# ROAD ACCESS PRICING

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27 February 2013

Mr Charles Casuscelli MP
Chair
Committee on Transport and Infrastructure
Parliament House
Macquarie Street
SYDNEY NSW 2000

Dear Mr Casuscelli

<div align="center">

**Inquiry into Road Access Pricing**

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**Introduction**

NRMA Motoring & Services (NRMA) welcomes the opportunity to provide a submission to the Legislative Assembly - Committee on Transport and Infrastructure Inquiry into Road Access pricing.

Any Inquiry into Road Access Pricing needs to consider what is the primary objective of implementing such a pricing regime and what are the issues that need to be addressed to achieve that objective.

Transport infrastructure is critical to New South Wales' (NSW) productivity and economic growth. However, transport infrastructure investment has not kept pace with either current or projected demand. Without resolution, these capacity constraints will continue to impose constraints on NSW productivity.

NSW faces profound challenges in managing and expanding its transport infrastructure network. Over the coming 25 years, demand for passenger and freight transport is predicted to double, with demand across the freight network set to triple by 2050[i]. Certain routes will experience even greater demand pressures.

The challenges include:

> ➤ Historic under-funding of transport infrastructure development and maintenance, resulting in an inefficient transport system that inhibits not just NSW productivity, but Australia's productivity and international competitiveness,

> ➤ Demand pressures – pressure from a growing population and economy are exacerbated by shifting demographics, increasing mobility - including leisure trips - and an increasing number of trips outside the traditional Monday to Friday AM and PM peak periods,

> ➤ Government transport agencies have been slow to recognise and manage this explosion in travel, with most initiatives still being targeted at the weekday AM and PM peaks,

➢ Inefficient use of transport infrastructure- leading to increased urban congestion, vehicle emissions and operating costs, and

➢ A general acceptance of the user pays principle through the levy of tolls to fund new urban motorways, but a very different view towards provision of urban public transport.

For example, the railway station access fee has recently been removed from the Mascot and Green Square railway stations, and there have been calls to remove the fee from the Domestic and International Airport stations. There appears to be a view by academics and by some within Government that motorists should subsidise the provision of public transport as a way of addressing the current deficiencies.

A recent Railcorp Performance Report[ii], however, highlighted how in comparison with other international metro systems, CityRail's fares are the second lowest relative to average city wages and have continued to reduce in real terms. The Report also states that CityRail provides extensive concession fares (unlike for road tolls) and CityRail fares are very low compared with the distance travelled.

➢ Ineffective taxes and charges – the economic policy debates associated with taxation and road user charges being in conflict and sending inefficient and confused price signals to road users.

The Australian Government currently receives more than $14 billion every year from petrol and diesel excise.

However, although NSW contributes approximately one third of total volume sales [iii], in 2013-14 it will receive just $1.2 billion in roads funding from the Australian Government. This means the Australian Government has allocated just 25 per cent of the NSW fuel excise towards building roads in NSW. This is in spite of the fact that New South Wales is home to more than 30 per cent of the population of Australia, contributes approximately 30 per cent of Australia's gross domestic product, and our roads carry more than 60 per cent of the national road freight task.

**Cost of Congestion**

Congestion already costs the Australian economy $9.4 billion each year. Without action, these costs will more than double to $20.4 billion by 2020[iv]. Inefficient, congested freight networks also have a significant impact on national productivity, with each one per cent improvement in supply chain efficiency estimated to save Australia more than $1.5 billion in deadweight logistics costs.

The same issues are now affecting Australia's major urban centres and in particular, Sydney. Dealing with these complex challenges will require a coordinated, long-term strategy which balances the provision of new infrastructure with considered ways of shaping and managing demand.

The need for greater infrastructure investment and the measures required to attract finance and more innovative funding solutions are now urgent. There is increasing academic debate for increased private sector investment, including the use of tolling and road user charging.

The NSW Government has stated its opposition to debt financing, partly through a desire to maintain its AAA credit rating.

In addition, both Infrastructure Australia and Infrastructure NSW are considering reforms to the funding of infrastructure, to increase the capacity to invest through tolls, the selling and or leasing of public assets to the private sector, greater joint government funding of projects and the examination of innovative financing models.

Given the current challenges facing the NSW economy in the provision of critical transport infrastructure, the funding of this infrastructure and the pricing of this infrastructure, it is important that the solutions to these challenges are economically sustainable in the long term to boost productivity and economic activity in NSW.

## Traditional Infrastructure Funding Sources

NRMA firmly believes that Governments should structure funding solutions for infrastructure projects on a case by case basis to deliver the best outcome for motorists and government. Debt financing, taxation, user pay principles, special purpose vehicles and developer levies should be properly evaluated as potential funding sources, the focus being on the most efficient, and value for money solution for motorists.

