

MAJOR PROJECT ASSESSMENT
Sydney Metro Network – Stage 1 (CBD Metro)



Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

December 2009

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EXECUTIVE SUMMARY

Sydney is a global city, with a population expected to reach 5.4 million by 2026 and 6.9 million by 2056 (ABS, 2008), increasing demand on existing transport infrastructure and services. Sydney's transport network, comprising a variety of modes is currently experiencing capacity constraints throughout the network and transport demand is expected to exceed population growth consistent with current trends. This demand will place further pressure on the network, increase congestion and related social, environmental and economic costs and requires the consideration of not only enhancing existing networks and services, but also investing in new modes and services capable of meeting forecast transport demand.

As part of meeting this demand, the NSW Government has committed to delivering Australia's first metro rail system, as part of a major investment in Sydney's sustainable growth and prosperity, with the CBD Metro being the first step of a broader Sydney Metro network. The project is a critical part of the government's plan to make Sydney's transport network more efficient, which will in turn contribute not only to its liveability, but also to its economy.

The CBD Metro would deliver a fast, frequent and reliable underground rail service between RailCorp's Central Station, and Rozelle. New stations would be built at Central, Town Hall Square, Martin Place, Barangaroo-Wynyard, Pyrmont and Rozelle, with infrastructure at White Bay for a future station, and a stabling and maintenance facility at the former Rozelle marshalling yard.

In the longer term, the CBD Metro would be extended beyond Rozelle to the north west and beyond Central to Westmead as part of Metro Line 1 (a project application has been received for the western section of this project). A second line is planned from Malabar via the city to the Northern Beaches. The metro network would serve major transport corridors that are not currently serviced by mass transit, or do not have the capacity to meet future needs.

A key concern raised by the community was that the Government is progressing a project in the absence of an integrated transport plan for Sydney and that the project and its cost is not fully justified within a broader transport network or against alternatives. The Department notes that the Government is currently preparing a transport blueprint for Sydney and it is expected that this blueprint will incorporate the project and a broader metro network. The Department considers that the project has been developed to address current and future transport needs and is broadly consistent with the *State Plan* and the *Metropolitan Strategy* and that a metro network, incorporating the project will provide broad social, economic and environmental benefits.

The Department has assessed the Proponent's Environmental Assessment and Submissions Report (including revised Statement of Commitments) and taken into consideration issues raised in private and public submissions. The Department is satisfied that the Environmental Assessment and Submissions Report, have considered the key issues to the greatest extent practicable, that mitigation measures are appropriate, and that the residual impacts of the proposal are manageable and acceptable.

However, this does not imply that there are not environmental issues associated to the project. These issues were reflected within the 2,539 submissions received from Government agencies, councils and the community during the exhibition of the Environmental Assessment. Of particular note are construction impacts, and in particular pertaining to traffic, noise and vibration, social and economic impacts, and non-indigenous heritage. Accordingly, this report and the conditions of approval are focused on assessing these matters. The Department also notes the importance of this project to the NSW economy and the broader Sydney community and has established an approval framework to ensure that the project is constructed in a manner that protects the environment and community amenity, whilst ensuring that construction can proceed in an efficient manner.

Operational impacts of concern include noise and vibration, social and land use impacts, transport integration and changes to the public domain. Further refinement of the proposal will occur during detailed design with the aim of further reducing these impacts and the Department has recommended a suite of conditions to ensure that the project is well integrated into the transport network and will provide an acceptable level of urban amenity.

The Department has also recommended conditions which define performance standards and targets which the project must achieve, as well as monitoring requirements which are aimed at measuring the effectiveness of the mitigation measures, which the Proponent has committed to in order to minimise environmental impacts.

In summary, the Department is of the opinion that on balance the project is justified and in the public interest. It is anticipated that the Proponent's revised proposal, Statement of Commitments and the recommended conditions of approval, should ensure that the project is designed, constructed and operated to meet acceptable environmental and amenity limits. Consequently, the Department recommends that the Minister for Planning approve the CBD Metro project, subject to the recommended conditions of approval.

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1. BACKGROUND

To maintain and improve Sydney's global position and contribution to national productivity, Sydney requires a comprehensive and efficient transport network to ensure equitable and sustainable access for its residents, workers and visitors, and to facilitate and support forecast population and employment growth. The Sydney Metro Network – Stage 1 (CBD Metro) and the wider planned metro network have been identified as one component of an enhanced, integrated transport system to support Sydney's pre-eminent position and growth.

On 11 June 2009, the then Premier announced a significant reform in the delivery of transport services and infrastructure, with the establishment of NSW Transport and Infrastructure, taking leadership in transport coordination, policy and planning. The immediate focus of the new department is to develop a single direction for transport services and to develop a single transport blueprint for NSW that integrates urban growth and transport delivery.

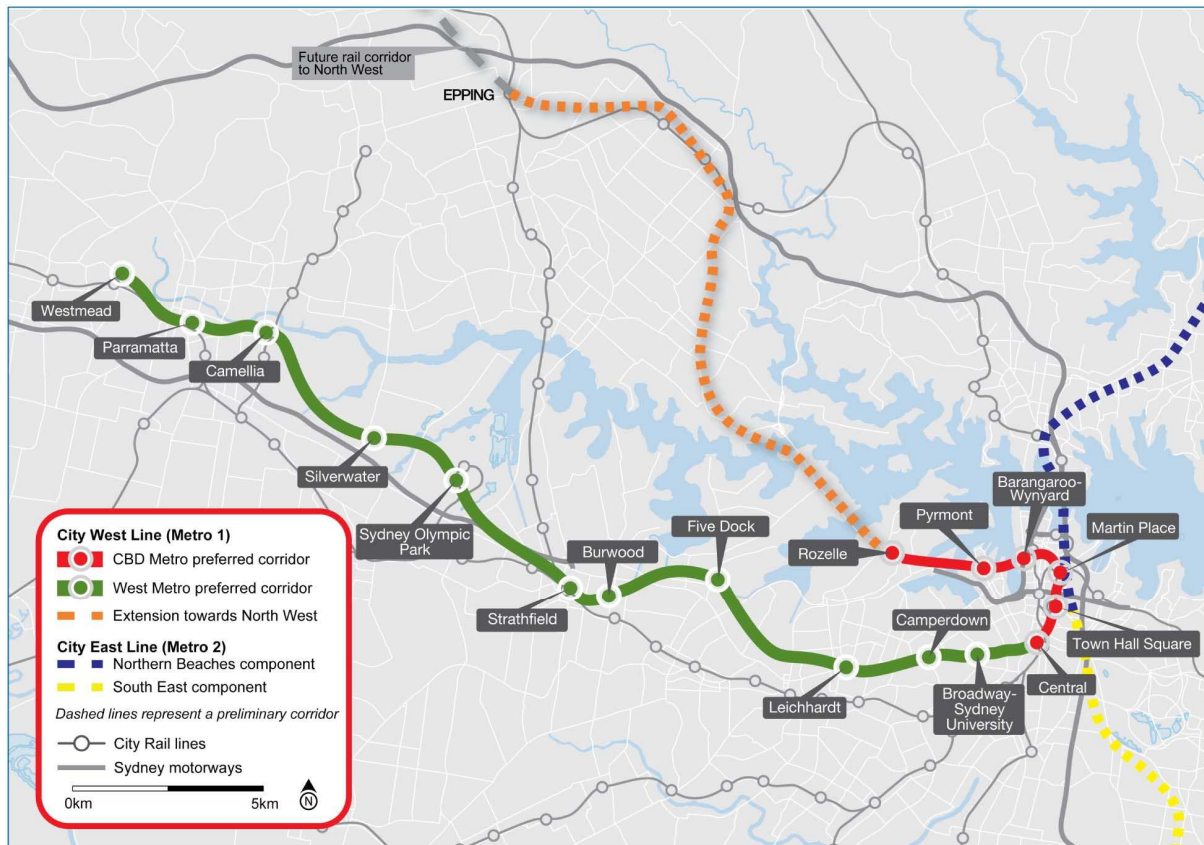
A key component of the Transport Blueprint is expected to be the NSW Government's commitment to the development of a metro network for Sydney to realise the objectives of the *Metropolitan Strategy* (NSW Government 2005) and other key State transport and planning policy documents. The *Metropolitan Strategy* is the overarching planning framework for Sydney, setting the parameters for residential and economic development, and sets the key transport initiatives to support the future growth of Sydney and to improve the availability and reliability of public transport services. The vision for Sydney in 2031 includes an expanded transport network to improve connectivity and access between centres and enterprise corridors.

Consistent with the *Metropolitan Strategy*, the *State Plan – A New Direction for NSW* (NSW Government 2006) supports a vision for NSW in which the transport system is defined by its safety and reliability. To deliver an effective transport system, the *State Plan* sets a number of priorities that relate specifically to transport:

- Priority S6 – Increasing share of peak hour journeys on a safe and reliable public transport system.
- Priority P2 – Maintain and invest in infrastructure.
- Priority E3 – Cleaner air and progress on greenhouse gas reductions.

The project is consistent with these *State Plan* priorities. It represents a significant investment in transport infrastructure, targeting the reliability and efficiency of train operations during peak periods, and contributing to reducing greenhouse gas emissions. The project is also consistent with the NSW Government's 2006 *Urban Transport Statement*, which aims to relieve road congestion and improve the existing public transport system in the metropolitan area. Specifically, the *Urban Transport Statement* included investigation of a metro system as part of its overall approach.

The project is the first component of a planned Sydney-wide metro network, which would underpin the transformation of Sydney's transport system into an integrated whole, combining complementary metro, heavy rail, bus and other mode networks, fulfilling clearly defined roles and supporting Sydney's economic growth. The project (including train and station platform lengths) is designed to allow for an extendable system. The system would allow the addition of train carriages and the lengthening of platforms, and also the extension of the metro system across the Sydney region. The project would be the backbone and 'enabler' of a Sydney-wide metro network, with a planned extension to the west and potential future extensions to the north-west, south-east and north-east (refer to Figure 1).

Figure 1 - Strategic Planning for Sydney's Metro Network (Source: Environmental Assessment 2009)

2. PROPOSED DEVELOPMENT

The project would provide a high quality rail service between Central Station and Rozelle with a travel time of approximately 10 minutes. The peak frequency of services is anticipated to be 22 trains per hour in the year 2016, and moving to 24 trains per hour from 2031. During off-peak periods the project would operate with a reduced number of trains per hour, with a daytime minimum of 12 trains per hour in each direction. The stabling facility and maintenance depot at Lilyfield/Rozelle would operate 24 hours a day to provide for the control and management of the metro railway network. An overview of the project and associated infrastructure is included in Table 1.

The project is currently proposed to operate from 5:30 am to midnight Mondays to Thursdays and until 1:00 am Fridays and Saturdays. On Sundays it is proposed to operate from 6:00 am to midnight. These operating hours could be adjusted to cater for special events. The trains would be equipped with modern passenger surveillance and communication systems and have disability access provisions.

Stations would be designed to provide easy access for all persons with a range of different needs. Platform screen doors would be utilised at all stations. These would effectively separate the station from the tunnel/surface rail line, and enable less disruption to service, less littering and trackside cleaning, improved safety and reduce the need for mechanical ventilation.

2.1 Route Alignment

The project would operate within twin underground tunnels, including a spur line to the Rozelle stabling and maintenance depot. The project route alignment is shown in Figure 1. The Proponent seeks approval for a 60-metre wide rail corridor within which to construct these tunnels, the rail track alignment, stations, station complexes and other project infrastructure. The route alignment within the Environmental Assessment is subject to further refinement during the detailed design development phase (prior to construction).

Figure 2 - Project Alignment

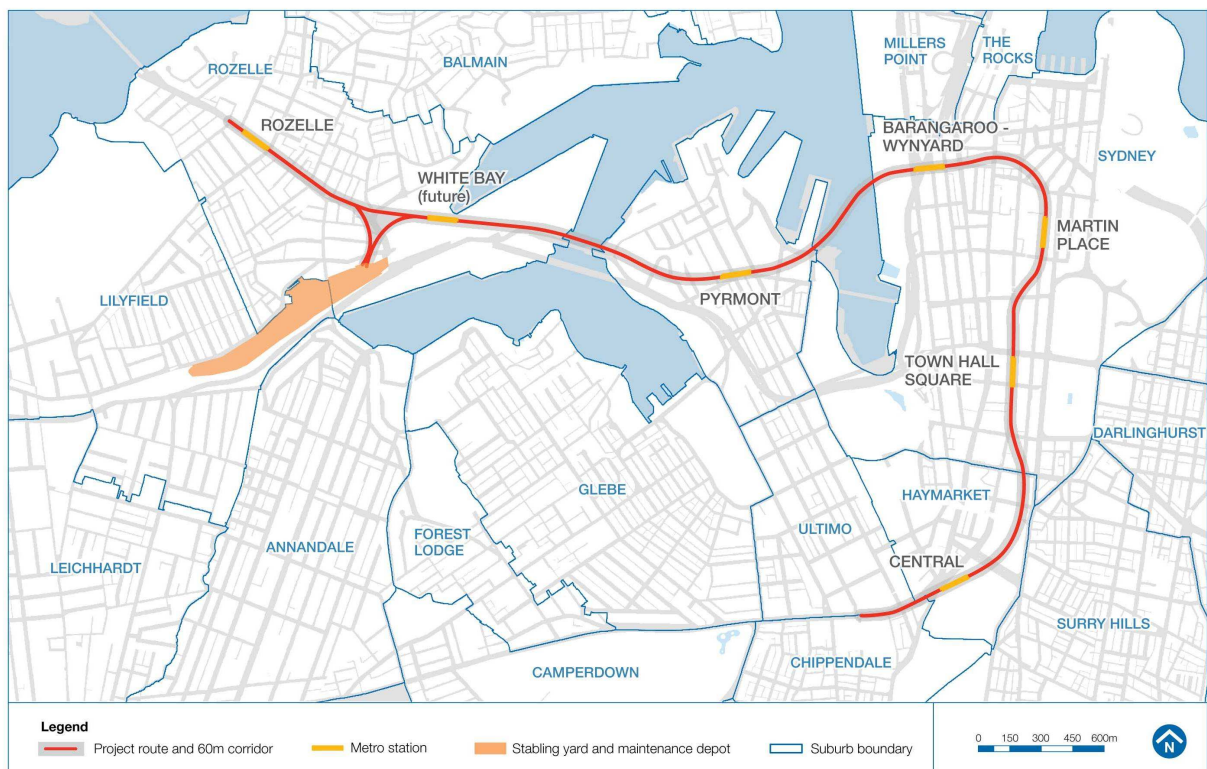


Table 1 - Overview of Project Components

Project Component	Details
Stations and Access	
Metro stations	6 stations, plus reservation for a future station at White Bay - deep cavern constructions with a general internal width of about 20 metres - depth of stations would range from approximately 19 to 39 metres - configuration to include an island platform about nine metres wide and 130 metres long
Ticketing system	- the CBD Metro ticketing system would use the latest automatic fare collection technology and would be fully gated and paperless - it is intended that the ticketing system would eventually be part of an integrated electronic ticketing system for Sydney - fares would be comparable to other public transport systems at the time of opening
Bus mode change	Central, Town Hall Square, Martin Place, Barangaroo-Wynyard, Pyrmont, Rozelle
Monorail	Central, Town Hall Square, Martin Place, Barangaroo-Wynyard
Light rail mode change	Town Hall Square
Ferry mode change	Central, Pyrmont
Infrastructure	
Running tunnels	- a total of about 14 kilometres of running tunnel, including about 6.2 kilometres for each running tunnel and about two kilometres for the connections to the stabling and maintenance depot - rail level about 20 – 35 metres, and as much as 45 metres, below St level, and about 30 metres below sea level under Darling Harbour and Johnstons Bay - internal diameter of approximately 5.7 metres - tunnels lined with pre-cast concrete segments to provide a watertight structure
Crossovers and turnbacks	- diamond crossover and turnback at the southern end of Central Station - crossover and turnout at White Bay Station and Victoria Road to provide metro trains access to the depot - rail turnback at the end of Rozelle - stub tunnels at the ends of the CBD Metro main tunnels to allow for future extension
Train stabling and maintenance	- stabling facility and maintenance depot to occupy approximately 8.6 hectares - provide for infrastructure maintenance equipment, Operational Control Centre, general administration and training, and depot traction substation area
Rolling Stock	
Train type	- single deck air-conditioned trains, approximately 113 metres long, with a body width of approximately 3.2 metres and a height of approximately 3.7 metres 5 cars per train, with potential for 6 car trains 3 bi-parting doors per side per car to allow easy entry and exit
Train control	- automatic, driverless trains controlled using an Automated Train Control system - trains operate under Automatic Train Operation and Automatic Train Protection systems, which supervises and controls trains - the Train Controller may intervene and operate train movements in the event of emergencies
Train capacity	965 passengers per train
Initial train fleet size	13 trains
Tunnel and Station Support Systems	
Emergency egress	- emergency egress would be provided at each station site and tunnel sections - stations would allow access for emergency services
Station ventilation	ventilation systems would be provided in the tunnels to allow effective natural ventilation and supplementary mechanical ventilation
Fire and life safety	- fire and life safety objectives prepared in consultation with NSW Fire Brigades - fire safety for the depot would be based on the requirements of the Building Code of Australia for buildings, and international codes where relevant
Power supply	- construction power supply will include a substation and generator to power the electrical equipment - operational power system is made up of various components, including bulk supply point from Energy Australia; high voltage reticulation; traction supply substations and station and depot supply substations

2.2 Station Sites

The project includes new stations at Central, Town Hall Square, Martin Place, Barangaroo-Wynyard, Pyrmont, and Rozelle. A site at White Bay will be 'safeguarded' to provide opportunities for development of a station at that site should it be required in future.

At each station, access to the project would be via entrances that are integrated with the existing and planned urban environment, including other transport modes. Minor changes to footpaths, bus stops and roads are expected. Signage and metro information would be installed at all stations, as well as real-time next train and bus information.

Station precincts would also comprise commercial and/or retail activities, open space and public domain improvements. Commercial and/or retail activities within the station complex would be constructed and operated as part of the project. Other development, for example on surplus construction sites or above service facilities, would be viable at some locations. Such development would be subject to relevant separate planning approvals. The project would be designed and constructed to accommodate future development (by providing structural support, servicing and access).

Central Station

The proposed Metro Central Station would provide the principal interchange between metro and CityRail services, and would be a key interchange station for nearby bus and coach services, light rail, taxi and 'kiss and ride' drop-off points. The station would service a walk-up catchment for key educational facilities (including the University of Technology Sydney, Sydney TAFE and Curtin University (Sydney campus)), the retail precinct at Broadway, Chinatown and Darling Harbour and cultural facilities such as the Entertainment Centre and Capitol Theatre; as well as commercial offices.

The station would be located to the north-east of Railway Square, on the western side of and adjacent to the existing Central Station. The station would have entrances, staged over time, including:

- an entrance at the corner of Eddy Avenue and Pitt St within the existing Central Station building;
- entrances to the metro station from Pitt St using existing vehicle entrances to Central Station;
- an entrance from the metro station providing access to Henry Deane Place;
- an entrance to Lee St across a re-designed Western Forecourt;
- an entrance from Quay St with an underpass link under George St; and
- an east-west concourse below the current Central Station platforms.

An indicative layout of the proposed station is provided in Figure 3, with staged entrances indicated in Figure 4.

Construction of station would be undertaken from one primary construction site located in the south-western portion of the Central Station Western Forecourt and two secondary construction sites in Belmore Park and on Quay Street. The primary construction site would be used to construct the main shaft, as well as a diamond crossover and turnback within the tunnels at the southern end of the station box. The Belmore Park site would include a second shaft constructed to facilitate retrieval of the tunnel boring machines (TBM) used to construct the running tunnels. The Quay Street site would be required for the construction of a station entrance.

The project would deliver a number of components of the broader plan for Central Station, including new station entries and associated public domain works, the reconstruction and finishing of the western forecourt, the interchange link with CityRail platforms (to Platform 11) and the connection to Henry Deane Plaza. These include the following works:

- create a loop road at the northern end of the Western Forecourt for kiss-and-ride and taxi access;
- reinstate the southern end of the Western Forecourt, remove vehicular access and parking, rationalise pedestrian movement, provide new landscape and opportunities for skylights to the station below;
- extend the eastern footpath of Pitt St at the north eastern corner of Eddy Avenue through the removal of the left turn slip lane; and
- reinstate areas of Belmore Park impacted during construction.

Figure 3 - Indicative Layout of Central Station



Figure 4 - Indicative Subsurface Connections and Staging at Central Station



Town Hall Square Station

Town Hall Square Station would be located under Pitt St, between Bathurst and Park Streets, as shown in Figure 5. The main station entrance would be provided at the south-western corner of the intersection of Park and Pitt Streets. An additional entrance would be provided on the north-western corner of this intersection, beneath the Pitt Street Monorail Station. The location of the station entrances provides bus interchange opportunities with the planned east-west bus corridor on Park St, and potential access from planned strategic cycleways crossing the CBD. The project would include a pedestrian connection to CityRail's Town Hall Station, and therefore also provide opportunity to interchange with CityRail services on the Bankstown, Inner West, Airport / East Hills, South, North Shore, Western and Northern Lines.

The primary Town Hall Square construction site would be located along Park St, between George and Pitt Streets. This site is currently occupied by the building housing the Woolworth's supermarket area, which would be demolished prior to construction commencing. A secondary construction site would be located at 125-135 Bathurst Street, on the south-eastern corner of Pitt and Bathurst Streets. This site is required to support station shaft excavation and to locate services buildings. The site currently houses retail buildings, which would be demolished prior to construction commencing. A shorter term construction site would also be required on Pitt St north of Park St to support construction of an underground pedestrian link and at Pitt Street north of Bathurst Street to support building basement protection works.

The project would deliver new station entries and associated public domain works, as well as subsurface links to entries and Town Hall Station. The proposed enhancements to the public domain for Town Hall Square Station, which are included in the CBD Metro project, include:

- safeguard the opportunity for a new Cycle2City facility beneath Town Hall Square;
- provide public pedestrian access between the new Town Hall Square and Pitt St;
- install parking for 25 bicycles;
- reinstatement/enhancement of footpaths adjacent to the station;
- widened footpaths on western side of Pitt St adjacent to station entries;
- transparency of northern side of station to allow sightline to Town Hall from Hyde Park; and
- sightline protected from new square to Uniting Church on Pitt St.

The proposed new Town Hall Square, including landscaping, lighting, seating and other public domain elements would be developed separately.

Martin Place Station

The proposed Metro Martin Place Station would be located under Castlereagh Street, between King Street and Martin Place, as shown in Figure 6. Access to the station would be provided from the western side of Castlereagh Street, in the location of the existing entrances to CityRail's Martin Place Station, and would include the introduction of lift access to the station. The existing retail link to CityRail would be retained and linked to the metro station unpaid concourse. The concourse would maintain a connection to CityRail's Martin Place Station and the MLC Centre. This would offer the opportunity to interchange with CityRail services on the Eastern Suburbs and Illawarra Lines. The entrance in this location would also offer the opportunity to interchange with the Eastern Suburbs bus services that run along Elizabeth Street.

Construction of the station cavern would be undertaken from two primary construction sites (one within Martin Place and the other between Castlereagh and Elizabeth Streets) and one secondary site located on Castlereagh Street, North of King Street. The Martin Place site would be required to support station shaft and cavern excavation and to construct the station entrance. The other primary construction site would be required to support station shaft, cavern, ventilation and emergency egress adit excavation. The site is currently occupied by retail and commercial buildings, which would be demolished prior to construction commencing. The staged secondary construction site located on Castlereagh Street, north of King Street, would be required to excavate down to platform level in order to construct tunnel vents, which are to be located along Castlereagh Street.

The temporary removal of on-street parking on Castlereagh and Elizabeth Streets adjacent to the site access locations would be required to facilitate truck turns from the kerbside lane and avoid delays to through-traffic.

movements. Temporary lane closure on Castlereagh Street would also be required to construct the ventilation facilities in existing parking bays.

The project would deliver a new station entry in Martin Place and public domain works associated with services sites to the north and south. The proposed enhancements to the public domain for Martin Place Station, which are included as part of the project, include:

- entry structures minimised and arranged to reduce visual and physical impact;
- reinstatement of areas of Martin Place impacted by construction, including paving, street furniture and other elements;
- reinstatement of footpaths adjacent to construction sites; and
- expand the footpath into the existing loading and parking zones on the western side of Castlereagh St between King St and Martin Place (to allow the construction of vent structures).

Figure 5 - Indicative Layout of Town Hall Square Station

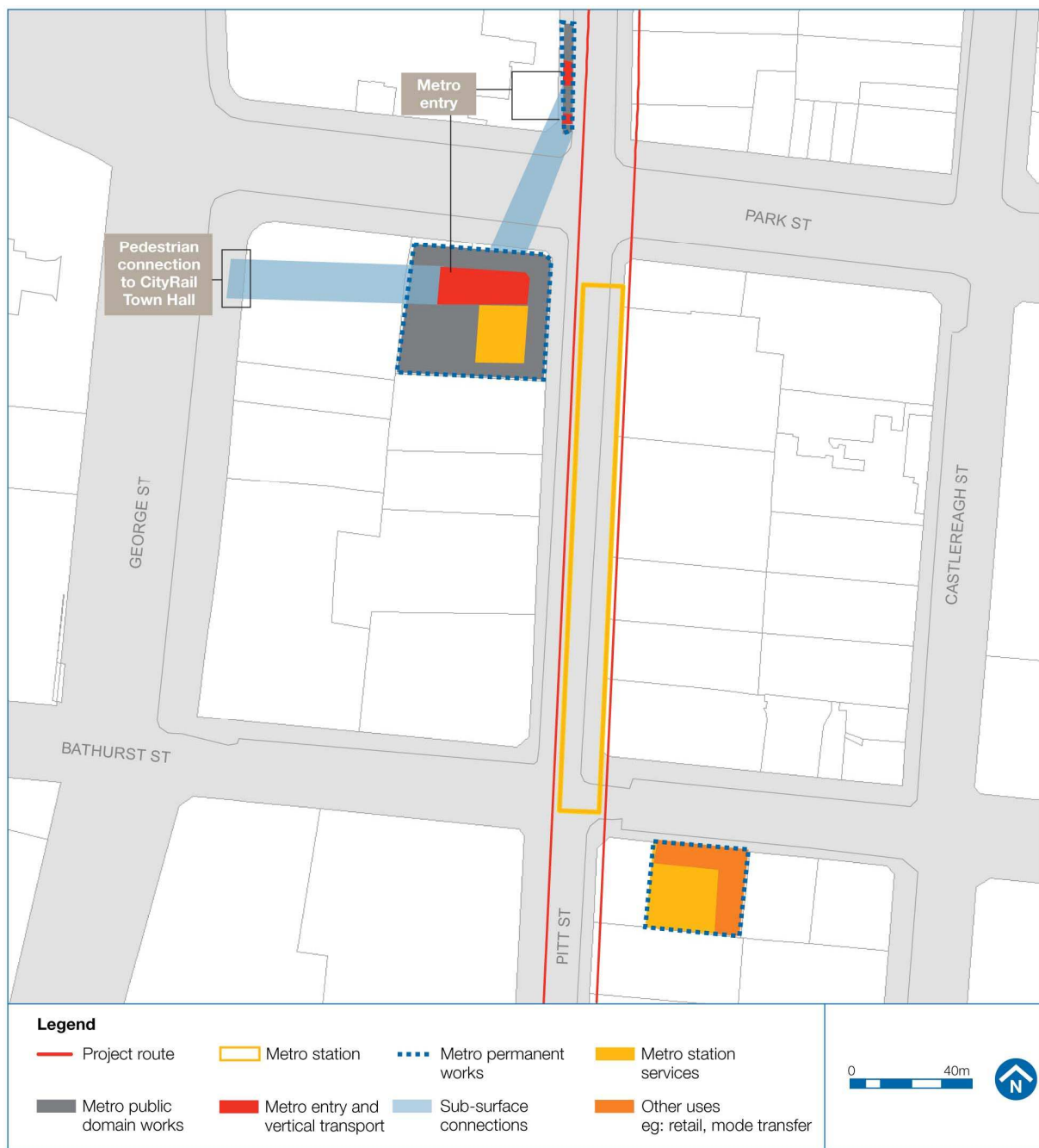
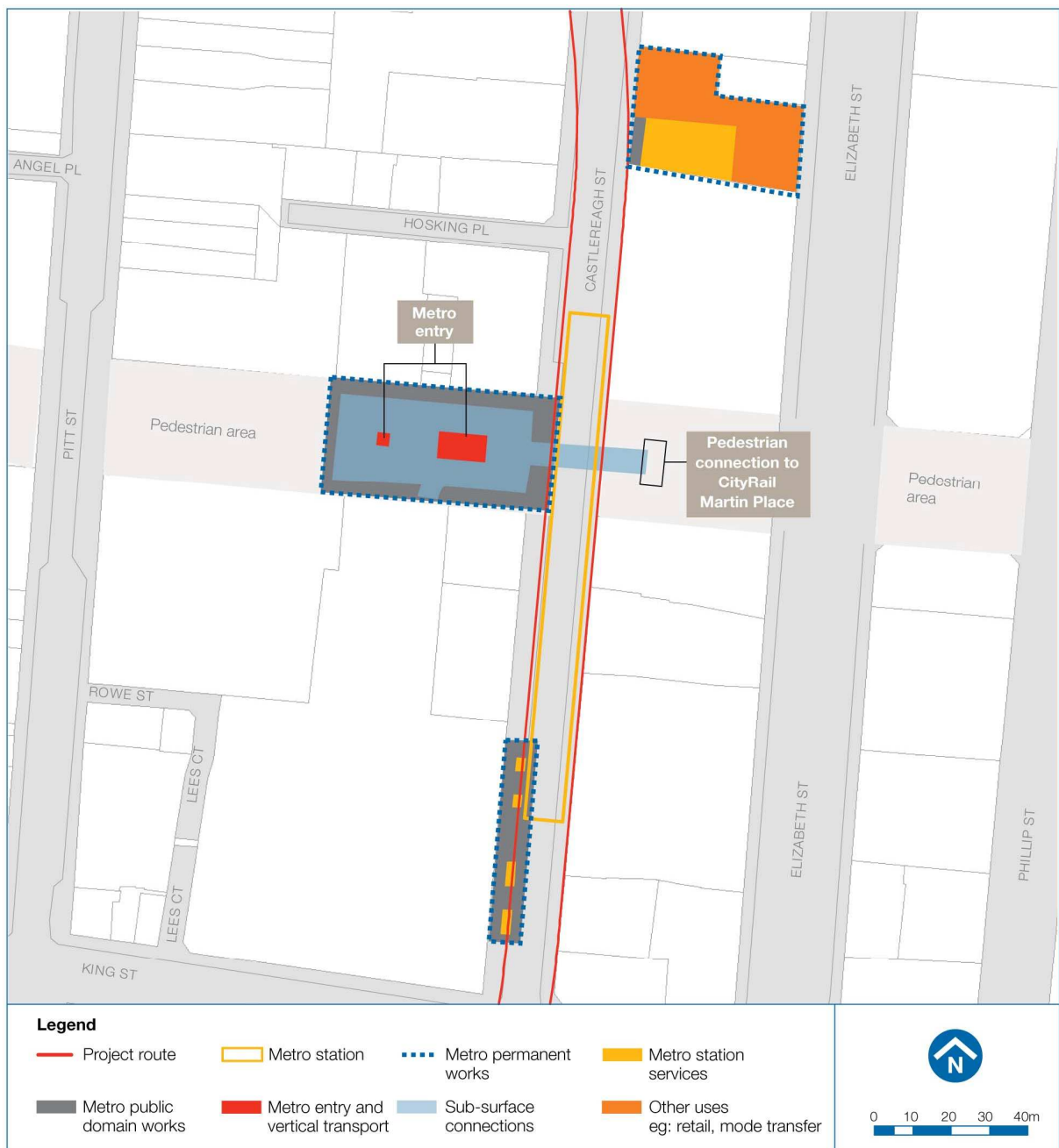


Figure 6 - Indicative Layout of Martin Place Station

Barangaroo-Wynyard Station

The Barangaroo-Wynyard Station would be located beneath Margaret Street between Clarence and York Streets, as shown in Figure 7. Station entrances are proposed on Shelley Street near Sussex Street, at the current Kent Street pedestrian subway entrance, at 1 Margaret Street and at 30-38 Clarence Street at the De La Salle House building adjacent to York Lane.

