every day life including work, rest and play.

New transport services for NWPGA must also be planned in the context of an integrated transport network. This network would range from local bus

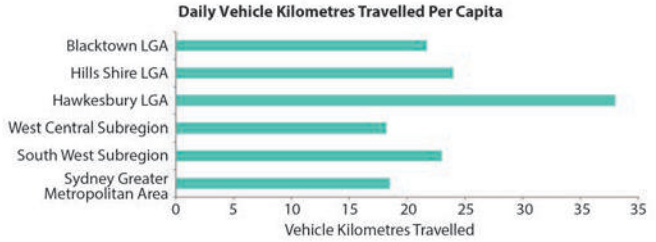


Figure 29: Vehicle Kilometres Travelled

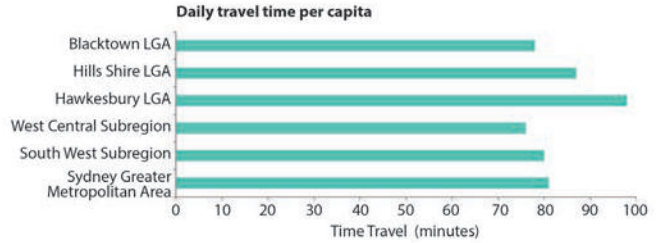


Figure 30: Daily Travel Time

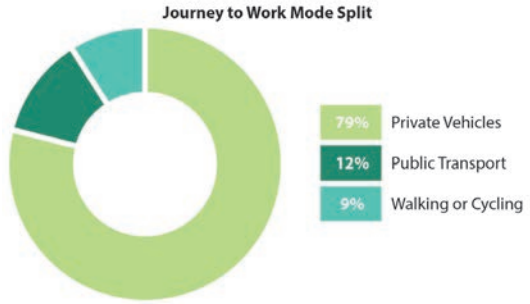


Figure 31: Journey to Work Mode

services and public transport nodes, to direct, high quality and efficient transit corridors and rail. A successfully integrated public transport network, incorporating bus and rail travel, would have minimal delays and costs associated with transferring from one mode or service to another.

The positioning of key centres, land use and transport connections are critical and will need to complement established urban structure within adjoining areas. The facilitation of primary and secondary mass transit infrastructure within NWPGA and the optimisation of this through support for highly accessible centres and high quality connections to key activity centres such as Norwest Business Park, Marsden Park, Rouse Hill, WSPGA, WSEA, WSA and SWPGA.

In this context, a schematic hierarchy concept has been developed to ensure that focus is on building transit corridors to support centres and linked to emerging nodes within NWPGA and beyond.

The transport movement network and hierarchy has been based on the *LTTMP* as follows:

- **Mass Transit Network** – comprising rail and rapid transit linking key centres in NWPGA with other urban centres to the east, south and west.
- **Intermediate Transit Network** – comprising bus rapid and light rail providing system integration and access to key centres from residential areas.
- **Local Transit Network** – comprising a bus-based network providing access to local centres and neighbourhoods and cross town movements.

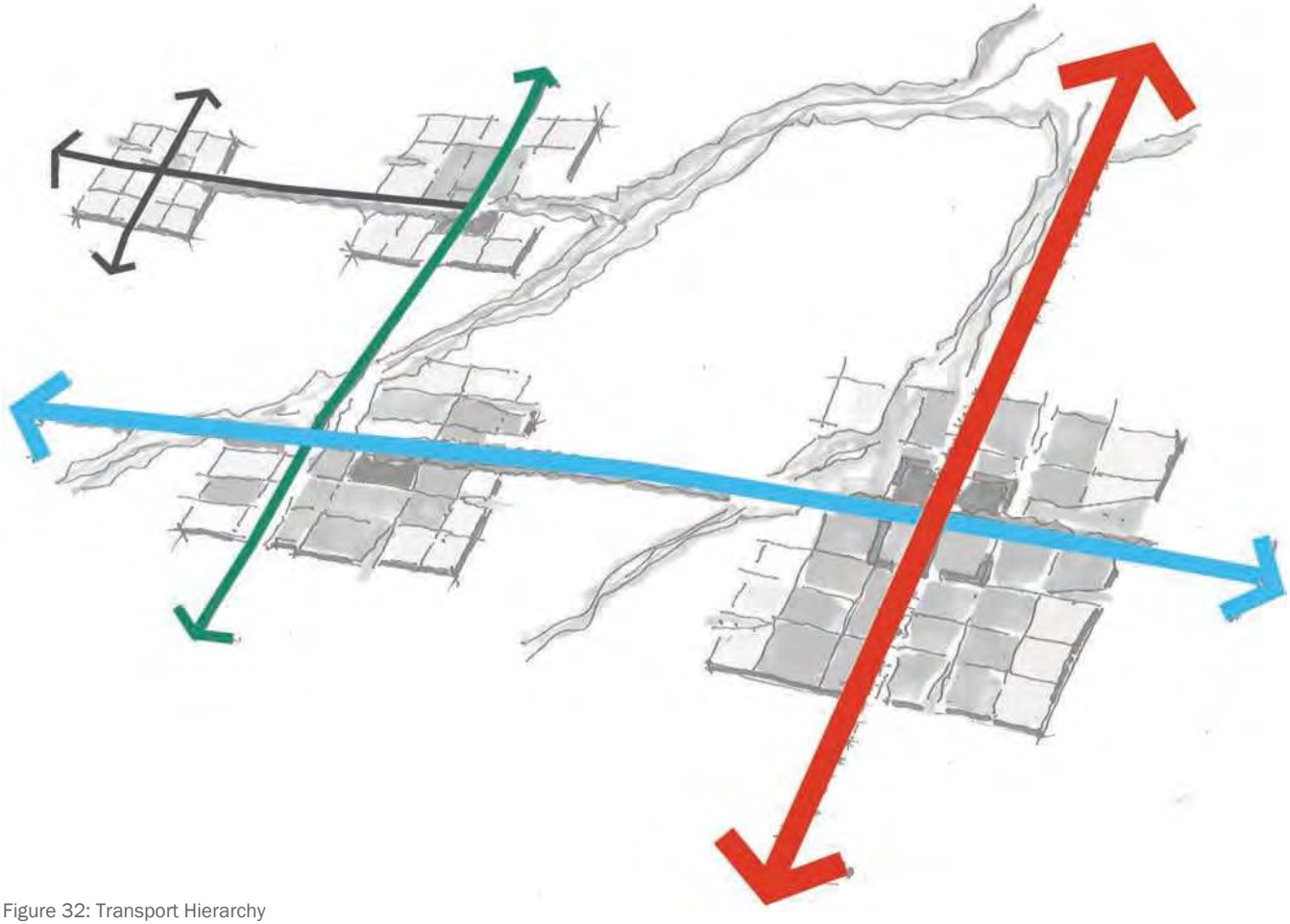


Figure 32: Transport Hierarchy

RAIL NETWORK

Sydney Metro Northwest's Influence on NWPGA

The SMN is intended to operate as a rapid transit network, whereby customers can turn up at a station and expect to get on a train within a short time period. The idea is that the operation of a high capacity, frequent service will encourage a greater use of public transport and ensure that the communities in the growth centres are not disadvantaged through poor access to public transport.

SMN will have a station located near Schofields Road between Cudgegong Road and Tallawong Road. SMN will connect NWPGA with key employment centres along the Global Economic Corridor including Rouse Hill, Norwest, Macquarie Park, Chatswood, and eventually St Leonards and Sydney CBD, by providing high frequency services with two- to three-minute headways using high capacity single deck services. The estimated travel time from Cudgegong Road to Chatswood will be in the order of 37 minutes, providing faster and more direct services for residents within the NWPGA.

A rapid transit corridor defined by the Sydney Metro Northwest (SMN) through the centre of the NWPGA will respond to emerging nodes within the centre and adjoining areas. It will be a catalyst to accommodate future network infrastructure and in the longer term, rapid transit services will provide an additional, more powerful attractor for transit users as well as stimulating further development.

The SMN and its future extension of the rapid transit network will be a main transport route in the area and will serve and connect the major centres of Rouse Hill, Schofields and Marsden Park. A direct route with an interchange at Schofields Station (via the Richmond Line) could provide a higher capacity interchange at Schofields.

Connecting to Growth Areas

The construction of the Sydney Metro Northwest (SMN) between Epping and the new Cudgegong Road Station and its potential for extension through Schofields, Marsden Park and south toward St Marys and WSPGA, combined with potential upgrades and duplication of the T1 Western Line between Schofields Station and Richmond Station will establish essential rail connections to the NWPGA. Such a placement of a major public transport investment with the SMN running east-west through NWPGA will provide levels of access and patronage catchment, both of which are crucial to the viability and value of such a link.

Potential connections at St Marys, the planned western line quadruplication terminus, will create an opportunity to further extend the rapid transit network through the Marsden Park corridor. This will enable these key centres and emerging nodes to link with the rapid transit network and the Main Western Line to cater for future growth.

The planned urban growth area of SWPGA, the WSPGA/WSEA and the proposed WSA will create an opportunity to further extend South West Rail Link to service these key growth areas, and to connect the Main Western Line at St Marys.

This will ensure a fully integrated transport network to support planned land use and be able to evolve and adapt as change occurs.

Expansion of the Rail Network

Initial investigation has identified a transport corridor that will run from the end of the SMN at Cudgegong Road to Marsden Park (near Richmond Road) via Schofields following the Schofields Road alignment just north of the Marsden Park Industrial Precinct border. This has been undertaken to future-proof the region's public transport needs to improve the rail network and increase capacity.

Marsden Park has been identified as a strategic centre within *A Plan for Growing Sydney* and any future rail connection will link people to this key residential and employment activity centre. Initial corridor investigation work has an option of the SMN extension running west from Schofields Station and then heading along the northern perimeter of Marsden Park Industrial precinct.

Such a placement of a major transport corridor is generally sub-optimal as it runs along a border of an industrial area with questionable levels of access and patronage catchment – both of which are crucial to the viability and value of such a link.

On this basis, we suggest that further investigation be undertaken in examining other potential transport corridor options. Another option could be a transport corridor realigned more centrally within the Marsden Park Precinct rather than the northern perimeter of Marsden Park Industrial. This creates a more central and efficient corridor that reflects potential access to Marsden Park that is expected to accommodate over 30,000 people. This is likely to constitute an optimal choice for promoting integrated land use development around the rail network and improving transit network coverage for Marsden Park.

These opportunities for the extension of the rail network through Schofields and Marsden Park, and then south to WSPGA, WSA and the SWPGA, via St Marys will strengthen links between these urban growth areas and emerging economic generators.

Formation of New Transport Hub at Schofields

Both the existing T1 Western Line and potential SMN extension to Marsden Park within the NWPGA support the creation of north-south and east-west transport corridors. Opportunity exists to create a future transport hub at Schofields as this will be the location where the two major rail axes intersect. Schofields is generally located centrally within NWPGA and will enable effective synergies to be developed to influence land use, urban form and densities around this emerging node. The future extension of the SMN will also enable the Schofields Road to be transformed to a major transport corridor.

Schofields occupies a prominent position within the NWPGA, ensuring that the interchange promotes the use of transit and that the surrounding area capitalises on the dynamic provided by transit. A transport hub at this location could promote sustainable transport and urban development by:

- Being located in the epicentre of activity and travel demand within NWPGA.
- Integrate with the accessibility, transit and traffic functions of NWPGA.
- Provide an animated hub of transport activity.
- Ensure the reliability and efficiency of transit operations.

Outer Sydney Orbital Multi-Modal Corridor

Planning and design work is currently underway to define a transport corridor for the future delivery of the OSO to provide increased capacity and connectivity to meet future demand. OSO will be considered as a multi-modal corridor including rail, freight and motorway alignments. The OSO corridor investigation area is currently pushed towards the western edge of the NWPGA and away from core centres.

The large scale of OSO implies a multi-decade infrastructure development timeframe under current land use and population aspirations. A future connection to OSO via the Richmond Line confers potential to capitalise upon economies generated by the movement of people, goods and information along this key north-south linear growth corridor linking WSPGA, WSEA, WSA and SWGC.

RECOMMENDED REFINEMENTS

- Extension of the SMN from Cudgegong Road station, through Schofields and Marsden Park, with potential for extension through to the WSA and SWGC via St Marys.
- Potential for Schofields Station to become a future ‘transport hub’ as it intersects two major transport axes with the T1 Western Line and SMN future extension.
- Duplication of the T1 Western Line from Schofields to Vineyard and T1 Western Line quadruplication between St Marys and Homebush.
- Provide additional services between Schofields and Campbelltown on Cumberland Line via the T5 Cumberland Line.
- Focus highest intensity land uses around the key transit nodes such as Schofields and Marsden Park.
- Potential to examine options for possible realignment of transport corridor (i.e. SMN extension) to be located centrally within Marsden Park.
- Future expansion of rail network connecting growth areas (NWPGA, SWPGA, WSA, WSPGA and WSEA).
- The ability for corridors to evolve and meet future needs in a way that considers existing, short-term and long-term land use opportunities and constraints.

BUS NETWORK

Existing Situation

The public transport system for the NWPGA comprises the interconnected bus and rail networks, linked to the SMN and T1 Western Line (Richmond Line). Within the NWPGA, a crucial role of the bus network will be to extend the rail transport catchment and to encourage the use of non-car modes for access to railway stations.

The *SMN Bus Strategy (June 2012)* nominates a major bus-rail and bus-bus interchange at Rouse Hill, for buses serving the NWPGA, North-West Transitway services and the SMN. Rouse Hill would therefore be a major bus terminus, including provision for bus layover. A minor bus interchange is also proposed at Kellyville and only limited interchange is expected at the Cudgegong Road station.

Current Challenges

Public transport in the NWPGA currently consists of a rail line and a network of bus services with key connections to the North-West Transitway. Public transport options in the region serve very little of the travel demand, resulting in private vehicles being the dominant transport mode in the region.

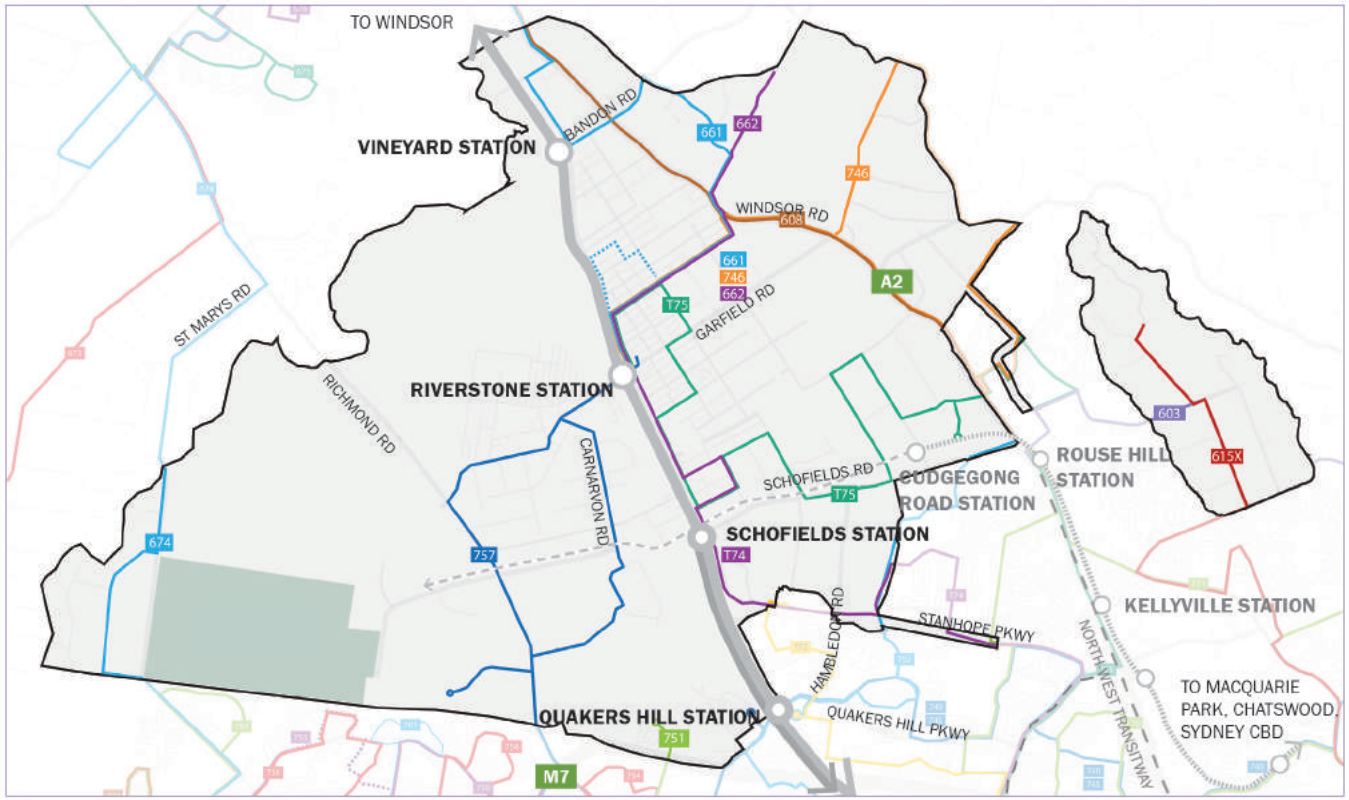


Figure 33: Existing Bus Network

T74	Blacktown to Riverstone via The Ponds
T75	Blacktown to Rouse Hill and Riverstone
603	Parramatta to Rouse Hill via Kellyville, Glenhaven, Castle Hill and East Baulkham Hills
608	Windsor to Rouse Hill Town Center via McGraths Hill & Windsor Rd
615X	North Kellyville to City via Baulkham Hills and M2 Busway
661	Windsor to Riverstone via McGraths Hill
662	Riverstone to Maraylya and Oakville
674	Windsor to Mt Druitt via Bligh Park, Shanes Park and Whalan
746	Riverstone to Box Hill
751	Blacktown to Colebee cia Richmond Road
757	Mt Druitt to Riverstone via Rooty Hill Road North & Marsden Park

Integrated Land use and Transport Planning

The NWPGA bus network structure should closely reflect the land use planning of the area and connect regional centres, major centres, strategic centres, village and neighbourhood centres. In simple terms, this means that the highest capacity modes providing the best service should run through the areas with highest public transport demand, and that passenger hubs should be located within the core of developments and provide logical transfer points between links of the network.