## Innovative Financing Tools

Reliance on traditional forms of financing, given the current climate of tight financial markets, the lack of investor confidence and a number of failures in infrastructure provision in Australia, has resulted in the need to consider more innovative non-traditional funding methods.

Whilst not a new concept internationally, tax incremental financing and value capture levies could be potential funding sources for road infrastructure.

## Tax Incremental Financing

Tax Increment Financing (TIF) is a tool that many cities and other development authorities in the United States have been using for a number of years to enhance urban infrastructure. TIF is confined to specially created location districts.

It allows the use of tax revenue increases, resulting from growth in that district's assessed real values, to finance the development costs. It is commonly used in conjunction with the issue of specific purpose bonds to finance development, with TIF revenue applied to pay the bond yield.

## Value Capture Levies

Land value capture levies (also known as betterment taxes) are widely used overseas, for example in Denmark, Hong Kong, New Zealand and the United States (particularly by local governments). These arrangements seek to capture a public return from the increase in property value created as a result of a major public investment in infrastructure. They are particularly relevant where developers and property owners are expected to benefit from increases in land values from public investment in new transport corridors.

The NSW Government should be well placed to share in the uplift in land values resulting from transport projects, since it is able to identify where new railway stations, transport interchanges and motorway on and off-ramps are positioned. Traditionally, whilst the State has funded major transport infrastructure, land developers have benefited from any increase in land values along the transport corridor and local Councils have benefited from the increase in building rates.

NRMA submitted an initial proposal to the NSW Government in 2011 for further examination of NRMA's **M4 East Extension – Road to the Future** study that proposed using incremental revenue financing techniques to fund this road. This proposal uses a land capture value modelling that has been successfully used in a number of major overseas cities as part of an urban renewal program. NRMA believes that the economic and social benefits likely to arise from the construction of this missing link would be maximised from using this innovative funding technique. It would also allow both the Australian and NSW Governments to bring forward the construction of this major missing link.

## Road User Charging

Congestion charging is being promoted by some as a panacea for all the transport problems, motorists are priced off roads and the revenue is reinvested in public transport.

However, NRMA strongly believes that motorists already pay enough for travel, evidenced by the large fuel excise collected by the Australian Government.

Tolls charged on motorists using Sydney's urban motorways are currently used to fund this specific infrastructure and provide a return to investors, but not to manage demand. The one exception to this is the Harbour Bridge where tolls continue to be levied on motorists using this infrastructure in spite of it being paid off in 1988.

Road user tolls have also funded off-motorway public transport and bicycle infrastructure, such as bus priority measures, and the shared bicycle paths alongside the Westlink M7 motorway, and on Epping Road above the Lane Cove Tunnel.

The 'no cost to Government' approach adopted for recent Sydney road tunnels resulted in minimal financial impact on the NSW Government when the Cross City and Lane Cove Tunnel private consortiums went into liquidation. This is in stark contrast to the failed Sydney Metro scheme which in 2010 was reported to have cost taxpayers in excess of $400 million.[v]

NRMA's Decongestion Strategy highlighted how the current academic and to some extent political focus in Australia appears to be moving away from how to accommodate more people on roads, to instead focussing on congestion pricing – in essence, how to get fewer vehicles on roads in peak periods by pricing them off the road.

This would inevitably result in those who have no option other than to start work before 9.30am, paying extra fees and charges for using the roads. Clearly this is something that needs to be considered before contemplating any form of road user pricing. The majority of workers, including teachers, police officers, nurses, and shop assistants need to arrive at their workplace at a set time to meet work requirements.

A blunt congestion charge based on time of day would also impact on those who are already 'doing the right thing' by 'trip chaining', such as dropping children at childcare or school, perhaps dropping a partner at a train station, and then continuing on to work. It would also impact on those who only use a car for part of their trip, for example, to get to their local train station in order to catch a train to work, and of course impact on those for whom public transport is not an option.

International experience has shown that all of the following are important aspects to consider in any consideration of congestion pricing:

- Major upgrades to both the road and the public transport system are a prerequisite, including addressing the need for travel across the city, not just to and from the CBD;
- There needs to be extensive dialogue with the community to ensure that the community understands and accepts any change;
- Flexible work arrangements need to be put in place to help people travel outside peak times; and
- Extensive and up to the minute road and public transport information for commuters would be needed so that they can make informed decisions about how best to get around.

The introduction of time of day tolling to the Sydney Harbour Bridge and Tunnel has been proven to be a revenue raising exercise by the NSW Government

Even though the current NSW Government has publicly acknowledged that time of day tolling has not worked, it has decided to continue levying these tolls on motorists to retain the revenue stream.

