Sustainable Transport Reference Group

Report ST02 - 2 June 2014

SUBJECT: Feasibility of Light Rail on Military Road and Update on the proposed Second Harbour Rail Crossing

AUTHOR: Michaela Kemp, Acting Traffic Planning Manager

ENDORSED BY: Duncan Mitchell, Director Engineering and Property Services

EXECUTIVE SUMMARY:

At its meeting on 28 April 2014 (Min. No.142) Council resolved (in part):

THAT a report on the feasibility of a light rail network along Military Road be submitted to the next Sustainable Transport Reference Group meeting.

THAT an update on the second rail crossing and Metropolitan Transport Plan context and content be submitted to the next Sustainable Transport Reference Group meeting.

This report discusses the relevant proposals that have been put forward by the NSW State Government to date and Council’s response and position on those proposals. It should be noted that the planning, funding and implementation of any such proposal ultimately rests with Transport for NSW and the NSW State Government.

FINANCIAL IMPLICATIONS:

There are no perceived financial implications for North Sydney Council. Costs associated with planning and implementation ultimately fall under the responsibility of the NSW State Government.

RECOMMENDATION:

1. THAT the Mayor write to the NSW Minister for Transport outlining Council’s concerns regarding the proposal for Bus Rapid Transit along the Military Road/ Spit Road corridor and urging Transport for NSW to also consider other high mass transportation options such as Light Rail and Heavy Rail in their assessments, and in assessing these options consider ways to utilise the existing traffic lanes more efficiently rather than replacing parking lanes which will significantly impact on local businesses, pedestrian amenity and surrounding residential areas.

2. THAT Council continues to lobby for a Second Harbour Rail Crossing including requesting more information on the location of the proposed corridor and possible location of any additional railway stations.
LINK TO DELIVERY PROGRAM

The relationship with the Delivery Program is as follows:

Direction: 2. Our Built Environment
Outcome: 2.5 Sustainable transport is encouraged
2.6 Improved traffic management

BACKGROUND

At its meeting on 28 April 2014 (Min. No.142) Council resolved (in part):

THAT a report on the feasibility of a light rail network along Military Road be submitted to the next Sustainable Transport Reference Group meeting.
THAT an update on the second rail crossing and Metropolitan Transport Plan context and content be submitted to the next Sustainable Transport Reference Group meeting.

CONSULTATION REQUIREMENTS

North Sydney Council will continue to request the NSW State Government undertakes adequate consultation with the North Sydney community, particularly in the areas affected throughout the planning stages of any major public transport proposal.

SUSTAINABILITY STATEMENT

The following table provides a summary of the key sustainability implications:

<table>
<thead>
<tr>
<th>QBL Pillar</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>• Potential for reduction in use of private vehicles along Military Road corridor which in turn would reduce emissions.</td>
</tr>
</tbody>
</table>
| Social | • Increase in public transport services for the corridor. Consideration needs to be given to location of stops and access to any underground tunnels.  
• Removal of parking will affect amenity of the area and could create an intimidating environment for pedestrians.  
• Improvements to public transport will help to create a shift away from private vehicles and more active community. |
| Economic | • Loss of parking as proposed for some options has potential to impact on local businesses. |
| Governance | • Aligns with initiatives for improved public transport particularly along Military Road/ Spit Road corridor. |
Report of Michaela Kemp, Acting Traffic Planning Manager  
Re: Feasibility of Light Rail on Military Road and Update on Second Harbour Rail Crossing

DETAIL

Current State Government Plans and Strategies

Transport for NSW and the NSW State Government released the following recent plans and strategies which are relevant to future plans for public transport throughout NSW and Sydney, including North Sydney.

1) Northern Beaches Bus Rapid Transit (BRT) Pre-Feasibility Study, June 2012
2) Sydney’s Rail Future, June 2012
3) NSW Long Term Transport Master Plan, December 2012
4) Sydney’s Light Rail Future, December 2012
5) Metropolitan Strategy for Sydney to 2031, March 2013

Council made submissions on the NSW Long Term Transport Master Plan, the BRT Pre-Feasibility Study and the Metropolitan Strategy for Sydney during the relevant consultation periods.

Feasibility of Light Rail on Military Road

Military Road currently experiences extreme congestion each day which significantly impacts on the amenity of the area and forces the overflow of traffic onto local streets. Council has previously identified that improved public transport is required along the Military Road/Spit Road Corridor to the Warringah Peninsula and Northern Beaches to address this problem, and for many years Council has lobbied the NSW State Government to act.

The NSW Long Term Transport Master Plan was released in December 2012. Of significance to North Sydney Council, the Master Plan makes reference to a Bus Rapid Transit (BRT) proposal along the Military Road/Spit Road corridor. No alternative high mass transportation options were considered in the NSW Long Term Transport Master Plan, additionally, no light rail projects on the North Shore were proposed in Sydney’s Light Rail Future. The BRT proposal is supported by SHROC (a partnership of Manly, Mosman, Pittwater and Warringah councils). In the past, Council has not supported the SHROC BRT proposal as it focused primarily on the Northern Beaches area, gave little regard to the residents and businesses of the Neutral Bay and Cremorne community, and it lacked the strategic approach in examining other more effective mass transportation systems (such as light rail, metro and heavy rail train system). The Pre-Feasibility Study also did not examine how the existing carriageway and traffic lanes on Military Road could be utilisied in a more efficient manner without resulting in the loss of parking.

Following the release of the NSW Long Term Transport Master Plan, Transport for NSW undertook a pre-feasibility study for the Bus Rapid Transit (BRT) proposal and released the Northern Beaches Bus Rapid Transit (BRT) Pre-Feasibility Study in June 2012. The BRT Pre-Feasibility Study explored a range of options for the Military Road / Spit Road corridor however a Light Rail system was not one of the options. Five of the BRT options were then short-listed and considered in more detail as part of the BRT Pre-Feasibility study.

Council in its submission back to Transport for NSW outlined that it was generally disappointed with the BRT Pre-Feasibility Study as Transport for NSW appears to have committed to Bus Rapid Transit for this corridor without examining more effective mass transportation systems. Further, Council has raised concerns that 4 of the 5 options considered in the Pre-Feasibility Study would result in a loss of kerb-side parking along Military Road.
The loss of parking would impact on local businesses and their customers; parking pressures would increase in surrounding local streets and the removal of parking would create a freeway type environment along Military Road which can be intimidating for pedestrians.

Option 5 of the BRT Pre-Feasibility Study referred to a BRT tunnel beneath Military Road. Given Council’s strong objection to the loss of on-street parking the only appropriate option out of those proposed, from Council’s perspective, is the BRT Tunnel. However Council pointed out in its submission that if a BRT Tunnel was to be considered then appropriate traffic and transportation planning should be undertaken to ensure that current levels of service do not decrease for bus passengers along the Military-Spit Road Corridor. The tunnel would have to incorporate adequate accessible bus stops and stations.

Option 4 of the BRT Pre-Feasibility Study consists of a kerb-side BRT along Military Road with an extension to a new BRT/rail station interchange in the North Sydney CBD which the Pre-Feasibility Study notes would align with the proposal for a second harbour rail crossing.

Council also emphasised to Transport for NSW in its submission of 12 June 2013 that long term consideration needs to be given as to whether mass rapid public transport in tunnels is the appropriate solution for parts of this corridor. All transport modes including light rail, metro and heavy rail (trains) should be included as part of any assessment for an underground tunnel along Military Road.

**Update on proposed Second Harbour Rail Crossing**

The *NSW Long Term Transport Master Plan*, the *Metropolitan Strategy for Sydney* and *Sydney’s Rail Future* all contain references to the Second Harbour Crossing, which is part of a long-term strategy to create a second rail link between Chatswood and the CBD to increase the capacity of rail services on the North Shore. A rapid transit service is proposed which is expected to enable a decrease in journey times between Chatswood and the Sydney CBD.

Council is generally supportive of the preservation of this corridor for a second harbour rail crossing as this will help to alleviate congestion on North Shore train services and improve public transport links between the North Shore and Sydney CBD. However, no information has been provided as to where this corridor is to be located. Through submissions on the relevant planning documents, Council has requested more information regarding the location of the corridor for the Second Harbour crossing and the possible location of any additional railway stations. This information would allow Council to assist in the planning for the Second Harbour Crossing and would provide greater certainty to the community.

No further information on the Second Harbour Crossing has been provided at this stage.

A summary table on the key planning documents and relevant references is provided below.
## Summary Table - Recent Transport Infrastructure Plans & Strategies for Sydney

<table>
<thead>
<tr>
<th>Transport Infrastructure Plan/ Strategy</th>
<th>Comments</th>
<th>Reference</th>
</tr>
</thead>
</table>
| 1. NSW Long Term Transport Master Plan, December 2012 | - Submission sent on Draft Master Plan in October 2012.  
- Identifies most strained and congested corridors  
- Discusses plans for rail future including second harbour crossing  
- Discusses plans for bus future including BRT along Military Road  
- Discusses plans for light rail future – no plans for North Shore | Pg. 127-129  
Pg. 130-136  
Pg. 152 |
| 2. Northern Beaches BRT Pre-Feasibility Study, June 2012 | - Submission sent 12 June 2013  
- Considered options for BRT proposal on Military Road.  
- Five options were shortlisted and considered in more detail.  
- Feedback would inform direction of more detailed analysis | Entire Document |
| 3. Sydney’s Rail Future, June 2012 | - Broad network map shows second harbour crossing proposed within train network  
- Identifies benefits of new harbour crossing for commuters on North Shore, CBD and wider train network  
- Rapid transit proposed to be incorporated into new harbour rail crossing | Pg. 11-17 |
| 4. Sydney’s Light Rail Future, December 2012 | - Discusses role and benefit of light rail  
- Outlines current plans for light rail including CBD & Inner West  
- Outlines Priority corridors for further investigation – North Shore is not identified. | Pg 8 |
| 5. Metropolitan Strategy for Sydney to 2031, March 2013 | - Outlines future directions for planning in Sydney as a global city  
- Identifies protection of corridor for second harbour crossing as key action | Accessibility & Connectivity Pg 77 |
NSW LONG TERM TRANSPORT MASTER PLAN

December 2012
4.7.1 Sydney’s Rail Future – modernising our metropolitan rail network

Over the next 20 years, we will build a modern rail system for Sydney that will rank with the best in the world, providing an efficient, reliable and comfortable service that is recognised as one of the great benefits of living in Sydney.

