

## 14 Operational transport

The overarching transport need and benefits of the metro network are presented in Chapter 4 and in Technical Paper 1 *Transport and traffic*. This chapter summarises the key findings of this assessment in relation to operational transport impacts and interactions, including integration with existing and proposed transport infrastructure and corridors.

### ***The Director-General's requirements***

*The Environmental Assessment must include consideration of, and a management framework for operational transport impacts and interactions including:*

- *A strategy to ensure that new rail stations will be integrated with existing and proposed transport infrastructure and networks, facilitate efficient mode change and improved accessibility, including for pedestrians and cyclists.*
- *Indication of how the project will be designed and implemented to facilitate a potential extension of the metro system, as relevant and*
- *Interaction with and/or protection of existing and proposed transport infrastructure and corridors.*

### 14.1 Overview

Sydney's population is expected to grow to six million in the next 25 years (DoP 2008), with resultant pressure on transport infrastructure. The NSW Government strategy is to encourage a significant proportion of this population growth into existing areas supported by new, high quality transport.

The CBD Metro is designed to be the first stage of a proposed Sydney-wide metro network that would bring major transport and land use benefits to the Sydney region. Proposed future stages include the Metro Line 1, with extensions to the west and north-west.

The metro stations would be fully integrated into the surrounding area, and the metro network would be integrated with existing transport infrastructure, enabling passengers to conveniently interchange between metro, bus, rail and light rail.

#### 14.1.1 Road network

The road network plays a regional and local role in providing access for buses and coaches, commercial and freight vehicles, pedestrians and cyclists, and private car trips in the Sydney Metropolitan Region.

Even with recent increases in peak-hour transit use, Sydney's road network continues to experience extended periods of congestion. There are limited opportunities to increase road network capacity without major infrastructure changes.

The cost of congestion in Sydney is forecast to rise to \$7.8 billion by 2020 (Bureau of Transport and Regional Economics 2007). Congestion imposes costs on individuals and businesses, which in turn affects both the state and national economy and also increases greenhouse gas emissions.

### 14.1.2 Rail network

Sydney has a major commuter rail network, operated by RailCorp under the 'CityRail' brand, which has formed the backbone of Sydney's public transport commuter task over the past 150 years.

Passenger loads on CityRail services to the Sydney CBD are at capacity on the Western and North Shore Lines and major CBD stations such as Town Hall and Wynyard suffer from recurring crowding problems. Additional line and station capacity is required into and within the CBD to accommodate future growth in demand for travel to and through the CBD.

### 14.1.3 Bus network

Bus services operate into and through the CBD via a number of strategic bus corridors. Buses perform the bulk of the public transport task in the key non-rail CBD corridors.

Bus patronage has increased significantly in recent years and is creating operational challenges close to, and within, the Sydney CBD. Elements of the government's *CBD Bus Strategy* (2006) will deliver short-term improvements, but more substantial infrastructure solutions will be required to accommodate demand growth on key bus corridors, such as from the Hills District and the Northern Beaches.

### 14.1.4 Light rail and monorail services

Light rail was first introduced in Sydney in 1997, between Central Station and Wentworth Park and was extended by three kilometres in 2000 from Wentworth Park to Lilyfield. Strategies to extend the light rail are currently being investigated.

The Sydney Monorail was opened in 1988, after having been conceived as part of the NSW Government's Darling Harbour redevelopment. There are no plans to extend this network.

### 14.1.5 Ferry network

While ferries will continue to play a unique role in Sydney's transport network, especially in the morning peak for travel from suburbs along the Parramatta River and around the harbour, the scale and passenger demand for ferry operations will remain small compared with rail and bus services. Travel on Sydney ferries accounts for only three per cent of total trips to the Sydney CBD.

### 14.1.6 Pedestrian network

Walking is the main way that people access the public transport network, with 47 per cent of passengers walking from home to the station and 84 per cent walking from the station to their final destination. At street level, pedestrians encounter challenges that include excessive delays at intersections, and crowded, narrow and cluttered footpaths.

### 14.1.7 Bicycle network

Despite high levels of bicycle ownership and the health and environmental benefits of cycling, recorded bicycle use in NSW is very low. The cycle routes in the Sydney Metropolitan Region are of varying quality and are not well connected or integrated. The City of Sydney has developed a cycleway program that aims to encourage bicycle use. However, public bicycle parking is still limited to bicycle stands and smart poles in the Sydney area.

## 14.2 Objectives and strategy

The following objectives would ensure modal integration is implemented effectively:

- Objective 1: Plan, design and operate integrated services for the benefit of users.
- Objective 2: Minimise interchange penalties.
- Objective 3: Provide appropriate station facilities to encourage active transport to metro stations.
- Objective 4: Allow for integrated ticketing and fares across the transport network.
- Objective 5: Co-ordinate feeder services (bus, light rail, monorail and ferry) to be consistent with the transport product offered by metro services.
- Objective 6: Provide passenger information systems and targeted integrated way-finding and information systems to enhance orientation and encourage patronage.
- Objective 7: Provide a consistent travel experience from door to door.

An integrated transport strategy has been developed for the CBD Metro based upon a detailed assessment of intermodal interchange, station connectivity and accessibility. Key features of the CBD Metro integrated transport strategy are shown in Figure 14.1 and include:

- Integrating the existing and proposed pedestrian network with the CBD Metro (e.g. delivery of the Barangaroo Pedestrian Link between Wynyard and the Barangaroo Precinct).
- Integrating metro stations with existing and planned cycling routes. Weather-protected bicycle parking facilities would be provided at station entries to allow cyclists to secure bicycles and continue their journey by metro.
- Relieving pressure on the rail network by providing additional stations to distribute passengers throughout the CBD and onwards to Pyrmont and Rozelle. The new stations would be carefully designed to integrate with existing CityRail stations and pedestrian networks to provide easy access for commuters while reducing the strain on CityRail stations.
- Supporting strategies to increase capacity on the CityRail network with a fast and efficient transfer to the CBD Metro at Central Station.
- Allowing for potential reconfiguration of the CityRail network to take advantage of freed up capacity and improve the 'sectorisation', and therefore the reliability, of the network.
- Providing direct and convenient passenger interchange between CBD Metro stations and area bus stops.
- Linking existing surface and sub-surface pedestrian desire lines to both metro and bus passenger-waiting areas.
- Rationalising some Victoria Road bus services and allowing redistribution of bus assets to better provide cross-regional or metro catchment services.

