NSW GOVERNMENT | Planning & Environment

STATE SIGNIFICANT INFRASTRUCTURE ASSESSMENT:
CBD and South East Light Rail, Sydney (SSI 6042)

Secretary's Environmental Assessment Report
Section 115ZA of the
Environmental Planning and Assessment Act 1979

June 2014

ABBREVIATIONS

Applicant	Transport for New South Wales
CIV	Capital Investment Value
CSELR	CBD and South East Light Rail
Department	Department of Planning & Environment
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPI	Environmental Planning Instrument
ESD	Ecologically Sustainable Development
LRVs	Light Rail Vehicles
MD SEPP	*State Environmental Planning Policy (Major Development) 2005*
Minister	Minister for Planning
PEA	Preliminary Environmental Assessment
PFM	Planning Focus Meeting
PIR	Preferred Infrastructure Report
RtS	Response to Submissions
SEARs	Secretary's Environmental Assessment Requirements (formerly known as Director-General's Requirements)
Secretary	Secretary of the Department of Planning and Environment
SEPP	State Environmental Planning Policies
SRD SEPP	State and Regional Development SEPP
UNSW	University of New South Wales

Cover Photograph: the proposed light rail at George Street, Martin Place (Source: Transport for NSW).

Published June 2014
NSW Department of Planning & Environment
www.planning.nsw.gov.au

NSW Government
Department of Planning & Environment

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EXECUTIVE SUMMARY

The NSW Government has identified the CBD and South East Light Rail (CSLER) as a key priority transport infrastructure project that would contribute to availability and capacity of Sydney's transport network, catering for a growing city; supporting urban renewal and improving global competitiveness.

The Department considers that the provision of an efficient and state of the art mass transit system presents a once in a generation opportunity to transform Sydney's CBD and South Eastern Suburbs, and would deliver a range of public benefits including:

- a $1.6 billion direct investment into the economy;
- the creation of over 10,000 (direct and indirect) jobs during construction and operation of the proposal;
- improved access to jobs, residences, educational, health, entertainment and sporting facilities;
- greater public transport choice and increased customer satisfaction including greater integration with existing transport modes; and
- reduced traffic congestion and subsequent productivity, sustainability and liveability benefits.

The Department acknowledges that Sydney's public transport capacity will need to increase along with the rate of population growth, which is expected to increase by 1.6 million, to approximately 5.9 million people by 2031. This includes an additional 86,000 residents and 147,000 workers within the CBD by 2031, as well as 37,000 new residents and 17,000 new workers in inner South East Sydney. The Inner South East suburbs also incorporate a number of key destinations, which generate high levels of public transport demand, including UNSW, the Moore Park sports stadiums, entertainment complex, the Royal Randwick Racecourse and the Prince of Wales and Sydney Children's hospitals. The proposal will assist in servicing the demand generated by these additional workers, residents and key destinations.

Transport modelling shows that if no public transport improvements are made then the increased demand for travel cannot be accommodated on existing networks without generating more congestion, overcrowding and longer travel times along key corridors. For Sydney to maintain its status as a strong global city, it must be supported by efficient public transport to maximise productivity, economic investment, employment growth and activity in centres. Investment in public transport must also support urban renewal that will improve the liveability of Sydney's local neighbourhoods.

Transport for NSW (the Applicant) proposes to construct and operate a new light rail service in Sydney. The service is to include 12 kilometres of new light rail track from Circular Quay to Central, Kingsford and Randwick via Surry Hills and Moore Park; 20 new light rail stops, a pedestrian zone on George Street (between Bathurst and Hunter Streets), approximately 12 substations to power the light rail vehicles (LRVs), a LRV stabling facility at Randwick and a LRV maintenance facility at Lilyfield. The proposal would result in a new high frequency light rail service departing every two to three minutes during peak periods within the CBD; with services operating every five to six minutes between Moore Park and the Randwick and Kingsford branches.

The CSELR is 'State Significant Infrastructure' pursuant to 115U(2) of the *Environmental Planning and Assessment Act 1979* and has also been declared 'Critical' State Significant Infrastructure as the proposal has been deemed essential for the State. The Minister for Planning is the approval authority.

The Applicant's Environmental Impact Statement was publicly exhibited for an extended period between 14 November and 31 December 2013. The Department received a total of 485 submissions (plus two late submissions) during the exhibition period including 13 submissions from public authorities. All submissions from public authorities including the City of Sydney, Randwick and Leichhardt Councils indicated support for the proposal subject to specific recommendations and or issues to be addressed. Key concerns include the location of proposed stops, urban design, the loss of parking and loss of public open space, noise, traffic, safety, visual and heritage impacts. Of the 472 public submissions received, 230 (49%) objected to the proposal, 81 (17%) supported the proposal and 161 (34%) did not object but raised concerns.

The Applicant provided a response to the issues raised in submissions in the form of a Response to Submissions report, combined with a Preferred Infrastructure Report on 6 March 2014. The Preferred Infrastructure Report proposed 13 amendments to the proposal, including:

- reduction of the wire-free zone within the CBD to between Wynyard and Town Hall stops;

- reconfiguration and revised design for stops at Chinatown, Central, Surry Hills, UNSW High Street, UNSW Anzac Parade and the High Cross Park Interchange;
- relocation of stops at Moore Park, Wansey Road (to Alison Road) and UNSW High Street;
- straightening of the Moore Park Tunnel alignment;
- replacement car parking for the Langton Centre, Surry Hills;
- construction of a pedestrian bridge across Anzac Parade connecting the Moore Park stop and Sydney Boys and Sydney Girls High School;
- reconfiguration of the Alison Road light rail alignment, the Alison Road and Darley Road intersection, and Wansey Road;
- refinement of a number of proposed substation locations; and
- new construction compounds at Bond Street, Barrack Street and the NIDA car park.

The Department received further submissions on the Response to Submissions and Preferred Infrastructure Report from the community and stakeholders including the City of Sydney, Randwick City Council, Leichhardt Council, The University of New South Wales and the Australian Turf Club (for Randwick Racecourse) which have also been taken into consideration in the Department's assessment. Based on the submissions from the community and public authorities, the key assessment issues for the proposal are:

- Route selection and a preference for different route options. In particular, the proposed route through Surry Hills and alignment along Wansey Road;
- Public safety along the entire route;
- Traffic, transport, parking and access issues including increased traffic congestion on the surrounding road network through construction and operation, loss of parking and access; and
- Noise impacts from its construction and operation.

Consideration

With regard to route selection, the Department is satisfied that a suitable process has been undertaken to identify a preferred alignment. The Applicant has explored a number of alternatives and it was determined that these alternatives do not meet operational, design and engineering requirements. The Department is mindful that the preferred alignment would result in the demolition of the Olivia Gardens Apartment Complex with owners subsequently compensated under *Just Terms* legislation. On balance, the Department considers the preferred alignment is optimal and the demolition of the complex justified when balanced against the overall benefits of the proposal for the wider community and Sydney as a whole.

The Department considers the proposal has a strong strategic planning framework supporting its development. The *NSW Long Term Master Plan* incorporates a suite of integrated modal delivery plans including *Sydney's Light Rail Future*. These plans identified light rail as the preferred solution to increase the capacity and improve the reliability of the inner Sydney and CBD transport network. The Department notes that the project is also consistent with key features of the *Sydney City Centre Access Strategy* (2012), which seeks to provide an integrated transport network including light rail on George Street between Central and Circular Quay, and the transformation of approximately 40 per cent of George Street in the CBD to a pedestrian zone. Further, the CSELR is consistent with and builds on the strategic land use and transport objectives for local government plans, including *Sustainable Sydney 2030: The Vision* (City of Sydney, 2008); *Randwick City Plan* (2006) and *Kingsford Town Centre Strategy* (2013).

The Department's environmental impact assessment of the proposal has been broad ranging and comprehensive. Public safety has been identified by the community as a key area of concern. It should be noted at the outset that Public safety is a priority of the NSW Government. The Applicant has recognised this and has provided an assessment of the safety for all road users including pedestrians, passengers, operators and the general public during both construction and operation phases. The Department understands the level of community concern around this issue, but considers that the CSELR would improve road safety along the route during operations, particularly within the pedestrian zone on George Street, and around the Moore Park Stop, Royal Randwick Racecourse Stop and UNSW Anzac Parade Stop. Further, the CSELR would result in improved road safety for all road users due to reduced traffic congestion.

The Department's consideration of traffic, transport, parking and access issues was supported by independent expert advice. The Department considers that the CSELR would ultimately have a net environmental benefit in relation to reduced traffic congestion, particularly in the CBD. It is acknowledged that the proposal would impact on the efficiency of the surrounding road network and the Department considers that these impacts can be mitigated through progressive upgrades to affected areas over the

course of the proposal. While the Department acknowledges that construction would be disruptive, it is considered that disruptions and other impacts would be minimised through the implementation of mitigation measures and that any inconvenience will be temporary and outweighed by the long-term traffic and transport benefits of the proposal.

The Department has identified that in the short term there will be approximately 780 on-street parking spaces lost due to the construction of the CSELR. However, there are measures available that will ensure in the long term that replacement parking is maximised. The Department has recommended a condition requiring a parking strategy be developed in consultation with Council which looks to increase parking in surrounding streets. In addition, the Department's key recommendations include a requirement for the Applicant to provide replacement parking in specific locations, including in the vicinity of the Kingsford interchange. This should ensure that once operational, there would be an appropriate level of replacement parking supporting businesses and the community.

Noise and vibration issues associated with the construction and operation of the proposal is another key issue of concern for the community. The Department engaged an independent noise and vibration expert to assist in its assessment of these matters. The Department's assessment concluded that there would be project specific noise levels that without mitigation would result in unacceptable amenity impacts.

Subsequently, the Department has recommended a comprehensive noise management framework to ensure the proposal meets acceptable noise limits during both construction and operational phases. This includes a requirement for the implementation of "at-receiver" mitigation in the form of architectural treatments at two locations along the route (Surry Hills and adjacent to the Randwick stabling facility), along with the preparation and implementation a comprehensive construction noise management framework. In addition, the Department has recommended development of an Operational Noise and Vibration Management Plan to assist in the ongoing management of noise and vibration during operation. The Department is confident that the adoption of these measures strikes the right balance between the need to deliver the project in timely manner and the need to protect the amenity of residents and sensitive receivers to the greatest extent possible.

Furthermore, to provide additional business and community input into the detailed design phase of the proposal, the Department supports the adoption of a governance structure to oversee delivery of the project. The structure includes the establishment of four reference groups that will provide an opportunity for stakeholders to participate in further design refinements. The reference groups provided for in the recommended conditions include the Utilities Reference Group; Business Reference Group; Urban Domain Reference Group; and Community Reference Group.

Overall, the Department has carefully considered all key issues relevant to the construction and operation of the project against the significant social and economic benefits of the project and its critical role in achieving the State Government's objective to maximise public transport and relieve congestion in Sydney's CBD.

The Department considers the proposal to be a generational project that will deliver significant benefits across Sydney, including efficiently servicing major trip generators such as the University of NSW, Randwick Racecourse, Randwick Health Precinct and the Moore Park Entertainment Precinct with a state of the art piece of public transport infrastructure. The Department has concluded that on balance, the proposal's benefits outweigh its potential impacts and is therefore in the public interest. Consequently the Department considers the CSELR should be approved subject to the recommended conditions of approval.

1. BACKGROUND

Transport for New South Wales (the Applicant) seeks approval for the construction and operation of the CBD and South East Light Rail (CSELR). The project consists of approximately 12 kilometres of new light rail track and 20 light rail stops for Sydney, located between Circular Quay and Moore Park, then separately to Kingsford and Randwick, with a stabling facility at Randwick and a maintenance depot at Lilyfield.

The CSELR would traverse a number of local precincts, including the City Centre, Surry Hills, Moore Park, Randwick, and the Kensington/Kingsford precincts, along with the maintenance depot at Lilyfield. These precincts each exhibit different urban environments containing a wide variety of land uses including residential and employment areas, retail, educational centres, health precincts and major recreational facilities. The project location and precincts are shown in **Figure 1**.

Figure 1: Preferred Route and Precincts along the Light Rail Alignment (Source: *Transport for NSW)*

City Centre Precinct
The City Centre Precinct consists of Sydney's CBD. George Street is the main vehicle and pedestrian thoroughfare through the precinct and runs from the historic Rocks area in the north to Haymarket in the south. The character of George Street is dominated by many examples of fine heritage buildings including Sydney Town Hall and the Queen Victoria Building, set amongst medium and high-rise commercial towers. Circular Quay, located in the north of the precinct is a transport hub providing ferry, train and bus services popular with workers, residents and tourists. More recently, many small bars and pop-up shops have set up in the city's laneways dispersed from George Street, adding to a vibrant and contemporary culture. At the Haymarket end of George Street, the precinct is home to many high-rise residential towers, restaurants, recreation facilities and a busy shopping district. The redevelopment of the Sydney International Convention, Exhibition and Entertainment Precinct at Darling Harbour is within this precinct and includes extensive public domain works and the construction of a mixed-use residential neighbourhood at Haymarket. This area is also in close proximity to the University of Sydney, the University of Technology, Sydney and Technical and Further Education NSW. Central Station is located at the southern end of the precinct and is Sydney's major transport hub and interchange.

Surry Hills Precinct
The Surry Hills Precinct is a vibrant inner city neighbourhood. A former working-class suburb and centre for the textile industry, the process of gentrification has seen an increasing focus on creative industries and small businesses within the suburb. An eclectic land use mix sees heritage terraces adjacent to converted warehouses, modern developments, apartment buildings and high-rise public housing at the Northcott Estate. Increasing local affluence has given rise to a diverse mix of cafes, pubs, fine dining restaurants and designer shops within the area. Surry Hills is the location of a wide range of cultural institutions including a number of galleries and the Belvoir Theatre. The precinct is predominantly served by bus transport services along Chalmers/Elizabeth Streets and Crown Street.

Moore Park Precinct
The Moore Park Precinct contains a unique mix of open parkland as well as commercial, education, entertainment and sporting facilities. Moore Park comprises 115 hectares of open space and playing fields, including a golf course, tennis courts and netball courts. The area also includes the Sydney Boys and Sydney Girls High Schools. To the east, the area known as the Entertainment Quarter contains a cinema, shops, eateries and other recreation facilities. Adjacent to the Entertainment Quarter is the Sydney Cricket Ground, Sydney Football Stadium, Royal Hall of Industries and the Hordern Pavillion, each of which are some of the state's largest entertainment and sporting venues. In addition, the precinct also includes Fox Studios, the largest film and television studio in the country. Buses currently serve the precinct along Anzac Parade.

Randwick Precinct
The Randwick Precinct is characterised by a mix of housing from many multi-storey residential flat buildings to detached dwellings and stately heritage homes. The precinct accommodates some of the state's key health and education facilities, including The University of New South Wales (UNSW), the Sydney Children's Hospital, Prince of Wales Hospital, Royal Hospital for Women and the Eastern Heart Clinic. High Street and Belmore Road are home to cafes and restaurants as well as a mix of retail and commercial premises, and small medical practices. Royal Randwick Racecourse, the state's premier racing facility sits within the northern side of the precinct. Buses serve the precinct primarily along the Alison Road alignment.

Kensington/Kingsford Precinct
The Kensington/Kingsford Precinct primarily consists of educational and residential uses, including UNSW, the National Institute of Dramatic Art and a high prevalence of residential flat buildings located close to Anzac Parade and grand Victorian and Federation style homes on the Kensington side of Anzac Parade. Anzac Parade also comprises a mix of retail uses from small neighbourhood shops to large retailers. The precinct is served by buses, primarily along the Anzac Parade alignment.

Lilyfield Precinct
The Lilyfield precinct is home to a mix of low-rise residential, recreational, commercial and former industrial spaces. The former Rozelle Goods Line is currently used as part of the existing Sydney light rail network. The City West Link Road and Anzac Bridge also traverse the area.

2. PROPOSED PROJECT

2.1. Project Description

The project consists of approximately 12 kilometres of new light rail track and 20 light rail stops between Circular Quay and Randwick / Kensington. The Capital Investment Value of the project is estimated as $1.6 billion. The detailed design, construction, maintenance and operation of the proposed light rail would most likely be delivered through a public private partnership arrangement, and would take approximately five to six years to build. The key components of the project are listed in **Table 1**.

Table 1: Key Construction Components

Aspect	*Description*
Construction Summary	Construction is to commence in mid-2014 and is anticipated to take approximately five to six years. Project staging would be developed via a public private partnership and consist of three stages; early works, main construction works and commissioning. Early works include installation of safety barriers around worksites and the relocation or protection of major utilities; the implementation of local bus diversions at Chalmers Street, Eddy Avenue, Rawson Place and the Park Street/Druitt Street/George Street intersection and the implementation of road configuration changes; early demolition works and potential remediation works; and early light rail works, such as track slab construction preparation works. Main construction works consist of site establishment, stop and platform construction, service diversions, civil engineering works, rail installation, communications and electrical installations, catenary power installation, and public domain works. Commissioning works consist of the trial running of the route.
Construction Compounds	The establishment of 13 construction compounds, each on public land to avoid impacts on private land uses and property. Compounds would be located at First Fleet Park, Bond Street, Barrack Street and Belmore Park in the Sydney CBD; Ward Park and Wimbo Park in Surry Hills; the site of the Moore Park Tunnel and Moore Park west of Anzac Parade (site office compound); Randwick Racecourse and High Cross Park in Randwick; within the NIDA car park and the Anzac Parade median south of the Nine Ways intersection; and within the Lilyfield maintenance depot. Typical compounds would consists of: office, lunchroom, toilets, first aid rooms, security, laydown area, security fencing and lighting. The Wimbo Park site would be used to sort demolition wast. No heavy vehicle storage would be provided in the CBD.
Civil Engineering Works	The removal and relocation of trees and utilities, saw cutting and removal of existing road pavement, subgrade, excavation, compaction, concrete pumping and/or pouring.
Earthworks	A total of approximately 210,000 m³ of material would be excavated during construction and tunnelling, including 44,000m³ in the City Centre, 19,000m³ in Surry Hills, 68,000m³ in Moore Park, 20,000m³ in Randwick, and 59,000m³ in Kensington/Kingsford. The EIS commits to a min diversion rate from landfill of 90% for construction waste.
Rail installation works	Progress in linear sections up to six months within any one section, with disruption at any point lasting approximately one month. Works include rail laying, installation of rail boot in embedded tracks, and installation of overhead wiring foundations and posts.
Light Rail Stops	Likely to consist of prefabricated materials and on-site concrete pours, with work anticipated to require up to three months for each location. Includes removal/relocation of significant trees, installation of light rail services and conduits, sawcutting, formwork, piling, construction of footings, concrete pouring, installation of services, including communications and electrical and charging units for wire free section of the track.
Demolition of Olivia Gardens Apartment Complex	Likely to be demolished using excavators with jaws/hammer attachments. Long reach excavators would be required to reach the upper levels of the building. Demolition rubble (brick and concrete) would be stockpiled and sorted within the proposed Wimbo Park construction compound. Creation of Wimbo Park.
Moore Park and Anzac Parade Tunnels	The cut-and-cover tunnel through Moore Park is likely to be a combination of a diaphragm wall and an open box dive structure with a combination of diaphragm wall and pilled walls. Tunnelling under Anzac Parade may consist of either twin rail tracks in two separate tunnels with a cover of six metres, or a pit with diaphragm walls on the west side of Anzac Parade to be incorporated into the permanent tunnel structure.
Bridge Crossing the Eastern Distributor	Is likely to comprise of a prefabricated steel arch bridge, with works including night time construction of bridge piles and the erection of the bridge deck steel work, works to tie the bridge to the cut-and-cover tunnel, the installation of light rail tracks to the bridge spans, and the regrading of South Dowling Street.
Maintenance Facility and Stabling Yard	Buildings/structures at the Lilyfield maintenance facility the Randwick Stabling facility to comprise a steel frame with a metal roof and metal cladding of precast concrete panel walls. Construction of each facility is to take approximately 18-24 months to complete.
Substations and Associated Works	Substations would comprise prefabricated structures, with the manufacturing and fit-out of each occurring off-site. On site works would typically comprise excavation, foundation preparation and construction, installation of conduits and other in-situ works.

The key operational components of the project are listed in **Table 2**.

Table 2: Key Operational Components

Aspect	*Description*
Operational Summary	A high frequency, light rail service departing every two to three minutes during peak periods within the CBD and out to Moore Park, with services operating every five to six minutes between Moore Park and the Randwick and Kingsford branches.
Light Rail Tracks	Approximately 12 kilometres of dual light rail track from Circular Quay to Central and Kingsford and Randwick via Surry Hills and Moore Park (13 kilometres total including track required for maintenance and stabling facilities).
Light Rail Stops	20 light rail stops along the route, located at Circular Quay, Grosvenor Street, Wynyard, Queen Victoria Building, Town Hall, World Square, Chinatown, Rawson Place, Central Station, Surry Hills, Moore Park, Royal Randwick Racecourse, Alison Road, UNSW High Street, High Cross Park (Randwick), Carlton Street, Todman Avenue, UNSW Anzac Parade, Strachan Street and Anzac Parade (Kingsford). Platforms at all stops will accommodate 45 metre long Light Rail Vehicles (LRVs), except at the Central Station and Moore Park stops, where platforms would be provided to accommodate both 45 metre and 90 metre long LRVs (double length vehicles for special event services between Central Station and Moore Park). Terminus facilities provided at the Circular Quay, Kingsford and High Cross Park.
Interchanges and Integration with Inner West Light Rail	Interchanges with heavy rail at CBD rail stations (Circular Quay, Wynyard, Town Hall and Central), a ferry interchange at Circular Quay and bus interchanges at Town Hall, Queen Victoria Building, Rawson Place, Central Station, Randwick and Kingsford stops. The line would be integrated with the existing light rail system including a new junction between the two lines at the intersection of Hay Street and George Street.
Light Rail Vehicles	A fleet of 30 electric powered LRVs, approximately 45 metres long, featuring air conditioning and accessible low-floor design. LRVs will each have the capacity to carry approximately 80 seated and 220 standing passengers.
Stabling and Maintenance Facilities	Stabling facility in Randwick and maintenance facility at Lilyfield (including wash down). The Randwick facility would include facilities for the storage of LRVs overnight, inspection and cleaning, and light maintenance or repair work. The Lilyfield maintenance depot consists of maintenance inspection tracks with workshops and storage and would allow for extensive maintenance and repair of LRVs.
Substations	Approximately 12 substations along the route (each approximately 90m^2) to supply power for LRVs, located at Circular Quay, Wynyard, Hay Street, Central Station, Ward Park, Lang Road, Randwick Racecourse, Alison Road, High Cross Park, High Street and Anzac Parade (Kingsford).
Bridges and Tunnel	A new bridge structure spanning the Eastern Distributor would lead into a tunnel under Moore Park and Anzac Parade. The construction of a pedestrian bridge over Anzac Parade at Moore Park.
Pedestrianisation and changes to the Public Domain	A pedestrian zone in George Street, with local vehicle access only, from Circular Quay to Town Hall, with LRVs operating overhead wire-free within this zone. Proposed public domain improvements include paving, street trees, lighting and furniture.
Traffic, Transport Access	Changes to property and utilities access, and traffic management changes. The project is integrated with, but does not include, a redesign of the Sydney bus network under the (draft) *Sydney City Centre Access Strategy 2013*.

2.2. Project Need and Justification

The NSW Government has identified the CSLER as a key priority transport infrastructure project that contributes to availability and capacity on Sydney's transport network, catering for a growing city; supporting urban renewal and improving global competitiveness. The Department considers the proposal presents a once in a generation opportunity to transform Sydney's CBD and South Eastern Suburbs, and would deliver a range of public benefits ranging from a $1.6 billion direct investment into the economy, to the creation of over 10,000 (direct and indirect) jobs during construction and operation of the proposal.

The Department acknowledges that Sydney's public transport capacity will need to increase along with the rate of population growth, with the population expected to increase by 1.6 million, to approximately 5.9 million people by 2031. The Inner South East suburbs incorporate a number of key destinations, which also generate high levels of public transport demand, including UNSW, the Moore Park sports stadiums, entertainment complex, the Royal Randwick Racecourse and the hospital. An additional 86,000 residents and 147,000 workers are expected within the CBD by 2031, as well as 37,000 new resident and 17,000 new workers in inner South East Sydney.

Transport modelling shows that if no public transport improvements are made then the increased demand for travel cannot be accommodated on existing networks without generating more congestion, overcrowding and longer travel times along key corridors. For Sydney to maintain its status as a strong global city, it must maximise the productivity advantages of supporting economic investment, employment growth and activity in centres. Investment in public transport must also support urban renewal that will improve the liveability of Sydney's local neighbourhoods.

Traffic congestion results in significant cost (around $5 billion) to the NSW economy. The proposed light rail addresses a number of Sydney's important transport challenges and would make a contribution to the delivery of an integrated and modern transport system. The CBD is the major employment hub in NSW, accommodating 450,000 employees as well as a residential population of 193,000, generating more than 630,000 passenger trips into the CBD each weekday via multiple modes of transport. Accordingly, the existing transport network between the Inner South East suburbs and throughout the CBD is highly constrained, such that congestion and reduced accessibility impacts on amenity, productivity and the future urban growth of Sydney.

Approximately 1,610 buses enter the CBD during the two-hour morning peak period, contributing to congestion along major streets within the CBD, resulting in slow and unreliable travel times for private and public transport vehicles (up to 30 minutes to travel the 2.5 kilometre distance from Central Station to Circular Quay). The proposal would result in 220 fewer peak hour buses into the Sydney CBD and deliver a state of the art mass transit system which would help relieve congestion and reduce these costs.

The presence of multiple major event venues in the South East, including the Sydney Cricket Ground and Sydney Football Stadium, place additional pressure on the existing bus network to provide sufficient capacity to serve peak loadings at the beginning and conclusion of major events. Transport to and from these events is largely dependent on private vehicles, with major events currently achieving a 5-20 per cent mode share to public transport compared to an average of 55 per cent at Sydney Olympic Park, leading to increased traffic congestion during major events. Currently, over 350 bus trips per day operate on the Central to UNSW route and there is still insufficient capacity to effectively accommodate peak demand.

The EIS demonstrates that the CSELR will provide the required capacity and efficiency necessary to facilitate Sydney's future growth and special event demand, as well as compliment proposed network upgrades for buses between the CBD and South East Sydney. The CSELR will have capability to carry up to 9,000 passengers per hour in each direction, with capacity for approximately 80 seated and 220 standing passengers in each LRV. LRVs would be given signal priority at intersections (where feasible) which would deliver a 97 per cent level of service reliability, which is a significant improvement over existing bus services. To increase capacity during special events, LRVs may be coupled together to provide a 90 metre long vehicle, which will provide greater capacity during peak demand. Other measures are available, including signalling optimisation, which would provide greater network efficiency should it be required.

In addition, the following strategies provide justification and support for the provision of the light rail service in Sydney:

- the proposal is wholly consistent and builds on the strategic land use and transport objectives identified in the *NSW Long Term Master Plan* (2012); *NSW 2021: A plan to make NSW number one* (2011); *Sydney's Light Rail Future* (2012); and the *State Infrastructure Strategy* (2012);
- the project is consistent with key features of the *Sydney City Centre Access Strategy* (2012), which seeks to provide an integrated transport network including light rail on George Street between Central and Circular Quay, and the transformation of approximately 40 per cent of George Street in the CBD to a pedestrian zone; and
- the CSELR is consistent with and builds on the strategic land use and transport objectives for local government plans, including *Sustainable Sydney 2030: The Vision* (City of Sydney, 2008); *Randwick City Plan* (2006) and *Kingsford Town Centre Strategy* (2013).

The *NSW Long Term Master Plan*, supported by a suite of integrated modal delivery plans including *Sydney's Light Rail Future*, identified light rail as the preferred solution in increase the capacity and improve the reliability of the inner Sydney and CBD transport network. Other options considered include an extension to the Eastern Suburbs rail link to Randwick and Maroubra, and the construction of a Bus Rapid Transit system. The extension to the heavy rail network was considered too expensive to construct as a result of extensive tunnelling and/or land acquisition requirements. Furthermore, analysis showed that the Bus Rapid Transit option provided a lower capacity than light rail in comparable traffic conditions, resulting in reduced passenger demand.

For the above reasons, the Department accepts that the CSELR would provide significant social and economic benefits to those living within the South East Sydney catchment area and those accessing the CBD. The Department accepts the Applicant's need and justification of the project, including the aims of improving public transport efficiency and catering to an increased CBD access demand.

The CSELR project offers a high capacity, accessible and reliable public transport solution for the Sydney CBD and South East suburbs. Studies show that the project will create significant economic, social and sustainability benefits. The project offers good value for money for NSW taxpayers, equating to a benefit-cost ratio of 2.5, or $2.50 worth of benefits for each dollar invested. These benefits include $308 million in environmental and health benefits, $333 million in benefits for pedestrians, $264 million in benefits for road users, $707 million in operating savings, $222 million in wider economic benefits and over $2 billion in benefits for public transport customers.

In addition to economic benefits, the project will deliver more frequent and reliable public transport services and increased high capacity special event services. The pedestrianisation of George Street will see an improvement in noise and air quality along the alignment, resulting in an enhanced pedestrian experience for CBD workers, residents and visitors.

The CSLER is expected to deliver significant economic benefits to Sydney through job creation, direct capital investment and delivery of a significant piece of public transport infrastructure that would boost Sydney's economic growth and productivity.