A metro station at Barangaroo-Wynyard would provide the opportunity to interchange with CityRail services at Wynyard Station, including the Bankstown, Inner West, Airport/East Hills, South, North Shore, Western and Northern lines. The station would also provide interchange opportunities for bus passengers coming over the Harbour Bridge who require a fast and effective journey to and through other parts of the CBD, and an opportunity for interchange with future ferry services.

The project includes the construction of the Barangaroo Pedestrian Link between Barangaroo and Wynyard. The provision of a grade separated pedestrian link is considered critical in ensuring safe and efficient pedestrian movement and transport integration between Barangaroo and the transport hub of Wynyard. The pedestrian link (as revised in the Submissions Report addendum) would include the following key elements:

- a surface pedestrian link from the Barangaroo waterfront to Sussex St;
- a bridge link over Sussex St into a public pedestrian plaza area located adjacent to Moreton's Hotel and known as the Napoleon Node; and
- a subterranean component aligned with the existing Kent Street pedestrian tunnel opening into the Westpac forecourt.

Construction of the station cavern would be undertaken from two construction sites. The primary construction site would be located mainly within the Barangaroo development site at the intersection of Sussex and Shelley Streets and would be required to support station shaft and cavern excavation. The secondary construction site would be located at De La Salle House, at 30 and 36-38 Clarence Street, and would be required to support station shaft, ventilation and emergency egress adit excavation. This site is currently occupied by retail and commercial office space, which would be demolished prior to construction commencing. In addition, components within the ground level of Transport House (corner of York and Margaret Streets) would be removed to facilitate the construction of the station entrance and provision of retail space. A staged worksite in the western side of Clarence Street would also be needed to provide an entrance to the Barangaroo Pedestrian Link and the station from the bus stops.

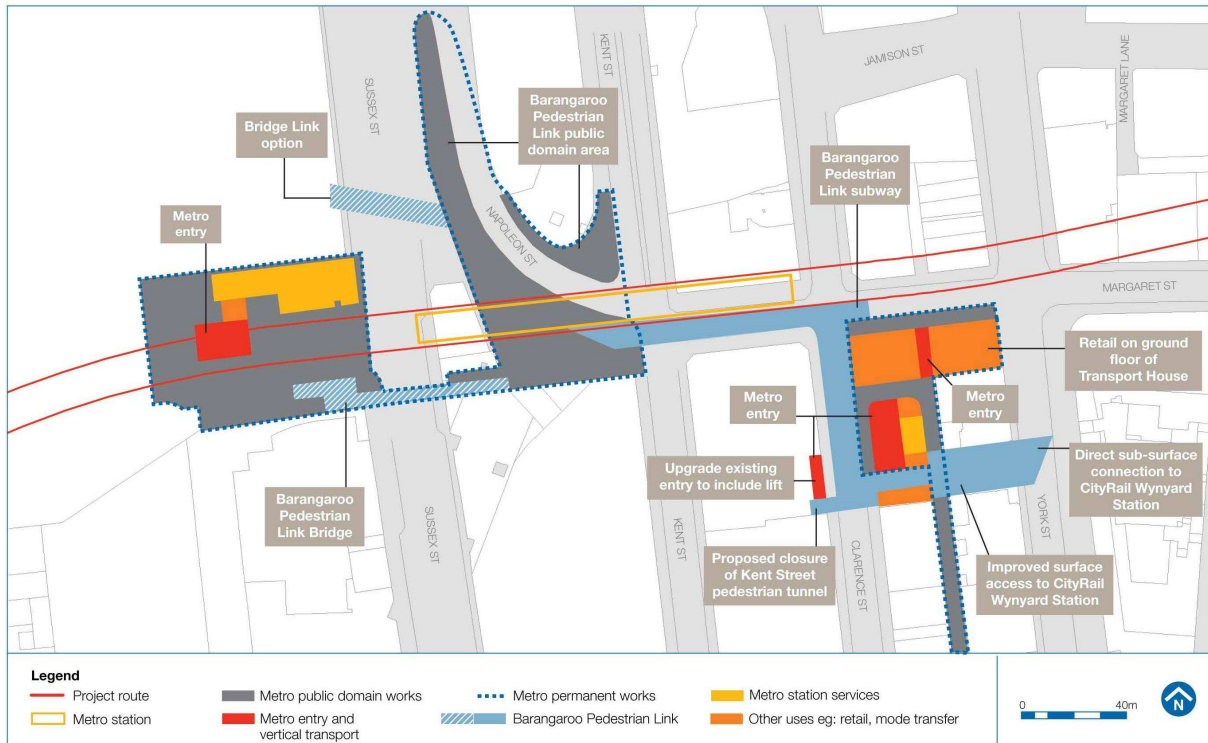
Road modifications would be required for the Barangaroo-Wynyard Station and Barangaroo Pedestrian Link construction sites, including some removal of parking and some road closures.

The project would deliver two new station entries, new public spaces along Margaret Street and at Barangaroo, the Barangaroo Pedestrian Link, and changes to streets and footpaths. The proposed enhancements to the public domain for Barangaroo-Wynyard Station, which are included in the CBD project, include:

- a metro station entry building that is built to the site boundary while allowing pedestrian access between York Lane and Clarence St to link with the existing CityRail entry;
- footpaths and open spaces around the entry at Barangaroo;
- upgrade of York Lane between Margaret and Erskine Streets, including pavement resurfacing, lighting and public art;
- a 'square' at the intersection of Kent and Margaret Sts through reduction of road widths on Napoleon Street, and the establishment of a grid of new trees;
- an enhanced setting for Moreton's Hotel by extending and flattening the open space adjacent to the hotel, and access to the Barangaroo Pedestrian Link;
- widen and improve footpaths on Napoleon Street;
- a landscaped shared zone between Hickson Road and Darling Harbour on the Margaret Street alignment;
- upgrade of the footpath on the southern side of Margaret St between Clarence and York Streets; and
- reinstatement of the footpath on the western side of Clarence St between the Metro entry and Margaret Street.

Figure 7 - Indicative Layout of Barangaroo-Wynyard Station

Note: The subterranean component of the Barangaroo Pedestrian Link has been amended to align with the Kent Street pedestrian tunnel, which is no longer proposed to be closed.



Pymont Station

The proposed Pymont Station would be located generally under Union Square and would have both an eastern entrance and a western entrance. Its location provides an opportunity for improved pedestrian connectivity.

As shown in Figure 8 an eastern entrance would be provided at the vacant site on the corner of Union and Pymont Streets (11 Union Street). In order to enable an entrance at this location, the station box and the alignment would need to be located beneath residential properties on the northern side of Union Street. The station entrance would require acquisition of the buildings fronting Union Street (3-11 Union Street) for the period of construction only. The front portions of the buildings would be retained and a section at the rear of the buildings would be demolished to provide a space to locate services buildings. The revised design as presented in the Submissions Report addendum would locate only a lift within Union Square. Union St would become pedestrianised between Paternoster Row and Pymont Street, and Union Square would be reconfigured for vehicle access from Paternoster Row.

The western entrance would be located at the corner of Mount and Miller Streets. Access improvements at the escarpment end of Mount Street would be constructed as part of the project, including the provision of a lift.

The primary construction site would be located at 102-108 Miller Street (on the corner of Mount St) and would be required to support station shaft and cavern excavation. The site is currently occupied by retail and commercial office space which would be demolished to facilitate construction of the station box and station entrance, and to locate station services. The secondary construction site would be required to support station shaft, ventilation and emergency egress adit excavation, as well as the passenger circulation link below Union Street. The site would be located either within part of the site occupied by 3-11 Union St. These properties are currently occupied by retail premises, and all or part of these buildings would need to be demolished prior to construction.

As part of its Submissions Report, the Proponent committed to removing all construction works and permanent infrastructure from Union Square, with the exception of minimal works required for the installation of a station access lift.

During construction, the eastbound traffic lane on Union Street would be closed between Paternoster Row and Pyrmont St to accommodate the works. Paternoster Row (northbound) would be rerouted through Union Square shared zone to the Harris Street and Miller Street intersection.

The project would deliver two new station entries, associated public domain works and some changes to roads, footpaths and open spaces. The proposed enhancements to the public domain for Pyrmont Station, which are included in the project, include:

- expand Union Square to Pyrmont Street by reconfiguring Paternoster Row to exit at Harris Street;
- widen the footpath on the western side of Pyrmont Street adjacent to the Metro station entry;
- a landscaped shared pedestrian and vehicle zone at Mount Street between Miller Street and the cliff edge;
- provide a new lift and stair between the two levels of Mount Street and in Union Square;
- allow for a future pedestrian connection between Mount and Harris Sts at the northern end of the western station entry;
- reinstate areas of Union Square / Street impacted by construction;
- continue the scale, grain and massing of the existing streetscape;
- provide trees to the eastern end of Union Square; and
- provide trees to the Mount Street shared zone.

Figure 8 - Indicative Layout of Pyrmont Station

Note: The Proponent has reconfigured the layout of Pyrmont Station to remove all works, other than those associated with the installation of an elevator, from Union Square.



(Future) White Bay Station

The provision to allow a future station to be constructed at White Bay is included as part of the project. The location of the potential future White Bay Station would be at White Bay adjacent to the Western Distributor, Robert Street and the disused White Bay Power Station site.

This would also be the location of the White Bay Station site. The existing functions of Sydney Ports would be relocated prior to work commencing on the site. The site would be used to launch and support the TBMs and roadheaders, as a spoil storage area, and to construct a station box for a future White Bay Station.

Access to the site would be via the intersection of James Craig Road and The Crescent. It is also proposed to provide construction vehicle access under the Victoria Road bridge to provide a link between the White Bay construction site and the Rozelle stabling and maintenance depot construction site to obtain access directly from City West Link Road.

Activities at the White Bay construction site would include:

- excavating the station box / launch site;
- undertaking temporary works, such as constructing HV power supply and a substation for operating TBMs and road headers, relocating services, demolition works, clearing vegetation, and levelling;
- undertaking ground improvement works, such as grouting at the eastern end of the station box;
- establishing site facilities;
- delivering and storing pre-cast segmental lining for the tunnels;
- concrete and/or grout batching for building the tunnel and station;
- delivering, assembling and launching the road headers to Rozelle (they may also be launched from the Rozelle stabling and maintenance depot site), installing pre-cast segments, and removing spoil generated by the road header;
- delivering, assembling and launching the TBMs to Central, installing pre-cast segmental lining and removing spoil generated by the TBM;
- storing and collecting spoil;
- treating construction water; and
- installing tunnel air ventilation and extraction plant and dust extraction / plant filtration.

There would potentially be up to 24 hours of construction per day. Spoil from the tunnelling works would be stockpiled on site and would subsequently be removed by truck.

Rozelle Station

The proposed Rozelle Station would be located under Victoria Road, immediately west of the intersection with Darling Street, as shown in Figure 9.

Rozelle Station would have one main station entrance on the north-western corner of the intersection of Victoria Road and Darling St, adjacent to the Balmain Leagues Club site. Additional entrances would be provided to connect to the unpaid concourse level below the main entrance, at the north-eastern corner of the intersection adjacent to St Paul's Church, and at the south-eastern corner of the intersection adjacent to St Thomas Church. Provision would be made so that a future entrance could be constructed within the Balmain Leagues Club redevelopment site to connect it to the station.

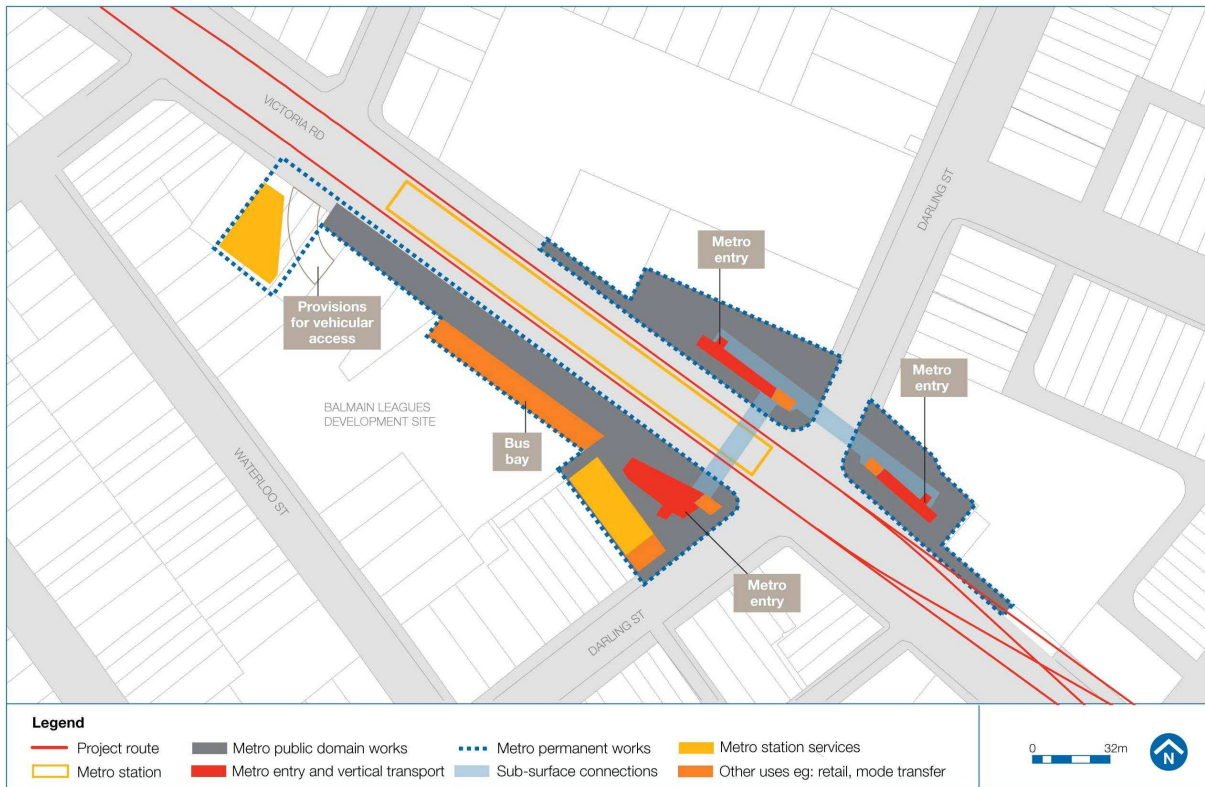
The primary construction site for Rozelle Station would be located within the Balmain Leagues Club development site along the south-western side of Victoria Road, and the adjacent block of retail premises on the corner of Victoria Road and Darling Street. Construction activities at this site would include constructing the shafts and station entrances, launching the road headers to construct the crossover, constructing a sub-surface pedestrian access to the opposite side of Victoria Road, and excavating stub tunnels for a future metro connection to the north-west. Two smaller secondary construction sites for station entrances would be located on the opposite side of Victoria Road, on either side of Darling Street. These sites would be required to support shallow station shaft excavation.

The project would deliver three new station entries, public spaces to the north of Victoria Road, new bus lanes, stops and waiting area, and additional changes to roads and footpath. The proposed enhancements to the public domain for Rozelle Station, which are included as part of the project, include:

- small station plazas to the north of northern entries that 'borrow' from the public domain of the adjacent churches, allow access between bus stops on Victoria Road and Darling St, and contain trees that enhance the landscape setting of adjacent buildings;
- widened footpaths to northern side by setting back entry building by 1-2 metres;
- paving/crossing treatment on Darling St on northern side of Victoria Road to emphasise pedestrian priority;
- repaving (and regrading if required) of footpaths and adjacent to station entries;
- construction of an unpaid subsurface link between the three station entries;

- removal of pedestrian-cyclist obstacles on the shared path on the northern side of Victoria Road at the station entries;
- an outbound bus lane and indented bus bay at Victoria Road between Darling St and Wellington St; and
- weather-protected bus passenger waiting areas at the inbound and outbound Victoria Road bus stops, and on Darling Street.

Figure 9 - Indicative Layout of Rozelle Station



2.3 Rozelle Stabling and Maintenance Depot

Metro trains would be stabled and maintained at a new purpose-built depot at the former Rozelle Marshalling Yard, within the area bounded by Victoria Road, Lilyfield Road, Catherine Street and the City West Link. An indicative layout of the depot site is shown in Figure 10. The depot site would incorporate the following components:

- Train stabling area used to stable trains when they are not required for service. The initial stabling area would provide space to accommodate 11 five-car trains in four stabling roads, each about 360 metres in length
- Rolling stock maintenance building to provide for the unscheduled, scheduled and heavy maintenance of trains. All train maintenance activities would be conducted within the building, about 148 metres long, 34 metres wide and 10 metres high, which would be equipped with end doors on each maintenance road to minimise noise. The main store, office facilities and component testing and servicing rooms to support the rolling stock maintenance activities would be attached to the rolling stock maintenance building in a two-storey building.
- Automated train wash. The plant would utilise rainwater collected from the roofs of the depot buildings, and would recycle up to 95 per cent of the wash water for use in subsequent washes. The train wash plant would be about 40 metres long and five metres wide and would be contained within an acoustic enclosure. The waste water treatment plant would occupy about 200 square metres, including the control room.
- Infrastructure vehicle maintenance facility and marshalling area. The infrastructure vehicle maintenance facility, which is incorporated into the train wash building, would be about 14 metres wide and 24 metres long and contain two maintenance tracks with pits. The infrastructure maintenance vehicle marshalling area would be used to assemble work trains ready for the commencement of the maintenance operations

periods. The marshalling area would consist of two parallel rail tracks about 100 metres long, feeding into the infrastructure vehicle maintenance facility.

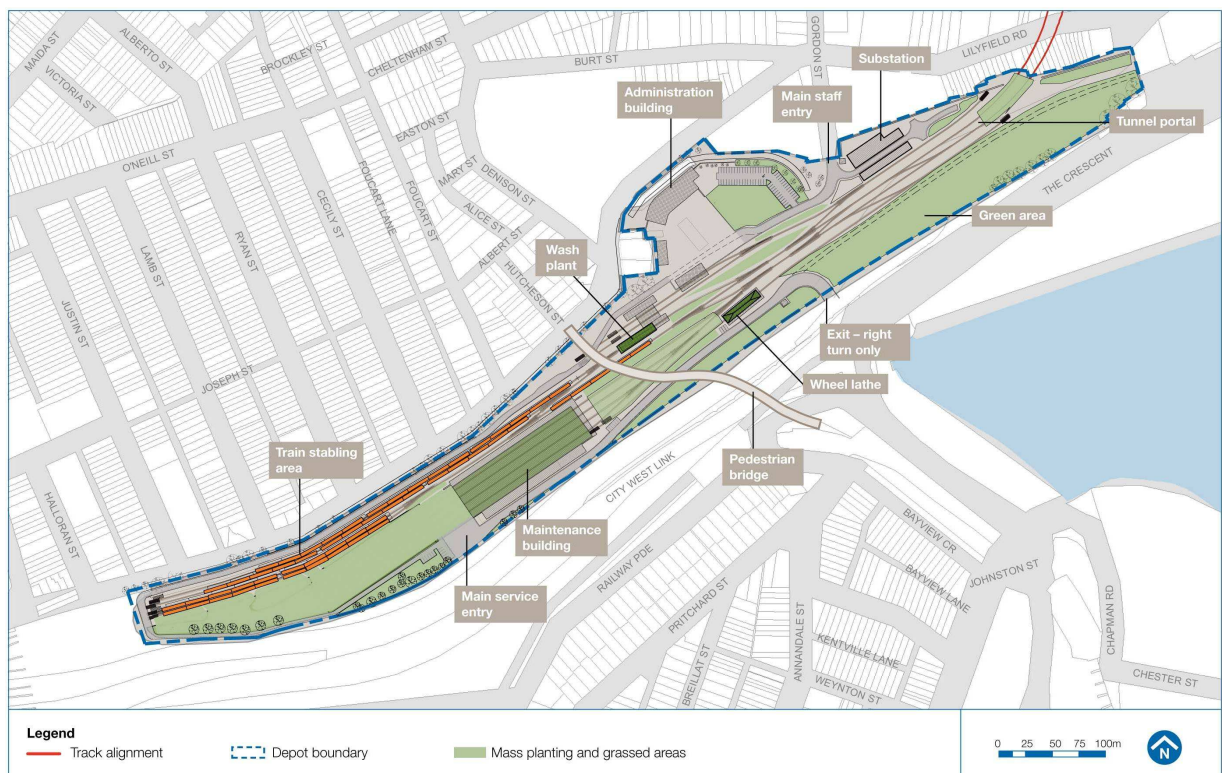
- Train control / administration building to house project operations control and emergency command rooms, and office facilities and locker areas for staff. The proposed administration building would be three-storeys high, about 65 metres long and 22 metres wide, containing a usable interior of 3,500 square metres.
- Bulk power supply building and traction power substation, fully enclosed brick building, about 55 metres long and 14 metres wide. The adjacent traction power substation, of a similar size, would convert the AC supply to DC, as required to power the trains.
- Depot connection tunnel portal and dive structure would be about 40 metres in length. It would have a concrete roof structure, which would be landscaped. A 70-metre long, 2.4-metre high noise barrier extending from the end of the portal structure on the northern side is also proposed.
- Wheel maintenance facility approximately 40 metres long and eight metres wide.
- Vehicle parking areas for up to 81 staff and visitors.

A pedestrian/bicycle bridge link would be provided over the stabling and maintenance depot from Lilyfield Road to the Annandale light rail station area as part of the project. The bridge would span the metro train stabling areas, the City West Link and Whites Creek and include a mid-landing point to provide pedestrian and bicycle access through open space in the east of the site to the existing Anzac Bridge. The bridge would be approximately 230 metres long and 3.6 metres wide.

The project would also deliver new publicly accessible open space and public domain improvements. The proposed enhancements to the public domain for the Rozelle depot, which are included in the project, include:

- provision of a new dedicated minimum 2.5-metre wide bidirectional pathway along southern side of Lilyfield Road from Catherine St bridge to Gordon St and through new open space from the Depot bridge to the existing Anzac Bridge pathway;
- provision of tree planting on the northern side of Lilyfield Road and adjacent to the City West Link road;
- provision of (three) landscaped seating courts / viewing areas on the southern side of Lilyfield Road; and
- provision of a new timber boardwalk (minimum five metres wide) at Rozelle Bay to mitigate visual impact of new stormwater pipes and headwall.

Figure 10 - Indicative Layout of Rozelle Stabling and Maintenance Depot



2.4 Construction Strategy

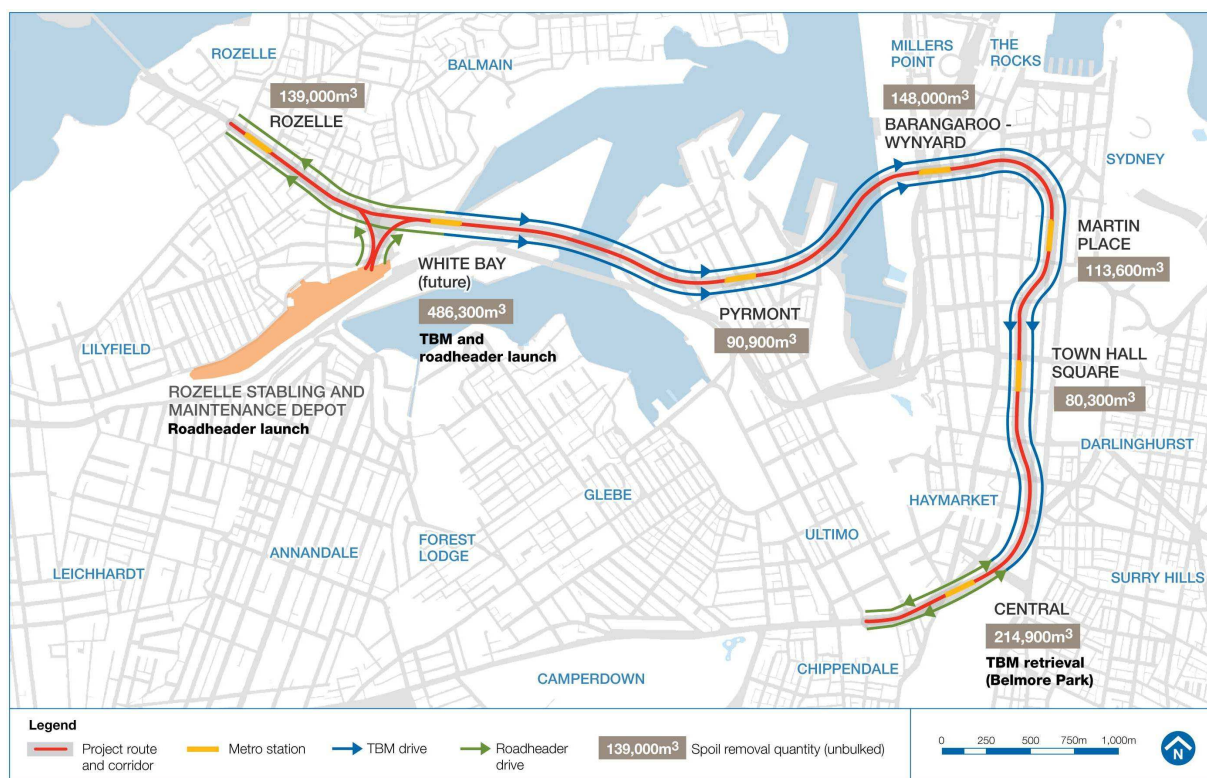
Given the large scale and complex nature of the permanent works it would be necessary to have some construction activities occurring over a 24-hour period to meet a 2015 completion date. A Construction Environmental Management Plan would be prepared prior to construction and would outline measures to mitigate the impact of construction activities and identify opportunities for environmental benefit. The Proponent proposes to generally undertake underground construction works 24-hours, 7 days per week, and aboveground construction works consistent with standard construction hours.

The Proponent proposes to undertake a series of enabling works prior to the construction of the principal project infrastructure. These enabling works would include: relocating various impacted facilities; local roadwork (on City West Link Road); supplying high voltage construction power for the tunnel boring machines; diverting or protecting utility services; dismantling and relocating and/or demolishing structures within the footprint of station and construction sites (a total of 33 buildings would be acquired and demolished for the project); erecting hoardings; and other minor works.

The construction of the permanent route infrastructure involves heavy civil works, including tunnelling works and excavation and construction of retaining structures associated with the station boxes at all stations. The preferred excavation method for tunnels and stations is largely driven by the geology and the expected ground conditions to be encountered during construction. The major tunnelling machinery would be by tunnel boring machines and road headers. Spoil from the tunnelling operations would be removed by conveyor (or other transport system) from the tunnel, stockpiled at White Bay and then removed from site. Figure 11 shows the indicative tunnelling sequence and location of plant launch and retrieval sites.

Cavern stations would be constructed at all of the station sites except for the future White Bay Station. Each station would be constructed from an access shaft, which would be constructed by a cut-and-cover method. A gantry crane (or similar) would lower machinery into the shaft to construct the cavern. The majority of the station fitout works would be undertaken underground, although there would still be a need to maintain a significant construction site at the station surface to facilitate the fitout activities. The safeguarded station box at White Bay would be a drained structure constructed by a bottom-up cut-and-cover method. The station structure would be constructed upward from the base slab and the box structure would then be backfilled to the surface.

Figure 11 - Indicative Tunnel Sequencing and Plant Launch and Retrieval Sites



2.5 Project Amendments and Preferred Project

As a result of the public exhibition process and submissions made on the project, the Proponent made a number of amendments to the project, including key changes at White Bay, Pyrmont and Barangaroo-Wynyard.

(Future) White Bay Station Location and Rail Alignment

The new preferred horizontal alignment of the White Bay Station box would be approximately 25 to 50 metres further south than the location described in the Environmental Assessment. The amendment is primarily due to re-assessment of the ground conditions, identified as comprising poor, soft ground material, and containing the remnants of timber piles used in the construction of the power station. Moving the alignment south would be sufficient to avoid any piles below the boiler house structure, and would result in the depot connection being situated within rock, making tunnelling of the turnout cavern more viable. In addition, the station box has been moved eastward towards the construction boundary.

As a result of the alignment alterations the total tunnel length would be increased by 16 metres on the Rozelle Down Main and by 15 metres on the Up Main. The revised main line tunnels would impact on the alignment of the depot connections. To avoid significant alterations at the tunnel portal, the radius on the western connection has been reduced to 180 metres.

Pyrmont Station Design (Eastern Entrance)

In response to the concerns raised in submissions the Proponent has investigated opportunities to reconfigure the construction worksite within Union Street. A reduction in the area of the worksite has been made possible through the adoption of alternative construction methodology and further design development. The alternative construction methods would involve excavation of the station shaft at the eastern entrance and excavation of the service adits and vertical transport deep (approximately 15-20 metres) below the buildings at 3-9 Union Street and below Paternoster Row. In addition to this change in construction methods, station services and access has continued to be refined, including locating a lift shaft within Union Street down to the unpaid concourse and reconfiguration of the rear lane access to the buildings at 3-9 Union Street.

There may be a requirement to extend the worksite marginally into Union Street in front of the buildings at 3 - 9 so that minor activities such as material storage may occur. In addition, there would need to be a relatively small worksite located within Union Street in order to construct the lift shaft to the concourse. It is envisaged that this worksite would be short term, being required for 12 months or less.

The alternative methods for construction reconfiguration of the services would:

- substantially reduce the size of the worksite within Union Street;
- allow room for access though Union Street on the south side and to the northern side;
- allow continued use by business of the paved areas to the north, resulting in a significant reduction on business viability impacts;
- minimise the time required to have a construction presence within Union Street for construction of the lift over a much reduced length of time;
- have the potential to maintain trees on both sides of Union Street during construction;
- no longer require sub-strata services below properties on the northern side of Union Street; and
- minimise relocation of utility services (power, water, fibre optics) below Union Street.