In planning Sydney’s Rail Future, we have looked to the best international examples to see what a world-class city railway looks like. The best city rail systems share several attributes: high capacity trains and platforms, simple stopping patterns, segregated tracks without complex junctions, separation from freight and high speed rail operations and advanced signalling.

We will take action to build a rail system that has these attributes.

We will follow the lead of other global cities and move to a ‘differentiated service’ approach. In this hierarchical approach, there will be three tiers of service with the implementation of high capacity rapid transit being added to the current two-tier arrangement of suburban and intercity services. This new tier will provide high frequency services, where the timetable is less significant and customers can simply turn up and go. On these lines, new single-deck trains will be introduced that can run faster, more frequently and carry more people. The development of the three tier network will untangle the current system and ensure fast, efficient and reliable services throughout the network.

The three tier network will be complemented by a modern fleet, upgraded Sydney stations and improved customer information.

Modernising our rail system cannot happen overnight, we can make an immediate start on getting the basics in place to enable us to build, over time, a system that not only meets our travel needs into the future but that is recognised as one of Sydney’s greatest assets.

More details are provided in Sydney’s Rail Future, our long term strategy for the city’s rail network.

Short term

**Action** Implement efficiencies across the rail network

We will introduce a series of essential rail operational efficiencies that will provide the foundation for further modernisation of the rail system:

- Timetable changes to introduce standardised and regular stopping patterns
- Significantly improved management of dwell times at stations
- Platform redesign, including de-cluttering to allow clear passenger entrance and exit
- Better incident recovery management through improvement of operational processes and the rollout of digital train radio systems
- Track infrastructure enhancement
- Transition to dedicated fleet types for some lines
- Introduction of simpler timetables across the network
- The rollout of automatic train protection on critical sections of the network.

**Action** Complete the South West Rail Link

We will complete the South West Rail Link, as well as station upgrades and rail clearways projects.

**Action** Undertake detailed planning for a second Harbour Crossing and CBD rail line with new stations

We will commence planning for the alignment of the second Harbour Crossing and new rapid transit line through the CBD.
SYDNEY’S RAIL FUTURE

Figure 4.49 Sydney’s Rail Future – How our rail network will look

The Long Term Transport Master Plan is accompanied by Sydney’s Rail Future which details how we will deliver the four core elements needed to give Sydney a world-class rail network that can support the city’s growth:

- **High capacity rapid transit services** – where customers can simply turn up at the station and expect to get on a train within a short time. These mass transit services will be separated from the current suburban and intercity services.

- **New rolling stock** – higher capacity single-deck trains that can carry more customers and move around the network more quickly. Compared with double-deck trains, single-deck trains are able to load and unload passengers more quickly, enabling shorter dwell times, and increasing train capacity at busy rail stations.
• **More trains** – operational changes to enable us to operate more trains an hour during peak times, alleviating capacity constraints.

• **New capacity through the heart of the network** – a new Harbour crossing and CBD line will address growing demand in Sydney’s north-south travel corridor and provide greater flexibility to respond to future requirements.

This additional capacity will enable Sydney Trains to carry another 90,000 to 100,000 people per hour in the peak, delivering sufficient capacity to serve Sydney well into the future.

The strategy will be delivered over five stages:

**Stage one** will improve the operational performance of the rail network through better dwell management, standardised stopping patterns and improved incident recovery management.

**Stage two** will consist of initiatives to improve network efficiency. This will include Automatic Train Operations, a transition to dedicated fleet types for certain lines, track infrastructure enhancements and some platform redesign.

**Stage three** will introduce a new rapid transit system.

The completion of the North West Rail Link and the introduction of rapid transit trains will provide comfortable, frequent and fast high capacity services from Rouse Hill to Chatswood (and later through to the CBD and south via the Bankstown and Hurstville sectors). The Epping to Chatswood Rail Link will be upgraded to facilitate the high capacity rapid transit system.

**Stage four** will consist of the largest increase in capacity to the Sydney rail network in 80 years with the completion of a second Harbour Crossing allowing services from the North West Rail Link to extend directly to Sydney CBD.

**Stage five** will consist of a southern extension of the rapid transit system through the conversion of the Bankstown and Hurstville sectors and major timetable changes to existing suburban services to increase capacity across the network.

### Medium term

**Action** Build the North West Rail Link

We will complete the North West Rail Link, our first high capacity rapid transit service railway, designed to operate single-deck, high frequency trains.

**Action** Epping to Chatswood conversion

We will convert the Epping to Chatswood line to operate single-deck, high frequency trains to enable North West Rail Link services to run from Rouse Hill to Chatswood as rapid transit services. In the initial stage after the North West Rail Link is opened, passengers will take a service to Chatswood where they will change trains to travel to the Sydney. We will develop a high-quality interchange to accommodate these passengers.

**Action** Improve rail safety through technology upgrades

We will make a major investment in rail safety programs, including Automatic Train Protection and digital train radio systems.

### Long term

**Action** Build a Second Sydney Harbour rail crossing, new CBD line and new CBD stations

The centrepiece of the modernised rail system will be a new Sydney Harbour crossing and CBD line that will connect Redfern to Chatswood via the CBD. We have commenced detailed planning for the second Harbour Crossing. The new CBD line and Harbour crossing will improve access and connectivity for the North Shore Line, Epping to Chatswood Rail Line and North West Rail Link, and will improve travel times and capacity through the city from the north and south. It will provide the largest increase in capacity to the Sydney rail network for 80 years. New stations will relieve pressure on Central, Wynyard and Town Hall Stations.
4.7.2 Sydney’s bus future

Buses have an important role to play as part of an integrated transport system. Buses are important for mass transit and connecting centres and local regions. They provide core services on corridors with intermediate demand, as well as on the local network servicing greenfield and other low density areas (delivering attractive service frequencies before rail is built, and filling gaps in or relieving pressure on the rail network).

As described in Chapter Two, we know that customers most value a fast and reliable bus journey. Therefore, reduced waiting and on-board journey time, extended service hours and improved service reliability are the leading factors that will encourage customers to use the bus.

For public transport patronage to grow on non-rail corridors, bus transport needs to be competitive with car travel in terms of network reach or coverage, door-to-door journey time, and reliability. This means average speeds of 25-30 km/h for selected highest priority corridors, with implications for how bus network layout and design can improve service speed, frequency, reliability and network legibility, and generally make for a more pleasant customer experience.

Some initiatives are already in progress to manage congestion including:

- Double decker bus trials
- Introduction of bus marshalls
- Traffic signaling and parking changes
- Rerouting of bus services to avoid congestion areas, including the diversion of services to operators via the Cahill Expressway in early 2013 to improve overall reliability
- Formation of a dedicated police motorcycle team for the Sydney CBD to target and avoid traffic stopping in intersections.

Our vision for the bus network

The bus system must be part of a seamlessly integrated public transport network. Integration means that the bus network is part of the overarching Strategic Transit Network that includes all other public and transport modes. The Strategic Transit Network will guide future decision making on what type of public transport service should be provided. Corridors and interchanges will form a connected system that offers a greater range of bus travel opportunities than the current radial system. The busiest, development-rich bus corridors within this network will be candidates for conversion to high capacity modes such as Bus Rapid Transit (BRT).

This all translates into the following actions:

- **Improve bus networks** - improve the quality of service offered to customers in terms of frequency, reliability, travel speed and legibility, improve the efficiency of operating the system and reduce the impacts of bus congestion in centres and structure bus networks to meet all day demand and to support better connections
- **Fleet upgrades** - upgrade the bus fleet and move toward a cleaner, quieter, fit-for-purpose fleet
- **Infrastructure upgrades** - implement bus priority works to improve reliability and, where possible, travel speeds, ranging from improvements in bus lanes and intersection treatments to the construction of dedicated BRT infrastructure
- **Customer experience improvements** - improve amenity on buses and at bus stops, T-way stations and multi-modal interchanges, by working toward making stops compliant with the *Disability Discrimination Act 1992*, and by improving walking and cycling transport facilities
- **Integration across modes** - introduce electronic ticketing and reformed fare structures, improved and integrated service planning, and a redesigned bus network to ensure that the bus system can be easily navigated as part of multi-modal public transport travel.
The table below shows our actions to improve the bus network over the short, medium, and long term.