Figure 2: Perspective along Devonshire Street, Surry Hills (Source: *Transport for NSW)*

3. STATUTORY CONTEXT

3.1. State Significant Infrastructure

Pursuant to section 115U(4) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), specified development on specified land may specifically be declared to be State Significant Infrastructure (SSI). On 20 May 2013, the then Minister declared the CSELR proposal to be SSI by way of the *Environmental Planning and Assessment Amendment (Light Rail Project) Order 2013*.

Under the provision of section 115W(1) of the Act, as an SSI development, the CSELR proposal may not be carried out without the approval of the Minister for Planning.

3.2. Critical Infrastructure

Pursuant to Section 115V of the EP&A Act, SSI development can be declared by the Minister to be critical State significant infrastructure by an order of the Minister, if the proposal is deemed essential for the State for economic, environmental or social reasons. On 20 May 2013, the Minister declared the CSELR proposal a critical SSI project by way of the *Environmental Planning and Assessment Amendment (Light Rail Project) Order 2013*, which amended Schedule 5 of the SEPP (State and Regional Development) 2011 to include the proposal.

As a critical SSI development, the Minister for Planning is the determining authority for the CSELR proposal. Under section 23(8)(a2) of the EP&A Act, the Minister may not delegate her approval role for the proposal.

3.3. Permissibility

The CSELR is defined as a rail infrastructure facility under the Infrastructure SEPP. As a rail infrastructure facility being carried out by a public authority it is identified as development that is permissible without consent under clause 79 of the Infrastructure SEPP.

The CSELR is located on land which is subject to the *Sydney Local Environmental Plan 2012* and *Randwick Local Environmental Plan 2013*. Relevant provisions of both these planning instruments have been considered during the preparation of the EIS. However, as the CSELR has been assessed under Part 5.1 of the EP&A Act, the permissibility and consent provisions of these plans do not apply.

3.4. Environmental Planning Instruments

The Environmental Planning Instruments that apply to the carrying out of the CSELR project include *State Environmental Planning Policy (State and Regional Development) 2011* and *State Environmental Planning Policy (*Infrastructure) *2007*. A number of environmental planning instruments have relevance to the CSELR proposal, however they do not apply to the CSELR by reason of section 115ZF(2). However, the Department considers that the proposal is consistent with the requirements of the relevant environmental planning instruments.

3.5. Reference Groups

In recognition of the Proposal's significance to the State, and to provide businesses, the community and significant stakeholders input to the detailed design phase, the Applicant has proposed a Governance Structure to oversee delivery of the proposal. The Governance structure would include the creation of an advisory board reporting to the Minister for Transport and the Minister for Roads and Freight.

The Governance structure would also include five reference groups including the Delivery Phase Roundtable (where government and institutional stakeholders provide input and receive updates); Utilities Reference Group; Business Reference Group; Urban Domain Reference Group; and Community Reference Group with a defined set of objectives and responsibilities for each group. The purpose of these groups is to provide further expertise and to provide an opportunity for stakeholders to partake in further design development and selected decision make in the delivery of the light rail.

Most of these groups play a role in the further design development of the proposal and consultation with stakeholders and are referred to in **Section 5** of this report. The framework for these groups is provided in the recommended conditions of approval.

3.6. Objects of the EP&A Act

Decisions made under the EP&A Act must have regard to the objects of the Act, as set out in Section 5 of the Act. The relevant objects are:

(a) to encourage:
- *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
- *(ii) the promotion and co-ordination of the orderly and economic use and development of land,*
- *(iii) the protection, provision and co-ordination of communication and utility services,*
- *(iv) the provision of land for public purposes,*
- *(v) the provision and co-ordination of community services and facilities, and*
- *(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
- *(vii) ecologically sustainable development, and*
- *(viii) the provision and maintenance of affordable housing, and*

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The objects stipulated in Section 5(a) are significant factors informing determination of the application. The Department considers that, given the urban environment of the proposal and the development being predominantly along road corridors, limited significant impacts on natural resources are anticipated, reflecting object 5(a)(i). Despite its urban route, the detailed mitigation and management measures proposed would ensure social, environmental and economic impacts of the proposal are minimised as far as practicable. The need for the acquisition of private property has been minimised as the proposal is located primarily on government land, supporting object 5(a)(ii). The proposal aligns with object 5(a)(iii) of the Act, as the Applicant has commenced consultation with utility and communication providers to ensure works to utilities are coordinated effectively. In addition, the Applicant has committed to undertake further investigations to ensure that all appropriate measures are in place to minimise the potential risks to existing utilities and services prior to commencement of construction works.

The proposal would enhance the capacity and quality of public transport in Sydney, including a number of public domain improvements providing land for public purposes (object 5(a)(iv)). The improvements of access to community facilities including Moore Park, Centennial Park, the Randwick hospital precinct, UNSW and the Sydney Opera House/Circular Quay area align with object 5(a)(v).

With the proposal being located in urban, developed areas, impacts upon native animals and plants are anticipated to be minimal. Whilst the proposal would result in the removal of habitat for the Powerful Owl, Grey-headed Flying-fox and Eastern Bent-wing Bat, these impacts are not anticipated to be significant as a result of the other habitat areas in close proximity (object 5(a)(vi)).

The Applicant has committed to complying with applicable sustainability targets and will aim for a minimum 'Gold' rating under Transport for NSW's *Sustainable Design Guidelines for Rail* (Version 3.0) and a minimum 'Excellent' (65 points) rating, under the Infrastructure Sustainability Council of Australia's *Infrastructure Sustainability Rating Scheme* indicating the Applicant's commitment to ecologically sustainable development (object 5(a)(vii)). The CSELR would improve access to affordable public housing along the alignment, including the Northcott Estate on Devonshire Street, Surry Hills, aligning with object 5(a)(viii).

Object 5(b) is relevant as the project involves the sharing of responsibility and information for environmental planning to provide light rail infrastructure through key strategic centres, including the CBD and Randwick Health & Education precincts. Object 5(c) is also relevant to the project as the issues raised by the community during the exhibition period of the EIS have been carefully considered as part of the Department's assessment.

The Applicant has outlined management strategies to maintain community services and facilities and commits to undertaking both the construction and operation of the light rail line in a manner that would

minimise impacts upon the environment. The Department notes that the objects of the Act have been considered during the assessment process of the CSELR project.

3.7. Ecologically Sustainable Development

The EP&A Act adopts the definition of Ecologically Sustainable Development (ESD) found in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

(a) the precautionary principle,
(b) inter-generational equity,
(c) conservation of biological diversity and ecological integrity,
(d) improved valuation, pricing and incentive mechanisms.

The principles of ESD have been addressed in the EIS. The EIS includes detailed discussion on the sustainability of the project, as well as detailed studies in the areas of construction and operational traffic and transport management, noise and vibration, heritage and surface water and hydrology. The Applicant has set out a number of mitigation and management measures that would be implemented throughout the project.

The light rail provides opportunities for improved transport sustainability. During operation, greenhouse gas emissions would primarily be associated with the operation and maintenance of LRVs and infrastructure. Emissions would be generated by electricity consumption, the combustion of fuel in maintenance plant, equipment and vehicles, disposal of waste from LRVs, and embodied energy from materials used in the maintenance of the infrastructure.

However, the Applicant is to comply with applicable sustainability targets and strive for a minimum 'Gold' rating under Transport for NSW's *Sustainable Design Guidelines for Rail (Version 3.0)* and a minimum 'Excellent' (65 points) rating, under the Infrastructure Sustainability Council of Australia's *Infrastructure Sustainability Rating Scheme*.

The Department considers that sustainability targets committed to within the EIS are acceptable.

4. CONSULTATION AND SUBMISSIONS

4.1. Exhibition

Under section 115Z(3) of the EP&A Act, the Department is required to make the EIS publicly available for at least 30 days. The Department publicly exhibited the CSELR proposal from 14 November 2013 to 31 December 2013 (48 days) on the Department's website, and at the following exhibition locations:

- Department of Planning and Environment, Information Centre;
- City of Sydney Council, One Stop Shop;
- Randwick City Council Administration Building;
- Leichhardt Municipal Council Citizen Service Centre;
- Customs House Library;
- Haymarket Library;
- Surry Hills Library and Neighbourhood Centre;
- Margaret Martin Library;
- Bowen Library & Community Centre;
- Malabar Community Library;
- Transport for NSW Information Centre;
- Transport for NSW Transport Projects;
- University of NSW, Library Building;
- Randwick TAFE Customer Service Centre;
- Prince of Wales Hospital; and
- Nature Conservation Council

The Department also advertised the public exhibition in the Sydney Morning Herald and the Wentworth Courier on 13 November 2013 and the Southern Courier and Inner West Courier on 12 November 2013, and notified State and local government authorities directly in writing.

The Department received 485 submissions during the exhibition period. A total of 13 submissions were received from public authorities and two additional submissions were received following the exhibition period. A summary of the issues raised in submissions received is provided below. The Department has considered the issues raised in submissions in its assessment of the project.

4.2. Public Authority Submissions

A total of 13 submissions were received from key public authorities. No public authority objected to the proposal, however each raised key issues for consideration. The key issues raised in public authority submissions are listed in **Table 3**, **Table 4**, and **Table 5**. A link to the public authority submissions is provided in **Appendix B**.

Table 3: Key issues raised by Councils

Council	*Key Issues Raised*
City of Sydney	• access to properties during construction; • implementation of noise mitigation measures; • public amenity concerns and ensuring high quality urban design outcomes; • a new park at the Olivia Gardens site; • the upgrade of footpaths along Devonshire Street; • wire-free pedestrianised section of George Street; and • requested ongoing consultation with Council staff.
Randwick City Council	• does not support terminus at High Cross Park; • notes the report for Infrastructure for NSW (October 2012), which indicated that an extension of heavy rail network from Bondi Junction to Randwick and Maroubra Junction and asks that the State Government commit to this part of its Strategic Transport Masterplan, in addition to the CSELR project; • project should not be used to justify the proposed Urban Activation Precincts; • increased bus services to meet the future demands created by commuters; • supports an underground pedestrian pathway at the Moore Park Tunnel; and • requests that a dedicated cycle/pedestrian way be provided.
Leichhardt Council	• In relation to the Lilyfield Light Rail Maintenance Depot, requests that: o follow up parking, traffic and noise studies be provided; o conditions to minimise noise impacts of construction activities; and o community consultation for any future development on the site.

Table 4: Key issues raised by public agencies

Agency	Key Issues Raised
Health Infrastructure (including Sydney and North Sydney Local Health Districts) *Note: submissions were received separately by Health Infrastructure and Sydney and North Sydney Local Health Districts*	• concerned that the CSELR has limited ability to serve future travel demand, including projected growth, of the Randwick Health Precinct; • preference for terminus in High Street, instead of at High Cross Park; • preference for stop Option 3, which includes a stop in High Street and a single traffic lane; • does not support proposals to modify intersections and access, including the signalisation of High Street and Clara Street or consolidation of the entrances to Prince of Wales Hospital; • concern relating to noise and vibration from construction work and light rail vehicles on hospital operations; • requests further information regarding the construction footprint around the Randwick Health Precinct; • does not support the dissection of the Langton Centre between its clinical area and the car park; • requires that alternate access arrangements for relevant health services be clearly communicated in order to avoid serious impacts on health service delivery; • a Health Impact Assessment should be undertaken; • bicycle access and storage on the light rail and bicycle parking at interchanges required; and • bicycle lanes should be maintained and extended to link with the network.
Roads and Maritime Services	• Working to address the following concerns: o the provision of suitable access for The Rocks and Circular Quay; o higher traffic demands on Hunter Street/Margaret Street due to the closure of George Street to through traffic; o suitable speed zones for light rail, motor vehicle and pedestrian interaction; o intersection design and the impact of new stops on existing traffic; o the retention of coach parking westbound in Eddy Avenue; o compatibility with the future Anzac Parade pedestrian bridge; and o the traffic impact of right turn reductions along Anzac Parade. • individual Traffic Management Plans will need to be prepared for each construction site.
Environment Protection Authority	• an Environment Protection Licence may be required for extractive activities and/or railway system activities; • any groundwater generated during construction of the Moore Park Tunnel should be disposed of in a manner that does not cause pollution of waters; • Phase 2 Environmental Site Assessments of any suspected contaminated areas and appropriate remediation should be undertaken prior to construction; • all waste should be classified according to the EPA's *Waste Classification Guidelines*; • construction compounds should be established and operated with consideration of the potential noise impacts on surrounding receivers; • suitable conditions to require additional noise mitigation measures if the actual impacts exceed predicted impacts; and • extensive community consultation is essential to inform the community of upcoming works and the expected impacts.
Department of Primary Industries NSW Office of Water	• requests a preliminary assessment of interference to the Botany Sands Aquifer for construction of the Moore Park Tunnel be undertaken.
Department of Education and Communities	• new local infrastructure such as alternative on-street parking, pedestrian pathways and crossings should be included around schools in Surry Hills, Moore Park and Randwick; • safety of students and evacuation routes should be considered for Bourke Street Public School and Sydney Boys and Sydney Girls High School; and • mitigation measures, such as noise barriers, window glazing, noise and dust monitoring and restrictions on construction activities during exams etc. be implemented by the Applicant and not the schools.
NSW Heritage Council	• expert heritage advice should be retained to avoid or minimise heritage impacts; • alternative designs to mitigate the visual and material impacts of the Moore Park light rail stop that respond to and enhance the landscape character of the area should be prepared; • eliminate the need to remove significant trees within Royal Randwick Racecourse along Alison and Wansey Roads; and • requests conditions relating to light rail stop impacts, the preservation of historical archaeology, and heritage interpretation.

Table 5: Key issues raised by public entities

Agency	*Key Issues Raised*
Sydney Water	• the proposal should include any Sydney Water asset adjustment/protection works required for the proposal; • does not agree with the hierarchy of mitigation measures and the assessment of impacts on a case by case basis during the detailed design; • Sydney Water is working with TfNSW to address potential water issues that will arise from the proposal, with the development of an Interface Agreement; and • will require all 'adjustment/protection', 'building adjacent to asset' or 'Section 73' applications to be submitted through standard Sydney Water processes.
NSW Small Business Commissioner (OSBC)	• recommends regular consultation with OSBC to ensure that proactive engagement with small business can occur; • parking, network changes, access and impacts to pedestrians and cyclists may be problematic during the construction and operation; • noise and vibration impacts should be clearly identified to local businesses prior to construction; and • requests TfNSW identify businesses which are economically vulnerable and refer them to business support services.
Centennial Park and Moore Park Trust	• any visual impact, impact on the environment or ecology of the park, reduction in amenity or reduction in parkland area must be kept to a minimum; • ongoing operations and maintenance of the parklands is undertaken on a self-funded basis and requests that any impact on revenue stream be replaced under the same terms; and • any impact on the parkland or its playing fields (temporary or permanent) be reinstated or replaced on a like-for-like basis.

4.3. Public Submissions

A total of 472 submissions were received from the public, including submissions from the remaining public authorities, special interest groups or organisations:

UNSW
National Institute of Dramatic Art
NRMA Motoring & Services
The Randwick-Botany Greens
Dymocks
Entertainment Quarter
AFL
Bicycle NSW
Randwick & District Historical Society
Sydney Swans
Sydney Boys High School
Sydney TAFE
Youth Hostel Association
Australian Turf Club
Australian Hotels Association
DEXUS Property Group
Westfield Limited
Playbill Venues
Fox Studios Australia
BusNSW
Wansey Road Action Group
Sydney Business Chamber
Sydney Girls High School
South Sydney Junior Rugby League Club
Transport & Tourism Forum

Of the 472 public submissions received, 230 (49%) objected to the proposal, 81 (17%) provided support and 161 (34%) raised concerns or provided comment. The key issues raised in public submissions are listed in **Table 6**.

Table 6: Summary of Issues Raised in Public Submissions

Issue	*Proportion of submissions (%)*
Traffic: including impacts to the CBD network; Devonshire Street; and Anzac Parade	38
Tree removal: including impacts to Anzac Parade; High Cross Park; and Alison Road	36
Loss of parkland: including High Cross Park and Centennial Parklands	35
Loss of parking: including spaces on Devonshire Street; Anzac Parade; and Alison Road	35
Access problems	28
Noise and vibration: including impact of construction and operation to residences on Devonshire Street and research facilities at UNSW and the Prince of Wales Hospital	28
Preference for different route options: including Foveaux Street, Surry Hills and within the external boundary of Royal Randwick Racecourse	26
Economic impact of construction and/or operation: including impacts on businesses	24
Visual impact: including impacts to visual amenity of parklands and private property	24
Concern over location of stop/interchange: including the length of distance between stops and requests for stops to be relocated.	21

Issue	Proportion of submissions (%)
Operation and/or pedestrian safety: including safety in and around Devonshire Street; George Street; and UNSW stops	20
Impacts on existing bus network: including increased travel times and forced modal changes	19
Lack of community consultation	17
Heritage: including impacts to High Cross Park	14
Demolition of Olivia Gardens: including the impact of forced relocation and reduced property values	13

As shown in the above table, the key issues raised in public submissions relate to changes to the existing traffic arrangements throughout the CBD network and Devonshire Street; the loss of parkland, trees, pedestrian safety and disruption to the public domain; and the economic impact on existing businesses. Amenity concerns raised in the submissions relate to noise and vibration impacts, and heritage concerns. More specific concerns were raised in relation to community consultation, the introduction of transport modal changes in the South East, and the demolition of the Olivia Gardens residential building. Finally, a number of submissions question the preferred light rail alignment and the location of proposed stops.

The Department has considered these issues and has conducted its assessment of the proposal in the later sections of this report.

4.4. Applicant's Response to Submissions and Preferred Infrastructure Report

TfNSW provided a response to the issues raised in submissions in a document titled 'Response to Submissions' and also prepared a Preferred Infrastructure Report. The Preferred Infrastructure Report included the following amendments:

- wire-free zone reduced to between Wynyard and Town Hall stops;
- reconfiguration of the Chinatown stop from a side to an island platform arrangement and shifting the stop 15 metres to the north;
- revised design for the Central station stop, removing the special event platform;
- existing traffic lanes along Chalmers Street between Randle Street and Elizabeth Street will be removed, converting the area into a shared zone for pedestrians, cyclists and vehicle access to properties in Chalmers Street in a low speed environment;
- reconfiguration of the Surry Hills stop from an island platform to two side platforms, approximately 2.8 metre wide and 45 metres long;
- replacement car parking for the Langton Centre, with up to 30 spaces on the northern side of the new Wimbo Park in Surry Hills;
- relocation of the Moore Park stop, approximately 250 metres southwards to reduce impact on the AFL training oval. The tunnel alignment would be straightened to provide a more direct route between the relocated Moore Park stop and Devonshire Street;
- a new pedestrian bridge across Anzac Parade connecting the Moore Park stop and Sydney Boys and Sydney Girls High School;
- reconfigured intersection at Alison Road and Darley Road to accommodate a new eastbound, bus-only slip lane from Alison Road onto King Street to allow buses and coaches to access the racecourse via a loop along King Street and John Street in a westbound direction from Alison Road;
- realignment along Alison Road to reduce impacts to mature fig trees;
- reconfiguration of Wansey Road, allowing for one southbound traffic lane and retention of one parking lane between Gate 10 of the racecourse and Arthur Street. The shared path would be relocated to the eastern side of the light rail alignment; which would be lowered vertically below the previously proposed level;
- relocated Wansey Road stop to the southern side of Alison Road, approximately 30 metres west of the intersection of Alison Road and Wansey Road. Revised platform configuration to consist of a 4.4 metre wide, 45 metre long island platform;
- relocated UNSW High Street stop to the centre of High Street, approximately 40 metres to the east of the intersection of High Street and Wansey Road. Revised platform configuration to consist of a 6.4 metre, 45 metre long island platform;
- change to the position of the Randwick stop and interchange, moved approximately 3 metres north towards Belmore Road (approximately one lane width), allowing the retention of an increased amount of parkland within High Cross Park;

- revised design for the UNSW Anzac Parade stop, locating the new stop in the centre of Anzac Parade as an island stop, just north of the University Mall crossing;
- refinement of a number of proposed substation locations; and
- new construction compounds at Bond Street, Barrack Street and the National Institute of Dramatic Art car park, and revised locations for the Moore Park site office, Moore Park tunnel and Ward Park compounds.

The Department forwarded a copy of the Response to Submissions and Preferred Infrastructure Report to agencies and key stakeholders that made submissions during the exhibition of the EIS. The documents were also placed on the Department's website. A copy of the documents can be found at **Appendix C** of this report. A number of agencies provided further submissions on the Response to Submissions and the Preferred Infrastructure Report. Key issues raised are summarised in **Table 7**.

Table 7: Issues Raised in Submissions on the Response to Submissions and Preferred Infrastructure Report

Agency	***Key Issues Raised***
City of Sydney	• concern regarding commitment of CSELR contractor's design teams to consult with Council officers on critical urban design aspects; and • design resolution of a separated cycleway in Chalmers Street.
Leichhardt Council	• the Response to Submissions has not addressed the information requested by Council regarding the nature of proposed vegetation to be removed along Lilyfield Road, landscaping compensation details, and consideration of the visual impact of vegetation removal; and • concern regarding consultation with local residents and requests involvement in future Reference Group consultation processes.
Randwick City Council	• continues to support the proposal overall, and supports the changes to the Wansey Road corridor; • advised of Council's set of Urban Design Guidelines presenting preferred design outcomes for the light rail corridor, stops and interchanges; • concern regarding the High Cross Park Interchange, requesting a paved plaza treatment including an underground electrical substation if the interchange cannot be placed on High Street; • concern regarding the location and impacts of the Randwick Stabling Facility; • location and design issues associated with the High Street Light Rail Stop, with the relocation of the stop further east and the pedestrianisation of High Street from Wansey Road to Botany Street; • requests the undergrounding of power along Anzac Parade; • concerns of safety at the UNSW Anzac Parade stop; • loss of trees and parking; • concern regarding the reconfiguration of bus arrangements to Randwick Racecourse; and • commitment to establishment of a Community Light Rail Support Plan Committee.
Health Infrastructure	• previous issues raised are being addressed by Transport for NSW.
UNSW	• concern regarding the architecture and capacity of UNSW stops, including platform sizes and Level of Service benchmarking; • requests the creation of a pedestrian plaza in High Street between Wansey Road and Botany Street; • concern regarding impacts of noise, vibration, electromagnetic interference and radio frequency interference upon sensitive campus environments; • highlights the importance of maintaining 'business-as-usual' operations; and • requests ongoing consultation with Transport for NSW.

Further detailed submissions were received from a number of stakeholders including the Australian Turf Club and Dymocks Bookstores, raising concerns regarding property access, the location of the Randwick Stabling Facility, impacts to business operations, safety, urban amenity, and future light rail passenger capacity. A link to the submissions is provided in **Appendix B** of this report.

5. ASSESSMENT

The Department has considered the following documents in assessing the merits of the proposal:

- relevant environmental planning instruments, guidelines and policies;
- the objects and relevant provisions of the EP&A Act;
- the EIS, submissions received and the Response to Submission (including the Preferred Infrastructure Report);
- the Applicant's revised management and mitigation measures; and
- supplementary information provided by the Applicant in response to specific queries raised by the Department during its assessment.

The Department considers the key issues for assessment of the proposal to be as follows:

- route selection and preferred alignment;
- public safety;
- traffic, transport and access impacts;
- noise and vibration impacts;
- landscape and visual impacts; and
- socio-economic impacts.

The Department's assessment of key issues is provided in **Sections 5.1 to 5.6**, while the Department's consideration of all other issues is provided in **Section 5.7**.

5.1. Route Selection

The NSW Government acknowledges the Sydney CBD and Sydney's south east are facing transport and accessibility challenges. For instance, there are large numbers of buses in the peak periods that contribute to heavy congestion in the Sydney CBD, and in the south east. In addition, major trip generators such as the UNSW, Royal Randwick Racecourse, the Moore Park Sports and Entertainment Precinct and Randwick Education and Health Specialised Centre are currently under-serviced by public transport, resulting in significant inefficiencies and delays.

The Applicant's 'Strategic Options Assessment' identifies its response to the public transport deficiency issues. The Options Assessment consisted of three stages including:

- Stage 1: Strategic assessment of potential solutions;
- Stage 2: Options identification and assessment; and
- Stage 3: Detailed scope and definition design.

The Assessment included an analysis of three priority corridors which were identified in the *NSW Long Term Master Plan*, including the CBD/University of Sydney corridor and the UNSW corridor, along with possible transport solutions.

The Applicant concluded that introduction of light rail to service the CBD and university corridors was the best option as it could significantly improve journey times and reliability for a large number of customers. For example, a light rail vehicle has the capacity to move up to 300 people compared with around 60 people on a traditional bus (refer **Figure 3**), and is expected to provide a more reliable service with the vast majority of services forecast to run within two to three minutes of the timetable. Currently, only approximately 19-34% of buses along Anzac Parade and within the Sydney CBD achieve similar efficiencies.

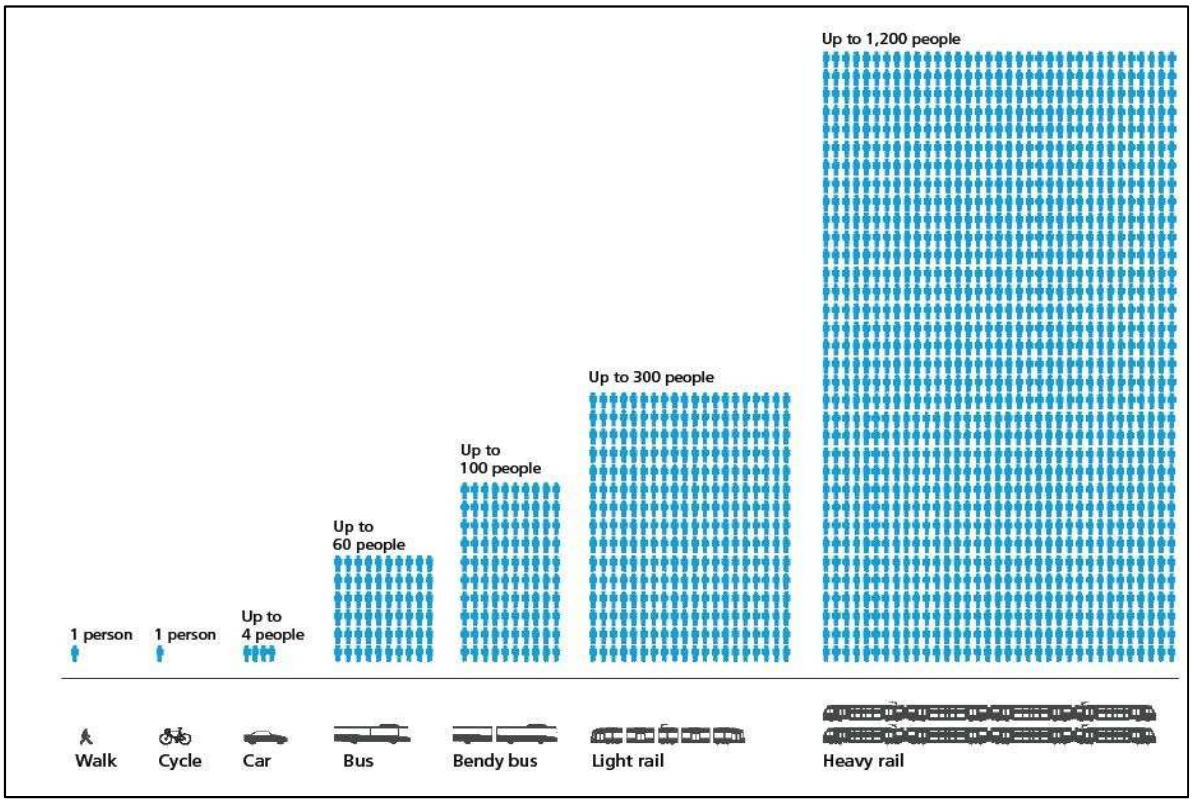


Figure 3: Indicative capacity by mode (Source: *CSELR Environmental Impact Statement*)

Options for the route of the light rail were assessed against a set of mandatory criteria including:

- Provides an interchange opportunity with a key heavy rail station (such as Central, Town Hall, Wynyard and Circular Quay);
- Serves key transport destinations such as the Sydney CBD, Barangaroo, UNSW, University of Sydney and the health precincts; and
- Not containing street sections known to have significant engineering constraints for light rail such as steep street gradients or prohibitively narrow widths.

In accordance with Stage 2 of the Strategic Options Assessment, a list of 15 route options were developed (refer **Figure 4)**. Further refinement of the options was undertaken via a 'Strategic Merit Test' that looked at their advantages and disadvantages against key public transport policy aims such as; customer experience, productivity, sustainability and liveability. This process narrowed the options to 11 routes, with Sussex Street (Route C), Cleveland Street (Route F), Green Square via Elizabeth Street (Route G) and Waterloo via Crown Street (Route H) not meeting the criteria and therefore not considered further.

The 11 short listed options were then further investigated using a Multi Criteria Analysis and Rapid Economic Appraisal process, in conjunction with key stakeholders. From these investigations several significant issues emerged, including:

- Within the CBD corridor, George Street to Circular Quay (Option A) emerged as the most feasible, being centrally located and providing good access to employment, services, recreation facilities and other transport modes. Light rail via Barangaroo, Walsh Bay and The Rocks (Option B) was discounted at this stage, mainly due to the construction of Wynyard Walk and its ability to connect these areas efficiently to bus and train services;
- For the UNSW corridor, a direct link from Central station to the UNSW and Randwick health precinct either via Devonshire Street or a tunnel through Surry Hills would provide an efficient connection catering for existing and future demand. Route options via Town Hall and Darlinghurst (including L1 via Oxford Street and L2 via Campbell Street) would not generate and serve the same demand as the Surry Hills option due to inefficiencies in access Central Station from the South East;
- At Randwick, a route option via Alison Road and Belmore Road was discounted as it would not serve UNSW effectively (one of the main trip generators). A route along Alison Road, Wansey Road and High Street emerged as the best performing option; and

- The University of Sydney options were all forecast with relatively low demand outcomes (particularly compared with UNSW) and would result in significant traffic conflicts on Parramatta and City Road, and therefore these options were not considered further

George Street to Circular Quay (Option A), Devonshire Street (Option I2), Wansey Road (Option O2), and Anzac Parade (Option M) emerged as the preferred options for the light rail alignment.