Barangaroo-Wynyard (Pedestrian Link)

The preferred design for the Barangaroo Pedestrian Link would be on the alignment of the existing Kent Street pedestrian tunnel which has to be closed as a result of the construction of the Sydney Metro works at Barangaroo-Wynyard Station (Clarence Street entrance). This preferred alignment provides the shortest tunnel length and most direct route, is able to provide enhanced amenity and safety over the reference design, provides a cost effective solution, and meets key stakeholders expectations. The preferred alignment would require the short-term closure of the Kent Street pedestrian tunnel. However the Proponent would develop options for the staging of works seeking to maximise the opportunity to keep open, that section of the Kent Street tunnel from Kent Street to Clarence Street, for as long a period as can practicably be achieved. Alternative pedestrian routes would be provided when this section of the Kent Street tunnel is closed for construction works.

3. PROJECT NEED AND JUSTIFICATION

3.1 Strategic Context

Growth in Population and Employment

In 2006, the Sydney region had a population of around 4.3 million people. This is forecast by the Australian Bureau of Statistics to reach 5.4 million by 2026 and 6.9 million by 2056. A substantial proportion of this growth is forecast in the eastern half of Sydney, which already has a significantly higher density than the western areas.

The number of jobs in Sydney is linked to the population of the area and to its ability to attract business. The NSW Government is planning for up to 500,000 more jobs by 2031. One-third of all future jobs is expected to be concentrated in existing centres, with good public transport access, and a further 10 percent in specialised economic centres such as Macquarie Park and Norwest Business Park. The Sydney CBD has more jobs than any other centre in the metropolitan area. Inner suburbs are also growing strongly. The CBD also has three-quarters of all hotel accommodation in the metropolitan area. As a result, the number of trips attracted by the city and within the city is higher than any other centre in the metropolitan area.

There is currently congestion on both road and rail routes approaching the CBD and within the CBD itself. This congestion affects the quality of existing public transport services and constrains future jobs growth in the CBD. Due to projected population and employment growth, the demand for travel within the CBD is estimated to rise by 32 percent by 2021, while the demand for travel to and from the CBD is expected to rise by 22 percent.

Existing Rail Services

Sydney has an existing commuter rail network, CityRail, operated by RailCorp. The majority of passenger rail travel is focused on the Sydney CBD, with approximately 60 per cent of the morning rail trips across the metropolitan area proceeding to or through the Sydney CBD. Major CBD stations such as Town Hall and Wynyard suffer from recurring crowding problems. The current CBD rail capacity is largely constrained by the following factors:

- the need for CityRail to accommodate long distance intercity services, outer suburban express services, and short-haul local suburban services, resulting in a mix of stopping patterns and sharing limited inner suburban tracks;
- the existing CBD area routes inbound from Central require services from different corridors to merge together to access the CBD area; and
- long dwell times in the CBD area constrain the ability to fully exploit the signalling capacity.

Currently, the most congested part of the rail network is the corridor operating from Parramatta to the Sydney CBD (the Main West Line). The infrastructure between Strathfield and Redfern (comprising six tracks) is the most heavily used part of the network, as trains are required to service both local (stopping) and regional (express) movements. It is operating during the AM peak period, at a load factor between Parramatta and the CBD of over 130 percent for the significant majority of its length (where a loading of 100 percent means all passengers have a seat).

The new Epping to Chatswood Rail Line was opened in February 2009, providing direct rail access for the first time to the expanding business and educational hub at Macquarie Park and North Ryde. The new link has been fully integrated with the northern line and provides some relief to passenger loads on both the Northern Line and the Main West Line, increasing the long term capacity of the network by providing an alternative path to Sydney's CBD from the north.

However, it is expected that recent and planned investments, including the Clearways program and projects as outlined in the NSW Government's State Infrastructure Strategy, will not be sufficient to accommodate long term travel demand, with overcrowding forecast to increase further.

By 2031, overcrowding on various sections of the rail network will have reached levels which are expected to force a significant percentage of travellers to either change the times of their journeys, switch modes, or not travel, imposing a very significant economic and social cost on the NSW economy and on individual travellers,

and leading to increased environmental and economic costs as private vehicle journeys and road congestion increases.

Existing Bus Services

Buses are also pivotal to Sydney's transport system. In the immediate future, buses will continue to perform the bulk of the task in the key non-rail CBD corridors such as the M2 from the north west, Military Road, Victoria Road, Oxford St, Anzac Parade and Parramatta Road. Accelerated implementation of strategic corridors and bus priority routes across Sydney, upgrading and expansion of bus fleets, increased use of technology to improve operations and greater integration of the bus and rail networks would improve travel times and reliability. However, buses servicing the CBD corridors are most at risk of declining performance as road congestion increases with population and employment growth.

Significant congestion is likely to occur on parts of the bus network by 2031. Sydney CBD would be a constraint point because of limitations on the capacity of bus access to and within the CBD and the need for more buses to access CBD interchange points. Opportunities for expansion are limited without significant investment. Increased volumes of buses in the Sydney CBD will also reduce amenity through noise, exhaust emissions, congestion, and the use of road and kerb space for bus stops, which would displace other essential uses such as service vehicles.

Victoria Road is one of the busiest bus corridors in Sydney, and one of the most unreliable in terms of peak travel times due to the high levels of traffic congestion experienced. Once these buses reach the city, they contribute significantly to congestion and suffer slow travel times as they traverse the northern part of George St to reach Circular Quay. The Inner West Busway will provide additional dedicated bus lanes along Victoria Road to address bus efficiency and reliability in the short to medium term. However these roads would need significant enhancement to cater for any sustained demand increase in the long term.

The Parramatta Road / Broadway corridor is made up of services operating from the inner west and inner south west. Bus reliability has been improved on the Parramatta Road corridor with the introduction of peak hour bus lanes on Parramatta Road, between Norton St Leichhardt, through to Broadway. However, reliability of services along Broadway / George St through to Sydney CBD is still an issue.

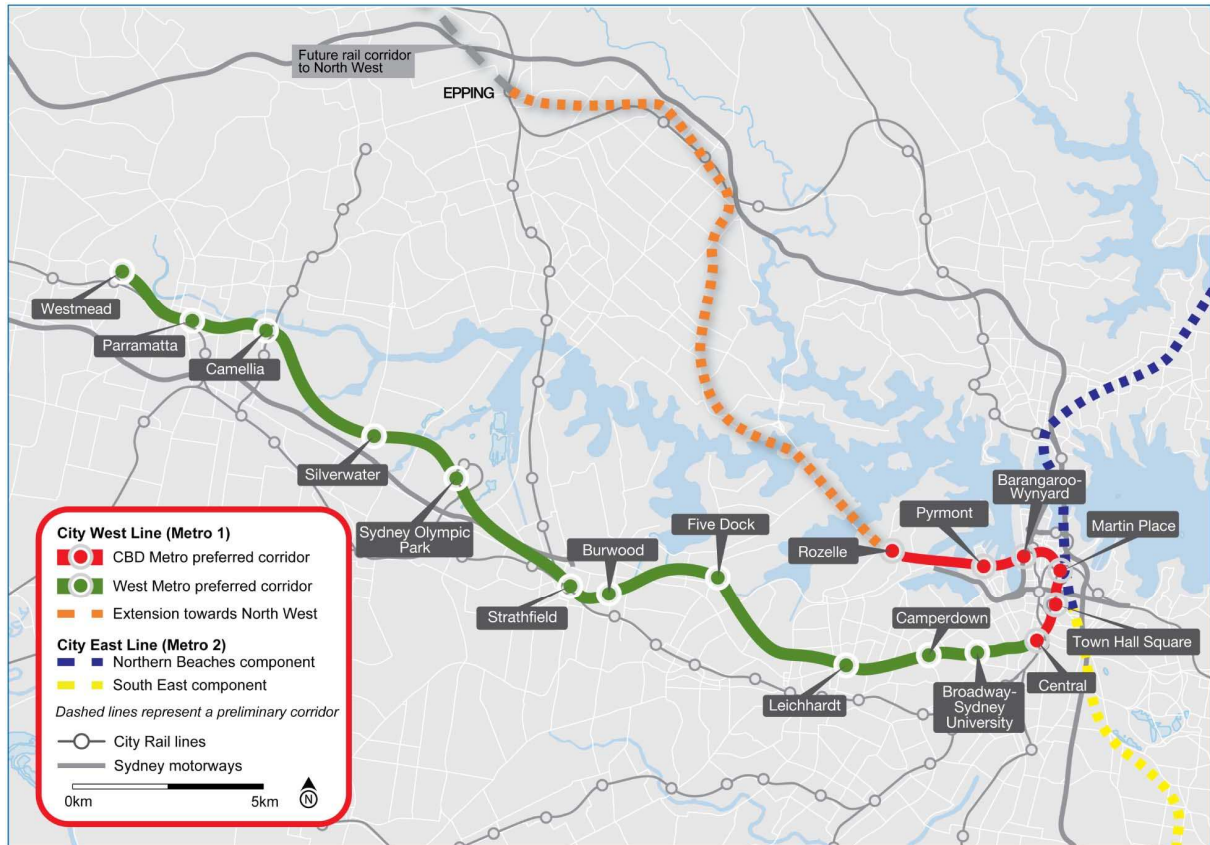
Other Existing Public Transport Services

Other transport options to and within the CBD include light rail between Central Station and Lilyfield, and the Monorail linking Darling Harbour with the CBD. Sydney's passenger ferries also provide a small, but important service for the travelling public. The planned new ferry wharf at Barangaroo, together with a new pedestrian tunnel linking into the CBD Metro, will enhance travel to the CBD, and will assist in making Barangaroo more accessible to existing public transport services. However, while these transport options will continue to play a unique role in supporting Sydney's transport task, the scale and customer markets for these operations will remain small compared with rail and bus services.

3.2 Need for a Metro Network

During exhibition, submissions were received on the need for and the future scale of a metro network in Sydney. The Department notes that the need for a metro network was identified in the *Urban Transport Statement*, which included investigation of a metro system as part of the overall approach in addressing Sydney's transport needs and is consistent with the land use and transport strategies identified in the *Metropolitan Strategy*. The subject project would act as an enabler, with the West Metro assessment currently being progressed. Future expansion into other corridors has been identified and would be progressed by NSW Transport and Infrastructure, as presented in Figure 12.

As considered above, Sydney's complex network of road, rail and bus routes is at capacity on key points of the network, points that are also experiencing the higher rates of population and employment growth. Metro rail has been selected as a transport alternative and step change to ensure that Sydney's transport network is run more efficiently in its delivery of services to the community, and to assist in relieving congestion on Sydney's bus and rail network. A metro system, capable of carrying 29,000-40,000 passengers per hour per direction would add a significant service to Sydney's constrained transport network.

Figure 12 - Strategic Planning for Sydney's Metro Network

The metro network would link land use and transport planning, delivering on the state's strategic objectives for improved urban environments with reliable transport access. The result would be to focus Sydney's population and employment growth on centres and corridors and accommodate the pressure on transport infrastructure. The current project will be the first step in delivering a broader metro network and the benefits it would provide.

Consistent with the *Metropolitan Strategy's* vision for Sydney in 2031, a metro network for Sydney would:

- support a series of stronger centres within the metropolitan area, providing jobs and services closer to where people live;
- support the growth and expansion of employment, housing, retailing and services within major centres;
- support the development of the Global Economic Corridor;
- support urban intensification to preserve valuable agricultural lands;
- provide more equitable access to housing, employment, services and open space while preserving the character of existing neighbourhoods; and
- provide an expanded transport network to improve connectivity and access between centres and enterprise corridors.

In the longer term, a broader metro network is planned, targeted to serve major transport corridors that are not currently serviced by mass transit, or do not have the capacity to meet future needs. This is expected to include many of Sydney's most heavily used and congested bus corridors, such as Parramatta Road, Victoria Road, Anzac Parade and Military Road. Two metro lines would form the basis of this broader metro network:

- Metro line 1 (City West line) – from Westmead to the CBD and then beyond Rozelle to the north-west (a major project application has been received for the western section of this project); and
- Metro line 2 (City East line) – from Malabar via Maroubra, the Prince of Wales Hospital and University of NSW to the city and beyond to the Northern Beaches.

These lines would support future growth in the west and north-west, and in the longer term in the south-east and north providing a fast and frequent rail service linking key population and employment centres, and supporting major destinations such as Parramatta and Macquarie Park, making them more attractive as employment locations.

Key benefits of the Metro line 1 (City West line) across the Sydney region would include:

- significantly improving public transport travel times and reliability, especially for travellers from areas currently served by buses;
- relieving bus congestion on three of Sydney's most congested bus corridors, Parramatta Road, Victoria Road and the M2 / Harbour Bridge corridor;
- relieving rail congestion on the Main West Line, North Shore Line and across the broader CityRail network;
- delivering strategically-located stations, directly accessible to employment and other key destinations;
- strengthening Parramatta's role as Sydney's second CBD and allowing for further employment growth in Macquarie Park, supporting national productivity and competitiveness;
- enabling strategic interchange opportunities with other transport networks across Sydney;
- providing significant support for transit-oriented development and urban regeneration within two major transport corridors; and
- delivering services to new rail markets, in areas which are currently poorly served by public transport.

During the exhibition of the Environmental Assessment for the project, submissions identified that a comprehensive and integrated transport plan should be developed and the project should be considered within this context prior to approval. The Department notes that the Government is currently finalising a Transport Blueprint for Sydney and it is expected that this Blueprint will incorporate the project and a broader metro network. Notwithstanding, the Department acknowledges the project has been developed to address current and future transport needs and is broadly consistent with the *State Plan* and the *Metropolitan Strategy* and that a metro network, incorporating the project will provide broad social, economic and environmental benefits.

3.3 Need for the Project

The CBD Metro would be the first component of a proposed Sydney-wide metro network, serving the area between the CBD and Rozelle. Its key strategic benefits would include:

- relief to the greatest capacity constraint on the entire transport network, the CBD, while providing for future metros to the west and north-west;
- provision of an alternative means for commuters to move around the CBD, relieving existing crowded rail and bus networks, particularly at key locations such as Central, Wynyard and Town Hall;
- facilitation of wider timetable and investment choices for the commuter rail network;
- relief of heavily congested bus services operating into and through the CBD, which currently compete with pedestrians, cyclists, delivery vehicles and cars; and
- support for the planned Barangaroo development and, in the future, the Bays Precinct and Blackwattle Bay area.

As a stand alone project, the CBD Metro would achieve significant benefits, and is predicted to carry 50-65 million passengers annually. Demand for the CBD Metro is expected to be high upon opening, given the substantial travel time savings it would bring to public transport users. However the value of the CBD Metro would be fully realised as an enabler of the broader metro network, forming the central spine to which all other metros would link or interchange, allowing the benefits of metro rail transport to be extended to other areas of Sydney.

The justification of the project is also based on the absence of feasible alternatives that could address the project objectives as effectively and efficiently as the CBD Metro. Alternatives considered included 'do-nothing', demand management, road network improvements, cycleway and walking improvements, heavy rail, bus augmentation/enhancement, and light rail. It was considered that alternatives by these modes, within a broader context, could not deliver the same capacity, land use and transport benefits because:

- the road network in key corridors is at capacity for much of the day and the significant investment required to achieve comparable levels of service for commuters would be contrary to the government's land use, environmental and sustainability objectives;
- buses are already operating at or beyond capacity in key corridors, and even with significant investment in infrastructure to boost capacity and improve travel times and reliability, buses would be unable to achieve the same network benefits as a metro;
- light rail, although more efficient than buses in moving larger numbers of people, would require a high level of investment approaching that of metro, but without providing comparable capacity or travel-time benefits; and

- heavy rail is constrained by the rolling stock, signalling and mixed service style of operation that CityRail is required to operate in what is a highly congested corridor to and through the Sydney CBD.

The Environmental Assessment stated that only a rail-based alternative could potentially satisfy the project objectives, particularly those relating to the need to relieve existing and future network congestion for CBD bus or rail services that would be achieved by the CBD Metro.

A number of submissions questioned the rigour of the assessment of alternatives and that further and more detailed assessment of alternatives was required. The Department considers that the Environmental Assessment was sufficient in its consideration of alternative transport options and has broadly demonstrated the project merits compared with other transport alternatives. The Department also considers that the project will meet the defined project objectives, particularly in enabling a broader metro network for Sydney, the provision of additional public transport capacity to and through the Sydney CBD, and transport and land use integration. Notwithstanding, the Department does not consider that the project excludes alternative options and notes that the detailed consideration of these options are outside the scope of this particular assessment.

Submissions received during the exhibition queried the justification for the project and the value of the project when compared against extending the light rail network and other surface transport modes, which have the potential to be more practical, cost effective, simpler and more expedient. Whilst other modes have this potential, the Department considers that the enhancement of these modes would not provide the same strategic and long term benefit as the project and that the project needs to be considered within a broader context of facilitating and being a catalyst for the long term expansion of a sustainable and high capacity public transport network. Notwithstanding, the Department considers that the project does not preclude the expansion of light rail nor other surface transport modes and has recommended conditions of approval to ensure that known potential light rail routes are not unduly compromised by the physical works associated with the project.

The Department also considers that the project has the potential to complement other transport modes, including surface modes, such as buses and ferries and travel demand initiatives. Whilst outside the scope of the project as presented, the project will facilitate a review of facilities and services and has been designed in consultation with transport agencies, to integrate with longer term transport initiatives such as the CBD Bus Strategy. Station locations have also been selected to facilitate modal integration with both current and proposed transport infrastructure, including the Barangaroo ferry wharf. In this respect, the Department is satisfied that station and entrance locations have been selected to maximise access to the project and integration with other modes, whilst minimising environmental impacts and significant infrastructure relocation.

In relation to patronage forecasts, the Department notes the public concern raised about the validity of the figures and the potential for the project to be underutilised, particularly as a stand alone project. The Department acknowledges that patronage forecasting is influenced by a range of assumptions and in this respect, it is satisfied with the general assumptions presented in the Environmental Assessment. The Department also considers that the project must be considered in its broader context as an enabler and its total lifespan.

In relation to heavy rail, the Department notes that submissions have advocated an expansion of the heavy rail network in preference to the project and the establishment of a broader metro network. Reasons for this position include ensuring the equitable provision of transport, the redundancy of having different systems, and removing the potential to expand the heavy rail network. The Department acknowledges these concerns and notes that the implementation of other transport initiatives is outside the scope of this assessment. Notwithstanding, the Department does not consider that the provision of heavy and metro rail is mutually exclusive, but rather complementary in the provision of a comprehensive and integrated transport system.

The Department considers that the project will be successfully integrated with and provide relief to the heavy rail network and notes the Proponent's advice that the project will not preclude the expansion of the heavy rail network through the CBD. To ensure this integration, the Department has recommended conditions ensuring that the project is integrated with existing and proposed transport initiatives and that the Proponent enter into an Interface Agreement(s) with RailCorp to ensure the successful operational integration of the project and the heavy railway network and the protection of physical and operational RailCorp assets and services, during construction and operation. This includes ensuring that the project does not unreasonably impact on the practicability of RailCorp carrying out future rail expansion projects.

4. STATUTORY CONTEXT

4.1 Major Project

On 5 February 2009, the then Minister for Planning declared the CBD metro project to be development to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies.

4.2 Critical Infrastructure Project

On 29 April 2008, the then Minister for Planning declared development for the purpose of metro rail lines to contribute to a metro rail network providing high speed, high frequency mass-transit capacity within the Greater Metropolitan Region to be critical infrastructure projects under Part 3A of the *Environmental Planning and Assessment Act 1979*.

4.3 Relevant Environmental Planning Instruments

There are no State Environmental Planning Policies that substantially govern the carrying-out of the project.

4.4 Minister's Approval Power

The Environmental Assessment was placed on public exhibition from 9 September 2009 until 12 October 2009. Submissions were invited during this period in accordance with Section 75H of the Act. The Department has met all of its legal obligations so that the Minister can make a determination regarding the project. It is also noted that the Environmental Assessment submitted in support of the subject application adequately addressed the Director-General's requirements issued for the project application and that sufficient information has been provided to allow the Minister to make a determination.

4.5 Station Plans

The Proponent is separately preparing Station Plans to guide the design of station precincts and their integration with the metro stations. These Station Plans were exhibited with the Environmental Assessment to provide an overall context for the project, and submissions were received. Submissions received on Station Plans will be considered by the Minister for Planning when determining if and how Station Plans are to be given effect under the Act, in relation to the future planning of and development at station precincts. Submissions received have not been included in this report, and Station Plans are not part of this approval.

5. CONSULTATION AND ISSUES RAISED

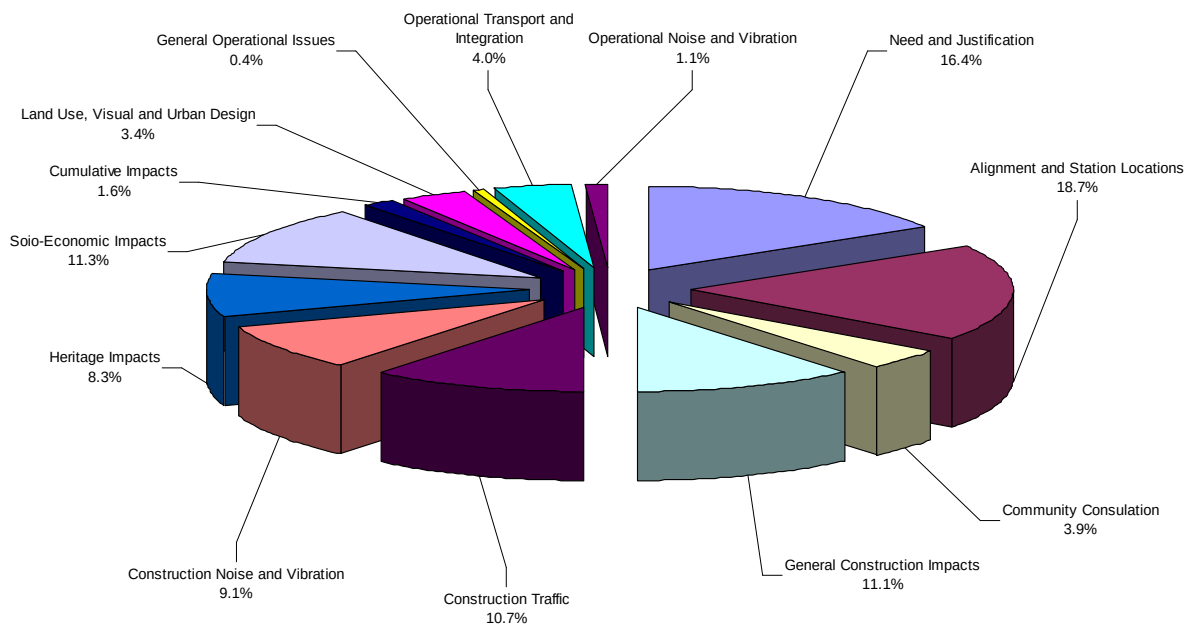
The Department received a total of 2,539 formal submissions on the project, comprising:

- 10 submissions from State Government agencies;
- six submissions from local government bodies;
- 292 individual submissions from the public;
- one petition from the public with 36 signatures;
- 2,230 form letters from members of the public.

5.1 Submissions from the Public

- Of the 2,523 submissions received from the public (292 letters, 2,230 form letters and one petition), 26 supported the project (1%), 125 raised various concerns with the project, without explicitly stating support or opposition (5%), and 2,372 objected to the project (95%). Key issues raised in public submissions are summarised in Figure 13.

Figure 13 - Key Issues Raised in Public Submissions



5.2 Submissions from Local Government Bodies

Submissions were received from Sydney City Council (two submissions, including one submission from the Lord Mayor and one submission from Council itself), Leichhardt Municipal Council (two submissions), Liverpool City Council and the Western Sydney Regional Organisation of Councils. Issues raised by these local government bodies are summarised below.

Leichhardt Municipal Council

Council considers that the Environmental Assessment had not adequately addressed the justification for the project, had not adequately provided an assessment of potential impacts on and implications for the Leichhardt local government area, or adequately prepared the Draft Statement of Commitments. Council considers that the project will not generate significant benefits for the municipality, and has high associated costs and risks. In particular, Council have raised the following key issues:

- Justification – lack of detail on how metropolitan and local objectives will be implemented by the proposal, and the lack of a cost-benefit analysis.

- Pitt Street rail corridor – the alignment may prohibit the metropolitan rail expansion program.
- Hydrology – the stabling yards would be located on flood prone land and the project should not exacerbate drainage problems in the area or limit Council's capacity to address flooding.
- Pedestrian/Cyclist impacts – bicycles should be permitted on trains and precincts should have secure and accessible facilities, a cycle link to the Anzac bridge route should be provided and the proposed bridge in the vicinity of the stabling yards should be at least 4 metres wide (not 2.5 metres) to accommodate both cyclists and pedestrians.
- Operational Noise - Council engaged an acoustic consultant to verify operational noise impacts arising from the proposal. The consultant considered that properties on Lamb Street were not representative of the area as they are most affected by City West Link traffic noise. Alternate modelling locations identified that a higher number of properties would be impacted than identified in the Environmental Assessment. The consultant suggested that operational noise levels be set at no more than 55dB(A) with a maximum of 70dB(A).
- Rozelle Station Precinct – The location of the station would alter the streetscape and place identity, and has not considered access, safety, social or economic costs. Notwithstanding, Council sought to be involved in the design and master planning of Rozelle station and environs including investigation of how existing built forms can be retained and enhanced, should the project be approved.
- General construction impacts – There would be significant waste, traffic and transport, access and noise impacts arising from construction of Rozelle Station, the Stabling Yards and White Bay station box and tunnelling activities. Of particular concern was a lack of commitment to mitigate adverse impacts on the range of users of the occasional care centre in the Rozelle neighbourhood centre.

City of Sydney Council

City of Sydney Council's *Sustainable Sydney 2030* includes actions that support the development of a metro system. In addition to improved public transport access, the City recognises that the project will provide significant opportunities to provide other benefits within the CBD, including the opportunity to reduce bus numbers in George Street, assist in the creation of facilities for pedestrian and cyclist access, and help in the creation of Town Hall and Central Station squares. Notwithstanding, Council considered there were a range of issues that needed to be further considered, including:

- alternatives, including provisions for underground bus/metro interchanges and extensions to Drummoyne and Sydney University and the deferral of works at Central Station to allow construction of at least two additional stations as this is likely to encourage a more significant modal shift;
- the provision of high quality and active urban spaces and that the final design of the Town Hall Square Station precinct should allow for maximum flexibility, specifically station services (exhausts fire escapes etc) should be contained to the rear of nearby buildings and not the Square itself;
- the need to minimise the visual and scale impacts of station structures and support facilities;
- the proposed augmentation of pedestrian accessibility between Barangaroo and Wynyard station contradicted Council policy to improve pedestrian amenity at ground level;
- support for the revised design proposal to extend Union Square and close the Union Street exit to Pyrmont Street on heritage grounds, but raised concerns small business impacts which are considered essential to local character and that alternative locations for station service infrastructure at Union Square should be explored further with a view to retain ongoing use and character;
- the project should encourage greater bicycle use including permitting bicycles on Metro carriages; and
- construction disruptions within station precincts, including impacts on traffic flows, existing public transport and pedestrian movements, Council requested a cross agency and co-operative management group to be established to manage these impacts.

The submission received from the Lord Mayor generally reinforced the key concerns as raised by Council, in particular construction impacts at Pyrmont, and suggested the rail alignment extend to Broadway. The Mayor's submission included the Council's long-term public transport plan for Sydney in response to the CBD Metro Environmental Assessment. The plan identifies that the existing Sydney public transport network is fragmented and underfunded, and justifies the need for an integrated transport approach, including five transport priorities for Sydney. However, if metro is to proceed it must not be at the expense of other essential public transport priorities, such as development of light rail routes, amplification and extension of the CityRail network, inner-city bus priority measures, and expansion of suburban bus transitways.

Liverpool City Council

Council believes that the project should be predominantly funded through private capital in a Private Public Partnership, enabling the Metropolitan Rail Expansion Program to be constructed in parallel using entirely public funding from the State. This would enable both projects to proceed as well as provide for a foundation for more sustainable transport within Sydney.

Western Sydney Regional Organisation of Councils

Western Sydney Regional Organisation of Councils (WSROC) considers that release of the Environmental Assessment prior to the preparation of an overall transport blueprint for the metropolitan area is both premature and misguided. The WSROC Board has resolved, that in relation to the project, to call for a review of the project and the reinstatement of both the South-West and North-West rail links as planned. Of particular concern to WSROC, is the lack of strategic justification for the project, evaluation of alternative options, and absence of environmental, social and cost-benefit analysis presented for public scrutiny.

5.3 Submissions from State Government Agencies

The Department received submissions from: Industry and Investment NSW; NSW Maritime; NSW Roads and Traffic Authority; Barangaroo Delivery Authority; State Transit Authority (Sydney Buses); Department of Environment, Climate Change and Water; Sydney Ports; Housing NSW; RailCorp; and the Casino, Liquor and Gaming Control Authority. Issues raised by these agencies are summarised below.

Roads and Traffic Authority

Cumulative and construction traffic impacts were identified as a key concern in the RTA's submission. The RTA raised the following key issues:

- truck movements should be restricted during peak traffic periods;
- on-Street queuing of heavy vehicles and truck size limits for areas of high pedestrian activity;
- consultation with Sydney Buses and the NSW Taxi Council regarding construction impacts;
- the preparation of construction traffic management plans and endorsement by the RTA and Councils;
- impacts on traffic, pedestrian and cyclist movement following closures or lane capacity reductions;
- cumulative impacts require further assessment; and
- the proposed location of the Lilyfield Pedestrian Link across the City West Link Road and its interaction with future road proposals.

Barangaroo Delivery Authority

The Barangaroo Delivery Authority supports the Metro and considers the project important for the successful delivery of the Government's vision for Barangaroo and the continued competitiveness and prosperity of the Sydney CBD. Key issues raised in the submission included:

- cumulative impacts as a result of the concurrent construction of Barangaroo Stage 1 and the project;
- consideration of the whole pedestrian network (surface and existing underground) between Barangaroo and Wynyard, not just the tunnel link; and
- construction impacts, in particular the need to complete station infrastructure in a timely manner, the preservation of amenity for surrounding areas, and management of construction traffic.

The Barangaroo Delivery Authority indicated its desire to be involved in the development and construction co-ordination process with a view to minimising impacts in the area, including a joint spoil removal plan. Impacts to the cruise ship terminal operations in the locale, contaminated spoil and regenerated noise and vibration once the project is operational were also identified.

State Transit Authority - Sydney Buses

The State Transit Authority (STA) raised various concerns in relation to the project at each station site and interaction of the Sydney Buses network during construction activities. STA's key concern was the functionality of bus services in the Central, Town Hall Square, Martin Place, and Barangaroo-Wynyard station areas, as construction activities would cause a reduction in capacity and lead to delay's in providing this service to the community. Any change to bus infrastructure would require consultation and subsequent approval from STA. From an operational perspective, STA considered that the bus bay design at Rozelle Station is unsuitable and

requires redesign. Real time information, improvements to bus signage and improved passenger waiting facilities were supported.