There are opportunities to boost residential densities along the chosen transit corridors such as Schofields Road and Garfield Road and around key stop locations particularly at Schofields, Riverstone and Marsden Park. This will support the transit service and encourage trips by public transport rather than private vehicle.

Proposed Bus Network Hierarchy

The bus network has been configured to serve centres and areas of higher density to maximise the public convenience of public transport use and encourage a shift away from use of the private car. Following the structure outlined in *Sydney's Bus Future* (TfNSW, December 2013), the proposed NWPGA bus network consists of three service types: rapid bus routes, suburban bus routes and local bus routes.

Rapid Bus – The Core Network

The NWPGA bus network is designed to provide a high frequency and direct east-west rapid bus link between the two primary NWPGA centres of Marsden Park and Rouse Hill. With a small diversion off the direct line of route, this link can also serve Schofields.

At Rouse Hill, interchange is available with frequent SMN trains to/from Castle Hill, Macquarie Centre, Chatswood and Sydney CBD and also with Transitway bus services to/from Parramatta and Blacktown.

At Schofields, interchange is available with trains on the Richmond line providing rapid links to/from Blacktown, Parramatta and Sydney CBD via the Western Line.

At Marsden Park a Rapid Bus Link will be available to/from Blacktown via Richmond Road. At Marsden Park frequent suburban bus services will also provide direct links to/from Penrith (in the west) and Mount Druitt (in the south, with the potential to extend into the WSPGA, WSEA and the proposed WSA).

At all three interchanges, suburban and local bus routes penetrate all parts of the NWPGA. Consequently, almost all parts of the NWPGA will be within a short walk of a bus stop or train station offering direct routes, or at most one interchange, to reach a major local or regional centre (including Sydney CBD).

The rapid route (Rouse Hill – Marsden Park – Blacktown) takes advantage of the high levels of bus priority on Schofields Road. Richmond Road, south of Marsden Park would also need high levels of bus priority to support the Rapid Bus philosophy. The rapid route will provide a high quality bus link for east-west travel within the growth centre and between the NWPGA and Blacktown.

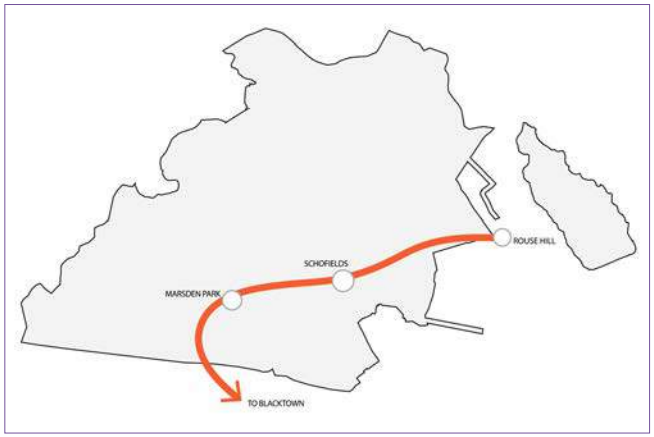


Figure 34: Proposed Rapid Bus Route

These are fast, frequent and direct services linking the major centres within the NWPGA and also serving major regional centres beyond the NWPGA.

Suburban Bus Network – Key Links for the NWPGA

The suburban bus network complements the rapid bus network by providing important links within the growth centre, beyond the rapid route corridor. The two suburban routes connect with the rail network and rapid bus routes at six purpose built interchanges (including Riverstone). The suburban network will provide high quality links between each of the major interchanges. The two designated suburban routes are:

- Rouse Hill – Schofields – Marsden Park – Penrith.
- Rouse Hill – Box Hill – Riverstone – Marsden Park – Mount Druitt.

It will be possible to extend some trips to/from Parramatta using the Nprth West Transitway south of Rouse Hill as demand requires. At other times, links to Parramatta will be by interchange with rail or rapid bus services at one of the designated interchanges. The suburban routes will benefit from bus priority measures within the NWPGA (and the North West Transitway for through Parramatta trips).

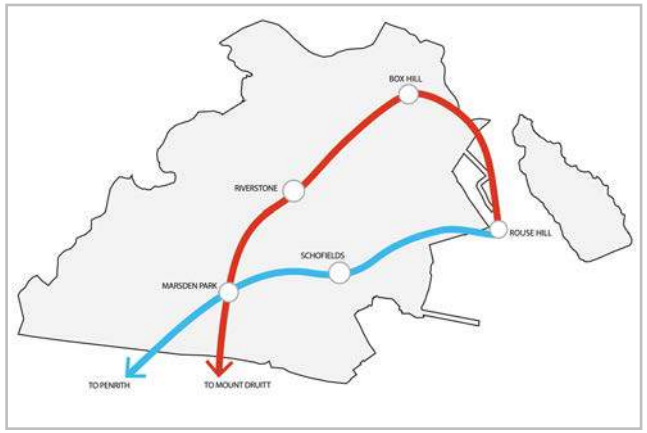


Figure 35: Proposed Suburban Bus Routes

These are frequent and scheduled services providing links within the NWPGA for places away from the Rapid Bus Network. Some suburban routes will also provide links to places outside the NWPGA in line with passenger demand.

Local Buses – Extending the Reach of the NWPGA Public Transport Network

The local bus network serves most parts of the NWPGA which are beyond 400-metre walking distance of a rapid or suburban bus stop. They are typically planned as routes linking two or more interchanges but are less direct (more circuitous) than the rapid and suburban routes in order to provide the higher level of walkable access to bus stops throughout the NWPGA.

Local bus services will be less frequent and are likely to have a more limited spread of service (first to last bus) than the suburban and rapid bus services. However, during peak periods, local services will continue to provide peak express and limited stop services. The detail of the local network routes will be determined in response to actual travel demand patterns.

Factors Influencing Bus Network Development

As the NWPGA develops, the following factors will influence the development of the bus network:

- The provision of effective and attractive bus/rail and bus/bus interchange. The primary interchanges will be in the major centres (which will also be the focus of the local bus network) at Rouse Hill, Schofields, Marsden Park, Riverstone and Box Hill.
- The availability of, or potential for, effective bus priority measures particularly along Schofield Road and Garfield Road.
- Options to provide through services via some regional centres to offer additional bus travel opportunities and improve operational efficiency. Such options would also be considered in the context of the potential impact of long bus routes on service reliability.
- Minimising disruption to established travel patterns.
- Protecting options for longer term developments such as the potential SMN extension and access to the Western Sydney Airport.
- Maximising the population within 400-metre walking distance of a bus service.

Transit Coverage

The bus network is designed to provide transit opportunities both within NWPGA and to the Sydney Metropolitan Area. It will connect into a wider local and regional transport system, including the proposed SMN rapid transit system, at high quality transit interchanges. Major railway stations and high capacity interchanges have been based on 800-metre catchments.

Proposed bus rapid transit corridors and stops will be based on an 800-metre catchment radius, ensuring a high level of coverage and accessibility. Suburban and local bus corridors will support both the rail and bus rapid network and provide a finer grain, local service. Bus stop locations along these corridors have been determined based on a 400-metre catchment radius to ensure a high level coverage within the NWPGA.

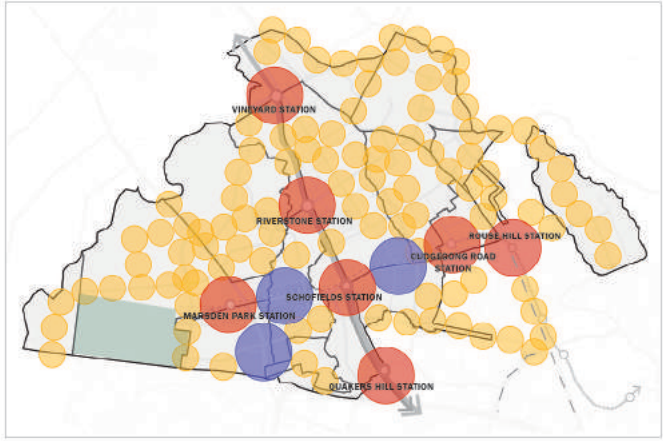


Figure 36: Indicative Public Transport Passenger Catchments

Identification of Bus Corridors

Within the NWPGA, the most important bus corridor will be along Schofields Road providing the direct link between Rouse Hill (SMN and North-West Transitway interchange), Schofields (Richmond Line interchange) and Marsden Park. This corridor is used by the core rapid bus route and also by one of the suburban routes. Bus service reliability will be essential to the successful achievement of the higher public transport mode share objective.

The rapid bus route will also require at least focussed bus priority at major delay points on Richmond Road south of Marsden Park if a reliable service through the NWPGA is to be delivered. If these priorities are not delivered, the rapid bus route may need to be split at Marsden Park to maintain operational reliability through the NWPGA.

The Garfield Road corridor on the approaches to Riverstone and Box Hill will also need bus priorities, at least through major intersections, given the number of suburban and local bus routes using part or all of this corridor.

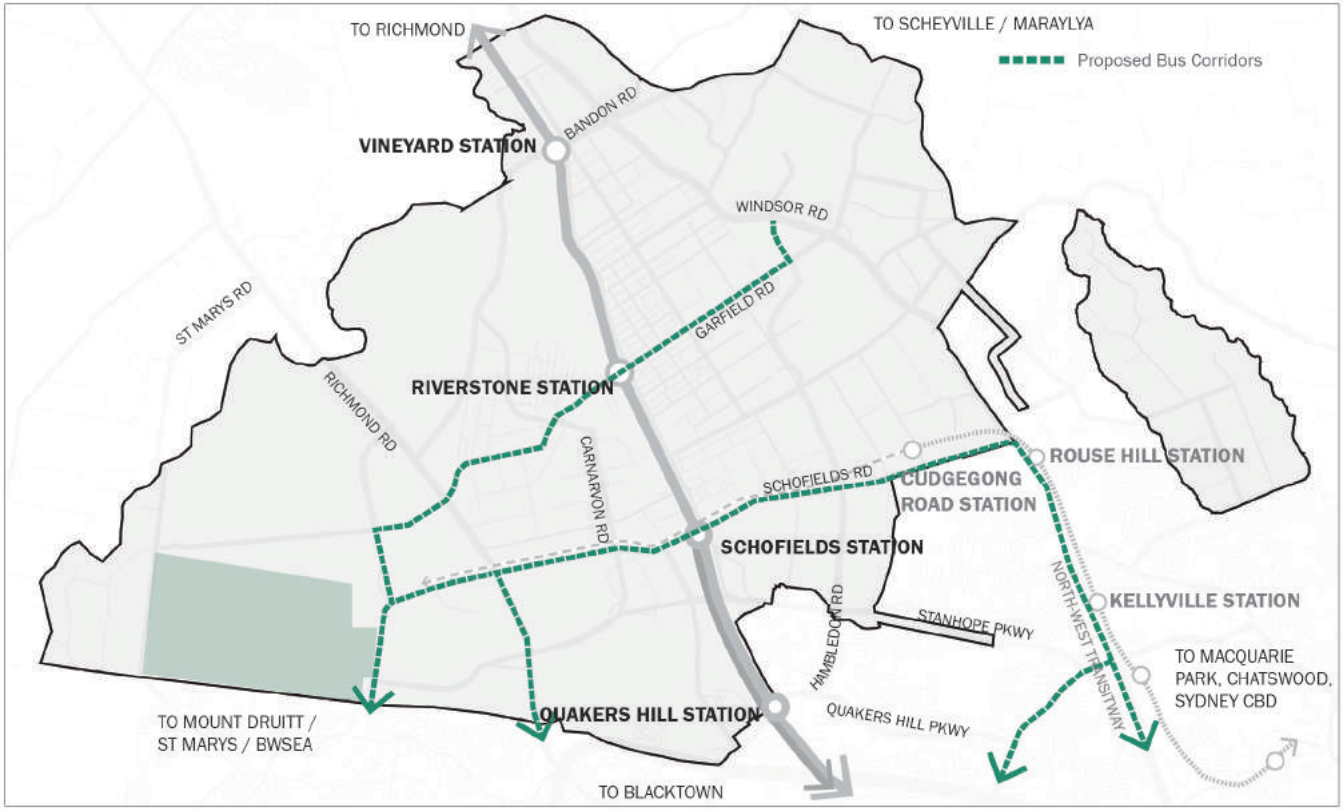


Figure 37: Proposed Bus Corridors

Provision of Bus Priority Infrastructure

Implementation and operation of the key bus corridors on Garfield Road and Schofields Road will require a range of supporting infrastructure to increase the speed and maintain the reliability of bus services. Bus priority infrastructure may be implemented at a specific point, intersection or along a corridor and may include:

- Public Transport Information and Priority System in operation at traffic signals, which uses satellite technology to identify late running buses and communicates with the traffic management system to direct traffic signal priority to late running buses (where possible).
- Short bus lanes at traffic signals that allow buses to bypass queuing traffic
- Dedicated bus lanes that separate buses from general traffic
- Dedicated bus-only links.

Other Considerations for Spatial Planning – Future Bus Depot Locations

It is likely that the existing bus depots serving the region will have insufficient capacity or the larger fleet required. Therefore, the selection of an appropriate depot location (or locations) to serve the growing network will be an important consideration. Depots are long term infrastructure investments and it will be important to select locations which will support the provision of efficient public transport by minimising the extent of "dead" running between the depot and the bus route. The challenge is to establish a depot – or depots – which would be sustainable over the short, medium and long term.

RECOMMENDED REFINEMENTS

- Location of primary interchanges will be in the major centres (which will also be the focus of the local bus network) at Rouse Hill, Schofields, Marsden Park, Riverstone and Box Hill.
- Options to provide through services via some regional centres to offer additional bus travel opportunities and improve operational efficiency.
- Public transport corridors to run through core development parcels wherever possible.
- Bus corridors (or transit spines) such as Garfield Road and Schofields Road to support the centres and linked to emerging nodes within NWPGA and beyond.
- Redefinition of previous service types to be consistent with *Sydney's Bus Future* definitions of rapid, suburban and local.
- Bus services to the Sydney City Centre via M2 Motorway curtailed to operate between NWPGA and SMN stations only.
- Reservation of land for future bus depots.

ROAD NETWORK

The key objective of the road network for NWPGA is to effectively cater for a variety of trip purposes while managing the impacts of roads on the community. The Structure Plan will need to promote management of the road network to provide maximum value to the different land uses and activities within NWPGA and beyond. Examples of this include: facilitating the efficient movement of road freight to and from industrial areas, ensuring fast and reliable bus access to urban centres and providing passage to regional through-traffic in such a way that minimises impacts on local networks and land uses.

Providing for Significant Land Use Changes within the Region

Perhaps more than any other region in Sydney, the NWPGA is seeing significant changes in land use that will affect the demand for transport, especially road transport.

The NWPGA has direct access to the Sydney's motorway network corridors of M2 and M7 motorways making it suitable for a flexible range of land uses. To the south of the NWPGA, both the M2 and M7 motorways have stimulated growth along these key corridors. Both of these key corridors will see increased movement from the NWPGA area towards the east and south of the Sydney Metropolitan Area.

Additionally, the NWPGA is providing for over 93,000 dwellings which will have significant travel impacts across the West Central sub-region, including the Hill Shire, Blacktown and Hawkesbury local government areas. While a mix of travel options is to be provided, including public transport, the demand for road capacity will require significant road upgrades.

Integrated Road Hierarchy Concept

The LTTMP has categorised roads into a functional hierarchy that includes arterial roads (including motorways, primary arterial roads and transit arterial roads), sub-arterial roads and local roads. These are described in detail below.

- **Motorways** – primarily dedicated to supporting traffic functions and facilitate the commercial and freight movement between strategically important ports, airports, employment areas, industrial areas, freight terminals and intermodal terminals. Major inter-regional traffic movements are catered for in a safe and operationally efficient manner with strict access control via grade separated interchanges and carriageway separation.
- **Primary Arterial roads** – predominantly carry through traffic from one region to another forming principal avenues of communication for urban traffic movements. Traffic movements are prioritised with a focus on capacity, congestion management, speed and safety.
- **Transit arterials** – are key routes between mixed use centres that support road-based public transport and feature significant bus priority infrastructure including bus lanes, bus bays, bus jump starts at traffic signals and electronic priority. Direct property access is restricted where possible.
- **Sub-arterial roads** – connect the arterial road to areas of development or carry traffic directly from one part of a region to another. They may also relieve traffic on arterial roads in some circumstances. The sub-arterial road environment balances the traffic movement function and the need for access.
- **Collector roads** – connect the sub-arterial roads to the local road system in developed areas.
- **Local roads** – the sub-divisional roads within a particular developed area. These are used solely as local access roads.

A more nuanced classification of roads based on their role in the multi-modal transport system and land use context is needed for the NWPGA.

This 'movement and place' approach has been developed based on experience in other jurisdictions and is critical to achieving the desired transport and land use outcomes – especially within a context that demands sound economic justification. A sample of this type of classification is provided in Figure 38.

The process of development of the road network framework for NWPGA has been undertaken in such a way that:

- Provides an integrated approach to road network planning across the various categories of roads.
- Recognises the different role that various roads perform and provide specific objectives for each type of road environment.

- Understands the competing demand, for access to the road network, from pedestrians, cyclists, public transport services which can be local, sub-regional or regional in nature.
- Segregates user classes across the road hierarchy, which will generally aid in maintaining the efficiency and safety of the road environment for all users.
- Manages the road environment in strong correlation with their surrounding land use context.
- Can be serviced by an integrated public transport network.
- Provides a structured approach to road network development that recognises the changing role many roads within NWPGA will play, as the city becomes further developed.

The existing Structure Plan and Precinct Plans were reviewed to determine key road connections within and through the NWPGA, and how these connections interact with and influence adjoining land uses. Circulation and access for NWPGA is based on a clear road hierarchy to ensure the road network provides safe and effective access for the full range of users, including public transport, pedestrians and cyclists, private vehicles, freight and service vehicles.

An integrated road hierarchy concept has been developed where a balance between the land use environment and the transport function is desired. This has been undertaken to ensure a legible and efficient transit network, appropriately sized and with enhanced connectivity. It is proposed to align current Precinct Planning with the integrated road hierarchy concept.