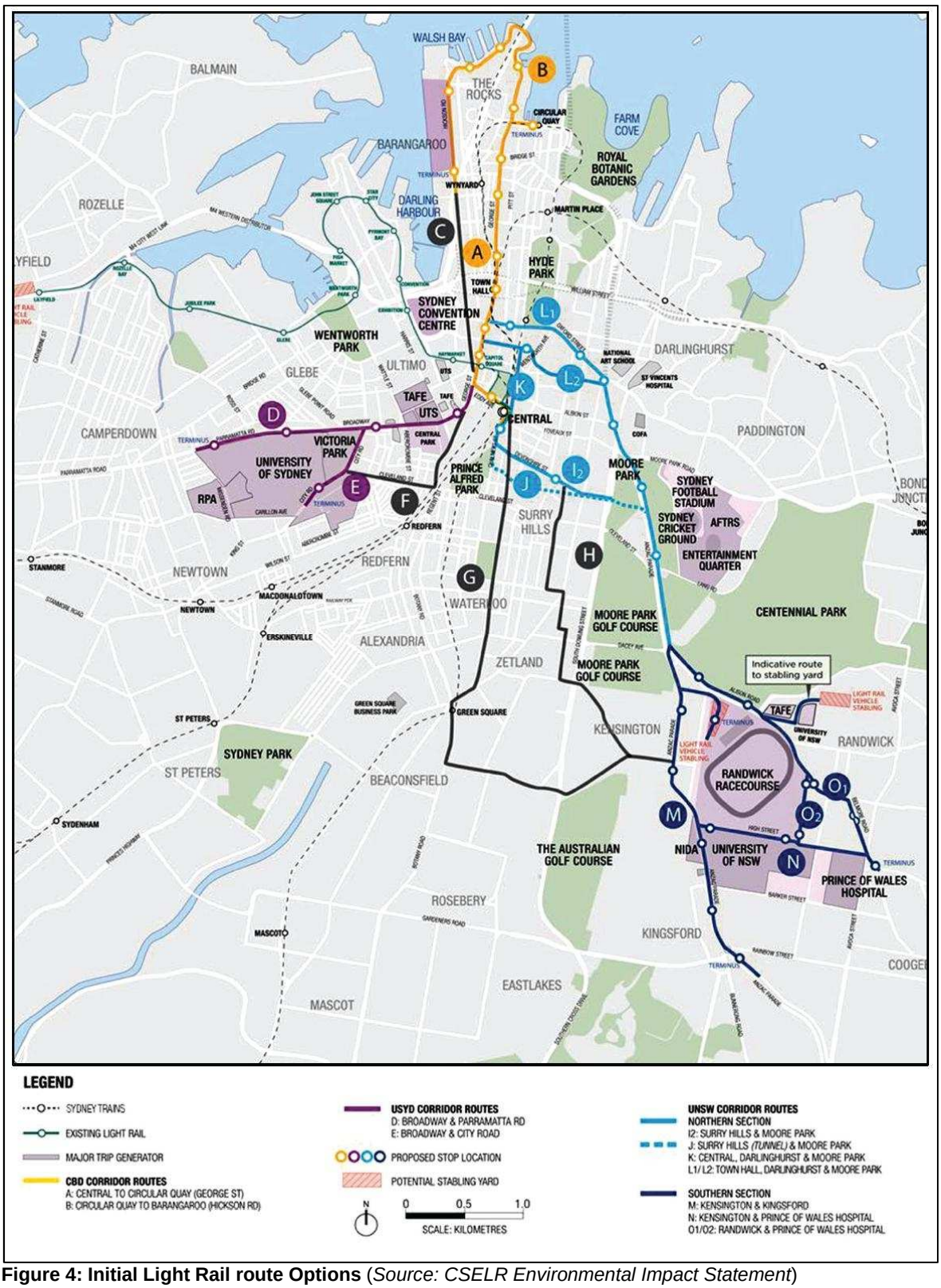


Figure 4: Initial Light Rail route Options (*Source: CSELR Environmental Impact Statement*)

The Applicant's preferred route for the light rail is illustrated in **Figure 1**, summarised in **Section 2.1** of this report and set out in detail in the EIS, Response to Submissions and Preferred Infrastructure Report documentation at **Appendix C**.

Detailed Design

Stage 3 of the Strategic Options Assessment process was guided by a range of principles which required further investigations into a number of matters including identifying the alignment of discrete sections of the route, developing stop and interchange locations, configurations, design and function and designing stabling and maintenance facilities including their locations and operational layouts. For example, stop locations were identified as needing to optimise user accessibility, minimise land acquisition, be compliant with the *Disability Discrimination Act 1992* (DDA) and other legislation and to minimise environmental impacts.

This final stage of the route selection process encompassed detailed analysis of several discrete sections of the alignment. These included analysis of the alignment through Moore Park (via tunnel or bridge/viaduct), the alignment between Bourke Street and Moore Park (in the vicinity of the Olivia Gardens apartment complex), the alignment along Wansey Road, the location for the Randwick Interchange (High Street vs High Cross Park) and the location and configuration of the Kingsford interchange. Other components of the proposal such as the specific locations for the stabling and maintenance facilities were also considered.

Consideration

More than a quarter of all public submissions received (26%) raised issues about the preferred route, indicating a preference for different route options.

In particular, the proposed route through Surry Hills and Wansey Road generated a number of concerns. The proposed demolition of the Olivia Gardens apartment complex in Surry Hills also generated concern, with 13% of submissions received on this issue.

The location of the Randwick Transport Interchange is a significant issue for Randwick Council and the community. Randwick Council and other stakeholders indicated a strong preference for locating the interchange in High Street rather than the currently proposed High Cross Park location. In addition, there are concerns regarding the Kingsford Transport Interchange location and its configuration. Many community members also sought an extension of the line to Maroubra and beyond rather than terminating at Kingsford. Other stakeholders, including the Souths Juniors Rugby League Club (located adjacent to the proposed Kingsford Transport Interchange) are concerned about loss of parking resulting from the construction and operation of the proposal.

The location of the Randwick stabling facility and the associated amenity impacts has also generated significant concern, particularly for Randwick Council and the residents along Doncaster Avenue. There have also been representations made with respect to the Lilyfield maintenance facility, noting a preference for the relocation of the facility to the western side of the Catherine Street bridge, and/or combining this maintenance facility with the proposed Randwick stabling facility.

The location of the UNSW High Street/Wansey Road stop is also contentious, particularly as it relates to potential interference with sensitive equipment located at UNSW and Health Infrastructure's cancer treatment facility currently under construction.

Finally, there have been several requests in submissions for additional stops along the alignment including another stop on George Street between Wynyard Station and the Queen Victoria Building, another stop at Wimbo Park in Surry Hills and an additional stop on High Street, Randwick to provide greater accessibility to users of the Randwick health precinct.

Overall, the Department considers that the Applicant has undertaken an appropriate and comprehensive route selection and evaluation process to identify the preferred alignment. The Department notes that investigations were undertaken to identify possible route alignments at both a macro and micro level, with appropriate criteria and objectives guiding the process. The Department is satisfied that the Applicant's route selection process has been rigorous, and that the optimal alignment has been identified.

More specifically, with regard to the alignment of the proposal through Surry Hills, the Department has considered the options for traversing a light rail through this densely populated and highly urbanised

area closely. It should be noted that the Department does not support tunnel options that effectively bypass Surry Hills. These options fail to recognise Surry Hills as an important destination. The Belvoir Street Theatre and Surry Hills restaurants are examples of the precinct's unique attractions and potential destinations for passengers.

Further, the Department does not consider a Foveaux Street alignment (via a cut and cover tunnel option or surface alignment) is viable. Foveaux Street is known to have significant engineering constraints for light rail given its steep gradient. The Department notes that this is contrary to one of the three key criteria which guided the route selection process. Further, Foveaux Street carries significant volumes of road traffic, and diversion of this traffic for both construction and operation would be problematic.

The Department closely reviewed alternative alignments focussed around Oxford Street (refer Options L1, L2 and K at **Figure 4**). One of the key challenges with an Oxford Street alignment is that it would not provide a competitive travel time to the UNSW which is one of the key destinations. In addition, the Department understands that there is strong demand from passengers in Sydney's south-east to get to Central station. The Oxford Street option(s) would not address this demand directly, with most of the options focussed around Town Hall station as the key transport interchange rather than Central. The Department acknowledges that an Oxford Street light rail alignment could have provided significant benefits to the regeneration of one of the city's main boulevards, however, it notes that this option also has significant constraints. If the light rail were to run along Oxford Street, buses from Bondi Junction and a number of other Eastern suburb locations would still need to continue to use Oxford Street, along with general vehicles and other road users, and this would inevitably result in conflicting capacity issues. Notwithstanding, the Department considers that the provision of light rail along Oxford Street should not be ruled out of any strategic planning that may occur around expansion of the light rail network. An Oxford Street alignment may well prove to be viable in the future, particularly for access to the eastern suburbs.

The use of Devonshire Street in the preferred alignment presents some design challenges and constraints, particularly in relation to potential noise impacts to adjoining residences and other sensitive receivers. However, the Department is confident that these issues can be managed to an acceptable level (refer to **Section 5.4**).

The Department is also mindful that the preferred alignment through Surry Hills would result in the demolition of the Olivia Gardens Apartment Complex comprising 69 residential apartments. The significance and potential impact of this possible relocation for the owners and occupants of the complex is acknowledged by the Department. It is noted that they will be compensated under the *Land Acquisition (Just Terms Compensation) Act 1991*. The 10 discrete route alignment options in the vicinity of the Olivia Gardens complex have been considered closely in the assessment process. The Department has concluded that the Applicant's preferred alignment effectively through the centre of the complex is optimal and justifiable. The Department considers there are broader public interest issues served by this option. These include provision of efficient public transport/light rail services to both the surrounding and wider community, and the creation of a significant new area of public open space (the new Wimbo Park) in the inner city.

Traffic circulation issues around Parkham Lane (adjoining the new Wimbo Park) and at Circular Quay (at the lower end of Pitt Street and Reiby Place) along with other finer design/alignment options have also been considered in the assessment process. For instance, there has been a suggestion that traffic lights on the crossing of South Dowling Street could be synchronised with a new set of traffic lights at Wimbo Park to allow general vehicle access to South Dowling Street from Parkham Lane and Parkham Street (where the Bourke Street public school drop off area is located). Whilst a possibility, this kind of arrangement would be technically challenging (given the changing ground levels) and could lead to an unacceptably lengthy delay to the traffic on South Dowling Street as the Light Rail vehicles would need to traverse a greater distance at this crossing. This is not considered an optimal outcome. Notwithstanding, options such as this and that at Circular Quay may be explored further through the detailed design process.

The Department acknowledges that the alignment of the light rail through Randwick, particularly along Wansey Road has been of great concern to the local community. At the same time, the Department is mindful of the strategic drivers for the proposal, including the desire to provide UNSW with an efficient and reliable public transport solution. Route options not involving Wansey Road, for example a route that runs along Belmore Road (option O1 at **Figure 4**) would not provide a direct access to UNSW for

the large number of university student/staff passengers. The Department agrees with the Applicant that the Wansey Road alignment is optimal and notes the Applicant made changes to the alignment within Wansey Road in response to concerns raised by the community and Council during the exhibition process. The Department is supportive of these refinements to the alignment.

The Department also acknowledges that the location of the Randwick interchange is a very significant issue for the community, Randwick Council and other stakeholders and notes the general preference for locating the interchange on High Street rather than the proposed High Cross Park. The Department has explored this issue in detail. The Department notes that a High Street stop/interchange option would have significant benefits, including providing excellent accessibility to the Prince of Wales Hospital. In addition, if the interchange were in High Street there would obviously be minimal disruption to High Cross Park, which is acknowledged as being highly valued by the community and Randwick Council.

Conversely, the Department notes that a High Street interchange would mean that the significant amount of commuters travelling by bus from the South East to the city would need to hop off the bus at High Cross Park, traverse the park and cross Avoca Street to then transfer to light rail to continue the journey into the city. In short, the Department considers this a sub optimal transport solution. The overall function of an interchange is to make the transfer between modes as seamless and efficient as possible. Locating the interchange in High Street would mean the majority of passengers, being city commuters would be inconvenienced, travel times would be compromised and inherent inefficiencies would be created in the system. Whilst it is acknowledged that the passengers travelling to the hospital precinct which is a significant minority of the passenger split; would need to walk several hundred metres further if the interchange were in High Cross Park, the Department believes that on balance, a transport interchange at High Cross Park is the optimal transport solution given that it provides a more efficient service for the vast majority of passengers.

The Department acknowledges that the location and configuration of the Kingsford Interchange has also been of concern to the community and Randwick Council. The Department understands the concern is principally related to loss of public car parking (currently located in the Anzac Parade median) where the interchange is proposed, along with a preference for extending the light rail line further along Anzac Parade to Maroubra Junction and even beyond. The Department suggests that an extension of the light rail towards Malabar may well be viable in the future, however, notes that such an extension does not form part of this application, nor part of this assessment.

In relation to the loss of parking that would result from locating the interchange on the Anzac Parade median at Kingsford, the Department is also concerned about this issue, and as a consequence, has recommended a condition of approval requiring TfNSW to provide replacement parking in the vicinity of the interchange in consultation with Randwick Council. This issue is discussed further in **Section 5.3** of this report.

The location and configuration of the UNSW High Street/Wansey road stop has also been contentious for a variety of issues. UNSW has raised concerns regarding potential impacts from vibration and electro-magnetic fields during the construction and operation of the proposal on its sensitive research equipment at the Lowy Cancer Research Facility and the Wallace Wurth building. In addition, UNSW has concerns regarding the capacity and configuration of the platforms for this stop. The Department further notes that both UNSW and Randwick Council are supportive of turning High Street (between Botany Road and Wansey Road) into a pedestrian zone and that this may resolve the issues raised by UNSW.

As part of the Preferred Infrastructure Report, the Applicant relocated the stop from Wansey Road to High Street. The Department is supportive of this outcome as it reduces impacts to the racecourse lands and provides better access arrangements for the University. This option however does bring the stop closer to the Lowy Cancer Research Facility but the speed of the LRVs in this location would be reduced thereby influencing and potentially reducing electromagnetic fields. Whilst the Department recognises the concerns regarding electromagnetic fields and vibration, the Department is confident these issues can be managed through detailed design and implementation of mitigation measures. The Department has recommended strict conditions around the issue. Refer **Section 5.4** for further discussion.

The Department recognises that turning High Street Randwick into a pedestrian zone (from Wansey Road to Botany Road) could have significant benefits, including the possibility of achieving a high

quality urban design/plaza outcome and completely dispensing debate regarding platform capacity. At the same time, the Department accepts that a pedestrian zone at this location is not strictly required as part of the proposal, and presents various traffic challenges that would take time to resolve. Therefore the Department does not want to preclude the pedestrianisation of this area in the future and has recommended a condition accordingly. Also, the Department notes that in Randwick Council's final 'Light Rail Urban Design Guidelines' Council suggested the High Street stop be moved closer to the corner of Botany Road and High Street. The Department agrees that moving the stop to this location could potentially service the residential areas around Botany Road more efficiently, but it would move the stop away from one of UNSW's most significant gateways/entry points. The Department considers the current location of the High Street stop preferable.

With respect to the location of both the stabling and maintenance facilities for the light rail vehicles, the Department notes at the outset that finding suitable sites that can accommodate these facilities in close proximity to the preferred alignment is challenging. The Department further notes that submissions made in respect to the Randwick stabling facility focused around the potential amenity impacts from the facility. The Department has reviewed the Applicant's options analysis for the stabling facility and accepts the points and conclusions made in the assessment. The Department notes that the alternative Wansey Street/ High Street stabling facility site suggested by the Doncaster Street residents and other stakeholders has some advantages, however, this site is not without constraints. The site's topography may provide some screening to adjacent residences, but it does present unique engineering challenges, that would be difficult and perhaps prohibitively expensive to overcome as a part of the proposal.

The Department has also analysed the location of the proposed maintenance facility in Lillyfield and accepts that the proposed location is optimal. The Department recognises there is insufficient land to combine both the maintenance facility and stabling facility at this location. In addition, the Department recognises that it would be difficult to locate the maintenance facility on the western side of the Catherine Street bridge as the configuration of the Catherine Street bridge pylons presents too many challenges in track and LRV access. Further, the shape and size of the land parcel on this side of the bridge is not optimal, as the parcel is too small to accommodate the maintenance facility..

Some submissions suggested additional stops along the alignment including, Wimbo Park, Surry Hills, an additional stop on George Street between the Queen Victoria building and Wynyard station along with some suggestion of an additional stop on High Street, Randwick outside the Prince of Wales hospital (which is largely related to the Randwick interchange issue discussed above). The Department accepts that the Applicant has presented an application with a sound assessment of preferred stop locations and spacing between stops. The Department notes that the proposal (if approved) would likely be delivered by a 'Public Private Partnership' (PPP) arrangement. If for any reason the private partner formed an alternative view with regard to additional stops or stop location, this proposal would be subject to a consistency review and/or separate application process.

The Department suggests that the process of identifying a preferred alignment for a significant piece of surface infrastructure that runs through the heart of Sydney and some of its most densely populated suburbs is always going to be challenging. However, the Department believes the Applicant has undertaken a credible route selection process, and is satisfied that the preferred alignment is optimal.

5.2. Public Safety

Safety was raised as a key issue in submissions received during the exhibition of the proposal and is the paramount consideration for the NSW Government. As part of the EIS, the Applicant provided an assessment on the safety of all road users including pedestrians, passengers, operators and the general public during both construction and operational phases of the proposal.

The Applicant has indicated that temporary impacts on pedestrians, cyclists and other road users would be likely during the construction phase however this would be managed through the preparation of relevant Construction Environmental Management Plans. During operation of the proposal, the Applicant has indicated that LRVs would form part of road traffic and drivers would be required to have regard to the NSW road rules and give consideration to traffic signals and other road users (including pedestrian movements). This would involve driver judgement including monitoring the LRV speed and using service brakes when required. A preliminary contingency plan has been provided in the EIS which establishes actions to be taken in the event of an emergency.

Approximately 53% of all LRV passengers are predicted to arrive by bus and board the light rail at the interchanges. The two most critical interchanges from a safety perspective are the Kingsford Stop and the Randwick Stop. The Kingsford Stop is proposed to be located between the north and southbound carriageways of Anzac Parade and the indicative design includes integrated bus stops, minimising the need for passengers to cross Anzac Parade. The location of the Randwick Stop is at High Cross Park being a triangular parcel of land with direct bus stop access. Existing traffic signals would enable passengers that are not transitioning to/from buses to cross Avoca Street, High Street and Belmore Road to continue to their final destinations.

The EIS and Preferred Infrastructure Report also include consideration of public safety in the Moore Park precinct, the Royal Randwick Racecourse Stop and the UNSW Anzac Parade Stop given the predicted high volumes of passengers at these stops. As a result of submissions received during the exhibition period, the Applicant made a number of amendments including a new pedestrian bridge over Anzac Parade near the Moore Park Stop (to cater for crowd dispersal from events and to improve safety of students at nearby Sydney Boys and Sydney Girls High Schools), and reconfiguration of the UNSW Anzac Parade Stop to improve safety for university students and staff.

Figure 5: Anzac Parade pedestrian crossing, UNSW *(Source: CSELR Environmental Impact Statement)*

Consideration

Public safety is of paramount importance to the NSW Government both during both construction and operation of the proposal. The EIS addresses a number of aspects that relate directly and indirectly to safety. The Applicant has also included a commitment to prepare and implement operational management plans and emergency contingency measures that are to be further developed by the future operator.

Construction

The Department notes that the proposal has the potential to impact on road users including pedestrians, cyclists, motorists and buses at various stages and for various durations during the construction phase. While these impacts cannot be avoided they can be minimised and mitigated to an extent that is reasonable for those directly and indirectly affected.

The existing CCTV network covers a large proportion of the proposed route alignment which may be at risk of being impacted during construction. To mitigate this potential impact and to ensure the existing network is maintained at all times (including precautions for work near underground cables,

positioning of ancillary construction equipment and layout of ancillary facilities), the Department has recommended a condition of approval to ensure public safety and security is maintained at all times.

Additionally, the Department has also recommended a number of conditions requiring the preparation of Construction Environmental Management Plans (and relevant sub plans), Community Communication Strategy and Construction Business Management Plan to manage any adverse impacts on road and pedestrian safety. These plans will ensure that any inconveniences to road users would be mitigated to the greatest extent practicable (eg installation of directional signage, temporary lighting, ramps (for pedestrians/cyclists), hoardings, traffic controllers etc).

Operational

The Department considers that for the City Centre precinct, the key safety issue relates to the pedestrianisation of George Street, between Hunter and Bathurst Streets. It is noted that for this section, the proposed footpath would generally be wider than the existing footpath, providing a more comfortable space for pedestrians. The pedestrianisation of George Street includes the provision of a larger shared space which allows for light rail, delivery vehicles and some local access. The EIS notes that initially, there may be some start up risks associated with this pedestrianised zone while people adjust to the new shared environment.

Pedestrian safety would also be improved along this section of George Street primarily due to the widened footpaths, and greater degree of safety/reduced risk and uncertainty associated with LRVs being confined to rails compared to the existing congested traffic environment comprising buses, taxis and private motor vehicles. Furthermore, the management of LRVs through pedestrian zones has been successfully demonstrated both domestically and also internationally and drivers of LRVs would be required to drive to the conditions, anticipate stops and use regular service brakes and warning bells where required. The Applicant has indicated that the maximum speed of LRVs in this section would be 20km/h, which is the same as the Haymarket section of the existing network. This speed limit would provide more reaction time for drivers of LRV vehicles and reduce the risk of collisions between pedestrians and LRVs.

Notwithstanding, and in light of concerns raised in relation to pedestrian safety in pedestrian zones, the Department has recommended a condition to set parameters on the use of these zones, limiting use to authorised vehicles only, with pedestrians having priority over all vehicles (except LRVs). It also notes the Applicant would undertake a road safety audit for each design stage (approved by the relevant authorities), taking into consideration the safety of pedestrians.

The Moore Park precinct includes the Moore Park Stop, which services the Sydney Football Stadium, Sydney Cricket Ground, the Entertainment Quarter and also the Sydney Boys and Sydney Girls High Schools. The Department considers the use of this stop during events could result in overcrowding and resultant safety issues for passengers. It is noted that the stop has been designed to cater for major events with a 90 metre platform (for extended LRV configurations), the inclusion of a central marshalling area for the queuing of passengers, and stairs and ramps distributed evenly along the platform for even loading of passengers. While the Department is satisfied that platform safety has been adequately considered by the Applicant, a condition has been recommended requiring the preparation of a Special Events Plan detailing how patrons would be managed during special events (including consideration of the need for marshals) to further minimise risks to pedestrians/passengers.

Additionally, in light of submissions received during the exhibition of the EIS, the Applicant has committed to constructing a pedestrian overpass to improve the safety of students from Sydney Boys and Sydney Girls High Schools accessing the Moore Park Stop. This bridge would remove the need for students to cross Anzac Parade at-grade and improve accessibility of this stop. The new bridge would also result in a safer and more efficient method of crowd dispersal following events in the Moore Park precinct. The Department considers this design refinement to be a welcome safety improvement for this aspect of the proposal.

Similar to the Moore Park Stop, the Royal Randwick Racecourse Stop in the Randwick precinct raises similar concerns relating to platform overcrowding for race/event days. There are two key differences when compared to the Moore Park Stop; there is an existing large forecourt area that would effectively accommodate high volumes of passengers; and access to the stop is at-grade, improving accessibility and efficiency. This stop would also be adjacent to kerbside bus and taxi services (on Alison Road). The Department has recommended the preparation of Special Events Plan. The aim of the Special

Events Plan is to describe how light rail patrons would be managed to and from Moore Park and Royal Randwick Racecourse during special events, and include consideration of the need for crowd marshals on platforms and additional/dedicated services or extended LRV configurations. The Plan would be prepared in consultation with the relevant stakeholders (Police, RMS, Council etc) and be made public once finalised.

With the inclusion of the recommended condition relating to the Special Events Plan, the Department considers that safety risks to patrons, pedestrians and passengers would be reduced compared to the existing situation.

The UNSW Anzac Parade Stop would also need to cater for large volumes of pedestrians and passengers due to its proximity to the lower campus of the university, the National Institute of Dramatic Arts and surrounding student accommodation. The Applicant has indicated that this stop would be one of the busiest on the network and would experience high volumes of passengers during the AM and PM peak periods. In response to comments made by UNSW during the exhibition period, the Department acknowledges the Applicant's amendment to relocate the stop to the centre of Anzac Parade just north of the University Mall crossing of Anzac Parade which would provide better integration with UNSW's masterplan for the lower campus and would result in improved safety for staff and students. Additionally, it is also noted that new indented northbound and southbound bus bays have been included in the Preferred Infrastructure Report confirming the Applicant's commitment to safety at this stop.

Both the Kingsford interchange in the Kensington precinct and the High Cross Park interchange in the Randwick precinct present similar safety issues. The majority of passengers at these stops would be transferring to/from buses therefore the pedestrian connections are important from a safety perspective. The Department is satisfied that in both cases, adequate regard has been given to pedestrian safety for those transitioning between different modes of public transport. Where passengers alight at the High Cross Park Stop for UNSW, Prince of Wales Hospital, Belmore Street existing signalised intersections would enable the safe crossing of Avoca Street, High Street and Belmore Road, subject to future upgrade works. To assist in the finalisation of the detailed design these interchanges, and to ensure the safety of passengers, the Department has recommended the submission of a detailed plan for each of these interchanges be prepared in consultation with relevant stakeholders prior to the commencement of construction.

The Department has recommended the submission of a Stop Access Plan for all stops on the network be prepared in consultation with the community, business and urban domain reference groups and major landholders (where relevant) prior to the commencement of construction. The Stop Access Plan would determine the final design of not only these interchanges but all Stops on the network (including associated infrastructure). A key aim is to ensure all Stops are designed to ensure public safety, efficiency and convenience is maximised. The Plan would also describe the delivery and implementation program and be made publicly available prior to the commencement of construction.

The Stop Access and Design Plan addresses the issue of platform capacity. Platform capacity is an issue raised by a number of submissions during the exhibition period and specifically whether adequate regard has been given to the platforms being able to accommodate the predicted passenger demand during AM and PM peak times, and during special events. The UNSW submission on the Preferred Infrastructure Report included platform size calculations, level of service calculations and a road safety audit. It also included guidelines from London, UK (overground and underground), and Victorian rail guidelines to support their conclusions. UNSW's main concern is that the proposed platforms have not been designed with adequate space for passengers and would result in a safety issue for students and staff using this stop.

The Department notes the conclusions and comments made by UNSW, and is aware of the differing methods used by the Applicant and UNSW in calculating platform space requirements. The Department acknowledges, safety comments and the concerns raised in submissions received during the exhibition period, and has recommended a conditions requiring the preparation of a Stop Access and Design Plan and a Pedestrian and Cyclist Network and Facilities Strategy. These plans, together with the Urban Design and Landscape Plan, would inform the final design of the stops and associated infrastructure. It is expected that specific issues such as transport and access facilities and services, including safety, patronage changes, connecting footpaths, cycleways, passenger facilities, parking, traffic and road changes, and integration between current and proposed public domain and transport

initiatives for each stop will be addressed. These plans would require consultation with relevant stakeholders.

Another consideration is Crime Prevention Through Environmental Design (CPTED). The Department acknowledges the Applicant has provided an assessment of the proposal against these principles, but also notes a more detailed assessment would be undertaken for each stop during the detailed design process. A condition has therefore been recommended requiring each stop to be subject to a detailed assessment of CPTED principles. It is also noted that the preliminary contingency measures provided as part of the EIS would be further developed by the future operator, who would be responsible for passenger and driver safety and also implementing active and passive security along the route including stops.

The Department acknowledges that a number of submissions raise concerns over the level of information provided in the EIS in relation to road safety during operation of the proposal. While a number of concerns have been resolved by the Applicant in its Preferred Infrastructure Report, some residual concerns remain. In considering the residual concerns, a number of conditions have been recommended including the preparation of the Stop Access and Design Plan, Pedestrian and Cyclist Network and Facilities Strategy and Urban Design and Landscape Plan. Further, the Department is recommending the Applicant prepare an Operational Performance Audit within 12 months of the completion of construction. This would assess the environmental performance, including safety audits of the operation of the proposal, and review the effectiveness of environmental management measures. This audit would ensure that any unforseen safety issues are addressed in a timely manner.

Overall, the Department is satisfied that the Applicant has given adequate regard to the safety impacts associated with the proposal during construction and operation. The proposal would provide contemporary and efficient public transport and associated stops, and would reduce risks by improving road safety along the route during operation, particularly within the pedestrian zone on George Street, and around the Moore Park Stop, Royal Randwick Racecourse Stop and UNSW stops. Further, the Department considers the proposal would also result in improved road safety for all road users due to reduced traffic congestion, particularly in the CBD and around the UNSW, and is supported on safety grounds.

5.3. Traffic, Transport and Access

The assessment of Traffic, Transport and Access impacts includes a Transport Operations Report (TOR) and a Construction Traffic Management Plan (CTMP).