Department of Environment, Climate Change and Water

The Department of Environment, Climate Change and Water (DECCW) considered the key environmental impacts from the project to be noise and vibration, contamination and spoil management. Key issues raised in the submission included:

- the need for out of hours applications to be assessed on a case by case basis and include reasonable and feasible mitigation measures;
- lack of certainty in relation to noise mitigation measures;
- the proposed validity of the vibration criteria for penetrating cone fracturing techniques;
- the application of the *NSW Industrial Noise Policy* to surface facilities;
- recommendations for ground-borne noise and vibration limits for in-tunnel train operations and a requirement for additional assessment of the final detailed design for the track bed form and rail;
- the further investigation, treatment (if required) and processing of extracted materials and contaminated soil and groundwater, including waste classification assessments and disposal methods and the preparation of remedial action plans; and
- the management, treatment and discharge of ground and surface water.

The project includes at least two activities that are scheduled under the *Protection of the Environment Operations Act 1997* (concrete works and extractive industries) and will therefore require licensing during construction of the project. Licensing of railway systems activities during construction and operation is not required, due to the length of the network falling below the 30 kilometres defined in the Schedule.

Sydney Ports

Sydney Ports considered the impact that the CBD Metro project proposal would have on Sydney Ports' landholdings and port operations at the Glebe Island and White Bay Port area, and the existing cruise ship operations and functions / events at Barangaroo. Ports key concern related to the protection of existing port operations in White Bay and Glebe Island both on land and in the water and ensuring that conflicts between construction activities and existing site operations are minimal. Sydney Ports identified that a site specific traffic management plan must be developed to its satisfaction for White Bay, Glebe Island and Barangaroo including impacts to the cruise passenger terminal and that the noise and air quality assessment be revised to consider impacts at surrounding tenants. Sydney Ports also raised concerns on various heritage items on its section 170 register.

Casino Liquor and Gaming Control Authority

The Authority raised concerns that the Lyric theatre, hotel (currently under construction) and apartments within the casino complex need to be protected with appropriate conditions related to the possible noise and vibration that will emanate from the proposed construction, operation and maintenance of the CBD Metro. These concerns extended to economic and social impacts such as loss of revenue and cancellation of performances as a result of construction activities. The need for a co-ordinated approach was advocated, and a number of conditions relating to noise and vibration levels and design goals suggested.

Industry & Investment NSW

Industry & Investment (I&I) NSW provided a co-ordinated response from the (former) Department of Primary Industries, pertaining to minerals issues and potential impacts on the aquatic habitat of Darling Harbour, Johnstons Bay and White Bay. I&I NSW has no objections to the proposal.

NSW Maritime

NSW Maritime's principal interest in relation to this project is with respect to the works proposed to land under the ownership of NSW Maritime and to the navigation impacts of on-water activities. NSW Maritime has no objection to the proposed development. NSW Maritime raised a number of issues for further review in the Environmental Assessment, including a more detailed assessment of proposed drainage works at the head of Rozelle Bay, and navigation impacts of on-water activities such as mooring of barges.

RailCorp

RailCorp and Sydney Metro have signed a Partnership Commitment document, agreeing to a long-term and collaborative partnership between the two agencies in the delivery of public transport services to the people of Sydney. RailCorp and Sydney metro are currently working towards agreements on detailed engineering and operational issues.

RailCorp's response to the CBD Metro Environmental Assessment was focused on the following key areas:

- the potential effect of the proposal on the safety or structural integrity of existing rail infrastructure facilities / assets (ie tunnels, stations, cables), and the safe and effective operation of these rail infrastructure facilities and rail services;
- the potential impact on the practicability of RailCorp carrying out future rail expansion projects; and
- the measures proposed, or that could reasonably be taken, to avoid or minimise the potential effects on the above items.

The proposed CBD Metro alignment will potentially impact upon existing and proposed RailCorp assets, operations and customers. Four of the CBD Metro stations are proposed to directly link to CityRail stations, resulting in numerous interfaces and potential impacts. RailCorp is seeking Interface Agreements with the Proponent to cover a range of matters to address the above matters.

Housing NSW

Housing NSW (formerly the Department of Housing) considers the new metro stations will present significant opportunities to increase residential densities and housing options in and around stations. Housing NSW also identified that it is a key stakeholder in Pymont and Rozelle and requested involvement in the detailed design of the station precincts.

6. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the Sydney Metro Network Stage 1 (CBD Metro) Environmental Assessment, all submissions received, and the Sydney Metro Submissions Report, the Department has identified the following key environmental issues associated with the proposal.

Underground rail line and station boxes

- construction noise and vibration; and
- operational noise and vibration.

Above ground station sites:

- construction traffic;
- construction noise and vibration;
- non-indigenous heritage;
- economic and social issues;
- visual and urban design;
- operational transport; and
- operational noise and vibration.

White Bay construction site and Rozelle maintenance and stabling depot:

- construction traffic
- construction noise and vibration;
- non-indigenous heritage;
- visual and urban design;
- operational transport; and
- operational noise and vibration

Other issues, including spoil management, air quality, ecology, indigenous heritage, geology and groundwater, water management, energy use and greenhouse gas, climate change, and resource use and waste, which are considered to be relatively minor have also been considered separately.

The Environmental Assessment identified that significant impacts predominantly related to the construction of the project and this report and the conditions of approval are focused on assessing these matters. The Department also notes the importance of this project to the NSW economy and the broader Sydney community and has established an approval framework to ensure that the project is constructed in a manner that protects the environment and community amenity, whilst ensuring that construction can proceed in an efficient manner.

Of particular note is the recommended Construction Environmental Management Framework. This Framework requires the Proponent to develop a Construction Environmental Management System to outline the general environmental management practices and procedures to be followed during construction and demolition works. This System will be supported by Construction Environmental Management Sub Plans focusing on key construction impacts. Construction risks will then be managed at a site level through Construction Method Statements, which will be informed by environmental risk screening. The Proponent will be required to develop an Environmental Risk Screening Matrix to be applied to each Construction Method Statement. The Matrix will be developed for the purpose of ranking and screening environmental risks associated with construction and demolition works, having regard to construction impacts issues. In developing the Matrix, the Proponent will be required to consider the limits, objectives and other standards required under the approval and will be developed in consultation with the Department and approved by the Director-General.

The Environmental Risk Screening Matrix will have three environmental risk tiers (high, medium and low). Where a Construction Method Statement, or part of a Statement, is identified as involving works of 'high environmental risk', the Statement or relevant part of the Statement will be submitted for the approval of the Director-General prior to commencing the works. The Department considers that this process will provide an efficient and comprehensive management process to ensure that the project is constructed within acceptable environmental impact limits.

UNDERGROUND RAIL LINE AND STATION BOXES

6.1 Construction Noise and Vibration Impacts

Issues

Construction noise and vibration impacts, including ground-borne noise transmission, are likely to be experienced at receivers in close proximity to excavation and tunnelling works. Receivers include commercial, educational, and residential uses, and places of worship, museums, and heritage items and highly sensitive receivers such as the CSC Data Centre in Pymont.

The effects of vibration in buildings can be divided into three main categories: where vibration can be perceived (human comfort vibration); where building contents may be affected; and where the integrity of building elements or the structure may be prejudiced. There are also three main types of vibration, including continuous, impulsive and intermittent vibration. For this project, continuous and intermittent vibration impacts are expected. Continuous vibration impacts are expected from tunnel boring machinery and intermittent impacts from other activities such as jack hammers.

The Proponent has developed a range of ground noise and vibration management goals based on current guidelines and standards, the receiving environment and the characteristics of the construction activities. A conservative vibration damage screening level of 7.5 mm/s has been adopted for residences and vibration sensitive receivers. For levels in excess of this value, further assessment and monitoring would be required. The primary sources of ground-borne noise and vibration sources and impacts are described in Table 2.

Table 2 - Primary Ground-borne Noise and Vibration Impacts

Activity	Potential Impacts
Ground-borne Noise	
Rockbreakers	- Rockbreakers would need to be used at station sites. - The night-time ground-borne noise management level is likely to be exceeded at sensitive receivers within about 70 metres of heavy rock breaking occurring. Rock breaking during night-time periods would be avoided where feasible. - When working adjacent to schools, childcare centres, churches and places of worship, rock breaking would be scheduled outside school and service hours where possible. - The penetrating cone fracture and drill and blast techniques, and use of dampened hammers, would be considered where appropriate to minimise ground borne noise levels at nearby sensitive receivers. Complying work distances could be reduced to five metres with this technology.
Roadheaders	- Roadheaders would be used for the station caverns, cross tunnels, and the tunnels from White Bay to Rozelle Station and White Bay to the Rozelle stabling and maintenance depot. - At station cavern sites, exceedences of the 35 dB(A) night-time residential noise management level at the nearest residences or hotels would be mostly minor, between 1-2 dB(A). - Exceedences are expected to occur at residences above tunnelling works between White Bay and Rozelle, by up to 5 dB(A); and at residences near the portal to the stabling yards, by up to 4 dB(A) (Quirk and Hornsey Streets) and up to 13 dB(A) (Lilyfield Rd). - Where practicable, the distance between the roadheaders and potentially affected receivers would be maximised during the night-time periods. - There may be a requirement to offer affected residents alternative temporary accommodation during these works.
Tunnel Boring Machines	- Tunnel boring machines would be used to excavate the main tunnels from Central to White Bay. - Receivers located directly above the tunnel are expected to experience exceedences of the residential night-time noise management level for a period of up to about 10 days. - Most of the receivers directly above the tunnel are commercial. - Residential/Hotel receivers directly above the tunnel are expected to

Activity	Potential Impacts
	experience between 4-17 dB(A) night-time exceedences, with higher exceedences experienced at the Hilton Hotel on Pitt Street, and the proposed Star City Hotel at Union St, Pyrmont. • There may be a requirement to offer affected residents alternative temporary accommodation during these works, or to avoid works during night time periods.
Vibration	
Rockbreakers, other excavation plant and equipment, vibratory pile drivers, vibratory rollers, and penetrating cone fracture operations	• In order to meet the vibration trigger levels, complying work distances have been established. However at some areas, the complying work distances would not be practical given the proximity of some structures. • Where construction works are undertaken closer than the safe working distance of nearby structures, site-specific vibration monitoring would be undertaken as well as consultation with potentially affected receivers and landowners to measure vibration levels. • Where nearby structures are likely to be affected by construction vibration, structural condition surveys would be prepared and reviewed during and following construction. • Vibration levels at services (especially critical infrastructure such as fibre optics, gas pipelines, etc) will be below 2 mm/s. • Use of rockbreakers would need to be carefully managed in the vicinity of residences due to potential noise impacts. Co-ordination may also be required with schools for rock breaking activities. • The use of impact-driven piles should be avoided where reasonable and feasible.

Vertical shaft excavation and excavation for the station cavern heading is expected to take six to 12 months to complete, and cavern excavation will take approximately nine months. The tunnelling works would progress at an average rate of about 300 metres per month (where the tunnel boring machine is used) and 110 metres per month (where the road header is used), thus potentially affecting any one receiver above the tunnels for a few days at some locations and up to three weeks at others. The below ground construction activities are proposed to be undertaken 24 hours a day, up to seven days a week.

To manage identified potential impacts, the Proponent has developed a Construction Noise and Vibration Strategy. The Strategy provides guidance on minimising ground borne noise and vibration impacts, and sets a framework for detailed construction phase noise assessment, the implementation of reasonable and feasible mitigation measures, and monitoring and reporting. The Strategy would be used to inform the Construction Noise and Vibration Management Plan, which would be implemented to manage the potential noise and vibration impacts.

Where construction ground-borne noise levels are predicted to exceed the noise management levels, all reasonable and feasible work practices would be investigated to minimise noise emissions. Having investigated all reasonable and feasible work practices, if construction noise levels are still predicted to exceed the noise management levels, then potential noise impacts would be managed via site-specific construction noise management plans.

Submissions

Public submissions raised concern regarding vibration impacts from tunnelling, demolition, excavation and construction activities on nearby structures and buildings. In particular, concern that vibration levels may cause structural damage to buildings, including homes, businesses and heritage items. A number of individual businesses and community organisations raised specific concern regarding vibration impacts on the viable operation of the business, its equipment, disruption to staff, clients, customers and the community.

The Casino, Liquor and Gaming Control Authority raised concerns regarding the impact of construction of the metro tunnels on the Lyric theatre. The Authority considers that a condition must be imposed requiring the acoustic examination of the Lyric theatre to establish the requirements necessary to achieve an inaudible standard. The Authority has also raised concerns regarding the five-star hotel, retail and gaming development (currently under construction), which are noise and vibration sensitive receivers. The proposed CBD Metro tunnels are planned to be only approximately 4.6 metres below the building, which result in risk factors for the casino site foundation, resulting in possible casino building damage during tunnel excavation.

Sydney Ports raised concerns with the potential for vibration impacts on Sydney Ports' structures in close proximity to the proposed tunnels, particularly structures at Glebe Island. Sydney Ports consider it necessary that the Proponent undertake a dilapidation survey of the Glebe Island Silos and the ballast banks and wharf structures, and undertake vibration/ settlement monitoring of these structures during construction to monitor impacts of the works.

DECCW raised concerns regarding the proposed vibration criteria for penetrating cone fracturing techniques based on the level of information in the Environmental Assessment and notes that the levels adopted are the impulsive vibration criteria listed in the DECCW guideline *Assessing Vibration: a technical guideline*, and which apply up to three events in an assessment period. The number of penetrating cone fracture initiations in an assessment period was not defined in the Environmental Assessment.

RailCorp raised concerns regarding noise impacts and that works near the CityRail tunnels may become an issue for employees and drivers in the affected areas.

Consideration

The noise assessment has adopted ground borne noise goals of 40 dB(A) during the evening and 35 dB(A) during the night-time for construction activities and has established complying working distances for rock breaking activities and excavation by penetrating core fracture (PCF) to assess compliance with these noise goals. The assessment concluded that due to the close proximity of sensitive receivers to the work sites (closer than the complying distances) the ground borne noise goals will be exceeded during evening and night time periods.

The Department notes that the ground borne noise goals are consistent with levels prescribed for recent tunnelling projects in Sydney, including the Cross City Tunnel and the *Interim Construction Noise Guideline*, and has specified these goals as noise objectives for this project. In most circumstances, these levels can be achieved due to the alignment of the project and the majority of receivers being of a commercial nature and accordingly, the Department considers that it is reasonable for tunnelling activities and cavern excavations to be undertaken over a 24 hour period subject to compliance with these noise objectives.

However, there are a number of circumstances, where it is expected that the identified noise goals will be exceeded. In relation to the excavation of station caverns, the use of conventional rock breaking methods would need to be restricted at evening and night time periods as complying work distances can not be achieved. The Proponent has identified that alternative construction methodologies, including the use of PCF techniques, could enable construction during these periods. These methods would require further construction methodology assessment and would need to be consistent with relevant guidelines, including the *Assessing Vibration: a technical guideline* (DEC, 2006), for PCF activities.

In relation to ground borne noise from road header works, the modelling predicted marginal exceedances of up to 2 dB(A) of the night-time noise goal at residences near station sites. For receivers at Pyrmont Station, noise exceedance of up to 6 dB(A) for 22 days is expected and in works between Rozelle and White Bay/Stabling yards, an exceedance of up to 13 dB(A) for 14 days is expected. In relation to ground-borne noise from tunnel boring machines similar exceedances are expected within the CBD and Pyrmont, but for a shorter period of time.

Due to the nature of the proposed works, the potential mitigation measures for reducing ground borne noise from tunnelling activities at these receivers is limited. However, the Proponent is required to implement reasonable and feasible measures with the aim of minimising the impacts. Where the impacts can not be reduced sufficiently to meet the objectives, options available to the Proponent include limiting night time tunnelling or respite offers, such as offering alternative accommodation. These measures are considered practical as the location and timing of activities can be well defined and the number of receivers is relatively limited, and therefore impacts to construction scheduling will be also be limited.

In relation to construction vibration impacts, the Proponent has identified a screening level for further detailed assessment and management of vibration levels to prevent cosmetic damage and has identified safe working distances to achieve this. At locations where the predicted and/or measured vibration levels are greater than the screening levels, a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be required to determine the applicable safe vibration level.

The Department is generally satisfied with this approach, and to ensure that the project is constructed to minimise vibration impacts on both structures and human exposure, has recommended vibration criteria consistent with *Assessing Vibration: a technical guideline* (DEC, 2006) for human exposure and German Standard DIN 4150 for structural vibration.

The Department also notes the significance, including the heritage significance of buildings in close proximity to works and has reinforced the Proponents commitments in this regard. Vibration criteria will be established based on a review and assessment of the existing noise and receiver environments, including consideration of a land use and building surveys to identify land uses, including potentially critical working areas (e.g. hospital operating theatres, precision laboratories etc), entertainment spaces, heritage items, railway stations, infrastructure and the like, which are sensitive to vibration impacts and that consideration be given to the assessment undertaken during the recommended building inspection reports.

In relation to blasting activities, the Department has recommended that the Proponent minimise the need for blasting to the greatest extent practicable and that any blasting be limited to two single detonations in any one area potentially affecting residents on any one day. All blasting will need to meet prescribed criteria and if blasting is required, test blasting would need to be undertaken to ensure that any blasting would meet the specified air blast overpressure and ground vibration limits.

To ensure that noise, vibration and blasting impacts would be minimised and managed it is recommended that the Proponent prepare a comprehensive Construction Noise and Vibration Management Sub Plan. The Plan would be prepared by a recognised acoustic consultant in consultation with the DECCW and would detail actions and measures that would be implemented to ensure, to the greatest extent practicable, that works would comply with the relevant noise, vibration and blasting criteria/ guidelines or impacts are mitigated by other means, such as respite periods. The Plan would also incorporate a monitoring regime and corrective preventative actions if any non-compliances were detected.

The Proponent will also be required to consult with potentially-affected community, religious, and educational institutions and vibration-sensitive critical working areas (such as laboratories and operating theatres) to ensure that noise and vibration generating construction works in the vicinity of the institutions are not timetabled during sensitive periods, unless appropriate other arrangements are made, and to undertake noise and vibration monitoring by a qualified acoustic consultant at the commencement of each new stage of the construction works and monthly thereafter. Additionally, the Proponent will be required to undertake real time vibration monitoring at sensitive properties including heritage items.

6.2 Operational Noise and Vibration Impacts

Issues

During operation of the project, noise and vibration impacts may be experienced by receivers within an approximate 50-metre wide corridor above the centre-line of the metro tunnels. The operational noise and vibration objective for the project relating to underground operation of the rail line is to avoid the impact of ground-borne noise and vibration impacts on sensitive receivers.

Potential noise and vibration impacts may be generated by wheel/ rail interaction and transmitted from the track bed, through the tunnel structure, via the ground and into the adjacent building structures. The effects in buildings can be divided as follows:

- those in which the occupants or users of the building are inconvenienced or possibly disturbed (human perception or human comfort vibration);
- those where the building contents may be affected;
- those in which the integrity of the building or the structure itself may be prejudiced; and
- ground-borne noise generated within buildings as a result of the vibration.

For much of the project alignment, the tunnels are located below major roads. From a ground-borne noise and vibration perspective, this is advantageous because in many areas the nearest receivers are of a commercial or industrial nature and therefore not highly susceptible to ground-borne noise and vibration emissions. Furthermore, as the background noise levels from road traffic are likely to be relatively high adjacent to major roads, the potential impact of ground-borne noise from train operations is reduced compared to quiet suburban

locations. In areas where background noise levels from road traffic are lower, the potential impact of ground-borne noise levels would be greater for the same noise level.

Modelling of potential operational noise and vibration identified that with the use of a higher performance track at the critical locations of Rozelle and Pyrmont (ie those points where the project must closely approaches residential receivers), compliance with the vibration design goals and the ground-borne noise levels is achievable at sensitive receivers. It was also identified that operation of the project would not result in any damage to nearby buildings, including heritage structures, noting that noise and vibration criteria for the protection of human amenity are typically lower than those for the protection of structural integrity. These results have been based on the premise that the operating parameters are well maintained, including track and rolling stock maintenance.

At the proposed Barangaroo and White Bay development sites, the track would be located about 20 and 15 metres (respectively) below the existing ground surface. A higher performance track would be considered in these areas in order to avoid the potential need to mitigate ground-borne noise levels as part of future building designs around those sites.

Submissions

A number of public submissions raised concerns about the impact of noise and vibration from the operation of trains on the underground tunnels. The concerns relate to impacts on residences above the tunnels, in particular from noise and vibration impacting on resident's amenity and comfort. Some submissions requested independent monitoring to validate the predictions made in the Environmental Assessment.

The Casino, Liquor and Gaming Control Authority is concerned that a high standard of acoustic and vibration performance is required during operation of the underground rail lines to protect the Casino's Lyric theatre and hotel complex (currently under construction). The quality of maintenance, repair and renewal of the metro train and rails would also be a long-term issue for the casino operations. The Authority considers that the concrete lined tunnels and rail installation will need specialised acoustic performance, in order to achieve a high quality result and requests that the proposed design goal be lowered. Star City Casino is also concerned about the impact of operational noise and vibration on the Lyric theatre, apartments and hotel complex.

Sydney Ports is concerned with the potential for vibration impacts on Sydney Ports' structures in close proximity to the proposed tunnels, particularly structures at Glebe Island, during operation of the CBD Metro project. Sydney Ports considers that the Proponent should undertake vibration/ settlement monitoring of these structures during operation to monitor impacts of the works

DECCW has noted that the Environmental Assessment indicates that varying levels of resilient track design will be required, and recommends ground-borne noise and vibration limits for in-tunnel train operations, together with a requirement for additional assessment of the final detailed design for the track bed form and rail fixing requirements against the limits and that in-tunnel track maintenance activities requires further assessment. RailCorp are concerned that once operation, and when trains are running in all tunnels (including CBD Metro), there may be detrimental impact from the combined vibration effects.

Consideration

The assessment of train operations considered impacts of train operations on buildings within a 50-metre wide corridor above the centre-line of the metro tunnel and considered likely vibration impacts on building/ structural integrity and noise and vibration impacts on human comfort. Buildings which are adjacent to rail tunnels could experience train noise transmitted as ground borne noise.

The Proponent has adopted the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* for the establishment of noise design goals for the operation of the project. The guideline provides noise trigger levels for residential and schools/ educational institutions and places of worship. However, no guideline is provided for acceptable noise levels for commercial receivers, shopping centres and industrial buildings. At these other sensitive receivers, the Proponent has applied ground-borne noise goals based on the educational and places of worship trigger levels and experience with other underground rail lines. The Department considers the proposed noise trigger levels for uses such as general office and retail areas are generally acceptable in the absence of guidance trigger levels in *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* for these land uses.

The Proponent has predicted compliance with the 35 dB(A) residential noise goal from night-time train passbys using a standard attenuation track form at all residential receivers except several residences in Crescent Street, Rozelle, and one house in Lilyfield. However, when a high attenuation track form is used at these locations, compliance with the noise goal can be achieved. For commercial receivers the night-time noise goal of 40 dB(A) is achieved at all locations.

The Department notes that compliance with the ground borne noise goals would ensure that the project achieves the residential vibration design goal (0.2 mm/s) for human comfort in Australian Standard *Evaluation of Human Exposure to Whole Body Vibration – Part 2: Continuous and Shock Induced Vibration in Buildings*. The assessment predicted compliance with the stringent residential building vibration goals at all receivers, at all locations. The assessment also predicted compliance with heritage building/ structures vibration goals.

The Proponent has committed to a track design that will achieve compliance with the vibration and ground borne design goals and the preparation of an Operational Noise and Vibration Management Plan, incorporating monitoring procedures, management and maintenance measures, reporting requirements and complaints management. The Proponent has also committed to investigating further, the adoption of a specific noise goal for train operations to maintain the high acoustic standards of the Lyric theatre.

Compliance monitoring will also be undertaken at the commencement of train operations at selected receiver locations to determine if additional feasible and reasonable mitigation measures are required. This commitment has been reinforced by a recommended condition of approval requiring compliance with the following ground borne noise and vibration limits developed in consultation with DECCW:

Table 3 - Ground-borne and Vibration Limits for the Operation of the Project

Receiver	Time of day	Ground-borne noise Limit (LA _{max} (slow))	Vibration Limit (RMS)
Residential and accommodation	Day (7am to 10pm)	40 dB(A)	0.2 mm/s
	Night (10pm to 7am)	35 dB(A)	0.14 mm/s
Schools, educational institutions, places of worship	When in use	40dB(A)	0.4 mm/s
Retail areas	When in use	50 dB(A)	0.4 mm/s
General office area	When in use	45 dB(A)	0.4 mm/s
Private offices and conference rooms	When in use	40 dB(A))	0.4 mm/s
Theatres	When in use	35 dB(A)	0.2 mm/s
Critical working areas	Any time	-	0.1 mm/s

The Department is satisfied with the assessment of ground borne noise and vibration from train pass-bys and notes that with the implementation of ground-borne noise mitigation measures, including track design measures, track and train maintenance and operational measures, that compliance with the ground-borne noise criteria will be achievable at sensitive receivers adjacent to the metro tunnels. Additionally, the final detailed design of the project, including noise mitigation measures, shall be subject to independent review by a qualified acoustic expert to confirm that the project has been designed to achieve the specified noise limits. This review process is required through the recommended conditions of approval.

It is also recommended that the Proponent enter into an Interface Agreement(s) with RailCorp to ensure the successful operational integration of the project and the heavy railway network, which will amongst other matters address the safe and effective operation of the rail network, including its acoustic performance.

The Department recommends that the Proponent be required to undertake a performance audit of the project within 12 months of the completion of construction and then again at five years after completion. The performance audit would assess the operation of the project against the predictions made in the Environmental Assessment and review the effectiveness of the environmental management and mitigation measures. This would ensure that the performance of the project is assessed against the aims and objectives of the project, its predicted impacts and whether the mitigation measures are appropriate and address the noise and vibration limits.

ABOVEGROUND STATION SITES

6.3 Construction Traffic Impacts

Issues

The project requires construction work to be undertaken adjacent to and connecting with the proposed station sites at busy locations within the CBD, with the removal of spoil associated with the cavern excavation expected to generate the highest volumes of heavy vehicle traffic. Within the CBD, it is expected that there would be limitations on the size of vehicle permitted to operate on the city streets. Larger trucks are expected to be able to access the Barangaroo-Wynyard site.

Construction activities are expected to occur outside normal daytime construction hours. Some activities would therefore also require truck movements outside normal working hours. Truck routes to and from construction sites have been identified by the Proponent in the context of minimising impacts on local streets and maximising use of arterial roads. The proposed construction routes for the station sites are illustrated in Figure 14 to Figure 16, which have been selected by the Proponent based on available capacity and considering opportunities to divert traffic, where possible, to roads of lesser strategic importance.

To manage construction traffic, the Proponent has identified a number of traffic objectives for the project, including to:

- minimise disruption to pedestrians, cyclists, buses and motorists;
- ensure the Sydney CBD can continue to function from a traffic perspective;
- limit impacts on bus routes and stops;
- minimise changes to traffic operation and kerbside access;
- minimise access disruptions to adjoining private and community properties and services;
- maximise construction-related road safety;
- minimise construction activities on roads and footpaths wherever possible;
- minimise traffic at construction sites by providing remote parking for workers;
- avoid disruptive construction-related truck operations during peak periods; and
- maximise spoil removal via White Bay.