Although In spite of serious deficiencies highlighted by NRMA, the former NSW Labor Government introduced time of day tolling on the Bridge and Tunnel in 2008, supposedly to manage demand, but as has been subsequently proven, it was a NSW Treasury response to an apparent budget crunch within the NSW Government.

NRMA was highly critical of time of day tolling, not least because:

- NSW road users were not consulted;
- other transport improvements were not put in place before the toll increase was introduced (in stark contrast to the way in which the London congestion charge was introduced);
- the majority of private sector workers do not have flexibility to travel to and from work outside peak periods;
- no corresponding price reduction was given for those who were able to shift their travel to after 9.30am – the toll simply stayed at the original price of $3
- there was no analysis of the financial / patronage impact on the adjacent privately owned motorways both to the north (Lane Cove Tunnel and Hills M2 Motorway) and south (Eastern Distributor and Cross City Tunnel), or on investor perception in NSW.
- It was another example of how Sydney's roads are currently considered only as isolated links instead of being managed as a network.

**NRMA's Decongestion Strategy**

NRMA's Decongestion Strategy (as attached) raised concerns that the congestion charging concept appears to be limiting many people's thinking on what is needed, today, to keep traffic moving in Sydney. By avoiding this issue, traffic congestion is only getting worse. There appears to be a growing tendency to 'blame' motorists for travelling on our roads and it seems to be increasingly politically incorrect to do anything that facilitates car travel.

The Strategy was developed within this context, and was partly an attempt to counter the pessimistic view that there is little point in innovating and innovating in the way that we manage our roads, since congestion is only going to get worse

Importantly the Strategy did not seek to prioritise cars over public transport, or above other modes such as walking or cycling. It simply recognised that for the majority of people, particularly those who live outside the inner suburbs, the car will continue to remain the most effective means of travel for many trips. It revealed how over two thirds of weekday journeys across Sydney are by private vehicle.

It highlighted that Sydney has the highest public transport usage of all the Australian capital cities, but even so it still only accounts for 11.2 per cent of weekday journeys. Importantly, it also highlighted the importance of investing in, and actively managing roads, given that roads cater for three quarters of all weekday private and public travel.

One of the important recommendations from the Decongestion Strategy was to promote flexible working hours and practices.

If a small percentage of people could be encouraged to travel outside peak hours on a normal weekday it would make a serious dent in congestion and help to keep Sydney moving.

Rather than forcing people to pay more to travel on roads during peak times (as those in favour of congestion charging advocate), similar results can be achieved by encouraging people to travel at different times.

In terms of roads, as a rule of thumb, when traffic on congested roads reduces by 5%, traffic speeds increase 50% (even if this only means going from 20 to 30km/h).

School holidays are an obvious example of how traffic can suddenly start flowing in the AM and PM peaks, due to a reduction of between 5 and 10% (depending on the holiday) in the volume of traffic.

Reducing or flattening travel demand during peak times means we can make much more effective use of existing transport infrastructure. The benefits of adopting this approach are felt across all transport networks – public and private. A small reduction in the amount of passengers during peak hours can sometimes make the difference between being able to squeeze onto a bus or train, or not, and for some it can make getting a seat on the bus or train a real possibility.

Adopting more flexible working hours and work practices can reduce or flatten travel demand and make a significant difference to the operation of Sydney's transport, particularly during the critical AM and PM peak periods

From a motorist's perspective, relatively small reductions in car travel could help some of those commuters who have to get up at 5:30am just to 'beat the traffic' or those trying to reduce the cost of their travel by avoiding the toll hikes imposed on motorists using the Harbour Bridge and Tunnel. The challenge, as with other improvements to the transport system, often lies in how to sustain these improvements over time.

It also provides one possible remedy to the funding constraints facing the new NSW Government that continue to impact on investment in transport infrastructure - and can be achieved at minimal cost to Government.

NRMA believes that not all solutions to reducing road congestion and improving roads need to be solved by massive expenditure. NRMA's decongestion strategy provides many ways to relieve Sydney's traffic headache for minimal cost.

