

Review of State Government Rail and Land Use Plans Sydney Phase A report

*Department of
Infrastructure,
Regional Development
and Cities*

*Review of State
Government Rail and
Land Use Plans
REFRESH*

January 2019

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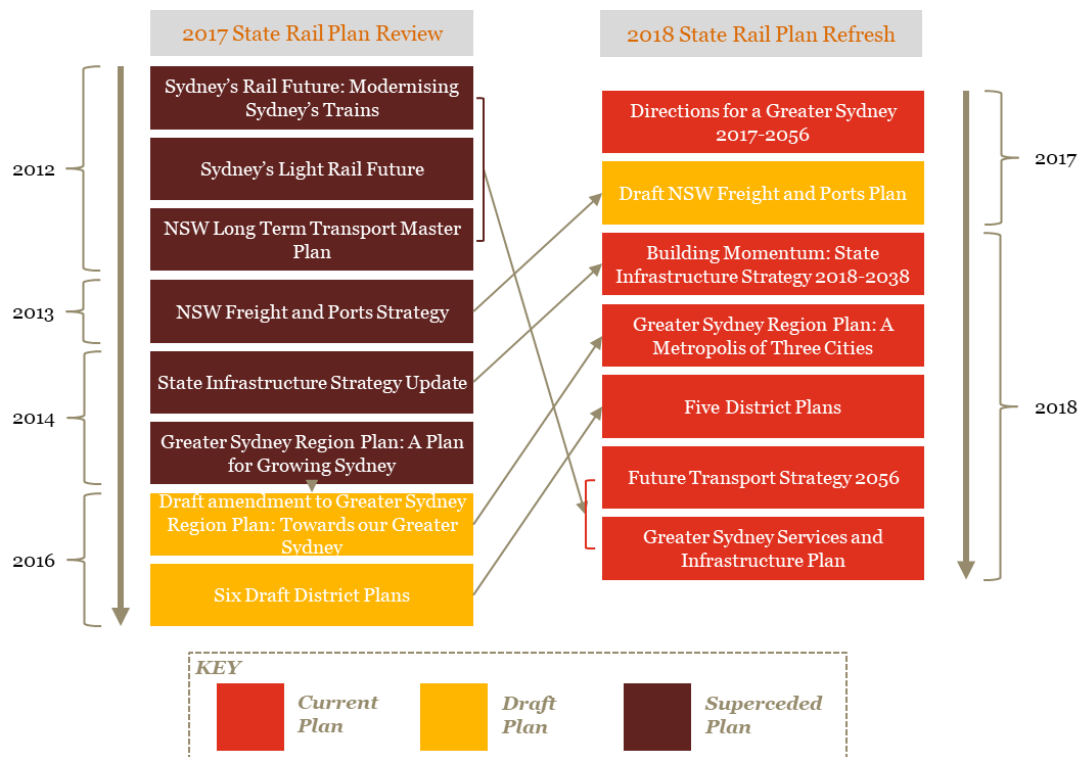
Executive summary

PricewaterhouseCoopers (PwC) was engaged by the Department of Infrastructure, Regional Development and Cities (DIRDC) to undertake a study of state rail and land use plans. The study is designed to articulate the objectives of the current endorsed plans, and assess the degree of alignment within the State's plans and with Australian Government objectives.

This report sets out the key findings from the study. The focus of this report is recently refreshed and updated NSW State plans as they relate to the capital city of Sydney. The study area includes the Sydney metropolitan rail network and the regional rail network, where it is situated within the Greater Sydney boundary.

The report documents the scope and approach of current NSW transport and land use plans, tests the alignment of transport and land use planning, and analyses the treatment of specific projects across the plans.

Figure 1. Current and superseded plans NSW



Source: PwC analysis.

According to PwC analysis, the three transport plans from 2012 (*Sydney's Rail Future: Modernising Sydney Trains*, *Sydney's Light Rail Future* and the *NSW Long Term Transport Master Plan*) have been superseded by the 2018 reports *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*.

The current planning approach divides Greater Sydney into five Districts (Western City, Central City, Eastern City, North, South), whereas the superseded approach divided Greater Sydney into six Districts.

The updated plans are aligned and integrated across vision, modelling and outcomes that work towards Greater Sydney as a ‘Metropolis of three cities’

The finalised transport and land use plans have been developed concurrently to ensure integration and alignment, which can be shown through an aligned vision for Greater Sydney, inputs and integrated modelling, transport and land use outcomes, and treatment of Western Sydney.

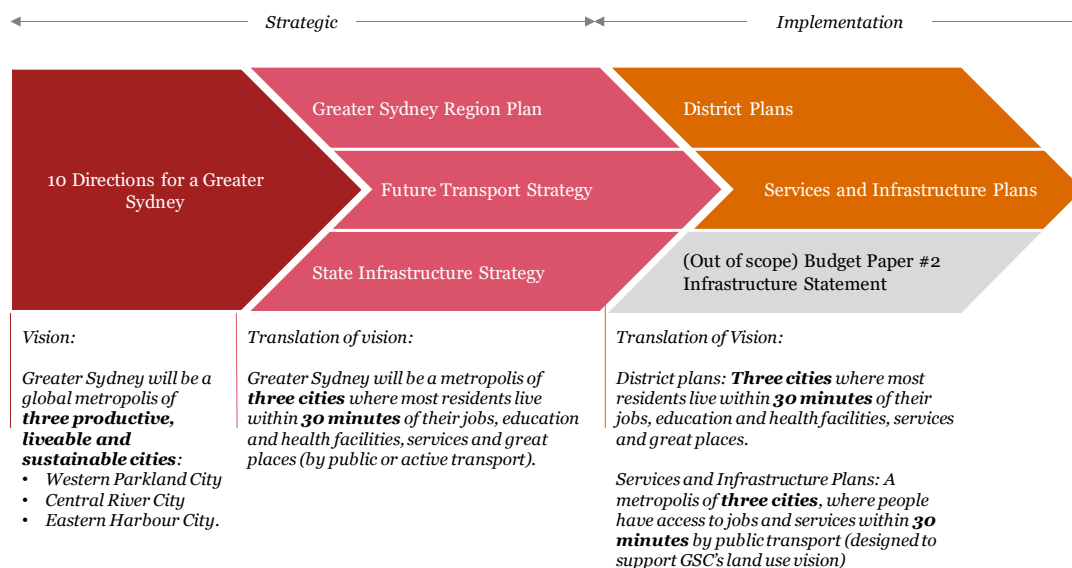
Vision statements are aligned across the in scope plans

Figure 2 shows all in-scope plans have an aligned long term vision and strategic direction for the Greater Sydney region, based on the vision and 10 directions set by the GSC in *Directions for a Greater Sydney 2017-2056*.¹

The 10 Directions for a Greater Sydney are:

- a city supported by infrastructure
- a city for people
- housing the city
- a city of great places
- jobs and skills for the city
- a well-connected city
- a city in its landscape
- an efficient city
- a resilient city
- a collaborative city.

Figure 2. Alignment of vision across plans



Source: GSC, Greater Sydney Region Plan: A Metropolis of Three Cities, March 2018; PwC analysis.

As Figure 2 shows, the visions in the three streams of reports are highly consistent, linked by a focus on three cities and access to jobs and services within 30 minutes.

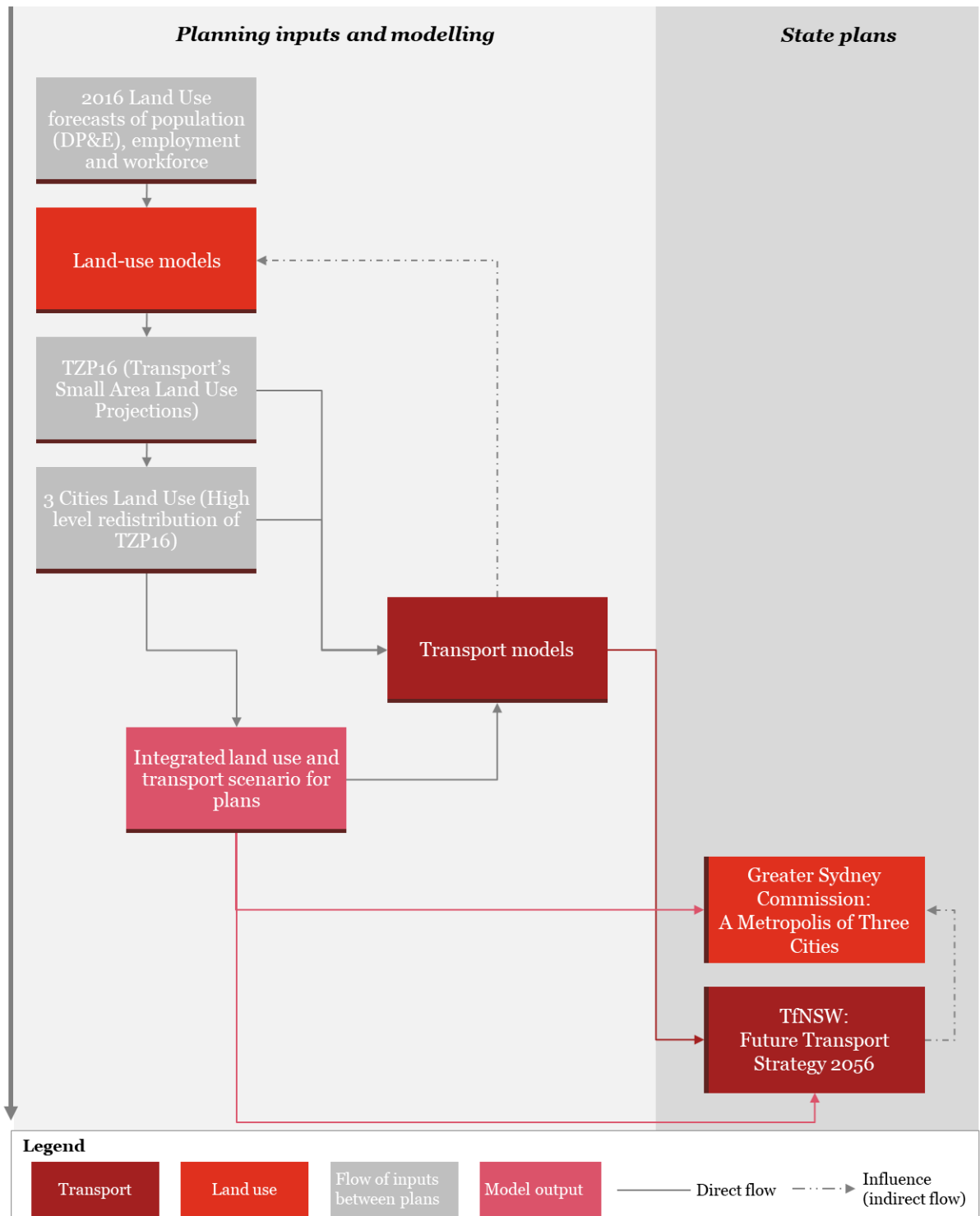
¹ The Draft Freight and Ports Plan does not state this vision as it is a people-based vision less applicable to freight. However, it does clearly state and show its alignment with the *Future Transport Strategy 2056*.

Aligned inputs and integrated modelling are used across the in scope plans

Transport and land use planning is an iterative process, with outputs from a sequence of land use plans forming inputs into transport plans and vice versa. An integrated modelling process determines (1) how land-use assumptions will affect transport demands and (2) how the transport plans can influence the desired urban form.

The planning process for Sydney began with land use inputs, modelling and assumptions, which fed into transport modelling, and then cycled iteratively until both models produced a consistent scenario as shown in Figure 3.

Figure 3. NSW integrated land use and transport planning – flow of inputs and outputs of the modelling process and into plans



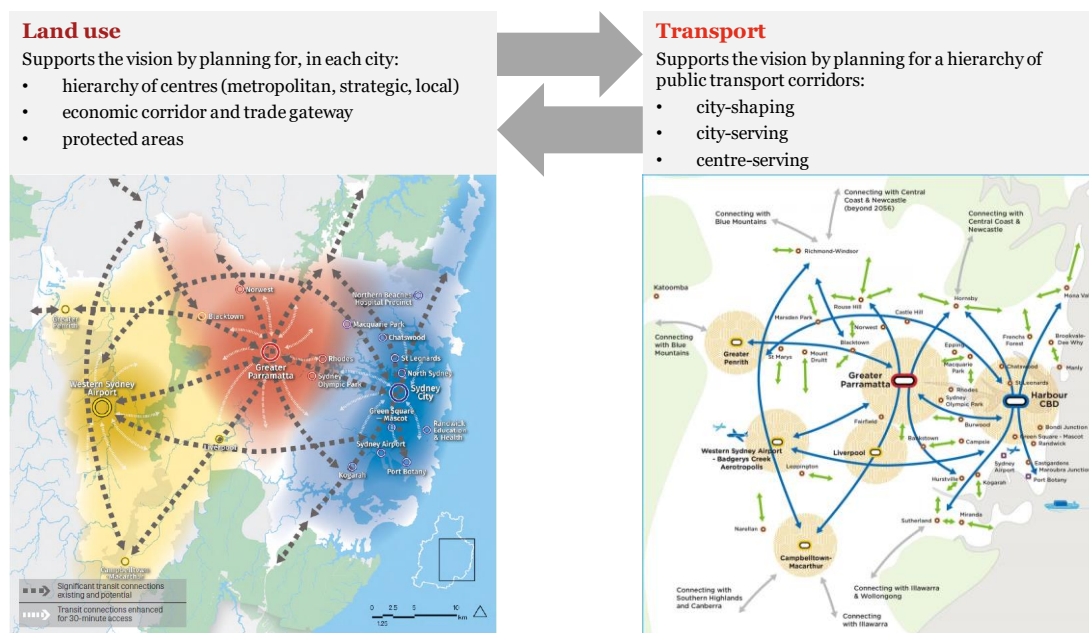
Source: PwC analysis.

As Figure 3 shows, the in-scope plans are aligned in that they use a consistent land use forecast for population and employment – the “three cities forecast” – as a strategic input. In the case of transport planning, the higher level three cities forecast has been used in conjunction with the more granular LU16 forecasts.

The in scope plans are aligned in their outcomes

All in-scope plans are aligned with a movement from a monocentric city with a radial transport network to the central CBD, to a polycentric city or ‘metropolis of three cities’, which services an interconnected system of cities and centres with accessible 30-minute catchments. Transport and land use plans also target the same corridors for access to and from the same centres. This is shown in Figure 4.

Figure 4. Aligned transport and land use outcomes



Source: GSC, Greater Sydney Region Plan: A Metropolis of Three Cities; Future Transport Strategy 2056; PwC analysis.

The in scope plans are aligned on delivery of Western Sydney investment

All transport and land use plans have an aligned focus on catalysing the development of the Western Parkland City over the next 20 to 40 years. They do this by:

- enabling and responding to the commitments in the Western Sydney City Deal
- using the Long Term Preferred Network identified through the Western Sydney Rail Needs Scoping Study for rail network planning
- integrating planning to ensure sufficient connectivity to/within strategic and metropolitan centres - the major planned transport corridors shape the city based on the urban structure determined through land use plans.

The updated plans more completely and consistently address NSW’s transport and land use planning objectives than those reviewed in 2017

The in scope plans were assessed for their alignment to five State Government planning objectives. These objectives capture the intent of the planning process in a standardised way, allowing for comparisons between plans and between states.

Table 1 shows the plans address the five State Government objectives, either explicitly or implicitly. As such, the updated plans more completely and consistently address the

overarching state objectives than those assessed in 2017. The updated plans focus these objectives around managing Greater Sydney's forecast population growth.

Table 1. Consistency of reference to State government objectives

Plan	Accessibility	Connectivity	User centricity	Economic Growth	Sustainability
Directions for a Greater Sydney 2017-2056	●	●	●	●	●
Greater Sydney Region Plan: A Metropolis of Three Cities and five District Plans	●	●	●	●	●
Future Transport Strategy 2056 and Greater Sydney Services and Infrastructure Plan	●	●	●	●	●
Draft NSW Freight and Ports Plan	●	●	●	●	●
Building Momentum: State Infrastructure Strategy 2018-2038	●	●	●	●	●

Source: PwC analysis.

The updated plans set a unique direction for the public transport network in each city, and consistently reference major rail projects to implement the direction

Major committed, for investigation and visionary rail infrastructure projects are consistently referenced across the updated plans – for example, Sydney Metro, CBD and South East Light Rail, North-South Rail Link, Parramatta Light Rail, Outer Sydney Orbital, and investment in freight corridors. The updated plans set a unique direction for the public transport network in each city, and consistently reference major rail projects to implement the direction

Alignment was observed with the state plans, and the state plans are aligned with Australian Government objectives

Overall, on the basis of plans reviewed in this report, evidence of alignment between the state government plans was found along six dimensions - vision, inputs, outcomes, Western Sydney focus, state government objectives and projects.

Further, on the basis of plans reviewed, the state plans are aligned with Australian Government objectives. These objectives centre on productivity, liveability and housing supply.

In the state plans, transport is conceived as an enabler of economic and social activity, and contributes to long term economic, social and environmental outcomes, thus addressing productivity and liveability.

State land use plans address liveability, housing supply and productivity by targeting densification of population and employment in under-developed centres and urban renewal. This planning direction will address both housing supply and create the density required to support mass transit.

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1 *Introduction*

PricewaterhouseCoopers Consulting (Australia) Pty Limited (PwC) was engaged by the Department of Infrastructure, Regional Development and Cities (DIRDC) to undertake a study of state rail transport and land use plans for five cities². This report sets out the key findings from the study, and is an update of the 'Review of State Rail and Land Use Plans' for Sydney, New South Wales (NSW) issued to DIRDC on 17 November 2017.

1.1 *Objective*

The aims of this activity are to analyse state urban rail plans and land use objectives; and the degree of alignment between state government and the Australian Government objectives. The analysis has focused on understanding how the plans will:

- drive productivity growth by improving connections to employment and services, promoting agglomeration economies and contributing to a more efficient transport network including through the efficient movement of freight
- improve liveability and public amenity by reducing congestion and improving accessibility, and reducing commute times
- increase housing supply by promoting higher density development in close proximity to rail stations and through urban renewal, supporting broader efforts to improve housing affordability.

The three policy objectives are broadly consistent with the Australian Government's policy objectives for Smart Cities.

1.2 *Approach*

The study has included the following phases:

- A structured review of existing land use and transport plans that enables:
 - clear articulation of the key land use and transport objectives that each State Government is planning to deliver
 - identification of those rail-based projects planned to deliver these objectives
 - alignment between State and Australian Government objectives.

1.3 *Scope*

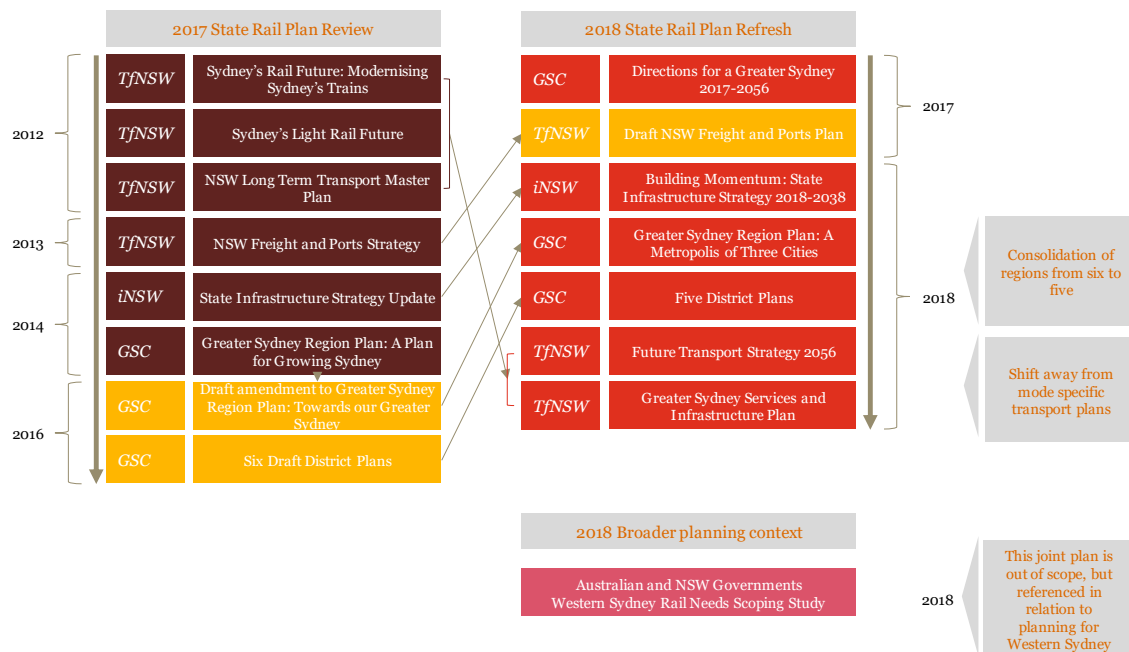
This report analyses land use and transport plans which have been endorsed by the NSW State Government and were publicly released by the 10th of September 2018 when the review commenced. Since PwC's initial analysis was performed in May-June 2017, seven plans have been updated.

² The reports focus on Sydney, Melbourne, Perth, Adelaide and Brisbane

1.3.1 Land use and transport plans

All of the plans assessed in the original ‘Review of State Rail and Land Use Plans’ for Sydney, issued to DIRDC on 17 November 2017, have been superseded. Figure 5 lists the plans in scope for this report, details their relationship to plans reviewed in 2017, and sets out a publication timeline for all plans.³ It also shows the Western Sydney Rail Needs Scoping Study, which is out-of-scope as it is not a formal state-government transport or land use plan and is an input to NSW’s endorsed transport plans. However, it is shown in the diagram as it is part of the broader planning context.

Figure 5. Current and superseded plans NSW



Source: PwC analysis

As Figure 5 shows, this report analyses seven plans published in final and draft over 2017 and 2018. An overview of the plans is provided in Table 2 including their responsible agencies, mode and date of publication.

³ PwC notes that the Draft NSW Freight and Ports Plan was finalised and released publicly by TfNSW on the 25th of September 2018. Due to project timelines the Draft Plan is reviewed in this document.

Table 2. Transport and land-use plans in-scope for review

Agency	Title	Date of publication	Period of coverage	Modes	
				Passenger	Freight
Greater Sydney Commission	Directions for a Greater Sydney 2017-2056	2017	2017 - 2056	Road,	Road,
	Greater Sydney Region Plan: A Metropolis of Three Cities	2018	Vision: 2018 - 2056 Plan: 2018 - 2038	Public Transport (bus, heavy rail, light rail, ferry),	Heavy rail
	Greater Sydney District Plans (for the Western City, Central City, Eastern City, North and South districts)	2018	2018 - 2038	Active Transport (walking, cycling)	
TfNSW	Future Transport Strategy 2056	2018	2018 - 2056		Road,
	Greater Sydney Services and Infrastructure Plan	2018	2018 - 2056		Heavy rail,
	Draft NSW Freight and Ports Plan*	2017	2018 - 2036+		Shipping, Air
Infrastructure NSW	Building Momentum: State Infrastructure Strategy 2018-2038	2018	2018 - 2038		Road, Heavy Rail

* The final NSW Freight and Ports Plan is scheduled to be released in 2018 as part of the Future Transport 2056 Strategy.

1.3.2 Study area

Figure 6 illustrates the study area and rail corridors in scope for the review of Sydney land use and transport plans.

Figure 6. Study area for Sydney region

[Placeholder – to be updated when TfNSW share the new GSC district boundaries in GIS in 2019]

Source: TBD.

The study area has been determined with reference to the boundary applied by the Greater Sydney Commission in the 2018 District Plans. It covers 1,195,609 hectares. In scope rail corridors are defined by the suburban network (Sydney Trains) and the intercity network (TrainLink). Study specific modifications to the district boundaries are detailed in Table 3.

Table 3. Sydney region definitions and modifications

Rail lines included in the Greater Sydney boundary defined by the GSC	Modification	Revised boundary for this review
Central Coast & Newcastle Line to Hawkesbury River	Boundary shortened by two stops to nearest major station	Central Coast & Newcastle Line to Berowra
Blue Mountains Line to Katoomba	No modification	Blue Mountains Line to Katoomba
Southern Highlands Line to Bargo	Boundary extended to next major station	Southern Highlands Line to Bowral
South Coast Line to Waterfall	Boundary extended to include rail junction with Port Kembla	South Coast Line to Coniston

Source: PwC Analysis.

1.3.3 *Report structure*

The report structure is outlined below in Table 4.

Table 4. Report structure and description of contents

Section	Title	Description
Section 2	Overview of land use and transport planning	This section identifies the agencies responsible for land use and transport planning in NSW, defines the study area for Sydney, and reviews the most recent published land use and transport plans for the rail network in this area.
Section 3	Integration of land use and transport plans	This section analyses the integration between the land use and transport plans summarised in Section 2. This analysis is limited to plans that are endorsed by the NSW Government, notwithstanding the land use and transport planning currently under Government consideration.
Section 4	Alignment of land use and transport plans	<p>This section provides an overview of NSW's land use and transport planning objectives, and:</p> <ul style="list-style-type: none"> • compares these objectives to those of the Australian Government • considers the extent to which objectives are consistently aligned between state plans • considers the extent to which plan objectives are met by the projects and outcomes articulated in the plans.
Section 5	Rail network planning	This chapter outlines the rail projects that are currently proposed, in planning, in progress or complete in NSW. The projects are understood to include those confirmed in <i>Future Transport Strategy 2056</i> and associated plan(s), as well as the <i>State Infrastructure Strategy 2018-2038</i> and associated plan(s).

2 Rail and land use planning overview

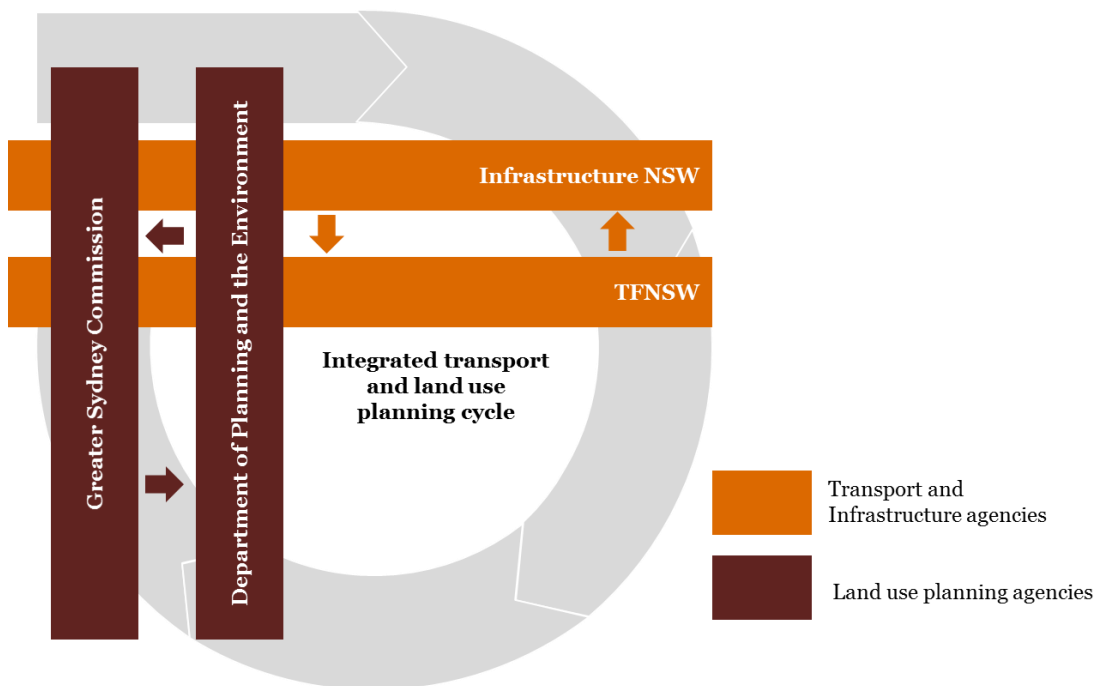
This section identifies the agencies responsible for rail and land use planning in NSW, defines the study area for Sydney, and reviews the most recent published transport and land use plans for the rail network in this area.

2.1 Responsible agencies

The relationship between land-use and transport planning is a mature one in NSW. Since the release of the *NSW Long Term Transport Master Plan* in 2012, transport planning has been integrated with land-use planning to ensure that appropriate services are provided to meet the needs of future growth and that best use is made of infrastructure and investment.

Figure 7 provides an overview of the relationships between the different bodies in the integrated transport and land use planning cycle.

Figure 7. Relationships between responsible agencies, NSW



Source: PwC

As Figure 7 illustrates, the land use bodies input into each other, as do separate transport and infrastructure bodies. Over the course of an integrated planning and land use cycle, outputs and inputs from each stream of planning are connected.

For the in-scope reports, it is understood that in this planning cycle land use inputs were developed first by the Greater Sydney Commission, starting the cycle of land use and transport integration illustrated in Figure 7.

Several government agencies and bodies in NSW are involved in the development of land use and transport plans, including:

Greater Sydney Commission (GSC)

The GSC was established in January 2016 as a new independent and dedicated body with statutory responsibilities under the *Greater Sydney Commission Act 2015*. The GSC is responsible for strategic metropolitan planning to support the development of the Greater Sydney region, working with state and local government.

The GSC has been established to play an intermediary role between state and local government planning. The GSC is led by four Greater Sydney Commissioners, supported by five District Commissioners aligned to the plans' districts.

The agency is responsible for the delivery of the *Greater Sydney Region Plan: A Metropolis of Three Cities*, and the *Greater Sydney District Plans* (for the Western City, Central City, Eastern City, North and South districts).

Department of Planning and Environment (DP&E)

DP&E is responsible for strategic planning to support the development of NSW. In particular, it:

- is responsible for developing regional land use plans for the regions outside Greater Sydney
- contributes to the planning for Greater Sydney, including structure planning for growth areas
- is responsible for local area planning and zoning
- assesses project proposals to ensure employment needs are balanced with community and environmental needs
- develops planning policies for government state and local governments.

Transport for NSW (TfNSW)

TfNSW is responsible for transport strategy, planning, policy, regulation, funding allocation and other non-service delivery functions for all modes of passenger and freight transport in NSW. This includes road, rail, ferry, light rail and active transport.

TfNSW was established in 2011, taking on responsibilities previously held by Transport Construction Authority, the Country Rail Infrastructure Authority, and the planning and coordination functions of RailCorp, the State Transit Authority and Roads & Maritime Services. RailCorp was further restructured in 2012, with operation and maintenance functions absorbed by Sydney Trains and NSW Trains,⁴ leaving RailCorp with asset ownership functions. Sydney Trains in particular, actively participate in urban planning around projects in their jurisdiction.

The agency is responsible for the delivery of the *Future Transport Strategy 2056*, *Greater Sydney Services and Infrastructure Plan* and *Draft NSW Freight and Ports Plan*.

Infrastructure NSW (iNSW)

iNSW was established in July 2011 “to assist the NSW Government in identifying and prioritising the delivery of critical public infrastructure for NSW”.⁵ It is an independent statutory agency, established under the *Infrastructure NSW Act 2011*.

⁴ NSW Trains manages the operation of NSW TrainLink. See <https://www.transport.nsw.gov.au/nswtrains>

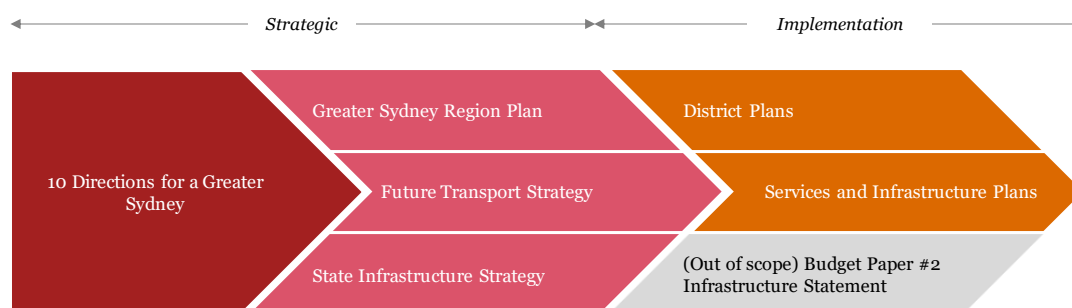
⁵ <http://www.infrastructure.nsw.gov.au/about-us.aspx>, Accessed 2017.

The agency is responsible for the delivery of sectoral State infrastructure strategy statements (i.e. *State Infrastructure Strategy 2018-2038*), which identify major infrastructure projects to be undertaken as a priority.

2.2 Summary of in-scope plans

This section summarises the current in-scope land use and transport plans for Greater Sydney. The in-scope plans were developed in a sequence of strategic and then implementation plans, as illustrated in Figure 8.

Figure 8. In scope-plan development sequence



Source: Greater Sydney Commission, *Greater Sydney Region Plan: A Metropolis of Three Cities – Connecting People*, March 2018, p.24.

As Figure 8 shows, the GSC's *Directions for a Greater Sydney 2017-2056* sets the strategic vision for the in scope plans. Note only a subset of the plans in are in scope for this updated report.

Directions for a Greater Sydney 2017-2056

<i>Background</i>	<p><i>Directions for a Greater Sydney 2017-2056</i> was published in 2017 by the GSC to better integrate land use, transport and infrastructure planning.</p> <p>It is not a strict planning document. However, it sets the governing vision for Greater Sydney to 2056 and 10 directions to realise the vision, which forms the basis for integrated land use, transport and infrastructure plans. It also outlines the policies and plans to which the NSW Government has currently committed to provide clarity about the current state and set the foundation for planning and growth.</p>
<i>Date released / issued</i>	2017
<i>Status</i>	Official NSW Government vision and directions for the 40 year period between 2017 and 2056
<i>High level objectives</i>	<p>Vision to 2056: Greater Sydney will be a global metropolis of three <i>productive, liveable and sustainable</i> cities: Western Parkland City, Central River City and Eastern Harbour City.</p> <p>10 Directions for a Greater Sydney:</p> <ul style="list-style-type: none"> • a city supported by infrastructure • a city for people • housing the city • a city of great places • jobs and skills for the city • a well-connected city • a city in its landscape • an efficient city • a resilient city • a collaborative city.

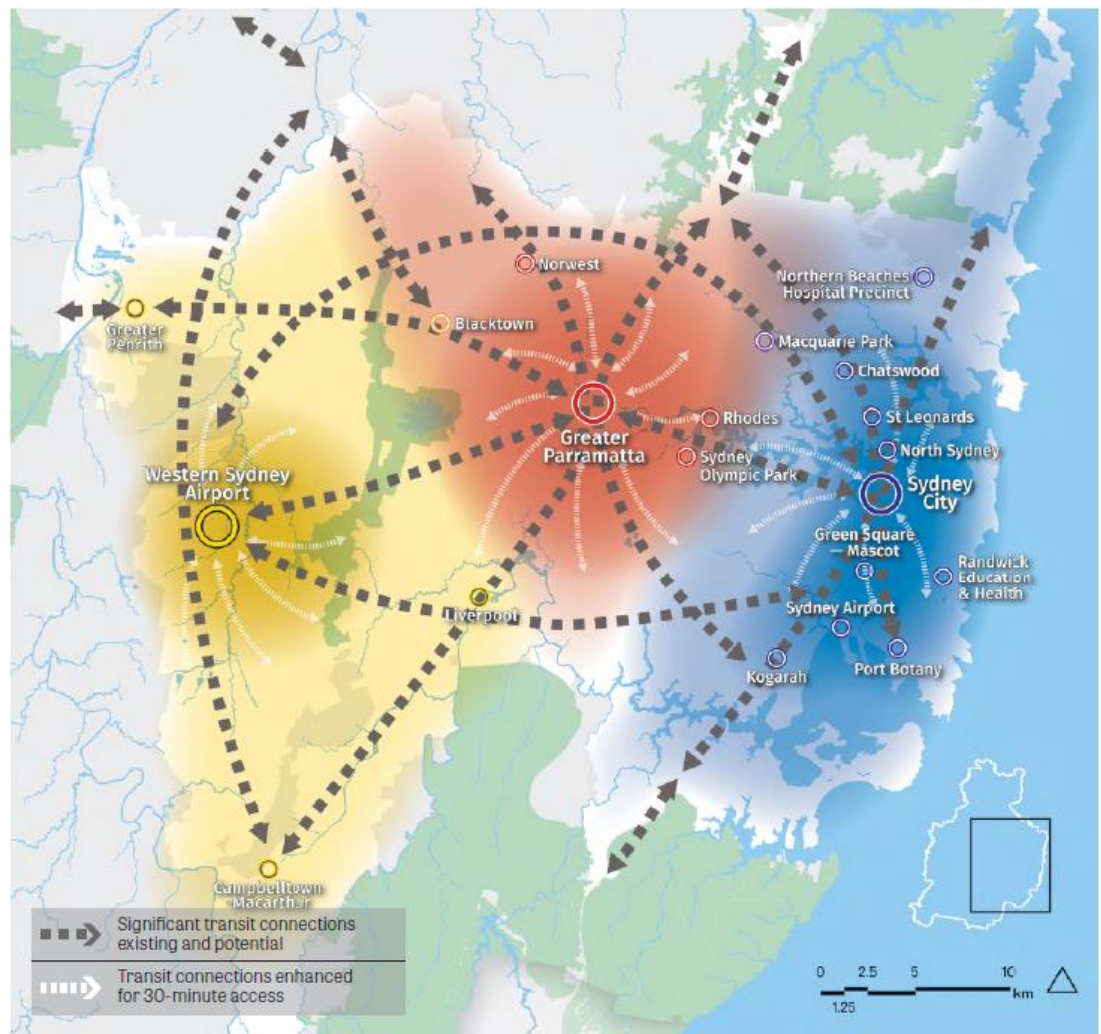
Directions for a Greater Sydney 2017-2056 (continued)

<i>Stated targets or metrics</i>	<p>No explicit targets or metrics. However, some directions mention targets such as:</p> <ul style="list-style-type: none"> • sustained population growth over the coming decades will require a minimum of 36,250 new homes every year • increasing the region's economic activity to \$655 billion by 2036 • required employment growth of 817,000 jobs • 30-minute public transport access to one of the three cities and/or the nearest district/strategic centre seven days a week.
<i>Geographic boundary</i>	<i>Directions for a Greater Sydney 2017-2056</i> applies to the Greater Sydney region, illustrated in Figure 9.
<i>Modes</i>	<i>Directions for a Greater Sydney 2017-2056</i> does not specifically highlight particular modes of transport. As a vision and direction document, it is assumed to consider all modes of transport. However, in considering the current state, it sets out key rail, light rail and road projects already committed by the NSW Government.
<i>Passenger/freight</i>	<i>Directions for a Greater Sydney 2017-2056</i> considers both the passenger and freight network at a high level.
<i>Timeframe</i>	<i>Directions for a Greater Sydney 2017-2056</i> provides a 40-year vision and directions.
<i>Relationship to other plans</i>	<p><i>Directions for a Greater Sydney 2017-2056</i> builds upon the superseded draft Greater Sydney region plan: <i>Towards our Greater Sydney 2056</i> (2016).</p> <p><i>Directions for a Greater Sydney 2017-2056</i> is the governing document upon which all other current in-scope plans have been developed, as shown in Figure 8 above. These plans respond to and build on the directions outlined in <i>Directions for a Greater Sydney 2017-2056</i>, ensuring integrated land use, transport and infrastructure planning and delivery.</p> <p><i>Directions for a Greater Sydney 2017-2056</i> also outlines the policies and plans to which the NSW Government has currently committed, to set the foundation for future planning.</p>

Figure 9 illustrates the study area underpinning *Directions for a Greater Sydney 2017-2056*. It highlights three priority centres, or cities, consistent with the superseded plan *Towards our Greater Sydney 2056*:

- Western Parkland City (focussed around WSA)
- Central River City (focussed around Greater Parramatta)
- Eastern Harbour City (focussed about Sydney city centre).

Figure 9. Indicative study area for Directions for a Greater Sydney 2017-2056



Source: Greater Sydney Commission, *Directions for a Greater Sydney 2017-2056*, 2017.

Greater Sydney Region Plan: A Metropolis of Three Cities, and the five District Plans

Background	<p><i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> and the five <i>District Plans</i> were published in March 2018 by the GSC as final land use plans.</p> <p>The <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> integrates land use, transport and infrastructure planning between the three tiers of government and across State agencies. It sets the planning framework for the five districts which make up the region and:</p> <ul style="list-style-type: none"> • sets a 40-year vision (to 2056) and a 20-year plan to manage growth and change for Greater Sydney in the context of social, economic and environmental matters • informs district and local plans and the assessment of planning proposals • assists infrastructure agencies to plan and deliver for growth and change, and to align their infrastructure plans to place-based outcomes • informs the private sector and the wider community of the growth management and infrastructure investment intentions of government. <p>The five <i>District Plans</i> are a guide for implementing <i>A Metropolis of Three Cities</i> at a District level. They are 20-year plans to achieve the 40-year vision for Greater Sydney. They are designed to connect longer-term metropolitan planning by the NSW Government with local planning by local government.</p> <p>Consistent with <i>Directions for a Greater Sydney 2017-2056</i>, the plans seek to develop Greater Sydney into a metropolis of three unique but connected cities:</p> <ul style="list-style-type: none"> • Western Parkland City • Central River City • Eastern Harbour City. <p>Each city will be supported by metropolitan (Harbour CBD, Greater Parramatta or in the Western City cluster, WSA-Badgerys Creek Aerotropolis, Greater Penrith, Liverpool and Campbelltown-Macarthur), strategic and local centres.</p>
Date released / issued	March 2018
Status	Official NSW Government land use plans that provide a 40-year vision and 20-year plans for the Greater Sydney region and five Districts.
High level objectives	<p>Vision: Three cities where most residents live within 30 minutes of their jobs, education and health facilities, services and great places.</p> <p>Four high level objectives aligned with the <i>Directions for a Greater Sydney 2017-2056</i>:</p> <ul style="list-style-type: none"> • infrastructure and collaboration (encompass directions 1-2) • liveability (encompass directions 3-5) • productivity (encompass directions 6-7) • sustainability (encompass directions 8-10).

Greater Sydney Region Plan: A Metropolis of Three Cities, and the five District Plans (continued)

<i>Stated targets or metrics</i>	<p>Targets</p> <p>Specific targets referenced in the plans include:</p> <ul style="list-style-type: none"> • 30-minute public transport access to one of the three metropolitan centres/clusters (or cities) and to services in their nearest strategic centre seven days a week • increasing the region's economic activity to \$655 billion by 2036 • required employment growth of 817,000 jobs • developing a network of 34 strategic centres • increasing the urban tree canopy to 40 per cent, up from the current 23 per cent <p>The plans reference (but do not provide specific targets):</p> <ul style="list-style-type: none"> • housing supply targets for each District (0-5 year, 6-10 year and 20-year) • job targets in each District Plan • a long-term objective for NSW to achieve net-zero emissions by 2050. <p>Metrics</p> <p>The plans list of potential indicators (or metrics) to track performance against directions and objectives:*</p> <ul style="list-style-type: none"> • increased 30-minute access to a metropolitan centre/cluster • increased use of public resources such as open space and community facilities • increased walkable access to local centres • increased housing completions (by type) • number of councils that implement Affordable Rental Housing Target Schemes • increased access to open space • percentage of dwellings located within 30 minutes by public transport of a metropolitan centre/cluster • percentage of dwellings located within 30 minutes by public transport of a strategic centre • increased jobs in metropolitan and strategic centres • increased urban tree canopy • expanded Greater Sydney Green Grid • reduced transport-related greenhouse gas emissions • reduced energy use per capita • number of councils with standardised state-wide hazard information
<i>Geographic boundary</i>	<p>Figure 10 illustrates the indicative study area, and Figure 11 shows the local government areas assigned to each District.</p> <p>The plans are focussed on the Greater Sydney region but do consider actions to improve connectivity with northern and southern regions outside Greater Sydney (e.g. Newcastle and Wollongong).</p>
<i>Modes</i>	<p>The plans include consideration of the following modes of transport:</p> <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail, ferry) • active transport (walking, cycling).
<i>Passenger/freight</i>	<p>The plans include initiatives for both the passenger and freight network.</p> <p>All transport initiatives have all been sourced from <i>Future Transport 2056</i>. They are in four categories: committed, investigation 0–10 years, investigation 10–20 years and visionary 20+ years. The latter three categories require further investigation and ultimately decisions of government on commitments to funding.</p>

* These are potential indicators only. It is noted that indicators will be developed in consultation with State and local government to optimise regional, district and local monitoring programs.

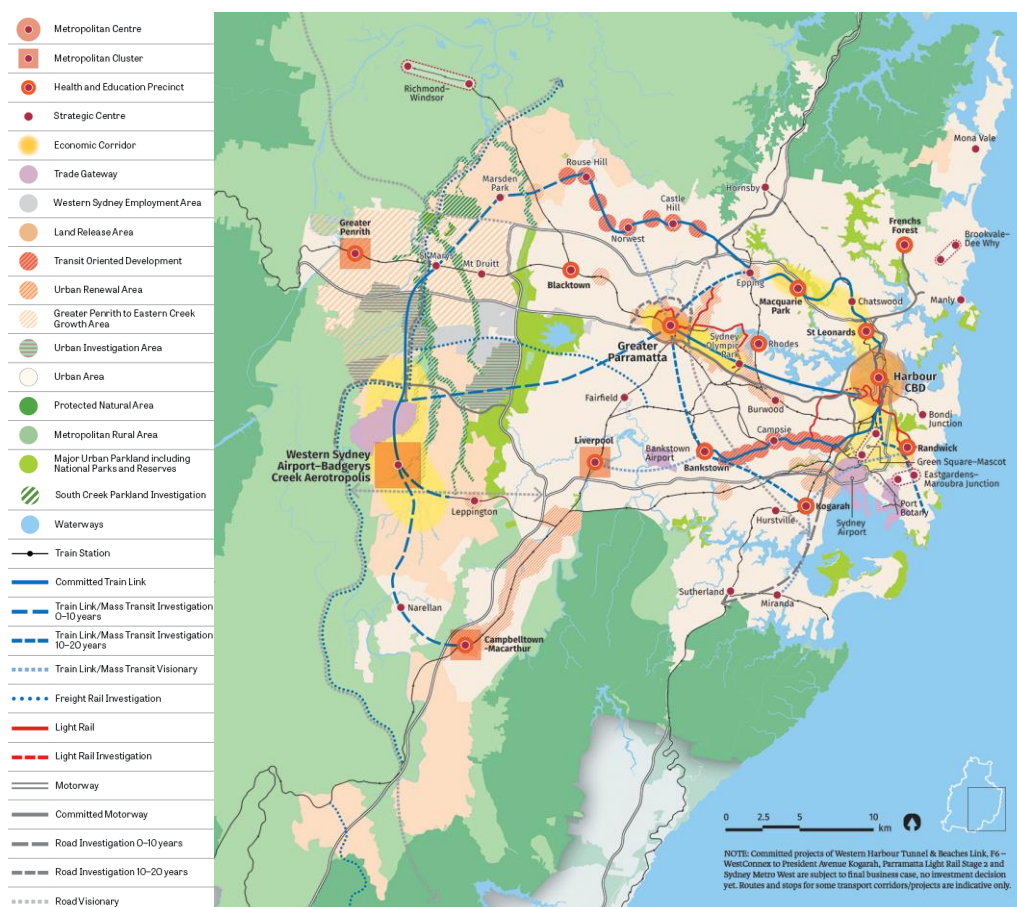
Greater Sydney Region Plan: A Metropolis of Three Cities, and the five District Plans (continued)

Timeframe	The plans provide a 40-year vision and 20-year planning strategy.
Relationship to other plans	<p>The plans replace the current <i>Greater Sydney Region Plan: A Plan for Growing Sydney</i> (2014) and build on the draft <i>Towards our Greater Sydney 2056</i> and six draft <i>District Plans</i> (2016).</p> <p>The concurrent preparation of the five <i>District Plans</i> with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> has optimised the integration of these plans. The plans have also been prepared concurrently with <i>Future Transport 2056</i> and <i>State Infrastructure Strategy 2018–2038</i> to align land use, transport and infrastructure outcomes for Greater Sydney for ‘the first time in a generation’.</p> <p>The plans outline how the <i>Directions for a Greater Sydney 2017–2056</i> is the starting point for delivering integrated planning. They also show how the alignment moves from the 10 directions to the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> to the five <i>District Plans</i>, as planning moves from setting to implementing direction.</p>

Figure 10 illustrates the study area of the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans*. Figure 11 shows the local government areas in each of the five Districts, which are different to the six Districts defined in *Towards our Greater Sydney 2056* and the original report issued to DIRDC.

In addition, the plans have a focus on the Western Sydney City Deal in driving the delivery of the WSA and Badgerys Creek Aerotropolis to stimulate the Western Parkland City. This is similar to *Towards our Greater Sydney 2056* and the six draft *District Plans*, as highlighted in the original report issued to DIRDC.

Figure 10. Indicative study area for Greater Sydney Region Plan: A Metropolis of Three Cities



Source: Greater Sydney Commission, *Greater Sydney Region Plan: A Metropolis of Three Cities*, March 2018.

Figure 11. Greater Sydney region and Districts



Source: Greater Sydney Commission, Greater Sydney Region Plan: A Metropolis of Three Cities, March 2018.

Future Transport Strategy 2056

Background	<p><i>Future Transport Strategy 2056</i> was published in March 2018 by TfNSW. It is an overarching strategy, supported by a suite of plans, to achieve a 40-year vision for NSW's transport system. It outlines a vision, strategic directions and customer outcomes, with infrastructure and services plans underpinning the delivery of these directions across NSW.</p> <p><i>Future Transport Strategy 2056</i> is a long-term plan that puts customers at the centre through 'co-operative design'. It prepares for rapid changes in technology and innovation to create and maintain a world class, safe, efficient and reliable transport system.</p> <p>It also builds on the achievements of previous transport plans and is integrated with land use and infrastructure plans. In particular, <i>Future Transport Strategy 2056</i> is aligned with the land use vision in the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>. It focusses on three types of corridors that have been developed to align with the land use vision, and to guide service levels and infrastructure investment:</p> <ul style="list-style-type: none"> • city-shaping corridors – major trunk road and public transport corridors providing higher speed and volume connections between cities and centres that shape locational decisions of residents and businesses • city-serving corridors – higher density corridors within less than 10km of metropolitan centres providing high frequency access to metropolitan cities/centres with more frequent stopping patterns • centre-serving corridors – local corridors that support, buses, walking and cycling, to connect people with their nearest centre and transport interchange.
Date released / issued	March 2018
Status	Official NSW Government strategy that provides a 40-year vision for NSW's transport system.
High level plan objectives	<p>Vision: Transport is an enabler of economic and social activity and contributes to long term economic, social and environmental outcomes.</p> <p>Greater Sydney vision: A metropolis of three cities, where people can access the jobs, education and services they need within 30 minutes by public or active transport.</p> <p>The visions are built on six outcomes to guide investment, policy and reform and service provision:</p> <ul style="list-style-type: none"> • customer focussed – customer experiences are seamless, interactive and personalised, supported by technology and data • successful places – the liveability, amenity and economic success of communities and places are enhanced by transport • a strong economy – the transport system powers NSW's future \$1.3 trillion economy and enables economic activity across the state • safety and performance – every customer enjoys safe travel across a high performing, efficient network • accessible services – transport enables everyone to get the most out of life, wherever they live and whatever their age, ability or personal circumstances • sustainability – the transport system is economically and environmentally sustainable, affordable for customers and supports emissions reductions.

Future Transport Strategy 2056 (continued)

<i>Stated targets or metrics</i>	<p>The strategy sets out performance focus areas and existing metrics:</p> <ul style="list-style-type: none"> • Maintain or improve customer satisfaction levels <ul style="list-style-type: none"> – monitor percentage of customers satisfied or highly satisfied using the NSW Customer Satisfaction Index. • Deliver transport initiatives that improve the liveability of places <ul style="list-style-type: none"> – monitor the application of Movement and Place principles to new or redesigned centres – increase the number of people able to access centres by walking, cycling and using public transport – develop indicators for transport enabled health and liveability outcomes. • Provide efficient public transport and road connections for passengers and freight <ul style="list-style-type: none"> – monitor the percentage of population within Greater Sydney with 30 minute or less access to their nearest strategic centre by public or active transport – monitor the percentage of towns and centres with day return public transport services to the nearest regional city – develop efficiency and productivity measurements for freight under the Freight and Ports Plan. • Deliver a safe and reliable network with zero trauma (fatalities and serious injuries)⁶ <ul style="list-style-type: none"> – monitor fatalities and serious injuries across the road and transport network – benchmark travel times for each mode – compare public transport travel times to private vehicle travel times on major metropolitan and regional corridors. • Provide whole of journey accessibility for customers regardless of age or ability <ul style="list-style-type: none"> – develop new measures for active and public transport accessibility to education, jobs and services along with regional and metro service affordability and fare parity – monitor infrastructure and service compliance with national disability standards – measure use and satisfaction by age, people with disability, people from Culturally and Linguistically Diverse (CALD) backgrounds and Aboriginal people. • Improve financial sustainability of transport in NSW and its contribution to net zero emissions <ul style="list-style-type: none"> – measure cost per service kilometre and overall cost recovery for public transport – measure cost effectiveness of road expenditure – measure energy efficiency of the vehicle fleet – measure mode shift to active and public transport and electric vehicle use – monitor transport-related greenhouse gas emissions and energy intensity.
<i>Geographic boundary</i>	<p>The strategy has an extended boundary definition beyond Greater Sydney to the NSW state borders. However, it defines the Greater Sydney transport system through strategic transport corridors (city-shaping, city-serving, centre-serving), as shown in Figure 12.</p>
<i>Modes</i>	<p>The strategy shifts the focus away from individual modes of transport and towards integrated solutions through issue-specific and place-based supporting plans. As such, it focuses more on strategic corridors than individual modes of transport, while including initiatives for the following modes of transport:</p> <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail, ferry) • active transport (walking, cycling).
<i>Passenger/freight</i>	<p>The strategy includes initiatives for both the passenger and freight network.</p>

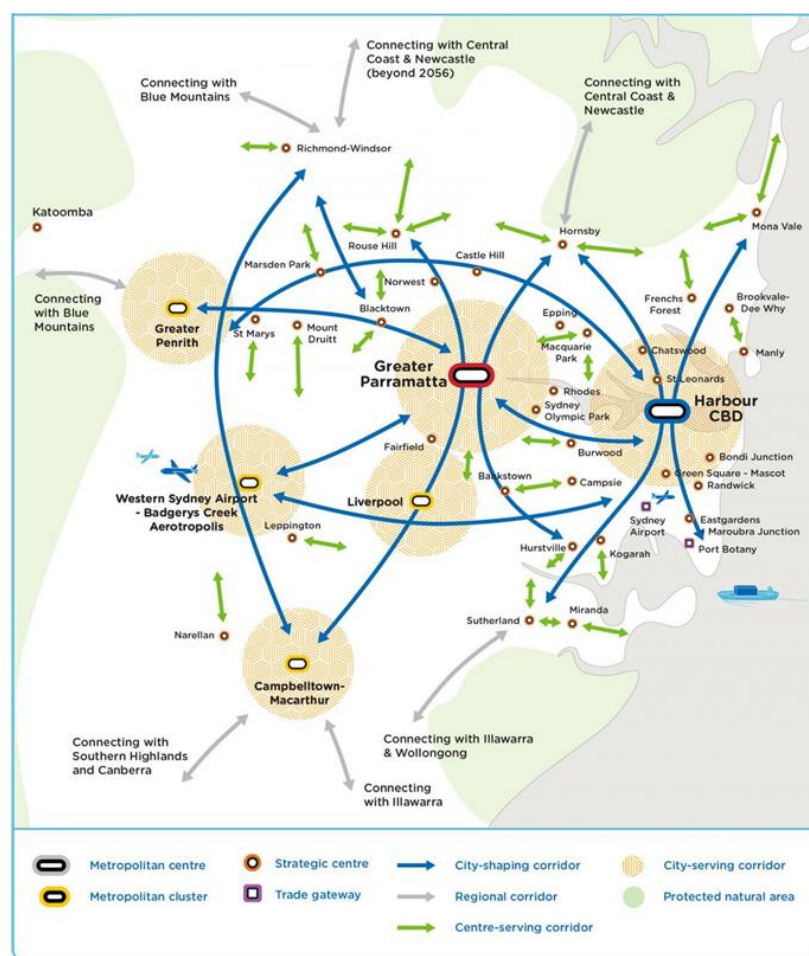
⁶ Based on the NSW Road Safety Plan 2021, TfNSW has set a State Priority Target to reduce fatalities by at least 30 per cent on 2008–2010 levels by 2021. In the longer term TfNSW's goal is to approach a trauma-free transport network towards 2056. While TfNSW references the whole transport network, this goal and associated initiatives appear focussed on the road network. See TfNSW, *Future Transport Strategy 2056*, March 2018, pp. 7–8.

Future Transport Strategy 2056 (continued)

Timeframe	<p>The strategy covers a 40-year period.</p> <p>Initiatives listed in the strategy are categorised as:</p> <ul style="list-style-type: none"> • committed/funded (0-10 years) • for investigation (0-10, 10-20 years) • visionary (20+ years).
Relationship to other plans	<p>The strategy, combined with the suite of supporting plans, replaces the <i>NSW Long Term Transport Master Plan</i> (2012) and supporting mode-specific plans.</p> <p>The strategy was prepared concurrently with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> to the five <i>District Plans</i>, as well as the <i>State Infrastructure Strategy 2018–2038</i>. This allowed for alignment of land use, transport and infrastructure outcomes for Greater Sydney. For example, the strategy specifically references and evidences its alignment with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>.</p> <p>The strategy's approach to technology-enabled mobility is underpinned by the <i>Future Transport Technology Roadmap</i>, delivered in 2016.</p>

The *Future Transport Strategy 2056* has an extended boundary definition beyond Greater Sydney to the NSW state borders. However, as this report is focussed on the Greater Sydney region, Figure 12 illustrates the Greater Sydney region and the strategic transport corridors associated with the *Future Transport Strategy 2056*. The strategic transport corridors show an integrated transport system, designed to achieve the vision in the *Greater Sydney Region Plan: A Metropolis of Three Cities*.

Figure 12. Indicative study area for Future Transport Strategy 2056



Source: TfNSW, Future Transport Strategy 2056, March 2018.

Greater Sydney Services and Infrastructure Plan

Background	<p><i>Greater Sydney Services and Infrastructure Plan</i> was published in March 2018 by TfNSW to support the delivery of the <i>Future Transport Strategy 2056</i>.</p> <p>It is a 40-year plan for transport in Greater Sydney that puts customers at the centre through 'co-operative design'. Building on the state-wide transport outcomes identified in the <i>Future Transport Strategy 2056</i>, it establishes the specific outcomes transport customers in Greater Sydney can expect and identifies the policy, service and infrastructure initiatives to achieve these. In particular, the plan defines the network required to achieve the service outcomes.</p> <p>The plan has been designed to support the land use vision for Greater Sydney set out in the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>, which influences the places the transport system will need to serve, the location of transport corridors and the level of service required. It also 'responds to the opportunities and challenges that will reshape city and the way people and goods move over the next 40 years'. As such, it focuses on:</p> <ul style="list-style-type: none"> • Supporting the land use vision through a transport system and corridors designed to support people and goods to move safely, efficiently and reliably around Greater Sydney. The hierarchy of corridors includes: <ul style="list-style-type: none"> – city-shaping corridors – city-serving corridors – centre-serving corridors. • Supporting the liveability, productivity and sustainability of places on transport networks. • Opportunities to support the growth of Greater Sydney, sustain and enhance its role as a global city, and harness technology for the benefit of customers.
Date released / issued	March 2018
Status	Official NSW Government plan that provides 40-year strategic planning for NSW's transport system.

Greater Sydney Services and Infrastructure Plan (continued)

<p><i>High level objectives</i></p>	<p>Vision: metropolis of three cities, where people have access to jobs and services within 30 minutes by public transport (designed to support GSC's land use vision)</p> <p>The vision is built on six state-wide outcomes to guide investment, policy and reform and service provision, with specific outcomes for the Greater Sydney region:</p> <ul style="list-style-type: none"> • Customer focussed – convenient and responsive to customer needs <ul style="list-style-type: none"> – new technology is harnessed to provide an integrated end-to-end journey experience for customers – future forms of mobility are made available to customers and integrated with other modes of transport. • Successful places – sustaining and enhancing the liveability of places <ul style="list-style-type: none"> – walking or cycling is the most convenient option for short trips around centres and local areas, supported by a safe road environment and suitable pathways – vibrant centres supported by streets that balance the need for convenient access while enhancing attractiveness of places. • A strong economy – connecting people and places in the growing city <ul style="list-style-type: none"> – 30 minute access for customers to their nearest metropolitan centre and strategic centre by public transport seven days a week – fast and convenient interchanging, with walking times of no longer than five minutes between services. • Safety and performance – safely, efficiently and reliably moving people and goods <ul style="list-style-type: none"> – efficient, reliable and easy-to-understand journeys for customers, enabled by a simple hierarchy of services – efficient and reliable freight journeys supported by 24/7 rail access between freight precincts with convenient access to centres – a safe transport system for every customer with the aim for zero deaths or serious injuries on the network by 2056. • Accessible services – accessible for all customers <ul style="list-style-type: none"> – fully accessible transport for all customers. • Sustainability – makes the best use of available resources and assets <ul style="list-style-type: none"> – transport services and infrastructure are delivered, operated and maintained in a way that is affordable for customers and the community – a resilient transport system that contributes to the NSW Government's objective of net-zero emissions by 2050.
<p><i>Stated targets or metrics</i></p>	<p>Targets and aspirations detailed across the document include:</p> <ul style="list-style-type: none"> • An aim to grow the share of cycling for trips up to 10 kilometres. • Achieving the 30 minute city through investment in mass transit, improving service frequencies, prioritising public transport around centres, and improving walking and road based connections to public transport and centres. • Indicative future frequency of all day services: <ul style="list-style-type: none"> – city shaping services – turn up and go, every 5 minutes or less – city serving services – high frequency, every 10 minutes or less, or on demand – centre serving services – high frequency, every 10 minutes or less, or on demand. • 24/7 rail access on the busiest freight corridors in Greater Sydney – between ports and intermodal terminals. • NSW Ports' target of 3 million TEUs of container movements to and from Port Botany moving by rail by 2045.
<p><i>Geographic boundary</i></p>	<p>The indicative study area covers the Greater Sydney region as defined by the GSC in <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> and the five <i>District Plans</i>. However, the plan also considers connections between Greater Sydney and Regional NSW.</p> <p>Figure 12 above illustrates the indicative study area, consistent with the <i>Future Transport Strategy 2056</i>. Figure 13, Figure 14 and Figure 15 illustrate the public transport city shaping and city serving networks, as well as the strategic freight network, based on the current state and the 40-year vision.</p>

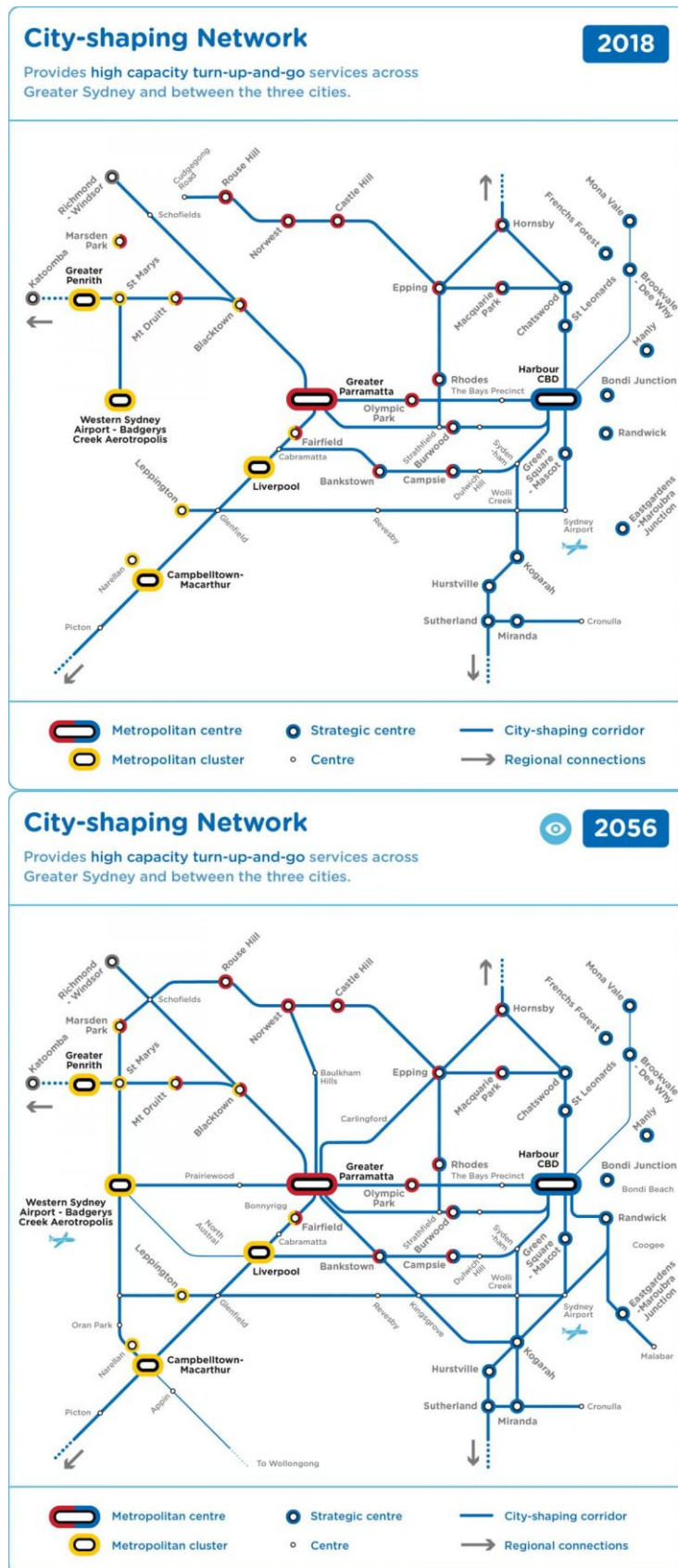
Greater Sydney Services and Infrastructure Plan (continued)

<i>Modes</i>	<p>The plan focuses more on strategic corridors than individual modes of transport. However, it does include initiatives for the following modes of transport:</p> <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail, ferry) • active transport (walking, cycling).
<i>Passenger/freight</i>	<p>The plan includes initiatives for both the passenger and freight network.</p>
<i>Timeframe</i>	<p>The plan covers a 40-year period.</p> <p>Initiatives listed in the strategy are categorised as:</p> <ul style="list-style-type: none"> • committed/funded (0-10 years) • for investigation (0-10, 10-20 years) • visionary (20+ years).
<i>Relationship to other plans</i>	<p>The <i>Greater Sydney Services and Infrastructure Plan</i> supports the <i>Future Transport Strategy 2056</i>. The plan sits alongside the <i>Regional NSW Services and Infrastructure Plan</i> (out of scope), which provides the 40-year transport plan for NSW regions outside Greater Sydney.</p> <p>The plan, combined with the <i>Future Transport Strategy 2056</i> and other supporting plans, replaces the <i>NSW Long Term Transport Master Plan</i> (2012) and supporting mode-specific plans.</p> <p>The plan was prepared concurrently with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> to the five <i>District Plans</i>, as well as the <i>State Infrastructure Strategy 2018–2038</i>. This allowed for alignment of land use, transport and infrastructure outcomes for Greater Sydney for ‘the first time in a generation’. For example, the strategy specifically references and evidences its alignment with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>.</p>

Figure 12 above illustrates the Greater Sydney region and the strategic transport corridors associated with the *Greater Sydney Services and Infrastructure Plan*. The strategic transport corridors show an integrated transport system, designed to achieve the vision in the *Greater Sydney Region Plan: A Metropolis of Three Cities*.

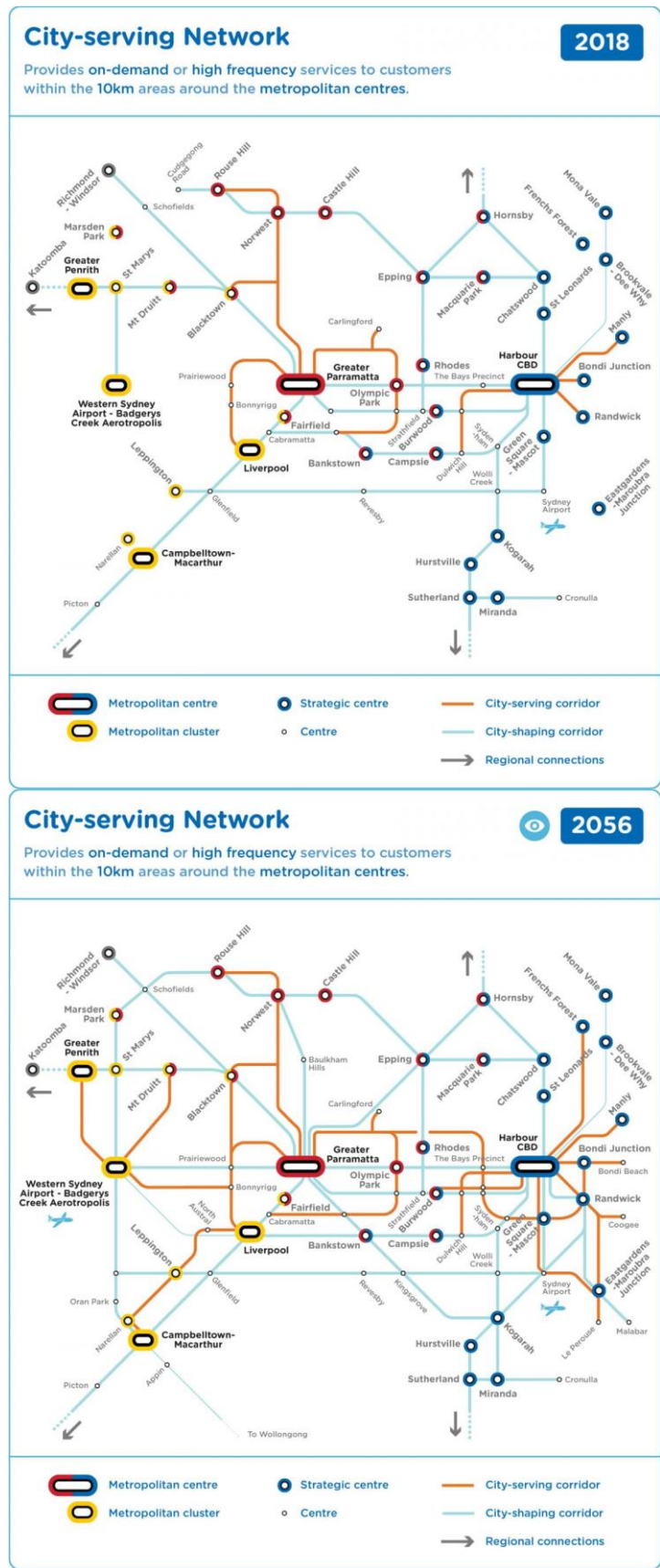
Figure 13, Figure 14 and Figure 15 illustrates the public transport city shaping and city serving networks, as well as the strategic freight network, based on the current state and the 40-year vision. These figures show greater connectivity between metropolitan and strategic centres.