The CSELR proposal will introduce traffic, transport and access interruptions and changes during construction and operation. Ongoing planning strategies relevant to the CSELR proposal have been prepared by the NSW Government to describe the future requirements of the expanding city centre. The *NSW Long Term Transport Masterplan* provides the framework for an improved transport system, whilst newer strategies, such as the *Sydney City Centre Access Strategy* and *Sydney's Bus Future* provide the framework for redeveloping the CBD and South East network to deliver more efficient transport systems.

Upon commencement of CSELR services, there is expected to be an overall decrease in traffic congestion, reduction in buses and an increase in public transport capacity that will enable future population growth in the South East region of Sydney. Given this, and the mitigations and management measures proposed, the Department considers that the CSELR represents a net environmental benefit and a positive public transport outcome for the wider community.

Key traffic, transport and access issues associated with the construction phase of the proposal include:

- traffic impacts to the local and regional road network, which may affect travel times, public transport operations, pedestrian and bicycle access and safety;
- permanent loss of a significant amount of kerbside parking and associated impacts on property access and businesses;
- impacts to the public domain, particularly by construction compounds required for the CSELR; and
- cumulative traffic impacts created from the simultaneous operation of 11 construction sites and construction of unrelated projects.

Construction of the proposal involves movement of extensive amounts of spoil, fill, equipment, machinery and infrastructure. This would include heavy vehicle haulage of up to 210,000 tonnes of material and the delivery of construction vehicles and plant such as dump trucks, cranes, concrete mixers and project materials to and from site compounds. In addition, it would necessitate large numbers of heavy vehicles on roads servicing construction compounds and site specific works along the corridor. Road closures and access changes would generate traffic congestion and cause delays to public and private transport, and will inconvenience property owners, pedestrians and cyclists. The resultant construction requires reallocation of road space between transport modes, kerbside uses and travel lanes.

Key traffic, transport and access issues associated with the operation of the proposal include:

- potential increases in traffic congestion, changes to intersection capacity, the creation of "rat runs", and traffic impacts resulting from potential vehicle breakdowns, permanent road closures, consolidation of right turns and increased signalisation;
- changed access arrangements for pedestrian and bicycle networks, business and property owners, access to and around Light Rail stops, interchange accessibility, and adequacy of inter-modal transfer;
- permanent loss of parking and changes to public transport arrangements; and
- safe integration between pedestrians, cyclist, vehicles and the CSELR.

For most sections of the CSELR alignment, LRVs would operate within a dedicated road corridor, which other vehicles would not be able to access. The only exceptions to this are within the George Street shared zone, and along a section of track from Anzac Parade and Alison Road, where buses and light rail would share the existing bus lane. Additionally, general vehicles would only be permitted to cross the light rail tracks at signalised intersections.

CBD Precinct

Given that construction activities will be undertaken in a heavily urbanised environment, impacts to traffic congestion in the CBD and surrounds are expected to occur. The EIS states that both George Street and Rawson Place have traffic volumes in excess of 2,000 vehicles during both the AM and PM peaks made up largely of light vehicles (a significant number of which are taxis). George Street carries up to 290 buses in the peak direction during the AM peak which is predicted to increase to over 310 by 2015. A large proportion of the traffic on George Street during the AM peak comprises city-bound movements (70%), while the PM peak volumes on George Street are more evenly distributed. Eddy Avenue has a relatively even distribution of city-bound and outbound traffic movements during both the morning and afternoon peaks.

Modelling of speed, volume and intersection performance during peak construction predicts satisfactory performance during the AM peak period, however the PM period conditions may present substantial traffic delays in the CBD, particularly given the predicted decrease in average speed for buses. Construction will impact on the performance of the intersections in the AM peak particularly in the mid-city area, along Park, Market, College and Hunter Streets. Proposed altered traffic arrangements during construction are summarised at **Table 8** below.

Table 8: Changes to traffic during construction and operation in the CBD precinct

Construction	***Operation***
• Closure of Alfred Street between George Street and Loftus Street, for access to the construction compound at First Fleet Park; • Pitt Street converted to two-way north of Bridge Street for local property access. Access maintained from the east via Loftus Street and Reiby Place; • George Street entrance to Jamison Street closed with access and egress via York Street provided; • Bond Street closed at George Street, with a 'no stopping restriction' proposed on approach to George Street to permit cars and vans to turn around for entry/exit to Pitt Street; • North of Liverpool Street, George Street would be closed to general traffic with only local and emergency access permitted. South of	• Pitt Street converted to two-way north of Bridge Street for local property access. Access maintained from the east via Loftus Street and Reiby Place; • Turning circle provided at the northern terminus of Pitt street; • Hunter Street converted to two-way between George and Pitt Streets enhance east-west connectivity; • Remove existing traffic lanes along Chalmers Street between Randle and Elizabeth streets and replace with a pedestrian zone; • Maintain Randle Street as a northbound-only traffic lane, providing three lanes of traffic including a single bus-only lane; • Use of Elizabeth Street as a traffic bypass route; • Closure of Rawson Place to general traffic; • Between Rawson Place and Hay Street, two

Construction	Operation
Liverpool Street, a general traffic lane maintained in each direction; • Part of Chalmers Street, and all of Devonshire Street closed to general traffic with only local and emergency access permitted; • Relocation of the coach station and bus lane along Eddy Avenue to the Western Forecourt on Lee Street and Chalmers Street; • Closure of Rawson Lane at Rawson Place; and • Closure of Chalmers and Rawson streets to buses.	northbound and a single southbound traffic lane provided on George Street; • Between Hay Street and Liverpool Street, two northbound lanes provided on George Street; • The northbound approach to Bathurst Street would operate with two right-turn lanes; and • Between Hunter and Grosvenor Streets, a single northbound lane and no southbound lane provided.

Servicing of construction compounds along the alignment, at First Fleet Park and Belmore Road near Eddy Avenue would generate traffic impacts. Road closures and changes around Circular Quay may result in traffic increases on Loftus Street, Pitt Street and Reiby Place, although this would be limited to local traffic accessing the businesses and car park in the northernmost block of Pitt Street.

Special events such as Anzac Day and St Patricks Day marches, the Vivid festival and New Year's Eve events may be impacted during construction. The Applicant has committed to timing construction works to minimise impacts to these events. In addition, weekend works would not be permitted at these times.

Key impacts to traffic from the operation of the CSELR will mainly derive from the reduction in traffic lanes required to accommodate the CSELR including the George (between Hunter and Bathurst Streets), Alfred and Chalmers Street pedestrian zones. Restricted vehicle access would apply to these pedestrian zones, and would allow access only to residents, light commercial deliveries (during restricted hours), and emergency vehicles, at a maximum speed of 10 kilometres per hour. Outside of the pedestrian zone George Street will generally consist of a single kerbside traffic lane in each direction with centre running light rail. The operational changes to traffic arrangements are summarised by **Table 8**.

Permanent road changes and diversions to alternate routes in the CBD will increase traffic volumes and intersection delays, particularly on intersections associated with Bathurst Street and Goulburn Street, and the Hunter Street and Grosvenor Street intersection (which will provide the key northern CBD east-west corridor). Substantial increases in bus and vehicular traffic volumes are expected on Castlereagh, Elizabeth and Goulburn Streets. Increased traffic is also expected on the supplementary north–south route provided by Macquarie Street, College Street, and Wentworth Avenue. Given that the standard traffic cross section for George Street includes a single lane in each direction, there is a subsequent risk to increase in traffic delays from incidents and vehicle breakdowns that could have effects across the broader network.

The Applicant considers that there will be a broader network benefit to traffic conditions in the CBD during operation. Modelling predicts that average bus and general traffic speeds will be maintained in the CBD precinct whilst fewer vehicles remain in the network at the end of the AM peak period, which indicates an increased level of vehicle capacity in the network for the operational scenarios. The ongoing re-design of the CBD traffic network, as documented in the *Sydney City Centre Access Strategy* and *Sydney's Bus Future*, are expected to identify further efficiencies in the network.

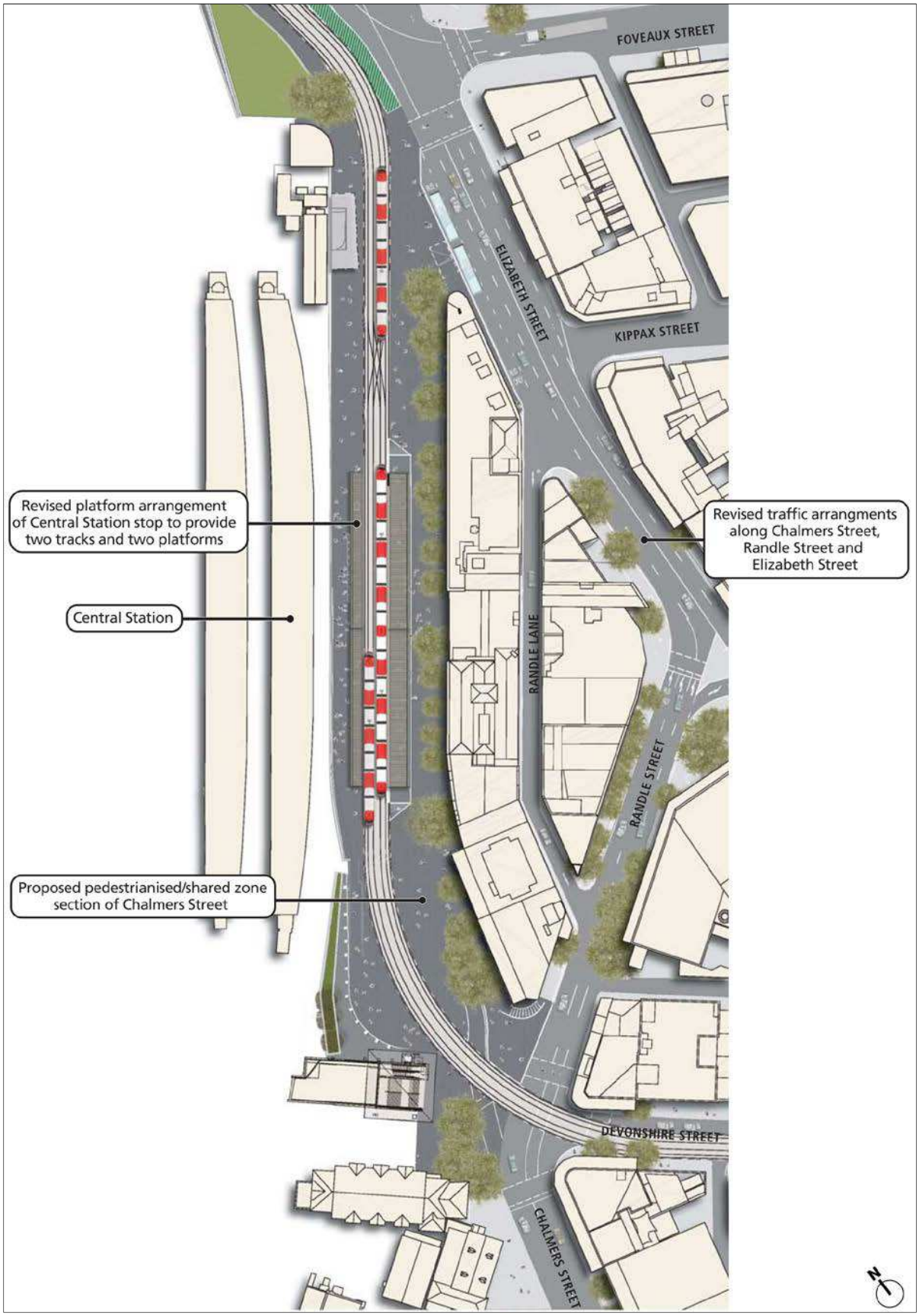


Figure 6: Chalmers Street stop and pedestrian zone

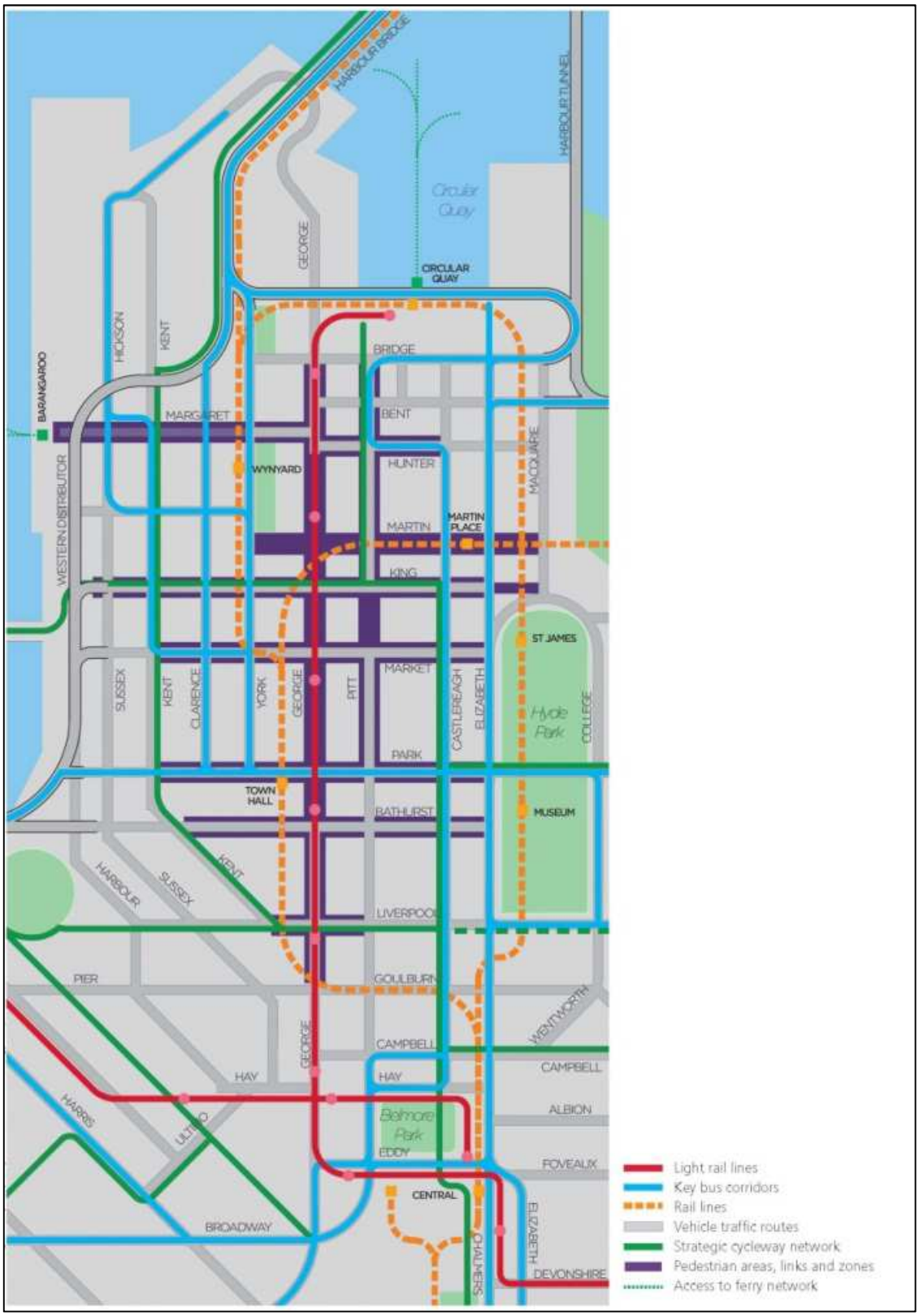


Figure 7: Redesign of City Centre Transport Access (Source: *Sydney City Centre Access Strategy*)

Construction and operation of the CSELR will also impact on commercial and private property accesses, such as private car parks, kerbside parking and loading docks and zones that access hotels, residences and businesses. No public car parks will be directly impacted by the CSELR.

Kerbside lanes along parts of George Street are currently used as bus lanes throughout the day until 8pm on weekdays. Outside of these hours, parts of these lanes are used as mail, loading and taxi zones, and on-street short term parking. During construction, all on-street parking or loading on

George Street will be removed as will access to driveways, but only where properties have other viable alternate frontages and access points. Various alternative locations for loading and taxi zones have been identified. A total of 63 kerbside spaces will be removed in the PM peak, whilst the Applicant has committed to retaining 158 kerbside spaces in the CBD precinct.

The section of the CBD between the George and Barrack Street construction zones (that includes Dymocks and Westfield access points), has the highest property access demand, with approximately 300 vehicles arriving and departing this zone between 7am and 7pm on a normal business day. Access to these locations would be maintained through the provision of a southbound lane on the eastern side of George Street, between King Street and Market Street, and in consultation with these business owners and Council.

Other access issues in the CBD include:

- changes to commercial, public and tour bus operations and access at Eddy Avenue during construction;
- changes to commercial access arrangements for Rawson Lane; and
- potential loss of parking capacity in the CBD to provide for construction staff parking.

During operation, the greatest access impacts will occur in the pedestrian zones of George, Chalmers and Alfred Streets. The Applicant commits to maintaining all existing access in the CBD affected by the CSELR, but notes that travel times and distances may be increased given the altered access arrangements and street closures required to necessitate the CSELR.

Rawson Place access issues would be resolved with the provision of a pedestrian transit mall, allowing multi modal access for passengers and pedestrians to businesses and transport transfers. The Applicant has committed to ongoing consultation with Council and RMS to ensure a refined design solution.

The Applicant predicts that general vehicle access restrictions and controls with appropriate exceptions would apply, and would be developed in consultation with affected parties on a case by case basis. The EIS maintains that access to the CBD precinct will be generally improved by implementation of the SSI.

Implementation of the CSELR will necessitate changes to the way buses access the CBD precinct, including the closure of George Street to buses and its discontinued use as the north-south transport spine of the CBD, as detailed in *Sydney's Bus Future*. The key issues include:

- bus network impacts and resultant traffic impacts from changes to routes, timetabling, and network integration; and
- changes to transport interchanges and bus infrastructure, including temporary changes to UNSW bus stops on Eddy Avenue during construction.

Prior to construction, all George Street bus services would be relocated as part of the redesign of the city centre bus network, as detailed in *Sydney's Bus Future*. New bus corridors to the east and west of George Street on York, Clarence, Elizabeth, Castlereagh Streets and Park/Druitt Streets will be created to accommodate the CSELR.

Given the locations of construction compounds, and the functional changes to the network, construction impacts would be greatest at Eddy Avenue, Chalmers Street, Rawson Place and the Park Street/Druitt Street/George Street intersection. Local bus diversions would be implemented to manage the impact on bus operations at the above four locations, and contingency measures detailed in the EIS would confirm that adequate replacement bus stop capacity is provided.

The Rawson Place stop will be a busy centre for transfers between light and heavy rail and buses during construction and operation. The EIS acknowledges the issues for pedestrian access at this stop location, and proposes mitigation measures to reduce pedestrian wait times at key intersections via mitigation measures such as signalling priority. These measures include provision for bus and light rail transfers to occur via cross platform interchanges, reducing conflicts between interchanging customers and footpath traffic.

The Eddy Avenue coach facilities would be relocated to the Western Forecourt on Lee Street and Chalmers Street during operation of the CSELR. Existing bus operations along Eddie Avenue would continue during construction, in particular the university express services would be maintained.

Both construction and operation of the CSELR proposal will have impacts on rail replacement and special event bus arrangements on Chalmers Street and Eddy Avenue as existing space used for layover and pick-up by rail replacement buses is required to accommodate the light rail corridor. Several alternative configurations are identified in the EIS within close proximity to their respective locations, including south of Devonshire Street. Where possible, rail replacement activities would be scheduled during weekends when no special events are proposed.

Figure 8: Indicative CBD stop shelter *(Source: CSELR Environmental Impact Statement)*

Provision of pedestrian and cyclist access in the CBD is considered a key issue. There are several networks of on-road and off-road cycleways in the vicinity of the proposed light rail corridor that may be impacted. East-West movements are expected to experience greatest impacts, however alternative routes, in line with those detailed in the *Sydney City Centre Access Strategy*, are expected to facilitate connectivity though the city. With the implementation of the CSELR, George Street, currently with an on-road cycleway, will no longer support a cycle route, however it is considered that there is adequate provision for alternate North-South cycle movements on adjacent roads.

Level of service for pedestrians is not expected to be greatly impacted by construction, as George Street traffic will be reduced to construction vehicles only. To facilitate pedestrian travel during construction, transverse pedestrian movements (i.e. pedestrian movements crossing the CSELR construction alignment) would generally be maintained at existing pedestrian crossing facilities either at signals or controlled by traffic controllers. Upon implementation of the SSI, the provision of pedestrian zones on George Street, Alfred Street and Chalmers Street will provide enhanced pedestrian amenity and will facilitate a significant growth in pedestrian movements in the CBD.

Surry Hills Precinct

Significant disruption to local traffic in the Surry Hills Precinct is expected. The EIS states that there is insufficient width on Devonshire Street to provide two-way traffic and the CSELR. During operation, Devonshire Street will be a single eastbound traffic lane open for vehicular traffic, with the exception of the section between Crown Street and Bourke Street, where one eastbound and one westbound traffic lane would be provided. Right turn movements heading south would be restricted to Elizabeth Street and Crown Street only. Intersections with Devonshire Street, including Buckingham, Holt, Waterloo, High Holborn and Clisdell Streets would be closed.

Devonshire Street would be closed prior to construction, which will create indirect impacts to traffic flow through the precinct. The eastern edge of Ward Park and the northern edge of Wimbo Park and Olivia Gardens are required for compounds to support construction activities along Devonshire Street

for the four-year construction period, which will have detrimental impacts on traffic during peak construction periods.

Elizabeth, Crown and Bourke Street intersections would remain open to traffic for the duration of construction. Construction at these intersections would be staged to allow traffic to pass adjacent to the worksites and ensure property and network accessibility is maintained. In addition, Cooper Street will be extended to Riley Street and Steel Street will be converted to a one-way southbound road.

The proposal includes a signalised at-grade crossing at South Dowling Street. Construction including bridge replacement and associated works will necessitate partial road closures of South Dowling Street/Eastern Distributor, however this would occur as staged night works due to the high volume of traffic on these roads and their importance to the function of the broader transport network. Proposed traffic diversion routes included in the EIS would be further refined in a Construction Traffic Management Plan and would be selected to provide the most efficient alternate routes available at the appropriate times.

Introduction of the CSELR crossing of South Dowling Street would result in a seven second increase in vehicle travel times on South Dowling Street during the morning peak, but expects that levels of service and queue lengths at the South Dowling/Cleveland and South Dowling Street/Moore Park Road/Fitzroy Street intersections would not be significantly affected.

The alternative east-west corridor provided by Cleveland Street and Foveaux Street may experience increased traffic volumes with the closure of Devonshire Street. Management plans will be prepared to mitigate impacts to these already congested corridors. The closure of Devonshire Street is likely to see increased traffic filtering through Surry Hills via Campbell, Hunt, and Goulburn Streets; however the total volume of through traffic will be slightly lower than would be expected without construction of the proposal.

The Applicant has committed to further refinement of alternative routes and local road connections during detailed design, and in consultation with relevant stakeholders including City of Sydney, RMS and the community.

The EIS identifies the inherit risks and challenges of constructing the CSELR in Surry Hills, and provides commitments to maintaining vehicle, pedestrian and cyclist access to all adjacent properties, including business and private residences, upon the closure of Devonshire Street. Nine vehicle accesses and driveways are present on Devonshire Street, with the majority located on the northern side of the road and are generally associated with local businesses, St Patrick's Business College and some residential driveways. Impacts to businesses, the childcare centre on Riley Street, Bourke Street Public School and St Peter's Catholic Church are likely to be adverse, especially for those with special needs. Residents of Northcott Estate may experience access disruptions due to its proximity to the CSELR construction zone.

Whilst access will be provided via traffic management and traffic control measures, residents within the Surry Hills precinct are likely to experience increased travel times and distances to access their properties. Upon implementation, access to all properties will be maintained, however this may be different to current access arrangements. Ongoing consultation would be undertaken with owners of properties with direct access onto the CSELR corridor to determine specific access arrangements where appropriate.

Kerbside parking will be removed from Devonshire Street to accommodate the CSELR, and works in this precinct will remove approximately 155 general car spaces, 5 disability car spaces and 15 loading zones. The EIS states that the loss of parking spaces would have the greatest impact on businesses along the Devonshire Street frontage and also on customers accessing childcare centres and medical centres in the Surry Hills precinct. The Applicant predicts that sufficient available parking will be retained within the precinct, and considers that sufficient latent parking remains in the surrounding streets. Notwithstanding, parking management measures would be further explored during detailed design of the proposal.

In addition, off-road and on-road parking at the Langton Centre will be removed. This is proposed to be replaced along the northern side of Wimbo Park. Access to the Langton Centre will be maintained at all times with alternative access arrangements provided during construction. These alternative arrangements, along with replacement parking, will be provided in consultation with the City of Sydney

and the Langton Centre management. Further, specific conditions require the Applicant to replace parking at the Langton Centre, Surry Hills, as well as maintain the existing kerbside parking alongside the Belmore Road medical facilities opposite High Cross Park, Randwick.

Connectivity and legibility for pedestrian and cyclist movement will be impacted during construction, with movements across Devonshire Street and to and from Moore Park and Central Station impacted. The Parkham Street bridge will be removed and relocated to the proposed light rail bridge approximately 50 metres to the north.

From the commencement of construction, cyclists will be prohibited from accessing Devonshire Street. The EIS further considers that the cross section of the alignment is too restricted to provide sufficient available width to accommodate a dedicated cycle facility (as represented by **Figure 7**). Alternative parallel cycle corridors with better connectivity to the CBD are identified, with Cooper and Arthur Streets considered the preferred permanent cycle route through Surry Hills. Arthur Street is classified as an on-road cycle route by the City of Sydney, connecting Surry Hills to Moore Park via an existing pedestrian/cycle bridge over South Dowling Street. Cooper Street would require pavement markings, paint and signage for better way finding to function as an on-road cycle route.

Figure 9: Perspective Anzac Parade *(Source: CSELR Environmental Impact Statement)*

It should be noted that the new Albert (Tibby) Cotter Walkway which is being constructed between the Sydney Cricket Ground and Surry Hills will provide a linkage to the existing cycleway located in Bourke Street. While some media reports indicate that Devonshire Street may be utilised as a cycleway, the light rail proposal along Devonshire Street would preclude the construction of a dedicated cycleway in this location. The configuration of Devonshire Street as part of the CSELR would include one traffic lane for eastbound traffic and two light rail tracks as well as pedestrian footpaths.

It should be noted that the new Albert (Tibby) Cotter Walkway which is being constructed between the Sydney Cricket Ground and Surry Hills will provide a linkage to the existing cycleway located in Bourke Street. While some media reports indicate that Devonshire Street may be utilised as a cycleway, the light rail proposal along Devonshire Street would preclude the construction of a dedicated cycleway in this location.

During construction, appropriate signposting would be required to direct cyclists from the crossing location at Devonshire Street and Bourke Street. The Cooper Street / Elizabeth Street intersection would also need to be reconfigured to be safer for cyclists. The reconfiguration of Randle Street would allow for two-way cycle movements, which will connect Cooper Street to Prince Alfred Park in the inner south and Belmore Park in the southern CBD.

In developing these temporary diversions, the EIS states that consideration has been given to the suitability of alternative routes based on the road environment and current function. Alternative cycle

routes would continue to be reviewed by the relevant roads authority with input from local bicycle user groups and from the local community, prior to their implementation.

Moore Park Precinct

The Moore Park tunnel is proposed to be constructed as a cut-and-cover tunnel under Moore Park and Anzac Parade, with portals in Moore Park west, directly adjacent to South Dowling Street, and Moore Park east, adjacent to Anzac Parade. Approximately 68 000m^3 of soil and rock would be excavated, necessitating stockpiling sites at construction compounds located for each portal. During peak construction a maximum of 113 heavy vehicle trips per day would occur, however Anzac Parade would remain open at all times. The Albert (Tibby) Cotter Walkway, approved on 14 May 2014 under a separate planning proposal by the RMS, is proposed to be constructed adjacent to these works, therefore management measures from cumulative construction impacts would have to be implemented.

The assessment acknowledges that construction activities to facilitate the CSELR cut-and-cover tunnel may impact on pedestrians, cyclists and park users, however considers that construction staging and other management measures will minimise impacts to these groups. Management measures identified to limit the impacts to arterial roads include co-ordinating heavy vehicle movement dispatch and storage as appropriate, as well as coordinating haulage routes via specific Traffic Management Plans.