We are also strongly of the view that all new or upgraded motorways in Sydney should incorporate an electronic freeway management system, similar to that in use on Melbourne's Monash Freeway. We are very concerned that Roads and Maritime Services (RMS) has not sought to develop either the M2 or M5 motorway upgrades in this way. Getting the most from existing assets should dictate that RMS adopts a similar approach to Melbourne. Indeed the Melbourne experience has shown that a proper managed motorway can deliver up to 25 per cent additional throughput during peak periods, 50 per cent in travel times and 50 per cent reduction in crashes.
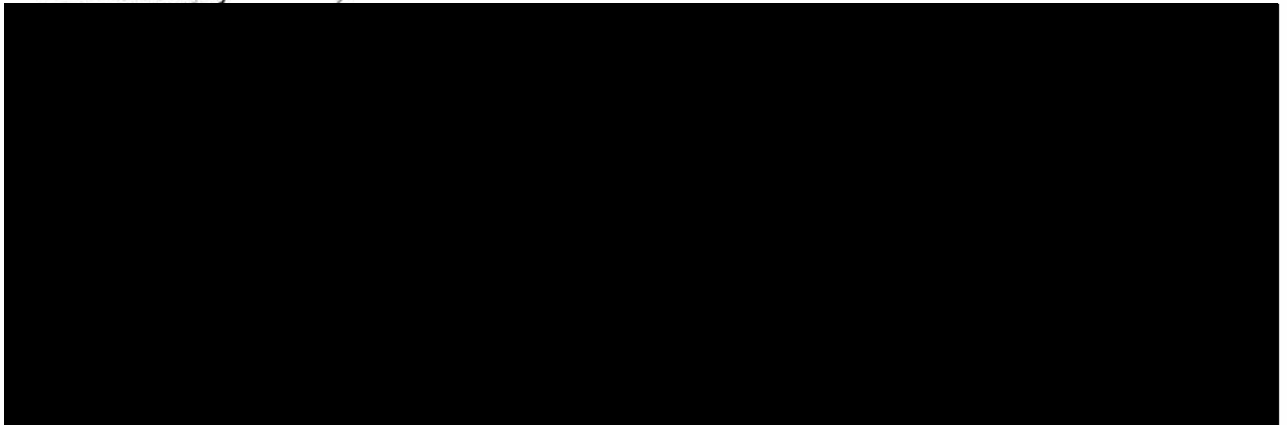
## NRMA's Policy Position – Tolling and Road User Charging

NRMA advocates for the following position in regards to road funding:

a) No congestion tax be imposed on motorists to fund road infrastructure;

b) No reintroduction of toll charging to fund new Motorway links, on Motorways that were previously tolled;

c) The return of all fuel excise levies collected by the Australian Government to the road network, and to include the funding of public and freight transport infrastructure of benefit to the road network;

d) Adopting the following policy guidelines (numbered 1-8 below) to assist in funding the current backlog of infrastructure projects, estimated at $115 billion;

1. All motor vehicle taxes, charges and levies collected from motorists to be returned to the road transport network;

2. Traditional Government financing and debt financing of infrastructure be considered as the first option in assessing fund availability to build key road projects;

3. Where debt financing is not readily available, Governments should work in partnership with the private sector to expedite the construction of key road projects;

4. Where feasible, innovative financing techniques should be encouraged as a means to secure finance to build key road projects;

5. Whether in partnership with the private sector, or where the private sector is the sole provider of finance, key road projects, should generate net economic and social benefits;

6. Where possible, new roads should be retained under Government ownership but outsourced for operational purposes in order to maximise net benefit to the community;

7. Further to point 6, the Government should be the owner of the road network, and set the rules for designing and constructing the road network; and

8. Where tolling is part of the private sector finance arrangement,

    i) Any agreements with Government regarding all contractual concessions, operational and pricing decisions, need to be made fully transparent, and

    ii) Government should not profit where tolling is part of a private sector finance arrangement on a public road, it should be at the lowest cost to the motorist, not the highest benefit to the Government;

NRMA would welcome the opportunity to expand on the points raised in this letter at your request.

Yours sincerely

## REFERENCES

[i] PriceWaterHouseCoopers 2009 – "Meeting the 2050 Freight Challenge" prepared for Infrastructure Partnerships Australia p.v.

[ii] CityRail Performance – Comparison to International CoMET / Nova Benchmarking Community peers, NSW Government Transport – Railcorp
http://www.railcorp.info/_data/assets/pdf_file/0008/10520/CoMET_Nova_Benchmarking_Report.pdf

[iii] Australian Government -Bureau of Resources and Energy Economics :Australian Petroleum Statistics – Issue No.196 November 2012 Table 3C, Australian Budget Paper 2012-13 p. 5-29 and Nation Building Program,
http://www.nationbuildingprogram.gov.au/funding/allocations/Funding_Allocations_Consolidated.aspx

[iv] Australian Government – Department of Transport and Regional Services: Bureau of Transport and Regional Economics "Estimating urban traffic and congestion cost trends for Australian cities; Working Paper No.71 p. xv.

[v] http://www.smh.com.au/nsw/failed-metro-leaves-93m-hole-20100603-x7d7.html

**Wendy Machin**
President

27 February 2013

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One of the important recommendations from the Decongestion Strategy was to promote flexible working hours and practices.

If a small percentage of people could be encouraged to travel outside peak hours on a normal weekday it would make a serious dent in congestion and help to keep Sydney moving.

Rather than forcing people to pay more to travel on roads during peak times (as those in favour of congestion charging advocate), similar results can be achieved by encouraging people to travel at different times.