Figure 13. Current/committed Greater Sydney city shaping network against 2056 vision



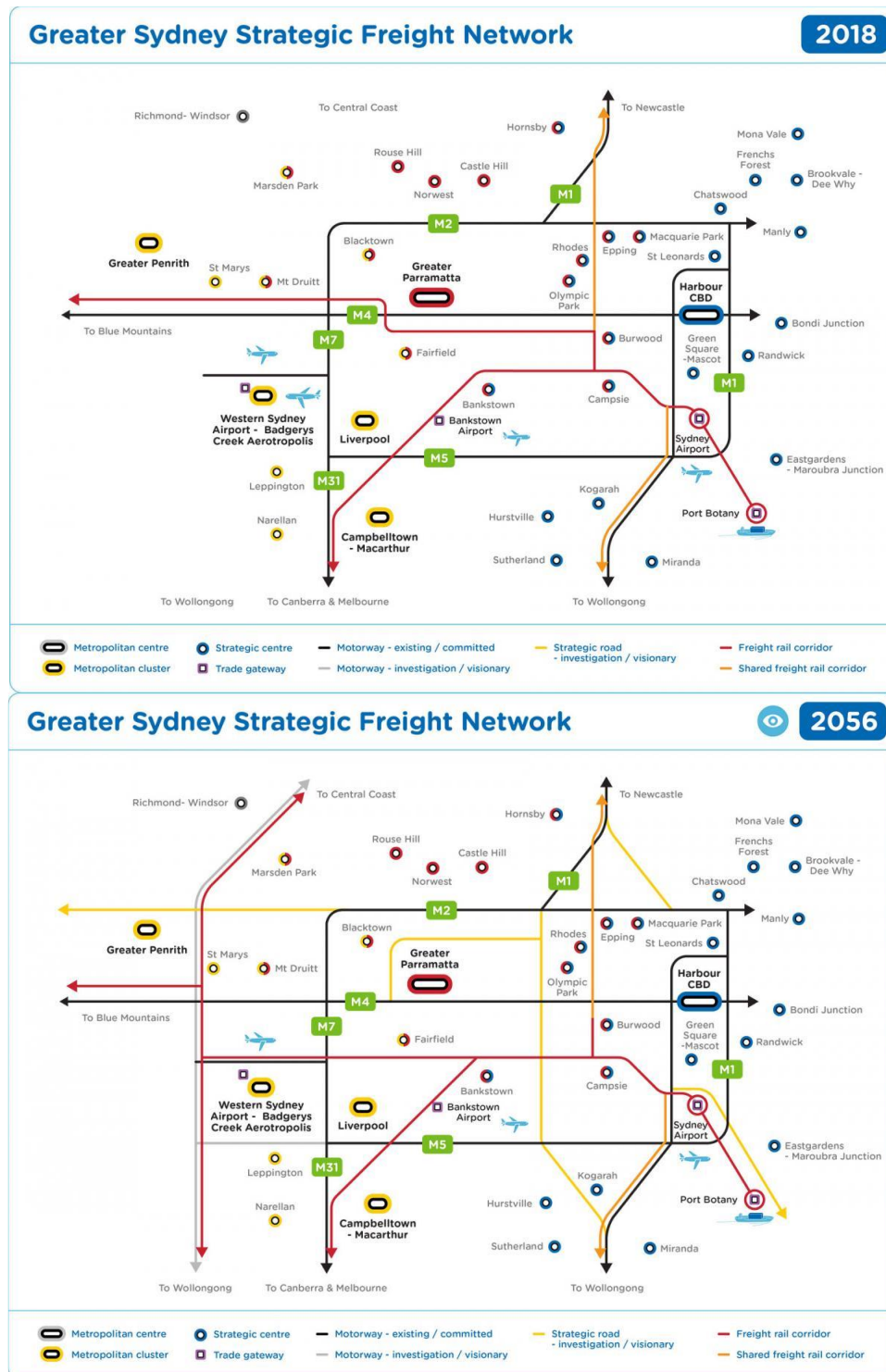
Source: TfNSW, Greater Sydney Services and Infrastructure Plan, March 2018.

Figure 14. Current/committed Greater Sydney city serving network against 2056 vision



Source: TfNSW, Greater Sydney Services and Infrastructure Plan, March 2018.

Figure 15. Current/committed Greater Sydney strategic freight network against 2056 vision



Source: TfNSW, Greater Sydney Services and Infrastructure Plan, March 2018.

NSW Draft Freight and Ports Plan

Background	<p>NSW Draft Freight and Ports Plan was published in 2017 by TfNSW as an issue-specific and place-based plan to support the delivery of the <i>Future Transport Strategy 2056</i>.</p> <p>It is a draft transport plan that, when finalised, will provide direction to business and industry for managing and investing in freight into the future. It seeks to reinforce the importance of freight and ports in NSW to the national economy and will ensure that NSW's freight and port system needs are well positioned to respond to emerging national and international markets and opportunities.</p> <p>The draft plan sets out:</p> <ul style="list-style-type: none"> the current state of freight in NSW opportunities and challenges for each of the freight commodity sectors potential priority action areas and infrastructure initiatives to be confirmed.
Date released / issued	2017
Status	Draft NSW Government plan
High level objectives	<p>Vision: moving goods in an efficient, safe and environmentally sustainable manner, providing successful outcomes for communities and industry.</p> <p>This vision is supported by six priority areas:⁷</p> <ul style="list-style-type: none"> Strengthen freight industry and government partnerships increase access for freight across the road and rail network protect existing freight precincts and ensure sufficient future land use facilitate introduction of technologies that reduce freight costs and impacts reduce the regulatory burden on industry ensure safe, efficient and sustainable freight access to places.
Stated targets or metrics	No explicit targets or metrics listed. The draft plan identified that through the consultation and finalisation process, industry and government delivery standards will be developed, and a target-based performance system to measure and report on delivery will be implemented.
Geographic boundary	The draft plan extends to the NSW state boundaries. However, Figure 15 illustrates the Greater Sydney region strategic freight network, based on the current state and the 40-year vision, as set out in the <i>Future Transport Strategy 2056</i> .
Modes	<p>The draft plan is more focussed on supply chains than modes of transport. However, it considers initiatives across the following modes</p> <ul style="list-style-type: none"> road rail air shipping.
Passenger/ freight	The plan is focussed on the freight network.
Timeframe	<p>The plan covers a 20+ year period.</p> <p>Initiatives listed in the strategy are categorised as:</p> <ul style="list-style-type: none"> committed/funded (0-10 years) for investigation (0-10, 10-20 years) visionary (20+ years).

⁷ The plan also references the NSW Premier's stated priorities: 1) grow the economy, accelerating major project assessments and delivering strong budgets; 2) build infrastructure and deliver better services, improving road travel, reliability and on time public transport running; 3) create safer communities, reducing road fatalities by at least 30 per cent by 2021 based on 2010 levels.

NSW Draft Freight and Ports Plan (continued)	
Relationship to other plans	<p>The draft plan has been guided by, and replaces, the <i>NSW Freight and Ports Strategy</i> (2013).</p> <p>The draft plan has been developed in close alignment with the <i>State Infrastructure Strategy 2018-2038</i>, and the <i>Future Transport Strategy 2056</i>, Services and Infrastructure Plans, and other issue-specific place-based supporting plans. This allows for alignment of land use, transport and infrastructure planning. For example, the draft plan specifically references the six outcomes in <i>Future Transport Strategy 2056</i>.</p> <p>The final Freight and Ports Plan will continue to align with these plans, as well as plans and strategies across all levels of Government. In particular, the importance of Local Government involvement in last mile issues will be further explored.</p> <p>The final Freight and Ports Plan will also closely align with the <i>National Freight and Supply Chain Strategy</i> and seek to identify those areas where Transport for NSW can work together with the Commonwealth Government on improved harmonisation across state borders.</p>

Building Momentum: State Infrastructure Strategy 2018-2038

Background	<p><i>Building Momentum: State Infrastructure Strategy 2018-2038</i> was published in February 2018 by iNSW. iNSW is an independent statutory authority charged with providing advice on infrastructure investment to the NSW Government.</p> <p><i>Building Momentum: State Infrastructure Strategy 2018-2038</i> is a 20-year infrastructure investment plan for NSW, which sets out iNSW's independent advice on the current state of NSW's infrastructure and the needs and priorities over the next 20 years.</p> <p>The strategy contains 122 recommendations across infrastructure sectors, including transport. These recommendations identify capital investment, policy initiatives, planning reforms and regulatory changes that are achievable, affordable and evidence-based, and that deliver the highest economic, employment and liveability benefits to people in NSW.</p> <p>The strategy:</p> <ul style="list-style-type: none"> • sets six overarching cross-sectoral strategic directions • sets new geographic directions, including for Greater Sydney as a metropolis of three cities • sets sector-based infrastructure directions, and challenges and opportunities, including for transport. <p>The strategy endorses and aligns with the land use vision in the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>. As major infrastructure networks are completed in the Eastern Harbour City, such as WestConnex and Sydney Metro, investment needs to shift westwards: first to the Central River City around Parramatta and ultimately to the emerging WSA and employment centres of the Western Parkland City.</p>
Date released / issued	February 2018
Status	NSW Government has reviewed the strategy and funding recommendations in its response. Projects where the NSW government has accepted recommendations (listed in the 2018-19 State Infrastructure Plan) are detailed in section 5.
High level objectives	<p>NSW Government endorsed vision for Greater Sydney: By 2056, Greater Sydney will be a metropolis of 'three cities' – an Eastern Harbour City, Central River City and Western Parkland City. Residents will be able to access jobs and services within 30 minutes.⁸</p> <p>6 cross-sectoral and state-wide strategic directions:⁹</p> <ul style="list-style-type: none"> • integrating land use and infrastructure planning • infrastructure planning, prioritisation and delivery • asset management – assurance and utilisation • resilience • digital connectivity and technology • innovative service delivery models. <p>Transport strategic objective: Ensure the transport system creates opportunities for people and businesses to access the services and support they need.</p>
Stated targets or metrics	No explicit targets or metrics.
Geographic boundary	The strategy extends to the NSW state boundaries. However, the strategy provides insights and recommendations for the Greater Sydney region and outer metropolitan area, as illustrated in Figure 16.

⁸ The NSW Government response has a vision for metropolitan NSW consistent with the *Greater Sydney Region Plan: A Metropolis of Three Cities*. It also notes that it will continue to invest in a transport network that can safely, efficiently and reliably move people and goods around NSW, consistent with the *Future Transport Strategy 2056*.

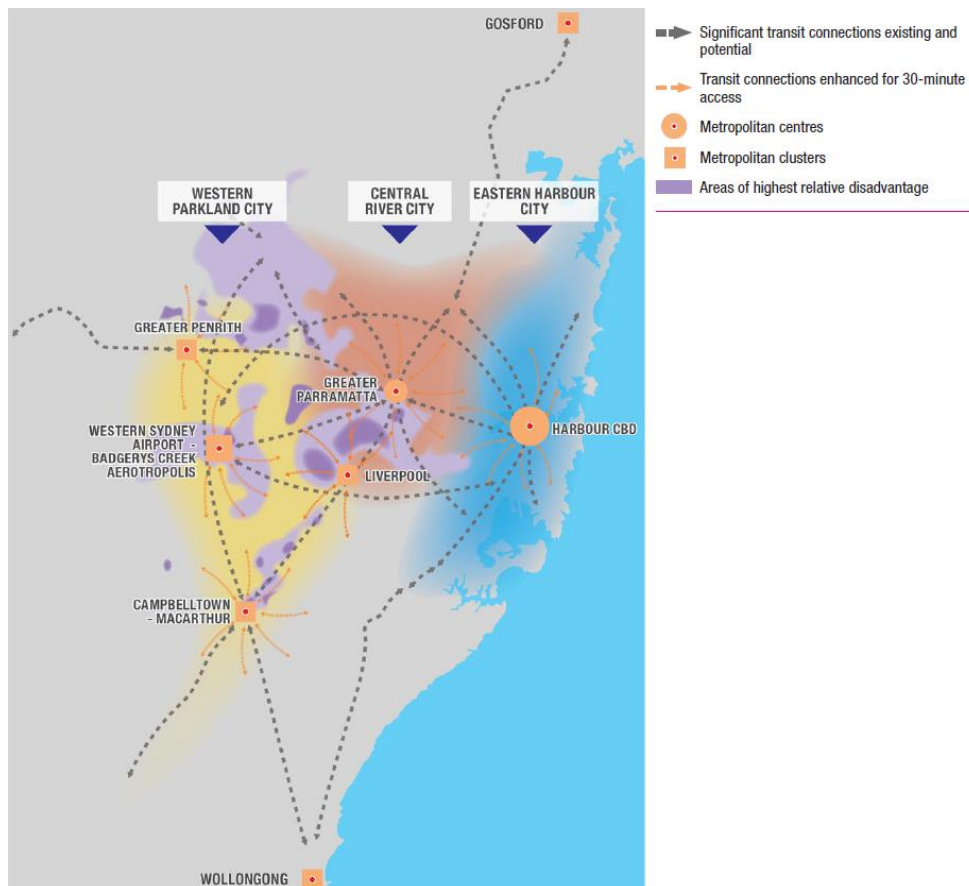
⁹ The NSW Government response confirms these strategic directions by adopting essentially equivalent directions: better integrating land use and infrastructure; delivering infrastructure to maximise value for money; optimising asset management; making NSW's infrastructure more resilient; improving digital connectivity; using innovative service delivery models.

Building Momentum: State Infrastructure Strategy 2018-2038 (continued)

<i>Modes</i>	<p>The strategy's infrastructure recommendations for the transport sector support the following modes (with the strongest focus on road and rail):</p> <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail) • active transport (walking, cycling).
<i>Passenger/freight</i>	<p>The plan contains recommendations for the passenger and freight networks.</p>
<i>Timeframe</i>	<p>The strategy covers a 20-year period.</p>
<i>Relationship to other plans</i>	<p><i>Building Momentum: State Infrastructure Strategy 2018-2038</i> replaces the 2012 <i>State Infrastructure Strategy</i> and the 2014 <i>State Infrastructure Strategy update</i>.</p> <p>This strategy has been developed in alignment with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> and <i>District Plans, Future Transport Strategy 2056</i> and suite of transport plans, and regional economic development strategies. As such, this strategy, for the first time, provides fully integrated land use and infrastructure plans.</p>

Figure 16 illustrates the indicative study area for iNSW's insights, directions and recommendations for the Greater Sydney region. The Greater Sydney region is consistent with the GSC's plans, consisting of three cities supported by metropolitan centres/clusters. iNSW adapted Figure 16 from the GSC and TfNSW.

Figure 16. Study area for iNSW's State Infrastructure Strategy 2018-2038 (specific to Greater Sydney)



Source: iNSW, *Building Momentum: State Infrastructure Strategy 2018-2038*, February 2018.

3 *Integration of rail and land use plans*

This section analyses the integration between the rail and land use plans summarised in Section 2. This analysis is limited to plans that are endorsed by the NSW Government,¹⁰ notwithstanding the transport and land use planning currently under Government consideration.

3.1 *Why integrate transport and land use plans?*

Land use and transport planning is an iterative process, with outputs from a sequence of land use plans forming inputs into transport plans and vice versa.

Land use assumptions encompass a multitude of criteria. Key inputs to transport modelling include forecasts of resident population, employment and the distribution of these within the city. These are key drivers to determine where there is future demand for public transport and to signal where there is a need for investment.

In return, investment in the transport network improves connections between residential and economic hubs which influences the urban form. If a new rail station is proposed and constructed, it will attract housing and property development close to the catchment area and encourage a higher density infill. Transport plans not only promote economic productivity but also help to shape the city's urban form and support delivery on the State's objectives.

3.2 *Integration of transport and land use plans for Sydney*

In NSW, the finalised transport, land use and infrastructure plans have been developed concurrently to ensure integration and alignment. While transport planning has been integrated with land-use planning since 2012, the current cycle is the first to align land use, transport and infrastructure outcomes for Greater Sydney and Regional NSW. This section focusses on the Greater Sydney region and shows the integration of planning through:

- an aligned vision for Greater Sydney
- aligned inputs and integrated modelling
- aligned transport and land use outcomes
- aligned treatment of Western Sydney.

3.2.1 *Alignment of vision*

Table 5 shows all in-scope plans have an aligned long term vision and strategic direction for the Greater Sydney region, based on the vision and 10 directions set by the GSC in *Directions for a Greater Sydney 2017-2056*.¹¹ The key elements of this vision are a polycentric city or 'metropolis of three cities', with 30 minute access to the nearest centre for jobs, education or

¹⁰ Except for the *State Infrastructure Strategy 2018-2038* developed by iNSW.

¹¹ The Draft Freight and Ports Plan does not state this vision as it is a people-based vision less applicable to freight. However, it does clearly state and show its alignment with the *Future Transport Strategy 2056*.

services. This vision addresses the challenge cited across all plans of managing Greater Sydney's forecast population growth.

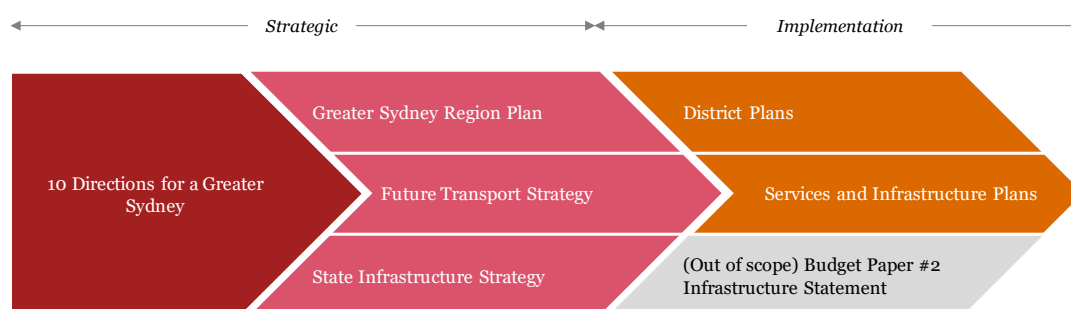
Table 5: Alignment of vision between key direction-setting plans

Directions for a Greater Sydney 2017-2056	Greater Sydney Region Plan: A Metropolis of Three Cities	Future Transport Strategy 2056	NSW Government endorsed State Infrastructure Strategy 2018-2038
<p>Greater Sydney will be a global metropolis of three productive, liveable and sustainable cities:</p> <ul style="list-style-type: none"> • Western Parkland City • Central River City • Eastern Harbour City. 	<p>A metropolis of three cities where most residents live within 30 minutes of their jobs, education and health facilities, services and great places.</p>	<p>A metropolis of three cities, where people can access the jobs, education and services they need within 30 minutes by public or active transport.</p>	<p>By 2056, Greater Sydney will be a metropolis of 'three cities' – an Eastern Harbour City, Central River City and Western Parkland City. Residents will be able to access jobs and services within 30 minutes.</p>

Source: Plans listed in section 2.

Figure 17 shows how the vision and directions established by the GSC are the starting point for delivering integrated planning and how this is carried through to other plans.

Figure 17. Alignment between state plans



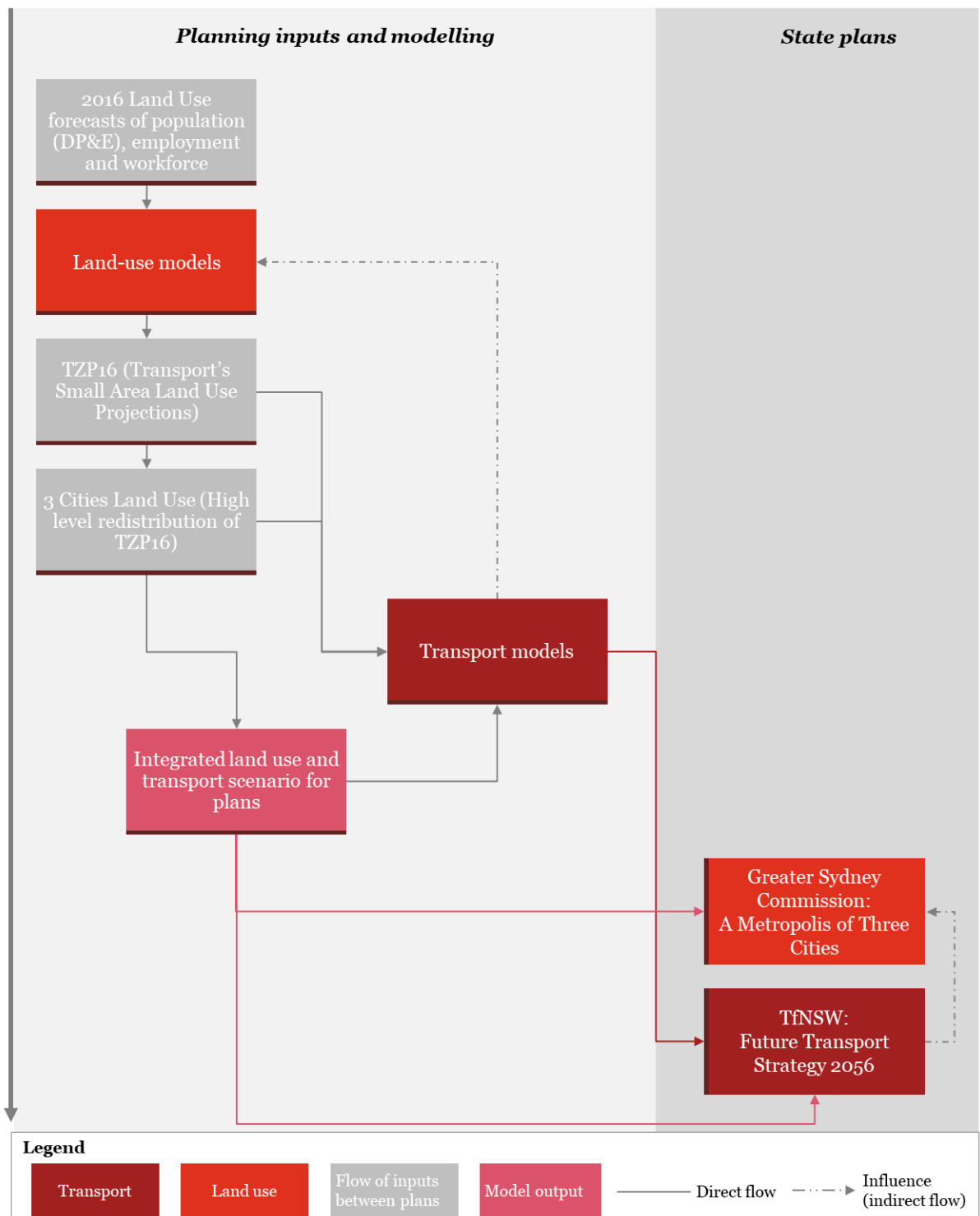
Source: PwC analysis; Greater Sydney Commission, Greater Sydney Region Plan: A Metropolis of Three Cities – Connecting People, March 2018, p.24.

3.2.2 Alignment of inputs and modelling

The finalisation of the *Future Transport Plan* and *Towards our Greater Sydney 2056* (currently issued in draft) took place iteratively, in order to achieve integration between the two planning processes. In particular, NSW's transport and land use models are used to explore the influence of land use on transport, and vice versa, to achieve integration.

The integration process determines (1) how land-use assumptions will affect transport demands and (2) how the transport plans can influence the desired urban form. The process for Sydney began with land use modelling and assumptions, which fed into transport modelling, and then cycled iteratively until both models produced a consistent scenario. This process is shown in Figure 18.

Figure 18. NSW integrated land use and transport planning – flow of inputs and outputs of the modelling process and into plans



Source: PwC analysis.

As Figure 18 shows, two key land use forecasts are inputs for the current planning cycle. They are:

- 2016 DP&E population, household and dwelling forecasts (LU16), which is a forecast of population, employment and workforce that is

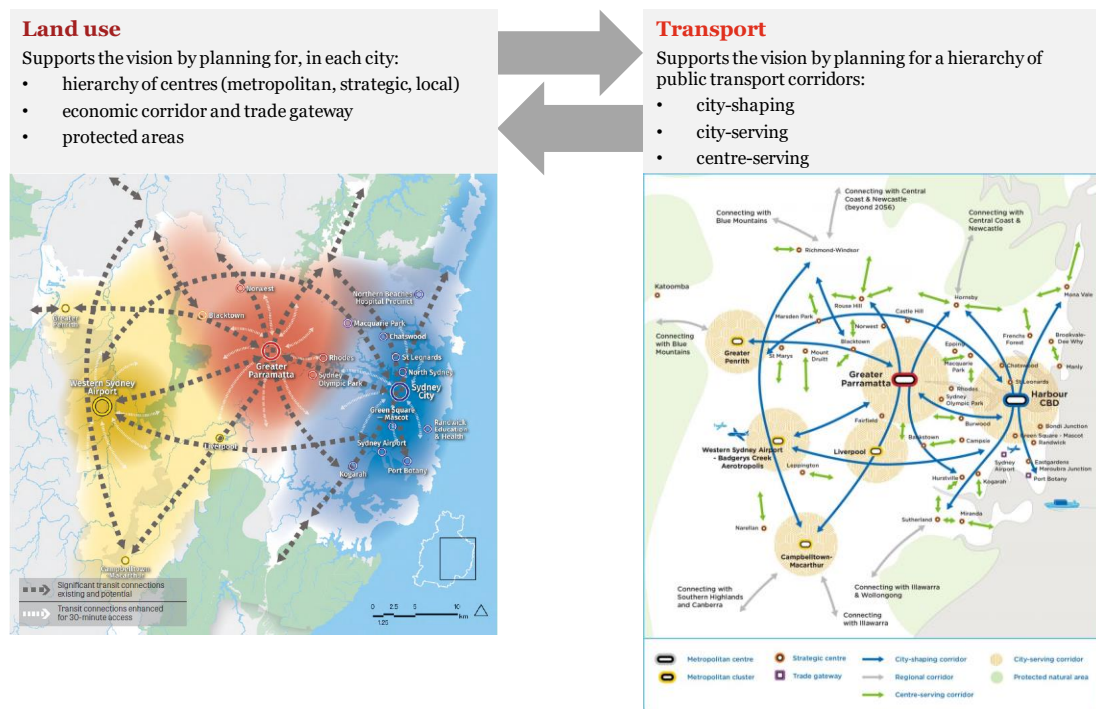
- more spatially disaggregated than the three cities forecast (ie forecasts are made for smaller geographic units)
- a suitable input to transport planning for analysis at the route/line/station level
- The three cities forecast, which reflects the land use planning direction established by the GSC and is:
 - understood to have evolved from the 2016 DP&E forecasts used as inputs to the draft *Towards our Greater Sydney 2056* plan
 - the input to land use plans
 - a strategic level input to transport plans to ensure integration

As Figure 18 shows both forecasts have been drawn on to develop integrated transport and land use scenarios to inform the finalised land use and transport plans.

3.2.3 *Alignment of transport and land use outcomes*

All in-scope plans are aligned with a movement from a monocentric city with a radial transport network to the central CBD, to a polycentric city or ‘metropolis of three cities’ which services an interconnected system of cities and centres with accessible 30-minute catchments. This is shown in Figure 19.

Figure 19. Aligned transport and land use outcomes



Source: GSC, Greater Sydney Region Plan: A Metropolis of Three Cities; Future Transport Strategy 2056; PwC analysis.

Figure 19 shows integrated land use and transport outcomes are achieved through:

- The *Greater Sydney Region Plan: A Metropolis of Three Cities* and five *District Plans* establishes place-making land use priorities for each city and its District(s):
 - Eastern Harbour City (Eastern City District, North District and South District)

- Central River City (Central City District)
- Western Parkland City (Western City District)

This includes a three-level hierarchy of centres – metropolitan, strategic and local centres – to support each city. It also includes commercial office precincts, health and education precincts, economic corridors and trade gateways.

- The *Future Transport Strategy 2056* and the *Greater Sydney Services and Infrastructure Plan* establishes connectivity and accessibility between metropolitan, strategic and local centres to enable 30 minute access to jobs, education and services by public or active transport. It does this by focussing on a public transport network based on three types of corridors:
 - City-shaping corridors – trunk road and public transport corridors providing higher speed and volume connections between cities and centres that shape locational decisions of residents and businesses.
 - City-serving corridors – higher density corridors within less than 10km of metropolitan centres providing high frequency access to metropolitan cities/centres with more frequent stopping patterns.
 - Centre-serving corridors – local corridors that support, buses, walking and cycling, to connect people with their nearest centre and transport interchange.
- *Building Momentum: State Infrastructure Strategy 2018-2038* makes recommendations for infrastructure to support the place-making of each city and its connectivity. It incorporates GSC's metropolitan and strategic centres, as well as TfNSW's strategic corridors.

3.3 Alignment in treatment of Western Sydney

All transport and land use plans have an aligned focus on catalysing the development of the Western Parkland City over the next 20 to 40 years. They do this by enabling the commitments in the Western Sydney City Deal, building on natural and community assets, and 'developing a more contained Western City District with a greater choice of jobs, transport and services aligned with growth'.¹² The plans are also part of a broader planning context across the three tiers of government (Commonwealth, State and local), which are linked as follows:

- GSC's *Directions for a Greater Sydney 2017-2056* sets the vision and strategic direction for Greater Sydney as a metropolis of three cities, which includes the development of the Western Parkland City, catalysed by and centred around the Western Sydney Airport (WSA) Badgery's Creek Aerotropolis.
- The Australian Government's Smart Cities Plan sets a vision for productive and liveable cities that foster innovation, support growth and create jobs. City Deals are the key mechanism to deliver on this vision by bringing together the three levels of government, the community and private enterprise to create long-term partnerships.
- On 4 March 2018, representatives across the three tiers of government signed the Western Sydney City Deal. This brings together all levels of government for collaborative planning and sets the investment foundation for the development of the Western Parkland City. The Western Sydney City Deal commits to the first stage of the North-

¹² GSC, Western City District Plan, March 2018, p. 6.

South Rail Link from St Marys to WSA and the Badgerys Creek Aerotropolis, with a joint objective to have rail connected to the airport by opening in 2026.

- GSC and TfNSW's land use and transport plans build upon the commitments in the Western Sydney City Deal, further developing land use and transport connections across the city.
- The long term rail network proposed across all plans is based on the Preferred Network for Western Sydney, identified through the Western Sydney Rail Needs Scoping Study, published in 2018. This was jointly undertaken by the Australian and NSW governments to determine the long-term need, timing and service options for passenger rail to service both Western Sydney and WSA.

Integrated transport and land use planning builds on the Western Sydney City Deal. It focusses on establishing a land use and transport structure which enables and supports:

- Integrated transport and land use planning in DP&E growth areas, including the Aerotropolis, South West and North West of Greater Sydney.
- The development and growth of new and existing economic agglomerations. For the Western City District, these include the Western Economic Corridor, Western Sydney Airport (WSA) and Badgerys Creek Aerotropolis, Liverpool, Greater Penrith, Campbelltown-Macarthur and the Western Sydney Employment Area. The structure also delivers on liveability and sustainability through urban investigation areas and the South Creek Corridor Project.
- Connectivity to and within metropolitan and strategic centres,¹³ and 30-minute access to jobs, education and services. This includes new city shaping public transport corridors and infrastructure to increase:
 - north-south connectivity – for example, through the North-south Rail Link, which, in later stages, also links to existing/committed rail lines to create an orbital connection around Greater Sydney
 - east-west connectivity – for example, through the WSA to Parramatta Rail Link (which then links to existing lines to the Harbour CBD to create an east-west spine through Greater Sydney) and Aerotropolis to Leppington Rail Link (which then links to existing lines to the Central and Eastern cities, including the Sydney Airport).
- Access to the freight rail and road networks – for example, through the Western Sydney Freight Line and Outer Sydney Orbital.

¹³ And precincts and trade gateways.

4 Alignment of rail and land use planning objectives

This section provides an overview of NSW's rail and land use planning objectives, and:

- compares these objectives to those of the Australian Government
- considers the extent to which objectives are consistently aligned between state plans
- considers the extent to which plan objectives are met by the projects and outcomes articulated in the plans.

4.1 Rail and land use planning objectives

Objectives are used in transport and land use plans to help define a future state and provide a framework for the development of strategies to achieve that future state. In the case of NSW, or Greater Sydney in this case, the objectives in the land use, transport and infrastructure plans are based on a governing vision set by the GSC and outlined in section 3.2.1. Each plan's objectives then form the basis for its proposed strategies, actions and/or initiatives.

As objectives capture the intent of the planning process, a comparison of objectives between plans can be used to provide insight as to shifts in emphasis and aims. But the ability to make direct comparisons between plans is limited due to variation in the structure and definition of objectives. Therefore, to enable comparison of objectives between plans, the objectives of individual plans have been mapped to themes observed across all the plans.

Upon review of the in-scope transport and land use plans, five overarching state objectives emerged across the documents. These are defined in Table 6.

Table 6. Definitions of high level objectives

Objective	Definition
Economic growth	Economic growth is defined as increases in economic output, productivity, jobs growth or the diversity and competitiveness of the Greater Sydney economy.
Accessibility	<p>Accessibility is defined as the ease of movement of goods and people around the urban environment and quality of this movement (which is affected by travel time and cost). Barriers to accessibility include congestion and the quality and affordability of transport options.</p> <p>Passenger accessibility is the ability to travel between places of residence, employment, education, activities and reach goods and services by preferred mode and at preferred times. Freight accessibility is defined as moving goods quickly and efficiently between points in the supply chain.</p>
Connectivity	<p>Connectivity is defined as the directness of links and the density of connections in a transport network, which influence in turn travel time and choice between points (e.g. choice of mode or of route).</p> <p>Barriers to connectivity include long links between destinations, dead ends and limited intersection points between links.</p>
User centricity	<p>User centred design identifies the needs of users of a system or space and designs solutions in response to these needs. In land use plans, the user is generally the resident of the city whereas in transport plans the user is the customer of the transport network.</p> <p>Residents</p> <p>Liveability is defined as the set of factors that contribute to quality of life in cities, such as housing choice and affordability, or land use that affects the amenity of an area.</p> <p>An interpretation of liveability often seen in land use plans is the idea of the “connected city”, a city with a dense mix of land use that allows for ease of access to services, employment, leisure areas and transport within areas across a city.</p> <p>Customer</p> <p>A customer focus means defining customer needs and using them to prioritise hard and soft infrastructure projects to change the way the transport network or the urban environment is experienced.</p> <p>Customer-focused projects include built projects that address stated customer needs (e.g. reliability) and non-built projects that improve customer experience (e.g. journey planning apps, real time travel information, modern ticketing, inclusion of private providers in network planning where they provide customer benefit).</p>
Sustainability	Sustainability has dual meanings in the plans reviewed. The first interpretation relates to the ability of the activities of a system (here: a city) to be maintained at a certain rate or level indefinitely, and the second relates to achieving environmental outcomes such as avoiding or slowing the depletion of natural resources.

Source: PwC analysis

4.2 *Alignment of State to Australian Government objectives*

The aim of this report is to analyse the articulation of state urban rail plans and land use objectives; and the degree of alignment between state government objectives and the following three policy objectives, which are broadly consistent with the Australian Government's policy objectives for Smart Cities:

- drive productivity growth by improving connections to employment and services, promoting agglomeration economies and contributing to a more efficient transport network including through the efficient movement of freight
- improve liveability and public amenity by reducing congestion and improving accessibility, and reducing commute times
- increase housing supply by promoting higher density development in close proximity to rail stations and through urban renewal, supporting broader efforts to improve housing affordability.

These objectives are largely consistent with the five state objectives identified across the plans as shown in Table 7.

Table 7. Relationship between State and Australian Government objectives

	Economic Growth	Accessibility	Connectivity	User centrality	Sustainability
Drive productivity growth by improving connections to employment and services, promoting agglomeration economies and contributing to a more efficient transport network including through the efficient movement of freight	●	●	●	●	
Improve liveability and public amenity by reducing congestion and improving accessibility, and reducing commute times		●	●		●
Increase housing supply by promoting higher density development in close proximity to rail stations and through urban renewal, supporting broader efforts to improve housing affordability.		●			●

Source: PwC analysis

As Table 7 shows, the broad Australian Government objectives for productivity and liveability are strongly aligned with the State Government objectives.

The definition of connectivity does not extend to liveability and amenity which are instead covered by the State Government objectives of accessibility and user centrality.

4.3 *Alignment of rail and land use planning objectives within state plans*

Table 8 identifies the objectives articulated in each of the in-scope NSW transport and land use plans.

Table 8. Consistency of reference to State government objectives

Plan	Accessibility	Connectivity	User centricity	Economic Growth	Sustainability
Directions for a Greater Sydney 2017-2056	●	●	●	●	●
Greater Sydney Region Plan: A Metropolis of Three Cities – Connecting People and five District Plans	●	●	●	●	●
Future Transport Strategy 2056 and Greater Sydney Services and Infrastructure Plan	●	●	●	●	●
Draft NSW Freight and Ports Plan	●	●	●	●	●
Building Momentum: State Infrastructure Strategy 2018-2038	●	●	●	●	●

Source: PwC analysis. Note: PwC has included the *Regional NSW Services and Infrastructure Plan* in this section but note it is out of scope and, as such, will not consider it in other sections of the report.

Table 8 shows that all plans embed accessibility, connectivity, user centricity, economic growth and sustainability as part of their objectives, either explicitly or implicitly, so there is consistency across the plans. All the plans focus these objectives around managing Greater Sydney's forecast population growth.

Accessibility and connectivity

The emphasis of accessibility and connectivity varies between plans, but all plans reference infrastructure and transportation to improve accessibility and connectivity. TfNSW's transport plans have the strongest focus on accessibility and connectivity, aligning with four of their six state-wide outcomes:

- successful places – e.g. connectivity and accessibility to enhance liveability
- a strong economy – e.g. connecting people and places in a growing city (to achieve a 30-minute metropolis of three cities for Greater Sydney, or a hub-and-spoke model for Regional NSW)
- safety and performance – e.g. efficient and reliable passenger and freight journeys
- accessible services – e.g. accessible for all customers, regardless of their location, age, ability or personal circumstances.

iNSW's infrastructure strategy sets out cross-sectoral strategic directions for infrastructure planning, as well as challenges and opportunities specific to the transport sector in delivering the 30 minute city that reflect accessibility and connectivity implicitly.

The GSC's land use plans embed accessibility and connectivity within productivity objectives and directions, which include 'a well-connected city' with 30-minute accessibility to jobs, education and services.

User centrality

The emphasis of user centrality is shaped by plan type, with transport and infrastructure plans focusing on technology to enhance customer experiences, and land use plans focusing on place-making and movement to enhance liveability.

TfNSW ‘places the customer at the centre’¹⁴ of its planning, a direction already established in the 2017 in scope reports. The first state-wide outcome defined in the TfNSW plans relate to customer focus, that ‘customer experiences are seamless, interactive and personalised, supported by technology and data’. It further considers the customer experience through its ‘safety and performance’ and ‘accessible services’ outcomes. The objectives of its *Draft NSW Freight and Ports Plan* also focus on the customer experience, but this focus is more on customers who use the freight network than end-users.

In terms of infrastructure, iNSW’s strategy considers the customer experience implicitly through strategic directions around the use of technology and innovative service models. It also considers the customer experience for transport infrastructure through its key challenges and opportunities for the sector, which consider congestion/crowding, road safety, socio-economic disadvantage and the travel needs of an aging population.

All plans (except for the *Draft NSW Freight and Ports Plan*) are aligned in their reference to liveability. Within liveability, access to a range of jobs, education facilities, services and activities is a factor that was continuously explicitly or implicitly (i.e. iNSW’s infrastructure strategy) referenced. GSC’s land use plans contain specific liveability directions and objectives including:

- ‘a city for people’ which capitalises on local identity, heritage and cultural values, together with easier access to services
- ‘housing the city’ with greater housing choice
- ‘a city of great places’ which enhances well-being and a sense of community identity by delivering safe, inclusive and walkable mixed-use areas.

Economic growth

All plans have objectives relating to productivity or economic growth, and note the importance of transportation linkages in facilitating jobs, investment and increased productivity. However, iNSW’s infrastructure strategy appears to contain the strongest focus on economic growth, as it underlies all the strategic directions, and iNSW specifically ‘focuses on the three essential ingredients for economic prosperity – population, productivity and participation’.¹⁵

TfNSW’s transport plans also contain an explicit outcome for ‘a strong economy’ where ‘the transport system powers NSW’s future \$1.3 trillion economy and enables economic activity across the state’. Similarly, the GSC’s land use plans have explicit productivity objectives and directions, including ‘jobs and skills for the city’ through business growth and skills development.

Sustainability

All the plans have stronger focus on economic and environmental sustainability than the superseded plans assessed in the original report issued to DIRDC. Sustainability is explicitly referenced in:

- GSC’s land use plans through sustainability objectives and directions including ‘a city in its landscape’ with a healthy natural environment; ‘an efficient city’ which manages

¹⁴ TfNSW, *Future Transport Strategy 2056*, March 2018, p. 4.

¹⁵ iNSW, *Building Momentum: State Infrastructure Strategy 2018-2038*, February 2018, p. 5.

resources to reduce costs, emissions and environmental impacts; and ‘a resilient city’ which builds capacity in systems to adapt and respond to changes in technology and climate. These plans reference the NSW Government’s target of net zero emissions by 2050.

- TfNSW’s transport plans through a ‘sustainable’ outcome, where ‘the transport is economically and environmentally sustainable, affordable for customers and supports emissions reductions’. These plans (except the *Draft NSW Freight and Ports Plan*) specifically reference the NSW Government’s target of net zero emissions by 2050.
- iNSW’s infrastructure strategy through all its strategic directions, but most specifically through ‘infrastructure planning, prioritisation and delivery’ optimising the use of existing infrastructure; ‘asset management – assurance and utilisation’ focussing on maintenance for sustainable assets; ‘resilience’ to natural hazards and human-related threats; and ‘digital connectivity and technology’ to sustain technological change/disruption.

4.4 *Alignment of plan outcomes*

Section 4.3 detailed the alignment of objectives between plans. This section summarises the alignment of the objectives with plan outcomes such as the reported benefits of proposed projects. For an overview of the scope of the plans and key aims refer to Section 2.2. As an overview, within the plans:

- *Building Momentum: State Infrastructure Strategy 2018-2038* most strongly articulates the link between economic growth objectives and transport project outcomes, although it also emphasises connectivity and accessibility (in driving the 30-minute city vision).
- *The Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan* has the clearest link between the objectives of accessibility and connectivity with recommended projects, in driving the 30-minute city vision. However, it also provides many transport initiatives that emphasise economic growth through access to jobs.
- For user centricity, the needs of the customer are most clearly linked to transport projects in the *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*. Liveability requirements are most detailed in the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans*.
- Sustainability is addressed most strongly in the *Draft NSW Freight and Ports Plan* in terms of transport network externalities, and *Building Momentum: State Infrastructure Strategy 2018-2038* in terms of resilience. Environmental sustainability is most strongly addressed in the *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*, although the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans* strongly links transport projects with mode shift outcomes that contribute to environmental sustainability.

As the following sections show, alignment of the objectives to plan outcomes is consistent to the alignment of plan objectives to the five overarching objectives identified between plans. In discussing transport projects below and section 5, *Building Momentum: State Infrastructure Strategy 2018-2038* is considered in conjunction with the list of NSW Government endorsed projects in *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan*.

4.4.1 *Future Transport Strategy 2056 and Greater Sydney Services and Infrastructure Plan (March 2018)*

Attribute	Inclusion	Description
Economic growth	●	<p>The plans articulate the role transport plays in supporting and ‘powering’ the growth of NSW’s economy. This is through projects that increase connectivity between people, jobs, education and services, to achieve the 30-minute city vision.</p> <p>In particular, the plans identify city shaping, city serving and centre serving corridors that increase access to strategic activity centres and precincts across the three cities. They use GSC’s hierarchy of centres to prioritise corridors/connections for greatest economic and productivity benefit.</p> <p>The plans also focus on improving freight connections to trade gateways (e.g. Port Botany, Sydney Airport, Bankstown Airport and WSA) and intermodal terminals.</p>
Accessibility	●	<p>Accessibility is embedded in the planning process and framework as the plans define city shaping, city serving and centre serving corridors to optimise connectivity and accessibility. They also prioritise projects that increase capacity and efficiency of existing corridors, and allow for greater choice of transport modes, to improve accessibility.</p> <p>In particular, the plans highlight staged projects that increase the frequency of high patronage public transport services. The Sydney Metro projects also increase capacity and efficiency, and on-demand bus service trials provide convenient access to transport hubs from local centres.</p> <p>The projects focus on improving accessibility the Eastern City, and between the Eastern and Western City, where connectivity is already well established.</p>
Connectivity	●	<p>Connectivity is embedded in the planning process and framework as the plans define city shaping, city serving and centre serving corridors to optimise connectivity and accessibility.</p> <p>The key focus for connectivity is improving connections between the three cities, and within the Central and Western cities. The plans also focus on fast and convenient interchanging between transport modes, and bus connections to train stations / transport hubs to enhance connectivity.</p>
User centrality	●	<p>Customer</p> <p>The strategy explicitly addresses who TfNSW’s customers are, what they value and how their priorities shape the plans. The plans address improvements to services and technology to attract more people onto public transport, and consider the priorities for key customer groups.</p> <p>The plans focus more on projects that increase service quality and travel times than those that promote new technologies or future forms of mobility. However, the plans highlight a small number of large strategic investments into this area, such as Mobility as a Service (MaaS) and Artificial Intelligence applications. They also focus on increasing access to transport infrastructure through the Transport Access Program.</p> <p>Liveability</p> <p>Liveability is expressly referenced in the customer outcomes for the plans, but it is less of a focus for individual projects. The plans support liveability through increasing connectivity and accessibility to jobs, education and services, and through managing the impact of freight on liveability.</p>
Sustainability	●	<p>The plans propose a number of projects to increase the sustainability of the transport system from an environmental and economic perspective. In particular, they highlight a Sustainable Transport Package to support NSW Government’s objective of net zero emissions by 2050.</p> <p>They also focus on increasing the connectivity and accessibility of the public transport system to manage population growth and encourage mode shift away from private vehicles.</p>

4.4.2 *Directions for a Greater Sydney 2017-2056 (2017), Greater Sydney Region Plan: A Metropolis of Three Cities and the five District Plans (March 2018)*

Attribute	Inclusion	Description
Economic growth	●	<p>The land use vision of a 'Metropolis of three cities with 30-minute access to jobs, education and services' strongly supports economic growth, as it recognises that infrastructure constraints associated with a monocentric city will stifle economic growth in the medium-long term.</p> <p>The plans address the development of, and connectivity between, a number of metropolitan and strategic centres/clusters/precincts with the objective of providing easier access to a wider range of jobs. This supports increasing productivity and economic growth.</p> <p>The plans anticipate there will be job growth in the Western City, catalysed by the WSA – Badgerys Creek Aerotropolis.</p>
Accessibility	●	<p>Access to jobs, education and services is emphasised in the plans, across all districts, through the vision of a 30-minute city and supporting transport projects.</p> <p>Accessibility is promoted through a hierarchy of centres, where people can move quickly and easily between local, strategic and metropolitan centres to access jobs, education or services. The plans support land use changes to intensify employment and housing density. The plans also expand on active transport links for in-centre accessibility.</p>
Connectivity	●	<p>The plans emphasise the need for transport connections between and within the three cities to achieve the vision of a 30-minute city by 2056.</p> <p>As with accessibility, the District Plans detail the specific transport projects that are anticipated to support the connectivity aspirations of each plan. These are referenced from TfNSW's <i>Future Transport Strategy 2056</i> (but do not provide a complete list), and GSC strongly links the 30-minute city vision to TfNSW's customer outcomes and the hierarchy of city shaping, city serving and centre serving corridors.</p> <p>The District Plans also consider the connectivity needs of the freight network (also from TfNSW's <i>Future Transport Strategy 2056</i>), for example, segregation of networks and capacity improvements.</p>
User centrality	●	<p>Customer</p> <p>The needs of users of the transport network are not strongly referenced.</p> <p>Liveability</p> <p>The plans strongly emphasise liveability by endorsing a polycentric urban form with easier (30-minute) access to jobs, education and services. They also include a strong focus on:</p> <ul style="list-style-type: none"> • housing supply (through urban renewal, local infill development and land release) and affordability to accommodate a growing population • great places that are fine grain, walkable, socially connected, healthy and culturally rich.
Sustainability	●	<p>The plans address sustainability with endorsement of public transport projects that encourage mode shift away from private vehicles and manage population growth.</p> <p>They also express a commitment to manage waterways, biodiversity, natural hazards / extreme heat and connected green space in balance with development. For example, they support urban tree canopy targets, the Greater Sydney Green Grid, and renewable energy generation, as well as the NSW Government's aim for net-zero emissions by 2050.</p>

4.4.3 *Building Momentum: State Infrastructure Strategy 2018-2038 (February 2018) and 2018-19 State Infrastructure Plan (June 2018)*

Attribute	Inclusion	Description
Economic growth	●	<p>The strategy clearly articulates the link between efficient and effective infrastructure and economic growth. In particular, the links between public transport capacity and enabling employment growth, labour force deepening and economic agglomeration. The strategy highlights that implementing its recommendations will boost the NSW economy by \$11 billion in 2036 and \$45 billion in 2056. The plan is simply a list of funded projects.</p> <p>The strategy identifies the economic costs of congestion, and the economic opportunities of developing strategic transport connections. It supports GSC's land use vision and identifies how specific projects alleviate congestion or improve accessibility or connectivity, and strongly links this to economic benefits.</p> <p>The strategy also positions for aligning the timing of major project investment more closely with observed land use changes – for example recommending that investment in rail services to WSA be considered only as a long-term proposition when an expected step-change in airport patronage occurs. This is a point of difference to other in scope plans which are stronger on leveraging the city and land use shaping potential of mass transit investments.</p>
Accessibility	●	<p>The strategy identifies the clearest accessibility benefits through projects that overcome local network constraints and service the vision of a 30-minute city. In particular, it emphasises that the SmartRail program (as part of More Trains More Services) would increase the efficiency and reliability of the rail network, allowing more trains to run per hour in peak times and helping separate longer distance intercity, suburban and freight services from suburban operations.</p> <p>The strategy also recommends travel demand management initiatives and mobility pricing reforms to encourage travel patterns that are tailored to the capacity of the network and help to manage congestion.</p>
Connectivity	●	<p>The strategy recommends increasing connectivity through new transport links to service the GSC's land use vision. In particular, it supports the Sydney Metro projects, as well as further rail network extensions to relieve capacity pressures, increase 30-minute catchments and facilitate the evolution from a predominantly radial to an interconnected network that is no longer reliant on travel through Harbour CBD to access other parts of the city.</p> <p>The strategy is more measured about developing city-shaping and city servicing rail connections in the Western City than other plans, due to the scale of investment required. It supports a short-term east-west connection from the T1 Western Line to WSA – Badgery's Creek Aerotropolis, but considers further north-south connections should be longer term investments to be considered as population and patronage grows.</p>
User centricity	●	<p>Customer</p> <p>The strategy endorses the use of emerging technology to enhance the customer experience. It recommends investments in connectivity and digital infrastructure that will encourage innovation and ensure the benefits of new technology can be fully realised.</p> <p>Liveability</p> <p>The strategy recommends further integration of land use, infrastructure and public transport to achieve GSC's land use vision of a global metropolis of three productive, liveable and sustainable cities with 30-minute access to jobs, education and services. It also supports infrastructure development in the Western Parkland City to increase liveability and reduce socio-economic disadvantage.</p>
Sustainability	●	<p>The strategy has strong references to sustainability in terms of using infrastructure to manage population growth, and improving the resilience and maintenance of infrastructure to increase its longevity. There is also a focus of cost-effectiveness in considering rail versus rapid bus transit options.</p>

4.4.4 *Draft NSW Freight and Ports Plan (2017)*

Attribute	Inclusion	Description
Economic growth	●	The draft plan emphasises the role that freight plays in supporting economic growth. It identifies projects that support the efficient, safe and reliable flow of goods and enhance the freight industry's contribution to NSW's economic growth. It also highlights projects that support Sydney's international trade gateways (e.g. Port Botany).
Accessibility	●	<p>The draft plan focuses on increasing accessibility for freight operators, particularly as passenger rail is prioritised over freight rail on shared lines/networks. In particular, it identifies projects improve the flow of freight by:</p> <ul style="list-style-type: none"> • separating freight and passenger lines (e.g. Northern Sydney Freight Corridor) • adding capacity to existing freight or shared lines (e.g. Southern Sydney Freight Line, South Coast Line) • improving cargo coordination, reducing regulatory burdens, and incorporating freight into managed motorway decisions.
Connectivity	●	<p>The draft plan focuses on improving connectivity for freight operators in light of an increasing freight task, and change in Greater Sydney's land use from a monocentric to polycentric city. In particular, it identifies projects that:</p> <ul style="list-style-type: none"> • provide new connectivity in the outer Sydney area (e.g. Outer Sydney Orbital) • provide new connections to the west (e.g. Western Sydney Freight Line and Intermodal Terminal) • provide more connections to Port Botany and the South East.
User centricity	●	<p>Customer</p> <p>The plan strongly targets freight customer needs such as reliability, safety and the efficiency of freight movements. It also identifies technology improvements to enhance the freight service (e.g. Freight Innovation Projects), and reductions in the regulatory burden.</p> <p>Liveability</p> <p>Actions to improve freight movement through places through better integration of freight into land use planning (e.g. adoption of Movement and Place framework), and promote alternative last mile modes (i.e. not truck, van) that are safe, sustainable and efficient within urban centres.</p>
Sustainability	●	Network sustainability (through protecting existing freight precincts and ensuring sufficient future land use) is a priority action area in the plan. Focus areas include strengthening government partnerships, corridor protection, and mitigating freight externalities including noise, emissions, safety and congestion.

5 Rail network planning

This chapter outlines the rail projects that are currently proposed, in planning, in progress or complete in Greater Sydney. These include those in TfNSW's *Future Transport Strategy 2056*, supported by the associated *Greater Sydney Services and Infrastructure Plan (and Regional NSW Services and Infrastructure Plan)*.

The first section of this chapter (section 5.1) presents an overview of the projects proposed for Sydney.

The subsequent sections of this chapter (section 5.2 to 5.2.3) outlines planned rail projects by District; Western City, Central City, Eastern City, North and South as defined by the GSC. If rail projects impact multiple cities they are included under each relevant district in the reporting.

5.1 *Alignment of current rail plans (from 2012) with later planning documents*

As an overview, Table 9 presents rail projects which have been referenced in the transport and land use plans.

Table 9 is structured by project type (passenger rail, freight rail, light rail and network) to allow comparability with the 2017 work and other cities¹⁶. Within the project type groups, projects are ordered by stage of development as set out in the TfNSW *Future Transport Strategy 2056*. For full descriptions of each project, please refer to Appendix A.

The development of rail projects across plans is also illustrated in Table 9. Starting with TfNSW's transport plans through to GSC's land use plans and iNSW's infrastructure plans, the table captures how GSC's land use plans in particular have aligned their transport projects with those listed in TfNSW's transport plans. The categories used for 'Status' are aligned with those used by TfNSW.

¹⁶ It should be noted that plans themselves focus more on the structure of the public transport network than individual transport modes.

Table 9. Overview of transport projects

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Passenger	East-west public transport between Mona Vale and Macquarie Park	North	0-10 For Investigation	Unknown	●	●			●	
	Extension of South East mass transit/train link to Miranda	Eastern City, South	20+ Visionary	Unknown	●	●	●		●	
	Higher frequency public transport services on selected corridors	All	0-10 Committed	Unknown	●	●				
	Higher frequency transport services across Greater Sydney (0-10 yr)	All	0-10 For Investigation	Unknown	●	●				
	Corridor Preservation for Higher Speed Connections	North, Eastern City, South, Outer Metro	10-20 For Investigation	Unknown	●	●				
	Investment in Higher Speed Connection along East Coast	North, Eastern City, South, Outer Metro	20+ Visionary	Unknown	●	●	●			
	Improved services on the Richmond Line	Western City, Central City	0-10 For Investigation	Unknown	●	●			●	
	Leppington to WSA - Badgery's Creek Aerotropolis Rail Link	Western City	0-10 For Investigation	Unknown	●	●	●		●	●
	Mass transit/train link to South East	Eastern City	10-20 For Investigation	Unknown	●	●	●		●	●

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Passenger	More Trains More Services program	All	0-10 Committed	Unknown						●
	New Intercity Fleet	All	0-10 Committed	Late 2019 to 2021	●	●	●			●
	New services on key routes (0-10 yr)	All	0-10 For Investigation	Unknown	●	●				
	New services on key routes (10-20 yr)	All	10-20 For Investigation	Unknown	●	●				
	North-south Rail Link in Western Parkland City: Cudgegong Road – St Marys	Western City, Central City	0-10 For Investigation	Unknown	●	●	●		●	●
	North-south Rail Link in Western Parkland City: St Marys – WSA-Badgery's Creek Aerotropolis	Western City	0-10 Committed	Objective to open in 2026	●	●	●		●	●
	North-south Rail Link in Western Parkland City: WSA-Badgerys Creek Aerotropolis – Campbelltown-Macarthur	Western City	0-10 For Investigation	Unknown	●	●	●		●	●
	Parramatta to Epping mass transit / train link	Central City	10-20 For Investigation	Unknown	●	●	●		●	●
	Parramatta to Kogarah mass transit / train link	Central City, South	10-20 For Investigation	Unknown	●	●	●		●	●
	Parramatta to Norwest mass transit / train link	Central City	20+ Visionary	Unknown	●	●	●		●	●
	Passenger train improvements to support growth at Wilton	Western City, Outer Metro	0-10 For Investigation	Unknown	●	●	●		●	

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Passenger	Public transport passenger service improvements	All	0-10 Committed	Unknown	●	●	●			
	Service changes to connect to new train lines (0-10 yr)	All	0-10 For Investigation	Unknown	●	●				
	Service changes to connect to new train lines (10-20 yr)	All	10-20 For Investigation	Unknown	●	●				
	Sydney Growth Trains as part of More Trains, More Services program	All	0-10 Committed	2019	●	●	●			
	Sydney Metro City and Southwest	North, Eastern City, South	0-10 Committed	2024	●	●	●	●	●	●
	Sydney Metro City & Southwest extension to Liverpool	Western City, South	20+ Visionary	Unknown	●	●	●		●	
	Sydney Metro City & Southwest extension to Liverpool corridor protection	Western City, South	Proposed	Unknown						●
	Sydney Metro Northwest	North	0-10 Committed	2019; construction ongoing	●	●	●	●	●	●
	Sydney Metro West	Central City, Eastern City	0-10 Committed	Unknown	●	●	●		●	●
	Sydney - Canberra Faster Rail Improvement	Western City, Outer Metro	0-10 For Investigation	Unknown	●	●	●			●
	Sydney - Central Coast - Newcastle Faster Rail Improvement	North, Outer Metro	0-10 For Investigation	Unknown	●	●	●		●	●

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Passenger	Sydney - Wollongong Faster Rail Improvement	South, Outer Metro	0-10 For Investigation	Unknown	●	●	●		●	●
	Train improvements as part of More Trains, More Services program	All	0-10 For Investigation	Unknown	●	●	●		●	●
	Train / mass transit link Macquarie Park to Hurstville via Rhodes	Central City, Eastern City and South	20+ Visionary	Unknown	●	●			●	
	Upgrade to Blue Mountains Line	Western City, Outer Metro	0-10 Committed	mid-2020	●	●	●		●	
	WSA-Badgerys Creek Aerotropolis - Parramatta Rail Link	Western City, Central City	0-10 For Investigation	Unknown	●	●	●		●	●
Light Rail	CBD & South East Light Rail	Eastern City	0-10 Committed	2019	●	●	●	●	●	●
	Light Rail Extension to Maroubra Junction	Eastern City	10-20 For Investigation	Unknown	●	●	●		●	●
	Light Rail to Bays Precinct	Eastern City	10-20 For Investigation	Unknown	●	●	●		●	●
	Parramatta Light Rail - Stage 1	Central City	0-10 Committed	2023	●	●	●	●	●	●
	Parramatta Light Rail - Stage 2	Central City	0-10 Committed	Unknown	●	●	●		●	●
	Parramatta Light Rail extensions	Central City	10-20 For Investigation	Unknown	●	●	●			

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Freight	Access to Moorebank Intermodal Terminal	Western City	0-10 Committed	Unknown	●	●	●	●	●	●
	Additional capacity on Southern Sydney Freight Line	Western City	10-20 For Investigation	Unknown	●	●	●			●
	Address long term capacity constraints to Port Botany and South East	Eastern City	20+ Visionary	Unknown			●			
	Automation	All	20+ Visionary	Unknown			●			
	Completion of Maldon to Dombarton railway line	Western City, Outer Metro	10-20 For Investigation	Unknown	●	●	●		●	●
	Duplication of Port Botany freight rail line	Eastern City	0-10 For Investigation	Unknown	●	●	●	●	●	●
	Freight Innovation Projects (0-10 yr)	All	0-10 For Investigation	Unknown			●			
	Freight Innovation Projects (10-20 yr)	All	10-20 For Investigation	Unknown			●			
	Freight Rail Capacity Enhancements	All	10-20 For Investigation	Unknown			●			
	Freight Separation	All	20+ Visionary	Unknown			●			
	Freight Sustainability and Resilience: Continue Freight Noise Attenuation Plan	All	0-10 Committed	2028			●			
	Freight Sustainability and Resilience: Identify constraints	All	0-10 For Investigation	Unknown			●			

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Freight	Freight Technology Improvements	All	0-10 For Investigation	Unknown			●			
	Metropolitan Rail Transfer Station	Eastern City	0-10 For Investigation	Unknown			●			
	Moorebank Intermodal Facility (capacity increases)	Western City	0-10 Committed	2019 - 2030						●
	Northern Sydney Freight Corridor Stage 1	North	0-10 For Investigation	Completed			●			
	Northern Sydney Freight Corridor Stage 2	Eastern City, North, Central City	0-10 For Investigation	Unknown. Stage 1 is complete	●	●	●		●	
	Outer Sydney Orbital corridor protection	Western City, North	0-10 Committed	Unknown, feedback period closed			●			●
	Outer Sydney Orbital from Great Western Highway and Western Line to Central Coast	Western City, North	20+ Visionary	Unknown	●	●	●		●	
	Outer Sydney Orbital from Great Western Highway and Western Line to WSA-Badgerys Creek Aerotropolis	Western City	10-20 For Investigation	Unknown	●	●	●		●	
	Outer Sydney Orbital from WSA-Badgerys Creek Aerotropolis to Hume Motorway and South Line	Western City	20+ Visionary	Unknown	●	●	●		●	
	Port Botany Landside Improvement Strategy	Eastern City	Proposed	Unknown						●
	South Coast Rail Enhancement	South	0-10 For Investigation	Unknown			●			●

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Freight	Southern Sydney Freight Line Improvements	Western City, Central City	0-10 For Investigation	Unknown	●	●	●		●	●
	State Environmental Planning Policies update	All	Proposed	Update by end of 2019						●
	Western Sydney Freight Line corridor protection	Western City, Central City	0-10 Committed	Unknown, feedback period closed			●			●
	Western Sydney Freight Line (and intermodal terminal)	Western City, Central City	10-20 For Investigation	Unknown	●	●	●		●	
Network	Automatic Train Protection	All	0-10 Committed	late 2020						●
	Central Walk	Eastern City	0-10 Committed	Construction begins 2018						●
	Expansion of Travel Choices Program	All	0-10 Committed	Unknown	●	●			●	
	Greater Parramatta Access Plan	Central City	Proposed	Unknown						●
	Greater Sydney Parking Guideline (train station car parking)	All	0-10 For Investigation	Unknown	●	●				
	Identification and protection of corridors for future transport links	All	0-10 For Investigation	Unknown	●	●				●
	Integrated active transport policies (including with rail)	All	0-10 For Investigation	Unknown	●	●				

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Network	Metropolitan Interchange Program	All	0-10 For Investigation	Unknown	●	●	●		●	●
	Mobility as a Service (MaaS) implementation	All	0-10 For Investigation	Unknown	●	●				●
	Power Supply Upgrades	All	0-10 Committed	Unknown						●
	Shared Network Improvements	All	10-20 For Investigation	Unknown			●			
	Sustainable Transport Package	All	20+ Visionary	Unknown	●	●	●			
	Sydney Airport road upgrades (level crossing removal)	Eastern City	0-10 Committed	2020	●	●	●			●
	Transport Access Program	All	0-10 Committed	Unknown	●	●	●		●	●
	Trial of Artificial Intelligence applications	All	0-10 For Investigation	Unknown	●	●				

Source: PwC analysis, in-scope reports. *This also includes rail projects from the five District Plans and the Directions for a Greater Sydney 2017-2056. **This also includes rail projects from the list of NSW Government endorsed projects in *Budget Paper #2: Infrastructure Statement – State Infrastructure Plan 2018-19*.

Alignment in rail project planning

Table 9 shows the *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan* presents the most exhaustive list of rail projects of the planning documents.

The projects most consistently referenced between plans are the following large scale public transport projects and major freight projects:

- Sydney Metro projects (Northwest, City & Southwest, West, and extension to Liverpool)
- South East mass transit / train link, and extension to Miranda
- Leppington to Aerotropolis-Badgerys Creek Aerotropolis Rail Link
- North-south Rail Link (all three stages)
- Parramatta to Epping, Kogarah and Norwest mass transit / train links
- Train / mass transit link Macquarie Park to Hurstville via Rhodes
- Passenger train improvements to support growth at Wilton
- Train improvements as part of More Trains, More Services program
- Transport Access Program
- WSA-Badgerys Creek Aerotropolis to Parramatta Rail Link
- CBD & South East Light Rail, and extension to Maroubra Junction
- Light Rail to Bays Precinct
- Parramatta Light Rail (Stage 1 and 2)
- Access to Moorebank Intermodal Terminal
- Completion of Maldon to Dombarton railway line
- Outer Sydney Orbital (three stages related to freight rail)
- Duplication of Port Botany freight rail line
- Northern Sydney Freight Corridor Stage 2
- Southern Sydney Freight Line Improvements
- Western Sydney Freight Line.

Treatment of transport projects in land use plans

The *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans* do not provide much detail on specific transport projects, nor provide any lists. However, they do mention major transport projects in each *District Plan*, and all of these projects are consistent with the project lists in *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*.

Treatment of transport projects in the state infrastructure strategy

Because *Building Momentum: State Infrastructure Strategy 2018-2038* is not a NSW government endorsed plan but a set of recommendations,¹⁷ there are some inconsistencies between its recommended projects and those listed in *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*. This reflects the remit of iNSW to develop independent recommendations. Overall, the majority of projects are consistent, as are those in the *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan*.

There are a few inconsistencies between committed projects in the *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan* and *Future Transport Strategy 2056 / Greater Sydney Services and Infrastructure Plan*. These could be due to projects in delivery not listed in *Future Transport Strategy 2056*, or projects provisionally committed outside the five year window in the *2018-19 State Infrastructure Plan*. The inconsistent projects are listed in Table 10.

Table 10. Inconsistent rail transport projects between plans

Future Transport Strategy 2056 – committed projects not reflected in Budget Paper #2: Infrastructure Statement, 2018-19 State Infrastructure Plan	Budget Paper #2: Infrastructure Statement, 2018-19 State Infrastructure Plan – funded projects not reflected in Future Transport Strategy 2056
Expansion of Travel Choices Program	Central Walk ¹⁸
Upgrade to Blue Mountains Line ¹⁹	Moorebank Intermodal Facility
	Power Supply Upgrades

Note: Projects listed under Future Transport Strategy 2056 are not included in the 2018-19 State Infrastructure Plan, and vice versa.

Treatment of freight

The *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan* provide further detail on passenger rail projects than freight projects. This may be as the *NSW Draft Freight and Ports Plan* contains the detailed list, but is still in draft form.

Both reports advocate freight on rail to achieve objectives relating to productivity and economic growth and untangling the freight and passenger network to improve capacity on both sides.

Geographic focus

Considering proposed projects by their geographic location provides insight in terms of the spatial focus of transport investment over time. While projects in themselves are not directly comparable, Table 9, Figure 10 and Figure 12 reveal that the proposed projects are fairly evenly distributed across Greater Sydney's economic corridors and centres in the Western Parkland, Central River and Eastern Harbour cities. The majority of new infrastructure projects are concentrated in the Western Parkland City and Central River City. The major projects in each city are:

- **Eastern Harbour City:** Sydney Metro projects, CBD & South East Light Rail, South East and Macquarie Park mass transit / train links, Light Rail to Bays Precinct and Duplication of Port Botany freight rail line

¹⁷ As such, their status is listed as 'Proposed' in the table above.

¹⁸ PwC has been advised that this project could potentially be considered as part of a broader station upgrade program.

¹⁹ PwC has been advised that this project is a subset of the New Intercity Fleet program.

- **Central River City:** Sydney Metro Northwest and West, Parramatta Light Rail and mass transit / train links from Parramatta to Epping, Kogarah and Norwest
- **Western Parkland City:** North-south Rail Link, WSA-Badgerys Creek Aerotropolis to Parramatta Rail Link, Leppington to Aerotropolis-Badgerys Creek Aerotropolis Rail Link, Outer Sydney Orbital and Western Sydney Freight Line.
- **Multiple Districts:** More Trains, More Services program, Transport Access Program and Northern Sydney Freight Corridor Stage 2.

The major projects listed above are referenced across multiple plans as detailed in Table 9. This indicates consensus on major projects in the in-scope plans.

5.2 *Analysis by region*

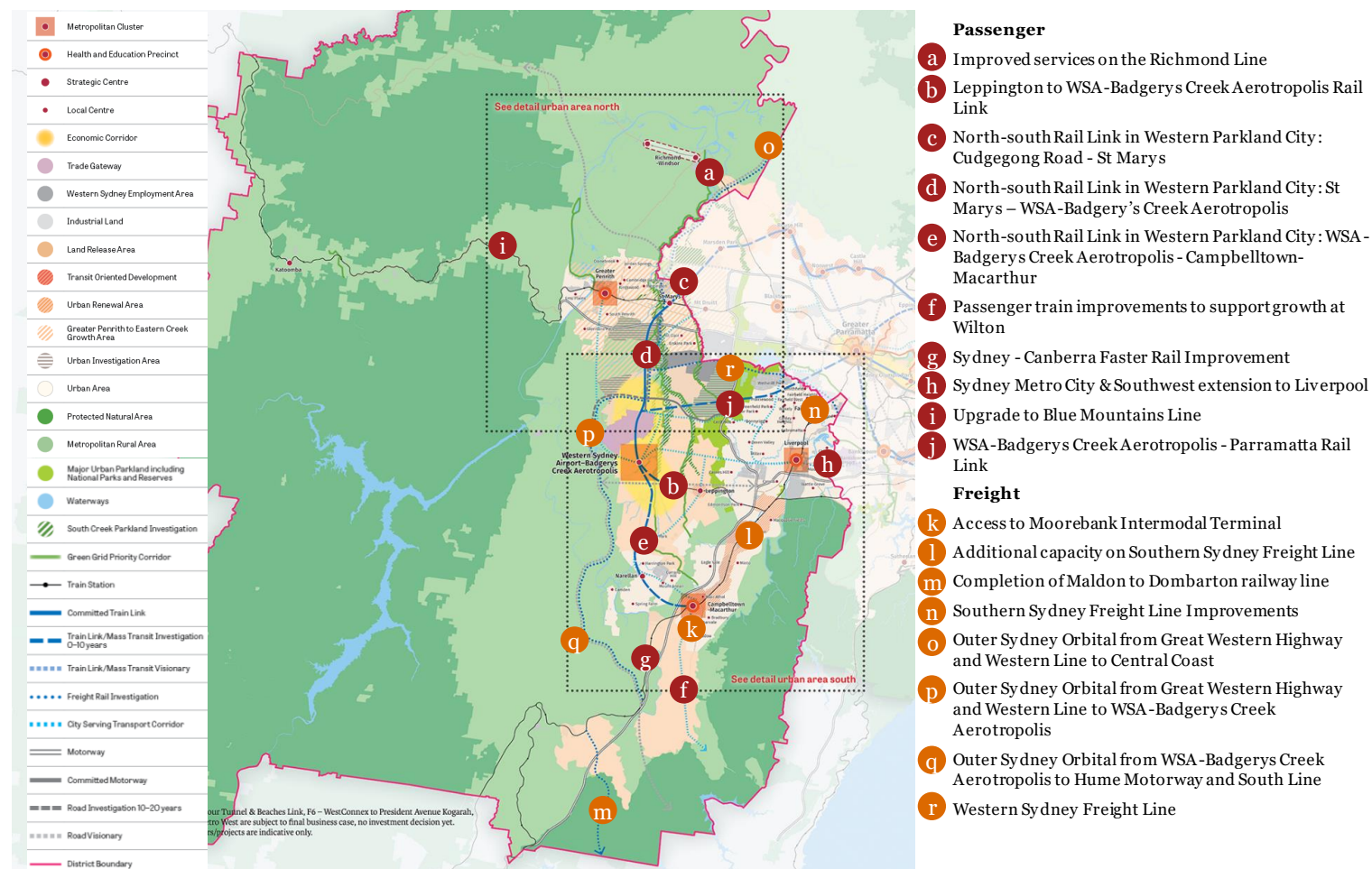
This section presents the Districts defined by the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans*, and illustrates the indicative location of TfNSW's rail projects relevant to the region.

5.2.1 *Western City District*

The Western City District contains the largest surface area and extends to Hawkesbury, the Blue Mountains and Wollondilly. It also contains Camden, Campbelltown, Fairfield, Liverpool and Penrith.

Figure 20 illustrates the Western City District and provides an indicative location of rail projects relevant to the district.