The essential initiatives to ensure integration with existing transport modes are discussed in section 14.3.1.



**Figure 14.1** CBD Metro integrated transport strategy

Note: Project detail shown is indicative only, subject to detailed design

## 14.3 Specific issues

### 14.3.1 Integration of metro stations with transport infrastructure and networks

#### ***The benefits of integration with the transport network***

A key objective of urban public transport systems is to integrate transport infrastructure and services across all transport modes. Integration provides a passenger-focused transport system that benefits not only passengers but also the wider community.

Integration of metro with existing transport modes bring major benefits for passengers, who would have a fast, efficient and seamless journey with a choice of access modes, including active transport (walking and cycling) and public transport (rail, bus, light rail and ferry). The location and design of each station would facilitate fast and convenient interchange between metro and other transport modes, while also ensuring good connectivity to the surrounding precinct.

Integration would increase catchment potential, thus maximising the potential demand for the metro.

The introduction of metro and its integration into the transport network would also provide opportunities to optimise other transport modes and provide broader benefits for Sydney.

Table 14.1 provides a summary of access and interchange modes available at each CBD Metro station.

**Table 14.1** Summary of access and interchange modes available at each CBD Metro station

Access and interchange	Central	Town Hall Square	Martin Place	Barangaroo-Wynyard	Pymont	White Bay (safe-guarded)	Rozelle
Pedestrians	✓	✓	✓	✓	✓		✓
Cyclists	✓	✓	✓	✓	✓		✓
Rail	✓	✓	✓	✓			
Bus	✓	✓	✓	✓	✓		✓
Coach	✓						
Light rail	✓				✓		
Monorail		✓					
Ferry				✓			
Taxi	✓	✓	✓	✓	✓		✓
Kiss-and-ride	✓				✓		✓

As shown in the Table 14.1, in planning the CBD Metro, priority would be given to the most efficient and sustainable modes of transportation; commuter parking would not be provided as part of the CBD Metro.



### ***Integration with pedestrian connections***

In central Sydney, pedestrians make more than 600,000 walking trips each day. Integration of metro with existing and planned pedestrian connections is critical to delivering a passenger-focused metro system. Walking would be the primary access/egress mode to/from the metro, and part of all interchange functions.

The CBD Metro, as the first step in building a wider metro network, would:

- Encourage walking as a mode of access to and from metro stations.
- Connect to the existing and planned pedestrian network.
- Provide localised pedestrian improvements around metro stations and entrances.
- Be a catalyst for pedestrian improvements within metro station precincts.

The potential catchment of each station would be affected by the pedestrian network connectivity, permeability, topography and weather-protection. Though a five-minute walk (about 400 metres) is the accepted walking distance for passengers to walk to access public transport, passengers are generally prepared to walk further to a better quality (faster and more reliable) service such as a metro. Through good design, the typical pedestrian catchment of a station would be expanded to 10 minutes or more.

Sydney Metro would work in partnership with local councils and the Roads and Traffic Authority to integrate the existing and proposed pedestrian network with the CBD Metro.

### ***Integration with bicycles***

Cycling increases the catchment of public transport stations and serves different journey types and different markets. It would therefore be important to integrate metro stations with existing and planned cycling routes.

Similar to other deep-tunnel metro systems, traditional bicycles would not be allowed in CBD Metro stations or on trains (although folding bikes would be permitted). Weather-protected bicycle parking facilities would be provided at station entries to allow cyclists to secure bicycles and continue their journey by metro.

The CBD Metro would also offer opportunities for local councils and other agencies to bring forward planned bicycle improvements within the station precincts. Improving the bicycle network would increase the attractiveness of cycling within the station precinct and may increase the bicycle catchment for the CBD Metro.

Sydney Metro would work in partnership with local councils and the Roads and Traffic Authority to integrate the existing and proposed bicycle network with the metro.

### ***Integration with railway stations***

Metro–rail integration is critical to delivering a customer-focused metro system. Interchange between CBD Metro and CityRail services would be an important function at CBD interchange stations, with passengers transferring to or from rail services to continue their journey. (CBD Metro would not affect existing rail operations.)

The existing CBD stations on the CityRail network have limited capacity to cater for growth in patronage and additional jobs in the CBD. Currently, high numbers of interchanging passengers and entering/exiting passengers combine during the peak hours to create crowded conditions within stations, which can also delay trains through increased dwell time.

The CBD Metro and future metro network would relieve this pressure on the rail network by providing additional stations to distribute passengers throughout the CBD and onwards to Pymont and Rozelle.



The new stations would be carefully designed to integrate with existing CityRail stations and pedestrian networks to provide easy access for commuters while reducing the strain on CityRail stations.

The CBD Metro stations would:

- Provide direct and convenient passenger interchange between CBD Metro stations and CityRail stations.
- Link existing surface and sub-surface pedestrian desire lines to both metro and CityRail CBD stations.
- Provide or improve links to existing pedestrian desire lines for both metro and CityRail passengers.
- Allow for easy-access interchange for mobility-impaired passengers.
- Install passenger way-finding within and throughout each station precinct including clear signage for transferring passengers.
- Improve passenger amenity and safety for metro and CityRail passengers within station precincts.

As the metro network develops, and the CityRail network is upgraded, the two passenger networks would have distinct but complementary roles.

### ***Integration with the rail network***

CBD Metro, in conjunction with other planned heavy rail upgrades (such as the Rail Clearways Program) would offer a number of benefits. In particular, it would:

- Support strategies to increase capacity on the CityRail network with a fast and efficient transfer to the CBD Metro at Central Station (allowing the use of the latent terminating capacity at Sydney Terminal).
- Allow for potential reconfiguration of the CityRail network to take advantage of freed up capacity and improve the 'sectorisation', and therefore the reliability, of the network.
- Enable the upgrade of CityRail CBD station concourses, platforms, vertical circulation and entries by providing alternative travel options during shutdowns.
- Provide a rail alternative to CityRail rail-replacement buses when CityRail CBD lines are closed for track work.
- Safeguard future opportunities to provide sub-surface pedestrian connections to both metro and CityRail CBD stations.
- Enable CityRail to investigate the feasibility of a 'metro-style' of operation on certain sections of the CityRail network in terms of rolling stock, frequency levels and mode of operation.
- Give impetus to CityRail to develop a master plan to enhance the wider Central Station precinct and urban domain encompassing all modes and land uses.
- Provide the catalyst for significant improvements to urban design of all station precincts and internal improvements in CityRail stations to meet easy access and fire and life safety requirements. This would enhance the quality of the CBD while allowing for essential works that would provide for future safe operation at all city stations.