<table>
<thead>
<tr>
<th>Fleet</th>
<th>infrastructure</th>
<th>Customer experience</th>
<th>Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short term (0-5 years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expand and upgrade existing fleet and deliver more services</td>
<td>Commence Bus Head Start priority works on key roads in Western Sydney growth areas</td>
<td>Enhance service frequencies on Western Sydney Bus Head Start routes and other strategic corridors</td>
<td>Complete whole-of-public transport system timetable integration</td>
</tr>
<tr>
<td></td>
<td>Deliver bus service reliability improvements on other strategic corridors</td>
<td>Upgrade vehicles, stops and interchanges, and information</td>
<td>Deliver integrated ticketing reforms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Progressively achieve Disability Discrimination Act compliance</td>
<td>Commence bus network realignment including low-frequency route consolidation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contract bus services based on outcomes for customers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Realign Sydney CBD bus network</td>
</tr>
<tr>
<td><strong>Medium term (5-10 years)</strong></td>
<td>Northern Beaches Bus Rapid Transit, subject to feasibility</td>
<td>Operate more frequent and reliable services</td>
<td>Complement North West Rail Link, other heavy rail upgrades and light rail</td>
</tr>
<tr>
<td>Introduce high-capacity buses on other key corridors</td>
<td>Study the development of a major CBD bus interchange</td>
<td>Add bus frequency to meet demand</td>
<td>Adopt the three level service hierarchy for Sydney’s bus system</td>
</tr>
<tr>
<td></td>
<td>Support emergence of high frequency strategic bus network for Sydney with bus priority packages</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Long term (10-20 years)</strong></td>
<td>Introduce Bus Rapid Transit on key established corridors including Victoria Road</td>
<td>Enable seamless interchange to, from and between bus services across entire network</td>
<td>Complete transition to fully connected bus system based on coherent spatial strategy</td>
</tr>
<tr>
<td>Continue investment in quieter, cleaner, fit-for-purpose fleet</td>
<td>Stage Bus Rapid Transit development on key city-shaping corridors to service growth areas and support sustainable land use change</td>
<td></td>
<td>Develop bus route networks for growth centre expansion</td>
</tr>
</tbody>
</table>

The sections that follow describe the initiatives that comprise our bus strategy for the next 20 years.
Phase one (short term, 0-5 years): Improve the customer experience

Our most urgent suite of short term actions will be focused on improving the customer experience, and reducing frustration caused by poor service reliability.

**Action** Improve bus services and frequency as the population changes and grows

We will extend operating hours and increase frequencies to meet demand and improve customer satisfaction. We will improve night and weekend services, and enhance services to growth areas, regional cities and employment areas such as Sydney Airport. We will also develop targeted bus transport service offerings where required. For example, new late night bus services are being offered from Kings Cross to city interchanges to better meet customer needs.

Bus timetables will be revised to align with the timetables for rail and other modes where the frequencies do not already allow for quick interchange between services.

**Action** Provide bus priority and better bus services on growth centre road networks under the Bus Head Start Program

An early priority for the development of greenfield areas will be the construction of bus priority measures that have the potential to improve bus speed and reliability for access to new suburbs. We will provide service frequencies and priority infrastructure as areas are developed, so that service is not lagging behind. This will include fleet acquisition, and service frequency to meet identified minimum standards.

By investing in growth centres, we can provide a high-standard public transport product at an efficient cost, provide a reliable public transport choice from the day people move in and shape sustainable travel patterns.

**Action** Enhance bus priority on Strategic Bus Corridors

We will implement urgent priority measures on existing Strategic Bus Corridors, as a means of making travel time competitive in established areas. For example, upgrades to enhance bus priority on clearways and at intersections is currently being investigated for the six highest priority Strategic Bus Corridors across Metropolitan Sydney.
Phase two (short and medium term, 0-10 years): Create a more efficient, integrated bus network

Short and medium term actions will focus on a more efficient bus network that is faster, more reliable, more cost effective and better integrated with the rest of the public transport system.

**Action** Adopt simplified service types for buses, to make the system easier to understand and use

Along with the construction of a Bus Rapid Transit line to the Northern Beaches, we will adopt a new three-tier service hierarchy for this and other major corridors in Sydney’s strategic bus network. For the Northern Beaches corridor this will comprise higher capacity services, frequent buses, larger fleet for intermediate capacity services, and standard route buses for all other services.

**Action** Redesign city-wide bus network to meet customer needs, use buses more efficiently, and better complement rail and light rail

We will redesign the bus network based on the Strategic Transit Network hierarchy (see Chapter Two). The focus initially will be on the development of a strategic bus network that complements the rail network outlined in *Sydney’s Rail Future*. The strategic bus network will consist of links with elevated service frequencies and on-road bus priority features that provide cross-regional connections between existing and emerging centres, including in Western Sydney.

A redesign of the bus network will focus on Sydney CBD. The reconfigured bus network will be planned around the principles of through-routing and some ‘near-side’ termination, rather than ‘far-side’ termination. In the short to medium term, the CBD bus routes and network will be restructured to avoid the impacts caused by significant levels of termination within the congested city centre. Improved levels of bus capacity, speed, reliability and legibility would be achieved by running buses on a smaller number of dedicated routes and through-routing a higher number of bus services.

Instead of the current arrangement under which many bus routes enter the CBD, travel through and terminate at the opposite side of the CBD, creating congestion and layover challenges, the future network will see additional cross-city Metrotub-style routes that traverse the CBD, terminating at destinations beyond. Local routes will through-route, or, where necessary, terminate just inside the CBD (the ‘near side’), allowing passengers to connect to other high-capacity modes such as rail or light rail, or to walk a short distance to their final destination. This more efficient use of Sydney’s bus fleet will result in more frequent, more reliable journeys for bus customers and relieve congestion for pedestrians, cyclists and other road users.

The centrepiece of a redesigned bus network in the CBD will be a high capacity north-south light rail line as part of a pedestrian zone on George Street. This light rail line will offer very frequent, high capacity transit from the Eastern Suburbs to the Harbour. It will enable convenient north-south travel for passengers transferring from near-side terminating local buses (see page 160).
A NEW STRUCTURE FOR SYDNEY’S BUS SYSTEM

Sydney’s highest demand, centre-to-centre core bus network will be serviced by frequent, fast, all-day routes, using T-ways, full Bus Rapid Transit, or arterial roads with a high level of priority. The core network will carry regular all-day, all-week services at a reliable and predictable minimum frequency.

Sydney’s highest demand, centre-to-centre Strategic Bus Corridors will be serviced by the most frequent, fastest, all-day routes, using T-ways, full Bus Rapid Transit, or arterial roads with a high level of bus priority. The city’s core network of standard bus routes will carry regular all-day, all-week services at a reliable and predictable minimum frequency. These standard routes will enable people to get around locally or connect to the wider transit network. Where needed to meet additional patronage demand, the standard network will be augmented by extra services, such as peak express services, school buses and NightRide services.

Bus priority infrastructure such as bus lanes, queue jumps and bus signals will be targeted at the highest demand corridors or on sections of the road network where multiple routes converge. This will improve the reliability and speed of all bus services, and particularly high demand bus routes. All bus services will be equipped to operate under PTIPS (Public Transport Information and Priority System), the traffic light operating module developed by RMS to help keep buses running to timetable.

The Long Term Transport Master Plan has defined tiers for all types of public transport as part of the Strategic Transit Network:

- **Mass Transit** – high frequency, high capacity services that provide access to major destinations, such as heavy rail
- **Intermediate Transit** – high frequency but moderate capacity
- **Local Transit** – getting around locally or providing access to the Mass or Intermediate Transit levels

Each service level in Sydney’s restructured bus system will be associated with specified operating standards for bus frequency, target speed and customer walking catchment. The highest demand Strategic Bus Corridors will therefore align with the Mass and Intermediate tiers of the Strategic Transit Network. Standard and demand-driven bus routes will align with the Intermediate and Local tiers.

Figure 4.50 shows the strategic routes of a restructured bus system for Sydney in 2031, representing the Mass Transit and Intermediate Transit levels for buses. The network will operate to a high frequency to service cross-metropolitan travel needs.

We will develop Sydney’s bus system through the introduction of new services, rationalisation of existing services and progressive delivery of packages of bus priority infrastructure over the short, medium and long term towards 2031.
Figure 4.50 Sydney’s core bus network in 2031
Phase three (medium term, 5-10 years): Build new bus infrastructure to support and extend improved services.

This phase will see the construction of major new bus infrastructure – primarily a new Bus Rapid Transit (BRT) line connecting to the Northern Beaches, and a major bus interchange in the CBD.

**Action** Bus Rapid Transit for the Northern Beaches

The Northern Beaches BRT system (see page 154) will improve travel time to the CBD for more than 200,000 residents of the Northern Beaches. The options identified in the recent pre-feasibility study will now be subject to detailed analysis, allowing the Government to make a long term decision based on sound evidence and cost information.

**Action** Investigate a new CBD bus interchange

As a result of the Northern Beaches BRT and further demand growth from North Western Sydney, new bus interchanges will be needed. We will study the feasibility of a new major bus passenger facility, possibly at the northern end of the CBD, that would link Northern Beaches BRT passengers, and other Lower North Shore and North Western Sydney bus customers, with the CityRail and wider bus networks, and offer good walking connections to Barangaroo and other CBD destinations.

**Action** New service hierarchy

We will adopt a new three-tier service hierarchy for this and other major corridors in Sydney’s strategic bus network. For the Northern Beaches corridor this will comprise a BRT spine for high capacity services, frequent articulated bendy buses or other larger fleet for intermediate capacity services, and standard route buses for all other services. The service hierarchy will align with the Mass Transit, Intermediate Transit and Local Transit framework outlined in the Strategic Transit Network.

**Action** Contract bus operators to continually improve service for customers

In the long term, we will move from input-based contracting of bus services to a customer outcomes orientation that will make bus providers more responsive to changes in demand and other customer needs, while still meeting all minimum service requirements.

Phase four (long term, 10+ years): A networked bus system

In the long term, we will make more investments in the bus network as a fully connected system.