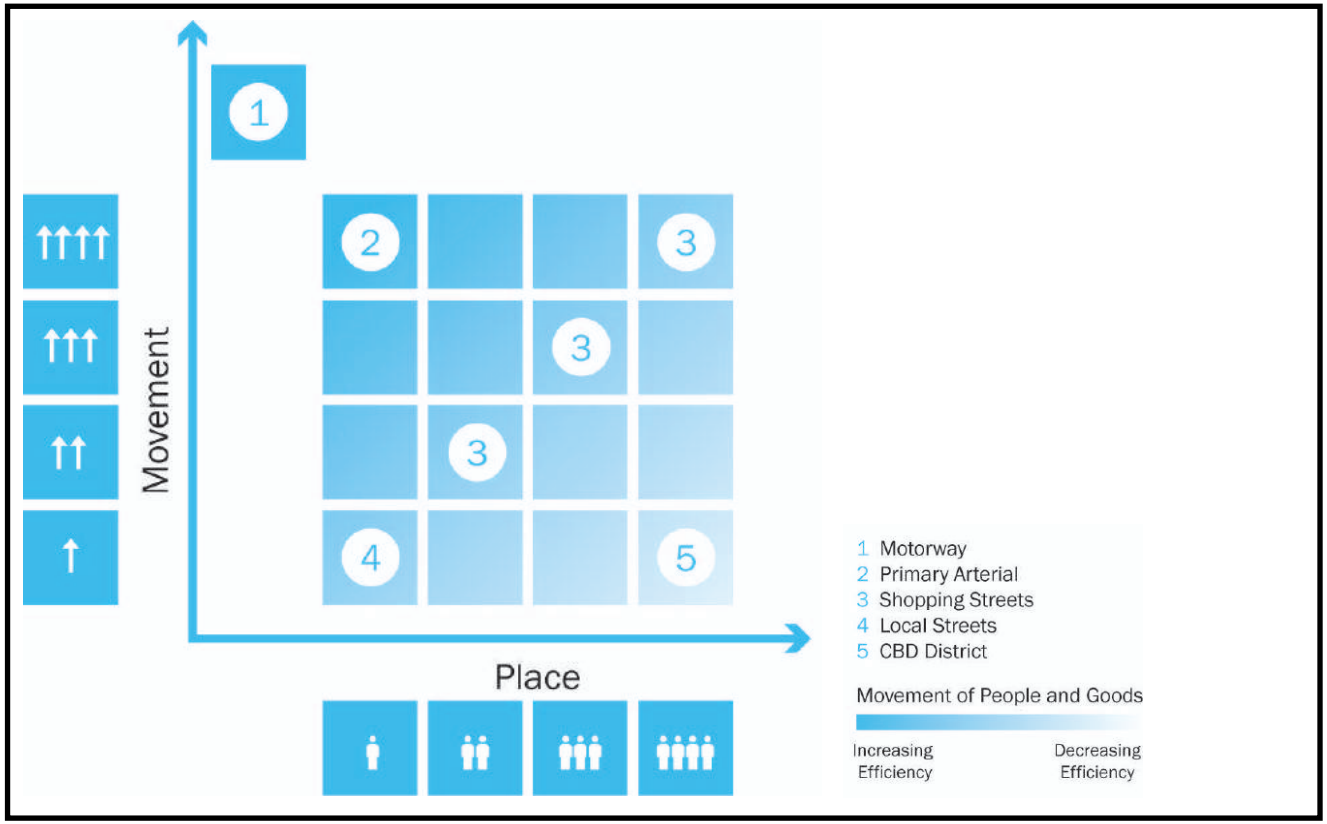


Figure 38: Relationship Between Movement and Place in the Road Network Function

Figure 39: Proposed Road Hierarchy

Two bus corridors have been proposed to link and pass through key centres within NWPGA at:

- **Garfield Road** – linking the Box Hill area to Marsden Park via Riverstone and beyond to Mount Druitt and Penrith via South Street.
- **Schofields Road** – linking Rouse Hill Centre to Marsden Park via Schofields and beyond to Blacktown via Richmond Road, and Parramatta and Blacktown via the North-West Transitway.

These bus corridors are intended to carry high volumes of customers on services operating at a high frequency. They typically serve the core area and thus should run through it.

The role of the primary arterial road network is to cater for regional through traffic that has to pass through the area but has no purpose in NWPGA. They typically carry a high proportion of through-traffic and should go around the core area.

Protecting the Regional Role of Arterial Roads

There are two main north-south routes within the NWPGA. These are Windsor Road and Richmond Road. In the future, as the NWPGA develops, these key arterial routes will also become increasingly significant.

These routes provide significant regional movement opportunities between major centres and to Sydney's motorway network. They operate in a variety of environments based on the current evolution in the land use of NWPGA (from semi-rural to suburban and suburban to urban).

The role of these arterial roads and efficient regional routes is vital to attracting and retaining business to the NWPGA. As such, access should be restricted to key intersections and local or property access should be avoided where possible.

East-West Connectivity

A key issue for the NWPGA is the availability and quality of east-west road connections of the existing Richmond Line rail corridor. A significant constraint is caused by the bisection of the NWPGA by the Richmond Line.

At present, the major traffic movement is carried along Garfield Road, which provides the most direct link across the Richmond Line between Box Hill and Marsden Park via Windsor Road and Richmond Road, respectively. A number of roads currently provide east-west connections, such as Schofields Road, Burdekin Road / Stanhope Parkway and Quakers Hill Parkway. There is also a high proportion of traffic and heavy vehicles using the existing level crossing at Garfield Road in Riverstone, causing congestion.

As the NWPGA develops, demand for access to regional facilities and employment in the NWPGA will grow. The limited capacity of east-west connections is likely to lead to congestion, resulting in problems for local access along these routes.

RMS has recently completed a study that examined the number, location and configuration of east-west links within NWPGA over the Richmond Line.

Bandon Road corridor was identified as a potential east-west connection between Windsor Road and Richmond Road. Selected in consultation with key stakeholders and with consideration of community feedback, the location of the proposed new crossings to the north of Quakers Hill Parkway are:

- Burdekin Road, Quakers Hill (planned);
- Westminster Street bridge, Schofields (existing with limited capacity);
- Schofields Road, Schofields (in progress as part of the Schofields Road upgrade project);
- Garfield Road, Riverstone (currently a level-crossing); and
- Bandon Road, Vineyard (currently a level-crossing).

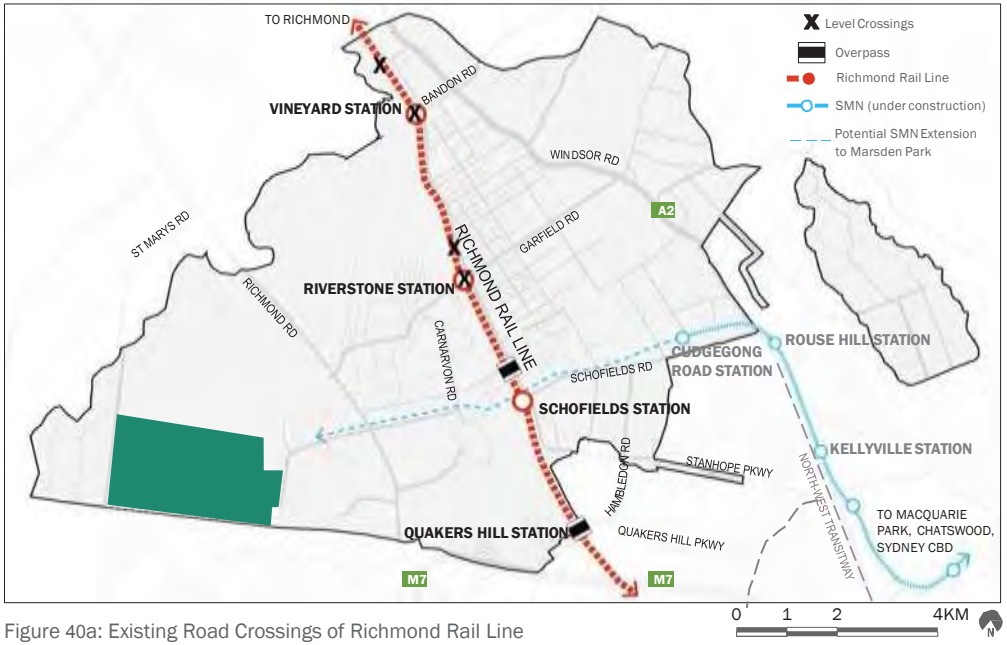


Figure 40a: Existing Road Crossings of Richmond Rail Line

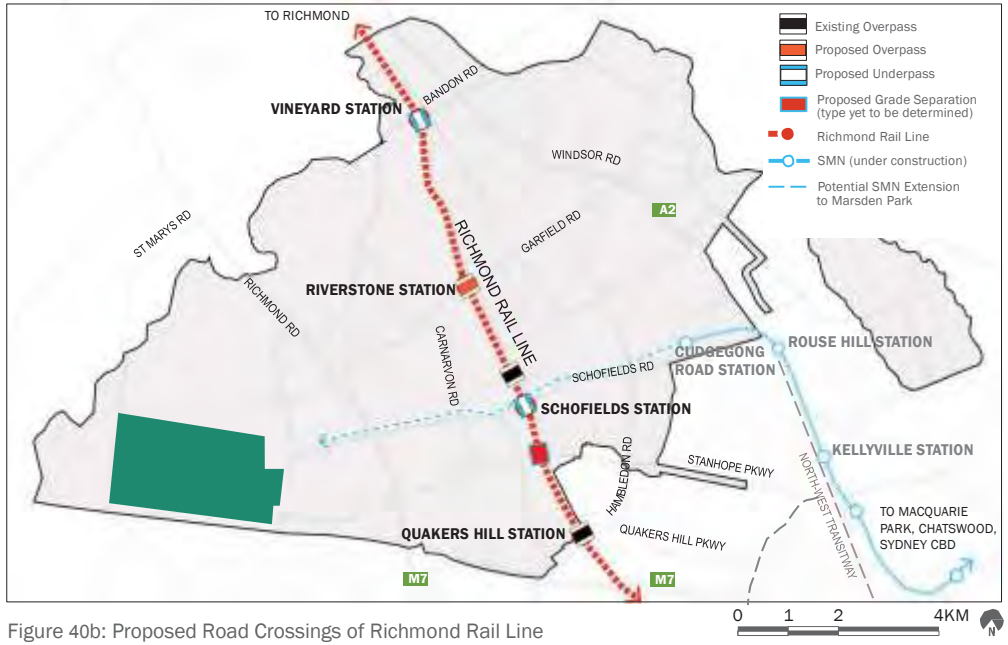


Figure 40b: Proposed Road Crossings of Richmond Rail Line

The key east-west connections identified for the NWPGA include:

- **Bandon Road**
  The Bandon Road corridor west of Windsor Road would form the northernmost east-west link in the NWPGA. East of Windsor Road, the corridor would follow the existing Chapman Road alignment and continue to the existing Boundary Road. The Bandon Road corridor is proposed to be a sub-arterial road, and will be a spine road in the Marsden Park North precinct that will link with the Marsden Park Industrial, Marsden Park, Riverstone West, Riverstone, Vineyard, Vineyard station and Box Hill precincts and beyond to Mount Druitt and St Marys to the south, and Scheyville and Maraylya to the north. Given Bandon Road traverses near the northern periphery of the NWPGA, it would be desirable to encourage use of this road by vehicles travelling through the NWPGA.

- **Garfield Road**
  The Garfield Road corridor is proposed to be a multi-functional bus corridor / sub-arterial road west of Windsor Road. Garfield Road has been proposed as a bus corridor given the corridor links the centres of Marsden Park, Riverstone, Riverstone station and Box Hill.

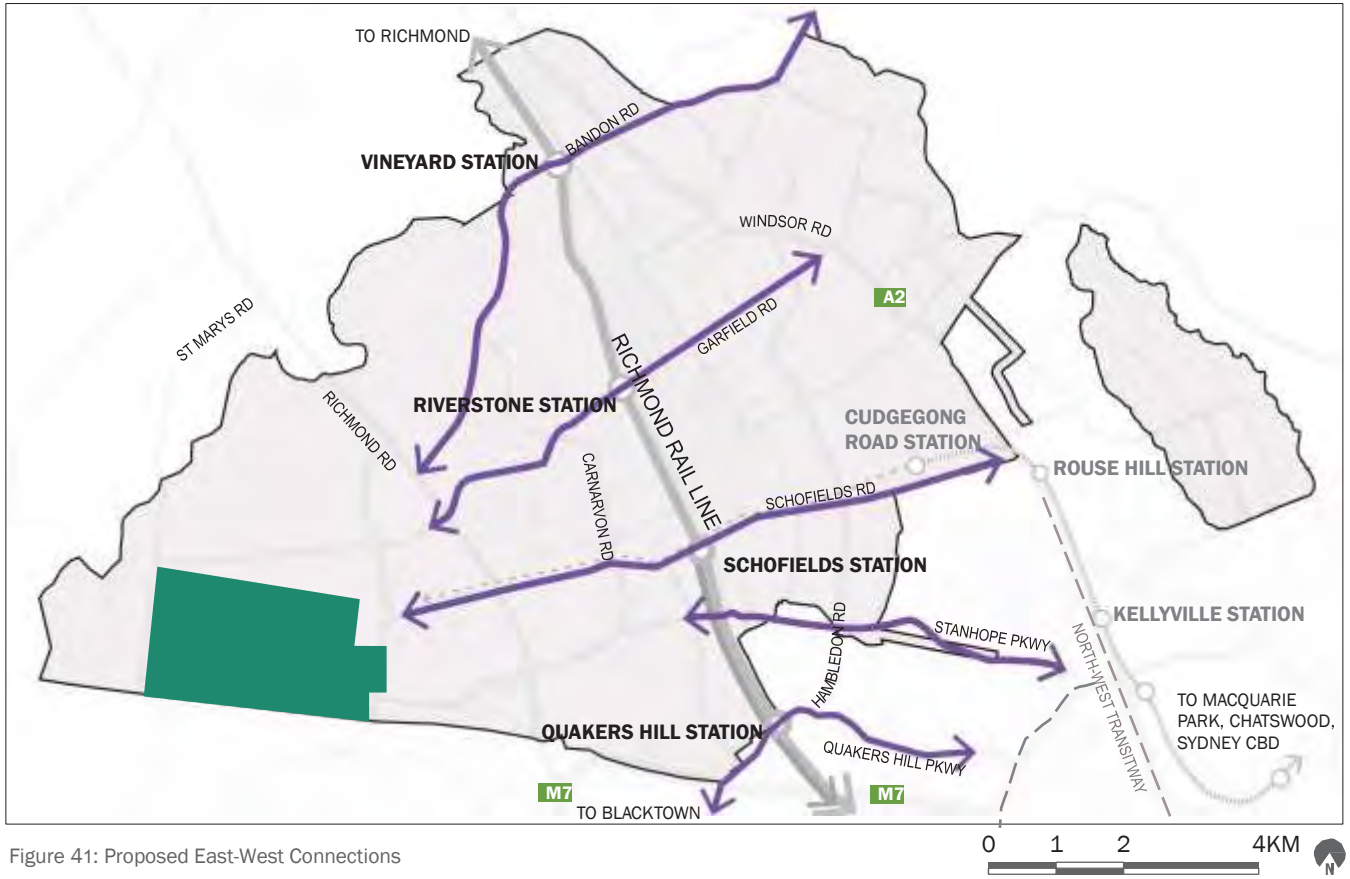


Figure 41: Proposed East-West Connections

- **Schofields Road / South Street**
  South Street is proposed to be an arterial road providing Marsden Park Industrial with a link to the primary arterial road network. Schofields Road, which is currently being upgraded to a four-lane divided road with bus priority infrastructure, is proposed as a multi-functional bus corridor / arterial road. Schofields Road / South Street is a major east-west connection given the corridor links the centres of Marsden Park, Schofields and Rouse Hill and would form the key east-west link to the Cudgegong Road rapid transit station.

- **Burdekin Road / Stanhope Parkway**
  Burdekin Road would be extended across the Richmond Rail Line and connect to Quakers Road. Together with Stanhope Parkway, the sub-arterial corridor would provide a secondary east-west link between the West Schofields, Schofields and Alex Avenue precincts. The function of the Townson Road corridor west of Quakers Road is currently under investigation.

- **Quakers Hill Parkway**
  Quakers Hill Parkway traverses the southern periphery of the NWPGA and would provide a secondary inter-regional link between the NWPGA and the M7 Motorway, the Western Sydney Priority Growth Area, Blacktown and Parramatta. It would also provide the Colebee, Schofields and Alex Avenue precincts with a link to the primary arterial road network.

North-South Connectivity

It is important to ensure that there is sufficient north-south connectivity created by using through streets. A limited number of roads (north of Schofields Road) currently with more minor roles, such as Hamilton Street, Railway Terrace, Riverstone Parade, Hambeldon Road, McCulloch Street and Boundary Road, provide north-south parallel routes for local access within the NWPGA.

To develop a proposed road network, it is important to create a rich mix of interconnected streets. Key north-south links should head in an essentially continuous direction, to aid in way-finding, legibility and clarity of the road network.

The key north-south connections identified for the NWPGA include:

- **St Marys Road / Stony Creek Road**
  St Marys Road / Stony Creek Road are proposed to be collector roads providing a secondary link between the NWPGA and south to Willmot, Ropes Crossing and Lethbridge Park, and would provide the Marsden Park and Shanes Park precincts with a link to the primary arterial road network.
- **Werrington Arterial Road**
  There is a reserved road corridor that traverses north-west from Stages 1 and 2 of the Werrington Arterial Road that would connect with South Street in Marsden Park at the Castlereagh Freeway corridor. The road would provide an inter-regional connection between the NWPGA and south to Mount Druitt, St Marys and the Western Sydney Priority Growth Area.

- **Richmond Road**
  The role of Richmond Road as a multi-functional primary arterial road will continue, providing an inter-regional connection between the NWPGA and north to Richmond and beyond to the Blue Mountains and Central West NSW, and south to the M7 Motorway and Blacktown. Richmond Road will be a key freight link providing access to the Marsden Park Industrial Area.