As the metro network develops further, and the CityRail network is further upgraded, the two networks would become more and more integrated yet still have distinct but complementary roles.

Sydney Metro would work in partnership with the NSW Transport and Infrastructure and RailCorp to develop transport strategies to meet the government's commitment to deliver the CBD Metro.

Integrated ticketing would also be introduced, to facilitate network integration and passenger interchange between metro and rail.

### ***Integration of metro stations with the existing bus network***

Interchange between CBD Metro and bus services would be an important function at metro stations served by strategic bus corridors or bus/coach terminals, with passengers transferring to or from services to continue their journey.

To maximise metro-bus integration, the CBD Metro stations would be located and designed to integrate with existing and proposed bus networks. Integration would:

- Provide direct and convenient passenger interchange between CBD Metro stations and area bus stops.
- Link existing surface and sub-surface pedestrian desire lines to both metro and bus passenger-waiting areas.
- Provide or improve links to existing pedestrian desire lines for both metro and bus passengers.
- Allow for easy-access interchange for mobility-impaired passengers.
- Hasten the installation of passenger way-finding within and throughout each station precinct, including clear signage for transferring passengers.
- Improve passenger amenity and safety for metro and bus passengers within station precincts.

The CBD Metro would offer an alternative route for passengers travelling between the CBD and Rozelle, offer significantly faster journey times to parts of the CBD, and increase passenger choice.

### ***Integration of metro services with the existing bus network***

Within the Sydney CBD, buses compete for road space with private vehicles, taxis, cyclists and pedestrians. During the morning peak two hours (7am–9am), over 1,300 buses enter the CBD. This affects the amenity of the city through noise and emissions and adds to the overall level of traffic in city streets.

The *CBD Bus Strategy* outlines opportunities to simplify bus operations in the CBD and to improve bus efficiency and reliability, thereby improving travel times for passengers. Bus routes are proposed to be consolidated onto three north–south corridors by destination, and east–west services would operate through the Mid City transport interchange at Town Hall before continuing to the new Domain layover.

The CBD Metro provides an opportunity to develop a fully-integrated and complementary bus network for Sydney.

The CBD Metro would provide an opportunity to rationalise some Victoria Road bus services and allow redistribution of bus assets to better provide cross-regional or metro catchment services. As bus passengers choose to interchange between bus and metro, there is an opportunity to:

- Re-route some Victoria Road corridor buses to Broadway and Railway Square.
- Terminate some Victoria Road corridor buses at Rozelle.
- Continue some services from Rozelle to the CBD or other destinations.



These initiatives would reduce the volume of buses on the approach to, and within, the CBD. Reduced bus demand in the northern CBD would:

- Increase the reliability of the surface network.
- Improve the efficiency of bus operations.
- Improve visual and physical amenity in the CBD.

There would also be the opportunity to terminate or commence some services at Rozelle, by using either Leichhardt Bus Depot or an alternative, temporary site in the vicinity of White Bay.

Sydney Metro would work in partnership with the NSW Transport and Infrastructure, Roads and Traffic Authority, Sydney Buses, private bus operators and local councils to integrate the future bus network with the metro and bring forward bus network improvements

### ***Integration with the ferry network***

Metro–ferry integration is an important consideration at metro stations that serve harbour locations. There would be advantages in locating the future Barangaroo wharf close to the western entrance of the proposed Barangaroo-Wynyard Station, and proposed Barangaroo Pedestrian Link. (The CBD Metro would not affect existing ferry operations.)

While there would be advantages in delivering the ferry wharf at Barangaroo and implementing the ferry strategy in conjunction with the opening of the CBD Metro, it could also be implemented independently, with new transport infrastructure provided by other organisations to meet the future travel demands of the Barangaroo precinct (this could include changes to the bus network and new light rail services).

### ***Integration with light rail and monorail***

Both the light rail and monorail would provide feeder services and local connectivity to the CBD Metro. The existing light rail system would extend the catchment of CBD Metro stations beyond the pedestrian catchment at Central Station, Town Hall Square and Pyrmont. (CBD Metro would not affect existing light rail or monorail operations.)

### ***Integration with the existing road network***

The road network plays a regional and local role in providing access for public transport services, goods and service vehicles, general public traffic, pedestrians and cyclists, motorists and on-street parking and emergency vehicle access. It is therefore an important consideration in the planning of CBD Metro stations.

In order to accommodate all modes and integrate with the CBD Metro, the following road network considerations would be required:

- Provide an integrated approach to transport in city centres.
- Provide access by pedestrians, cyclists, public transport, taxi and private vehicles.
- Review the allocation of space for pedestrians, cyclists and public transport and the scope for implementing priority measures.
- Protect and enhance the pedestrian environment.
- Reduce the impact of through traffic.
- Address the need for deliveries and emergency access.

No customer or commuter-style parking would be provided as part of the CBD Metro project. The parking policy would need to be station-specific and developed in conjunction with local councils.

A parking policy at metro stations that balances the commercial needs of businesses and retail, while encouraging public transport use would:

- Limit casual parking on-street and discourage long-term parking.
- Provide for commercial needs in the city (loading and taxi zones).
- Provide convenient spaces for mobility-impaired drivers.
- Control car use in terms of trip-end restraint i.e. inconvenience of parking at stations.

Sydney Metro would work in partnership with NSW Transport and Infrastructure, RTA, Sydney Buses, private bus and coach operators, the Taxi Council and local councils to integrate the road network with the metro.

The assessment of a series of possible end-state road arrangements in the vicinity of the proposed stations was undertaken with the assistance of the RTA's Paramics SCATSIM models of the CBD and Rozelle–Pyrmont corridor (PUR model). The initiatives examined included those proposed by CBD Metro as part of the project and potential future initiatives.