**Action** Move from a radial to a networked bus system

The current radial one-seat bus service network, which attempts to provide single-service bus transport from many origins to many destinations without interchange, has little capacity for growth and is not adequate to the task of meeting complex, modern travel patterns. Over time we will transform Sydney’s bus system from a radial system of routes oriented towards a few major centres to a connected system, scaling up bus capacity on cross-city routes in response to changes in demand. This will be enabled in part by consolidating some existing low frequency bus routes onto major corridors, and by reallocating resources to provide a higher frequency on trunk corridors and their rearranged intersecting feeder routes. With a connected network, the need for interchange may be increased, but the inconvenience of interchange is reduced due to higher service frequencies. The net effect is to extend the bus travel possibilities available to the public transport customer.

**Action** Investigate BRT or light rail on high demand corridors

Bus system capacity will need to continue to grow along with Sydney’s population and travel demand. The arrival of BRT on the Northern Beaches will be accompanied by an investigation of the use of high frequency and high capacity buses, BRT infrastructure or light rail on other corridors in Sydney that face high demand and heavy traffic congestion. For example, the corridor from Parramatta to the CBD via Victoria Road will be investigated for potential BRT or light rail development.
Mona Vale to the CBD

Key actions on the corridor
• Introduce Bus Rapid Transit to the CBD

The Mona Vale to CBD corridor is a highly constrained corridor leading from the Northern Beaches to the CBD via the Spit Bridge. As the corridor is an important bus corridor, we will focus our short to medium term efforts on improving the bus network.

The level of bus demand and current operating conditions supports the implementation of a Bus Rapid Transit (BRT) system to relieve congestion and provide better services for customers. BRT usually involves very frequent services, exclusive bus roadways and high quality stations and vehicles. BRT works well in delivering fast travel times where demand is high, but not high enough to make investing in heavy rail systems a viable alternative.

The options identified in the recent pre-feasibility study will now be subject to detailed analysis, allowing the Government to make a long term decision based on sound evidence and cost information.

The first stage of developing the BRT will be to provide dedicated lanes and address the key bottlenecks along the corridor, such as Spit Bridge, to provide improved bus travel times and reliability.

The redesign of the bus network will enable the public transport network to better service growing east-west demand, such as between Dee Why and Chatswood.

Parramatta to the CBD via Strathfield

Key actions on the corridor
• Increase rail frequency
• Connect the M4 to the Port/Airport as part of WestConnex

This is one of the most important rail and road corridors in Sydney, carrying the highest number of public transport passengers. It is also one of the city’s most constrained corridors, with a high level of road congestion and crowding on trains.

The Northern Sector of WestConnex, comprising the M4 Extension, upgrades to the existing M4 between Strathfield and Parramatta, and a tunnel between the Taverners Hill area in Petersham and the St Peters area, will alleviate congestion on Parramatta Road and improve conditions for bus services.

One of the aims of the WestConnex program is to support the regeneration of the Parramatta Road corridor. A slotted road concept has been proposed to enable this regeneration. The slotted concept sinks the motorway below surface level while constructing a new local road at surface level.

Improvements to rail infrastructure will improve the capacity of the corridor by increasing the frequency and speed of trains to and from the CBD. In the short term, timetable and operational changes and the new 2013 timetable will deliver services at a reliable 20 trains per hour.

The construction of a new Harbour crossing and CBD line will provide additional capacity on the Western Line to the CBD, increasing the number of trains per hour on the line by a further 14 trains per hour.
Northern Beaches Bus Rapid Transit (BRT) Pre-Feasibility Study
# Contents

1. Introduction ................................................. 1

2. Development of options ................................. 3
   2.1 Shortlist of options .................................. 4
   2.2 Travel time improvements ......................... 6

3. North-South Corridor ........................................ 7
   3.1 Option 1: North-South Priority Works .......... 9
   3.2 Option 2: North-South Median BRT .............. 11
   3.3 Option 3: North-South Kerbside BRT .......... 13
   3.4 Option 4: North-South Northern Interchange BRT 15
   3.5 Option 5: North-South Tunnel BRT .............. 17
   3.6 Tidal flow options .................................. 19

4. East-West Corridor .......................................... 20
   4.1 Option 6: East –West Kerbside BRT ............ 22

5. Bus Network Considerations ............................. 24
   5.1 North-South Corridor: Bus Network Rationalisation 25
   5.2 East-West Corridor: Proposed Bus Network .... 27

6. Summary of key findings ................................. 28
Executive Summary

The NSW Government made a commitment to examine the feasibility of Bus Rapid Transit (BRT) for the Northern Beaches of Sydney. This report provides a summary of the findings from a pre-feasibility study undertaken in response to that commitment.

The initial scope of the study was to assess the feasibility of BRT on the North-South Corridor between the Northern Beaches and the Sydney CBD but it was extended to also include the East-West Corridor between Chatswood and Dee Why. This was in response to the Shore Regional Organisation of Councils (SHOROC) which considered the East-West Corridor a priority for investment because increased capacity on that route could take pressure off the North-South Corridor.

The two main problems with public transport services in the region are:

- reliability and travel time variability of current bus services (buses between Spit Junction and Wynyard can vary from timetable by 15 to 20 minutes)
- slow travel speeds of buses in the peak periods.

Bus priority measures already operate on the North-South Corridor. Key components include: a continuous dedicated bus lane between Mona Vale and Seaforth; transit lanes; intersection upgrades; and, bus priority at traffic signals. Further work has been planned and is programmed for implementation.

On the East-West Corridor, dedicated bus lanes are in operation on three sections of the route and bus priority is provided at one intersection.

The study initially assessed 15 BRT options that would improve bus travel speeds and operations in the peak and off peak periods and increase the overall use of public transport to meet existing and future demand on both corridors. Six of these were short listed for further analysis. None of the short listed options require widening of the road except for bus stops and at intersections and in some cases to widen bridges.

The results of the analysis indicate the six short listed options are effective in reducing trip times and trip time variability for public transport users. A rapid economic appraisal shows the costs of the BRT options are higher than the benefits. This is partly because dedicating additional road space to BRT will reduce the space available and increase congestion for private vehicles.

The options all assume bus priority 24 hours a day. In practice this would be a ‘final state’ (or may not be required along the full length of the corridor) and in the interim bus priority measures would apply for a shorter period of the day and/or parts of the corridors would be shared with general traffic as options are delivered incrementally. More detailed appraisal of options accounting for this variation would most likely reduce the costs relative to the benefits. The options could also be expanded to include options that are broader than BRT measures. For example, a general traffic tunnel under Military Road could be further considered – this option was not shortlisted although it ranked highly in an initial multi-criteria analysis because it was considered out of scope of BRT measures.

Several options are feasible from a construction and deliverability perspective and implementing preferred options using a staged approach coupled with re-configuring existing services could increase the economic viability of progressing BRT on the Northern Beaches.

The NSW Government is seeking comment on the options considered in the pre-feasibility study.
1. Introduction

This summary report outlines the findings of the Northern Beaches Bus Rapid Transit (BRT) Pre-Feasibility Study (the Study). The Study was undertaken between June 2011 and March 2012 because of the NSW Government’s commitment to examine the feasibility of Bus Rapid Transit (BRT) for the Northern Beaches of Sydney (the Region). The study region is shown in Figure 1.1. The detail of the study is documented in Northern Beaches Bus Rapid Transit (BRT) Study – Pre-Feasibility Report.

Bus priority measures already operate on the North-South Corridor. These have been targeted to improve travel time reliability, maximise efficiency of road space and encourage public transit use along the North–South Corridor. Key components include: a continuous dedicated bus lane between Mona Vale and Seaforth, transit lanes, intersection upgrades, additional road space and bus priority at traffic signals.

Dedicated bus lanes are also operating in three sections of the East–West Corridor and bus priority is provided at one key intersection. Roads and Maritime Services (RMS) is also seeking approval to undertake a Corridor Development Strategy with the aim of providing a higher level of bus priority on the corridor.

Despite these improvements there remain two main issues with public transport services along the corridors:

- The reliability and travel time variability of the current bus services. For example the travel time of a limited stops bus between Spit Junction and Wynyard can vary from the timetable by 15 to 20 minutes on some mornings depending on traffic congestion levels.

- The travel speed of buses in the peak periods. The Auditor-General identified the Pittwater-Spit-Military Road corridor as the second-slowest commuter route in Sydney.

Demand on the transport system will continue to grow which will result in additional pressure on existing services. The Northern Beaches region is shown in Figure 1.1. Its population of 263,000 is forecast to increase by 45,000 by 2036 and employment of 97,000 is expected to grow by 25,500 over the same period. Already 128,000 commute trips and 900,000 non-commute trips are made in the region each weekday.

The objectives of the Study are to provide the NSW Minister for Transport and the Northern Beaches community with:

- A description of BRT and whether or not it can provide the required step change in public transport for the Region.

- Solutions to identified problems, recognising the bus priority work already implemented by RMS along the Pittwater Road corridor.

- A preliminary assessment of the benefits and costs of BRT options linking the Region with the Sydney, North Sydney and Chatswood CBDs.

- Key BRT impacts and possible mitigation strategies.

- Road and bus network changes required to accommodate BRT operations.

- Physical and operational options to address key pinch points on the road corridor.
Figure 1.1: Northern Beaches BRT Region
2. Development of options

The study team developed a long list of BRT options for the Northern Beaches for assessment – 10 for the North-South Corridor and 5 for the East-West Corridor.

BRT systems typically include:

- frequent services.
- exclusive roadway/priority over other modes providing improved travel times and reliability.
- high quality stations.
- high quality vehicles.
- off-board fare collection.
- real-time passenger information.
- system identity/branding.

The options developed for the study included various combinations of dedicated bus lanes (in the kerb lane or on the median lane), peak tidal flow arrangements and supporting infrastructure investments including options that replace existing bridges (at the Spit and Narrabeen) with wider bridges and a tunnel to by-pass Military Road.

