

the solution

Securing the networks required to enable the efficient flow of people, goods and information is key to the success of NSW.

At the same time, ensuring the fundamentals of community wellbeing in health and education are in place is important.

The solutions recommend completing the missing motorways, fixing public transport, decongesting freight links and

investing in schools and hospitals. This strategy also recommends safer regional water supplies and containing flood risks.

6.0 Urban roads

Summary

- Sydney's road network serves 93 percent of passenger journey and 86 percent of port freight movements. Even under high growth scenarios for rail freight and public transport, most growth in transport demand over the next twenty years will be met by roads.
- Traffic on key corridors has grown by 50 percent in the last twenty years and investment in new roads has struggled to keep up with demand. Congestion currently occurs across the day on key corridors, and this has a real economic cost to NSW.
- New road capacity is urgently required to meet the challenge of population growth and substantial increases in freight volumes. In addition, new roads will relieve legacy arterial roads such as Parramatta Road, Pennant Hills Road and the Princes Highway, and permit urban regeneration in these areas.
- The most pressing investment needs occur on the M4 and M5 corridors because of their importance for the freight and business transport task; connecting Global Sydney and the international gateways with the industries and residential areas in the West and South-West.
- Infrastructure NSW has developed a scheme called WestConnex, which it proposes as Sydney's next motorway project. WestConnex integrates the M4 extension towards the Airport with an expansion of the M5 East. This new tollroad is proposed to be delivered in stages over the next ten years.
- The F3-M2 link and F6 extension are also highly desirable to bring connections North and South of Sydney up to motorway standard. These roads are scheduled for development between Years 10 and 20, but may be accelerated if the private sector can provide financing.
- We need to make the most of the existing network. Infrastructure NSW supports the managed motorways program and views the concept of variable road pricing as having merit over the longer term. A program of investment in congestion hotspots across the city is also recommended, including in Parramatta and other growing centres.

6.1 Snapshot¹

- The road network is the dominant transport network in Sydney, and will remain so over the next twenty years under any plausible scenario.
- 93 percent of passenger travel in Sydney is by road (refer Section 2) – 12 million trips on an average weekday.
- The vast majority of freight journeys in and through Sydney are by road. At present, only 14 percent of container freight to and from Port Botany is moved by rail.
- Over 73 percent of the forecast growth in passenger journeys between 2011 and 2031 will be by car.
- Road demand is more sustained across the day than demand for the rail network. This reflects the variety of journeys (commuter, educational, social, freight, business, etc) that use the road network.
- Urban roads have received a relatively small proportion of NSW Government investment in transport in recent years. For example, most recent motorways in Sydney, have been privately funded and financed. In 2012-13, only 8 percent of transport capital expenditure is planned to be on Sydney's roads.
- The section identifies Infrastructure NSW's view on the priorities for investment in Sydney's major roads over the next twenty years. It also considers options to better operate and manage demand for these assets.

¹ All data and forecasts in section 6.1 from Bureau of Transport Statistics, 2011.

6.2 The Sydney Strategic Road Network

For the purposes of the Strategy, the Sydney Strategic Road Network (“SSRN”), shown in Figure 6.1, is defined as comprising:

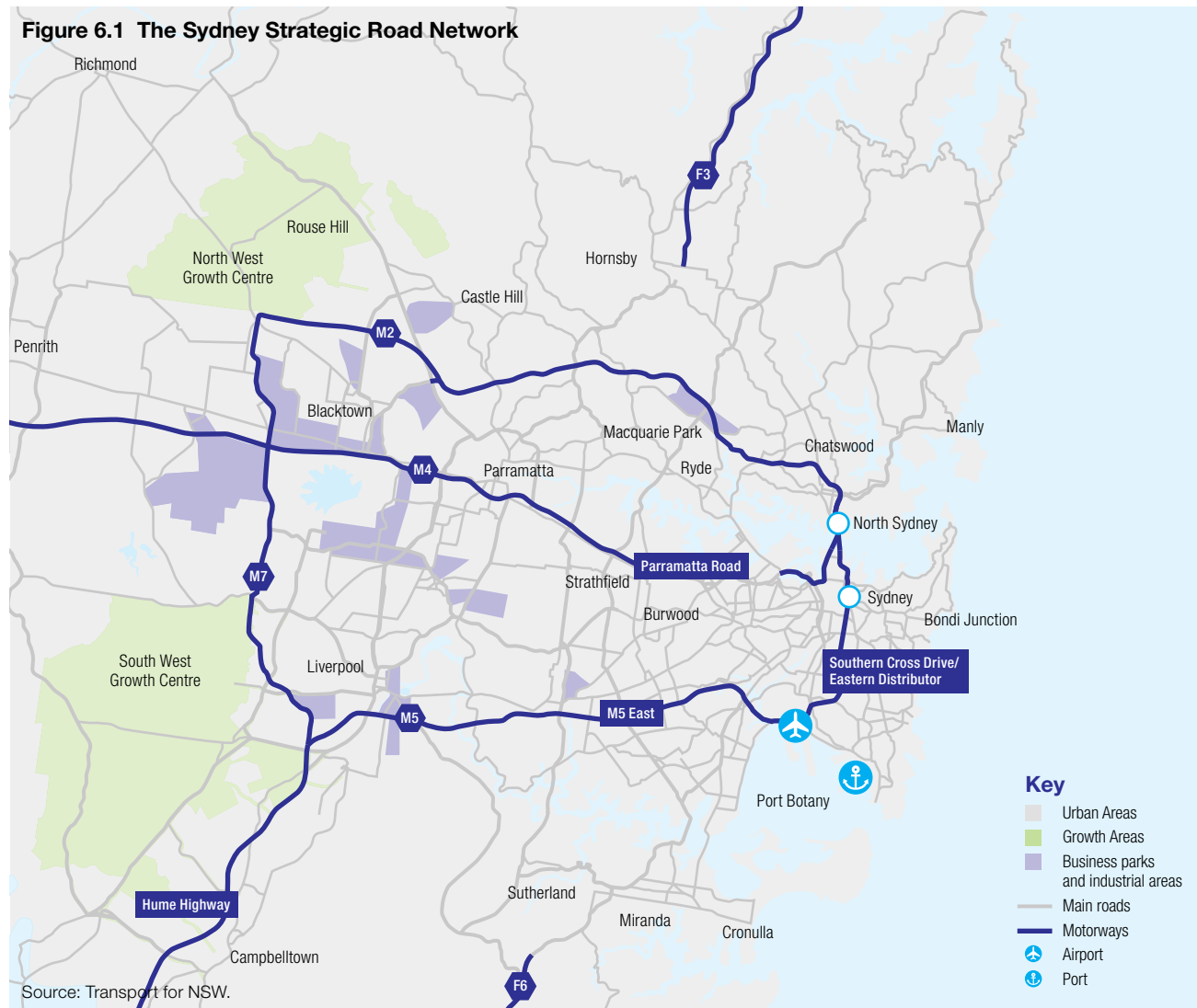
- the Sydney Orbital Network
- the M4 Motorway and Parramatta Road corridor
- the so-called missing links to connect the Sydney Orbital to the F3 and the F6.