Traffic and urban design opportunities that may be facilitated by the introduction of the CBD Metro and will require further scrutiny, and specifically outputs from the Paramics Model have yet to be finalised. Further discussion and modelling will be undertaken with the RTA and local councils to resolve traffic matters during the second half of 2009, which may result in minor design changes around CBD Metro station entrances.

### 14.3.2 Passenger demand

#### **Central**

Central Station is expected to be the single busiest station for the CBD Metro, with high tidal flows in the AM and PM peak periods. The majority of passengers boarding CBD Metro at Central station in the morning peak would be interchanging from other modes of public transport, particularly rail, to continue their journey on the metro. The majority of passengers alighting from metro would walk to destinations within the Central precinct, including the southern CBD, Surry Hills, Chippendale, the UTS and TAFE.

A summary of 2021 AM Peak 1 Hour forecast passenger boarding and demand at Central Station is presented in Table 14.2.

**Table 14.2** Central Station – CBD Metro 2021 AM Peak 1 Hour

Boarding					Alighting					Total passengers
Walk	Rail	Bus	Car	Total	Walk	Rail	Bus	Car	Total	
13%	80%	6%	0%	100%	78%	15%	8%	0%	100%	
Passengers:				5,500 to 7,400	Passengers:				1,500 to 2,100	7,000 to 9,500

Note: Percentages may not add up due to rounding.

Source: Sydney Metro, Zenith demand estimates (LU3A), July 2009.

### **Town Hall Square**

Town Hall Square Station would function as both a catchment and interchange station. It would be close to both the CityRail's Town Hall Station and Mid City bus interchange, and the majority of passengers boarding CBD Metro at Town Hall Station in the morning peak would be interchanging from other modes of public transport to continue their journey on the metro. The majority of passengers alighting from metro would walk to destinations within the midtown precinct, including Town Hall, Pitt Street Mall and the Queen Victoria Building; and the southern CBD precinct, including the George Street precinct and Chinatown.

A summary of 2021 AM Peak 1 Hour forecast passenger boarding and demand at Town Hall Square Station is presented in Table 14.3.

**Table 14.3** Town Hall Square Station – CBD Metro 2021 AM Peak 1 Hour

Boarding					Alighting					Total passengers
Walk	Rail	Bus	Car	Total	Walk	Rail	Bus	Car	Total	
26%	70%	5%	0%		80%	19%	1%	0%		
Passengers:				1,800 to 2,400	Passengers:				2,600 to 3,500	4,400 to 5,900

Note: Percentages may not add up due to rounding.  
Source: Sydney Metro, Zenith demand estimates (LU3A), July 2009.

### **Martin Place**

Martin Place Station would function as both a catchment and interchange station. It would be located close to both the CityRail's Martin Place Station and Elizabeth and Castlereagh Street bus stops. A high proportion of passengers boarding CBD Metro at Martin Place Station in the morning peak would be interchanging from other modes of public transport to continue their journey on the metro, and there would also be a significant proportion of walk-up passengers. The majority of passengers alighting from metro would walk to their employment destinations within the financial core of Sydney, and other major attractors including Circular Quay, the State Library and The Domain. Martin Place Station would also service the midtown precinct to the south.

A summary of 2021 AM Peak 1 Hour forecast passenger boarding and demand at Martin Place Station is presented in Table 14.4.

**Table 14.4** Martin Place Station – CBD Metro 2021 AM Peak 1 Hour

Boarding					Alighting					Total passengers
Walk	Rail	Bus	Car	Total	Walk	Rail	Bus	Car	Total	
27%	46%	27%	0%		94%	5%	0%	0%		
Passengers:				1,500 to 2,000	Passengers:				4,900 to 6,700	6,400 to 8,700

Note: Percentages may not add up due to rounding.  
Source: Sydney Metro, Zenith demand estimates (LU3A), July 2009

**Barangaroo-Wynyard**

Barangaroo-Wynyard Station would function as both a catchment and interchange station. A high proportion of passengers boarding CBD Metro at Barangaroo-Wynyard Station in the morning peak would be interchanging from other rail and bus to continue their journey on the metro, and there would also be a significant proportion of walk-up passengers.

The majority of passengers alighting from metro would walk to their employment destinations within the western corridor (including the proposed development at Barangaroo), the financial district, or to destination in the Rocks and midtown precincts. Interchange to rail would also be an important function.

Barangaroo-Wynyard Station would be the gateway to the new development at Barangaroo to west of the station. The new Barangaroo development would potentially include 22,000 jobs, residential apartments and recreational waterfront facilities. Key transport objectives for the Barangaroo development include a very high mode share to public transport, walking and cycling for people travelling to and from Barangaroo, very low use of cars, and restricted parking supply.

A summary of 2021 AM Peak 1 Hour forecast passenger boarding and demand at Barangaroo-Wynyard Station is presented in Table 14.5.

**Table 14.5** Barangaroo-Wynyard Station – CBD Metro 2021 AM Peak 1 Hour

Boarding					Alighting					Total passengers
Walk	Rail	Bus	Car	Total	Walk	Rail	Bus	Car	Total	
17%	54%	29%	0%		73%	23%	5%	0%		
Passengers:				2,400 to 3,300	Passengers:				3,300 to 4,500	5,700 to 7,800

Note: Percentages may not add up due to rounding.

Source: Sydney Metro, Zenith demand estimates (LU3A), July 2009.

**Pymont**

Pymont Station would be both a destination and a catchment station with the majority of passengers walking to and from the station. Interchange between metro and light rail or bus would be expected to be minimal.

Pymont Station would serve the Pymont and Ultimo precincts, which include a mixture of residential and employment land uses. Pymont Station would also serve the western side of Darling Harbour.

A summary of 2021 AM Peak 1 Hour forecast passenger boarding and demand at Pymont Station is presented in Table 14.6.

