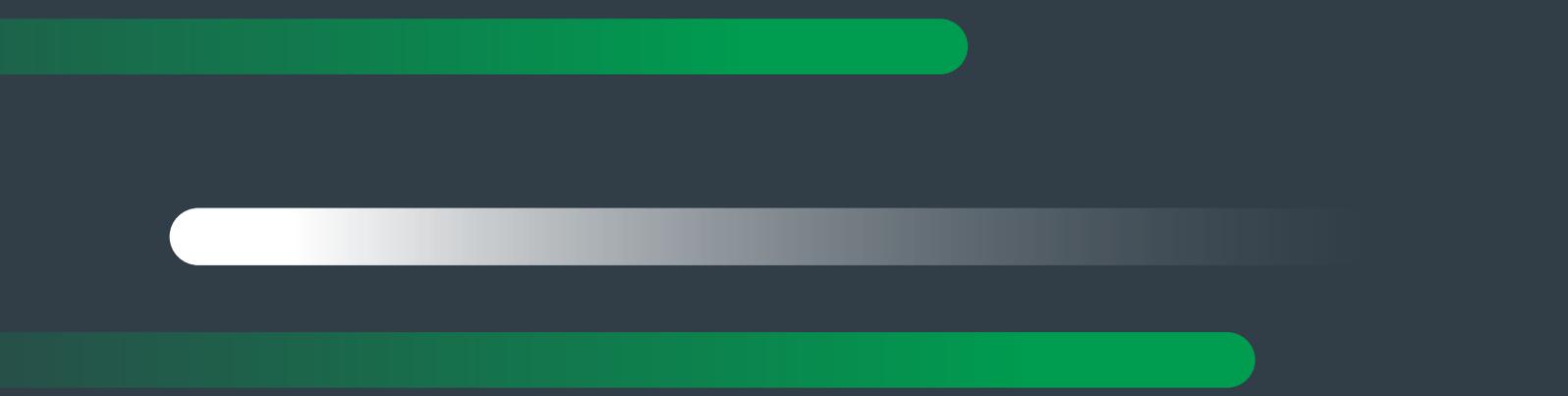


NSW Legislative Council

Inquiry Into Road Tolling

Transurban Submission

28 February 2017

The page features three horizontal decorative bars at the bottom. The top and bottom bars are solid green, while the middle bar is a gradient from white to dark grey.

Transurban's ne



Commuters

- Travel-time savings across the network including up to 25 minutes westbound on the M5 in peak periods
- 30% quicker incident clearance time than government guidelines
- \$4.2 billion travel-time savings*
- \$2.5 billion vehicle operating cost savings*



Economic

- Business/productivity benefits—\$7 billion*
- Household benefits—\$7 billion*
- Gross State Product—\$9.5 billion*



Government

- \$3.3 billion investment in Sydney network by Transurban and partners over six years[†]
- Accelerated project delivery—M1–M2 link (NorthConnex) brought forward 10 years
- A partner focused on network outcomes
- Full regulatory control of pricing

NorthC

Hills

Westlink M7

M5

Transurban's network footprint in Sydney means we take a holistic view of the operation and development of the road network as a whole, rather than focusing on a single toll road.

Our focus is on enhancing the efficiency and safety of the network for the benefit of all NSW motorists and to meet the needs of Sydney's growing population.

By considering the overall traffic flow around the network in alignment with government priorities, rather than just the traffic on a single toll road,

Network approach

onnex

M2

LCT

CCT

ED

We seek opportunities to reduce overall congestion both on and off our network of toll roads.

Our network-wide insights allow us to pinpoint the areas that are starting to experience strain, analyse the cause and implement actions that ensure the best possible experience for motorists.

We also understand the impact an incident can have beyond its immediate location so we are committed to continuing to achieve best-in-class roadside operations and incident response.



Freight

- Travel-time savings across the network including up to 15 minutes using Hills M2 and Westlink M7 northbound in evening peak, reducing operating costs by up to \$95 per hour
- NorthConnex travel-time savings estimated at up to 15 minutes
- Travel-time and operating savings \$2.8 billion over 10 years*



Community

- Training and up-skilling for 300 employees working on NorthConnex project
- Public art and roadside regeneration project at Macquarie Park
- Project to transform disused Hornsby Quarry into a public park
- Bushland regeneration project in Hornsby Shire to plant 17,000 native species



Investors

- Significant infrastructure investment opportunity for Australian investors
- 70% of Transurban security holders are Australian
- 20% of Transurban security holders are from NSW

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1. A review of the tolling regime in place on different roads and an explanation for the differences between each	Section 3 Appendix 1
2. The process for determining how tolls are set for all types of vehicles, the length of tolling concession periods, the rationale for extending these concession periods and opportunities to increase transparency for the public, particularly given the absence in some instance of any competitive process	Section 3 Section 4
3. How tolling contracts are negotiated and varied and opportunities to increase public scrutiny and accountability of the negotiations that take place between private tolling companies and the NSW Government	Section 3
4. The rationale for allowing higher than CPI increases on certain tolls	Section 3
5. The extent of any consultation undertaken with the trucking industry before changes are made to tolling regimes	Section 3
6. The appropriateness of involving the Independent Pricing and Regulatory Tribunal (IPART) in the determination of tolls and their escalation, given the involvement of IPART and other such independent regulators in setting public transport fares and other services such as electricity transmission and distribution charges	Section 4
7. Opportunities to increase the assurance to the public that tolling arrangements represent the fairest possible outcome	Section 1 Section 2 Section 6
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Executive Summary

Freedom of movement directly impacts quality of life and the economic productivity of a city. Sydney's toll road network provides tangible evidence, having delivered billions of dollars in economic benefits to the city through the efficient movement of people, goods and services. Indeed, KPMG has estimated that over a 10- year period, Sydney's toll road network has delivered more than \$14 billion in economic, social and environmental benefits to the city.

These benefits mean travel-time savings, reliability gains and reduced vehicle operating costs for households and businesses.

There are also environmental benefits from demonstrated reductions in vehicle emissions from more efficient movements on the network. Improved access to economic centres has generated city-wide benefits with thousands of additional jobs created through increased economic activity.

Sydney's toll road network, and by extension, these benefits, could not have been realised without the effective partnering of the public and private sector. The current network represents more than \$9 billion of investment, of which the private sector has contributed 80 per cent. The involvement of the private sector has substantially accelerated this investment, delivering the associated benefits many years ahead of when they might otherwise have been achieved. The most recent example is the NorthConnex project, where Transurban and its partners worked with the New South Wales (NSW) Government to deliver this \$3 billion project an estimated 10 years earlier than anticipated if the government had not involved the private sector.

The benefits that have come from private-sector participation go well beyond the initial project, with the Public Private Partnership (PPP) model proven to deliver ongoing investment into the network. In recent years, Transurban and its partners have invested approximately \$1 billion to upgrade the Hills M2 and the M5 corridors with further investment into technology, operations and maintenance to enhance network efficiency. The risk transfer away from the public sector has also been shown to be real and effective, as demonstrated by the Cross City Tunnel and Lane Cove Tunnel projects. In both instances the under performance of the project against the initial owners' expectations led to significant losses to the private sector, however the city still benefitted from the delivery of these major pieces of infrastructure and government was protected from the downside risks.

The involvement of the private sector at the procurement phase of projects has also led to positive outcomes, as demonstrated most recently through the NorthConnex project. Not only were the procurement time-frames significantly fast-tracked, but the value for money was evidenced by the fact that the final project scope was effectively a future-proofed design. This was achieved by driving innovation from the contractors through the tender process, without exceeding the budget expectations around the project.

Successful partnering between the public and private sectors to deliver toll-road projects in Sydney extends back a number of decades, and the model for private sector participation is considered one of the most advanced and effective in the world. The concession agreements provide the regulatory framework governing the operation of the respective roads, with clear and

Sydney motorists share their views on toll roads



"They (toll roads) are better roads. They're generally a good quality road. Good access, multiple lanes."

Parramatta motorist



"Not enough of them, the missing links, when you want to leave Sydney to the north, you get ejected at Pennant Hills Road, why are there these missing links?"

Sydney motorist



"I don't even consider the cost, if it's the quickest direct route, I'll take it."

Parramatta motorist



"(Toll roads are) safer. You look at people, they are damn tired, doing the commute every day. I've seen a few times when people have drifted off, that's a consideration of mine."

Sydney motorist

transparent pricing arrangements set at the commencement of the concession. Beyond the initial agreement there is no pricing flexibility in the concession. Any revision to pricing requires a renegotiation of the concession agreement, and the only circumstances in which this has taken place has been in the context of major enhancements and upgrades to the network. In NSW, the unsolicited proposals process provides a clear framework through which the private sector can work with the public sector to develop unique projects in a transparent and equitable way, creating value for NSW.

In setting the initial pricing for a given asset, the government requirements determine the regime that best meets the funding needs of the project, while at the same time providing a value-for-money toll proposition for motorists. This is based on factors such as the travel-time savings delivered by the project. In considering the commercial arrangements, of which the toll prices are one of the critical elements, a range of factors need to be considered including the:

- value the project delivers for the community
- complexity of the project, which impacts the design and delivery costs
- ongoing operations and maintenance costs, and
- forecast levels of traffic.

The private sector's involvement in the delivery and management of

road infrastructure has traditionally been fragmented in Australia. To ensure the liveability and productivity of Sydney, individual pieces of infrastructure have been procured through different private operators. In recent years, Transurban has extended its network footprint in Sydney mostly by acquiring projects that did not meet their original private sector forecasts. This has brought considerable strategic alignment with government in how Transurban develops and operates the network, for the benefit of all NSW motorists. This leads to a focus in seeking opportunities to reduce overall congestion both on and off our network of toll roads. This has further enhanced the benefits that can be derived from the privately-operated portions of Sydney's road network while NSW maintains contractual and legislative control over pricing.

The government's ability to continue to work with the private sector to deliver major road infrastructure projects will be critical to Sydney's continued economic prosperity and success in the years and decades ahead. Having established a PPP model that is the envy of the world, and with growing and diverse requirements on the public purse, the need to continue to harness this delivery model is critical. Sydney is Australia's busiest and most congested city with congestion costs around \$6.1 billion annually—equivalent to annual losses of more than \$1,500 per Sydneysider—and forecast to increase to around \$12.6 billion per year by 2030.¹ The public and private sectors must continue to work together to address this problem.

¹ Australian Government, BITRE, Traffic and congestion trends for Australian capital cities, 2015

Sydney motorists' attitudes to toll roads



75%
believe toll roads provide a more direct route



69%
believe toll roads save them time



54%
believe toll roads make their lives easier



56%
believe toll roads create less wear & tear on their car

Source: GfK research report, 2015

About Transurban

Transurban's NSW toll road network in numbers

 6
operating
assets

 \$9B
nominal construction
in NSW network

 \$1.3B[§]
project pipeline

 479 km
total lane kilometres
managed by Transurban

 2.5B kms
travelled by drivers
on our roads in FY16

 >700,000
trips per workday

 155,000 hrs
travel-time saved
per workday

 1,750
Transurban NSW
employees and
contractors

 7,700
incidents managed
annually*

Transurban has expanded both nationally and internationally to become a leading developer, operator and long-term concessionaire of toll roads since its establishment in 1996.

We have built a track record of partnering with governments to successfully deliver and manage key road infrastructure, and are recognised for developing innovative and effective transport solutions to meet the needs of growing cities.

In NSW, alongside our equity partners, we have interests in six toll roads in Sydney's orbital network—Hills M2, Westlink M7, M5 Motorway, the Eastern Distributor, Lane Cove Tunnel and Cross City Tunnel. These roads are among the city's busiest commuter and freight routes with more than 700,000 trips recorded every workday.

To achieve our vision to strengthen communities through transport, we understand that we must take a big picture view of our roads and the transport networks in which we operate to provide smarter, safer, and more sustainable ways for people to travel.

Our long-term concessions with governments create a strong incentive for us to actively manage these roads with a view to not only meet today's needs, but the future needs of communities.

Our NorthConnex tunnel project in northern Sydney is an example of how we have taken a proactive approach to address one of the city's most notorious transport bottlenecks with an innovative design that caters for future traffic growth.

We are working with the NSW Government to construct the \$3 billion tunnel, which will link the M1 Pacific Motorway at Wahroonga to the M2 Motorway at West Pennant Hills. NorthConnex will bring the community significant benefits in terms of travel-time savings and reliability as well as completing the new national freight route linking the east coast of Australia.

NorthConnex was recently named by the Infrastructure Sustainability Council of Australia as the nation's highest-rated road project to date. The recognition exemplifies our commitment to achieving industry-leading outcomes in sustainability.

Last year we were included in the Dow Jones Sustainability Index World Leadership listing and we were recently awarded the Industry Mover Sustainability Award 2017 for the Transportation and Transportation Infrastructure sector, which further recognises our commitment to sustainability.

Transurban represents one of the most significant infrastructure investment opportunities available to Australian investors. Seventy per cent of our security holders are Australian superannuation funds and individual security holders, while 20 per cent are based in NSW.

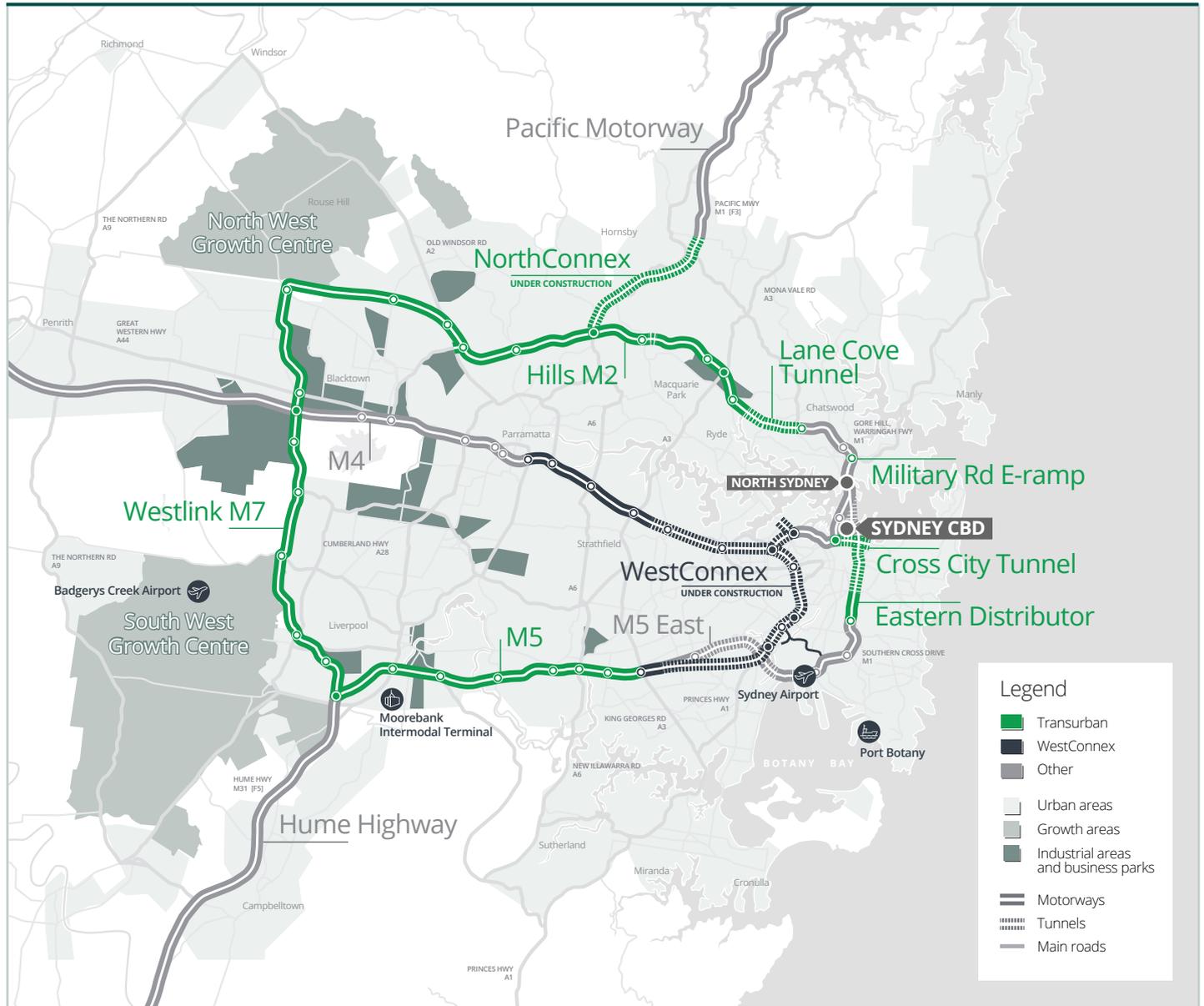
We directly employ more than 1,100 people across Australia, with 24 per cent based in our NSW business. In addition, our construction projects create thousands of jobs. For example, NorthConnex will create 8,700 jobs over the life of the project.

Our aim is to foster an engaged and diverse workforce that can make a significant and lasting contribution to the cities and communities in which we operate.

[§] Transurban share

* Hills M2, Lane Cove Tunnel, Cross City Tunnel, and Eastern Distributor.

The Sydney Strategic Road Network



TRANSURBAN OWNERSHIP		
Hills M2	100%	Eastern Distributor Transurban (75.1%), IFM Investors and UniSuper own the remaining 24.9%
Lane Cove Tunnel	100%	M5 South West* Transurban (50%), Hastings Funds Management, IFM Investors and AMP Capital own the remaining 50%
Cross City Tunnel	100%	Westlink M7[§] Transurban (50%), QIC Global Infrastructure and Canada Pension Plan Investment Board each own 25%

* M5 South West operated by Interlink Roads

§ Westlink M7 operated by Northwestern Roads Group

Section 1: Economic Benefits of Toll Roads

Sydney's toll road network is critical to the movement of freight and passengers, and underpins economic growth and social connectivity.