The SSRN is the most important transport network in the State. The SSRN carries the bulk of the State’s container freight and acts as a feeder and distributor for other modes – for example, rail, sea and air transport. It supports economic growth across the metropolitan area by connecting people to jobs and allowing businesses to trade with each other.

Much of the SSRN has been delivered through partnerships between Government and the private sector. These investments have transformed travel in Sydney and have had a profound impact on freight logistics. Ernst and Young has estimated the value of the tollroad network to the NSW economy at \$22.7 billion².

The success of the network in serving previously unmet need means that today, some two decades since this cycle of motorway construction began, congestion is a major issue on many parts of the SSRN. Some motorway sections are operating well in excess of design

² Ernst & Young 2008, The Economic Contribution of Sydney’s Toll Roads to NSW and Australia.



capacity. Where there are missing links, such as along Parramatta Road or Pennant Hills Road, traffic is forced to use the legacy road network. Traffic congestion in Sydney is forecast to cost the NSW economy \$8 billion per annum by 2020³.

In conjunction with the private sector, the Government is already delivering improvements to two of the most congested motorway corridors: the M2 will be widened by 2013 and the M5 West widened by 2014. While these projects are important, more needs to be done to meet future traffic requirements.

6.3 Adequacy of Sydney's Strategic Road Network

This section analyses the performance of the SSRN today in terms of traffic and congestion, and considers how growing travel demand is likely to affect performance over the next twenty years.

6.3.1 Demand

Traffic is most commonly measured in terms of Average Annual Daily Traffic (AADT), the average (taken over a year) of the two-way total 24 hour traffic flow. Table 6.1 summarises the AADT for major roads today:

Table 6.1 Current AADT on Major Arteries

Road	Estimated AADT 2011
Sydney Harbour Crossings	250,000
Eastern Distributor	115,000
M4 (Mays Hill)	170,000
M5 East (Bardwell Park)	105,000
M5 West (Revesby)	95,000
M7 (Kings Langley)	60,000
M2 (North Ryde)	70,000
Parramatta Road (Five Dock)	100,000
Pennant Hills Road (Pennant Hills)	80,000
Princes Highway (Blakehurst)	80,000

Source: Roads and Maritime Services.

The high volumes on the motorways show how heavily people and businesses rely on those roads for access around Sydney. The motorways cater for high volumes of traffic in a more efficient manner than legacy arterial roads like Parramatta Road.

6.3.2 Congestion

AADT is a crude measure since it does not indicate the peakiness of demand, nor does it provide a measure of congestion.

Table 6.2 shows the periods of congestion (traffic travelling at lower than 'design speed' and experiencing periods of queuing) currently experienced on some major corridors.

Table 6.2 Periods of Congestion

Motorway	Hours of Congestion
Sydney Harbour Tunnel	8.6
M2	9.9
M5	10
M4	13
M5 East	13.3
Eastern Distributor	13.5

Source: Ernst & Young.

Importantly, congestion on roads such as the M4, M5 and Eastern Distributor is no longer a peak-only phenomenon, but is sustained for much of the day. The morning peak on the M5 East now starts to build from 5am.

Sustained congestion reduces the efficiency of commuter journeys, freight movements and business travel, hindering economic growth and affecting people's quality of life.

Unlike the rail system, where demand is focused during peak hours, motorists have less opportunity to shift the timing of their trip where the road is congested through long periods of the day, and in these cases the congestion indicates a greater need for capacity augmentation.

6.3.3 Servicing Global Sydney

As Section 3 notes, Sydney is unusual in having its CBD, airport and container port all in close proximity. While this has productivity benefits, it concentrates commuter, business and freight traffic on the eastern part of the SSRN and drives the need for new infrastructure.

³ Bureau of Transport and Regional Economics 2007, Estimating Urban Traffic and Congestion Cost Trends for Australian Cities.

Both the airport and port generate significant traffic, and demand generated by these facilities is growing much faster than general travel demand. By 2031, the number of people accessing Sydney Airport is expected to double to 200,000 per day⁴, and the number of containers travelling to and from Port Botany by road is forecast to triple⁵.

There is insufficient road capacity connecting the port and airport gateways to Greater Sydney's residential and industrial centres. The M5 East is congested daily, and whenever an incident occurs, traffic delays can be lengthy. Parramatta Road carries high volumes of traffic for its configuration and has relatively poor connections towards the airport. Without new infrastructure, increasing demand will worsen congestion, with significant negative economic impact.

As has been noted in earlier sections, the data about road journey patterns in Sydney shows that traditional perceptions of suburban commuter traffic flowing primarily into the Sydney CBD are not correct. Relatively few private road journeys on the SSRN terminate in Sydney's CBD, where, as Section 3 notes, public transport has a 75 percent modal share in peak hours.

Instead, the SSRN is a distribution system that allows traffic to bypass the centre to access its end destination at a wide variety of locations dispersed across the metropolitan area. The primary weakness in the existing distributor system is a lack of connectivity to the areas South and West of the CBD.

⁴ Based upon passenger forecasts in Sydney Airport Corporation 2009, Sydney Airport Master Plan.

⁵ Based upon Sydney Ports Corporation 2011, Freight Forecasts, and assumes 28 percent rail mode share in 2031.

6.3.4 Servicing Greater Sydney

The M2, M4, M5 and M7 corridors support the travel needs of Greater Sydney – already home to almost three quarters of Sydney's population. Over the next 20 years, most residential growth in the metropolitan area will be in Greater Sydney, through in-fill and on greenfield sites.

As Section 4 notes, most Sydney residents do not work in defined metropolitan centres. Some 60 percent of employment is dispersed across the metropolitan area⁶. Public transport cannot viably serve most of these jobs. Many other significant journey patterns, such as triangular or multi-stop trips, are also most effectively served by private vehicles.

A significant proportion of journeys on the SSRN are for business-related travel. On the M4 and M5 corridors, around 40 percent of users during business hours are on work-related business⁷. Road travel is the most suitable choice for workers travelling between widely dispersed locations (eg sales representatives) or who carry tools of trade.

Population and economic growth in Greater Sydney is likely to place most pressure on the SSRN East of Parramatta and on the M5 East. These assets are already operating well beyond design capacity. In contrast, the current widening of the M2 and the latent capacity in the Lane Cove Tunnel should keep this corridor moving for a considerable time.