**Table 14.6** Pymont Station – CBD Metro 2021 AM Peak 1 Hour

Boarding					Alighting					Total passengers
Walk	Rail	Bus	Car	Total	Walk	Rail	Bus	Car	Total	
95%	0%	1%	0%		100%	0%	0%	0%		
Passengers:				1,500 to 2,000	Passengers:				3,700 to 5,000	5,200 to 7,000

Note: Percentages may not add up due to rounding

Source: Sydney Metro, Zenith demand estimates (LU3A), July 2009

### Rozelle

Rozelle Station would be a catchment station servicing the Balmain Peninsula. Significant interchange would also occur between metro and bus services along Victoria Road and on Darling Street. Bus passengers would board the CBD Metro at Rozelle Station in the morning peak to continue their journey into the city. In the longer term, with a potential extension of the CBD Metro to the north-west, the interchange role of Rozelle would reduce.

A summary of 2021 AM Peak 1 Hour forecast passenger boarding and demand at Rozelle Station is presented in Table 14.7.

**Table 14.7** Rozelle Station – CBD Metro 2021 AM Peak 1 Hour

Boarding					Alighting					Total passengers
Walk	Rail	Bus	Car	Total	Walk	Rail	Bus	Car	Total	Grand Total
33%	0%	61%	6%		59%	0%	39%	2%		
Passengers:				4,300 to 5,000	Passengers:				800 to 1,000	5,100 to 6,800

Note: Percentages may not add up due to rounding.  
Source: Sydney Metro, Zenith demand estimates (LU3A), July 2009.

### 14.3.3 Integration of metro stations to facilitate mode change and access

The metro stations would be integrated with the current and future urban context and public transport infrastructure and networks. This would facilitate passenger access and interchange; encourage walking, cycling and public transport usage; and create a customer journey that is seamless from origin to destination.

#### **Pedestrian and metro entrances**

To ensure that the key benefits of the project are realised for pedestrians, the following elements in Table 14.8 are proposed as part of, or in association with, the CBD Metro project.

**Table 14.8** Integration with pedestrian connections

Station	Element
Central	<ul style="list-style-type: none"> <li>• Provide a metro station entry at Eddy Avenue and Pitt Street (street level), linking to the metro concourse via the Central undercroft area beneath the western forecourt (Entry 01).</li> <li>• Provide a metro station entry at Quay Street (street-level), linking to the metro concourse via a pedestrian subway under Pitt and George streets (Entry 02).</li> <li>• Provide a metro station entry at Henry Dean Place linking the metro concourse to the western end of the Devonshire Street tunnel (Entry 03).</li> <li>• Provide a metro station entry at Lee Street near Ambulance Avenue (Entry 04).</li> <li>• Construct a sub-surface pedestrian link under George and Pitt Streets, connecting the metro concourse to Quay Street entry.</li> <li>• Construct a concourse within the Central undercroft area beneath the western forecourt, linking the Metro concourse to Eddy Avenue and Pitt Street entry.</li> <li>• Widen footpath at Quay Street station entry.</li> <li>• Widen footpaths at the intersection of Pitt Street and Eddy Avenue.</li> <li>• Install way-finding signage and metro information.</li> <li>• Install real-time 'next train' and 'next bus' information.</li> </ul>



Town Hall Square	<ul style="list-style-type: none"> <li>• Provide a metro station entry on the south-west corner of Pitt Street and Park Street intersection.</li> <li>• Provide a metro station entry in Pitt Street, north of Park Street beneath the monorail, connecting to the metro concourse via a pedestrian subway connection beneath Park Street.</li> <li>• Install way-finding signage and metro information.</li> <li>• Install real-time 'next train' and 'next bus' information.</li> </ul>
Martin Place	<ul style="list-style-type: none"> <li>• Provide a metro station entry within Martin Place, west of Castlereagh Street.</li> <li>• Install way-finding signage and metro information.</li> <li>• Install real-time 'next train' and 'next bus' information.</li> </ul>
Barangaroo-Wynyard	<ul style="list-style-type: none"> <li>• Provide a metro station entry within Barangaroo west of Sussex Street, north of proposed Margaret Street West (western entry).</li> <li>• Provide a metro station entry on Clarence Street (between Margaret Street and Erskine Street, adjacent to the existing CityRail concourse (eastern entry)).</li> <li>• Connect the eastern metro station entry to Margaret Street via an upgraded York Lane and to York Street via the existing CityRail street-level concourse.</li> <li>• Upgrade the existing entry to the existing Kent Street–Wynyard pedestrian link on the western side of Clarence Street, and connect to the metro concourse underneath Clarence Street.</li> <li>• Construct the Barangaroo Pedestrian Link (BPL) connecting Barangaroo to Barangaroo-Wynyard Station and CityRail stations. The BPL would include: <ul style="list-style-type: none"> <li>• A pedestrian bridge across Sussex Street, landing south of Moreton's Hotel.</li> <li>• A sub-surface link beneath Margaret Street.</li> <li>• A western portal near Westpac Plaza.</li> <li>• An eastern connection RailCorp concourse and metro vertical transfer.</li> </ul> </li> <li>• Provide a pedestrian bridge over Sussex Street (part of BPL works).</li> <li>• Provide a Napoleon Street pedestrian nodal point, including eastern footings of the pedestrian bridge, linking with the adjacent Westpac gardens and Plaza (part of BPL works).</li> <li>• Reconfigure Napoleon Street to provide cycle lanes and enhance footpaths (part of BPL works).</li> <li>• Provide a tunnel beneath Margaret Street (9 m wide and 4 m high) connecting the Napoleon Street pedestrian nodal point to the RailCorp concourse and metro vertical transfer (part of BPL works).</li> <li>• Install way-finding signage and metro information.</li> <li>• Install real-time 'next train' and 'next bus' information.</li> </ul>
Pymont	<p><b>Alternative 1</b></p> <ul style="list-style-type: none"> <li>• Provide metro station entry at the corner of Union Street and Pymont Street (eastern entry).</li> <li>• Provide a metro station entry at Miller Street, near the corner of Mount Street (western entry).</li> <li>• Implement a shared pedestrian and vehicle zone at Mount Street, north from Miller Street.</li> <li>• Provide lift access to the cliff walk at the northern end of Mount Street.</li> <li>• Install way-finding signage and metro information.</li> <li>• Install real-time 'next bus' information.</li> </ul> <p><b>Alternative 2</b></p> <ul style="list-style-type: none"> <li>• Provide metro station entry on the western side of Pymont Street, near the corner of Union Street (eastern entry).</li> <li>• Provide a metro station entry at Miller Street near the corner of Mount Street</li> </ul>