- **Carnarvon Road**
  The Carnarvon Road corridor utilises the existing Carnarvon Road alignment south of Garfield Road to Townson Road. North of Garfield Road, the road would continue to the west of Eastern Creek to Bandon Road. It is proposed to be a collector road, providing a secondary north-south connection west of the Richmond rail line linking the Marsden Park North, West Schofields and Marsden Park Industrial precincts.

- **Quakers Road**
  The proposed Quakers Road extension would provide the Schofields precinct with a north-south connection, linking Quakers Hill Parkway and Schofields Road.

- **Riverstone West Link**
  The Riverstone West link would be a collector road that traverses to the west of the Richmond rail line between Bandon Road and Garfield Road. Its function would be to provide direct access to the Riverstone West employment precinct.

- **Hambledon Road**
  Hambledon Road would continue north from Schofields Road and connect with Garfield Road and Windsor Road. It is proposed to be a sub-arterial road, providing a secondary north-south connection east of the Richmond rail line linking the Alex Avenue and Riverstone East precincts and beyond to Quakers Hill, the M7 Motorway, Blacktown and the Western Sydney Employment Area/ Western Sydney Priority Growth Area.

- **Windsor Road**
  The role of Windsor Road as a multi-functional primary arterial road will continue, providing an inter-regional connection between the NWPGA and north to Windsor and beyond to the Blue Mountains and Central West NSW, and south to the M7 Motorway and Parramatta. Windsor Road will be a key freight link providing access to the Box Hill Industrial Area.

- **Withers Road / The Water Lane**
  Withers Road / The Water Lane will continue along its current alignment. It is proposed to be a sub-arterial road connecting Box Hill and the Rouse Hill strategic centre and providing regional connectivity via Annangrove Road. Its function south of Commercial Road would be to provide local access to North Kellyville.

Cross Regional Connections

The SMN is the core element of public transport infrastructure for the NWPGA. It is a significant investment in public infrastructure and represents an important opportunity to carefully consider the wider implications of the SMN, and to comprehensively plan for future growth and the regional connectivity required to deliver this growth.

Major land use changes such as the Western Sydney Airport, WSPGA, WSEA, and SWPGA will provide a focus for local and intraregional transit with the opportunity to offer improved transport connections within the NWPGA to these key employment and population centres. This will enable enhanced accessibility between the NWPGA and primary employment centres and urban growth areas.

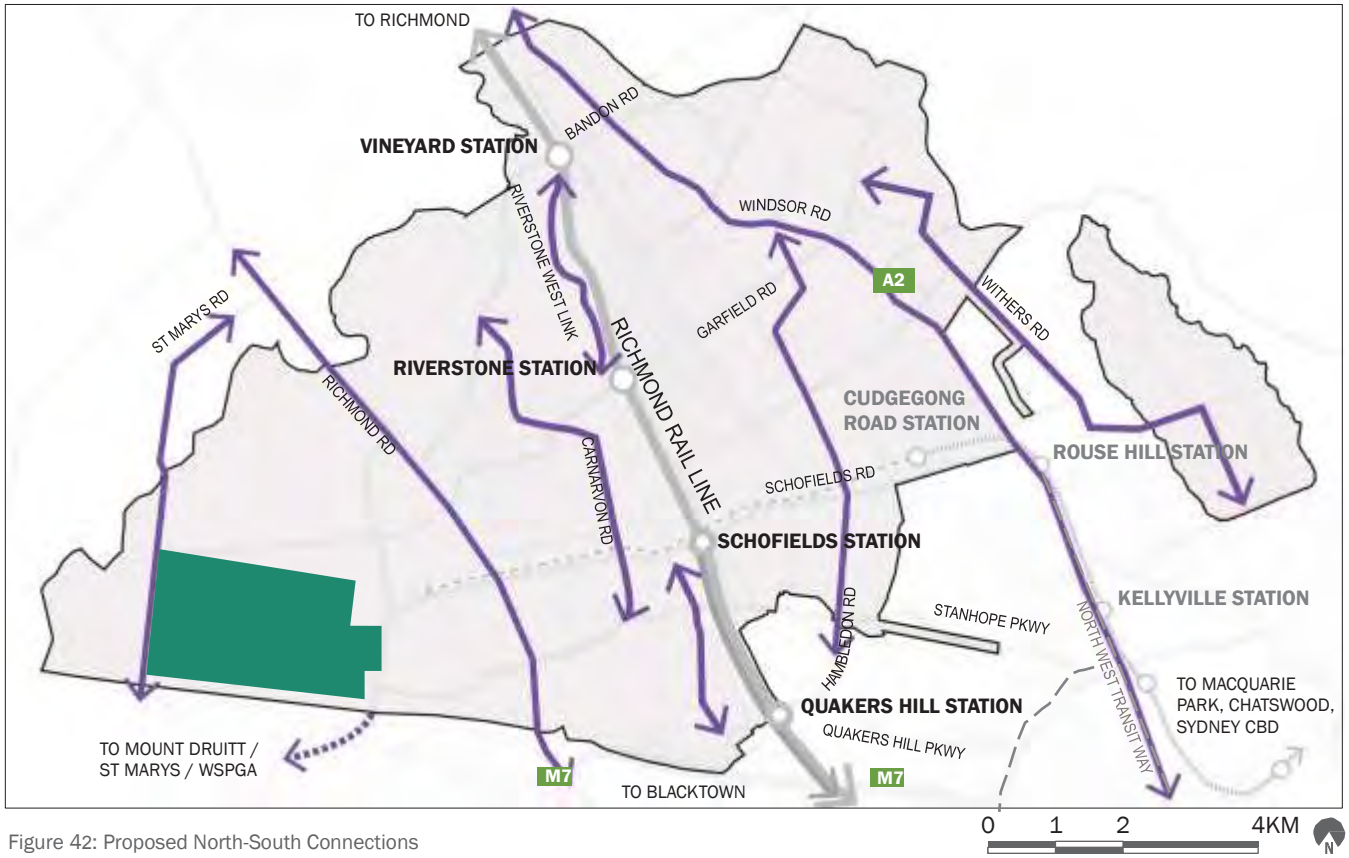


Figure 42: Proposed North-South Connections

Key strategic transport corridors and desire lines include:

- Rouse Hill to Penrith via Marsden Park;
- Rouse Hill to Castle Hill;
- Blacktown to Richmond via Marsden Park;
- Rouse Hill to Western Sydney Airport via WSPGA; and
- Rouse Hill to Parramatta.

Other major transport initiatives currently under investigation which will enhance cross regional connections include:

- Outer Sydney Orbital corridor to the western edge of NWPGA.
- Bells Line of Road – Castlereagh Connection corridor to the southern edge of NWPGA.
- Werrington Arterial Road Corridor providing direct connection from M4 Motorway to Richmond Road.

- Grade separated road crossings of the Richmond Line at Bandon Road, Garfield Road and Schofields Road.
- Potential extension of SMN to further west into Marsden Park.
- Potential extension of SMN south of Marsden Park to St Marys.

Provision for Pedestrians, Cyclists and Public Transport

There is now a greater recognition in the community that roads are transport corridors that must provide for a range of uses in addition to private vehicle traffic. Prioritisation of infrastructure for pedestrians, cyclists and public transport is required for a range of reasons including providing for greater equity, lower environmental impacts and creation of sustainable and attractive neighbourhoods.

As roads are upgraded within the NWPGA area, and as traffic growth leads to congestion, the need for alternative facilities for pedestrians, cyclists and public transport will become even more pressing. The refinement of the Structure Plan will provide the opportunity to provide bus priority on key routes, in order to promote increased public transport patronage and minimise car use and ensure high quality pedestrian and cycling facilities are provided across the area.

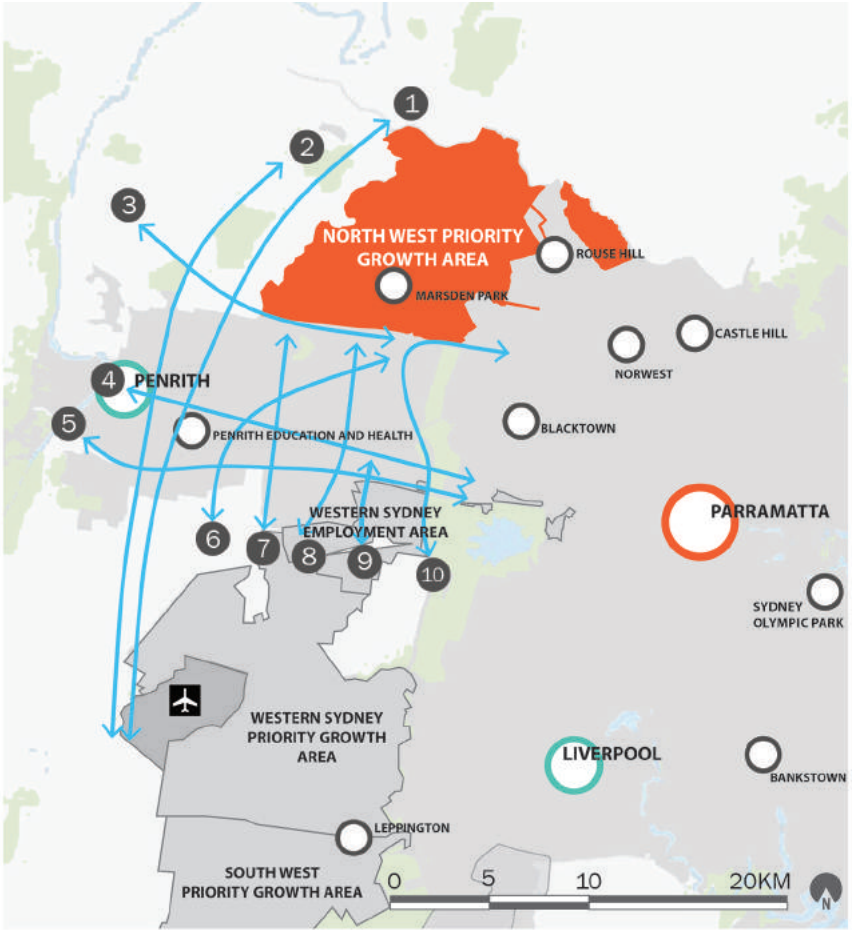


Figure 43: Indicative Cross Regional Transport Connections

1. Outer Sydney Orbital
2. The Northern Road
3. Bells Line of Road / Castlereagh Connection
4. Great Western Highway
5. M4 Motorway
6. Werrington Arterial Road
7. Mamre Road
8. Carlisle Avenue / Roper Road / Erskine Park Road
9. Archbold Road
10. M7 Motorway

RECOMMENDED REFINEMENTS

- Define an interconnected road network.
- Establish and define clear north-south and east-west connections.
- Extend existing road corridors to provide continuity of route and capacity beyond NWPGA
- Seperate local and regional trips where possible, particularly through key centres such as Schofields Riverstone and Marsden Park.
- Safeguard the integrity and continuity of strategic transport corridors such as Outer Sydney Orbital, Bells Line of Road -Castlereagh Connection and Werrington Arterial.
- Redefinition of the road hierarchy to provide:
  - Transit corridors pass through mixed use centres at Riverstone and Schofields
  - Arterial and sub-arterial roads act as local bypasses for the bus corridors adjacent to them.
  - Strategic east-west bus corridors to bisect centres.

FREIGHT MOVEMENT

Western Sydney plays an important role in the freight task, claiming almost 50% of imported containers from Port Botany with the remaining destined for other areas within the Sydney Metropolitan region (source: Logistic Review 2010/2011, Sydney Ports Corporation, May 2012). It also is a key access route for port exports, particularly cotton, grain and coal from central and northern NSW.

A Plan for Growing Sydney and the *NSW Freight and Ports Strategy* have both identified the OSO as a potential future multi-modal corridor skirting the western periphery of the NWPGA in a north-south alignment to the east of The Northern Road. These documents identify OSO as a proposed long term multi-modal corridor that would support freight growth and provide opportunities to move a greater share of freight around the metropolitan area on rail, thereby bypassing the congested Sydney rail network.

Intermodal Terminal

A new Intermodal Terminal (IMT) with a spatial requirement of approximately 52 hectares has been identified in an area to the west of Riverstone Station under the ILP for Riverstone West, accessed by road from a new road running parallel to the western side of the Richmond Rail Line between Bandon Road and Garfield Road. While this location is no longer being considered, the area is still identified as an area of freight activity (*NSW Freight and Ports Strategy*).

The suitability and practicality of an IMT in the NWPGA or adjacent to it will need address the following key implications:

- Richmond Line is not currently used for rail freight, with a single track between Schofields and Richmond.
- Richmond Line will require full duplication and additional loops for trains exiting the main line.
- The junction at Blacktown Station with the Richmond Line will need to be upgraded.
- Truck accessibility to the proposed IMT is not direct to the existing arterial road network (via Garfield Road and Bandon Road).
- The location will conflict with passenger rail operations and capacity along the Richmond Line with additional train paths.
- The length of freight line passing through residential areas and located close to sensitive receivers.

It is suggested that a more appropriate location for this IMT might be to the north of the current Riverstone West location adjacent to the intersection of Windsor Road / Richmond Road with the OSO, or alternatively in the Shanes Park precinct. Some of the benefits of these locations include:

- Direct access to the higher order road network.
- The IMT would be ideally located where two major freight transport axes intersect (OSO and Windsor Road / Richmond Road; OSO and Bells Line of Road – Castlereagh Connection)
- The OSO multi-use corridor would enable rail freight to bypass the main Sydney passenger rail network, improving efficiency an productivity.
- The prevention of noise impacts as a result of being located away from residential areas.

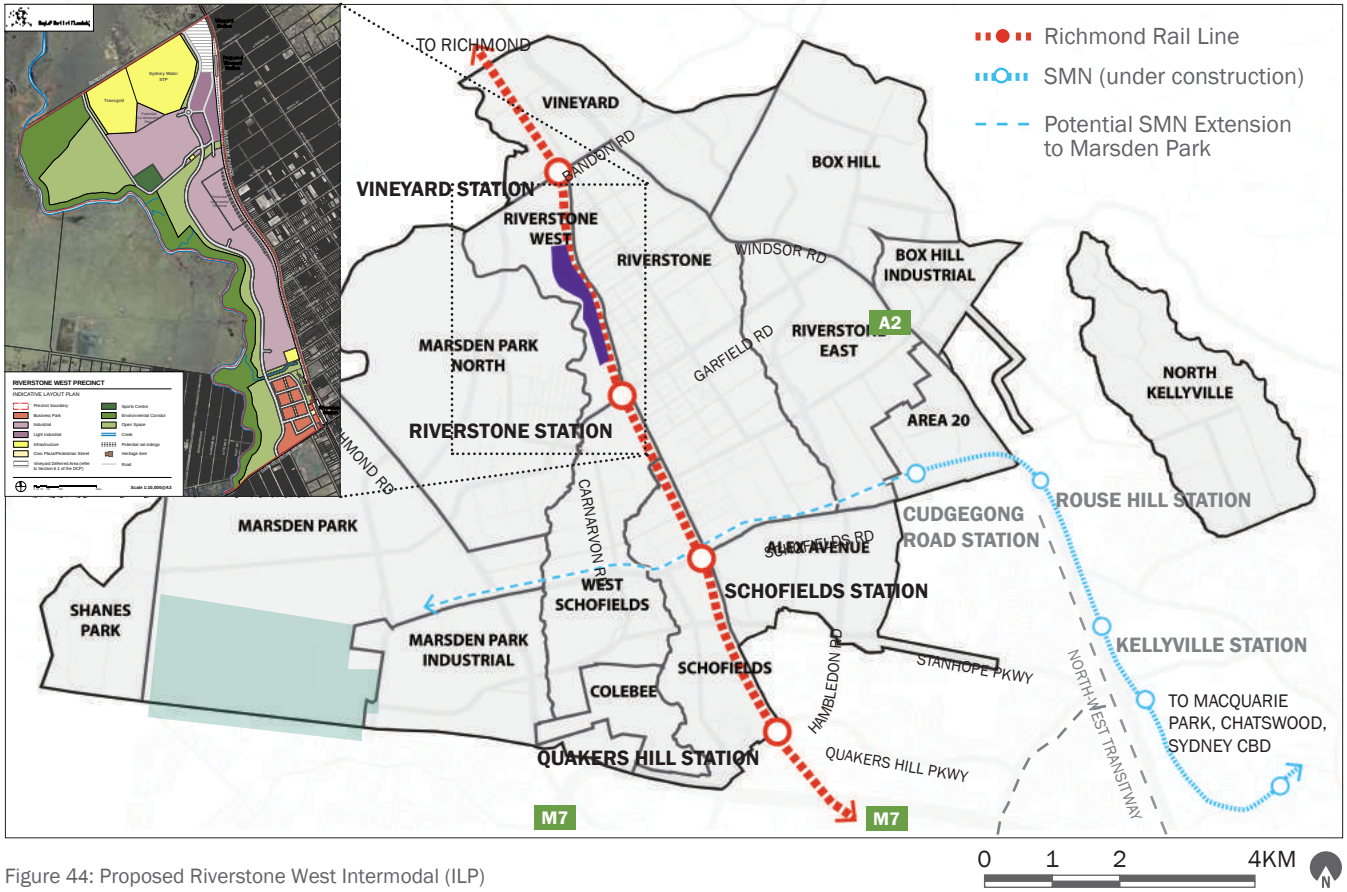


Figure 44: Proposed Riverstone West Intermodal (ILP)

RECOMMENDED REFINEMENTS

- Intermodal terminal located within Riverstone West ILP is no longer required as the site has been purchased by a developer and earmarked for other land uses.
- Location of future IMT within NWPGA should be located where major freight taxes intersect such as OSO / Richmond Road / Windsor Road.
- Increasing freight density on selected high capacity corridors (rail and road).
- Optimisation of modal share between road and rail.
- Ensure revised structure plan balances the freight needs with community and environmental needs.
- Separation of rail freight movements from passenger rail movements.
- Protection of long term freight corridors (e.g. Outer Sydney Orbital) on the western edge of NWPGA.

ACTIVE TRANSPORT (CYCLING AND WALKING

Overview

Sydney's Walking Future (TfNSW, December 2013) focuses on connecting people to places through safe walking networks around centres and public transport interchanges. It states that walking will be linked to urban growth, with the needs of pedestrians being a priority in the planning, design and construction of new transport and urban development projects.