⁶ NSW Department of Planning 2010, Metropolitan Plan for Sydney 2036.

⁷ Bureau of Transport Statistics 2011, Household Travel Survey.

6.3.5 Conclusions

As Sydney's population continues to grow, people will continue to expect mobility for work, business and recreation. Efficient delivery of consumer goods will remain important to NSW's economy. This will only occur if a clear and realistic direction for Sydney's SSRN is articulated and pursued.

Road links between Sydney's West and South-West and Global Sydney are particularly critical. They allow people in Greater Sydney – particularly Western Sydney – to access Global Sydney, and connect Sydney's gateways with the industrial lands of the West and South-West.

6.4 The rationale for urban road investment

The SSRN is critical for sustaining Sydney's economy and quality of life. But urban road projects are not universally popular. Some commentators argue that new roads do not solve congestion, that they discourage public transport use, or are environmentally unsustainable. This section considers these arguments in more detail.

6.4.1 Do new roads relieve congestion?

It is sometimes argued that building new roads is a futile exercise since within a few years, the road network will be as congested as it was before: new traffic ("induced demand") wiping out initial benefits.

This argument needs to be treated with care: new roads are not primarily required to increase journey speeds for existing users in peak hours (a common definition

of congestion). Rather new roads provide the capacity needed for a growing population and economy. In some cases, new roads are desirable to relieve pressure on unsuitable legacy arterial roads, in order to stimulate urban regeneration and improve safety.

Accordingly, a reduction in journey times in peak periods is desirable, but the first task is to maintain existing performance standards and reliability levels as traffic grows.

In the last twenty years, traffic volumes on the SSRN have grown by approximately 50 percent, while travel speeds in the peak periods have remained broadly stable. The new roads built in the last two decades were the minimum required to maintain quality of network service and meet growth requirements.

There is some evidence that growth in vehicle kilometres travelled per person may now be stabilising⁸, but demand for freight is still increasing rapidly and our population continues to grow. The need to provide traffic relief on corridors such as Parramatta Road and Pennant Hills Road remains acute. Accordingly further investment in the SSRN is required to maintain existing levels of mobility across the network, with targeted opportunities to reduce congestion in some locations.

6.4.2 Can public transport replace the need for new roads?

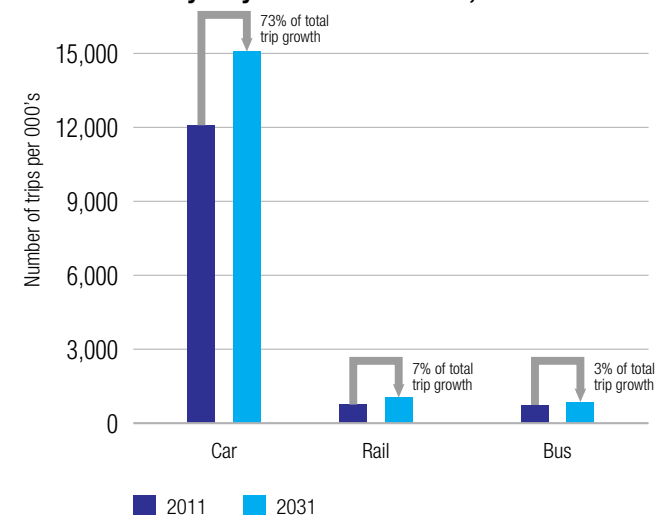
As in other major cities, public transport is the best option for journeys to dense employment centres – such as the Sydney CBD and Parramatta. In these areas, public transport is already the preferred choice for many employees and that will continue to be the case in future.

However, the overwhelming majority of Sydney’s journeys are dispersed in nature. For such trips the flexibility of the private car makes it the dominant choice. This pattern is the consequence of established land use patterns in Sydney and there is no indication in the available data that the patterns of demand will change in future.

The forecast growth in demand for passenger road travel is shown in Figure 6.2. The vast majority of the growth in travel demand is expected to be accommodated by road.

The same is true for freight movements. The Government has set a target to double the share of port container freight that is moved by rail by 2021. However, as Section 9 shows, meeting this target will still leave two thirds of the growth in container demand to be moved by road over the next twenty years.

Figure 6.2 Total number of trips per weekday in Sydney Statistical Division, 2011-31



Source: Bureau of Transport Statistics.

Table 6.3 Forecast average annual growth rates by travel mode

Average Annual Growth rate	Car	Train	Bus
Historic	0.9%	0.8%	1.0%
2011 – 2031	1.1%	1.6%	0.8%

⁸ Bureau of Infrastructure, Transport and Regional Economics, quoted in Infrastructure Australia 2012, Australian Infrastructure: Progress and Action, A report to the Council of Australian Governments.

6.4.3 Can't we just manage our roads better?

As noted in Section 1, measures to improve asset utilisation are favoured by Infrastructure NSW as they often provide a cheaper and faster means of addressing congestion than investment in major new infrastructure.

In the case of roads, Infrastructure NSW has considered two main 'better use' options:

- managing existing motorways more efficiently
- road pricing

These are valuable options that should be progressed as discussed in Section 6.7. However, because of the underlying demand growth these options will provide only part of the solution to the capacity constraints on the SSRN which ultimately needs further development.

6.4.4 Are new roads environmentally sustainable?

The use of fossil fuels to power cars raises concerns about environmental pollution and energy security. However the embedded land use and travel patterns in Sydney require affordable personal transport. Even under the most ambitious scenarios for land use change and growth in public transport, the absolute number of car journeys will continue to increase.

One of the most comprehensive studies into the issue of charging motorists for environmental costs⁹ suggested that there would still be very high levels of demand for road travel relative to other modes even with environmental and other costs factored into prices.

⁹ Sir Rod Eddington 2006, The Eddington Transport Study: The Case for Action.

The most realistic and effective means to substantially reduce environmental impacts will be through continued improvements in vehicle fuel-efficiency, and a market-led shift towards alternative fuel technologies, not through restrictions on travel movements.

A second consideration is the environmental impact of continuing to use legacy arterial roads as part of the SSRN. This has direct impacts on affected communities and discourages urban renewal and densification along these corridors.

6.4.5 Conclusion

It is unfortunate that roads and public transport have often been positioned as opposing alternatives competing for scarce public funding. In reality these modes are complementary to each other, each having a valuable, but different role.

The evidence is clear that private road transport is – and will remain – the only viable option for most journeys in Sydney most of time, even with the targeted growth in public transport and rail freight sought by Government, and the expected increase in the population density of the city.

Better management of the SSRN is therefore essential, and is being pursued through a developmental process already. Road pricing is an emerging area that offers potential benefits in the longer term.

There will, however, be places where more capacity will be needed on the motorway system. Investment in the SSRN can be sustainable, if complemented by strategies to manage congestion and environmental impacts, and undertaken in tandem with investment in public transport.