Figure 14 – Proposed Rozelle Heavy Vehicle Routes

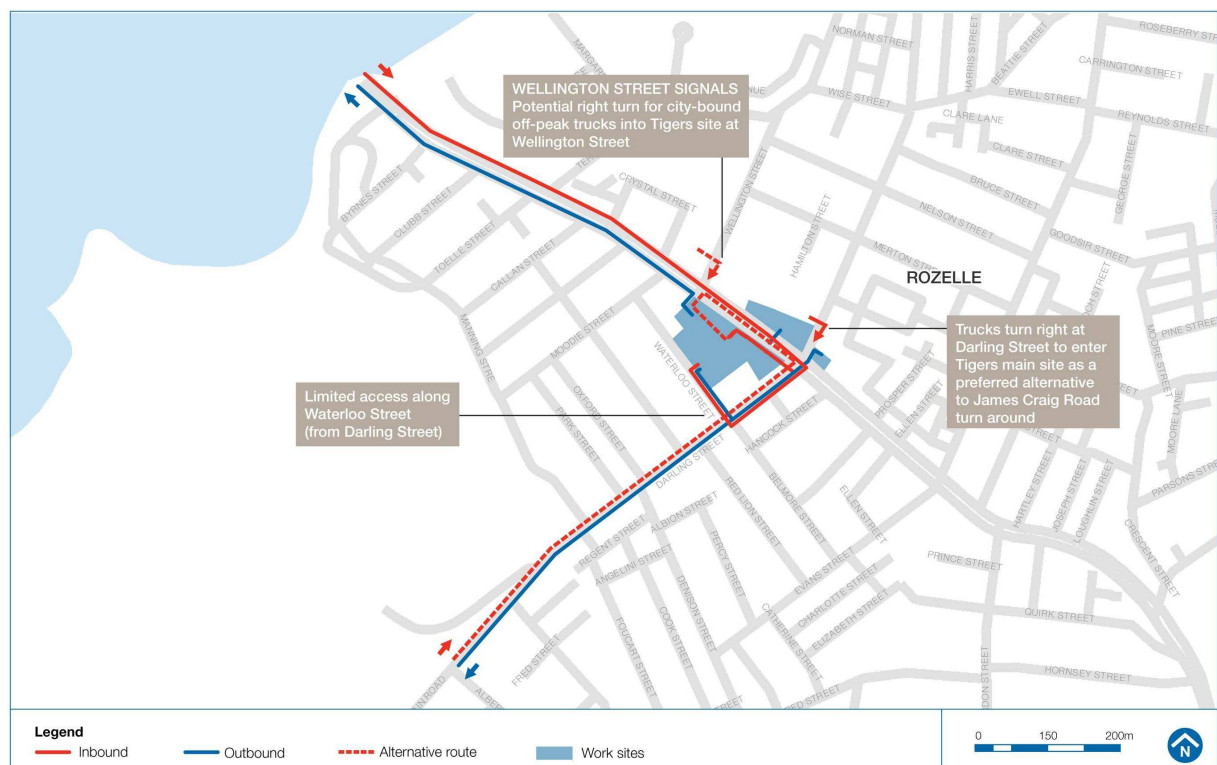


Figure 15 – Proposed CBD Heavy Vehicle Routes

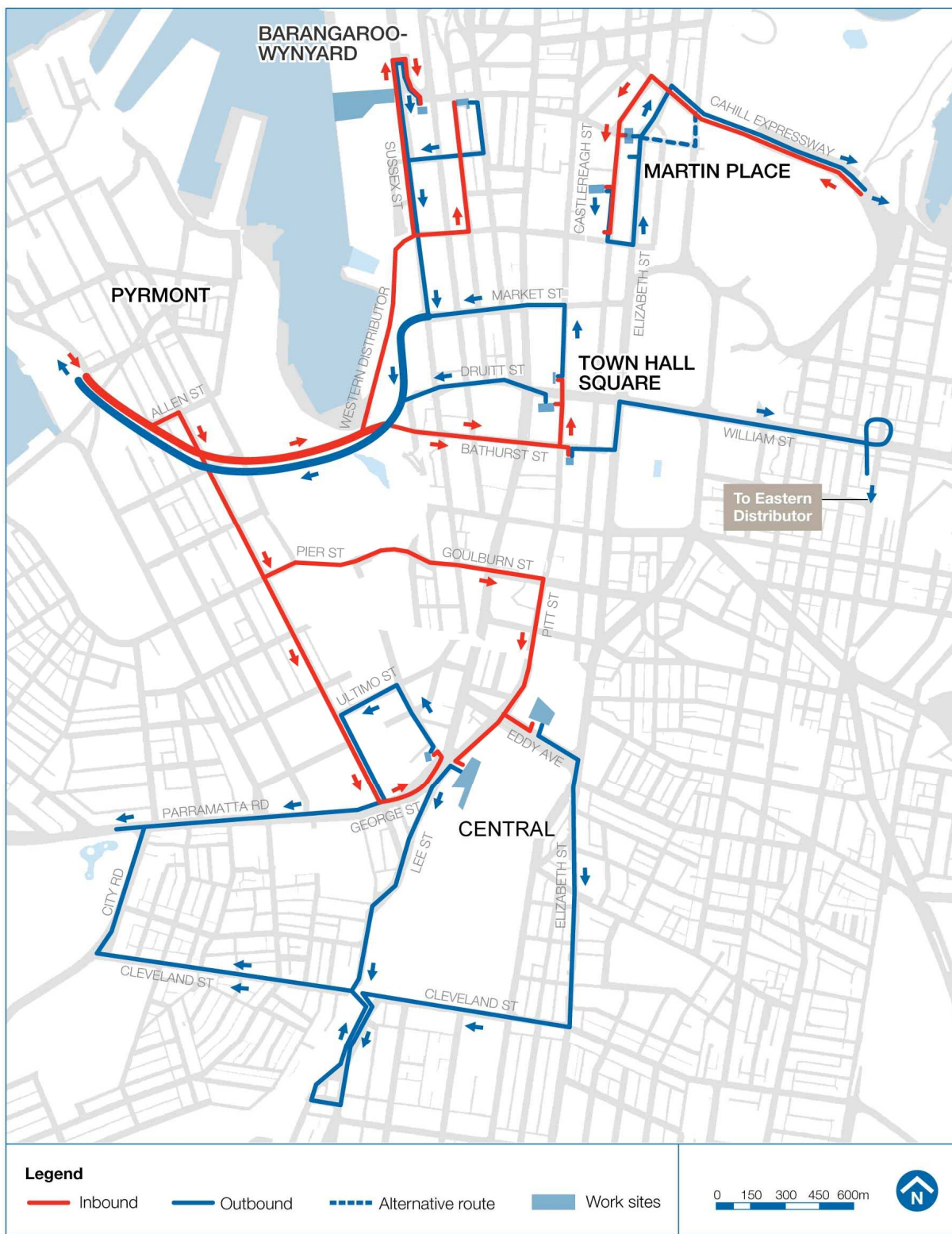
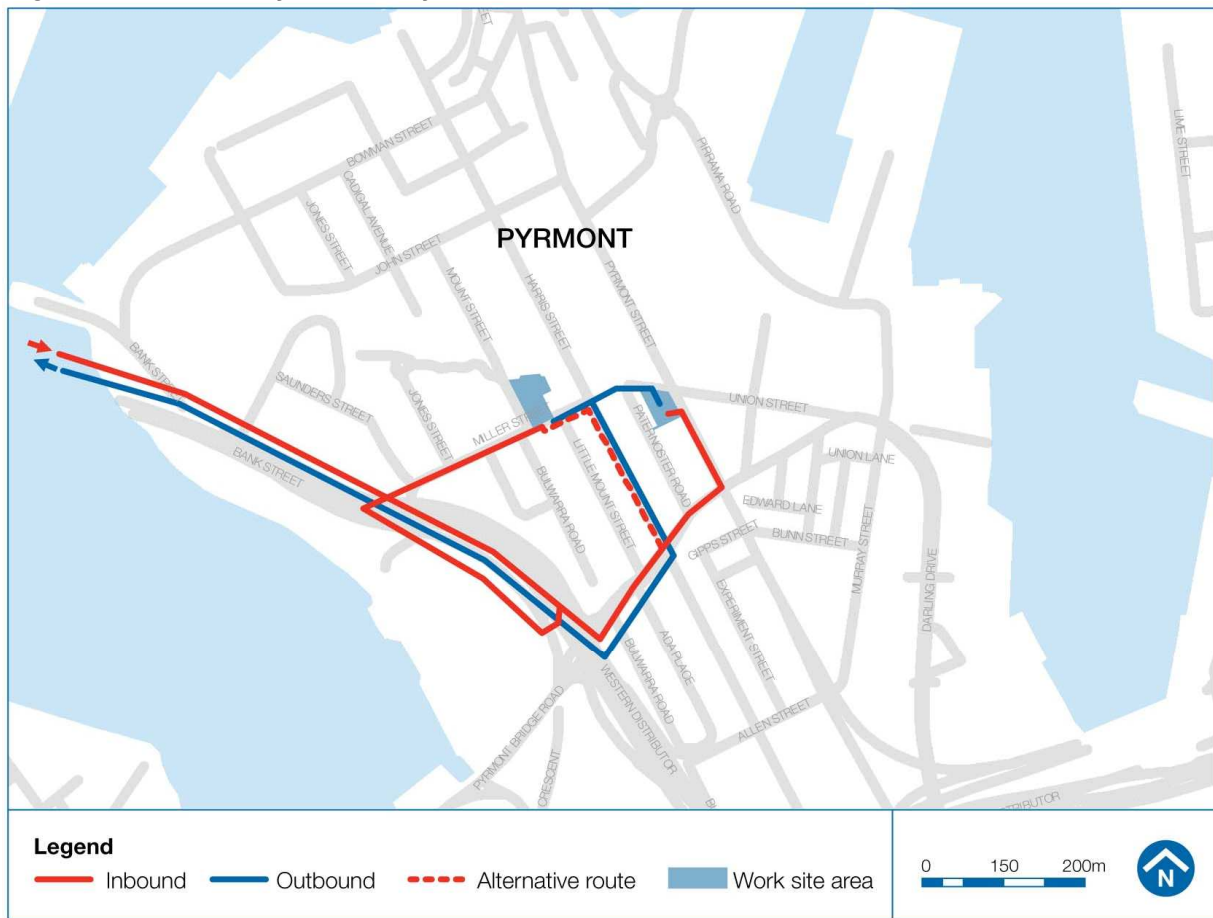


Figure 16 – Proposed Pyrmont Heavy Vehicle Routes

Notwithstanding, there will be traffic and access impacts associated with the construction of the project, including vehicle and pedestrian access issues, construction site traffic movements, and parking impacts. These are summarised in Table 4. The Proponent also undertook modelling of the construction impacts to determine performance impacts at key intersections during peak periods. This modelling identified that at most sites, the level of service would remain at acceptable levels. However, the modelling does indicate that the intersection of Pyrmont and Union Streets would become saturated in the PM peak, but that a revised route could alleviate this constraint. At Rozelle, saturated intersections are expected during the PM peak and that further analysis and modelling is required. Notwithstanding, one option is to restrict trucking to outside of peak periods.

Table 4 - Summary of Primary Construction Traffic Impacts

Station Site	Predicted Traffic Impacts
Central	- reduced vehicle access to Central Station main entrance - a less direct path for pedestrians currently using the western forecourt to gain access to Central Station, with pedestrians diverted to the footpath around the construction site - construction site traffic movements crossing pedestrian movements on Pitt Street and Lee Street frontage during construction - impacts on access to Central Station during construction, particularly taxi access, passenger access, flow and way-finding. Disruptions to taxi, coach and other vehicular access to the western forecourt areas of Central Station and diversion to the Hay Street ramp for access to the main concourse - maintenance of access to the Medina Hotel car parking, RailCorp food preparation area and small retail outlets, during works affecting Ambulance Lane - truck movements occurring primarily during the cavern excavation with fewer truck movements during demolition and station fitout - the need to relocate University of Sydney shuttle bus stops on Eddy Avenue (at the Belmore Park construction site) to Pitt Street or Chalmers Street. Provision of new

Station Site	Predicted Traffic Impacts
	facilities and the associated legibility and capacity of the pedestrian access route to the relocated stops • partial lane closure in Eddy Avenue at the eastbound bus stop • the need for oversized loads for deliveries and/or removal of equipment/materials. Operation may be restricted to night-time hours. Any oversized loads would be limited one-off events and would be subject to RTA restrictions on access routes and times and approvals • rationalisation of activities on the western forecourt and the conversion of upper level rail employee parking to coach layover and public parking
Town Hall Square	• re-allocation of existing kerbside loading/parking restrictions to enable provision of a 'works zone' adjacent to each site, including in the site establishment/demolition phase • temporary lane closures in Pitt Street (northbound) on its approach to Park Street during off peak periods to enable trucks to serve the Pitt Street construction site • to provide building basement support works a single temporary lane (parking) and footpath closure is likely to be required in Pitt Street • re-allocation of existing kerbside loading/parking restrictions to enable provision of a truck call-forward location in Bathurst Street, between Kent and George Streets • minor footpath narrowing in the immediate vicinity of the construction sites • closure of underground access to the Woolworths building (to be demolished) from CityRail's Town Hall Station • additional truck movements on the surface road network adjoining the site • minor delays to pedestrian movement on footpaths adjoining the site when trucks are required to cross the footpath
Martin Place	• impacts on pedestrian movements in Martin Place and bus passengers on Castlereagh Street and Elizabeth Street. There may also be some impact on pedestrians on Hunter Street, Bligh Street, O'Connell Street and other CBD streets within the vicinity of the works due to construction traffic movements • possible periodic closure of the western footpath along Castlereagh Street and diversion of pedestrians to the eastern side of Castlereagh Street via the King Street/Castlereagh Street and Martin Place/Castlereagh Street signal crossings • a temporary lane closure on Castlereagh Street to construct the ventilation facilities in existing parking bays • impacts on traffic and pedestrian movements along Castlereagh and Elizabeth Streets due to trucks entering from Castlereagh Street southbound and exiting onto Elizabeth Street northbound • impacts on bus services on Castlereagh Street (southbound bus lane) and Elizabeth Street (northbound) due to truck movements. As part of the CBD Bus Strategy, relocation of existing southbound Castlereagh Street bus services to George Street and Elizabeth Street would remove all buses from Castlereagh Street, and remove any conflict between buses and truck movements • the temporary removal of on-street parking on Castlereagh Street and Elizabeth Street adjacent to the site access locations to facilitate truck turns from the kerbside lane and avoid delays to through-traffic movements • the need for oversized loads for deliveries and/or removal of equipment/materials. Hours of operation may be restricted to night-time hours. Any oversized loads would be limited, one-off events and would be subject to RTA restrictions on access routes and times and approval
Barangaroo-Wynyard	• temporary relocation of the taxi zone (two spaces) in Sussex Street south of Shelly Street • temporary closure of the footpath on the southern side of Margaret Street, (between York and Clarence Streets and Clarence and Kent Streets) and the eastern side of Clarence Street at the York Lane site • relocation of the Sydney Explorer bus stop in Sussex Street to an adjoining location • removal of parking in Kent Street, Hickson Road, Sussex Street, Napoleon Street, Margaret Street and Clarence Street • removal of the loading zone (two spaces) in York Lane and, potentially, elsewhere in York, Clarence and Kent Streets • removal of authorised RailCorp parking from York Lane • lane closures and potentially temporary road closures in Margaret, Kent and Sussex/Shelly Streets due to staged cut-and-cover activity in these streets • temporary reduction in lanes on Sussex, Margaret, Kent and Napoleon Streets, and

Station Site	Predicted Traffic Impacts
	reconfiguration of Shelly and Lime Streets • loss of lanes in Napoleon Street (due to Barangaroo Pedestrian Link) • loss of parking and the potential reduction in the number of eastbound lanes in Margaret Street adjacent to Transport House for the purpose of pedestrian management • removal of the right turn bay into the Sussex Street development • temporary closure of Shelly Street, north of Lime Street • temporary closure of the Kent Street pedestrian tunnel, which provides pedestrian access between CityRail's Wynyard Station, Erskine Street and Kent Street. This would require the re-routing of CityRail patrons via the footpaths of York, Clarence and Margaret Streets, and possibly via York Lane
Pymont	• the footpath on the northern side of Miller Street would be maintained at 2.6 metres (minimum) • the footpath on the eastern side of Mount Street would be temporarily closed • pedestrian and cycle access through Union Street would be maintained on the northern side • the footpath on the western side of Pymont Street would be maintained at 2.1 metres • impacts on pedestrian movements through Union Square, which is part of a cycle and pedestrian route between Anzac Bridge and the CBD • limited impacts on footpath capacity due to hoardings extending over footpaths on Miller Street and Pymont Street • truck access and pedestrian/cycle/vehicular conflict management, notably in the vicinity of Union Square at the Paternoster Row intersection and at the Harris Street intersection • truck movements generated on Miller Street and crossing Harris Street to gain access to the eastern construction site • local access and traffic diversions at Paternoster Row and Union Square/Pymont Street • closure of the eastbound traffic lane on Union Street between Paternoster Row and Pymont Street to accommodate the work site • re-routing of Paternoster Row (northbound) through Union Square shared zone to the Harris Street and Miller Street intersection • pedestrian re-routing and diversions primarily on Union Square and Mount Street • displacement of on-street car parking from Mount Street (six spaces) and Union Street (five spaces) • displacement of on-street car parking in Pymont Street (about 11 spaces) • diversion of the existing pedestrian footpath on the western side of Pymont Street south of Union Street and a reduction in width to 1.5 metres, utilising part of the existing kerbside parking lane • reconfiguration of the existing traffic signals at Miller Street/Harris Street and Pymont Street/Union Square intersections
Rozelle	• the footpath around the Balmain Leagues Club construction site would be reduced to 2.4 metres on Victoria Road • pedestrian/cycle/vehicular conflict on the northern side of Victoria Road, with trucks crossing footpaths and, to a lesser extent, along the southern side of Victoria Road • impacts on traffic and pedestrians on Darling Street, with trucks exiting the south-eastern site near the traffic signals • impacts on Victoria Road bus services, due to trucks entering and exiting construction sites • potential impacts on the regular Saturday market days, church services and meetings, and schools, which attract additional pedestrian movements in the vicinity of the construction sites • the need for delivery and/or removal of oversized loads subject to relevant approvals (these may be restricted to night time hours) • impacts on footpaths and road crossings due to the relocation or diversion of major services, affecting both the duration and extent of disruption

Submissions

Proposed activities within the station precincts was a key issue raised in public submissions. The overwhelming majority of submissions questioned the likely conflicts that would be experienced within each station precinct and the, resultant impact on pedestrian, bicycle, public transport and vehicle movement. Functionality of the networks surrounding each precinct due to an increase in heavy vehicles was also questioned, as each station is located

within a highly constrained and congested location. Submissions also questioned the possible impact that construction traffic would have on businesses, parking and sensitive land uses, such as schools.

The RTA has identified that all traffic, pedestrian, bicycle and public transport issues need to be addressed throughout the construction phase, including the preparation of comprehensive traffic management plans for each construction site, and consultation with key transport stakeholders, including Councils. The RTA clearly stated that it did not support the proposal allowing construction traffic to operate between 7:00am and 7:00pm due to adverse impacts on peak period traffic. The RTA also suggested that trucks must not be permitted to queue in the street, rather use dedicated off road waiting areas and that truck size be limited to rigid single-tray trucks in areas of high pedestrian activity. Cumulative impacts were also identified as a concern and were considered to not have been adequately addressed along with the justification for and impacts of several of the ancillary projects such as footpath widening, lane closures and bus route relocations.

State Transit Authority's submission welcomed the Proponent's commitment to be involved in the proposed traffic and transport liaison group although noted that it was unclear what the construction timeframe would be. Of key concern was the interaction of the Sydney Buses network during the construction phase as station sites would significantly impact on the stopping patterns and movement of buses. The submission also identified that each station precinct would, in most cases, not have the ability to cater for a decrease in infrastructure capacity.

The Barangaroo Delivery Authority identified that there is likely to be a cumulative impact arising from redevelopment of the Project and Metro, with the consideration of joint management plans (i.e. spoil and construction traffic) requested.

The City of Sydney Council was concerned with the need for co-ordination of construction impacts as the project will have significant impact on a range of users including pedestrian, taxi, cyclist and buses. The City identified that a five year construction period will cause significant disruptions and that a cross agency and cooperative management group should be established to manage impacts. Further, the City requested that traffic management plans be developed for the project and concerns were raised as to adequacy of construction traffic during peak periods during the week.

Leichhardt Council identified that there would be significant impacts arising from construction traffic, specifically on local roads, pedestrian and parking for shops. Council requested that dilapidation reports be developed for all local roads, and management plans be developed (including detail to service individual properties impacted by work i.e. garbage trucks). Further, Council identified that the Darling Street crossing at Victoria Road should not be unnecessarily impeded.

The overarching concern raised by RailCorp was the need to enter into an interface agreement prior to any works commencing likely to directly or indirectly impact on their assets or infrastructure. In addition, RailCorp requested that it be consulted regularly during detailed design and the construction phase so that the concerns and needs of passengers and other stakeholders are monitored and addressed. RailCorp also raised concerns with respect to the predicted truck movements and associated conflicts with pedestrians particularly in peak periods and considered that a management plan would need to be developed to this effect for each station precinct. Further, disruption to public access/egress and impacts to staff facilities were identified as were the cumulative impacts that concurrent construction activities will have on its customer's ability to safely access City Rail stations.

Consideration

The Department recognises that existing traffic conditions along the project alignment are constrained with any significant increase in traffic movements or disruption likely to result in significant flow-on impacts to the wider network, particularly during peak periods. Based on the Proponent's modelling and consultation with a range of stakeholders, impacts are inevitable, although it is noted that construction traffic will generally be manageable

The Proponent did not agree with the RTA's (and City of Sydney Councils') position in relation to operating hours for construction traffic. It argued that due to the critical nature of the project, and tight delivery timeframes, movements will need to occur during and outside business hours and peak periods. Notwithstanding, the Department considers that traffic impacts should be limited to the greatest extent practicable and has recommended conditions requiring that construction traffic be scheduled, to the greatest extent practicable, to be outside of AM and PM peak traffic periods and outside special event periods. The Department also considers it important that the Proponent schedule and manage construction traffic movements to minimise the impacts of the

project on existing levels of service for affected roads, and has therefore recommended a condition of approval that requires the project to be constructed with the aim of ensuring that no existing intersection operates at a level of service worse than its existing performance, to the greatest extent practicable.

The Proponent has developed an overarching traffic management framework and site specific traffic management plans, which will inform detailed traffic control plans. The site-specific traffic plans describe potential truck routes and estimated vehicle numbers, hours of operation, potential site conflicts such as pedestrians or public transport, and include proposed mitigation and management measures to ensure access and safety is maintained. The Department considers that the framework developed by the Proponent is a robust approach to the management of construction traffic and the minimisation of traffic-related impacts. The Department supports this multilayered approach and notes that the effectiveness of traffic management plans has previously been demonstrated through other large scale infrastructure projects within the Sydney CBD, such as the Cross City Tunnel. Notwithstanding, the Department realises that these documents must be dynamic and be informed in consultation with key stakeholders and in this respect notes the Proponent's commitment to form a Traffic Transport Liaison Group to progress key traffic and transport decisions during construction.

To ensure the effectiveness of this management approach, the Department has reinforced this commitment with a recommended condition requiring the formation of a Traffic and Transport Liaison Group to oversee and coordinate project-specific and cumulative traffic and transport issues and impacts during construction and demolition works. The Group will comprise representatives from NSWTI, RailCorp, RTA, STA, Councils, Barangaroo Delivery Authority, and relevant transport associations including, but not necessarily limited to the Taxi Council, the Bus and Coach Association, Bicycle NSW, Pedestrian Council of Australia and the NSW Bike Plan team. In addition, representatives of the Sydney Harbour Foreshore Authority, Sydney Ports, Metro Light Rail and Metro Monorail will be invited to attend Liaison Group meetings on an 'as-needs' basis.

The Proponent will also be required to undertake supplementary analyses as required by the Traffic and Transport Liaison Group and, where required, detailed modelling of traffic changes and impacts that have the potential to have a significant impact on traffic signal operation and traffic and pedestrian flow efficiency with the objective of informing and improving traffic and pedestrian management measures.

The Department notes that access will also be constrained by the project, including restrictions to parking, servicing and pedestrian areas. In this respect, the site specific traffic plans present practical methods to manage these impacts. However, in some cases there are no alternatives to the loss of parking and accordingly, the Department has recommended conditions to limit these impacts to the greatest extent practicable.

These conditions include requiring the Proponent to limit the displacement of on-street parking and servicing facilities to the greatest extent practical and to ensure that all emergency access to all properties and access to emergency facilities are maintained. The Proponent is also required to maintain safe pedestrian and cyclist access around and adjacent worksites and ensure all work sites are secure and not accessible by the public. Access to properties and services, bus passenger waiting areas and rail stations will also be maintained during construction.

The State Transit Authority's submission identified that relocation of bus stops to the Proponent's preferred location(s) may not be optimal due to other services currently using the space and/or existing infrastructure is not capable of supporting the increase in patrons associated with the relocation of services. The Department accepts, that in order to minimise conflicts between construction sites and patrons, relocation is the better option, provided it is located within a reasonable distance of the original stop(s) and is of comparable quality. Therefore, the Department has recommended a condition requiring the Proponent to undertake consultation with the NSWTI, STA, Hillsbus and other transport operators to ensure that functionality of bus services remain throughout the CBD. This will ensure that a co-ordinated approach to optimal location of bus services occurs.

6.4 Construction Noise Impacts

Issues

Construction noise impacts as a result of above ground works would occur at all surface station sites. These impacts may occur as a result of airborne noise, including noise generated from truck movements, excavation, spoil conveyors, loading operations, tunnel ventilation fans, dust collectors, materials and equipment deliveries, and general station construction activities. The majority of the above ground construction activities would be

undertaken between 7:00 am and 6:00 pm weekdays and 8:00 am and 1:00 pm on Saturdays. However, some activities would need to be undertaken outside of these hours. The scheduling of different activities would respond to local conditions and allow for receiver respite during periods of high noise-generating activities.

Construction would continue for the entire five year construction period at all station locations, but there may be some temporary construction sites that would be required for shorter durations. The main noise generating activities would include the demolition of existing structures (typically lasting three months, up to nine months for multi-story buildings), site establishment including spoil handling facilities (about nine months), spoil removal from on site storage areas by heavy vehicle; and completing the station structures, fit-out and commissioning (about nine months).

The highest noise impacts are likely to take place during the initial site demolition and excavation works. These works will primarily be undertaken during the day time period. The cavern excavation and spoil storage/ removal and associated truck movements would need to occur 24 hours a day.

Submissions

Public submissions raised concerns about the impact of noise generated by the construction of the aboveground stations. In particular, noise exceedances of up to 19 dB(A) and 24-hour construction work and the consequent impacts on nearby receivers and that noise mitigation measures needed to be mandated and independent monitoring of construction noise levels carried out.

DECCW noted the construction noise predictions considered the majority of the work sites being fully enclosed, however there was no commitment to do this as this decision would depend on the detailed design and selected work method. DECCW recommended that out of hours construction be considered on a case by case basis by DECCW (for licensed activities).

RailCorp is concerned about the duration and impact of noise and vibration levels on CountryLink staff working at Central Station.

Leichhardt Council raised concerns about the level of noise generated by the construction of the Rozelle Station. Council states there should be no loss of acoustic amenity for residents, the building suites should be enclosed, that acoustic and vibration criteria should be stated and that independent monitoring of construction noise and vibration should be carried out.

Consideration

Airborne Noise

The noise assessment predicted exceedances of the noise management levels defined in the *Interim Construction Noise Guideline* at each of the station sites during demolition and excavation activities, particularly during the evening and at night. However, there will be impacts during the day where residences or accommodation is within close proximity to the site, including at Central, Pyrmont and Rozelle.

The highest airborne noise impacts will take place during the initial demolition and excavation works for the station cavern and shaft. Demolition works will occur during the daytime, however, following demolition construction works are proposed over a greater time period. The following table defines the maximum expected exceedances at Central, Pyrmont and Rozelle stations, with and with out mitigation measures

Table 5 - Summary of Primary Station Noise Impacts

Station	Activity	Time	Exceedance of Noise Management Levels (dBA)			
			No Mitigation	3m Hoarding	6m Hoarding	Enclosure
Central	Demolition and Excavation	Day	38	28	23	13
	Excavation	Evening	47	37	32	22
	Excavation	Night	54	44	39	29
	Construction	Day	28	18	13	3
	Construction	Evening	37	27	22	12
	Construction	Night	44	36	29	19
Pyrmont	Demolition and Excavation	Day	47	37	32	22
	Excavation	Evening	51	41	36	26

Station	Activity	Time	Exceedance of Noise Management Levels (dBA)			
			No Mitigation	3m Hoarding	6m Hoarding	Enclosure
	Excavation	Night	55	45	40	30
	Construction	Day	37	27	22	12
	Construction	Evening	41	31	26	16
	Construction	Night	45	35	30	20
Rozelle	Demolition and Excavation	Day	50	40	35	25
	Excavation	Evening	50	40	35	25
	Excavation	Night	55	45	40	30
	Construction	Day	40	30	25	15
	Construction	Evening	40	30	25	15
	Construction	Night	21	11	6	-

Note: Noise Management Levels are specified in the *Interim Construction Noise Guideline*. At Belmore Park, exceedances are greater than those listed for Central Station. Exceedances are also experienced at other station locations.

The Department notes that the predicted exceedances are not unexpected and are typical for infrastructure works undertaken in urban areas where it is difficult to minimise noise levels that achieve the construction noise management levels due to space limitations, proximity to sensitive receivers and the nature of the construction works required. The Department also notes that noisiest activities will not occur for the entire construction period and as the excavation of the station cavern and shaft deepens, noise levels will reduce as the cavern walls will provide a level of noise shielding. However, the identified exceedances clearly demonstrate a need to actively manage noise impacts at stations.

To actively manage these impacts the Proponent has identified a range of measures including hoarding and site enclosures. Notwithstanding, exceedances are still expected, particularly during evening and night works. These exceedances will require the Proponent to revise its work scheduling and to consider other mitigation measures such as respite periods, or offers of alternate accommodation.

Construction Traffic Noise

The background noise levels at the station sites are influenced by road traffic and existing land uses. The assessment concluded that construction traffic generated by the project would not result in more than 2 dB(A) increase on existing traffic noise levels during the day. A 2dB(A) increase is generally imperceptible and should not cause adverse impacts.

Night-time construction traffic in the CBD has the potential to exceed the 2dB(A) criteria, particularly at a number of hotels in close proximity to traffic routes. However, at these locations, it is expected that the sleep disturbance criteria will generally be met, with minor exceedance of up to 3 dB(A) or that existing noise levels are relatively high and therefore sleep disturbance is considered marginally acceptable. Notwithstanding, the Proponent has committed to undertaking further investigation to address these exceedances, including alternate routes. The Department is satisfied with this response in noting that hotels generally have a high degree of noise insulation due to prevailing high levels of ambient noise and where this is not the case, the Proponent may need to investigate further at receiver treatments.

At Pyrmont and Rozelle, there are expected to be sleep disturbance events due to the location of receivers and low ambient noise levels, particularly at Pyrmont. At Rozelle, the exceedances are masked by existing heavy vehicle movements along Victoria Road, however, impacts could occur on residences in Waterloo Street. The Department considers that the exceedances are excessive at these locations and that heavy vehicle movements should be restricted during the night time period. Accordingly, it has recommended conditions restricting night time heavy vehicle movements at these locations.

Construction Noise Management

The Department is satisfied that the construction noise assessment has adequately considered the impacts of construction noise at station sites. The assessment has predicted significant exceedances of the noise criteria without noise mitigation and therefore the Proponent will need to proactively manage noise impacts.

The Proponent has sought to undertake construction activities beyond the standard construction hours as prescribed in the *Interim Construction Noise Guidelines*. The Department acknowledges the advantages of

extending construction hours for the project to facilitate its efficient delivery and the broad economic, social and environmental benefits associated with that delivery. However, in noting the impacts associated with the works, it considers that standard hours should apply and out of hours activities be approved through an Environmental Protection Licence or a Construction Method Statement approved by the Director-General.

To ensure that noise, vibration and blasting impacts would be minimised and actively managed it is recommended that the Proponent prepare a comprehensive Construction Noise and Vibration Management Sub Plan. The Plan would be prepared by a recognised acoustic consultant in consultation with the DECCW and would detail actions and measures that would be implemented to ensure, to the greatest extent practicable, that works would comply with the relevant noise and vibration criteria/ guidelines or impacts mitigated by other means.

To mitigate noise impacts, feasible mitigation measures include the use of noise walls or the full enclosure of the worksites, which would generally be required for evening and night time works that are to be undertaken for extended periods of time. The proactive communication of impacts to receivers is also important in these circumstances. The Plan would also incorporate a monitoring regime and corrective preventative actions if any non-compliances were detected. The Proponent will also be required to consult with potentially-affected community, religious, and educational institutions to ensure that noise generating construction works in the vicinity of the institutions are not timetabled during sensitive periods.

6.5 Non-indigenous Heritage Impacts

Issues

There are 70 built heritage items and 30 archaeological heritage items located in the study area. Construction of the project would directly affect 15 built heritage items and 14 archaeological heritage items. A summary of the impacts at station sites is included in Table 6.

Table 6 - Summary of Predicted Impacts on Non-indigenous Heritage

Station Site	Predicted Heritage Impacts
Central	- Two state significant items would be directly affected by the project, the Sydney Terminal and Central Railway Station group. In particular, much of the existing western forecourt and the whole west forecourt garden would be demolished for the construction of the station. The western forecourt would be rebuilt and landscaped in a different configuration from the original, incorporating a number of new elements such as ventilation shafts, skylights and a Metro station entrance. - The proposed worksite will impact on a number of archaeological items, some of state significance, including Macquarie-period buildings that include Government Cottage, Christ Church parsonage and the Benevolent Asylum, and a section of Belmore Park (an area of early 19th century brick and pottery making).
Town Hall Square	- Heritage items at Town Hall Square Station, of local significance, which will be impacted by the project include the following: ⇒ Park House, 295-301 Pitt St – demolished for the new station; ⇒ Coronation Hotel, 5-7 Park St – demolished for the new station; ⇒ Woolworths Building, 532-540 George St – demolished as part of the establishment of the construction site; and ⇒ Britannia House, 131-135 Bathurst St – demolished for services facility for the new station. - The Bathurst St worksite may impact on remains of two c1840s houses at 125-129 and 131-135 Bathurst St.
Martin Place	- The Commonwealth Bank (Martin Place), of state significance, may be indirectly impacted by the project. Adjoining buildings to the Commonwealth Bank building at 48-50 Martin Place would be demolished and deep excavation would be undertaken, followed by erection of a new building. - The only built heritage site directly affected by the project would be the Martin Place Special Area, of local significance, where construction works would be undertaken. - Two archaeological heritage sites may be directly affected by the project, including the remains of pre-1820s housing at 9 Elizabeth St and a section of the Bennelong stormwater channel.
Barangaroo-Wynyard	One built heritage site would be directly affected by the project. The former Railway House is a state significant item. At the level of the CityRail station concourse, the Barangaroo Pedestrian Link would be constructed through the basement of Railway

Station Site	Predicted Heritage Impacts
	House, with some existing structural columns demolished. • The former Big House Hotel (Moreton's Hotel) is state significant, and would not be physically impacted by the project. However the proposed Barangaroo Pedestrian Link would pose a potential negative impact on the setting of the hotel as viewed from Hickson Road. • Three archaeological sites would be directly affected by the project. The archaeological sites comprising wharfage structures and early 19th and 20th century reclamation, early 19th century residential and industrial property remains, and 36-38 Clarence St are locally significant.
Pyrmont	• The Victorian commercial buildings, at 3-9 Union St, are not individually listed, but are located in the Pyrmont Heritage Conservation Area, which has local significance. Partial demolition of the rear of the terraced shops is required to allow construction of the eastern entrance building, a services building and egress shafts behind the four retail tenancies. About 90 per cent of the buildings including the façade and the bulk of the buildings that have pre-1900 structural elements would be retained. • One built archaeological site would be directly affected by the project. The archaeological heritage sites comprising the remains of the earlier buildings at 108-114 Miller St and the existing terrace buildings along Union St would also be removed as part of the works. These have been assessed as having low archaeological potential.
Rozelle	• Three Edwardian commercial buildings on Darling St would be demolished during construction of the metro. Although not listed individually, these items are part of the locally listed Balmain-Rozelle Conservation Area. • St Thomas Church Group and St Paul's Presbyterian Church may be indirectly affected during construction as a result of demolition of adjoining buildings and site construction compounds. The buildings themselves would be retained and the removal of the corner commercial buildings offers the opportunity to enhance the setting of these church buildings. • The Balmain Leagues Club construction site would impact on residential and commercial buildings dating to the late 19th century. All these building sites are considered to have low archaeological potential.