All options focused on the existing road corridors complemented by a redesign of the bus network aimed at making the network easier to understand and use. While consideration was given to alternative corridors, it was considered unlikely that the existing trunk corridors could be substituted or alternative “greenfield” corridors developed because of:

- the investment already made in the existing road infrastructure.
- the density of development adjacent to the existing corridors.
- the high cost, potential environmental impacts and requirement for property acquisition.
2.1 Shortlist of options

The set of 15 options were reduced to six using multi-criteria analysis. Each option was scored against a set of assessment criteria. The six shortlisted options were then subject to more detailed assessment. A brief description of the options and the rationale for whether or not an option was shortlisted is provided in Table 2.1.

Table 2.1: Description of preliminary options and outcome of Multi-Criteria Assessment

<table>
<thead>
<tr>
<th>Name</th>
<th>Alignment of NWRL</th>
<th>Description</th>
<th>Rationale for inclusion/exclusion on short list</th>
</tr>
</thead>
<tbody>
<tr>
<td>North-South Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority Works</td>
<td>☑ Option 1</td>
<td>Upgrade existing kerbside bus lanes to 24 hour.</td>
<td>Option ranked third in the multi-criteria analysis and warranted closer analysis.</td>
</tr>
<tr>
<td>BRT on median</td>
<td>☑ Option 2</td>
<td>Segregated median BRT lanes and local buses on the kerbside.</td>
<td>Dedicated BRT running along the centre of the road carriageway is a mid-ranking option.</td>
</tr>
<tr>
<td>BRT on kerb</td>
<td>☑ Option 3</td>
<td>Segregated kerbside BRT lanes and passing bays at all bus stops.</td>
<td>Dedicated BRT running along the kerb ranked favourably. This provides opportunities to use and augment existing kerbside bus infrastructure and does not require passengers to change their access/egress arrangements.</td>
</tr>
<tr>
<td>Traffic tunnel</td>
<td>☑</td>
<td>General traffic tunnel from Warringah to CBD providing road capacity for BRT.</td>
<td>This ranked highest amongst the options but was not considered because of its likely high cost, assessment complexity, delivery challenges and the likelihood that it would adversely impact on the achievement of the study’s public transport objectives. It was considered beyond the scope of BRT measures.</td>
</tr>
<tr>
<td>Tidal flow median</td>
<td>☑</td>
<td>Peak hour tidal flow lane in the median along Military Road.</td>
<td>This was a mid ranking option and warranted closer scrutiny as part of the evaluation of the BRT on median option rather than a separate option (Option 2). Although tidal flow may provide additional short to medium measures, it may be a less reliable long term option depending on whether future levels of contra-peak traffic can be accommodated on fewer lanes.</td>
</tr>
<tr>
<td>Tidal flow kerbside</td>
<td>☑</td>
<td>Peak hour tidal flow lane on the kerb along Military Road.</td>
<td>This was considered to have merit and warranted closer scrutiny as part of the BRT on kerb option rather than a separate option (Option 3).</td>
</tr>
<tr>
<td>North side interchange</td>
<td>☑ Option 4</td>
<td>Segregated kerbside BRT lanes with rail interchange at North Sydney.</td>
<td>This was considered a longer term alternative that warranted scrutiny to assess its ability to relieve bus congestion in the CBD and facilitate modal interchange.</td>
</tr>
<tr>
<td>Name</td>
<td>Alignment of NWRL</td>
<td>Description</td>
<td>Rationale for inclusion/exclusion on short list</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>BRT viaduct</td>
<td>✅</td>
<td>Overhead bus viaduct on Military Road.</td>
<td>Provision of dedicated BRT running via an elevated viaduct along Military Road between Spit Junction and Neutral Bay ranked second highest amongst all the broad BRT options. It was not shortlisted because of adverse amenity impacts that could not be ameliorated and would be unlikely to garner community support.</td>
</tr>
<tr>
<td>Military Road widening</td>
<td>✅</td>
<td>Widen Military Road to increase bus capacity for BRT.</td>
<td>The option of providing additional BRT (road) capacity along Military Road through carriageway widening between Medusa Street and Neutral Bay was considered. This would result in the need for in excess of 160 partial and full property acquisitions. The adverse urban amenity, community disruption, visual, property, cost and business impacts would be significant and further consideration was not considered warranted.</td>
</tr>
<tr>
<td>BRT tunnel</td>
<td>✅ Option 5</td>
<td>Kerbside BRT on Pittwater Rd and bus tunnel under Military Road.</td>
<td>The provision of a dedicated two lane bus tunnel beneath Military Road between Spit Junction and the Warringah Freeway ranked favourably because of its ability to deliver bus travel time and general traffic relief and warranted further consideration despite its greater cost compared to other options.</td>
</tr>
<tr>
<td>East-West Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority Works</td>
<td>✅ Option 6</td>
<td>Upgrade existing kerbside bus lanes to 24 hour.</td>
<td>It was decided to treat these East-West Corridor options as one with potential to implement aspects of each in stages with BRT on median or BRT on kerb longer term options compared to the priority works.</td>
</tr>
<tr>
<td>BRT on median</td>
<td></td>
<td>Segregated median BRT lanes and provision for local buses on the kerbside.</td>
<td></td>
</tr>
<tr>
<td>BRT on kerb</td>
<td></td>
<td>Segregated kerbside BRT lanes and passing bays at all bus stops.</td>
<td></td>
</tr>
<tr>
<td>Tidal flow Boundary Street</td>
<td>✅</td>
<td>Peak hour tidal flow lane in the median on Boundary Street, Chatswood.</td>
<td>Some targeted tidal flow options may have short term merit but in parts of the corridor these rank poorly because of constrained road capacity and minimal travel time and operational benefits.</td>
</tr>
<tr>
<td>Widen Wakehurst Parkway</td>
<td>✅</td>
<td>Widen Wakehurst Parkway to increase bus capacity for BRT.</td>
<td>The option of widening Wakehurst Parkway at selected pinch points between Pittwater Road, North Narrabeen and Warringah Road, Frenchs Forest was considered as a relief route to Pittwater Road. The option ranked poorly because of its inaccessibility to key centres and sources of patronage, incompatibility with broader bus plans, road capacity constraints and limited relieve at key pinch points.</td>
</tr>
</tbody>
</table>
2.2 Travel time improvements

Three generic BRT scenarios were tested using TfNSW’s Strategic Transport Model (STM) to provide an indication of the travel time savings for the options:

- Kerbside and Median BRT Options
- Kerbside BRT with Bus Tunnel Option
- Kerbside BRT with north side Interchange Option.

Table 2.2 shows the results for both corridors. It is estimated that the introduction of dedicated BRT on either the kerbside lanes or in the central median along the North-South Corridor could deliver travel time savings of between 7 to 13 minutes for limited and express bus services. The construction of a bus tunnel under Military Road increases the travel time saving to 17 minutes. The overall travel time of a peak period bus trip between Mona Vale and the Sydney CBD could be reduced from 74 to 57 minutes under the bus tunnel option. Travel time savings of 3 to 5 minutes could be achieved on the East-West Corridor.

Table 2.2: Estimated Travel Time Savings

<table>
<thead>
<tr>
<th>Route Type</th>
<th>Route Section</th>
<th>Travel Time</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Without Project “Current”</td>
<td>Kerb / median BRT</td>
<td>Bus Tunnel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time</td>
<td>Time</td>
<td>Saving</td>
</tr>
<tr>
<td>All stops</td>
<td>Spit Junction to Wynyard</td>
<td>26</td>
<td>23</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td>Spit Junction to Wynyard (via North Sydney interchange)</td>
<td>27</td>
<td>+1</td>
<td>27</td>
</tr>
<tr>
<td>Limited-stops</td>
<td>Mona Vale to Wynyard</td>
<td>74</td>
<td>61</td>
<td>-13</td>
</tr>
<tr>
<td></td>
<td>Mona Vale to Wynyard (via North Sydney interchange)</td>
<td>67</td>
<td>-7</td>
<td>63</td>
</tr>
<tr>
<td>Express</td>
<td>Mona Vale to Wynyard</td>
<td>66</td>
<td>53</td>
<td>-13</td>
</tr>
<tr>
<td></td>
<td>Mona Vale to Wynyard (via North Sydney interchange)</td>
<td>59</td>
<td>-7</td>
<td>55</td>
</tr>
<tr>
<td>Warringah Road</td>
<td>Narraweena to Skyline</td>
<td>11</td>
<td>8</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td>Frenchs Forest to Chatswood East</td>
<td>19</td>
<td>14</td>
<td>-5</td>
</tr>
</tbody>
</table>
3. **North-South Corridor**

Five of the shortlisted options were for the North-South Corridor which links the Sydney CBD with Mona Vale via Pittwater, Spit and Military Roads (refer Figure 3.1). This is one of Sydney’s busiest bus corridors with a total of 74 bus routes operating along it. Between 7am and 9am, approximately 9,600 passenger and 210 buses enter the CBD from this corridor. This represents 35% of total buses and 45% of total bus passengers entering the CBD via the Sydney Harbour Bridge. Of all services travelling along Military Road in the morning peak, half are limited-stops and express services to the City.

Although the majority of services are to the CBD around 25% travel to North Sydney, St Leonards and Chatswood.

Each of the five options, their advantages and disadvantages and the outcome of a rapid economic appraisal are outlined in the following sections.
3.1 Option 1: North-South Priority Works

Option 1 is shown in Figure 3.2 and is a package of bus priority works that includes:

- removal of on-street parking over the entire length of the corridor and replacement with off-street parking
- replacement of existing bus lanes with 24-hour kerb-side bus lanes between Mona Vale and Neutral Bay
- upgrade bus stops at 9 key locations on the corridor to include high quality shelters and customer information
- widening the existing roadway at six key locations to provide right turn lanes to eliminate discontinuities in the existing bus priority measures.