Figure 20. Greater Sydney Commission – Western City District map and rail projects



Source: GSC, Western City District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis. B: Note that PwC has been advised that this rail link is from Leppington to the Aerotropolis only

The Western City District is underdeveloped relative to the other Districts. As such, the majority of projects outlined in Table 9 are associated with building rail connectivity to/from and within the District, to improve 30-minute access to jobs, education and services, and reducing car dependency. In particular:

- North-south Rail Link, which is designed to provide a mass-transit spine through the Western City. This links growth areas (Northwest, Southwest, Aerotropolis) with new and existing economic centres, including the WSA and Badgerys Creek Aerotropolis core. The project is then proposed to extend the northern line to the Sydney Metro Northwest terminus at Cudgegong Road,²⁰ and the southern line to Campbelltown-Macarthur (under investigation). It is being developed in collaboration with the Commonwealth Government, and the objective is for the first stage to commence operations in 2026, aligned with the scheduled opening of the WSA.
- The Leppington to WSA-Badgerys Creek Aerotropolis Rail Link is a potential extension of the South West Rail Link from Leppington to the metropolitan centre of WSA-Badgerys Creek Aerotropolis, providing access to WSA via an interchange with the North-south Rail Link.²¹
- The WSA-Badgerys Creek Aerotropolis to Parramatta Rail Link is a potential new rail link from Parramatta to WSA-Badgerys Creek Aerotropolis via Prairiewood to reduce journey times between these centres and the Harbour CBD. This would connect the three cities / metropolitan centres with a high frequency, high capacity transport link, and act as the central east-west public transport spine for Greater Sydney.
- The Western Sydney Freight Line is a potential new line that would connect the Southern Sydney Freight Line to an intermodal terminal site in Western Sydney and to the Outer Sydney Orbital, which will provide a connection with the Main West Railway Line. It would support dedicated freight rail access between Port Botany and the new Western Sydney Intermodal Terminal, enable an increase in service frequency on the T1 Western Line by removing freight trains from the line between St Marys and Penrith, and support the emergence of Parramatta as a liveable Metropolitan Centre by diverting freight rail movements away from the centre.
- The Outer Sydney Orbital is a potential north-south orbital transport corridor around Greater Sydney. It includes both motorway and freight rail and would provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This first stage will connect the Great Western Highway to WSA-Badgerys Creek Aerotropolis. The freight rail connection will link the Western Line to the Western Sydney Freight Line, north of WSA-Badgerys Creek Aerotropolis.²²

5.2.2 *Central City District*

The Central City District surrounds Parramatta, covering Blacktown, Cumberland, Parramatta and The Hills.

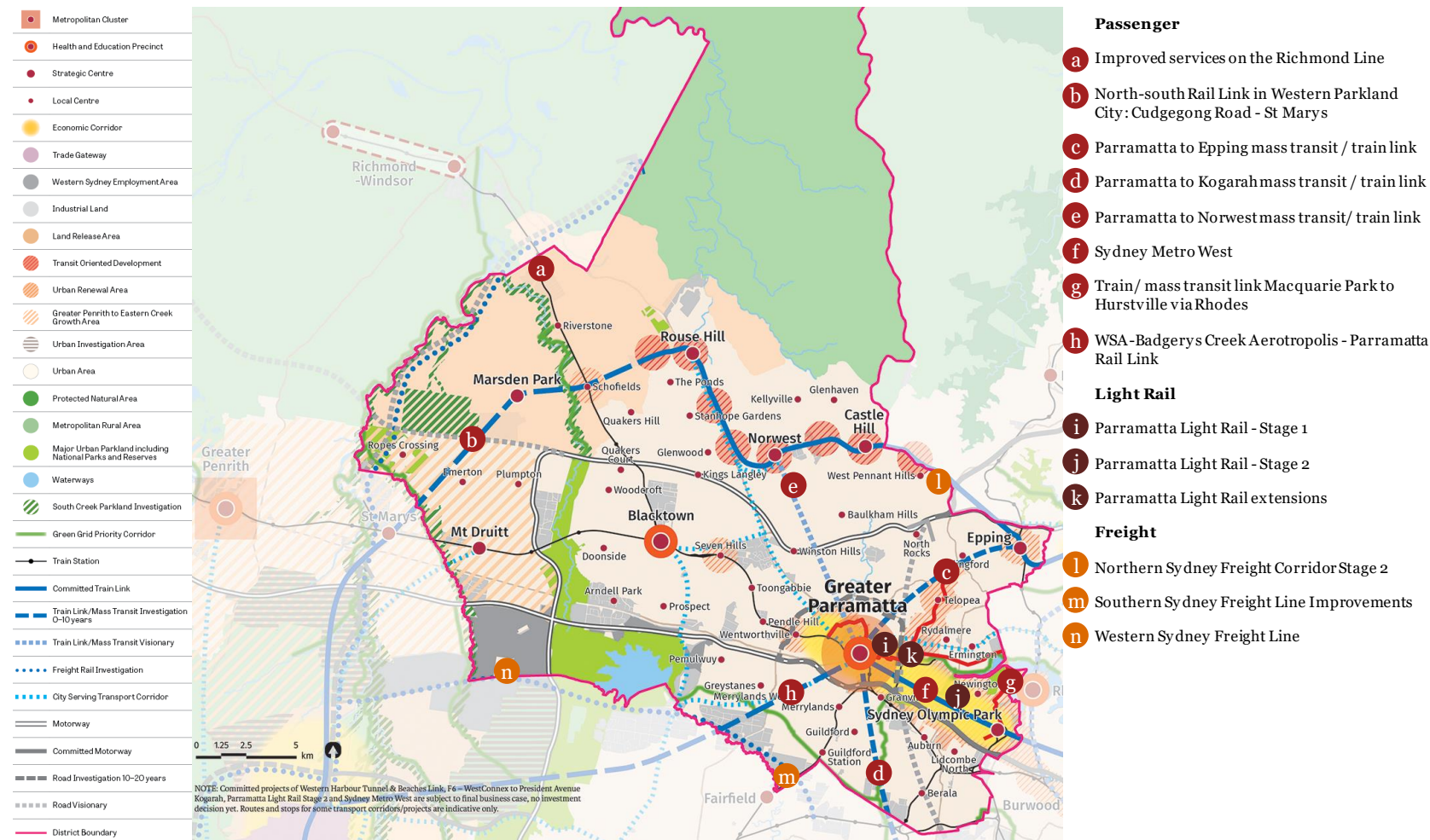
Figure 21 illustrates the Central City District and provides an indicative location of rail projects relevant to the district.

²⁰ PwC has been advised that the northern line of the North-South Rail Link will extend to Shofields, and Sydney Metro Northwest will also extend to Schofields from Cudgegong Road, to make a three-way interchange.

²¹ PwC has been advised that this rail link is from Leppington to the Aerotropolis only.

²² PwC has been advised that the freight line does not go to the Aerotropolis.

Figure 21. Greater Sydney Commission – Central City District map and rail projects



Source: GSC, Central City District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

The Central City District is already attracting jobs and population growth targeted in planning. To support further growth the majority of projects in Table 9 are associated with enhancing connectivity within the city and increasing access to the Central City District from the Eastern City District. In particular:

- Sydney Metro West and Northwest are committed projects that increase the capacity and reliability of overcrowded rail links to the west (along the T1 western line) and northwest (along the T1 northern lines, feeding into Chatswood).²³ Sydney Metro Northwest will also extend the T1 Epping line northwest to Rouse Hill and Tallawong. Sydney Metro Northwest is in progress with some services beginning in 2019, and Sydney Metro West is subject to final business case, with some funding set aside through the Restart NSW fund.²⁴
- Parramatta Light Rail is a committed new light rail line that will link Parramatta's CBD and train station to health, education, social, cultural and housing infrastructure across Parramatta and Westmead.
 - Stage 1 will connect the Parramatta CBD and trains station to the Westmead Health precinct, Parramatta North Urban Transformation Program, the new Western Sydney Stadium, the Camellia Precinct, the new Powerhouse Museum and Riverside Theatres Cultural Hub, the private and social housing redevelopment at Telopea, Rosehill Gardens Racecourse and three Western Sydney University campuses. Stage 1 is in progress with services to commence 2023.
 - Stage 2 will connect to Stage 1 and run north of the Parramatta River through the rapidly developing suburbs of Ermington, Melrose Park and Wentworth Point to Sydney Olympic Park, providing a new public transport option to this booming sport, entertainment and employment hub. It is subject to final business case and funding.
- Mass transit / train links from Parramatta to Epping, Kogarah and Norwest will build connectivity within the Central City District.

5.2.3 *Eastern City, North and South Districts*

This section address the final city – the Eastern District City – and the two remaining GSC districts:

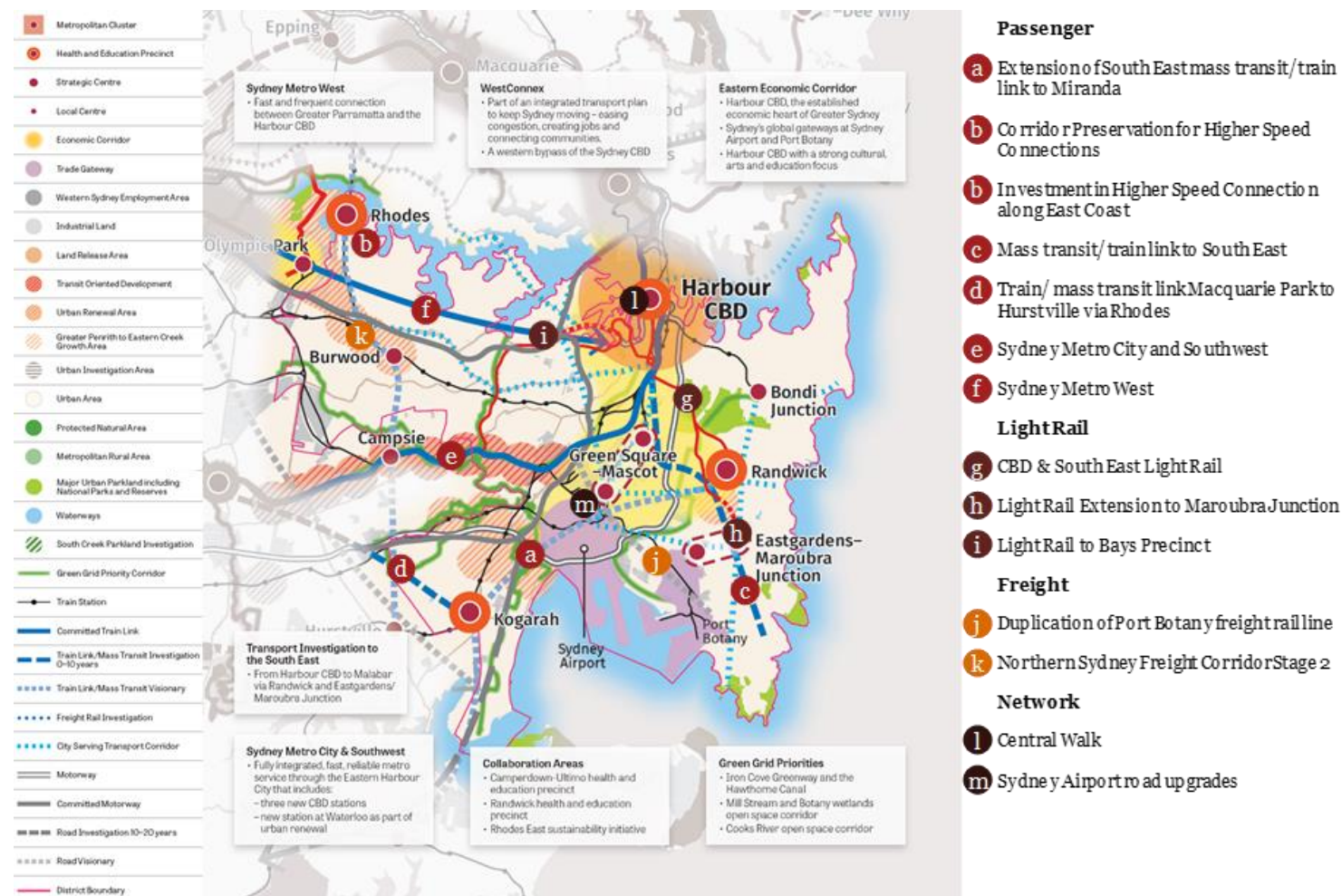
- The Eastern City District centres around the Harbour CBD, the current Greater Sydney CBD. It includes Bayside, Burwood, Canada Bay, City of Sydney, Inner West, Randwick, Strathfield, Waverley and Woollahra.
- The North District encompasses the northern local government areas in the Eastern City District. It includes Hornsby, Hunter's Hill, Ku-ring-gai, Lane Cove, Mosman, North Sydney, Northern Beaches, Ryde, and Willoughby.
- The South District encompasses the southern local government areas in the Eastern City District. It includes Canterbury–Bankstown, Georges River and Sutherland.

Figure 22 to Figure 24 illustrates the Eastern City, North and South Districts and provides an indicative location of rail projects relevant to the district.

²³ Sydney Metro Northwest ends at Chatswood, it does not support the line further into the Harbour City CBD, which is highly congested.

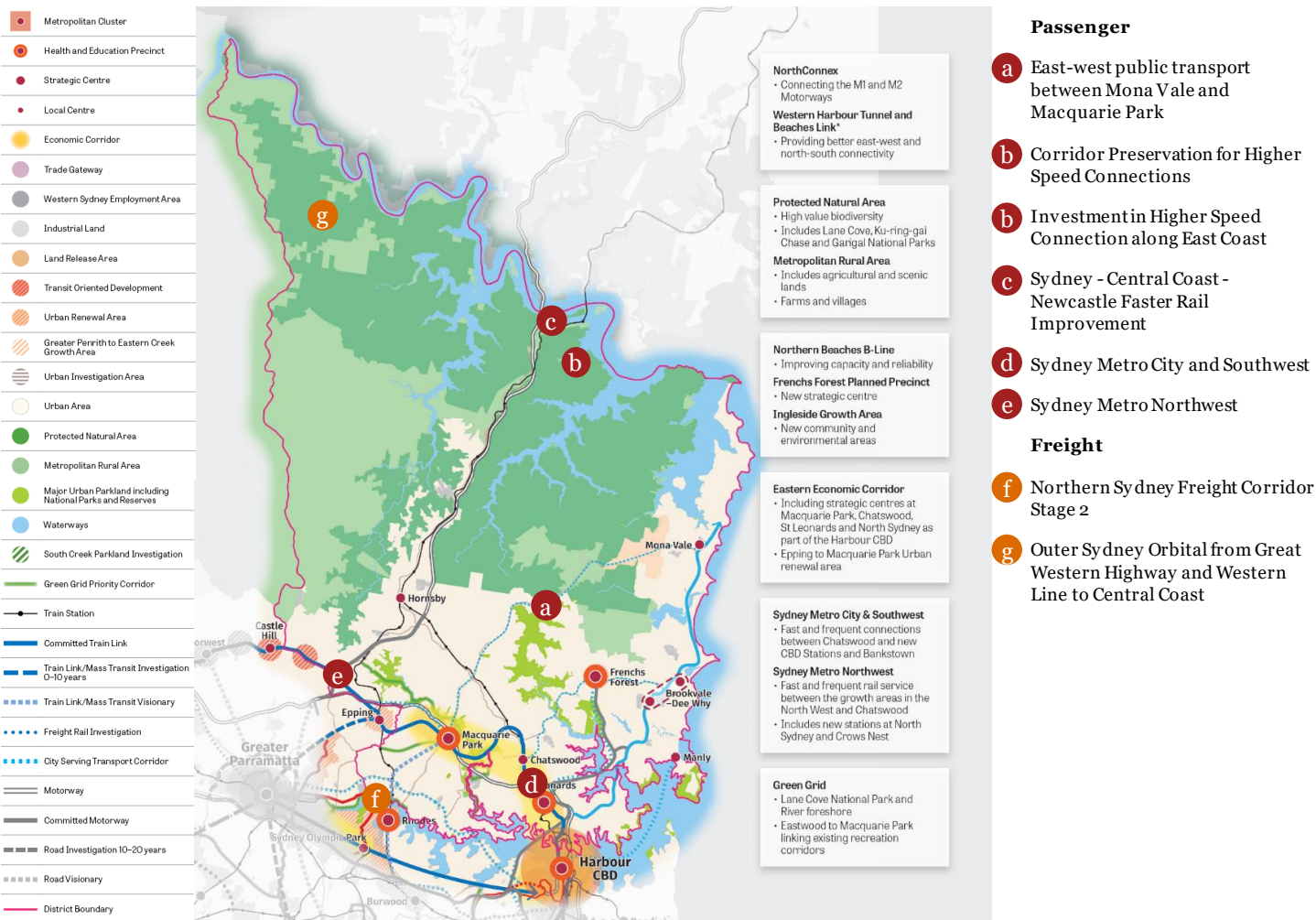
²⁴ From the sale of electricity assets. See <http://www.infrastructure.nsw.gov.au/restart-nsw/>

Figure 22. Greater Sydney Commission – Eastern City District map and rail projects



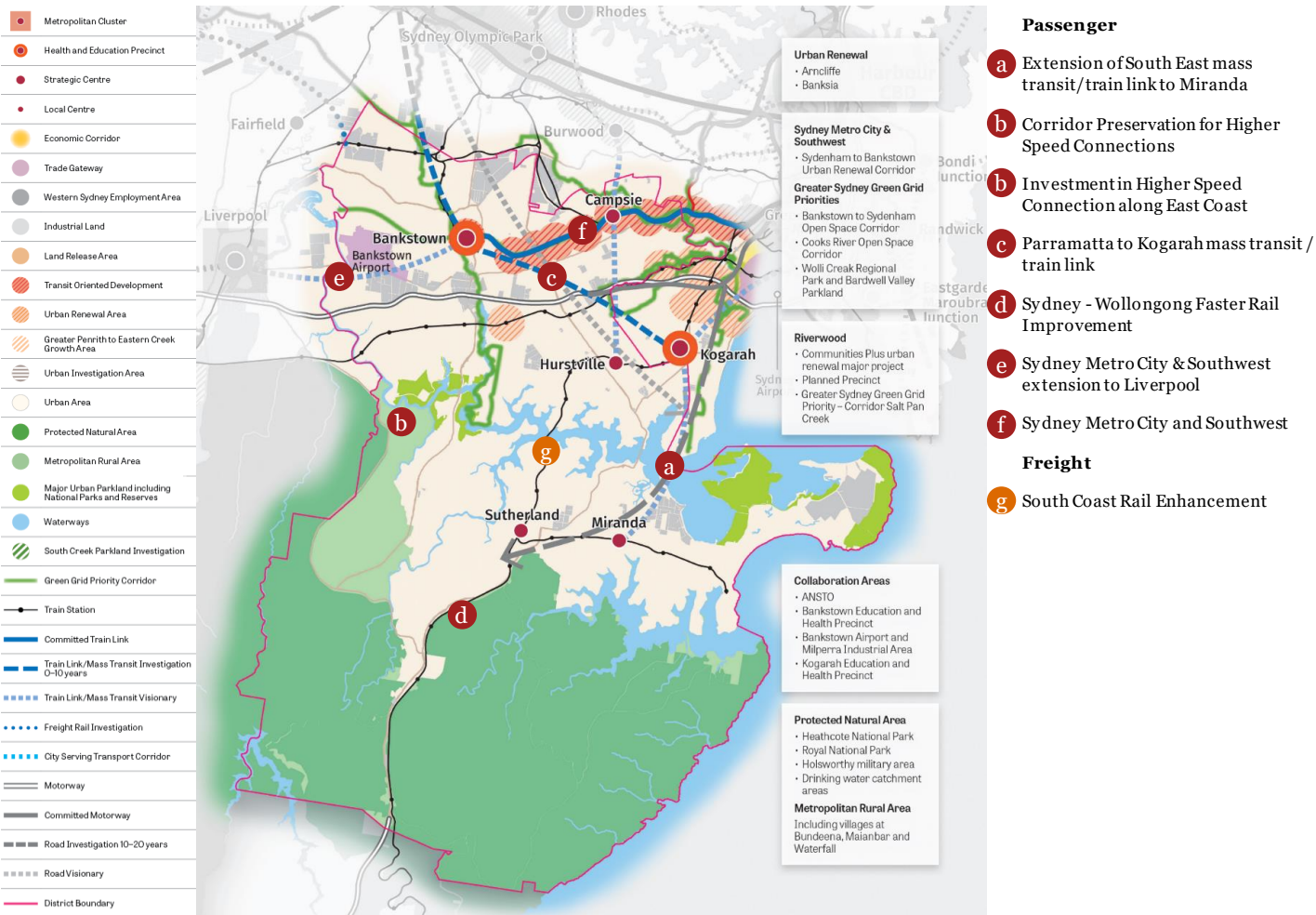
Source: GSC, Eastern City District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

Figure 23. Greater Sydney Commission – North District map and rail projects



Source: GSC, North District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

Figure 24. Greater Sydney Commission – South District map and rail projects



Source: GSC, South District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

These Districts in the Eastern City have a well-established transport network, although it is experiencing overcrowding and congestion as the population grows and centres around the Harbour CBD. As such, the majority of projects affecting The Eastern City District outlined in Table 9 are associated with building capacity, improving services and increasing access to the South East. In particular:

- Sydney Metro West and Northwest are committed projects that are discussed in detail in section 5.2.2.
- CBD & South East Light Rail is a committed project that will provide new connections access to the Harbour CBD, major sporting and entertainment facilities from south-eastern suburbs. This will provide more options for public transport along this corridor and reduce congestion.
- South East and Macquarie Park mass transit / train links are potential new connections that will support urban renewal and growth in the south-east. The Macquarie Park link will alleviate longer-term capacity pressures and improve the resiliency of the network by providing an additional north-south connection through Macquarie Park, Rhodes and Hurstville, enabling customers to transfer between Illawarra Line, East Hills Line, Metro Southwest-CBD, the Metro West, the Main West Line and the Northern Line.
- Light Rail to Bays Precinct is a potential new light rail link connecting the Harbour CBD with the Bays Precinct and Glebe Island.

6 Conclusion

This section outlines key insights from the review relating to the alignment of land use and transport plans.

6.1 *Alignment of current endorsed land use and transport plans*

This section will outline key insights from the review including:

- the level of alignment identified between the land use and transport plans
- the alignment of land use and transport plans to Australian Government objectives.

NSW land use and transport plans are aligned as evidenced by consistency in vision, inputs, target outcomes, geographic focus and projects

The approach tested internal alignment of land use and transport plans across five dimensions, finding alignment:

1. **Consistency of vision:** The in scope plans adopt the vision set in *Directions for a Greater Sydney 2017-2056* for a metropolis of three cities defined by 30 minute access.
2. **Integration of land use and transport planning:** land use and transport plans use the same population and employment forecasts for strategic direction – the three cities forecast.
3. **The in scope plans are aligned in their objectives and outcomes:** land use and transport plans are fully aligned to state government objectives, and the plan outcomes address these objectives.
4. **The in scope plans are aligned in the focus on Western Sydney activation:** All transport and land use plans have an aligned focus on catalysing the development of the Western Parkland City over the next 20 to 40 years. They do this by enabling the commitments in the Western Sydney City Deal through transport investment and land use.
5. **Reference to projects is consistent across the plans:** 20 major transport projects are consistently referenced across the plans, including Sydney Metro projects, links to WSA and the Aerotropolis (Leppington, Parramatta), light rail investment and freight investments (Outer Sydney Orbital, Western, Southern and Northern Sydney freight lines).
 - Smaller rail, network and freight projects tend to be referenced in transport plans only.

NSW land use and transport plans are aligned to a vision for Sydney that address Australian Government objectives of productivity growth, access to jobs and services, liveability and public amenity, increased housing supply

The primary aim of the plans is to re-shape Sydney into a metropolis of three cities targeting access within 30 minutes to jobs and services, delivering the necessary infrastructure investment and land use changes to support the transition. This includes integrating catalytic investment like the WSA.

From a transport plan perspective, investment is intended to develop Sydney as a ‘metropolis of three cities’, where people can access the jobs, education and services they need within 30 minutes by public or active transport, improving liveability. This allows transport to be an enabler of economic and social activity, and contribute to long term economic, social and environmental outcomes.

To deliver this the plans have the following rail network investment focus on each city:

- **Eastern Harbour City** – reducing congestion and crowding on train networks, and providing more connectivity, particularly in the South-East
- **Central River City** – improving radial connectivity to Greater Parramatta, to enable the Central River City to ultimately become the centre of Greater Sydney’s transport network
- **Western Parkland City** – investment to create a new city and reduce high car dependency, with a focus on city-shaping north-south rail connections within the city, as well as east-west connections to the other cities.

From a land use plan perspective, the focus on three cities will respond to forecast population and employment growth by enabling densification of population and employment in under-developed centres and urban renewal. This will address both housing supply and create the density required to support mass transit. The hierarchy of plan centres has been designed to integrate with the proposed transport investment.

Appendices

Appendix A Detail of rail projects

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Appendix A Detail of rail projects

This section presents a list of projects understood to be under consideration for Sydney and a brief description and status for each (taken directly from the *Greater Sydney Services and Infrastructure Plan*, *Draft NSW Freight and Ports Plan*, *Building Momentum: State Infrastructure Strategy 2018-2038* or *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan*), ordered as per Table 9. The projects are drawn from all in-scope reports and aligned to regions detailed in Section 5.1.

Table 11. Projects identified from in scope plans for NSW

Project	Description	District	Status	Timing
East-west public transport between Mona Vale and Macquarie Park	East-west public transport connection from Mona Vale to Macquarie Park. Investigate a transport corridor from Mona Vale to Macquarie Park along the A3 corridor. Benefit: Support the efficiency and reliability of passenger journeys west from the Northern Beaches, and improve 30 minute access to key employment centres by enabling customers to use rapid, high frequency buses, as opposed to lower frequency suburban services.	North	0-10 For Investigation	Unknown
Extension of South East mass transit / train link to Miranda	Bifurcation of the potential mass transit / train link to South East at Randwick. The mass transit / train link would then extend to Sydney Airport, Kogarah and (via the Sandringham Peninsula) to Miranda. Benefit: Support reliable 30 minute access by public transport for customers in southern Sydney by addressing capacity constraints on the existing train line and connecting new parts of the area by mass transit / train, including the Sandringham Peninsula.	Eastern City, South	20+ Visionary	Unknown
Higher frequency public transport services on selected corridors	Introduction of higher frequency public transport services on selected corridors across Greater Sydney. Increase in service frequencies on selected train lines and bus services to address capacity constraints or as part of new infrastructure (e.g., Sydney Metro). Benefit: This initiative will deliver benefits across the network by reducing congestion in peak times, increasing the resiliency of the network, and providing safer, more reliable journeys.	All	0-10 Committed	Unknown
Higher frequency transport services across Greater Sydney (0-10 yr)	<p>Introduction of higher frequency transport services across Greater Sydney:</p> <ul style="list-style-type: none"> • Turn-up-and-go services (<5 minute frequencies) on city-shaping and city-serving corridors • High frequency (<10 mins) or on-demand services on centre-serving corridors. <p>This increase in service frequencies on selected train lines and bus services supports the vision for Greater Sydney as a '30 minute city'. Benefit: Improve the efficiency and reliability of journeys across the transport network by encouraging greater public transport use, and boost 30 minute access to centres through more frequent services.</p>	All	0-10 For Investigation	Unknown

Project	Description	District	Status	Timing
Corridor Preservation for Higher Speed Connections	Confirm and begin the preservation of a corridor, based on the corridor set out in the Australian Government's High Speed Rail Study Phase 2, for a high speed rail link between Melbourne, Sydney and Brisbane. Benefit: Enable a future high speed connection to be delivered more affordably by minimising the risk of future land acquisitions being required, and providing greater clarity of land use for the community to enable them to make more informed decisions when purchasing land.	North, Eastern City, South, Outer Metro	10-20 For Investigation	Unknown
Investment in Higher Speed Connection along East Coast	Investment in higher speed connection along East Coast. Deliver a high speed transport connection along the East Coast of NSW (traversing Greater Sydney). Benefit: Future connectivity between Western Sydney and Central Coast, Newcastle and Canberra, providing cross-border connections and connecting Sydney, Global Gateway Cities and Regional Cities	North, Eastern City, South, Outer Metro	20+ Visionary	Unknown
Improved services on the Richmond Line	A corridor investigation for improved services, including potential duplication of Richmond Line to Riverstone, Vineyard, Marsden Park, North West Priority Growth Area. Benefit: Support improved reliability, capacity, and journey times on the Richmond Line.	Western City, Central City	0-10 For Investigation	Unknown
Leppington to WSA-Badgerys Creek Aerotropolis Rail Link	Potential extension of the South West Rail Link from Leppington to the metropolitan centre of WSA-Badgerys Creek, providing access to WSA via an interchange with the north-south train link. Benefit: Provide efficient and reliable access to WSA for customers to the east. Strategic modelling indicates this project would reduce the AM peak public transport travel time between Liverpool and WSA from approximately 68 minutes to 36 minutes, and support a sustainable urban form in the Western City by providing an additional east-west train link that supports convenient access to centres by public transport. This project has been listed for priority planning in collaboration with the Australian Government.	Western City	0-10 For Investigation	Unknown
Mass transit / train link to South East	Mass transit / train link from the Harbour CBD to Malabar via Randwick and Eastgardens-Maroubra Junction. Benefit: Support urban renewal and growth in the south-east, including around Malabar, by providing a high-capacity mass transit / train link, reduce the AM peak public transport travel time between Maroubra Junction and the Sydney CBD, and address potential longer-term capacity constraints by providing an additional mass transit link to the south and south-east of the Harbour CBD.	Eastern City	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
More Trains More Services program	<p>Called SmartRail program by iNSW. A series of network-wide investments that will deliver additional capacity, reduce the complexity of rail operations and better connect the network. The program will transform the rail network by utilising technology to enable automated high-capacity turn-up-and-go services. The first three stages should be delivered over the next 10 years, with targeted investments to remove bottlenecks, automate train control, improve signalling systems and capitalise on the benefits of new rolling stock and infrastructure.</p> <p>Stage 1 would deliver extra capacity across the network by upgrading rail infrastructure to unlock capacity in central Sydney. It includes the development of new automated systems to cost-effectively improve train control. Stage 1 would deliver capacity upgrades on the T4 Eastern Suburbs and Illawarra line and the T8 Airport line.</p> <p>Stage 2 would continue to upgrade the T4 Eastern Suburbs and Illawarra line and improve the T8 Airport line, providing an uplift of capacity, as well as delivering further upgrades in central Sydney to provide a network-wide benefit. Stages 1 and 2 include the deployment of new suburban trains and coincide with the introduction of the New Intercity Fleet, further improving services across the network.</p> <p>Stage 3 would complete the reconfiguration of the network in central Sydney, deploying automation and providing the transformative programs needed to separate inner urban and intercity services on the T1 Western and Northern line and the T4 Eastern Suburbs and Illawarra line.</p> <p>The State Infrastructure Strategy Update 2014 allocated \$1 billion towards the More Trains More Services program, and SmartRail should continue to be a priority for funding to ensure that existing rail assets are used to their full potential. Infrastructure NSW recommends that Transport for NSW complete business cases for Stage 1 and Stage 2 of the SmartRail program by the end of 2018 and 2019 respectively to enable progressive delivery of this program as a priority to provide capacity needed beyond 2021.</p> <p>This program includes Rebuilding NSW funding contributions, and has been funded \$648.2 million (2018-19).</p>	All	0-10 Committed	Unknown
New Intercity Fleet	<p>A new fleet of long distance, intercity trains from Sydney to the Central Coast, Newcastle, the Blue Mountains and the South Coast. The new intercity trains will provide improved accessibility including priority seating, wheelchair and luggage spaces, and charging stations. Overall, these investments will make journeys by train faster, safer, more accessible, and more reliable.</p> <p>The program has been funded \$495.7 million (2018-19).</p>	All	0-10 Committed	Late 2019 to 2021
New services on key routes (0-10 yr)	<p>Shorter term project: As new transport links are delivered, services will be reconfigured so that they provide faster access and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections.</p>	All	0-10 For Investigation	Unknown
New services on key routes (10-20 yr)	<p>Longer term project: As new transport links are delivered, services will be reconfigured so that they provide faster access and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections.</p>	All	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
North-south Rail Link in Western Parkland City: Cudgegong Road – St Marys	The north-south rail link is a rail train link for the Western City linking the growth areas in the Northwest and Southwest with WSA-Badgerys Creek Aerotropolis. This stage will connect the existing Sydney Metro Northwest terminus at Cudgegong Road to St Marys on the Western Line. ²⁵ Benefit: Provide 30 minute access to growth areas in the north west, and provide efficient and reliable access by train to Greater Parramatta, Penrith and other centres on the train network via an interchange at St Marys. This project has been listed for priority planning in collaboration with the Australian Government.	Western City, Central City	0-10 For Investigation	Unknown
North-south Rail Link in Western Parkland City: St Marys – WSA-Badgerys Creek Aerotropolis	<p>The north-south rail link is a new rail link for the Western City linking the growth areas in the Northwest and Southwest with WSA-Badgerys Creek Aerotropolis. This stage will connect St Marys with the WSA Badgerys Creek Aerotropolis. Benefit: Provide 30 minute access to WSA-Badgerys Creek Aerotropolis along the north-south spine of the Western City, including for customers in suburbs north of WSA-Badgerys Creek Aerotropolis, St Marys and Schofields.</p> <p>This project is subject to Final Business Case and funding in collaboration with the Australian Government. The commitment is part of the Western Sydney City Deal – a 20 year agreement between the three levels of government to deliver a vision for Western Sydney as part of an integrated planning and city-shaping approach. As a first step, the Australian and NSW Governments will each contribute up to \$50 million towards a business case process for Western Sydney Rail, in consultation with local government. The Australian and NSW Governments will be equal partners in funding the first stage of the North South Rail Link and have a shared objective to connect rail to Western Sydney Airport in time for opening in 2026, informed by the business case.</p> <p>This project has been funded \$35.0 million (a 2018-19 commitment by the Commonwealth)²⁶ for planning and the final business case for the North-South Rail Stage 1 to service the new Western Sydney Airport. This is part of a joint funding commitment of \$100.0 million between the Commonwealth and NSW Governments through the Western Sydney City deal.</p> <p>Infrastructure NSW stated that ‘While mass transit is not a near-term priority, the first phase should incorporate a connection from the T1 Western Line to Western Sydney Airport and the adjacent new CBD for the Western Parkland City. As this is developed, opportunities to advance the second stage to extend south from Western Sydney Airport to Campbelltown-Macarthur through intergovernmental partnerships should be considered. In the longer term, further development of the mass transit network could explore potential connections from centres including Leppington and Campbelltown-Macarthur and beyond’. (p.147)</p>	Western City	0-10 Committed	Objective to open in 2026

²⁵ PwC has been advised that the northern line of the North-South Rail Link will extend to Schofields, and Sydney Metro Northwest will also extend to Schofields from Cudgegong Road, to make a three-way interchange.

²⁶ PwC has been advised that NSW is likely to match the Commonwealth funding for 2018-19, pending actual spending.

Project	Description	District	Status	Timing
North-south Rail Link in Western Parkland City: WSA-Badgerys Creek Aerotropolis – Campbelltown-Macarthur	The north-south rail link is a new train link for the Western City linking the growth areas in the Northwest and Southwest with WSA-Badgerys Creek Aerotropolis. This stage will extend from WSA-Badgerys Creek Aerotropolis to Campbelltown-Macarthur. Benefit: Provide 30 minute access to WSA-Badgerys Creek Aerotropolis from Campbelltown-Macarthur and surrounding suburbs, improving access to jobs and services for customers in this area and shape a sustainable urban form in the Western City by providing a mass transit spine to attract sustainable development and minimise sprawl. This project has been listed for priority planning in collaboration with the Australian Government.	Western City	0-10 For Investigation	Unknown
Parramatta to Epping mass transit / train link	A mass transit / train link between Greater Parramatta and Epping via Carlingford to be considered as part of a Parramatta to Epping corridor study. Benefit: This would extend 30 minute access to Greater Parramatta to a significant number of suburbs on the train network, especially for customers from centres such as Rouse Hill, Hornsby, Epping and Macquarie Park. This would also improve the resilience of the train network by providing a new north-south train link in Greater Sydney that does not traverse the Harbour CBD and better spreading demand away from the busiest corridors in the Eastern City.	Central City	10-20 For Investigation	Unknown
Parramatta to Kogarah mass transit / train link	A mass transit / train link from Greater Parramatta to Kogarah via Bankstown. Benefit: Extend 30 minute access to Greater Parramatta to a significant number of suburbs on the train network by unlocking network benefits, improve the resilience of the train network by providing a new north-south train / mass transit link in Greater Sydney that does not traverse the Harbour CBD and better spreading demand away from the busiest corridors in the Eastern City.	Central City, South	10-20 For Investigation	Unknown
Parramatta to Norwest mass transit / train link	A mass transit / train link from Greater Parramatta to Norwest; preferred station locations TBC. Could potentially be connected to the proposed mass transit / train link to Kogarah to from a north-south link through Parramatta. Benefit: Travel time analysis suggests that this project would dramatically improve travel times between Norwest Business Park and Parramatta, providing 30 minute access to Greater Parramatta from Rouse Hill and surrounding centres in the Hills area. This project would also alleviate longer-term capacity pressures on Sydney Metro Northwest (west of Epping) by providing a more direct link between the Hills area and Greater Parramatta (rather than via Epping).	Central City	20+ Visionary	Unknown
Passenger train improvements to support growth at Wilton	Suburban passenger train improvements south of Macarthur (including consideration of passenger services to support growth at Wilton). A program of operational, fleet and targeted fixed infrastructure improvements (for example, electrification and new deviations to eliminate curvatures and flatten grades) to facilitate improved service frequencies to support Wilton Growth Area. Benefit: This will improve rail travel times, and connectivity to support Wilton Growth Area.	Western City, Outer Metro	0-10 For Investigation	Unknown
Public transport passenger service improvements	Infrastructure upgrade (including passenger information, CCTV, platform upgrades) to ensure that public transport assets meet required safety, performance and operational standards, meet designated customer amenity standards and are reliable and sustainable. Benefit: Stations that are accessible to people with a disability, limited mobility and parents with prams; modern buildings and facilities for all modes that meet the needs of a growing population; and modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers.	All	0-10 Committed	Unknown

Project	Description	District	Status	Timing
Service changes to connect to new train lines (0-10 yr)	Shorter term: Service changes to connect to new train lines. As new train links are delivered, bus services will be reconfigured so that they provide faster access to train lines and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections to train and higher-capacity transport links.	All	0-10 For Investigation	Unknown
Service changes to connect to new train lines (10-20 yr)	Longer term: Service changes to connect to new train lines. As new train links are delivered, bus services will be reconfigured so that they provide faster access to train lines and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections to train and higher-capacity transport links.	All	10-20 For Investigation	Unknown
Sydney Growth Trains as part of More Trains, More Services program	Investment in the 'More Trains, More Services' program and Sydney Growth Trains to provide more frequent and express services on selected corridors. Sydney Growth Trains is the centrepiece of the More Trains, More Services program and will provide customers with more frequent and express services on selected corridors. Benefit: The new double deck trains will provide improved accessibility including priority seating, wheelchair spaces and hearing aid loops. Key features include improved air conditioning with advanced temperature control, high definition customer information screens to provide journey and safety information, and internal and external CCTV and customer help points. Overall, these investments will make journeys by train faster, safer, more accessible, and more reliable.	All	0-10 Committed	2019
Sydney Metro City and Southwest	Sydney Metro City and Southwest is second stage of Sydney Metro. It will deliver a fast, reliable metro service for the Eastern Harbour City, and will be fully segregated from the existing Sydney Trains network between Sydenham and Bankstown, improving the reliability of services on the line. The metro will provide additional rail capacity and stations to further reduce congestion in the Harbour CBD. A 30km extension of metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and south west to Bankstown. Benefit: Sydney Metro City & Southwest will deliver a fast, reliable metro service for the Eastern Harbour City, and will be fully segregated from the existing Sydney Trains network between Sydenham and Bankstown, improving the reliability of services on the line. The metro will provide additional rail capacity and stations to further reduce congestion in the Harbour CBD. This project has been funded \$1.9 billion (2018-19).	North, Eastern City, South	0-10 Committed	2024
Sydney Metro City & Southwest extension to Liverpool	Extension of Sydney Metro City and Southwest from Bankstown to Liverpool. Benefit: Provide a direct, high-frequency train connection between significant strategic centres in the Central and Western City, improving 30 minute access to jobs and services for customers living in surrounding suburbs, and extend efficient, reliable, high-frequency train access to the Harbour CBD for residents living in Liverpool and surrounding suburbs.	Western City, South	20+ Visionary	Unknown
Sydney Metro City & Southwest extension to Liverpool corridor protection	Corridor protection for the project, in the first instance.	Western City, South	Proposed	Unknown

Project	Description	District	Status	Timing
Sydney Metro Northwest	<p>Sydney Metro Northwest is the first stage of Sydney Metro. Sydney Metro Northwest will deliver a high-frequency, high capacity rail service between the growth areas in the Northwest and Chatswood with interchanges to the North Shore and Northern train lines. Benefits: Sydney Metro Northwest will deliver, for the first time, a reliable public transport service to a region which has the highest car ownership levels per household in NSW. It will reduce congestion on roads, and provide a modern turn-up-and-go service to the Eastern Harbour CBD.²⁷</p> <p>This project has been funded \$8.3 billion (2018-19) by the Commonwealth.</p>	North	0-10 Committed	2019; construction ongoing
Sydney Metro West	<p>A new underground metro railway under investigation to link the Parramatta and Sydney CBDs. Key precincts already identified to be serviced by Sydney Metro West include Parramatta, Sydney Olympic Park, The Bays Precinct and the Sydney CBD. Benefit: Sydney Metro West doubles the capacity of the currently overcrowded T1 Western Line and establishes future capacity for Sydney's fast growing west and the planned airport. Passengers will also enjoy faster travel times all the way from Penrith and Blacktown to the Eastern Harbour City. This project also delivers strong city-shaping outcomes along its proposed route. The project is subject to Final Business Case and funding.</p> <p>There is a \$3.0 billion Restart reservation for the Sydney Metro West. This funding, subject to the final business case and the requirements of the Restart Act (2011), will fund project development and commencement of land acquisition, early works and tunnelling. However, this does not cover the full \$8.3 billion cost of the project. The NSW Government will also invest \$28.1 million in 2018-19 to continue the planning and the final business case for this project.</p>	Central City, Eastern City	0-10 Committed	Unknown
Sydney - Canberra Faster Rail Improvement	A program of operational, fleet and targeted fixed infrastructure improvements south of Macarthur (for example, electrification and new deviations to eliminate curvatures and flatten grades). Benefit: This will improve rail travel times, services and facilities to enable increased capacity as well as connecting and developing greater economic synergies between Sydney and the Global City of Canberra as well as improve cross-border connections.	Western City, Outer Metro	0-10 For Investigation	Unknown
Sydney - Central Coast - Newcastle Faster Rail Improvement	A program of operational, fleet and targeted fixed infrastructure improvements (for example, new deviations to eliminate curvatures and flatten grades). This would include a new rail crossing of the Hawkesbury River. Benefit: Improved rail journey travel times and services and facilities to enable increased capacity. Will result in stronger connections and the development of greater economic synergies between Sydney and the Satellite City of Gosford and the Global Gateway City of Newcastle Assist in easing housing affordability pressure and provide a strategic connection between Sydney, the Satellite City of Gosford and the Global Gateway City of Newcastle.	North, Outer Metro	0-10 For Investigation	Unknown

²⁷ PwC has been advised there will be six stations in Sydney Metro West.

Project	Description	District	Status	Timing
Sydney - Wollongong Faster Rail Improvement	A program of operational, fleet and targeted fixed infrastructure improvements (for example, new deviations to eliminate curvatures and flatten grades). This would include a new rail crossing through the Illawarra Escarpment. Benefit: Improved rail travel times to provide a time and cost competitive freight corridor (when compared with road). Improved rail services and facilities to enable increased capacity. Connect and develop greater economic synergies between Sydney and the Satellite City of Wollongong, supporting the easing of housing affordability pressure.	South, Outer Metro	0-10 For Investigation	Unknown
Train improvements as part of More Trains, More Services program	<p>A staged program of works delivering upgraded rail infrastructure, new trains and extra services across the suburban train network to address the growth in patronage forecast over the next 5 years. Train improvements on T1, T2, T4, T5, and T8 lines, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning) roll out of Advanced Train Control System to improve safety, capacity and reliability; upgrade of junctions to segment different lines on the network; additional tracks on some sections of existing corridors to boost capacity. Specific to each city:</p> <p>Eastern City: Train improvements on T8 Airport Line, T4 Illawarra Line (including South Coast Line) and T1 Western Line as part of the More Trains, More Services program, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning).</p> <p>Central City: Train improvements on T1 Western Line as part of the More Trains, More Services program, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning).</p> <p>Western City: Train improvements on T8 Airport Line, and T1 Western Line as part of the More Trains, More Services program, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning).</p>	All	0-10 For Investigation	Unknown
Train / mass transit link Macquarie Park to Hurstville via Rhodes	A potential mass transit / train link from Hurstville (or Kogarah) to Burwood and Strathfield and then potentially on to Rhodes and Macquarie Park. Benefit: This project would alleviate longer-term capacity pressures and improve the resiliency of the network by providing an additional north-south connection through Macquarie Park, Rhodes and Hurstville, enabling customers to transfer between Illawarra Line, East Hills Line, Metro Southwest-CBD, the Metro West, the Main West Line and the Northern Line.	Central City, Eastern City and South	20+ Visionary	Unknown
Upgrade to Blue Mountains Line	Station and track improvements along the rail corridor from west of Springwood Station to Lithgow Station to accommodate new and existing trains. Benefit: This project will deliver upgraded rail infrastructure allowing the complex network to operate at an even greater capacity, including better signalling systems, power supply upgrades and station improvements.	Western City, Outer Metro	0-10 Committed	mid-2020
WSA-Badgerys Creek Aerotropolis - Parramatta Rail Link	New rail link from Parramatta to WSA-Badgerys Creek Aerotropolis via Prairiewood to reduce journey times between these centres and the Harbour CBD. Benefit: Connect the three Metropolitan Centres with a high frequency, high capacity transport link, acting as the central east-west public transport spine for Greater Sydney, and boost 30 minute access to Greater Parramatta for residents living to the south-west of the centre. This project will be developed in collaboration with the Australian Government.	Western City, Central City	0-10 For Investigation	Unknown

Project	Description	District	Status	Timing
CBD & South East Light Rail	<p>A high-capacity and frequent service to improve access between the Sydney CBD and south-eastern suburbs. The 12km route extends from Circular Quay along George Street to Central Station, through Surry Hills to Moore Park, then to Kensington and Kingsford via Anzac Parade and Randwick via Alison Road and High Street. Benefits: The Light rail will provide reliable, efficient, turn-up-and-go public transport, with services every four minutes between CBD and Moore Park, and every eight minutes to and from Randwick and Kingsford between 7am and 7pm. A combined bus and light rail network will significantly improve public transport access to the Harbour CBD, major sporting and entertainment facilities at Moore Park and Randwick along with the University of NSW, TAFE and health precincts.</p> <p>This project has been funded \$2.1 billion (2018-19) - New light rail line extending from Circular Quay along George Street to Central Station then on to Moore Park, Kingsford and Randwick.</p>	Eastern City	0-10 Committed	2019
Light Rail Extension to Maroubra Junction	<p>Extension of the current CBD and South East Light Rail project to Maroubra Junction. Benefit: Support urban renewal and growth to the south of Kingsford with a mode of transport that supports street activation; enable future connectivity between CBD and South-east Light Rail and mass transit / train link to South East at Maroubra Junction. Benefit: This will improve access to key centres in the south-east, such as Randwick Health Precinct for customers living west of the Harbour CBD, and alleviate potential long-term capacity constraints on CBD and Southeast Light Rail by enabling customers to interchange between mass transit / train link and light rail at Maroubra Junction.</p>	Eastern City	10-20 For Investigation	Unknown
Light Rail to Bays Precinct	<p>A proposed loop from the existing Inner West Light Rail connecting the existing line at North Leichhardt and at Pyrmont via The Bays Precinct and Old Glebe Island Bridge. Benefit: Support urban renewal of the Bays Precinct with a mode of transport that supports street activation, provide efficient and reliable local access by public transport to the Bays Precinct for customers in the Inner West, alleviate potential long-term capacity constraints on the Inner West light rail line by spreading inbound demand from west of Lilyfield via two branches – either via Glebe or via the Bays Precinct, and enable interchange between Inner West Light Rail and Sydney Metro West at Bays Precinct, improving access to jobs and services for Inner West customers.</p>	Eastern City	10-20 For Investigation	Unknown
Parramatta Light Rail - Stage 1	<p>The first stage of Parramatta Light Rail will connect Westmead to Carlingford via Parramatta CBD and Camellia. The route will link Parramatta's CBD and train station to the Westmead Health precinct, Parramatta North Urban Transformation Program, the new Western Sydney Stadium, the Camellia Precinct, the new Powerhouse Museum and Riverside Theatres Cultural Hub, the private and social housing redevelopment at Telopea, Rosehill Gardens Racecourse and three Western Sydney University campuses. Benefit: Light rail will create new communities, connect great places and help both locals and visitors move around and explore what the region has to offer.</p> <p>This project has been funded \$258.0 million (2018-19).</p>	Central City	0-10 Committed	2023

Project	Description	District	Status	Timing
Parramatta Light Rail - Stage 2	<p>Stage 2 will connect to Stage 1 and run north of the Parramatta River through the rapidly developing suburbs of Ermington, Melrose Park and Wentworth Point to Sydney Olympic Park, providing a new public transport option to this booming sport, entertainment and employment hub. Benefit: Light rail will create new communities, connect great places and help both locals and visitors move around and explore what the region has to offer. This project is subject to Final Business Case and funding.</p> <p>Infrastructure NSW states that 'Improving connectivity to Sydney Olympic Park and the Wentworth Point peninsula will increase accessibility and help to cater for growth. The relative merit of Stage 2 as an investment priority should be considered once the business case is complete and the route, benefits and costs are clear.'</p> <p>This project has been funded \$20.0 million (2018-19) for planning.</p>	Central City	0-10 Committed	Unknown
Parramatta Light Rail extensions	Potential extensions of Parramatta Light Rail to be considered. Benefit: Improve the vibrancy and liveability of suburbs in and around Greater Parramatta by supporting the renewal of these areas with a high-quality on-street public transport mode.	Central City	10-20 For Investigation	Unknown
Access to Moorebank Intermodal Terminal	Development of a package of road upgrades to alleviate impacts from Moorebank Intermodal Terminal (MIT) and related regional traffic growth. Benefit: The terminal will boost productivity and improve transport links enabling import-export freight travelling through Sydney to and from Port Botany to be transported on rail instead of the road network, providing cheaper and more efficient freight transportation. It will support the intermodal terminal following operational start in 2019. This project will be developed in collaboration with the Australian Government.	Western City	0-10 Committed	Unknown
Additional capacity on Southern Sydney Freight Line	Continued network improvements of the SSFL south of Liverpool to increase capacity. Benefit: Improve the efficiency and reliability of rail freight movements by better separating freight from passenger trains, and enable an increase in passenger train service frequency on the T5 Cumberland Line by opening up additional train paths to passenger trains. This project will be developed in in collaboration with the Australian Government.	Western City	10-20 For Investigation	Unknown
Address long term capacity constraints to Port Botany and South East	<p>Address long term capacity constraints to Port Botany and South East. Investigation of new train and road links to address longer-term capacity constraints on selected corridors.</p> <p>Note: This is different to <i>Future Transport Strategy 2056's</i> reference of this project, which only identifies improved road connectivity, with no mention of rail.</p>	Eastern City	20+ Visionary	Unknown
Automation	Investigation of the potential for automation of freight movements between ports and inland terminals	All	20+ Visionary	Unknown
Completion of Maldon to Dombarton railway line	Complete the Maldon to Dombarton Railway, a 35-kilometre single-track rail line between the Main South Line at Maldon (in Wollondilly Shire) and Dombarton (near Port Kembla), in the Illawarra. Benefit: Enable higher passenger train service frequencies on the T4 Illawarra line by diverting rail freight movements between the Illawarra and Greater Sydney to the Maldon-Dombarton link, improve the efficiency and reliability of rail freight movements between the Illawarra, Greater Sydney and regions to the north and west of Sydney with a dedicated, more direct freight rail line, and support the potential future growth of container movements to and from Port Kembla by providing dedicated 24/7 freight rail access between the port and intermodal terminals in the west of Sydney.	Western City, Outer Metro	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
Port Botany Rail Line Duplication (including Cabramatta Loop)	Duplication of the remaining 2.9km freight rail single-track section of the Port Botany Rail Line between Mascot and Botany (including construction of new track and rail bridges), and construction a 1.4km passing loop to allow freight trains to pass at Cabramatta on the Southern Sydney Freight Line. Benefit: Support the growth, reliability and safety of container movements to and from Port Botany by enabling more goods to be reliably moved by rail between the port and intermodal terminals in Greater Sydney and regional NSW. The Australian Government has committed \$400 million for the Australian Rail Track Corporation to deliver this project.	Eastern City, Western City	0-10 Committed	2019 - 2023
Freight Innovation Projects (0-10 yr)	Shorter term: Investment in new technology and trials that deliver system integration, efficiencies and improved safety.	All	0-10 For Investigation	Unknown
Freight Innovation Projects (10-20 yr)	Longer term: Investment in new technology and trials that deliver system integration, efficiencies and improved safety.	All	10-20 For Investigation	Unknown
Freight Rail Capacity Enhancements	Providing additional or dedicated capacity for freight in the Southern Highlands, Illawarra and Main West rail lines.	All	10-20 For Investigation	Unknown
Freight Separation	Continuing to plan for the separation of freight from passenger tasks on key shared networks to optimise performance for both freight and passenger services.	All	20+ Visionary	Unknown
Freight Sustainability and Resilience: Continue Freight Noise Attenuation Program	The Freight Noise Attenuation Program (FNAP) aims to minimise the impact of existing freight rail noise in homes and some sensitive use community buildings. Transport for NSW will reduce the impact of freight noise by installing noise-reducing treatments in eligible homes and buildings.	All	0-10 Committed	2028
Freight Sustainability and Resilience: Identify constraints	Identify constraints to the ongoing performance of freight networks due to a changing environment, and community expectations.	All	0-10 For Investigation	Unknown
Freight Technology Improvements	Identify and implement technology solutions to improve the efficiency of freight movements in Metropolitan areas, with a view to increasing the mode shift to rail over time.	All	0-10 For Investigation	Unknown
Metropolitan Rail Transfer Station	Support the development of an Intermodal terminal to handle bulk waste and recycling materials originating in the growing Sydney metropolis.	Eastern City	0-10 For Investigation	Unknown
Moorebank Intermodal Facility (capacity increases)	The NSW Government is working with the Commonwealth Government and the private sector to develop the Moorebank intermodal site to increase the proportion of container movements carried by rail. This is to support growth in container freight volumes and reduce the growth rate in truck movements to and from the port precinct.	Western City	0-10 Committed	2019 - 2030

Project	Description	District	Status	Timing
Northern Sydney Freight Corridor	<p>Northern Sydney Freight Corridor: Supporting separation of freight and passenger trains by investing in freight capacity between Sydney and the Central Coast.</p> <p>Note: This appears similar to Northern Sydney Freight Corridor Stage 1, which has been completed. However, this project has been listed as '0-10 For Investigation' in the <i>Draft NSW Freight and Ports Plan</i>.</p>	North	0-10 For Investigation	Unknown
Northern Sydney Freight Corridor Stage 2	<p>Investment in third tracks and/or quadruplication between Strathfield and north of Greater Sydney to improve freight rail capacity. Benefit: This will improve the efficiency and reliability of freight movements between Greater Sydney and regions to the north by improving the separation of freight and passenger trains on the T1 Northern Line.</p> <p>Note: The <i>Draft NSW Freight and Ports Plan</i> has a different status for this project (10-20 For Investigation) than the <i>Future Transport Strategy 2056</i>.</p>	Eastern City, North, Central City	0-10 For Investigation	Unknown. Stage 1 is complete
Outer Sydney Orbital corridor protection	<p>Protect corridors in Western Sydney for a future Outer Sydney Orbital Freight Line, and secure supporting, connected intermodal terminal precincts. Transport for NSW will act to secure sufficient land for freight precincts, as well as identify and protect transport corridors to lower costs of development and maximise development potential, look at strategies to address urban encroachment, plan for future growth in movement of goods across NSW, and within both Greater Sydney and regional areas, improving the efficiency of supply chains and overall freight productivity. The direction for this Priority Action Area is to maintain and enhance access to existing freight precincts to improve the efficiency of the supply chain, protect corridors and land for freight activities and take account of freight in future strategic planning activities.</p>	Western City, North	0-10 Committed	Unknown, feedback period closed
Outer Sydney Orbital from Great Western Highway and Western Line to Central Coast	<p>A future North – South orbital transport corridor around Greater Sydney. Including motorway and freight rail, it will provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This stage will connect the Great Western Highway / Western Line near St Marys via Box Hill in Sydney's Northwest to the Central Coast near Gosford. Benefit: Support the efficient and reliable movement of freight bypassing Greater Sydney with a single dedicated outer bypass, improve the resilience of the transport network connecting Greater Sydney and the Central Coast by alleviating sole reliance on the M1 Pacific Motorway, and support longer-term growth in passenger train movements on the T1 Northern Line by providing a new dedicated freight rail connection between Greater Sydney and the Central Coast.</p>	Western City, North	20+ Visionary	Unknown
Outer Sydney Orbital from Great Western Highway and Western Line to WSA-Badgerys Creek Aerotropolis	<p>A future North – South orbital transport corridor around Greater Sydney. Including motorway and freight rail, it will provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This first stage will connect the Great Western Highway to WSA-Badgerys Creek Aerotropolis. The freight rail connection will link the Western Line to the Western Sydney Freight Line, north of WSA-Badgerys Creek Aerotropolis. Benefit: Support the efficient and reliable movement of freight bypassing Greater Sydney with a single dedicated outer bypass, and support growing demand to access WSA from the Central West and centres such as Penrith and surrounding areas with a higher capacity road link.</p>	Western City	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
Outer Sydney Orbital from WSA-Badgerys Creek Aerotropolis to Hume Motorway and South Line	A future North – South orbital transport corridor around Greater Sydney. Including motorway and freight rail, it will provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This stage will connect WSA-Badgerys Creek Aerotropolis to the M31 Hume Motorway south of Campbelltown-Macarthur. The freight rail connection will link OSO freight rail and Western Sydney Freight Line (north of WSA-Badgerys Creek Aerotropolis) to the Main South Line south of Campbelltown-Macarthur. Benefit: Support the efficient and reliable movement of freight bypassing Greater Sydney with a single dedicated outer bypass, unlock the benefits of the Maldon-Dombarton link to the Illawarra by providing the connection to OSO freight rail and Western Sydney Freight Line (north of WSA-Badgerys Creek Aerotropolis), and provide additional capacity for road transport to the Western City as demand on The Northern Road grows.	Western City	20+ Visionary	Unknown
Port Botany Landside Improvement Strategy	Infrastructure NSW recommends this project to enhance the efficient coordination of road and rail freight in and out of Port Botany.	Eastern City	Proposed	Unknown
South Coast Rail Enhancement	Providing additional capacity on the Main South and Illawarra rail lines. Infrastructure NSW states that ‘in the next five to 10 years, Transport for NSW should prepare an updated business case for the project that incorporates updated land use, transport and freight forecasts that reflect planned growth in the Western Parkland City and passenger rail demands on the T4 Illawarra and South Coast line.’	South	0-10 For Investigation	Unknown
Southern Sydney Freight Line Improvements	Supporting freight with upgrades to the Southern Sydney Freight Line north of Liverpool to increase capacity for freight and support Moorebank. Benefit: Improve the efficiency and reliability of rail freight movements by providing additional capacity for freight, particularly to and from Moorebank Intermodal Terminal.	Western City, Central City	0-10 For Investigation	Unknown
State Environmental Planning Policies update	Infrastructure NSW recommends that the Department of Planning and Environment update the relevant State Environmental Planning Policies by the end of 2019 to further protect strategically important ports, airports, industrial lands, freight precincts and key corridors from incompatible uses to ensure the efficient movement of freight in Sydney and NSW, now and into the future.	All	Proposed	Update by end of 2019
Western Sydney Freight Line corridor protection	Protect corridors for a future Western Sydney Freight Line, and secure supporting, connected intermodal terminal precincts.' Transport for NSW will act to secure sufficient land for freight precincts, as well as identify and protect transport corridors to lower costs of development and maximise development potential, look at strategies to address urban encroachment, plan for future growth in movement of goods across NSW, and within both Greater Sydney and regional areas, improving the efficiency of supply chains and overall freight productivity. The direction for this Priority Action Area is to maintain and enhance access to existing freight precincts to improve the efficiency of the supply chain, protect corridors and land for freight activities and take account of freight in future strategic planning activities.	Western City, Central City	0-10 Committed	Unknown, feedback period closed
Western Sydney Freight Line (and intermodal terminal)	Western Sydney Freight Line would connect the Southern Sydney Freight Line to an intermodal terminal site in Western Sydney and to the Outer Sydney Orbital which will provide a connection with the Main West Railway Line. Benefit: Support dedicated freight rail access between Port Botany and the new Western Sydney Intermodal Terminal, enable an increase in service frequency on the T1 Western Line by removing freight trains from the line between St Marys and Penrith, and support the emergence of Parramatta as a highly liveable Metropolitan Centre by diverting freight rail movements away from the centre.	Western City, Central City	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
Automatic Train Protection	Progressively fit the network and fleet with a modern signalling, control and train protection system in the driver's cabin that interfaces with the trackside signalling system. This project has been funded \$186.0 million (2018-19).	All	0-10 Committed	late 2020
Central Walk	A new underground pedestrian concourse at Central Station to better connect passengers to trains, buses, light rail and the new Sydney Metro. This project has been funded \$132.4 million (2018-19).	Eastern City	0-10 Committed	Construction begins 2018
Expansion of Travel Choices Program	Expansion of Travel Choices Program to encourage customers to change travel behaviours to support better use of transport capacity. Roll-out of Travel Choices Program to additional corridors and precincts. Benefit: The program will encourage customer travel behaviour change to support better use of transport capacity. The focus includes customers rerouting journeys, retiming journeys, using different modes or reducing the need to travel to spread demand and soften the weekday peak periods. This initiative will deliver benefits across the network by reducing congestion in peak times, increasing the resiliency of the network, and providing safer, more reliable journeys.	All	0-10 Committed	Unknown
Greater Parramatta Access Plan	Infrastructure NSW recommends a Greater Parramatta Access Plan, stating it would identify ways of integrating the various precincts across the Greater Parramatta to the Olympic Peninsula area by improving their connectivity, calming traffic and enhancing urban amenity. Infrastructure NSW recommends that by the end of 2018, Transport for NSW and the Greater Sydney Commission develop a Greater Parramatta Access Plan leading to a strategic business case for a program of works under the pilot growth infrastructure compact.	Central City	Proposed	Unknown
Greater Sydney Parking Guideline (train station car parking)	Development and implementation of a Greater Sydney Parking Guideline in collaboration with local government to ensure parking will be provided in a way that is consistent with the level of access by alternative modes of transport, including addressing the future provision of commuter car parks. Development and implementation of policy, in collaboration with local government, to ensure parking will be provided in a way that is consistent with the level of access by alternative modes of transport, including addressing the future provision of commuter car parks. Benefit: Support the use of private vehicles to access public transport as an option of a first and last mile solution, support the implementation of the Movement and Place Framework, and provide leadership and guidance to local government on issues of parking.	All	0-10 For Investigation	Unknown

Project	Description	District	Status	Timing
Identification and protection of corridors for future transport links	<p>Investigating and analysing future transport demands, developing multi-modal corridor plans and identifying and preserving corridors for future transport links, particularly to support growth in the emerging Western City, and provide greater east-west and north-south connections. Benefit: Identifying corridors supports the delivery of future transport initiatives, supports the financial sustainability of the transport network by reducing the need for more expensive land acquisitions in the future, and provides greater certainty to the community on planned land use to enable informed decisions to be made.</p> <p>Transport for NSW is already investigating corridors of land in the Western Parkland City for the delivery of the South West Rail Link Extension, North South Rail Link, Outer Sydney Orbital, Bells Line of Road – Castlereagh Connection and Western Sydney Freight Line. The NSW Government will continue to consult with communities and landowners on the protection process, the alignment and delivery for the final corridors.</p> <p>Infrastructure NSW recommends that the NSW Government plan and protect the corridors and precincts necessary for future transport, freight, logistics, energy and communications facilities and infrastructure in the Western Parkland City. Infrastructure NSW recommends that the NSW Government provide funding for a second round of the Corridor Identification and Reservation Fund</p>	All	0-10 For Investigation	Unknown
Integrated active transport policies (including with rail)	<p>Integrated active transport policies to support long-term integrated transport and land use planning. Development and implementation of policy to ensure walking and cycling is provided and integrated for, where appropriate, as part of new and upgraded road, rail, bus and transport interchange projects, such as State Infrastructure Multi Modal Corridor Program (i.e. delivering cycling routes within state owned assets). Train fleet and station upgrades will include space for active transport devices and major interchanges will include bicycle facilities. Benefit: Improving the sustainability of the transport network by encouraging more short trips to be made by walking or cycling.</p>	All	0-10 For Investigation	Unknown
Metropolitan Interchange Program	<p>Making interchanges safer, faster and more convenient to encourage public transport use. This includes developing centre-specific plans with bus operations requirement, making interchanges more attractive, and providing more services, such as shops, and major interchanges will include bicycle facilities. Benefit; Improve the range of services at interchanges to improve the attractiveness of interchanging, thereby boosting public transport mode share</p> <p>Transport for NSW has identified Central station, Redfern, Circular Quay, and other locations in the Metropolitan Interchange Program as priorities in the existing network for upgrades. In addition, as major transport projects like the Metro and light rail networks are delivered, new interchanges will be established. Infrastructure NSW recommends that by the end of 2018, Transport for NSW complete business cases and planning for the upgrade of major public transport interchanges at Central, Redfern and Circular Quay, and develop a program for the progressive upgrade of other major interchanges across Greater Sydney.</p>	All	0-10 For Investigation	Unknown

Project	Description	District	Status	Timing
Mobility as a Service (MaaS) implementation	<p>Implementation of Mobility as a Service (MaaS) model in collaboration with industry. Harnesses the potential of MaaS to provide a more integrated, convenient journey experience for customers by working with industry to enable MaaS service providers to operate in Greater Sydney. This will include ensuring transport data is made available to MaaS operators and that technology platforms are in place. Benefit: Providing a more integrated, convenient journey experience for customers, and improving the sustainability of the transport system by attracting more customers to using public transport.</p> <p><i>Future Transport Strategy 2056</i> outlines a move to a 'Mobility as a Service' model (MaaS), where customers access combined public and private transport services through a digital platform such as a mobile app. This would enable travel planning and payments to be part of a single service.</p>	All	0-10 For Investigation	Unknown
Power Supply Upgrades	Upgrades and new construction designed to meet expected power requirements for Sydney's future rail network and new air-conditioned fleet. This project has been funded \$21.8 million (2018-19).	All	0-10 Committed	Unknown
Shared Network Improvements	Enhancements to the shared rail network to improve efficiency of freight and passenger train services.	All	10-20 For Investigation	Unknown
Sustainable Transport Package	Sustainable Transport Package to support NSW Government's objective of net zero emissions by 2050. Various measures to support NSW Government's objective of net zero emissions by 2050. Benefit: To achieve net zero emissions by 2050 while meeting increasing energy requirements, NSW will need to rethink how it powers transport.	All	20+ Visionary	Unknown
Sydney Airport road upgrades (level crossing removal)	Upgrades to roads around Sydney's Kingsford Smith Airport and removing the General Holmes Drive rail level crossing by constructing a road underpass. Benefit: The upgrades will provide customers with a better travel experience, increased capacity on the road network and improved access to Sydney's Kingsford Smith Airport and Port Botany.	Eastern City	0-10 Committed	2020
Transport Access Program	<p>The Transport Access Program is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure, and to ensure more stations, stops and wharves are compliant with Disability Discrimination Act requirements. Benefit: Stations that are accessible to people with a disability, limited mobility and parents with prams; modern buildings and facilities for all modes that meet the needs of a growing population; and modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers.</p> <p>This project has been funded \$132.9 million (2018-19).</p>	All	0-10 Committed	Unknown
Trial of Artificial Intelligence applications	Trial of artificial intelligence applications that actively gather data and use real time analytics to optimise capacity, planning and customer service. Create intelligent transport networks, managed with data: installing technologies and building networks that actively gather data, using Artificial Intelligence and real time analytics to optimise capacity and planning. Benefit: Improve the efficiency and reliability of journeys across the transport network and support the use of technology to improve accessibility to transport the system.	All	0-10 For Investigation	Unknown

Review of State Government Rail and Land Use Plans Sydney refresh report

*Department of
Infrastructure,
Transport, Cities and
Regional Development*

*Review of State
Government Rail and
Land Use Plans
REFRESH*

June 2019

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Executive summary

PricewaterhouseCoopers (PwC) was engaged by the Department of Infrastructure, Transport, Cities and Regional Development (DITCRD) to undertake a study of state land use and transport plans.

The study is designed to articulate the objectives of the current endorsed plans, and assess the degree of alignment within the State's plans and with Australian Government objectives. The study has considered the ability of rail based projects, as part of the public transport network, to deliver against Australian and State government objectives.

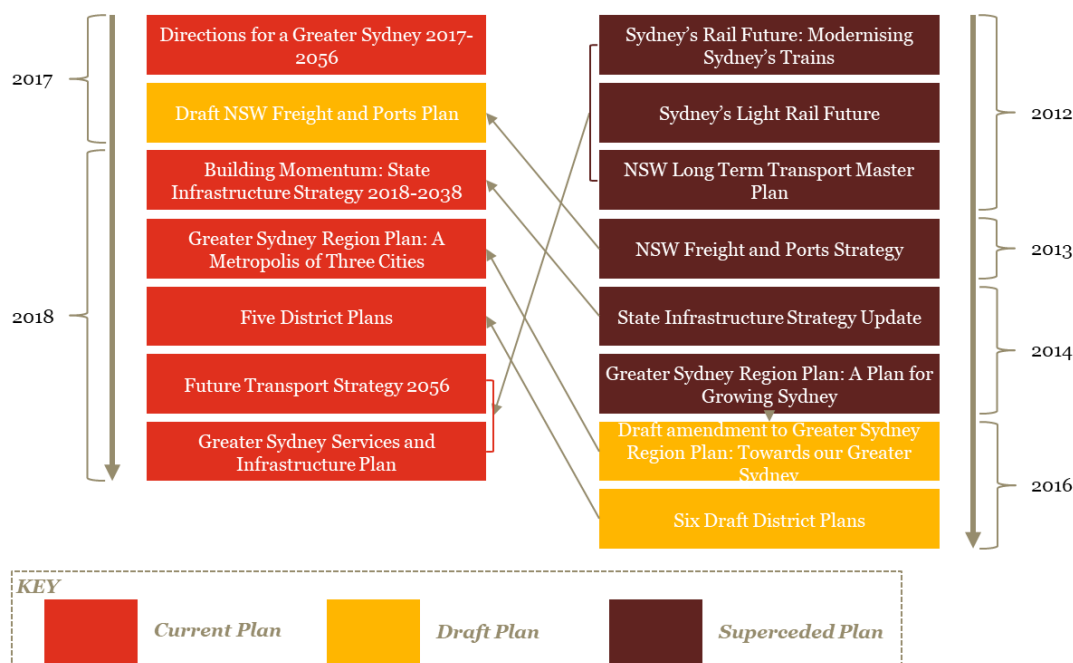
The focus of this report is recently refreshed and updated NSW state plans as they relate to the capital city of Sydney, and analysis of the modelling inputs that supported their development. NSW state modelling outputs have been reviewed to prepare an evidence-base showing land use and transport forecast changes over a 20-year period from 2016 to 2036.

The study area includes the Sydney metropolitan rail network and the regional rail network, where it is situated within the Greater Sydney boundary.

The current plans are integrated and aligned to articulate a clear set of land use and transport objectives to shape Greater Sydney as a 'Metropolis of three cities'

This report focuses on the suite of land use and transport plans developed across 2017 and 2018. These are illustrated in Figure 1, including their relationship to earlier plans reviewed by PwC in 2017 on behalf of DITCRD.¹

Figure 1. Current and superseded plans NSW



Source: PwC analysis.

¹ PwC notes that the Draft NSW Freight and Ports Plan was finalised and released publicly by TfNSW on the 25th of September 2018. Due to project timelines the Draft Plan is reviewed in this document.

As Figure 1 shows, compared to the earlier planning cycle, land use and transport plans were developed over the course of 2017 and 2018. The development timelines allow for integration and alignment between transport and land use planning. This contrasts with the staged development between 2012 and 2016 observed in the earlier cycle.

The analysis shows the current planning cycle in NSW has delivered:

- **Aligned vision and objectives across plans:** in-scope plans consistently reflect the strategic direction for the Greater Sydney region set by the GSC in *Directions for a Greater Sydney 2017-2056*^{2,3}, which in turn is aligned with state government planning objectives assessed in this report.
- **Alignment on targeted outcomes:** All in-scope plans target a movement from a monocentric city with a radial transport network to the central CBD, to a polycentric city or ‘metropolis of three cities’. The aspiration is that this metropolis will contain a connected network of cities and centres accessible to the population within 30-minute catchments, supported by investment in transport corridors. Transport and land use plans consistently reference the same cities and centres, and target the same corridors for access to deliver on this aspiration. This is shown in Figure 4.
- **A consistent view of the major projects that will deliver objectives across plans:** The in-scope plans consistently reference the same set of major committed, for investigation, and visionary rail infrastructure projects to implement the directions set for the public transport network in each city. These include Sydney Metro, CBD and South East Light Rail, North-South Rail Link, Parramatta Light Rail, Outer Sydney Orbital, and investment in freight corridors.
- **Use of common and aligned inputs across plans and integrated modelling:** in-scope plans use a consistent land use forecast for population and employment – the “three cities forecast” – as a strategic input. In the case of transport planning, the higher level three cities forecast has been used in conjunction with the more granular LU16 forecasts. While consistent, it is noted that LU16 forecasts use 2016 base data and therefore may not reflect latest land use data.
- **Alignment on delivery of Western Sydney investment:** All transport and land use plans have an aligned focus on catalysing the development of the Western Parkland City over the next 20 to 40 years. They:
 - enable and respond to the commitments in the Western Sydney City Deal
 - use the Long Term Preferred Network identified through the Western Sydney Rail Needs Scoping Study for rail network planning
 - integrate planning to ensure sufficient connectivity to / within strategic and metropolitan centres – the major planned transport corridors shape the city based on the urban structure determined through land use plans.