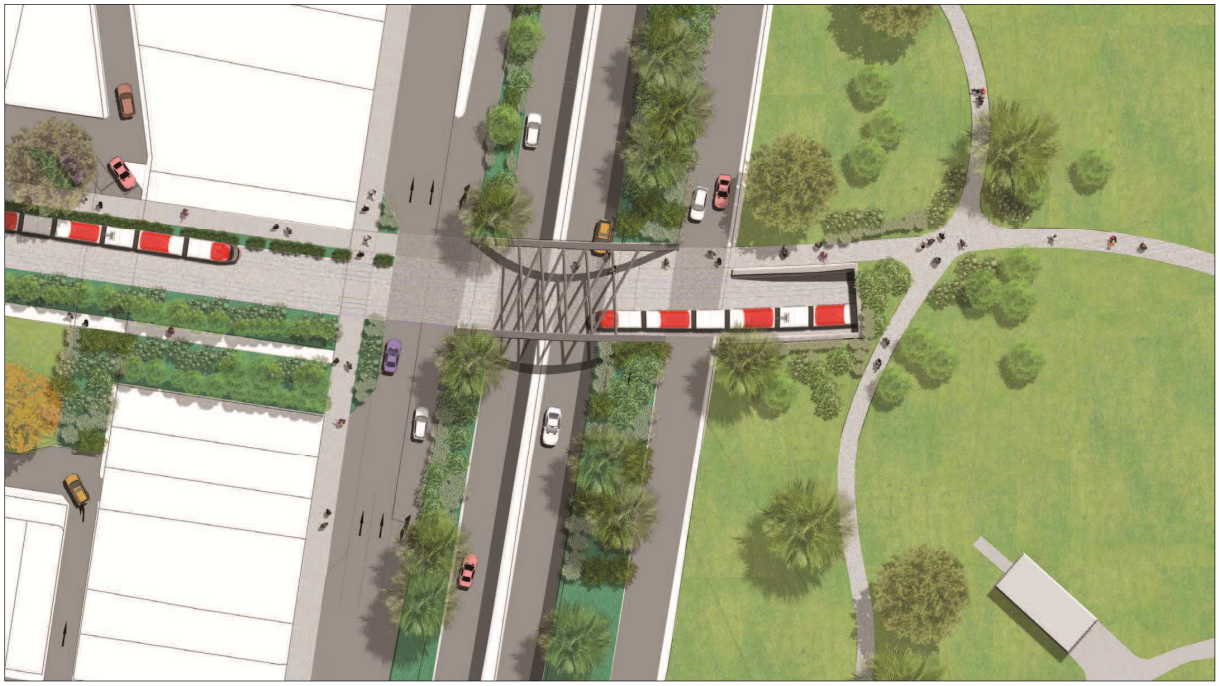


Figure 10 South Dowling Street crossing*(Source: CSELR Environmental Impact Statement).*

The Applicant considers that staff parking is appropriate at this location, given the availability of parking at Moore Park East as well as the potential use of this location as a staff transfer point, where staff will be transferred to areas of the work sites as needed. Randwick Racecourse may also be used for this purpose.

The Lang Road/ Anzac Parade intersection works are not expected to affect traffic in the local area or during special events, as works are scheduled to occur at night over two weeks and with consideration of special events. Mitigation such as use of alternative access routes and traffic management measures are proposed to limit the impacts of accessing Moore Park during general construction works. During CSELR operation, minor impacts to traffic efficiency at the Lang Road intersection are expected.

During construction, one lane of the dedicated busway adjacent to Anzac Parade will be closed at Robertson Road, whereby the remaining bus lane will operate in the peak flow direction (northbound during the morning peak and southbound during the afternoon peak). At Robertson Road both lanes of the busway will be closed to accommodate the CSELR alignment. At this point, buses will divert on to Anzac Parade through the Robertson Road bus layover facility. This arrangement would impact on

counter-peak services, including those that service UNSW. Management measures such as peak hour bus priority lanes along Anzac Parade would be identified in the Construction Traffic Management Plan and in consultation with key stakeholders such as UNSW and Health Infrastructure.

A pedestrian bridge (separate to the Albert (Tibby) Cotter Walkway) will be provided over Anzac Parade at the Moore Park stop. This will provide pedestrian and cyclist access over Anzac Parade via ramps and stairs, as well as provide access for children attending Sydney Boys and Sydney Girls High schools.

Randwick Precinct

Key traffic issues during construction will be generated from the location of construction activities within an already busy traffic corridor that services the Royal Randwick Racecourse, UNSW and the Randwick health precinct. In addition, traffic impacts are predicted from works involved in upgrading several key intersections, for example the Doncaster/Alison Road/ Anzac Parade, Belmore Road/High Street intersections and the Highcross Interchange. Site compounds will be located at the southern edge of the Randwick Racecourse near Doncaster Avenue (stabling facility), at High Cross Park and within the alignment itself. High Cross Park would be unavailable for public use during construction.

The Doncaster/Alison Road intersection works consist of a crossing for the CSELR alignment from the northern side of Alison Road to the southern side across Alison Road at Doncaster Avenue, and includes a ten week construction period. To minimise impacts to the network, intersection works will be staged at weekends and at nights, and will allow for two-way traffic at all times on Alison Road. In addition, major construction works would take place outside of Randwick Racecourse race days and other events.

Additional construction impacts include:

- closure of two of the six lanes on Alison Road and weekend closures of some intersections;
- traffic on Avoca Street south of the intersection with Belmore Road would be reduced to a single lane in both directions, and intersection works would be staged on weekends;
- closure of the intersection of Wansey Road and High Street to general traffic with only local and emergency access permitted; and
- weekend closure of some intersections connecting with High Street.

A number of intersections are predicted to provide a reduced level of service once the CSELR is operational. The Applicant has committed to preparing detailed traffic signal control plans and will prepare corridor strategies to ensure that intersection level of service is optimised. Separate intersection upgrades ancillary to this proposal may be required as an outcome of these further operational refinements. The Applicant has committed to a broader Network Management Plan to identify these potential upgrades and to inform further management and mitigation measures.

Performance of the Anzac Parade/Alison Road intersection is considered a key issue in the assessment of operational traffic impacts. The EIS indicates that this intersection would operate with significant delay in the morning peak, indicating there will be insufficient capacity to accommodate the predicted increased traffic demand. Intersection optimisation is considered an ongoing issue requiring further refinement, to ensure appropriate traffic capacity is provided and delays are reduced.

The connecting intersections at the High Cross Park interchange will operate with reduced efficiency, as a substantial change to the configuration of this intersection will occur. Belmore Road will be made two-way at this location (currently one way southbound) and will include restrictions such as providing a bus only lane in the northbound direction, general traffic only in the southbound lane, and restricting right turns from High Street into Avoca Street to buses only.

Access changes will impact on the health precinct on High Street and at Randwick Racecourse. Property access and right turn movements will be consolidated throughout the corridor, to minimise turning vehicle conflicts with the CSELR alignment. Access to the Prince of Wales Hospital from High Street would be maintained via:

- the porte cochere entrance to the adult wing of the Prince of Wales Hospital modified and integrated with a four-way signalised intersection at Clara Street, including an indented westbound bus bay on High Street; and
- the operation of the porte cochere entrance to the Sydney Children's Hospital would be reversed to provide entry via Hospital Road. Exit would be limited to a left-turn only onto High Street.

Potential access issues will be experienced by vulnerable persons required to travel additional distances to the relocated taxi and bus services on High Street and Clara Street. Emergency vehicle access to the Sydney Children's Hospital will be provided at all times.

The Randwick stabling and maintenance facility is expected to provide approximately 100-120 car parking spaces for staff and visitors and may be used to facilitate staff transfers during construction. Access to the facility would be via an existing vehicular access at Ascot Street which would exit to Doncaster Avenue, south of the intersection with Alison Road. Impacts to the local road network during construction and operation of the facility are expected to be minor, given the peak traffic generation would be attributable to shift changeovers where staff vehicles would be entering and exiting the site mostly outside of peak times.

The main access points to the Randwick Racecourse affected by the CSELR proposal are located at Alison Road and Ascot Street. Construction activities would impact on the Alison Road access point however, given that access is available across the racecourse internally, and the majority of vehicles accessing the site use the Ascot or High street entrances, these access impacts would not be adverse. The racecourse has identified a key future access to the site for heavy vehicles through the Cowper Street intersection, and the Applicant has committed to ongoing negotiations to provide this access. In addition, works will be suspended during events so as not to impact on the roundabout operation at the intersection of Ascot Street and Doncaster Avenue.

Minor access points are located further south along Alison Road and Wansey Road which provide access for service vehicles and access to the stables. These access gates would need to be closed to vehicle traffic during construction and alternate access points would be used along High Street. Despite some increases in travel distance and time, the Applicant considers that the existing racecourse internal roads would maintain accessibility to areas restricted by the closure of entrance gates on Wansey Road and Alison Road. The Applicant has committed to ongoing consultation over access arrangements with the Australian Turf Club.

To accommodate the requirement for eastbound access to the racecourse, the refined design provides a reconfigured intersection at Alison and Darley Roads to provide a new eastbound, bus-only slip lane from Alison Road onto King Street (Figure 9). This would allow buses and coaches to access the racecourse in a westbound direction from Alison Road. This access arrangement will remove the requirement to perform a U-turn at the Darley Road roundabout, and the need for special event bus staging in Darley Road. The Applicant considers that the changes will provide a net benefit to the performance of the Alison Road/Darley Road intersection.

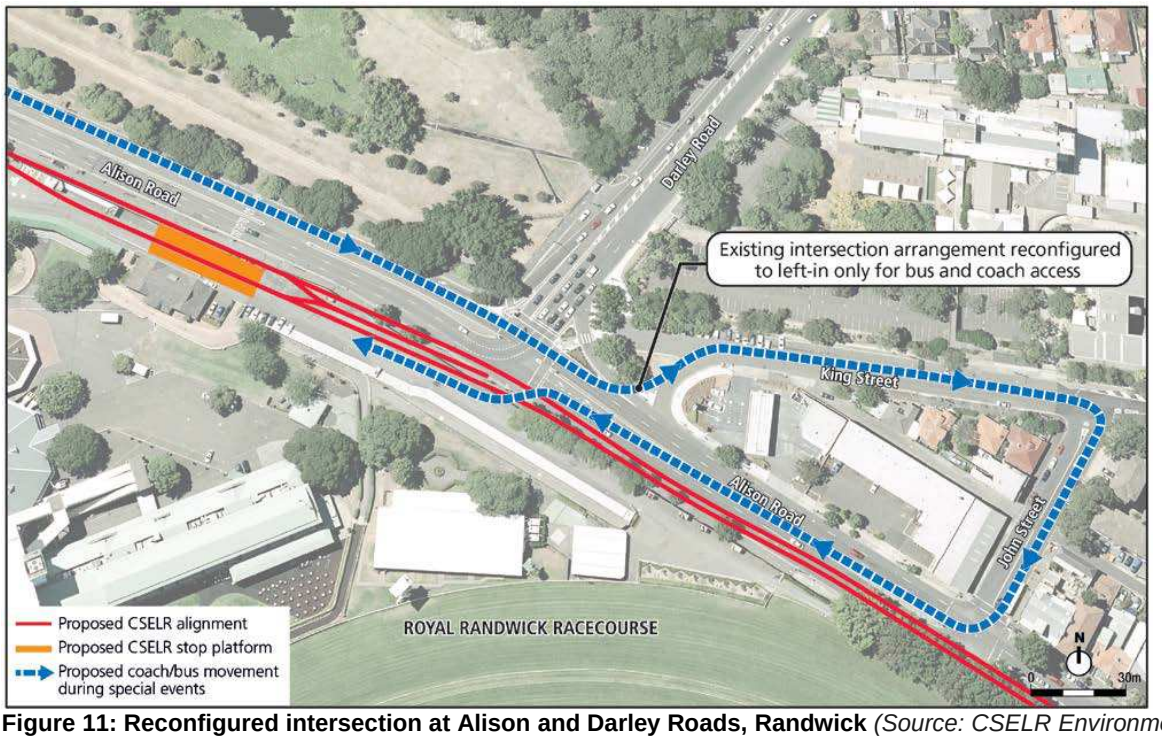


Figure 11: Reconfigured intersection at Alison and Darley Roads, Randwick *(Source: CSELR Environmental Impact Statement).*

Approximately 297 general parking spaces (from 302 existing spaces) between Darley Road and High Cross Park would be permanently removed. A shortfall in parking capacity within the Randwick precinct is predicted, which will subsequently impact on businesses, residents, and patients of medical centres and the health precinct. The EIS details strategies that may lessen the impacts to residents and local businesses such as parking controls and restrictions, and replacement of disabled parking. The Applicant further considers that parking demand would be reduced to meet the available capacity in time.

The Wansey Road alignment has been refined after consultation with residents and submissions on the EIS. The Applicant proposes to maintain one lane of parking along the eastern side of Wansey Road between Gate 10 of the racecourse and Arthur Street. The other lane will provide a one-way traffic lane in a southbound direction. Between Arthur Street and High Street, Wansey Road will revert to one traffic lane in each direction. The shared pedestrian and cycle path would be located between the traffic lanes and the tracks, and access between Alison Road and the Wansey Road shared path would be provided via a new crossing at the stop location.

Changes to bus stops and services are proposed to accommodate the CSELR alignment on High Street and to enhance public transport integration in the South East. The taxi zone located on High Street, outside the Prince of Wales Hospital will be removed to enable construction. This would be relocated to Clara Street adjacent to the bus stops.

Bus services will generally be unaffected during construction, with the exception of the bus-way between Alison Road and Doncaster Avenue where travel times are expected to increase given the loss of bus only lanes to the proposal alignment. Minor bus stop relocations and diversions are required to accommodate construction, however impacts to commuters are expected to be minimal.

Bus services that may be discontinued in the Randwick Precinct during operation are mainly those travelling to the southern section of the CBD, but also cross-city services such as the M50. *Sydney's Bus Future* has identified the Alison Road corridor as a strategic connection to the CBD, which will be enhanced by the transition from bus services to light rail.

The South East Bus Corridor strategy is in the early planning phase and final changes to bus services and routes will be undertaken in consultation with the relevant road authority and the community to ensure that an efficient bus network is provided. The EIS states that northbound bus services will generally terminate at High Cross interchange where passengers will be required to transfer to the CSELR. Bus services heading to the north of the CBD, including the morning express services, are likely to be retained.

Adverse impacts to cyclists and pedestrians will occur unless construction is carefully managed. During construction, the existing shared path along Alison Road will be relocated to the northern side to accommodate pedestrians. Where existing cycle routes or facilities are occupied by construction worksites, alternate routes would be identified. Alternative cycle routes along Botany Street, Belmore Road, Church Street and King Street would be implemented. Increases in distances travelled and travel times are expected.

During operation, cyclists and pedestrians will be impacted by the increase in signalised intersections, particular where shared paths interact with the CSELR alignment, however provision of a dedicated cycleway is a separate project to this application.

Kensington/ Kingsford Precinct

The full width of the Anzac Parade median from Tay Street to the Kingsford interchange is required for construction and operation of the CSELR. Key traffic issues in this precinct concern construction compound access, access consolidation and the Anzac Parade/ Alison Road intersection, as identified by the EIS.

To limit impacts to the broader network, the Applicant commits to maintaining a minimum of two traffic lanes on Anzac Parade in each direction during the daytime and limiting construction activities at major intersections to weekends. Access through the median strip will be closed during construction and right turn movements consolidated to Todman Avenue. The management of construction activities within the vicinity of the National Institute of Dramatic Art and UNSW will need to consider the traffic management plans of these institutions to minimise impacts where feasible.

Operation of the CSELR will require a number of turn restrictions on Anzac Parade and capacity reductions along the corridor, resulting in forecast traffic diversions to secondary roads and residential side streets. The applicant has committed to further investigations with the relevant road authority to ensure that impacts are minimised. Operational changes to the Anzac Parade alignment include:

- right turn movements to Doncaster Avenue will be consolidated into a single right turn at Todman Avenue;
- no right turn from Anzac Parade into Day Avenue. Buses currently using this route will be rerouted;
- right turn movements from Anzac Parade between Barker and Meeks Streets will be consolidated into a single right turn at Barker Street;
- a minimum of two traffic lanes along Anzac Parade in each direction. Where feasible, an additional city-bound lane will be provided which operates as a peak period bus only lane and off-peak parking;
- the existing signalised pedestrian crossing will be relocated adjacent to the Carlton Street stop;
- the existing Nineways roundabout intersection will be upgraded to signal control; and
- investigations are continuing regarding the need for physical separation between light rail and general traffic, particularly at locations where right turns off Anzac Parade have been consolidated.

The implementation of the CSELR will reduce the capacity of the Anzac Parade/Alison Road intersection. The CSELR vehicles will run concurrently with vehicular traffic and require a two stage transition through the intersection from the eastern side of Anzac Parade into the median, south of Alison Road. This is considered the most efficient operation and would provide a 20–35 per cent reduction in light rail delays at the intersection and an increase in traffic capacity of five per cent compared to a single transition through the intersection.

Other key intersections along Anzac Parade, including Middle High Streets are expected to experience decreased levels of service and increased delays with implementation of the CSELR. The Applicant has committed to further investigations to optimise network performance, with suggested measures including signal phasing and other traffic management measures.

During construction, staging of works and other mitigation measures will minimise any potential issues in providing access to the National Institute of Dramatic Art and UNSW. Implementation of the CSELR proposal would provide improved accessibility via public transport and connectivity with other locations along the corridor to UNSW, National Institute of Dramatic Art, South Sydney Juniors Rugby League Club and the Kingsford town centre.

The primary parking impacts to the Kensington/Kingsford precinct occur along the eastern kerb of Anzac Parade and in the median south of Nineways. Parking will be reduced by 390 spaces in this precinct, which may impact on businesses and services in the area, including the South's Juniors Football Club. The Applicant considers that a high degree of parking latency is provided in side streets in the vicinity of Anzac Parade, however has committed to undertaking further investigations to identify solutions with relevant road authorities and ongoing negotiations with Council, and with input from local businesses and the community.

The requirement for a bus priority lane during construction and operation to provide capacity for buses traveling to and from UNSW in the morning and afternoon peak periods and to complement buses traveling along Anzac Parade to the CBD has been identified. The Applicant commits to further investigating a tidal flow operation to facilitate priority bus movements in combination with the operation of the CSELR. *Sydney's Bus Future* has identified the Anzac Parade corridor as a strategic connection to the CBD, which will be enhanced by the transition from bus services to light rail in the future.

The Randwick Council bicycle route map designates Doncaster Avenue as an existing sign posted on-road bicycle route. This route connects with a dedicated cycle path running along the northern side of Alison Road. There are no formal cycleways along Anzac Parade, and provision will not be made for alternate cycleways at this location. The main impacts to pedestrians will be experienced by the reduction in footpath width, and during operation, potential safety aspects associated with the centre-aligned stop locations on Anzac Parade.

Lilyfield stabling and maintenance facility
Vehicle access to the facility and adjacent commercial properties within the rail corridor would be via the existing access located off Lilyfield Road, east of Catherine Street. Heavy vehicles would use the City West Link, with vehicles accessing Balmain Road and Catherine Street to enter the site. Given the low traffic volumes currently on Lilyfield Road, the impact of additional traffic generated by the maintenance facility along this road would be minor.

Peak traffic generation during operation would be attributable to shift changeovers where staff vehicles would enter and exit the site. To ensure efficient operation, staff parking would be accommodated internally, with approximately 50 parking spaces provided for both staff and visitors. Impacts on adjacent on-street parking provisions would therefore be minimal.

Further, as the development of the maintenance facility at Lilyfield would reflect its former use as a goods and marshalling yard, with minimal changes to access arrangements, it is considered that the traffic impacts on pedestrians, cyclists, existing light rail users and other road users would be generally acceptable.

Consideration
The Department considers that, based on the EIS and associated documents, adverse yet short term traffic, transport and access impacts cannot be avoided during construction of the CSELR. The department acknowledges the disruptions caused by constructing an infrastructure project of this scale within a confined, highly urbanised setting, yet considers that, given the management measures proposed and the Department's recommended conditions of approval, impacts will be reduced to a an acceptable level. The Department considers that the implementation of the CSELR represents a net environmental benefit and a positive transport outcome for the broader community.

Of the community submissions on the EIS, 58% raised traffic, transport and access impacts as key issues of concern. Specific issues include:
- removal and/or changes to bus services, particularly from the south-eastern suburbs;
- accessibility to the CSELR and other public transport services;
- introduction of rat runs, increased traffic congestion, loss of road space and road closures;
- consolidation of right turns throughout the corridor;
- access changes to private property and businesses during construction;
- lack of information in the EIS;
- cumulative construction related transport impacts;
- safety concerns regarding integration between light rail, pedestrians, cyclists and private vehicles; and
- substantial temporary and permanent loss of kerbside parking

The Applicant has committed to minimising traffic, transport and access impacts through a framework of management measures including preparation of specific precinct management plans, in consultation with community, business and government reference groups. The Department supports these commitments and has recommended that various plans, discussed below, be prepared to provide input to relevant stakeholders and transparency in the ongoing decision making process.

Given the scale and inherit complexities of the CSELR proposal, and the number of submissions identifying transport related issues, the Department engaged Samsa Consulting to undertake an independent review of the traffic and transport impact assessment. The review confirms that the relevant key traffic and transport issues have been identified, however further detail is required once the staging construction and operation phases are refined to ensure that specific management issues are addressed. Further detail is required regarding consideration of local network operations, particularly for areas outside of the CBD, and specifically the unintended consequences such as traffic permeation and creation of 'rat runs' in local streets. These and other traffic related issues will be resolved, in part by a governance structure to be implemented by RMS and TfNSW, that will devise and refine specific mitigation and management measures at a later date. A copy of the independent review can be found at **Appendix E**.

The review recommended conditions to address these matters, and these have largely been adopted by the Department. The Department is satisfied that the recommended conditions of approval will provide an appropriate framework to inform effective management and mitigation measures that will limit long term, adverse impacts from the proposal.

TfNSW and RMS are developing a Network Management Plan, which will provide a framework to address the effects of future traffic patterns, and will provide for appropriate traffic and transport mitigation and management measures. The Plan will be based on refined modelling of intersection modifications, traffic signal changes and other traffic management measures to provide the necessary framework for efficient network operations upon commencement of construction. The information on which the EIS is based represents the first stage in the development of the Network Management Plan and as the plan is refined, further improvement to the operation of the network will be achieved.

The Department considers this approach to be an appropriate method to plan for and manage complex traffic related issues at various scales. The Plan shall provide management measures to limit potential cumulative impacts and detail access changes and alternative access arrangements. It will also provide special events traffic and transport network management plans, and will monitor the performance and function of pedestrian zones and shall detail contingency measures should these zones underperform. The Department acknowledges that traffic management and mitigation will be an iterative process to respond to a dynamic construction environment.

Construction Traffic and Potential Cumulative Impacts

Impacts will be primarily derived from road closures, night works, changes to access arrangements and from the additional number of vehicles accessing the site corridor for construction purposes. Cumulative traffic impacts, with construction of key projects near the alignment, including the CBD (Barangaroo) and Moore Park (Albert (Tibby) Cotter Walkway) as well as from multiple CSELR construction sites are likely to impact on traffic throughout the network. Given that most traffic routes along the alignment are currently operating at capacity during peak periods, the addition of a substantial number of heavy vehicles to the network and its impacts to traffic flow will require careful management in order to maintain impacts to an acceptable level.

The Department notes that there are few specific measures identified to mitigate potential cumulative impacts, particularly in regards to details around the timing of other potential construction activities in the vicinity and from the simultaneous use of construction compounds for the CSELR. The department acknowledges the complexity of this task, given the lack of available information regarding construction activities for other projects and particularly where those projects are in preliminary planning stages. The Applicant expects that cumulative impacts from the proposal itself will be lessened given that compounds are located over the entire 13 kilometre route.

Notwithstanding, the Department considers that a detailed strategy is required to manage and anticipate the potential cumulative impacts from numerous city-wide projects on traffic, transport and access impacts, and also from within the proposals' footprint, particularly given the tight construction deadline which may necessitate concurrent operation. The Department's recommended conditions of approval, including the Network Management Plan and the Construction Traffic, Transport and Access Management Plan require that a framework is provided to manage and minimise cumulative impacts across the broader project area.

The Applicant considers that a broader network management approach would sufficiently address the broader network wide construction traffic impacts. It proposes to further develop responses regarding critical incidents, demand management and network optimisation not only resulting from the CSELR but together with the cumulative effects of other initiatives, major projects, events and private developments across Sydney.

The Department considers this to be an appropriate approach to managing general construction traffic and potential cumulative impacts across the network, and has recommended several conditions of approval to enhance this commitment. Implementation of these measures will ensure that, as works occur simultaneously or during the closure of multiple main roads in any precinct, for example where Alison Road and Anzac Parade are closed concurrently, management measures identified through this plan will minimise any adverse impacts to traffic and access amenity.

Operational Traffic

The Department considers that implementation of the CSELR will result in considerable change to the traffic network throughout the corridor and at larger network scales throughout Sydney. The flow of private and public transport vehicles will be affected by permanent road closures and altered traffic arrangements. However the Department considers that, overall, the impacts will be short term while users become familiar with the changes and ultimately offset by the improvements provided by the CSELR. Several access strategies, including the *SCCAS* and *Sydney's Bus Strategy* will work in

consort to provide a coordinated solution to traffic and access issues, and provide for future network capacity and expansion.

A number of submissions raised the issue of unintended traffic impacts on alternative routes as a consequence of closing or reducing traffic lanes elsewhere. For example, Cleveland Street and Foveaux Streets were identified as receiving a greater share of traffic given the lane reduction of Devonshire Street. The consolidation of right turns particularly along Anzac Parade at Kensington and Kingsford may also have unintended consequences of encouraging rat-runs through local roads while diverting excessive traffic toward alternate routes.

Whilst the Department considers the assessment of intersection and flow connectivity to be adequate, particularly as it applies to the areas of major impacts in the CBD, the level of detail required to ascertain detrimental changes to the South East corridor requires further consideration, particularly in regards to the local road network and other access changes. In addition, there is a risk of potential impacts to traffic flow from breakdowns and incidents (including light rail or other vehicle breakdowns and accidents), particularly where shared and one lane traffic sections occur, such as at George Street and Devonshire Street.

The Applicant has acknowledged the complex nature of traffic interactions in the CBD and beyond, and has proposed that management measures are continually refined during the detailed design phase to provide adequate network performance. Key intersections and corridors are identified for this purpose, as well as an ongoing commitment to continue working with the RMS to provide solutions where appropriate. In addition, the Applicant has committed to ongoing consultation with Councils in managing congestion on local traffic networks, focusing on mitigating significantly degraded performance as appropriate, which will address residual amenity impacts at the local level.

The EIS also states that as a guiding principle right turns shall be consolidated throughout the alignment, and will only be permitted at signalised intersections to provide safety and efficiency benefits which will improve travel times for the CSELR. The Applicant considers that Cleveland Street, a major East-West arterial route, will likely experience an increase in traffic volumes for vehicular traffic as a result of the proposal.

To ensure that operational traffic impacts are minimised, the Department recommends that an Operational Traffic, Transport and Access Performance Review is provided to further identify contingency management measures, and to provide a framework for corrective management actions should they be required. The monitoring and review shall be undertaken at twelve months and 5 years after the commencement of operation of the proposal, or as otherwise agreed by the Secretary.

In general, the Applicant has demonstrated that the CSELR can be introduced into the road network without significant detrimental impact to general traffic and buses. A number of critical intersections have been identified where further design and optimisation work is underway, and management measures have been identified.

Parking

A large number of public submissions raised concerns at the loss of parking and subsequent impacts. The Applicant has committed to working with local councils to provide solutions to the loss of parking across affected precincts, and at a minimum identifies that 100 per cent replacement of impacted special kerbside uses i.e. disabled car spaces will be provided. The Applicant has identified a number of operational strategies to increase the number of available parking spaces, primarily for businesses and residents that include timed parking and clearways on general traffic lanes.

The Applicant considers that a significant behavioural change will occur in time, as the public increasingly relies on the CSELR for movement throughout the corridor and demand for available kerbside parking diminishes.

The Department considers that the implementation of parking strategies is an appropriate response to loss of parking, particularly within the Surry Hills, Randwick and Kensington/Kingsford. However, there are concerns regarding the unintended impacts to local traffic flow and access from this approach particularly as the details and timing of the implementation of such strategies remains unclear. In addition, the sufficient availability of latent side street parking, and the behavioural changes predicted by the Applicant, requires a contingency framework, and the Department therefore has recommended

conditions of approval, including a Parking Offsets Management Strategy, that will ensure replacement parking strategies are further identified and implemented within an appropriate timeframe.

Whilst the review identified areas within the assessment requiring more detail, the Department considers that this information can be provided subject to detailed design. The independent review considered the Transport assessment and reports and concluded that the EIS and associated documents have correctly identified the issues and potential impacts, however considers that more detail is required to identify parking strategies that will lessen the impacts to residents and business owners. The Department has generally adopted the recommendations of the peer review and has included these requirements in its recommended conditions, including provision of management plans and parking strategies.

In order to accommodate construction staff parking, the Applicant will consider long-term leases of adjacent commercial parking stations within the CBD, Moore Park and Royal Randwick racecourse worksites, with transfers to adjacent worksites along the route. The Department considers that, given the size of the workforce required to construct the CSELR and the lack of available space for parking and the impacts to parking generally through construction activities, staff transfer points should be provided where feasible. To establish a framework around construction staff parking provision, the Department recommends that the Applicant develop alternative plans to accommodate staff movements where they are needed in the corridor, for example via consolidated transfer stations to facilitate bulk movement of staff around the construction site. The Department recommends that this information is included in the Construction Traffic Transport and Access Management Plan.

Cycleways

The Applicant considers that whilst cycleways make an important contribution to the sustainability of Sydney's transport systems, provision of dedicated cycleways is generally not a part of this proposal. The Department acknowledges that the CSELR proposal is a complex transport project in its own right, and that separate cycling plans and strategies, including *Sydney's Cycling Future*, cater to improving the cycle network.

Submissions have raised concerns about the proposal's impact on cyclists and cycleways, particularly impacts to connections to Central Station and Moore Park, and the absence of dedicated cycleways adjacent to the corridor. Concerns were also raised regarding the relocation of bike routes and shared paths and potential safety, efficiency and accessibility issues. The Applicant has committed to upgrading shared paths between Central and Moore Park, via Cooper Street and Arthur Streets and to maintaining cycleways and shared paths along the alignment, including Wansey Road and Alison Road, and within the shared vehicle/ pedestrian zones of George Street and Chalmers Street. In addition, it is proposed to extend the cycle way from Chalmers Street to Prince Alfred Park, to improve east west access across the CBD.