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Reducing or flattening travel demand during peak times means we can make much more effective use of existing transport infrastructure. The benefits of adopting this approach are felt across all transport networks – public and private. A small reduction in the amount of passengers during peak hours can sometimes make the difference between being able to squeeze onto a bus or train, or not, and for some it can make getting a seat on the bus or train a real possibility.

Adopting more flexible working hours and work practices can reduce or flatten travel demand and make a significant difference to the operation of Sydney's transport, particularly during the critical AM and PM peak periods

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It also provides one possible remedy to the funding constraints facing the new NSW Government that continue to impact on investment in transport infrastructure - and can be achieved at minimal cost to Government.

NRMA believes that not all solutions to reducing road congestion and improving roads need to be solved by massive expenditure. NRMA's decongestion strategy provides many ways to relieve Sydney's traffic headache for minimal cost.

We are also strongly of the view that all new or upgraded motorways in Sydney should incorporate an electronic freeway management system, similar to that in use on Melbourne's Monash Freeway. We are very concerned that Roads and Maritime Services (RMS) has not sought to develop either the M2 or M5 motorway upgrades in this way. Getting the most from existing assets should dictate that RMS adopts a similar approach to Melbourne. Indeed the Melbourne experience has shown that a proper managed motorway can deliver up to 25 per cent additional throughput during peak periods, 50 per cent in travel times and 50 per cent reduction in crashes.
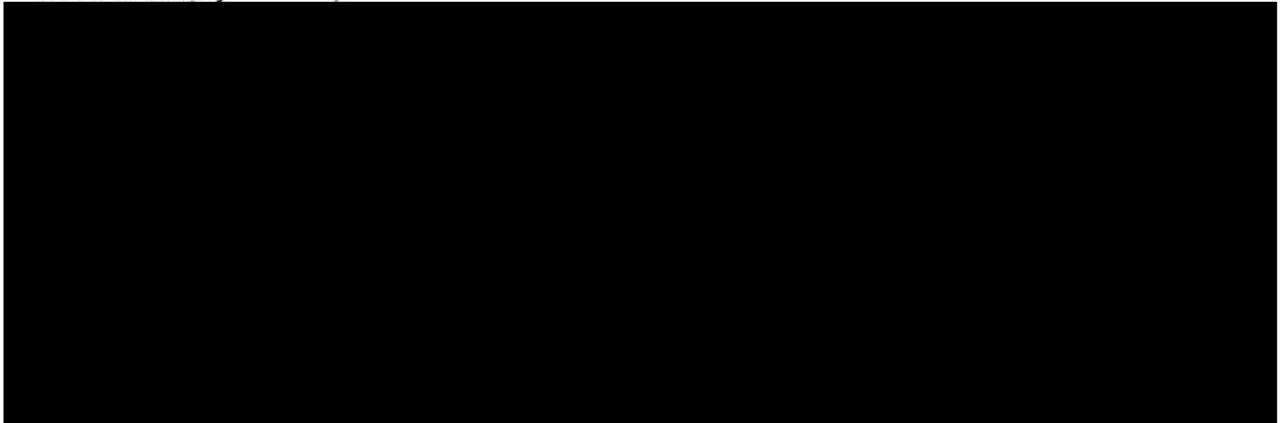
**NRMA's Policy Position – Tolling and Road User Charging**

NRMA advocates for the following position in regards to road funding:

a)   No congestion tax be imposed on motorists to fund road infrastructure;

b)   No reintroduction of toll charging to fund new Motorway links, on Motorways that were previously tolled;

c)   The return of all fuel excise levies collected by the Australian Government to the road network, and to include the funding of public and freight transport infrastructure of benefit to the road network;

d)   Adopting the following policy guidelines (numbered 1-8 below) to assist in funding the current backlog of infrastructure projects, estimated at $115 billion;

1.   All motor vehicle taxes, charges and levies collected from motorists to be returned to the road transport network;

2.   Traditional Government financing and debt financing of infrastructure be considered as the first option in assessing fund availability to build key road projects;

3.   Where debt financing is not readily available, Governments should work in partnership with the private sector to expedite the construction of key road projects;

4.   Where feasible, innovative financing techniques should be encouraged as a means to secure finance to build key road projects;

5.   Whether in partnership with the private sector, or where the private sector is the sole provider of finance, key road projects, should generate net economic and social benefits;

6.   Where possible, new roads should be retained under Government ownership but outsourced for operational purposes in order to maximise net benefit to the community;

7.   Further to point 6, the Government should be the owner of the road network, and set the rules for designing and constructing the road network; and

8.   Where tolling is part of the private sector finance arrangement,

i)   Any agreements with Government regarding all contractual concessions, operational and pricing decisions, need to be made fully transparent, and

ii)   Government should not profit where tolling is part of a private sector finance arrangement on a public road, it should be at the lowest cost to the motorist, not the highest benefit to the Government;

NRMA would welcome the opportunity to expand on the points raised in this letter at your request.