Infrastructure NSW identified the Orbital Network (many sections of which are tolled), the M4, Parramatta Road, the F6 corridor and the missing link now known as NorthConnex as comprising the Sydney Strategic Road Network. This has been highlighted as the most important transport network in the state.²

Much of the toll-road network has been delivered through partnerships between government and the private sector. Without private sector investment, delays in these projects would have negatively impacted the state's economy and its communities.

By applying the right policy framework, long-term planning and judicious use of private sector expertise, Sydney's toll road projects have addressed genuine accessibility needs, reduced travel times, improved travel-time reliability and created a smoother flow of traffic across the entire road network. The high volumes on the motorways show how heavily people and businesses rely on that road network for access around Sydney.³ Each day the toll road network carries a significant portion of the city's passenger trips and the bulk of the freight task. It acts as a feeder and distributor of other transport modes (including rail, sea and air), providing Sydney with a more integrated transport system.⁴ By enhancing access and transport connections, toll roads have also supported the development of growth corridors and the establishment of new commercial precincts and communities.

KPMG has estimated that the toll road sector has contributed \$14 billion in economic, social and environmental benefits and increased gross state product

(GSP) by \$9.5 billion over 10 years (Figure 1).⁵ Overall, the annual economic benefit of toll roads in NSW has been estimated at \$1.9 billion (Figures 2 and 4). Approximately \$1.3 billion of the total benefits are derived by toll-road users due to reduced travel times, reduced vehicle operating costs and improved travel-time reliability. Additionally, the toll-road network has significantly improved access to economic centres (Figure 3).

Relieving traffic congestion and improving traffic flow also has significant environmental benefits. Our analysis of travel time and fuel efficiency data confirm that using Transurban's routes in free-flow traffic situations produces less greenhouse gas emissions per kilometre than using an alternative route along arterial roads. Our roads are designed and operated to keep traffic flowing. An environmental review of the M5 South West Widening Project estimated a 30–40 per cent reduction in customer greenhouse gas emissions as a result of improvement in travel times and improved driving conditions. KPMG modelling estimated that toll roads generated \$72 million in environmental benefits over a 10-year period.

⁵ KPMG, Economic Contribution of Australia's Toll Roads, 2015

Figure 1: Economic contribution of NSW toll roads over 10 years

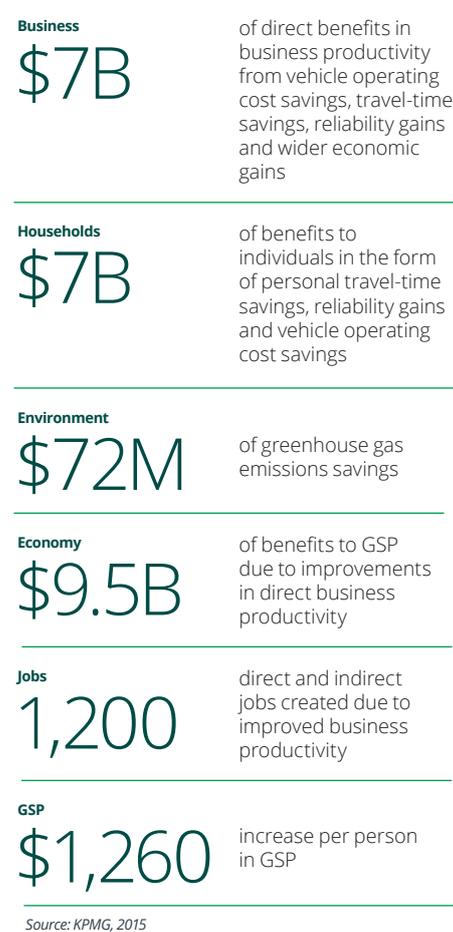
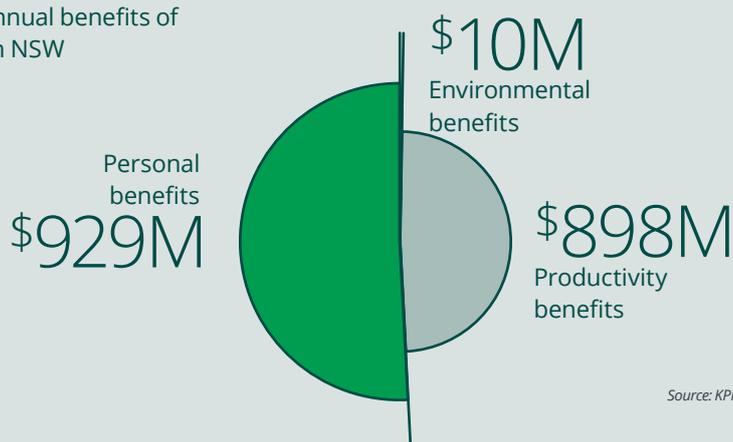


Figure 2: Annual benefits of toll roads in NSW



² Infrastructure NSW, The State Infrastructure Strategy 2012-32

³ Infrastructure Partnerships Australia, Urban Transport Challenge: Driving reform on Sydney's roads, 2009

⁴ Ibid

Figure 3: Improved access to economic centres

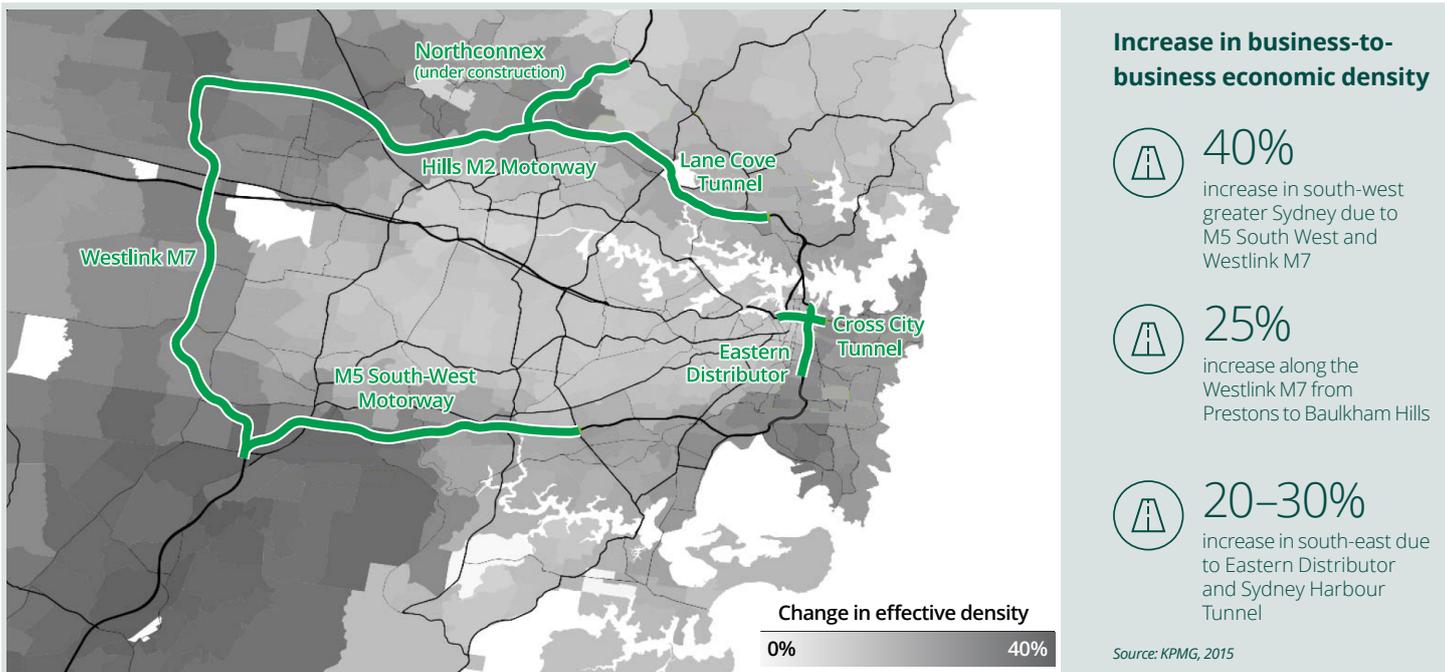
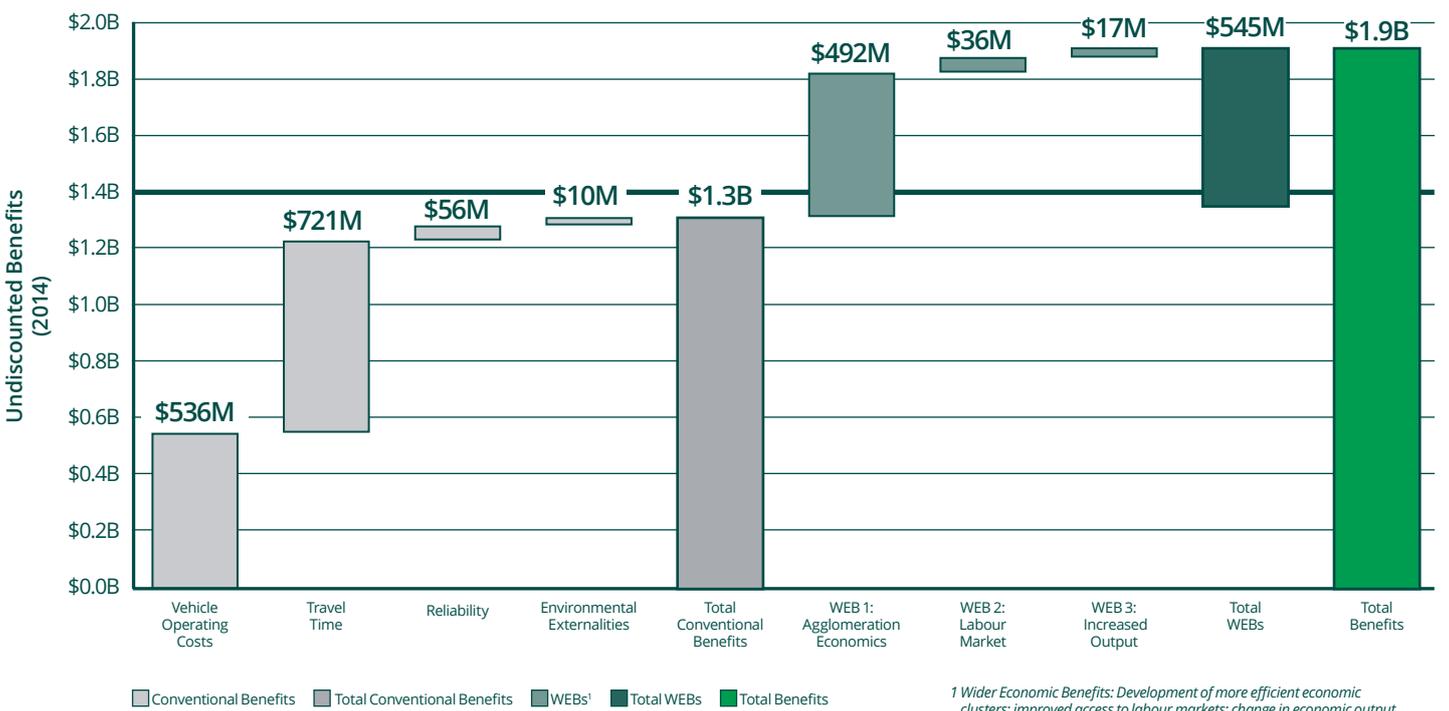


Figure 4: Annual benefits of toll roads in NSW





Personal users (over a 10-year period)

\$4.2B

travel-time savings

\$0.3B

travel-time reliability benefits

Source: KPMG, 2015



M5 West Widening project

Cost

\$400M

Capacity increase

50%

Travel-time savings up to

25 mins

westbound in peak times

Direct User Benefits

Central to the value that toll roads offer users is travel-time savings. This is the amount of time users save by choosing the tolled route over untolled alternatives. Toll-road projects are designed to create efficient routes that reduce travel times for users while optimising safety. For example, the NorthConnex project in northern Sydney is expected to provide up to 15 minutes of travel-time savings as motorists will be able to avoid 21 sets of traffic lights on the alternate route between the Hills M2 and the M1 Pacific Highway.

Transurban's existing NSW toll road network offers ongoing value for users with significant travel-time savings provided across all of our road assets (Figure 5).

For example, on average every work day motorists save 155,750 hours collectively across the toll road network.⁶

Figure 5: Hours saved daily³



These travel-time savings translate into direct benefits for households and freight. KPMG estimates that these amount to \$4.2 billion for individuals over a 10-year period.

As Sydney's population grows, so does demand for our roads. To ensure service levels remain high, we undertake major upgrade projects in partnership with the NSW Government and others. The \$400 million M5 West Widening in south-west Sydney increased the motorway's capacity by 50 per cent, adding a third lane in each direction. Since its completion in December 2014, motorists have benefitted from up to 25 minutes in travel-time savings. For the average workday commuter this amounts to an extra four hours a week that could be better spent with family, community and sporting involvement, or other recreational pursuits.

⁶ Average workday time savings (May 2016)



Case study one

A tradesperson heading to a job travels southbound on the M7 to Macquarie Fields in the morning peak hour rather than taking the alternative untolled route.

32
minutes

Estimated
time saving

\$53

Tradesperson's
hourly rate

\$7.85

Maximum
toll

\$28

Potential
productivity gain



Case study two

A working parent living in Sydney's south-western suburbs is running late picking up their children from a child care centre, which charges \$1 per minute in late fees, and takes the M5.

25
minutes

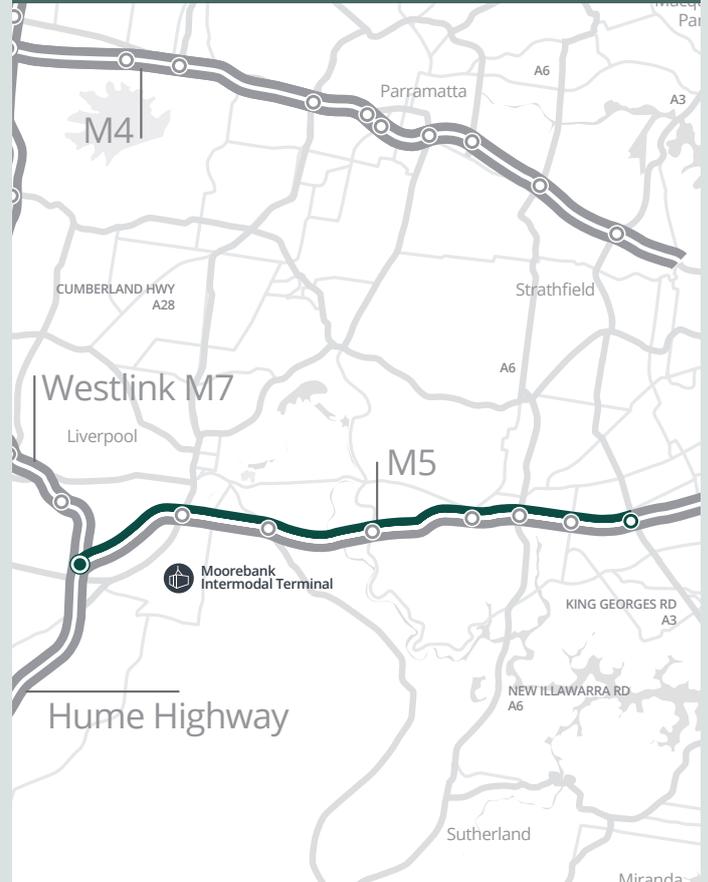
Estimated
time saving

\$4.57

Estimated
toll

\$25

Saving in
late fees



In Sydney the value of time savings for the average car being used for private travel is assumed to be \$21.20 per hour, based on typical occupancy rates and the value of time per occupant based on

figures used for economic appraisal of transport investments. Time savings for cars being used for business purposes are valued higher at \$53.30 per hour.

Value of travel time on urban roads

VEHICLE TYPE	OCCUPANCY RATE	VALUE PER OCCUPANT (\$/PERSON-HOUR)	IMPLIED VALUE (PER VEHICLE-HOUR)
Car—private	1.4	\$15.14	\$21.20
Car—business	1.1	\$48.45	\$53.30

Source: Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013.



Business & freight users (over a 10-year period)

\$1.2B

travel-time
savings

\$0.1B

travel-time
reliability benefits

\$1.5B

vehicle operating
cost savings

Source: KPMG, 2015

Benefits for the Freight Industry

Sydney's toll road network is comprised of motorways that have been purpose built to support the freight industry. The network provides considerable benefits for heavy vehicles in terms of increased safety, reduced fuel consumption, greater travel-time reliability, smoother travel and less wear and tear on the vehicle, which all contribute to overall operational costs savings.

At a Sydney network level, the benefits to business and freight users have been estimated to be \$2.8 billion (over 10 years). This includes \$0.1 billion in travel-time reliability benefits, \$1.2 billion in travel-time savings and \$1.5 billion in vehicle operating costs savings, which results in material financial outcomes for freight operators. Additionally, the NSW Freight and Ports Strategy estimated that a one per cent increase in freight efficiency saves the national economy \$1.5 billion.⁷

For freight operators, reduced travel time can result in lower costs associated with fuel and wages. Travel on the toll road network also improves safety by reducing the number of times trucks have to stop for traffic lights. Transport for NSW publishes values of time and operational cost savings for freight. This has indicated that in urban traffic conditions one hour saved is worth \$45 for a heavy rigid truck, \$74 for an articulated truck and \$95 for a B-Double to the operator.⁸ These are 2014 figures and escalation in wages since this time would underpin higher figures today.

For example, a truck travelling northbound through Sydney from the Hume Highway at Glenfield to the start of the M1 at Wahroonga using the old Cumberland Highway currently takes anywhere from one to two hours during the evening peak period on a Friday. Alternatively the same truck choosing Westlink M7 and Hills M2 would take between 50 and 80 minutes (Figures 6 and 7). This represents potential time savings of up to 40 minutes and in dollar terms this translates to time and cost savings ranging from \$30 for a rigid truck to \$63 for a B-Double (more than double the toll outlay for these two motorways).