Within the CBD, additional cycle paths have been considered in the *Sydney City Central Access Strategy*, which has been developed to improve access within and to the CBD through the consideration of all transport modes and their key networks. The provision of signage and way finding for cycleways and shared pedestrian and cycle paths would be provided in consultation with Councils.

Notwithstanding, the Department considers that cycleways impacted by the corridor, including provision of alternative routes, dedicated cycleways and provision of any future cycleways should be detailed under a Pedestrian and Cyclist Network and Facilities Strategy. The strategy must be prepared in consultation with Councils, RMS, Bicycle NSW and relevant Reference Groups as detailed by the conditions of approval. The strategy will identify and address any issues identified during the construction phase, will provide required contingencies where necessary, and provide dedicated cycleways as per Council requirements.

In addition, a specific condition recommends that the Applicant provide design provisions for a dedicated cycleway connecting the northern end of Prince Alfred Park in the southern end of Castlereagh Street.

Public Transport

Much of the assessment governing integration of the CSELR within the CBD precinct, including public transport mode share and access changes, is detailed under the *Sydney City Centre Access Strategy* and *Sydney's Bus Future*. These strategies describe proposed changes to the transport network and its interaction with the Sydney CBD over the next 20 years. Bus network changes to and from South

East Sydney and traffic management changes (and associated impacts) are also outlined in these strategies, however the Applicant considers these to be related though separate projects in their own right, and hence do not form part of this proposal.

Operation of the CSELR is addressed in the strategy, which includes the pedestrianisation of a section of George Street, provision of cycleways, and changes to public transport to improve accessibility and capacity across transport modes. The EIS identifies that an equivalent plan is required for the South East, and has committed to preparing a final bus network plan for South East Sydney in 2016–2017. The Applicant has provided potential changes to services and routes in the EIS, yet has stated that these changes require further community consultation and refinement prior to completion.

The Department acknowledges that the identification of bus network changes represents a significant task, and is satisfied that the strategies in place will address the final changes to bus routes, timetables and infrastructure in consultation with the community. Notwithstanding, the Department has recommended that the Operational Traffic, Transport and Access Performance Review includes information regarding detailed changes to the bus network.

Access

The Department accepts that the proposal presents a considerable challenge to property and business access requirements during both construction and operation, particularly the more restricted precinct of Surry Hills, and acknowledges the measures proposed by the Applicant to minimise these impacts to an acceptable level by providing alternatives. The Applicant is committed to maintaining loading zones and property access during construction, including provision of specific access corridors, scheduling deliveries out of work hours, and managing access through and around work sites with traffic controllers.

Local access plans for individual properties and affected accesses will be finalised by the Applicant and have been provided in the EIS. These access plans will be further developed in liaison with businesses and landowners, and would establish existing servicing and delivery requirements, access periods and alternative arrangements for businesses and landowners affected by the proposal. These access plans would also identify alternative routes, specific activities or land uses (such as schools, medical centres etc.) within each precinct and would identify strategies to maintain emergency access throughout each precinct at all times.

To further strengthen these measures, and to provide a transparent decision making and consultation process, the Department recommends that the Applicant prepare Property Access Plans and Stop Access Plans to ensure that landowners, businesses, and Councils are provided adequate access alternatives and notification during construction and operation of the CSELR, including during special events.

Pedestrians

The Department considers that pedestrians will be inconvenienced by the construction of the CSELR, and particularly notes the potential impacts to businesses, risks to pedestrian safety and the access requirements for vulnerable persons living in close proximity to the proposal. Several submissions from the community raised concerns regarding impacts to pedestrians during construction, including access to and from businesses, schools, residences and public transport.

The Department acknowledges the Applicant's commitment to maintaining pedestrian access during construction and operation, including provision of the *Disability Discrimination Act 1992* requirements, and identification of crossings that require greater emphasis on safety particularly for vulnerable groups. In regards to pedestrian access to businesses, the department notes that the Applicant will take a consultative approach to managing construction impacts to businesses and landowners alike.

The Department considers that implementation of the recommended conditions of approval, along with the Applicant's management measures, will provide adequate provision for pedestrian movement and access to public transport, private properties, health outlets and businesses during both construction and operation phases of the proposal.

The Department agrees that, overall, an improved pedestrian experience will be provided by the implementation of the CSELR, particularly for the key pedestrian zones that include Alfred Street, George Street and Chalmers Street in the CBD. The numbers of buses removed from the broader

network will reduce local pollution throughout the corridor and will provide enhanced connectivity and facilitate improved integration across transport modes.

To ensure acceptable pedestrian amenity, safety, and integration with the CSELR, the Department recommends that the Applicant prepare detailed Stop Access and Design Plans, in consultation with the relevant Community Reference Group. In addition, the application of the Network Management Plan will provide strategies for the efficient integration of the CSELR and pedestrians across the network, enhance pedestrian amenity and provide for increased pedestrian capacity, which would further enhance the positive sustainability outcomes of the proposal.

Submissions received during the exhibition period discussed the potential for a shared light rail/ pedestrian zone on High Street from Wansey Road to Botany Street, to facilitate pedestrian access between the CSELR stop locations and UNSW, the Health Precinct and the Randwick Shopping Precinct. This would also provide future benefit to UNSW, which proposes to develop the upper campus, across High Street and Botany Street. RMS provided feedback on this option and recommended that, given the importance of this section of High Street to through traffic during normal use and during events at Randwick Racecourse; it could not support its closure to traffic at this time.

The Department acknowledges that the closure of this section of High Street would place pressure on adjacent roads and thoroughfares, and given the reduced capacity of alternative routes this would likely create unacceptable impacts elsewhere. Notwithstanding, the Department has included a condition of approval recommending that the design does not preclude future potential pedestrianisation at this location.

As noted, the Department has conducted its assessment on traffic, transport and access impacts and has relied on the assessment of its expert. During its assessment, the Department has carefully considered the issue of transport related impacts and it is considered that the assessment is adequate, and has been carried out in accordance with relevant guidelines. Notwithstanding, the Department has recognised the broader issue of network wide impacts and has recommended a number of conditions to support the future management of this issue.

5.4. Noise and Vibration Impacts

The CSELR proposal will be developed in an existing highly developed urban environment with the majority of the alignment located within established road transport corridors.

The operation of the light rail has been assessed in accordance with the *Rail Infrastructure Noise Guideline (RING)* (EPA, 2013). The stabling facility at the north-western corner of Randwick Racecourse and a maintenance facility adjacent to the existing light rail stop at Lilyfield have been assessed in accordance with the NSW *Industrial Noise Policy* (EPA, 2000). Vibration from both construction and operation of the light rail was assessed in accordance with *Assessing Vibration: A Technical Guideline* (DEC, 2006). Construction noise was assessed against the *Interim Construction Noise Guideline* (DECC, 2009).

Attended and unattended noise monitoring was conducted in each of the nominated precincts along the route to ascertain representative background and ambient noise levels. Each precinct was also divided into noise catchment areas.

The existing ambient noise environment is variable and road traffic noise is the predominant component of background noise levels, particularly in the CBD. Noise levels are also higher in the city than in surrounding areas. Relevant daytime and night time airborne noise trigger levels are 60 dBA and 50 dBA respectively for residential receivers and 80 dBA for maximum noise levels. More stringent noise trigger levels are outlined for sensitive receivers such as educational institutions, places of worship and hospitals.

Since the EIS was prepared, additional night-time noise measurements have been conducted at representative locations in each precinct and provided to the Department for consideration. These were undertaken mid-week from 10.00 pm and 12.00 am and 5.00 am and 7.00 am to characterise how existing road traffic noise contributes to the noise environment at these times. The results indicated that traffic noise does not dominate the Surry Hills (Devonshire Street), Moore Park and Randwick (particularly Wansey Road) precincts which is contrary to the information provided in the EIS. The background noise levels in these precincts are generally below the light rail noise trigger levels.

Construction Noise

Early construction works would include property acquisition, service relocations, building demolition and tree/vegetation clearing. These works would be carried out from mid 2014 to 2016 followed by main alignment works (earthworks and light rail infrastructure and stops) from 2016 to 2019/2020. Where possible, construction would be undertaken during standard construction hours, however, the nature of the proposal is such that evening and night works would be required, especially in the City Centre and in the vicinity of intersections to minimise impacts to the operation of the road network. For example, construction is proposed to occur 24 hours a day, 7 days a week in George Street.

The construction noise assessment was undertaken in accordance with the EPA's *Interim Construction Noise Guidelines*. Noise management levels for construction works at residential receivers in each of the precincts along the alignment are outlined in **Table 9**. There are separate noise management levels for other sensitive receivers such as schools, places of worship, hospitals and recreation areas.

Table 9 – Residential Construction Noise Management Levels

Precinct	*Noise Catchment Area*	*Construction Noise Management Level ($L_{Aeq(15\ minute)}$) (dBA)*			
		Daytime	**Daytime Out of Hours**	**Evening**	**Night-time**
City Centre	NCA01.1	73	68	67	62
	NCA01.2	74	69	67	61
	NCA01.3	68	63	61	57
Surry HIlls	NCA02.1	54	49	48	44
Moore Park	NCA03.1	64	59	56	47
Kensington/ Kingsford	NCA04.1	63	58	55	44
	NCA04.2	69	64	62	51
	NCA04.3	67	62	59	53
Randwick	NCA05.1	63	58	55	44
	NCA05.2	54	49	49	43
	NCA05.3	57	52	50	44
	NCA05.4	66	61	57	48
Lilyfield Stabling	NCA06.1	66	61	60	52
	NCA06.2	59	54	54	47

Note: Daytime is defined as 7am to 6pm, Daytime out of hours as Sat 1pm to 6pm and anytime on Sundays and public holidays, Evening is 6pm to 10 pm and Night-time is 10pm to 7am.

Consistent with the *Interim Construction Noise Guidelines*, the construction noise assessment was based on a worst case (conservative) scenario and it is expected that actual noise levels would be lower than predicted in the EIS, as the assessment predicts noise at the most exposed location which would be the closest receptor. A summary of the expected unmitigated noise impacts in each precinct is presented in **Table 10**.

Table 10 – Predicted Construction NML Exceedances (Unmitigated)

Precinct	*Receiver*	*Worst Case NML Exceedance Nearby Receivers dBA (least noise to most noise intensive scenario)*	
		Standard Construction Hours	*Out of Hours Works*
City Centre	Residential	3-18	1-29
	Commercial	1-30	1-30
	Other Sensitive	0-54	0-54
Surry HIlls	Residential	7-41	3-51
	Commercial	1-29	1-29
	Other Sensitive	1-50	1-50
Moore Park	Residential	2-17	1-34
	Commercial	-	-
	Other Sensitive	33-45	33-45
Kensington/ KIngsford	Residential	1-28	3-47
	Commercial	1-21	1-21
	Other Sensitive	3-52	3-39
Randwick	Residential	4-33	2-46
	Commercial	15-32	15-32
	Other Sensitive	1-38	3-38
Randwick Stabling Facility	Residential	15-30	4-41

Precinct	Receiver	Worst Case NML Exceedance Nearby Receivers dBA (least noise to most noise intensive scenario)	
		Standard Construction Hours	Out of Hours Works
	Commercial	0-10	0-10
	Other Sensitive	-	-
Lilyfield Maintenance Facility	Residential	0-12	3-25
	Commercial	0-8	0-8
	Other Sensitive	-	-

Note: Standard construction hours are defined as 7am to 6pm Mondays to Fridays; 8am to 1pm on Saturdays and no work on Sundays or public holidays.

TfNSW's *Construction Noise Strategy* (2012) describes strategies for mitigating construction noise. Where works are proposed at night-time, site specific Construction Noise and Vibration Impact Statements would be prepared outlining potential construction noise levels and site specific measures to control noise and minimise impacts and disturbance at receivers.

The Applicant would keep the community informed of upcoming works throughout the construction period by various means including notifications to residents, information on the proposal website, an email distribution list, information on the info-line and a Construction Response telephone line.

Rail Noise

The main sources of airborne noise from LRVs originate at the wheel-rail interface, with increased noise levels generated at cross-overs and turnouts. Other noise is generated from warning bells and auxilliaries such as air conditioning units and power converters. While LRVs are fitted with warning bells, the EIS states that they would only be used in the event of emergencies or where the driver considers there is a danger to public safety, not as part of normal operations and therefore have not been addressed as part of the noise impact assessment.

Light rail services would commence at 5.00 am and conclude at 1.00 am the next day. Predicted noise levels have been calculated on normal operations based on the daytime and night-time light rail numbers, as outlined in the EIS. This shows a service frequency every two to three minutes during peak hour operations at opening in the City Centre/Surry Hills and Moore Park precincts. During periods of higher demand, such as special sporting events or concerts, a special event service would operate between Moore Park and Central with the frequency of every 2.5 minutes. LRVs would also move across the network between 1.00 am and 5.00 am in readiness for the next day's operations. The Applicant has indicated that these movements would be minimal and would generally occur just before 5.00 am rather than throughout the night-time period.

Worst case operational noise levels for residential receivers are outlined in **Table 11**. Exceedances of the RING trigger levels are outlined in bold text.

Table 11 – Residential Operational Noise Levels – Without Mitigation

Precinct	Noise Catchment Area	Worst Case Predicted Noise Levels (dBA)					
		2021 Opening Scenario			2036 Future Scenario		
		Daytime $L_{Aeq\ (15h)}$	Night time $L_{Aeq\ (9hr)}$	L_{Amax}	Daytime $L_{Aeq\ (15h)}$	Night time $L_{Aeq\ (9hr)}$	L_{Amax}
RING Noise Trigger Levels (dBA)		*60*	*50*	*80*	*60*	*50*	*80*
City Centre	NCA01.1	49	42	70	49	42	70
	NCA01.2	55	48	72	55	48	72
	NCA01.3	59	**52**	77	60	**52**	77
Surry Hills	NCA02.1	**62**	**55**	**83**	**62**	**55**	**83**
Moore Park	NCA03.1	52	45	68	52	45	68
Kensington/ Kingsford	NCA04.1	58	**51**	**82**	59	**51**	**82**
	NCA04.2	57	**51**	79	58	**51**	79
	NCA04.3	55	48	75	55	48	75
Randwick	NCA05.1	53	46	75	54	46	75
	NCA05.2	49	43	70	50	43	70
	NCA05.3	55	49	77	56	49	77
	NCA05.4	58	**52**	**83**	59	**52**	**83**

The predicted exceedances outlined in **Table 11** are located as follows:

- City Centre – the western façade of a residential apartment building on Chalmers Street;
- Surry Hills – residential terraces and apartments on Devonshire Street to the west of Marlborough Street;
- Kensington – an apartment building located on the southern corner of Anzac Parade and Abbotsford Street as well as apartments on Anzac Parade between Darling Street and Doncaster Avenue; and
- Randwick – 1-3 Eurimbla Avenue and 19 Clara Street.

Locations where the predicted noise levels exceed the airborne noise trigger levels for sensitive receivers along the alignment are outlined in **Table 12** and show that the trigger levels are exceeded at all locations (without mitigation).

Table 12 – Other Sensitive Receivers Operational Noise Levels – Without Mitigation

Precinct	***Sensitive Receiver***	***Type***	***External Noise Trigger Level (dBA) (L_{Aeq}(1hr)***	***Maximum Predicted Noise Level (dBA) (L_{Aeq}(1hr)***	
				2021 At Opening Scenario	***2036 Future Scenario***
City Centre	Event Cinemas	Cinema	55	**59**	**59**
	Metro Theatre	Theatre	50	**59**	**59**
	Haymarket Library	Library	60	**62**	**62**
Surry Hills	Twinkle Twinkle Child Care	Childcare	50	**61**	**61**
	St Vincents Hospital Child Care	Childcare	50	**51**	**52**
	SalesITV	Recording Studio	45	**63**	**63**
	Quaker Service Australia	Place of Worship	50	**62**	**62**
	St Peter's Catholic Church	Place of Worship	50	**58**	**59**
Moore Park	Sydney Girls High School	Educational	50	**55**	**55**
Kensington/ Kingsford	UNSW – Tyree Energy Building	Educational	50	**54**	**54**
	UNSW – 223 Anzac Parade	Educational	50	**57**	**57**
	Masonic Temple	Place of Worship	50	**53**	**54**
	NIDA	Theatre	50	**53**	**54**
Randwick	UNSW – Lowy Institute	Educational	50	**54**	**54**

Potential mitigation options include:

- Source control measures such as reduction of LRV speeds (outside of peak periods such as at night), minimising wheel and rail roughness, use of non-embedded trackforms (e.g. ballasted track), absorptive track design and vegetated trackforms; and
- Receiver controls at existing developments, such as building façade treatments.

The Applicant has indicated that higher rail noise levels are considered reasonable in locations where existing noise from other sources (for example road traffic noise) is higher than the predicted rail noise impacts and are unlikely to decrease in the future. Rail noise mitigation is unlikely to provide a benefit in these situations. This would be the case along George Street in the City Centre precinct, along High Street in the Randwick precinct and along Anzac Parade in the Kensington/Kingsford Precinct.

Stabling and Maintenance Facilities

The Randwick stabling facility and Lilyfield maintenance facility are fixed industrial facilities assessed in accordance with the NSW Industrial Noise Policy (INP). At the Randwick stabling facility there would be approximately 84 movements into and out of the facility every day between 4.30 am to 2.00 am at a maximum speed of 10 km/hr.

There would be 24 hour activity at the Randwick stabling facility with overnight activities including interior LRV cleaning (sweeping, vacuuming and mopping). Start-up activities would commence at approximately 4.00 am, however, warning bells would not be tested. Noise would also be generated by on-board power converters and air conditioning units, car park access and occasional heavy vehicle deliveries.

Maintenance would occur at Lilyfield 24 hours per day. Both visible and audible warning systems would be used to alert staff of LRV movements. The EIS recommends that these be non-tonal and that maintenance and hard stand areas be designed so that vehicles do not need to reverse

unnecessarily. Heavy vehicles and staff cars would also need to access the site. Similar to the stabling facility, a PA system would be installed but would only be used in emergencies. Noise from PA systems was not assessed for either facility.

The Lilyfield maintenance facility would be located within the existing Rozelle Goods Yard corridor adjacent to the Lilyfield light rail stop and east of Catherine Street. This facility would include a staff warning system when LRVs are moving or about to move. Approximately four movements are expected to occur into and out of the facility each day. A summary of the operational noise goals for these facilities is provided in **Table 13**.

Table 13 – Operational Noise Goals for Stabling and Maintenance Facilities

Location	*Period*	*Existing Noise Levels (dBA)*		*Operational Noise Goals (dBA)*		
		RBL	**L_{Aeq} (period)**	**$L_{Aeq(15\ min)}$ intrusive**	**$L_{Aeq\ (period)}$ amenity**	**$L_{A1(60\ sec)}$ Sleep Disturbance Screening Level**
Randwick Stabling Facility	Daytime 7.00 am to 6.00 pm	44	54	49	60	
	Evening 6.00 pm to 10.00 pm	44	52	49	50	
	Night-time 10.00 pm to 7.00 am	38	46	43	45	53
Lilyfield Maintenance Facility	Daytime 7.00 am to 6.00 pm	56	66	61	60	
	Evening 6.00 pm to 10.00 pm	55	64	60	54	
	Night-time 10.00 pm to 7.00 am	47	59	62	49	62

Without mitigation measures, the Randwick stabling facility would exceed the noise goals in **Table 13** during all assessment periods. For example, four LRVs departing the stabling facility between 10.00 pm and 7.00 am would exceed the goals by up to 17 dBA at up to 77 residential properties located in the vicinity of Doncaster Avenue. Inclusion of a six metre high noise wall adjacent to the stabling facility would still result in exceedances of up to 8 dBA at night at 33 properties. With the inclusion of an acoustic shed instead of a wall the number of properties that exceed the goals (by up to 3 dBA) is reduced to five, mainly due to staff cars entering and leaving the site.

Six properties (three to the north and three to the south) would exceed the night-time noise goal by up to 2 dBA during operation of the Lilyfield maintenance facility. The dominant contributor to the noise level exceedances at these receptors is the open LRV entry doors of the maintenance building, however, the Applicant has stated that closing these doors during the night-time period would eliminate these exceedances.

Vibration and Ground-Borne Noise

The applicable human comfort vibration goal for intermittent vibration sources is defined in terms of Vibration Dose Value, which is the total vibration exposure during a specific assessment period (daytime or night-time). It is a cumulative measure and indicates the combined effect of all passby events within the specified period. The preferred and maximum vibration dose values for intermittent vibration varies depending on the building type of the receiver, as outlined in **Table 14**.

Table 14 – Preferred and Maximum Vibration Dose Values

Building Type	*Preferred Vibration Dose Value ($m/s^{1.75}$)*	*Maximum Vibration Dose Value ($m/s^{1.75}$)*
Critical working areas (e.g. hospital operating theatres, precision laboratories)	0.10	0.20
Residential daytime	0.20	0.40
Residential Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80
Workshops	0.80	1.60

Note: Daytime – 7.00 am to 10.00 pm; Night-time – 10.00 pm to 7.00 am

A number of buildings close to the alignment would require detailed review to determine their sensitivity to vibration. These include but are not limited to, the Sydney Dental Hospital in Chalmers Street, Tyree Engineering Building (UNSW), the Lowy Cancer Research Centre and Wallace Wurth Buildings (UNSW) fronting High Street, the Randwick Hospital Precinct on High Street and a new Cancer Research centre being constructed on the corner of High and Avoca Streets in Randwick.

No exceedances of the human comfort vibration dose criteria are predicted, although potential exceedances may occur at locations with vibration sensitive equipment such as those identified above. Further investigation would be required at these locations to inform the required trackform design to control operational vibration impacts. Consultation with the owners and operators of vibration sensitive equipment would be ongoing during detailed design to achieve appropriate vibration outcomes at these facilities.

Ground-borne noise from the transmission of vibration generated from the wheel/rail interaction can cause the floor and walls within a building to vibrate and re-radiate. As the light rail alignment would be located adjacent to or on existing roads, it is expected that airborne noise would mask any ground borne noise at many receivers. Ground-borne noise would be controlled with various trackforms along the alignment depending on the sensitivity of receivers in each precinct. The locations in **Table 15** would require more detailed analysis of ground-borne noise impacts during detailed design as the assessment undertaken to date indicates that the ground-borne noise trigger levels would be exceeded at these receivers. The ground-borne noise predicted at each location and the relevant trigger levels are outlined in **Table 15**.

Table 15 – Ground-borne Noise Sensitive Receivers

Precinct	***Address***	***Description***	***Ground-borne Noise L_{ASmax} (dBA) (trigger level)***
City Centre	505-525 George Street, Sydney	Event Cinemas	47 (35 dBA)
	744 George Street, Sydney	Haymarket Library	46 (40-45 dBA)
	624 George Street, Sydney	Metro Theatres	37 (approx. 30 dBA)
	13 Campbell Street, Haymarket	Capital Theatre	39 (approx. 30 dBA)
Surry Hills	1-51 Foveaux Street, Surry Hills	Australian Institute of Music (AIM)	27 (approx. 20 dBA)
	41 Holt Street, Surry Hills	JMC Academy (Audio and Visual Design)	40 (approx. 20 dBA)
	127 Devonshire Street, Surry Hills	Sales ITV	42 (approx. 30 dBA)
Kensington/Kingsford	215 Anzac Parade, Kensington	National Institute of Dramatic Art (NIDA)	42 (approx. 30 dBA)

Note: L_{ASmax} refers to the maximum noise level not exceeded 95 per cent of the time of rail passbys measured using the "slow" response on the noise sound level meter

There are a number of measures that would be considered to reduce ground-borne noise impacts from the CSELR. High resilience trackforms would be required at many locations to control ground-borne noise impacts except where there are no sensitive receivers close to the alignment and through most of the George Street pedestrian zone where LRV speeds would be low. Very high attenuation track (for example, floating slab) may be required adjacent to the Randwick Hospital Precinct. Further investigation of these measures would be undertaken during detailed design to ensure ground-borne noise is acceptable.

Substation Noise

Substations are fixed facilities assessed in accordance with the Industrial Noise Policy. Twelve substations and a sectioning hut at Dacey Avenue would be required for the proposal. The major source of noise is electric transformers that operate continuously throughout the day and night. Of the 12 substations, nine comply with the noise goal. Exceedances of 1 dBA and 2 dBA of the night time noise goal are predicted for the Randwick racecourse and Anzac Parade substations (in the vicinity of High Street) respectively. The substation in Wimbo Park results in a 20 dBA exceedance of the night-time noise goal. Shielding or an enclosure is proposed to mitigate noise impacts at this substation.

Operational Traffic Noise

The proposal would result in a change in road traffic flows, mainly as a result of the transformation of a section of George Street into a pedestrian zone, changing Devonshire Street to one way eastbound, redirecting traffic from Chalmers Street to Randle and Elizabeth Streets, changing Wansey Road to one way southbound between Arthur Street and Alison Road, and as a result of removing a number of right turns along Anzac Parade. These are discussed in more detail in **Section 5.3**. The EIS states that road traffic noise levels may increase by a noticeable 3-4 dBA in some areas of the CBD (e.g. Pitt Street, between Bond Street and Abercrombie Lane and York Street between Market and King Streets) and decrease in others (e.g. George Street, Grosvenor Street and Margaret Street), but that further detailed analysis is required. In the absence of practical mitigation measures, increased traffic noise impacts are unavoidable.

Consideration

The Department acknowledges that noise impacts would occur during both construction and operational phases including stabling and maintenance operations, substations and changes to road traffic redistribution, flows and volumes. Given this, the Department commissioned Wilkinson Murray Pty Ltd to provide an independent adequacy review and gap analysis on the Applicant's assessment of noise and vibration. The independent review generally considered that the noise and vibration assessment undertaken by the Applicant was adequate, proficient and consistent with the Director-General's Requirements, however, considered that a number of mitigation measures could have been resolved as part of the assessment instead of being deferred to the detailed design phase. This is discussed in further detail below. A copy of the independent review can be found at **Appendix E**.

Because noise would affect different parts of the route differently, the assessment of noise impacts has been based on the precincts identified in the EIS and addresses construction, operation and noise from stationary sources such as the stabling and maintenance facilities and substations.

Of the 472 submissions received, a high proportion (28%) raised noise and vibration as an issue of concern, with many of these submissions specifically concerned with construction noise. Specific issues raised included the following:

- noise and vibration during construction and what mitigation would be implemented. A number of submissions stated that a temporary noise wall should be used;
- noise impacts to existing businesses including hotels and outdoor cafes;
- impacts of 24 hour construction activities;
- impacts to schools and other sensitive receivers;
- lack of detail in the EIS regarding methods and equipment to be used;
- dispute resolution should be provided in the event that landowners are not satisfied with the management of noise;
- high noise and vibration activities should not be undertaken during trading hours; and
- warning bells and public address (PA) systems should not be used.

Significant construction noise impacts are likely to occur due to the highly urbanised and densely populated environment and close proximity of activities to residents for extended periods of time. It is acknowledged that Noise Management Levels would not be able to be achieved, however, the Department does expect the Applicant to implement mitigation measures to minimise impacts to the greatest extent possible and to keep residents informed of construction ahead of time.

The Applicant has committed to minimising construction noise and vibration impacts at sensitive receivers, scheduling work to provide respite periods from the noisiest activities and implementing specific management plans to manage noise. The Department supports these commitments and recommends that a Construction Noise and Vibration Management Plan be prepared to identify noise management practices and mitigation measures that could be adopted across the project. This document would provide a framework from which specific Construction Noise and Vibration Impact Statements for each precinct would draw. The Impact Statements would be specific to a particular location (i.e. compound or construction area) with measures to be adopted that address specific noise characteristics of that area.

The Applicant has stated that the reasonableness of the following feasible mitigation measures would be considered:

- for construction concentrated in a single area, such as at the stops, worksites, substation construction sites, bridge sites and stabling/maintenance facility locations, temporary acoustic

fencing/barriers around the site perimeter would be considered to mitigate off site noise levels. Noise walls are effective for receptors at or near ground level and not effective for receptors overlooking the sites;

- given the high construction noise levels at residential receptors, adherence to daytime construction hours is recommended for excavation, demolition or rock breaking activities, and for activities concentrated in a single area (i.e. activities that do not move along the alignment, and do not require out of hours activities for safety reasons or to minimise disruption to road networks);
- night works should be programmed to minimise the number of consecutive nights work impacting the same receptors;
- when working adjacent to schools, particularly noisy activities should be scheduled outside normal school hours, where possible;
- avoiding noisy plant working simultaneously close together and adjacent to sensitive receptors;
- equipment which is used intermittently is to be shut down when not in use;
- the offset distance between noisy plant items and nearby noise sensitive receptors should be as great as possible;
- equipment with directional noise emissions should be oriented away from sensitive receptors, where possible;
- regular compliance checks on the noise emissions of all plant and machinery;
- ongoing noise monitoring during construction at sensitive receptors during critical periods;
- heavy vehicle movements should be limited to daytime hours, where possible;
- reversing of equipment should be minimised so as to prevent nuisance caused by reversing alarms; and
- loading and unloading should be carried out away from sensitive receptors, where practicable.

The Department considers all of the above measures to be reasonable and would expect them to be implemented to reduce construction noise impacts from the proposal. In relation to night works, the Department considers that no more than two consecutive nights of construction works should be undertaken followed by two nights of no work to provide respite for residents. These measures would be additional to mitigation measures described in the Applicant's Construction Noise Strategy and the Department recommends this measure be included as part of the Construction Noise and Vibration Management Plan.