Yours sincerely

## REFERENCES

[i] PriceWaterHouseCoopers 2009 – "Meeting the 2050 Freight Challenge" prepared for Infrastructure Partnerships Australia p.v.

[ii] CityRail Performance – Comparison to International CoMET / Nova Benchmarking Community peers, NSW Government Transport – Railcorp
http://www.railcorp.info/_data/assets/pdf_file/0008/10520/CoMET_Nova_Benchmarking_Report.pdf

[iii] Australian Government -Bureau of Resources and Energy Economics :Australian Petroleum Statistics – Issue No.196 November 2012 Table 3C, Australian Budget Paper 2012-13 p. 5-29 and Nation Building Program,
http://www.nationbuildingprogram.gov.au/funding/allocations/Funding_Allocations_Consolidated.aspx

[iv] Australian Government – Department of Transport and Regional Services: Bureau of Transport and Regional Economics "Estimating urban traffic and congestion cost trends for Australian cities; Working Paper No.71 p. xv.

[v] http://www.smh.com.au/nsw/failed-metro-leaves-93m-hole-20100603-x7d7.html

# DECONGESTION

**10 ways to relieve Sydney's traffic headache**



**May 2011**

# 10 ways to relieve Sydney's traffic headache

1. RENEWED FOCUS ON MANAGING TRAFFIC

2. MANAGE THE MOTORWAYS

3. OPTIMISE THE OPERATION OF THE TRAFFIC LIGHT NETWORK

4. QUICK CLEARANCE OF TRAFFIC INCIDENTS

5. GIVE MOTORISTS RELIABLE & UP TO DATE INFORMATION

6. PROMOTE FLEXIBLE WORKING HOURS & PRACTICES

7. IMPROVE THE TRANSIT LANES

8. REMOVE INACCURATE TRAFFIC SIGNS & DECLUTTER

9. REVIEW PARKING RESTRICTIONS

10. ADOPT MEANINGFUL PERFORMANCE MEASURES

# DECONGESTION
## 10 ways to relieve Sydney's traffic headache

## Purpose

How to reduce congestion, maintain reliable travel times, manage demand, and keep Sydney moving by adopting practical and low cost initiatives.

## Background

Sydney – Australia's premier city

Sydney is an amazing city to live, work, and play. It consistently ranks highly in comparison with other world cities not least because of its natural attractions such as the harbour, beaches, parks, and a great climate.

But Sydney's ongoing success cannot be taken for granted. Sydney faces increasing competition from interstate rivals and also some serious international competition for people, companies, cultural and sporting events, not least from our Asian neighbours.

Some of the biggest challenges are right here and include high house prices, and unreliable and crowded transport infrastructure. For Sydney to remain competitive and accommodate future growth, it is critical that we sort out these issues.

## About NRMA Motoring & Services

NRMA Motoring & Services is one of the largest Member-owned mutual organisations in Australia, with over 2.2 million Members across New South Wales and the Australian Capital Territory.

For more than 90 years, as well as delivering our legendary roadside service, NRMA has represented the interests of motorists. NRMA campaigns for better roads, fairer licensing for older and younger drivers, better value petrol prices, greener motoring, integrated transport, and much more.

## Comments and Queries

Comments and queries on this strategy may be directed to:
Mr Mark Wolstenholme, Senior Policy Adviser – Traffic & Roads
NRMA Motoring & Services
PO Box 1026, Strathfield NSW 2135

# Executive Summary

This Decongestion Strategy highlights how over two thirds of weekday journeys across Sydney are by private vehicle. In comparison, bus and train journeys combined account for 11%, walking 18.3% and cycling 0.6%.

It also highlights that there is no overall government policy or strategy for managing Sydney's traffic and how responsibility for managing traffic within the Roads & Traffic Authority is fragmented.

It dispels the myth that Sydney's roads are actively managed and discredits the prevailing attitude that once a road is built, it will pretty much look after itself.

▶ NRMA calls on the RTA to actively manage Sydney's motorways and toll roads, and calls for the appointment of an influential new anti-congestion Director within the RTA - with the vision and accountability for managing congestion on Sydney's major road network.

The Strategy reinforces what motorists already know - that traffic congestion has long since ceased to be a 'peak hour' problem and how weekend congestion in many parts of Sydney is now similar or worse to that experienced on weekdays. This is backed up by a recent NRMA survey that reveals how more Sydney residents use their cars to go shopping and to visit family and friends than those who commute by car.