*Value of time and
operational costs savings
for freight operators of
up to \$95 per hour*

Most of the uncertainty and delay in travel time that remains in this vital freight corridor exists in the eight kilometre stretch along Pennant Hills Road where accidents and breakdowns are frequent. Once NorthConnex is completed in 2019, it is expected that a truck would be able to complete a peak-hour trip through Sydney from Glenfield to Wahroonga in only 40 to 50 minutes.

Freight operators using NorthConnex will avoid 21 sets of traffic signals between the Pennant Hills interchange at the Hills M2 Motorway and the M1 Pacific Motorway interchange at Wahroonga. When compared to the travel time on Pennant Hills Road without the project, NorthConnex is expected to offer travel-time savings of up to 15 minutes in 2019, and up to 25 minutes in 2029.⁹ Thus by choosing NorthConnex, freight operators will achieve operational savings (time and cost) of up to \$24 for each B-Double trip in 2019 and \$40 in 2029 (in real terms).

Transurban's investment in the Sydney network over two decades since the early 2000s has produced significant productivity benefits for freight operators and also created less frustrating driving conditions for large vehicle drivers. Heavy vehicles can largely avoid travelling in suburban streets, enhancing the liveability of those areas. Without this investment from Transurban, its partners and the NSW Government, the Cumberland Highway would still be the main thoroughfare for trucks passing through Sydney. Travel times and reliability would have continued to deteriorate to levels significantly worse than they are today.

⁷ Transport for NSW, 2013b

⁸ Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013

⁹ NorthConnex EIS Volume 6, Appendix K

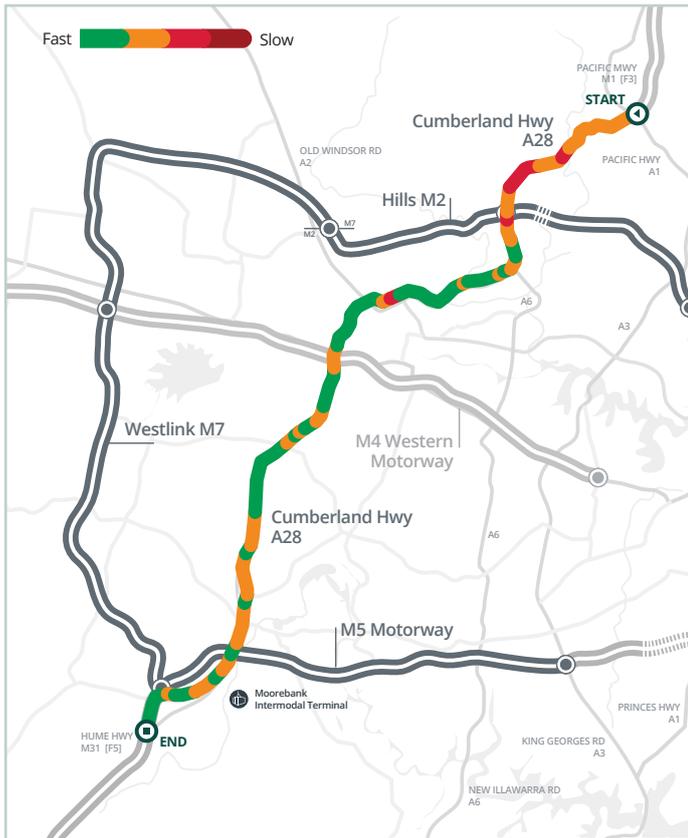


Figure 6: Northbound non-tolled route can take up to two hours during evening peak periods

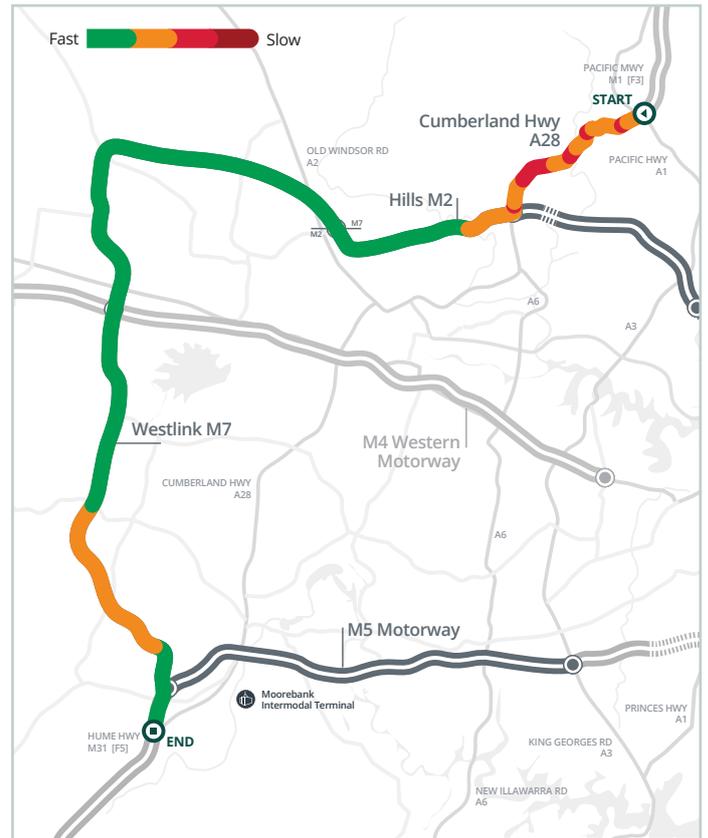


Figure 7: Time saved using northbound tolled route (M2 and M7) during evening peak reduces operational costs by up to \$95 per hour

Figure 8: Value of travel time on urban roads for freight operators

Rigid Trucks



Light commercial—2 axle / 4 tyre
 Medium—2 axle / 6 tyre
 Heavy—3 axle

Total hourly operation cost

\$33.73
 \$34.12
 \$44.98

Articulated Trucks



4 axle
 5 axle
 6 axle

\$62.12
 \$71.14
 \$74.26

Combination vehicles



B-Double

\$94.94

Source: Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013. Transurban calculated based on source document.

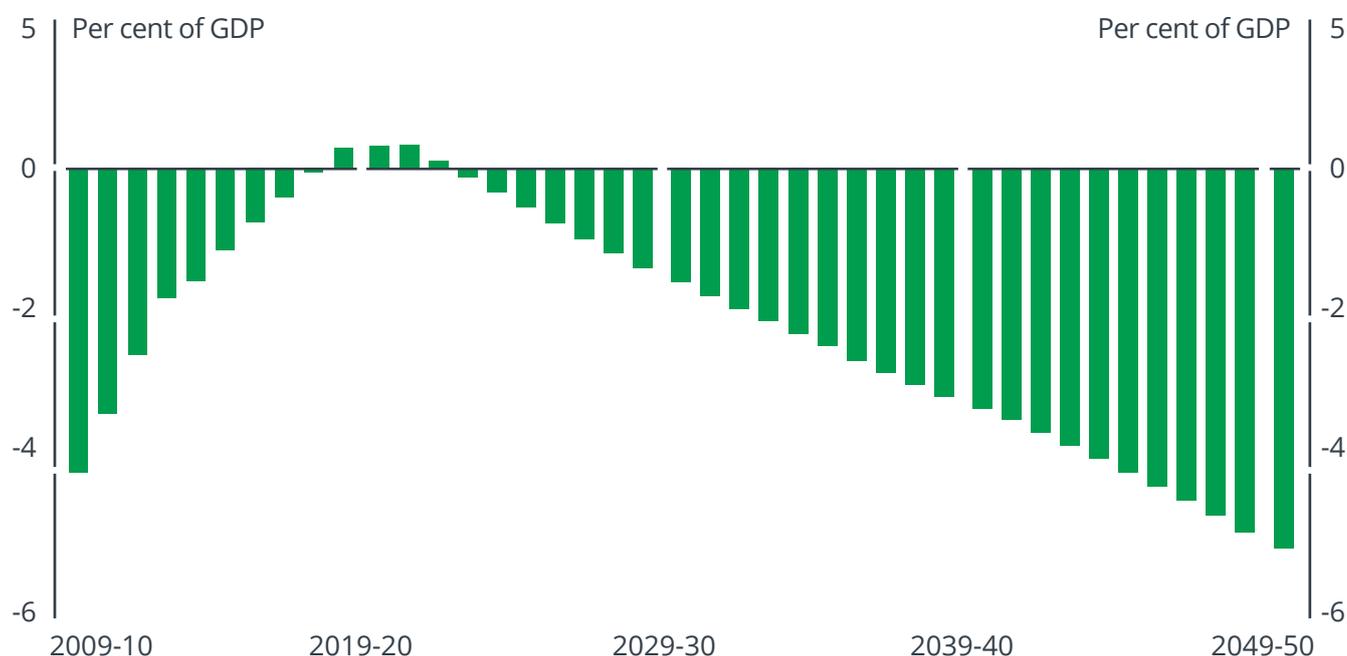
Section 2: Benefits of Private Sector Involvement in Transport Infrastructure

Australia has been a world-leading proponent of public-private partnerships with an estimated \$52 billion¹⁰ of investment over the past 10 years to address the growing backlog of transport infrastructure projects.

The injection of private sector capital and expertise into major projects has allowed governments and communities to benefit from critical infrastructure without government taking on the risk or financial burden (Figure 9). It has allowed governments to free up their balance sheets for social infrastructure and other priorities at a time when they are facing competing funding demands.

Roads are overwhelmingly the most popular form of transport in Sydney, catering for more than 90 per cent of travel (Figure 10). It is estimated that by 2031–32, Sydney will need to accommodate 2.3 million more daily car trips.¹¹ However, demands on government funding, have meant less than half of the transport budget is allocated for roads.¹²

Figure 9: Significant fiscal pressure ahead for governments



Source: Deloitte Access Economics, 'An Intergenerational Report for the States', incorporated within the BCA Submission to the 2011 Tax Forum, October 2011.

¹⁰ Infrastructure Partnerships Australia analysis, 2017

¹¹ Infrastructure NSW, The State Infrastructure Strategy, 2012-32

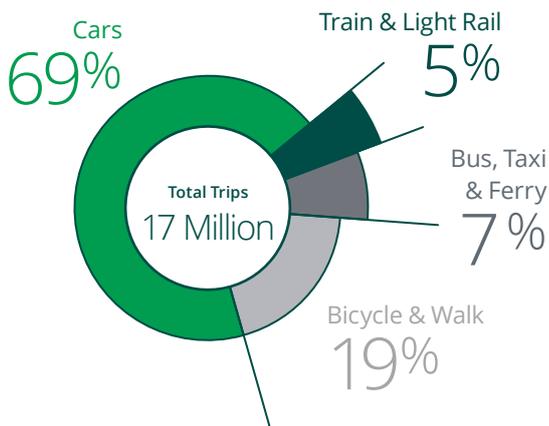
¹² Ibid

Figure 10: Moving around Sydney

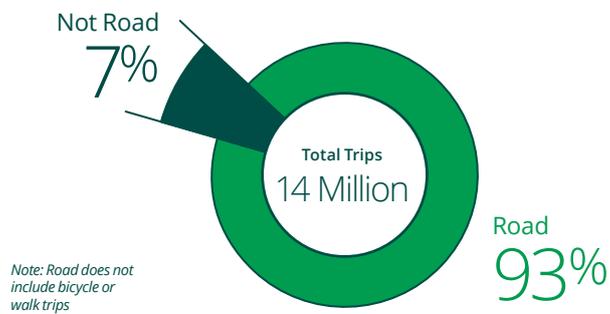
Each week there are over 17 million passenger journeys across Sydney.



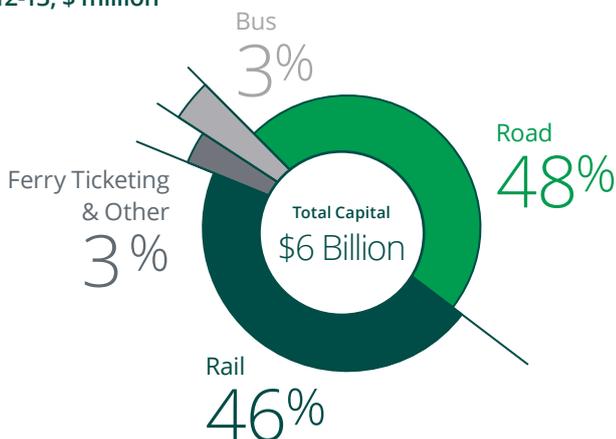
**Mode share:
Average weekday trips (2010)**



**Road vs non-road:
Average weekday trips (2010)**



**Funding share to mode:
2012-13, \$ million**

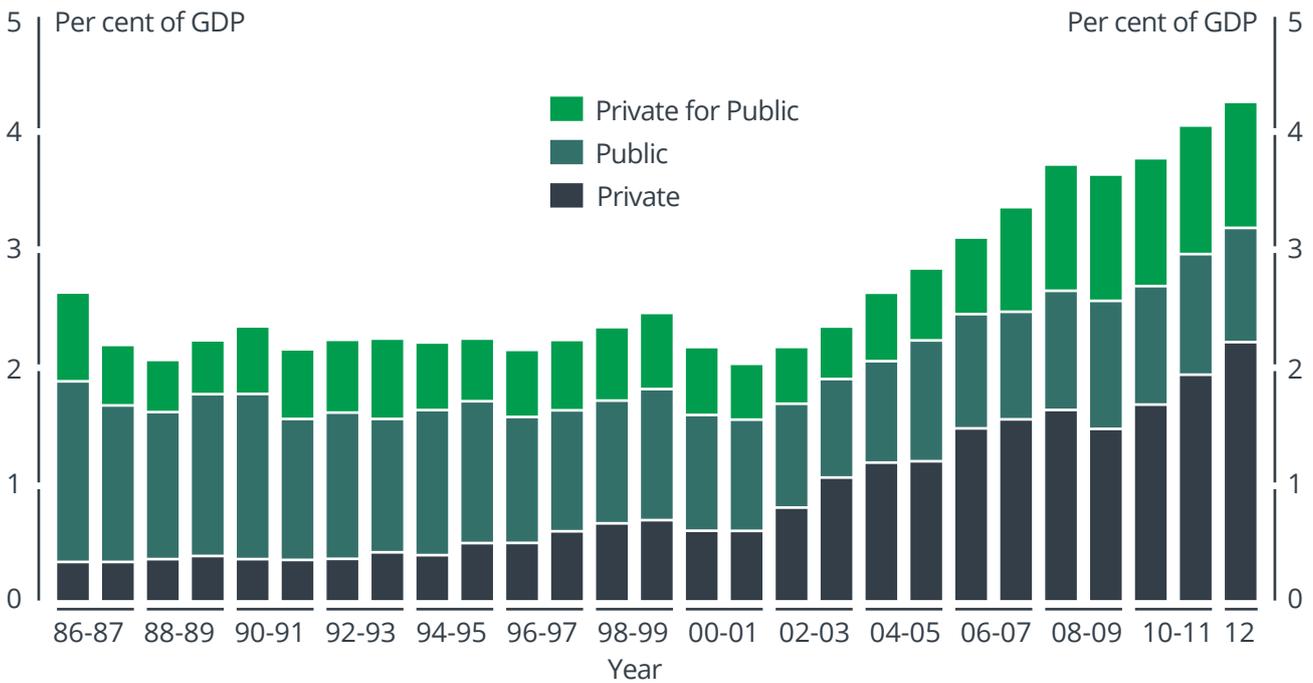


Source: NSW Government; NSW Bureau of Transport Statistics; cited in Infrastructure NSW, *The State Infrastructure Strategy 2012-2032*

“Increasing use of outsourcing and divestment are a feature of modern government service delivery and can deliver lower cost with greater innovation. In general, private sector-led projects are delivered closer to time and budget than public-sector led projects.”

Infrastructure NSW
State Infrastructure Strategy
2012-2032

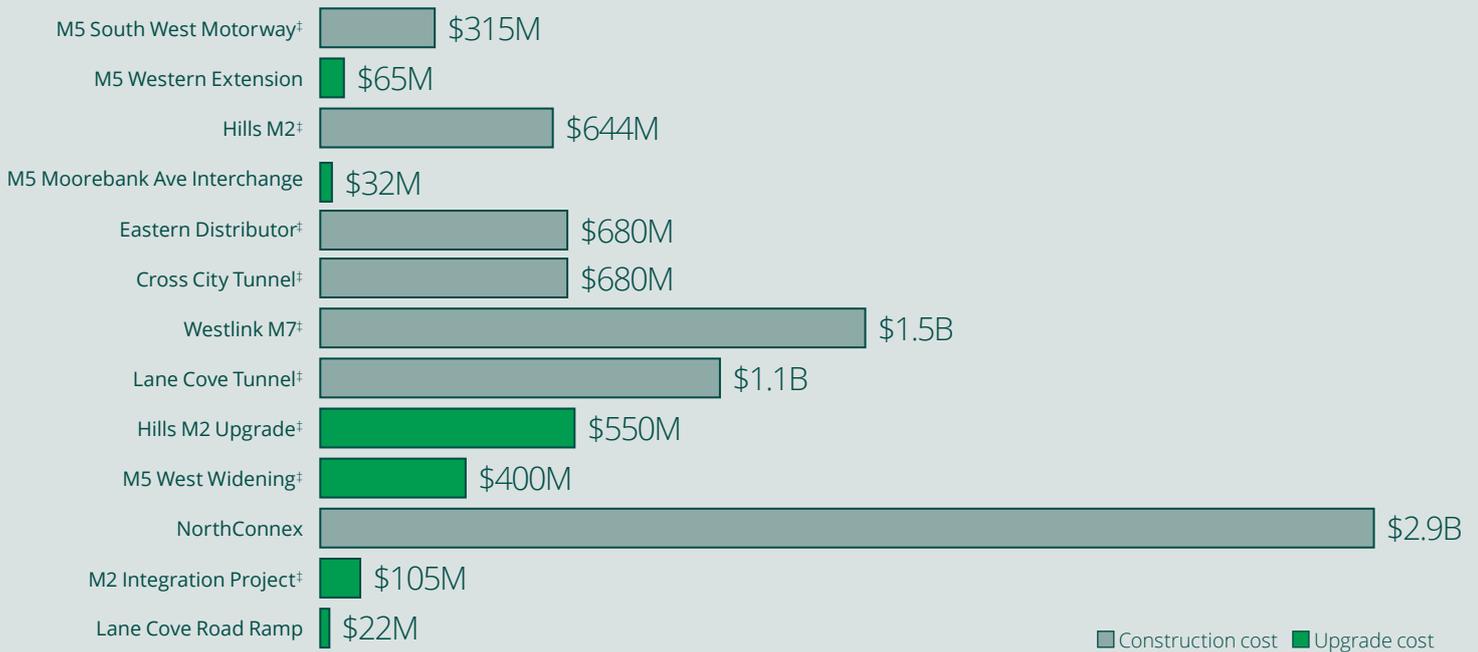
Figure 11: Total infrastructure investment in Australia



Source: ABS cat. no. 5204.0, 8762.0 and Business Council of Australia (BCA).