6.5 Developing Sydney's Strategic Road Network

6.5.1 Network Vision for Sydney

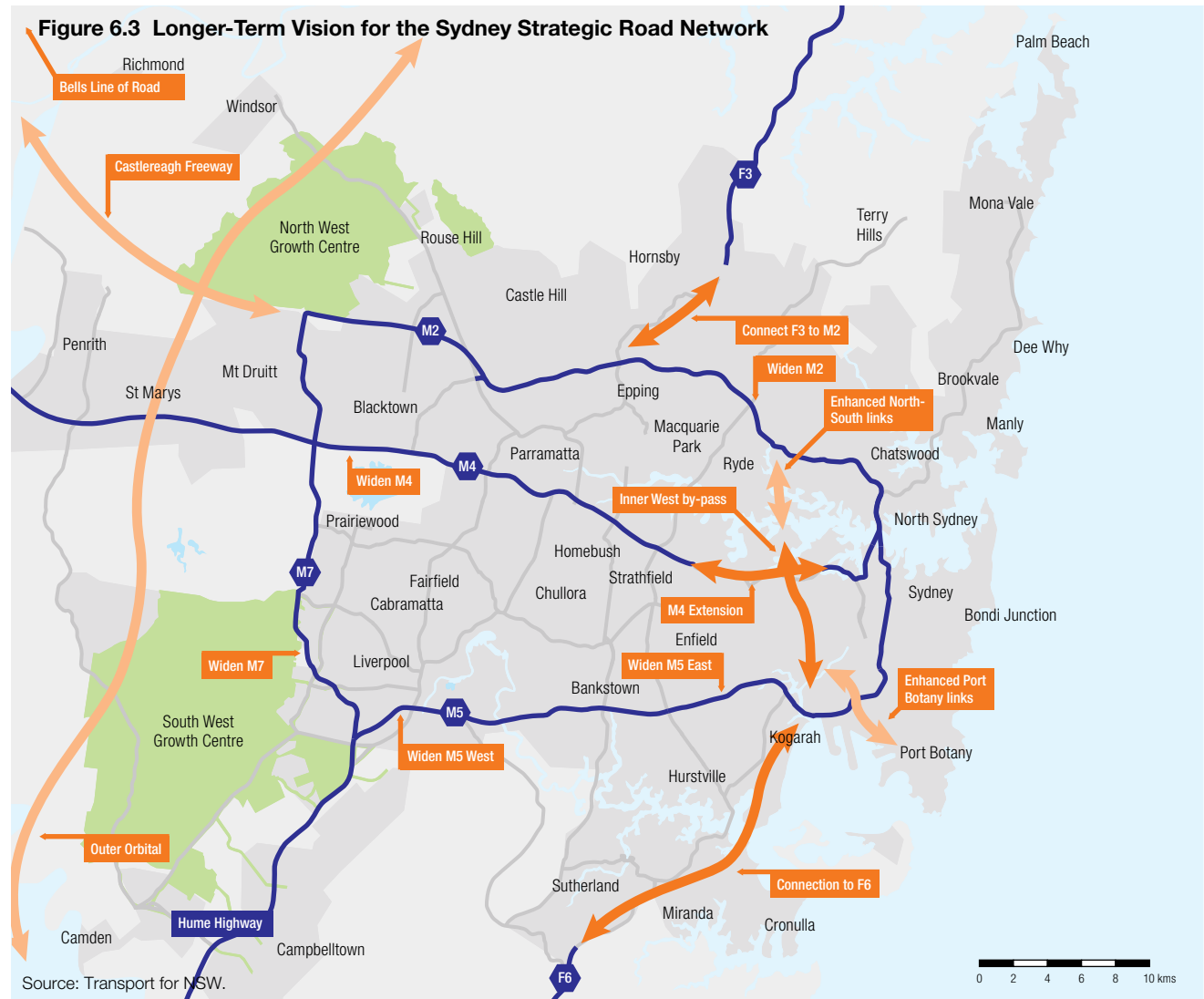
No new motorway project has been tendered in NSW for almost a decade. One factor behind this has been the lack of an affordable coherent network strategy for the SSRN. Before any new project is commenced, NSW needs an overarching vision equivalent to the Sydney Orbital Network plan of two decades ago.

The Draft NSW Long Term Transport Master Plan (Draft Transport Master Plan) sets out a vision for the longer term of Sydney's motorway infrastructure. This is shown in Figure 6.3. Infrastructure NSW is strongly supportive of this vision.

Infrastructure NSW supports extending and expanding the SSRN through the longer-term network vision set out in the Draft Transport Master Plan as one of the State's highest infrastructure priorities.

6.5.2 Overview of Options

Infrastructure NSW has reviewed each of the motorways identified by Transport for NSW, together with a potential Northern Beaches Link, which has been advocated in a number of unsolicited proposals to the NSW Government.



6.5.3 Delivering Integrated Planning Outcomes, Not Just Roads

This Strategy has outlined the reasons why infrastructure investment needs to focus on economic benefits if NSW is to be number one again. A key element of economic success, as we have seen, is ensuring that NSW is an attractive place not only to work but also to live.

This means that investment in major infrastructure, such as roads, must do more than deliver economic connectivity. Cities are extremely complex, crowded structures and any new road building scheme needs to integrate with existing land uses and legacy road networks to deliver a better place to live.

The community rightly expects any major scheme to deliver tangible benefits for public transport and for urban regeneration. Infrastructure NSW considers that delivery of these wider integrated planning imperatives is critical if NSW is to maximise the potential for infrastructure to make our urban landscape more liveable.

6.5.4 Prioritisation Analysis

Sequencing of the connections shown in figure 6.3 is essential. Neither the State nor the private sector has the resources to progress all of this program in parallel.

Infrastructure NSW has evaluated which motorways should be built first from the perspectives of traffic, wider benefits and serving key demand generators. A summary of this analysis is shown in Table 6.4.