Pedestrian access to public transport, town centres and hub areas is required to ensure easy, safe and attractive pedestrian connections can be made. Attractive footways adjacent to road corridors should be provided, as well as off-road paths, to provide a connected pedestrian network that provides links to key destinations.

Active transport relates to opportunities / facilities for movement by cycling and/or walking. One of the overarching goals of *Sydney's Cycling Future* is to make cycling a safe, convenient and enjoyable transport option for short journeys. The *LTTMP* sets a target that by 2016 the number of bicycle trips in Metropolitan Sydney will double.

'Boost walking and cycling and support its integration with public transport, including extensions and improvements to the State's walking and cycling networks, better storage facilities and signs and new interchanges that are attractive activity hubs for local communities.'

Figure 45: Cycle Network as Shown in Existing Precinct Plans

TfNSW recognises that bicycles provide a viable alternative mode of transportation and can help create a better transportation system and have set as their goal to make Sydney more environmentally sustainable by introducing innovative non-motorised approaches to transport management. Well established government transport policies and strategies now support the development of cycle transport system.

The review of the current Structure Plan has recognised the role walking and cycling plays in the reduction of car-based trips in the NWPGA, and how the provision of improved facilities and opportunities can help promote mode change in the future.

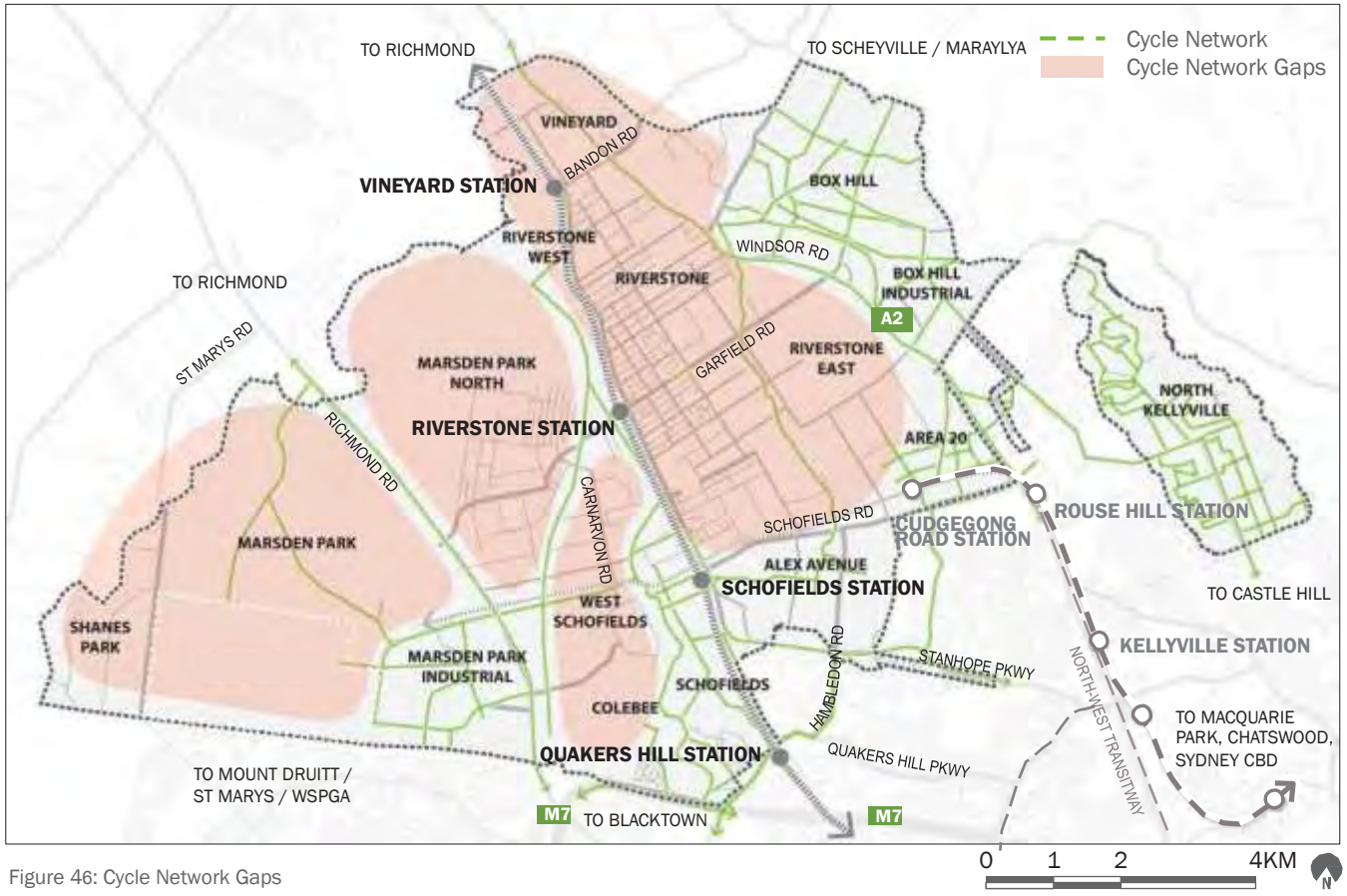


Figure 46: Cycle Network Gaps

Precinct Planning – Network Gaps

Existing cycle facilities within the NWPGA are limited to mixed traffic lanes along Richmond Road as well as sections of separated cycleway along Windsor Road, Stanhope Parkway, Garfield Road and Railway Terrace.

Out of the 11 precincts in the NWPGA that have been rezoned, only three have comprehensive bike plans – Box Hill, North Kellyville, and Alex Avenue. As such, there are significant opportunities to develop an integrated cycling strategy and/or a comprehensive interconnected cycle network. The current gaps in the cycle network within current Precinct Plans include:

- Vineyard;
- Riverstone;
- Riverstone East;
- Marsden Park;
- Marsden Park North;
- Colebee;
- West Schofields (yet to be released for Precinct Planning); and
- Shanes Park (yet to be released for Precinct planning).

Walking and cycling are valued as a means of transportation and recreation due to their low cost, low impact, wide suitability and health benefits. However, there are numerous barriers to increasing walking and cycling within NWPGA through a lack of infrastructure, heightened safety concerns, long trip distances and an urban form structured to provide increased mobility by private vehicles to the detriment of other modes.

Indicative Cycle Network Hierarchy

The purpose of a bicycle network is to enable cyclists of a wide range of abilities and experiences to move safely and conveniently to chosen destinations via suitable desire lines. The basis of a bicycle network is the road network, augmented by special on-road facilities together with dedicated infrastructure such as off-road paths, and can include public transport.

A hierarchy of safe cycleways that inter-connects all areas of the NWPGA to the major centres, as well as to regional cycling corridors beyond the NWPGA is needed. The anticipated cycleway infrastructure hierarchy consists of:

- Regional bicycle corridors – Highly used routes that connect to major destinations, on cycleways that are separate from motor vehicles and pedestrians.
- Local bicycle network – lower use corridors that connect to the priority corridors and neighbourhood destinations.
- Quiet local streets – connecting residential destinations and local services in low traffic environments and design treatments that make provision for people on bikes.

There are various forms of cycleway infrastructure that provide differing levels of safety and comfort for users. Customer preference is for off-road separated bicycle paths (separated from pedestrians), or on-road cycle paths that are separated from cars and pedestrians. Less preferred facilities include mixed traffic lanes on quiet local streets and dedicated cyclist lanes within the road shoulder. The least preferred facility is for mixed traffic lanes on busy streets.

Separated bicycle lanes aim to improve the safety for cyclists by providing physical separation from other motor traffic whilst maintaining directness of travel and priority at intersections. They are usually considered when a substantial length of road is being widened or duplicated and where there are few driveways and intersections. They provide a higher level of service for cyclists and have been shown to promote increased patronage on cycling routes .

Bicycle /car parking lanes (on-road) are most appropriate where the street is wide, there is a demand for parking (and where road space and capacity requirements allow parking throughout the day). It is important to provide a width that is adequate to accommodate parked vehicles, operating space for cyclists and adequate clearance to accommodate the opened door of parked vehicles.

Contra-flow bicycle lanes are an exclusive bicycle lane that enables cyclists to travel in both directions in a one-way street. They should be considered an acceptable treatment in urban environments where sufficient road widths exist to provide safe treatment.

The Pedestrian Realm

Pedestrian connectivity is important for successful transit ridership and the overall health of community. It relies on the ability to establish a well connected walkable street grid with active mixed-uses to encourage and reward the pedestrian.

Establishing a safe, accessible, convenient, and vibrant pedestrian realm relies on the ability of an integrated transport and land use plan that looks at last-mile connectivity and enhancing pedestrian connects to destinations. A review of the NWPGA's pedestrian realm should occur at the ILP level with the structure plan providing a high-level review of primary pedestrian corridors to ensure that a balanced and complete transport approach.

Infrastructure Opportunities

There is an opportunity to provide for increased walking and cycling through the provision of a suitable environment within existing and future urban areas for NWPGA. The provision of infrastructure includes walking and cycle paths, which should be clearly defined and separated from roads and traffic, and possibly even between cyclists and pedestrians.

The strategic infrastructure planning on the Richmond Rail Line and in particular new road crossings proposed of the Richmond Line within the NWPGA will provide an opportunity to improve accessibility, safety and connectivity for walking and cycling. The proposed improvements to the role, location and configuration of road crossings of

the Richmond Line will enhance safety along walking and cycling routes. These road improvements will entail grade separation across the Richmond Line at Bandon Road, Garfield Road, Westminister Street and Schofields Road which can be used for walking and cycling.

The proposed OSO is currently being planned as a multi-modal corridor and will form part of a future north-south motorway link to bypass metropolitan Sydney to the west, connecting the Hume Highway in the south with the M1 Motorway to the north. The opportunity exists to create a north-south cycleway link along this important linear corridor in the long term.

Open Space Network Opportunities

The NWPGA Structure Plan will need to incorporate a multi-layered system designed to provide an open space network that is truly integrated with the wider fabric and the surrounding parks such as Western Sydney Parklands, Prospect Nature Reserve, Wianamatta Regional Park, and Scheyville National Park. The open space strategy for NWPGA creates synergies through collating complementary land uses and open space activities such as walking and cycling. There is an opportunity to build upon the planned 'Green Grid' developed by the NSW Government Architects Office for public open space investment within NWPGA and link this into a continuous public space network.

The use of green space to support potential recreational and commuter use along the Richmond Line has also been identified. A green spine along the existing Richmond Line (western side) draws amenity and value through the centre of the NWPGA (connecting cycle network on M2 and M7 Motorway) and intersects with Western Sydney Parklands.

Integration with Other Transport Modes and Urban Planning

Pedestrian and cycle plans for NWPGA cannot be considered in isolation from other forms of transport and urban planning. This applies to the integration of pedestrian and cycle plans with access to existing and potential bus and rail networks, and with the encouragement of higher density, mixed land-use developments. Urban design also plays a role in achieving satisfactory pedestrian and cycle plans. Residents must be able to walk or cycle to shops.

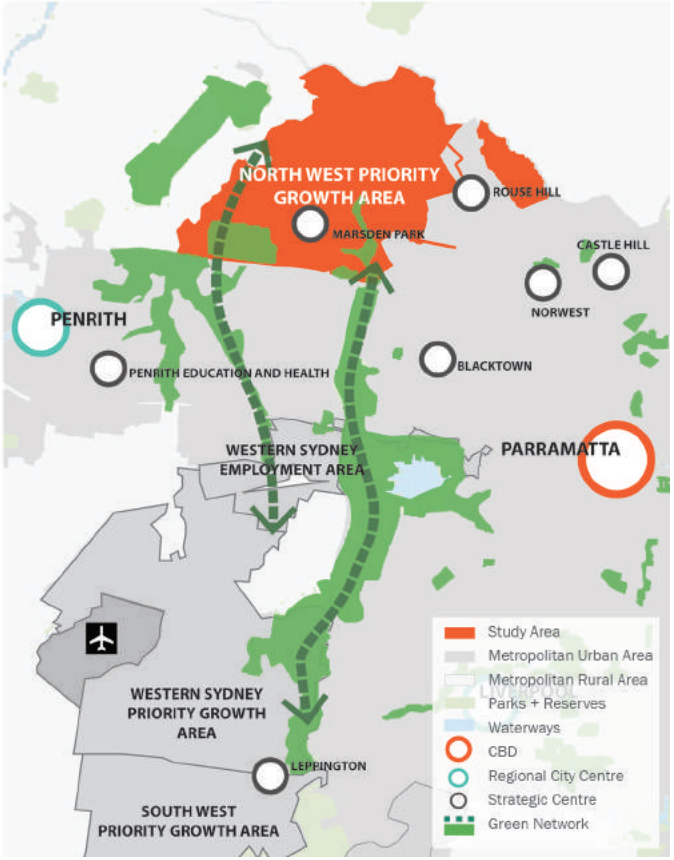


Figure 47: Green Network

Identification of Cycle Networks

The development of the cycle network considered land uses and specialised activity areas within 5-kilometre catchments around major centres. The cycle network within NWPGA will need to connect centres, regional network, activity areas, open space and transit nodes. The cycle network has been developed on the basis of overlaying a 'coarse' regional bike network with a 'fine' local bike network as shown in the ILPs.

The regional network will encourage bicycle trips into and through main centres for distribution of local bike trips and recreation. The regional cycle network and comprises the following key corridors:

- Winsdor Road – connecting Winston Hills, Riverstone, Box Hill and Richmond.
- Richmond Road – connecting Mount Druitt, Prospect Nature Reserve and UWS Hawkesbury Campus.
- Richmond Rail Line – connecting Western Sydney Parklands, M7 Motorway and Richmond.
- Bandon Road – connecting Vineyard, Marsden Park to St Marys and Wianamatta Regional Park.
- Garfield Road – connecting Scheyville National Park, Box Hill, Riverstone and Mount Druitt
- Schofields Road – connecting North Kellyville, Rouse Hill, Schofieldsto Mount Druitt.

The 'fine' local network comprises the filling in of the missing gaps to provide an interconnected network. The 'fine' network complements the open space network and generally provides links to destinations, transit stops and parks. The fine local cycle network will need to be further developed once the remaining ILPs have been completed.

Figure 48: Proposed Regional Cycle Network

RECOMMENDED REFINEMENTS

- Development of an interconnected cycle and pedestrian network.
- Utilise open space network to create direct and efficient connections
- Utilise proposed road crossing locations of Richmond Line to accommodate pedestrian and cycling infrastructure.
- Focus pedestrian and cycling network along key bus corridors such as Garfield Road and Schofields Road.
- Focus pedestrian and cycling network to support key transit nodes at Cudgegong Station, Schofields Station, Riverstone Station.

4.1 1 INTRODUCTION

The Preferred Plan (the Plan) addresses both the local and regional transport needs with a particular focus on the North West Priority Growth Area (NWPGA). It is a high level strategic plan, designed as part of an ongoing process of delivery, whereby the various elements of the Plan will be subject to detailed study, design and refinement but always within the same strategic framework. The Plan presents the opportunity to manage NWPGA potential for urban development and renewal in order to:

- Respond to the growth in travel associated with increased population and economic activity.
- Provide the levels of access and mobility to, from and within NWPGA required to meet the needs of workers, residents, visitors and students.
- Meet the aspirations of people in terms of liveability and quality of life.

The Plan will be continuously monitored and updated by the Department of Planning and Environment (DPE) and Transport for New South Wales (TfNSW), remaining a 'live' document, which is vital given the dynamic nature of Sydney's urban development and renewal.

CONTEXT - THE NORTH WEST PRIORITY GROWTH AREA

The NWPGA will be an area of intense development growth over the next 30 years and is one of two priority growth areas identified in *A Plan for Growing Sydney*. The 2011 population within the NWPGA is approximately 29,000 persons. At full development the population in the NWPGA is expected to increase to approximately 260,000.

While existing infrastructure will in some way serve this growth, improvement and expansion of the transport network will be required to effectively serve the access and mobility needs of this emerging area. The key to managing this growth will be through a highly compact and connected urban, land use and transport framework focussed at precincts and serviced by an integrated land use and transport system.

The NWPGA Structure Plan will also make an important contribution to enhancing the sustainability of the area and improving its liveability. It will play a positive role in stimulating urban regeneration in the centres connected by the network to provide both housing and access to increased quality and higher order employment types.

DEMOGRAPHIC AND DEMAND DRIVERS

Population Growth and Potential Impacts on Travel

Sydney's population is expected to rise by more than 1.7 million by 2036 and this additional population will require some 570,000 more homes and 700,000 more jobs. A significant amount of this growth will occur in the North West and South West of Sydney. Figure 50 shows the forecast spatial distribution of Sydney's population growth to 2036.

By 2036, more than half of Sydney's population will live in Western Sydney which will increase the demand for transport services to and from this region.

NWPGA has an integral part to play in the provision of housing and jobs to Sydney, with DPE projecting an additional 93,000 new dwellings and 44,000 new jobs by 2036. In total, nearly 274,000 person trips are expected to be generated by 2036 during the critical morning peak two hour period.

The *Housing Market Needs Analysis Report* (June 2015) undertaken by AEC Group estimates based on a high growth scenario that the total population for Priority Growth Areas (i.e. North West Priority Growth Area and South West Priority Growth Area combined) is projected to increase to 550,000 residents by 2036. NWPGA's share of this urban growth is projected to be in the order of 260,000 residents (or 47%).

Until operation of Sydney Metro Northwest commences in 2019, the existing T1 Western Line (Richmond-Sydney CBD and Schofields-Sydney CBD, both via Blacktown and Parramatta) rapid bus (i.e. North West Transitway), suburban and local bus transport infrastructure will need to support future growth in the short to medium term.

It should be noted that if a significant proportion of planned growth in NWPGA should occur before the delivery of the Sydney Metro Northwest, this will have a significant impact on road infrastructure and travel choice from the new urban release and precinct areas in which the majority of this growth will be concentrated. The key to managing this growth will be through a connected urban design and transport strategy focussed at precincts and serviced by an integrated transport system.