Substantial increase in infrastructure spend has been supported by greater contributions from the private sector.

Figure 12: Investment in Transurban-operated road network



† Estimated at time of contract award

NSW has been a leader in the use of PPPs to deliver toll road projects with eight motorways and tunnel projects opened to date.¹³ PPPs have allowed the government to provide tangible outcomes for the community, while transferring the significant patronage risk to the private sector and freeing the public balance sheet for other priorities.

Westlink M7, which opened in late 2005, is widely regarded as a “best practice” PPP.¹⁴ The motorway was procured by the NSW Government with the construction and ownership risks transferred to the private sector. Transurban is a 50 per cent shareholder in Westlink M7. The motorway, which opened eight months ahead of schedule, provided a vital missing link in the Sydney Orbital network and has played a major role in the economic development of adjoining areas, including the development of transport and logistics industries around Eastern Creek.

Transurban’s current Australian development pipeline represents approximately \$9 billion and includes funding of five critical infrastructure projects in NSW, Victoria and Queensland, which enables those governments to focus on non-economic infrastructure and social investment. Transurban and its partners will fund \$6.8 billion of this pipeline, with the remainder coming from governments (Figure 13).

In NSW, Transurban and its partners have invested approximately \$1 billion to enhance Hills M2 and M5 West motorways over the past five years. These investments and network enhancements have been negotiated and agreed with the NSW Government.

This has been achieved through adjustments to tolling levels and extensions to concession agreements. These projects have significantly improved the traffic flows and travel times on the broader network, providing direct economic benefits to the city with minimal direct capital investment by the government.

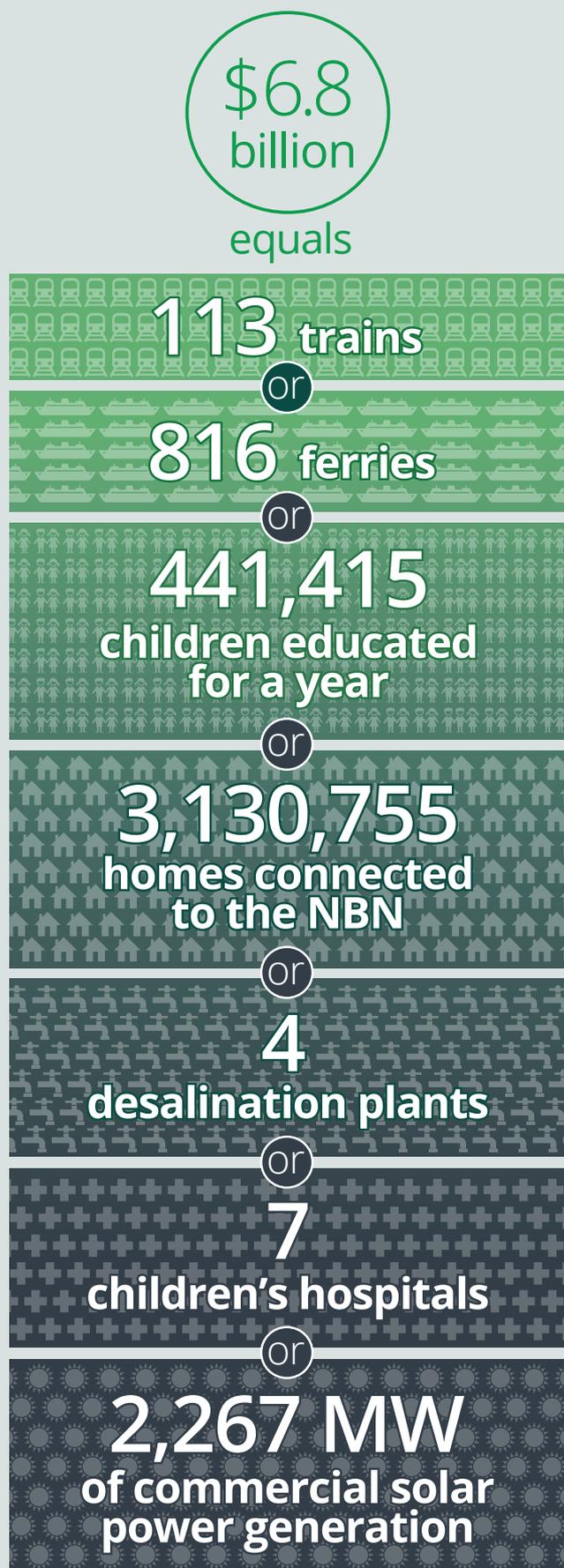
Our project to provide another missing link in the network, NorthConnex, which connects the M2 with the M1 Pacific Highway, represents a further multi-billion dollar investment from Transurban and its partners. This project has also been a model for collaboration between the NSW Government and Transurban (and its partners), leading to a reduction in the government funding commitment required for this project.

The project will offer motorists significant benefits in terms of travel-time savings and create more efficient movement of state and national freight.

This PPP procurement model allows the flexibility to continually enhance the network throughout the concession period and, importantly, provides the motivation for the private sector to do so.

Figure 13: Private sector contribution

Transurban and its partners’ current financial contribution to infrastructure projects in Australia.



13 Infrastructure Partnerships Australia, Urban Transport Challenge: Driving reform on Sydney’s roads, 2009

14 Australian Government, Department of Infrastructure and Transport, Infrastructure Planning and Delivery: Best Practice Case Studies, December 2010

Risk Allocation

Private sector involvement in a new project transfers the construction and patronage risk away from governments.

The risk is significant, with well-documented failures in the sector.

Failure of projects such as the Cross City Tunnel (Figure 14) hold lessons for investors and government alike. However, in spite of public controversy, such projects also show the value of risk transfer gained through a PPP model. The use of PPPs protects taxpayers from the impact of overly optimistic patronage forecasts. Private investors lost equity when the project failed to meet its patronage forecast—however, taxpayers continued to benefit from access to a world-class tunnel.

Transurban believes that private sector operators that are long-term stewards of the roads are best placed to estimate network traffic, understand operations and maintenance costs and bear the project risk. They have a vested interest in its ongoing success and value for customers, clients and investors.

There is strong evidence that the discipline, project governance and risk arrangements instilled through a PPP arrangement improves their cost and time performance over traditionally procured projects.

A 2007 study¹⁵ found that non-PPP projects had cost overruns of 14.7 per cent compared with only 1.2 per cent for PPPs. Time performance was even greater with non-PPP projects being delivered 23.5 per cent behind time while PPPs have been delivered 3.4 per cent ahead of their construction schedule (on a value weighted average).

There was also evidence to suggest PPPs were more transparent than traditionally procured projects—with more publicly available data on the PPP projects.

Procurement and Project Delivery

Incentivised to achieve the best outcomes for its government partners, communities, customers as well as its investors, the private sector has a proven track record of driving efficiency and innovation in design, construction and operation as well as comprehensive community and stakeholder engagement.

Private sector investment has allowed infrastructure projects to be accelerated by years and sometimes decades, allowing governments to deliver value and benefits to the community sooner.

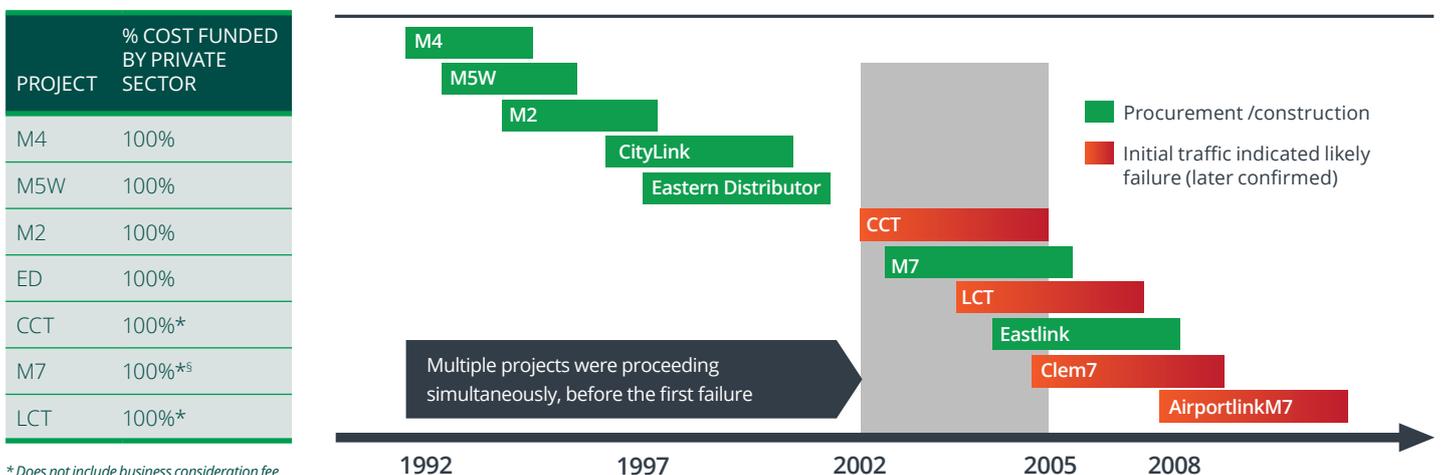
NSW's 2012 State Infrastructure Strategy originally scheduled development of the M1-M2 link (now NorthConnex) for a 10 to 20 year time frame. Through Transurban's unsolicited proposal to the NSW Government, the project has been brought forward by more than a decade with completion scheduled for 2019. The project's flexible approach to procurement fast-tracked the bid process with tenders received in December 2013 and a preferred design-build contractor selected in March 2014.

The flexible approach to procurement also produced a practical design solution to meet the growing transport needs in Sydney's northern suburbs.

Regardless of the procurement methodology, (traditional procurement PPP or unsolicited proposal), road construction is always competitively tendered. On NorthConnex, for example, \$2.7 billion of the \$3 billion project consisted of a design and construct contract that was competitively tendered by Transurban (and partners) and RMS working in partnership. Competition for road construction projects remains intense as evidenced by NorthConnex, WestConnex and projects interstate such as Gateway Upgrade North in Queensland.

15 Infrastructure Partnerships Australia, Performance of PPPs and Traditional Procurement in Australia, 2007

Figure 14: Between 1992 and 2008 most major projects were funded as demand-risk PPPs



* Does not include business consideration fee paid to the NSW Government in addition to fully funding the road.

^s Additional funding provided by the Federal Government to support costs associated with connecting roadworks.

Case Study

Private Sector Excellence in Project Delivery

NorthConnex is an excellent example of the private sector working with government to fast-track a project that will address one of Sydney's most critical transport challenges.

The missing link between the M1 and the M2 had been high on the agenda of road transport planners for more than a decade, with estimated costs of the project around \$4 billion in 2008.

In March 2012 Transurban delivered the state's first unsolicited motorway proposal since its three-stage process was launched in January 2012. It was the first greenfield NSW motorway project to be borne out of an unsolicited process since the Sydney Harbour Tunnel in 1986.

The unsolicited proposal process allowed for a collaborative approach to refining the funding mix, providing an acceptable return to the private sector while achieving project objectives including transport network outcomes and value for money for road users.

Working in partnership with government, Transurban and partners were able to fast-track the development of the project through commercial agreements, procurement of the design and construction and environmental approvals for a cost of \$3 billion.

Streamlined procurement

Transurban and the NSW Government went to the design and construction market together with an innovative approach to tendering that set a \$2.65 billion design and construction budget cap as a condition for the project to proceed.

The process was not overly prescriptive and allowed bidders to bring their best ideas forward, with guidance provided through interactive sessions. Bid costs were kept lower by avoiding the need for excessive bid documentation.

The tender designs were guided by:

- mandatory functional requirements, "must haves"
- scope of works and technical criteria, the base document which tenders could innovate and change
- an illustrative scheme design, which communicated key project parameters
- tender baseline conditions of approval, and
- a summary of community consultation outcomes.

This approach allowed requirements to be clearly understood while promoting innovation. The process has produced an outstanding tunnel design which is future proofed, with a wider cross-section and more height for trucks than existing tunnels.

Skilling NSW

NorthConnex Hub is a dedicated facility designed to provide training and certification in high-demand skill areas for 300 employees working on the project.

The hub is part of a \$10 million investment in training across the whole NorthConnex project.

Up to 90 trainees and apprentices as well as other employees are being trained in courses including civil construction, mobile plant operation, emergency and crisis management, financial acumen, leadership and cultural heritage awareness.



The tender process also fast-tracked the bid time frames to just 16 weeks, further reducing bidding costs.

The planning approval process ran in parallel to procurement, allowing the Environmental Impact Statement (EIS) to accurately reflect the design and construction design, rather than a generic reference design that may change after planning approval. This was a good outcome for the community, ensuring no major 'surprise' design changes once the project had received planning approval. The parallel processes also allowed construction to start approximately one year quicker than the traditional procurement process.



Project delivery

PPPs are the most efficient and effective way to deliver large-scale projects with complex stakeholder relationships and interfaces with other infrastructure. By having ‘skin in the game’ for the construction, operation and equity phases, Transurban is incentivised to deliver projects on-time and on-budget.

The commercial interest in the safe delivery of the project, as well as the same reputational concerns with government and other stakeholders, combined with Transurban’s ability to be flexible and nimble throughout the construction phase promotes innovation and leads to positive outcomes such as using the spoil from tunnelling to transform the disused Hornsby Quarry into a public park.

Creating jobs for NSW

The high levels of infrastructure investment in NSW and the specialised nature of tunnelling have led to skills shortages. The project delivery team has met this challenge through a \$10 million investment in training, including a “NorthConnex Hub” classroom and training facility. More than 8,700 jobs will be created over the life of the project.

Delivering safely

Health, safety and the environment are key focuses for Transurban and are instilled in the NorthConnex project. The Transurban project team works closely with the design and construction contractor and RMS to be an industry leader.

NorthConnex is a 24-hour operation with an average daily peak workforce of 1,500 construction staff. It is a high-risk environment that requires stringent project controls as workers tunnel 24 hours a day, seven days a week, building on operational motorways as well as carrying out a large civil works program.

Despite these challenges, NorthConnex has an extremely strong safety record with a current Recordable Injury Frequency Rate of around five. The project has also achieved three million work hours completed without a Lost Time Incident as at December 2016.

Customer-focussed, long-term operational approach

In addition to the customer focussed, long-term design improvements delivered as part of the innovative tendering process, Transurban’s long-term interest in the successful, efficient and safe operation of the motorway promotes ongoing innovation. The project’s commercial structure allows it to be responsive and nimble in driving this innovation through to the delivery phase.



For example, once operational, NorthConnex will be the first new tunnel in Australia to use digital radio. In addition to helping to future-proof the infrastructure and ensure road users can access the technology from their vehicles, this will allow important safety messages to be more effectively communicated directly to motorists as they travel through the tunnel.

Sustainability

NorthConnex has been independently recognised for its sustainable approach to design. In late 2016, the project achieved a 'Leading' Infrastructure Sustainability Design rating by the Infrastructure Sustainability Council of Australia. To date NorthConnex is one of only six projects, and the only motorway, in Australia to receive this rating. The team is now focused on achieving a 'Leading' operational rating.

The Transurban project team is also exploring opportunities to incorporate more sustainable technology into the design. NorthConnex will be the first tunnel in Australia to switch to LED lighting, drastically reducing electricity consumption and maintenance impacts during operation.

NorthConnex is committed to leaving a lasting legacy in the community. So far the project has reduced the need to clear more than 1.3 hectares of vegetation, delivered presentations to over 1,300 school children and responded to more than 800 vehicles incidents/accidents along the alignment.

The project is working with RMS and Hornsby Council to help in the transformation of the disused Hornsby Quarry into a thriving public parkland. The project team identified an opportunity to assist Hornsby Council to achieve its goal of creating a new community space by helping to fill the old quarry site with around one million cubic tonnes of spoil from the NorthConnex tunnels. This innovation benefits the local community, and also helps to reduce truck movements and improve the project's environmental outcomes.

NorthConnex has demonstrated the benefits that Transurban can offer as an operator of assets and leader of a private consortium to build new infrastructure. This multifaceted ability has enabled the project team to manage the complex interface with new tunnel construction, the upgrade to the Hills M2 motorway and managing the needs of road users and public transport on the motorway and the wider road network.

Operational Excellence and Customer Service

As a long-term owner and operator, the efficient and safe operation of our toll road networks are central to our value proposition.

Health, safety and environment

Safety is our highest priority and we have sophisticated systems, practices and targets in place to ensure we offer the safest possible experience for drivers on our roads.

Compared to the broader network, the serious injury rate per 100 million vehicle kilometres travelled on Transurban's roads is 50 to 80 per cent below comparable state averages on the broader network.

In what is considered a leading form of measurement on road networks, we benchmark our historical road safety performance using a Road Injury Crash Index (RICI), measuring the frequency of serious road injury crashes on our networks.

In FY16, the RICI across all Transurban assets was 4.58 injury crashes per 100 million vehicle kilometres travelled.

Traffic control centres monitor road conditions and safety for each asset, while response teams provide rapid response in the event of a crash, traffic disruption or other incidents.