Table 3.1: Advantages and disadvantages of Option 1.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides a constant level of priority across the corridor for 24 hours in both directions.</td>
<td>Does not address the pinch points of Narrabeen and Spit Bridges which are only 4 lanes wide.</td>
</tr>
<tr>
<td>Eliminates six points of congestion where three lanes are reduced to two at right turns, improving travel time and reliability for all services.</td>
<td>Does not provide stopping or overtaking facilities at the majority of bus stops.</td>
</tr>
</tbody>
</table>

Option 1 has one of the highest economic returns of all the options assessed though the costs are higher than the benefits (refer Table 3.2).

Table 3.2: Option 1 Outcomes of rapid economic appraisal

<table>
<thead>
<tr>
<th></th>
<th>Total costs ($m)</th>
<th>Total benefits ($m)</th>
<th>Benefit cost ratio</th>
<th>NPV ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>336</td>
<td>226</td>
<td>0.67</td>
<td>(110)</td>
</tr>
</tbody>
</table>
Figure 3.2: Priority works Option 1
3.2 Option 2: North-South Median BRT

Option 2 would provide a dedicated BRT over the entire length of the corridor. It is illustrated in Figure 3.2 and would include:

- Removal of on-street parking and widening the roadway at key locations as for Option 1.
- BRT on the median/centre lanes.
- Replacement of the Spit and Narrabeen bridges with six lane bridges.
- Upgraded BRT stations on the median with pedestrian overpasses providing access.

A median BRT system requires all passengers to access the centrally located BRT platforms either via grade separated pedestrian/cyclist bridges or to wait and cross the road. It does not provide priority for local bus services as BRT stations will be widely spaced and local buses would still use the kerbside lane for drop-offs and pick-ups at local stops. The advantages and disadvantages of Option 2 are summarised in Table 3.3.

Table 3.3: Advantages and disadvantages of Option 2

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Exclusive operation for BRT express services for the entire length of the corridor.</td>
<td>• Reduction in priority for local bus services which would share the kerbside lane with local traffic.</td>
</tr>
<tr>
<td>• Dedicated median Stations.</td>
<td>• Stations on the median will increase access and egress travel time and increase the potential for accidents.</td>
</tr>
<tr>
<td>• Eliminates six points of congestion where three lanes are reduced to two at right turns improving travel time and reliability for all services.</td>
<td>• On-street parking removed to compensate for conversion of median lanes for BRT operation and maintain general traffic capacity.</td>
</tr>
<tr>
<td>• Additional capacity on Spit and Narrabeen Bridges</td>
<td></td>
</tr>
</tbody>
</table>

Option 2 has the highest BCR of all the options assessed. The costs are higher than the benefits and it has a negative net present value of $140 million (refer Table 3.4).

Table 3.4: Option 2 Outcomes of rapid economic appraisal

<table>
<thead>
<tr>
<th></th>
<th>Total costs ($m)</th>
<th>Total benefits ($m)</th>
<th>Benefit cost ratio</th>
<th>NPV ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2</td>
<td>488</td>
<td>348</td>
<td>0.71</td>
<td>(140)</td>
</tr>
</tbody>
</table>
Figure 3.3: Option 2 Median BRT
3.3 Option 3: North-South Kerbside BRT

Option 3 (shown in Figure 3.4) would provide a dedicated BRT running along the kerb. Some of its features are common to Option 2 but configured for the kerbside and include:

- Removal of on-street parking and widening the roadway at key locations as for Option 1.
- Exclusive 24 hour kerbside BRT lanes.
- Overtaking bays at all bus stops.
- Replacement of the Spit and Narrabeen bridges with 6 lane bridges.

This option differs from Option 1 as the kerbside BRT would be fully segregated from other traffic. Passing bays at bus stops would mean express buses are also able to avoid more frequently stopping local buses.

Table 3.5: Advantages and disadvantages of Option 3

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Exclusive operation for BRT express services for the entire length of the corridor.</td>
<td>• Requirement for property acquisition.</td>
</tr>
<tr>
<td>• Kerbside running provides opportunities to use and augment existing infrastructure and does not require passengers to change their access arrangements.</td>
<td></td>
</tr>
<tr>
<td>• Passing bays for bus overtaking.</td>
<td></td>
</tr>
<tr>
<td>• Additional capacity on Spit and Narrabeen Bridges</td>
<td></td>
</tr>
</tbody>
</table>

Option 3 has a relatively high cost compared to Option 1 with the biggest difference being additional costs for property acquisition (to provide space for additional infrastructure including for additional passing bays). The BCR is marginally lower than Options 1 and 2 (refer Table 3.6).

Table 3.6: Option 3 Outcomes of rapid economic appraisal

<table>
<thead>
<tr>
<th></th>
<th>Total costs ($m)</th>
<th>Total benefits ($m)</th>
<th>Benefit cost ratio</th>
<th>NPV ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 3</td>
<td>572</td>
<td>354</td>
<td>0.62</td>
<td>(218)</td>
</tr>
</tbody>
</table>
Figure 3.4: Option 3 Kerbside BRT
3.4 Option 4: North-South Northern Interchange BRT

Option 4 (shown in Figure 3.5) would provide a dedicated BRT running along the kerb as for Option 3 but this option would include an interchange north of the harbour bridge. A north side interchange facility is identified as a priority in the Shore Regional Organisation of Council’s Shaping our Future strategy.1

Key features would include:

- Extension of Military Road improvements to a new rail station at North Sydney (an underground interchange facility at Neutral Bay was also considered but North Sydney was preferred because it aligns with the long term rail plan for a second harbour crossing serving a new station in the North Sydney area).
- A dedicated interchange facility providing transfer onto rail.
- Provision of sufficient stand capacity to accommodate bus and passenger volumes designed to allow rapid transfers.
- Provision of driver and layover facilities.

Table 3.7: Advantages and disadvantages of Option 4

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in bus volumes entering the CBD (a proportion would be diverted to North Sydney).</td>
<td>Forced interchange at North Sydney for passengers travelling beyond North Sydney to the Sydney CBD.</td>
</tr>
<tr>
<td></td>
<td>Trip lengths could be longer than a direct bus to the Sydney CBD in the off-peak.</td>
</tr>
</tbody>
</table>

Option 4 is a relatively high cost option but has a similar benefit cost ratio to Options 1 and 2. Option 4 has the highest costs for property acquisition of all the options (refer Table 3.8).

Table 3.8: Option 4 Outcomes of rapid economic appraisal

<table>
<thead>
<tr>
<th></th>
<th>Total costs ($m)</th>
<th>Total benefits ($m)</th>
<th>Benefit cost ratio</th>
<th>NPV ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 4</td>
<td>552</td>
<td>372</td>
<td>0.67</td>
<td>(181)</td>
</tr>
</tbody>
</table>

Figure 3.5: Option 4 Northern Interchange BRT
3.5 Option 5: North-South Tunnel BRT

Option 5 (shown in Figure 3.6) enhances road capacity through incorporation of a dedicated 2 lane bus tunnel for a section of the corridor. Any tunnel option is only likely to be considered for the Military Road corridor because of the high cost and because other roads along the corridor are capable of providing adequate priority for buses. The key features of this option are:

- BRT on the kerbside from Mona Vale to Spit Junction as described for Option 3.
- A two lane dedicated bus tunnel beneath Military Road between the Spit Junction and Warringah Freeway which would join the Sydney Harbour Bridge bus lane.

The capacity of a bus tunnel would only be fully utilised during peak periods. Bypassing the Military Road corridor may also limit travel and interchange options for some customers.

Table 3.9: Advantages and disadvantages of Option 5

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full priority operation in tunnel.</td>
<td>Construction impacts.</td>
</tr>
<tr>
<td>New underground bus stations.</td>
<td>Large capital costs.</td>
</tr>
<tr>
<td>Release of road space on Military Road to general traffic and local bus services.</td>
<td>Limited interchange options for passengers travelling to North Sydney.</td>
</tr>
<tr>
<td>Greatest travel time savings of all options.</td>
<td></td>
</tr>
</tbody>
</table>

Option 5 is the highest cost option. The biggest component of the cost is tunnelling (refer Table 3.10).

Table 3.10: Option 5 Outcomes of rapid economic appraisal

<table>
<thead>
<tr>
<th></th>
<th>Total costs ($m)</th>
<th>Total benefits ($m)</th>
<th>Benefit cost ratio</th>
<th>NPV ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 5</td>
<td>1,212</td>
<td>466</td>
<td>0.38</td>
<td>(746)</td>
</tr>
</tbody>
</table>
Figure 3.6: Option 5 Tunnel BRT
### 3.6 Tidal flow options

A number of other options were developed that incorporated tidal flow arrangements that provide an additional bus lane in the peak direction. This would provide opportunities for bus services to overtake other bus services without mixing with general traffic. The additional lane could be provided in the median or outside lanes as shown in Figure 3.7 and Figure 3.8.

Tidal flow bus lane arrangements could be implemented in the short term and in corridor segments where a combination of traffic congestion and corridor width constraints may otherwise make it difficult to provide a high level of priority to buses.

![Figure 3.7: Tidal Flow Express BRT on median lane](image)

![Figure 3.8: Tidal Flow Express BRT on outside lane](image)

The options provide bus priority for the peak direction and would allow on-street parking to be maintained in the off-peak. They may provide a short to medium solution but their longer term effectiveness is dependent on whether current and future levels of contra-peak traffic could be accommodated in fewer lanes.