The Proponent has committed to ensuring that where new built elements associated with the metro project are adjacent to significant heritage buildings or conservation areas, the design of these elements will be guided by established principles for contextual design, such as those set out in the publication *Design in Context* (NSW Heritage Office and Royal Australian Institute of Architects). The Proponent has also committed to the preparation and implementation of a Heritage Management Sub Plan to manage and monitor impacts on items directly and indirectly affected by construction.

Submissions

A large number of public submissions were received raising concern over heritage impacts at the station sites as a result of construction of the project. In particular, the Commonwealth Bank of Australia consider that inadequate consideration has been given in the Environmental Assessment to the heritage significance of the building on 48 Martin Place, and having regard to its 'brittle' and 'frangible' characteristics, its susceptibility to significant damage as a consequence of vibration from demolition, excavation and construction activity adjacent to and beneath the building. Architectural finishes are of a high standard and any damage caused would affect the heritage significance and be costly and difficult to repair.

The heritage settings of Pyrmont and Rozelle were also issues raised as a major concern in a large number of individual submissions as well as form letters. A submission from the Local Member of Sydney also acknowledged that the Pyrmont community opposes demolition of buildings in Union St, wanting to preserve this conservation area.

RailCorp identified that the proposed metro tunnel could intersect the line of the Railway Square road overbridge on the old Darling Harbour branch, a state listed item and that further detailed analysis should be undertaken to avoid conflicts with the overbridge.

Leichhardt Council raised concerns that the local significance of the buildings to be demolished at Rozelle, and their contribution to streetscape and place identity, had not been adequately considered, and that detailed design of the station and environs should be undertaken to reduce these impacts.

City of Sydney Council raised a number of issues regarding heritage impacts within the CBD. Council does not support aboveground changes at Central Station, including those associated with the Western Forecourt and Main Entrance driveway, and impact on significant archaeological remains. At Town Hall Station, Council considers that the design of the station and associated buildings should be sensitive to the heritage context. And at Martin Place Station archaeological management is required for remains below 9 Elizabeth St and those associated with earlier road surfacing and services such as a branch of the Bennelong Stormwater Channel. Council also does not support the proposed bridge across Sussex St at the Barangaroo-Wynyard Station due to view and setting impacts on the state listed Moretons Hotel.

Within Pyrmont, the City of Sydney Council does not support the demolition of heritage items anywhere in the Pyrmont Heritage Precinct, but supports the revised design proposal to extend Union Square and close the Union St exit to Pyrmont St, which would substantially address heritage concerns. Additionally, the Lord Mayor identified that Council had strong concerns about even partial demolition of terraces in the Pyrmont conservation area and that the Union St terraces should be protected throughout construction.

In response to public submissions the Proponent prepared nine draft heritage principles to guide its management of heritage matters during planning and construction. These include:

1. Existing significant elements of listed heritage items or conservation areas will be conserved wherever feasible.
2. Station structures and public domain areas will be sympathetic and in context to surrounding Streetscapes.
3. Design for new building or structures will be in context of significant heritage buildings or areas, responding to key proportions and materials.
4. Historic views and vistas will be preserved wherever possible.
5. Heritage will be considered at all phases of the project as follows:
 - a) heritage specialists will be included in contract design documentation and construction;
 - b) the Design Review Panel, consisting of eminent architects including the NSW Government Architect, will consider heritage in its oversight of architectural design; and
 - c) a suitably qualified heritage architect will be employed to assist in development of station and public areas designs.
6. When a final design is proposed, a heritage impact assessment should be undertaken to clearly identify the nature and extent of any heritage impacts (either positive or negative).
7. Archival recording of affected sites will be undertaken.
8. Heritage monitoring of works will be undertaken during construction.

The Proponent has also committed to ongoing consultation with the Heritage Council, and the National Trust.

Consideration

The Department acknowledges the consideration the Proponent has undertaken to minimise impacts to heritage items during initial planning and supports the Proponent's intention to minimise and manage impacts on non-indigenous heritage, and that due to the significance of the non-indigenous heritage items (including archaeology) throughout the project area, a high level of consideration is needed during the detailed design and construction of the project.

The Department also acknowledges that the detailed design process will allow the Proponent to refine its assessment and consequent management measures in relation to non-indigenous heritage. Accordingly, the Department has recommended conditions of approval that require the Proponent to refine its heritage assessment and that this be undertaken by a suitably qualified heritage specialist in consultation with the Heritage Council of NSW and other relevant agencies. Further, to ensure that detailed design is reflective of the concerns raised by the community and Councils, the Department has recommended a comprehensive design and review process inclusive of heritage considerations.

Built Heritage

The Department notes the potential for indirect impacts to adjoining heritage items as a result of construction activities and the Proponent's commitment to reduce the risk of damage to buildings through the careful planning and execution of demolition of nearby buildings. This would include protection of adjacent structures and monitoring of the demolition process under the advice and supervision of a heritage specialist. In acknowledging the significance of heritage items within the vicinity of the works, the Department considers that these

commitments need to be enhanced and has recommended a number of conditions in respect of property, settlement and vibration impacts inclusive of heritage items within the Heritage Study Area Boundary.

These conditions include the consideration of heritage items in the establishment of vibration criteria and undertaking of building inspections prior to construction, and vibration monitoring at sensitive locations and regular inspections during construction, in consultation with the relevant property owners. A suitably qualified heritage specialist will also be required to supervise all works within the vicinity of these items.

The Department notes that Policy 1.0 of the *Central Station Conservation Management Plan (1996)* is to 'continue the primary use of the site as the Sydney railway terminal and as a transport interchange' and ensure that changes of use or new developments are compatible with the primary use of the site. It is the view of the Department that construction of the CBD metro is consistent and compatible with this use.

In response to community and Council's concerns, the Department highlights that the Proponent has revised the Station design to minimise potential construction impacts on heritage items in the vicinity of Union Square, which has resulted in the relocation of the lift access into the Square. The Department acknowledges the site constraints, including the location of existing utilities and heritage items adjoining Union Square and considers that the heritage impact on the Pyrmont Heritage Conservation Area to be acceptable. It is also noted that the design will be refined to further minimise impacts as part of ongoing design refinements.

The Department also notes that the Proponent has initiated an interactive Design Workshop to be used to inform the appearance and character of the Rozelle and Pyrmont stations. The Design Workshop is an opportunity to explore a large range of options to retain the original character of these areas and will be considered in the final design of the project. This process is consistent with the recommended Community Communication Strategy, which the Proponent is required to prepare.

In consideration of the above issues and the ongoing refinement of the project to minimise direct and indirect impacts to heritage items and conservation areas, the Department considers the impacts to be acceptable and will be appropriately managed. Notwithstanding, there will be impacts and the Department has recommended that photographic and archival recording of all affected heritage items be undertaken prior to the commencement of any relevant construction or demolition activity, and that recording is to be completed in accordance with Heritage Council of NSW Guidelines.

Archaeological Impacts

The Department notes that a range of historical sites with archaeological potential have been identified as potentially being impacted by the project. One archaeological site, the Destitute Asylum at Central Station, is identified as being of State heritage significance and, should evidence survive, would be partially impacted by the project.

The Department supports the Proponent's proposal to undertake detailed archaeological excavation and recording program of both State and locally significant archaeological sites (including public open days and media releases during the excavation) and public interpretation within the new station complexes. These measures will ensure the appropriate mitigation of impacts to archaeological sites and enhance the public knowledge and understanding of Sydney's heritage and archaeology.

To reinforce these measures, the Department has recommended conditions to ensure that archaeological impacts are appropriately managed. The Proponent will be required to prepare and implement a Research Design and Management Strategy, including an Archaeological Excavation Methodology, and Post Excavation and Reporting Program, for each construction site, which will be prepared in consultation with Councils, the Department and generally in accordance with Heritage Council of NSW Guidelines.

The Proponent will also be required to avoid, to the greatest extent practicable, intrusive development works in areas of potential archaeological remains and ensure that archaeological heritage be retained and preserved in situ. Archaeological monitoring will also be undertaken and if any unidentified archaeological items are identified during construction, works will be required to cease and consultation undertaken with the Department to determine appropriate mitigation and management measures.

6.6 Socio-Economic Impacts

Issues

The project would support capacity improvements to Sydney's existing transport network thereby increasing the scale of the workforce that could access the Sydney CBD using sustainable travel options. In the short term, however, construction of the project would cause a number of unavoidable economic and social impacts, including temporarily affecting the day to day operation of numerous businesses.

The greatest impact would be caused through the acquisition of approximately 33 properties, comprising retail buildings, offices, mixed retail/offices, commercial and residential properties. As a result of the property acquisitions, approximately 175 business tenants would require relocation.

Construction activities would also cause temporary adverse impacts, on businesses, residents, tourists and workers. Likely impacts would include noise, dust and vibration, disruptions to traffic and pedestrian movements, changes to levels in passing trade and customer access, and the availability of some public spaces, community and cultural services. These impacts may be exacerbated in some locations where the construction program requires 24-hour operation in order to meet project milestones.

Although the capacity of the existing transport services in Sydney would not change during construction, their operation would be partly hindered. The level of traffic congestion could increase the economic cost to businesses and the workforce. The scale and concurrency of the construction works across the study area have the potential to negatively affect the ease and duration of travel to and within the city.

Various public spaces would be directly or indirectly affected by the construction works, which would affect how local spaces are used by social groups and communities, and influence the identity of localities and the ability of social groups to integrate within these areas. Balmain Leagues Club property would be used as a temporary construction site. There would also be use of public spaces and facilities such as Rozelle Community Neighbourhood Centre rear open space, Union Street and Martin Place.

It is considered that overall, the shorter term adverse impacts of the project during construction, would be outweighed by the significant economic social benefits that would result from the introduction of a metro service. Improvements in travel speed, reliability, accessibility and connectivity, would bring better access to employment and education opportunities, social and community services, and cultural activities.

Submissions

A large number of public submissions were received raising concern over economic and social impacts as a result of construction of the project. Social impacts of concern mostly related to negative impacts of construction on local amenity; also of concern were potential safety impacts, disruption to community / social events, and access impacts. A number of submissions raised the issue of compulsory acquisition, and the rights of owners and appropriate compensation.

Issues raised regarding economic impacts included access to businesses for both customers / clients and staff, including parking arrangements; business viability during construction as a result of noise, dust, traffic and other construction generated impacts; the loss of businesses which will be compulsorily acquired and associated jobs loss; impacts to residential rental and property values; impacts to business rental and property values; impacts on property security, impact on public events, including local markets and compensation for impacts / relocation.

The Casino Liquor and Gaming Control Authority identified that the economic and social issues component of the Environmental Assessment does not include adequate investigation of the economic and financial impact on the casino hotel, apartments and Lyric theatre during construction and operation of the metro rail, and that consideration should be given the Casino in the 'Business Management Strategy and Plan' and 'Property Risk Management Plan'. Specific concerns were also raised in regard to economic impacts associated with noise and vibration.

City of Sydney Council considers that the proposed five year construction period for Metro will cause significant disruption to the City's public domain, city events (including losses of revenue) and to the many small businesses within the vicinity of the works. In addition to direct economic impacts, Council considered there would be secondary impacts such as the loss of trade for nearby properties acquired for the project and recommended that

positive arrangements be established to identify, quantify, ameliorate, and monitor these impacts. Council also raised concern about impacts to business at Pymont, and that the Proponent should explore alternative locations for station service infrastructure more thoroughly, with a view to retain the ongoing use and character of Union Square and more actively manage business impacts.

The Lord Mayor expressed that the highly valued character of Union Square is likely to suffer long term damage if the small businesses fronting onto it are forced to close for five years during construction and that the Proponent should undertake a comprehensive economic impact assessment on Pymont businesses in order to determine fair and reasonable compensation for business owners in the locality.

Leichhardt Municipal Council considers that the Environmental Assessment did not provide sufficient information in relation to land values, employment, business viability, economic multipliers and potential agglomeration. The Council also raised concerns that while the Environmental Assessment notes a net economic benefit to residents (increased land values and property prices) it does not take into consideration housing affordability and potential social exclusion from the local government area.

Consideration

The Department acknowledges that construction of the project will have an impact upon businesses and community facilities within the project area, although these are not expected to be significant at a macro level and will be primarily related to construction period and construction related impacts. During operation, economic impacts will be positive. Social impacts will also be negative during construction, particularly in relation to property acquisition, and will generally be positive during operation, particularly if operational impacts are appropriately managed and mitigated.

The Department considers that the Proponent has adequately demonstrated that the majority of businesses (large retailers including chain stores and destination shops) will not be significantly affected by temporary works, providing general environmental management measures are implemented during construction. These measures, including the preparation of traffic and transport, noise and vibration, and dust management plans, will be actively monitored through the implementation of a comprehensive compliance tracking program. These environmental management measures will also protect the amenity of adjoining residences and community facilities. The Department also notes that following construction, businesses will gain a benefit from the project through improved customer and employee access and improvements to the urban domain.

In relation to property acquisition, the Department notes that the Proponent has minimised the number of properties to be acquired and that the acquisition process and related compensation is administered under the *Land Acquisition (Just Terms Compensation) Act 1991*. The Department also considers that the acquisition of properties and general construction impacts will not have significant impacts on the functionality of centres or the range of services and facilities available to the adjoining community. The Department also notes that the Proponent has significantly reduced construction impacts at Pymont and consequential impacts on adjoining businesses.

However, the Department also acknowledges that there is potential for impacts to Council and businesses directly impacted by or adjoining construction sites and that these impacts need to be proactively managed by the Proponent to ensure that the impacts are minimised to the greatest extent practicable and that financial support be available in exceptional cases. In this respect, the Department notes that the Proponent has committed to preparing a range of strategies and plans to address potential economic impacts of the project. These include an Events Management Strategy to minimise impacts on cultural / special events adjacent to major project construction sites during construction; a Business Management Strategy, including a Small Business Owners Support Program, to minimise impacts on businesses adjacent to major construction sites during construction, and a Construction Stakeholder and Community Involvement Plan to ensure effective communication between affected parties.

In responses to the housing affordability issues, and related social impacts raised by Leichhardt Council, the Department notes that whilst accessibility is a factor contributing to the value of housing, affordability is influenced by a range of demand and supply factors, and that a significant factor within the Leichhardt local government area is lack of supply. However, the need to address this lack of supply and pressure for the redevelopment of adjoining land would be assessed through the appropriate strategic planning processes. Other matters raised by

Council in relation to access, design, urban amenity, have been addressed in the corresponding sections of this report or through the Proponents Submissions Report.

To reinforce these commitments and to proactively manage business viability impacts, particularly to small businesses, the Department has recommended a condition requiring the proponent to prepare and implement a Business Management Strategy. The Strategy will include measures to maintain vehicular and pedestrian access during business hours and to maintain the visibility of the business appropriate to its reliance on such. The Strategy shall include Business Management Plans for each construction site, and a Small Business Owners Support Program.

In relation to potential property damage and security, the Department has recommended a suite of conditions to ensure that impacts to third party property and security are avoided in the first instance, minimised and appropriately managed during the construction and operation of the project. Should impacts occur, the Proponent will be responsible for the repair of any impact to a standard comparable to that in existence prior to the impact.

To ensure that clear and consistent stakeholder consultation is ongoing during the detailed design and construction of the project the Department has recommended a condition requiring the Proponent prepare a Construction Stakeholder and Community Involvement Plan to provide further consideration of potential impacts on the community. The strategy is to take account of a range of issues including construction (works, scheduling and methodology), business impacts, property access, transport and traffic management (including access and construction vehicle management), property acquisition, landscaping and station design matters, and noise, vibration mitigation and management, including construction hours.

The Department notes, and supports, the Proponent's commitment to capacity building and generation of skilled employment with consideration of NSW Government guidelines including the Green Skills program and Aboriginal Participation in Construction guidelines.

6.7 Land Use and Urban Design Issues

Issues

During construction, the visual integrity and character of areas would be affected by the visual impact of vacant sites (as a result of demolition) and ongoing construction sites and facilities. This will impact on highly visible and public spaces, and conservation areas such as Union Square, Rozelle, Martin Place, and Central Station western forecourt. Construction hoardings, scaffolding and lighting would be the most pronounced visual change and visual impacts would also occur from temporary road works and/or traffic diversions.

The construction works would occur at each of the sites for at least 12 months. In many instances, they would continue for the entire five year construction period, resulting in a medium-term temporary deterioration in the visual amenity within the precincts around the construction sites. Visual impacts of construction sites would be minimised through screening and designing construction lighting to minimise light spill.

The visual impact of Station precincts and how they integrate with existing (and future) land uses is a key issue. The integration of the stations, their entry and exit points, will have an important influence on the character of areas surrounding the stations. The Environmental Assessment has described these facilities through a range of reference designs, which will be subject to further refinement as detailed design progresses, including the implementation of a public art strategy.

The interface of the project with both current and potential future land uses is also being addressed through a parallel station planning process. This process is being undertaken under the *Transport Administration Act 1988* and will provide a strategic framework to integrate the project into the adjoining environment. This process has informed station design and in conjunction these processes define project elements to be implemented as part of the project or by others at a later date, which has been guided by 4 key objectives:

1. connectivity, amenity, safety and security for pedestrians, cyclists, vehicles and public transport through design of station buildings, entries, intersections and street upgrades;
2. high quality built form outcomes, sensitive to the local context and high quality design of buildings;
3. high quality built form outcomes for stand-alone station entries, bus shelters, and other architectural structures within the public domain;
4. streetscape and public domain improvements around stations and at the delivery points for pedestrian links.

The project will also allow for the future development of residual sites required during construction, consistent with local planning controls. These sites would be managed by Sydney Metro and the redevelopment of these sites would be subject to further approval. The Proponent has also sought to undertake interim land uses, such as retail and commercial uses in consultation with councils.

Following the lodgement of the Submissions Report, the Proponent undertook further refinement of Barangaroo Pedestrian Link and Pymont Station. The Barangaroo Pedestrian Link has been modified to provide a more direct link aligned with the Kent St pedestrian tunnel. Changes at Pymont Station have resulted in the repositioning of the lift into Union Square and the loss of a service lane between Paternoster Row and Pymont Street.

Submissions

Public submissions raised concern regarding how the project will affect land use, including planning at Barangaroo, and the densification of development around stations. With regard to urban design, concerns were raised regarding loss of amenity during construction, loss of trees, impacts to the public domain and the visual impacts of the stations and ancillary buildings and the need to have structures integrated with the local character of the area, including conservation values.

The Barangaroo Delivery Authority noted the need to integrate the design of the Barangaroo-Wynyard Station and the Barangaroo Pedestrian link with the Barangaroo Delivery. Housing NSW identified that the project provided opportunities for denser transit orientated development, although current planning controls, particularly in the Rozelle area limit this potential. Both agencies sought to be further consulted on their specific matters during the detailed design of the project and it is noted that the Proponent has committed to undertake further consultation on these matters.

RailCorp raised specific concerns with regards to land use implications at Central Station, in particular the plan for the western concourse after construction and during operation, and at the Wynyard-Barangaroo site. RailCorp requests development of an Interface Agreement with the Proponent to address these issues.

The State Member for Sydney raised a number of matters in relation to public domain improvements, including design excellence, high quality landscaping, the facilitation of Town Hall square, minimising impacts at Union Square, changes to the Western forecourt at Central Station.

The City of Sydney and Leichhardt Council raised numerous concerns regarding the urban design and land use implications of the project, including amenity impacts during construction and ensuring that the detailed design of stations reflected the intrinsic nature of each locality, including heritage values, future plans and that appropriate consultation was undertaken during detailed design. In summary, issues raised by councils included:

- integration with the current and future built environment and public domain (including the Town Hall square and civic precinct);
- the provision of spaces that have high amenity and design standards and appropriate endemic landscaping;
- contextual relationship with heritage items, and conservation areas (including at Central and Union Square, Pymont);
- the provision of secure, safe and legible environments for commuters and the wider public;
- the location and design of entrance and ancillary infrastructure to minimise impact on private and public domain (including impacts to the visual axis of Martin Place);
- the retention and enhancement of existing services and facilities;
- sustainable design through active and passive measures;
- the utilisation of high quality and durable structures, fixtures and finishes; and
- maintenance and ownership of the public domain.

Consideration

Matters raised by the community, and in particular Councils detailed comments, reflect the conceptual nature of the design and the importance of having high quality and integrated stations, that are refined in consultation with community. The Department acknowledges the conceptual nature of the plans as presented and that the detailed design will need to address the urban design matters raised by the community. To ensure that detailed design is

reflective of the concerns raised by the community, the Department has recommended a comprehensive design and review process.

The design and review process is based on design principles and standards, which will need to be considered during the design of stations, ancillary facilities, and station precincts. Specific consideration will also need to be given to the, integration with the proposed Town Hall square (including maximising the pedestrian and view corridor to the Uniting Church), and minimising impacts on the visual axis of Martin Place. Urban design reports will be prepared in consultation with the local councils and shall be subject to review by an Urban Design Review Panel to ensure 'design excellence' is achieved. The Panel will include representation from the Proponent, Council, the Department and an independent design professional.

In relation to land use change as a result of the project, the Department notes that there is potential for redevelopment in some station catchments to capitalise on improved public transport but that such change would be subject to a separate planning processes. Where there is the potential for development to occur at station sites after construction has finished (residual development), the project would be designed to allow future development by other parties, which would be subject to relevant planning controls and independent approval. The Proponent has suggested that interim uses would be developed in consultation with council's.

In order to address concerns raised by RailCorp, the Department has recommended a condition requiring the Proponent to enter into an Interface Agreement(s) with RailCorp to ensure the successful operational integration of the project and the heavy railway network and the protection of physical and operational RailCorp assets and services, during construction and operation.

The Proponent has also committed to the development of a Public Art Plan to facilitate attractive public domain areas, with a greater sense of community interaction. The Public Art Plan would be developed in consultation with councils and the Arts Council of NSW and the community stakeholders.

Amenity impacts during construction will be managed through a comprehensive construction environmental management framework, which is to be endorsed by the Director-General and the proponent has committed to the screening of work sites in areas that have high amenity value, including conservation areas, consistent with council standards and that lighting would be designed to comply with *AS4284-1997 Control of the Obtrusive Effects of Outdoor Lighting*. These measures would be maintained through the implementation of a comprehensive compliance tracking program, including a program of environmental auditing.

6.8 Operational Transport Impacts

Issues

The metro stations would be integrated into the surrounding area, and the metro network would be integrated with existing transport infrastructure, enabling passengers to conveniently interchange between metro and other public transport services, and pedestrian and cyclist facilities. Table 7 provides a summary of access and interchange modes available at each CBD Metro station. An integrated transport strategy has been developed for the project based upon a detailed assessment of intermodal interchange, station connectivity and accessibility.

Table 7 - Summary of Access and Interchange Mode Availability

Access and Interchange	Central	Town Hall Square	Martin Place	Barangaroo-Wynyard	Pymont	Rozelle
Pedestrians	X	X	X	X	X	X
Cyclists	X	X	X	X	X	X
Rail	X	X	X	X		
Bus	X	X	X	X	X	X
Coach	X					
Light Rail	X				X	
Monorail		X				
Ferry				X		
Taxi	X	X	X	X	X	X
Kiss-and-ride	X				X	X

Key network impacts, including integration with the pedestrian network, cyclists network, rail services, bus services, coach services, light rail services, monorail services, ferry services, and the road network are described below for each station site, as relevant, as well as key elements of the integrated transport strategy. It should also be noted that not all transport elements presented in the Environmental Assessment and the concurrent Station Plans form part of the project. These elements are beyond the remit of the project, but illustrate how the project will integrate with other transport (and urban design) initiatives and strategies.

Central Station

Pedestrian access would be gained from station entrances at Quay Street, Henry Dean Plaza, the Western Forecourt and at the corner of Pitt St and Eddy Ave. These entrances have been located to maximise connectivity with the pedestrian network and other surface transport facilities in the vicinity of the station.

Interchange between metro and CityRail services would be a major function at Central, with passengers transferring from terminating services, as well as interchanging from other CityRail suburban services, through a subsurface connection between the metro concourse and CityRail platforms 4 to 11 (with a future opportunity to connect to platforms 11 to 25). Operation of the Metro at Central Station would not affect existing rail operations.

Interchange between metro and bus services would be limited, with some bus transfers from suburban bus services from Railway Square and Eddy Avenue. The project would not significantly affect existing bus routes, stops or operations and interchange between project and coach services would also be limited. Interchange between Metro and light rail services would be low. The project would not affect existing light rail routes, stops or operations.

The most significant access changes at Central Station relate to the reconstruction of the Western Forecourt, which would impact on servicing, access, parking, kiss and ride, taxi and coach facilities. The Proponent has proposed a primarily pedestrianised area to the south of the forecourt, with parking and servicing facilities located on a loop road adjacent the western entrance of Central Station and with road access restricted to Hay Street. Bicycle parking to cater for Metro passengers would be provided within the Western Forecourt and would be linked to the City of Sydney bicycle network.

Town Hall Square Station

Pedestrian access would be gained from entrances at Pitt Street, north of Park Street and within the proposed Town Hall square, with a potential entrance safeguarded at the corner of Pitt Street and Bathurst Street. Interchange between Metro and CityRail services would be an important function at Town Hall Square. Connections between the Metro and CityRail at Town Hall would be possible both at street level and a subsurface pedestrian connection (beneath a future Town Hall Square) connecting the Metro and CityRail unpaid concourses. The Metro would not affect existing rail operations.

Interchange between Metro and bus services is expected to be moderate. Existing eastbound bus lanes on Park Street would be retained, and metro entries would provide access to both sides of Park Street. George Street buses and the buses at the proposed Midcity Bus Interchange would be the key source of metro-bus passenger interchange in the future.

Interchange between Metro and monorail services is expected to be minimal. Interchange would be facilitated by a Metro entrance in Pitt Street, north of Park Street. Cycle facilities would be provided at Town Hall Square and the opportunity for a Cycle2City facility would be safeguarded beneath Town Hall Square.

Access impacts are primarily related to the loss of some parking along Pitt Street due to entrance works and the widening of footpaths and lane configurations in Park Street to facilitate additional buses.

Martin Place Station

Pedestrian access would be gained from an entrance within Martin Place west of Castlereagh Street. The Metro station is expected to facilitate metro-rail interchange between Rozelle/Pymont, and the Eastern Suburbs and Illawarra Lines. The Metro would not affect existing rail operations.

Interchange between Metro and bus services at Martin Place is expected to be moderate. The Metro would not affect existing bus routes, stops or operations. Martin Place Station would connect directly to existing bus stops via the surface and sub-surface pedestrian network.

The Metro station would be linked to the existing surface pedestrian network and subsurface pedestrian link below Martin Place and Elizabeth Street. The Metro station would also be linked to the planned future City of Sydney bicycle network, and bicycle parking would be provided at the station.

Access impacts are primarily related to the loss of some loading zones and parking along Castlereagh Street, to facilitate vent structures.

Barangaroo-Wynyard Station

Pedestrian access would be gained from an entrance within Barangaroo, an upgraded entrance on the western side of Clarence Street and an entrance on the corner of Clarence Street and York Lane. The project would also implement the Barangaroo Pedestrian Link, through the upgrade of the Kent Street tunnel and a pedestrian overbridge at Sussex Street. The Link would greatly enhance pedestrian connectivity to the Wynyard transport hub, and cater for future growth in pedestrian movements within the precinct.

Interchange between Metro and CityRail services would be an important function at Barangaroo-Wynyard. A direct subsurface link with the CityRail station concourse would facilitate transfer between the Metro and CityRail services. The Metro would not affect existing rail operations.

Interchange between Metro and bus services would be significant, with bus transfer from suburban bus services. Barangaroo-Wynyard Station would connect directly to existing bus stops via the surface and sub-surface pedestrian network. The Metro would not significantly affect existing bus routes, stops or operations.

Development of a ferry terminal is proposed at Barangaroo close to the proposed Metro station. The Metro would provide interchange opportunities for ferry users for travel beyond the walking catchment of the terminal. Bicycle parking to cater for Metro passengers would be provided at the station.

Access impacts are primarily related to the removal of parking to create a bi-directional cycleway on Napoleon Street and parking and servicing impacts in York Lane.

Pymont Station

Pedestrian access would be gained from entrances at the corner of Miller and Mount Streets, and at Pymont Street, adjoining Union Square (disabled access would be via Union Square) and the project would allow for a future pedestrian connection between Mount and Harris Streets. Interchange between Metro and bus services would be minimal, with some bus transfer from suburban bus services. The Metro would not significantly affect existing bus routes, stops or operations. As part of the Metro, improvements to bus waiting facilities on Miller Street and Harris Street would be provided as well as a pick up / drop off zone on the north side of the Pymont Street / Union Street intersection.

Interchange between Metro and light rail services would be low. The Metro would not affect existing light rail routes, stops or operations. Interchange between Metro and monorail services would also be minimal. The CBD Metro is not expected to impact on the operations of the monorail service.

Vehicular access from the road network to Pymont Station is expected to be low. The Metro may require changes to and upgrade of local intersections. Changes to vehicle operations would maintain access for Pymont residents and would improve the pedestrian amenity near the Pymont entry. Further traffic assessment will be undertaken in consultation with the RTA and local councils to confirm traffic requirements which may result in minor design changes around Pymont Station.

Bicycle parking to cater for Metro passengers would be provided at the station and works within in the vicinity of the Station would be undertaken having regard to City of Sydney proposals for bi-directional cycleway through Union Street and Union Square, and streetscape works in Pymont Street.

The key access impacts are related to the expansion and reconfiguration of Union Square to Pymont Street by reconfiguring Paternoster Row to exit at Harris Street, the creation of a shared pedestrian and vehicle zone at Mount Street and some parking losses on Pymont Street as a part of footpath widening to facilitate the station entrance and the provision of taxi stands.