Some of the key ways in which we seek to manage and improve road safety include:

- effective road design and traffic management
- road safety audits
- monitoring of road safety statistics including crashes, breakdowns and other on-road incidents, and
- promoting public awareness of road safety issues and education campaigns.

Reliable network—incident clearance

Rapid and effective response to any incidents on our roads is fundamental to ensuring and minimising traffic disruptions, which can affect the broader network.

Transurban's in-house response teams are well below the target response time for clearing incidents on Sydney roads with accident clearance times on the motorways 30 per cent quicker than the Traffic Management Centre target clearance times.

Enhancing customer service

Transurban is committed to continuously improving the products and service we offer our customers (Figure 15). We have a Customer Engagement Program, which aims to increase our understanding of customers' expectations. We have identified a number of opportunities to enhance our customer service through face-to-face consultation, call centre evaluation, market research and customer data analysis.

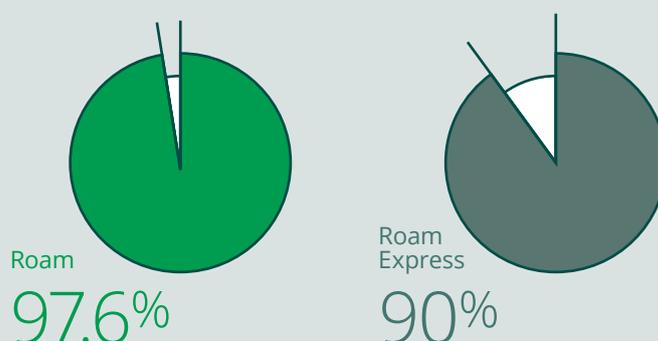
We also continue to develop our products, particularly in the mobile space, as more than half of our customers now access their accounts on mobile devices.

Some of the initiatives we are planning or have under way in the NSW market include:

- investigations into a tagless product in NSW. With the assistance of video tolling, the new product will allow more infrequent users to travel the roads and pay as they go
- iOS and Android apps to allow customers to manage their accounts on the go including checking their balance and updating account information, and
- significantly improved digital experience with reduced data fields to streamline account management on line.

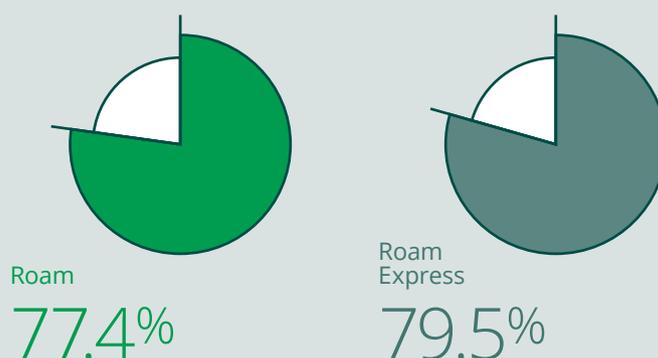
Figure 15: Customer service performance (FY16)

First call resolution



Grading of service—target 70%

Percentage of calls answered within a specified timeframe.



Customer satisfaction (out of 5)



Technology Investment

On our foundation asset, CityLink in Melbourne, Transurban pioneered the implementation of one of the first fully electronic tolling systems in the world, minimising congestion by collecting tolls at motorway speed.

As we acquired interests in a number of Sydney toll roads, this method was extended across the portfolio, both to greenfield development and in progressive conversion of existing toll roads in the Sydney network.

We continue to actively manage our assets (Figure 16) by investing in technology such as lane-usage management systems and ramp metering to improve traffic throughput, travel speeds, reliability and safety for drivers. On our US Express Lanes assets, we have introduced dynamic tolling to manage traffic flow and customers are realising travel-time savings of up to 40 minutes a day.

Smart motorway technologies use real-time information to evaluate traffic conditions and actively manage demand on the asset.

In Melbourne, the Monash–CityLink–West Gate corridor incorporates a freeway management system to enhance traffic flow and safety along the corridor. The coordinated ramp metering alone has increased throughput by 5 to 20 per cent during congested periods.

Smart motorway technologies have the potential to improve efficiency and safety across the Sydney network. While smart motorway projects are planned for the M4 and WestConnex as well as Transurban's NorthConnex tunnel project, there are opportunities for further implementation.

NorthConnex will feature a range of technologies (Appendix 3) to ensure the best and most sustainable outcomes for our customers and government partners.

Investing in innovation

Transurban is committed to investing in innovative projects that help address challenges in the transport and infrastructure areas. Through our Transurban Innovation Grants program we offer grants of up to \$100,000 to universities and research organisations to fund projects in these areas.

The University of Newcastle in NSW was awarded the 2015 grant to trial a revolutionary, new material in road safety barriers. The team is working on a material that is stronger and lighter and could have the ability to better cushion collision impacts.

Our 2016 Innovation Grant was awarded to RMIT University in Melbourne to trial cutting-edge technology to determine whether noise cancellation and transformation can create meaningful impacts for residents who live near motorway sound walls.

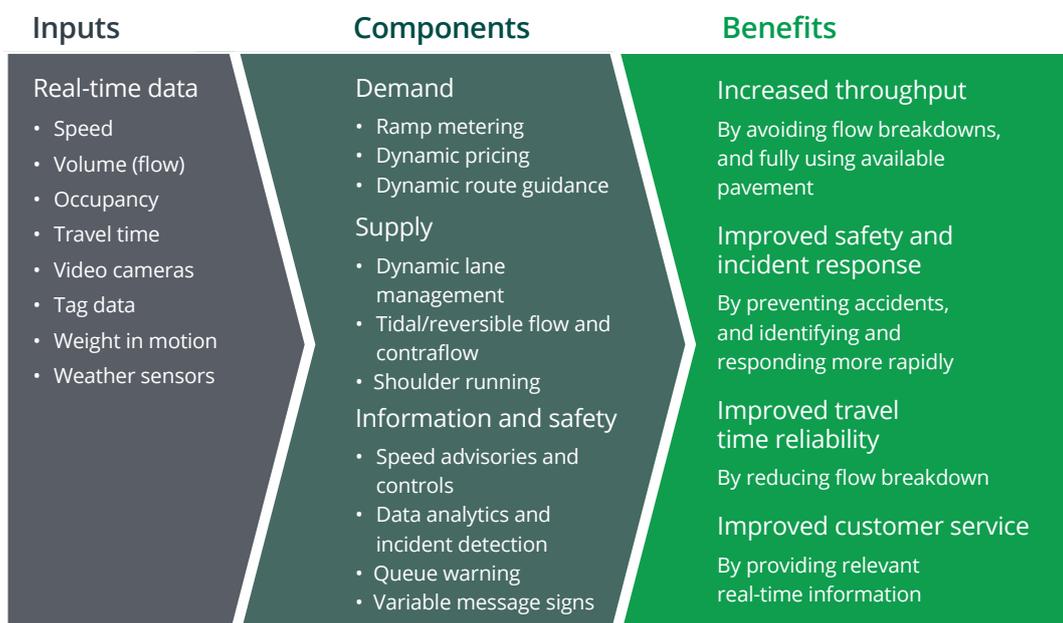
The team at RMIT, in partnership with the University of Technology, Sydney, will investigate the management of the motorway noise through acoustic treatment, using noise cancellation and transformation technologies.

The project will be conducted at two trial sites, the M2 in NSW and CityLink in Victoria—with nearby residents invited to participate in the trials and provide feedback to determine the feasibility and effectiveness.

Noise management along motorways is a global issue, particularly in densely populated urban areas. This research seeks to address this issue by testing this unique technology.

The project will be completed by June 2017.

Figure 16: Active traffic management



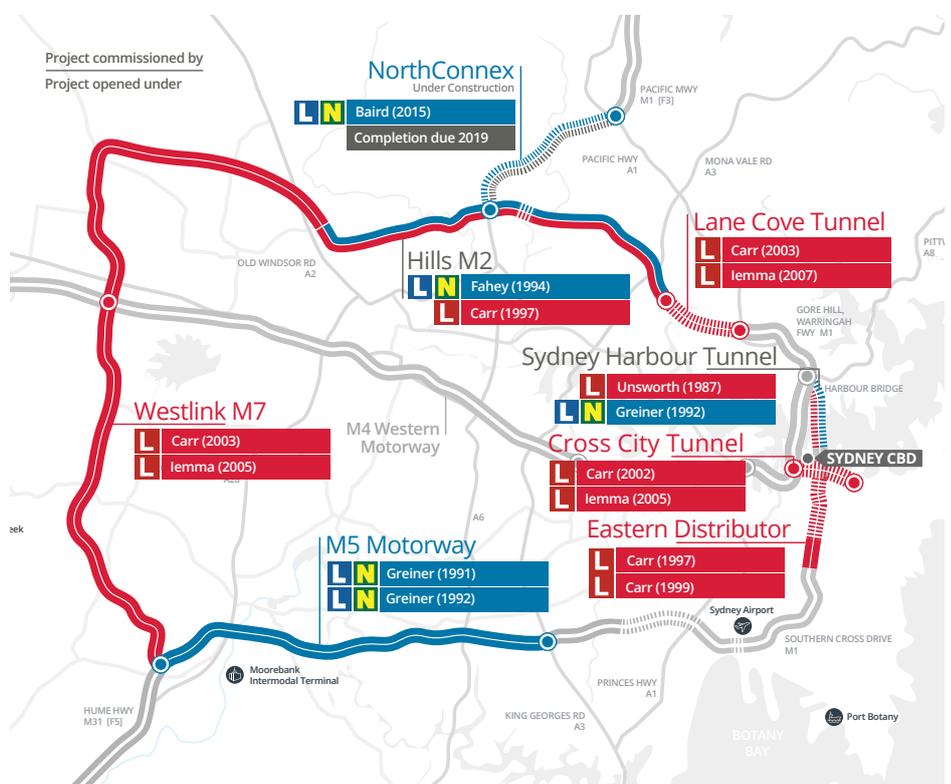
Section 3: Sydney's Toll Road Network— A Bipartisan Achievement

For 30 years, successive NSW Governments have been implementing the Roads 2000 Plan which mapped the development of an orbital road corridor for Sydney.

The plan has largely been completed mainly due to the delivery of assets through privately financed toll roads.

Central to the successful development of the network has been bipartisan support for innovative private financing funded by 'user-pays' models (Figure 17). Most of NSW's tolled motorways were developed through PPPs on Crown land under long-term concessions. This model has provided Sydney with a motorway-grade, free-flowing road network that connects economic and residential growth areas. As industry organisations such as Infrastructure Partnerships Australia have recognised, these motorways play a "critical role in reducing travel times and alleviating congestion in Australia's most heavily populated city."¹⁶ Further information about the development of Sydney's toll road network is provided in Appendix 2.

Figure 17: Example of bipartisan support for the user-pays model across the toll road network



PROJECT	COMMISSIONING GOVERNMENT*	OPENED
Sydney Harbour Tunnel	Unsworth Labor (1987)	Greiner Liberal National (1992)
M5 South West Motorway	Greiner Liberal National (1991)	Greiner Liberal National (1992)
Hills M2	Fahey Liberal National (1994)	Carr Labor (1997)
Eastern Distributor	Carr Labor (1997)	Carr Labor (1999)
Cross City Tunnel	Carr Labor (2002)	Iemma Labor (2005)
Westlink M7	Carr Labor (2003)	Iemma Labor (2005)
Lane Cove Tunnel	Carr Labor (2003)	Iemma Labor (2007)
NorthConnex	Baird Liberal National (2015)	Expected (2019)

* Government at project financial close

16 Infrastructure Partnerships Australia, Urban Transport Challenge: Driving reform on Sydney's roads, 2009

Concession Arrangements

Historically PPPs for toll road projects have been based on concession/project deeds that regulate the commercial arrangements for the ownership and operation of individual road assets. The deeds were originally negotiated by the NSW Government, the successful private sector bidder and the NSW bureaucracy in accordance with protocols and guidelines set by the government. Each toll road is governed by its own concession deed.

Transurban entities hold seven concession deeds with the NSW Government as outlined in Figure 18. We partnered with government and others to construct the Westlink M7 and NorthConnex and negotiated the concession terms with government. In addition, we acquired the M5 South West, Hills M2, Eastern Distributor, Lane Cove Tunnel¹⁷ and Cross City Tunnel¹⁸ once they were fully operational and are bound by the concession terms that were originally negotiated between the project developer and government. Specific terms can be renegotiated for augmentation and improvement projects.

In considering the commercial arrangements, government considers a range of factors including:

- the value the project delivers for the community and how it helps progress its transport priorities
- complexity of the project—tunnel projects require more capital outlay than open road projects (eg NorthConnex will cost five times more to construct per kilometre than Westlink M7 in today's dollars)
- the project design and associated delivery costs
- operation and maintenance costs, and
- forecast levels of traffic.

There are three key financial levers available to government including the concession length, initial toll prices and the toll price escalation schedule. Beyond these main value sources, government would have to consider reducing the cost of the project through agreeing a reduced scope or an increased government financial contribution. These options and impacts are discussed in the following sections.

¹⁷ Acquired post receivership

¹⁸ Acquired post receivership

Figure 18: Transurban's concession agreements with NSW Government

CONCESSION AGREEMENTS	M5	M2	ED	M7	NCX	LCT	CCT
TRANSURBAN OWNERSHIP	50%	100%	75.1%	50%	50%	100%	100%
OPENING DATE	August 1992	May 1997	December 1999	December 2005	Expected 2019	March 2007	August 2005
DATE TRANSURBAN ACQUIRED AN INTEREST IN OR COMMENCED OPERATING THE ASSET	June 2007 [§]	June 2005	June 2007	December 2005*	Expected 2019+	August 2010	June 2014

[§] M5 operated by Interlinks Roads

* M7 operated by Northwestern Roads Group

+ NorthConnex to be operated by Northwestern Roads Group

Traffic forecasting—what's taken into account



Land-use forecasts and their geographic distribution



Socio-demographic breakdowns



Road network characteristics and planned changes



Mode share patterns and usage



Income levels and distribution

Overconfidence in Traffic Forecasting

Private sector involvement in the delivery of toll roads has protected government and taxpayers from a number of poor outcomes over the past decade.

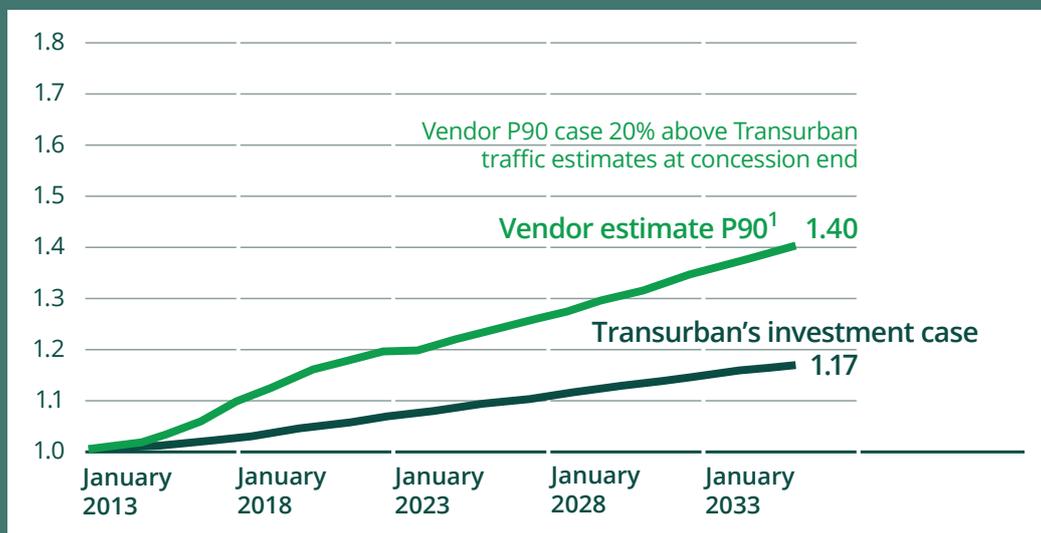
In Sydney, the two notable examples are the Cross City Tunnel and the Lane Cove Tunnel. In both instances the initial traffic levels substantially underperformed expectations (Figure 20), resulting in the assets being placed into receivership and ultimately acquired by Transurban.

In examining the potential causes for over confident traffic forecasting there are a range of factors at play. A misalignment of interest between potential fees that financial sponsors and contractors stood to gain upfront from winning a project is one factor that is believed to have contributed to aggressive traffic modelling for these projects. Groups with a long-term approach to owning and operating this infrastructure are considered to have a stronger alignment of interest in ensuring accuracy of traffic forecasts over the life of concession. The complexity of traffic modelling stems from the extensive range of variables

that underpin the outcomes (ie supply/demand/capacity/time value of money). Assuming small upside on individual inputs compounds exponentially in aggregate forecasts.

Transurban continues to observe the potential for aggressive bidding in asset sale processes in recent years. In particular, vendor forecasts that have been put forward on a number of projects are substantially above the traffic estimates that Transurban has assumed for those projects. For those lacking the requisite expertise to assess this critical component of a project there is a heightened risk of assuming an overly aggressive traffic forecast. Figure 19 below demonstrates one such example that Transurban has experienced in an asset sale process it was involved in.