It reveals that the RTA has a very minimal focus on managing weekend congestion, and how a serious lack of traffic data means the RTA has only a very limited picture of what is actually happening on Sydney's roads.

▶ NRMA calls on the RTA to adopt clear and challenging performance measures for managing key routes, to pay much more attention to collecting, analysing, and responding to traffic data and to adopt a clear strategy for managing weekend congestion.

Importantly, the Strategy reveals that the RTA only has 15 people operating the entire network of over 4,000 traffic lights across New South Wales. The results are all too evident - whether it is being stopped by an endless stretch of red lights, bumper to bumper stationary buses in Sydney's CBD, or pedestrians having to wait to cross the road when no traffic is coming. There are just too many lights for the operators to manage them all efficiently. The 15 staff responsible for traffic lights is contrasted with the 11 staff working in the RTA's head office on 'sustainable transport'.

▶ NRMA calls on the RTA to redirect resources into optimising the traffic light network and to decentralise from Sydney the traffic light operations for regional centres such as Parkes, Wagga, Grafton, Coffs Harbour, Tamworth, Armidale and Wollongong.

The Strategy finds that every day traffic management tends to take a back seat to high profile events such as the V8 supercar event at Homebush and the Breakfast on the Harbour Bridge event, and identifies that road incidents can be managed much more effectively to minimise delays for motorists.

Fundamentally, it questions why we continue to accept the closure of major roads such as the F3 freeway or the M5 motorway for hours on end due to incidents, and importantly provides some key solutions.

▶ NRMA calls for the adoption of a maximum target time of 3 hours to clear major traffic incidents in Sydney. We also call for a reduction in the target time for clearing minor traffic incidents in Sydney to 25 minutes and targets for managing incidents on regional roads.

▶ We call on the Transport Management Centre (TMC) to extend its pilot of travel time on the F3 Freeway to cover all major routes, including toll roads, without further delay. This must also include those routes radiating from Sydney airport to warn motorists of incidents at and around the airport. We also believe there is scope to expand this concept to provide travellers with access to wide ranging travel information ranging from flight arrival times to information on next train or bus timetables or of potential delays.

▶ The case studies on the Eastern Distributor and M5 East motorways are real examples of how the TMC must improve the information it gives to motorists.

▶ We call for some basic improvements such as fixing those traffic signs that are blatantly wrong so as to reduce frustration and last minute lane changing. Helping motorists get into the correct lane in this way can improve both traffic flow and road safety.

The Strategy highlights how the last major review of clearways and parking on major transport routes across Sydney was conducted in the lead up to the 2000 Olympic Games.

▶ We call for a new audit and assessment of parking on these routes to reflect the changes in traffic patterns and demand since 2000.

We highlight how the RTA was once a world leader in transit lanes, but now oversees an increasingly disjointed transit lane network.

▶ We recommend improving the forgotten transit lanes by highlighting them in orange to make them easier to see and to deter illegal use - just as bus lanes are highlighted in red and bicycle lanes in green.

Many of the ideas within this Decongestion Strategy will also have a positive effect on road safety. We are, however, mindful of the ongoing issues around speed limits and speed cameras and the impact this has had on the way the RTA is perceived by motorists.

▶ We suggest that only through handing over responsibility for road safety education, road user behaviour and speed camera operations to another agency, will the RTA be able to improve this perception by focusing on the things that it is historically good at - such as building and operating road infrastructure.

# Introduction

This Decongestion Strategy demonstrates how we can get much more effective use from the existing road and transport network.

Up to 25% more capacity can be achieved from Sydney's motorways simply by changing the way they are managed and by adopting proven technology. Significant gains can also be achieved on some arterial roads through measures that include more effective operation of traffic lights.

This Decongestion Strategy does not seek to prioritise cars over public transport, or above other modes such as motorbikes, walking, or cycling. It simply recognises that for the majority of people, particularly those who live outside the inner suburbs, the car will continue to remain the most effective means of travel for many trips.

The threat of peak oil that may once have spelt the end of cars is being countered by a gradual transition to alternative fuels and in particular the advent of electric vehicles. One thing is certain, cars are not going to go away any time soon and with an expanding population it is inevitable that there are going to be more of them (however difficult this may be for some to accept). We need to adopt clear, achievable strategies for managing this growth.

Various measures to manage travel demand are being pursued by the NSW Department of Transport. These include:
- ► workplace travel plans aimed at making it easier for employees to get to and from the workplace, and to reduce dependence on private vehicles and parking spaces, and
- ► increasing the number of walking and cycling trips.

All of these are required since on its own this Decongestion Strategy cannot solve Sydney's traffic and transport problems - but importantly this Strategy is something that can have an immediate and positive effect. If properly managed, these positive effects can be locked in for the future.