A tidal BRT option was not shortlisted but tidal flow options could be further explored as part of the staged implementation of a preferred option.
4. East-West Corridor

The East-West Corridor links the Chatswood CBD with Dee Why via Warringah Road, Boundary and Archer Streets. Forest Coach Lines and Sydney Buses operate approximately 20 bus services on the corridor.

Some sections do not have a service. For example, there is no service on Warringah Road between Pittwater Road and Allambie. There is also no direct express connection between Chatswood and Dee Why / Brookvale. Estimated weekly patronage is less than 30,000 trips compared to more than 140,000 trips on the North-South Corridor.

Only one option, Option 6, was shortlisted for the corridor as the costs and benefits for several of the options were considered to be similar.
Figure 4.1: East-West Corridor
4.1 Option 6: East –West Kerbside BRT

Option 6 (shown in Figure 4.2) features:

- Replacement of existing bus lanes and clearways with 24 hour kerbside bus lanes.
- Removing off-peak on-street parking along the corridor.
- Widening of Warringah Road at Forest Way intersection.
- Improved access into Chatswood including increased capacity at Chatswood interchange.

Table 4.1: Advantages and disadvantages of Option 6

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Consistent level of priority over much of the corridor.</td>
<td>• Significant increase in general traffic congestion for other road users.</td>
</tr>
<tr>
<td>• Enhanced priority into Chatswood.</td>
<td></td>
</tr>
</tbody>
</table>

Option 6 is relatively low cost compared to other options but the costs are higher than the benefits with a cost benefit ratio of 0.54 (refer Table 4.2).

Table 4.2: Option 6 Outcomes of rapid economic appraisal

<table>
<thead>
<tr>
<th></th>
<th>Total costs ($m)</th>
<th>Total benefits ($m)</th>
<th>Benefit cost ratio</th>
<th>NPV ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 6</td>
<td>77</td>
<td>41</td>
<td>0.54</td>
<td>(36)</td>
</tr>
</tbody>
</table>
Figure 4.2: Option 6 East-West Kerbside BRT
5. Bus Network Considerations

The effectiveness of each infrastructure option in improving passenger outcomes on both corridors is closely aligned with implementing supporting bus network improvements.

It is proposed to make it easier for people to understand the systems on the two corridors, how they function, and where to wait for buses by:

- providing a simpler core network of full-time routes (seven days and seven nights) supported by demand-driven peak-hour supplementary routes.
- providing supporting infrastructure (e.g. branding, signage and other station like infrastructure) and streamlining stopping patterns.

While a more detailed review will be required to develop a final network of services key features for the corridors will be:

- a tiered network structure for routes on the trunk North-South Corridor from Mona Vale to the City.
- new and improved connections operating on the East-West Corridor (Warringah Road).

These network features are outlined in sections 5.1 and 5.2
5.1 North-South Corridor: Bus Network Rationalisation

The North-South Corridor will continue to be a significant focus for public transport, both for trips to/from the City as well as for connections between residential and employment activity centres within the Region.

A tiered network structure for this corridor would provide consistency of service along different sectors of the corridor, recognising the different characteristics of each.

Using a simplified route numbering system, the four network tiers would be:

- Northern Beaches Rapid (routes 1 to 9).
- Warringah Rapid (routes 10 to 20).
- All-stops (routes 100 to 110).
- Local (routes 200 and above).

There may also be scope to improve ferry operations and connecting bus services.

The tiered network would have a common stopping pattern. More trips would be provided on trunk routes with other routes restructured to operate local services with interchange onto the trunk BRT routes at key locations. The number of services going beyond Wynyard would be reduced.

A schematic of the proposed network is shown in Figure 5.1.
Figure 5.1: North-South Corridor Bus Network Rationalisation
5.2 East-West Corridor: Proposed Bus Network

Network legibility on this corridor is better than the North-South Corridor. Improvements to service levels along Warringah Road, and the extent and range of bus priority measures will provide the most immediate step change in service provision along this corridor.

For example, bus connections on the Warringah Road corridor could be improved through:

- A new full time route (169) from Manly to Chatswood via Warringah Mall, Dee Why and Frenchs Forest.
- A new full time route (271) from Warringah Mall to the City via Narrabeena, Beacon Hill and Frenchs Forest.
- A new direct connection from Manly to Chatswood via Allambie Heights and Frenchs Forest (Route 280A).
- Amendment to route 139 (Manly to Warringah Mall via Harbord) to instead operate Manly to Chatswood via Harbord, Dee Why and Frenchs Forest.
- The withdrawal of peak-hour only Route L60 between Mona Vale and Chatswood.

A schematic of the east-west connections on and around the Warringah Road corridor is shown in Figure 5.2.

A schematic of the east-west connections on and around the Warringah Road corridor is shown below.

---

Figure 5.2: Indicative Revised Network of Routes using the Warringah Road Corridor
6. Summary of key findings

The study has confirmed the feasibility of constructing and delivering a package of BRT measures on the identified corridors in the Northern Beaches. These include infrastructure options as well as operational changes to the network that can be progressed with or without infrastructure changes. The results of the preliminary economic analyses indicate the costs for the options considered are higher than the benefits. Each option assumed 24 hour bus priority – there is scope to apply measures for a shorter period of the day which would reduce the negative impacts (and costs) for private vehicles without significantly reducing benefits. More detailed analysis of options with these variations may show increased economic viability.

Implementation of any option needs to take into account:

- The impacts on general traffic, given that these road corridors suffer congestion at peak times and removal of general traffic lanes for BRT will make congestion worse for private vehicles.
- The provision of exclusive running lanes for BRT impact on-street parking and access for both residents and businesses along the corridors.
- The significant property acquisition required as a result of constrained road reservation widths which add substantially to project costs.
- The impacts associated with the provision of high quality stations and passing lane facilities.
- Cost allocation for the replacement of Spit Bridge and widening of Narrabeen Bridge as well as the costs associated with the emerging Wynyard bus interchange concepts.

TfNSW is now seeking comment on these options and the initial findings to inform the direction of more detailed studies and analysis.
SYDNEY’S RAIL FUTURE
Modernising Sydney’s Trains
June 2012
Figure 5: Sydney’s Rail Future – A Three Tier Railway

- Red: Rapid Transit Network (Single Deck)
- Orange: Suburban Network (Double Deck)
- Blue: InterCity (Double Deck) and Regional Diesel
THE FIVE STAGES OF SYDNEY’S RAIL FUTURE

1. Operational efficiencies
- Timetable overhaul to introduce standardised and regular ‘clockface’ stopping patterns, more express services
- Significantly improved dwell management, with better management of door closure
- Platform de-cluttering to allow clear passenger entrance and exit
- Better incident recovery management through improved operational processes.

2. Network efficiencies
- Completion of South West Rail Link, station upgrades and Rail Clearways projects
- Introduction of even simpler timetables across the network
- Introduction of Automatic Train Operations
- Transition to dedicated fleet types for some lines
- Track infrastructure enhancement
- Platform re-design.

3. New rapid transit system
- Rapid transit trains are used to offer a comfortable, frequent, fast and high capacity link to busy inner areas
- Completion of the North West Rail Link and procurement of rolling stock for the new rapid transit single deck train system initially operating between the North West and Chatswood, with a cross-platform interchange to suburban services for those customers travelling to the CBD
- There will be a train from Chatswood to the CBD every three minutes in peak periods
- In line with the North West Rail link, upgrade of the Epping to Chatswood Rail Link to a high capacity rapid transit system.

4. Second Harbour Crossing
- Completion of a new tunnel under the Harbour and a new Sydney CBD line, allowing services from the North West Rail Link to extend directly to the Sydney CBD
- The second Harbour Crossing will create the largest increase in capacity to the Sydney rail network for 80 years
- Untangling the CBD enables major capacity increases on the Western line.

5. Southern sector conversion
- Extension of the new single deck service to Bankstown and Hurstville
- Continue major timetable changes to the existing suburban services to continue major capacity increases to the South West and Western Sydney
- Better express services introduced due to separation from rapid transit.
PUTTING THE CUSTOMER FIRST

The NSW Government is committed to putting the customer first. Driving this strategy is a commitment to:

- Creating a more reliable service
- Getting Sydneysiders to work on time
- Maintaining a safe, clean and comfortable commuting environment
- Running more services
- Reducing travel times.

Sydney’s Rail Future is a modern approach that will accommodate population growth and ensure that the rail system provides an efficient and reliable backbone to the public transport system into the future.

The future customer experience

Sydney’s Rail Future will positively influence customers’ experience of the rail network. People travelling along the corridors linking the north west, the global economic corridor and the Bankstown and Illawarra lines will be able to ‘turn up and go’ without consulting a timetable. Passengers travelling on other lines will have access to suburban or intercity services, with improved reliability and additional services that will be greatly enhanced by a range of technological innovations.

Modern passenger information systems – integrated ticketing

Real-time information will be provided at stations by introducing more modern passenger information systems.

High-quality facilities will be put in place through an ongoing program of upgrades and redevelopment, including the construction of new car parks and improvement of lighting and other safety features at stations, as outlined in the Transport Access Program. Integrated ticketing will also make it easier for customers to switch transport modes.

Interchange

Some customers may need to interchange more than they currently do, but increased frequency of services on the new rapid transit system will reduce the inconvenience of interchange, as customers will not need to wait long for a connecting service. Customers will in most cases be able to board the next train arriving at their platform in busy CBD stations. They will not have to wait at crowded CBD stations for what may be the third or fourth train. Overall journey times will be reduced.

Safety

All new train carriages will be fitted with security cameras and there will be improved lighting at stations and car parks.

WHAT IS THE TRANSPORT ACCESS PROGRAM?