Figure 19: Traffic comparison—Indexed



1. P90 case assumes 90% probability of meeting or exceeding forecast

Figure 20: Traffic comparison—forecast vs actual

ROAD	OPENING DAILY VOLUME (ORIGINAL OWNER FORECAST)	OPENING VOLUME (DAILY ACTUAL)
Cross City Tunnel	85,000	27,000
Lane Cove Tunnel	104,786	44,420

Determining the Length of the Concession

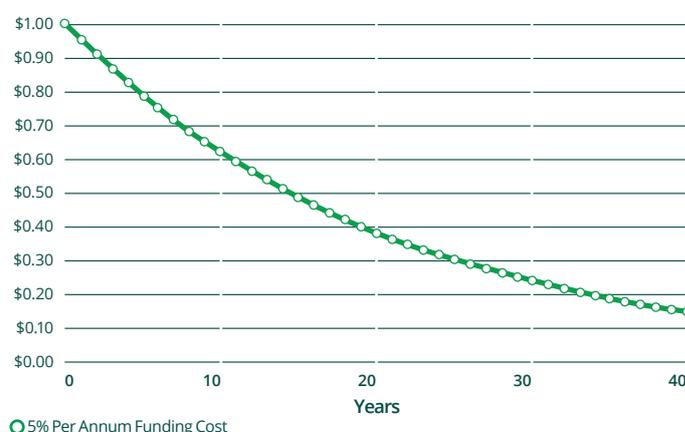
To create a commercially viable project that is attractive to the private sector, the capital and ongoing operational and maintenance costs of the project need to be able to be recouped. Therefore, the lower the initial toll rate and/or future toll escalation rate, the longer the concession agreement length and/or the higher the contribution required from government. However, there is a limit to how much value longer concession terms can contribute to the funding mix due to the impact of time value of money. The more long dated the cashflow, the lower it is valued in today's dollars (Figure 21).

Setting Toll Prices

Time savings weighed against time value of money considerations are critical in determining the appropriate pricing points for a project, and this directly impacts the value proposition for motorists. If tolls are set too high, not enough users will use the road to maximise the project benefits. If tolls are set too low or are not escalated at a high enough rate, government may face the prospect of a large funding gap (that may need to be met through increased taxes). In Sydney, the value of time savings for the average car being used for private travel is assumed to be \$21.20 per hour, based on typical occupancy rates and value of time per occupant based on figures used for economic appraisal of transport investments.¹⁹ Time savings for vehicles being used for business purposes are valued higher at \$53.30 per hour.²⁰

The concession deeds set out the toll prices that can be charged by the road operator and are determined at the time of negotiation and sometimes years prior to opening of the project. In setting the initial cost and escalation rates, the government decides on a regime to best meet the objectives of funding the project and providing a value-for-money toll proposition that will make paying the toll attractive to motorists.

Figure 21: Current worth of one dollar received over a 40-year concession period



Sydney offers examples of differences in the implied value of tolls, reflecting the approaches of commissioning governments. For example, the current toll for cars in the 2.1 kilometre Cross City Tunnel is \$5.47, which is more costly than the implied cost of the NorthConnex tunnel, which in today's dollars would be \$6.89 for nine kilometres. Tolls on NorthConnex, currently being constructed, present a stronger implied value of time savings offered to users of that road due to the other funding sources that supported the project. Adjustments to the adjacent M7 concession and a government contribution bridged a significant portion of the value for NorthConnex, which meant only one third of the project value was modelled to come from the tolls on the new tunnel itself.

Figure 22: Transurban's concession agreements with NSW Government

	M5	M2	ED	M7	NCX	LCT	CCT
OPENING DATE	August 1992	May 1997	December 1999	December 2005	Under Construction	March 2007	August 2005
COST TO BUILD	\$380M	\$644M	\$680M	\$1.54B	\$3B	\$1.14B	\$680M
REMAINING CONCESSION PERIOD [‡]	10 years	31 years	31 years	31 years	28 years [§]	31 years	19 years
CONCESSION TO END	December 2026	June 2048	July 2048	June 2048	June 2048	June 2048	December 2035

[‡] As at 31 December 2016

[§] Concession period from expected opening date late 2019

¹⁹ Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013

²⁰ Ibid

Tolling Arrangements for Freight Vehicles

Each concession deed also includes tolling arrangements for large vehicles that are intended to capture the provision made to accommodate these vehicles on the motorway (Figure 24).

The specific tolling mechanism is called a “large vehicle multiplier” as large vehicles using the NSW toll road network pay between two-to-three times the car toll depending on the road asset.

The higher tolls for large vehicles in part reflects the greater value they derive from the time savings provided by the tolled network. Figure 8 (page 15) outlines the total hourly operating costs for various classes of large vehicles, and shows that operating costs are around three times and up to five times the cost of the average car. This implies that at current levels, large vehicles derive at least the same amount of value as cars based on their operating costs.

The higher tolls for large vehicles also reflect the greater impact they have on the road infrastructure. However, the current tolls charged for large vehicles do not accurately reflect these costs.

The wear-and-tear to road infrastructure caused by one articulated truck has been estimated to equal that of 6,000 cars.²¹ Comparatively, the tolling charges for these vehicles are currently set at two to three times the car toll charge. Currently every workday we record more than 70,000 truck trip transactions across the toll roads we operate in Sydney; so the scope of the maintenance task borne by the private sector is evident.

Finally, the road design also incorporates special features, such as suitable pavement depth and grades, tunnel ventilation and break-down bays, to accommodate these vehicles, which increases the overall project cost. Large vehicles also occupy a greater proportion of road capacity. There are significant additional costs incurred in the design of tunnel infrastructure that is specifically derived from the freight industry. For instance, more gradual inclines are required for trucks, which lengthens the required amount of tunnelling, and this is demonstrated in the design of the NorthConnex tunnel. For the M7, a continuously reinforced concrete pavement was constructed at significant cost.

Figure 23: Tolling arrangements currently in place for cars across Transurban-operated assets

	M5	M2	ED	M7	NCX	LCT	CCT
TYPE OF TOLLING	Flat rate	Flat rate	Flat rate (Northbound), untolled (Southbound)	Distance based	Flat rate	Flat rate	Flat Rate
CURRENT TOLL CHARGES (CARS)	\$4.57 Each way	\$6.89 North Ryde	\$6.95 NB only	39.24¢ cents/km capped at \$7.85 after 20km	Same as M2 (North Ryde) toll point	\$3.21 Main tunnel	\$5.47 Main tunnel
		\$3.44 Pennant Hills Rd				\$1.61 Military Rd E-Ramp	\$2.58 Sir John Young Cr
		\$2.43 Windsor Rd					
		\$2.04 Lane Cove Rd					
		\$3.44 Herring & Christie Rds					

Figure 24: Tolling arrangements currently in place for large vehicles across Transurban-operated assets

	M5	M2	ED	M7	NCX	LCT	CCT
LARGE VEHICLE MULTIPLIER	3x	3x	2x	3x	3x	3x	2x
CURRENT TOLL CHARGES (CLASS B)	\$13.70 Each way	\$20.65 North Ryde	\$13.90 Northbound only	\$1.1772 per km capped at \$23.55	Same as M2 (North Ryde) toll point	\$9.67 Main tunnel	\$10.93 Main tunnel
		\$10.32 Pennant Hills Rd				\$ 4.83 Military Rd E-Ramp	\$5.16 Sir John Young Cr
		\$7.30 Windsor Rd					
		\$6.11 Lane Cove Rd					
		\$10.32 Herring & Christie Rds					

²¹ Mid-North Weight of Loads Group analysis, 2017

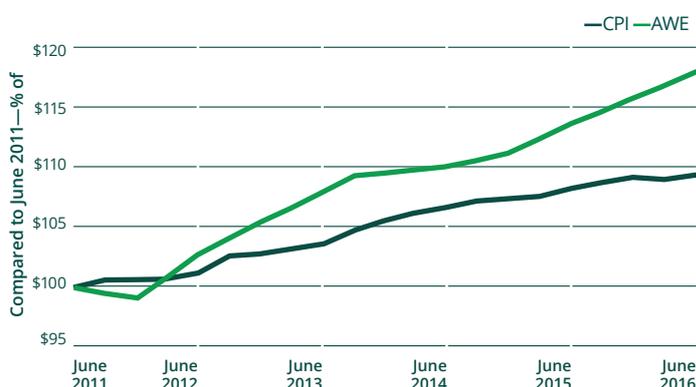
Increasing Toll Prices

Increasing tolls at a rate that is comparable to the rate at which users' wages and willingness to pay increases means that lower tolls can be charged in the early years of a concession. Traffic volumes are still ramping up and the travel time savings are not as large as in later years when population and employment growth lead to increased congestion and larger time savings for motorist using the motorway than the untolled alternative route.

If tolls were escalated at a lower rate, there would be a funding gap that would either need to be made up through government contributions, longer concessions or higher initial tolls. Higher initial tolls may not be fair to users of the motorway in the early years of a concession because they would be getting lower travel times savings and have less ability to pay the higher tolls than motorists using the road later in its life.

As discussed in the *Direct User Benefits* section, the key benefits toll roads provide are travel-time savings and reliability. The best proxy to measure the value of time is the rate at which the earnings for workers increase. Average Weekly Earnings (AWE) is a more direct connection between time and money for individuals than the Consumer Price Index (CPI), which measures the price inflation of a basket of various goods and services of which transport is one of only 11 major groups. Figure 25 shows how AWE has grown in Australia in comparison to CPI over the last five years (June 2011 to June 2016). AWE has increased 18 per cent (3.4 per cent CAGR) in this period whereas CPI has increased by 9.4 per cent (1.8 per cent CAGR).

Figure 25: AWE and CPI increases over five years



Notifying Customers of Changes to Toll Charges

The timing of the quarterly toll adjustments is harmonised across the NSW toll road network. To ensure customers are aware of the change and know where to access the new prices, every quarter we undertake a series of communication activities. We submit communication strategies to RMS one month in advance of the toll price change. Following approval of the strategy we roll out communications across on road (via variable message signs) and online (via Roam and Roam Express website updates) channels for a two-week period.

Figure 26: Tolling adjustment schedule

M5	Escalated quarterly by quarterly CPI. The toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased.
M2	Escalated quarterly by the greater of quarterly CPI or 1%.
ED	Escalated quarterly by the greater of a weighted sum of quarterly AWE and quarterly CPI or 1%.
M7	Escalated or de-escalated quarterly by quarterly CPI.
NCX	Escalated quarterly by the greater of quarterly CPI or 1%.
LCT	Escalated quarterly by quarterly CPI for cars and the toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased. Escalated quarterly by the greater of quarterly CPI or 1% for trucks.
CCT	Escalated quarterly by: the greater of quarterly CPI or 0.9853% (equivalent to 4% per annum) to June 2012; the greater of quarterly CPI or 0.7417% (equivalent to 3% per annum) to June 2018; quarterly CPI to concession end.

Changes to Concession Terms

Over the past six years, Transurban and its partners have invested or committed approximately \$3.3 billion to upgrade and expand the toll road network through upgrade projects. These have significantly enhanced capacity and safety across the motorway corridor, resulting in improved travel times and traffic flows across Sydney's broader network. This was achieved with minimal direct capital investment by the government.

These investments and network enhancements were negotiated and agreed with the NSW Government as a substitute for direct capital contributions by the government. Doing so has in effect expanded the pool of value sources available to the NSW Government.

This has enabled two major road enhancements projects to be undertaken and brought the delivery of NorthConnex forward by more than a decade, benefitting the community sooner than originally planned. These projects are discussed below.

Hills M2 Upgrade

In 2007, Transurban put forward a proposal to widen the Hills M2 Motorway. The upgrade involved building an extra lane in each direction between Windsor Road at Baulkham Hills and Lane Cove Road to improve traffic flow and reduce congestion for motorists; and additional entry and exit ramps to provide access to the motorway for users.

A combination of funding sources was negotiated for the \$550 million project, including a one-off toll increase of around eight per cent upon completion of the project, and extending the concession period by four years.

M5 West Widening Project

A project to widen the M5 West Motorway was completed in December 2014, which added an additional lane in each direction across the entire length of the motorway. The project also included the installation of variable message signs, up to 18 kilometres of noise walls, and a new operations management control system at Hammondville.

The project added 50 per cent more capacity to a corridor servicing some of Australia's most vital infrastructure, including Sydney Airport, Port Botany and growing industrial, commercial and residential areas.

The funding mix for the \$400 million project included a concession extension of an additional 3.3 years to 2026, and increasing the truck toll multiplier from 2.2 times to 3 times increased incrementally over two years. There was no change to the toll charge for cars as a result of the project. The project also included a \$50 million NSW Government contribution (predominately towards the cost of noise walls and other noise mitigation measures).

NorthConnex

Transurban partnered with Westlink M7 major shareholders to lodge a successful unsolicited proposal to build NorthConnex, a nine kilometre twin tunnel linking the M1 Pacific Motorway at Wahroonga with the Hills M2 Motorway at Pennant Hills. The NSW and Federal Governments are contributing up to \$405 million each towards the cost of construction of the \$3 billion project.

The remainder of the cost is funded by Transurban and Westlink M7 shareholders. The funding mix includes:

- tolling on NorthConnex once it has opened, which will be consistent with toll charges on the Hills M2 Motorway main toll point
- changes to the tolling for large vehicles on the M7 Motorway, Lane Cove Tunnel and Hills M2, and
- concession extensions on Westlink M7 and Hills M2 motorways, and Lane Cove Tunnel.

Process Transparency

The Unsolicited Proposal Framework (UPF) was adopted by the NSW Government in 2012 as a set of guidelines facilitating private sector engagement with the State Government. It comprises a three stage assessment process that guides the evaluation of unsolicited proposals from the private sector, clarifying and streamlining the avenues through which non-government bodies can engage with service delivery and infrastructure development in NSW. Importantly, the framework provides clear steps for the assessment of a project that provides consistency, rigour and transparency.

The process requires the private sector to demonstrate how it can help government deliver on its priorities effectively. It has a number of tests for the private sector around the proposed project's uniqueness and the value it could bring to the state. A probity advisor is appointed to monitor and report to the chair of the steering committee during the assessment process. Two of the five roles of the probity advisor are 'obtaining value for money' for tax payers and 'maintaining accountability and transparency.' Furthermore, all decisions relating to unsolicited proposals are considered by the Cabinet Infrastructure Committee which further safeguards taxpayers' interests.

Since its introduction, the UPF has become a proven method used by a number of consecutive governments to encourage the private sector to bring forward innovative and unique ideas. As at June 2016, 118 proposals had been submitted to government. Of these, five are progressing. NorthConnex was the first road infrastructure project to commence construction under the framework.

Contract summaries for all NSW road infrastructure projects are publicly available.

Engaging the Freight Industry

Transurban values its customers and a key part of Transurban's role is to ensure that we regularly engage with our key account holders to better understand their needs and improve our services to them. In fact 10 of our top 20 customers are fleet-leasing companies such as Leaseplan, Toll and Australia Post.

Part of our engagement includes biannual strategic review meetings where we meet one-on-one with our key account holders and discuss their requirements and how we can better assist them. These biannual one-on-one meetings have been occurring for the past eight years and it is through this collaboration that we are able to inform them on any upcoming toll changes and better service the needs of our key account holders.

In addition to these meetings there is regular communications by Transurban to our key account holders through quarterly market updates and one-on-one meetings when requested.

NorthConnex Engagement

Transurban, in partnership with the NSW Government, has undertaken substantial engagement with the freight industry around the NorthConnex project, given the associated changes to truck tolls on the M7 that were agreed as a part of the funding arrangements for that project.

Representatives from Transurban and the NSW Government met with representatives of the freight industry on two occasions to brief them on the NorthConnex project and its funding model. The meetings were held in March and August 2014 and were chaired by the Chief Executive of RMS as part of the Road Freight Industry Council meeting.

The August workshop attendees were briefed on the key components of the funding model to deliver NorthConnex by extending the Westlink M7 concession and the gradual introduction of a heavy vehicles toll multiplier on the M7 motorway. Briefing the industry at this session provided organisations with the opportunity to prepare a submission to the NorthConnex EIS which went on display in late 2014.

Further to this engagement, stakeholder letters were sent in February 2015 outlining the changes over the two-year period. Other forms of engagement in February 2015 included electronic message signage on the motorways, website updates and a media release.

During construction and prior to opening, Transurban will continue to engage with the freight industry to outline the benefits, timing and opportunities associated with a traffic light-free connection through Sydney.

Section 4: How Tolling Works

Transurban pioneered multi-lane, free-flow tolling on CityLink in Melbourne in the late 1990s and have continued to develop technologies at the forefront of the industry.

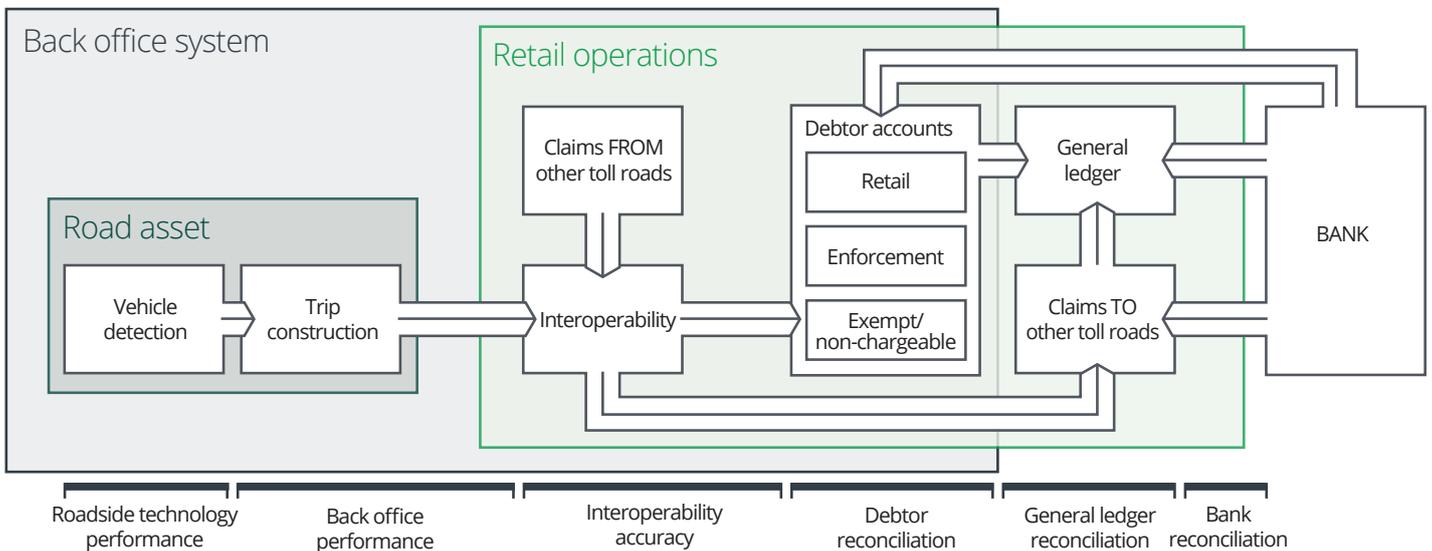
Every workday more than 700,000 trips are made across our NSW road assets. Each trip is recorded by sophisticated roadside equipment and processed through our state-of-the-art back-office tolling system (Figure 27). This complex and sophisticated process generates approximately 2.6 terabytes of data each month.²² This amount of data provides regular intelligence on travel patterns and movements across the network.