Table 6.4 Sydney Strategic Road Network Development Options

Road	Commentary
M4 Extension	This project proposes to extend the M4 motorway from Strathfield towards the CBD and the Airport, thereby connecting Global Sydney to Parramatta and Western Sydney. A number of potential schemes have been developed but have not progressed to construction. The principal issues have been inadequate connections to the existing road network and affordability concerns. Widening of the existing M4 between Parramatta and Strathfield is seen as an integral part of this option due to high demand along this section.
M5 East Expansion	The current 2x2 toll-free tunnel is severely congested for large parts of the day. Options to duplicate the existing tunnels have been under consideration for some years, but have foundered on the lack of a viable scheme to distribute traffic to the North of Sydney Airport. Additional traffic cannot pass South of the Airport due to the existing congestion on General Holmes Drive.
F3-M2 Link	This project would link the Sydney Orbital to the F3 northwards to the Central Coast and Hunter. Current proposals require the construction of the longest road tunnel in Australia, which raises affordability issues.
F6 Extension	This project would link the Sydney Orbital southwards to the Sutherland Shire and the F6 to the Illawarra. A largely preserved transit corridor exists between St Peters and the Royal National Park at Loftus.
Inner West Bypass and enhanced North-South links to the M2	This conceptual option proposes a motorway from the airport to the Victoria Road corridor, with a potential extension North to the M2. The road would form a Western bypass of the CBD to relieve pressure on the harbour crossings. No reservation or detailed alignment exists and construction costs are likely to be very high.
Outer Western Sydney Orbital	This road would run on the Western edge of the Sydney Basin, connecting the South-West and North West Growth Centres via the Penrith area. No detailed alignment exists, but the corridor is generally undeveloped at present.
Castlereagh Freeway/Bells Line of Road	These projects would extend the existing M2/M7 West towards the Blue Mountains. These proposals are discussed in Section 10 due to their proposed role in improving connections to Regional NSW.
Northern Beaches Link	This road would link the Gore Hill Freeway with the Burnt Bridge Creek Deviation via a tunnel under Mosman and a new bridge over the Spit. It could be combined with a transitway for buses from the Northern Beaches to the CBD.

Table 6.5 Motorway Implementation Prioritisation Summary

Route	Traffic Flows	Congestion Relief	Wider benefits*	Servicing Key Demand Generators			
				International Gateways	Global Sydney	Freight movement	People movement
M4 Extension	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓
M5 East Expansion	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓
F3 – M2	✓✓	✓✓	✓	✓	✓	✓✓	✓
F6	✓✓	✓✓	✓	✓✓	✓	✓	✓✓
Inner West Bypass/ Enhanced North South Link	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓	✓✓
Northern Beaches Link	✓	✓✓	✓	✓	✓✓	✓	✓
Outer Western Sydney Orbital	✓	✓	✓	✓	✓	✓✓	✓

* Wider benefits include potential urban regeneration and agglomeration benefits.

6.5.5 Recommendations

Infrastructure NSW’s analysis indicates that the M4 and M5 corridors have the most pressing need for augmentation because of their importance in supporting freight and business travel, high levels of existing demand and forecast population and economic growth along and around these corridors. Given the importance of connections to Sydney’s international gateways, Infrastructure NSW recommends the M4 connects to Sydney Airport as part of an integrated program of work.

A potential way to progress these links as a single integrated scheme – known as WestConnex – is set out in Section 6.6.

The immediate case for the other motorway options is less pressing.

The F3-M2 meets a strategic need in completing a motorway grade bypass of Sydney. This is important to freight traffic and for wider connectivity within NSW and along the eastern seaboard. However, the lack of preserved corridor for this route make it expensive relative to the benefits it provides due to the expectation that the route would be in an eight kilometre long tunnel.

The NSW Government has received an unsolicited proposal for the F3-M2 which proposes developing this link without the need for any public support. This proposal is currently being assessed by Infrastructure NSW and other Government agencies.

Recommendation Infrastructure NSW recommends that the F3-M2 link should be the next priority following completion of the M4 and M5 upgrades. This scheme could be accelerated if shown to be viable without public subsidy.

The lower forecast freight flows on the future F6 make its extension less of a priority in the short term. However, over the longer term, it will have an important role in connecting Southern Sydney to Wollongong and Port Kembla (discussed in Section 9). Existing analysis of this route is several years old and needs updating for contemporary land use and demand patterns. Positively, the existing corridor along much of this route provides the opportunity to develop a more affordable scheme.

The completion of an Inner West Bypass to Victoria Road and potentially the M2 (the enhanced North-South link) is an attractive concept. Over the long-term, there is likely to be a need to relieve pressure on Sydney's existing harbour crossings by providing a comprehensive Western bypass of the CBD. However in the absence of a specific business case, it is difficult for Infrastructure NSW to identify the prioritisation of the project. It appears likely to be completed beyond the timeframe of this strategy.

Recommendation Infrastructure NSW recommends development should begin on the F6 extension and proposed North-South links West of Sydney's CBD beyond year 10 of the strategy.

Infrastructure NSW has concluded that Northern Beaches Link is a lower priority for Government funding support because of the lower traffic volumes, the lack of through traffic, limited population growth on the Peninsula and the limited role of Military Road in the freight distribution network.

As with the F3-M2 link, the Northern Beaches Link could be accelerated if it can be built without public subsidy. In the short term, priority should be placed on incremental reforms to improve public transport from the Northern Beaches. These options are discussed in more detail in Section 7.

The construction of the Outer Western Sydney Orbital has also been assessed as falling outside the 20-year time horizon of the strategy. At present appropriate connectivity is provided by the M7, which can be widened as traffic grows.

Infrastructure NSW believes it is essential to preserve the corridor for this motorway in the near term, before development encroaches on the optimal route.

Recommendation Infrastructure NSW recommends the identification and preservation of a corridor for the Outer Western Sydney Orbital.

6.6 WestConnex

6.6.1 Reference Scheme

To support the NSW Government in progressing the next motorway project in Sydney, Infrastructure NSW has worked with Transport for NSW and Roads and Maritime Services (RMS) to develop a high-level reference scheme that integrates the proposed M4 Extension, M5 East Expansion, and part of the Inner West Bypass.