During the operational phase of the proposal, noise impacts could occur from the sounding of warning bells and announcements over PA systems, however, the Applicant has stated that these noise sources would not form part of normal operations and only be used during emergencies. Nevertheless, this commitment has been reinforced as part of the recommended conditions of approval.

The Applicant also notes in its Supplementary Information provided to the Department that the night-time L_{Aeq} noise trigger levels, as outlined in *RING* (EPA, 2013) are considered relatively stringent. As a result, it has proposed that a level of 55 dBA be adopted. The Department does not agree with increasing the noise limits as this is against NSW Government policy. It has therefore recommended a condition of approval that requires that the proposal be designed and operated with the objective of not exceeding the airborne and ground-borne noise trigger levels as defined in the *RING*. Consideration of construction and operational noise impacts specific to each of the precincts is discussed below.

City Centre Precinct

High volumes of traffic and pedestrian activity occur within the city centre precinct. Construction works may be undertaken 24 hours a day within the proposed pedestrian zone to reduce the overall duration and thereby reduce impacts to residents, businesses and pedestrians. While there are residential apartments and hotel developments that would be affected, it is considered that many of these buildings would have been designed to minimise internal noise levels to some extent from the external busy traffic environment of George Street and surrounding streets. This would be particularly the case in the area between Circular Quay and Park Street, however, may be less to the south of Park Street to Rawson Place where older buildings exist and residential development often occurs on top of commercial shopfronts. It is unclear what noise attenuation measures, if any, exist at these locations.

Moderate to high exceedances of the Noise Management Levels would occur, particularly during excavation. The Department considers that specific mitigation measures should be implemented to

minimise these. In this regard, offers of alternative accommodation to residents are unlikely to be reasonable and feasible in the City Centre precinct. This is partly due to the impracticality of providing alternative accommodation to large numbers of people. The Department does not believe that a blanket approach to ruling out alternative accommodation across the precinct should be implemented, given there may be instances where it is reasonable. The Department does not consider it reasonable to permit 24 hour construction works 365 days per year within the City Centre precinct, but it does consider that construction hours could be generally extended to 6.00 am to 10.00 pm Mondays to Fridays and 8.00 am to 5.00 pm on Saturdays and that out of hours construction works be subject to an out of hours works protocol approved as part of the Construction Noise and Management Plan.

A small number of submissions received from commercial properties along George Street raised concerns regarding disruption during construction. One business owner suggested that construction between Market and King Streets should only be undertaken from Friday to Wednesday between 7 pm and 8 am and on Thursdays from 10 pm to 8am and that in general construction works should also be restricted such that they not occur between 15 October and 15 February every year to minimise impacts to the busiest commercial trading period. While the Department notes that there are conflicting viewpoints regarding suitable times for construction, both commercial and residential receivers occur along George Street and therefore construction works cannot be undertaken such that a particular type of receiver is not unduly affected. The Applicant has indicated that George Street would be closed to vehicular traffic (other than resident and property access) following the 100 year Anzac Day event in 2015 and that a Business Reference Group would be established to advise on business concerns related to the proposal. While the Applicant has indicated that it would establish both Business and Community Reference Groups, the Department recommends a condition of approval outlining how these be formed, particularly in relation to the selection of community and business representatives.

The transformation of George Street into a pedestrian zone results in the redistribution of traffic in the CBD. This may lead to noticeable traffic noise increases, particularly in Pitt, York, Castlereagh, Clarence and Margaret Streets. In accordance with the Road Noise Policy, reasonable and feasible mitigation measures would need to be investigated where noticeable increases in traffic occur as a result of the proposal and where the external noise assessment criteria identified in the policy would be exceeded. A particular location where noise mitigation would be required to be investigated is Randle Street, Surry Hills where traffic volumes are predicted to increase from no traffic to 20,000 vehicles per day and on Elizabeth Street, where traffic volumes are expected to double between Randle and Foveaux Streets. The Department notes that residential apartments are located in Randle Street and a number of hotels in Elizabeth Street.

Due to the low vehicle speeds proposed along George Street and particularly in the pedestrian zone, the Department does not consider that the CSELR would result in adverse noise impacts in this area and therefore no additional specific conditions have been recommended for operations in this Precinct.

The Department does not expect any adverse noise impacts from the operation of substations in this precinct as the Development Agreement with the City of Sydney states that traction power substations proposed on roadways or lands belonging to the City of Sydney would need to be constructed underground.

Surry Hills Precinct

Construction within the Surry Hills precinct is expected to have significant noise impacts to residents and commercial premises due to the close proximity to receivers. Exceedances of up to 51 dBA of the Noise Management Levels are predicted without mitigation during standard and out of hours periods. The Applicant has described construction activities in this precinct as being highly intrusive in all time periods. Demolition of Olivia Gardens would be particularly noisy and could last for up to 14 months, however the Applicant has indicated that these works would generally only occur during daytime hours. The Moore Park tunnel excavation works are also expected to impact certain Surry Hills residents as these works may be undertaken outside the specified construction hours..

While construction in this precinct would not occur continuously over the four to five year construction period, the operational phases of the proposal are also expected to result in exceedances of the noise trigger levels on a regular basis and therefore the Department considers that specific noise mitigation measures should be implemented early to address operational noise issues prior to the commencement of construction in this precinct. In this regard, the Department has recommended a

condition of approval requiring the Applicant to provide "at-receiver" architectural treatment to all applicable residential facades prior to the commencement of construction. The Department considers that, given the impact expected in this precinct as a result of all aspects of the proposal, the requirement to implement this measure is reasonable and therefore this has been recommended as a condition of approval.

The Department notes that the Applicant has indicated that noise barriers or solid hoardings are likely to be reasonable and feasible around the Wimbo Park construction site which would provide a noticeable reduction of noise in the order of 5 to 10 dBA. The Development Agreement with the City of Sydney also requires that substations on land owned by the City be located underground and therefore while not stated in the Preferred Infrastructure Report, the substation proposed to be located within the new Wimbo Park would be required to be constructed underground. This would also ensure that noise generated from the substation would not impact on surrounding residential receivers as part of its operation. Notwithstanding the Development Agreement, the Department has recommended that this substation be located underground as part of the conditions of approval. In addition, as a result of both potential noise and visual impacts (refer **Section 5.3**), the Department recommends a condition of approval that requires the substation be undergrounded. This would ensure that the operation of the substation would not impact on surrounding residential receivers, the closest of which is approximately 10 metres from its location.

The proposal would introduce a new noise source to Surry Hills resulting in a noticeable change to the existing noise environment. The restriction of traffic flows to eastbound only on Devonshire Street is expected to result in reduced traffic volumes and the Department expects that this could also result in beneficial impacts in terms of reduced traffic noise levels.

Notwithstanding, the Department recommends conditions of approval that require the Applicant to implement appropriate mitigation measures so that the CSELR is operated with the objective of not exceeding air-borne and ground-borne noise trigger levels as defined in the *RING* (EPA, 2012) and the vibration levels defined in *Assessing Vibration: A Technical Guideline* (DEC, 2006). In addition, a condition requiring the preparation of an Operational Noise and Vibration Management Plan also includes the need to address the Industrial Noise Policy and the Road Noise Policy.

Moore Park Precinct
Moderate to high noise exceedances of the Noise Management Levels between 17 and 34 dBA are predicted to occur in this precinct from construction of the tunnel and the Moore Park stop. While these works are sufficiently distant from residential receivers, the Department notes that noise intensive excavation works would occur as part of tunnel construction and this may impact on residents in Surry Hills located close to South Dowling Street as well as at Sydney Boys and Sydney Girls High Schools.

The Department considers that with the implementation of mitigation measures outlined earlier in this section, construction noise would be minimised to surrounding residential receivers. In relation to the schools, the Department would expect the Applicant to minimise high construction noise activities as much as possible during the school day and particularly during exam periods. Where this cannot be achieved hoardings or temporary noise barriers should be erected to limit construction noise to acceptable levels. Ongoing consultation with the schools would be necessary. Specific mitigation measures would be outlined in the Construction Noise and Vibration Impact Statements prepared in consultation with the Community and Business Reference Groups.

The Department does not consider that the operation (sources including wheel-rail interface and noise from crossovers and turnouts) of the CSELR would result in adverse noise impacts in this precinct.

Kensington/Kingsford Precinct
Construction noise may result in moderate to high noise exceedances in this precinct between 28 and 47 dBA due to works close to residents, particularly road excavation works along Anzac Parade which may require the use of a rockbreaker. The Department notes that the works would be transient in nature and would not affect any one particular receiver for more than two weeks at a time. Mitigation measures identified by the Applicant would reduce impacts to some extent, however, works along Anzac Parade would mostly have to be undertaken during the night to reduce impacts to the traffic network and associated noise impacts would result.

A submission from the UNSW indicates that a number of sensitive receivers occur at the university including current and future research spaces which are sensitive to vibration and electromagnetic and radio frequency interference, teaching and performance spaces near proposed stops on High Street and Anzac Parade as well as the construction compound adjacent to the National Institute of Dramatic Art on Anzac Parade and student accommodation alongside High Street and Anzac Parade. Additionally, the CSELR could impact on sensitive periods such as exams which occur during the entire month of June and November from 9 am to 5 pm throughout the day (based on 2012 and 2013 timetabling). Summer exams occur in mid February, typically from 9 am to 4 pm. The submission states that the student vacation periods preceding exams are often used for study and therefore these should also be considered as sensitive times. Buildings within Randwick Racecourse are also used for university exams and these too could be impacted by construction noise.

The Department considers that the Applicant would have to carefully consider the way construction proceeds and the noise generated in the vicinity of the university such that impacts from construction are minimised to the extent possible. Management measures are required to be outlined in the Construction Noise and Vibration Management Plan, as required by the conditions of approval. Operation of the CSELR is not expected to result in adverse noise impacts in this precinct.

The Department does not consider that the operation of the CSELR would result in adverse noise impacts in this precinct.

Randwick Precinct

Construction of the stabling facility and the light rail in this precinct would result in construction noise exceedances by up to 46 dBA at the nearest residential receiver. While excavation activities are expected to require the use of rockbreakers, it is noted that no individual receiver would be subject to significant construction noise levels from this activity for more than two weeks.

The Department notes that construction of the main line works and the stabling facility would impact on residents along Doncaster Avenue and coupled with proposed operations, these residents would be subject to high noise level exceedances for both construction and operational phases. An acoustic shed was modelled as part of the assessment of the stabling facility, however the Applicant has stated that the provision of a shed has implications on cost, visual amenity and potential overshadowing impacts and therefore requires further investigation during detailed design. The EIS did not provide detailed information on the layout and configuration of the facility and given the potential noise and visual implications of a shed or noise wall in this locality and its potential to impact on a large number of residences in close proximity, the Department considers that the Applicant must prepare a detailed design of the facility in consultation with Council and the surrounding community.

The Department considers that many solutions exist to minimise noise at this location, and does not want to limit the flexibility of the design by stipulating the form of noise mitigation for the facility. In this regard, the Department recommends a condition which requires the Applicant to design the stabling facility to meet specific design criteria and standards and in relation to noise to comply with the noise levels in the INP (inclusive of traffic movements to and from the facility). The recommended condition also requires the Applicant to submit sections and perspective views and sketches of key elements of the facility and provide evidence of consultation undertaken on the proposed design. Given that operational noise levels at this facility need to be addressed, the Department has recommended an additional condition to require that any noise mitigation proposed for the facility at or adjacent residential receivers to address operational noise impacts shall be implemented prior to the commencement of construction. Therefore, adopted mitigation measures would minimise construction noise impacts on nearby residential receivers during the facility's construction. To provide additional certainty to the community about the operation of the facility, the recommended conditions of approval also include operational noise limits for the facility at sensitive receivers based on the assessment undertaken as part of the EIS. These include daytime and evening limits of 49 dBA ($L_{Aeq,\ 15\ minutes}$) and a night-time limit of 43 dBA ($L_{Aeq,\ 15\ minutes}$) and a night-time maximum limit of 53 dBA ($L_{A1,\ 1\ minute}$) .

The noise mitigation measures outlined previously in this section are considered sufficient to protect the remaining residential receivers along the route for the duration of construction. These include those residents located along Alison Road, Wansey Road and High Street.

The UNSW outlined its particular concerns about the proposal and its potential noise and vibration impacts to sensitive environments within the university near High Street. Of specific concern are the highly intrusive construction noise levels expected, as well as potential vibration during construction

and from the operation of the LRVs on the track affecting the performance of sensitive laboratory equipment and research animals. In this regard, the UNSW has suggested a number of conditions relating to construction management and the implementation of commercially available mitigation measures and alternative construction technologies to enable compliance with noise and vibration criteria. The Applicant would undertake consultation with UNSW during the construction period to manage construction noise in an appropriate manner and in accordance with its Construction Noise and Vibration Management Plan and site specific Construction Noise and Vibration Impact Statements.

The Department does not consider that the operation of the CSELR would result in adverse noise impacts in this precinct. The redistribution of buses in the South East would also reduce traffic noise impacts to some extent.

Lilyfield Precinct
Construction of the maintenance facility may result in moderate to high exceedances of the Noise Management Levels, particularly during demolition where existing warehouses and buildings would be removed from the site. The Applicant has indicated that it can design the facility to meet the noise limits within the Industrial Noise Policy and the Department considers that warning systems, the enclosure of the wheel lathe within the building and the use of non-tonal reversing alarms would need to be implemented such that noise impacts from the operational phase of the facility do not occur.

While a number of submissions raised noise as an issue of concern at this facility, particularly from traffic movements to and from the site, the Department considers that removal of the existing container storage facility from the site would result in a substantial reduction of heavy vehicle movements along Lilyfield Road and that operation of the facility may result in less noise to surrounding residents than is currently experienced. Notwithstanding, the Department recommends noise limits for the facility's operation. In addition, it recommends that the design of the facility include specific measures to control noise.

The Department considers that with the application of appropriate mitigation measures during operation, the CSELR is not expected to result in adverse noise impacts to surrounding residential or sensitive receivers.

Apart from specific conditions regarding construction hours and noise and vibration limits during operation for key components, the Department has recommended specific conditions of approval to minimise noise from the construction and operation of the SSI. Specifically, this has included the requirement for the Applicant to prepare construction noise and vibration impact statements, to undertake monitoring to verify construction noise levels, prepare both Construction and Operational Noise and Vibration Management Plans and to prepare an Operational Noise and Vibration Review to outline what reasonable and feasible mitigation measures would be implemented to for the CSELR.

The Applicant would also be required to undertake operational noise and vibration monitoring to assess the adequacy of noise mitigation measures and compliance with the predictions in the Operational Noise and Vibration Review. Where the monitoring indicates exceedances of the noise and vibration criteria established as part of the Review, further reasonable and feasible measures may be required.

The Department considers that the recommended conditions of approval regarding noise and vibration are comprehensive and would provide adequate protection for the local residential and commercial receivers to ensure that noise and vibration impacts are adequately managed.

5.5. Landscape and Visual Impacts

The CSELR corridor comprises a predominantly urban and highly developed environment which includes a range of landscape elements that would be directly and indirectly impacted by the proposal. Particular elements in each precinct such as public plazas, parks, streetscapes and functional elements such as footpaths, built edges, feature trees and the visual connections and interaction between these items were assessed. In addition to mitigation measures incorporated into the design, other measures have been identified to reduce and manage potential adverse landscape and visual impacts during construction and operation, including new street plantings and utilising a controlled palette of materials along the length of the route to ensure a consistent design.

The assessment included an urban design strategy for the City Centre and Surry Hills precincts, developed in consultation with the City of Sydney Council. This strategy considered the design of poles and overhead wires, street lighting and switch track lighting, furniture, stop and interchange platform configurations and canopies, footpaths, ramps and fencing, signage and wayfinding, as well as landscape treatments. New infrastructure such as overhead wires, supporting poles, and built elements such as stops, substations, driver facilities, tracks and associated slabs would be permanent fixtures in the streetscape and would be most visible to the non-transient community. An urban design strategy was also developed for Randwick, Kensington and Kingsford precincts with the aim of seamlessly integrating the light rail infrastructure into the surrounding environment.

Construction would have significant and enduring adverse landscape and visual impacts, including service and utility relocations, modification to existing intersections, removal of mature street trees, operation of construction compounds and substation site compounds as well as the main construction zones. These would result in moderate to very high adverse landscape and visual impacts. While construction would be temporary it would cause visual impacts of varying magnitude and restoration works would be undertaken to ameliorate many but not all of the identified impacts.

Adverse landscape and visual impacts of varying degrees would result from loss of mature vegetation and the insertion of light rail infrastructure and associated street furniture. These would change the character of many areas and resultant views in the majority of the affected precincts.

In many cases, changes to the proposal outlined in the Preferred Infrastructure Report would increase the visual impacts compared with that assessed in the EIS. These changes are outlined in **Table 16** according to the precincts they occur in.

Figures 12 and 13: Existing trees along the route *(Source: Department of Planning & Environment)*

Table 16 – Visual Impacts from Preferred Infrastructure Report changes

Precinct	***Changes to Visual Impact***
City Centre	Reducing the wire-free zone to between Wynyard and the Town Hall only. Overhead wiring and poles between Circular Quay and Wynyard would change the visual impact along Alfred Street (from a high beneficial impact to a moderate adverse visual impact) and along George Street to the northern extent of the pedestrianised area from a negligible impact to a moderate adverse visual impact. Revising the Central Station stop to remove the need for the special event track and platform. New street tree planting is proposed at the corner of Chalmers Street and Randle Street and retention of 17 trees previously earmarked for removal however an additional two street trees would be removed from Elizabeth Street. These changes would result in an overall improvement to Chalmers Street and a moderate beneficial impact compared to the negligible visual impact assessed in the EIS.
Surry Hills	Changing the location of the Surry Hills substation from Ward Park to the newly created Wimbo Park. The substation would be set back from properties and screened from view to minimise its impact on the park.
Moore Park	Relocation of the Moore Park tunnel and Moore Park light rail stop. Although additional fig trees would be removed, the high adverse landscape impact assessed in the EIS would remain unchanged. During operations however, the visual impact would be greater than the moderate adverse impacts identified in the EIS with high adverse impacts from the removal of additional mature vegetation. Due to increased vegetation removal, the relocated stop would also result in greater adverse visual impacts than the negligible impacts previously assessed at the eastern side of Moore Park. A new pedestrian bridge over Anzac Parade in the vicinity of Sydney Boys and Sydney Girls High Schools is a significant piece of new infrastructure in the visual catchment. The final design of the bridge would be determined during detail design in consultation with City of Sydney. High visual impact is expected during construction and once operational, the bridge would be the dominant visual element along this section of Anzac Parade, removing the focus

Precinct	Changes to Visual Impact
	from the existing avenue of mature fig trees. Due to the close proximity of the bridge and the removal of mature fig trees, the visual impact to the school buildings is also expected to result in a high adverse impact.
Kensington/ KIngsford	Repositioning the UNSW Anzac Parade stop to a central island location would reduce the permanent effects following construction due to the significant trees adjacent to Anzac Parade between High Street and University Mall being retained, however, additional trees adjacent to the Tyree Building would be removed to accommodate a bus stop.
Randwick	Relocating the stop from Wansey Road to Alison Road would require the removal of fewer mature trees changing the impact from a high adverse to a moderate adverse visual impact during both construction and operation. Relocating the stop from Wansey Road to High Street would result in high adverse visual impacts in the vicinity of UNSW during its construction and operation as the loss of trees on the eastern side of the street would result in a noticeable reduction in visual amenity and the traffic lanes would be moved closer to UNSW buildings. Retention of seven trees previously to be removed by moving the light rail stop by one lane width closer to Belmore Road and reconfiguring other infrastructure within High Cross Park. While design changes would result in reduced impacts to the park, the removal of approximately 33 trees and associated infrastructure works for the proposal would still result in high adverse visual impacts during operation.

The Preferred Infrastructure Report also outlined changes to the location of construction compounds and additional compounds required. The Moore Park construction compound has been moved to reflect the relocated stop and tunnel alignment. Three new construction compounds are also proposed in the CBD in Bond and Barrack Streets and one compound is to be located in the National Institute of Dramatic Art car park on Anzac Parade in Kensington. The visual impacts of these changes would generally not be additional to the overall visual impacts assessed.

Consideration

An infrastructure project of this magnitude and complexity operating in a highly urbanised environment would result in substantial visual amenity and landscape changes. While the Applicant has committed to making further improvements to the design and landscaping, key components require further refinement and resolution.

The Department has recommended a number of conditions requiring the Applicant to prepare detailed design plans in consultation with relevant stakeholders prior to their construction. In this regard, design plans are required for the stabling and maintenance facilities (refer **Figures 14** and **15**), the High Cross Park Transport Interchange, the pedestrian bridge over Anzac Parade, the portals for the Moore Park tunnel and the rail bridge over South Dowling Street adjacent to the Eastern Distributor, the Kingsford Transport Interchange and for the replacement buildings and car parking associated with the Randwick Racecourse.

The Department recommends that these conditions require specific urban design principles and standards be met for each component as well as the provision of design details for each of the built elements and graphics including sections and perspective sketches. The design plans are required to be prepared in consultation with relevant stakeholders including the relevant Reference Groups (encompassing urban design experts, Council, relevant government agency, community and business representatives).

Figure 14: Perspective of potential Stabling Facility at Randwick *(Source:TfNSW)*

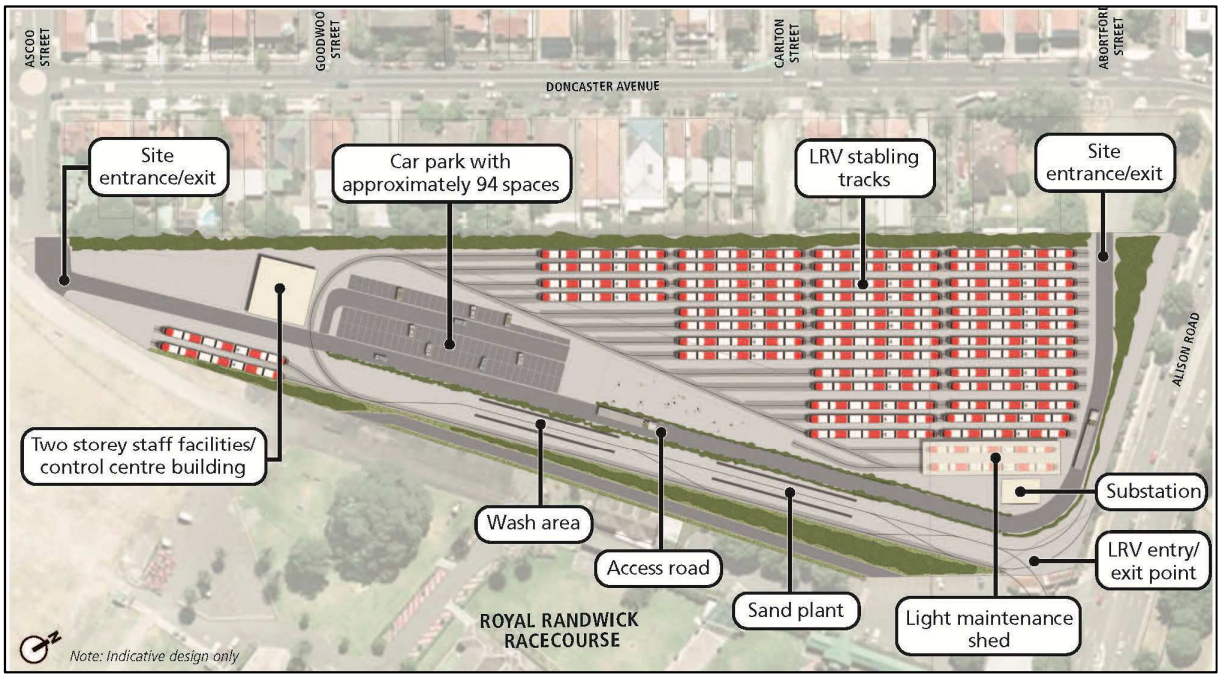


Figure 15: Indicative stabling facility layout *(Source: CSELR Environmental Impact Statement)*

A large number of submissions raised visual impacts as an issue of concern. Of the 472 public submissions received, visual impacts were raised in 110, urban design in 29 and concern regarding the number of trees to be removed in 170.

The Applicant has indicated that more trees may be retained following a detailed arborist survey but that where trees cannot be retained, a strategy of tree replacement or other mitigation is proposed in accordance with TfNSW's *Vegetation Offset Guide*. This includes replacing trees removed at a ratio of between 2:1 and 8:1 depending on size, in consultation with City of Sydney or Randwick Councils and the Centennial Park and Moore Park Trust, as relevant. To strengthen this commitment, the Department recommends that an independent arborist be commissioned to review the detailed design of the CSELR, the location of stops and associated infrastructure with a view to maximising tree retention along the corridor. This would be particularly important for construction compounds located in Belmore, Moore and High Cross Parks, as well as mature fig trees along Anzac Parade, Alison and Wansey Roads which provide substantial benefits to both the visual amenity of road users as well as adjacent residents and educational facilities.

The Applicant has stated that any branches overhanging catenary would need to be pruned which may make the retention of some trees unviable, for example along Wansey Road. Careful routing of the light rail infrastructure with input from the arborist would therefore be required to avoid or minimise impacts to existing trees as much as possible. In addition, the Department recommends the Applicant prepare and submit a Revegetation Compensation Package which requires consultation with key stakeholders and the approval of the Secretary.

The Department considers that retaining as many trees as possible would go a long way to minimising not only the visual impacts of the proposal but also any associated heritage significance and social amenity that these trees provide. While the Applicant has made a number of changes to the proposal to reduce the number of trees to be removed, many of the design changes outlined in the Preferred Infrastructure Report increase the visual impacts from those identified in the EIS. There is therefore a need to focus the detailed design on avoiding or minimising visual impacts to the extent possible. In this regard, the Department has recommended other conditions to minimise vegetation removal generally and specifically with construction compounds. These are intended to soften visual impacts; and to retain mature trees along Lilyfield Road during construction of the maintenance facility to provide visual screening of this area to local residents.

The Department also considers that visual and landscape impacts of the CSELR could be further minimised during detailed design through the preparation of plans and strategies in order to ensure that it reflects best practice and considers input from relevant stakeholders. The Department has recommended that the current Landscape Strategy be revised and updated to reflect the changes

made as part of the Preferred Infrastructure Report and to consider outcomes of the urban design conditions. A comprehensive Urban Design and Landscape Plan would need to be prepared and would include design plans for the route, stops, retaining walls, substations as well as final landscaping arrangements and offset measures. This has been recommended as a condition of approval with the Plan proposed to include the following:

- identification of design objectives and standards based on local environmental and heritage values, sustainable design and maintenance, transport and land use integration, passenger and community safety and security, community amenity and privacy, and relevant design standards and guidelines;
- details on the plans to provide, mitigate and/or augment landscaped areas and elements, with landscaping works to offset the removal of vegetation along the route;
- design details of the built elements of the CSELR and the measures to minimise the impact of these elements, particularly with respect to the impacts on adjoining residences, educational facilities, open space areas, heritage items and landscapes;
- specific plans proposed to enhance the public domain and integrate the proposal within its environment;
- details on pedestrian and cycle access elements and fixtures, including crossings, secure cycle facilities, and other fixtures such as seating, lighting, fencing, signage etc, to enhance connectivity and the provision of a safe and secure environment;
- details on public art and heritage (indigenous and non-indigenous) interpretation installations; and
- implementation, management and monitoring strategies to ensure the establishment and ongoing maintenance of built elements and landscaped areas, including performance standards.

Minimising opportunities for graffiti has also been recommended as a condition of approval with the requirement that when graffiti occurs to light rail vehicles or associated infrastructure, the Applicant is required to organise its removal within a certain timeframe to minimise impacts.

The Department also recommends that the Applicant minimise visual impacts of light rail infrastructure and hard landscaping elements, particularly overhead wiring. A design change made in the Preferred Infrastructure Report introduced catenary and supporting pole infrastructure between Circular Quay and Wynyard as it was stated that this would maximise the reliability of the service. This is in contrast to the EIS which showed this area as wire-free in recognition of the visual impacts of pole and wire infrastructure in the urbanscape of the CBD. Minimising visual clutter, particularly in the City Centre precinct is considered important in minimising impacts in this highly urbanised and significant area. Sydney Harbour Foreshore Authority considers that given the significance of Circular Quay and its role as a gateway to Sydney Harbour, the introduction of catenary and associated poles would be detrimental to the future of this internationally iconic foreshore location and should be reconsidered. The Department agrees and has recommended a condition of approval requiring that the section from Circular Quay to Wynyard and for the full extent of the pedestrian zone along George Street be wire free unless it can be fully demonstrated that catenary is required to maintain the reliability of the service in this location.

The Department recognises that even with the implementation of the Applicant's mitigation measures, together with the conditions that have been recommended, the visual impacts of the proposal would result in significant change to some neighbourhoods along the route, in particular, Devonshire Street and Wansey Road. Impacts are likely to be less in the CBD. However, the Department has assessed these impacts in the context of the existing highly developed and constrained urban area, and balanced them against the proposed benefits to be delivered to the community and commuters by the provision of a high quality light rail system and an improved public transport system. The Department considers that, on balance, the visual impacts with mitigation can be absorbed by the receiving environments and are acceptable.

5.6. Socio-economic impacts

The CSELR corridor comprises a range of socio-economic environments from commercial to residential that would be directly and indirectly impacted by the proposal. Socio-economic effects vary along the corridor, and the Applicant's Social Impact Assessment and Economic Impact Assessment identified impacts during both construction and operation. These aspects include:

- noise (Refer **Section 5.4**);
- local traffic and associated access (Refer **Section 5.3**);
- safety and security (Refer **Section 5.2**);

- retail and business;
- housing and land value;
- access to community services, public spaces and urban connectivity;
- community cultural issues and alterations to the natural environment;
- property Acquisition;
- employment;
- health and wellbeing; and
- tourism.