Tolling system intelligence

As an example, in one month, for trips made across the Eastern Distributor, Lane Cove Tunnel, Cross City Tunnel and Hills M2 Motorway our tolling system captured and processed:

- 17.5 million vehicles images
- 9.7 million vehicle detections
- 8.4 million tag detections
- 8.1 million tag trips, and
- 935,000 video matched transactions.

Figure 27: Toll Transaction Processing Chain



²² Includes Hills M2 Motorway, Eastern Distributor, Lane Cove Tunnel and Cross City Tunnel

Tolling Innovation—Express Lanes, USA

Transurban's dynamically priced 495 and 95 Express Lanes in Northern Virginia, in the USA, offer an example of how the public and private sectors have applied innovative thinking and technology to tackle peak-hour gridlock on two of the country's most congested highways. At the same time they have addressed policy issues for stakeholders.

Prior to the Express Lanes projects being operational, the Capital Beltway was ranked in the top three worst commutes with 194 hours of congestion a week. Since opening in the 1960s, traffic has increased by more than 600 per cent on some stretches. The Virginian Government had planned a traditional highway expansion but was forced to abandon plans after significant public opposition due to residential acquisitions and prohibitive costs.

Transurban and its partners proposed an alternative solution under the Public Private Transportation Act—to build four new dynamically tolled Express Lanes next to the eight existing freeway lanes. The proposal largely used the existing footprint, reducing the impact on the local community and transferring the risk to the private sector. The project also included the replacement of \$260 million worth of ageing bridge infrastructure.

The 495 Express Lanes opened in late 2012 and delivered the area's first major expansion of interstate capacity in over 40 years. The 95 Express Lanes opened late in 2015 and adjoined the 495 Express Lanes to create a network of managed motorways around the busy Washington D.C. area.

Based on a sophisticated algorithm, the toll-price increases and decreases depending on traffic density and ensures a minimum average speed of 55 miles per hour and 45 miles per hour for the 95 and 495 Express Lanes respectively.

The Express Lanes offer motorists with three choices:

- travel on the regular lanes that run alongside the Express Lanes for free
- pay to use the Express Lanes – where they can rely on minimum speed, or
- car pool or take the bus and get to travel on the Express Lanes for free.

The creation of the Express Lanes has addressed long-standing gridlock on a section of the East Coast's busiest transport corridor and the Washington DC region now has a facility that provides reliable and faster travel times. For example, during peak periods, traffic speeds on the 95 Express Lanes are on average 40 per cent higher than in the adjacent general purpose lanes. The lanes encourage car pooling and predictable travel times mean buses can meet their schedules. Travel times have also improved on the regular lanes as commuters take advantage of the new options and capacity.

Figure 28: Benefits of Express Lanes in the Greater Washington area

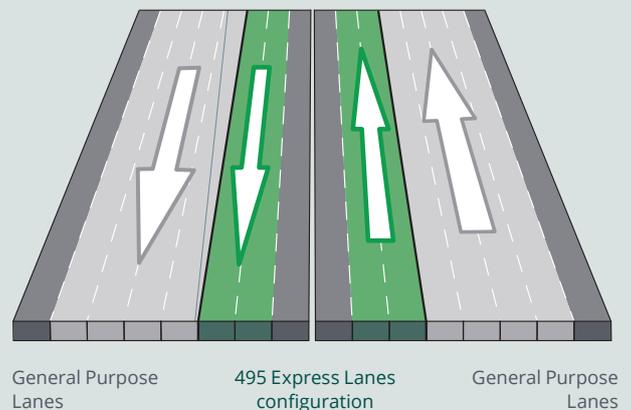
 **3 in 4**
drivers say the Express Lanes benefit the DC area

 **>30%**
of trips on the 95 Express Lanes were toll free for high occupancy vehicles or exempt in 2016

 **35-40 min***
saved per day on an average commute between Quantico and Alexandria using the Express Lanes

**from April to June 2015*

What are Express Lanes?



Section 5: Regulatory Environment

The tolling sector is heavily regulated in NSW through concession agreements with government.

As noted in Section 3, toll charges and increases are set under each concession deed by government in the initial contract stage of a project. Each toll road is governed by its own concession deed, the terms of which (including pricing) are determined on the basis of the particular features of that project, and independently of any other toll road. For this reason, it is immaterial to the terms of any concession deed as to whether the owner/operator is a concessionaire for any other toll road assets or projects (in NSW or elsewhere).

As has been acknowledged by the Australian Competition and Consumer Commission (ACCC) in a number of previous merger assessments, each toll road operates as a separate, discrete and independent business that must be operated strictly in accordance with the terms of its concession deed. This is evidenced, in practical terms, by the relevant toll road concessionaire:

- having no pricing power
- operating a toll road that constitutes the supply of a service within a distinct geographic area by reference to a particular origin and destination with no capacity to influence alternative routes or modes of transport, and
- operating a toll road that is not influenced or affected by pricing on any other toll road (eg the northern corridor M2 motorway does not 'compete' against the southern corridor M5 or Eastern Distributor for patronage).

Although subject to very different regulatory regimes (Figure 29), an analogy can be drawn with electricity distribution network providers. Access to, and pricing of, electricity distribution is

determined by the Australian Energy Regulator under the National Electricity Rules. Although the process and body undertaking the determination is different, the outcome is the same for toll roads where pricing is set by government through the concession agreements.

We note that the recent *Harper Competition Policy Review 2015* did not raise any concerns about competition in the toll road industry, rather it focused strongly on road pricing reform, which Transurban supports.

Development of new toll roads

In considering the construction of a new road project, the NSW Government has multiple delivery options available that can be adopted to best deliver value for money based on the specific circumstances. These range from a traditional PPP; State delivery in collaboration with private D&C contractors; government tender of the concession; or unsolicited proposals as a few examples.

Toll road concessions in NSW are highly sought after and there has always been significant competition to acquire these assets whether it is through direct tender for the greenfield concessions or as secondary sales of brownfield assets. The market interest in toll road concessions has been demonstrated by recent transactions both in Australia and internationally. Infrastructure Partnerships Australia's recent *Perpetual Infrastructure Investment Report* (2016) highlighted that roads were voted as the single most attractive infrastructure asset class by investors.

Figure 29: Regulatory environment across industry sectors

	CONCESSION DEEDS	INDEPENDENT REGULATION	LIGHT-HANDED MONITORING
EXAMPLE INDUSTRIES	Toll roads	Utilities including electricity, water, gas	Airports, railway and some ports
PRICING FREEDOMS	Australian tolls fixed from date of concession with defined escalation. Other charges are set out in concession deeds, legislation or agreed with client (cost recovery)	Prices reset periodically (around every five years) to allow agreed return hurdles to be met based upon a regulated asset base	Price monitoring by the ACCC. Commercial arrangements with users renegotiated periodically
CUSTOMER CHOICE	Road users have alternatives including non-tolled roads and other modes of transport	Choice at retailer level but monopolies around distribution infrastructure	Limited alternatives for consumers and users (airlines, shipping lines)

The long-term economic benefit to a bidder for a toll road concession is tied to the exclusive right granted by the State to the concessionaire to operate that toll road under the terms of the concession deed and related legislation. That exclusive right is not affected by the ownership or operation of other toll roads. Each bidder (regardless of whether it has an interest in another toll road concession or is a potential new entrant) will assess the bidding opportunity by reference to economic and financial factors and criteria relevant to that toll road concession.

Regardless of the procurement methodology used, road construction is always competitively tendered. On NorthConnex, for example, \$2.65 billion of the \$3 billion project consisted of a D&C contract that was competitively tendered by Transurban and RMS working in partnership. Competition for road construction projects remains intense as evidenced by NorthConnex, WestConnex, Gateway Upgrade North, Western Distributor and various other road construction projects Transurban is currently involved in.

Expansion of existing roads

The existing owner of a toll road (as the holder of the exclusive concession for that toll road) can practically negotiate or in some cases be directed by the government to upgrade/ improve that existing road. This has occurred several times in Australia and is common place overseas. This is an excellent way for government to enable improved services for road users through the existing owner investing further in the toll road. These upgrades are often to improve road capacity and undertaken whereby the government does not need to invest taxpayer money into capital improvements and the design, construction and delivery risk is taken by the toll road owner.

Acquisition of toll roads

If toll roads are developed by government for sale to the private sector at a later date (such as the WestConnex project), then the private sector participates in a formal competitive sale process to secure the concession rights for the toll road. Sale processes for toll roads attract significant private sector interest and are highly competitive, which results in excellent bid prices. These sale processes are subject to scrutiny by the ACCC as well as FIRB and the ATO (as required). The rights acquired by the successful bidder are documented in a written concession deed, including the tolling regime set out by government.

Operations and maintenance

Operations and maintenance services are procured from a range of providers. There is significant competition and benchmarking around efficiency both in Australia and overseas. This is forecast to continue across both operations and maintenance.

Tags and passes (retail back office)

Tags, passes and their associated back office services are not profitable endeavours for toll road owners. At best, they cover their costs. Industry roaming arrangements are based on the fundamental requirement for interoperability and, to ensure that outcome, are agreed amongst all operators along similar (and often standard) commercial arrangements.

Toll collection systems

Tolling systems are provided by a number of local and international companies. Over 90 per cent of the NorthConnex project cost was competitively tendered, which is standard practice for these types of procurements. Tolling systems can be provided by companies like Transurban and others on a fee-for-service basis or delivered as a bespoke system, such as the one being developed for WestConnex. There are many options and providers of these services. This area is also likely to drastically change over the next decade with new technology offering many different alternatives and providers for toll collection.

Enforcement

In NSW, approximately 94 per cent of customers travel on toll roads with a valid arrangement for payment of tolls within the required time-frame.

While the tolling enforcement regime is regulated through the concession agreements that apply to each road, Transurban has a number of initiatives in place to give drivers information about tolling and payments processes and prevent and resolve any issues before they escalate.

We aim to improve the efficiency and value of tolling accounts by:

- proactively notifying customers when there are issues with their account (eg when they have a low balance)
- converting more road users into account holders to simplify services and reduce fees, and
- encouraging customers with multiple accounts to merge these into a single account.

Where a customer has a Roam or Roam Express retail account and does not have money on the pre-paid account at the time of travel, we provide extensive notifications to the customer to avoid a toll notice being issued.

Where a trip remains unpaid, RMS issues a toll notice on behalf of the motorways and the motorway issues two written notices to drivers to encourage them to pay outstanding tolls.

This ensures we strike a fair and reasonable balance for the vast majority of our customers who do the right thing and pay on time.

Transurban has a first-time forgiveness program where the fee is waived if a customer has an account and it is the customer's first toll invoice.

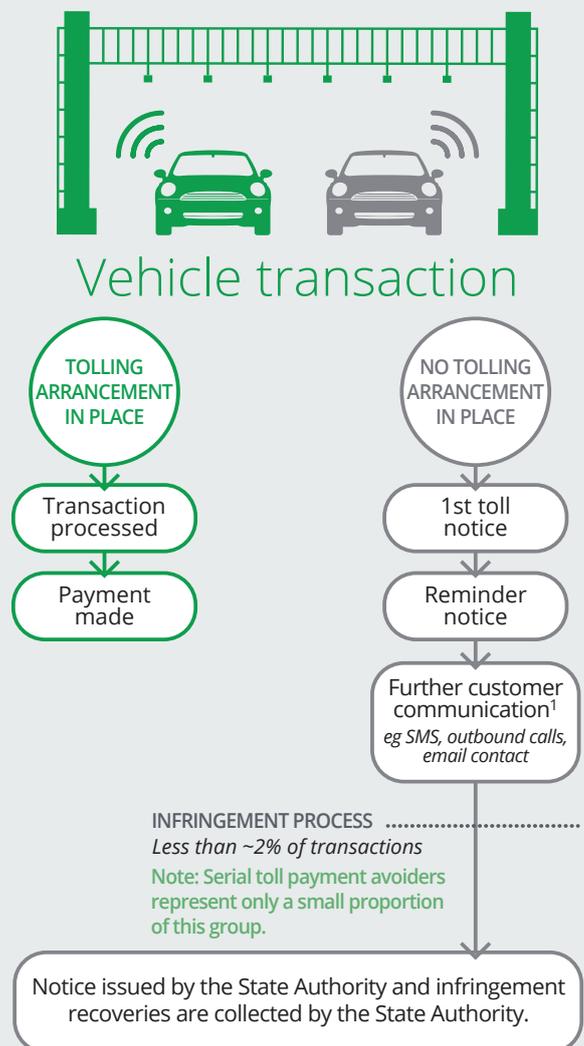
We also have a financial hardship policy for customers who are finding it difficult to settle any payments. For those who haven't made any travel arrangements with us, in the first instance, we also waive the toll invoice fees if an account is opened.

Through enhanced digital communication services, we can more effectively notify customers about any unpaid tolls.

Regulation in NSW allows for the registered vehicle owners' details to be provided under certain circumstances only (NSW vehicle, 10 or more trips outstanding).

Figure 30: Enforcement process

Most motorists use NSW toll roads without incurring fees and charges.



1. Where legislation allows and information is available

Section 6: Alignment with Government Priorities

At Transurban we are focused on keeping traffic flowing to ensure our cities' productivity and liveability. This is our core focus and we have spent 20 years' understanding how we can better assist governments manage traffic flow across major urban centres.

We see Sydney's freeways and arterial roads operating as an interconnected network that connects people and freight with where they need to be. Some of these roads we operate and others are operated by RMS or local councils. However, as we and these other road operators readily understand, what happens on one part of the network can affect people travelling on other parts—even those that are many kilometres away.

For this reason, we work to ensure the whole network operates safely and efficiently, rather than just optimising our own motorways at the expense of other sections of the road. This aligns our interests with that of government and the community.

To keep Sydney moving we believe in taking a holistic view of the operation and development of the broader road network in ways that create value for governments and benefits for road users. This leads us to seek out opportunities that reduce overall congestion both on and off our toll road assets in a way that a passive investor would not.

As a long-term owner and operator, we are incentivised to get the best outcomes for our customers, government and the communities in which we operate. Section 2 of this submission contains key examples of how we deliver on this objective through:

- strategic investment in the network through upgrade and construction projects
- applying our expertise in road operations to manage traffic flow across our toll roads assets
- delivering technology solutions that enhance road operations, traffic flow and the experience of our customers.

Striving to be the partner of choice for the NSW Government underpins how we think about day-to-day road operations, customer service and strategic planning for Sydney's roads (refer to examples on page 40).

This is what differentiates Transurban from others investing in the toll road network. We regularly look beyond what is contractually required in our concession deeds to be a true partner for government.

Transurban's strategy is to be the partner of choice with governments providing effective and innovative urban road infrastructure utilising core capabilities



Network planning / forecasting



Community engagement



Development / delivery



Technology



Operations



Customer engagement

Finding new ways to engage and partner with government

Monitoring travel time trends—gathering and sharing data

With the help of TomTom data, we have been monitoring travel time and speed data in NSW since 2009. This data captures the average speed on Sydney toll roads at different times of the day, which can be compared year-on-year. This provides new opportunities to more effectively manage the motorway as a whole. This information is shared with RMS to ensure that investment decisions can be made by government with the most accurate information.

For example, Figure 31 shows that congestion across Sydney has been steadily increasing over the years. The charts also highlight when the Hills M2 Motorway Upgrade and M5 South West projects were completed (August 2013 and December 2014 respectively), which added more capacity to the network. As the charts show, since those projects, traffic has been increasing, however we attribute that to the current NorthConnex project. Data analytics such as these provide better understanding and allow for better decisions, clearer priorities and the ability for real-time management of the road network.

This insight allows the areas of the network that are starting to experience strain to be pinpointed; perform analysis of the cause; and implement actions that ensure the best possible experience for our customers.

Working with RMS to reduce congestion on and off motorways

A collaborative group has been established between Transurban and RMS with the mandate to plan for improvements on and off toll roads to alleviate congestion on the overall Sydney network. Called the 'Journey Enhancement Team', Transurban and RMS are each contributing significant resources, capability and data to this working group.

Establishing network-based reporting on KPIs—increasing visibility of our performance

Transurban initiated network-based KPI reporting, which provides visibility into the performance of the toll roads we operate beyond what is contractually required and set ourselves stretch targets to help improve overall congestion beyond our toll roads. After consultation with both the Transport Management Centre (TMC) within Transport for NSW and RMS, Transurban now provides a quarterly performance report which addresses KPIs that are directly aligned with those of RMS and the TMC. This interest and willingness to align our reporting with government has been positively received as it allows it to report on the operation of the broader road network.

Applying technology to manage congestion

Transurban has been a global leader in implementing the latest smart transport technology on its assets interstate and overseas to improve their efficiency and safety. This experience and capability allows us to look for opportunities where technology can be applied to enhance transport networks.