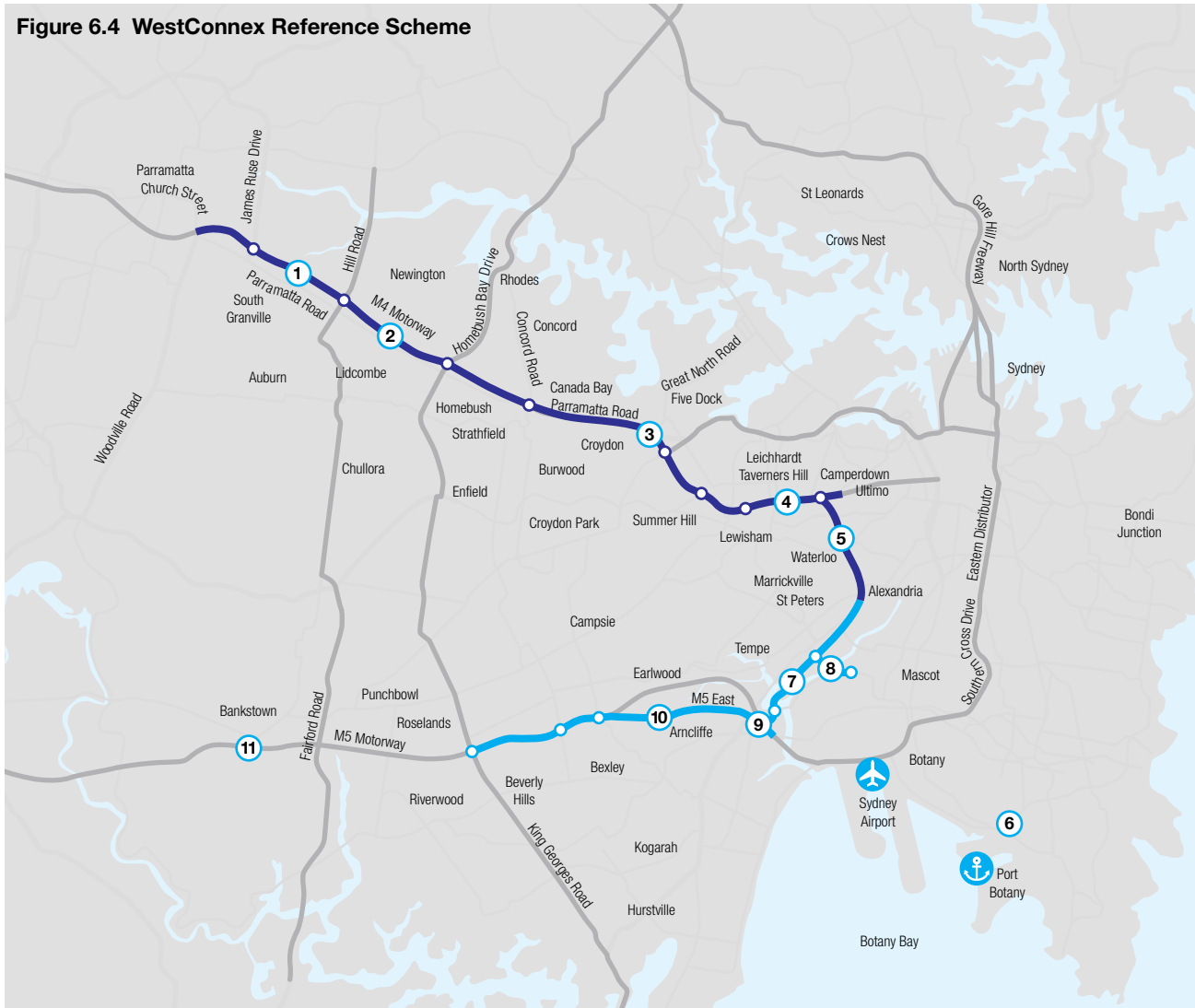
This project has been named WestConnex, reflecting the connectivity it would provide between Greater Sydney and Global Sydney's primary economic centres and international gateways.

Options to extend the M4 and expand the M5 have been considered over a number of years, but have struggled with scope and cost issues. Infrastructure NSW has worked to value engineer the design options for these corridors to provide a more focused and affordable scheme.

Figure 6.4 indicates the proposed alignment of WestConnex.

A more detailed description of the constituent elements of the proposed WestConnex reference scheme, its benefits and delivery options is set out in the document *WestConnex: Sydney's Next Motorway Priority* on Infrastructure NSW's website.

Figure 6.4 WestConnex Reference Scheme



- 1 Reduced congestion on Parramatta Road near Granville by improving M4.
- 2 Widening of the existing M4 to 4 lanes in each direction alleviates congestion for cars and trucks especially at James Ruse Drive where the motorway currently reduces from 3 to 2 lanes causing congestion in the morning and afternoon peak periods.
- 3 A new M4 extension completes the Motorway missing link east of Strathfield and improves travel times for cars and trucks.
- 4 The M4 Extension caters for cars and trucks, allowing Parramatta Road to cater for surface traffic and side road connections. This creates the opportunity for urban renewal along this section of Parramatta Road.
- 5 The new tunnel from the St Peters area to the Camperdown area provides a motorway for vehicles accessing the international gateways of the Port and Airport and removes through trucks from surface roads.
- 6 WestConnex gives improved access to the major international gateway of Port Botany; and increases the economic efficiency of this international gateway.
- 7 Traffic has better choices to travel north of or south of the airport, improving traffic flow generally.
- 8 WestConnex gives improved access to the major international gateway of Sydney Airport giving better road travel reliability, particularly in peak periods.
- 9 Improved connections between Marsh Street and the M5 East.
- 10 The M5 East widened to four lanes in each direction. This provides extra capacity in both directions for cars and trucks and alleviates extended congestion currently experienced in both directions.
- 11 An upgraded M5 improves industrial access and business efficiency along the full M5 corridor.

6.6.2 Project Benefits

WestConnex is intended to be more than a motorway. It is a scheme designed to act as a catalyst to renew and transform the parts of Sydney through which it passes. WestConnex is intended to develop as an integrated land use and transport scheme delivering on road transport, urban renewal and public transport outcomes.

Key benefits include:

- Relieving congestion on the existing M4/Parramatta Road and M5 East
- Supporting freight movements between Sydney's Gateways and the logistics hubs in Western and South Western Sydney
- Supporting people movements to Sydney Airport
- Acting as a catalyst for urban regeneration along key corridors, particularly Parramatta Road
- Enhancing orbital road connectivity South and West of the CBD
- Facilitating improvements in public transport, particularly on the Parramatta Road corridor

Forecast travel time savings and numbers of traffic signals avoided once WestConnex is completed are summarised in Table 6.6.

The strategic benefit-cost ratio for the WestConnex project has been assessed at more than 1.5. This is a traffic benefit-cost ratio that excludes consideration of wider benefits such as urban regeneration. This is a high return for a major transport investment in an inner urban environment. It reflects the high levels of existing

Table 6.6 Travel time savings with WestConnex in 2021 compared to travel via existing routes

Between	Existing route	Estimated time saving using WestConnex (minutes)	Traffic signals Avoided
Parramatta and Sydney Airport	via City Rd, Regent St	35	52
Parramatta and Sydney Airport	via Sydenham Rd	30	44
Eastern Creek and Port Botany	via Sydenham Rd	30	44
Flemington to Sydney Airport	via KGR/M5	15	0
Revesby to Port Botany	via General Holmes Dr	15	0
Liverpool to Sydney Airport	via Marsh St	15	0

utilisation of these roads and the significant journey time savings that WestConnex would offer.

6.6.3 Design Considerations

Infrastructure NSW, RMS and Transport for NSW have identified opportunities for improving value for money and tailoring WestConnex more effectively to user needs than previous proposals through:

- reducing the amount of deep tunnelling, which is expensive and reduces opportunities for connectivity with the legacy road network. The proposed design includes elements of slotting and surface grade road, as well as shorter tunnels.
- optimising connection points to address as much potential demand as possible, and distribute traffic efficiently across the legacy road network.
- improving the proposed road configuration to the North of Sydney Airport.