	<p>(western entry).</p> <ul style="list-style-type: none"> <li>• Implement a shared pedestrian and vehicle zone at Mount Street north from Miller Street.</li> <li>• Implement a pedestrianised area on Union Street between Paternoster Row at Union Square and Pyrmont Street.</li> <li>• Widen footpath on the western side of Pyrmont Street at the eastern entry by removing existing parking spaces.</li> <li>• Provide lift access to the cliff walk at the northern end of Mount Street.</li> <li>• Install way-finding signage and metro information.</li> <li>• Install real-time 'next bus' information.</li> </ul>
Rozelle	<ul style="list-style-type: none"> <li>• Provide a metro entry on the corner of Victoria Road and Darling Street near the Balmain Leagues Club site (entry 1).</li> <li>• Provide a metro entry on the corner of Victoria Road and Darling Street near St Paul's church (entry 2).</li> <li>• Provide a metro entry on the corner of Victoria Road and Darling Street near the St Thomas church (entry 3).</li> <li>• Construct an unpaid subway link between the three Rozelle Station entries beneath Victoria Road / Darling Street (entry 1 connected to entry 2, entry 2 connected to entry 3).</li> <li>• Install way-finding signage and metro information.</li> <li>• Install real-time 'next bus' and 'next metro' information.</li> </ul>
Rozelle stabling and maintenance depot	<ul style="list-style-type: none"> <li>• Construct a shared pedestrian / bicycle bridge over the depot site linking Lilyfield Road to Annandale light rail station.</li> <li>• Upgrade the Lilyfield Road shared bicycle and pedestrian path between Catherine Street Bridge and Gordon Street.</li> <li>• Improve shared bicycle and pedestrian links to the Lilyfield Road shared path.</li> </ul>

## Bicycle

To ensure that the key benefits of the project are realised for cyclists, the following elements in Table 14.9 are proposed as part of, or in association with the CBD Metro project.

**Table 14.9** Integration with the bicycle network

Station	Element
Central	<ul style="list-style-type: none"> <li>• Install weather-protected parking for 50 bicycles (100 bicycles in the long term).</li> </ul>
Town Hall Square	<ul style="list-style-type: none"> <li>• Install weather-protected parking for 25 bicycles (50 bicycles in the long term).</li> </ul>
Martin Place	<ul style="list-style-type: none"> <li>• Install weather-protected parking for 15 bicycles (25 bicycles in the long term).</li> </ul>
Barangaroo-Wynyard	<ul style="list-style-type: none"> <li>• Install weather-protected parking for 25 bicycles (50 bicycles in the long term).</li> <li>• Investigate opportunity to reconfigure Napoleon Street to provide one lane of traffic each way and bicycle lanes.</li> </ul>
Pyrmont	<p><b>Alternative 1</b></p> <ul style="list-style-type: none"> <li>• Install weather-protected parking for 25 bicycles (50 bicycles in the long term).</li> </ul> <p><b>Alternative 2</b></p> <ul style="list-style-type: none"> <li>• Install weather-protected parking for 25 bicycles (50 bicycles in the long term).</li> <li>• Upgrade the existing signalised intersection at Union and Pyrmont streets.</li> </ul>
Rozelle	<ul style="list-style-type: none"> <li>• Install weather-protected parking for 50 bicycles (100 bicycles in the long term).</li> </ul>

Rozelle stabling and maintenance depot	<ul style="list-style-type: none"> <li>Construct a shared pedestrian / bicycle bridge over the depot site linking Lilyfield Road to Annandale light rail station.</li> <li>Upgrade the Lilyfield Road shared bicycle and pedestrian path between Catherine Street Bridge and Gordon Street.</li> <li>Install weather-protected parking for five bicycles at the operations control centre, three bicycles at the rolling stock maintenance yard, three bicycles at the depot entry.</li> <li>Improve shared bicycle and pedestrian links to the Lilyfield Road shared path.</li> </ul>
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### **Rail**

To ensure that the key benefits of the project are realised for metro–rail interchange the following elements in Table 14.10 are proposed as part of, or in association with the CBD Metro project.

**Table 14.10** Integration with the rail network

Station	Element
Central	<ul style="list-style-type: none"> <li>Construct a sub-surface east–west concourse connection between the metro and CityRail platforms 4 to 11 (Stage 1).</li> </ul>
Town Hall Square	<ul style="list-style-type: none"> <li>Provide an unpaid sub-surface pedestrian connection between metro and CityRail unpaid concourses.</li> </ul>
Martin Place	<ul style="list-style-type: none"> <li>Construct a pedestrian sub-surface connection between the unpaid metro concourse and the Martin Place shopping circle and connection to CityRail's Martin Place Station.</li> </ul>
Barangaroo-Wynyard	<ul style="list-style-type: none"> <li>Construct a sub-surface pedestrian connection between metro and CityRail unpaid concourses at Wynyard Station.</li> </ul>
Pyrmont	N/A
Rozelle	N/A

### **Bus and coach**

To ensure that the key benefits of the project are realised for metro–bus interchange the following elements in Table 14.11 are proposed as part of, or in association with the CBD Metro project.

**Table 14.11** Integration with the bus and coach network

Station	Element
Central	N/A
Town Hall Square	N/A
Martin Place	<ul style="list-style-type: none"> <li>Extend weather-protected bus passenger waiting areas at Elizabeth Street.</li> <li>Relocate Castlereagh Street bus services to Elizabeth and George streets.</li> </ul>
Barangaroo-Wynyard	N/A
Pyrmont	<b>Alternative 1</b> <ul style="list-style-type: none"> <li>Provide weather-protected bus passenger waiting areas at Miller and Harris streets.</li> </ul>

	<b>Alternative 2</b> <ul style="list-style-type: none"> <li>• Provide weather-protected bus passenger waiting areas at Miller and Harris streets.</li> </ul>
Rozelle	<ul style="list-style-type: none"> <li>• Provide a weather-protected bus passenger facility at the outbound Victoria Road bus stops along the Victoria Road frontage, including seating and real-time 'next bus' information, and connected to metro via entry 1.</li> <li>• Provide a new bus stop and weather-protected passenger facility connecting the inbound bus stop to the metro entry (intersection approach side – entry 2).</li> <li>• Upgrade the existing bus passenger facility to provide weather-protected connection at the inbound bus stop to the metro entry (intersection departure side – entry 3).</li> <li>• Upgrade the Victoria Road and Wellington Street signalised intersection.</li> <li>• Provide an outbound indented bus bay on Victoria Road between Darling Street and Wellington Street.</li> <li>• Provide an outbound bus lane on Victoria Road between Darling Street and Wellington Street.</li> </ul>

### Light rail

To ensure that the benefits of the project are realised for the metro–light rail interchange, in association with the CBD Metro project, it is proposed to upgrade the vertical transfer between the light rail colonnade stop and the metro entry at the corner of Eddy Avenue and Pitt Street.