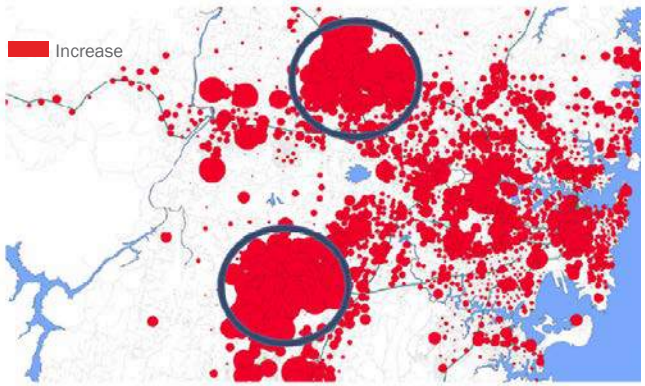


Figure 49: Spatial Distribution of Sydney's Population Growth to 2036

Economic and Employment Growth

A strong economic growth impetus is expected for the area from the already established Strategic Centre at Rouse Hill which currently provides most shopping and entertainment requirements for the North-West Sector. Public transport services such as the Sydney Metro Northwest (under construction), the North West Transitway and local bus services converge at this location will provide the centre with a high degree of public transport accessibility.

A Plan for Growing Sydney also identifies Marsden Park as a Strategic Centre and will also be a key employment zone. With future extensions of the Sydney Metro Northwest along Schofields Road, existing centres such as Schofields and Marsden Park will allow the consolidation of land use around the future transport network to effectively serve the accessibility needs of these centres.

Opportunities for further expansion of employment within the NWPGA Structure Plan include Riverstone West, Box Hill and Marsden Park Industrial. This local provision of housing, jobs and business opportunities will encourage a degree of transport containment for workers in NWPGA.

Employment centres influencing the study area are expected to include the following:

- Norwest Business Park;
- Castle Hill;
- Parramatta;
- Blacktown;
- Penrith;
- Macquarie Park / Lower North Shore; and
- Sydney CBD.

Major Land Use Changes

Major land use changes such as the Western Sydney Airport (WSA), Western Sydney Priority Growth Area (WSPGA) and South West Priority Growth Area (SWPGA) will provide a focus for local and regional transit with the opportunity to offer improved transport connections within the NWPGA to these key employment and population centres. This will enable enhanced accessibility between the NWPGA and primary employment centres and urban growth areas.

The Plan will play a key role in assisting to respond to growth in travel associated with increased economic activity to support major proposed land use changes and growth areas in Western Sydney. Key strategic transport corridors and desire lines identified within the *LTTMP* include:

- Penrith to Rouse Hill via Marsden Park.
- Rouse Hill to Castle Hill, Parramatta to Rouse Hill.
- Blacktown to Richmond via Marsden Park.

Any expansion of transport networks provides an opportunity to integrate land use planning and influence the way NWPGA is planned and developed, and most importantly the ease of access and mobility to and from the Greater Metropolitan region of Sydney. This will include the potential of different connections to integrate with the wider network, establish multi-modal connections, to influence land use patterns, to influence travel demand and ultimately to influence urban form and structure.

MULTI-LAYERED PROCESS TO DEVELOP PREFERRED PLAN

The planning process for the development of the Plan involved several activities. Initially the proposed land use, travel demand, transport network, and connections to the transport system within and outside of the NWPGA were reviewed. The network planning used all available information and was developed based on the location of land uses along key corridors, connections to key activity centres, and connectivity between other major transport systems such as the Sydney Metro Northwest (currently under construction), the existing T1 Western Line (between Blacktown and Richmond) and the T5 Cumberland Line.

The planning and evaluation of the Plan for NWPGA involved a multi-layered process involving the key following steps:

- Analysis of land use for NWPGA including population and employment densities.
- Analysis of travel demand using the Western Sydney Strategic Model (WSSM) and selection of suitable transport network.
- Further refinement of the transport network using the WSSM and evaluation of the preferred Plan.

Land use and travel demand are both fundamentally interrelated and intrinsically linked. Change in one prompts change in the other. The NWPGA Structure Plan ensured the integration of land use and transportation planning in order to maximise transport system efficiency in line with policy framework incorporated within the *LTTMP* and *A Plan for Growing Sydney*.

Based on the transport network identified, a number of concept networks were created that focussed on servicing key demand areas within NWPGA and the surrounding regional transport network. These initial concepts were then evaluated using WSSM that provided key network performance results. Following an evaluation of the model outputs, initial transport network concepts were further refined and filtered.

The Preferred Integrated Transport Plan was further developed from the results of the initial model testing and evaluation. The integrated components (i.e. coordinated public transport, roads, freight, active transport) together with the strong policy framework provided within the *LTTMP* and *A Plan for Growing Sydney* were combined to make up the Preferred Plan.

INTEGRATION OF LAND USE WITH TRANSPORT

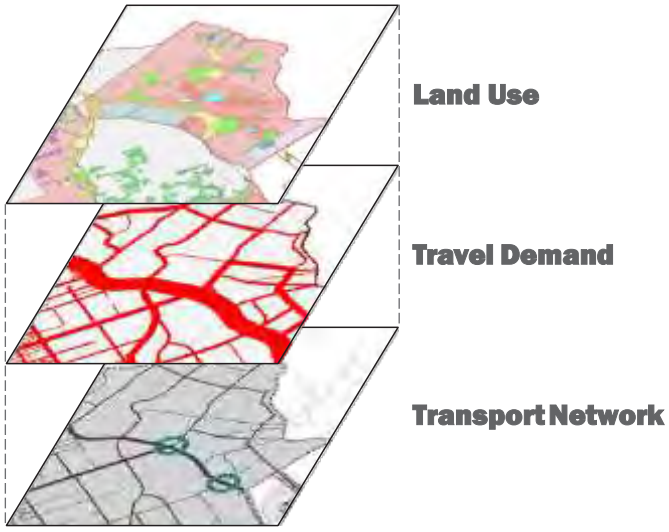


Figure 50: Multi-Layered Process Approach

The Plan has ensured that land use and transport have been integrated at every stage and in every aspect of the structure plan. The integrated transport plan has been developed in response to the following organising elements for urban structure:

- The positioning of key land uses and transport connections to complement established and future urban structure.
- A balance of residential, business and employment land uses to encourage trip containment.
- The potential for higher densities and clusters of land uses around public transport nodes in order to promote increased use of public transport.
- The location of the public transport network to connect directly with land uses with transit running directly through residential and core mixed use centres.
- The facilitation of mass and intermediate transit infrastructure and the optimisation of this through support for highly accessible strategic centres (Rouse Hill and Marsden Park) and high quality connections to adjoining existing and future transport networks.
- Emphasis has been placed on achieving a high level of internal connectivity within the NWPGA, and the diversion of externally focussed “cross-site” road-based journeys to occur around the edges of, rather than through, the core centres of the NWPGA.
- An interconnected road network structure to service multiple centres and activity nodes that complements the road based public transport network.
- Provision of an integrated range of options such as rail, rapid bus, local bus, bicycle and walking, that can be efficiently accessed and used by people travelling to and from the areas to serve their individual needs.
- A greater mixture of land uses and employment opportunities within NWPGA, meaning that destinations are closer together, thus reducing travel distances and making journeys by public transport more viable.
- Enhance effectiveness and efficiency of freight movement within the NWPGA and its surrounds through strengthening of the primary freight network and ensuring high quality connections.
- Appropriate land use planning to prevent noise impacts at new dwellings around transport corridors and freight hubs.

4.2 PUBLIC TRANSPORT NETWORK

RAIL AND BUS

A key component of the Plan is the provision of a comprehensive, fine grained and integrated public transport system that provides regular and reliable services accessible to all and offers an attractive, high quality alternative to the private car. The public transport network has been configured to serve centres, activity areas and areas of higher density to maximise public transport use and encourage a shift away from use of the private car.

A key element of the Plan is to cluster commercial and medium to high density residential development in such a way that a 'critical mass' of trip generation is established within transit catchments from the earliest stages of development.

For longer journeys, the mass transit network comprising the T1 Western Line (Richmond-Sydney CBD and Schofields-Sydney CBD, both via Blacktown and Parramatta), T5 Cumberland Line and Sydney Metro Northwest (currently under construction) will allow customers to transfer directly from local services to fast longer distance services. Parking will be provided at key interchanges to enable travellers to park-and-ride particularly along the Sydney Metro Northwest.

In the short to medium term, railway services will provide an additional, more powerful attractor for transit users for NWPGA. New railway stations at Rouse Hill and Cudgegong Road as part of the Sydney Metro Northwest will also constitute another layer of the interchange, complementing the North West Transitway and local bus services.

The spatial plan also allows for the future extensions of the rail network particularly the Sydney Metro Northwest from Cudgegong Road to Marsden Park (via Schofields). In the longer-term, the future extension of Sydney Metro Northwest over the existing T1 Western Line (at Schofields) will create an opportunity for a future transport

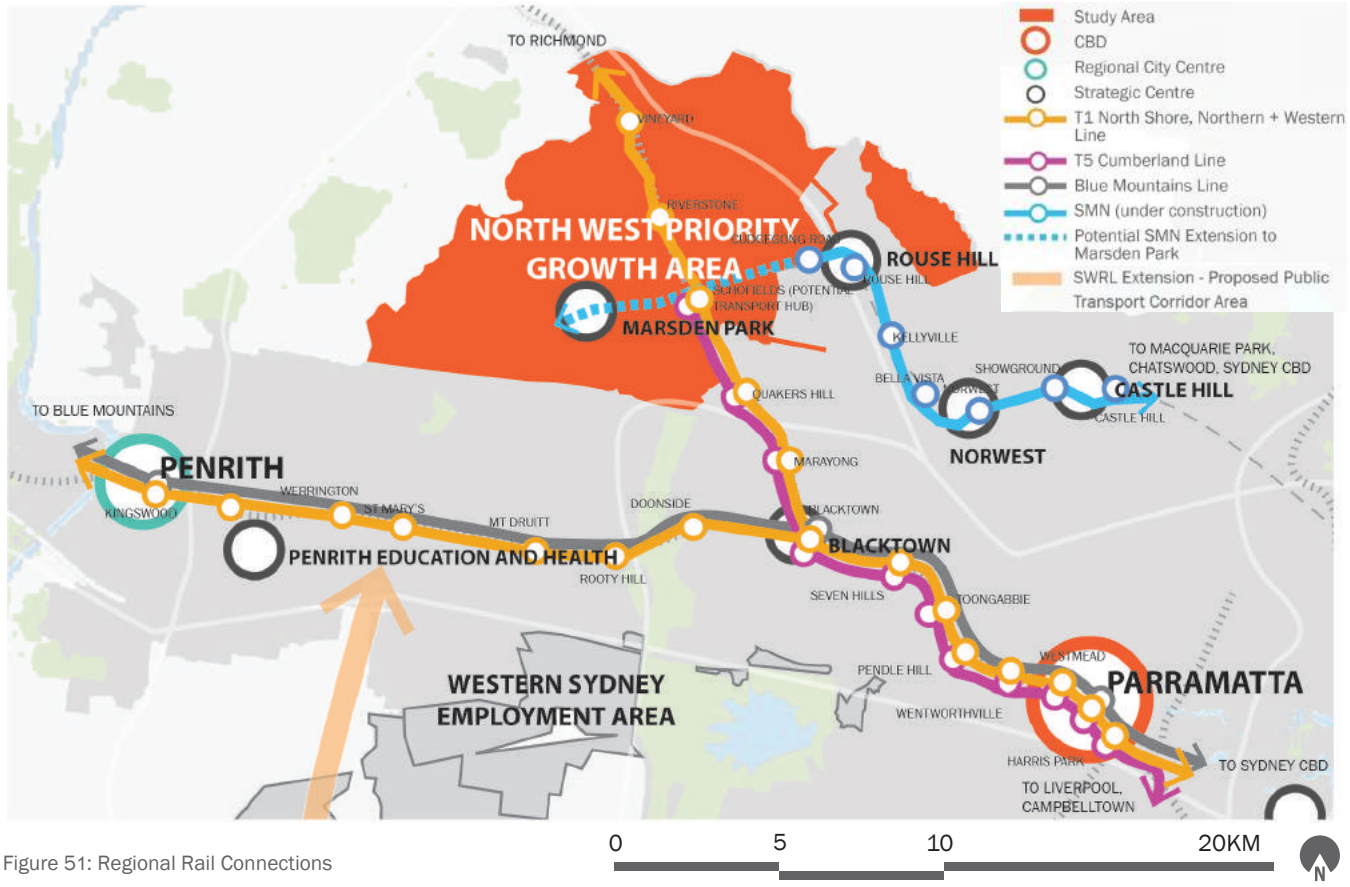


Figure 51: Regional Rail Connections

hub at Schofields Station where the two major rail axes intersect. It occupies a prominent position within the NWPGA, ensuring that this transport hub promotes the use of transit enabling the surrounding precinct to capitalise on the dynamic provided by this animated hub of transport activity.

The intermediate transit network will comprise rapid bus routes and suburban bus routes linking major centres within the NWPGA and serving major centres such as Parramatta, Blacktown and Penrith. The local transit network comprising local bus services will support the mass transit network and provide a finer grain, local service. Bus stop locations have been determined based on a 400m catchment radius to ensure a high level coverage of the NWPGA.

The Plan aims to ensure that no one will need to walk more than 400 metres to their nearest public transport stop. Local bus services have been generally planned to fill remaining gaps, provide connections to the mass transit network, and provide accessibility and connectivity to residents and employment opportunities both within and outside the NWPGA.

The complete public transport network has been developed as a single integrated system so that a high level of accessibility is maintained irrespective of location or service.

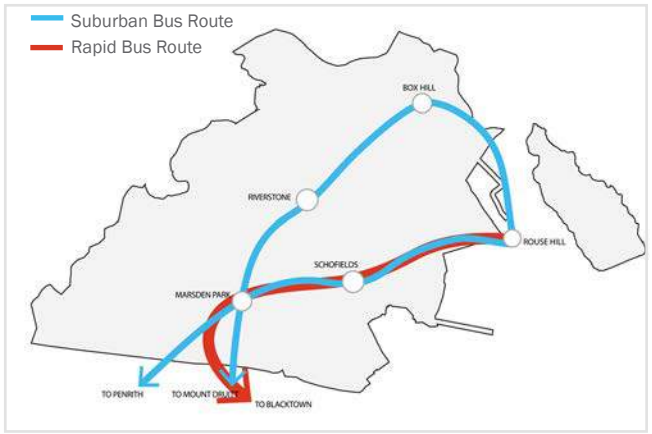


Figure 52: Proposed Bus Rapid and Suburban Bus Routes

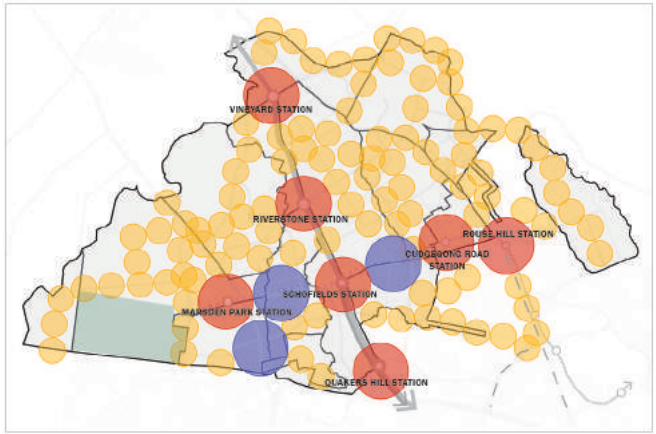


Figure 53: Indicative Public Transport Passenger Catchments

4.3 ROAD NETWORK

The Plan for NWPGA is based on a clear road hierarchy which broadly aligns with the *LTTMP* and the *NSW Road Plan* currently under development from TfNSW. The street network layout has been planned in such a way that provides an interconnect grid network layout promoting connectivity, permeability and legibility. The proposed hierarchy results in optimal opportunities to be serviced by an integrated public transport network and has been planned and dimensioned integrally with the land use planning framework. This has ensured that the each street and its position in the road hierarchy is appropriate to its role and the likely traffic demands placed upon it.

The primary access to NWPGA will be via M7 Motorway, Richmond Road and Windsor Road. Connected to these, Schofields Road, Garfield Road and Bandon Road form a major access spines providing access to the wider local and regional road network. Both Schofields Road and Garfield Road are envisaged as a multi-purpose corridor providing vehicular and non-vehicular transit opportunities (pedestrians, cyclists and bus rapid, suburban bus). A series of sub-arterials roads have also been provided to distribute traffic from higher order road network throughout the NWPGA.

The NWPGA road network has been developed on the basis of promoting local access rather than regional traffic. The road hierarchy is compatible with the land use and range of roles that each street serves. This incorporates a grid of collector roads to distribute traffic within the NWPGA and each corresponding precinct. The collector roads provide local access within each precinct.

Figure 54: Proposed Road Hierarchy

Figure 55 : Road Hierarchy – Motorways and Arterials

Figure 56: Road Hierarchy – Sub-Arterials

Figure 57: Road Hierarchy – Collector Roads

4.4 FREIGHT MOVEMENT

The Plan seeks to enhance the effectiveness and efficiency of freight movement within NWPGA and its surrounds. The aim is to support the development of a sustainable freight system that provides an appropriate balance between alternative transport modes, improves the utilisation of the transport resources deployed, and lowers the unit cost of freight based services.

The Plan promotes the strengthening of the primary freight transport network and the optimisation of this through high quality connections to Windsor Road, Richmond Road, M2 Motorway and M7 Motorway. An extension of the freight network to the Outer Sydney Orbital a multi-modal corridor which is currently under investigation will complement an already established freight network to the north, east and south of the NWPGA.

The multimodal aspects of the Outer Sydney Orbital (OSO) corridor in the longer term will also promote the case for the interchange of freight between alternative road and rail services, promoting broader freight transport connectivity across the Sydney Metropolitan Area. This may encourage a gradual shift from road based haulage to alternative rail services on this key north to south route for NWPGA.