The state plans are aligned with Australian Government objectives

The state plans are aligned with Australian Government objectives, which centre on productivity, liveability and housing supply. These three Australian Government objectives are addressed in the state plans as follows:

² The Draft Freight and Ports Plan does not state this vision as it is a people-based vision less applicable to freight. However, it does clearly state and show its alignment with the *Future Transport Strategy 2056*.

³ For detail of the 10 directions, see section 12.2.

- **Productivity and liveability:** in the state plans, transport is conceived as an enabler of economic and social activity, and contributes to long term economic, social and environmental outcomes, thus addressing productivity and liveability
- **Housing supply and liveability:** state land use plans address liveability, housing supply and productivity by targeting densification of population and employment in under-developed centres and urban renewal. This planning direction will address both housing supply and create the density required to support mass transit.

Land use and transport objectives have been translated into a series of metrics

Australian Government land use and transport planning objectives have been translated into a series of metrics against which network performance can be measured. These metrics are broadly accepted and applied consistently throughout the public transport industry. Data has been sourced from the State's land use and transport models to analyse these metrics.

Table 1 details the full assessment framework. For this report, responding to the available data, select land use and passenger objectives are applied, as indicated.

Table 1. Metrics for analysis of transport plans

	Metric	Economic growth	Accessibility	Connectivity	User centrality	Sustainability
Land use and passenger objectives	Growth in employment density (2016-2036)	✓				
	Growth in population within 45 minutes of employment precincts (2016-2036)	✓	✓			
	Growth in population within 45 minutes of health and education services and passenger gateways (2016-2036)	✓	✓			
	Growth in housing density in the rail corridor (2016-2036)	✓				
	Socio-Economic Indexes For Areas (SEIFA) score within rail corridor				✓	
	SEIFA scores in areas with high population density and low employment accessibility (time to closest strategic Centre is 45 minutes or more) (2036)		✓		✓	
	Growth in rail patronage relative to population and employment growth (2016-2036)					
Network objectives	Mode share of public transport for trips during AM peak					
	Growth in patronage by line (2016-2036)					
	Growth in total passenger train capacity by line in one hour travel period (2016-2036)					
	Growth in load to capacity ratio on passenger trains in one hour travel period (2016-2036)					
	Growth in total trips with transfer by line (2011-2031)					
	Origin Destination pairs connected by rail with maximum travel time of 45 minutes (total travel time – not limited to in vehicle time) (2016-2036)					

	Metric	Economic growth	Accessibility	Connectivity	User centrality	Sustainability
Network objectives	Growth in number total vs scheduled passenger and freight train paths by line (2016-2036)			N/A		
Freight objectives	Growth in freight net tonnes (2016-2036)			N/A		
	% of freight terminals within Greater Metropolitan Area connected by dedicated freight lines					

Source: PwC

The metrics have been applied to data from the State's land use and transport models, focusing on outputs for 2016 and 2036. The major heavy rail and light rail projects that were assumed in the data modelling provided for this study are listed in Table 2.

Table 2. List of planned construction / upgrades

Type	Planned construction / upgrades	Expected operation date
Heavy rail	Sydney Metro Stage One – Sydney Metro Northwest (SMNW)	2019
	Sydney Metro Stage Two – Sydney Metro City & Southwest (SMC&SW)	2024
	Sydney Metro West (SMW)	Late 2020s
	South West Rail Link Extension Corridor (SWRL) ⁴	TBA (around opening of Western Sydney Airport in 2026)
Light rail	Parramatta Light Rail (ParraLR)	2023
	CBD and South East Light Rail (CBD&SELR)	2020

Note: Expected operation dates were not provided and are estimates. It is assumed all new rail stations will be captured in the STM by the expected operation date

Source: List of stations provided by TfNSW. PwC analysis to determine planned construction / upgrades.

The viability of rail services in the current and planned transport network is tested with respect to population density and employment access

The viability of rail services is considered with respect to two of the strongest correlated variables to public transport demand – population density and employment accessibility (noting that there are many other viability drivers in the literature).

Analysis in this study is based on a range of density and accessibility intervals, reflecting the lack of industry accepted thresholds. Intervals are designed to identify areas with the minimum acceptable thresholds for density (30 persons per hectare) and accessibility (45 minutes travel time)⁵. The viability of public transport is more probable in areas with population densities in excess of the minimum threshold.

⁴ This project has since been superseded by the current Airport Metro

⁵ The metric of 45 minutes has been applied consistently in earlier analysis, and so is used here too for consistency. It is acknowledged that the accessibility metric of 45 minutes is inconsistent to the current transport plans. Future Transport 2056 Strategy focuses on delivering a 30 minute city, where people can access the jobs, education and services they need within this timeframe by public or active transport.

In all instances, the current analysis focuses on the public transport network and the viability of rail services. However, further analysis would need to be performed to consider the benefits of rail compared to road investment. Alternative modes of transport need to be assessed as part of an integrated transport network.

Employment and housing densification in the rail corridor support objectives for economic growth and liveability

The current endorsed plans show progress against delivering on Australian Government objectives through densification of employment and housing in the rail corridor. This is evidenced by:

- **Growth in forecast employment in the rail corridor:** The proportion of employed workers within the rail corridor is forecast to increase by 1.9 per cent each year between 2016 and 2036. This amounts to an average employment density of 15.29 employees per hectare inside the rail corridor in 2036, compared to 0.97 employees per hectare outside the rail corridor.
- **Growth in forecast housing supply in the rail corridor:** Housing supply is forecast to grow at a higher rate within the rail corridor relative to outside the corridor. Dwelling density within the rail corridor is forecast at 8.7 dwellings per hectare in 2036 inside the rail corridor, compared to 1.0 dwellings per hectare outside. By comparison, in 2016, these figures are 5.6 and 0.8 dwelling per hectare respectively.
- **Improvement in access to strategic centres:** Accessibility to strategic centres is forecast to improve over time inside the rail corridor, with the majority of travel times falling or remaining static between 2016 and 2036. As a result, there are expected to be productivity gains arising from travel time savings, agglomeration benefits and labour market deepening.

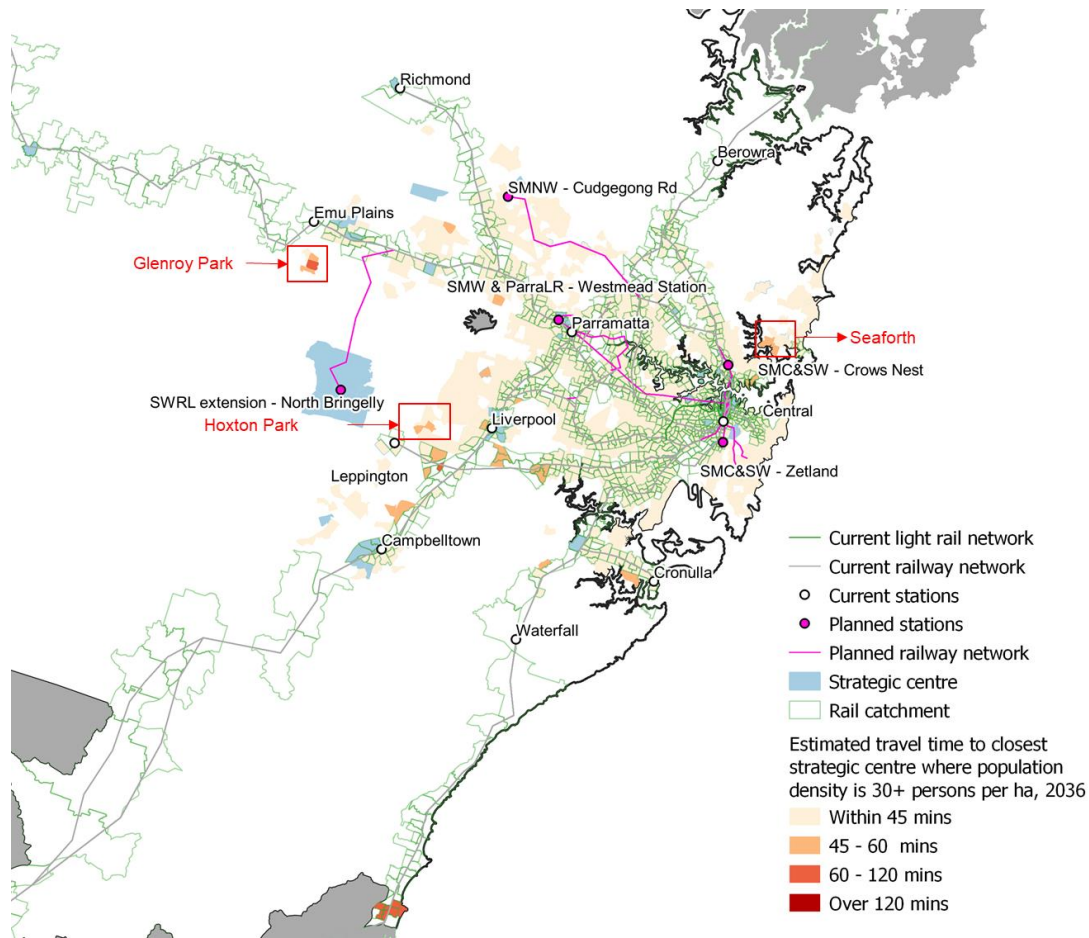
The planned rail network supports population growth projections

Using the latest travel zone projections (TZP16), population growth is expected to concentrate in the west districts (i.e. West, West Central and South West districts). Specifically, almost half of the population in Greater Sydney is projected to reside west of Parramatta.

New / planned rail networks such as Sydney Metro West and the South West Rail Link Extension Corridor will provide rail services to these areas that will experience the highest growth rates. This is evident from the fact that 54 per cent of the population in the study area will be located inside the rail corridor in 2036, compared to 47 per cent in 2016.

Additionally, densely populated areas over 30 persons per hectare in 2036 will also have good access to strategic centres. Figure 2 visualises the estimated travel time in 2036, to the closest strategic centre.

Figure 2. Density and accessibility thresholds to strategic centres where population density is 30+ people per hectare in 2036



Note: The origin is defined as any travel zone with population density forecast to be 30+ people per hectare. The destination is defined as any travel zone that contains a strategic centre in Sydney. The 'closest' strategic centre travel zone is defined with reference to travel time by public transport rather than distance. Public transport travel time has been forecast by the Strategic Travel Model (STM) for the AM 2-hour period for origin-destination (OD) pairs.

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

As Figure 2 shows, the vast majority of the strategic centres are accessible within 45 minutes by 2036. The majority of the limited exceptions, including Glenroy Park, south of Penrith, Hoxton Park, north-east of Leppington and Seaforth, east of St Leonards, have access within 45-60 minutes.

Public transport connectivity and accessibility is forecast to improve as new rail extensions provide new points of access

The number of origin-destination pairs connected within 45 minutes by public transport is forecast to increase from 5.8 per cent in 2016 to 10.2 percent in 2036. The areas of greatest connectivity in 2036 are located within the Central regions, and decreases the further out from the CBD areas.

The improvements to the proportion of the population with access by public transport to key health, education and passenger gateways is evident:

- Access to a regional hospital within 45 minutes increases from 50.5 per cent in 2016 to 69.6 per cent in 2036 (~ 2,135,978 additional people)

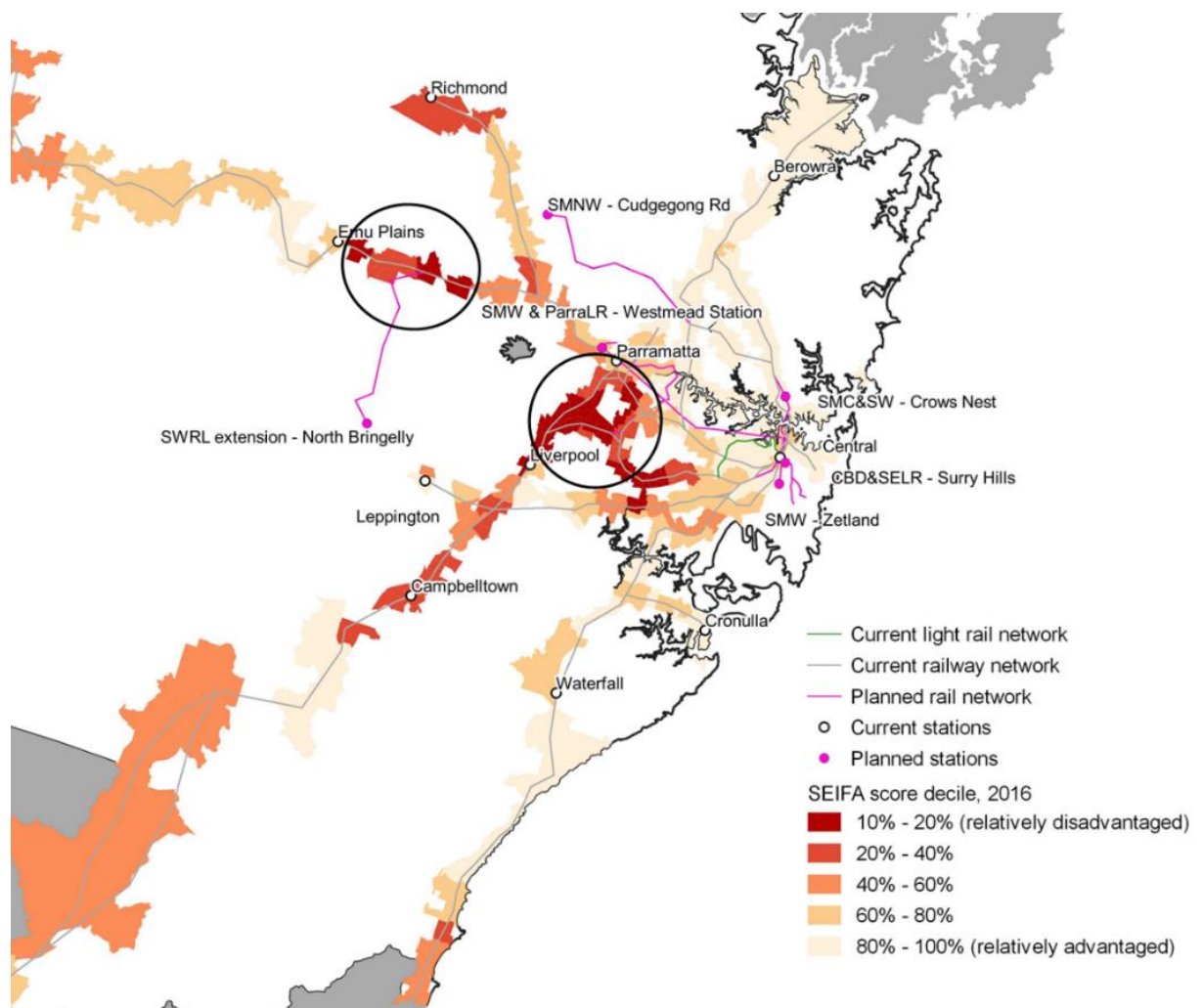
- Access to a main university campus within 45 minutes increases from 36.8 per cent in 2016 to 52.1 per cent in 2036 (~1,648,778 additional people)
- Access to a main airport within 45 minutes increases from 11.8 per cent in 2016 to 18 percent in 2036 (~611,358 additional people).

Areas of existing relative disadvantage are forecast to benefit from access improvements by 2036

The analysis overlays 2016 SEIFA deciles to consider the distribution of relative advantage and disadvantage across the rail corridor, with a focus on areas of high population density.

The analysis shows there is a current concentration of relative disadvantage around the rail corridor in Liverpool and Cabramatta, through to Bankstown and Canterbury, and also Penrith to Emu Plains. This is illustrated in Figure 3. Figure 3 also highlights that these areas do not currently, but are estimated by 2036, to have access to a strategic centre within 45 minutes.

Figure 3. 2016 SEIFA deciles within rail catchment



Note: this figure shows the 2016 Socio-Economic Indexes for Areas (SEIFA) deciles. SEIFA is a measure of relative advantage and disadvantage developed by the ABS using Census results and reported at the ABS statistical area level 2 (SA2).

Source: Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

The access expansion illustrated in Figure 3, could create the potential for lessening of disadvantage experienced by populations in these areas.

It is recommended that data gaps are closed to complete this study's analysis

Analysis as an integrated transport network

The current analysis focuses on the public transport network and viability of railway and light rail services. While this reflects the core scope of the project, transport planning in NSW has evolved to focus on a corridor rather than mode approach.

For example, the Future Transport 2056 Strategy lists a range of initiatives for all transport modes, including infrastructure to support rapid bus connections between key strategic centres, including Western Sydney Airport – Badgerys Creek Aerotropolis and Penrith, Liverpool, Blacktown and Campbelltown-Macarthur. Consultation with TfNSW and analysis of the data provided by TfNSW evidences planned upgrades and new routes for Sydney's bus network, to support bus rapid transit.

Accordingly, to draw broader conclusions, further analysis would need to consider the benefits of rail compared to road investment, and disaggregate the role of alternative modes of transport (traditional bus services, bus rapid transit, active transport) as part of an integrated transport network.

Changes to the bus network may be particularly relevant for this study, as access improvements, while driven by new / planned projections, often extend beyond these areas (i.e. improvements outside the rail corridor). Therefore additional analysis on all transport modes could help build a comprehensive analysis of the study area.

Update data with the latest geography distribution

Travel zone boundaries from 2011 underpin both the STM and land use forecasts distribution analysed in this report. The latest geography (TZ16) involved a redesign that moved zone boundaries, split and combined zones. Updates to the STM and land use forecast distribution data to align to the latest zoning system would allow for a more detailed analysis of transport networks and travel behaviour at the travel zone level, and also align with the latest ABS population census data.

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1 *Introduction*

PricewaterhouseCoopers Consulting (Australia) Pty Limited (PwC) was engaged by the Department of Infrastructure, Transport, Cities and Regional Development (DITCRD) to undertake a study of state rail transport and land use plans for five cities⁶. This report is an update of the 'Review of State Rail and Land Use Plans' for Sydney, New South Wales (NSW) issued to DITCRD on 17 November 2017.

1.1 *Objective*

This report aims to analyse state urban rail plans and land use objectives; and the degree of alignment between the state government and Australian Government objectives. The analysis has focused on understanding how the plans will:

- drive productivity growth by improving connections to employment and services, promoting agglomeration economies and contributing to a more efficient transport network including through the efficient movement of freight
- improve liveability and public amenity by reducing congestion and improving accessibility, and reducing commute times
- increase housing supply by promoting higher density development in close proximity to rail stations and through urban renewal, supporting broader efforts to improve housing affordability.

The three policy objectives are broadly consistent with the Australian Government's policy objectives for Smart Cities.

1.2 *Approach*

The study has included the following phases:

- A structured review of existing land use and transport plans that enables:
 - clear articulation of the key land use and transport objectives that each State Government is planning to deliver
 - identification of those rail-based projects planned to deliver these objectives
 - alignment between State and Australian Government objectives.
- Collation of data inputs/outputs from the State's land use and transport models in order to:
 - prepare an evidence-base showing land use and transport changes over a 20-year period
 - indicate the ability of rail based projects, as part of the public transport network, to deliver against state and Australian government objectives.

⁶ Individual reports were produced for each of the five cities (Sydney, Melbourne, Perth, Adelaide and Brisbane).

- Granular geospatial modelling that proves, visualises and communicates the ongoing relationship between urban rail networks and land use/urban form, including the performance of rail-based projects against government objectives.

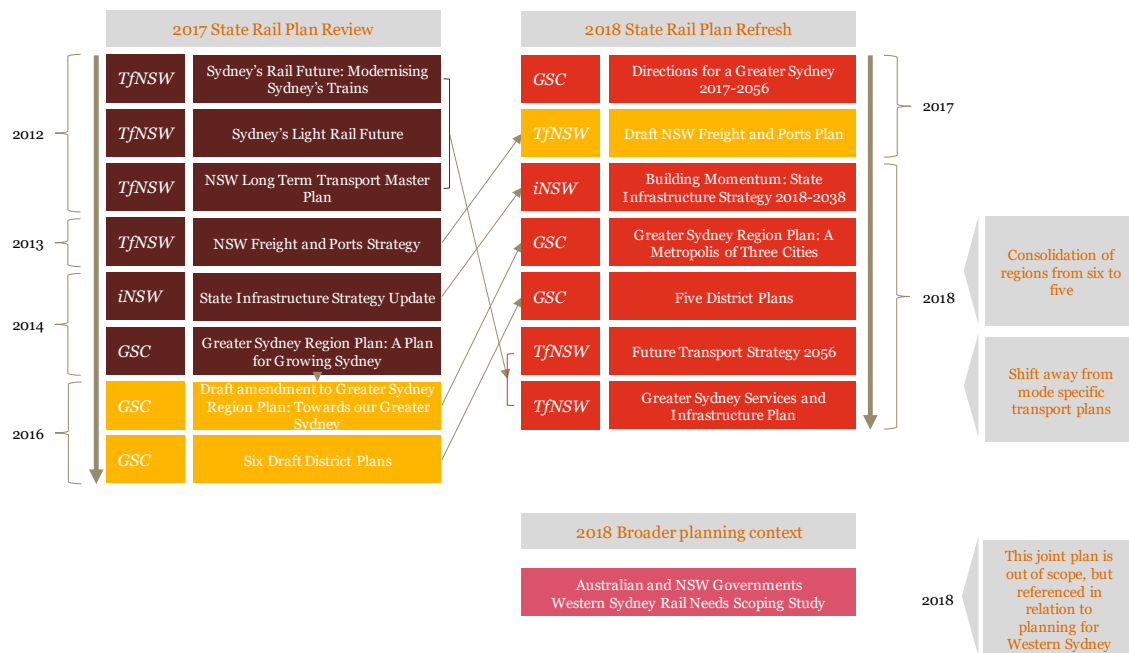
1.3 Scope

This report analyses land use and transport plans which have been endorsed by the NSW State Government and were publicly released by the 10th of September 2018 when the review commenced. Since PwC's initial analysis was performed in May-June 2017, seven plans have been updated.

1.3.1 Land use and transport plans

All of the plans assessed in the original 'Review of State Rail and Land Use Plans' for Sydney, issued to DITCRD on 17 November 2017, have been superseded. Figure 4 lists the plans in scope for this report, details their relationship to plans reviewed in 2017, and sets out a publication timeline for all plans.⁷ It also shows the Western Sydney Rail Needs Scoping Study, which is out-of-scope as it is not a formal state-government transport or land use plan and is an input to NSW's endorsed transport plans. However, it is shown in the diagram as it is part of the broader planning context.

Figure 4. Superseded and current plans NSW



Source: PwC analysis

As Figure 4 shows, this report analyses seven plans published in final and draft over 2017 and 2018. An overview of the plans is provided in Table 2 including their responsible agencies, mode and date of publication.

⁷ PwC notes that the Draft NSW Freight and Ports Plan was finalised and released publicly by TfNSW on the 25th of September 2018. Due to project timelines the Draft Plan is reviewed in this document.

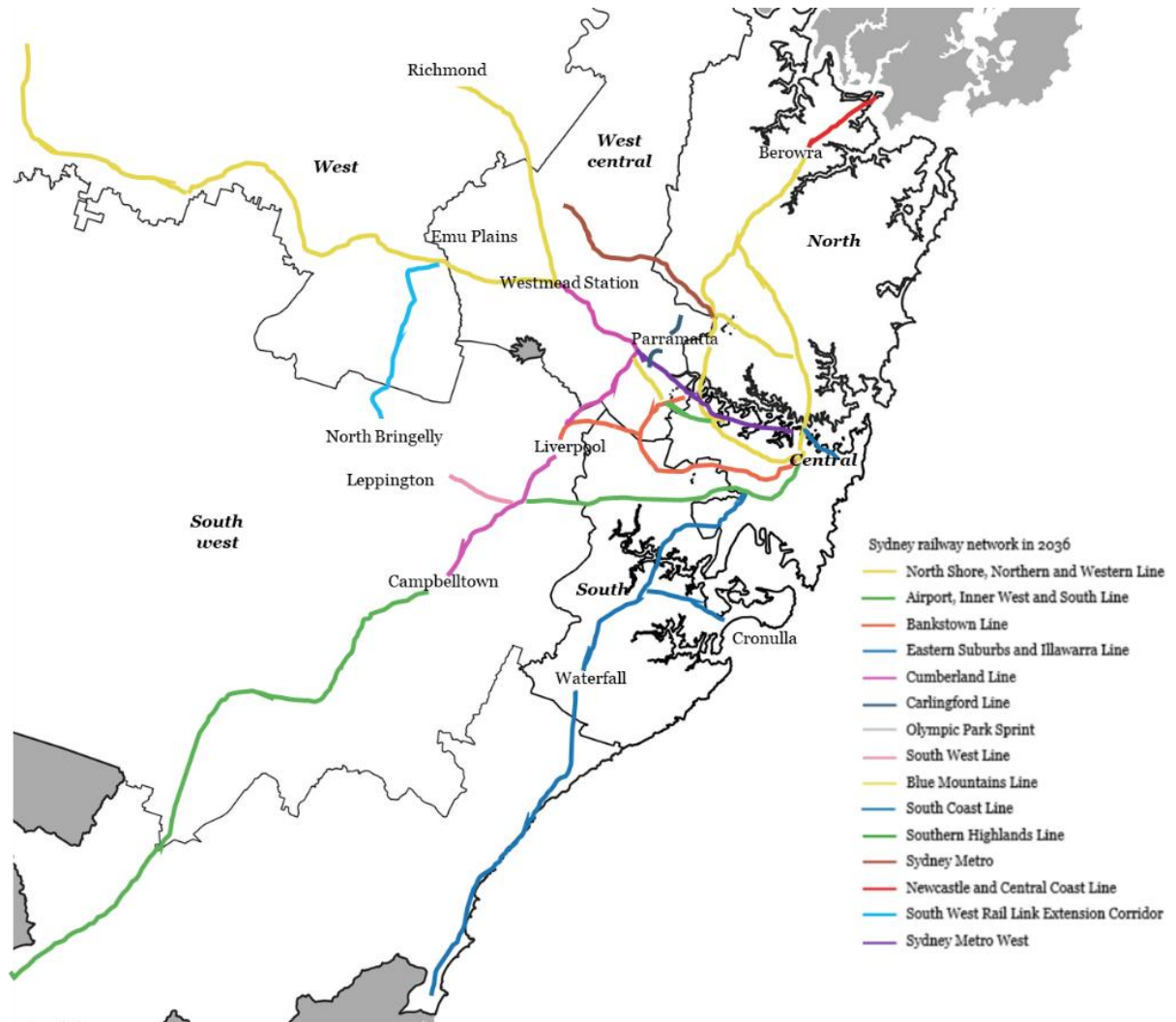
Table 3. Transport and land-use plans in-scope for review

Agency	Title	Date of publication	Period of coverage	Modes	
				Passenger	Freight
Greater Sydney Commission	Directions for a Greater Sydney 2017-2056	2017	2017 - 2056	Road,	Road,
	Greater Sydney Region Plan: A Metropolis of Three Cities	2018	Vision: 2018 - 2056 Plan: 2018 - 2038	Public Transport (bus, heavy rail, light rail, ferry),	Heavy rail
	Greater Sydney District Plans (for the Western City, Central City, Eastern City, North and South districts)	2018	2018 - 2038	Active Transport (walking, cycling)	
TfNSW	Future Transport Strategy 2056	2018	2018 - 2056		Road,
	Greater Sydney Services and Infrastructure Plan	2018	2018 - 2056		Heavy rail,
	Draft NSW Freight and Ports Plan*	2017	2018 - 2036+		Shipping, Air
Infrastructure NSW	Building Momentum: State Infrastructure Strategy 2018-2038	2018	2018 - 2038		Road, Heavy Rail

1.3.2 Study area

Figure 5 illustrates the study area and rail corridors in scope for the review of Sydney land use and transport plans.

Figure 5. Study area for Sydney region



Source: Travel zones and land area defined by TZ in previous report (Review of State Government Rail and Land Use Plans – NSW August 2017). Map prepared by PwC using QGIS open source software. Shapefiles of network provided by TfNSW. District boundaries defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019

The study area has been determined with reference to the boundary applied by the Greater Sydney Commission in the 2018 District Plans. It covers 1,195,609 hectares. In scope rail corridors are defined by the suburban network (Sydney Trains) and the intercity network (TrainLink). Study specific modifications to the district boundaries are detailed in Table 4.

Table 4. Sydney region definitions and modifications

Rail lines included in the Greater Sydney boundary defined by the GSC	Modification	Revised boundary for this review
Central Coast & Newcastle Line to Hawkesbury River	Boundary shortened by two stops to nearest major station	Central Coast & Newcastle Line to Berowra
Blue Mountains Line to Katoomba	No modification	Blue Mountains Line to Katoomba

Southern Highlands Line to Bargo	Boundary extended to next major station	Southern Highlands Line to Bowral
South Coast Line to Waterfall	Boundary extended to include rail junction with Port Kembla	South Coast Line to Coniston

Source: PwC Analysis.

1.3.3 Report structure

The report structure is outlined below in Table 5.

Table 5. Report structure and description of contents

Section	Title	Description
Section 2	Overview of land use and transport planning	This section identifies the agencies responsible for land use and transport planning in NSW, defines the study area for Sydney, and reviews the most recent published land use and transport plans for the rail network in this area.
Section 3	Integration of land use and transport plans	This section analyses the integration between the land use and transport plans summarised in Section 2. This analysis is limited to plans that are endorsed by the NSW Government, notwithstanding the land use and transport planning currently under Government consideration.
Section 4	Alignment of land use and transport plans	This section provides an overview of NSW's land use and transport planning objectives, and: <ul style="list-style-type: none"> • compares these objectives to those of the Australian Government • considers the extent to which objectives are consistently aligned between state plans • considers the extent to which plan objectives are met by the projects and outcomes articulated in the plans.
Section 5	Rail network planning	This chapter outlines the rail projects that are currently proposed, in planning, in progress or complete in NSW. The projects are understood to include those confirmed in <i>Future Transport Strategy 2056</i> and associated plan(s), as well as the <i>State Infrastructure Strategy 2018-2038</i> and associated plan(s).
Section 6	Network delivery against objectives	This chapter sets out a methodology for identifying how the transport network identified in the NSW land use and transport plans is delivering against Australian and NSW State Government objectives.
Section 7	Network performance	This section will identify where: <ul style="list-style-type: none"> • the network is delivering against objectives as planned • network performance may require further analysis.
Section 8	Conclusion	This section will outline key insights from the review including: <ul style="list-style-type: none"> • the level of alignment identified between the land use and transport plans • the viability of rail services • potential gaps in land use and transport planning which require further investigation including: <ul style="list-style-type: none"> – areas of Sydney outside of the current/planned rail corridor which appear to merit rail services – existing areas of the public transport network which do not appear to meet land use and transport plan objectives • recommendations to close data gaps as a result of which the study's analysis is incomplete and/or not current.

Source: PwC

2 Rail and land use planning overview

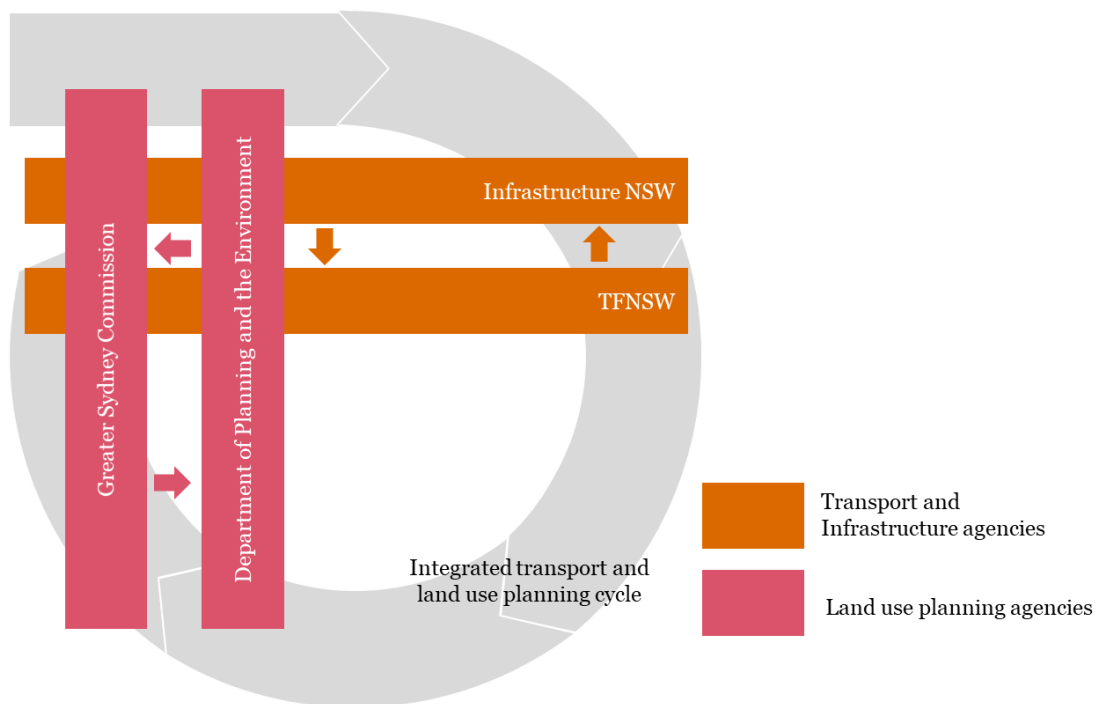
This section identifies the agencies responsible for rail and land use planning in NSW, defines the study area for Sydney, and reviews the most recent published transport and land use plans for the rail network in this area.

2.1 Responsible agencies

The relationship between land-use and transport planning is a mature one in NSW. Since the release of the *NSW Long Term Transport Master Plan* in 2012, transport planning has been integrated with land-use planning to ensure that appropriate services are provided to meet the needs of future growth and that best use is made of infrastructure and investment.

Figure 6 provides an overview of the relationships between the different bodies in the integrated transport and land use planning cycle.

Figure 6. Relationships between responsible agencies, NSW



Source: PwC

As Figure 6 illustrates, the land use bodies input into each other, as do separate transport and infrastructure bodies. Over the course of an integrated planning and land use cycle, outputs and inputs from each stream of planning are connected.

For the in-scope reports, it is understood that in this planning cycle land use inputs were developed first by the Greater Sydney Commission, starting the cycle of land use and transport integration illustrated in Figure 6.

Several government agencies and bodies in NSW are involved in the development of land use and transport plans, including:

Greater Sydney Commission (GSC)

The GSC was established in January 2016 as a new independent and dedicated body with statutory responsibilities under the *Greater Sydney Commission Act 2015*. The GSC is responsible for strategic metropolitan planning to support the development of the Greater Sydney region, working with state and local government.

The GSC has been established to play an intermediary role between state and local government planning. The GSC is led by four Greater Sydney Commissioners, supported by five District Commissioners aligned to the plans' districts.

The agency is responsible for the delivery of the *Greater Sydney Region Plan: A Metropolis of Three Cities*, and the *Greater Sydney District Plans* (for the Western City, Central City, Eastern City, North and South districts).

Department of Planning and Environment (DP&E)

DP&E is responsible for strategic planning to support the development of NSW. In particular, it:

- is responsible for developing regional land use plans for the regions outside Greater Sydney
- contributes to the planning for Greater Sydney, including structure planning for growth areas
- is responsible for local area planning and zoning
- assesses project proposals to ensure employment needs are balanced with community and environmental needs
- develops planning policies for state and local governments.

Transport for NSW (TfNSW)

TfNSW is responsible for transport strategy, planning, policy, regulation, funding allocation and other non-service delivery functions for all modes of passenger and freight transport in NSW. This includes road, rail, ferry, light rail and active transport.

TfNSW was established in 2011, taking on responsibilities previously held by the Transport Construction Authority, the Country Rail Infrastructure Authority, and the planning and coordination functions of RailCorp, the State Transit Authority and Roads & Maritime Services. RailCorp was further restructured in 2012, with operation and maintenance functions absorbed by Sydney Trains and NSW Trains,⁸ leaving RailCorp with asset ownership functions. Sydney Trains in particular, actively participate in urban planning around projects in their jurisdiction.

The agency is responsible for the delivery of the *Future Transport Strategy 2056*, *Greater Sydney Services and Infrastructure Plan* and *Draft NSW Freight and Ports Plan*.

Infrastructure NSW (iNSW)

iNSW was established in July 2011 “to assist the NSW Government in identifying and prioritising the delivery of critical public infrastructure for NSW”.⁹ It is an independent statutory agency, established under the *Infrastructure NSW Act 2011*.

⁸ NSW Trains manages the operation of NSW TrainLink. See <https://www.transport.nsw.gov.au/nswtrains>

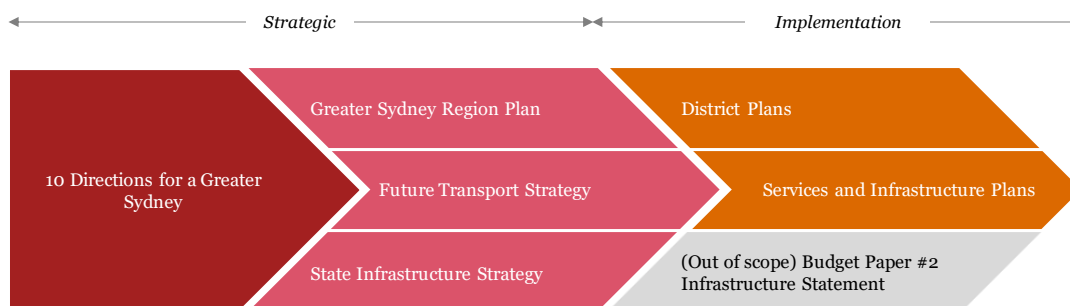
⁹ <http://www.infrastructure.nsw.gov.au/about-us.aspx>, Accessed 2017.

The agency is responsible for the delivery of sectoral State infrastructure strategy statements (i.e. *State Infrastructure Strategy 2018-2038*), which identify major infrastructure projects to be undertaken as a priority.

2.2 Summary of in-scope plans

This section summarises the current in-scope land use and transport plans for Greater Sydney. The in-scope plans were developed in a sequence of strategic and then implementation plans, as illustrated in Figure 7.

Figure 7. In scope-plan development sequence



Source: Greater Sydney Commission, *Greater Sydney Region Plan: A Metropolis of Three Cities – Connecting People*, March 2018, p.24.

As Figure 7 shows, the GSC's *Directions for a Greater Sydney 2017-2056* sets the strategic vision for the in scope plans. Note only a subset of the plans are in scope for this updated report.

Directions for a Greater Sydney 2017-2056

Background	<p><i>Directions for a Greater Sydney 2017-2056</i> was published in 2017 by the GSC to better integrate land use, transport and infrastructure planning.</p> <p>It is not a strict planning document. However, it sets the governing vision for Greater Sydney to 2056 and 10 directions to realise the vision, which forms the basis for integrated land use, transport and infrastructure plans. It also outlines the policies and plans to which the NSW Government has currently committed to provide clarity about the current state and set the foundation for planning and growth.</p>
Date released / issued	2017
Status	Official NSW Government vision and directions for the 40 year period between 2017 and 2056
High level objectives	<p>Vision to 2056: Greater Sydney will be a global metropolis of three <i>productive, liveable and sustainable</i> cities: Western Parkland City, Central River City and Eastern Harbour City.</p> <p>10 Directions for a Greater Sydney:</p> <ul style="list-style-type: none"> • a city supported by infrastructure • a city for people • housing the city • a city of great places • jobs and skills for the city • a well-connected city • a city in its landscape • an efficient city • a resilient city • a collaborative city.

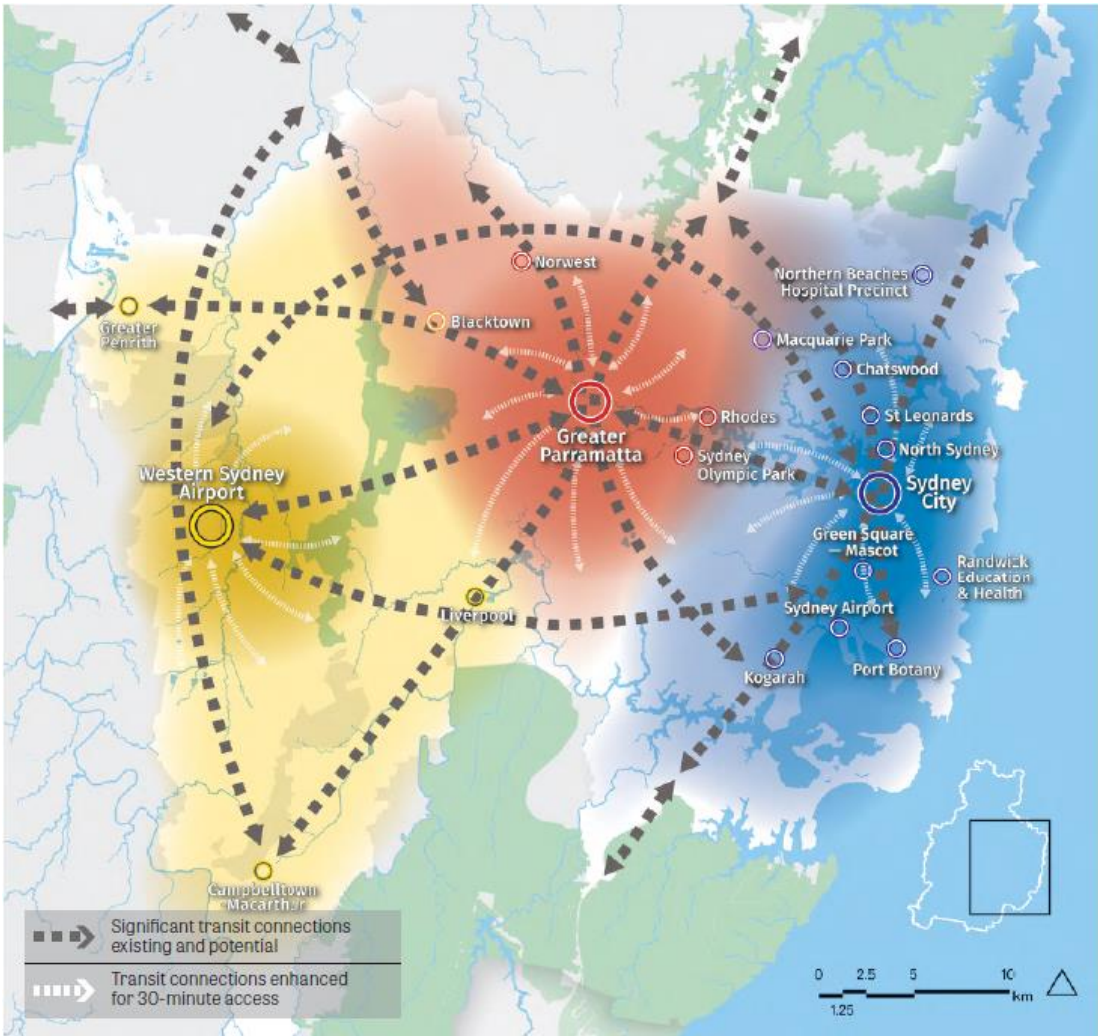
Directions for a Greater Sydney 2017-2056 (continued)

<i>Stated targets or metrics</i>	<p>No explicit targets or metrics. However, some directions mention targets such as:</p> <ul style="list-style-type: none"> • sustained population growth over the coming decades will require a minimum of 36,250 new homes every year • increasing the region's economic activity to \$655 billion by 2036 • required employment growth of 817,000 jobs • 30-minute public transport access to one of the three cities and/or the nearest district/strategic centre seven days a week.
<i>Geographic boundary</i>	<i>Directions for a Greater Sydney 2017-2056</i> applies to the Greater Sydney region, illustrated in Figure 8.
<i>Modes</i>	<i>Directions for a Greater Sydney 2017-2056</i> does not specifically highlight particular modes of transport. As a vision and direction document, it is assumed to consider all modes of transport. However, in considering the current state, it sets out key rail, light rail and road projects already committed by the NSW Government.
<i>Passenger/freight</i>	<i>Directions for a Greater Sydney 2017-2056</i> considers both the passenger and freight network at a high level.
<i>Timeframe</i>	<i>Directions for a Greater Sydney 2017-2056</i> provides a 40-year vision and directions.
<i>Relationship to other plans</i>	<p><i>Directions for a Greater Sydney 2017-2056</i> builds upon the superseded draft Greater Sydney region plan: <i>Towards our Greater Sydney 2056</i> (2016).</p> <p><i>Directions for a Greater Sydney 2017-2056</i> is the governing document upon which all other current in-scope plans have been developed, as shown in Figure 7 above. These plans respond to and build on the directions outlined in <i>Directions for a Greater Sydney 2017-2056</i>, ensuring integrated land use, transport and infrastructure planning and delivery.</p> <p><i>Directions for a Greater Sydney 2017-2056</i> also outlines the policies and plans to which the NSW Government has currently committed, to set the foundation for future planning.</p>

Figure 8 illustrates the study area underpinning *Directions for a Greater Sydney 2017-2056*. It highlights three priority centres, or cities, consistent with the superseded plan *Towards our Greater Sydney 2056*:

- Western Parkland City (focussed around WSA)
- Central River City (focussed around Greater Parramatta)
- Eastern Harbour City (focussed about Sydney city centre).

Figure 8. Indicative study area for Directions for a Greater Sydney 2017-2056



Source: Greater Sydney Commission, *Directions for a Greater Sydney 2017-2056*, 2017.

Greater Sydney Region Plan: A Metropolis of Three Cities, and the five District Plans

Background	<p><i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> and the five <i>District Plans</i> were published in March 2018 by the GSC as final land use plans.</p> <p>The <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> integrates land use, transport and infrastructure planning between the three tiers of government and across State agencies. It sets the planning framework for the five districts which make up the region and:</p> <ul style="list-style-type: none"> • sets a 40-year vision (to 2056) and a 20-year plan to manage growth and change for Greater Sydney in the context of social, economic and environmental matters • informs district and local plans and the assessment of planning proposals • assists infrastructure agencies to plan and deliver for growth and change, and to align their infrastructure plans to place-based outcomes • informs the private sector and the wider community of the growth management and infrastructure investment intentions of government. <p>The five <i>District Plans</i> are a guide for implementing <i>A Metropolis of Three Cities</i> at a District level. They are 20-year plans to achieve the 40-year vision for Greater Sydney. They are designed to connect longer-term metropolitan planning by the NSW Government with local planning by local government.</p> <p>Consistent with <i>Directions for a Greater Sydney 2017-2056</i>, the plans seek to develop Greater Sydney into a metropolis of three unique but connected cities:</p> <ul style="list-style-type: none"> • Western Parkland City • Central River City • Eastern Harbour City. <p>Each city will be supported by metropolitan (Harbour CBD, Greater Parramatta or in the Western City cluster, WSA-Badgerys Creek Aerotropolis, Greater Penrith, Liverpool and Campbelltown-Macarthur), strategic and local centres.</p>
Date released / issued	March 2018
Status	Official NSW Government land use plans that provide a 40-year vision and 20-year plans for the Greater Sydney region and five Districts.
High level objectives	<p>Vision: Three cities where most residents live within 30 minutes of their jobs, education and health facilities, services and great places.</p> <p>Four high level objectives aligned with the <i>Directions for a Greater Sydney 2017-2056</i>:</p> <ul style="list-style-type: none"> • infrastructure and collaboration (encompass directions 1-2) • liveability (encompass directions 3-5) • productivity (encompass directions 6-7) • sustainability (encompass directions 8-10).

*Greater Sydney Region Plan: A Metropolis of Three Cities, and the five District Plans
(continued)*

<i>Stated targets or metrics</i>	<p>Targets</p> <p>Specific targets referenced in the plans include:</p> <ul style="list-style-type: none"> • 30-minute public transport access to one of the three metropolitan centres/clusters (or cities) and to services in their nearest strategic centre seven days a week • increasing the region's economic activity to \$655 billion by 2036 • required employment growth of 817,000 jobs • developing a network of 34 strategic centres • increasing the urban tree canopy to 40 per cent, up from the current 23 per cent <p>The plans reference (but do not provide specific targets):</p> <ul style="list-style-type: none"> • housing supply targets for each District (0-5 year, 6-10 year and 20-year) • job targets in each District Plan • a long-term objective for NSW to achieve net-zero emissions by 2050. <p>Metrics</p> <p>The plans list of potential indicators (or metrics) to track performance against directions and objectives:*</p> <ul style="list-style-type: none"> • increased 30-minute access to a metropolitan centre/cluster • increased use of public resources such as open space and community facilities • increased walkable access to local centres • increased housing completions (by type) • number of councils that implement Affordable Rental Housing Target Schemes • increased access to open space • percentage of dwellings located within 30 minutes by public transport of a metropolitan centre/cluster • percentage of dwellings located within 30 minutes by public transport of a strategic centre • increased jobs in metropolitan and strategic centres • increased urban tree canopy • expanded Greater Sydney Green Grid • reduced transport-related greenhouse gas emissions • reduced energy use per capita • number of councils with standardised state-wide hazard information.
<i>Geographic boundary</i>	<p>Figure 9 illustrates the indicative study area, and Figure 10 shows the local government areas assigned to each District.</p> <p>The plans are focussed on the Greater Sydney region but do consider actions to improve connectivity with northern and southern regions outside Greater Sydney (e.g. Newcastle and Wollongong).</p>
<i>Modes</i>	<p>The plans include consideration of the following modes of transport:</p> <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail, ferry) • active transport (walking, cycling).
<i>Passenger/freight</i>	<p>The plans include initiatives for both the passenger and freight network.</p> <p>All transport initiatives have all been sourced from Future Transport 2056. They are in four categories: committed, investigation 0–10 years, investigation 10–20 years and visionary 20+ years. The latter three categories require further investigation and ultimately decisions of government on commitments to funding.</p>

* These are potential indicators only. It is noted that indicators will be developed in consultation with State and local government to optimise regional, district and local monitoring programs.

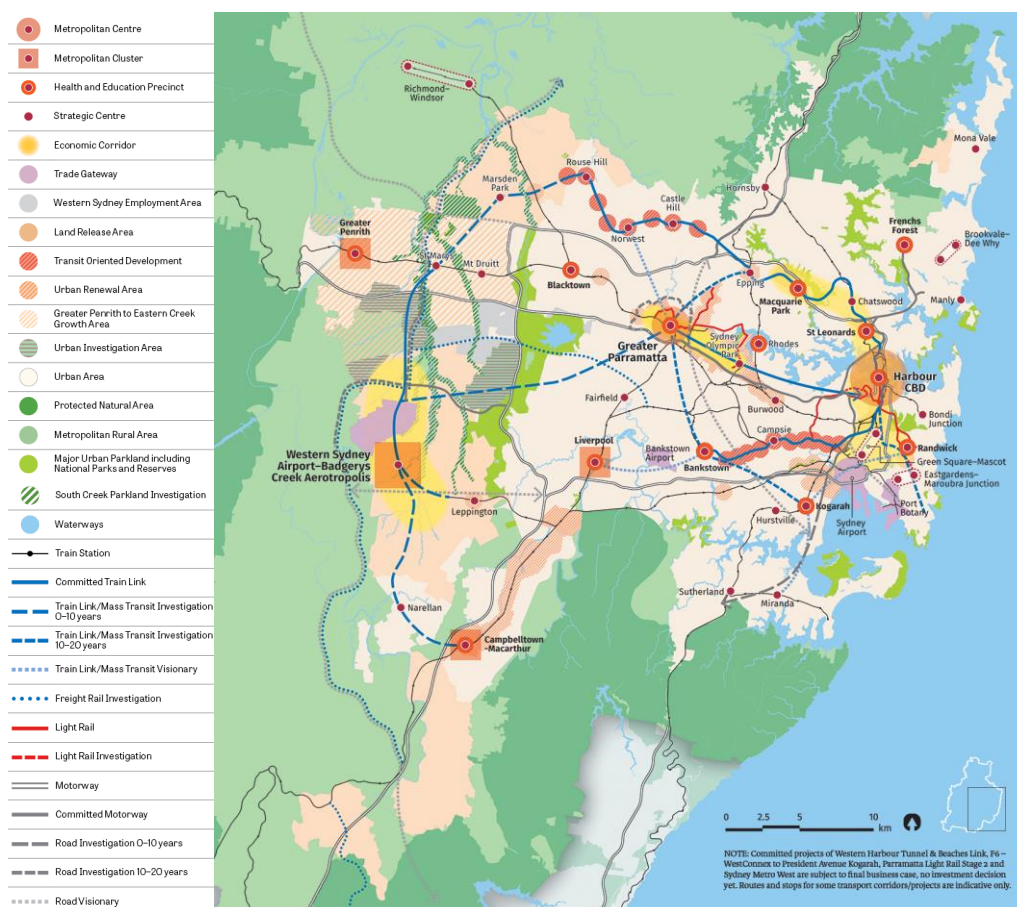
Greater Sydney Region Plan: A Metropolis of Three Cities, and the five District Plans (continued)

Timeframe	The plans provide a 40-year vision and 20-year planning strategy.
Relationship to other plans	<p>The plans replace the current Greater Sydney Region Plan: A Plan for Growing Sydney (2014) and build on the draft Towards our Greater Sydney 2056 and six draft District Plans (2016).</p> <p>The concurrent preparation of the five District Plans with the Greater Sydney Region Plan: A Metropolis of Three Cities has optimised the integration of these plans. The plans have also been prepared concurrently with Future Transport 2056 and State Infrastructure Strategy 2018–2038 to align land use, transport and infrastructure outcomes for Greater Sydney for ‘the first time in a generation’.</p> <p>The plans outline how the Directions for a Greater Sydney 2017–2056 is the starting point for delivering integrated planning. They also show how the alignment moves from the 10 directions to the Greater Sydney Region Plan: A Metropolis of Three Cities to the five District Plans, as planning moves from setting to implementing direction.</p>

Figure 9 illustrates the study area of the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans*. Figure 10 shows the local government areas in each of the five Districts, which are different to the six Districts defined in *Towards our Greater Sydney 2056* and the original report issued to DITCRD.

In addition, the plans have a focus on the Western Sydney City Deal in driving the delivery of the WSA and Badgerys Creek Aerotropolis to stimulate the Western Parkland City. This is similar to *Towards our Greater Sydney 2056* and the six draft *District Plans*, as highlighted in the original report issued to DITCRD.

Figure 9. Indicative study area for Greater Sydney Region Plan: A Metropolis of Three Cities



Source: Greater Sydney Commission, *Greater Sydney Region Plan: A Metropolis of Three Cities*, March 2018.

Figure 10. Greater Sydney region and Districts



Source: Greater Sydney Commission, Greater Sydney Region Plan: A Metropolis of Three Cities, March 2018.

Future Transport Strategy 2056

Background	<p><i>Future Transport Strategy 2056</i> was published in March 2018 by TfNSW. It is an overarching strategy, supported by a suite of plans, to achieve a 40-year vision for NSW's transport system. It outlines a vision, strategic directions and customer outcomes, with infrastructure and services plans underpinning the delivery of these directions across NSW.</p> <p><i>Future Transport Strategy 2056</i> is a long-term plan that puts customers at the centre through 'co-operative design'. It prepares for rapid changes in technology and innovation to create and maintain a world class, safe, efficient and reliable transport system.</p> <p>It also builds on the achievements of previous transport plans and is integrated with land use and infrastructure plans. In particular, <i>Future Transport Strategy 2056</i> is aligned with the land use vision in the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>. It focusses on three types of corridors that have been developed to align with the land use vision, and to guide service levels and infrastructure investment:</p> <ul style="list-style-type: none"> • city-shaping corridors – major trunk road and public transport corridors providing higher speed and volume connections between cities and centres that shape locational decisions of residents and businesses • city-serving corridors – higher density corridors within less than 10km of metropolitan centres providing high frequency access to metropolitan cities/centres with more frequent stopping patterns • centre-serving corridors – local corridors that support, buses, walking and cycling, to connect people with their nearest centre and transport interchange.
Date released / issued	March 2018
Status	Official NSW Government strategy that provides a 40-year vision for NSW's transport system.
High level plan objectives	<p>Vision: Transport is an enabler of economic and social activity and contributes to long term economic, social and environmental outcomes.</p> <p>Greater Sydney vision: A metropolis of three cities, where people can access the jobs, education and services they need within 30 minutes by public or active transport.</p> <p>The visions are built on six outcomes to guide investment, policy and reform and service provision:</p> <ul style="list-style-type: none"> • customer focussed – customer experiences are seamless, interactive and personalised, supported by technology and data • successful places – the liveability, amenity and economic success of communities and places are enhanced by transport • a strong economy – the transport system powers NSW's future \$1.3 trillion economy and enables economic activity across the state • safety and performance – every customer enjoys safe travel across a high performing, efficient network • accessible services – transport enables everyone to get the most out of life, wherever they live and whatever their age, ability or personal circumstances • sustainability – the transport system is economically and environmentally sustainable, affordable for customers and supports emissions reductions.

Future Transport Strategy 2056 (continued)

<i>Stated targets or metrics</i>	<p>The strategy sets out performance focus areas and existing metrics:</p> <ul style="list-style-type: none"> • Maintain or improve customer satisfaction levels <ul style="list-style-type: none"> – monitor percentage of customers satisfied or highly satisfied using the NSW Customer Satisfaction Index. • Deliver transport initiatives that improve the liveability of places <ul style="list-style-type: none"> – monitor the application of Movement and Place principles to new or redesigned centres – increase the number of people able to access centres by walking, cycling and using public transport – develop indicators for transport enabled health and liveability outcomes. • Provide efficient public transport and road connections for passengers and freight <ul style="list-style-type: none"> – monitor the percentage of population within Greater Sydney with 30 minute or less access to their nearest strategic centre by public or active transport – monitor the percentage of towns and centres with day return public transport services to the nearest regional city – develop efficiency and productivity measurements for freight under the Freight and Ports Plan. • Deliver a safe and reliable network with zero trauma (fatalities and serious injuries)¹⁰ <ul style="list-style-type: none"> – monitor fatalities and serious injuries across the road and transport network – benchmark travel times for each mode – compare public transport travel times to private vehicle travel times on major metropolitan and regional corridors. • Provide whole of journey accessibility for customers regardless of age or ability <ul style="list-style-type: none"> – develop new measures for active and public transport accessibility to education, jobs and services along with regional and metro service affordability and fare parity – monitor infrastructure and service compliance with national disability standards – measure use and satisfaction by age, people with disability, people from Culturally and Linguistically Diverse (CALD) backgrounds and Aboriginal people. • Improve financial sustainability of transport in NSW and its contribution to net zero emissions <ul style="list-style-type: none"> – measure cost per service kilometre and overall cost recovery for public transport – measure cost effectiveness of road expenditure – measure energy efficiency of the vehicle fleet – measure mode shift to active and public transport and electric vehicle use – monitor transport-related greenhouse gas emissions and energy intensity.
<i>Geographic boundary</i>	<p>The strategy has an extended boundary definition beyond Greater Sydney to the NSW state borders. However, it defines the Greater Sydney transport system through strategic transport corridors (city-shaping, city-serving, centre-serving), as shown in Figure 11.</p>
<i>Modes</i>	<p>The strategy shifts the focus away from individual modes of transport and towards integrated solutions through issue-specific and place-based supporting plans. As such, it focuses more on strategic corridors than individual modes of transport, while including initiatives for the following modes of transport:</p> <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail, ferry) • active transport (walking, cycling).
<i>Passenger/freight</i>	<p>The strategy includes initiatives for both the passenger and freight network.</p>

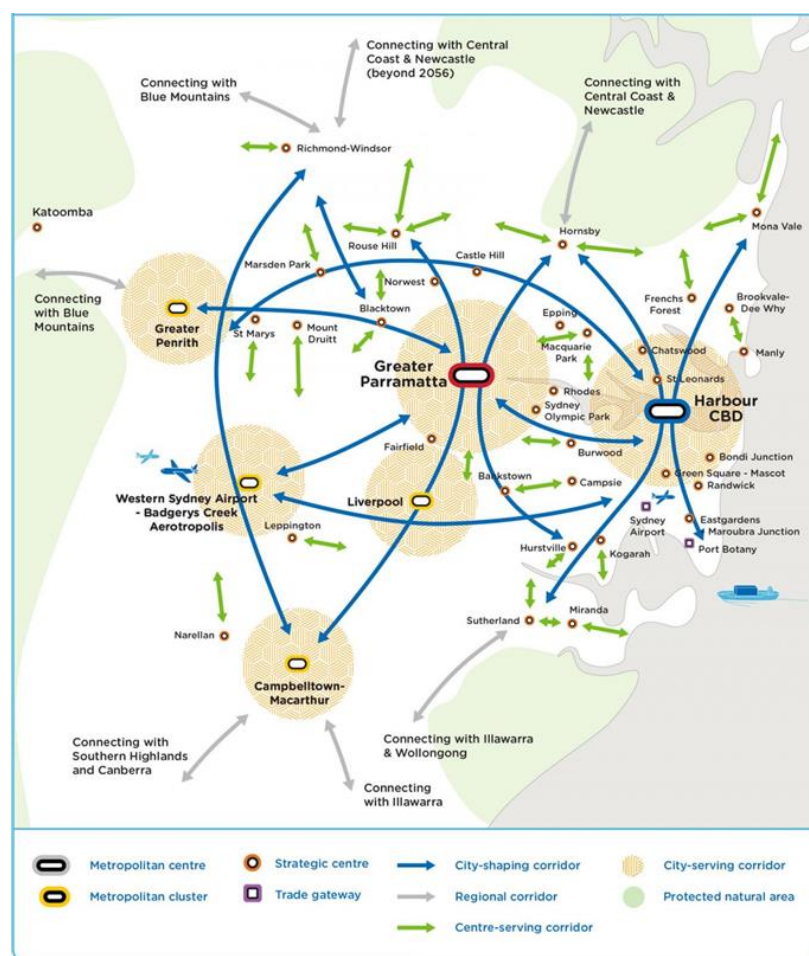
¹⁰ Based on the NSW Road Safety Plan 2021, TfNSW has set a State Priority Target to reduce fatalities by at least 30 per cent on 2008–2010 levels by 2021. In the longer term TfNSW's goal is to approach a trauma-free transport network towards 2056. While TfNSW references the whole transport network, this goal and associated initiatives appear focussed on the road network. See TfNSW, *Future Transport Strategy 2056*, March 2018, pp. 7–8.

Future Transport Strategy 2056 (continued)

Timeframe	<p>The strategy covers a 40-year period.</p> <p>Initiatives listed in the strategy are categorised as:</p> <ul style="list-style-type: none"> • committed/funded (0-10 years) • for investigation (0-10, 10-20 years) • visionary (20+ years).
Relationship to other plans	<p>The strategy, combined with the suite of supporting plans, replaces the <i>NSW Long Term Transport Master Plan</i> (2012) and supporting mode-specific plans.</p> <p>The strategy was prepared concurrently with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> to the five <i>District Plans</i>, as well as the <i>State Infrastructure Strategy 2018–2038</i>. This allowed for alignment of land use, transport and infrastructure outcomes for Greater Sydney. For example, the strategy specifically references and evidences its alignment with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>.</p> <p>The strategy's approach to technology-enabled mobility is underpinned by the <i>Future Transport Technology Roadmap</i>, delivered in 2016.</p>

The *Future Transport Strategy 2056* has an extended boundary definition beyond Greater Sydney to the NSW state borders. However, as this report is focussed on the Greater Sydney region, Figure 11 illustrates the Greater Sydney region and the strategic transport corridors associated with the *Future Transport Strategy 2056*. The strategic transport corridors show an integrated transport system, designed to achieve the vision in the *Greater Sydney Region Plan: A Metropolis of Three Cities*.

Figure 11. Indicative study area for Future Transport Strategy 2056



Source: TfNSW, *Future Transport Strategy 2056*, March 2018.

Greater Sydney Services and Infrastructure Plan

<i>Background</i>	<p><i>Greater Sydney Services and Infrastructure Plan</i> was published in March 2018 by TfNSW to support the delivery of the <i>Future Transport Strategy 2056</i>.</p> <p>It is a 40-year plan for transport in Greater Sydney that puts customers at the centre through ‘co-operative design’. Building on the state-wide transport outcomes identified in the <i>Future Transport Strategy 2056</i>, it establishes the specific outcomes transport customers in Greater Sydney can expect and identifies the policy, service and infrastructure initiatives to achieve these. In particular, the plan defines the network required to achieve the service outcomes.</p> <p>The plan has been designed to support the land use vision for Greater Sydney set out in the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>, which influences the places the transport system will need to serve, the location of transport corridors and the level of service required. It also ‘responds to the opportunities and challenges that will reshape city and the way people and goods move over the next 40 years’. As such, it focuses on:</p> <ul style="list-style-type: none"> • Supporting the land use vision through a transport system and corridors designed to support people and goods to move safely, efficiently and reliably around Greater Sydney. The hierarchy of corridors includes: <ul style="list-style-type: none"> – city-shaping corridors – city-serving corridors – centre-serving corridors. • Supporting the liveability, productivity and sustainability of places on transport networks. • Opportunities to support the growth of Greater Sydney, sustain and enhance its role as a global city, and harness technology for the benefit of customers.
<i>Date released / issued</i>	March 2018
<i>Status</i>	Official NSW Government plan that provides 40-year strategic planning for NSW’s transport system.

Greater Sydney Services and Infrastructure Plan (continued)

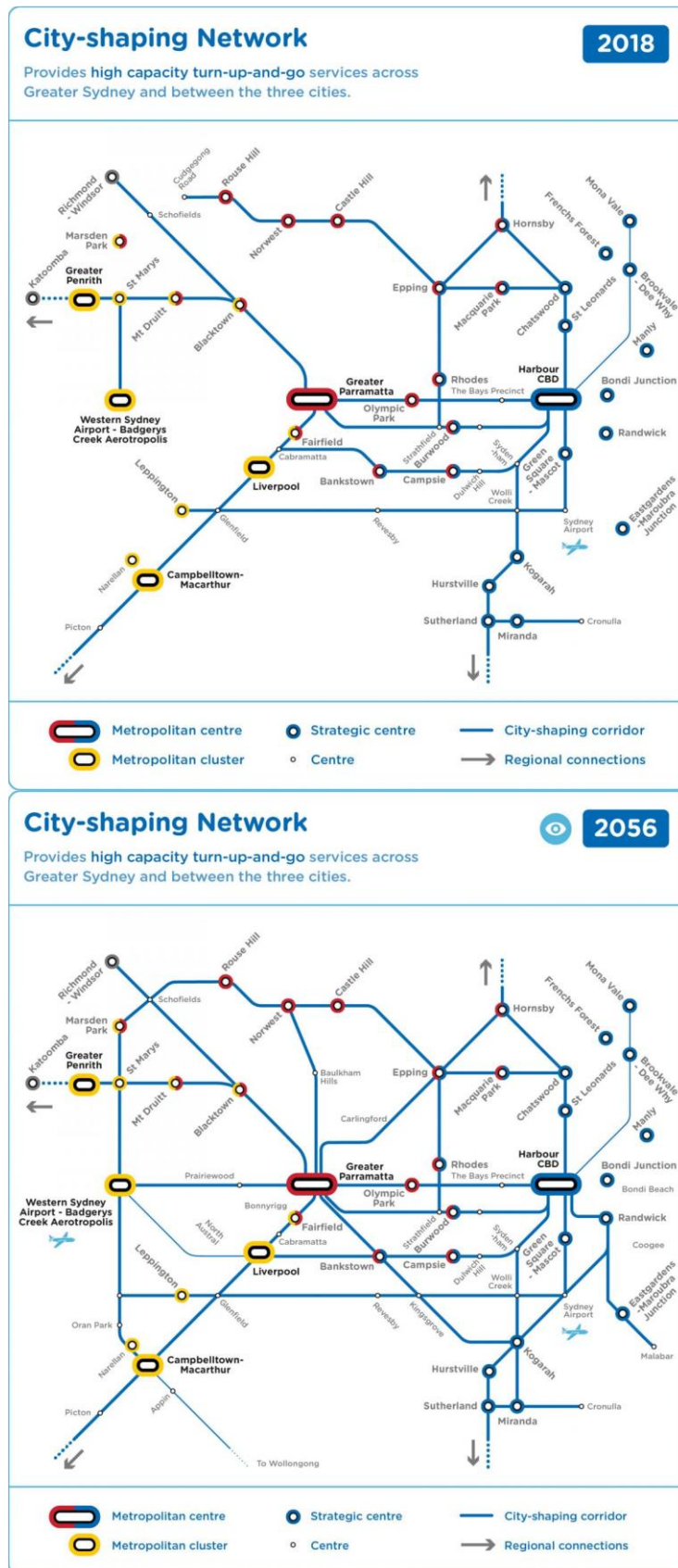
<p><i>High level objectives</i></p>	<p>Vision: metropolis of three cities, where people have access to jobs and services within 30 minutes by public transport (designed to support GSC's land use vision)</p> <p>The vision is built on six state-wide outcomes to guide investment, policy and reform and service provision, with specific outcomes for the Greater Sydney region:</p> <ul style="list-style-type: none"> • Customer focussed – convenient and responsive to customer needs <ul style="list-style-type: none"> – new technology is harnessed to provide an integrated end-to-end journey experience for customers – future forms of mobility are made available to customers and integrated with other modes of transport. • Successful places – sustaining and enhancing the liveability of places <ul style="list-style-type: none"> – walking or cycling is the most convenient option for short trips around centres and local areas, supported by a safe road environment and suitable pathways – vibrant centres supported by streets that balance the need for convenient access while enhancing attractiveness of places. • A strong economy – connecting people and places in the growing city <ul style="list-style-type: none"> – 30 minute access for customers to their nearest metropolitan centre and strategic centre by public transport seven days a week – fast and convenient interchanging, with walking times of no longer than five minutes between services. • Safety and performance – safely, efficiently and reliably moving people and goods <ul style="list-style-type: none"> – efficient, reliable and easy-to-understand journeys for customers, enabled by a simple hierarchy of services – efficient and reliable freight journeys supported by 24/7 rail access between freight precincts with convenient access to centres – a safe transport system for every customer with the aim for zero deaths or serious injuries on the network by 2056. • Accessible services – accessible for all customers <ul style="list-style-type: none"> – fully accessible transport for all customers. • Sustainability – makes the best use of available resources and assets <ul style="list-style-type: none"> – transport services and infrastructure are delivered, operated and maintained in a way that is affordable for customers and the community – a resilient transport system that contributes to the NSW Government's objective of net-zero emissions by 2050.
<p><i>Stated targets or metrics</i></p>	<p>Targets and aspirations detailed across the document include:</p> <ul style="list-style-type: none"> • An aim to grow the share of cycling for trips up to 10 kilometres. • Achieving the 30 minute city through investment in mass transit, improving service frequencies, prioritising public transport around centres, and improving walking and road based connections to public transport and centres. • Indicative future frequency of all day services: <ul style="list-style-type: none"> – city shaping services – turn up and go, every 5 minutes or less – city serving services – high frequency, every 10 minutes or less, or on demand – centre serving services – high frequency, every 10 minutes or less, or on demand. • 24/7 rail access on the busiest freight corridors in Greater Sydney – between ports and intermodal terminals. • NSW Ports' target of 3 million TEUs of container movements to and from Port Botany moving by rail by 2045.
<p><i>Geographic boundary</i></p>	<p>The indicative study area covers the Greater Sydney region as defined by the GSC in <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> and the five <i>District Plans</i>. However, the plan also considers connections between Greater Sydney and Regional NSW.</p> <p>Figure 11 above illustrates the indicative study area, consistent with the <i>Future Transport Strategy 2056</i>. Figure 12, Figure 13 and Figure 14 illustrate the public transport city shaping and city serving networks, as well as the strategic freight network, based on the current state and the 40-year vision.</p>

<i>Greater Sydney Services and Infrastructure Plan (continued)</i>	
<i>Modes</i>	<p>The plan focuses more on strategic corridors than individual modes of transport. However, it does include initiatives for the following modes of transport:</p> <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail, ferry) • active transport (walking, cycling).
<i>Passenger/ freight</i>	<p>The plan includes initiatives for both the passenger and freight network.</p>
<i>Timeframe</i>	<p>The plan covers a 40-year period.</p> <p>Initiatives listed in the strategy are categorised as:</p> <ul style="list-style-type: none"> • committed/funded (0-10 years) • for investigation (0-10, 10-20 years) • visionary (20+ years).
<i>Relationship to other plans</i>	<p>The <i>Greater Sydney Services and Infrastructure Plan</i> supports the <i>Future Transport Strategy 2056</i>. The plan sits alongside the Regional NSW Services and Infrastructure Plan (out of scope), which provides the 40-year transport plan for NSW regions outside Greater Sydney.</p> <p>The plan, combined with the <i>Future Transport Strategy 2056</i> and other supporting plans, replaces the <i>NSW Long Term Transport Master Plan</i> (2012) and supporting mode-specific plans.</p> <p>The plan was prepared concurrently with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> to the five <i>District Plans</i>, as well as the <i>State Infrastructure Strategy 2018–2038</i>. This allowed for alignment of land use, transport and infrastructure outcomes for Greater Sydney for ‘the first time in a generation’. For example, the strategy specifically references and evidences its alignment with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>.</p>

Figure 11 above illustrates the Greater Sydney region and the strategic transport corridors associated with the *Greater Sydney Services and Infrastructure Plan*. The strategic transport corridors show an integrated transport system, designed to achieve the vision in the *Greater Sydney Region Plan: A Metropolis of Three Cities*.