### Road

To ensure that the benefits of the project are realised, the following elements in Table 14.12 are proposed as part of, or in association with the CBD Metro project.

**Table 14.12** Integration with the road network

Station	Element
Central	<ul style="list-style-type: none"> <li>• Dedicate kiss-and-ride kerb space in the western forecourt area.</li> <li>• Upgrade taxi rank in western forecourt area.</li> </ul>
Town Hall Square	N/A
Martin Place	<ul style="list-style-type: none"> <li>• Provide a taxi rank on Castlereagh Street.</li> </ul>
Barangaroo-Wynyard	N/A
Pymont	<b>Alternative 1</b> <ul style="list-style-type: none"> <li>• Dedicate kiss-and-ride kerb space on Pymont Street.</li> </ul> <b>Alternative 2</b> <ul style="list-style-type: none"> <li>• Dedicate kiss-and-ride kerb space on Pymont Street.</li> <li>• Re-route Paternoster Row (northbound) through existing Union Square shared zone to Harris Street/Miller Street intersection.</li> <li>• Upgrade the existing signalised intersection of Harris and Miller streets.</li> <li>• Upgrade the existing signalised intersection at Union and Pymont streets.</li> </ul>
Rozelle	<ul style="list-style-type: none"> <li>• Dedicate kiss-and-ride space on Darling Street (Balmain side of Victoria Road).</li> <li>• Dedicate kiss-and-ride space on Darling Street (Rozelle side of Victoria Road).</li> <li>• Provide a taxi rank on National Street.</li> <li>• Extend the existing Resident Parking Scheme in the vicinity of Rozelle Station.</li> <li>• Upgrade the Victoria Road and Wellington Street signalised intersection.</li> </ul>

Rozelle stabling and maintenance depot	<ul style="list-style-type: none"> <li>• Provide car parking for depot staff: ten vehicles at the operations control centre, ten vehicles at rolling stock maintenance yard, and five vehicles at depot entry.</li> <li>• Provide operational vehicle access to the depot from the City West Link at a new four-leg intersection of the City West Link and the Crescent; or retain a 'western' left in/left out access way on City West Link.</li> <li>• Provide operational vehicle access to the depot from Gordon Street for light vehicles.</li> <li>• Implement local area traffic management initiatives near Rozelle depot at Lilyfield Road.</li> </ul>
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### **Future opportunities**

Future opportunities to improve passenger access and interchange have also been identified. These could potentially be delivered by other transport agencies, operators and local councils. These would enhance access to the public transport system, make substantial improvements to the public domain, or unlock opportunities that are provided through the introduction of the CBD Metro.

Sydney Metro would continue to work with relevant agencies and local councils to ensure that complementary future opportunities are progressed effectively.

### **14.3.4 Future transport infrastructure and corridors**

The CBD Metro is the first stage of a wider Sydney metro network. As such, the design allows for future growth. The CBD Metro would enable extensions to the west and north-west with resulting benefits for passengers in these corridors.

The CBD Metro offers the opportunity to upgrade the existing transport networks and rationalise some existing transport operational issues. It would not preclude proposed corridor improvements along the proposed CBD Metro alignment.

### **CBD Metro**

The CBD Metro would be designed to allow for the future extension of the metro alignment without impacting on the CBD Metro operations. The elements included in the CBD Metro project, to support future growth include tunnel stubs, stabling facilities and rolling stock, as presented in more detail below.

#### **Tunnel stubs**

Tunnel stubs would be provided at either end to facilitate the construction. Tunnel stubs would extend a minimum of 30 metres beyond the operational area of the CBD Metro at Rozelle and Central stations. The 30-metre buffer zone requirement consists of:

- 10 metres for the inclusion of appropriate buffer stops.
- 20 metres construction buffer zone (including rock-fall area).

#### **Stabling and maintenance depot**

The CBD Metro stabling and maintenance depot at Rozelle has been designed to accommodate the rolling stock required for the future extension of the line west to Parramatta/Westmead ('West Metro').

The stabling and maintenance depot has been designed to stable 30 six-car sets (maximum) and provide maintenance areas for up to eight train sets at any given time. The proposed depot has been designed in consultation with the Sydney Metro Shadow Operators Team and is considered acceptable for future metro operations to Westmead provided suitable layovers are provided along the western extension. These layovers would provide the optimal setting for commencement of morning services.



### *Rolling stock*

With a five-car train set, each metro train has a capacity of 965 passengers per train, based on a 37 per cent seating arrangement. With a train every two minutes (30 trains per hour) the metro would provide capacity for around 29,000 passengers per hour per direction.

Preliminary estimates indicate that this would provide enough capacity to meet the peak line load demand in 2031 for Metro Line 1. Should the demand be higher than anticipated, arrangements can be made to increase the capacity by increasing service frequency, reconfiguring seats to increase the train capacity, accepting higher load levels, or changing to six-car train sets.

### **Metro network extension**

The CBD Metro offers the opportunity to upgrade the existing transport networks and rationalise some existing transport operational issues. The development of the CBD Metro would not preclude proposed corridor improvements along the proposed CBD Metro alignment, and provision has been made in the design to cater for future extensions.

### *West metro extension*

Sydney Metro, in conjunction with the Commonwealth, is currently undertaking feasibility studies into a West Metro to Parramatta/Westmead.

CBD Metro stations, such as Town Hall Square, would become more significant destination stations as they would be accessible from a much larger catchment via a greater number of stations, over longer distances.