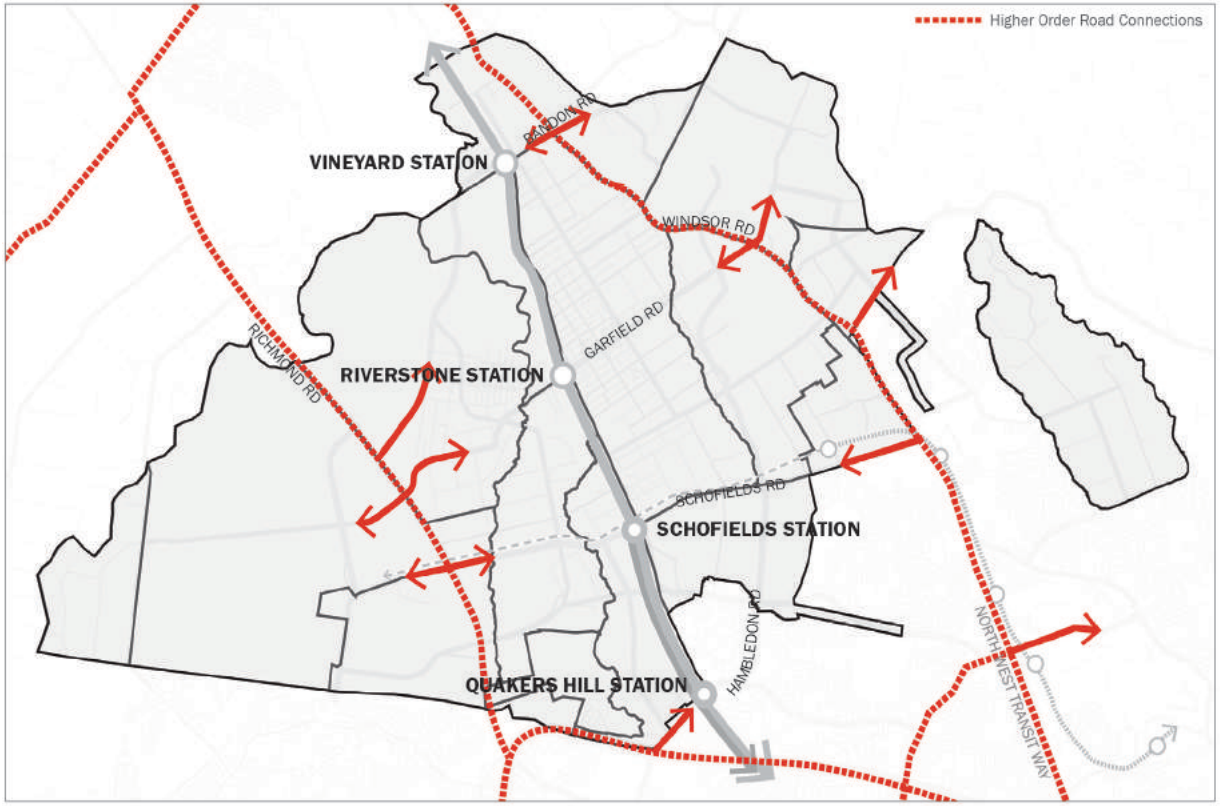


Figure 58: NWPGA Freight Higher Order Road Connections

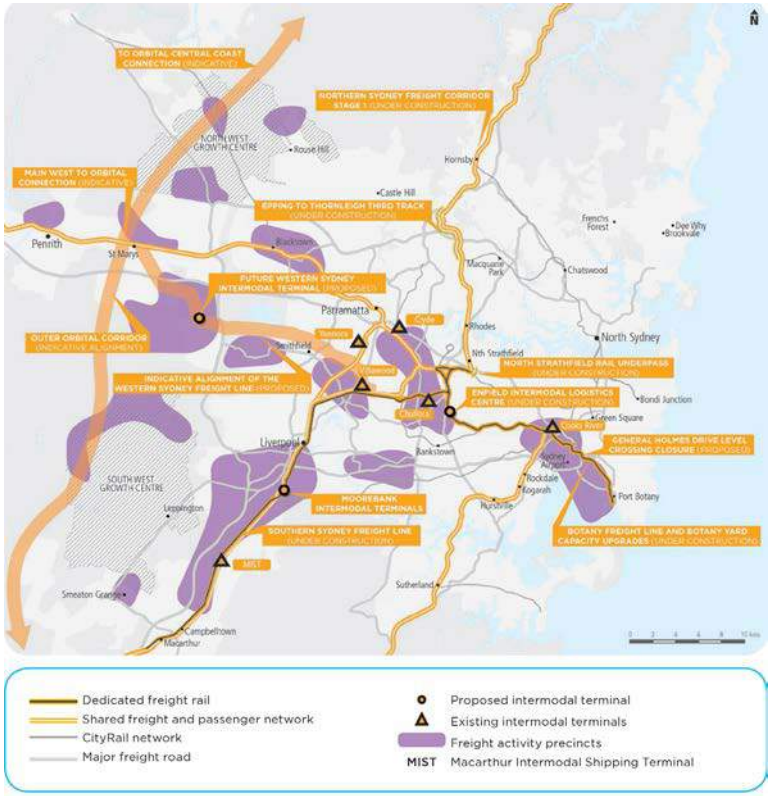


Figure 59: Metropolitan Freight Network

Source: NSW Freight and Ports Strategy

4.5 CYCLING + WALKING NETWORK

A comprehensive regional cycle network is provided for NWPGA. These regional bicycle corridors are likely to be separated cycleway located adjacent to the pedestrian network. Separated bicycle lanes for regional connections will improve safety for cyclists providing physical separation from other motor traffic whilst maintaining directness of travel. The regional scale connections alongside key corridors are generally straight in alignment to provide direct and efficient connection across the NWPGA, whilst the lower order paths typically meander to allow the landscape to be experienced at a slower pace.

The Plan for NWPGA is based on connecting the cycle network to centres and transport nodes. The catchment area of public transport services can be greatly enhanced with the aid of bicycles. Investing in safe, convenient and connected bike routes that are within five kilometres of major centres and transport nodes, that link the regional cycle network, and are associated with bicycle parking facilities, will help to increase cycling for short trips and encourage more public transport use.

Pedestrian circulation is provided within the street network proposed and open space typologies connecting people with key destinations and offering a comfortable microclimate for pedestrian journeys. The pedestrian path network also provides six grade separated crossing points of the Richmond Line between Quakers Hill Station and Vineyard Station. Pedestrian access provided at these key locations will provide uninterrupted pedestrian access across the Richmond Rail Line.

This secondary pedestrian network provides the dominant lateral connections within NWPGA. Pedestrian links are focussed within public open space areas, where tree planting provides shade along the pathways and access is provided to both passive and active spaces within the open space network. All future streetscapes will need to be designed as walkable environments, with generous shaded pedestrian pathways incorporated into each right of way.

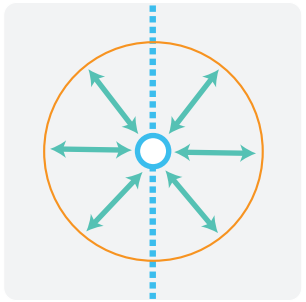


Figure 60: Connecting Cycle Network to Centres + Transport Nodes

Figure 61: Proposed Regional Cycle Network

4.6 STRUCTURE PLAN EVALUATION

OVERVIEW

In order to determine an optimum transport network for NWPGA in 2036, it was necessary to evaluate a wide range of choices. A high level strategic process was applied, whereby alternative transport networks were identified, modelled, evaluated and further developed by an iterative process in order to define a preferred transport network. The preferred transport network was in turn refined through a further set of modelling and evaluation exercises to reach the final Plan.

EVALUATION PROCESS

The evaluation was based on a two stage process using the WSSM. In the first stage, transport networks were defined and subject to a high level evaluation against the overall project objectives. A comparison of the transport networks was then made in order to identify an emerging preferred network.

In the second stage, this emerging preferred network was subject to iterative testing using the WSSM. The results enabled an overview to be taken of the performance of the transport network based on key performance indicators. Consultation with TfNSW, DPE and RMS at key decision points in the process was undertaken, contributing to the selection of the preferred transport network.

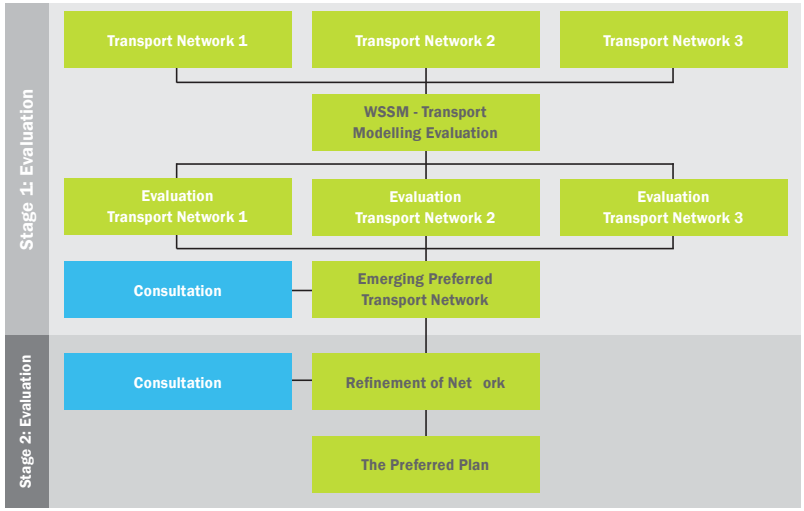


Figure 62: Strategic Evaluation Process Flow Chart

	2011	2026	2036
	AM peak[2]	AM peak[2]	AM peak[2]
Total number of trips[1]	45,000	174,000	275,000
Total number of trips (cars)	43,000	154,000	241,000
Total number of trips (public transport)[3]	2,000	20,000	34,000
Vehicle kilometres travelled (VKT)	327,000	657,000	912,000
% of Links VCR > 0.90	1.0%	0.3%	2.5%

Notes:
(1) Total number of trips include 'to' and 'from' trips for NWPGA
(2) The AM peak represents the 2 hour peak period
(3) Public transport trips includes both rail and bus trips

Figure 63: Measures of Effectiveness of the Preferred Plan

PREFERRED PLAN ASSESSMENT

The WSSM was used to evaluate the relative merits of the Plan to reflect the key objectives and indicators established as part of the Structure Plan review. The results of the assessment are summarised in Figure 64.

In 2036, a total of 274,000 person trips during the critical two hour AM peak period are expected to be generated for NWPGA. The modelling of the base year (2011) shows 2,000 public transport trips during the two hour AM peak period. By 2026, this is expected to increase to 20,000 trips and a further increase to 34,000 trips by 2036. These estimates indicate that patronage will increase over ten fold over the next 25 years.

The overall increase in public transport usage capitalises on the completion of the Sydney Metro Northwest (2019), complementing bus services on the North West Transitway and bus services incorporated within the NWPGA Structure Plan. These integrated transport planning responses incorporated in the Plan will provide a powerful attractor for transit users in the medium and longer term.

Changes in the level of reliance on cars and the use of alternative modes have been evaluated on the basis of the changes in mode share of car and public transport using direct outputs from the WSSM. The mode share of car and public transport is shown in Figure 65. The model outputs show how the mode share has evolved in favour of public transport for the various horizon years. A key objective of the Plan is to increase the public transport mode share, and this has clearly been achieved.

The model estimates car trips will increase from 43,000 in 2011 to 154,000 by 2026, and a further increase to 241,000 by 2036. The strategic modelling confirms that the majority of road links in the NWPGA core areas will operate satisfactorily with spare mid-block capacity.

Figure 66 shows that the performance of the road based transport system is in line with the stated performance indicator where less than 15% of links have a Volume to Capacity Ratio (VCR) that exceeds 90%. This indicates that even with an increasing demand for road based travel by 2036, the overall road network performance within NWPGA appears to be adequate and well within threshold performance levels.

The road network is compatible with the land use and range of roles that each street serves and incorporates an interconnected grid network of roads to distribute traffic within the NWPGA.

Figure 67 shows that as car mode share reduces in the medium to longer term, the proportion of links where the VCR exceeds 90% remains below the maximum 15% threshold.

It is essential to the success of the Plan is undertaken in such a way that ensures that public transport network integration principles inherent in the Plan are maintained, and that oversupply of road capacity does not undermine public transport choices for the NWPGA.

The strategic modelling outputs are intended to guide the Structure Plan and should not be seen as final detailed proposals. It may be required to undertake further detailed study and mesoscopic modelling work to develop the Preferred Plan into technically and feasible solutions.

On the basis of a strategic model evaluation process, a robust Preferred Plan was identified and tested. This Plan will significantly increase the use public transport as illustrated. The Plan was subject to consultation at key stages and has sought to accommodate, as far as possible, the needs of all key stakeholders.

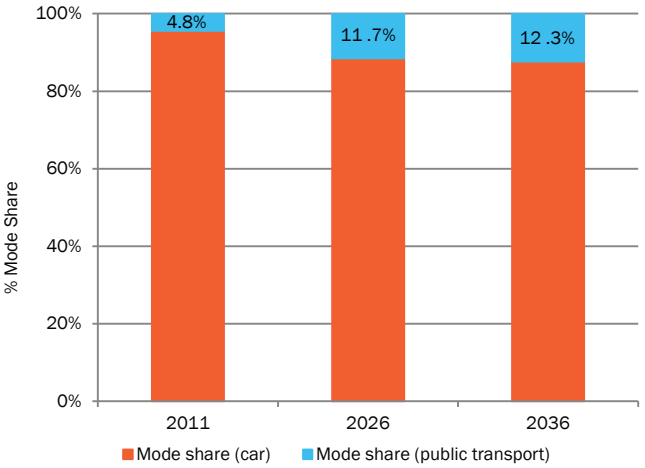


Figure 64: Mode Share Relative Change

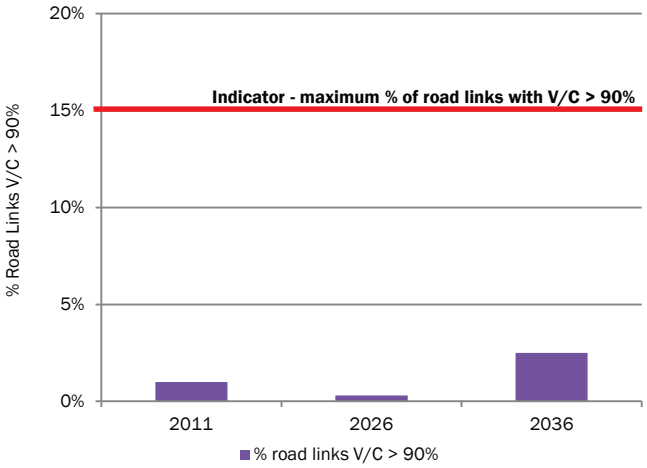


Figure 65: Proportion of Links where VCR exceeds 90%

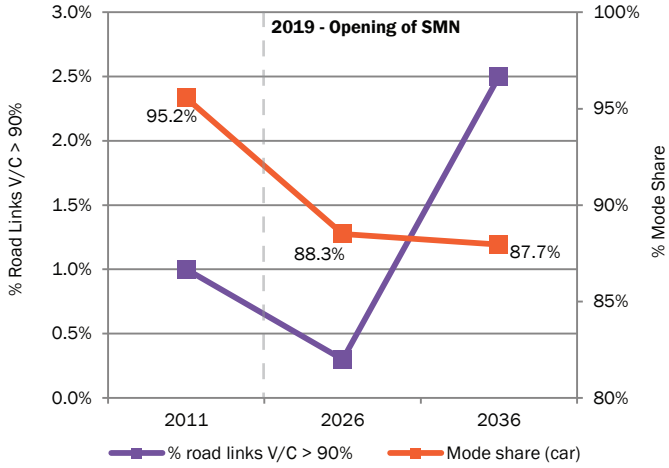


Figure 66: Mode Share Relationship with Congestion

05 CONCLUSION

5.1 OVERVIEW

This report provides an assessment of the current Structure Plan for NWPGA. The report identifies key gaps and planning issues to consider, and defines strategic directions to guide the generation and refinement of the NWPGA Structure Plan. The preliminary nature of the structure planning process will by necessity be an iterative process requiring a series of further investigations and updates to refine the structure plan

This section incorporates a range of considerations relating to the future development of the NWPGA. The section is structured by initiatives formulated to address the issues raised in the preceding sections of the report.

5.2 INTEGRATED TRANSPORT + LAND USE APPROACH

From the integrated transport and land use planning process, the following guiding principles formed the basis of the NWPGA Structure Plan Review:

- Provide an urban structure and form that provides accessibility to local activities rather than one that relies on significant mobility to access such activities.
- Achieve the required mode share to public transport by understanding and responding to the needs and expectations of the customer that will (potentially) choose to use the public transport network.
- Provide an urban structure and form that minimises car dependence.
- Provide a multi-modal transport network that is integrated with the urban form and will offer the future community a choice of transport options to access activities in the local area, as well as the wider metropolitan area.
- Achieve urban consolidation by promoting higher intensity land uses while simultaneously improving local amenity and viability of the local community.
- Provide future transport connections that will strengthen regional links, efficiency , attractiveness and integration of the overall transport network.
- Achieve good speed and reliability along transit corridors through high levels of physical and operational priority.
- Increase transport capacity and retain flexibility to accommodate future options.

5.3 KEY CONSIDERATIONS

As part of the structure planning process, the following key opportunities have been identified for NWPGA with respect to integrated transportation and land use planning.

FOCUS ON CUSTOMERS USING PUBLIC TRANSPORT

A key objective of the public transport network serving the NWPGA is to provide access for more people, more efficiently, on the available transport corridors. This reduces impacts on the traffic network, which is far less efficient in carrying high volumes of people within a constrained corridor. The key to achieving the required mode share to public transport is to understand and respond to the needs and expectations of the people that will (potentially) choose to use the public transport network. This is a critical shift in thinking about transport planning: every decision and consideration needs to focus on the aim of attracting people to use public transport.

INTEGRATION OF TRAVEL MODES TO PROVIDE INCREASED CHOICE

There is no single mode of transport that can respond to all the travel needs of people in NWPGA. Given the range of origins and destinations of people travelling to, from and around the NWPGA, it will be necessary to have a 'multi-layered' transit system that can meet the complex travel needs of the community.

It is important to provide an integrated range of options such as mass rapid transit, rapid, suburban and local buses, bicycle and walking that can be efficiently accessed and used by people travelling to and from the areas to serve their individual needs.