Consideration has also been given to the urban regeneration potential provided by the scheme, particularly along Parramatta Road. This is a significant opportunity for rejuvenation of a tired corridor that has the potential to play an important economic role in Sydney's future.

Ultimately, should the Government adopt WestConnex, it is important that its procurement seeks to maximise the potential for innovation. As discussed in Section 16, rather than seeking to specify in detail every aspect of the WestConnex scheme, it would be preferable for Government to provide the private sector with a high-level output specification based upon the work developed for the reference scheme.

This approach would only set out those aspects that are essential to meeting the scheme's objectives, but offer flexibility for private sector creativity and innovation in how these elements are provided.

Redeveloping Parramatta Road

Parramatta Road is Australia's oldest transport artery: "Every chapter of Sydney's history has been written on Parramatta Road." It was constructed late in the eighteenth century and upgraded to its present form during the Great Depression. It was not built to be the primary East-West route for a city of over four million people. The result is predictable: congestion, a poor safety record and urban blight.

One of the aims of the WestConnex program is to support the regeneration of the Parramatta Road corridor. Infrastructure NSW believes that a slotted road concept would enable this more than a tunnelling approach. The slotted concept sinks the motorway below surface level while constructing a new local road at surface level.

Depressing the motorway reduces surface impacts such as noise and pollution, but allows traffic from surrounding suburbs to readily access the motorway. Capacity on the surface-level local road is managed in order to reduce through journeys made on the surface roads, support public transport and therefore enable redevelopment. During construction, particular provision is made to ensure least disruption to local people and traffic.

This approach has been successfully applied in Sydney along parts of the Eastern Distributor. The approach is used a number of European cities, including Barcelona and Paris.

A conceptual outline of this approach is shown on the right:



6.6.4 Delivering WestConnex

WestConnex is a single integrated scheme. However, it is expected that WestConnex would be delivered in two stages if adopted by the Government:

- A Northern Sector, 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. This is shown in dark blue in Figure 6.4.
- A Southern Sector, comprising the M5 East Expansion and the new connections proposed around Sydney Airport, shown in light blue in Figure 6.4.

The timetable for delivering these stages is still under consideration, although it is likely that much development and construction would occur in parallel. Infrastructure NSW proposes WestConnex should be completed within ten years.

Analysis indicates that WestConnex could be primarily funded by user contributions supported by limited government support.

The tolling arrangements for WestConnex would be based on experience on other roads, in particular the M7. It is proposed that WestConnex's tolls will comprise a distance-based charge, a flagfall charge and a maximum toll cap. The exact tolling mix would be subject to detailed development, should Government decide to progress WestConnex. Alternative funding mechanisms, which may include some degree of value capture, will also be taken into consideration, should the Government choose to proceed with the scheme.

WestConnex would require loan financing to bridge the timing gap between capital expenditure and future toll revenues. An element of private financing would be adopted to manage project delivery risks, but given the pricing of risk in the current financial markets, Government financing and risk sharing may also be required to ensure a value-for-money outcome. These financing issues are discussed in more depth in Section 16.

6.6.5 Next Steps

The scale and complexity of the problems along the M5 and M4 corridors, and the latter's inadequate connectivity to Sydney's Gateways suggests a transformational solution is needed. The solution needs to fit within and connect with the existing transport network and must also enable urban renewal.

The feasibility study that Infrastructure NSW has led with Transport for NSW and RMS suggests WestConnex is the solution to these issues.

WestConnex is a major undertaking but the price of not acting is greater. Infrastructure NSW's analysis shows that WestConnex could be delivered at a target cost of \$10 billion within ten years. Achieving this requires a new approach that learns from the best of international design, procurement and delivery experience, and a funding strategy that incorporates user funding, supported by limited and affordable Government support.

Recommendation Infrastructure NSW recommends that Government progress the development of WestConnex, an integrated toll-road scheme designed to innovatively and affordably deliver the M4 Extension and M5 East Expansion projects within the next ten years.

Recommendation Infrastructure NSW recommends that urban renewal – in particular, the transformation of Parramatta Road – should be placed at the heart of the WestConnex scheme from the beginning.

6.7 Making better use of the road network

Improving asset utilisation needs to be central to the development of the SSRN, as with any other infrastructure network.

6.7.1 Managed Motorways

The managed motorways program is a collection of smart technology and infrastructure measures to get more efficiency out of the existing motorways. Managed Motorways increase the effective capacity of a road at lower cost than traditional road widening. Measures include ramp metering, variable speed limits, turning the unused shoulders into through lanes, enhanced driver information and accelerated obstruction clearance.

In combining these measures, the flow of vehicles onto the motorways via on-ramps will be controlled to minimise disruption to through traffic, and speed limits will be electronically adjusted through the day to optimise

motorway traffic flows. Using shoulders makes more through lanes available at low cost. Improved driver information can be provided via variable message signs and over-riding of car radios, enabling drivers to make more informed decisions about choice of routes.

These measures have been effectively implemented in other countries, such as the United Kingdom (UK) and the Netherlands. Results from the UK have been positive. Drivers experienced an improvement in journey times of up to 25 percent, and there was a 55 percent reduction in crashes¹⁰.

In NSW, a trial is proposed for the M4 motorway. Infrastructure NSW supports the Managed Motorways concept, and, subject to its successful trial, would recommend it be implemented across other congested Sydney motorways.

Recommendation Infrastructure NSW recommends the roll-out of the Managed Motorways program, subject to successful trial on the M4.

6.7.2 Time-of-Day Road Pricing

Time-of-day road pricing offers a way to discourage traffic from particularly congested locations, and can also provide funds to support investment. Conceptually, variable road pricing is similar to the demand management strategies in the energy or aviation industries. When demand is highest (such as at peak hours), customers pay more to travel, moderating demand.

¹⁰ Highways Research Group, 2011.

Singapore is the leading exponent of road congestion pricing. Since the 1970s it has progressively rolled out an increasingly complex system, which has reduced traffic congestion during peak periods by 15-20 percent. In Sydney, a form of time-of-day pricing has been in place on the Harbour crossings since 2009.

Over the longer term, as Sydney grows to a city of six million people, road pricing may need to play a role in balancing supply and demand for road travel.

Potential road pricing options for the longer-term are discussed in an independent experts report prepared for Infrastructure NSW by SMART Infrastructure and ACIL Tasman. This report is on Infrastructure NSW's website¹¹.

This analysis suggests that ultimately it may be desirable to implement a comprehensive system of congestion pricing on the SSRN, but such far-reaching changes cannot be pursued in isolation of other reforms.