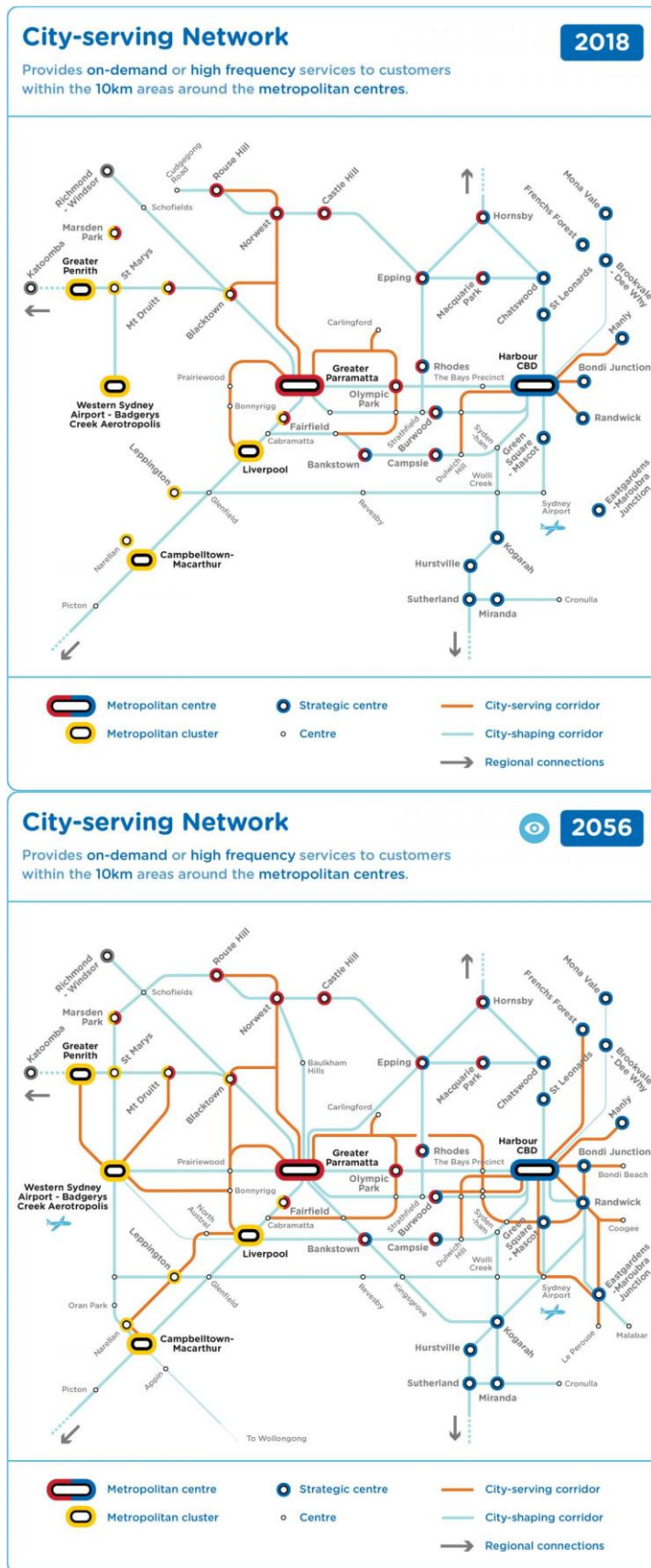
Figure 12, Figure 13 and Figure 14 illustrates the public transport city shaping and city serving networks, as well as the strategic freight network, based on the current state and the 40-year vision. These figures show greater connectivity between metropolitan and strategic centres.

Figure 12. Current/committed Greater Sydney city shaping network against 2056 vision



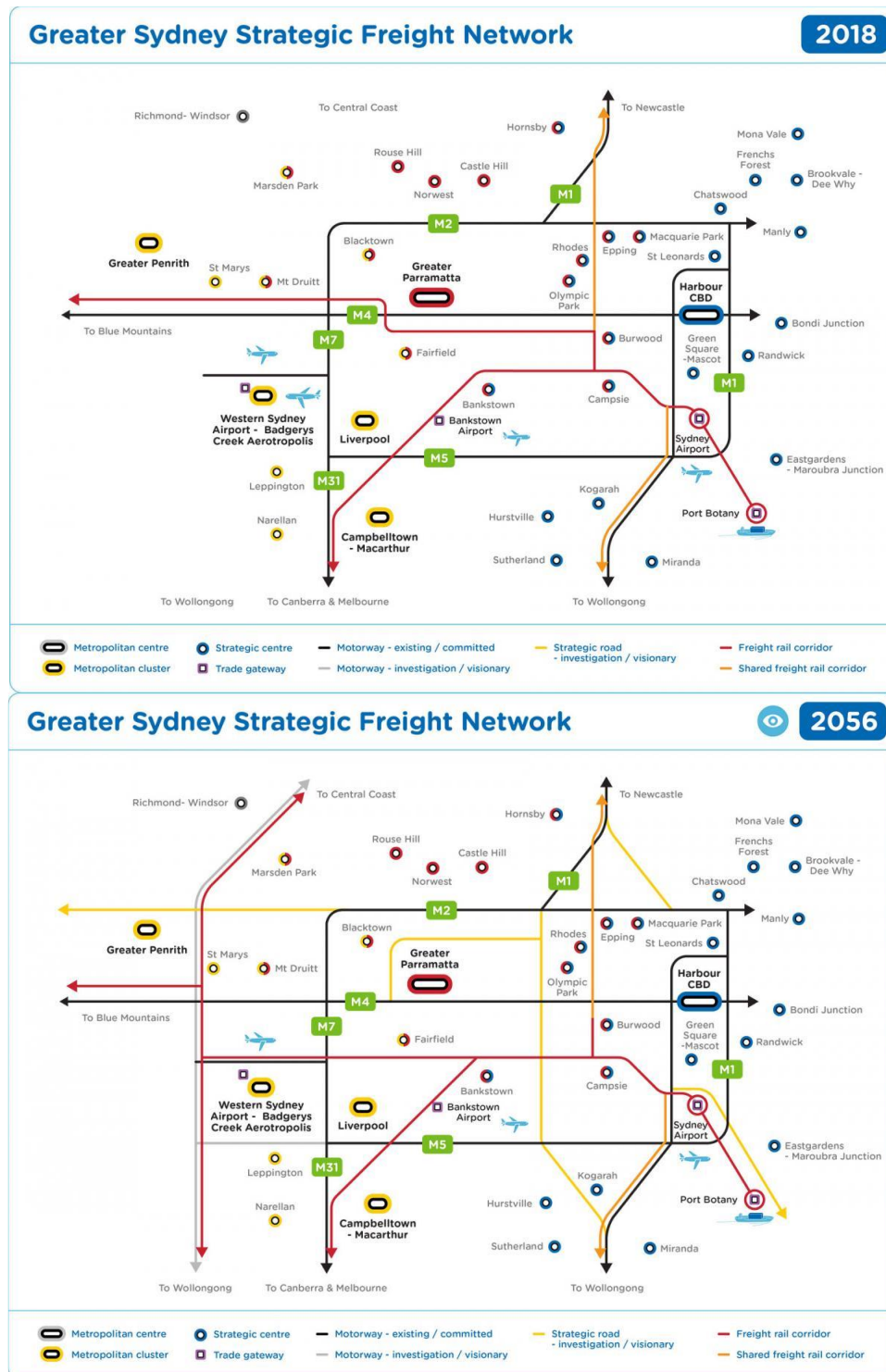
Source: TfNSW, Greater Sydney Services and Infrastructure Plan, March 2018.

Figure 13. Current/committed Greater Sydney city serving network against 2056 vision



Source: TfNSW, Greater Sydney Services and Infrastructure Plan, March 2018.

Figure 14. Current/committed Greater Sydney strategic freight network against 2056 vision



Source: TfNSW, Greater Sydney Services and Infrastructure Plan, March 2018.

NSW Draft Freight and Ports Plan

Background	<p>NSW Draft Freight and Ports Plan was published in 2017 by TfNSW as an issue-specific and place-based plan to support the delivery of the <i>Future Transport Strategy 2056</i>.</p> <p>It is a draft transport plan that, when finalised, will provide direction to business and industry for managing and investing in freight into the future. It seeks to reinforce the importance of freight and ports in NSW to the national economy and will ensure that NSW's freight and port system needs are well positioned to respond to emerging national and international markets and opportunities.</p> <p>The draft plan sets out:</p> <ul style="list-style-type: none"> the current state of freight in NSW opportunities and challenges for each of the freight commodity sectors potential priority action areas and infrastructure initiatives to be confirmed.
Date released / issued	2017
Status	Draft NSW Government plan
High level objectives	<p>Vision: moving goods in an efficient, safe and environmentally sustainable manner, providing successful outcomes for communities and industry.</p> <p>This vision is supported by six priority areas:¹¹</p> <ul style="list-style-type: none"> strengthen freight industry and government partnerships increase access for freight across the road and rail network protect existing freight precincts and ensure sufficient future land use facilitate introduction of technologies that reduce freight costs and impacts reduce the regulatory burden on industry ensure safe, efficient and sustainable freight access to places.
Stated targets or metrics	No explicit targets or metrics listed. The draft plan identified that through the consultation and finalisation process, industry and government delivery standards will be developed, and a target-based performance system to measure and report on delivery will be implemented.
Geographic boundary	The draft plan extends to the NSW state boundaries. However, Figure 14 illustrates the Greater Sydney region strategic freight network, based on the current state and the 40-year vision, as set out in the <i>Future Transport Strategy 2056</i> .
Modes	<p>The draft plan is more focussed on supply chains than modes of transport. However, it considers initiatives across the following modes</p> <ul style="list-style-type: none"> road rail air shipping.
Passenger/ freight	The plan is focussed on the freight network.
Timeframe	<p>The plan covers a 20+ year period.</p> <p>Initiatives listed in the strategy are categorised as:</p> <ul style="list-style-type: none"> committed/funded (0-10 years) for investigation (0-10, 10-20 years) visionary (20+ years).

¹¹ The plan also references the NSW Premier's stated priorities: 1) grow the economy, accelerating major project assessments and delivering strong budgets; 2) build infrastructure and deliver better services, improving road travel, reliability and on time public transport running; 3) create safer communities, reducing road fatalities by at least 30 per cent by 2021 based on 2010 levels.

NSW Draft Freight and Ports Plan (continued)	
Relationship to other plans	<p>The draft plan has been guided by, and replaces, the <i>NSW Freight and Ports Strategy</i> (2013).</p> <p>The draft plan has been developed in close alignment with the <i>State Infrastructure Strategy 2018-2038</i>, and the <i>Future Transport Strategy 2056</i>, Services and Infrastructure Plans, and other issue-specific place-based supporting plans. This allows for alignment of land use, transport and infrastructure planning. For example, the draft plan specifically references the six outcomes in <i>Future Transport Strategy 2056</i>.</p> <p>The final Freight and Ports Plan will continue to align with these plans, as well as plans and strategies across all levels of Government. In particular, the importance of Local Government involvement in last mile issues will be further explored.</p> <p>The final Freight and Ports Plan will also closely align with the <i>National Freight and Supply Chain Strategy</i> and seek to identify those areas where Transport for NSW can work together with the Commonwealth Government on improved harmonisation across state borders.</p>

Building Momentum: State Infrastructure Strategy 2018-2038

Background	<p><i>Building Momentum: State Infrastructure Strategy 2018-2038</i> was published in February 2018 by iNSW. iNSW is an independent statutory authority charged with providing advice on infrastructure investment to the NSW Government.</p> <p><i>Building Momentum: State Infrastructure Strategy 2018-2038</i> is a 20-year infrastructure investment plan for NSW, which sets out iNSW's independent advice on the current state of NSW's infrastructure and the needs and priorities over the next 20 years.</p> <p>The strategy contains 122 recommendations across infrastructure sectors, including transport. These recommendations identify capital investment, policy initiatives, planning reforms and regulatory changes that are achievable, affordable and evidence-based, and that deliver the highest economic, employment and liveability benefits to people in NSW.</p> <p>The strategy:</p> <ul style="list-style-type: none"> • sets six overarching cross-sectoral strategic directions • sets new geographic directions, including for Greater Sydney as a metropolis of three cities • sets sector-based infrastructure directions, and challenges and opportunities, including for transport. <p>The strategy endorses and aligns with the land use vision in the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i>. As major infrastructure networks are completed in the Eastern Harbour City, such as WestConnex and Sydney Metro, investment needs to shift westwards: first to the Central River City around Parramatta and ultimately to the emerging WSA and employment centres of the Western Parkland City.</p>
Date released / issued	February 2018
Status	NSW Government has reviewed the strategy and funding recommendations in its response. Projects where the NSW government has accepted recommendations (listed in the 2018-19 State Infrastructure Plan) are detailed in section 5.
High level objectives	<p>NSW Government endorsed vision for Greater Sydney: By 2056, Greater Sydney will be a metropolis of 'three cities' – an Eastern Harbour City, Central River City and Western Parkland City. Residents will be able to access jobs and services within 30 minutes.¹²</p> <p>6 cross-sectoral and state-wide strategic directions:¹³</p> <ul style="list-style-type: none"> • integrating land use and infrastructure planning • infrastructure planning, prioritisation and delivery • asset management – assurance and utilisation • resilience • digital connectivity and technology • innovative service delivery models. <p>Transport strategic objective: Ensure the transport system creates opportunities for people and businesses to access the services and support they need.</p>
Stated targets or metrics	No explicit targets or metrics.
Geographic boundary	The strategy extends to the NSW state boundaries. However, the strategy provides insights and recommendations for the Greater Sydney region and outer metropolitan area, as illustrated in Figure 15.

¹² The NSW Government response has a vision for metropolitan NSW consistent with the *Greater Sydney Region Plan: A Metropolis of Three Cities*. It also notes that it will continue to invest in a transport network that can safely, efficiently and reliably move people and goods around NSW, consistent with the *Future Transport Strategy 2056*.

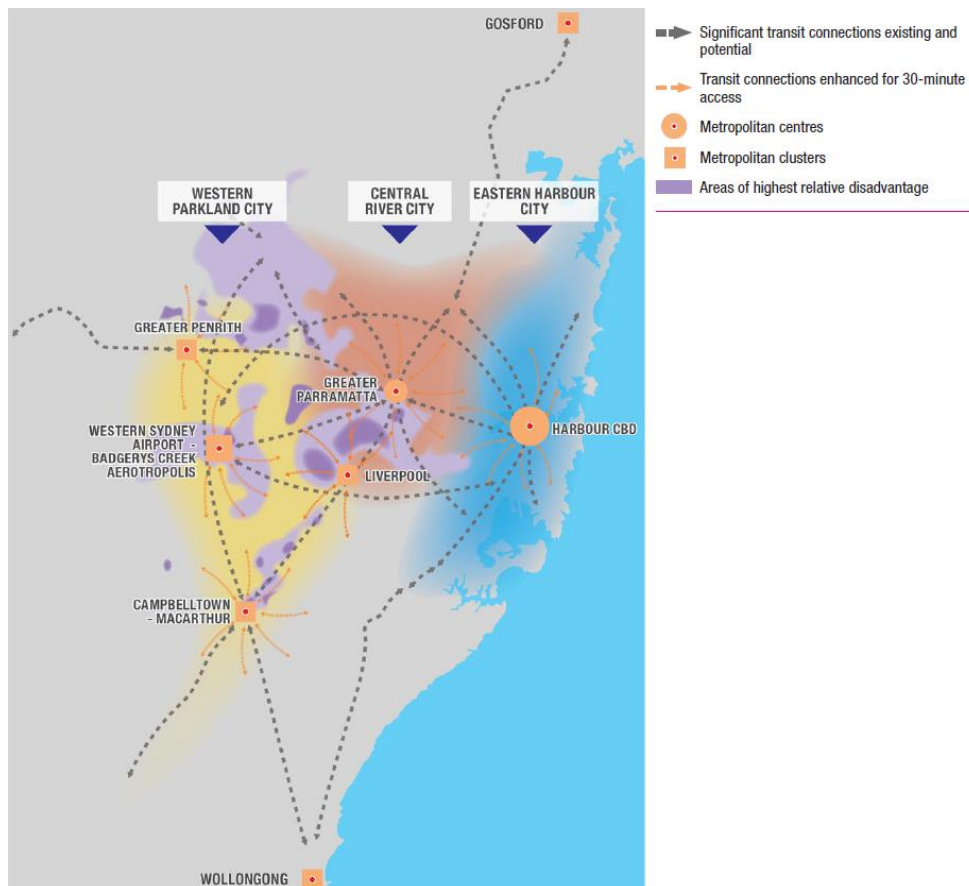
¹³ The NSW Government response confirms these strategic directions by adopting essentially equivalent directions: better integrating land use and infrastructure; delivering infrastructure to maximise value for money; optimising asset management; making NSW's infrastructure more resilient; improving digital connectivity; using innovative service delivery models.

Building Momentum: State Infrastructure Strategy 2018-2038 (continued)

Modes	The strategy's infrastructure recommendations for the transport sector support the following modes (with the strongest focus on road and rail): <ul style="list-style-type: none"> • road • public transport (rail, bus, light rail) • active transport (walking, cycling).
Passenger/freight	The plan contains recommendations for the passenger and freight networks.
Timeframe	The strategy covers a 20-year period.
Relationship to other plans	<p><i>Building Momentum: State Infrastructure Strategy 2018-2038</i> replaces the 2012 <i>State Infrastructure Strategy</i> and the 2014 <i>State Infrastructure Strategy update</i>.</p> <p>This strategy has been developed in alignment with the <i>Greater Sydney Region Plan: A Metropolis of Three Cities</i> and <i>District Plans, Future Transport Strategy 2056</i> and suite of transport plans, and regional economic development strategies. As such, this strategy, for the first time, provides fully integrated land use and infrastructure plans.</p>

Figure 15 illustrates the indicative study area for iNSW's insights, directions and recommendations for the Greater Sydney region. The Greater Sydney region is consistent with the GSC's plans, consisting of three cities supported by metropolitan centres / clusters. iNSW adapted Figure 15 from the GSC and TfNSW.

Figure 15. Study area for iNSW's State Infrastructure Strategy 2018-2038 (specific to Greater Sydney)



Source: iNSW, Building Momentum: State Infrastructure Strategy 2018-2038, February 2018.

3 *Integration of rail and land use plans*

This section analyses the integration between the rail and land use plans summarised in Section 2. This analysis is limited to plans that are endorsed by the NSW Government,¹⁴ notwithstanding the transport and land use planning currently under Government consideration.

3.1 *Why integrate transport and land use plans?*

Land use and transport planning is an iterative process, with outputs from a sequence of land use plans forming inputs into transport plans and vice versa.

Land use assumptions encompass a multitude of criteria. Key inputs to transport modelling include forecasts of resident population, employment and the distribution of these within the city. These are key drivers to determine where there is future demand for public transport and to signal where there is a need for investment.

In return, investment in the transport network improves connections between residential and economic hubs which influences the urban form. If a new rail station is proposed and constructed, it will attract housing and property development close to the catchment area and encourage a higher density infill. Transport plans not only promote economic productivity but also help to shape the city's urban form and support delivery on the State's objectives.

3.2 *Integration of transport and land use plans for Sydney*

In NSW, the finalised transport, land use and infrastructure plans have been developed concurrently to ensure integration and alignment. While transport planning has been integrated with land-use planning since 2012, the current cycle is the first to align land use, transport and infrastructure outcomes for Greater Sydney and Regional NSW. This section focusses on the Greater Sydney region and shows the integration of planning through:

- an aligned vision for Greater Sydney
- aligned inputs and integrated modelling
- aligned transport and land use outcomes
- aligned treatment of Western Sydney.

3.2.1 *Alignment of vision*

Table 6 shows all in-scope plans have an aligned long term vision and strategic direction for the Greater Sydney region, based on the vision and 10 directions set by the GSC in *Directions for a Greater Sydney 2017-2056*.¹⁵ The key elements of this vision are a polycentric city or 'metropolis of three cities', with 30 minute access to the nearest centre for jobs, education or

¹⁴ Except for the *State Infrastructure Strategy 2018-2038* developed by iNSW.

¹⁵ The Draft Freight and Ports Plan does not state this vision as it is a people-based vision less applicable to freight. However, it does clearly state and show its alignment with the *Future Transport Strategy 2056*.

services. This vision addresses the challenge cited across all plans of managing Greater Sydney's forecast population growth.

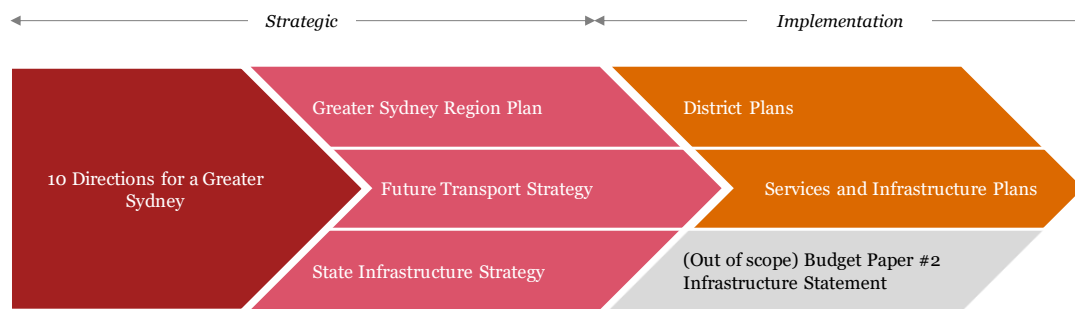
Table 6. Alignment of vision between key direction-setting plans

Directions for a Greater Sydney 2017-2056	Greater Sydney Region Plan: A Metropolis of Three Cities	Future Transport Strategy 2056	NSW Government endorsed State Infrastructure Strategy 2018-2038
<p>Greater Sydney will be a global metropolis of three productive, liveable and sustainable cities:</p> <ul style="list-style-type: none"> • Western Parkland City • Central River City • Eastern Harbour City. 	<p>A metropolis of three cities where most residents live within 30 minutes of their jobs, education and health facilities, services and great places.</p>	<p>A metropolis of three cities, where people can access the jobs, education and services they need within 30 minutes by public or active transport.</p>	<p>By 2056, Greater Sydney will be a metropolis of 'three cities' – an Eastern Harbour City, Central River City and Western Parkland City. Residents will be able to access jobs and services within 30 minutes.</p>

Source: Plans listed in section 2.

Figure 16 shows how the vision and directions established by the GSC are the starting point for delivering integrated planning and how this is carried through to other plans.

Figure 16. Alignment between state plans



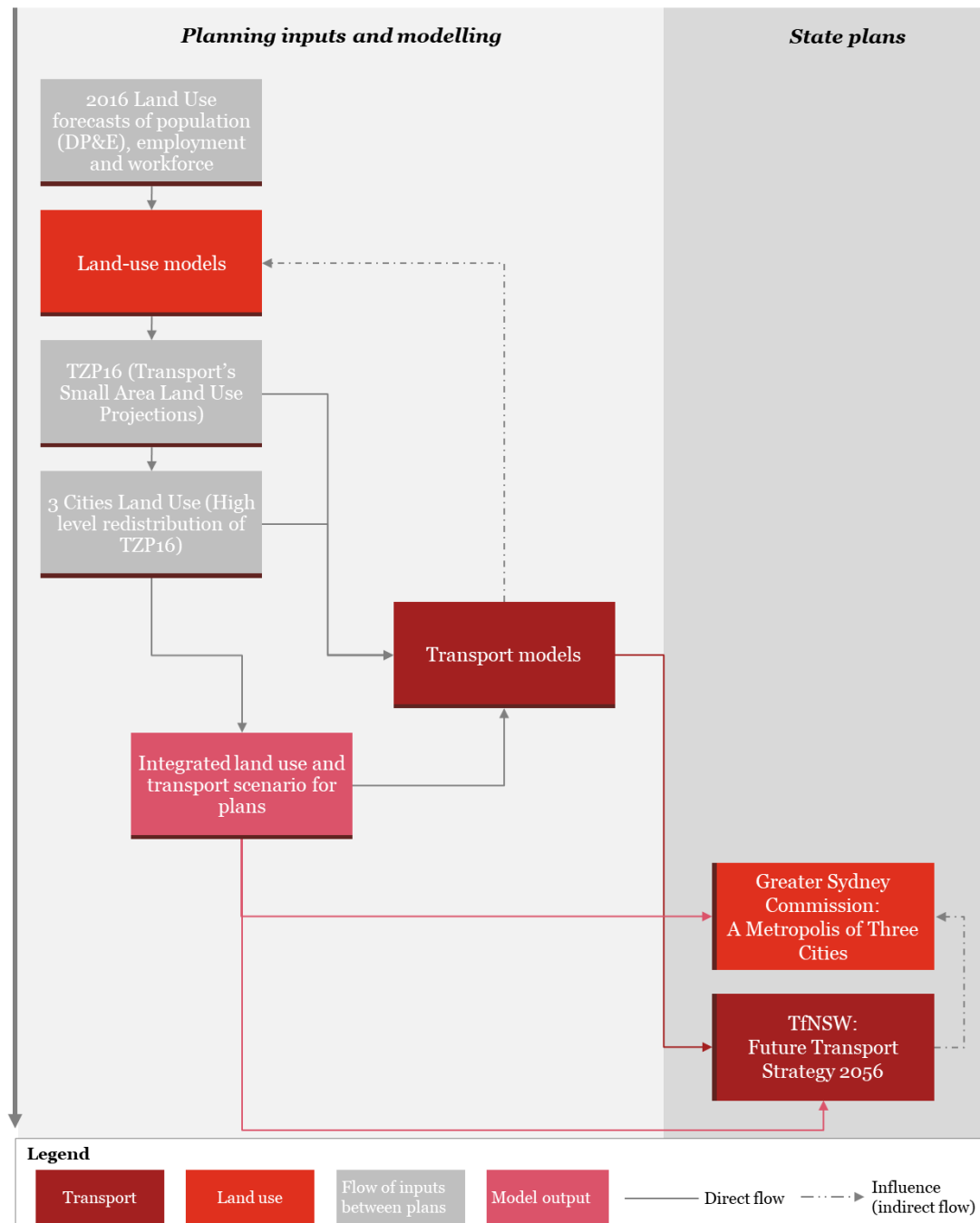
Source: PwC analysis; Greater Sydney Commission, Greater Sydney Region Plan: A Metropolis of Three Cities – Connecting People, March 2018, p.24.

3.2.2 Alignment of inputs and modelling

The finalisation of the *Future Transport Plan* and *Towards our Greater Sydney 2056* took place iteratively, in order to achieve integration between the two planning processes. In particular, NSW's transport and land use models are used to explore the influence of land use on transport, and vice versa, to achieve integration.

The integration process determines (1) how land-use assumptions will affect transport demands and (2) how the transport plans can influence the desired urban form. The process for Sydney began with land use modelling and assumptions, which fed into transport modelling, and then cycled iteratively until both models produced a consistent scenario. This process is shown in Figure 17.

Figure 17. Current state NSW land use and transport planning cycle



Source: PwC analysis.

As Figure 17 shows, two key land use forecasts are inputs for the current planning cycle. They are:

- 2016 DP&E population, household and dwelling forecasts (LU16), which is a forecast of population, employment and workforce that is:
 - more spatially disaggregated than the three cities forecast (ie forecasts are made for smaller geographic units)
 - a suitable input to transport planning for analysis at the route/line/station level

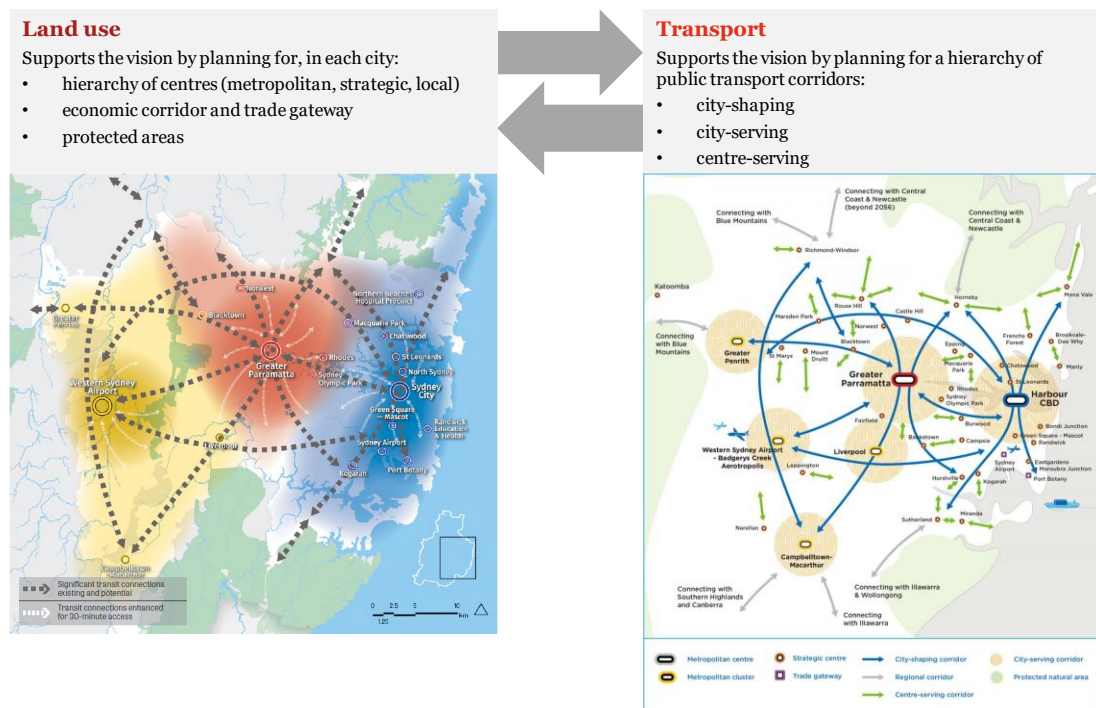
- The three cities forecast, which reflects the land use planning direction established by the GSC and is:
 - understood to have evolved from the 2016 DP&E forecasts used as inputs to the draft *Towards our Greater Sydney 2056* plan
 - the input to land use plans
 - a strategic level input to transport plans to ensure integration

As Figure 17 shows both forecasts have been drawn on to develop integrated transport and land use scenarios to inform the finalised land use and transport plans.

3.2.3 *Alignment of transport and land use outcomes*

All in-scope plans are aligned with a movement from a monocentric city with a radial transport network to the central CBD, to a polycentric city or 'metropolis of three cities' which services an interconnected system of cities and centres with accessible 30-minute catchments. This is shown in Figure 18.

Figure 18. Aligned transport and land use outcomes



Source: GSC, Greater Sydney Region Plan: A Metropolis of Three Cities; Future Transport Strategy 2056; PwC analysis.

Figure 18 shows integrated land use and transport outcomes are achieved through:

- The *Greater Sydney Region Plan: A Metropolis of Three Cities* and five *District Plans* establishes place-making land use priorities for each city and its District(s):
 - Eastern Harbour City (Eastern City District, North District and South District)
 - Central River City (Central City District)
 - Western Parkland City (Western City District)

This includes a three-level hierarchy of centres – metropolitan, strategic and local centres – to support each city. It also includes commercial office precincts, health and education precincts, economic corridors and trade gateways.

- The *Future Transport Strategy 2056* and the *Greater Sydney Services and Infrastructure Plan* establishes connectivity and accessibility between metropolitan, strategic and local centres to enable 30 minute access to jobs, education and services by public or active transport. It does this by focussing on a public transport network based on three types of corridors:
 - City-shaping corridors – trunk road and public transport corridors providing higher speed and volume connections between cities and centres that shape locational decisions of residents and businesses.
 - City-serving corridors – higher density corridors within less than 10km of metropolitan centres providing high frequency access to metropolitan cities/centres with more frequent stopping patterns.
 - Centre-serving corridors – local corridors that support buses, walking and cycling, to connect people with their nearest centre and transport interchange.
- *Building Momentum: State Infrastructure Strategy 2018-2038* makes recommendations for infrastructure to support the place-making of each city and its connectivity. It incorporates GSC's metropolitan and strategic centres, as well as TfNSW's strategic corridors.

3.2.4 *Alignment in treatment of Western Sydney*

All transport and land use plans have an aligned focus on catalysing the development of the Western Parkland City over the next 20 to 40 years. They do this by enabling the commitments in the Western Sydney City Deal, building on natural and community assets, and 'developing a more contained Western City District with a greater choice of jobs, transport and services aligned with growth'.¹⁶ The plans are also part of a broader planning context across the three tiers of government (Commonwealth, State and local), which are linked as follows:

- GSC's *Directions for a Greater Sydney 2017-2056* sets the vision and strategic direction for Greater Sydney as a metropolis of three cities, which includes the development of the Western Parkland City, catalysed by and centred around the Western Sydney Airport (WSA) Badgery's Creek Aerotropolis.
- The Australian Government's Smart Cities Plan sets a vision for productive and liveable cities that foster innovation, support growth and create jobs. City Deals are the key mechanism to deliver on this vision by bringing together the three levels of government, the community and private enterprise to create long-term partnerships.
- On 4 March 2018, representatives across the three tiers of government signed the Western Sydney City Deal. This brings together all levels of government for collaborative planning and sets the investment foundation for the development of the Western Parkland City. The Western Sydney City Deal commits to the first stage of the North-South Rail Link from St Marys to WSA and the Badgerys Creek Aerotropolis, with a joint objective to have rail connected to the airport by opening in 2026.

¹⁶ GSC, Western City District Plan, March 2018, p. 6.

- GSC and TfNSW's land use and transport plans build upon the commitments in the Western Sydney City Deal, further developing land use and transport connections across the city.
- The long term rail network proposed across all plans is based on the Preferred Network for Western Sydney, identified through the Western Sydney Rail Needs Scoping Study, published in 2018. This was jointly undertaken by the Australian and NSW governments to determine the long-term need, timing and service options for passenger rail to service both Western Sydney and WSA.

Integrated transport and land use planning builds on the Western Sydney City Deal. It focusses on establishing a land use and transport structure which enables and supports:

- Integrated transport and land use planning in DP&E growth areas, including the Aerotropolis, South West and North West of Greater Sydney.
- The development and growth of new and existing economic agglomerations. For the Western City District, these include the Western Economic Corridor, Western Sydney Airport (WSA) and Badgerys Creek Aerotropolis, Liverpool, Greater Penrith, Campbelltown-Macarthur and the Western Sydney Employment Area. The structure also delivers on liveability and sustainability through urban investigation areas and the South Creek Corridor Project.
- Connectivity to and within metropolitan and strategic centres,¹⁷ and 30-minute access to jobs, education and services. This includes new city shaping public transport corridors and infrastructure to increase:
 - north-south connectivity – for example, through the North-South Rail Link, which, in later stages, also links to existing/committed rail lines to create an orbital connection around Greater Sydney
 - east-west connectivity – for example, through the WSA to Parramatta Rail Link (which then links to existing lines to the Harbour CBD to create an east-west spine through Greater Sydney) and Aerotropolis to Leppington Rail Link (which then links to existing lines to the Central and Eastern cities, including the Sydney Airport).
- Access to the freight rail and road networks – for example, through the Western Sydney Freight Line and Outer Sydney Orbital.

¹⁷ And precincts and trade gateways.

4 Alignment of rail and land use planning objectives

This section provides an overview of NSW's rail and land use planning objectives, and:

- compares these objectives to those of the Australian Government
- considers the extent to which objectives are consistently aligned between state plans
- considers the extent to which plan objectives are met by the projects and outcomes articulated in the plans.

4.1 Rail and land use planning objectives

Objectives are used in transport and land use plans to help define a future state and provide a framework for the development of strategies to achieve that future state. In the case of NSW, or Greater Sydney in this case, the objectives in the land use, transport and infrastructure plans are based on a governing vision set by the GSC and outlined in section 3.2.1. Each plan's objectives then form the basis for its proposed strategies, actions and/or initiatives.

As objectives capture the intent of the planning process, a comparison of objectives between plans can be used to provide insight as to shifts in emphasis and aims. But the ability to make direct comparisons between plans is limited due to variation in the structure and definition of objectives. Therefore, to enable comparison of objectives between plans, the objectives of individual plans have been mapped to themes observed across all the plans.

Upon review of the in-scope transport and land use plans, five overarching state objectives emerged across the documents. These are defined in Table 7.

Table 7. Definitions of high level objectives

Objective	Definition
Economic growth	Economic growth is defined as increases in economic output, productivity, jobs growth or the diversity and competitiveness of the Greater Sydney economy.
Accessibility	<p>Accessibility is defined as the ease of movement of goods and people around the urban environment and quality of this movement (which is affected by travel time and cost). Barriers to accessibility include congestion and the quality and affordability of transport options.</p> <p>Passenger accessibility is the ability to travel between places of residence, employment, education, activities and reach goods and services by preferred mode and at preferred times. Freight accessibility is defined as moving goods quickly and efficiently between points in the supply chain.</p>
Connectivity	<p>Connectivity is defined as the directness of links and the density of connections in a transport network, which influence in turn travel time and choice between points (e.g. choice of mode or of route).</p> <p>Barriers to connectivity include long links between destinations, dead ends and limited intersection points between links.</p>
User centricity	<p>User centred design identifies the needs of users of a system or space and designs solutions in response to these needs. In land use plans, the user is generally the resident of the city whereas in transport plans the user is the customer of the transport network.</p> <p>Residents</p> <p>Liveability is defined as the set of factors that contribute to quality of life in cities, such as housing choice and affordability, or land use that affects the amenity of an area.</p> <p>An interpretation of liveability often seen in land use plans is the idea of the “connected city”, a city with a dense mix of land use that allows for ease of access to services, employment, leisure areas and transport within areas across a city.</p> <p>Customer</p> <p>A customer focus means defining customer needs and using them to prioritise hard and soft infrastructure projects to change the way the transport network or the urban environment is experienced.</p> <p>Customer-focused projects include built projects that address stated customer needs (e.g. reliability) and non-built projects that improve customer experience (e.g. journey planning apps, real time travel information, modern ticketing, inclusion of private providers in network planning where they provide customer benefit).</p>
Sustainability	Sustainability has dual meanings in the plans reviewed. The first interpretation relates to the ability of the activities of a system (here: a city) to be maintained at a certain rate or level indefinitely, and the second relates to achieving environmental outcomes such as avoiding or slowing the depletion of natural resources.

Source: PwC analysis

4.2 *Alignment of State to Australian Government objectives*

The aim of this study is to analyse the articulation of state urban rail plans and land use objectives; and the degree of alignment between state government objectives and the following three policy objectives, which are broadly consistent with the Australian Government's policy objectives for Smart Cities:

- drive productivity growth by improving connections to employment and services, promoting agglomeration economies and contributing to a more efficient transport network including through the efficient movement of freight
- improve liveability and public amenity by reducing congestion and improving accessibility, and reducing commute times
- increase housing supply by promoting higher density development in close proximity to rail stations and through urban renewal, supporting broader efforts to improve housing affordability.

These objectives are largely consistent with the five state objectives identified across the plans as shown in Table 8.

Table 8. Relationship between State and Australian Government objectives

	Economic Growth	Accessibility	Connectivity	User centrity	Sustainability
Drive productivity growth by improving connections to employment and services, promoting agglomeration economies and contributing to a more efficient transport network including through the efficient movement of freight	●	●	●	●	
Improve liveability and public amenity by reducing congestion and improving accessibility, and reducing commute times		●	●		●
Increase housing supply by promoting higher density development in close proximity to rail stations and through urban renewal, supporting broader efforts to improve housing affordability.		●			●

Source: PwC analysis

As Table 8 shows, the broad Australian Government objectives for productivity and liveability are strongly aligned with the State Government objectives.

The definition of connectivity does not extend to liveability and amenity which are instead covered by the State Government objectives of accessibility and user centrity.

4.3 *Alignment of rail and land use planning objectives within state plans*

Table 9 identifies the objectives articulated in each of the in-scope NSW transport and land use plans.

Table 9. Consistency of reference to State government objectives

Plan	Accessibility	Connectivity	User centricity	Economic Growth	Sustainability
Directions for a Greater Sydney 2017-2056	●	●	●	●	●
Greater Sydney Region Plan: A Metropolis of Three Cities – Connecting People and five District Plans	●	●	●	●	●
Future Transport Strategy 2056 and Greater Sydney Services and Infrastructure Plan	●	●	●	●	●
Draft NSW Freight and Ports Plan	●	●	●	●	●
Building Momentum: State Infrastructure Strategy 2018-2038	●	●	●	●	●

Source: PwC analysis. Note: PwC has included the *Regional NSW Services and Infrastructure Plan* in this section but note it is out of scope and, as such, will not consider it in other sections of the report.

Table 9 shows that all plans embed accessibility, connectivity, user centricity, economic growth and sustainability as part of their objectives, either explicitly or implicitly, so there is consistency across the plans. All the plans focus these objectives around managing Greater Sydney's forecast population growth.

Accessibility and connectivity

The emphasis of accessibility and connectivity varies between plans, but all plans reference infrastructure and transportation to improve accessibility and connectivity. TfNSW's transport plans have the strongest focus on accessibility and connectivity, aligning with four of their six state-wide outcomes:

- successful places – e.g. connectivity and accessibility to enhance liveability
- a strong economy – e.g. connecting people and places in a growing city (to achieve a 30-minute metropolis of three cities for Greater Sydney, or a hub-and-spoke model for Regional NSW)
- safety and performance – e.g. efficient and reliable passenger and freight journeys
- accessible services – e.g. accessible for all customers, regardless of their location, age, ability or personal circumstances.

iNSW's infrastructure strategy sets out cross-sectoral strategic directions for infrastructure planning, as well as challenges and opportunities specific to the transport sector in delivering the 30 minute city that reflect accessibility and connectivity implicitly.

The GSC's land use plans embed accessibility and connectivity within productivity objectives and directions, which include 'a well-connected city' with 30-minute accessibility to jobs, education and services.

User centrality

The emphasis of user centrality is shaped by plan type, with transport and infrastructure plans focusing on technology to enhance customer experiences, and land use plans focusing on place-making and movement to enhance liveability.

TfNSW ‘places the customer at the centre’¹⁸ of its planning, a direction already established in the 2017 in scope reports. The first state-wide outcome defined in the TfNSW plans relate to customer focus, that ‘customer experiences are seamless, interactive and personalised, supported by technology and data’. It further considers the customer experience through its ‘safety and performance’ and ‘accessible services’ outcomes. The objectives of its *Draft NSW Freight and Ports Plan* also focus on the customer experience, but this focus is more on customers who use the freight network than end-users.

In terms of infrastructure, iNSW’s strategy considers the customer experience implicitly through strategic directions around the use of technology and innovative service models. It also considers the customer experience for transport infrastructure through its key challenges and opportunities for the sector, which consider congestion/crowding, road safety, socio-economic disadvantage and the travel needs of an aging population.

All plans (except for the *Draft NSW Freight and Ports Plan*) are aligned in their reference to liveability. Within liveability, access to a range of jobs, education facilities, services and activities is a factor that was continuously explicitly or implicitly (i.e. iNSW’s infrastructure strategy) referenced. GSC’s land use plans contain specific liveability directions and objectives including:

- ‘a city for people’ which capitalises on local identity, heritage and cultural values, together with easier access to services
- ‘housing the city’ with greater housing choice
- ‘a city of great places’ which enhances well-being and a sense of community identity by delivering safe, inclusive and walkable mixed-use areas.

Economic growth

All plans have objectives relating to productivity or economic growth, and note the importance of transportation linkages in facilitating jobs, investment and increased productivity. However, iNSW’s infrastructure strategy appears to contain the strongest focus on economic growth, as it underlies all the strategic directions, and iNSW specifically ‘focuses on the three essential ingredients for economic prosperity – population, productivity and participation’.¹⁹

TfNSW’s transport plans also contain an explicit outcome for ‘a strong economy’ where ‘the transport system powers NSW’s future \$1.3 trillion economic and enables economic activity across the state’. Similarly, the GSC’s land use plans have explicit productivity objectives and directions, including ‘jobs and skills for the city’ through business growth and skills development.

Sustainability

All the plans have stronger focus on economic and environmental sustainability than the superseded plans assessed in the original report issued to DITCRD. Sustainability is explicitly referenced in:

- GSC’s land use plans through sustainability objectives and directions including ‘a city in its landscape’ with a healthy natural environment; ‘an efficient city’ which manages

¹⁸ TfNSW, *Future Transport Strategy 2056*, March 2018, p. 4.

¹⁹ iNSW, *Building Momentum: State Infrastructure Strategy 2018-2038*, February 2018, p. 5.

resources to reduce costs, emissions and environmental impacts; and ‘a resilient city’ which builds capacity in systems to adapt and respond to changes in technology and climate. These plans reference the NSW Government’s target of net zero emissions by 2050.

- TfNSW’s transport plans through a ‘sustainable’ outcome, where ‘the transport is economically and environmentally sustainable, affordable for customers and supports emissions reductions’. These plans (except the *Draft NSW Freight and Ports Plan*) specifically reference the NSW Government’s target of net zero emissions by 2050.
- iNSW’s infrastructure strategy through all its strategic directions, but most specifically through ‘infrastructure planning, prioritisation and delivery’ optimising the use of existing infrastructure; ‘asset management – assurance and utilisation’ focussing on maintenance for sustainable assets; ‘resilience’ to natural hazards and human-related threats; and ‘digital connectivity and technology’ to sustain technological change/disruption.

4.4 *Alignment of plan outcomes*

Section 4.3 detailed the alignment of objectives between plans. This section summarises the alignment of the objectives with plan outcomes such as the reported benefits of proposed projects. For an overview of the scope of the plans and key aims refer to Section 2.2. As an overview, within the plans:

- *Building Momentum: State Infrastructure Strategy 2018-2038* most strongly articulates the link between economic growth objectives and transport project outcomes, although it also emphasises connectivity and accessibility (in driving the 30-minute city vision).
- *The Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan* has the clearest link between the objectives of accessibility and connectivity with recommended projects, in driving the 30-minute city vision. However, it also provides many transport initiatives that emphasise economic growth through access to jobs.
- For user centricity, the needs of the customer are most clearly linked to transport projects in the *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*. Liveability requirements are most detailed in the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans*.
- Sustainability is addressed most strongly in the *Draft NSW Freight and Ports Plan* in terms of transport network externalities, and *Building Momentum: State Infrastructure Strategy 2018-2038* in terms of resilience. Environmental sustainability is most strongly addressed in the *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*, although the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans* strongly links transport projects with mode shift outcomes that contribute to environmental sustainability.

As the following sections show, alignment of the objectives to plan outcomes is consistent to the alignment of plan objectives to the five overarching objectives identified between plans. In discussing transport projects below and section 5, *Building Momentum: State Infrastructure Strategy 2018-2038* is considered in conjunction with the list of NSW Government endorsed projects in *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan*.

4.4.1 *Future Transport Strategy 2056 and Greater Sydney Services and Infrastructure Plan (March 2018)*

Attribute	Inclusion	Description
Economic growth	●	<p>The plans articulate the role transport plays in supporting and ‘powering’ the growth of NSW’s economy. This is through projects that increase connectivity between people, jobs, education and services, to achieve the 30-minute city vision.</p> <p>In particular, the plans identify city shaping, city serving and centre serving corridors that increase access to strategic activity centres and precincts across the three cities. They use GSC’s hierarchy of centres to prioritise corridors / connections for greatest economic and productivity benefit.</p> <p>The plans also focus on improving freight connections to trade gateways (e.g. Port Botany, Sydney Airport, Bankstown Airport, WSA) and intermodal terminals.</p>
Accessibility	●	<p>Accessibility is embedded in the planning process and framework as the plans define city shaping, city serving and centre serving corridors to optimise connectivity and accessibility. They also prioritise projects that increase capacity and efficiency of existing corridors, and allow for greater choice of transport modes, to improve accessibility.</p> <p>In particular, the plans highlight staged projects that increase the frequency of high patronage public transport services. The Sydney Metro projects also increase capacity and efficiency, and on-demand bus service trials provide convenient access to transport hubs from local centres.</p> <p>The projects focus on improving accessibility the Eastern City, and between the Eastern and Western City, where connectivity is already well established.</p>
Connectivity	●	<p>Connectivity is embedded in the planning process and framework as the plans define city shaping, city serving and centre serving corridors to optimise connectivity and accessibility.</p> <p>The key focus for connectivity is improving connections between the three cities, and within the Central and Western cities. The plans also focus on fast and convenient interchanging between transport modes, and bus connections to train stations / transport hubs to enhance connectivity.</p>
User centrality	●	<p>Customer</p> <p>The strategy explicitly addresses who TfNSW’s customers are, what they value and how their priorities shape the plans. The plans address improvements to services and technology to attract more people onto public transport, and consider the priorities for key customer groups.</p> <p>The plans focus more on projects that increase service quality and travel times than those that promote new technologies or future forms of mobility. However, the plans highlight a small number of large strategic investments into this area, such as Mobility as a Service (MaaS) and Artificial Intelligence applications. They also focus on increasing access to transport infrastructure through the Transport Access Program.</p> <p>Liveability</p> <p>Liveability is expressly referenced in the customer outcomes for the plans, but it is less of a focus for individual projects. The plans support liveability through increasing connectivity and accessibility to jobs, education and services, and through managing the impact of freight on liveability.</p>
Sustainability	●	<p>The plans propose a number of projects to increase the sustainability of the transport system from an environmental and economic perspective. In particular, they highlight a Sustainable Transport Package to support NSW Government’s objective of net zero emissions by 2050.</p> <p>They also focus on increasing the connectivity and accessibility of the public transport system to manage population growth and encourage mode shift away from private vehicles.</p>

4.4.2 *Directions for a Greater Sydney 2017-2056 (2017), Greater Sydney Region Plan: A Metropolis of Three Cities and the five District Plans (March 2018)*

Attribute	Inclusion	Description
Economic growth	●	<p>The land use vision of a 'Metropolis of three cities with 30-minute access to jobs, education and services' strongly supports economic growth, as it recognises that infrastructure constraints associated with a monocentric city will stifle economic growth in the medium-long term.</p> <p>The plans address the development of, and connectivity between, a number of metropolitan and strategic centres / clusters / precincts with the objective of providing easier access to a wider range of jobs. This supports increasing productivity and economic growth.</p> <p>The plans anticipate there will be job growth in the Western City, catalysed by the WSA – Badgerys Creek Aerotropolis.</p>
Accessibility	●	<p>Access to jobs, education and services is emphasised in the plans, across all districts, through the vision of a 30-minute city and supporting transport projects.</p> <p>Accessibility is promoted through a hierarchy of centres, where people can move quickly and easily between local, strategic and metropolitan centres to access jobs, education or services. The plans support land use changes to intensify employment and housing density. The plans also expand on active transport links for in-centre accessibility.</p>
Connectivity	●	<p>The plans emphasise the need for transport connections between and within the three cities to achieve the vision of a 30-minute city by 2056.</p> <p>As with accessibility, the District Plans detail the specific transport projects that are anticipated to support the connectivity aspirations of each plan. These are referenced from TfNSW's <i>Future Transport Strategy 2056</i> (but do not provide a complete list), and GSC strongly links the 30-minute city vision to TfNSW's customer outcomes and the hierarchy of city shaping, city serving and centre serving corridors.</p> <p>The District Plans also consider the connectivity needs of the freight network (also from TfNSW's <i>Future Transport Strategy 2056</i>), for example, segregation of networks and capacity improvements.</p>
User centrality	●	<p>Customer</p> <p>The needs of users of the transport network are not strongly referenced.</p> <p>Liveability</p> <p>The plans strongly emphasise liveability by endorsing a polycentric urban form with easier (30-minute) access to jobs, education and services. They also include a strong focus on:</p> <ul style="list-style-type: none"> housing supply (through urban renewal, local infill development and land release) and affordability to accommodate a growing population great places that are fine grain, walkable, socially connected, healthy and culturally rich.
Sustainability	●	<p>The plans address sustainability with endorsement of public transport projects that encourage mode shift away from private vehicles and manage population growth.</p> <p>They also express a commitment to manage waterways, biodiversity, natural hazards /extreme heat and connected green space in balance with development. For example, they support urban tree canopy targets, the Greater Sydney Green Grid, and renewable energy generation, as well as the NSW Government's aim for net-zero emissions by 2050.</p>

4.4.3 *Building Momentum: State Infrastructure Strategy 2018-2038 (February 2018) and 2018-19 State Infrastructure Plan (June 2018)*

Attribute	Inclusion	Description
Economic growth	●	<p>The strategy clearly articulates the link between efficient and effective infrastructure and economic growth. In particular, the links between public transport capacity and enabling employment growth, labour force deepening and economic agglomeration. The strategy highlights that implementing its recommendations will boost the NSW economy by \$11 billion in 2036 and \$45 billion in 2056. The plan is simply a list of funded projects.</p> <p>The strategy identifies the economic costs of congestion, and the economic opportunities of developing strategic transport connections. It supports GSC's land use vision and identifies how specific projects alleviate congestion or improve accessibility or connectivity, and strongly links this to economic benefits.</p> <p>The strategy also positions for aligning the timing of major project investment more closely with observed land use changes – for example recommending that investment in rail services to WSA be considered only as a long-term proposition when an expected step-change in airport patronage occurs. This is a point of difference to other in scope plans which are stronger on leveraging the city and land use shaping potential of mass transit investments.</p>
Accessibility	●	<p>The strategy identifies the clearest accessibility benefits through projects that overcome local network constraints and service the vision of a 30-minute city. In particular, it emphasises that the SmartRail program (as part of More Trains More Services) would increase the efficiency and reliability of the rail network, allowing more trains to run per hour in peak times and helping separate longer distance intercity, suburban and freight services from suburban operations.</p> <p>The strategy also recommends travel demand management initiatives and mobility pricing reforms to encourage travel patterns that are tailored to the capacity of the network and help to manage congestion.</p>
Connectivity	●	<p>The strategy recommends increasing connectivity through new transport links to service the GSC's land use vision. In particular, it supports the Sydney Metro projects, as well as further rail network extensions to relieve capacity pressures, increase 30-minute catchments and facilitate the evolution from a predominantly radial to an interconnected network that is no longer reliant on travel through Harbour CBD to access other parts of the city.</p> <p>The strategy is more measured about developing city-shaping and city servicing rail connections in the Western City than other plans, due to the scale of investment required. It supports a short-term east-west connection from the T1 Western Line to WSA – Badgery's Creek Aerotropolis, but considers further north-south connections should be longer term investments to be considered as population and patronage grows.</p>
User centricity	●	<p>Customer</p> <p>The strategy endorses the use of emerging technology to enhance the customer experience. It recommends investments in connectivity and digital infrastructure that will encourage innovation and ensure the benefits of new technology can be fully realised.</p> <p>Liveability</p> <p>The strategy recommends further integration of land use, infrastructure and public transport to achieve GSC's land use vision of a global metropolis of three productive, liveable and sustainable cities with 30-minute access to jobs, education and services. It also supports infrastructure development in the Western Parkland City to increase liveability and reduce socio-economic disadvantage.</p>
Sustainability	●	<p>The strategy has strong references to sustainability in terms of using infrastructure to manage population growth, and improving the resilience and maintenance of infrastructure to increase its longevity. There is also a focus of cost-effectiveness in considering rail versus rapid bus transit options.</p>

4.4.4 *Draft NSW Freight and Ports Plan (2017)*

Attribute	Inclusion	Description
Economic growth	●	The draft plan emphasises the role that freight plays in supporting economic growth. It identifies projects that support the efficient, safe and reliable flow of goods and enhance the freight industry's contribution to NSW's economic growth. It also highlights projects that support Sydney's international trade gateways (e.g. Port Botany).
Accessibility	●	The draft plan focuses on increasing accessibility for freight operators, particularly as passenger rail is prioritised over freight rail on shared lines/networks. In particular, it identifies projects to improve the flow of freight by: <ul style="list-style-type: none"> • separating freight and passenger lines (e.g. Northern Sydney Freight Corridor) • adding capacity to existing freight or shared lines (e.g. Southern Sydney Freight Line, South Coast Line) • improving cargo coordination, reducing regulatory burdens, and incorporate freight into managed motorway decisions.
Connectivity	●	The draft plan focuses on improving connectivity for freight operators in light of an increasing freight task, and change in Greater Sydney's land use from a monocentric to polycentric city. In particular, it identifies projects that: <ul style="list-style-type: none"> • provide new connectivity in the outer Sydney area (e.g. Outer Sydney Orbital) • provide new connections to the west (e.g. Western Sydney Freight Line and Intermodal Terminal) • provide more connections to Port Botany and the South East.
User centricity	●	<p>Customer</p> <p>The plan strongly targets freight customer needs such as reliability, safety and the efficiency of freight movements. It also identifies technology improvements to enhance the freight service (e.g. Freight Innovation Projects), and reductions in the regulatory burden.</p> <p>Liveability</p> <p>Actions to improve freight movement through places through better integration of freight into land use planning (e.g. adoption of Movement and Place framework), and promote alternative last mile modes (i.e. not truck, van) that are safe, sustainable and efficient within urban centres.</p>
Sustainability	●	Network sustainability (through protecting existing freight precincts and ensuring sufficient future land use) is a priority action area in the plan. Focus areas include strengthening government partnerships, corridor protection, and mitigating freight externalities including noise, emissions, safety and congestion.

5 Rail network planning

This chapter outlines the rail projects that are currently proposed, in planning, in progress or complete in Greater Sydney. These include those in TfNSW's *Future Transport Strategy 2056*, supported by the associated *Greater Sydney Services and Infrastructure Plan (and Regional NSW Services and Infrastructure Plan)*.

The first section of this chapter (section 5.1) presents an overview of the projects proposed for Sydney.

The subsequent sections of this chapter (section 5.2 to 5.2.3) outlines planned rail projects by District; Western City, Central City, Eastern City, North and South as defined by the GSC. If rail projects impact multiple cities they are included under each relevant district in the reporting.

5.1 Alignment of rail projects with planning documents

As an overview, Table 10 presents rail projects which have been referenced in the transport and land use plans.

Table 10 is structured by project type (passenger rail, freight rail, light rail and network) to allow comparability with the 2017 work and other cities²⁰. Within the project type groups, projects are ordered by stage of development as set out in the TfNSW *Future Transport Strategy 2056*. For full descriptions of each project, please refer to Appendix A.

The development of rail projects across plans is also illustrated in Table 10. Starting with TfNSW's transport plans through to GSC's land use plans and iNSW's infrastructure plans, the table captures how GSC's land use plans in particular have aligned their transport projects with those listed in TfNSW's transport plans. The categories used for 'Status' are aligned with those used by TfNSW.

²⁰ It should be noted that plans themselves focus more on the structure of the public transport network than individual transport modes.

Table 10. Overview of transport projects

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrast. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrast. Strategy (2018)**
Passenger	East-west public transport between Mona Vale and Macquarie Park	North	0-10 For Investigation	Unknown	●	●			●	
	Extension of South East mass transit/train link to Miranda	Eastern City, South	20+ Visionary	Unknown	●	●	●		●	
	Higher frequency public transport services on selected corridors	All	0-10 Committed	Unknown	●	●				
	Higher frequency transport services across Greater Sydney (0-10 yr)	All	0-10 For Investigation	Unknown	●	●				
	Corridor Preservation for Higher Speed Connections	North, Eastern City, South, Outer Metro	10-20 For Investigation	Unknown	●	●				
	Investment in Higher Speed Connection along East Coast	North, Eastern City, South, Outer Metro	20+ Visionary	Unknown	●	●	●			
	Improved services on the Richmond Line	Western City, Central City	0-10 For Investigation	Unknown	●	●			●	
	Leppington to Aerotropolis Badgerys Creek Aerotropolis Rail Link	Western City	0-10 For Investigation	Unknown	●	●	●		●	●
	Mass transit/train link to South East	Eastern City	10-20 For Investigation	Unknown	●	●	●		●	●

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Passenger	More Trains More Services program	All	0-10 Committed	Unknown						●
	New Intercity Fleet	All	0-10 Committed	Late 2019 to 2021	●	●	●			●
	New services on key routes (0-10 yr)	All	0-10 For Investigation	Unknown	●	●				
	New services on key routes (10-20 yr)	All	10-20 For Investigation	Unknown	●	●				
	North-south Rail Link in Western Parkland City: Cudgegong Road – St Marys	Western City, Central City	0-10 For Investigation	Unknown	●	●	●		●	●
	North-south Rail Link in Western Parkland City: St Marys – WSA-Badgery's Creek Aerotropolis	Western City	0-10 Committed	Objective to open in 2026	●	●	●		●	●
	North-south Rail Link in Western Parkland City: WSA-Badgerys Creek Aerotropolis – Campbelltown-Macarthur	Western City	0-10 For Investigation	Unknown	●	●	●		●	●
	Parramatta to Epping mass transit / train link	Central City	10-20 For Investigation	Unknown	●	●	●		●	●
	Parramatta to Kogarah mass transit / train link	Central City, South	10-20 For Investigation	Unknown	●	●	●		●	●
	Parramatta to Norwest mass transit/ train link	Central City	20+ Visionary	Unknown	●	●	●		●	●
	Passenger train improvements to support growth at Wilton	Western City, Outer Metro	0-10 For Investigation	Unknown	●	●	●		●	

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Passenger	Public transport passenger service improvements	All	0-10 Committed	Unknown	●	●	●			
	Service changes to connect to new train lines (0-10 yr)	All	0-10 For Investigation	Unknown	●	●				
	Service changes to connect to new train lines (10-20 yr)	All	10-20 For Investigation	Unknown	●	●				
	Sydney Growth Trains as part of More Trains, More Services program	All	0-10 Committed	2019	●	●	●			
	Sydney Metro City and Southwest	North, Eastern City, South	0-10 Committed	2024	●	●	●	●	●	●
	Sydney Metro City & Southwest extension to Liverpool	Western City, South	20+ Visionary	Unknown	●	●	●		●	
	Sydney Metro City & Southwest extension to Liverpool corridor protection	Western City, South	Proposed	Unknown						●
	Sydney Metro Northwest	North	0-10 Committed	2019; construction ongoing	●	●	●	●	●	●
	Sydney Metro West	Central City, Eastern City	0-10 Committed	Unknown	●	●	●		●	●
	Sydney - Canberra Faster Rail Improvement	Western City, Outer Metro	0-10 For Investigation	Unknown	●	●	●			●
	Sydney - Central Coast - Newcastle Faster Rail Improvement	North, Outer Metro	0-10 For Investigation	Unknown	●	●	●		●	●

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Passenger	Sydney - Wollongong Faster Rail Improvement	South, Outer Metro	0-10 For Investigation	Unknown	●	●	●		●	●
	Train improvements as part of More Trains, More Services program	All	0-10 For Investigation	Unknown	●	●	●		●	●
	Train/ mass transit link Macquarie Park to Hurstville via Rhodes	Central City, Eastern City and South	20+ Visionary	Unknown	●	●			●	
	Upgrade to Blue Mountains Line	Western City, Outer Metro	0-10 Committed	mid-2020	●	●	●		●	
	WSA-Badgerys Creek Aerotropolis - Parramatta Rail Link	Western City, Central City	0-10 For Investigation	Unknown	●	●	●		●	●
Light Rail	CBD & South East Light Rail	Eastern City	0-10 Committed	2019	●	●	●	●	●	●
	Light Rail Extension to Maroubra Junction	Eastern City	10-20 For Investigation	Unknown	●	●	●		●	●
	Light Rail to Bays Precinct	Eastern City	10-20 For Investigation	Unknown	●	●	●		●	●
	Parramatta Light Rail - Stage 1	Central City	0-10 Committed	2023	●	●	●	●	●	●
	Parramatta Light Rail - Stage 2	Central City	0-10 Committed	Unknown	●	●	●		●	●
	Parramatta Light Rail extensions	Central City	10-20 For Investigation	Unknown	●	●	●			

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Freight	Access to Moorebank Intermodal Terminal	Western City	0-10 Committed	Unknown	●	●	●	●	●	●
	Additional capacity on Southern Sydney Freight Line	Western City	10-20 For Investigation	Unknown	●	●	●			●
	Address long term capacity constraints to Port Botany and South East	Eastern City	20+ Visionary	Unknown			●			
	Automation	All	20+ Visionary	Unknown			●			
	Completion of Maldon to Dombarton railway line	Western City, Outer Metro	10-20 For Investigation	Unknown	●	●	●		●	●
	Duplication of Port Botany freight rail line	Eastern City	0-10 For Investigation	Unknown	●	●	●	●	●	●
	Freight Innovation Projects (0-10 yr)	All	0-10 For Investigation	Unknown			●			
	Freight Innovation Projects (10-20 yr)	All	10-20 For Investigation	Unknown			●			
	Freight Rail Capacity Enhancements	All	10-20 For Investigation	Unknown			●			
	Freight Separation	All	20+ Visionary	Unknown			●			
	Freight Sustainability and Resilience: Continue Freight Noise Attenuation Plan	All	0-10 Committed	2028			●			
	Freight Sustainability and Resilience: Identify constraints	All	0-10 For Investigation	Unknown			●			

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Freight	Freight Technology Improvements	All	0-10 For Investigation	Unknown			●			
	Metropolitan Rail Transfer Station	Eastern City	0-10 For Investigation	Unknown			●			
	Moorebank Intermodal Facility (capacity increases)	Western City	0-10 Committed	2019 - 2030						●
	Northern Sydney Freight Corridor Stage 1	North	0-10 For Investigation	Completed			●			
	Northern Sydney Freight Corridor Stage 2	Eastern City, North, Central City	0-10 For Investigation	Unknown. Stage 1 is complete	●	●	●		●	
	Outer Sydney Orbital corridor protection	Western City, North	0-10 Committed	Unknown, feedback period closed			●			●
	Outer Sydney Orbital from Great Western Highway and Western Line to Central Coast	Western City, North	20+ Visionary	Unknown	●	●	●		●	
	Outer Sydney Orbital from Great Western Highway and Western Line to WSA-Badgerys Creek Aerotropolis	Western City	10-20 For Investigation	Unknown	●	●	●		●	
	Outer Sydney Orbital from WSA-Badgerys Creek Aerotropolis to Hume Motorway and South Line	Western City	20+ Visionary	Unknown	●	●	●		●	
	Port Botany Landside Improvement Strategy	Eastern City	Proposed	Unknown						●
	South Coast Rail Enhancement	South	0-10 For Investigation	Unknown			●			●

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Freight	Southern Sydney Freight Line Improvements	Western City, Central City	0-10 For Investigation	Unknown	●	●	●		●	●
	State Environmental Planning Policies update	All	Proposed	Update by end of 2019						●
	Western Sydney Freight Line corridor protection	Western City, Central City	0-10 Committed	Unknown, feedback period closed			●			●
	Western Sydney Freight Line (and intermodal terminal)	Western City, Central City	10-20 For Investigation	Unknown	●	●	●		●	
Network	Automatic Train Protection	All	0-10 Committed	late 2020						●
	Central Walk	Eastern City	0-10 Committed	Construction begins 2018						●
	Expansion of Travel Choices Program	All	0-10 Committed	Unknown	●	●			●	
	Greater Parramatta Access Plan	Central City	Proposed	Unknown						●
	Greater Sydney Parking Guideline (train station carparking)	All	0-10 For Investigation	Unknown	●	●				
	Identification and protection of corridors for future transport links	All	0-10 For Investigation	Unknown	●	●				●
	Integrated active transport policies (including with rail)	All	0-10 For Investigation	Unknown	●	●				

Type	Project	District	Status	Timing	Future Transport Strategy (2018)	Greater Sydney Services and Infrs. Plan (2018)	Draft NSW Freight and Ports Plan (2017)	Directions for a Greater Sydney (2017)	A Metropolis of Three Cities (2018)*	State Infrs. Strategy (2018)**
Network	Metropolitan Interchange Program	All	0-10 For Investigation	Unknown	●	●	●		●	●
	Mobility as a Service (MaaS) implementation	All	0-10 For Investigation	Unknown	●	●				●
	Power Supply Upgrades	All	0-10 Committed	Unknown						●
	Shared Network Improvements	All	10-20 For Investigation	Unknown			●			
	Sustainable Transport Package	All	20+ Visionary	Unknown	●	●	●			
	Sydney Airport road upgrades (level crossing removal)	Eastern City	0-10 Committed	2020	●	●	●			●
	Transport Access Program	All	0-10 Committed	Unknown	●	●	●		●	●
	Trial of Artificial Intelligence applications	All	0-10 For Investigation	Unknown	●	●				

Source: PwC analysis, in-scope reports. *This also includes rail projects from the five District Plans and the Directions for a Greater Sydney 2017-2056. **This also includes rail projects from the list of NSW Government endorsed projects in *Budget Paper #2: Infrastructure Statement – State Infrastructure Plan 2018-19*.

Alignment in rail project planning

Table 10 shows the *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan* presents the most exhaustive list of rail projects of the planning documents.

The projects most consistently referenced between plans are the following large scale public transport projects and major freight projects:

- Sydney Metro projects (Northwest, City & Southwest, West, and extension to Liverpool)
- South East mass transit/train link, and extension to Miranda
- Leppington to Aerotropolis-Badgerys Creek Aerotropolis Rail Link
- North-south Rail Link (all three stages)
- Parramatta to Epping, Kogarah and Norwest mass transit / train links
- Train / mass transit link Macquarie Park to Hurstville via Rhodes
- Passenger train improvements to support growth at Wilton
- Train improvements as part of More Trains, More Services program
- Transport Access Program
- WSA-Badgerys Creek Aerotropolis to Parramatta Rail Link
- CBD & South East Light Rail, and extension to Maroubra Junction
- Light Rail to Bays Precinct
- Parramatta Light Rail (Stage 1 and 2)
- Access to Moorebank Intermodal Terminal
- Completion of Maldon to Dombarton railway line
- Outer Sydney Orbital (three stages related to freight rail)
- Duplication of Port Botany freight rail line
- Northern Sydney Freight Corridor Stage 2
- Southern Sydney Freight Line Improvements
- Western Sydney Freight Line.

Treatment of transport projects in land use plans

The *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans* do not provide much detail on specific transport projects, nor provide any lists. However, they do mention major transport projects in each *District Plan*, and all of these projects are consistent with the project lists in *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*.

Treatment of transport projects in the state infrastructure strategy

Because *Building Momentum: State Infrastructure Strategy 2018-2038* is not a NSW government endorsed plan but a set of recommendations,²¹ there are some inconsistencies between its recommended projects and those listed in *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan*. This reflects the remit of iNSW to develop independent recommendations. Overall, the majority of projects are consistent, as are those in the *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan*.

There are a few inconsistencies between committed projects in the *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan* and *Future Transport Strategy 2056 / Greater Sydney Services and Infrastructure Plan*. These could be due to projects in delivery not listed in *Future Transport Strategy 2056*, or projects provisionally committed outside the five year window in the *2018-19 State Infrastructure Plan*. The inconsistent projects are listed in Table 11.

Table 11. Inconsistent rail transport projects between plans

Future Transport Strategy 2056 – committed projects not reflected in Budget Paper #2: Infrastructure Statement, 2018-19 State Infrastructure Plan	Budget Paper #2: Infrastructure Statement, 2018-19 State Infrastructure Plan – funded projects not reflected in Future Transport Strategy 2056
Expansion of Travel Choices Program	Central Walk ²²
Upgrade to Blue Mountains Line ²³	Moorebank Intermodal Facility
	Power Supply Upgrades

Note: Projects listed under Future Transport Strategy 2056 are not included in the 2018-19 State Infrastructure Plan, and vice versa.

Treatment of freight

The *Future Transport Strategy 2056* and *Greater Sydney Services and Infrastructure Plan* provide further detail on passenger rail projects than freight projects. This may be as the *NSW Draft Freight and Ports Plan* contains the detailed list, but is still in draft form.

Both reports advocate freight on rail to achieve objectives relating to productivity and economic growth and untangling the freight and passenger network to improve capacity on both sides.

Geographic focus

Considering proposed projects by their geographic location provides insight in terms of the spatial focus of transport investment over time. While projects in themselves are not directly comparable, Table 10, Figure 9 and Figure 12 reveal that the proposed projects are fairly evenly distributed across Greater Sydney's economic corridors and centres in the Western Parkland, Central River and Eastern Harbour cities. The majority of new infrastructure projects are concentrated in the Western Parkland City and Central River City. The major projects in each city are:

- **Eastern Harbour City:** Sydney Metro projects, CBD & South East Light Rail, South East and Macquarie Park mass transit/train links, Light Rail to Bays Precinct and Duplication of Port Botany freight rail line

²¹ As such, their status is listed as 'Proposed' in the table above.