Rozelle Station

Pedestrian access would be gained from the north eastern, north western and south western corners of the Victoria Road and Darling Street intersections. Surface crossings at the Victoria Road / Darling Street intersection would be retained with improvements made to the pedestrian network around each of the station entrances. A publicly accessible subsurface pedestrian link connecting the three station entries would be provided. Station entries would be located and oriented to maximise connectivity with the pedestrian network, and bicycle parking for Metro passengers would be provided at the station.

Victoria Road bus services would serve on street bus stops at Rozelle station, providing the opportunity to interchange with the Metro, and then continue to the City. New weather-protected bus waiting facilities at inbound stops on either side of Darling Street would be provided a new bus stop and interchange facility would be provided on the Balmain Tigers site, including weather protected bus passenger waiting areas, an outbound bus lane and indented bus bays between Darling Street and Wellington Street. Bus priority has also been proposed as part of the modification of the Victoria Road / Wellington Street intersection.

Other access changes include the redistribution of parking facilities to facilitate taxi and kiss and ride elements on Darling Street on both sides of Victoria Road, the extension of residential parking schemes, and the upgrade of the Victoria Road and Wellington Street intersection signalised intersection to provide access to the Balmain Leagues Club.

Submissions

Public submissions were received regarding operational transport issues, including commuter car parking and residents parking issues around metro stations, pedestrian access, volumes and safety around metro stations, cycle facilities, including cycles being permitted on trains. A number of submissions raised concern regarding the operational traffic impacts at stations. In particular, the local community consider that operation of the metro at Rozelle will put more pressure on the already congested roads and limited parking in the area as a result of increased commuters accessing this major interchange point between the metro and bus services, and metro and commuters.

The issue of integrated transport was also raised in a number of submissions, identifying an apparent lack of transport integration between modes (current and future) or a holistic planning approach for Sydney, and questionable efficiency of modal transfers particularly at Central Station and Rozelle Station.

State Transit Authority (STA) supports the inclusion of facilities such as real time bus information, provision of additional passenger waiting facilities, upgraded bus stop signage, and improved bus mapping and information. STA considers that further consideration of on road bus facilities, such as bus lanes and off road bus interchange facilities at Town Hall, Barangaroo-Wynyard, White Bay, and Rozelle is needed and has queried the impacts on a number of road changes that may impact on bus services and has requested further consultation on these matters. In particular, STA did not support the proposed bus bay at Rozelle, and considers the inclusion of an additional inbound stop prior to Darling Street will not provide any benefit and considers that the existing bus stopping arrangements are satisfactory and provides safe access for pedestrians to the interchange using existing signalised crossing facilities.

The Roads and Traffic Authority considered that the justification for and impacts of ancillary projects such as footpath widening, lane closures and bus route relocations required further assessment, further consultation required regarding the Lilyfield Pedestrian Link was required and that construction of the project should not impact on major road infrastructure.

Leichhardt Council considers that a more rigorous approach to public transport that embodies a holistic and strategic approach should be undertaken. It also considers that the proposal does not adequately integrate with the bicycle network, that bike parking needs to be secure and accessible, and there is no firm commitment that a cycle linkage will be provided to the Anzac Bridge route. It also notes that bicycles will not be permitted on trains. Council has requested further detailed information regarding the modal change at Rozelle, including potential reorganisation of bus routes and resultant impacts on traffic and accessibility.

City of Sydney Council raised a number of issues with regards to operational transport impacts and interactions, and transport integration, and considers that Council should have ongoing involvement in the coordination of operational transport impacts and interactions. Key issues raised by Council include, the removal of buses from Druiitt Street following the opening of the Metro; the likely economic impact on the existing light rail operation, which is substantially reliant on patronage between Central and Pyrmont; the need to maximise the convenience of the project for cyclists, including cycle parking around stations, the provisions of bicycle hire services and safe access to and from the station for cyclists; and allowing bicycles on the metro system.

The Barangaroo Delivery Authority considers that the Barangaroo-Wynyard pedestrian tunnel link should not be considered in isolation. There is an identified need to also implement on-surface pedestrian enhancements along the multiple Street networks as part of a strategy to enhance pedestrian connectivity between the western edge of the CBD, Wynyard and surrounds.

RailCorp considers that further information is required to promote the effective and efficient integration of the RailCorp and Metro networks and noted that patronage demand for the project would be influenced by the operating patterns adopted by RailCorp. RailCorp has also sought an Interface Agreement with the Proponent to ensure the successful operational integration of the project and the heavy railway network and the protection of physical and operational RailCorp assets and services, during construction and operation.

Consideration

The Department notes that the Proponent's design intention was to facilitate access and multi-modal interchange at each station and considers that the design has generally achieved this objective, with stations located and designed to integrate with existing pedestrian, cycle and public transport networks and services. Proposals for changes to the road network in association with the project are considered to be relatively minor when considered in the broader context of the project and aim to accommodate pedestrians, cyclists, public transport services, goods and service vehicles, general traffic, on-street parking and emergency vehicle access. The Department also accepts that for a project of this scale, there will be impacts to road facilities, however, these impacts are minor when considered against the significant accessibility gains afforded by the project.

The Department also notes that a significant number of the matters raised in submissions reflected concern over the integration of the Rozelle Station with the surrounding bus, cyclist, pedestrian, and local road network and that the Proponent has advised that the design of the proposed bus bay at Rozelle has been developed to

address a number of issues including STA and RTA safety requirements; that there will be no forced interchange at Rozelle Station from bus to Metro; that further consultation would be undertaken with Council to determine the need for and extent of expansion of its existing resident parking scheme at Rozelle; and that the location of taxi and kiss and ride zones will be further developed in consultation with the RTA and Leichhardt Council.

The Proponent has also identified further measures to ensure the integration of the project with the transport network, including working in partnership with NSW Transport and Infrastructure and RailCorp, Councils and other transport operators to integrate the future bus network with the project and bring forward bus network improvements; to integrate the existing and proposed pedestrian and bicycle network with the project; to resolve traffic and urban design opportunities that may be facilitated by the introduction of the project; and introduce integrated ticketing to facilitate network integration and passenger interchange between metro, rail and bus services. The Department also notes that whilst non foldable bicycles would not be permitted onto trains due to operational constraints, it is providing weather protected cycle storage facilities at stations.

Notwithstanding, the Department considers that the Proponent can further refine the project during detailed design to minimise impacts on other transport modes and services, whilst ensuring that the project is well integrated with existing and proposed transport services and the broader public domain. In this respect, the Department has recommended that the Proponent undertake a detailed design of the project with the design objectives of minimising negative changes to existing access arrangements and services for other transport modes and facilitate an improved level of access and service to those other transport modes comparable to the existing situation.

As part of this process it is also recommended that the Proponent prepare a Transport Integration Plan to inform the final design of transport and access facilities and services, including footpaths, cycleways, passenger facilities, parking, traffic and road changes, and integration between current and proposed public domain and transport initiatives. The Plan would be prepared in consultation with the Traffic and Transport Liaison Group and be reviewed by a qualified traffic and transport professional(s), independent of the detailed design process. To ensure that the project is appropriately integrated into the current and proposed Rail Corp network, the Department has also recommended that the Proponent enter into an Interface Agreement with RailCorp.

The Department has also recommended that the Proponent consult with the Roads and Traffic Authority, NSW T&I, Sydney Ports, Sydney Harbour Foreshore Authority and Metro Transport Sydney Pty Ltd, as relevant, to identify and address any potential conflicts between the design of the project and the design of an expanded light rail stabling facility, M4 Motorway extension or a road connection (including pedestrian and cycle access) between the City West Link / The Crescent intersection through to White Bay under Victoria Road.

6.9 Operational Noise Impacts

Issues

At underground sections of track, airborne noise generated by trains is reduced to inaudible levels at above-ground receivers, with the exception at ventilation stacks and shafts, where airborne noise from trains may be audible. Other ancillary noise sources would typically include mechanical services plant to ventilate underground areas and surface buildings.

Mechanical services plant used to ventilate underground areas and surface buildings would be located at each of the stations, either within the station entrance buildings or within a separate building above the station cavern. At this stage, the exact location and specification of the ancillary equipment which is likely to be used has not yet been fixed and may be subject to change.

The maximum allowable mechanical services sound power levels emitted at each location for detailed design purposes have been calculated and range from 60dB(A) to 100dB(A). Train noise break-out through the tunnel ventilation shafts from trains operating within the tunnel is not expected to exceed the noise design goals, subject to the application of appropriate mitigation measures.

Submissions

A number of submissions raised concern about noise from ventilation shafts and plant/ services adjacent to residential buildings. The need to screen noise from the Rozelle Station bus interchange on the adjacent playground was raised by several submissions.

Consideration

The noise assessment has considered airborne noise emissions from the metro stations and ancillary facilities. The noise emissions are either continuous noise from mechanical plant and equipment or train noise break-out from ventilation shafts and draught relief stacks.

Continuous noise would be subject to the *NSW Industrial Noise Policy*. The night-time noise goals are the most stringent and are the design goals at all station locations for noise generated by ancillary facilities. The noise assessment concluded it is likely that mitigation measures would be required for some station and tunnel ventilation equipment/ locations in order to comply with the noise design goals. Mitigation measures that may need to be considered in order to comply with the *NSW Industrial Noise Policy* include equipment selection, in-duct attenuators, noise barriers, acoustic enclosures and positioning of critical plant away from sensitive receivers.

The Proponent has adopted design goals for noise break-out from train pass bys based on the Epping to Chatswood Rail Line and Sydney Airport Rail Line, which are more stringent than DECCW's *Interim Guideline for the Assessment of Noise from Infrastructure Projects*. The assessment predicted maximum noise levels from train pass-bys would exceed the design goals where unmitigated draught relief shafts are located within 350 metres of a residential façade and 120 metres of a commercial façade. Tunnel ventilation shafts are expected to have attenuators which would decrease train noise to less than 50 dB(A) at one metre from the surface discharge. With the application of mitigation measures, typically in-duct noise attenuation, train noise break-out through the tunnel ventilation shafts from trains operating within the tunnel is not expected to exceed the noise design goals at the nearby sensitive receivers.

If future brake release noise levels should be significantly higher than those predicted, there may be a requirement for some form of noise mitigation in order to minimise potential sleep disturbance at the nearest residences during the night-time period.

The Department notes that the existing background noise environment is high, influenced by road traffic noise and surrounding land uses and that the Proponent has committed to minimise noise impacts on nearby sensitive receivers and that measures to minimise noise impacts would continue to be developed during the detailed design phase of the project and incorporated into an Operational Noise and Vibration Management Plan. Accordingly, the Department is generally satisfied that air-borne noise from the station sites and ancillary facilities (ventilation shafts and draught relief stacks) is unlikely to result in an adverse impact on nearby sensitive receivers.

Notwithstanding, the Department has recommended conditions which require the Proponent to meet breakout noise criteria and to identify the project specific noise levels for stations to ensure compliance with the relevant noise levels under the *NSW Industrial Noise Policy*, and notify the Department and DECCW of these levels prior to construction of that component commencing. The Proponent is also required to independently audit the operational noise and vibration levels and performance of the mitigation measures, twelve months after and five years after completion of construction of the project.

WHITE BAY CONSTRUCTION SITE AND ROZELLE STABLING AND MAINTENANCE DEPOT

6.10 Construction Traffic Impacts

Issues

In the absence of alternative rail and water spoil removal options, the assessment considers the 'worst case' (i.e. inability to use alternative methods of disposal) scenario. In this scenario, there will be up to 192 truck movements per day from the White Bay construction site and up to 78 truck movements per day for the Rozelle maintenance and stabling and depot sites.

The White Bay construction site and the Rozelle stabling and maintenance depot sites are relatively unconstrained from a space point of view and adjoin the arterial road network (Victoria Road and City West Link). An existing signalised intersection (James Craig Road) functions as a connection for Port users and is capable of handling articulated vehicles. Accordingly, most heavy vehicle movements will directly access port and arterial roads, however, some movements will be required on local roads.

The modelling of key intersections in the area indicates a deterioration of the performance of key intersections along the City West Link road without road improvements and that revised traffic arrangements along the City West Link road would be required, including a left in and left out access point off the City West Link Road directly into the depot site and a right turn out of the depot site.

In order to meet the construction program, the Proponent has identified that activities would require truck movements outside normal working hours. Truck routes to and from construction sites were developed in the context of minimising impacts on local streets and maximising use of arterial roads.

In addition, White Bay will be used as the employee parking location for contractors who will then be conveyed to station locations by bus to minimise parking and traffic impacts at station sites.

Submissions

Submissions raised concerns regarding conflicts with construction traffic along the project generally, rather than at specific locations. Site specific concerns raised by the community supported the use of White Bay as the truck marshalling area.

The RTA raised concerns related to the operation of the traffic network at the City West Link / The Crescent access, via James Craig Road. Further, the RTA identified that the proposed right turn access from the Rozelle yard onto City West link be restricted to the construction stage only.

Sydney Ports identified a range of concerns within the precinct, including the need to retain access and movement for existing port operations and users and the level of assessment related to traffic impacts on port operations. Truck queuing on James Craig Road was considered to cause conflict with tenant operations and suggested that Glebe Island be used for employee parking, coach pickup / drop off points and truck queuing. Sydney Ports was also concerned with the provision of pedestrian access along Sommersville Road due to the narrowness, safety concerns with mixing vehicles / trucks with pedestrian movements, and the need to cut into the existing rock face to provide access.

Leichhardt Council identified that total truck movements around White Bay needs to be more descriptive. Council suggested that all waste be removed, where possible by barge and did not support on-road waste transfer via Council managed roads or Darling Street/Victoria Road. Council supported the use of White Bay for parking during construction of the project. Council also identified that Balmain peninsula is constrained during New Years, cruise ship activity and during special events, highlighting that a co-ordinated approach would be required to minimise conflicts arising from truck movements.

Consideration

White Bay is considered to be the best alternative for facilitating vehicle intensive activities required to deliver the project. Sites with the desired characteristics such as ready access to arterial roads and not subject to space

constraints are limited, with alternate sites likely to be under development when the project commences (i.e. Barangaroo and CUB Site, Broadway). Access impacts would generally be limited to the City West Link road, rather than Victoria Road thus limiting the impacts to traffic along this important transport route. Further, the site is considered suitable for these activities as existing site infrastructure already caters for heavy vehicles, although minor refinements would be required to the existing James Craig Road/City West Link intersection to cater for right turn movements away from the City. To reinforce the Proponents commitments to limit the amount of traffic accessing local roads, the Department has recommended a condition requiring that use of heavy vehicles on Lilyfield Road and Gordon Street, be limited to the greatest extent practicable and occur during normal construction hours.

The Proponent has identified that further liaison with Sydney Ports is required to address concerns unique to the White Bay precinct. However, it remained preferable to use James Craig Road as a queuing area and that by activating a disused rail access point to the City West Link (for left in and left out turns) and former truck access under Victoria Road, impacts were mitigated as far as practicable at this locale. Further, pedestrian access is currently available along part of Sommersville Road and, it is not envisaged to cut into the rock face for the purpose of pedestrian access.

The Department considers that the proposed access arrangements are generally acceptable at this location with direct impacts to Port users reduced by redistributing some traffic away from the internal port network. Notwithstanding the Department has recommended that Proponent liaise with Sydney Ports with the objective of minimising impacts on Port operations and Sydney Port roads particularly in relation to parking, pick-up and drop-off points and vehicle queuing. The Proponent will also be required to undertake the detailed design of construction traffic access onto and off City West Link Road and the Crescent in consultation with the Roads and Traffic Authority.

As previously discussed, traffic in this locality will be managed by a suite of traffic management processes including management plans and the oversight of the Traffic and Transport Liaison Group. The Department considers that refinements to the plans would resolve issues raised by Sydney Ports regarding tenant operations and Leichhardt Council in relation to the Balmain Peninsula. This has been reflected in the recommended general and site specific conditions of approval for White Bay.

On balance, the Department considers the use of White Bay and surrounds, provides the best outcome for a project which runs through densely populated areas of Sydney, when presented with alternatives such as all traffic movements into and out of the CBD and environs. It is highly likely that movements would be considerably less following refinement of both the construction scheduling, vehicle types and alternative spoil disposal methods as identified elsewhere in this report.

6.11 Construction Noise and Vibration Impacts

Issues

Construction noise impacts as a result of above ground works would primarily occur at the Rozelle stabling and maintenance depot site. Whilst the area is already affected by noise related to industrial activities and road traffic, surrounding residential areas would be exposed to noise impacts, particularly in relation to the excavation and construction of the portal and dive structure, where night time exceedances of up to 25dB(A) have been predicted. However, the majority of the above ground construction activities would be undertaken between 7:00 am and 6:00 pm weekdays and 8:00 am and 1:00pm on Saturdays, where there would be exceedances of up to 11dB(A). No air-borne noise impacts are expected at the White Bay construction site.

Vibration has the potential to impact on sensitive receivers and structures near construction sites. These impacts may occur as a result of surface works (such as vibratory rollers) or from the operation of excavation equipment such as road headers, TBMs and rock breakers. Vibration impacts are not expected to occur at the site, as receivers fall outside safe working distances.

To manage identified potential impacts, the Proponent has developed a Construction Noise and Vibration Strategy Framework. The Strategy provides guidance on minimising airborne noise and vibration impacts, and sets a framework for detailed construction phase noise assessment, the implementation of reasonable and feasible mitigation measures, and monitoring and reporting.

Submissions

Two public submissions raised concerns about noise and vibration from tunnelling and building work at the Rozelle stabling and maintenance facility and that construction work should be limited to the period 8:00 am to 6:00 pm and an independent review of noise impacts on Lilyfield residents should be undertaken. The noise from train or truck removal of spoil on residents in Lilyfield Road has not been assessed.

Leichhardt Council stated the background noise levels used to determine the construction noise criteria for the Rozelle stabling and maintenance facility is flawed and therefore the noise impact would be greater than predicted in the Environmental Assessment. The Council notes the predicted noise level in the vicinity of the Rozelle portal and dive structure, with noise mitigation, would exceed the noise criteria by more than 20 dB(A). Council considered that the Proponent's Noise and Vibration Strategy did not provide adequate protection for residents and options for full enclosure of the site, limiting construction to day-time only or temporarily relocating affected residents/ businesses need to be considered.

Consideration

Construction of the Rozelle stabling facility, which includes general earthworks and construction of buildings and the portal and dive structure, is predicted to result in exceedances of the construction noise criteria. The assessment predicted a minor exceedance of the day-time noise goal at receivers in Lilyfield Road of 4dB(A) from general earthworks and building construction. Construction of the portal and dive structure is predicted to generate an exceedance of 11 dB(A) at receivers in the eastern part of Lilyfield Road, primarily due to the use of rock breaking equipment. Noise exceedances were predicted for evening and night-time periods, particularly for portal and dive structure construction where an unmitigated exceedance of up to 25dB(A) could be expected.

The assessment concluded that due to the location of construction equipment and the location of residences overlooking the Rozelle stabling facility site, noise barriers would only be effective for earthworks and the portal and dive structure construction. The use of an enclosure is not feasible during earthworks and building construction. Construction works at the White Bay site are predicted to comply with the day and night-time construction noise criteria. The site is distant to sensitive receivers and in many instances is shielded by topography and commercial/ industrial buildings. Noise impacts associated with construction traffic are not expected to be perceptible with traffic directly accessing the City West Link Road.

As previously noted, noise levels from the construction of major infrastructure often exceeds noise management levels because of the activities undertaken and site constraints. At this location, the Department does not consider that the daytime exceedances, although clearly audible, will be excessively intrusive as they are relatively minor and will be limited to a specific construction activity. Extending construction activities outside of the standard daytime construction hours will require approval through an Environmental Protection Licence or through a construction method statement approved by the Director-General, which will define mitigation and management measures. These activities will also need to be consistent with a comprehensive Construction Noise and Vibration Management Plan prepared for the project.

Leichhardt Council questioned the accuracy of the background noise assessment, stating that the monitoring locations of the Proponent's noise assessment were heavily influenced by road traffic noise from City West Link road. The Proponent's response indicated the monitoring locations were appropriate as they represented the potentially most affected noise receivers and that noise levels would reduce as distance between the monitoring location and noise source increased. Similarly, as the distance between the Rozelle stabling facility and residential receivers increased there would be a corresponding decrease in noise levels attributed to the facility. The Department is satisfied with the noise assessment of the project and considers that the existing noise characteristics of the sensitive receivers in the surrounding area have been comprehensively assessed.

6.12 Non-indigenous Heritage Impacts

Issues

Significant heritage and archaeological heritage items are located in the vicinity of the White Bay construction site and former Rozelle Marshalling yards. The White Bay Power Station and its ancillary infrastructure, a state significant item, would be affected by the works. The station box for the future White Bay Station would intrude into the curtilage of the White Bay Power Station and could influence future development potential (and thus the

conservation) of the power station. The final design of the above-ground elements of White Bay Station (height, scale etc) could also impact on a significant view corridor within the power station group.

The western side of the construction site, to enable cut and cover construction of the turn-out to the stabling yard, would extend into an area assessed as having high heritage significance, the site of the former Boiler House No. 2, and another area of exceptional significance, the Railway Corridor. The site of the former Boiler House No 2 could retain a range of remains connected to the operation of the power station, some of which would be disturbed by sub-surface impacts within the worksite. However, the project does not at this stage include permanent above ground structures.

It is likely that other services, such as electric cabling from and to the power station to the adjacent railyards, travel through the area proposed for the future new station. The construction site on the eastern side of White Bay Power Station also appears to have been occupied by a coal yard and railway sidings. These remains have been assessed as being of little or no heritage significance.

The Rozelle depot site is located adjacent to the listed stormwater canal (at Lilyfield Road), and is the site of the former Rozelle Marshalling Yards. Heritage items in the vicinity of this site, but not impacted by it, include two railway bridges and two buildings (a former hotel and the *Cadden Le Messurier* property). The final design of any structures on site will need to take into consideration the stormwater canal and any negative visual impacts to the surrounding heritage items.

Further physical investigation would need to be carried out to identify the likelihood of encountering any surviving sub-surface items. Any significant items found would require appropriate recording and may also require careful relocation and storage, followed by reconstruction on completion of the works.

To address these matters, the Proponent has committed to preparing and implementing a Heritage Management Sub Plan for non-indigenous heritage with project wide and site specific measures. The Proponent has also committed to including heritage issues in site inductions, and regular monitoring and reporting on heritage items in the vicinity of construction works.

Submissions

No public submissions raised specific concerns regarding heritage at the White Bay construction site or Rozelle maintenance and stabling depot site. However, some submissions in general raised concern over potential damage to heritage buildings.

Sydney Ports identified a number of heritage items which are listed on its section 170 Heritage Register and which may be impacted by construction works and require further assessment. These include:

- White Bay Power Station Canal (northern canal);
- Glebe Island Bridge Approach;
- Glebe Island Silos; and
- Glebe Island Dyke Exposure (also known as the Great Sydney Dyke).

Consideration

The Submission Report identified a need to realign and locate the station box and construction compound at White Bay. The realignment of the station box would impact on the White Bay Power Station, including the Coal Yards and a protected view corridor, and the construction compound would extend into the Power Station curtilage by a further 35m and would impact on areas of high and exceptional conservation value as identified in the *White Bay Station Conservation Management Plan*.

Whilst the Department acknowledges that impacts to the Coal Yards and the view corridor could be addressed through the future design of the station (not part of this project), it considers that the Proponent has not adequately justified or assessed the above impacts, particularly in relation to construction impacts. Accordingly, the Department has recommended a condition restricting construction activities to areas of little or neutral heritage significance, as defined by the White Bay Power Station Conservation Management Plan.

In response to the matters raised by Sydney Ports, the Proponent identified that although part of the Northern Canal is within the worksite area, no excavation is proposed within that part of the worksite and that significant

elements within the worksite would be recorded and protected before construction works commence. The Proponent noted that the remains of the Glebe Island Bridge Approach were outside the White Bay worksite area, and that the Glebe Island Silos would be assessed for mitigation requirements to ensure that the structural integrity of the silos is maintained. The Proponent also noted that works to the Great Sydney Dyke were limited to the south side of Victoria Road, and therefore much of the significant exposed face of the dyke, on the northern side of Victoria Road, would be unaffected.

Based on this response, the Department considers that construction operations at White Bay and the Rozelle maintenance and stabling depot should be controlled in areas of heritage significance. Accordingly, the Department has recommended conditions requiring construction of the project to avoid direct impacts to all listed heritage items within the vicinity of White Bay station and construction zone and the Rozelle Stabling and Maintenance Depot, unless approval is obtained from the Director General. Should any impacts to these items be required, then a heritage assessment would need to be undertaken in consultation with the Heritage Council of NSW and be generally consistent with Heritage Council Guidelines and any conservation management plans applying to the item(s).

6.13 Land Use and Urban Design Issues

Issues

The Rozelle stabling and maintenance depot and White Bay sites are visually degraded areas situated within existing industrial and port areas, with frontages to major transport routes, residential areas and open space (Easton Park). The design of the depot has been guided by a range of design principles including the provision of high quality buildings, maximising views from Easton Park and Lilyfield Road to Rozelle Bay and the CBD. The Depot also incorporates significant landscaping and public domain works that link open spaces of Annandale, Rozelle and Lilyfield, including the provision of a pedestrian link between Lilyfield and Annandale over the Depot and the City West Link Road. These works will improve the visual and general amenity of the area.

Construction will occur over a five year period at the Rozelle stabling and maintenance depot and at White Bay, due to it being the primary construction site. However, the land use and visual impacts of construction at these locations will be limited due to their industrial location and topographical characteristics.

Submissions

Sydney Ports identified the need for the Environmental Assessment to consider the *Customs Act 1901* and the *Maritime Transport and Offshore Facility Act 2003*, and the maintenance of port operations to ensure legislative requirements are met, particularly during construction, and the need to reduce light spill to minimise impacts on shipping.

Leichhardt Council raised concerns regarding the ramifications for White Bay and its future role in the Bays Precinct in the absence of rigorous Master planning and community consultation.

Public submissions raised concern over future planning for the Bays Precinct and integration with future uses at the depot site, the lack of a master plan and impacts on the extension of the light rail to the proposed White Bay Overseas Passenger Terminal and residential developments in East Balmain. Concern was also expressed about the existing poor visual quality of the sites and further visual degradation resulting from site clearance and the depot.

Consideration

The Department recognises the need for the project to be constructed and operated in accordance with all relevant legislation, and this approval does not extinguish these legislative requirements. The Department also notes that the Proponent has committed to ongoing consultation with Sydney Ports regarding port security and operations and those construction activities will be managed through the implementation of the recommended construction management systems and plans. This includes the provision of construction lighting that complies with *AS4284-1997 Control of the Obtrusive Effects of Outdoor Lighting* in order to reduce shipping hazards. Amenity impacts during construction will also be managed through these systems, with measures maintained through the implementation of a comprehensive compliance tracking program, including a program of environmental auditing.

With regard to the appropriateness of the Rozelle stabling and maintenance depot at this location, the Department notes the land currently contains industrial uses, and port and transport related infrastructure, related to its previous use as a freight rail stabling facility and that it has a ports and employment zoning, and that the proposal is generally consistent with these. In relation to White Bay and its future role in the Bays Precinct, it is noted that White Bay Station does not form part of the project and the Department is satisfied that the safeguarded station location will be considered in the ongoing master planning of the area.

The Department considers that the proposed Depot and ancillary facilities will enhance the visual amenity of the area. In particular, the Depot will incorporate high quality and sustainable buildings that address and respond to the surrounding urban form and which retain and provide view lines to the harbour and the city. The Depot will also incorporate a significant landscaping and public domain component, including enhancements and additional open space and improved connectivity to surrounding areas, including the provision of a pedestrian and cycle bridge over the Depot, linking Lilyfield Road to Annandale light rail station.

Notwithstanding these initiatives, the Department notes the contextual nature of the design and has recommended a comprehensive design and review process.

6.14 Operational Transport Impacts

Issues

Operational transport issues for the Rozelle maintenance and stabling depot generally relate to integration with the transport network, and vehicle access and parking issues surrounding the depot.

For employees, the depot is accessible from the Inner West Busway and pedestrian and cyclist access at the depot would be improved through new and upgraded shared links, including a public pedestrian/cyclist bridge across the depot to the light rail network.

Existing road access to the depot is provided via Gordon Street, connecting to Victoria Road and Lilyfield Road. The depot would incorporate several existing traffic generating developments on the south side of Lilyfield Road. Trips generated by these sites would no longer be impacting on the local road network and a net reduction in trips on the local network, particularly Lilyfield Road is anticipated.

Future heavy vehicular access into the site would be facilitated by a proposed left in/left out from the City West Link Road, and possible creation of a new four leg intersection at the existing City West Link Road / the Crescent intersection. Secondary access to the Depot would be via Gordon Street.

The operation of the depot is not expected to generate significant number of traffic movements or impact on the operation of the existing road network. An estimated total of 22 staff car movements per shift with less than 10 delivery movements per day are unlikely to have a significant impact on the road network. Parking will be provided on site.

As White Bay will not be operational as part of the project, no impacts are expected. However, the project has been designed to ensure that it can be integrated with the surrounding network when it is developed.

Submissions

Leichhardt Council considers that the Proponent should provide an operational plan and meet the cost of any load limits, resident parking scheme or other traffic management scheme required in the vicinity of the Rozelle Depot. Lilyfield Road streetscape and traffic parking design should be submitted to Council for approval and all works should be undertaken at no cost to Council. Council requires further information regarding the access from City West Link and how separation of bicycle and cars will be achieved.

The RTA identified that the location where the Lilyfield Pedestrian Link crosses the City West Link Road is not acceptable taking into account future road proposals under consideration by the RTA in this area. Whilst discussions have taken place between the RTA and the Proponent, a resolution of the issue has not been reached. The RTA suggests a condition of approval requiring further consultation with regards to this issue.

Consideration

The Department considers that the operation of the Rozelle stabling and maintenance depot will have minimal impact on the surrounding local road environment and that the depot can be designed and managed such that the local environment is not negatively affected. Accordingly, the Department has recommended conditions requiring that heavy vehicle access to and from the Rozelle stabling and maintenance depot be restricted, to the greatest extent practicable, to the City West Link Road and the Crescent; that parking provision and access requirements to and within the depot be consistent with *Guide to Traffic Generating Developments* (RTA, 2002); and that cycle and pedestrian facilities along Lilyfield Road and over the Rozelle stabling and maintenance depot be designed in consultation with Leichhardt Council and be consistent with *Austroads Guide To Traffic Engineering Practice - Part 14 Bicycles*.

The Department notes that the Proponent has undertaken considerable consultation with the RTA to inform the design and construction activities associated with the depot, including reservation of land to account for future road proposals in this area. It is understood that the location of the Lilyfield Pedestrian Link would not preclude future RTA road proposals, although minor adjustments may be necessary. To ensure the RTA's concerns are addressed, the Department has recommended that it consult with the RTA to identify and address any potential conflicts, where reasonable and feasible, between the design of the project and the design of future motorway projects. The relevant components of the final design of access to the Rozelle stabling and maintenance facility from the City West Link Road and the Crescent are also required to be endorsed by the RTA.