The Transport Access Program is a new initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most. The NSW Government has made available more than $770 million over four years to build key facilities and undertake much needed upgrade works at stations and interchanges.

The program aims to provide:

- Accessible stations
- Modern, efficient interchanges
- Commuter car parking
- Safety improvements, such as extra lighting, help points and other security measures
- Signage improvements.

An alternative to cars

More services will be available throughout the day on many lines, giving customers real alternatives to using their car or other transport modes.
KEY CUSTOMER BENEFITS – SYDNEY’S RAIL FUTURE

Faster more reliable services
- Timetable improvements – less crossings at busy junctions
- Major technological advancements, like Automatic Train Protection (ATP) and Automatic Train Operation (ATO)
- Improvements to platform efficiency and design
- Reduction in the time trains are stalled at stations - ‘dwell time’.

A new rapid transit system
- A rapid-transit, high capacity, fast single deck train every five minutes, providing access to key destination points through Sydney’s major employment and education centres
- Rapid transit services for Hurstville, Bankstown, the lower North Shore, Epping to Chatswood and the North West Rail Link
- A new high capacity service in the CBD
- No timetable required on rapid transit system – turn up and go
- Reliable with new infrastructure and technology.

Increased capacity
- More than a 60 per cent increase in services to the Sydney CBD, representing the biggest step change in capacity since the construction of the Harbour Bridge and city underground railway - an increase of up to 75 services over today’s busiest peak hour
- Ability to carry an additional 90,000 to 100,000 people per hour in the peak
- Major capacity improvements across the network with increases in the peak of more than:
  - 60 additional trains across the Harbour and through the CBD (30 each direction)
  - Up to 14 additional trains on the Western line.

Improved amenities
- Greater customer information through countdown clocks and screens
- Modern, clean and spacious new CBD stations
- Transport Access Program – accessible stations, modern efficient interchanges, safety and signage improvements.
YOUR TRAIN LINE

Sydney’s Rail Future will modernise our train services, extending their reach and capacity. Benefits will be noticeable with the new 2013 timetable and will progressively continue in the following years.

New Harbour Crossing and new CBD line

The new Harbour Crossing and new CBD line will deliver a step change for Sydney’s rail services. It will provide the foundation for a 60 per cent increase in the number of trains that can run during the busiest and most congested times. This will represent an increase of around 75 services over today’s busiest peak hour.

Additional capacity

This additional capacity will enable Sydney Trains to carry another 90,000 to 100,000 people per hour in the peak, delivering sufficient capacity to serve Sydney well into the future. Improved timetables, upgraded stations and advanced signalling systems will help to maximise the utilisation of new and existing tracks and deliver reliable services across the entire Sydney Trains network.

Sydney’s Rail Future removes bottlenecks and it enables trains on the Western line to be separated onto three dedicated lines. Currently trains are sharing and merging across lines, causing delays and reducing capacity and the ability to run more trains.

Benefits all customers

The new Harbour Crossing and new CBD line will benefit all customers, not just those who commute across the Harbour and into the CBD. The additional capacity through Sydney’s most heavily used transit corridor will allow for a reduction in the network’s complexity that will benefit services on all lines, because, for example, trains at Parramatta or Chatswood will not be delayed by conflicting train movements at the Homebush, Strathfield or Redfern junctions. Reducing these bottlenecks frees up capacity across the Sydney Trains network.

A SECOND HARBOUR CROSSING AND NEW CBD LINE WILL:

- Unlock the CBD bottleneck and enable more services from the West, South West, Illawarra, Bankstown, North Shore and the North West
- Provide an extra 60 train services per hour through the CBD
- Create the largest increase in capacity to the Sydney rail network for 80 years
- Build new train stations relieving pressure on existing crowded platforms in the CBD
- Enable better connections to employment opportunities across Sydney.
Figure 6 – Your train line
Under the new three tier system each line will benefit as follows:

**Tier 1: Rapid Transit**

**North West Rail Link**
- Rapid transit services, initially **12 trains per hour** during peak periods (a train every five minutes in peak periods) will be operated with new generation single deck trains, advanced signalling and dedicated track.
- The North West Rail Link trains will provide **faster services** than a double deck service. This relates to a journey time saving of 10 per cent. The trains will be fast, safe and highly reliable. Services will be intuitive, offering turn up and go convenience with high service frequency.
- The Macquarie Park and University area will move from the current service of a train every 15 minutes to a **train every five minutes** – from four trains per hour to 12 trains per hour.
- There will be a high frequency service to cater for the large number of customers getting on and off at employment, commercial and educational centres between Rouse Hill and Chatswood, as well as along the lower North Shore towards the CBD.

**North Shore**
- Peak period services will increase from the current 18 trains per hour to **20 trains per hour** prior to the new Harbour Crossing.
- Demand on this line will ease once the new Harbour Crossing is delivered, offering a higher capacity route from the North Shore to the CBD and to Sydney’s South.
- The new rapid transit service will also enable **journey time savings of up to eight minutes** between Chatswood and the CBD using the new Harbour Crossing, an improvement of 35 per cent over the current 23 minute journey.
- The additional capacity will lead to a significant improvement of rail services on the North Shore and allow for up to an additional 30 trains from the North Shore in the longer term.
SYDNEY’S LIGHT RAIL FUTURE
Expanding public transport, revitalising our city

December 2012
The Four Stages of Sydney’s Light Rail Future

1. Service integration and improvements
   - Integration of light rail into the existing MyZone ticketing system and 131 500 information line and website – completed June 2012
   - Introduction of the Opal card, the integrated electronic ticketing system, on light rail to make travelling easier between modes.

2. Modernise and extend the existing network
   - Construction of the 5.6 kilometre Inner West Light Rail Extension to connect Dulwich Hill to the CBD – to be completed in 2014
   - Modern light rail fleet introduced to improve commuter experience
   - Real time information and timetable updates.

3. Deliver a new CBD and south east service
   - Overhaul of CBD bus network to integrate with light rail and better connect commuters
   - Completion of light rail connecting Circular Quay, the CBD and the south east including Moore Park and the University of NSW
   - Pedestrianisation of 40 per cent of George Street.

4. Longer term investigations
   - Feasibility investigations of light rail or other high capacity public transport, like Bus Rapid Transit, for additional corridors including Victoria Road, Parramatta Road, Anzac Parade to Maroubra and potentially Western Sydney
   - Continued support to councils investigating potential light rail schemes
   - Growing the light rail network in line with demand and integrated with new urban development
   - Investigating potential extensions to the line such as to Malabar, Walsh Bay and Barangaroo North.
OBJECTIVE 28: Protect corridors and sites for our long-term transport needs

Major transport corridors require planning to start years in advance. One of the barriers to investment in transport infrastructure is the time and cost associated with identifying and acquiring land for new corridors. This is particularly problematic in Sydney in areas with difficult topography and where transport investment may have lagged behind urban growth. This is the case for both new and existing urban areas and to both road and rail/light rail transport.

The budgetary impacts of acquiring corridors by Government need to be recognised when designating corridors for acquisition.

The Metropolitan Strategy for Sydney identifies corridors for protection and sites for the city’s long-term transport needs. This work aligns with national criteria for future strategic planning of capital cities that emphasises the importance of planning for corridors.

The Metropolitan Strategy for Sydney and the Long Term Transport Master Plan establish a program of corridors that will need to be investigated and protected for future transport investment. Work is already underway to investigate potential corridors beyond the planned North West Rail Link.

Policy

a. Corridors and sites for Sydney’s long-term transport needs will be identified and protected for future generations.

b. Residential and commercial development will be encouraged and facilitated in centres along corridors identified as having potential to support future urban renewal.

c. The process of acquiring corridors and sites for future transport needs will be clear, timely and responsive to long-term needs.
### Action Delivery tool Timing Lead agency Other key partners

<table>
<thead>
<tr>
<th>Action</th>
<th>Delivery tool</th>
<th>Timing</th>
<th>Lead agency</th>
<th>Other key partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.1 Investigate the potential role, alignment and opportunities for:</td>
<td>Long Term Transport Master Plan</td>
<td>Short, medium and longer term</td>
<td>TfNSW</td>
<td>DP&amp;I, councils</td>
</tr>
<tr>
<td>- South West Rail Link extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- North West Rail Link extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Marsden Park to Mount Druitt to Western Sydney</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Employment Area to Fairfield and Leppington corridor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Outer Sydney Orbital (Central Coast to Western Sydney to Wollongong)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- WestConnex Motorway</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- F3 to M2 corridor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- north-south corridor (WestConnex to M2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Port Botany links</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Bells Line of Road</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.2 Use statutory plans to protect corridors for:</td>
<td>Subregional Delivery Plans</td>
<td>Short term</td>
<td>DP&amp;I Councils</td>
<td>Business, community</td>
</tr>
<tr>
<td>- North West Rail Link</td>
<td>Local Plans</td>
<td>Ongoing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Second Harbour crossing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- F6 corridor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Prospect Highway</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Georges River Parkway</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.3 Use statutory plans to protect and encourage urban renewal and development from:</td>
<td>Subregional Delivery Plans</td>
<td>Short term</td>
<td>DP&amp;I Councils</td>
<td>Business, community</td>
</tr>
<tr>
<td>- Parramatta to Macquarie Park</td>
<td>Local Plans</td>
<td>Ongoing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Westmead to Malabar via Central Sydney</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Macquarie Park to Hurstville via Sydney Olympic Park and Burwood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Parramatta to Hurstville via Bankstown</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.4 Use statutory plans to protect additional sites for Sydney’s future transport needs</td>
<td>Subregional Delivery Plans</td>
<td>Ongoing</td>
<td>DP&amp;I Councils</td>
<td>Councils, business, community</td>
</tr>
</tbody>
</table>