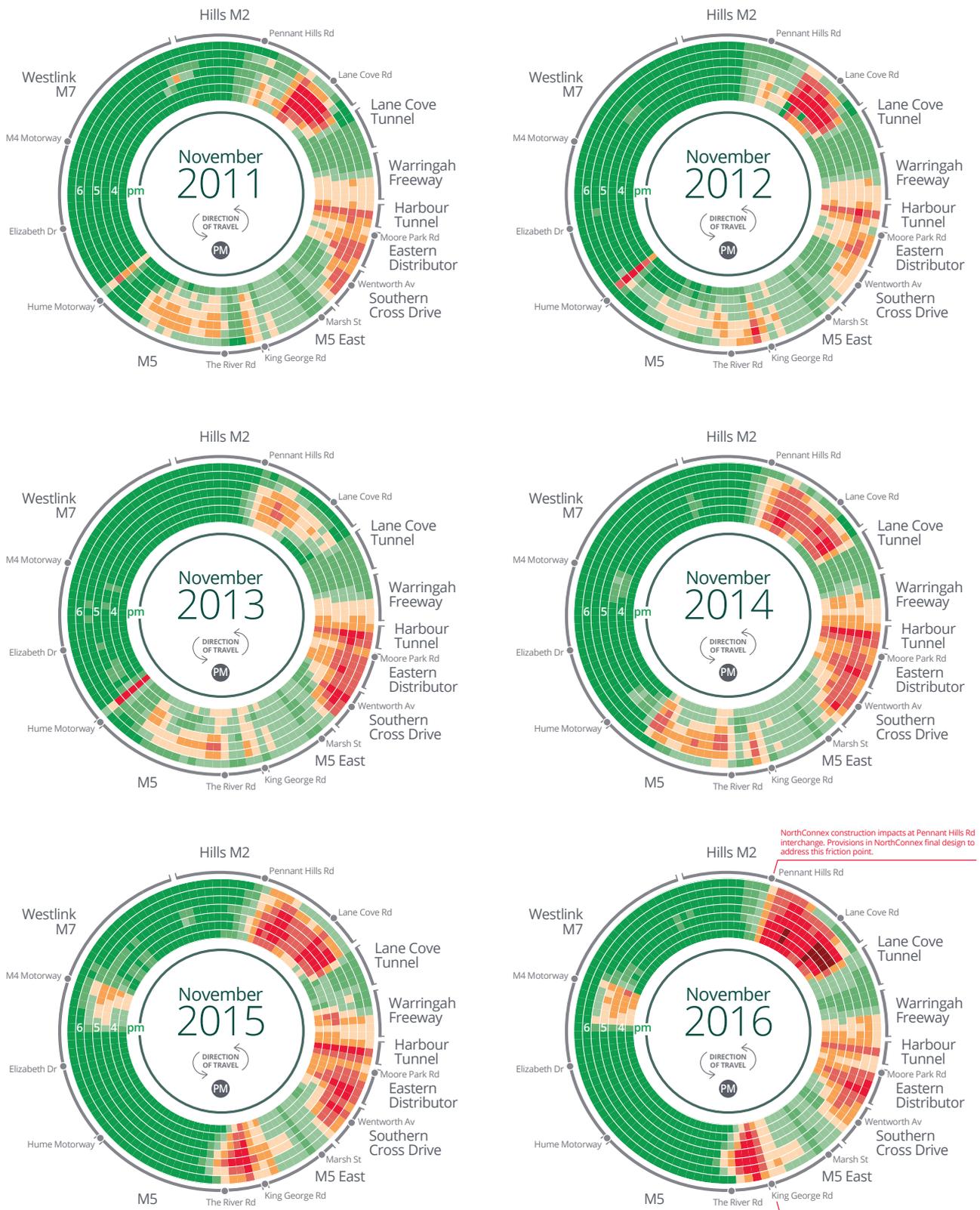
We worked with RMS and technology manufacturers to develop, test and implement state-of-the-art electronic speeds signs on the Eastern Distributor. These signs are used to manage incidents, congestion and worker safety on the motorway by adjusting speeds to match the conditions. This is the first time the electronic speed signs have been used in NSW. Embedded with smart functionality, in the future the signs will become part of the Smart Motorways system.

We have also assisted RMS to implement real-time travel information across the network. Road users can now see the time it will take them to travel to various landmarks and connection points in real-time via overhead electronic message signs, which allows them to make decisions about their journey with accurate information.

Commitment to continuous improvement

Transurban is committed to continuously improving our services, operations and the way we engage with government. Recently we initiated a "health check" in collaboration with RMS where a series of stakeholder interviews identified the areas Transurban could improve how we assisted and worked with government. Led by an independent expert, this activity demonstrated the excellent collaboration between RMS and Transurban. As a result, a number of actions were identified to enhance our ongoing engagement to improve outcomes for road users. This exercise has enabled thoughtful conversation and will be repeated annually to provide an ongoing assessment of the ways in which Transurban can support government.

Figure 31: Monitoring friction points across the Sydney toll-road network



NorthConnex construction impacts at Pennant Hills Rd interchange. Provisions in NorthConnex final design to address this friction point.

Congestion at east end of M5 South West towards CBD to be addressed as part of WestConnex project.

Speed Legend

Kph	0-20	20-30	30-40	40-50	50-60	60-70	70-80	>80
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Appendix 1— Tolling Arrangements in Place on Transurban-Operated Roads

OVERVIEW	M5	M2	ED	M7	NCX	LCT	CCT
OPENING DATE	August 1992	May 1997	December 1999	December 2005	Under Construction	March 2007	August 2005
COST TO BUILD	\$380M	\$644M	\$680M	\$1,540M	\$3B	\$1,142M	\$680M
DATE TRANSURBAN COMMENCED OPERATING THE ASSET	June 2007	June 2005	June 2007	December 2005	Expected 2019	August 2010	June 2014
REMAINING CONCESSION PERIOD	10 years	31 years	31 years	31 years	28 years*	31 years	19 years
CONCESSION END DATE	December 2026	June 2048	July 2048	June 2048	June 2048	June 2048	December 2035
PHYSICAL DETAILS							
LENGTH (TOTAL)	22km	21km	6km	40km	9km	3.8km	2.1km
LENGTH (SURFACE)	22km	20.4km	4.3km	40km	–	0.3km	–
LENGTH (TUNNEL)	–	0.6km	1.7km	–	9km	3.6km	2.1km
LANES	2x3	2x3	2x3 2x2 some sections	2x2	2x2	2x2 2x3 some sections	2x2 2x3 some ramp sections
OWNERSHIP							
TRANSURBAN OWNERSHIP	50%	100%	75.1%	50%	50%	100%	100%
TOLLING							
LARGE VEHICLE MULTIPLIER	3x	3x	2x	3x	3x	3x	2x
TOLL CHARGE	Flat rate	Flat rate	Flat rate (Northbound) Untolled (Southbound)	Distance based	Flat rate	Flat rate	Flat rate
CURRENT TOLL CHARGES— CLASS A (CARS)	\$4.57 each way	\$6.89 North Ryde	\$6.95 (Northbound only)	\$0.3924 cents/km capped at \$7.85 after 20km	Same as M2 (North Ryde) toll point	\$3.21 Main tunnel	\$5.47 Main tunnel
		\$3.44 Pennant Hills				\$1.61 Military Rd	\$2.58 Sir John Young
		\$2.43 Windsor					
		\$2.04 Lane Cove					
		\$3.44 Herring and Christie Rds					

OVERVIEW	M5	M2	ED	M7	NCX	LCT	CCT
CURRENT TOLL CHARGES —CLASS B (TRUCKS)	\$13.70 Each way	\$20.65 North Ryde	\$13.90 (Northbound only)	\$1.1772 cents/km capped at \$23.55	Same as M2 (North Ryde) toll point	\$9.67 Main tunnel	\$10.93 Main tunnel
		\$10.32 Pennant Hills Rd				\$4.83 Military Rd E-Ramp	\$5.16 Sir John Young Cres
		\$7.30 Windsor Rd					
		\$6.11 Lane Cove Rd					
		\$10.32 Herring and Christie Rds					
TOLLING ADJUSTMENT SCHEDULE	Escalated quarterly by quarterly CPI. The toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased.	Escalated quarterly by the greater of quarterly CPI or 1%.	Escalated quarterly by the greater of a weighted sum of quarterly AWE and quarterly CPI or 1%.	Escalated or de-escalated quarterly by quarterly CPI.	Escalated quarterly by the greater of quarterly CPI or 1%	Escalated quarterly by quarterly CPI for cars and the toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased. Escalated quarterly by the greater of quarterly CPI or 1% for trucks.	Escalated quarterly by: the greater of quarterly CPI or 0.9853% (equivalent to 4% per annum) to June 2012; the greater of quarterly CPI or 0.7417% (equivalent to 3% per annum) to June 2018; quarterly CPI to concession end.

* Concession period from expected opening date late 2019.

Appendix 2— Development of the NSW Toll Road Network

The extent of private sector involvement has typically been dependent on market conditions and appetite for risk by the private sector and funding constraints on government. The combination of funding sources and timing of private sector involvement in transport infrastructure projects has varied in NSW over the last twenty years. Approaches have included:

- Government undertakes the development and funding of the project on their balance sheet (eg WestConnex).
- Governments partner with the private sector using a PPP model, where government leads the development of a concept design, obtains planning approval and then runs a procurement process with the private sector to design and construct the motorway based on their preferred design and tolling concept. A consortium is selected to fund, design, construct and operate the motorway for a fixed period of time. Most existing tolled motorways in the NSW network were created using this model.
- The private sector provides a proposal to fund and deliver an identified government motorway through the Unsolicited Proposal Framework. A competitive procurement model in partnership with the government provides best value for money. This acts to accelerate the delivery of infrastructure projects that may have taken longer to procure due to funding constraints on state budgets (eg NorthConnex).

A brief summary of the development of Sydney's toll road assets is provided below.

Sydney Harbour Tunnel

Unsworth Labor Government received an unsolicited proposal from the private sector in 1985. The tunnel was approved just prior to the change of government in 1987 and proceeded under the new Greiner Liberal Government despite their initial opposition and opened in 1992.

M5 South-West

Put out for tender in 1989 under the Greiner Liberal Government and built as a build-own-operate-transfer project. It opened to traffic in 1992. A widening project was started in June 2012 and completed in December 2014; funded by concession changes agreed between the operator Interlink (50 per cent Transurban) and the O'Farrell Coalition Government.

M5 South-East Tunnel

The M5 South East began construction in 1998 under the Carr Labor Government and was opened in 2001. It was originally planned with the intention of being tolled, however this changed during the development phase and this section remains untolled. The current WestConnex project includes a duplication of the M5 East tunnels and both the existing and new link will be tolled after completion.

Hills M2

The contract was signed by the Fahey Coalition Government and the private sector in 1994 and opened to traffic in 1997 by the Carr Labor Government. A widening project was undertaken in 2011 and completed in August 2013; funded by concession changes agreed between the operator, Transurban, and the Keneally Labor Government.

M4 Western Motorway

Originally constructed in several stages as the F4 Western Freeway between the late 1960s and the mid-1980s, however a lack of funding resulted in the Wran Labor Government halting plans to construct the final stage between Mays Hill and Prospect in 1985. In December 1989, work to construct this stage began as a build-own-operate-transfer project. In return for funding construction StateWide Roads, the consortium awarded the contract to build the stage, was given permission to toll the section between James Ruse Drive and Silverwater Road as traffic volumes on this section were significantly higher than between Mays Hill-Prospect and would allow a shorter toll period with lower tolls. The concession held by StateWide Roads ended on 15 February 2010, with operation of the motorway returned to the Roads and Traffic Authority and the toll removed. The toll is due to be reinstated on the M4 as part of the WestConnex project.

Eastern Distributor

Financial close for the Eastern Distributor was reached in August 1997 and it opened to traffic in December 1999 under the Carr Labor Government.

Cross City Tunnel

The Cross City Tunnel reached financial close in December 2002 and opened in August 2005, under the Lemna Labor Government. The tunnel has been acquired out of receivership twice. In 2007, RBS, EISER and Leighton bought the road out of receivership. It went into receivership again in September 2013 when Transurban acquired it for \$475 million. The Cross City Tunnel has provided an excellent example of the difficulty of predicting traffic volumes. The current vehicle numbers using the Cross City Tunnel are approximately 34,000 per day, considerably lower than the 'up to 90,000' vehicles per day by 2006 predicted by the Cross City Tunnel original owners.

Lane Cove Tunnel

Lane Cove Tunnel reached financial close in December 2003 and opened to traffic in March 2007 under the Lemna Labor Government. The tunnel went into receivership in January 2010 and was acquired by Transurban in May 2010 for \$630 million. Traffic forecasts inaccurately predicted traffic volumes with opening volumes less than half predictions.

Westlink M7

Developed by the Howard Liberal Government and Carr Labor Government and the private sector in 2003. It opened to traffic in December 2005.

NorthConnex

First road infrastructure proposal to be procured through the NSW Government's Unsolicited Proposal Framework. The proposal was submitted in March 2012 and progressed by the O'Farrell Liberal Coalition Government. The project reached financial close under the Baird Liberal Coalition Government in January 2015 and is currently under construction. It is expected to open late-2019.

Appendix 3— NorthConnex Technology

FEATURE	DESCRIPTION	EFFICIENCY IMPACT?	NETWORK EFFICIENCY BENEFITS	ITS RELATED?	UNIQUE?	SAFETY RELATED?
Ramp metering capability	Ability to control timing and flow of traffic entering the tunnel from the on-load ramps – based on observations and traffic data.	Yes	Optimum flow, reduced accident number and severity	Yes	Unique for NSW tunnels	Yes
Tunnel closure system	Coordinated system for effective and safe tunnel closure including management of vehicle movement / diversion	Yes	Effective management of closures would minimise queuing in tunnel	Yes	No	Yes
Future proofing for consolidation of operation	NCX Control Centre has provisions for coordinated operation of NCX and WM7 (from one control room)	Yes	Coordinated traffic operation	Yes	Yes for NSW	Yes
Automatic video incident detection system	Best practice incident detection system— rapid detection optimises response time	Yes	Most effective incident detection	Yes	No	Yes
Electronic signs	Best practice traffic management and driver communication signs	Yes	Most effective traffic management	Yes	Integrated speed and lane usage signage implemented on ED	Yes
CCTV / Digital video management system	Best practice infrastructure to monitor and manage traffic	Yes	Most effective traffic management Integrated with TMC video	Yes	No	Yes
Traffic monitoring	Best practice infrastructure to monitor and manage traffic eg induction loops	Yes	Most effective traffic management Provides traffic data to TMC via Centre to Centre for Smart Motorway Management	Yes	No	Yes
Digital radio rebroadcast	Best practice radio communication	Yes	Most effective traffic management	Yes	Early adopter, only Sydney Harbour Tunnel has digital audio broadcasting	Yes
Public address system (PA)	Best practice PA communication	Yes	Most effective traffic management	Yes	No	Yes
Ventilation system	Jet fan and axial fan operation (with variable speed drives), simple vent outlet arrangement optimising piston effect from vehicles	Minimise power consumption	Optimise traffic management	Yes	No	Yes
Aesthetic lighting/ enhanced urban design features	Enhances driver attention, reduces accident number and severity	Minimises closures	Optimise operation	No	Unique for NSW tunnels	Yes
Simplified/ sympathetic road alignment/ geometry	Slight vertical grades only, simple merge and diverge geometry	Optimum fuel efficiency, reduced accident number and severity	Optimise operation	No	No	Yes

FEATURE	DESCRIPTION	EFFICIENCY IMPACT?	NETWORK EFFICIENCY BENEFITS	ITS RELATED?	UNIQUE?	SAFETY RELATED?
LED lighting	Enhanced visuals due to broader spectrum (white light), improved video performance	Yes, reduced power consumption	Optimise operation	No	Unique for NSW tunnels	Yes
Surface road truck regulation	Improving efficiency/safety of surface routes	Yes	Optimise operation	Yes	Unique for NSW tunnels	Yes
Best practice incident management features eg breakdown lane, emergency vehicle crossovers, incident response bays	Operations coordinated through Intelligent Transport System (ITS)/ data collection	Yes	Optimise operation	Yes	No	Yes
Over height vehicle detection/diversion system	Best practice systems to identify and manage over height vehicles	Yes	Most effective traffic management	Yes	No	Yes
State of the art control room with disaster recovery site	Best practice control and incident room facilities	Yes	Most effective traffic management	Yes	No	Yes
TFNSW Transport Management Centre – Centre to Centre Interface	Whole of network coordinated management (ED and M2)	Yes	Coordinated traffic operation	Yes	No	Yes
Readiness for Managed Motorways	Whole of network coordinated management	Yes	Coordinated traffic operation	Yes	Yes for NSW	Yes
Power—highly resilient and reliable supply	Critical equipment, plant and system operation is reliable	Yes	Surety of operation	Indirectly	No	Yes
Best practice fire system including fire detection, independent water supply and separate hydrant and deluge mains	Components and overall system are best in class and ensure rapid detection and effective reaction	Yes	Rapid return to service	Indirectly	Yes	Yes
Dangerous goods vehicle detection and identification	Best practice systems to identify and manage dangerous goods vehicles	Yes	Most effective traffic management	Yes	Yes for NSW	Yes
Others	Speed cameras Smoky vehicle cameras	Yes	Coordinated traffic operation and enforcement	Yes	No	Yes

Source: NorthConnex Project Team

Appendix 4— Glossary

ADT	Average Daily Traffic
AWE	Average Weekly Earnings
CCT	Cross City Tunnel
CPI	Consumer Price Index
D&C	Design and Construct
ED	Eastern Distributor
EIS	Environmental Impact Statement
FY16	Financial Year 2015–2016
GSP	Gross State Product
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
IS	Infrastructure Sustainability rating scheme administered by ISCA
ISCA	Infrastructure Sustainability Council of Australia
ITS	Intelligent Transport Systems
LCT	Lane Cove Tunnel
LTI	Lost Time Injury
M2	Hills M2
M5	M5 South West Motorway
M7	Westlink M7
NCX	NorthConnex
NSW	New South Wales
O&M	Operations and Maintenance
PPP	Public Private Partnership
RICI	Road Injury Crash Index—serious road injury (an individual transported from, or receives medical treatment, at scene) crashes per 100 million vehicle km travelled
RMS	Roads and Maritime Services
Roam	Tolling brand
Roam Express	Tolling brand
TMC	Traffic Management Centre

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