### *North-west metro extension*

If the proposed CBD Metro were extended beyond Rozelle towards the north-west, passengers whom would join the metro further out would benefit from improved journey times. This would reduce the importance of a bus–metro transfer at Rozelle, and possibly the size of the facility. In addition, the function of the line would change, with more balanced counter-flows of passengers accessing the key employment and educational centre of Macquarie-North Ryde.

A potential longer term extension towards Rouse Hill could deliver better access to jobs in centres such as Rouse Hill and Norwest, and provide communities in the newly developing North West Growth Centre with benefits from having access to the highest quality public transport service. A metro extended towards Rouse Hill would provide significant travel time savings for residents in the Hills District, with a reduction in travel times between Rouse Hill and Sydney CBD of about 50 per cent.

### *South-east and north-east extensions*

If the proposed network were to develop further – with a metro linking the northern beaches and North Sydney with the south-east – metro–metro interchange would become a significant function of some CBD stations. Depending on the route through the CBD, these are likely to be at Martin Place, Barangaroo-Wynyard and/or at Central Station. A cross-harbour metro line would relieve CityRail services across the Harbour Bridge and provide congestion relief for CityRail Wynyard and Town Hall Stations by diverting transfers to metro services.

With further lines in the longer term, all three stations would become key metro network interchange points. As such, it is essential that the design of the CBD Metro does not preclude this occurring at some point in the future.

### **Future transport infrastructure corridors**

#### *Heavy rail*

During feasibility studies for the CBD Metro, the development of the alignment took into consideration the need for separate additional heavy and metro rail alignments running north–south through the Sydney CBD. The alignments are required to:

- Provide for an additional heavy rail crossing of Sydney Harbour, allowing for an alignment running down either the eastern or western side of the Sydney CBD.
- Provide for a metro rail alignment through the Sydney CBD serving future extensions to either Malabar in the south-east and the Northern Beaches (Metro 2).

### *Light rail*

The location and design of the proposed Rozelle stabling and maintenance depot allows for the future extension of the light rail line to Dulwich Hill. The facility has also been designed to allow a future light rail depot to the west of Catherine Street, should this be required.

Potential extension of the light rail line into White Bay via the existing rail tunnels under Victoria Road may also be possible in the vicinity of the area reserved for future transport infrastructure (refer to Figure 6.25). Should this extension be identified as being required by government, additional investigation of potential alignment options would be required.

### *Bus*

If the metro network were expanded with the Metro Line 1, there would be opportunities to re-route buses from the most heavily congested corridors approaching the CBD to improve service frequencies on cross-regional routes and in other parts of Sydney that do not have access to rail services. This would provide a network-wide improvement in public transport connectivity and contribute to improved accessibility to sub-regional centres.

### *Road network*

The current design of the Rozelle stabling and maintenance depot makes provision for the future construction of other transport infrastructure and future connections to the Bays Precinct (refer to Figure 6.25).

The depot has been designed in consultation with the Roads and Traffic Authority and includes a provision of a five-metre construction buffer at the edge of the site.

## 14.3.5 Infrastructure protection

Future development above and close to underground elements of the CBD Metro would need to consider the structural integrity of the future tunnel and station elements. Important considerations for evaluating the potential impact of future development include founding levels, foundation loads, excavation details, site geology and the proximity of the proposed development to the underground infrastructure.

The need to protect the metro corridor has been given statutory recognition by the Infrastructure SEPP which defines the Interim Metro Corridor (including that for the CBD Metro) and includes referral provisions directed at ensuring development has considered any potential adverse impacts on the viability of a metro project.

The design process has recognised existing structures and underground services and key constraints and has endeavoured to minimise impacts on these assets. This is evidenced by the horizontal and vertical alignment of the CBD Metro and the preference for utilising existing road alignments as far as possible for that alignment.

Significant technical consultation has been undertaken with infrastructure asset owners to ensure the long-term protection of existing and proposed infrastructure, including but not limited to:

- RailCorp, particularly with regard to existing and protected rail corridors through the CBD.
- RTA, particularly with regard to protection of existing road tunnels through the CBD (such as the Cross City Tunnel) and safeguarding potential future road infrastructure.



- EnergyAustralia, particularly with regard to existing and proposed cable tunnels and facilities.
- Building owners where deep basements occur, or are proposed.

The CBD Metro tunnel alignment and/or design reflect the outcomes of this ongoing consultation. Importantly, the CBD Metro would not preclude a heavy rail alignment utilising the Interim Rail West corridor, which is protected under the Infrastructure SEPP.

## 14.4 Mitigation and management

Measures to integrate the CBD metro project during operation with Sydney's existing transportation network would include the following:

- Sydney Metro would work in partnership with the NSW Transport and Infrastructure and RailCorp to develop transport strategies to meet the government's commitment to deliver the CBD Metro.
- Sydney Metro would work in partnership with local councils and the Roads and Traffic Authority to integrate the existing and proposed pedestrian and bicycle network with the CBD Metro.
- Metro stations would be carefully designed to integrate with existing CityRail stations and pedestrian networks to provide easy access for commuters while reducing the strain on CityRail stations.
- Integrated ticketing would be introduced, to facilitate network integration and passenger interchange between metro and rail.
- Sydney Metro would work in partnership with the NSW Transport and Infrastructure, Roads and Traffic Authority, Sydney Buses, private bus operators and local councils to integrate the future bus network with the metro and bring forward bus network improvements.
- Further discussion and modelling would be undertaken with the Roads and Traffic Authority and local councils to resolve traffic and urban design opportunities that may be facilitated by the introduction of the CBD Metro.
- Sydney Metro would continue to work with relevant agencies and local councils to ensure that complementary future opportunities and integration of metro stations with the current and future urban context and public transport infrastructure and networks, are progressed effectively.

## 14.5 Conclusion

With the implementation of the initiatives proposed as part of the integrated transport strategy, the CBD Metro would provide efficient transfers with other modes of transport, including walking, cycling, other rail, bus, ferries, light rail and monorail. Further consultation with government agencies would be required to ensure the effectiveness of this strategy.

As the first stage of a wider Sydney metro network, the CBD Metro design allows for future growth and would enable extensions to the west and north-west, with resulting benefits for passengers in these corridors.