²² PwC has been advised that this project could potentially be considered as part of a broader station upgrade program.

²³ PwC has been advised that this project is a subset of the New Intercity Fleet program.

- **Central River City:** Sydney Metro Northwest and West, Parramatta Light Rail and mass transit / train links from Parramatta to Epping, Kogarah and Norwest
- **Western Parkland City:** North-South Rail Link, WSA-Badgerys Creek Aerotropolis to Parramatta Rail Link, Leppington to Badgerys Creek Aerotropolis Rail Link, Outer Sydney Orbital and Western Sydney Freight Line.
- **Multiple Districts:** More Trains, More Services program, Transport Access Program and Northern Sydney Freight Corridor Stage 2.

The major projects listed above are referenced across multiple plans as detailed in Table 10. This indicates consensus on major projects in the in-scope plans.

5.2 *Analysis by region*

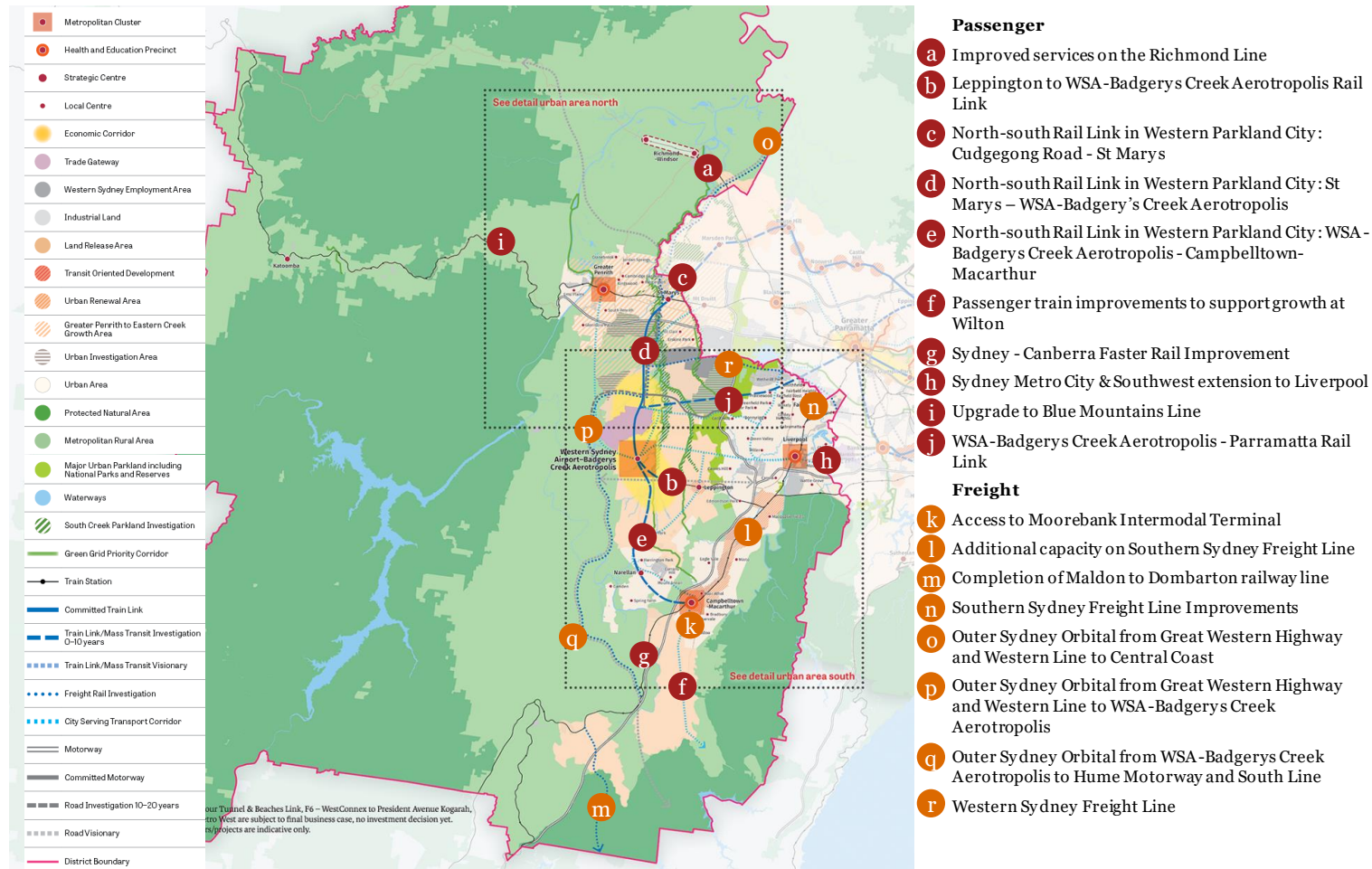
This section presents the Districts defined by the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the five *District Plans*, and illustrates the indicative location of TfNSW's rail projects relevant to the region.

5.2.1 *Western City District*

The Western City District contains the largest surface area and extends to Hawkesbury, the Blue Mountains and Wollondilly. It also contains Camden, Campbelltown, Fairfield, Liverpool and Penrith.

Figure 19 illustrates the Western City District and provides an indicative location of rail projects relevant to the district.

Figure 19. Greater Sydney Commission – Western City District map and rail projects



Source: GSC, Western City District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis. B: Note that PwC has been advised that this rail link is from Leppington to the Aerotropolis only

The Western City District is underdeveloped relative to the other Districts. As such, the majority of projects outlined in Table 10 are associated with building rail connectivity to/from and within the District, to improve 30-minute access to jobs, education and services, and reducing car dependency. In particular:

- North-south Rail Link, which is designed to provide a mass-transit spine through the Western City. This links growth areas (Northwest, Southwest, Aerotropolis) with new and existing economic centres, including the WSA and Badgerys Creek Aerotropolis core. The project is then proposed to extend the northern line to the Sydney Metro Northwest terminus at Cudgegong Road,²⁴ and the southern line to Campbelltown-Macarthur (under investigation). It is being developed in collaboration with the Commonwealth Government, and the objective is for the first stage to commence operations in 2026, aligned with the scheduled opening of the WSA.
- The Leppington to WSA-Badgerys Creek Aerotropolis Rail Link is a potential extension of the South West Rail Link from Leppington to the metropolitan centre of WSA-Badgerys Creek Aerotropolis, providing access to WSA via an interchange with the North-South Rail Link.²⁵
- The WSA-Badgerys Creek Aerotropolis to Parramatta Rail Link is a potential new rail link from Parramatta to WSA-Badgerys Creek Aerotropolis via Prairiewood to reduce journey times between these centres and the Harbour CBD. This would connect the three cities / metropolitan centres with a high frequency, high capacity transport link, and act as the central east-west public transport spine for Greater Sydney.
- The Western Sydney Freight Line is a potential new line that would connect the Southern Sydney Freight Line to an intermodal terminal site in Western Sydney and to the Outer Sydney Orbital, which will provide a connection with the Main West Railway Line. It would support dedicated freight rail access between Port Botany and the new Western Sydney Intermodal Terminal, enable an increase in service frequency on the T1 Western Line by removing freight trains from the line between St Marys and Penrith, and support the emergence of Parramatta as a liveable Metropolitan Centre by diverting freight rail movements away from the centre.
- The Outer Sydney Orbital is a potential north-south orbital transport corridor around Greater Sydney. It includes both motorway and freight rail and would provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This first stage will connect the Great Western Highway to WSA-Badgerys Creek Aerotropolis. The freight rail connection will link the Western Line to the Western Sydney Freight Line, north of WSA-Badgerys Creek Aerotropolis.²⁶

5.2.2 *Central River City District*

The Central River City District surrounds Parramatta, covering Blacktown, Cumberland, Parramatta and The Hills.

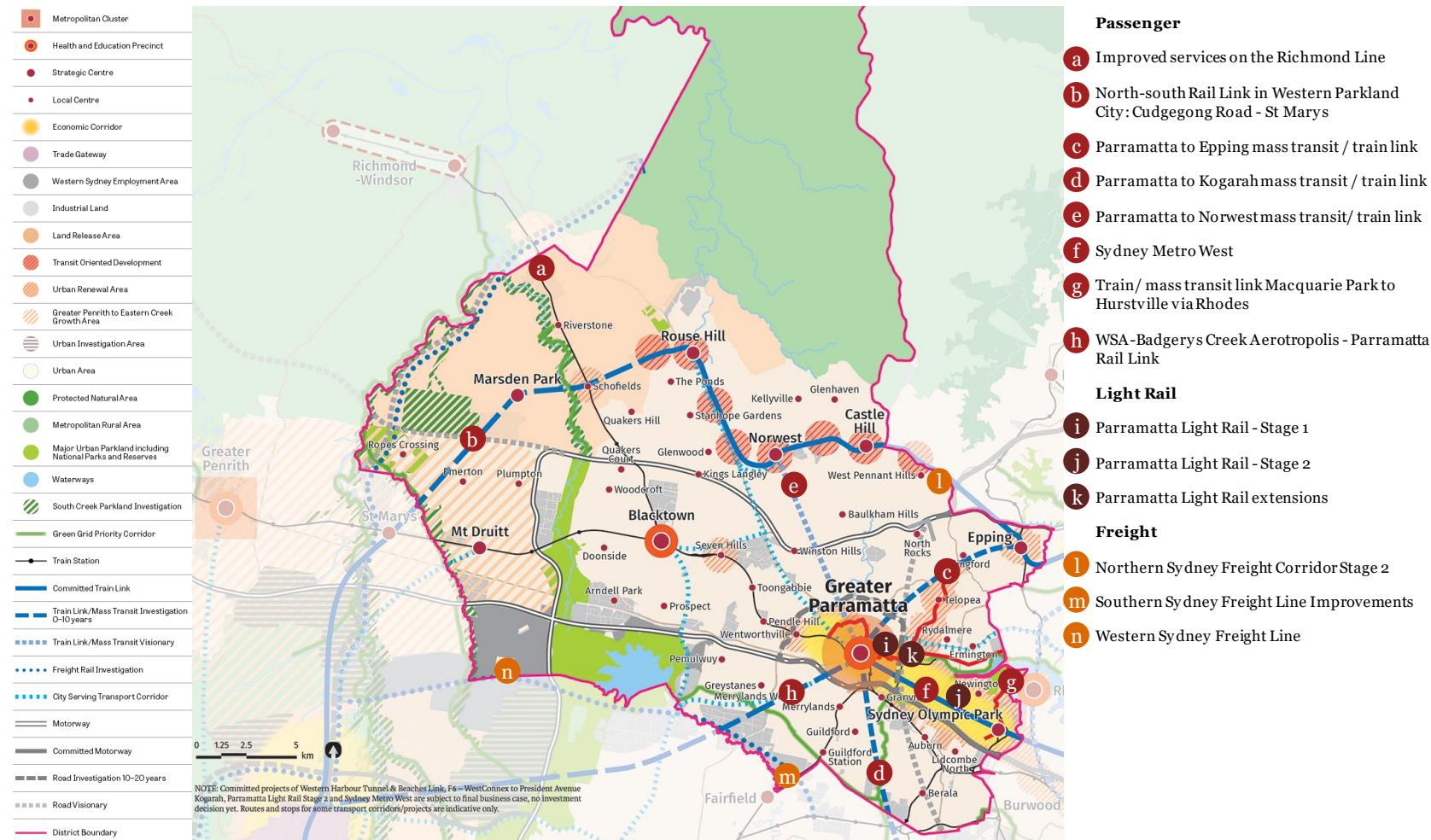
Figure 20 illustrates the Central River City District and provides an indicative location of rail projects relevant to the district.

²⁴ PwC has been advised that the northern line of the North-South Rail Link will extend to Schofields, and Sydney Metro Northwest will also extend to Schofields from Cudgegong Road, to make a three-way interchange.

²⁵ PwC has been advised that this rail link is from Leppington to the Aerotropolis only.

²⁶ PwC has been advised that the freight line does not go to the Aerotropolis.

Figure 20. Greater Sydney Commission – Central River City District map and rail projects



Source: GSC, Central City District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

The Central River City District is already attracting jobs and population growth targeted in planning. To support further growth the majority of projects in Table 10 are associated with enhancing connectivity within the city and increasing access to the Central River City District from the Eastern City District. In particular:

- Sydney Metro West and Northwest are committed projects that increase the capacity and reliability of overcrowded rail links to the west (along the T1 western line) and northwest (along the T1 northern lines, feeding into Chatswood).²⁷ Sydney Metro Northwest will also extend the T1 Epping line northwest to Rouse Hill and Tallawong. Sydney Metro Northwest is in progress with some services beginning in 2019, and Sydney Metro West is subject to final business case, with some funding set aside through the Restart NSW fund.²⁸
- Parramatta Light Rail is a committed new light rail line that will link Parramatta's CBD and train station to health, education, social, cultural and housing infrastructure across Parramatta and Westmead.
 - Stage 1 will connect the Parramatta CBD and trains station to the Westmead Health precinct, Parramatta North Urban Transformation Program, the new Western Sydney Stadium, the Camellia Precinct, the new Powerhouse Museum and Riverside Theatres Cultural Hub, the private and social housing redevelopment at Telopea, Rosehill Gardens Racecourse and three Western Sydney University campuses. Stage 1 is in progress with services to commence 2023.
 - Stage 2 will connect to Stage 1 and run north of the Parramatta River through the rapidly developing suburbs of Ermington, Melrose Park and Wentworth Point to Sydney Olympic Park, providing a new public transport option to this booming sport, entertainment and employment hub. It is subject to final business case and funding.
- Mass transit / train links from Parramatta to Epping, Kogarah and Norwest will build connectivity within the Central River City District.

5.2.3 *Eastern City, North and South Districts*

This section address the final city – the Eastern District City – and the two remaining GSC districts:

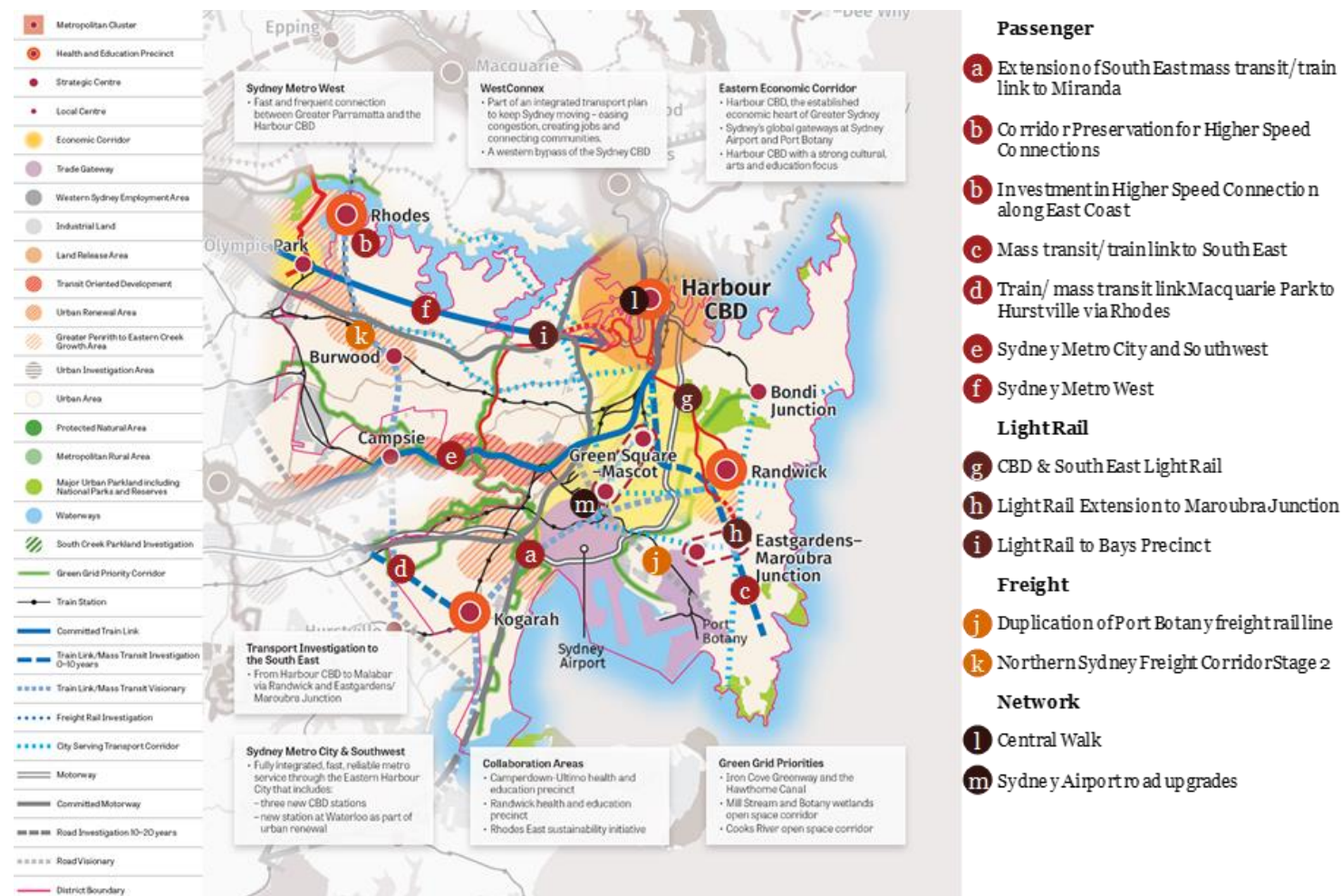
- The Eastern City District centres around the Harbour CBD, the current Greater Sydney CBD. It includes Bayside, Burwood, Canada Bay, City of Sydney, Inner West, Randwick, Strathfield, Waverley and Woollahra.
- The North District encompasses the northern local government areas in the Eastern City District. It includes Hornsby, Hunter's Hill, Ku-ring-gai, Lane Cove, Mosman, North Sydney, Northern Beaches, Ryde, and Willoughby.
- The South District encompasses the southern local government areas in the Eastern City District. It includes Canterbury–Bankstown, Georges River and Sutherland.

Figure 21 to Figure 23 illustrates the Eastern City, North and South Districts and provides an indicative location of rail projects relevant to the district.

²⁷ Sydney Metro Northwest ends at Chatswood, it does not support the line further into the Harbour City CBD, which is highly congested.

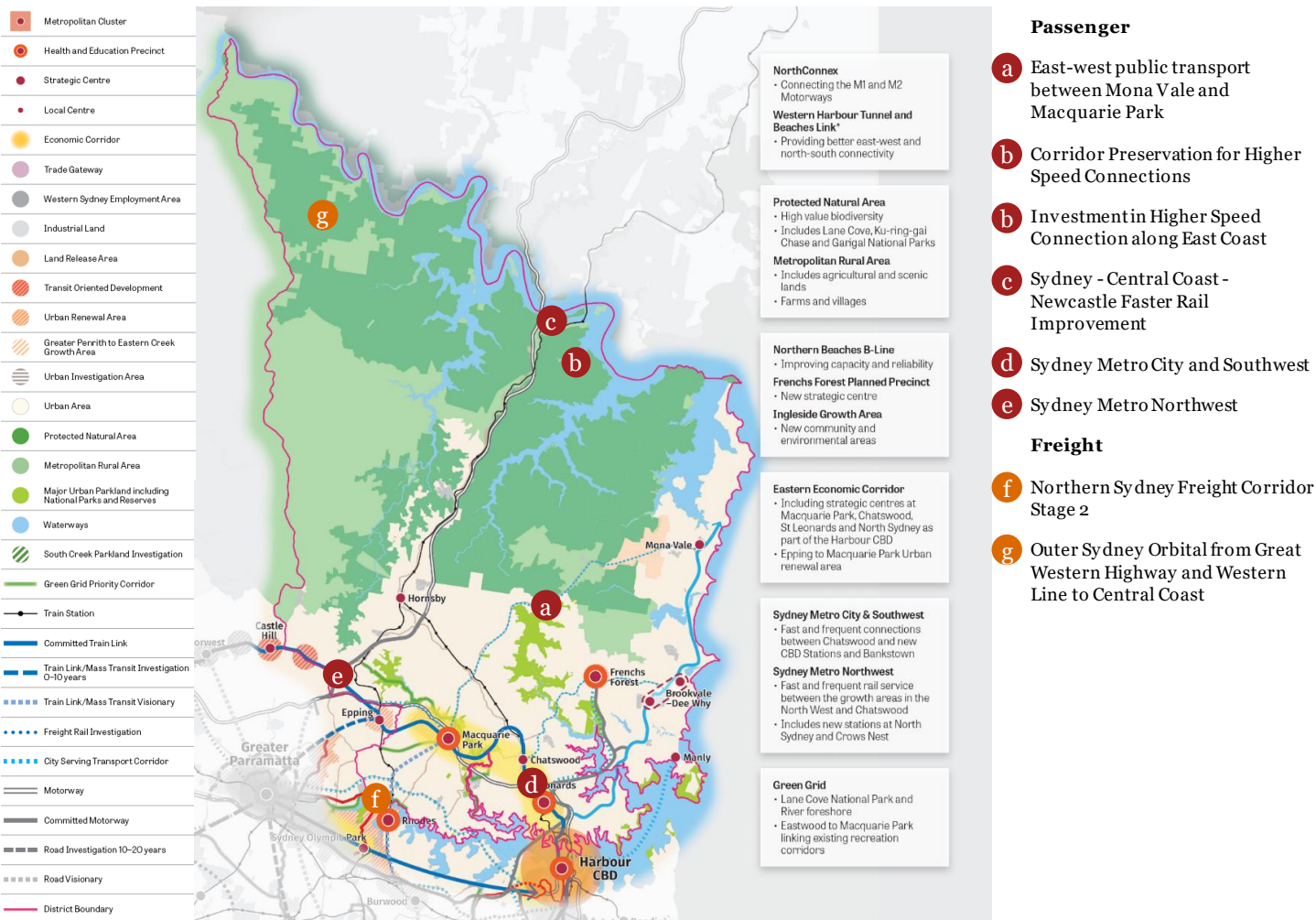
²⁸ From the sale of electricity assets. See <http://www.infrastructure.nsw.gov.au/restart-nsw/>

Figure 21. Greater Sydney Commission – Eastern City District map and rail projects



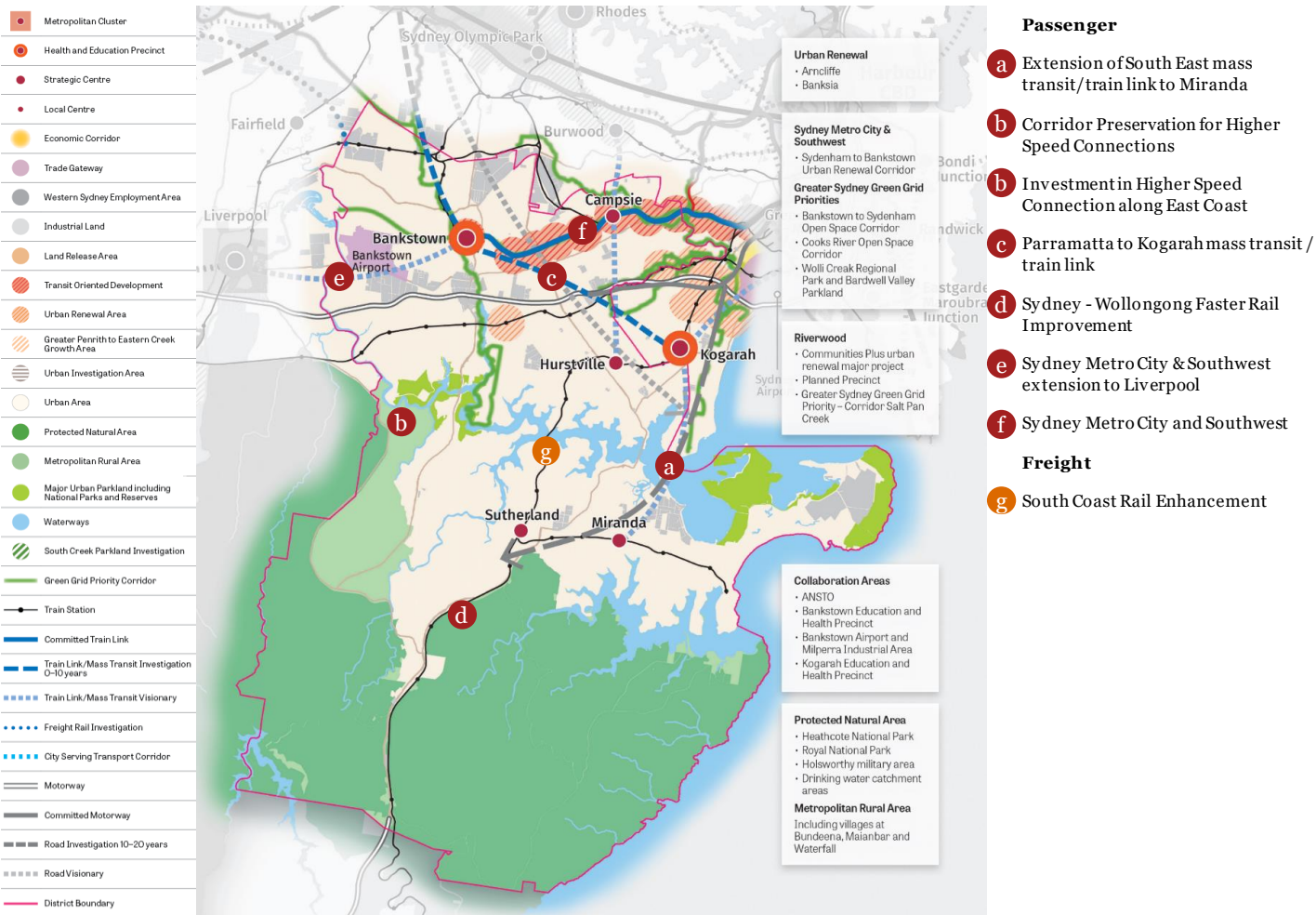
Source: GSC, Eastern City District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

Figure 22. Greater Sydney Commission – North District map and rail projects



Source: GSC, North District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

Figure 23. Greater Sydney Commission – South District map and rail projects



Source: GSC, South District Plan, TfNSW, Future Transport Strategy 2056, PwC analysis.

These Districts in the Eastern City have a well-established transport network, although it is experiencing overcrowding and congestion as the population grows and centres around the Harbour CBD. As such, the majority of projects affecting The Eastern City District outlined in Table 10 are associated with building capacity, improving services and increasing access to the South East. In particular:

- Sydney Metro West and Northwest are committed projects that are discussed in detail in section 5.2.2.
- CBD & South East Light Rail is a committed project that will provide new connections access to the Harbour CBD, major sporting and entertainment facilities from south-eastern suburbs. This will provide more options for public transport along this corridor and reduce congestion.
- South East and Macquarie Park mass transit/train links are potential new connections that will support urban renewal and growth in the south-east. The Macquarie Park link will alleviate longer-term capacity pressures and improve the resiliency of the network by providing an additional north-south connection through Macquarie Park, Rhodes and Hurstville, enabling customers to transfer between Illawarra Line, East Hills Line, Metro Southwest-CBD, the Metro West, the Main West Line and the Northern Line.
- Light Rail to Bays Precinct is a potential new light rail link connecting the Harbour CBD with the Bays Precinct and Glebe Island.

6 *Network delivery against objectives*

This chapter sets out a methodology for identifying how the transport network identified in rail and land use plans is delivering against Australian and NSW Government objectives.

6.1 *Determining the viability of rail services*

There is a substantial body of academic research supporting the theory that viable public transport services (including rail) exists where there is sufficient demand to raise fare box revenue and reduce subsidies to the point at which they are equal to the positive externalities (the public good) generated by public transport.²⁹

Demand for public transport is driven by multiple variables. Two of the strongest correlated variables to public transport demand are population density and employment accessibility. A summary of some of the key academic papers on this topic is provided in Table 35 in Appendix B. However industry accepted thresholds of density and accessibility for viable rail services have yet to be agreed.

This analysis to measure provision of rail services in the Sydney rail network is based on a range of density and accessibility intervals taken from the literature reviewed. Intervals are designed to identify areas with the minimum acceptable density (30 persons per hectare) and accessibility (45 minutes travel time to strategic centres) thresholds as well as those with higher population densities. The viability of public transport is more probable in areas with population densities in excess of the minimum threshold.

The analysis identifies regions of Sydney that warrant further investigation of their potential to support rail services in future. The analysis does not indicate regions where rail is viable – only regions that have sufficient density and accessibility to potentially generate sufficient demand for rail.

6.2 *Measuring network performance*

Land use and transport planning objectives have been aligned with a series of metrics against which network performance can be measured. Metrics are shown in Table 12 and grouped according to land use and passenger metrics that are broadly accepted and applied consistently throughout the public transport industry.

It is noted that the scope of this refresh is limited to select land use and passenger metrics, as it is understood that the data to support rail patronage, mode share and any of the network and freight metrics has not been refreshed since the 2017 review.

²⁹ This assumes the network operates at efficient cost. Please also note that viable is used in the sense of economically viable, not the narrower criteria of financial viability.

Table 12. Metrics for analysis of transport plans

	Metric	Economic growth	Accessibility	Connectivity	User centrality	Sustainability
Land use and passenger objectives	Growth in employment density (2016-2036)	✓				
	Growth in population within 45 minutes of employment precincts (2016-2036)	✓	✓			
	Growth in population within 45 minutes of health and education services and passenger gateways (2016-2036)	✓	✓			
	Growth in housing density in the rail corridor (2016-2036)	✓				
	Socio-Economic Indexes For Areas (SEIFA) score within rail corridor				✓	
	SEIFA scores in areas with high population density and low employment accessibility (time to closest strategic Centre is 45 minutes or more) (2036)		✓		✓	
	Growth in rail patronage relative to population and employment growth (2016-2036)	No change from 2017				
Network objectives	Mode share of public transport for trips during AM peak	No change from 2017				
	Growth in patronage by line (2016-2036)	No change from 2017				
	Growth in total passenger train capacity by line in one hour travel period (2016-2036)					
	Growth in load to capacity ratio on passenger trains in one hour travel period (2016-2036)					
	Growth in total trips with transfer by line (2016-2036)					
	Origin Destination pairs connected by rail with maximum travel time of 45 minutes (total travel time – not limited to in vehicle time) (2016-2036)					
	Growth in number total vs scheduled passenger and freight train paths by line (2016-2036)					
Freight objectives	Growth in freight net tonnes (2016-2036)					
	% of freight terminals within Greater Metropolitan Area connected by dedicated freight lines					

Source: PwC

As Table 12 shows, user centrality will be measured using two metrics that incorporate the SEIFA index. It is important to note that the plans indicate user experience will be improved through a number of initiatives that are unlikely to be reflected in network performance outputs. For example, projects to upgrade stations, upgrade rolling stock or investment in digital platforms to customise interactions with users are likely to improve the user experience across the network.

6.3 *Data sources*

Input data to metrics was sourced from the following models:

- Sydney Strategic Transport Model (STM)
- Travel zones projections 2016 (TZP 2016)
- QGIS open source software.

6.3.1 *Land use forecasting*

The Transport Performance and Analytics (TPA) business unit within Transport for NSW (TfNSW) is responsible for generating travel zone projections (population, enrolments, labour force and employment) as an input into the STM. At a broad level, the data covers three dimensions:

- 1 Time period: 5 yearly time periods from 2016 to 2056
- 2 Geographic: 2,949 Travel zones (TZ11 geography) across Sydney Greater Metropolitan Area (GMA)
- 3 Variables: 60+ variables covering people, employment and students.

Projections are regularly updated through major and interim updates. Major updates realign to ABS Census data releases and geographies, while interim updates incorporate other updated datasets and approach improvements.

The latest update provides a new interim version (1.5) to the previous TZP16 projections to re-base the projections with the latest ABS Census 2016 data and ratios.

However, the latest version does not consider new major development information or changes in metropolitan strategy or policy, such as the Three Cities Concept. This is anticipated to be incorporated into a future TZP19 release.

6.3.2 *Strategic centres*

This report measures accessibility to employment hubs (strategic centres), regional health centres (hospitals), education centres (universities) and passenger gateways (airports).

A strategic centre, for the purpose of this report, includes:

- Metropolitan centres and clusters – Areas of economic focus of Greater Sydney and are fundamental to growing its global competitiveness. This can take the form of single centres or a cluster of centres.
- Strategic centres – Areas that are expected to accommodate high levels of private sector investment, enabling them to grow and evolve. They will become increasingly important parts of the region's structure and vary in size, location and mix of activities.³⁰

These areas represent the greatest density of activity within Greater Sydney, accounting for 50 per cent (in 2011) of all Greater Sydney's jobs.³¹ Table 13 lists the strategic centres, while

³⁰ Greater Sydney Region Plan – A Metropolis of Three Cities, Updated March 2018

³¹ Greater Sydney Region Plan – A Metropolis of Three Cities, Updated March 2018

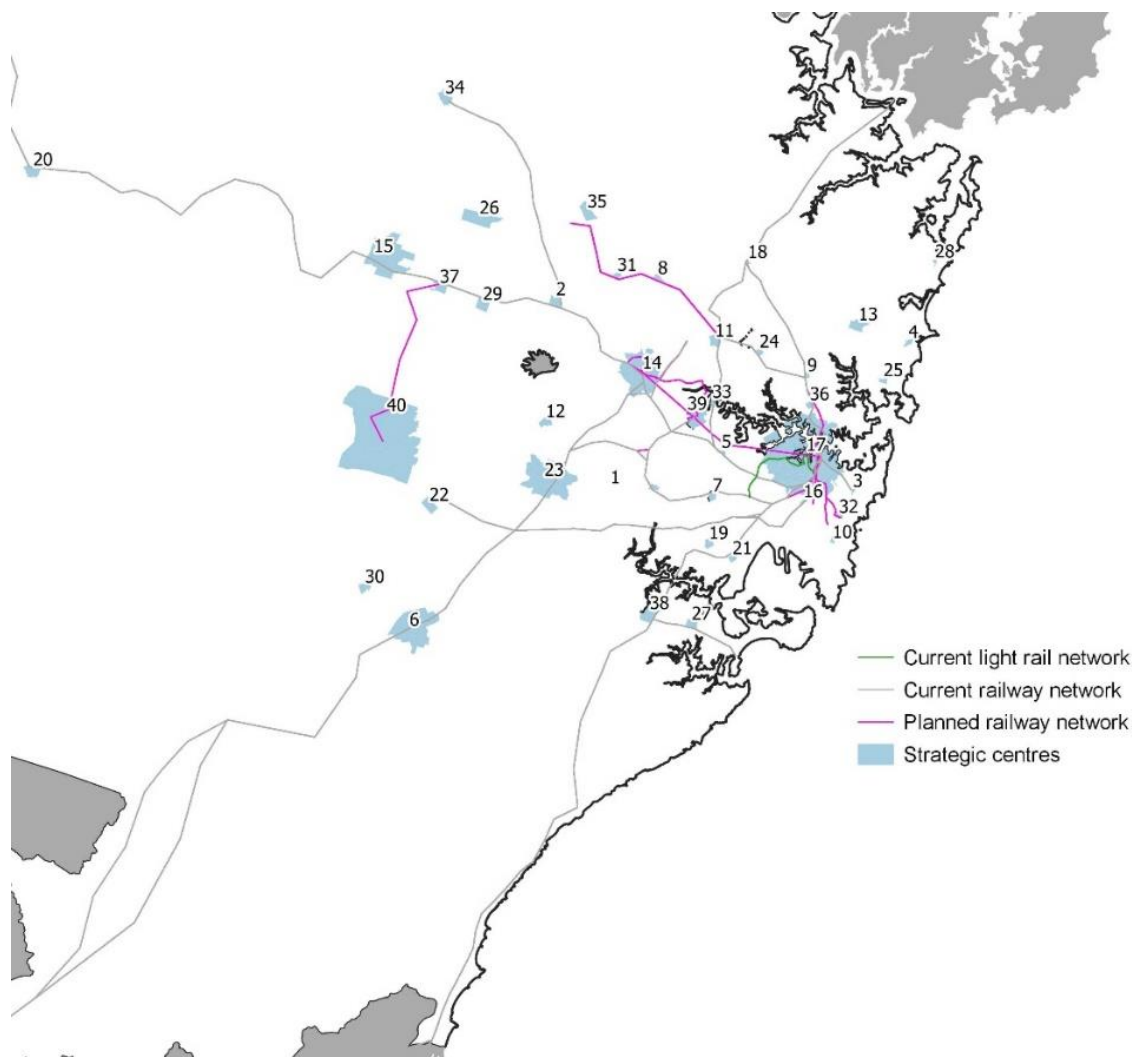
Figure 24 illustrates the locations and rail infrastructure featured within Sydney to connect the strategic centres.

Table 13. List of strategic centres

Priority area	Name	
Metropolitan centres / clusters	<ul style="list-style-type: none"> • Campbelltown-Macarthur • Greater Parramatta • Greater Penrith • Harbour CBD • Liverpool • Western Sydney Airport and Badgerys Creek Aerotropolis 	
Strategic centres	<ul style="list-style-type: none"> • Bankstown • Blacktown • Bondi Junction • Brookvale–DeeWhy • Burwood • Campsie • Castle Hill • Chatswood • Eastgardens – Maroubra Junction • Epping • Fairfield • Frenchs Forest • Green Square–Mascot • Hornsby • Hurstville • Katoomba • Kogarah • Leppington • Macquarie Park • Manly • Marsden Park • Miranda • Mona Vale • Mt Druitt • Narellan • Norwest • Randwick • Rhodes • Richmond-Windsor • Rouse Hill • St Leonards • St Marys • Sutherland • Sydney Olympic Park 	

Source: *Greater Sydney Region Plan – A Metropolis of Three Cities, Updated March 2018*

Figure 24: Location of strategic centres



1	Bankstown	14	Greater Parramatta	28	Mona Vale
2	Blacktown	15	Greater Penrith	29	Mt Druitt
3	Bondi Junction	16	Green Square-Mascot	30	Narellan
4	Brookvale-Dee Why	17	Harbour CBD	31	Norwest
5	Burwood	18	Hornsby	32	Randwick
6	Campbelltown-Macarthur	19	Hurstville	33	Rhodes
7	Campsie	20	Katoomba	34	Richmond-Windsor
8	Castle Hill	21	Kogarah	35	Rouse Hill
9	Chatswood	22	Leppington	36	St Leonards
10	Eastgardens-Maroubra	23	Liverpool	37	St Marys
11	Junction	24	Macquarie Park	38	Sutherland
12	Epping	25	Manly	39	Sydney Olympic Park
13	Fairfield	26	Marsden Park	40	Western Sydney Airport and
	Frenchs Forest	27	Miranda		Badgerys Creek Aerotropolis

Source: Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

6.3.3 Sydney Strategic Transport Model (STM)

STM is a multi-modal strategic transport model that is developed and maintained by TPA. The model has provided multi-modal public transport travel time by origin-destination pairs in 2016, 2026 and 2036.

Key rail projects assessed

Table 14 provides a list of rail network projects that we have identified in the STM.

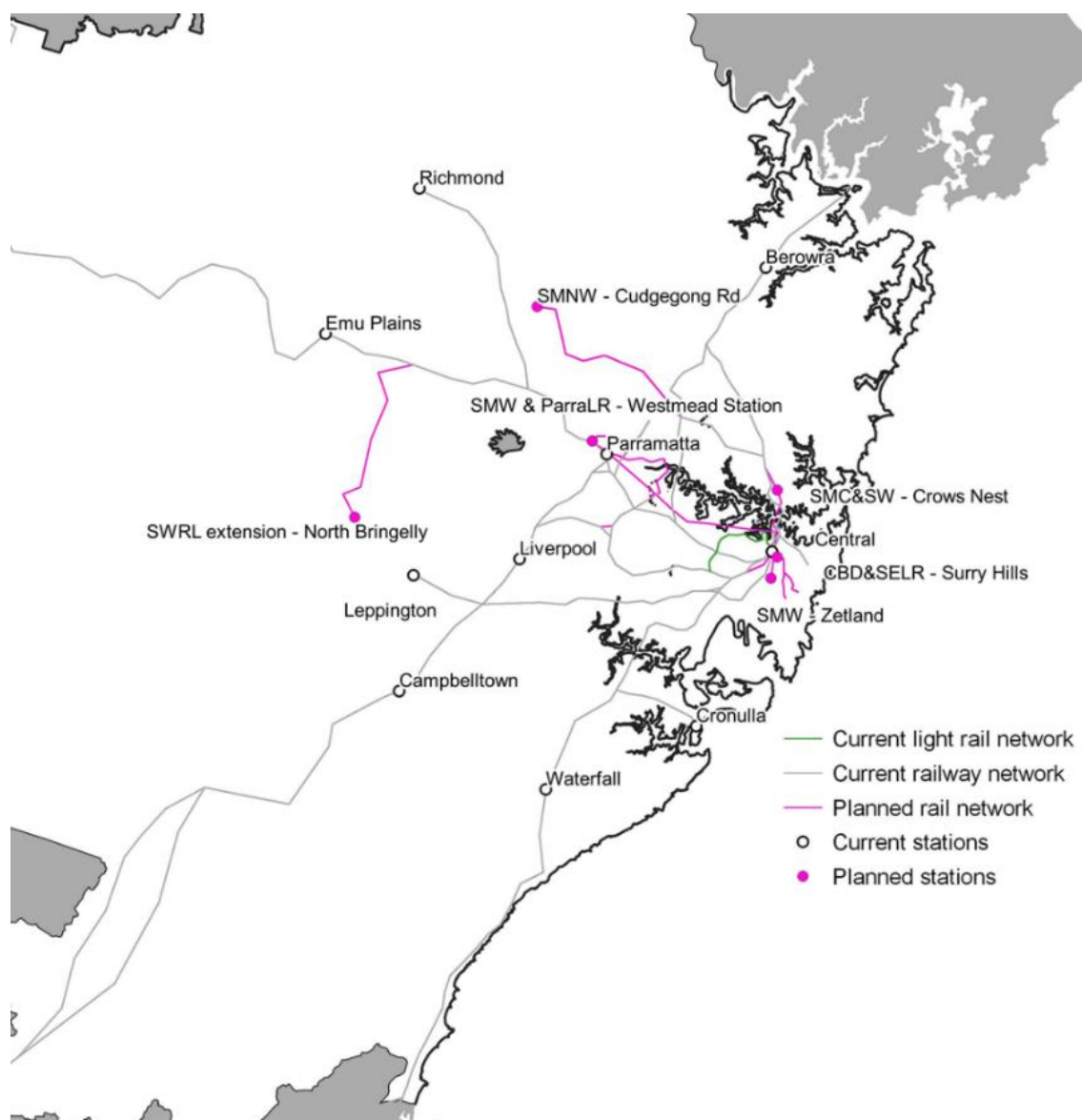
Table 14. Timing of key rail projects assessed in STM

Type	Planned construction / upgrades	Expected operation date
Heavy rail	Sydney Metro Stage One – Sydney Metro Northwest (SMNW)	2019
	Sydney Metro Stage Two – Sydney Metro City & Southwest (SMC&SW)	2024
	Sydney Metro West (SMW)	Late 2020s
	South West Rail Link Extension Corridor (SWRL)	TBA (around opening of Western Sydney airport in 2026)
Light rail	Parramatta Light Rail (ParraLR)	2023
	CBD and South East Light Rail (CBD&SELR)	2020

Note: Expected operation dates were not provided and are estimates. It is assumed all new rail stations will be captured in the STM by the expected operation date

Source: List of stations provided by TfNSW. PwC analysis to determine planned construction / upgrades.

Figure 25 Location of rail networks



Source: Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Road network assumptions

Detailed assumptions and data on new / planned road projects modelled in the STM were not provided, due to the scope of the report. The impacts of this data gap are not considered to be substantial, as the focus of the analysis is on land use and passenger based metrics. Metrics which reflect considerations of patronage and capacity on the rail network, and so have a strong interdependency with investment in the road network, are out of scope.

Bus assumptions

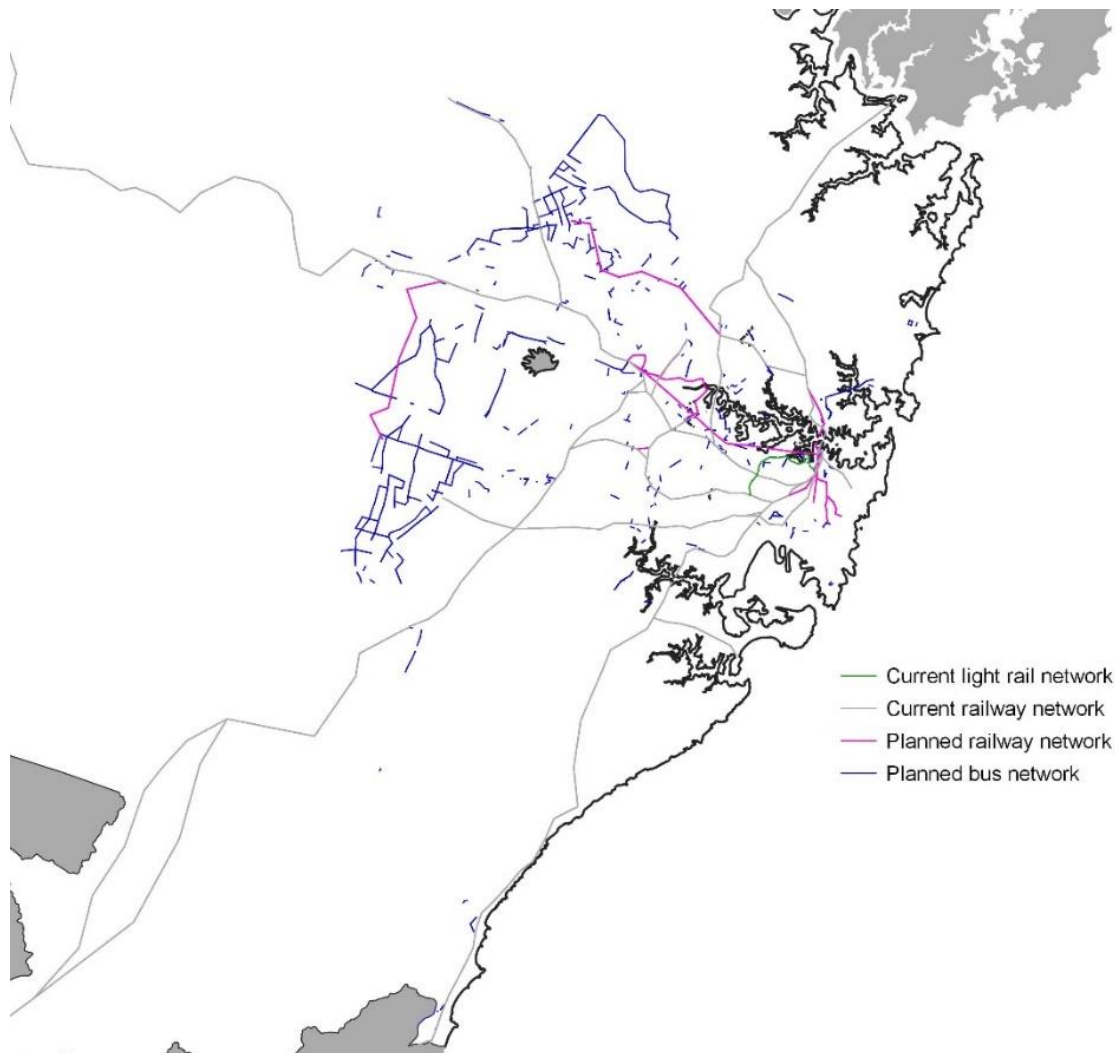
Explicit assumptions and data on new / planned bus network upgrades modelled in the STM were not provided by TfNSW. Through consultation with TfNSW, and analysis of the transport network in the STM model, it has been identified that there is expansion to the size and function of the network that may influence the analysis of access times in this study.

As evidenced in transport planning and consultation, it is understood that bus upgrades such as bus rapid transits and increases of 'on-demand' buses are designed to improve capacity and reliability. For example, the Future Transport 2056 Strategy lists a range of initiatives for all transport modes, including infrastructure to support Rapid Bus Connections between

key strategic centres, including Western Sydney Airport – Badgerys Creek Aerotropolis and Penrith, Liverpool, Blacktown and Campbelltown-Maccarthur.

Figure 26 visualises the expansions to the bus network that are in place by date 2036.

Figure 26 Planned bus network changes by 2036



Source: Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

As Figure 26 illustrates, there are a number of new routes that extend the reach of the public transport network to the west of Sydney. It is possible that the addition of these services is amplifying the impact of projects such as the South West Rail Link extension to the Western Sydney Airport.

It is assumed that the new planned bus routes, along with potential increases in bus trip frequencies, will influence the analysis of access times in this study.

STM limitations

There are a number of limitations to the data provided:

- STM modelling assumes land use projections based on TZP 2011 dataset
- STM outputs are for public transport and are not rail specific. Therefore generalised journey time also includes bus and ferry transport modes

- No data has been provided about any changes or improvements in transport service frequencies. It is assumed that changes in service planning is a driver in better access outcomes in this report
- Public transport generalised journey time is a weighted time, meaning the factors are applied to the elapsed time to show the time as it is perceived by travellers, based on the following factors:
 - In-vehicle time: 1.0
 - Auxiliary / Walk time: 2.0
 - Wait time: 2.0
 - Transfer penalty: +5.0 minutes

Appendix B provides an overview as to how generalised journey time is calculated and includes a worked example for a journey using these parameters.

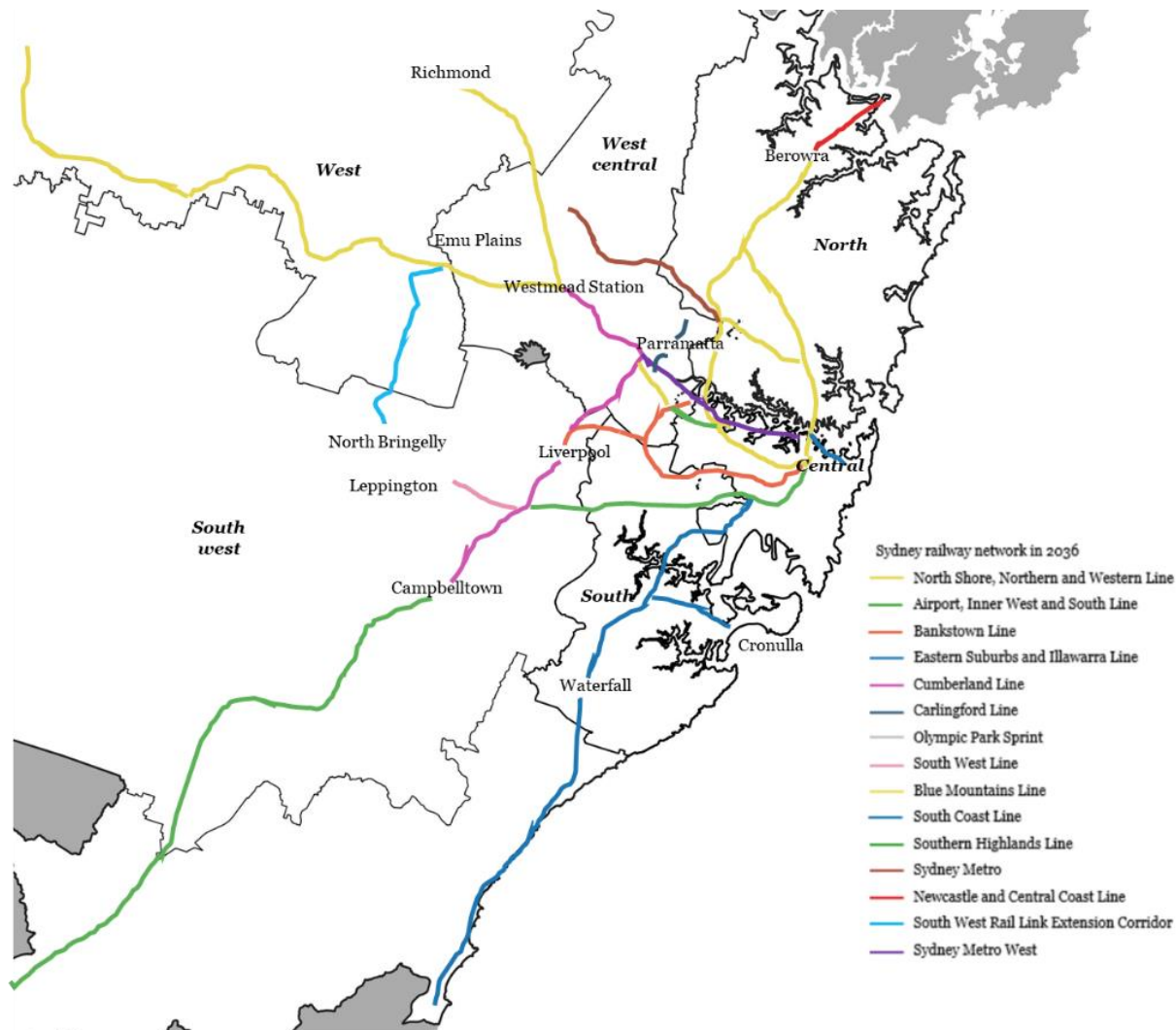
6.3.4 *Geospatial limitations*

Inputs to subsequent geospatial analysis were sourced from TfNSW and STM. Limitations to note include:

- Geospatial data of relevant travel zones were not provided for strategic centres
- The geographic classifications adopted in this analysis are based on 2011 geographies but 2016 projections (based on the latest ABS census data). Therefore some geospatial boundaries depicted in the following maps, particularly those in Sydney's growth corridors in the North West and South West, have large boundaries. In the future these boundaries will shrink as large areas are disaggregated into smaller areas in which development is consolidated. This has the following implications for the analysis in Section 7:
 - The ultimate location of development will be somewhere within the geographic boundary (which will ultimately be disaggregated to reflect the concentration of development) rather than distributed evenly across the geospatial unit as currently depicted in the maps
 - Density calculations (and therefore the capacity to satisfy density thresholds required for rail provision) will potentially yield different results as the total area (hectares) will reduce when geospatial areas are disaggregated.

6.3.5 Study area

Figure 27. Study area for Sydney and the surrounding regions



Source: Travel zones and land area defined by TZ in previous report (Review of State Government Rail and Land Use Plans – NSW August 2017). Map prepared by PwC using QGIS open source software.

- Western Line – key destinations Penrith, Parramatta and Strathfield
- Northern Line – key destinations Newcastle, Gosford and Epping
- North Shore Line – key destinations Hornsby, Gordon and Central
- South & Inner West Line – key destinations Lidcombe and Newtown
- Bankstown Line – key destinations Campsie and St Peters
- East Hills Line – key destinations Central and Glenfield

7 *Network performance*

Using the metrics and approach detailed in Section 6, this section will identify where:

- the network is delivering against objectives as planned
- network performance may require further analysis.

7.1 *Determining the viability of rail services*

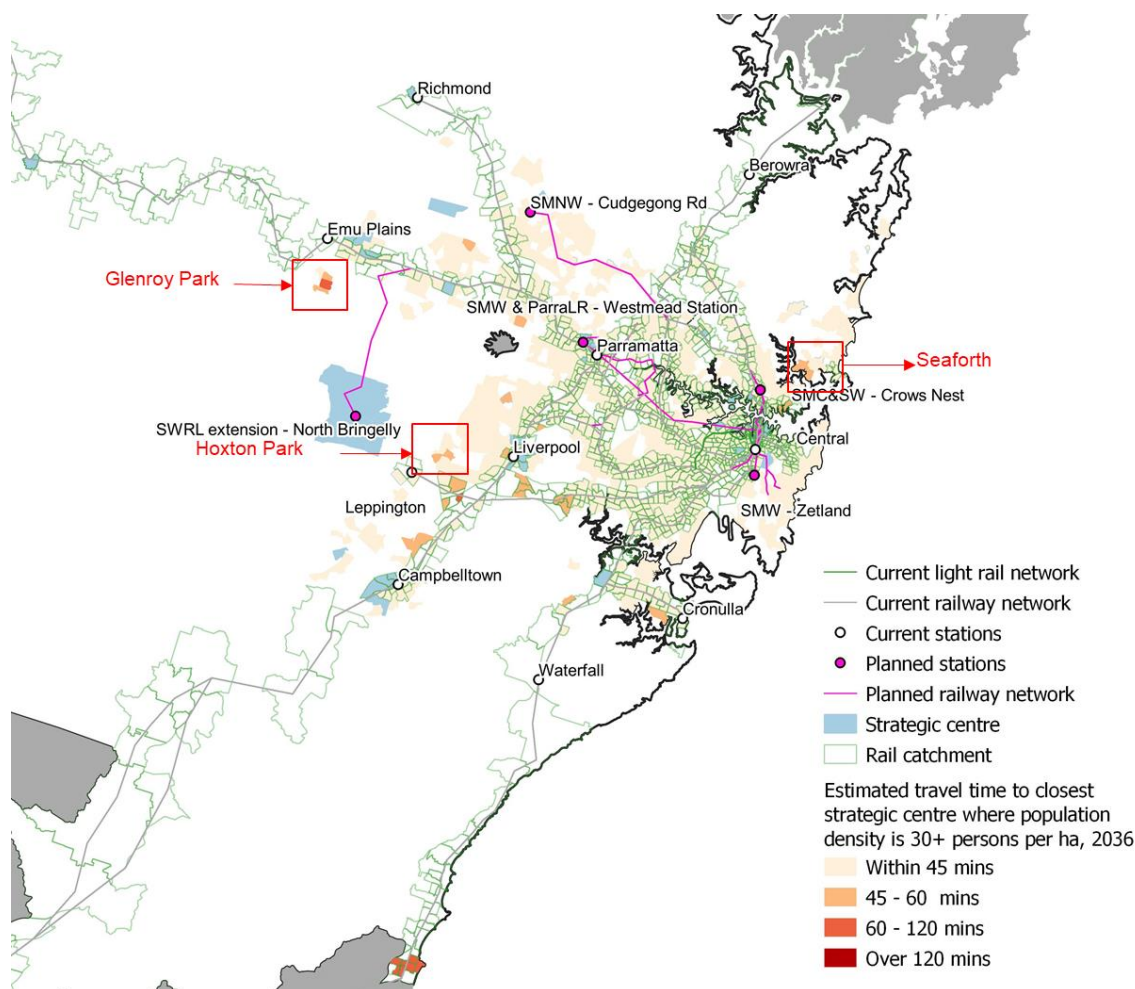
The viability of rail has been determined with reference to forecast population density and employment accessibility, in order to determine whether sufficient travel demand will be generated for rail services. This section identifies regions of Sydney which are:

- within a station's walkable catchment and served by rail but are not able to access the nearest strategic centre within 45 minutes. Strategic centres are identified in Sydney's land use plans as key employment hubs.
- not directly served by the existing or planned rail network (and cannot access strategic centres by public transport in less than 45 minutes), but meet the density threshold at which a rail service may viably be provided.

It should be noted that this is a high level assessment and it is not intended to assess whether rail is warranted but rather to identify areas where further investigation may be beneficial.

Figure 28 illustrates the estimated travel time in 2036, to the closest strategic centre, for travel zones with a population density of over 30 persons per hectare.

Figure 28. Density and accessibility thresholds to strategic centres where population density is 30+ people per hectare in 2036



Note: The origin is defined as any travel zone with population density forecast to be 30+ people per hectare. The destination is defined as any travel zone that contains a strategic centre in Sydney. The 'closest' strategic centre travel zone is defined with reference to travel time by public transport rather than distance. Public transport travel time has been forecast by the STM model for the AM 2-hour period for origin-destination (OD) pairs.

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

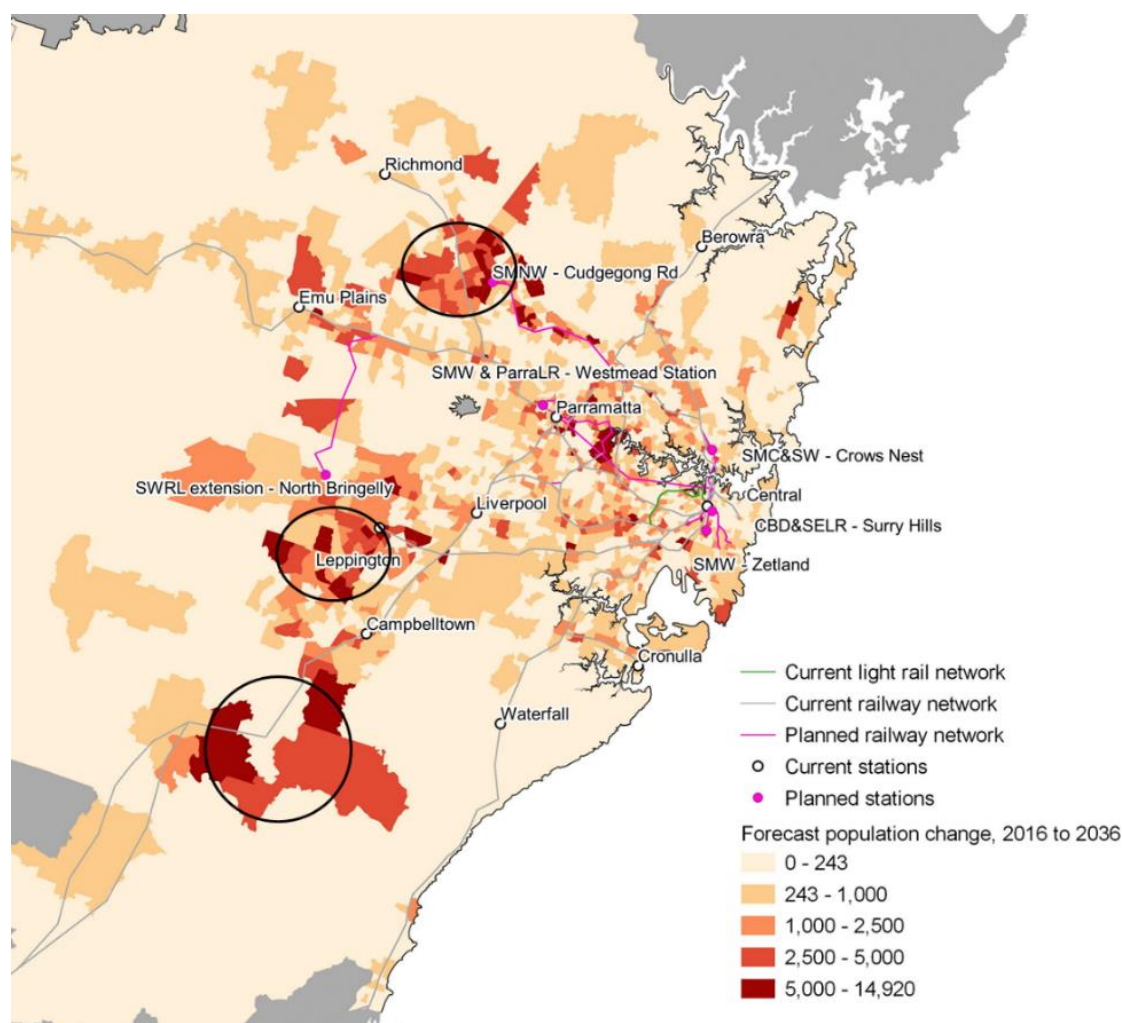
As Figure 28 shows, with this density threshold of 30 persons per hectare applied, the majority of the strategic centres are accessible within 45 minutes by 2036.

This travel time by public transport may not be achieved where the origin travel zone (where population density is greater than 30 persons per hectare) is not located within the rail corridor. Examples include:

- Glenroy Park, south of Penrith
- Hoxton Park, north-east of Leppington
- Seaforth, east of St Leonards.

Figure 29 illustrates the forecast population change between 2016 and 2036, in absolute terms, while Table 15 details the estimated count of population inside the rail corridor in 2016 and 2036, and as a proportion of the total population (inside and outside the corridor).

Figure 29 Change in population by travel zone between 2016 and 2036 (count)



Source: Travel zones, land area and forecast population defined by TZ in previous report (Review of State Government Rail and Land Use Plans – NSW August 2017). Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Table 15. Population inside the rail corridor*

	2016	2036
Count of population (persons)	2,249,326	3,528,696
Percentage of total population (%)	47%	54%

Note: Rail corridor is defined as the travel zones within 800 metres of the rail stations (current and proposed).

Source: Travel zones, land area and forecast population defined by TZ in previous report (Review of State Government Rail and Land Use Plans – NSW August 2017). PwC calculation of population within rail corridor with reference to travel zones within 800m catchment of current and planned stations (those included in STM) to 2036.

Figure 29 shows that the highest areas of population growth is expected to occur in the west and south west areas. This is consistent with the land use plans, where 47 per cent of the total

forecast population in 2036 will be accounted in the west, west central and south west GSC districts.³²

Table 15 shows that by 2036, a greater proportion of the total population will be better supported by the transport network, with 54 per cent of the population being within an 800m walk catchment of a rail station, compared to 47 per cent in 2016.

7.2 *Land use and passenger outcome metrics*

This section documents the performance of the network against land use and passenger metrics. Table 16 shows that four of the objectives are captured by land use and passenger metrics.

Table 16. Land use and passenger outcome metrics

Land use and passenger objectives	Metric	Economic growth	Accessibility	Connectivity	User centrality	Sustainability
	Growth in employment density (2016-2036)	✓				
	Growth in population within 45 minutes of employment precincts (2016-2036)	✓	✓			
	Growth in population within 45 minutes of health and education services and passenger gateways (2016-2036)	✓	✓			
	Growth in housing density in the rail corridor (2016-2036)	✓				
	Socio-Economic Indexes For Areas (SEIFA) score within rail corridor				✓	
	SEIFA scores in areas with high population density and low employment accessibility (time to closest strategic Centre is 45 minutes or more) (2036)		✓		✓	
	Growth in rail patronage relative to population and employment growth (2016-2036)	No change from 2017				
	Mode share of public transport for trips during AM peak	No change from 2017				

Source: PwC

The relationships between metrics and objectives are discussed below.

Economic growth

Effective rail networks are a key driver of economic growth and can contribute to increased economic output, productivity, jobs growth and the diversity and competitiveness of the Melbourne economy. They do this through allowing more intensive land use and improved access to employment and other services, as captured in the metrics identified in Table 16.

Accessibility

The importance of an effective public transport system is imperative in stimulating employment and business growth, by providing comprehensive access into and around Melbourne. To measure accessibility, travel time to the nearest strategic centre, as defined in

³² Travel zones projections 2016, provided by TfNSW. PwC calculation, based on study zone travel zones only.

land use planning, is used as well as access to key education and health services. In addition, the uptake of rail services by commuters as employment grows is used as a metric to capture the relative accessibility and attractiveness of services.

User centrality

The responsiveness of a service to the needs of its customers is an important determinant of its viability. The metrics proposed here capture mode share, which is an outcome of the attractiveness of a service.

Sustainability

High capacity public transport provides recognised environmental benefits as compared to passenger vehicles due to reduced energy usage per traveller. Transport appraisal formally recognises benefits of reduced noise, air and water emissions as accruing to the use of public transport instead of private vehicles. Accordingly, an improving mode share for public transport as compared to private vehicles over time indicates that a transport network is becoming more environmentally sustainable.

7.2.1 *Growth in employment density 2016 to 2036*

Employment density is measured as the number of jobs per hectare within each transport zone in Sydney. Employment density creates economic benefits through:

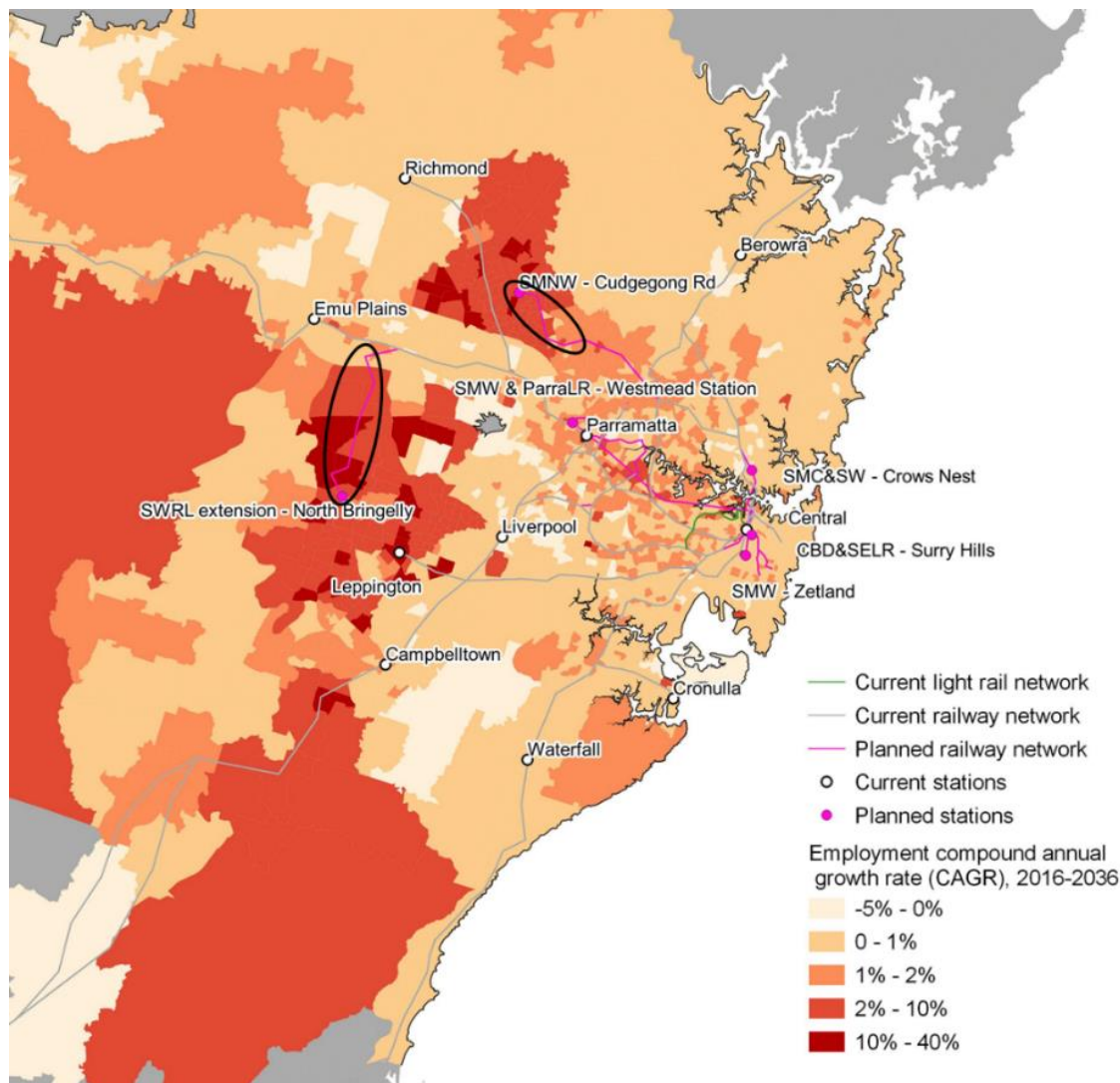
- reducing the cost of development per employee
- productivity gains through agglomeration and labour force deepening, which are recognised in transport appraisal.³³

Transport investments that improve accessibility of an area can be a catalyst for employment densification as they increase the pool of labour available to employers. Therefore, employment density is a performance metric for the effectiveness of the transport network.