STRATEGIC DRIVERS FOR LAND USE

The following strategic drivers are considered to be relevant to the consideration of land use for NWPGA:

- Land use and transit infrastructure investment should support development of a 'growth corridor' of mixed residential, business and industrial opportunities linking WSPGA, WSA and SWPGA.
- Land use distribution within NWPGA should seek to support an economical and efficient outlay of transport infrastructure by striving for a high level of transport containment and local provision of housing, job and business opportunities.
- Investment in high quality transit to support regional mass rapid transit network connections and the viability of a network of accessible and high quality mixed use activity centres within NWPGA.
- Provide a balance between employment and residential opportunities within NWPGA to encourage a degree of transport containment. A target of employment population that is 50-60% of the size of the stable residential population will encourage transport containment.

PROVIDING TRANSPORT SUPPORTIVE LAND USE AND URBAN FORM

It is well recognised that the viability of public transport is strongly influenced by land use and urban form. The location of services and amenities in proximity to transit nodes that are accessible from residential areas is crucial to engender sustainable, transit-served travel patterns.

The concentration of origins and destinations such as schools, employment, shopping and recreation around transit will give rise to desire lines that can be viably served by transit. As the proportion of trips that can be viably undertaken by transit increases, car dependence will decrease.

Urban design features to optimise the interface between land use and transit need to proceed to a high level of detail, from the alignment and dimension of streets to roadway design, stop access and creation of high quality pedestrian and cyclist environments.

The relationship between development patterns within the NWPGA and transit is the idea of proximity to transit. This is really the same issue as density, but viewed from the customer's point of view. Cervero's findings in his paper "Ridership Impacts of Transit Focussed Development" (1993) are summarised below:

- Residents living near rail stations are 5 times more likely to commute by rail.
- Employees working near rail stations are 2.7 times more likely to commute by rail.

INCREASE DENSITY AROUND TRANSPORT INFRASTRUCTURE

NWPGA offers excellent physical dimensions for transit-oriented development, or development in such a way that can effectively and efficiently provide access by public transport. Increasing the amount of employment and density around the transport network in the early years will bring a range of economic benefits to operators of the bus network (including the North-West Transitway) and the SMN. By providing a larger patronage catchment, it will be more viable to run transit at higher levels of service. This is critical to instill sustainable travel behaviour to, from and within the NWPGA, as well as promote transit oriented urban form within and around key centres.

It is crucial that residential densities are increased around transit infrastructure particularly at Schofields, Marsden Park and Riverstone because:

- It will result in a higher mode share to public transport, and a commensurate reduction in car use and dependence (and the range of associated economic, environmental and social impacts).
- It will increase the viability and vitality of the commercial interests and community infrastructure in the study area.
- It will improve the sustainability of the NWPGA.

Both the Richmond Line and the SMN (currently under construction) will provide an excellent primary-tier public transport network within and around the NWPGA in the near future. Transfer nodes between the first- and second-tier public transport networks within NWPGA will constitute a critical consideration in terms of:

- Public transport network structure and operation.
- Responding to the needs of users.
- Location of key land uses.
- Enabling access between multiple trip origins and destinations.

FUTURE CROSS REGIONAL TRANSPORT CONNECTIONS

High population, employment and freight growth will require improving regional connectivity, transport improvements and protecting critical corridors. The lack of transport connectivity at a regional level to, through and from the NWPGA will require improving cross regional connections. At present, there is a sparse transport network with large north-south gaps in the existing network particularly to the south of the NWPGA.

The SMN is the core element of public transport infrastructure for the NWPGA. It is a significant investment in public infrastructure and represents an important opportunity to carefully consider the wider implications of the SMN, and to comprehensively plan for future growth and the regional connectivity required to deliver this growth.

Major land use changes such as the WSA, WSPGA and SWPGA will provide a focus for local and intraregional transit with the opportunity to offer improved transport connections within the NWPGA to these key employment and population centres. This will enable enhanced accessibility between the NWPGA and primary employment centres and urban growth areas.

PROTECTING CRITICAL TRANSPORT CORRIDORS AND TRANSPORT INTERCHANGES

Key strategic transport corridors and desire lines that have been identified include

- Penrith to Rouse Hill via Marsden Park;
- Rouse Hill to Castle Hill;
- Parramatta to Rouse Hill;
- Rouse Hill to WSA via WSPGA; and
- Blacktown to Richmond via Marsden Park.

Future cross regional connections cannot be made purely on the ability of a particular connection or option to work optimally in isolation. The future assessment of regional connections for NWPGA must consider the ability of different options to guide and develop a multi-modal network to respond to the broad range of future travel requirements. This will include the potential of different connections to integrate with the wider network, establish multi-modal connections, to influence land use patterns, to influence travel demand and ultimately to influence urban form and structure.

Transport Corridors

Continued growth of NWPGA will make even greater demands on the existing transport network that is already close to capacity. Flexibility and adaptability of the wider transport network is constrained by availability of suitable reserved land on which new transport corridors can be built. Some corridors are already reserved. There are also new transport corridors being identified for which no land is currently reserved. It is important that the future transport corridors are confirmed and preserved as a priority. Recognising the need to address this potential problem, the *LTTMP* has identified several transport corridors for protection within the West Central Subregion which includes NWPGA. The corridors are:

- Outer Sydney Orbital;
- Bells Line of Road - Castlereagh Connection;
- SMN extension from Cudgegong Road to Marsden Park (via Schofields);
- Werrington Arterial Road – connecting M4 Motorway to Richmond Road (near South Street); and
- Marsden Park to Mount Druitt – with connection to WSPGA, Fairfield and Leppington.

Transport Interchanges

In addition to the transport corridors previously outlined, two stations on the SMN extension have been suggested. The stations are:

- **Schofields Station** – upgrade existing station as a future transport hub with a higher capacity interchange.
- **Marsden Park** – new station near Richmond Road to serve the Marsden Park strategic centre and Marsden Park Industrial.

It is imperative that the above station locations and spatial requirements are reserved as development is likely to proceed at a rapid pace within NWPGA. Station locations would need to be finalised and adequate land purchased for future construction of both stations and interchanges.

DEDICATING SPACE AND PRIORITY FOR PROPOSED BUS CORRIDORS

Public transport links and proposed bus corridors have been located in such a way that they run through the core of development areas within NWPGA. Two bus corridors have been proposed to pass through the area at:

- **Garfield Road** – linking the Box Hill area to Marsden Park via Riverstone and beyond to Mount Druitt and Penrith via South Street.
- **Schofields Road** – linking Rouse Hill to Marsden Park via Schofields and beyond to Blacktown via Richmond Road, and Parramatta and Blacktown via the North West Transitway.

These corridors are intended to carry public transport and traffic with a purpose in the area it travels through. Operational priority is a key factor to the success of these bus corridors within NWPGA. It will be optimised through the provision of:

- **Physical priority** – physical segregation from impacts (or potential impacts) associated with other traffic
- **Signal priority** – priority at locations (generally intersections) where physical segregation is not provided.

In addition to physical and signal priority, bus only links (including through centres) could be introduced in the longer term to provide direct connectivity and improve operational performance.

PROVISION OF BICYCLE FACILITIES

Cycling is a low impact yet flexible form of private transportation. Many benefits to the wider community can be observed from higher levels of cycling. These include:

- Lower VKT (vehicle kilometres travelled), with commensurate reductions in road congestion and air and noise pollution.
- Less demand for car parking, which encourages more efficient use of land and better urban form.
- Health benefits,by making transport an integral part of daily exercise.
- Greater catchment areas are formed for public transport nodes compared to walking alone. Thus many more people are given access to, for example, train services, increasing the viability of these services.

Both on and off road facilities for cyclists should be provided in the NWPGA. These facilities must recognise and cater for the wide variety of cyclists, by providing:

- Commuter cycle lanes, providing direct access to public transport links and trip destinations, as well as trip end facilities such as secure bicycle storage and showers.
- Off road and local on street (in quiet areas) cycle routes for school children and others who do not choose to travel on busy streets.
- Recreational routes, to further promote cycling within the area and provide for the demand for scenic and exercise related trips.

These would normally be developed into a local hierarchy, so that local routes feed into and complement cross-regional cycle routes.

In addition, secure bike parking should be provided at transit nodes and other key centres to enable easier access by bicycle.

ESTABLISH A PEDESTRIAN-FRIENDLY ENVIRONMENT

Walking constitutes a part of every trip. As such, it is an integral part of any transport planning. Consideration must be given as to the needs and relative volumes of pedestrians in different areas, and an appropriate level of expenditure and quality of facilities must be provided.

A pedestrian-friendly environment is an essential part of the provision of public transport. For such a trip on a bus or train to be attractive, the entire route must be considered in terms of safety, interest and amenity. Important elements that need to be achieved for NWPGA include:

- Pedestrian-scaled architecture that allows for passive surveillance along pedestrian corridors.
- Footpaths designed based on the land use and pedestrian activity.
- Pedestrian amenities that improve accessibility for all users.
- A public realm that is vibrant, active and engaging and safe.
- Capatilising on existing green space within the NWPGA for both passive and active recreation.
- Structuring the Richmond Line Corridor to incorporate shared cycle and pedestrian facilities.
- Connect NWPGA to the 'green grid' for the Sydney Metropolitan Area.

STAGING TO ACHIEVE OPTIMAL INTEGRATION OF LAND USE AND TRANSPORT

Staging of development is critical to ensure that land use and transportation can be efficiently integrated to optimal effect. In broad terms, improvements to transit infrastructure and service levels should be made before intensification of land use commences. It is widely recognised that urban form and design will respond to the transport opportunities available at the time of development.

The future urban form of the NWPGA can be developed in a way that could be described as transit oriented, and can provide a very positive starting point for urban renewal. Timely introduction of transit improvements in the NWPGA can be expected to influence the following elements of new development:

- **Land use** – more intensive, mixed-use development will seed around transit links.
- **Density** – good transit provision stimulates higher density development.
- **Parking provision** – demand for parking spaces is generally lower around transit stops, reducing the building / site area dedicated to parking and thus making development more efficient. Reduced parking provision is also well-recognised as an effective way to manage car-based travel demand.
- **Travel behaviour** – general travel behaviour of communities can best be influenced when they initially move to an area. If viable non-car based travel opportunities (transit, bike, walking) are available at the time of arrival to NWPGA, it is more likely that the community will make use of such opportunities.

MECHANISMS TO INCORPORATE TRANSPORT CORRIDORS AND INTERCHANGES INTO PLANNING INSTRUMENTS

The Structure Plan for NWPGA would support the key actions of the *LTTMP* and *A Plan for Growing Sydney* by protecting key transport corridors that integrates future transport infrastructure with planned urban centres to provide connectivity to centres and jobs. Incorporation of transport corridor alignments and station locations into the structure plan and Local Environmental Plans (LEPs) can potentially minimise land acquisition problems in the future. Potential exists to pursue joint venture activities in order to assure coordinated and timely provision of infrastructure.

The key steps for the future protection of transport corridors and interchanges through the NWPGA are:

- Corridor planning studies be undertaken for areas in which transport corridors and interchanges are proposed, that investigates the constraints and opportunities affecting the reservation of land for a future corridor or interchange.
- Preservation through the State Environmental Planning Policies (SEPPs) by State Government or Local Environmental Plans (LEPs) by Local Government, outlining the potential for transport corridors along specified routes.
- Precinct planning approach through the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (the Growth Centres SEPP) through Department of Planning and Environment.
- Transport for NSW and other relevant State Authorities to acquire land for the purposes of a future transport corridor or interchange.

APPENDIX

APPENDIX

STAKEHOLDER INTERVIEWS

It is recognised that key stakeholders hold valuable knowledge about the existing study area and any future plans for transport improvements and land use developments. Initial stakeholder consultation was undertaken in the form of a workshop with some additional stakeholder meetings with individual organisations also taking place throughout the study.

RMS CONSULTATION – ROAD NETWORK CONCEPTS

A meeting was held with the RMS on 22 April 2015, to further discuss initial road network concepts for NWPGA, strategic modelling work undertaken by Transport Modellers Alliance (TMA) on behalf of TfNSW and identify any further issues.

Road Network

- Where key links intersect with primary arterial roads, they should continue through rather than terminate to avoid dog-leg movements – this places additional pressure on the arterial road network.
- A review of whether key links that run parallel to the railway line on both sides should be provided.
- The yet-to-be finalised NSW Roads Plan being developed by TfNSW moves away from the term ‘transit arterial’ as stated in the LTTMP. In its place will be a broad category called ‘arterial roads.’
- The need for a sub-arterial road through the “middle” of the Marsden Park residential precinct should be re-examined.
- The need for a motorway interchange at Castlereagh Freeway / Stony Creek Road given Stony Creek Road is a sub-arterial road should be re-examined.
- There is a reserved corridor that traverses north-west from Stages 1 and 2 of the Werrington Arterial Road that would connect with South Street in Marsden Park at the Castlereagh Freeway corridor.

Flooding and Evacuation Routes

- Flooding is a major issue in the area. RMS are undertaking further investigation in this area is required in consultation with the State Emergency Services to determine evacuation and flooding requirements.

STAKEHOLDER WORKSHOP OUTCOMES – DRAFT PLAN DISCUSSION

A key part of the process for review of the current Structure Plan was DPE's facilitation of a two hour Workshop held on 29 April 2015. This workshop involved participants from the NWPGA project team and the various stakeholders DPE, TfNSW, RMS, Infrastruture NSW, Office of Environment and Heritage, Environmental Protection, Endeavour Energy, Transgrid, Sydney Water, Blacktown Council, The Hills Council and Hawkesbury Council.

The workshop provided the stakeholders with an overview of the project and an opportunity to provide information on relevant plans completed for the area to date. Discussions during the workshop revealed a number of issues and relevant information concerning the study area. These issues have been categorised and are outlined below.

Transport

- Proposed Intermodal Terminal site at Riverstone West has been sold to a private developer and unlikely to proceed.
- The use of high voltage easements for cycleways and/or greenways should be provided outside the current easement right-of-way.
- Transport connections to the south of NWPGA towards St Marys and Mount Druitt is considered important to critical to connect key activity centres and emerging nodes.
- Revised structure plan should show proposed regional connections.
- The International Transmitter Station is a conservation area and transport corridors at the surface level through this area should be avoided.
- Bandon Road considered an important east-west link to Vineyard and Vineyard Station.
- Bandon Road at Windsor Road will need to connect to Boundary Road at Box Hill.
- Collector road missing from the structure plan connecting southern end of Bandon Road (at Richmond Road) and Garfield Road within Marsden Park.
- Consideration of Schofields as a major transport hub in the future.
- Pedestrian connectivity not considered in current structure plan and some ILPs.

Land Use

- Good transport access and connectivity required to enable Marsden Park as a strategic centre.
- Unclear of the definition of strategic centre.
- Potential to increase land use densities within NWPGA as denser built forms are becoming popular and the land capacity to provide more.
- It is unlikely that any changes will be made to existing ILPs.
- The number of neighbourhood centres have been reduced from the current Structure Plan.
- Potential to increase densities around Schofields.

Flooding and Evacuation

- North West Sydney has the potential for one of the largest flood vents in NSW.
- Flood evacuation paths include Richmond Road and Windsor Road.
- Need to ensure that sufficient road capacity is provided to allow for full evacuation in extreme flooding events.
- Increases in current densities will require more people to be evacuated and needs to be considered as part of the structure plan review.

PROJECT TEAM CONSULTATION – LAND USE AND CENTRES

A meeting was held with TfNSW, DPE, Jacobs and AECOM on 05 May 2015, to gain an understanding of the land use and centre planning approach in relation to NWPGA. The following issues were identified at the meeting:

- The location of centres will based on outcomes of the draft plan discussion workshop held on 29 April 2015.
- Several neighbourhood centres have been removed from the previous Structure Plan.
- Rouse Hill downgraded to a strategic centre instead of regional centre.
- Marsden Park nominated as a strategic centre with an employment focus.
- Strategic centres do not have a clear definition but comprises up to 10,000 jobs, education and open space uses, etc.
- Schofields to be a designated town centre and a key transport hub.
- Riverstone West will no longer have the IMT and a development proposal for office / business park / warehouse distribution land uses.
- Open space will need to consider the green grid.

TFNSW CONSULTATION – BUS NETWORK PLANNING

A meeting was held with TfNSW on 06 May 2015, to gain an understanding of TfNSW's requirements in relation to bus planning for NWPGA. The following issues were identified at the meeting:

- The process TfNSW has followed in developing the current NWPGA bus network is as follows:
  - 2009 – MR Cagney NWPGA Bus Network Report
  - 2012 – Update to MR Cagney report
  - 2012 – Long Term Transport Master Plan
  - 2013 – Sydney's Bus Future
  - 2014 – Bus and Rapid Network Development (BRND) update of MR Cagney Report
  - Consultation at officer level with Transport Services Division
  - Utilised Integrated Layout Plans (2014)
- Differences between the TfNSW and MR Cagney networks is as follows:
  - R1, R2, R3 removed.
  - R2 replaced with a local route between Vineyard and Rouse Hill.
  - New Rapid Route Between Blacktown - Rouse Hill.
  - New Suburban Route Rouse Hill - Penrith.
  - New Suburban Route Rouse Hill - Prairiewood.
  - Route D5 route changed and sent to Penrith instead of Mount Druitt.
  - Route R5(D) new route alignment into Blacktown.
  - Route R4(D) new route alignment into Blacktown and sent to Richmond via UWS.
  - D1, D2, D3 all changed through Box Hill to enable D2 to service Box Hill North.
  - D6 route changed to follow ILP road network & service north Rouse Hill.
  - New Route D4(A) from Blacktown - Schofields
  - D7 and R5(D) merged at Riverstone.
  - T74 sent to Castle Hill instead of Blacktown.
  - 752 using current alignment to Rouse Hill instead of servicing Schofields
- Differences between Jacobs and TfNSW bus networks were compared. The two networks are broadly similar, with the following exceptions:
  - The TfNSW rapid route terminates at Rouse Hill rather than extending to Parramatta. The reasoning given is that there is an intention to operate Hurstville – Parramatta – Rouse Hill services. Extending it to Blacktown would create a 70+ km route that would be susceptible to reliability issues given its long length.
  - The TfNSW network has two suburban routes compared to five suburban routes in the Jacobs network. It was agreed for our suburban network to be consistent with the TfNSW suburban network. The remaining three suburban services would be included in the local service network.
  - TfNSW advised the demand for bus services from Rouse Hill is to Macquarie Park and Sydney CBD rather than Parramatta.
  - TfNSW advised there are three sub-tiers of local routes.

JACOBS