A summary of socio-economic impacts is presented within **Table 17**.

Table 17: Summary of the potential construction and operation impacts upon social and economic aspects

Aspect	*Construction Impact*	*Operational Impact*
Noise	• The proximity of residential and other sensitive receivers during construction would likely result in high noise impacts. The linear nature of the CSELR should result in short-term, transient impacts. • Detail provided in **Section 5.4**.	• Many areas would experience an improved noise environment, including George Street and Anzac Parade, due to reduced bus congestion. • There is the potential noise increases in Surry Hills and along Wansey Road. • Health and medical practices along High Street may be sensitive to noise and vibration. • Detail provided in **Section 5.4**.
Access and local traffic	• Temporary access and local traffic re-configurations would be required during construction affecting road users, businesses, loading zones, residents and customers. • Parking spaces would be removed along some roadways affecting road users, businesses and residents. • Detail provided in **Section 5.3**.	• The pedestrianisation of George Street requires traffic diversions. • Parking spaces and loading zones would be removed along some roadways, causing disruption in the short-term. • Detail provided in **Section 5.3**.
Safety and Security	• Temporary diversions, lighting and construction have the potential to impact upon safety and security. • Privacy of residences and sensitive businesses may be altered. • Detail provided in **Section 5.2**.	• There are potential safety conflicts for pedestrians within the pedestrianised zone of George Street, at overcrowded light rail stops, and the reconfiguration of the Nine Ways intersection Kingsford. • The safety of passengers crossing the street, particularly to island stops or across from a destination (e.g. UNSW, Sydney Boys of Sydney Girls High Schools) is likely to be impacted. • There is potential for the privacy of residences and businesses to be altered, the proposal results in higher levels of pedestrian activity. • Detail provided in **Section 52**.
Retail and Business	• Alterations to business deliveries and servicing as a result of road and access reconfigurations likely to cause disruption. • Removal of street-level parking in retail areas may impact on access and customer passage. • The cumulative effects of the construction phase have the potential to impact the viability of businesses.	• Enhanced access to customers would be provided to businesses along the route. • Rail users would benefit from more convenient access to businesses and retail premises. • Businesses and retail services would be accessible to a potentially wider range of customers.
Housing and Land Value	• The cumulative effects of the construction phase could affect the value of some housing and land along the route.	• There is potential for the delivery of new housing in areas due to access and proximity to public transport. • Research has suggested that land values with improved access to transport could change.

Aspect	Construction Impact	Operational Impact
Access to community services, public spaces and urban connectivity	• Access and local traffic conditions would be altered impacting on the access to community services, public spaces and urban connectivity. • There is potential for severance of communities during construction. This would likely be temporary. • Some connectivity to public spaces and urban areas may be impaired at some locations. This would likely be temporary.	• Benefits to students and staff travelling to the University of NSW with a more reliable and comfortable public transport service. • Increased visitor numbers travelling Randwick. • A connection would be provided to demographically similar areas such as Haymarket and Kensington/Kingsford. • Access to public spaces would improve. • George Street would be reclaimed as a public space, which could improve access for pedestrians and provide a major civic spine. • There is potential to improve existing or construct new public spaces along the route.
Sensitive community/cultural issues and alterations to the natural environment	• There is potential for some severance of cultural facilities, and the removal of significant trees.	• The CSELR would likely result in enhanced connectivity and the potential for the expansion of public spaces.
Property Acquisition Alteration	• Property acquisitions are required, including Olivia Gardens in Surry Hills, a 69 unit residential building that would be demolished. • Land in the north-west of Royal Randwick Racecourse would be acquired and developed into a light-rail stabling facility. • A number of public sector property transfers, both temporary and permanent would be required. • Vegetation would be required to be cleared.	• Once construction is complete, the acquired property in Surry Hills would be transformed into public open space.
Employment	• There is potential for noise to impact upon workers and workplace ambience along the route. • Jobs would be created during the construction period.	• Approximately 203 jobs would be created. • Potential for new business and employment opportunities due proximity to new stops and surrounding areas.
Health and Wellbeing	• Health and wellbeing may be impacted, particularly in relation to increased noise and dust.	• The reduced congestion within George Street and Anzac Parade would likely improve the health and wellbeing in these areas. • It is likely that walking in the CBD would increase.
Tourism	• There is potential for disruptions to access arrangements.	• The CSELR increases travel options for visitors. • The extended hours of service of the light rail could further develop and support Sydney's night-time economy.

The Department acknowledges the potential impacts during construction and operation to privacy and safety; traffic and access and noise and as such, has discussed these matters in detail within **sections 5.2**, **5.3** and **5.4** of this report respectively.

Whilst construction impacts would be temporary and transient, there is potential for these works to have a significant impact on the socio economic environment. The cumulative effects of elements of the construction phase have the potential to impact on the viability of businesses; housing and land value; and employment conditions. Further, connectivity of communities to services, transport infrastructure and access, public spaces and cultural facilities would be temporarily altered causing some impacts to communities. Some permanent changes made to connectivity to facilities across the route would be inconvenient, particularly following implementation and during the period of adjustment.

Once operational, the CSELR would connect the CBD to the south-east contributing to the vision of a connected Sydney. The CSELR would result in enhanced access to public transport which would likely increase trade due to convenient access to the CBD and south-east. Improved community connectivity and public spaces, in addition to reduced bus congestion would contribute to the net environmental improvement along the route.

Consideration

An infrastructure project of this scale, operating in an existing commercial and highly urbanised area would result in alterations to the socio-economic environment. A number of public submissions received about the proposal raised concerns regarding the social and economic impacts.

Economic Environment

The economic impact of construction and/or operation was raised in approximately 24 per cent of submissions. The Department agrees with the position of the Applicant that the cumulative effects of elements of the construction phase have the potential to impact upon the viability of businesses and potentially lead to some business turnover. It is expected that an infrastructure project of this nature would result in some unavoidable disturbance; however, given its linear nature, it is expected that these impacts would be short-term and transient. The Department acknowledges the mitigation measures proposed by the Applicant, including the preparation of an Access Management Plans and a Business Landowner and Engagement Management Plan. The Sydney City Centre Access Strategy developed by Transport for NSW outlines initiatives that will keep the city moving and minimise impacts on businesses, workers, visitors and residents in the city centre during construction and after the commencement of light rail services. The Access Strategy clearly prioritises and allocates street space for public transport, general traffic, pedestrians, cyclists, taxis and service vehicles to unlock Sydney's latent transport capacity.

The Department notes that the Access Strategy may not provide adequate consideration of the discrete impacts of the CSELR. As such, the Department has recommended a condition that requires the development of local access plans for individual properties and businesses impacted. The access plans shall be developed in consultation and agreement with affected parties and shall establish access/road closures and the provision of alternative routes; provision of servicing and delivery requirements; and strategies to maintain emergency and incident response access at all times. The Department does not support removing access to properties during construction and operation without the consent of the relevant property owner/s or occupier and as such has also included a condition to this effect.

To further minimise the disruptions of the construction phase, the Department has recommended the Applicant develop a Construction Business Management Plan to detail how works would be managed to minimise impacts to existing businesses located in the vicinity of construction sites and activities. The Plan shall include measures to maintain vehicular and pedestrian access during business hours and maintain visibility of the business, appropriate to its reliance on such.

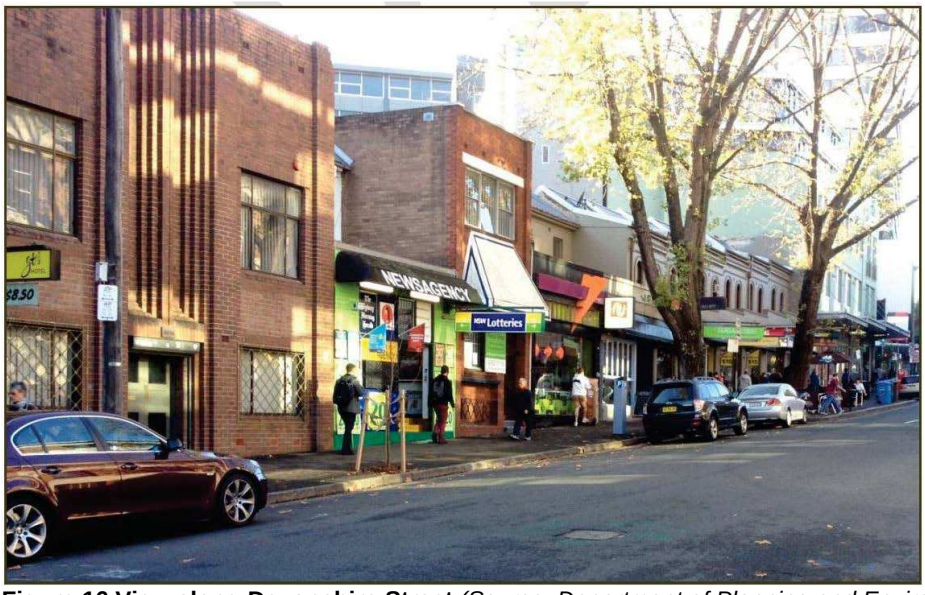


Figure 16 View along Devonshire Street *(Source: Department of Planning and Environment)*

To provide support to businesses through the construction phase, the Applicant has committed to the establishment of a Business Reference Group. The Department has provided conditions on the composition and function of the group to ensure appropriate representation from the local business community and the NSW Small Business Commissioner. The Business Reference Group would be consulted during the development of the Construction Business Management Plan, Station Access and Design Plans and the Pedestrian and Cyclist Network and Facilities Strategy.

Submissions received from the community and businesses indicate concerns regarding services and utilities impacts during construction. To avoid such disturbance/s, the Department recommends that the Applicant consult with the relevant owner and/or provider of services that are likely to be affected and make suitable arrangements for access, diversion, protection, and/or support of the affected infrastructure as required. Furthermore, the Applicant shall ensure that any disruption to any service is minimised and shall be responsible for affected businesses and households prior to any planned service disruption.

As per the impacts of construction upon the viability of businesses, it is considered that these impacts are temporary, and that the areas along the route would be transformed resulting in improved access to public transport overall.

The Department considers the operation of the light rail will deliver significant benefits across Sydney through the provision of efficient public transport. The CSELR would result in overall enhanced access to residents along the route and has the potential to expose businesses to a wider range of customers. The CSELR would create direct jobs and likely result in new business opportunities fostered by commercial outlets at the proposed stops and in surrounding areas.

Social
Connectivity, access and provision of services are paramount to the functioning of communities. The Applicant has provided a commitment to maintaining pedestrian access during construction and operation, including provision of *the Disability Discrimination Act 1992* requirements, and identification of crossings that would require greater emphasis on safety. The Department recognises this commitment and considers that the CSELR should not result in severance of any community members or facilities along the route.

Where temporary access re-configurations are required that would impact connectivity and access for both cyclists and pedestrians, the Department has recommended the Applicant develop a Pedestrian and Cyclist Network and Facilities Strategy. This Strategy shall identify alternative accesses/routes with the objective of providing seamless, coherent, visible and safe pedestrian and cycle access throughout the corridor. The Strategy would be developed in consultation with the Community Reference Group and would also outline signage and way-finding that would be provided along the route to enable passage to, from and within the affected area.

The Applicant assessed options for the alignment, identifying a preferred option that would result in a number of property acquisitions and transfers, including the demolition of the Olivia Gardens Apartment Complex. The Department acknowledges that this would have a significant impact upon the owners and residents of the properties affected, and notes that owners would be compensated financially in accordance with the *Transport Administration Act 1998* (NSW) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). Also, the potential for additional open space in the area of the Olivia Gardens complex is supported by the Department.

Functioning communities rely upon an appealing urban environment with open spaces. Based on the submissions received, loss of parkland is the key social impact (Refer **Table 17**). The Applicant has committed to making further refinements to the proposal during the detailed design stage, key components relating to the urban, landscaped environment. The Department emphasises this commitment and has recommended that the Applicant develop a comprehensive Urban Domain and Landscape Plan.

The Department acknowledges that social impacts are inevitable for a project of this scale in an established urban environment. The Applicant has committed to involving the community directly in the process through the establishment of a Community Reference Group with an independent chair which would advise on construction impacts and provide advice on environmental management plans, audit reports and complaints.

Once operational, the CSELR would provide enhanced connectivity and access to services and public spaces along the route, benefiting communities, businesses and residents through improved public transport. The potential for improvements in public spaces, including the pedestrianisation of George Street and civic spaces at Ward Park, High Cross Park and the Olivia Gardens site provide public assets that have a positive impact on communities in the long-term. The improved access to the Randwick hospital precinct, The University of NSW and the Moore Park Entertainment Precinct would enhance the movement of people to and from these areas.

The potential benefits of the operational CSELR on social aspects including health, wellbeing and tourism would likely be significant. The reduced congestion on George Street and Anzac Parade would likely improve local air quality, health and overall wellbeing in these areas. Further, it is likely that walking in the CBD would increase as pedestrianisation is more conductive to walking and active transport. The CSELR would provide clearer, more user-friendly travel options to tourists, particularly to the cultural hub of Surry Hills and would improve aesthetics in the CBD, especially along George Street.

5.7. Other issues

Table 18: Other Issues

Issue	*Potential Impact and Consideration*	*Conclusion and Recommendation*
Air Quality	• During operation, minor particulate matter emissions would be generated by the entrainment (lift-off) of surface particles along the light rail corridor, wheel and rail wear and traction sanding. The removal of buses is expected to result in a net benefit to local air quality related to gaseous emissions. • Fugitive emissions would be expected from fuel and chemicals stored at the proposed Lilyfield maintenance depot and Randwick stabling facility. • During construction, particulate matter would be generated by the operation of on-site machinery, excavation works, materials handling and material storage. Vehicle movements within the construction footprint would also contribute to emission loads.	• Operational air quality impacts would be managed through street sweeping, maintenance of ancillary service vehicles and equipment, and the avoidance of unnecessary release of air pollutants from the Lilyfield and Randwick sites. • The Department considers that the proposed air quality management and mitigation measures appropriate and recommends that these be included in Operation EMP. • measures to manage gaseous and fugitive emissions would be developed and implemented as part of the CEMP including, but not limited to plant and equipment maintenance, regulation of truck emissions in accordance with the NEPM *In Service Emission Testing*, compliance with the Smoky Vehicles Program, purchasing of off road equipment to meet the USEPA Tier 3 emission standard for non-road vehicles; sealing and storage of chemicals and fuels in accordance with appropriate regulations and guidelines; minimising on-site fuel storage etc. • For construction, a dust management plan would be developed and implemented as part of the CEMP, identifying triggers and procedures for dealing with significant dust generating activities. The Department concurs with this approach.
Biodiversity	• No threatened ecological communities were recorded, however one bird and two bat species may occur in habitat within the study area. Potential impacts include loss of vegetation, direct loss of animal life (e.g. from vehicle strike), habitat fragmentation, isolation and barrier effects, and environmental impact of noise on wildlife. • Fauna injury or death during operation is unlikely. • The removal of a number of roosting (Powerful Owl only) and foraging trees may impact on threatened biodiversity such as the Grey headed Flying-Fox,	• The construction contractor(s) would implement pre-clearing and construction protocols including confirmation of hollow-bearing tree locations, identifying nearby suitable habitat for release of any fauna captured; pre-clearing fauna checks; awareness training etc. • The Department accepts that the likely impacts on fauna are low and that proposed biodiversity management and mitigation measures proposed are generally adequate therefore no further conditions are considered necessary.

Issue	Potential Impact and Consideration	Conclusion and Recommendation
	Eastern Bent-wing Bat and Powerful Owl. • The risk of impacts to groundwater dependent ecosystems is considered low as any drawdown would be temporary and groundwater dependent ecosystems are upstream of the excavation, at least 800 metres away and adjacent to recharge ponds.	
Electromagnetic Fields	• Electromagnetic fields (EMF) from proposed substations, overhead wiring and LRV charging points were briefly mentioned by the Applicant in the Hazards and Risks section of the EIS. • The Applicant proposes to manage the issue through the detailed design process (incorporating appropriate mitigation measures into the design). • UNSW and Health Infrastructure have raised the issue of impacts of EMF and vibration on sensitive equipment (e.g. MRIs and electron microscopes) in the Lowy Research Facility, cancer treatment centre along with other facilities. • The Department is generally satisfied with the Applicant's approach, however, has recommended conditions that establish a clear framework to manage the issue.	• The Department has recommended a condition that requires the Applicant to monitor pre-construction electromagnetic field and vibration levels in consultation with UNSW and Health Infrastructure. • In addition, the Department has recommended a condition that requires the Applicant to prepare and implement a Vibration and EMF Management Plan. The condition includes identification of sensitive receivers, prediction of operational vibration and EMF levels from the SSI, identification of all reasonable and feasible vibration and EMF reduction strategies to reduce impacts, establishment of appropriate criteria that are to be maintained; and establishment of a monitoring and auditing program.
Soil and Water	• Based on CSIRO's *Acid Sulfate Soil Risk Map*, the risk of disturbing Acid Sulfate Soils is low. No further management is proposed. • Botany Sands, through which the Moore Park Tunnel would be constructed, are largely unconsolidated with a high water table. Construction of the tunnel may result in loss of stability and localised failure if not designed effectively. • The brick retaining wall between Wansey Road and the racecourse would be replaced and would require measures to avoid stability impacts. • Capacity assessments undertaken by Sydney Water indicated that stormwater drain capacity within the project's CBD alignment vary from less than a one in two year average recurrence interval (ARI) event to in excess of a 1 in 20 ARI event, with the lesser capacity primarily evident at the northern end of the alignment. • During operation, where the CSELR alignment intersects existing overland flow paths, the potential exists for stormwater to pond. • preliminary flood assessments have shown that the existing peak flood level along the northern edge of the Randwick stabling facility site is 29.2 mAHD in the 1% AEP (1 in 100 year) flood event, with the 1% AEP not encroaching to higher ground at the southern end of the site. Removal of existing buildings would result in reduced levels in the northern end of the site, however resulting in a slight increase in peak flood levels along	• Despite the low risk of encountering acid sulfate soils, the Department considers it prudent to require a contingency plan in the Construction Soil and Water Management Plan for the Moore Park Tunnel to manage any unexpected discovery of ASS during tunnel excavation. • Management of soil erosion during and following construction would be an important consideration during detailed design, and specific requirements would be set out in the CEMP for key elements such as Wansey Road retaining wall and the Moore Park cut-and-cover tunnel to avoid loss of stability. • Erosion and sediment control plans would be prepared for each worksite in accordance with Volume 2D of *Managing Urban Stormwater: Soils and Construction* (DECC 2008), with regular inspection of control measures. • Notwithstanding the above, the Department considers that further investigations into surface water, groundwater and geotechnical issues are required, particularly in regards to the Moore Park Tunnel prior to construction and has recommended a condition that the Applicant prepare a report for the Secretary's approval that outlines details of excavation, tunnels and construction; any structures or infrastructure that may be impacted; impacts on surface and groundwater quality and quantity and discharge; and groundwater flow rates and drawdown amongst other matters. • The Department accepts that the proposal's integration with the adjoining stormwater systems will be addressed during the detailed design stage. • The Department's recommended conditions

Issue	Potential Impact and Consideration	Conclusion and Recommendation
	the western boundary of the site.	of approval include the preparation of a Stormwater and Flooding Management Plan and require that, where reasonable and feasible, the Applicant no worsen existing flood characteristics in the vicinity of the CSELR alignment. • The Department acknowledges that the construction of the Randwick stabling facility may result in minor changes to the 1% AEP peak flood levels expected in the immediate surrounds of the site. A condition of approval has been recommended, stipulating that the design of the stabling facility shall not worsen flooding impacts to adjoining residential areas and/or the Royal Randwick Racecourse.
Contamination	• Existing soil contamination may occur in the Haymarket to Moore Park, the Moore Park to Kingsford and Randwick precincts, predominantly in fill used for road construction, parks and open spaces, underground services etc., building rubble. • large scale soil remediation is not considered likely. • Contamination associated with historical land use, the racecourse and horse stables may be present at the Randwick stabling facility but is unlikely to be widespread. A sampling plan has been prepared to assess the contamination status. • Soil contamination (fuel and oil spills, engine emissions, maintenance, asbestos etc. was identified at the Rozelle Goods Yard in 2003 and 2011.	• A Phase 2 Environmental Site Assessment would be undertaken during detail design to further characterise the nature of potential contamination • An Asbestos Management Plan would be developed in accordance with *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia* (Western Australia Department of Health 2009) and a contaminated materials remediation strategy would also be included within the CEMP. • The Department recommends that a condition be included that requires the Applicant to submit to the Secretary reports detailing the Stage 2 contamination site investigations and certification by a site auditor that any remediation is to a standard consistent with the intended land use. Where no specific remediation strategy is required, measures to manage potentially contaminated soils, materials or groundwater should be included in the Construction Environmental Management Plan.

Non-Aboriginal Heritage	• A total of 174 heritage listed items were identified as being affected by the light rail corridor.
	• 50 of the identified heritage items may be directly affected.
	• A number of items have been are on the State Heritage Register (SHR) or local heritage registers.
	• The type of heritage impacts include:
	  • Direct physical impacts such as tunnelling, tree removal or demolition;
	  • Impacts on visual settings from associated infrastructure such as stops, catenary wires and supporting poles; and
	  • Significant incursion into landscape areas such as Moore Park, Tay Reserve and High Cross Park.
	• The assessment revealed the following heritage impacts
	  • Major (temporary) impacts expected on First Fleet Park;
	  • Major impact expected on the significant trees of Devonshire Street, Tay Reserve, Kensington, UNSW, Royal Randwick Racecourse, Wansey Road and High Cross Park;
		• The Applicant has committed to undertaking works in a manner that minimises heritage impact.
		• Where possible, design modifications to avoid identified archaeological sites would be undertaken.
		• Historical archaeological test excavation and further research would be undertaken in archaeological resource areas.
		• The Applicant committed to undertake archaeological monitoring and/or salvage excavation in order to mitigate the impacts.
		• The Applicant has committed to implementing measures to protect the physical fabric of heritage items.
		• Light rail stops and substations would be designed to minimise impacts on heritage items.
		• The Department requires the Applicant to complete archival recordings for all heritage items directly and physically impacted by the proposal.
		• The Department considers the proposal to be in the public interest and can be supported with the inclusion of recommended conditions to mitigate heritage impacts.
		• The Applicant's mitigation measures provide

Issue	Potential Impact and Consideration	Conclusion and Recommendation
	• Major impact expected on buildings within the Royal Randwick Racecourse conservation area; • Major impact expected on High Cross Park; • Major impact expected at the crossing of the subsurface path of the Tank Stream. • Moderate or minor impact expected on heritage items and landscapes including Martin Place, Moore Park, Central Station and Daking House (Rawson Place).	an appropriate framework to define and manage potential heritage impacts during construction and operation. • The Department's recommended conditions of approval include the preparation of a Construction Heritage Management Plan, prepared in consultation with the Heritage Division.
Aboriginal Heritage	• Aboriginal archaeological potential varies along the CSELR alignment although there is a concentration of Aboriginal sites around the Port Jackson foreshore. • Areas with the highest archaeological potential have been identified near Moore Park and the alignment immediately east of South Dowling Street; from Elizabeth Street to Chalmers Street; at the Randwick stabling facility; near the intersection of Anzac Parade and Alison Road. • Due to its location within a highly modified landscape, no operational impact on Aboriginal archaeology is expected. • Potential impacts during construction may arise from the regrading of soil landscapes, construction of track slab and stops, the installation of substations and overhead cabling, the cut-and-cover tunnel construction and the installation of two crane pads adjacent to the cut-and-cover tunnel alignment.	• Further steps would be undertaken including targeted test excavations and geotechnical investigations to refine areas and extent of potential impact on PADs; keeping an "archaeological watching brief" where no impacts are anticipated; heritage inductions for all contractors; and procedures for dealing with human remains. • Given the high potential for Aboriginal objects in the Moore Park Precinct, it is recommended that a condition of approval be included that requires further archaeological investigation. A further condition requires the development of a detailed strategy for salvage prepared in consultation with the OEH and Aboriginal stakeholders. • The Department considers that the Aboriginal heritage management and mitigation measures proposed for the SSI are generally adequate and recommends that the procedures relating to construction be outlined in a Construction Heritage Management Plan to be prepared as part of the Construction Environmental Management Plan.

6. CONCLUSION

With Sydney's population expected to increase by 1.6 million, to approximately 5.9 million people in 2031, the CSELR will play a key role in accommodating the Sydney CBD and South East Sydney's transport needs into the future.

Currently, the CBD is the major employment hub in Sydney, accommodating 450,000 employees as well as a residential population of 193,000, generating more than 630,000 passenger trips each weekday via multiple modes of transport. The South East suburbs incorporate a number of key destinations, including UNSW, Randwick Education and Health Specialised Centre, the Moore Park sports and entertainment complex and the Royal Randwick Racecourse. Currently, over 350 bus trips per day operate on the Central to UNSW route, however there is still insufficient capacity to effectively accommodate peak demand. Additionally, other major travel destinations within South East Sydney are no longer efficiently and effectively supported by the existing public transport network. High demand for public transport services throughout the region has led to a highly constrained network, such that congestion and reduced accessibility may impact on the amenity, productivity and future growth of Sydney.

With future population increases, transport modelling indicates that based on a 'do-nothing' scenario, the increased demand for travel in the CBD and South East Sydney cannot be accommodated on existing networks without generating more congestion, overcrowding and longer travel times along key corridors.

The CSELR proposal involves the construction and operation of a new light rail service in Sydney including 12 kilometres of new light rail track from Circular Quay to Central, Kingsford and Randwick via Surry Hills and Moore Park. The proposal includes 20 new light rail stops, a pedestrian zone on George Street (between Bathurst and Hunter Streets), approximately 12 substations to power the light rail vehicles (LRVs), a LRV stabling facility at Randwick and a LRV maintenance facility at Lilyfield.
The Department considers that the CSELR is justified and is in the public interest because it is necessary to deliver a vital piece of public infrastructure which is the key to the efficient economic future of the CBD and the South East suburbs. The adverse consequences of not proceeding with the proposal would be significant in the long term, in terms of the capacity of the transport network and road network congestion, and poor levels of accessibility between homes, jobs and major event precincts.

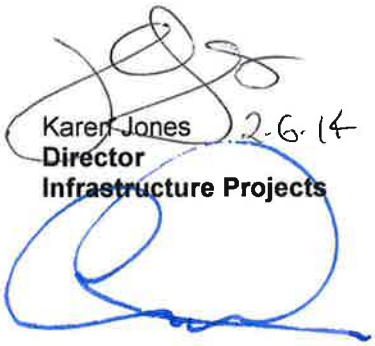
The Department has carefully considered all environmental, social and economic impacts of the proposal, in accordance with the requirements of the EP&A Act. It has undertaken an extensive consultation process with Government agencies and other relevant stakeholders. Following a detailed assessment of the Applicant's EIS, Response to Submissions Report and Preferred Infrastructure Report, and the submissions received from agencies, local Councils and the public during the exhibition period of the proposal, the Department is satisfied that the residual impacts of the proposal can be appropriately mitigated or managed to within acceptable levels. The Department therefore recommends that the proposal be approved subject to the recommended conditions of approval.

The recommended conditions of approval for the proposal provide for the mitigation and management of key impacts associated with the proposal. These include specific environmental performance and construction environment management conditions for traffic, transport and access; noise and vibration; electromagnetic fields; urban design; visual quality and landscape character; heritage; soil, water and hydrology; sustainability; property and business impacts; and land use and community facilities. The Department has also recommended conditions of approval for construction environment management planning, including the requirements for a Construction Compound and Ancillary Facilities Management Plan; a Construction Noise and Vibration Management Plan; a Construction Traffic, Transport and Access Plan; a Construction Soil and Water Management Plan for the Moore Park Tunnel; a Construction Heritage Management Plan; a Construction Business Management Plan; and an Equine Management Plan. To further strengthen project management, the conditions of approval also require the environmental management of ongoing operational issues and the implementation of a Governance Structure, to provide for consultation with Community Reference Groups.

The Department believes that these requirements would provide for the implementation of best management practices during detailed design, construction and operation of the proposal, and would

ensure that the impacts of the proposal on the surrounding environment and the amenity of local residents, workers and commuters are managed to acceptable levels.

The Department has carefully considered the key areas of concern, including traffic, access, noise and amenity impacts, against the significant transport and socio-economic benefits of the proposal. The proposal represents a vital infrastructure which will provide significant benefits to communities and the city as a whole, and is in the public interest. Consequently, the Department recommends that the Minister for Planning approve the CBD and South East Light Rail proposal, subject to the recommended conditions of approval.



Karen Jones 2.6.14
Director
Infrastructure Projects

3.6.14

Chris Wilson
Executive Director
Development Assessment Systems and Approvals

APPENDIX A ENVIRONMENTAL ASSESSMENT

See the Department's website at www.planning.nsw.gov.au.

APPENDIX B SUBMISSIONS

See the Department's website at www.planning.nsw.gov.au.

APPENDIX C APPLICANT'S RESPONSE TO SUBMISSIONS AND PREFERRED INFRASTRUCTURE REPORT

See the Department's website at www.planning.nsw.gov.au.

APPENDIX D SUPPLEMENTARY INFORMATION FROM TRANSPORT FOR NSW

See the Department's website at www.planning.nsw.gov.au.

APPENDIX E INDEPENDENT EXPERT REPORTS

See the Department's website at www.planning.nsw.gov.au.

APPENDIX F RECOMMENDED CONDITIONS OF APPROVAL