For example, existing road charges may need adjusting. The main existing road charges include fuel excise, registration fees, parking levies and vehicle taxes. These are levied by all tiers of government, and reforming them would require inter-governmental agreement. New technological charging systems may need to be installed and operated.

The complexities of delivering a comprehensive scheme, leads Infrastructure NSW to favour a graduated approach to time-of-day road pricing. At this stage, Infrastructure NSW does not make any recommendations in this regard, pending more detailed study of the issues.

¹¹ SMART Infrastructure and ACIL Tasman 2012, Pricing Congestion in Sydney: Discussion Paper.

6.8 Roads across Metropolitan Sydney

The wider road network, including major arterials, will also require improvement. Infrastructure NSW supports incremental options to address infrastructure problems where available. Some of the highest value infrastructure investments come from pinch point relief that addresses road congestion 'hotspots'. This section highlights pressing areas for pinch point investment identified during the preparation of the Strategy.

6.8.1 Parramatta Ring Road

To address growing road congestion issues around Parramatta, Parramatta Council has proposed a 'ring road' concept, with an inner city ring road and outer regional ring road. These ring roads would utilise existing roads, but have improved flows through a series of upgrades at key locations.

The many cross-regional trips in the area, and the continued growth expected within Parramatta suggest that investment to improve the connectivity of Parramatta and adjoining regions is of value.

The proposed new road works would reduce intersection constraints and thus improve traffic flows around Parramatta for private vehicles and improve access into Parramatta for buses. More efficient traffic flows at intersections around Parramatta could also reduce congestion for buses and vehicles seeking access to and from Parramatta centre. On the southern M4 section of the regional ring road, a number of works could improve access and exit from the motorway. Some of these works could be part of the WestConnex proposal.

A secondary benefit of the ring road would be to improve access between the centre of Parramatta and the Camellia and Rosehill employment and industrial lands. These employment lands, which have the opportunity of further development and value uplift with the exit of the Shell Refinery, currently have poor access to Parramatta's centre.

On face value, these proposals appear to have strategic logic both from a traffic management perspective and the broader urban planning perspective of improving transport that will support Parramatta's forecast employment growth. Infrastructure NSW recommends detailed assessment be undertaken of the proposed program with a view to its prioritisation within the next 10 years.

6.8.2 Roads Serving the Growth Areas

The construction of new dwellings in greenfield areas is focused on the North West Growth Centre, around Rouse Hill, and the South-West Growth Centre, around Leppington. When developed, these will contain a larger population than Canberra and form an integral part of a Greater Sydney.

When completely developed over the next 30 to 40 years, the South-West Growth Centre will contain around 300,000 new residents¹². Such significant growth needs to be supported by new transport infrastructure.

The South-West Rail Link will play an important role in connecting the Growth Centres to the Metropolitan Area. Road upgrades to serve such a large population are underway including the widening of Camden Valley Way and other roads.

¹² NSW Department of Planning 2010, Metropolitan Plan for Sydney 2036.

At Rouse Hill, the major centre for the North West Centre, stage one of the town centre opened in 2008. When fully developed, the town centre will accommodate 12,000 jobs and operate as the regional focus for people living and working in the North West Centre¹³.

Over the medium term the North West Rail Link will connect to this Growth Centre. In the short term, works are identified for upgrading Richmond Road and Schofields Road, however other road upgrades may also be required to serve bus priority and to support access to train stations, retail centres and employment areas.

6.8.3 Pinch points

The NSW Government is continuing to investigate and implement measures to reduce delays and manage traffic on major arterial roads across Sydney at pinch points. This targets peak hour traffic hot spots to improve overall efficiency of the traffic stream.

Various targeted approaches are used. These include lengthening turn bays, adding short sections of additional lanes, widening intersections, upgrading traffic signal facilities, installing bus priority measures, providing more Variable Message Signs and installing more cameras for traffic supervision.

Pinch points of special concern are evident in the surrounds of Port Botany and Sydney Airport, discussed in Section 9. Within the CBD, there are major pinch points, particularly for buses at key turn-around spots.

¹³ NSW Department of Planning 2010, Metropolitan Plan for Sydney 2036.

Recommendation Infrastructure NSW recommends targeted investments around Parramatta and other growing urban centres.

6.9 Conclusions

The case for new road investment on Sydney's transport backbone – the Sydney Strategic Road Network – is strong. Other transport modes cannot accommodate all of the forecast growth in demand. Options to better manage existing road space – while supported – are not sufficient. Without intervention, journey times and congestion will worsen – impacting on the productivity of the NSW economy and Sydneysiders' quality of life.

Infrastructure NSW has identified in outline a scheme – WestConnex – that can help support freight and people movements across the city, and support major urban redevelopment. Infrastructure NSW believes that, while ambitious, WestConnex can be delivered in ten years with sufficient will.

The delivery structures of the past need to be refreshed for WestConnex. Greater private sector involvement at the design phase, a new approach to procurement and delivery, combined with a revised tolling approach and limited Government financial support, will be needed to make this program viable. These issues are considered further in Section 16.

Other investments in the SSRN such as F3-M2 and the F6 Extension are desirable, but are of lower relative priority than WestConnex from an economic perspective. It is possible that the private sector may be able to offer proposals to accelerate the delivery of these schemes, if construction costs can be kept to reasonable levels.

Outside of the Sydney Strategic Road Network, investment is needed to unblock the most congested spots and provide access to important and growing centres.

6.9.1 Recommended Actions

	Recommendations	Years	Type	Cost and Funding Implications
	Section 6 Urban Roads			
1	WestConnex planning and delivery of initial phases	0 – 5	Major project	Target estimate of \$10 billion. Modelling indicates a government funding requirement of \$2.5 billion.
2	Pinch points program around Parramatta and other growing centres	0 – 5	Program	Scoping of \$300 million
3	Identify and preserve corridor for Outer Western Sydney Orbital	0 – 5	Corridor	Cost of corridor preservation is not material. No assessment of land acquisition costs has been made.
4	Construct F3-M2	0 – 5	Major project	Proposal assumes private sector solution via current unsolicited proposal.
5	WestConnex project completion Includes: Parramatta Road urban regeneration	5 – 10	Major project	Target capital cost included above. Regeneration will be through private investment – assume no net cost to Government.
6	Roll-out Managed Motorways program to increase effective capacity	5 – 10	Asset utilization	Scoping of \$300 million
7	Identify and preserve corridor for new sub-surface motorway links West of the CBD (Airport – Gladesville – M2)	10 – 20	Corridor	Cost of corridor preservation is not material. No assessment of land acquisition costs has been made.
8	Construct F6 Extension	10 – 20	Major project	Scoping of \$3 billion assumes use of existing F6 transit corridor and surface construction. Assumption of two thirds user funding.