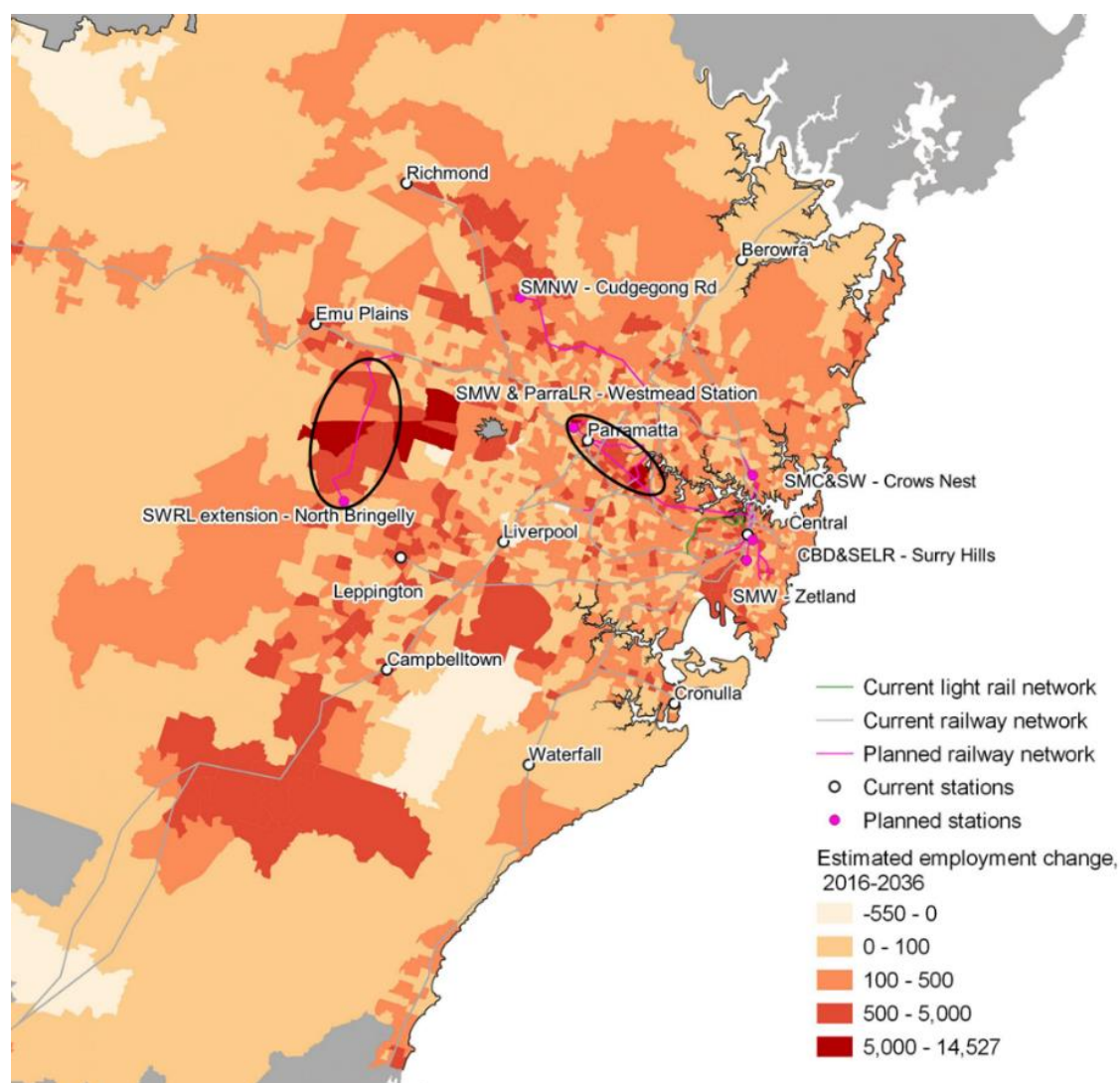
Figure 30 and Figure 31 present the growth in employment by travel zone, and the absolute change in employment by travel zone respectively. Table 17 supports these visualisations, summarising forecast employment inside and outside the rail corridor in 2016 as compared to 2036.

³³ Australian Transport Assessment and Planning Guidelines, *T3 Wider Economic Benefits*, 2016

Figure 30. Change in employment by travel zone between 2011 and 2036 (CAGR %)



Source: Travel zones, land area and forecast population defined by TZ in previous report (Review of State Government Rail and Land Use Plans – NSW August 2017). PwC calculation of employment compound annual growth rate. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 31. Change in employment by travel zone between 2016 and 2036 (count)

Source: Travel zones, land area and forecast population defined by TZ in previous report (Review of State Government Rail and Land Use Plans – NSW August 2018). Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Table 17. Forecast employment inside and outside the rail corridor

	2016	2036	CAGR 2016-36 (%)
Inside rail corridor	1,698,463	2,466,028	1.9%
Outside rail corridor	858,181	1,001,205	0.8%
Total	2,556,644	3,467,233	1.5%

Note: There are 2,399 TZs contained in the study area for Greater Sydney

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Forecast employment to 2036 defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019

Figure 30 shows strong employment growth rates to the west and south west areas. These growth areas align to planned transport network investments, particularly along the South-West Rail Line Extension and Sydney Metro North-West corridors.

Similarly, Figure 31 also illustrates high employment growth to the west and west central areas, in absolute terms. Specifically, some of the highest change is forecast for:

- Luddenham, along the south-west rail line extension corridor
- Parramatta, along the Sydney Metro West and Parramatta light rail corridor.

Table 17 details that a higher proportion of employment growth is occurring within the rail corridor in 2036, when compared to 2016. This indicates that the planned changes to the transport network in 2036 is improving the population's connectivity to jobs.

The clear focus and anticipated growth in the west supports the delivery of the Western Sydney City Deal, which will leverage key infrastructure investments such as the Western Sydney Airport to catalyse job growth and better support transport links.³⁴

7.2.2 *Growth in employment accessibility 2016 to 2036*

Employment accessibility is measured as residing within 45 minutes of a strategic centre by public transport. Improving access to employment centres creates economic benefits by:

- reducing travel times and cost for existing workers in the centres
- increasing the pool of people who can access jobs and opportunities, which can attract industry to an area
- enabling employment density, supporting productivity gains through agglomeration and labour force deepening.

Transport appraisal guidelines recognise the productivity benefits of agglomeration and labour force deepening from improved access to jobs,³⁵ and the travel time savings.³⁶

To the extent that increasing access to employment allows people who were previously unemployed to enter the workforce, unemployment may also be improved. Reducing unemployment has positive social impacts as unemployment is a documented risk factor for “family tensions and breakdown, boredom, alienation, shame and stigma, increased social isolation, crime, erosion of confidence and self-esteem, the atrophying of work skills and ill-health.”³⁷

Table 18 details the growth in population within 45 minutes of a strategic centre, while Figure 32 visualises the spatial distribution of change in access times between 2016 and 2036.

³⁴ Greater Sydney Commission, *Greater Sydney Region Plan – A Metropolis of Three Cities*, updated 2018

³⁵ Australian Transport Assessment and Planning Guidelines, *T3 Wider Economic Benefits*, 2016

³⁶ National Guidelines for Transport System Management in Australia, as referenced in the Australian Transport Assessment and Planning Guidelines, *M1 Public transport*, 2006

³⁷ Alison McClelland and Fiona Macdonald for the Business Council of Australia, *The social consequences of unemployment*, 1998

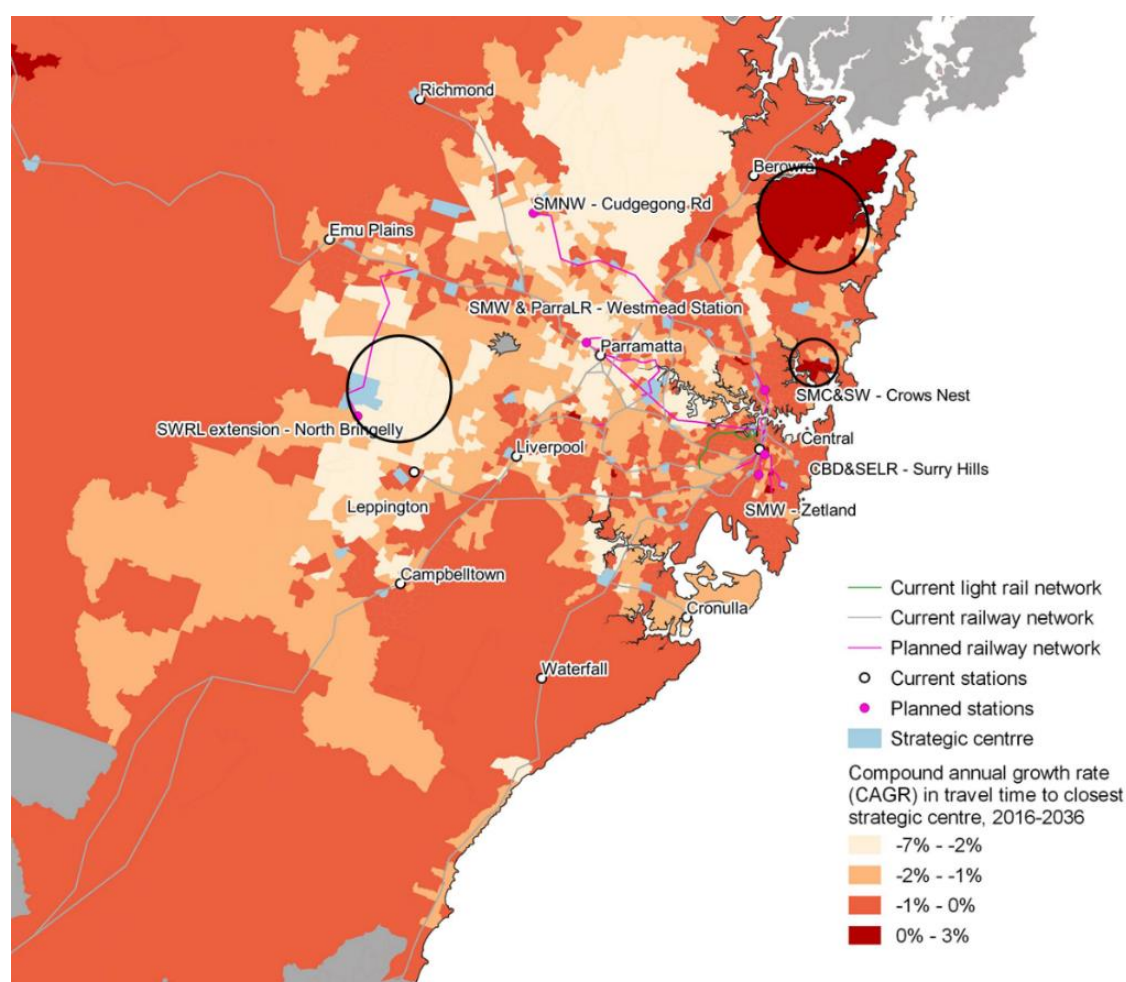
Table 18. Growth in the population within 45 minutes of strategic centre

Metric	2016	2036
Count of TZs with a strategic centre within 45 minutes	1,872	2,079
Count of population with a strategic centre within 45 minutes	3,890,046	5,826,105
% of total population with a strategic centre within 45 minutes	80.6%	88.7%

Note: There are 2,399 TZs contained in the study area for Greater Sydney

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. PwC calculation of population within 45 mins of strategic centres with reference to travel zones included in STM. Forecast population to 2036 defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019

Figure 32. Change in access to the closest strategic centre, 2016 to 2036 (CAGR %)



Note: The origin is defined as any travel zone in the Sydney study area. The destination is defined as any strategic centre travel zone in Sydney. The 'closest' strategic centre travel zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Table 18 shows that 80.6 per cent of Sydney's population is currently within 45 minutes of a strategic centre. Within 20 years, it is estimated to rise to 88.7 per cent as new / planned transport networks are developed.

Figure 32 shows improvements in travel time to 2036 to the closest strategic centre in the majority of the travel zones. In particular, areas that have experienced time savings of more than 5 per cent are located around the future Sydney Western Airport, namely Kemps Creek, Badgerys Creek and Luddenham.

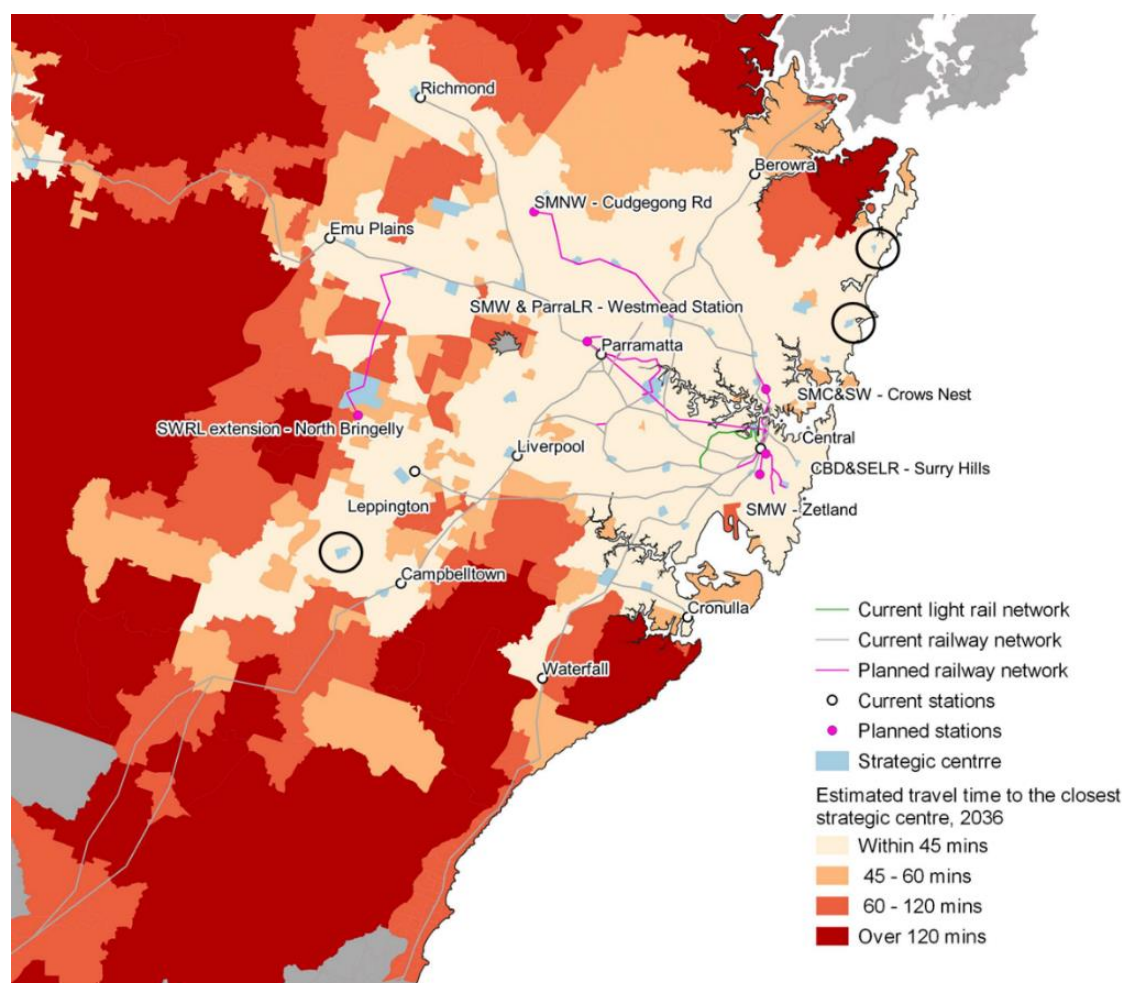
Areas of increased (i.e. worsening) travel time to closest strategic centre are largely insubstantial, with only a number of areas experiencing more than a one per cent increase in travel time between 2016 and 2036:

- Bayview, east of Berowra, and closest to the Mona Vale strategic centre
- Balgowlah, east of Seaforth and closest to the Manly strategic centre.

These areas are outside the rail corridor, where patrons are likely to rely on bus transfers to connect to train services.

Figure 33 illustrates the outcome of the uplift in access between 2016 and 2036, showing the travel time to closest strategic centre in 2036.

Figure 33. Travel time by public transport to the closest strategic centre, 2036



Note: The origin is defined as any travel zone in the Sydney study area. The destination is defined as any strategic centre travel zone in Sydney. The 'closest' strategic centre travel zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 33 illustrates that the majority of travel zones along the rail corridor are able to reach a strategic centre within 45 minutes. This is likely due to the dispersion of strategic centres around the Greater Sydney area, making it easier to access an employment hub from across the city.

Additionally, there are also areas that are located outside the rail corridor that have access to a strategic centre within 45 minutes. This includes the surrounding travel zones around Fairfield, Mona Vale, Brookvale-Dee Why and Narellan. This may be due to improvements in bus travel times and improved links of bus services to the rail network.

7.2.3 *Growth in access to education and health*

This section analyses access to key health and education services. Figure 34 illustrates the location of the main university campuses and regional hospitals considered in the analysis.

While many healthcare and education services are provided locally, such as GP clinics and primary schools, the hospitals and universities detailed in Table 19 serve large catchment

areas. For the purposes of this analysis the number of university campuses and hospitals have been held constant to 2036.

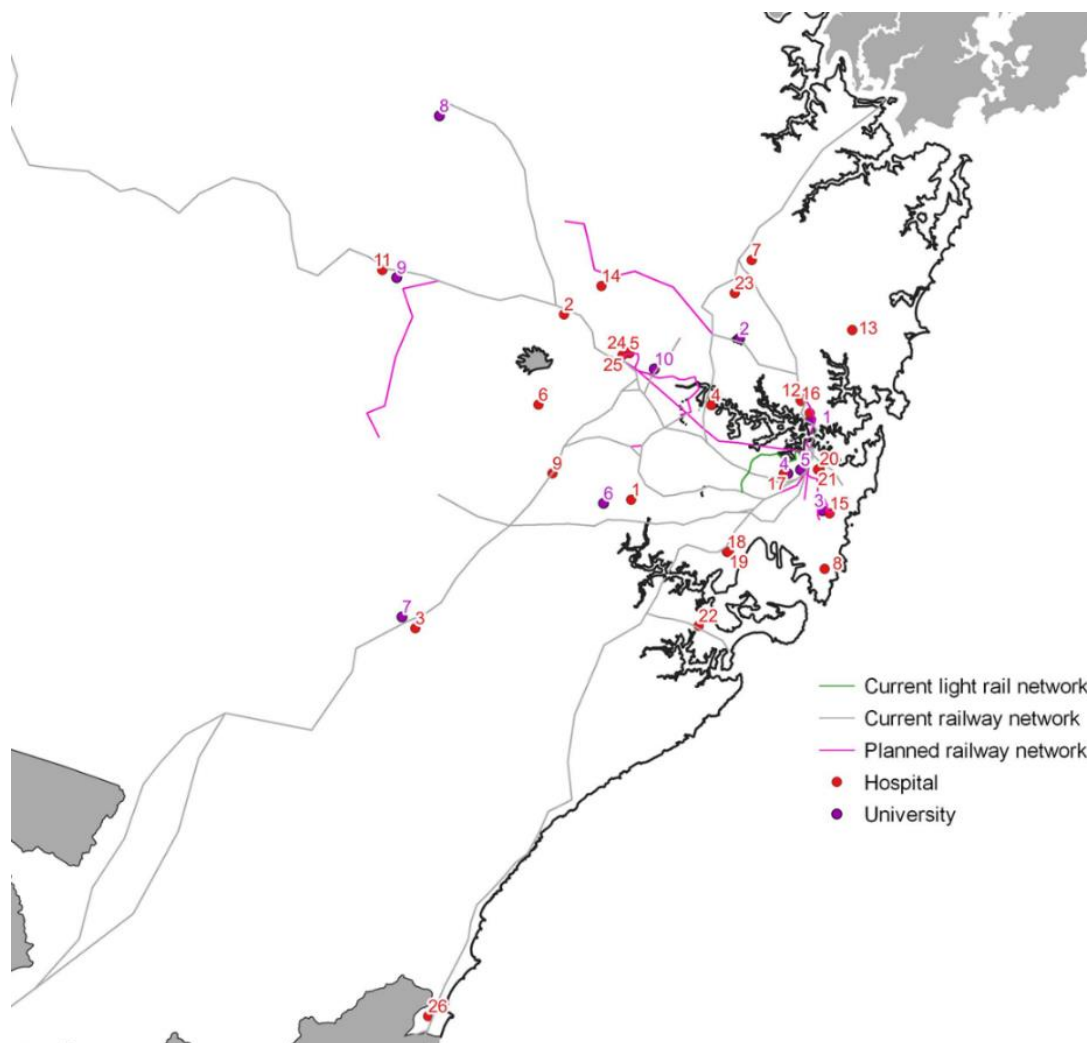
Table 19 List of hospitals and universities considered in analysis

Hospital		
1. Bankstown Lidcombe Hospital	10. Mater Hospital Sydney	19. St George Private Hospital
2. Blacktown Hospital	11. Nepean Hospital	20. St Vincent's Hospital [Darlinghurst]
3. Campbelltown Hospital	12. North Shore Private Hospital	21. St Vincent's Private Sydney
4. Concord Hospital	13. Northern Beaches Hospital	22. Sutherland Hospital
5. Cumberland Hospital	14. Norwest Private Hospital	23. Sydney Adventist Hospital
6. Fairfield Hospital	15. Prince of Wales Hospital	24. The Children's Hospital at Westmead
7. Hornsby Ku-ring-gai Hospital	16. Royal North Shore Hospital	25. Westmead Hospital
8. Justice Health Services	17. Royal Prince Alfred Hospital	26. Wollongong Hospital
9. Liverpool Hospital	18. George Hospital NSW	
University		
1. Australian Catholic University	5. University of Technology Sydney	9. University of Western Sydney - Parramatta
2. Macquarie University	6. University of Western Sydney - Bankstown	
3. The University of New South Wales	7. University of Western Sydney - Campbelltown	
4. The University of Sydney	8. University of Western Sydney - Kingswood	

Source: Hospitals include those with 200 or more beds as at 22-03- 2019, MyHospitals contact data, <https://www.myhospitals.gov.au/about-the-data/download-data>, Australian Institute of Health and Welfare (AIHW). Main university campuses are those specified by each University on their website, Locations determined by latitude and longitude of centre of each hospital and university. Map prepared by PwC using QGIS open source software.

The location of the hospitals and university campuses detailed in is illustrated in Figure 34.

Figure 34. Location of universities and hospitals



Source: Location of universities and hospitals were identified using Google Maps. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Access to healthcare

Access to healthcare services is seen as a right in Australia's universal system. In this analysis, access to hospitals is considered, which includes outpatient clinics for access to specialists and any other co-located services.

Access to health services creates multiple economic and social benefits. These occur as:

- Access to health services is a factor that determines health outcomes³⁸ with lack of access to health services contributing to poorer health outcomes.^{39,40}

³⁸ Australian Institute of Health and Wellness, *Understanding health and illness*, 2014

³⁹ Productivity Commission, *Report on Government Services Health Sector Overview*, 2017

⁴⁰ For example, it is documented that Australians living in regional and remote areas with relatively less access to health services have experience poorer health. Productivity Commission, *Report on Government Services Health Sector Overview*, 2017

- There are clear economic benefits of a “healthier” population, including direct financial benefits such as reduced health expenditure and economic benefits such as improved labour force supply.
- There are large social benefits from good health and wellbeing.
- Hospitals are major centres of employment, and are often co-located with supporting services, such as pathology labs, increasing the employment density of such sites.

Table 20 details the growth in population within 45 minutes of a regional hospital, while Figure 35 visualises the change in access times to the closest hospital between 2016 and 2036, in compound annual growth terms.

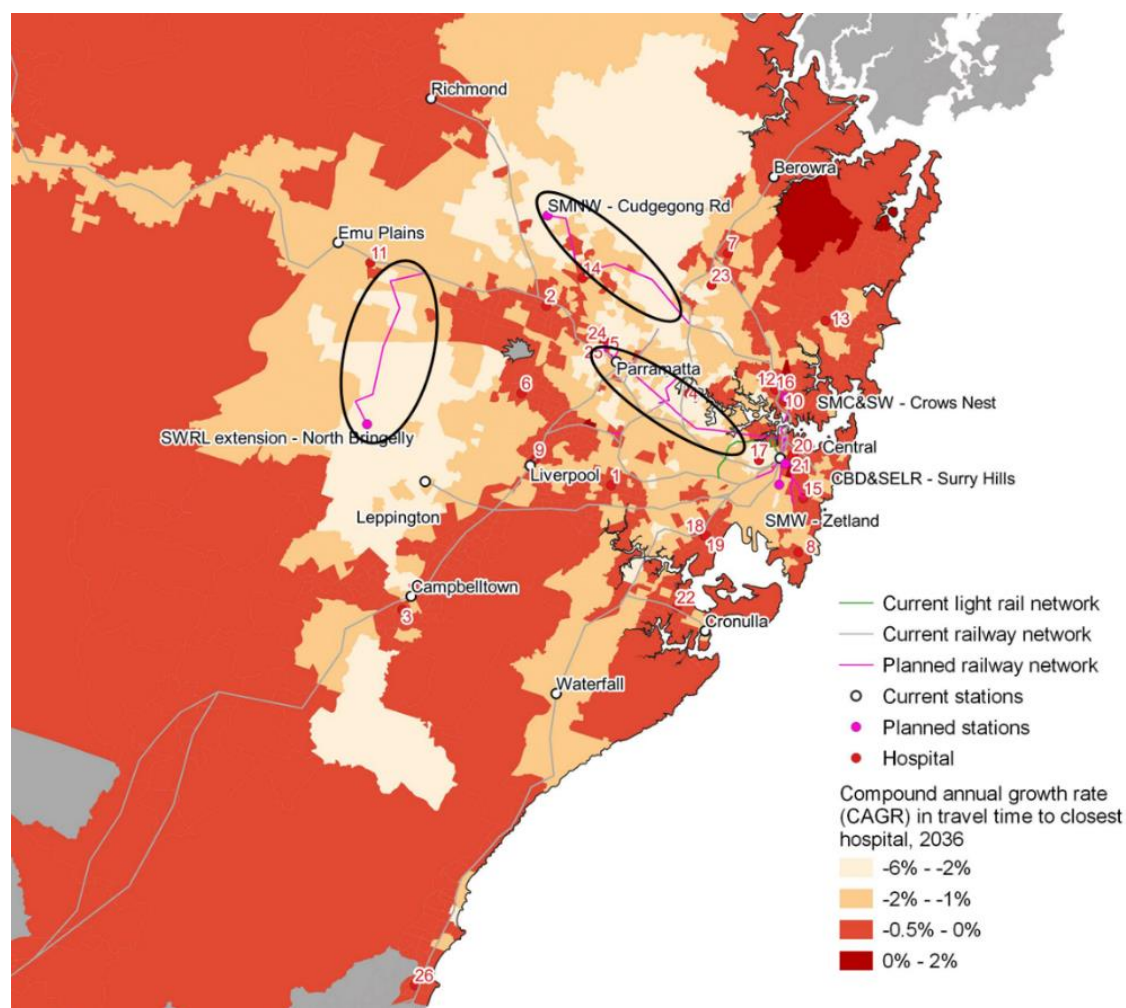
Table 20. Growth in the population within 45 minutes of regional hospitals

	2016	2036
Count of TZs with a regional hospital within 45 minutes	1,222	1,635
Count of population with a regional hospital within 45 minutes (% of total)	2,438,897	4,574,875
% of total population with a regional hospital within 45 minutes	50.5%	69.6%

Note: There are 2,399 TZs contained in the study area for Greater Sydney

Source: Table 20 List of hospitals and universities considered in analysis, Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. PwC calculation of population within 45 mins of regional hospital with reference to travel zones included in STM. Forecast population to 2036 defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019

Figure 35. Change in access to closest hospitals by travel zone, 2016 – 2036 (CAGR %)



Note: The origin is defined as any travel zone in the Sydney study area. The destination is defined as any travel zone with a hospital with more than 200 beds. The 'closest' hospital travel zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

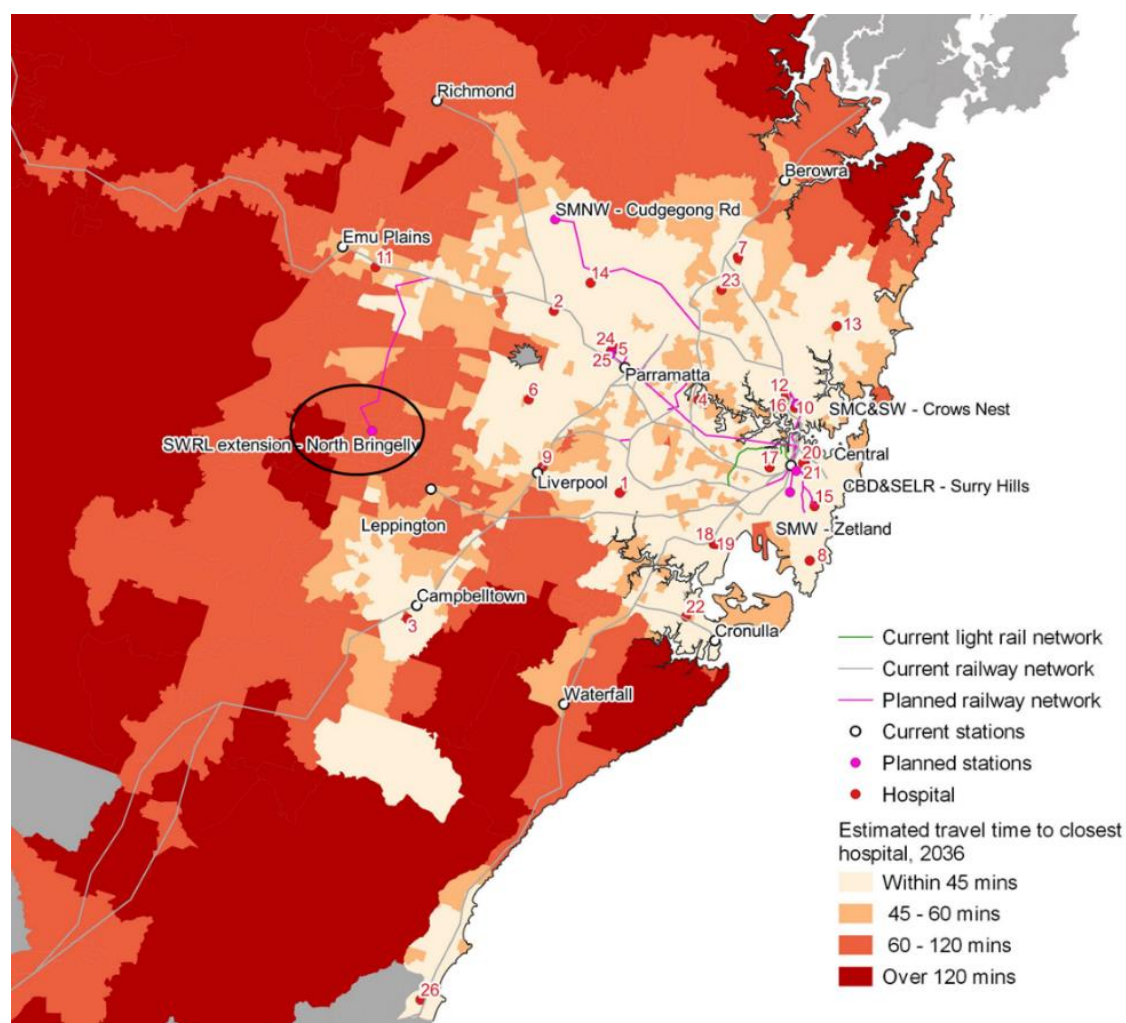
Source: Table 20 List of hospitals and universities considered in analysis, Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Table 20 shows that there is a significant increase in travel zones that are within 45 minutes of a hospital. This difference positively affects around 1.97 million additional people by 2036, as nearly 70 per cent of the total population would be able to access via public transport to a hospital with over 200 beds within 45 minutes.

Figure 35 illustrates that most of the study area have experienced time travel savings to hospitals between 2016 and 2036. This is most prominent along the corridors of new / planned rail networks, such as the South-West Rail Link Extension, Sydney Metro North-West line and Sydney Metro West.

Figure 36 illustrates the forecasted access times to the closest hospital in 2036.

Figure 36. Access to closest regional hospitals by travel zone, 2036



Note: The origin is defined as any travel zone in the Sydney study area. The destination is defined as any travel zone with a hospital with more than 200 beds. The 'closest' hospital travel zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

Source: Table 20 List of hospitals and universities considered in analysis. Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 36 shows that time savings on the South-West Rail Link Extension is coming from a low base in 2016, with parts of the corridor taking between 60-120 minutes to travel to the closest hospital in 2036.

Access to education

As with healthcare, there are strong economic and social benefits from higher education. In terms of economic benefits, higher education:

- allows individuals to increase the productivity of their labour, benefiting the economy as a whole and reflected in higher life time earnings for the individual⁴¹
- is funded by the government and industry to conduct research and innovation, which can improve economic productivity⁴²
- is a major export service for Australia⁴³
- is a significant employer in precincts in which institutions are located⁴⁴

Education is positively related to improved health, wellbeing and family outcomes, among other social benefits.⁴⁵

Despite advances in online learning and collaboration, teaching and research activities at many universities remain majority face to face⁴⁶. For this reason, access to the physical locations is important.

In the Greater Sydney area, all main university campuses are located within the rail corridor, except the University of Western Sydney – Bankstown campus. The location of the main university campuses are dispersed across the Greater Sydney area, with campuses located in the CBD as well as the outer suburbs.

Table 21 details the growth in population within 45 minutes of the closest university, while Figure 37 visualises the change in access times to the closest hospital between 2016 and 2036, in compound annual growth terms.

Table 21. Growth in population within 45 minutes of the closest university

	2016	2036
Count of TZs with a university within 45 minutes	998	1288
Count of population with a university within 45 minutes	1,775,869	3,424,647
% of total population with a university within 45 minutes	36.8%	52.1%

Note: There are 2,399 TZs contained in the study area for Greater Sydney

Source: Table 20 List of hospitals and universities considered in analysis. Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. PwC calculation of population within 45 mins of main university campus with reference to travel zones included in STM. Forecast population to 2036 defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019.

⁴¹ Deloitte Access Economics, *The importance of universities to Australia's prosperity*, 2015

⁴² Deloitte Access Economics, *The importance of universities to Australia's prosperity*, 2015

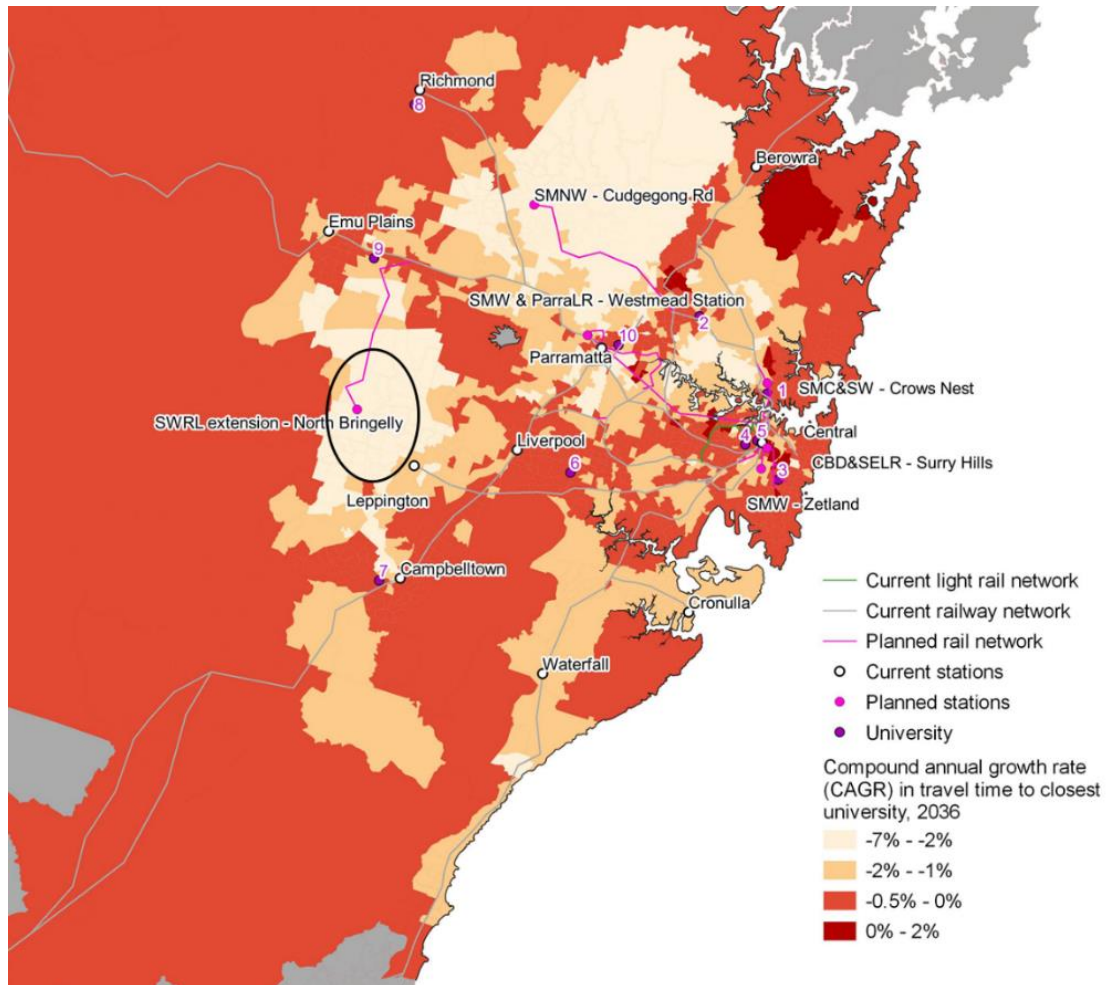
⁴³ Department of Foreign Affairs and Trade, *Australia's trade in goods and services 2016*, 2016

⁴⁴ PwC GEM analysis

⁴⁵ Deloitte Access Economics, *The importance of universities to Australia's prosperity*, 2015

⁴⁶ Leo Goedegebuure, Ian Marshman, *Australian University Productivity: Some food for thought in improving service sector productivity: the economic imperative*, CEDA, 2017

Figure 37. Change in access to the closest main university campus by travel zone, 2016 – 2036 (CAGR %)



Note: The origin is defined as any travel zone in the Sydney study area. The destination is defined as any travel zone with a main university campus. The 'closest' hospital travel zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

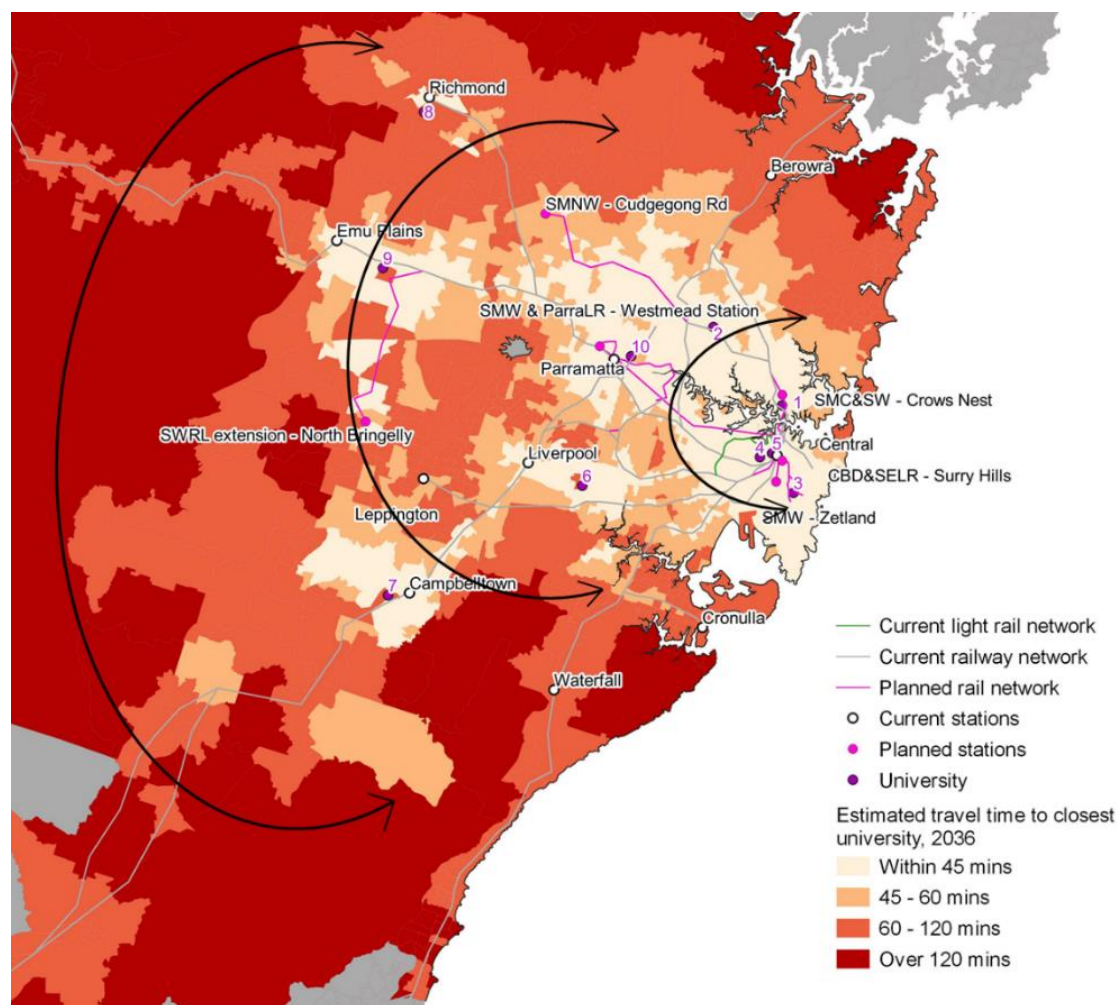
Source: Table 20 List of hospitals and universities considered in analysis. Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Table 21 shows that the proportion of the population with access to a university within 45 minutes by public transport will increase by 15.3 per cent between 2016 and 2036.

Similar to the change in access to hospitals, Figure 37 illustrates that the majority of the study area has experienced time savings between 2016 and 2036 for access to a main university campus. This is most evident in the south west, with the Badgerys Creek and Luddenham areas experiencing the highest growth rates.

Figure 38 illustrates the forecasted access times to the closest university in 2036.

Figure 38. Access to closest main university campus by travel zone, 2036



Note: The origin is defined as any travel zone in the Sydney study area. The destination is defined as any travel zone with a main university campus. The 'closest' hospital travel zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

Source: Table 20 List of hospitals and universities considered in analysis. Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 38 shows that access times to a university have a broad inner, middle and outer ring pattern. Most travel zones in and around the inner ring have access to a university within 45 minutes. While areas beyond this have access times over 45 minutes.

7.2.4 *Growth in access to passenger gateways*

Access to international gateways such as airports provides important economic benefits by supporting:

- trade in goods and services
- connectedness and mobility of a national and globalised workforce
- the tourism industry in greater Sydney and NSW by allowing visitors to access the city conveniently.⁴⁷

Increased access to passenger gateways has social and recreation benefits of allowing local residents access to intrastate, interstate and international destinations for leisure.

This study has modelled access to two passenger gateways, Sydney International Airport and Western Sydney Airport. The analysis assumes access to the Western Sydney Airport is available from 2026.

Table 22 details the growth in population within 45 minutes of a passenger gateway. It shows that around 600,000 more of the population will have access to a passenger gateway within 45 minutes. This population is located in an additional 139 travel zones.

Table 22. Growth in the percentage of the population with 45 mins of a passenger gateway

	2016	2036
Count of TZs within 45 minutes of passenger gateway	418	557
Count of population within 45 minutes of passenger gateway	570,808	1,182,166
% of total population within 45 minutes of passenger gateway	11.8%	18.0%

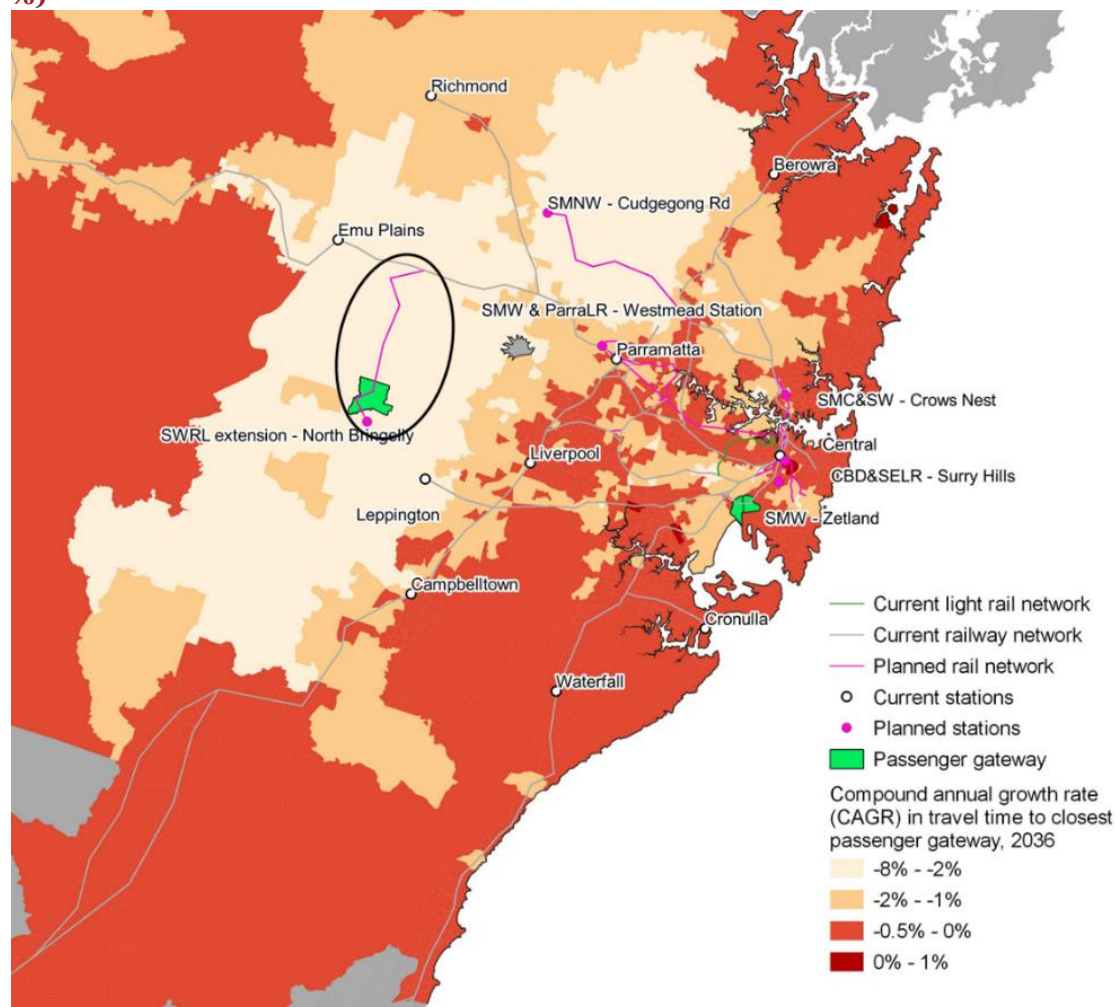
Note: There are 2,399 TZs contained in the study area for Greater Sydney

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. PwC calculation of population within 45 mins of a passenger airport with reference to travel zones included in STM. Forecast population to 2036 defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019.

Figure 39 visualises the change in access times to the closest passenger gateway from 2016 to 2036, while Figure 40 illustrates the forecasted access times to the closest passenger gateway in 2036.

⁴⁷ These economic benefits are explored in detail in the *Economic and Social analysis of potential airport Sites: Sydney Aviation Capacity Study*, Commonwealth Department of Infrastructure and Transport, 2012

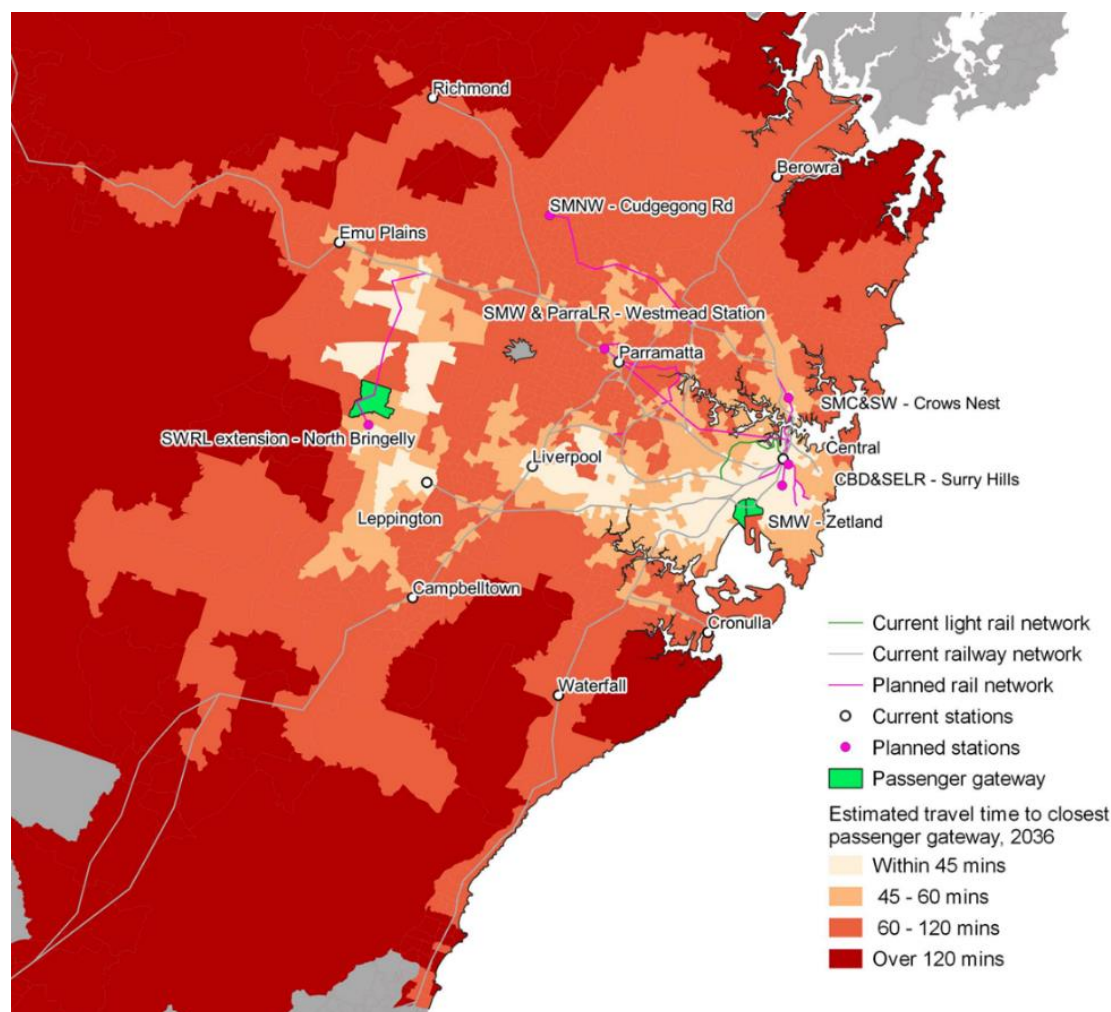
Figure 39. Change in access to closest passenger gateways, 2016 – 2036 (CAGR %)



Note: Access to Western Sydney Airport is assumed to be from 2036. The origin is defined as any travel zone in the Sydney study area. The destination is defined as any travel zone with a passenger gateway in Sydney. The 'closest' passenger gateway travel zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 40. Access to closest passenger gateways by travel zone, 2036



Note: Access to Western Sydney Airport is assumed to be from 2036. The origin is defined as any travel zone in the Sydney study area. The destination is defined as any travel zone with a passenger gateway in Sydney. The 'closest' passenger gateway zone is identified with reference to travel time by public transport, rather than distance. Public transport travel time has been forecast by STM model for the AM 2-hour period for origin-destination pairs.

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 39 illustrates that the South-West Rail Line Extension, servicing the opening of the Western Sydney Airport by 2036, will improve access times to the surrounding areas in the west and south west.

Figure 40 shows that improvements in travel times in most travel zones between 2016 and 2036 result in the majority of travel zones have access times between 60 and 120 minutes to a passenger gateway. In 2036, the forecast 45 minute catchment area by public transport to passenger gateways remains limited.

7.2.5 *Growth in dwelling density in the rail corridor 2016 to 2036*

Housing density is measured as the number of occupied private dwellings per hectare within each transport zone in Sydney. Dwelling density creates economic benefits through:

- increased efficiency in use of scarce land resources
- increased population density per hectare (which may increase the viability of light or heavy rail services)
- reduced length of the transport network required to serve a given population.

Transport investments that improve an area's accessibility can be a catalyst for dwelling densification as the amenity improves and demand for dwellings increase in that area.

Conversely, increased dwelling density can be a catalyst for transport investment when a critical mass is achieved for investment such as light or heavy rail. Dwelling density is a performance metric for the effectiveness of the transport network. It provides an indicator of liveability and housing supply.

Greater Sydney's urban form has changed overtime. The Greater Sydney Commission reports that in 2016, density increased across the urban area. According to the land use forecasts, by 2036 there will be increased intensity of development within existing centres and the existing urban areas, with little change in the outward spread.⁴⁸

This forecast is captured in Table 23, which details the growth in household density in Greater Sydney, in aggregate, and in/out of the rail corridor.

Table 23. Growth in household density in Greater Sydney

		2016	2036
Count of households	Total	1,697,181	2,470,078
	Inside the rail corridor	827,432	1,400,691
	Outside the rail corridor	869,749	1,069,386
Household density per hectare	Total	1.4	2.1
	Inside the rail corridor	5.6	8.7
	Outside the rail corridor	0.8	1.0
Change in household density (CAGR*)	Total	n/a	1.9%
	Inside the rail corridor	n/a	2.2%
	Outside the rail corridor	n/a	1.1%

*CAGR calculation over twenty year period i.e. from 2016 to 2036. Household data defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019.

Note: Area inside rail catchment defined as any travel zone that falls (either partially or wholly) within an 800m radius around a current or proposed tram or rail station in Melbourne. Area outside rail catchment is defined as all travel zones that lie wholly outside an 800m radius around a station in Melbourne.

Table 23 shows that there is an estimated 1.9 per cent growth rate in dwellings annually over the next 20 years. Density within the rail corridor is expected to grow significantly higher than the density outside the rail corridor – to 8.7 households per hectare inside, versus 1.0 outside.

⁴⁸ Greater Sydney Commission, *Greater Sydney Region Plan – A Metropolis of Three Cities*, updated 2018

While household density is forecast to increase, especially inside the rail corridor, the average persons per household is forecast to decrease. This is in line with the historical trend of the last 20 years, where household numbers have increased faster than the total population. Specifically, the overall average household size in Greater Sydney between 2016 and 2036 is forecasted to reduce from 2.84 to 2.66.⁴⁹ Key factors driving this trend include:

- the older age structure projected in the future contributing to an increased proportion of one- and two- person households in Sydney
- an increase in the propensity of persons of most ages to live alone
- a decrease in the proportion of children and increase in the number of sole parent families.

7.2.6 Providing rail services with reference to SEIFA

SEIFA is a score of relative advantage and disadvantage, used as a proxy for Socio-Economic Status, which is reported in deciles. As the deciles increase, the relative advantage increases, i.e. a SEIFA decile of 80 to 100 per cent indicates the highest relative advantage. The deciles applied are relative to national SEIFA scores and relate to the distribution calculated in 2016 from census data.⁵⁰

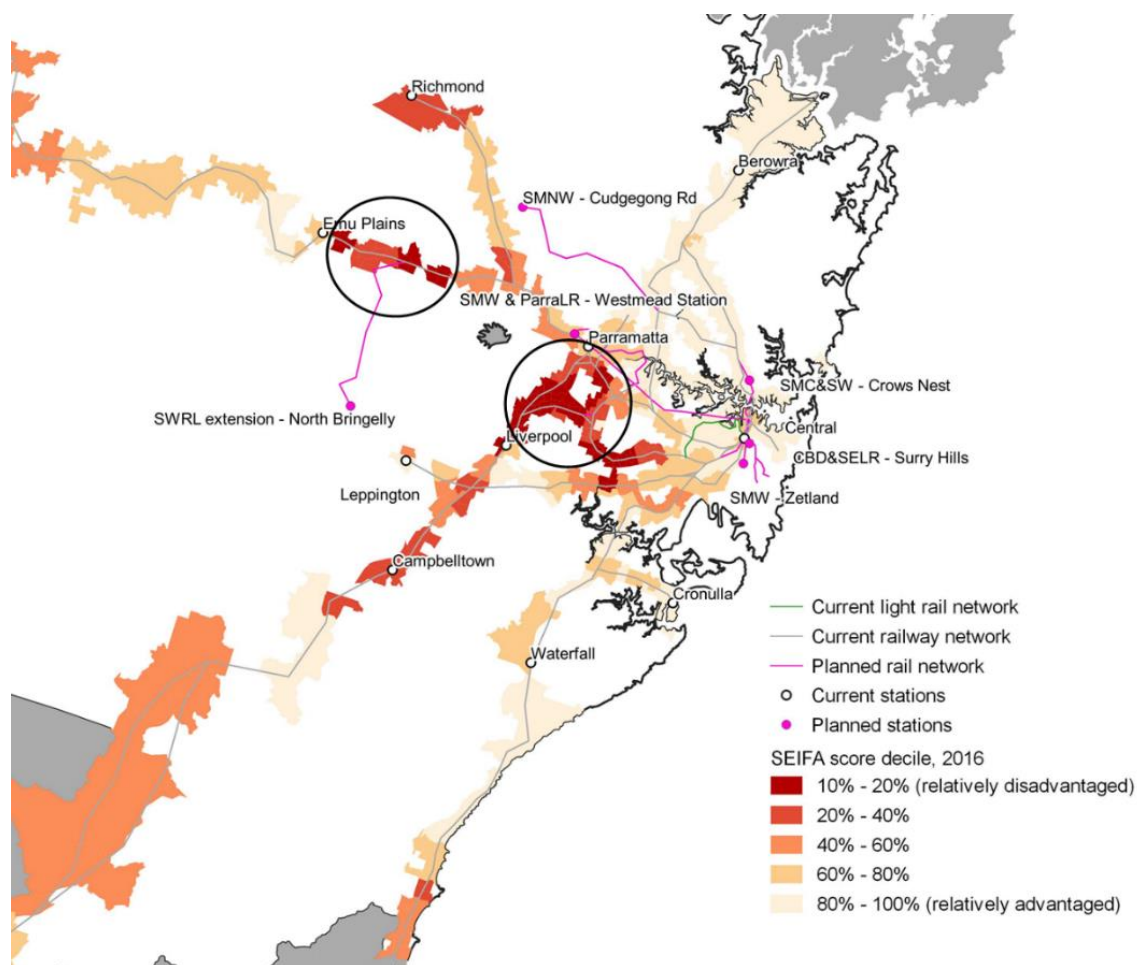
Socio-Economic Indexes For Areas (SEIFA) score within rail corridor

Figure 41 overlays the areas in the walkable catchment from rail stations with 2016 SEIFA deciles.

⁴⁹ Total population divided by total occupied private dwellings. Household data defined by TZ in TZP2016 v1.5 received from TfNSW 05-04-2019.

⁵⁰ Due to the complex factors that determine SEIFA scores, the 2036 distribution of these has not been forecast.

Figure 41. 2016 SEIFA deciles overlaid on the rail catchment for the study area



Note: this figure shows the 2016 Socio-Economic Indexes for Areas (SEIFA) deciles. SEIFA is a measure of relative advantage and disadvantage developed by the ABS using Census results and reported at the ABS statistical area level 2 (SA2). Travel zones within the rail catchment have been assigned the SEIFA decile of the SA2 they fall within.

Source: Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

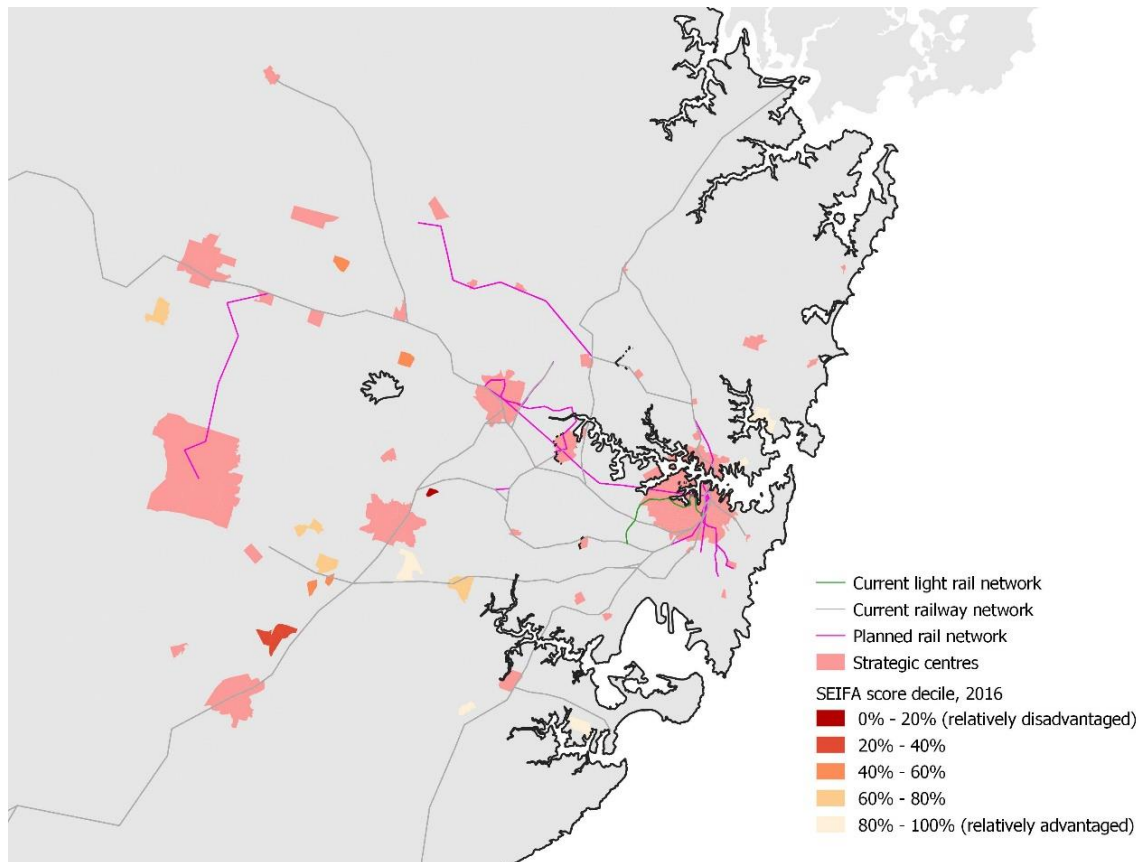
Figure 41 shows a diversity of relative advantage and disadvantages in the rail corridor, with a current concentration of relative disadvantage around the rail corridor in Liverpool and Cabramatta, through to Bankstown and Canterbury, and also Penrith to Emu Plains. For this area of relative disadvantage in the west central district, there does not appear to be a current increased advantage to living in areas in walkable catchment of the rail line and areas outside of this catchment.

Figure 41 also highlights two areas of current relative disadvantage where access to strategic centres improves between 2016 and 2036, as illustrated in Figure 32. The uplift in access may have the potential to improve the relative disadvantage of populations in these areas.

SEIFA scores in areas with high population density and low employment accessibility (45 minutes or more to nearest strategic centre), 2036

Figure 42 illustrates 2016 SEIFA deciles overlaid on travel zones that in 2036 are forecast to have a population density of greater than 30 people per hectare, and have travel times of greater than 45 minutes to a strategic centre.

Figure 42. 2016 SEIFA deciles overlaid on travel zones where the population density is greater than 30 people per hectare and travel time to a strategic centre is greater than 45 minutes in 2036



Note: this figure shows the 2016 Socio-Economic Indexes for Areas (SEIFA) deciles. SEIFA is a measure of relative advantage and disadvantage developed by the ABS using Census results and reported at the ABS statistical area level 2 (SA2). Travel zones within the rail catchment have been assigned the SEIFA decile of the SA2 they fall within.

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

As Figure 42 shows, by 2036, there is no clear pattern in the overlay of 2016 SEIFA deciles on areas meeting population density thresholds that do have access to a strategic centre in 45 minutes. This captures the improvements to access forecast for the Liverpool and Cabramatta, through to Bankstown and Canterbury, and also Penrith to Emu Plains areas highlighted in Figure 41. It also captures the widespread improvement in access to strategic centres in 45 minutes discussed in section 7.2.2.

7.2.7 *Number of Origin-Destination pairs connected within 45 minutes*

Improved connectivity is a key objective of Sydney's plan. The Future Transport 2056 Strategy details the importance of optimising the network and better using existing infrastructure, such as improving inland connectivity to the future international airport in Western Sydney.

Table 24 shows the number of origin-destination pairs connected within 45 minutes. It demonstrates that connectivity of travel zones in Sydney is forecast to grow 4.4 per cent over the next 20 years. This increase amounts to 124,649 more origin-destination pairs that are accessible within 45 minutes.

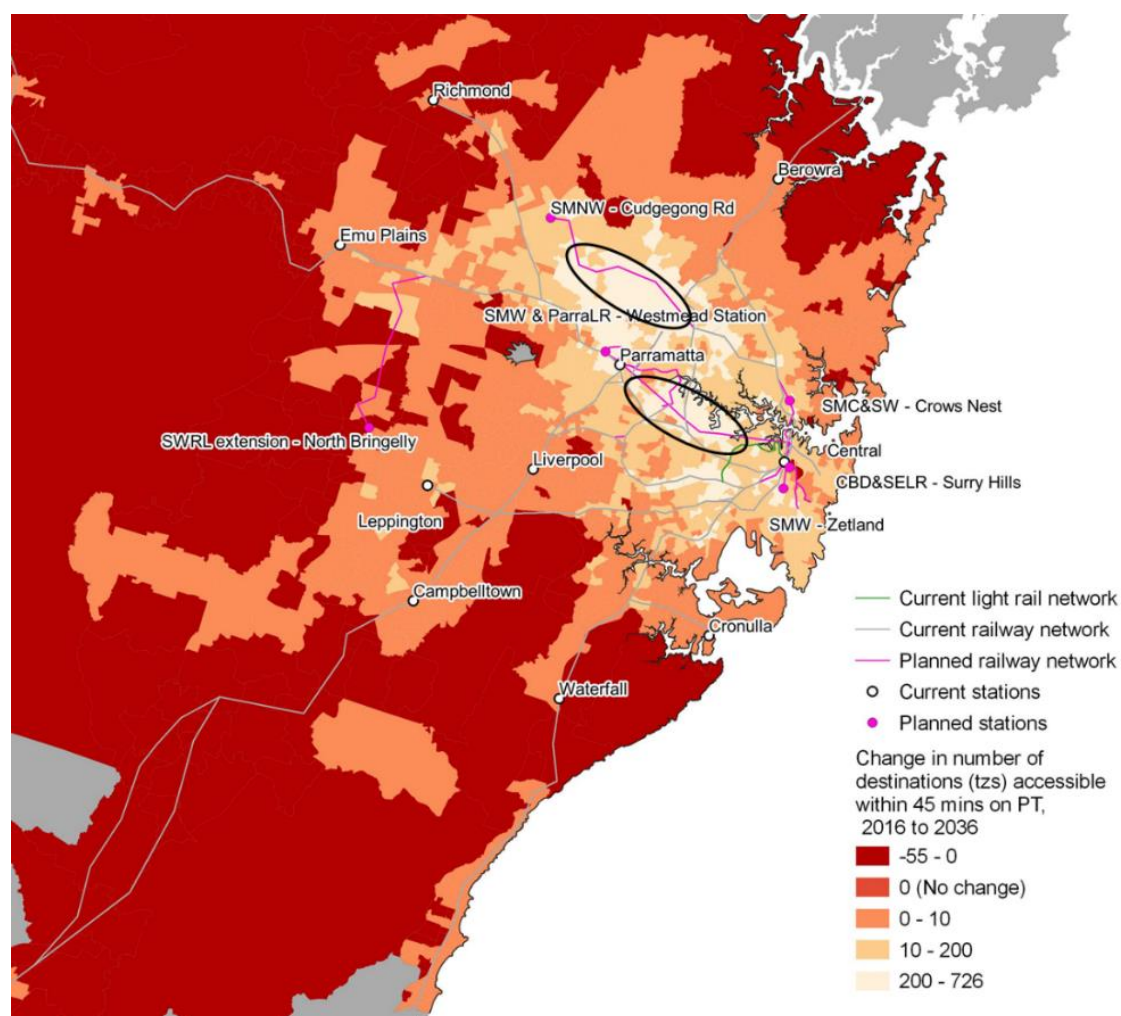
Table 24. Number of OD pairs (travel zones) connected within 45 minutes

	2016	2036
Count of OD pairs connected within 45 mins	167,354	292,003
% of all OD pairs connected within 45 mins	5.8%	10.2%

Note: OD pair is classified as an origin travel zone to a destination travel zone (rather than from individual stops or stations).

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019.

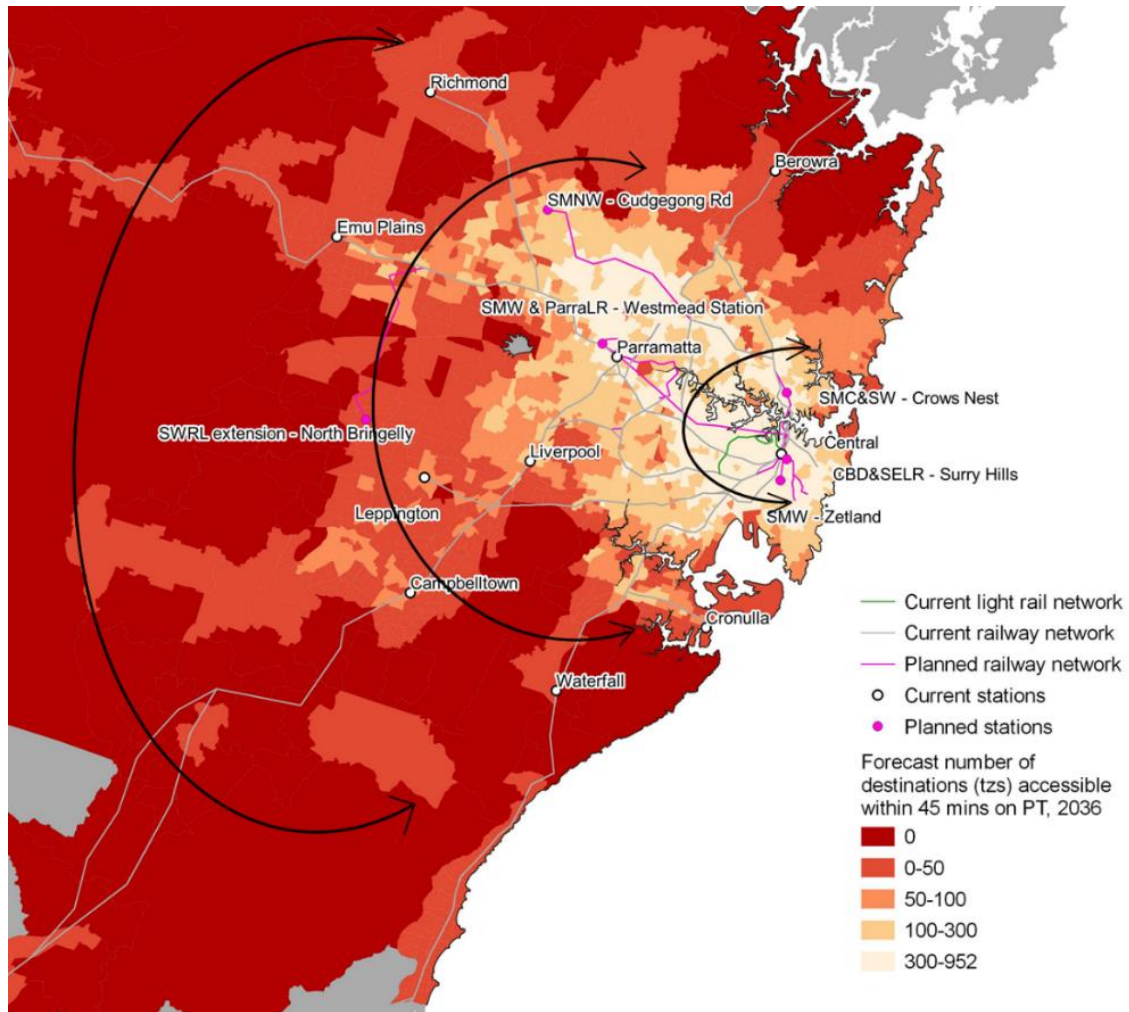
Figure 43 visualises the difference in the number of pairs connected between 2016 and 2036, while Figure 44 illustrates the number of destination pairs accessible with 45 minutes.

Figure 43. Change in number of destinations (travel zones) accessible within 45 minutes on public transport, 2016 to 2036

Note: OD pair is classified as an origin travel zone to a destination travel zone (rather than from individual stops or stations).

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 44 Number of destinations (travel zones) accessible within 45 mins on public transport, 2036



Note: OD pair is classified as an origin travel zone to a destination travel zone (rather than from individual stops or stations).

Source: Generalised journey time by OD pairs in AM peak period, received from TfNSW 12-03-2019. Map prepared by PwC using QGIS open source software. Shapefiles provided by TfNSW.

Figure 43 shows the change in the connectivity of origin-destination pairs between 2016 and 2036. It evidences a clear improvement around the Sydney Metro North-West and Sydney Metro West corridors.

Figure 44 shows the absolute number of destinations accessible from a given travel zone in 2036. It demonstrates a radial pattern of connectivity, where travel zones in the CBD have the greatest connectivity. This reduces the further out from the CBD, with zero or little access to another destination in the outer rings.

8 Conclusion

This section outlines key insights from the review, including:

- the level of alignment identified between the land use and transport plans
- network delivery against objectives
- recommendations to close data gaps of which the study's analysis is incomplete and / or not current.