The Department is satisfied that the revised proposal, the Statement of Commitments, and the Department's recommended conditions of approval, provide the necessary measures for mitigating and managing any potential operation transport impacts at the Rozelle Depot. The ongoing performance of the project will be addressed through the recommended operational performance audit to be carried out at 12 months and five years after completion of construction.

Potential transport impacts related to the operation of the future White Bay Station will be addressed as part of a separate approval process when the White Bay area is developed and the Metro station is considered to be required.

6.15 Operational Noise and Vibration Impacts

Issues

The operation of the Rozelle stabling and maintenance depot on a 24-hour basis has the potential to affect nearby residential receivers from maintenance activities carried out on the facility and the periodic movement of trains to and from the facility.

Train stabling and maintenance facilities have been assessed in accordance with the *NSW Industrial Noise Policy*. The assessment has identified that the majority of the noise intensive maintenance works would most likely be carried out within dedicated on-site maintenance buildings during daytime and evening periods. Accordingly, the predicted noise levels for stabling and maintenance activities are likely to comply with the $L_{Aeq}(15min)$ intrusive noise goals and the $L_{Aeq}(period)$ amenity noise goals at all residential receiver locations.

For noise emissions from the air dryers on trains and brake testing during night-time periods, the predicted noise levels are predicted to comply with the sleep disturbance screening criteria at all residential receiver locations, and are predicted to be lower than the existing ambient $L_{A1}(15\text{ minute})$ noise levels, hence the potential noise impact of these activities is regarded to be minimal. However, if future brake release noise levels should be significantly higher than predicted there may be a requirement for some form of noise mitigation in order to minimise potential sleep disturbance at the nearest residences during the night-time period, including acoustic silencers.

Noise levels from the operation of metro trains between the tunnel portals and the depot are predicted to comply with the appropriate noise design goals at all locations surrounding the Rozelle stabling and maintenance depot due to reduced train speeds of 40 kilometres/hour. However, noise impacts could be higher at the tunnel portals due to reduced curve radii and these may require at-source mitigation.

Submissions

A number of public submissions raised concerns about the operation of the Rozelle stabling and maintenance facility, particularly from track and rolling stock maintenance, cleaning of carriages during the night and early morning start up of trains and the need for the project to comply with noise goals.

DECCW recommended a detailed design assessment of the Rozelle stabling and maintenance facility in accordance with the *NSW Industrial Noise Policy*.

Leichhardt Council considers that there will be breaches of the noise criteria based on Council's independent monitoring of ambient background levels and assessment and that there should be no loss of acoustic amenity for residents.

Consideration

The Proponent has undertaken a noise assessment of the operation of the Rozelle stabling and maintenance facility in accordance with the *NSW Industrial Noise Policy*. The assessment predicted that noise from stabling and maintenance activities during the day, evening and night periods will comply with the operational noise criteria and amenity noise goals at all residential receivers. The noise assessment predicted compliance with the sleep disturbance noise goals at all residential receivers from train air dryers noise and train test braking noise in the stabling area and inside the maintenance facility.

It is also noted that the assessment of airborne noise from the movement of trains on the surface track from the tunnel portal to the stabling area has predicted compliance with the noise goals for day and night and maximum noise ($L_{A\max}$) at all residential receivers.

Whilst the Department notes Leichhardt Council's concern with the assessment, it is satisfied with the noise assessment of the operation of the Rozelle stabling facility, and that the facility can be operated to meet the appropriate noise goals. Notwithstanding, to ensure that the facility does not significantly impact on the adjacent residential areas, the Department has recommended conditions of approval which requires the Proponent to design and operate the facility in accordance with the *NSW Industrial Noise Policy* and to notify the Department and DECCW of the project specific noise levels prior to construction commencing.

Conditions have also been recommended to ensure that surface rail operations outside of the Rozelle stabling and maintenance depot do not exceed the noise trigger levels in the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECCW / DoP, 2007) and that the final design of the project be subject to independent review to ensure compliance with noise goals.

OTHER ISSUES

6.16 Spoil Management

Issues

Due to extensive excavation and tunnelling, the expected volume of spoil generated by this project is approximately 1.27 million cubic metres. Table 8 outlines the volume and type of spoil expected to be produced at station and construction site. Of the 1.27 million cubic metres of spoil expected to be generated by construction of the project, about 0.5 million cubic metres would be extracted via the White Bay construction site.

The spoil would be temporarily stored at the White Bay site until transported off-site. The spoil storage area would have a capacity of approximately 10,000 cubic metres, and would be able to accommodate about a week of high productivity from two Tunnel Boring Machines. In addition, the site may be used as a spoil storage location for spoil from all other CBD sites, whilst spoil transit is arranged and scheduled.

Table 8 – Estimate Spoil Generation

Spoil management site	Total volume (m ³) (approximate) ¹	Source of spoil	Material and percentage
Central Station	214,900	Entrances, shafts, station cavern and mined tunnels	Sandstone and shale Rock 70% / Soft 30%
Town Hall Square Station	80,300	Entrances, shafts, station cavern and mined tunnels	Sandstone Rock 85% / Soft 15%
Martin Place Station	113,600	Shafts, station cavern and mined tunnels	Sandstone Rock 88% / Soft 12%
Barangaroo-Wynyard Station	148,000	Shafts, station cavern and mined tunnels, pedestrian link	Sandstone Rock 75% / Soft 25%
Pymont Station	90,900	Shafts, station cavern and mined tunnels	Sandstone ² Rock 95% / Soft 5%
Rozelle Station	139,000	Entrance shafts, station cavern and mined tunnels	Sandstone Rock 95% / Soft 5%
Total volume	786,700		
White Bay construction site	400,100	Future station box, running tunnels from White Bay to Rozelle, White Bay to Central and White Bay to depot	Sandstone Rock 77% Soft 23%
Rozelle stabling and maintenance facility	86,200	Surface material	
Total volume	486,300		

¹ Note that the volumes are likely to be reduced by as much as 10% with further design refinements.

² The Pymont Station shaft or cavern may have Yellow Block Sandstone present.

Given the small size of the station sites, only very limited spoil storage capacity would be provided, about 200 cubic metres, which would provide about half a day of storage based on predicted production rates. Once the station caverns are about 50 per cent complete (after about 18 months), there would be the opportunity to temporarily store spoil within the station caverns.

The main impacts at each station site as a result of spoil generation, would be related to the transportation of spoil. Associated with truck transport are potential impacts on neighbourhood amenity, access impacts and traffic congestion. Truck movements would occur at specific times to minimise impacts on the road network operation and on the community.

Over 80 per cent of the excavated material is likely to be Virgin Excavated Natural Material (VENM). However, some spoil generated from surface activities, less than one per cent of the total excavated volume, has the potential to be contaminated, especially excavation in the former industrial areas at White Bay and the former Rozelle Marshalling Yard.

There are two areas of shallow soil contamination within the White Bay construction site that pose a potential risk to human health and constraint on the proposed works. Shallow polycyclic aromatic hydrocarbon contamination present along the northern boundary of the CBD Metro construction site is currently capped by a bitumen hard stand, preventing access to the underlying fill material and contaminants contained within. The second area, comprising lead contamination is located to the south-west of the White Bay Station, where the state of groundcover in this location is unclear. However, where the concrete and bitumen ground cover remains intact, the risk is considered low and the Department notes Sydney Ports submission that identifies that lead contamination was removed and disposed of offsite approximately 10 years ago.

At the former Rozelle Marshalling Yard there are a number of contaminated areas. One area in particular poses a constraint to the CBD Metro project as it would affect the construction of some buildings associated with the stabling and maintenance depot. The other area, although heavily contaminated, would only affect the proposed rail tracks leading into the site.

About 150,000 cubic metres of fill would be required to raise the ground levels at the Rozelle stabling and maintenance facility site. Other than this requirement, there is limited opportunity for reuse of excavated spoil material within the rest of the project. However, there is potential to reuse the spoil off-site, for construction purposes, engineering fill, or to produce by-products such as sand and crushed rock. Both the sandstone rock and shale (about 95% of the expected volume of spoil) would have the potential for reuse as construction materials. An alternative would also be to reuse spoil for land management (reclamation), such as for the proposed Port Kembla Outer Harbour project, or for land rehabilitation.

If spoil is classified as waste (that is, its physical or chemical characteristics does not allow it to be classified as VENM), it must be disposed of at an appropriately licensed landfill. The areas of shallow soil contamination within the White Bay construction site and the former Rozelle Marshalling Yard may be able to be retained on site. However, if there is a need to remove the material off-site, then it may be sent to an appropriate landfill site.

There are a number of options available for the transportation of spoil from White Bay, including by truck, rail or barge. By truck, from City West Link Road, the spoil haulage route would depend on location for reuse or disposal. Road haulage would be generally be undertaken on arterial roads and the impacts on pedestrians, cyclists and communities would be minimal.

Removal of spoil from White Bay by rail would utilise the existing, but currently disused freight rail line from the site and would gain access to the broader rail network at Dulwich Hill. The rail infrastructure from White Bay to Dulwich Hill is generally in a suitable condition for transporting the spoil, and it is likely that sufficient locomotives, wagons and train paths would be available to transport the spoil. However, a number of potential environmental risks related to the train operations have been identified and would require further assessment. These include noise associated with loading and rail transport outside normal construction working hours.

The proximity of construction sites to Sydney Harbour foreshores at White Bay provides an opportunity for removal of spoil by barge. Consideration was also given to spoil removal by barge from Barangaroo, but the scale of works required for the limited amount of spoil to be removed meant this option was regarded as impractical. While there may be opportunity to use the waterways to transport spoil excavated from the tunnels and stations, this has potential costs associated with the provision of barges and new infrastructure for handling spoil at either end. Environmental impacts associated with the use of waterways would relate primarily to loading noise at White Bay and potential impacts on marine ecology from spills or accidents.

Further assessment of spoil transport alternatives would need to be undertaken to determine opportunities for removal of spoil from White Bay by rail or barge. Both rail and barge would require investment in infrastructure for loading, transport and unloading.

Submissions

Submissions were received raising concerns in relation to the handling and transportation of spoil from station sites and White Bay, including the need to use non-road based options, and the disposal and reuse of spoil. In particular, the Star City Casino expressed concern regarding the effect that significant spoil quantities at the Pyrmont project site, and associated truck movements, may have on the construction and operation of the new Star City Hotel.

DECCW raised issues regarding the management of potentially contaminated spoil and required that the extent of the lead contamination at White Bay and other sites be delineated and remediated, if required. DECCW also recommended the preparation and implement Remediation Action Plans with Site Auditor approval and that waste classification assessments are undertaken for the classification of spoil.

Sydney Ports raised specific concerns regarding the White Bay construction site, including dust impacts on port tenants and impacts on port operations from spoil storage and handling activities. In relation to alternative transportation options, Sydney Ports queried the availability of rail windows and restrictions on rail movements in peak hours and the effects on train capacity, and that the Environmental Assessment did not adequately address barge related impacts, including water quality and operational impacts on Sydney Harbour. NSW Maritime raised concerns in relation to navigation impacts should barging be considered as a viable option.

RailCorp identified that spoil transport by rail would require changes and improvements to rail infrastructure. and operating parameters, thus potentially impacting on current RailCorp operations.

The Barangaroo Delivery Authority raised issues regarding spoil management and in particular the cumulative impacts associated with the concurrent development of the Barangaroo site, including construction traffic, remediation and public access issues. The Authority also raised the need to further review the option to barge spoil from the Barangaroo-Wynyard construction site.

Leichhardt Council raised issues particularly relating to the transportation of spoil on Council managed roads or via Darling St / Balmain Road, and sought a commitment that it be provided an opportunity to utilise excavated Yellow Block Sandstone for local projects, in recognition of its connection historically to the locality and in reducing transport-related energy consumption.

Consideration

The Department considers that the Proponent has undertaken an appropriate assessment of spoil handling issues and notes that the Proponent has committed to the implementation of a Spoil Management Sub Plan to address the potential impacts from spoil generation and transportation, including methods for onsite spoil handling, testing and transportation. This includes stockpiling and handling spoil to minimise the potential for generation of dust and contaminated run-off, and the transportation requirements from the construction sites to the reuse or disposal sites via road, rail or barge. The Plan also focuses on opportunities for beneficial reuse of spoil in preference to disposal. The Proponent has additionally committed to a target of 100 percent reuse or recycling (on or off-site) of virgin excavated natural material for the project. The Department is satisfied with these commitments, which will be incorporated into the recommended construction environmental management system, which identifies the need to develop a Construction and Demolition Spoil and Waste Management Plan.

The Department notes that a decision as to the means by which spoil would be transported would depend on the timing of the availability of sites, costs associated with infrastructure and the intent of the construction contractor and that the form of transportation would be determined through the procurement and delivery phases of the project. Accordingly, the Department is satisfied that the assessment regarding transportation of spoil is adequate and has recommended a condition requiring reasonable and feasible consideration of non road transport, including the requirement for consultation with RailCorp and Sydney Ports as appropriate, and subject to additional assessment and determination under the Act. If the option of barging spoil is utilised, consultation with NSW Maritime will also be required to ensure ongoing maritime safety and navigational requirements.

The Department notes that the Proponent has committed to implement a strategy for managing potentially contaminated areas. However, the Department considers that a more structured management approach is required and has recommended a suite of conditions in relation to the management of contaminated areas, including requiring the Proponent, in the event of discovery of previously unidentified area(s) of potentially contaminated material, to cease work until the extent of contamination has been assessed and if necessary, a Remedial Action Plan has been prepared and endorsed by an accredited Site Auditor.

The Department considers that the reuse options for the Yellow Block Sandstone should be undertaken in consultation with local Councils in the first instance, to minimise transportation impacts on the wider community. A condition requiring an Excavation Works Method Statement to be prepared for extracting, storing and reusing any Yellow Block has been recommended. Management and storage would be coordinated with the NSW

Department of Commerce, and in consultation with Sydney of City and Leichhardt Councils, to identify potential reuse options for the Sandstone.

The Department is also satisfied with the Proponent's commitment to establish a Barangaroo Construction Management Committee, including the Barangaroo Delivery Authority, to coordinate construction activities at Barangaroo and manage cumulative impacts including spoil management and contamination.

The Department is of the opinion that the above measures would contribute to the safe handling and management of spoil produced as a result of the project and thus reduce the likelihood of adverse environmental impacts.

6.17 Water Management

Issues

Water would be required during construction of the project for excavation (particularly at White Bay and at each of the station sites), tunnelling, for the batching plant at White Bay and for dust suppression and wheel washing at the construction sites, where required. During the most intense construction period, over 1,000 cubic metres of water would be used each day. Consequently, the construction of the project would generate significant quantities of wastewater, some of which may be contaminated and require treatment prior to disposal or reuse. Site run-off may also be contaminated with sediment and possibly with chemicals such as fuels, oils and lubricants.

The following potential impacts and resultant water contamination would need to be managed during construction:

- soil erosion and excavated materials draining from construction sites to local stormwater systems and/or waterways;
- exposure of acid sulfate soils at White Bay, Barangaroo-Wynyard, and the Rozelle stabling and maintenance depot site, with potential to enter the waterways;
- groundwater inflows during tunnel construction and the excavation of station caverns; and
- groundwater and surface water inflows unlikely to be of a quality suitable for immediate reuse on site or for disposal to the stormwater system.

To manage these impacts the Proponent has committed to preparing a Construction Water Management Plan to be developed in accordance with relevant water quality guidelines and legislative requirements. Environmental Construction Method Statements would also be prepared for each construction site and would document all water management measures to be implemented.

A water treatment plant would be installed at the White Bay construction site. All wastewater generated during construction would be pumped to a holding tank within the construction site and treated to a level necessary to achieve discharge goals. Once treated the water would be transferred to a holding area for reuse or disposal.

In relation to operation, the completed rail tunnels would be fully tanked and lined and are expected to have negligible water ingress during operation. Permanent sumps would be provided in the track slab, at low points within the tunnels and other areas to collect water ingress and any occasional spillage from fire hydrants. This water would be pumped to each station or removed by a pump train before being treated and discharged to the stormwater system. Wastewater from the station plant rooms, platforms and concourses would be collected separately and pumped to the municipal sewer via an oil separator plant.

During operation, the stations and the Rozelle stabling and maintenance depot would require water, the majority of which would be used and recycled for train washing. Train wash water would not be suitable for immediate reuse or direct disposal to the sewer system and, therefore, a treatment plant would be installed to treat the water to a quality suitable for reuse or discharge. An Operation Water Management Plan would also be developed and implemented to address the management of wash water and deluge water, and to ensure water discharged to the waterways from the project meets relevant water quality guidelines.

Submissions

DECCW considers that the Construction Water Management Plan should quantify and confirm the adequacy of treatment plants and indicate whether any treated water is intended to be disposed of by the sewer or by

stormwater. Any discharges to the environment are required to comply with s120 of the *Protection of the Environment Operations Act 1997*, which prohibits the pollution of waters, unless otherwise provided in an Environment Protection Licence. DECCW also noted that the Environmental Management System for the operation of the Metro should determine the requirements for ongoing capture, treatment and discharge of surface water ingress into the stations and tunnels.

Leichhardt Council considers that the Environmental Assessment has not addressed flooding adequately. Preliminary results from a Council study have identified that the Rozelle maintenance and stabling depot is substantially flood prone and that the proposed works should not cause or exacerbate existing flooding problems, or limit Council's capacity to address flooding problems upstream or adjacent to the site. It is also considered more can be done to utilise stormwater runoff in the design and construction of the Depot.

RailCorp considers that the design of tunnel portals should place them at such a level, or include protection of entrances, that should take into account major flood events or king tide inundations.

Consideration

The Proponent has committed to ensure that water is managed to maximise its beneficial use and reuse, and that the risk of flooding is minimised. A Construction Water Management Plan would be prepared to ensure that potable water demand during construction is minimised, and that there is no impact on the water quality of surrounding surface or underground watercourses. The Proponent has incorporated comments from DECCW to update the requirements of the Plan.

Construction of the tunnel and stations would be undertaken with consideration to minimise water ingress so as to minimise the volume of water requiring treatment and / or disposal. The temporary water treatment plants would be sized and operated to accommodate the water in-flow into the tunnels and caverns. Where necessary water quantities would be estimated. In addition to these measures, the Department has recommended conditions of approval to ensure that all operational stormwater and wastewater systems are designed, constructed, operated and maintained to meet the requirements of relevant authorities as applicable, and that operational management of groundwater and surface water ingress into stations and tunnels shall be undertaken in consultation with DECCW, and in accordance with ANZECC water quality guidelines.

An Operational Water Management Plan would also be developed and implemented to address the management of wash water and deluge water. At the Rozelle stabling and maintenance depot, the following measures have been committed to:

- the depot will capture rainwater to supply the depot's non-potable requirements;
- the depot will aim to recycle 95 percent of train wash water; and
- the depot will have water-sensitive urban design features, including permeable paving and vegetated swales.

The Department is of the opinion that such measures would contribute to ensuring that there is no impact on water quality of the receiving environment. The Department considers that the risk of pollution of waterways during construction can effectively be managed, and to further ensure this outcome has required compliance with section 120 of the *Protection of the Environment Operations Act 1997* which prohibits the pollution of waters. The Department has also recommended conditions of approval to protect the receiving physical and human environment, including requirements to mitigate the potential impacts of disturbance to acid sulfate soils and contaminated soils. These include the management of acid sulfate soils in accordance with the *Acid Sulfate Soil Manual*, and the installation of erosion and sedimentation control measures consistent with the *Managing Urban Stormwater: Soils and Construction* guidelines.

The Department notes the concerns regarding the potential for flooding at Rozelle maintenance and stabling depot, and has recommended a condition of approval that requires the Proponent to ensure that the detailed design of the Depot does not significantly increase flooding characteristics both within and outside the site. This includes limiting increases in inundation levels to a maximum of 50mm, and 1 hour, in a 1 in 100 year ARI rainfall event and that works shall be designed with consideration of the *NSW Floodplain Development Manual*, 2005. The Department also notes that the project will be designed to address major flood events.

6.18 Hydrogeological Impacts

Issues

The majority of the project corridor is underlain by Ashfield Shale of the Wianamatta Group and Hawkesbury (Sydney) Sandstone. The rock is overlain by limited thicknesses of residual soil, with some areas of alluvium near the water crossings and man-made fill. These conditions are favourable for the excavation of tunnels using conventional techniques. At White Bay, areas of man-made fill underlay the White Bay construction site and the Rozelle stabling and maintenance depot.

The quality of groundwater in the Sydney basin is generally high in iron (ranging from 40-110 milligrams per litre), may contain manganese and other contaminants, with relatively high total dissolved salts and low pH. Investigations undertaken as part of the Barangaroo development identified groundwater and elevated hydrocarbons and other contaminants. At the former Rozelle stabling and maintenance depot, hydrocarbons may be present in groundwater due to previous industrial activity at the site.

A number of components of the project have the potential to cause ground settlement as a result of the process of tunnel excavation and associated dewatering of adjacent aquifers, which can result in damage to land and property. The construction of fully tanked tunnels would also limit groundwater drawdown to negligible levels. It is anticipated that the majority of the settlement induced along the alignment due to tunnel construction would be a result of stress redistribution within the rock mass, which would be small and unlikely to cause major distress to existing nearby surfaces and underground structures along the route.

Submissions

A small number of submissions were received suggesting that testing of rock mass and detailed geotechnical investigation is required, including monitoring of groundwater impacts.

DECCW consider that further investigation into the groundwater quality at White Bay will be required should dewatering works be required to construct the White Bay Station box. The extent of the lead contamination in the soil at White Bay should also be delineated prior to the commencement of construction and remediated if required.

At the former Rozelle Marshalling Yards, a limited groundwater investigation found total petroleum hydrocarbons in one groundwater monitoring bore. In all areas requiring dewatering, the groundwater quality and any potential impacts of dewatering on surrounding contaminated sites should be assessed to determine the management and treatment requirements, including the potential for reuse of groundwater on the site during construction.

The former Millers Point Gasworks site is located 300 metres north of the proposed Barangaroo-Wynyard Station and has not yet been remediated. There is the potential for dewatering activities occurring at the station to draw contaminated groundwater from the gasworks towards the construction site. Further assessment of all the available information from the Millers Point Gasworks in relation to impacts of dewatering activities is required prior to commencement of construction.

Consideration

The project would be designed and constructed in a manner that would minimise the damage to land and property as a result of ground movement. While ground settlement would be small and unlikely to cause major distress to existing nearby surfaces and underground structures along the route, appropriate design requirements and safeguards would be required.

The Proponent has committed to the development of a Geotechnical and Settlement Management Strategy to ensure that geotechnical conditions are modelled and the likely effects of any groundwater drawdown is considered as part of the detailed design development process. This strategy would include a process for ensuring that full details of existing and approved excavations, basements, tunnels and other sub-surface structures are identified. Groundwater levels and ground settlement would also be monitored.

Notwithstanding, the Department considers that the risk of settlement must be appropriately analysed and as such has recommended a number of conditions of approval including the requirement for geotechnical modelling of representative geological and groundwater conditions, modelling of property and infrastructure risk from

damage to determine appropriate settlement criteria to prevent damage, identification of mitigation measures as appropriate, and monitoring requirements. These conditions are focused at structures that have a relatively high risk of impact including buildings adjoining work sites and heritage items.

The Department has also recommended a suite of conditions to define, manage and compensate damage and property claims should such damage occur. This includes property inspections by qualified engineering and heritage specialists, and the establishment of an Independent Property Impact Assessment Panel responsible for independently verifying property inspections, the resolution of property damage disputes and the establishment of ongoing settlement monitoring requirements.

Where dewatering is required in potential or known contaminated sites the groundwater quality will be assessed prior to identifying potential discharge, reuse or treatment options. It is noted that Sydney Ports Corporation indicated that contaminated material at White Bay has been removed. The Construction Water Management Plan includes the requirement for assessment of groundwater quality to determine the requirement to treat contaminated groundwater prior to discharge or reuse.

The Department is of the opinion that such measures would contribute to ensuring minimal impact to groundwater resources, and management of any contaminated groundwater. To further ensure this outcome, the Proponent is required to design and construct the project in a manner that minimises impacts to groundwater hydrology, and undertake further assessment of the potential for the migration of contaminated groundwater as a result of construction and dewatering.

6.19 Air Quality Impacts

Issues

Air quality impacts during construction would be associated with dust from demolition of buildings, excavation works, and spoil handling and storage at construction sites and compounds and have the potential to affect the amenity for residences and businesses near construction sites. Other air pollutants would also be emitted by construction plant and machinery, and vehicles; however this would be minor within the context of the existing environment.

Once the CBD Metro is operational, the primary source of potential air quality impacts would include minor particulate matter generated by train operations and passenger movements. Brake dust would be produced at locations where trains would be required to slow down or stop. These emissions are anticipated to be minor as trains would use regenerative braking, reducing the potential for the generation of particulates, and station platforms would be partitioned by platform screen doors from the main tunnels.

The tunnel ventilation system, which would be used to prevent the build-up of hot air and in emergency situations, would generally not have adverse impacts on air quality. Tunnel air would be discharged through ventilation shafts designed in accordance with Australian Standards, to ensure the air is discharged dispersed and diluted, resulting in negligible impacts on local air quality.

Changes to local air quality near the Rozelle stabling and maintenance depot is expected to be negligible. The use of diesel-powered plant, equipment and vehicles would result in the release of exhaust emissions into the environment; however these would be minor within the context of the existing environment.

Submissions

The issue of air quality during construction was raised as a concern in public submissions. Submissions questioned the potential risk of health implications arising from dust, asbestos and other materials from demolition of structures and spoil handling during the construction period. Submissions noted that dust, if left unmitigated, would negatively impact on amenity of neighbouring residents and have businesses impacts.

Submissions identified that best practice controls should be implemented for each site to minimise impacts to receivers. Submissions also questioned the resultant health impacts which would arise during operation of the Rozelle maintenance and stabling facility.

The Barangaroo Delivery Authority identified that the Proponent would need to preserve amenity throughout the construction period and employ measures to minimise dust impacts. Sydney Ports also identified that dust

impacts from spoil and spoil locations may be an issue particularly as a number of tenants in White Bay are sensitive to such impacts.

Consideration

The Department is of the opinion that there is potential for air quality impacts during construction and considers that these can be managed through established management practices. It also notes that White Bay, which is a major source of spoil and dust generating activities is generally remote from residences and that a range of mitigation measures have been identified by the Proponent. This includes the preparation of a Construction Air Quality Management Plan. This Plan would include, but not be limited to, mitigation measures for vehicle and plant emissions, and a dust control strategy. The proposed Environmental Construction Method Statements would also include dust management plans for each work site to limit dust emissions.

Notwithstanding, the Department has recommended integrating these measures into the proposed construction environmental management systems and has included specific conditions in relation to air quality performance during construction, including that construction and demolition activities, including haulage of materials, shall be carried out in a manner that minimises or prevents the emission of dust.

The Department considers that the projects operational air quality impacts would be marginal as the project will comprise electrically driven units and have lower emissions per capita than other passenger and or/ freight locomotives in use within NSW, and that dust generation within tunnels and stations would be limited and that emissions would be consistent with ambient air quality.

In relation to the operation of the Rozelle stabling and maintenance depot, the Department considers that emissions would be minor within the context of the existing environment and notes that air quality data obtained from the Rozelle monitoring station (2000-2008) has identified that air quality goals are generally in compliance with key parameters, with exception of particulate matter, which marginally exceeds levels and that air quality at the site and surrounding areas is influenced by the proximity of the City West Link road.

7. CONCLUSIONS AND RECOMMENDATIONS

This report has defined the significant challenges facing Sydney's transport network and its ability to meet the demands of population and employment growth and travel demand. Key components of the transport network are at capacity, resulting in significant congestion and related social, environmental and economic costs. Within this context, the Department considers that the project has been adequately justified and considers that the project will meet the defined project objectives, particularly in enabling a broader metro network for Sydney, the provision of additional public transport capacity to and through the Sydney CBD and the wider metropolitan region, and transport and land use integration.

The Department also notes that the Government is currently preparing a transport blueprint for Sydney and it is expected that this blueprint will incorporate the project and a broader metro network. Notwithstanding, the Department acknowledges the project has been developed to address current and future transport needs and is broadly consistent with the *State Plan* and the *Metropolitan Strategy* and that a metro network, incorporating the project will provide broad social, economic and environmental benefits.

Following a detailed review of the Environmental Assessment, Submissions Report and the submissions received during the exhibition period for the project, the Department is satisfied that the impacts of the project can be appropriately mitigated or managed to acceptable levels and therefore recommends that the project be approved subject to the recommended conditions of approval. However, this does not imply that there are not environmental constraints to the project.

The report has identified that significant impacts relate to the construction of the project, particularly in relation to noise and vibration, construction traffic, access restrictions, and non-indigenous heritage impacts.

The Department also notes the importance and the critical nature of this project to the NSW economy and the broader Sydney community and has recommended construction approval framework to ensure that the project is constructed in a manner that protects the environment and community amenity, whilst ensuring that construction can proceed in an efficient manner.

The Proponent will be required to design, construct and operate the project so that it minimises impacts to and interference with third party property and infrastructure and is subject to a comprehensive range of noise and vibration standards, and monitoring regimes. These will ensure that community amenity is protected to the greatest extent practicable and that indirect impacts to adjoining properties are adequately mitigated.

The Department notes the constrained traffic environment adjoining the project and accordingly has recommended a range of conditions that will manage and minimise construction traffic impacts. These include establishing a Traffic and Transport Liaison Group to oversee and coordinate project specific and cumulative traffic and transport issues and impacts during construction and demolition works. As part of the detailed design process for the project, the Proponent is required to develop a Transport Integration Plan to inform the final design and integration of transport and access facilities and services.

The Department notes the construction of the project occurs within the vicinity of a number of heritage items, and within the heritage conservation areas at Pyrmont and Rozelle, and acknowledges the consideration the Proponent has undertaken to minimise impacts to heritage items during initial planning. The Department also acknowledges that the detailed design process will allow the Proponent to refine its assessment and consequent management measures in relation to non-indigenous heritage. Accordingly, the Department has recommended conditions of approval that require the Proponent to refine its heritage assessment and to ensure that detailed design is reflective of the concerns raised by the community.

The Department acknowledges that operation of the project will change the appearance of the CBD where new stations are located, and will add new built elements into Pyrmont and Rozelle's urban landscape. The Department has therefore outlined design principles and standards that the Proponent will be required to address during detailed design of the project and has recommended that the Proponent prepare an Urban Design and Landscape Report in consultation with Councils and for review by an Urban Design Review Panel.

The recommended conditions of approval for the project also provide for the mitigation and management of other impacts associated with the project during the detailed design, construction and operational phases of the project, including spoil, waste and contamination management, water, groundwater and hydrological impacts, and air quality. The Department believes that these requirements will provide for the implementation of best management practices during all phases of the project, and ensure that the construction and operational impacts of the project on the surrounding environment and the amenity of local residents are managed to acceptable levels.

The Department has concluded that these impacts are considered to be acceptable given the benefits that the total project would provide to the general public through an improved public transport network. Consequently, the Department recommends that the Minister for Planning approve the CBD Metro project, subject to the recommended conditions of approval.

APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX B – STATEMENT OF COMMITMENTS

APPENDIX C – SUBMISSIONS REPORT

APPENDIX D – ENVIRONMENTAL ASSESSMENT