8.1 *Alignment of current endorsed land use and transport plans*

NSW land use and transport plans are aligned as evidenced by consistency in vision, inputs, target outcomes, geographic focus and projects

The approach tested internal alignment of land use and transport plans across five dimensions, finding alignment:

1. **Aligned vision and objectives across plans:** in-scope plans consistently reflect the strategic direction for the Greater Sydney region set by the GSC in *Directions for a Greater Sydney 2017-2056*^{51,52}, which in turn is aligned with state government planning objectives assessed in this report
2. **Alignment on targeted outcomes:** All in-scope plans target a movement from a monocentric city with a radial transport network to the central CBD, to a polycentric city or 'metropolis of three cities'. The aspiration is that this metropolis will contain a connected network of cities and centres accessible to the population within 30-minute catchments, supported by investment in transport corridors. Transport and land use plans consistently reference the same cities and centres, and target the same corridors for access to deliver on this aspiration.
3. **Integration of land use and transport planning:** land use and transport plans use the same population and employment forecasts for strategic direction – the three cities forecast
4. **Reference to projects is consistent across the plans:** 20 major transport projects are consistently referenced across the plans, including Sydney Metro projects, links to Western Sydney Airport and the Aerotropolis (Leppington, Parramatta), light rail investment and freight investments (Outer Sydney Orbital, Western, Southern and Northern Sydney freight lines).
5. **The in scope plans are aligned in the focus on Western Sydney activation:** All transport and land use plans have an aligned focus on catalysing the development of the Western Parkland City over the next 20 to 40 years. They do this by enabling the commitments in the Western Sydney City Deal through transport investment and land use.

⁵¹ The Draft Freight and Ports Plan does not state this vision as it is a people-based vision less applicable to freight. However, it does clearly state and show its alignment with the *Future Transport Strategy 2056*.

⁵² For detail of the 10 directions, see section 12.2.

NSW land use and transport plans are aligned to a vision for Sydney that address Australian Government objectives of productivity growth, access to jobs and services, liveability and public amenity, increased housing supply

The primary aim of the plans is to re-shape Sydney into a metropolis of three cities targeting access within 30 minutes to jobs and services, delivering the necessary infrastructure investment and land use changes to support the transition. This includes integrating catalytic investment like the WSA.

From a transport plan perspective, investment is intended to develop Sydney as a ‘metropolis of three cities’, where people can access the jobs, education and services they need within 30 minutes by public or active transport, improving liveability. This allows transport to be an enabler of economic and social activity, and contribute to long term economic, social and environmental outcomes.

To deliver this the plans have the following rail network investment focus on each city:

- **Eastern Harbour City** – reducing congestion and crowding on train networks, and providing more connectivity, particularly in the South-East
- **Central River City** – improving radial connectivity to Greater Parramatta, so enable the Central River City to ultimately become the centre of Greater Sydney’s transport network
- **Western Parkland City** – investment to create a new city and reduce high car dependency, with a focus on city-shaping north-south rail connections within the city, as well as east-west connections to the other cities.

From a land use plan perspective, the focus on three cities will respond to forecast population and employment growth by enabling densification of population and employment in under-developed centres and urban renewal. This will address both housing supply and create the density required to support mass transit. The hierarchy of plan centres has been designed to integrate with the proposed transport investment.

8.2 Network delivery against objectives

Access to economic and social opportunity is forecast to strengthen by 2036, supporting objectives for economic growth and liveability

Access is measured as the travel time to the nearest strategic centre, as defined in land use planning, is used as well as access to key education and health services. The STM and land use outputs show broad improvement in the proportion of the population within 45 minutes of:

- **Strategic centres** – forecast to grow to ~89 per cent in 2036, from ~80 per cent in 2016
- **Major hospitals (>200 beds)** – forecast to grow to ~70 per cent in 2036, with clear time savings near rail network expansions, up from ~50.5 per cent in 2016
- **Universities** – by 2036 is access as a share is forecast reach ~52 per cent, up from ~37% in 2016
- **Transport gateways** – forecast growth to 18 per cent in 2036 from a base of ~12 per cent, noting that the strongest expansion in travel time savings is the share of the population moving into the 60-120 minutes band from over 120 minutes

Employment and housing densification in the rail corridor supports objectives for economic growth, liveability and housing supply

There are a number of objectives regarding the densification of employment and housing supply in the rail corridors which appear to be supported by the current endorsed plans. These include:

- **Increasing the share of employment in the rail corridor** – The proportion of employed workers within the rail corridor is forecast to increase by 1.9 per cent each year between 2016 and 2036. This amounts to an average employment density of 15.29 employees per hectare inside the rail corridor in 2036, compared to 0.97 employees per hectare outside the rail corridor.
- **Increasing housing supply in the rail corridor** – Housing supply is forecast to grow at a higher rate within the rail corridor relative to outside the corridor. Dwelling density within the rail corridor is forecast at 8.7 dwellings per hectare in 2036 inside the rail corridor, compared to 5.6 dwellings per hectare outside (in 2016, these figures are 1.0 and 0.8 dwelling per hectare respectively).
- **Improving access to strategic centres** – Accessibility to strategic centres is forecast to improve over time inside the rail corridor, with the majority of travel times falling or remaining static between 2016 and 2036. As a result, there are expected to be productivity gains arising from travel time savings, agglomeration benefits and labour market deepening.

The planned rail network is supporting population growth projections

New / planned rail networks such as Sydney Metro West and the South West Rail Link Extension Corridor will provide rail services to the areas in the west, which are forecast to experience the highest population growth.

For the study area as a whole, the study demonstrates that 54 per cent of the population will be located inside the rail corridor in 2036, compared to 47 per cent in 2016. Additionally, the majority of all densely populated areas will have access to a strategic centre within 45 minutes by public transport in 2036.

8.3 Recommendation for next steps

Closing data gaps will help create a more robust analysis

The current analysis focuses on the public transport network and viability of railway and light rail services. However, further analysis would need to be performed to consider the benefits of rail compared to road investment. Additionally, alternative modes of transport would also need to be assessed as part of an integrated transport network.

In addition, both data from the STM and land use forecasts are currently distributed by 2011 travel zone geography. The latest geography (TZ16), involved a redesign that moved zone boundaries, split and combined zones. Updating the STM and land use data to align to the latest zoning system will allow for a more detailed analysis of transport networks and travel behaviour at the travel zone level, and also align with the latest ABS population census data.

Sharing access and SIEFA implications with relevant stakeholders

The analysis identifies that select travel zones in central and western Sydney forecast to experience uplift in access to employment and social opportunity are currently home to relatively disadvantaged populations as assessed by the ABS's SEIFA index.

As access times improve with planned and future investment in the network, the areas with a relatively disadvantaged population may experience displacement from these areas or uplift from the benefits of access improvements.

There may be potential to investigate a cross-state government agencies approach to socially inclusive growth in these areas, including relevant bodies, such as the Greater Sydney Commission. Knowledge sharing and collaboration across agencies would better support the planning and development of the State, including the alignment of land use and transport plans.

Extending planned networks in STM analysis

In line with the investments in Future Transport Strategy 2056, there may be scope to include more network initiatives as inputs into the STM, noting that the strategy prioritises initiatives as committed (0-10 years), for investigation (up to 20 years) and visionary (over 20 years).

The inclusion of more initiatives would provide a better understanding of where the future areas or growth patterns will occur.

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Appendix A Detail of rail projects

This section presents a list of projects understood to be under consideration for Sydney and a brief description and status for each (taken directly from the *Greater Sydney Services and Infrastructure Plan*, *Draft NSW Freight and Ports Plan*, *Building Momentum: State Infrastructure Strategy 2018-2038* or *Budget Paper #2: Infrastructure Statement – 2018-19 State Infrastructure Plan*), ordered as per Table 10. The projects are drawn from all in-scope reports and aligned to regions detailed in Section 5.1.

Table 25. Projects identified from in scope plans for NSW

Project	Description	District	Status	Timing
East-west public transport between Mona Vale and Macquarie Park	East-west public transport connection from Mona Vale to Macquarie Park. Investigate a transport corridor from Mona Vale to Macquarie Park along the A3 corridor. Benefit: Support the efficiency and reliability of passenger journeys west from the Northern Beaches, and improve 30 minute access to key employment centres by enabling customers to use rapid, high frequency buses, as opposed to lower frequency suburban services.	North	0-10 For Investigation	Unknown
Extension of South East mass transit/train link to Miranda	Bifurcation of the potential mass transit/train link to South East at Randwick. The mass transit/ train link would then extend to Sydney Airport, Kogarah and (via the Sandringham Peninsula) to Miranda. Benefit: Support reliable 30 minute access by public transport for customers in southern Sydney by addressing capacity constraints on the existing train line and connecting new parts of the area by mass transit/ train, including the Sandringham Peninsula.	Eastern City, South	20+ Visionary	Unknown
Higher frequency public transport services on selected corridors	Introduction of higher frequency public transport services on selected corridors across Greater Sydney. Increase in service frequencies on selected train lines and bus services to address capacity constraints or as part of new infrastructure (e.g., Sydney Metro). Benefit: This initiative will deliver benefits across the network by reducing congestion in peak times, increasing the resiliency of the network, and providing safer, more reliable journeys.	All	0-10 Committed	Unknown
Higher frequency transport services across Greater Sydney (0-10 yr)	<p>Introduction of higher frequency transport services across Greater Sydney:</p> <ul style="list-style-type: none"> • Turn-up-and-go services (<5 minute frequencies) on city-shaping and city-serving corridors • High frequency (<10 mins) or on-demand services on centre-serving corridors. <p>This increase in service frequencies on selected train lines and bus services supports the vision for Greater Sydney as a '30 minute city'. Benefit: Improve the efficiency and reliability of journeys across the transport network by encouraging greater public transport use, and boost 30 minute access to centres through more frequent services.</p>	All	0-10 For Investigation	Unknown

Project	Description	District	Status	Timing
Corridor Preservation for Higher Speed Connections	Confirm and begin the preservation of a corridor, based on the corridor set out in the Australian Government's High Speed Rail Study Phase 2, for a high speed rail link between Melbourne, Sydney and Brisbane. Benefit: Enable a future high speed connection to be delivered more affordably by minimising the risk of future land acquisitions being required, and providing greater clarity of land use for the community to enable them to make more informed decisions when purchasing land.	North, Eastern City, South, Outer Metro	10-20 For Investigation	Unknown
Investment in Higher Speed Connection along East Coast	Investment in higher speed connection along East Coast. Deliver a high speed transport connection along the East Coast of NSW (traversing Greater Sydney). Benefit: Future connectivity between Western Sydney and Central Coast, Newcastle and Canberra, providing cross-border connections and connecting Sydney, Global Gateway Cities and Regional Cities	North, Eastern City, South, Outer Metro	20+ Visionary	Unknown
Improved services on the Richmond Line	A corridor investigation for improved services, including potential duplication of Richmond Line to Riverstone, Vineyard, Marsden Park, North West Priority Growth Area. Benefit: Support improved reliability, capacity, and journey times on the Richmond Line.	Western City, Central City	0-10 For Investigation	Unknown
Leppington to WSA-Badgerys Creek Aerotropolis Rail Link	Potential extension of the South West Rail Link from Leppington to the metropolitan centre of WSA-Badgerys Creek, providing access to WSA via an interchange with the north-south train link. Benefit: Provide efficient and reliable access to WSA for customers to the east. strategic modelling indicates this project would reduce the AM peak public transport travel time between Liverpool and WSA from approximately 68 minutes to 36 minutes, and support a sustainable urban form in the Western City by providing an additional east-west train link that supports convenient access to centres by public transport. This project has been listed for priority planning in collaboration with the Australian Government.	Western City	0-10 For Investigation	Unknown
Mass transit/train link to South East	Mass transit/train link from the Harbour CBD to Malabar via Randwick and Eastgardens-Maroubra Junction. Benefit: Support urban renewal and growth in the south-east, including around Malabar, by providing a high-capacity mass transit/train link, reduce the AM peak public transport travel time between Maroubra Junction and the Sydney CBD, and address potential longer-term capacity constraints by providing an additional mass transit link to the south and south-east of the Harbour CBD.	Eastern City	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
More Trains More Services program	<p>Called SmartRail program by iNSW. A series of network-wide investments that will deliver additional capacity, reduce the complexity of rail operations and better connect the network. The program will transform the rail network by utilising technology to enable automated high-capacity turn-up-and-go services. The first three stages should be delivered over the next 10 years, with targeted investments to remove bottlenecks, automate train control, improve signalling systems and capitalise on the benefits of new rolling stock and infrastructure.</p> <p>Stage 1 would deliver extra capacity across the network by upgrading rail infrastructure to unlock capacity in central Sydney. It includes the development of new automated systems to cost-effectively improve train control. Stage 1 would deliver capacity upgrades on the T4 Eastern Suburbs and Illawarra line and the T8 Airport line.</p> <p>Stage 2 would continue to upgrade the T4 Eastern Suburbs and Illawarra line and improve the T8 Airport line, providing an uplift of capacity, as well as delivering further upgrades in central Sydney to provide a network-wide benefit. Stages 1 and 2 include the deployment of new suburban trains and coincide with the introduction of the New Intercity Fleet, further improving services across the network.</p> <p>Stage 3 would complete the reconfiguration of the network in central Sydney, deploying automation and providing the transformative programs needed to separate inner urban and intercity services on the T1 Western and Northern line and the T4 Eastern Suburbs and Illawarra line.</p> <p>The State Infrastructure Strategy Update 2014 allocated \$1 billion towards the More Trains More Services program, and SmartRail should continue to be a priority for funding to ensure that existing rail assets are used to their full potential. Infrastructure NSW recommends that Transport for NSW complete business cases for Stage 1 and Stage 2 of the SmartRail program by the end of 2018 and 2019 respectively to enable progressive delivery of this program as a priority to provide capacity needed beyond 2021.</p> <p>This program includes Rebuilding NSW funding contributions, and has been funded \$648.2 million (2018-19).</p>	All	0-10 Committed	Unknown
New Intercity Fleet	<p>A new fleet of long distance, intercity trains from Sydney to the Central Coast, Newcastle, the Blue Mountains and the South Coast. The new intercity trains will provide improved accessibility including priority seating, wheelchair and luggage spaces, and charging stations. Overall, these investments will make journeys by train faster, safer, more accessible, and more reliable.</p> <p>The program has been funded \$495.7 million (2018-19).</p>	All	0-10 Committed	Late 2019 to 2021
New services on key routes (0-10 yr)	<p>Shorter term project: As new transport links are delivered, services will be reconfigured so that they provide faster access and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections.</p>	All	0-10 For Investigation	Unknown
New services on key routes (10-20 yr)	<p>Longer term project: As new transport links are delivered, services will be reconfigured so that they provide faster access and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections.</p>	All	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
North-south Rail Link in Western Parkland City: Cudgegong Road – St Marys	The north-south rail link is a rail train link for the Western City linking the growth areas in the Northwest and Southwest with WSA-Badgerys Creek Aerotropolis. This stage will connect the existing Sydney Metro Northwest terminus at Cudgegong Road to St Marys on the Western Line. ⁵³ Benefit: Provide 30 minute access to growth areas in the north west, and provide efficient and reliable access by train to Greater Parramatta, Penrith and other centres on the train network via an interchange at St Marys. This project has been listed for priority planning in collaboration with the Australian Government.	Western City, Central City	0-10 For Investigation	Unknown
North-south Rail Link in Western Parkland City: St Marys – WSA-Badgerys Creek Aerotropolis	<p>The north-south rail link is a new rail link for the Western City linking the growth areas in the Northwest and Southwest with WSA-Badgerys Creek Aerotropolis. This stage will connect St Marys with the WSA Badgerys Creek Aerotropolis. Benefit: Provide 30 minute access to WSA-Badgerys Creek Aerotropolis along the north-south spine of the Western City, including for customers in suburbs north of WSA-Badgerys Creek Aerotropolis, St Marys and Schofields.</p> <p>This project is subject to Final Business Case and funding in collaboration with the Australian Government. The commitment is part of the Western Sydney City Deal – a 20 year agreement between the three levels of government to deliver a vision for Western Sydney as part of an integrated planning and city-shaping approach. As a first step, the Australian and NSW Governments will each contribute up to \$50 million towards a business case process for Western Sydney Rail, in consultation with local government. The Australian and NSW Governments will be equal partners in funding the first stage of the North South Rail Link and have a shared objective to connect rail to Western Sydney Airport in time for opening in 2026, informed by the business case.</p> <p>This project has been funded \$35.0 million (a 2018-19 commitment by the Commonwealth)⁵⁴ for planning and the final business case for the North-South Rail Stage 1 to service the new Western Sydney Airport. This is part of a joint funding commitment of \$100.0 million between the Commonwealth and NSW Governments through the Western Sydney City deal.</p> <p>Infrastructure NSW stated that ‘While mass transit is not a near-term priority, the first phase should incorporate a connection from the T1 Western Line to Western Sydney Airport and the adjacent new CBD for the Western Parkland City. As this is developed, opportunities to advance the second stage to extend south from Western Sydney Airport to Campbelltown-Macarthur through intergovernmental partnerships should be considered. In the longer term, further development of the mass transit network could explore potential connections from centres including Leppington and Campbelltown-Macarthur and beyond’. (p.147)</p>	Western City	0-10 Committed	Objective to open in 2026

⁵³ PwC has been advised that the northern line of the North-South Rail Link will extend to Schofields, and Sydney Metro Northwest will also extend to Schofields from Cudgegong Road, to make a three-way interchange.

⁵⁴ PwC has been advised that NSW is likely to match the Commonwealth funding for 2018-19, pending actual spending.

Project	Description	District	Status	Timing
North-south Rail Link in Western Parkland City: WSA-Badgerys Creek Aerotropolis – Campbelltown-Macarthur	The north-south rail link is a new train link for the Western City linking the growth areas in the Northwest and Southwest with WSA-Badgerys Creek Aerotropolis. This stage will extend from WSA-Badgerys Creek Aerotropolis to Campbelltown-Macarthur. Benefit: Provide 30 minute access to WSA-Badgerys Creek Aerotropolis from Campbelltown-Macarthur and surrounding suburbs, improving access to jobs and services for customers in this area and shape a sustainable urban form in the Western City by providing a mass transit spine to attract sustainable development and minimise sprawl. This project has been listed for priority planning in collaboration with the Australian Government.	Western City	0-10 For Investigation	Unknown
Parramatta to Epping mass transit / train link	A mass transit / train link between Greater Parramatta and Epping via Carlingford to be considered as part of a Parramatta to Epping corridor study. Benefit: This would extend 30 minute access to Greater Parramatta to a significant number of suburbs on the train network, especially for customers from centres such as Rouse Hill, Hornsby, Epping and Macquarie Park. This would also improve the resilience of the train network by providing a new north-south train link in Greater Sydney that does not traverse the Harbour CBD and better spreading demand away from the busiest corridors in the Eastern City.	Central City	10-20 For Investigation	Unknown
Parramatta to Kogarah mass transit / train link	A mass transit / train link from Greater Parramatta to Kogarah via Bankstown. Benefit: Extend 30 minute access to Greater Parramatta to a significant number of suburbs on the train network by unlocking network benefits, improve the resilience of the train network by providing a new north-south train/mass transit link in Greater Sydney that does not traverse the Harbour CBD and better spreading demand away from the busiest corridors in the Eastern City.	Central City, South	10-20 For Investigation	Unknown
Parramatta to Norwest mass transit/ train link	A mass transit/ train link from Greater Parramatta to Norwest; preferred station locations TBC. Could potentially be connected to the proposed mass transit/ train link to Kogarah to from a north-south link through Parramatta. Benefit: Travel time analysis suggests that this project would dramatically improve travel times between Norwest Business Park and Parramatta, providing 30 minute access to Greater Parramatta from Rouse Hill and surrounding centres in the Hills area. This project would also alleviate longer-term capacity pressures on Sydney Metro Northwest (west of Epping) by providing a more direct link between the Hills area and Greater Parramatta (rather than via Epping).	Central City	20+ Visionary	Unknown
Passenger train improvements to support growth at Wilton	Suburban passenger train improvements south of Macarthur (including consideration of passenger services to support growth at Wilton). A program of operational, fleet and targeted fixed infrastructure improvements (for example, electrification and new deviations to eliminate curvatures and flatten grades) to facilitate improved service frequencies to support Wilton Growth Area. Benefit: This will improve rail travel times, and connectivity to support Wilton Growth Area.	Western City, Outer Metro	0-10 For Investigation	Unknown
Public transport passenger service improvements	Infrastructure upgrade (including passenger information, CCTV, platform upgrades) to ensure that public transport assets meet required safety, performance and operational standards, meet designated customer amenity standards and are reliable and sustainable. Benefit: Stations that are accessible to people with a disability, limited mobility and parents with prams; modern buildings and facilities for all modes that meet the needs of a growing population; and modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers.	All	0-10 Committed	Unknown

Project	Description	District	Status	Timing
Service changes to connect to new train lines (0-10 yr)	Shorter term: Service changes to connect to new train lines. As new train links are delivered, bus services will be reconfigured so that they provide faster access to train lines and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections to train and higher-capacity transport links.	All	0-10 For Investigation	Unknown
Service changes to connect to new train lines (10-20 yr)	Longer term: Service changes to connect to new train lines. As new train links are delivered, bus services will be reconfigured so that they provide faster access to train lines and enable more people to access their nearest Metropolitan City Centre within 30 minutes. Benefit: Encouraging the take up of public transport by providing convenient and reliable connections to train and higher-capacity transport links.	All	10-20 For Investigation	Unknown
Sydney Growth Trains as part of More Trains, More Services program	Investment in the 'More Trains, More Services' program and Sydney Growth Trains to provide more frequent and express services on selected corridors. Sydney Growth Trains is the centrepiece of the More Trains, More Services program and will provide customers with more frequent and express services on selected corridors. Benefit: The new double deck trains will provide improved accessibility including priority seating, wheelchair spaces and hearing aid loops. Key features include improved air conditioning with advanced temperature control, high definition customer information screens to provide journey and safety information, and internal and external CCTV and customer help points. Overall, these investments will make journeys by train faster, safer, more accessible, and more reliable.	All	0-10 Committed	2019
Sydney Metro City and Southwest	Sydney Metro City and Southwest is second stage of Sydney Metro. It will deliver a fast, reliable metro service for the Eastern Harbour City, and will be fully segregated from the existing Sydney Trains network between Sydenham and Bankstown, improving the reliability of services on the line. The metro will provide additional rail capacity and stations to further reduce congestion in the Harbour CBD. A 30km extension of metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and south west to Bankstown. Benefit: Sydney Metro City & Southwest will deliver a fast, reliable metro service for the Eastern Harbour City, and will be fully segregated from the existing Sydney Trains network between Sydenham and Bankstown, improving the reliability of services on the line. The metro will provide additional rail capacity and stations to further reduce congestion in the Harbour CBD. This project has been funded \$1.9 billion (2018-19).	North, Eastern City, South	0-10 Committed	2024
Sydney Metro City & Southwest extension to Liverpool	Extension of Sydney Metro City and Southwest from Bankstown to Liverpool. Benefit: Provide a direct, high-frequency train connection between significant strategic centres in the Central and Western City, improving 30 minute access to jobs and services for customers living in surrounding suburbs, and extend efficient, reliable, high-frequency train access to the Harbour CBD for residents living in Liverpool and surrounding suburbs.	Western City, South	20+ Visionary	Unknown
Sydney Metro City & Southwest extension to Liverpool corridor protection	Corridor protection for the project, in the first instance.	Western City, South	Proposed	Unknown

Project	Description	District	Status	Timing
Sydney Metro Northwest	<p>Sydney Metro Northwest is the first stage of Sydney Metro. Sydney Metro Northwest will deliver a high-frequency, high capacity rail service between the growth areas in the Northwest and Chatswood with interchanges to the North Shore and Northern train lines. Benefits: Sydney Metro Northwest will deliver, for the first time, a reliable public transport service to a region which has the highest car ownership levels per household in NSW. It will reduce congestion on roads, and provide a modern turn-up-and-go service to the Eastern Harbour CBD.⁵⁵</p> <p>This project has been funded \$8.3 billion (2018-19) by the Commonwealth.</p>	North	0-10 Committed	2019; construction ongoing
Sydney Metro West	<p>A new underground metro railway under investigation to link the Parramatta and Sydney CBDs. Key precincts already identified to be serviced by Sydney Metro West include Parramatta, Sydney Olympic Park, The Bays Precinct and the Sydney CBD. Benefit: Sydney Metro West doubles the capacity of the currently overcrowded T1 Western Line and establishes future capacity for Sydney's fast growing west and the planned airport. Passengers will also enjoy faster travel times all the way from Penrith and Blacktown to the Eastern Harbour City. This project also delivers strong city-shaping outcomes along its proposed route. The project is subject to Final Business Case and funding.</p> <p>There is a \$3.0 billion Restart reservation for the Sydney Metro West. This funding, subject to the final business case and the requirements of the Restart Act (2011), will fund completion of project development and commencement of land acquisition, early works and tunnelling. The NSW Government will also invest \$28.1 million in 2018-19 to continue the planning and the final business case for this project.</p>	Central City, Eastern City	0-10 Committed	Unknown
Sydney - Canberra Faster Rail Improvement	A program of operational, fleet and targeted fixed infrastructure improvements south of Macarthur (for example, electrification and new deviations to eliminate curvatures and flatten grades). Benefit: This will improve rail travel times, services and facilities to enable increased capacity as well as connecting and developing greater economic synergies between Sydney and the Global City of Canberra as well as improve cross-border connections.	Western City, Outer Metro	0-10 For Investigation	Unknown
Sydney - Central Coast - Newcastle Faster Rail Improvement	A program of operational, fleet and targeted fixed infrastructure improvements (for example, new deviations to eliminate curvatures and flatten grades). This would include a new rail crossing of the Hawkesbury River. Benefit: Improved rail journey travel times and services and facilities to enable increased capacity. Will result in stronger connections and the development of greater economic synergies between Sydney and the Satellite City of Gosford and the Global Gateway City of Newcastle Assist in easing housing affordability pressure and provide a strategic connection between Sydney, the Satellite City of Gosford and the Global Gateway City of Newcastle.	North, Outer Metro	0-10 For Investigation	Unknown

⁵⁵ PwC has been advised there will be six stations in Sydney Metro West.

Project	Description	District	Status	Timing
Sydney - Wollongong Faster Rail Improvement	A program of operational, fleet and targeted fixed infrastructure improvements (for example, new deviations to eliminate curvatures and flatten grades). This would include a new rail crossing through the Illawarra Escarpment. Benefit: Improved rail travel times to provide a time and cost competitive freight corridor (when compared with road). Improved rail services and facilities to enable increased capacity. Connect and develop greater economic synergies between Sydney and the Satellite City of Wollongong and Sydney, supporting the easing of housing affordability pressure.	South, Outer Metro	0-10 For Investigation	Unknown
Train improvements as part of More Trains, More Services program	<p>A staged program of works delivering upgraded rail infrastructure, new trains and extra services across the suburban train network to address the growth in patronage forecast over the next 5 years. Train improvements on T1, T2, T4, T5, and T8 lines, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning) roll out of Advanced Train Control System to improve safety, capacity and reliability; upgrade of junctions to segment different lines on the network; additional tracks on some sections of existing corridors to boost capacity. Specific to each city:</p> <p>Eastern City: Train improvements on T8 Airport Line, T4 Illawarra Line (including South Coast Line) and T1 Western Line as part of the More Trains, More Services program, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning).</p> <p>Central City: Train improvements on T1 Western Line as part of the More Trains, More Services program, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning).</p> <p>Western City: Train improvements on T8 Airport Line, and T1 Western Line as part of the More Trains, More Services program, including implementation of modern Train Control and Signalling technology across the network (Digital Systems currently in planning).</p>	All	0-10 For Investigation	Unknown
Train/ mass transit link Macquarie Park to Hurstville via Rhodes	A potential mass transit/train link from Hurstville (or Kogarah) to Burwood and Strathfield and then potentially on to Rhodes and Macquarie Park. Benefit: This project would alleviate longer-term capacity pressures and improve the resiliency of the network by providing an additional north-south connection through Macquarie Park, Rhodes and Hurstville, enabling customers to transfer between Illawarra Line, East Hills Line, Metro Southwest-CBD, the Metro West, the Main West Line and the Northern Line.	Central City, Eastern City and South	20+ Visionary	Unknown
Upgrade to Blue Mountains Line	Station and track improvements along the rail corridor from west of Springwood Station to Lithgow Station to accommodate new and existing trains. Benefit: This project will deliver upgraded rail infrastructure allowing the complex network to operate at an even greater capacity, including better signalling systems, power supply upgrades and station improvements.	Western City, Outer Metro	0-10 Committed	mid-2020
WSA-Badgerys Creek Aerotropolis - Parramatta Rail Link	New rail link from Parramatta to WSA-Badgerys Creek Aerotropolis via Prairiewood to reduce journey times between these centres and the Harbour CBD. Benefit: Connect the three Metropolitan Centres with a high frequency, high capacity transport link, acting as the central east-west public transport spine for Greater Sydney, and boost 30 minute access to Greater Parramatta for residents living to the south-west of the centre. This project will be developed in collaboration with the Australian Government.	Western City, Central City	0-10 For Investigation	Unknown

Project	Description	District	Status	Timing
CBD & South East Light Rail	<p>A high-capacity and frequent service to improve access between the Sydney CBD and south-eastern suburbs. The 12km route extends from Circular Quay along George Street to Central Station, through Surry Hills to Moore Park, then to Kensington and Kingsford via Anzac Parade and Randwick via Alison Road and High Street. Benefits: The Light rail will provide reliable, efficient, turn-up-and-go public transport, with services every four minutes between CBD and Moore Park, and every eight minutes to and from Randwick and Kingsford between 7am and 7pm. A combined bus and light rail network will significantly improve public transport access to the Harbour CBD, major sporting and entertainment facilities at Moore Park and Randwick along with the University of NSW, TAFE and health precincts.</p> <p>This project has been funded \$2.1 billion (2018-19) - New light rail line extending from Circular Quay along George Street to Central Station then on to Moore Park, Kingsford and Randwick.</p>	Eastern City	0-10 Committed	2019
Light Rail Extension to Maroubra Junction	<p>Extension of the current CBD and South East Light Rail project to Maroubra Junction. Benefit: Support urban renewal and growth to the south of Kingsford with a mode of transport that supports street activation; enable future connectivity between CBD and South-east Light Rail and mass transit/train link to South East at Maroubra Junction. Benefit: This will improve access to key centres in the south-east, such as Randwick Health Precinct for customers living west of the Harbour CBD, and alleviate potential long-term capacity constraints on CBD and Southeast Light Rail by enabling customers to interchange between mass transit/train link and light rail at Maroubra Junction.</p>	Eastern City	10-20 For Investigation	Unknown
Light Rail to Bays Precinct	<p>A proposed loop from the existing Inner West Light Rail connecting the existing line at North Leichhardt and at Pyrmont via The Bays Precinct and Old Glebe Island Bridge. Benefit: Support urban renewal of the Bays Precinct with a mode of transport that supports street activation, provide efficient and reliable local access by public transport to the Bays Precinct for customers in the Inner West, alleviate potential long-term capacity constraints on the Inner West light rail line by spreading inbound demand from west of Lilyfield via two branches – either via Glebe or via the Bays Precinct, and enable interchange between Inner West Light Rail and Sydney Metro West at Bays Precinct, improving access to jobs and services for Inner West customers.</p>	Eastern City	10-20 For Investigation	Unknown
Parramatta Light Rail - Stage 1	<p>The first stage of Parramatta Light Rail will connect Westmead to Carlingford via Parramatta CBD and Camellia. The route will link Parramatta's CBD and train station to the Westmead Health precinct, Parramatta North Urban Transformation Program, the new Western Sydney Stadium, the Camellia Precinct, the new Powerhouse Museum and Riverside Theatres Cultural Hub, the private and social housing redevelopment at Telopea, Rosehill Gardens Racecourse and three Western Sydney University campuses. Benefit: Light rail will create new communities, connect great places and help both locals and visitors move around and explore what the region has to offer.</p> <p>This project has been funded \$258.0 million (2018-19).</p>	Central City	0-10 Committed	2023

Project	Description	District	Status	Timing
Parramatta Light Rail - Stage 2	<p>Stage 2 will connect to Stage 1 and run north of the Parramatta River through the rapidly developing suburbs of Ermington, Melrose Park and Wentworth Point to Sydney Olympic Park, providing a new public transport option to this booming sport, entertainment and employment hub. Benefit: Light rail will create new communities, connect great places and help both locals and visitors move around and explore what the region has to offer. This project is subject to Final Business Case and funding.</p> <p>Infrastructure NSW states that 'Improving connectivity to Sydney Olympic Park and the Wentworth Point peninsula will increase accessibility and help to cater for growth. The relative merit of Stage 2 as an investment priority should be considered once the business case is complete and the route, benefits and costs are clear.'</p> <p>This project has been funded \$20.0 million (2018-19) for planning.</p>	Central City	0-10 Committed	Unknown
Parramatta Light Rail extensions	Potential extensions of Parramatta Light Rail to be considered. Benefit: Improve the vibrancy and liveability of suburbs in and around Greater Parramatta by supporting the renewal of these areas with a high-quality on-street public transport mode.	Central City	10-20 For Investigation	Unknown
Access to Moorebank Intermodal Terminal	Development of a package of road upgrades to alleviate impacts from Moorebank Intermodal Terminal (MIT) and related regional traffic growth. Benefit: The terminal will boost productivity and improve transport links enabling import-export freight travelling through Sydney to and from Port Botany to be transported on rail instead of the road network, providing cheaper and more efficient freight transportation. It will support the intermodal terminal following operational start in late 2018 or early 2019. This project will be developed in collaboration with the Australian Government.	Western City	0-10 Committed	Unknown
Additional capacity on Southern Sydney Freight Line	Continued network improvements of the SSFL south of Liverpool to increase capacity. Benefit: Improve the efficiency and reliability of rail freight movements by better separating freight from passenger trains, and enable an increase in passenger train service frequency on the T5 Cumberland Line by opening up additional train paths to passenger trains. This project will be developed in in collaboration with the Australian Government.	Western City	10-20 For Investigation	Unknown
Address long term capacity constraints to Port Botany and South East	<p>Address long term capacity constraints to Port Botany and South East. Investigation of new train and road links to address longer-term capacity constraints on selected corridors.</p> <p>Note: This is different to <i>Future Transport Strategy 2056</i>'s reference of this project, which only identifies improved road connectivity, with no mention of rail.</p>	Eastern City	20+ Visionary	Unknown
Automation	Investigation of the potential for automation of freight movements between ports and inland terminals	All	20+ Visionary	Unknown
Completion of Maldon to Dombarton railway line	Complete the Maldon to Dombarton Railway, a 35-kilometre single-track rail line between the Main South Line at Maldon (in Wollondilly Shire) and Dombarton (near Port Kembla), in the Illawarra. Benefit: Enable higher passenger train service frequencies on the T4 Illawarra line by diverting rail freight movements between the Illawarra and Greater Sydney to the Maldon-Dombarton link, improve the efficiency and reliability of rail freight movements between the Illawarra, Greater Sydney and regions to the north and west of Sydney with a dedicated, more direct freight rail line, and support the potential future growth of container movements to and from Port Kembla by providing dedicated 24/7 freight rail access between the port and intermodal terminals in the west of Sydney.	Western City, Outer Metro	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
Duplication of Port Botany freight rail line	<p>Duplication of the line between Port Botany and Cooks River including construction of new track and duplication of three existing single track bridges (Robey Street, O’Riordan Street and Southern Cross Drive). Benefit: Support the growth, reliability and safety of container movements to and from Port Botany by enabling more goods to be reliably moved by rail between the port and intermodal terminals in Greater Sydney and regional NSW.</p> <p>The NSW Government is currently exploring potential partnerships and funding arrangements with the Australian Rail Track Corporation (ARTC), the Australian Government and the private sector to progress the duplication of the Port Botany rail line. This project will be developed in collaboration with the Australian Government.</p>	Eastern City	0-10 For Investigation	Unknown
Freight Innovation Projects (0-10 yr)	Shorter term: Investment in new technology and trials that deliver system integration, efficiencies and improved safety.	All	0-10 For Investigation	Unknown
Freight Innovation Projects (10-20 yr)	Longer term: Investment in new technology and trials that deliver system integration, efficiencies and improved safety.	All	10-20 For Investigation	Unknown
Freight Rail Capacity Enhancements	Providing additional or dedicated capacity for freight in the Southern Highlands, Illawarra and Main West rail lines.	All	10-20 For Investigation	Unknown
Freight Separation	Continuing to plan for the separation of freight from passenger tasks on key shared networks to optimise performance for both freight and passenger services.	All	20+ Visionary	Unknown
Freight Sustainability and Resilience: Continue Freight Noise Attenuation Plan	The Freight Noise Attenuation Program (FNAP) aims to minimise the impact of existing freight rail noise in homes and some sensitive use community buildings. Transport for NSW will reduce the impact of freight noise by installing noise-reducing treatments in eligible homes and buildings.	All	0-10 Committed	2028
Freight Sustainability and Resilience: Identify constraints	Identify constraints to the ongoing performance of freight networks due to a changing environment, and community expectations.	All	0-10 For Investigation	Unknown
Freight Technology Improvements	Identify and implement technology solutions to improve the efficiency of freight movements in Metropolitan areas, with a view to increasing the mode shift to rail over time.	All	0-10 For Investigation	Unknown
Metropolitan Rail Transfer Station	Support the development of an Intermodal terminal to handle bulk waste and recycling materials originating in the growing Sydney metropolis.	Eastern City	0-10 For Investigation	Unknown
Moorebank Intermodal Facility (capacity increases)	The NSW Government is working with the Commonwealth Government and the private sector to develop the Moorebank intermodal site to increase the proportion of container movements carried by rail. This is to support growth in container freight volumes and reduce the growth rate in truck movements to and from the port precinct.	Western City	0-10 Committed	2019 - 2030

Project	Description	District	Status	Timing
Northern Sydney Freight Corridor Stage 1	Northern Sydney Freight Corridor: Supporting separation of freight and passenger trains by investing in freight capacity between Sydney and the Central Coast. Note: This appears similar to Northern Sydney Freight Corridor Stage 1, which has been completed.	North	0-10 For Investigation	Completed
Northern Sydney Freight Corridor Stage 2	Investment in third tracks and/or quadruplication between Strathfield and north of Greater Sydney to improve freight rail capacity. Benefit: This will improve the efficiency and reliability of freight movements between Greater Sydney and regions to the north by improving the separation of freight and passenger trains on the T1 Northern Line. Note: The <i>Draft NSW Freight and Ports Plan</i> has a different status for this project (10-20 For Investigation) than the <i>Future Transport Strategy 2056</i> .	Eastern City, North, Central City	0-10 For Investigation	Unknown. Stage 1 is complete
Outer Sydney Orbital corridor protection	Protect corridors in Western Sydney for a future Outer Sydney Orbital Freight Line, and secure supporting, connected intermodal terminal precincts. Transport for NSW will act to secure sufficient land for freight precincts, as well as identify and protect transport corridors to lower costs of development and maximise development potential, look at strategies to address urban encroachment, plan for future growth in movement of goods across NSW, and within both Greater Sydney and regional areas, improving the efficiency of supply chains and overall freight productivity. The direction for this Priority Action Area is to maintain and enhance access to existing freight precincts to improve the efficiency of the supply chain, protect corridors and land for freight activities and take account of freight in future strategic planning activities.	Western City, North	0-10 Committed	Unknown, feedback period closed
Outer Sydney Orbital from Great Western Highway and Western Line to Central Coast	A future North – South orbital transport corridor around Greater Sydney. Including motorway and freight rail, it will provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This stage will connect the Great Western Highway / Western Line near St Marys via Box Hill in Sydney's Northwest to the Central Coast near Gosford. Benefit: Support the efficient and reliable movement of freight bypassing Greater Sydney with a single dedicated outer bypass, improve the resilience of the transport network connecting Greater Sydney and the Central Coast by alleviating sole reliance on the M1 Pacific Motorway, and support longer-term growth in passenger train movements on the T1 Northern Line by providing a new dedicated freight rail connection between Greater Sydney and the Central Coast.	Western City, North	20+ Visionary	Unknown
Outer Sydney Orbital from Great Western Highway and Western Line to WSA-Badgerys Creek Aerotropolis	A future North – South orbital transport corridor around Greater Sydney. Including motorway and freight rail, it will provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This first stage will connect the Great Western Highway to WSA-Badgerys Creek Aerotropolis. The freight rail connection will link the Western Line to the Western Sydney Freight Line, north of WSA-Badgerys Creek Aerotropolis. Benefit: Support the efficient and reliable movement of freight bypassing Greater Sydney with a single dedicated outer bypass, and support growing demand to access WSA from the Central West and centres such as Penrith and surrounding areas with a higher capacity road link.	Western City	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
Outer Sydney Orbital from WSA-Badgerys Creek Aerotropolis to Hume Motorway and South Line	A future North – South orbital transport corridor around Greater Sydney. Including motorway and freight rail, it will provide a continuous bypass of Greater Sydney, ultimately connecting the Illawarra, Sydney and the Central Coast. This stage will connect WSA-Badgerys Creek Aerotropolis to the M31 Hume Motorway south of Campbelltown-Macarthur. The freight rail connection will link OSO freight rail and Western Sydney Freight Line (north of WSA-Badgerys Creek Aerotropolis) to the Main South Line south of Campbelltown-Macarthur. Benefit: Support the efficient and reliable movement of freight bypassing Greater Sydney with a single dedicated outer bypass, unlock the benefits of the Maldon-Dombarton link to the Illawarra by providing the connection to OSO freight rail and Western Sydney Freight Line (north of WSA-Badgerys Creek Aerotropolis), and provide additional capacity for road transport to the Western City as demand on The Northern Road grows.	Western City	20+ Visionary	Unknown
Port Botany Landside Improvement Strategy	Infrastructure NSW recommends this project to enhances the efficient coordination of road and rail freight in and out of Port Botany.	Eastern City	Proposed	Unknown
South Coast Rail Enhancement	Providing additional capacity on the Main South and Illawarra rail lines. Infrastructure NSW states that ‘in the next five to 10 years, Transport for NSW should prepare an updated business case for the project that incorporates updated land use, transport and freight forecasts that reflect planned growth in the Western Parkland City and passenger rail demands on the T4 Illawarra and South Coast line.’	South	0-10 For Investigation	Unknown
Southern Sydney Freight Line Improvements	Supporting freight with upgrades to the Southern Sydney Freight Line north of Liverpool to increase capacity for freight and support Moorebank. Benefit: Improve the efficiency and reliability of rail freight movements by providing additional capacity for freight, particularly to and from Moorebank Intermodal Terminal.	Western City, Central City	0-10 For Investigation	Unknown
State Environmental Planning Policies update	Infrastructure NSW recommends that the Department of Planning and Environment update the relevant State Environmental Planning Policies by the end of 2019 to further protect strategically important ports, airports, industrial lands, freight precincts and key corridors from incompatible uses to ensure the efficient movement of freight in Sydney and NSW, now and into the future.	All	Proposed	Update by end of 2019
Western Sydney Freight Line corridor protection	Protect corridors for a future Western Sydney Freight Line, and secure supporting, connected intermodal terminal precincts.' Transport for NSW will act to secure sufficient land for freight precincts, as well as identify and protect transport corridors to lower costs of development and maximise development potential, look at strategies to address urban encroachment, plan for future growth in movement of goods across NSW, and within both Greater Sydney and regional areas, improving the efficiency of supply chains and overall freight productivity. The direction for this Priority Action Area is to maintain and enhance access to existing freight precincts to improve the efficiency of the supply chain, protect corridors and land for freight activities and take account of freight in future strategic planning activities.	Western City, Central City	0-10 Committed	Unknown, feedback period closed
Western Sydney Freight Line (and intermodal terminal)	Western Sydney Freight Line would connect the Southern Sydney Freight Line to an intermodal terminal site in Western Sydney and to the Outer Sydney Orbital which will provide a connection with the Main West Railway Line. Benefit: Support dedicated freight rail access between Port Botany and the new Western Sydney Intermodal Terminal, enable an increase in service frequency on the T1 Western Line by removing freight trains from the line between St Marys and Penrith, and support the emergence of Parramatta as a highly liveable Metropolitan Centre by diverting freight rail movements away from the centre.	Western City, Central City	10-20 For Investigation	Unknown

Project	Description	District	Status	Timing
Automatic Train Protection	Progressively fit the network and fleet with a modern signalling, control and train protection system in the driver's cabin that interfaces with the trackside signalling system. This project has been funded \$186.0 million (2018-19).	All	0-10 Committed	late 2020
Central Walk	A new underground pedestrian concourse at Central Station to better connect passengers to trains, buses, light rail and the new Sydney Metro. This project has been funded \$132.4 million (2018-19).	Eastern City	0-10 Committed	Construction begins 2018
Expansion of Travel Choices Program	Expansion of Travel Choices Program to encourage customers to change travel behaviours to support better use of transport capacity. Roll-out of Travel Choices Program to additional corridors and precincts. Benefit: The program will encourage customer travel behaviour change to support better use of transport capacity. The focus includes customers rerouting journeys, retiming journeys, using different modes or reducing the need to travel to spread demand and soften the weekday peak periods. This initiative will deliver benefits across the network by reducing congestion in peak times, increasing the resiliency of the network, and providing safer, more reliable journeys.	All	0-10 Committed	Unknown
Greater Parramatta Access Plan	Infrastructure NSW recommends a Greater Parramatta Access Plan, stating it would identify ways of integrating the various precincts across the Greater Parramatta to the Olympic Peninsula area by improving their connectivity, calming traffic and enhancing urban amenity. Infrastructure NSW recommends that by the end of 2018, Transport for NSW and the Greater Sydney Commission develop a Greater Parramatta Access Plan leading to a strategic business case for a program of works under the pilot growth infrastructure compact.	Central City	Proposed	Unknown
Greater Sydney Parking Guideline (train station carparking)	Development and implementation of a Greater Sydney Parking Guideline in collaboration with local government to ensure parking will be provided in a way that is consistent with the level of access by alternative modes of transport, including addressing the future provision of commuter car parks. Development and implementation of policy, in collaboration with local government, to ensure parking will be provided in a way that is consistent with the level of access by alternative modes of transport, including addressing the future provision of commuter car parks. Benefit: Support the use of private vehicles to access public transport as an option of a first and last mile solution, support the implementation of the Movement and Place Framework, and provide leadership and guidance to local government on issues of parking.	All	0-10 For Investigation	Unknown

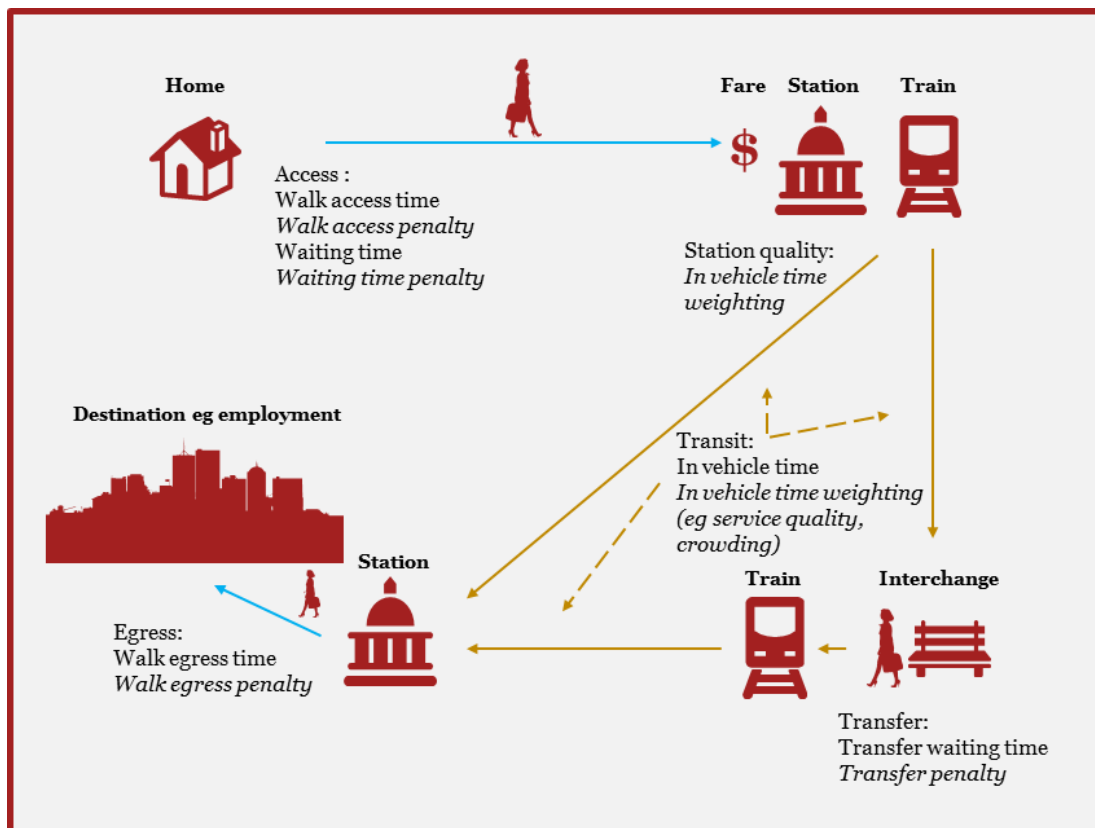
Project	Description	District	Status	Timing
Identification and protection of corridors for future transport links	<p>Investigating and analysing future transport demands, developing multi-modal corridor plans and identifying and preserving corridors for future transport links, particularly to support growth in the emerging Western City, and provide greater east-west and north-south connections. Benefit: Identifying corridors supports the delivery of future transport initiatives, supports the financial sustainability of the transport network by reducing the need for more expensive land acquisitions in the future, and provides greater certainty to the community on planned land use to enable informed decisions to be made.</p> <p>Transport for NSW is already investigating corridors of land in the Western Parkland City for the delivery of the South West Rail Link Extension, North South Rail Link, Outer Sydney Orbital, Bells Line of Road- Castlereagh Connection and Western Sydney Freight Line. The NSW Government will continue to consult with communities and landowners on the protection process, the alignment and delivery for the final corridors.</p> <p>Infrastructure NSW recommends that the NSW Government plan and protect the corridors and precincts necessary for future transport, freight, logistics, energy and communications facilities and infrastructure in the Western Parkland City. Infrastructure NSW recommends that the NSW Government provide funding for a second round of the Corridor Identification and Reservation Fund</p>	All	0-10 For Investigation	Unknown
Integrated active transport policies (including with rail)	<p>Integrated active transport policies to support long-term integrated transport and land use planning. Development and implementation of policy to ensure walking and cycling is provided and integrated for, where appropriate, as part of new and upgraded road, rail, bus and transport interchange projects, such as State Infrastructure Multi Modal Corridor Program (i.e. delivering cycling routes within state owned assets). Train fleet and station upgrades will include space for active transport devices and major interchanges will include bicycle facilities. Benefit: Improving the sustainability of the transport network by encouraging more short trips to be made by walking or cycling.</p>	All	0-10 For Investigation	Unknown
Metropolitan Interchange Program	<p>Making interchanges safer, faster and more convenient to encourage public transport use. This includes developing centre-specific plans with bus operations requirement, making interchanges more attractive, and providing more services, such as shops, and major interchanges will include bicycle facilities. Benefit; Improve the range of services at interchanges to improve the attractiveness of interchanging, thereby boosting public transport mode share</p> <p>Transport for NSW has identified Central station, Redfern, Circular Quay, and other locations in the Metropolitan Interchange Program as priorities in the existing network for upgrades. In addition, as major transport projects like the Metro and light rail networks are delivered, new interchanges will be established. Infrastructure NSW recommends that by the end of 2018, Transport for NSW complete business cases and planning for the upgrade of major public transport interchanges at Central, Redfern and Circular Quay, and develop a program for the progressive upgrade of other major interchanges across Greater Sydney.</p>	All	0-10 For Investigation	Unknown

Project	Description	District	Status	Timing
Mobility as a Service (MaaS) implementation	<p>Implementation of Mobility as a Service (MaaS) model in collaboration with industry. Harnesses the potential of MaaS to provide a more integrated, convenient journey experience for customers by working with industry to enable MaaS service providers to operate in Greater Sydney. This will include ensuring transport data is made available to MaaS operators and that technology platforms are in place. Benefit: Providing a more integrated, convenient journey experience for customers, and improving the sustainability of the transport system by attracting more customers to using public transport.</p> <p><i>Future Transport Strategy 2056</i> outlines a move to a 'Mobility as a Service' model (MaaS), where customers access combined public and private transport services through a digital platform such as a mobile app. This would enable travel planning and payments to be part of a single service.</p>	All	0-10 For Investigation	Unknown
Power Supply Upgrades	Upgrades and new construction designed to meet expected power requirements for Sydney's future rail network and new air-conditioned fleet. This project has been funded \$21.8 million (2018-19).	All	0-10 Committed	Unknown
Shared Network Improvements	Enhancements to the shared rail network to improve efficiency of freight and passenger train services.	All	10-20 For Investigation	Unknown
Sustainable Transport Package	Sustainable Transport Package to support NSW Government's objective of net zero emissions by 2050. Various measures to support NSW Government's objective of net zero emissions by 2050. Benefit: To achieve net zero emissions by 2050 while meeting increasing energy requirements, NSW will need to rethink how it powers transport.	All	20+ Visionary	Unknown
Sydney Airport road upgrades (level crossing removal)	Upgrades to roads around Sydney's Kingsford Smith Airport and removing the General Holmes Drive rail level crossing by constructing a road underpass. Benefit: The upgrades will provide customers with a better travel experience, increased capacity on the road network and improved access to Sydney's Kingsford Smith Airport and Port Botany.	Eastern City	0-10 Committed	2020
Transport Access Program	<p>The Transport Access Program is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure, and to ensure more stations, stops and wharves are compliant with Disability Discrimination Act requirements. Benefit: Stations that are accessible to people with a disability, limited mobility and parents with prams; modern buildings and facilities for all modes that meet the needs of a growing population; and modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers.</p> <p>This project has been funded \$132.9 million (2018-19).</p>	All	0-10 Committed	Unknown
Trial of Artificial Intelligence applications	Trial of artificial intelligence applications that actively gather data and use real time analytics to optimise capacity, planning and customer service. Create intelligent transport networks, managed with data: installing technologies and building networks that actively gather data, using Artificial Intelligence and real time analytics to optimise capacity and planning. Benefit: Improve the efficiency and reliability of journeys across the transport network and support the use of technology to improve accessibility to transport the system.	All	0-10 For Investigation	Unknown

Appendix B Generalised journey time

The generalised journey time seeks to measure the perceived, rather than elapsed, travel time between an origin and destination. Key components include the time associated with accessing transport, wait time for services, transfer between services, and egress from services to a destination. Figure 45 illustrates a generic journey and the associated time components.

Figure 45. Generalised journey time



Source: PwC

Figure 45 shows both the elapsed time associated with each leg of the illustrated journeys. As elapsed time is not equivalent to perceived time, a weighting factor is applied to the elapsed time involved in each leg of the journey to reflect the perceived cost. Weightings reflect factors such as disutility of walking, waiting, transferring and crowding on public transport. Weightings can also reflect the perceived amenity of station or service characteristics, eg shelter, travel information.

Formerly, the generalised cost of travel for urban public transport is calculated as follows:

$$GC = F + V * [(T_A * W_A) + (T_W * W_W) + (T_R * W_R) + (T_I * W_I) + N_T * \{T_p + ((T_{AT} + (T_{AT} * W_{AT}) + (T_{WT} * W_{WT}))\}]^{56}$$

where:

Figure 46. Generalised journey time component parameters

Formula	Parameter
GC	generalised cost
F	fare (\$)
V	standard value of time (\$/min of a benchmark)
T _A	access time
W _A	weighting on accessing time
T _W	(expected) weighting time
W _W	weighting on expected weighting time
T _R	unexpected weighting time
W _R	weighting on unexpected weighting time
T _I	in-vehicle time
W _I	weighting on in-vehicle time
N _T	number of transfers
T _P	transfer penalty associated with inconvenience where an interchange occurs
T _{AT}	access/walk time on transfer
W _{AT}	weighting time on transfer access/walk
T _{WT}	weighting time on transfer
W _{WT}	weighting on transfer weight time

Source: Australian Transport Council, *National Guidelines for Transport System Management in Australia: Urban Transport*, 2004

Time weightings are developed through observing traveller behaviours, for example, through stated and revealed preference surveys. The Australian Transport Assessment and Planning (ATAP) Guidelines (overseen by the Department of Infrastructure, Transport, Cities and Regional Development) detail the most commonly used parameters and approaches for weighting time, and their adoption by states ensures consistency in approach to transport project appraisal.

Specific weightings are applied to each aspect of a journey to produce a generalised journey time. For example, in NSW, the following weightings and penalties apply:

- In-vehicle time: 1.0
- Walk time: 2.0
- Wait time: 2.0
- Transfer penalty: +5.0 minutes

⁵⁶ Australian Transport Council, *National Guidelines for Transport System Management in Australia: Urban Transport*, 2004

The weighting is a multiple of elapsed time (indicating dis-benefits), and hence the generalised journey time is greater than the elapsed journey time.

Table 26 provides an illustrative example (excluding fare costs) from travel zone 4149 to travel zone 146 in 2016, representing a resident living near Seven Hills station and travelling to Central station.

Table 26. Generalised journey time from travel zone 4149 to 146 in 2016

Journey element	Elapsed time (minutes)	Generalised journey time (in-vehicle time minutes)
Walk to station from origin	5	10
Wait at station	3	6
In-vehicle time	12	12
Transfer penalty	n/a	5
Wait time	2	4
In-vehicle time	4	4
Walk to destination	4	8
Journey time	30	49

Source: PwC analysis, TfNSW strategic Transport Model inputs

As Table 26 details, a journey with an elapsed time of 30 minutes could have a hypothetical in vehicle time of 49 minutes due to the time weightings applied. In this analysis, the generalised journey time has been used to assess metrics such as accessibility and connectivity, as it is reflective of the perceived cost of travel by users of the system and assumed to influence their travel behaviours.

Within the strategic Transport Model, the generalised journey time for each journey is used to determine determines mode share. Travellers are assumed to take the lowest cost option (in terms of generalised journey time and other financial costs) between the origin and destination.

Appendix C Literature review: relationship between density and mode share

This section presents an overview of research into the relationship between public transport mode share and the density of population and employment to support the analysis in section 6. The objective of the review is to establish a benchmark minimum density threshold for rail passenger services. This is used in section 6 to exclude areas from the analysis where density is unlikely to be sufficient to support rail services.

1 Overview: research into transport and density

There is large body of literature that explores the relationship between transport mode share and density, and the potential of transit orientated developments. This starts with studies in the 1950s examining the relationship between population and employment density, and the mode share between automobiles and public transport.

The research has progressed over time as follows:

- Consideration of the relationship between urban population and employment densities to the share of trips held by different modes
- Inclusion of the "three Ds of density" in analysis:
 - density
 - design (of urban form)
 - diversity (of land use)
- Expansion to consideration of the "five Ds of density" in analysis:
 - density
 - design
 - diversity
 - destination accessibility
 - distance to transit
- Exploration of the relationship of density to the financial viability of mass transit systems

For the purposes of this study, a representative sample of work has been considered from the initial research, the "five Ds" approach and financial viability analysis. Where possible, Australian analysis has been used.

2 Overview: literature reviewed

In order to establish benchmark population and employment densities for analysis, a literature review has been undertaken. Table 27 summarises the documents considered.

Table 27. Summary of literature reviewed

Study	Authors	Date published	Study objective	Study data and methodology	Relevant study conclusions
<i>Cities and Automobile Dependence: An International Sourcebook</i>	Peter Newman and Jeff Kenworthy	1989	The book investigates the variation in per capita car use, transport energy use and public transport use across cities, and the relationship of these variables to major transport and land use indicators.	<p>Method: The authors assess the linear correlation between transport and urban form variables. Transport variables include fuel use, car ownership, public transport passenger kms per capita, public transport mode share and active transport, among others. Urban form variables include urban, job and CBD employment density, among others.</p> <p>Data: 32 cities the USA, Australia, Canada, Western Europe and Asia were chosen for their prominence and distinctive features of their transport network; all have populations over 700,000. Five Australian capital cities already studied by the authors were included in the analysis. The authors visited the cities in question to collect and validate data.</p>	<p>Urban densities (population and employment) of around 30 to 40 people per hectare are associated with reduced automobile dependence and accordingly higher use of public and active transport.</p> <p>The authors also note the strong positive correlations between the density variables considered in the study and the public transport variables.</p>
<i>The influence of the built environment on mode choice – evidence from the journey to work in Sydney</i>	Matthew McKibbin	2011	The study examines the strength of the effect of five built environment factors on journey to work mode share in Sydney	<p>Method: McKibbin examines the relationship between five built environment factors and mode choice by travel zone, using a multivariate regression and built environment data from Sydney travel zones. McKibbin holds the factors income, trip destination and car ownership constant.</p> <p>Data: 2006 census journey to work data for the Sydney Statistical Division, which is defined by the Australian Bureau of Statistics. Travel Zones from the Inner Sydney Statistical Local Area (Sydney CBD) are excluded due to their disproportionate population and employment densities.</p>	<p>McKibbin shows that four of the tested variables have a statistically significant relationship to mode share. The four significant variables are:</p> <ol style="list-style-type: none"> 1. density 2. land use diversity 3. destination accessibility 4. distance to transit <p>Pedestrian oriented design was not found to have a statistically significant effect on mode share.</p>

Study	Authors	Date published	Study objective	Study data and methodology	Relevant study conclusions
<i>Cost of a ride: the effects of densities on fixed-guideway transit ridership and costs</i>	Cervero, R., Guerra, E., Journal Of The American Planning Association	2011	The study seeks to establish the relationship between the net capital and operating costs per mile of transit investment to job and population densities	<p>Method: Regression analysis was used to test the relationship between job and population density, ridership, and capital costs. These relationships are then used to estimate threshold densities to achieve a specified cost per mile given capital costs.</p> <p>Data: 50 investment on 23 transit networks in America and accompanying time series data on performance. Financial costs normalised to 2009. Projects were built between 1970 and 2010.</p>	<p>Bare minimum threshold:</p> <p>The authors conclude that based on the projects analysed, that there is a “bare minimum” threshold of 27 jobs and persons per gross acre⁵⁷ for heavy rail, and 14 for light rail</p> <p>Thresholds for set cost recovery:</p> <p>Controlling for neighbourhood, regional, and transit service attributes, population and job density are positively correlated with both ridership and capital costs.</p> <p>As density increases, so do capital costs and ridership. Density, however, has an inverse relationship to capital cost per rider and total costs per passenger mile. Higher densities tend to improve transit's cost effectiveness, in spite of higher capital costs.</p> <p>The authors produce density threshold estimates for 10 different per kilometre capital costs</p>

⁵⁷ Gross is a measure that includes the whole area of land used for a dedicated purpose, for example in residential areas, gross residential area includes housing, and the transport network and other infrastructure required to support housing. A net measure by contrast would only include the land used for housing. Measures used in this report are gross.

3 Discussion

The first study exploring the connection between population density and transport service provisions is the Chicago Area Transportation Study of 1956.⁵⁸ This study has been followed by decades of research internationally and in Australia, including multiple studies from Peter Newman and Jeff Kenworthy,⁵⁹⁶⁰⁶¹ and Paul Mees.⁶²

The early work of Newman and Kenworthy, *Cities and Automobile Dependence: An International Sourcebook* (1989), is notable in setting a minimum threshold for public transport viability of 30 people per hectare, a benchmark that continues to be explored by researchers.⁶³

More recent work has sought to use additional factors in conjunction with density to model the viability of public transport services⁶⁴. For example, recent Australian work on Sydney has sought to combine density analysis with other affecting use of public transport, building a five factor model based on density, land use diversity, design, destination accessibility and distance.⁶⁵

Recent American work has sought to identify the effect of density thresholds on the financial viability of transit systems (light and heavy rail). *Cost of a ride: the effects of densities on fixed-guideway transit ridership and costs* (2011) establishes population and employment densities required to achieve a target cost per rider per mile, based on 50 projects completed in 23 US cities after 1970. The authors conclude that based on the projects analysed, that there is a “bare minimum” threshold of 27 jobs and persons per gross acre⁶⁶ for heavy rail, and 14 for light rail.⁶⁷ This is equivalent to 10.9 and 6 jobs and persons for heavy rail and light rail per hectare respectively.

In addition to this “bare minimum”, the authors produce density threshold estimates for 10 different per kilometre capital costs for bus, light rail and heavy rail systems. As an example, their results indicate that for an average heavy rail system in an average American city approximately 76 jobs and persons per gross acre are required in order to achieve a strong cost per rider performance if the average capital cost is USD \$75 million per mile in (2011 US

⁵⁸ *Density and transport mode choice in Australian, Canadian and US cities*, Australasian Transport Research Forum, Paul Mees, 2009

⁵⁹ See Newman, P., Kenworthy, J., *Cities and Automobile Dependence: An International Sourcebook*. Gower, Aldershot, UK, 1989

⁶⁰ *Patterns of automobile dependence in cities: an international overview of key physical and economic dimensions with some implications for urban policy*, Jeffrey R. Kenworthy, Felix B. Laube, Transportation Research Part A 33 (1999)

⁶¹ Newman, P., Kenworthy, J., *The Density Multiplier: A Response to Mees*, World Transport Policy and Practice Volume 17, 2011

⁶² In *Density and transport mode choice in Australian, Canadian and US cities*, Australasian Transport Research Forum, Paul Mees, 2009, Paul Mees criticises the contention that density is a significant factor in determining mode choice. In *The Density Multiplier: A Response to Mees*, Newman and Kenworthy address his

⁶³ *The influence of the built environment on mode choice –evidence from the journey to work in Sydney*, Australasian Transport Research Forum, Matthew McKibbin, 2011

⁶⁴ *Cost of a ride: the effects of densities on fixed-guideway transit ridership and costs*, Cervero, R., Guerra, E., Journal Of The American Planning Association, 2011

⁶⁵ *The influence of the built environment on mode choice –evidence from the journey to work in Sydney*, Australasian Transport Research Forum, Matthew McKibbin, 2011

⁶⁶ Gross is a measure that includes the whole area of land used for a dedicated purpose, for example in residential areas, gross residential area includes housing, and the transport network and other infrastructure required to support housing. A net measure by contrast would only include the land used for housing. Measures used in this report are gross.

⁶⁷ *Cost of a ride: the effects of densities on fixed-guideway transit ridership and costs*, Cervero, R., Guerra, E., Journal Of The American Planning Association, 2011

dollars).⁶⁸ This is equivalent to 30.75 jobs and persons per gross hectare. The density threshold is higher for light rail at USD \$75 million per mile, with a density threshold of approximately 116 jobs and persons per gross acre (46 per gross hectare)⁶⁹. Equivalent work incorporating employment density has not been identified using Australian data.

4 Approach to use of population density to measure performance

Source of employment and population densities:

In our analysis, we use transport model outputs from the NSW strategic Transport Model for population, employment and service densities.

To the degree that the transport model is integrated with the land use forecasts, this approach allows for some consideration of the factors identified in “five D” analysis. In an integrated transport and land use planning cycle, employment densities will represent the forecast future growth of employment that is accessible within reasonable travel time from residential densities. Reasonable travel time means that the trip is within the assumed travel budget of travellers. The calculation of travel time in strategic models takes into account assumptions such as:

- travel time, including access, egress and interchange time
- perceived travel cost including perceived service quality
- car ownership
- congestion of road networks

In an integrated planning process, if the travel times to forecast future employment centres were too high, meaning that a workforce was unlikely to be able to be attracted to the area, the forecast growth in employment would be moderated. So, the employment densities used in the analysis can be considered to take into account factors from the five density approach far as they affect the choice to travel or not to travel.

Density thresholds applied

We apply the original Newman and Kenworthy density threshold of 30 people per hectare to capture regions of interest for further investigation. For employment density, we also apply a threshold of 30 people per hectare. This means the analysis is broadly consistent with the Cervero and Guerra findings, both as they related to a “bare minimum threshold” and the range of densities for rail given a set cost per mile.⁷⁰

⁶⁸ See Table 8, *Cost of a ride: the effects of densities on fixed-guideway transit ridership and costs*, Cervero, R., Guerra, E.. Journal Of The American Planning Association, 2011

⁶⁹ See Table 8, *Cost of a ride: the effects of densities on fixed-guideway transit ridership and costs*, Cervero, R., Guerra, E.. Journal Of The American Planning Association, 2011

⁷⁰ Noting that these apply to a set capital cost per mile and that in their analysis higher densities were required to support more expensive projects.

Appendix D Technical assumptions

Determining rail catchment/rail corridor

A key component of the study analysis is understanding the variations between what is estimated to happen inside the rail catchment compared to outside the rail catchment.

We have defined the rail catchment as any travel zone which partially or wholly lies within an 800 metre radius around each current and planned railway stations in Greater Sydney.

Of a total 2,399 travel zones in scope for Greater Sydney, 1,186 travel zones either partially or wholly lie within an 800 metre radius around railway stations in 2016, and 1307 travel zones in 2036.

Determining the current and new / planned public transport networks

Table 28 outlines the data extracted from STM v 3.6 and shapefiles provided by TfNSW that were used in the analysis of this report.

Table 28. Description of data provided

Data provided	Description of data provided	PwC analysis	Output
Public transport skims for 2016, 2021, 2026, 2031, 2036	Origin-destination matrices by travel zone for Sydney, listing wait time, auxiliary time, number of boardings and distance travelled	<ul style="list-style-type: none">Matrix of access times to the closest point of interest (employment hub, hospital, university and passenger gateway) from each travel zoneMatrix of the number of travel zones each travel zone can reach within 45 minutes	<ul style="list-style-type: none">Access times for strategic centre, hospital, university, passenger gateway for 2016 and 2036, (study area tzs only)Origin-destination pairs for 2016 and 2036 (study area tzs only)
Itinerary Shapefiles for 2016, 2021, 2036, 2031, 2036	Shapefiles of all active bus, rail, light rail and ferry station centroids	<ul style="list-style-type: none">Filtered shapefile for railway and light rail station centroidsDetermined rail catchment by including tzs that are within 800m of an active station centroid	<ul style="list-style-type: none">Rail catchment in 2016 and 2036 (study area only)
Nodes Shapefiles for 2016, 2021, 2036, 2031, 2036	Shapefiles of all active and inactive rail, light rail and ferry station centroids	<ul style="list-style-type: none">Crossed checked itinerary shapefile with nodes shapefile	n/a
Lines Shapefiles for 2016, 2021, 2036, 2031, 2036	Shapefiles of all active rail, light rail and ferry networks	<ul style="list-style-type: none">Created separate shapefile of new / planned network differences between 2016 and 2036	<ul style="list-style-type: none">Visual representations of current railway and light rail networks, and planned rail network (study area only)

Data of new / planned rail stations centroids and their station names that were modelled in the STM were not provided. However, a list of active and inactive station names were provided by TfNSW. This list was used to cross reference the itinerary shapefile to determine the names of the new / planned station in 2036. A web search was then undertaken to determine which rail project each new / planned station was a part of.

Analysis of strategic centres

Data of travel zones encompassing the relevant strategic centres was not provided.

The list and location of strategic centres used in access time analysis were based on travel zone centroids provided by TfNSW for the Review of State Government Rail and Land Use Plans – NSW August 2017. It is assumed travel zone centroids have not changed since the publication of this report in 2017.

This list was cross checked with strategic centres reported in Greater Sydney Region Plan – A Metropolis of Three Cities report by the Greater Sydney Commission, 2018. This report was also used to visualise the strategic centres. Therefore strategic centres visualised in this report may not cover the correct number of travel zones.

Compound annual growth rate (CAGR) calculations

A number of metrics used to measure and assess network performance include testing growth or change over time. For example, population growth in each travel zone over time, or, change in travel time to the closest university over time.

TfNSW data provided for this analysis is typically at 2016, 2021, 2026, 2031 and 2036 intervals. To estimate change or growth over time we have calculated the compound annual growth rate (CAGR) from 2016 to 2036 using the following equation:

$$CAGR = \left(\frac{\text{End period value}}{\text{Beginning period value}} \right)^{\left(\frac{1}{n} \right)} - 1$$

Where n = number of periods from beginning period to end period.

An example CAGR calculation used in our analysis is shown below:

2016 employment in travel zone #77 (Martin Place Station) = 3,408

2036 forecast employment in travel zone #1 = 4,488

$$CAGR = \left(\frac{4,488}{3,408} \right)^{\left(\frac{1}{(2036-2016)} \right)} - 1 = 0.014 = 1.4\% \text{ per annum (p. a)}$$

Density calculations

Our analysis also includes a number of density calculations which are particularly useful as an indicator of the viability of heavy rail, light rail and bus services. Density has been estimated for population, employment and dwellings.

Density calculations are based on the following formula:

$$\text{Density} = \frac{\text{Count in travel zone (e.g. count of population or count of dwellings)}}{\text{travel zone area in hectares (Ha.)}}$$

An example population density calculation used in our analysis is shown below:

2036 population in travel zone #77 (Martin Place station) = 119

Travel zone area in hectares (Ha.) = 1.42

$$\text{Population density} = \left(\frac{119}{1.42} \right) = 83.99 \text{ population per Ha.}$$