NRMA fully appreciates that building more roads to expand capacity to cater for population and economic growth is both costly and difficult given the current funding constraints facing the NSW Government. On their own, these roads will not 'solve' congestion anyway in the longer term. We also recognise that there is a clear case for providing a well-connected and well-managed road network - fixing the missing and deficient links in the motorway network, along with integration with other transport modes is part of the solution.

Whilst some of the proposals in this Decongestion Strategy are purposefully aimed at reducing bottlenecks, they are specifically aimed at making the most out of the existing road network, rather than by building new roads.

Clear and decisive action is required to ensure people can continue to move around Sydney.

This Decongestion Strategy identifies **ten** relatively quick and achievable ways to squeeze more out of Sydney's existing roads. There is no single solution and the list is by no means exhaustive, but these ten initiatives can contribute to making a real difference and form the basis for generating other ideas.

# The Transport Challenge

The task of keeping Sydney moving is enormous, with over **15.7 million trips** currently made each weekday across Sydney (Edwards & Smith, 2008).

The transport network as a whole will continue to be placed under ever increasing pressure due in no small part to the North West and South West Sydney 'Growth Centres'[1] (NSW Urban Taskforce, 2007).

> The task of keeping Sydney moving is enormous, with over **15.7 million trips** currently made each weekday across Sydney

Recent research shows that Sydney's population is expected to explode by 23% over the next 20 years, increasing by over a million people to 5.5 million (Residential Development Council, 2009). Over the same period the New South Wales population will grow by 20%, increasing by over 1.4 million to nearly 8.5 million.

Targeted investment is required to make sure that transport infrastructure can keep pace with this growth. Given the current NSW and Australian Government funding constraints, it is imperative that we look at how to get more out of the existing transport network by considering practical and effective low cost initiatives.

We need the new Integrated Transport Authority to promote bold strategies, developed by people with the vision to make Sydney a better place to live, work and play. These strategies need to be backed up with clear performance measures to ensure that the NSW Roads & Traffic Authority (RTA) and the Transport Management Centre (TMC) deliver on the strategy outcomes.

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[1] The North West Growth Centre consists of land located in The Hills, Blacktown, and Hawkesbury Council areas. The Growth Centres Commission estimates it will contain about 66,000 new homes - a city the size of Wollongong. The South West Growth Centre consists of land located in Liverpool, Camden, and Campbelltown Council areas. The Growth Centres Commission estimates it will contain around 115,000 new homes - a city the size of Canberra.

## The Public Transport Challenge

Sydney has the highest public transport usage of all the Australian capital cities (Mees, Sorupia, & Stone, 2007), but even so it still only accounts for 11.2% of weekday journeys. Given the crowded nature of public transport in the peaks, the need to run to timetables, and on only a limited number of routes, it is unrealistic to assume that public transport is the answer to all our transport problems.

We are also mindful that research indicates that to date the small increases in the number of cycling trips have often been at the expense of walking and public transport, rather than car use (Mees, Sorupia, & Stone, 2007). Cycling currently represents just 0.6% of total weekday journeys.

Item 6 of this Decongestion Strategy makes a number of suggestions for encouraging travel outside the peaks. By reducing or flattening the demand for travel during the peaks, we can make much more effective use of the existing infrastructure.

Even where bus improvements have been made, such as installing bus lanes, many suburbs still suffer from poor integration with public transport and for many people, public transport is simply not a viable option. The problems are not limited to the outer suburbs either - regular and reliable buses integrating with rail in areas within 10km south of the CBD, for example, can also be few and far between.

There is also an increasing tendency to focus on running long distance 'metro' buses as opposed to shuttling buses between transport hubs. These types of services are



Figure 1: Morning peak bus congestion in York Street at Wynyard, Sydney CBD.
Source: Mark Wolstenholme, NRMA Motoring & Services, 2011

The radial nature of Sydney's heavy rail network is still largely geared to serving Sydney CBD. It does not serve the large number of cross regional trips particularly well; for example, there is no train line between Hurstville and Strathfield, requiring passengers to head north towards the CBD to change at Redfern before changing trains to head west on another line. The delays and costs involved in adding new rail capacity makes improving bus services an attractive way for Government to try to meet the growing demand for travel.

However, too many buses can also cause problems.

The above photograph (Figure 1), taken at Wynyard in Sydney's CBD, is an example of what can happen when there are too many buses. It is also a visible reminder of how delays to the North West rail link are significantly impacting on CBD bus operations.

particularly suited where the majority of passengers do not need to change buses or mode and are travelling directly between the start and end points, for example, to and from a CBD. Unfortunately, 'bendy' buses are not very compatible with CBD streets.

But one of the other disadvantages with these buses is that if a problem happens at one location on the bus route, all passengers can quickly end up being delayed, often causing bunching of buses at one particular point. For this reason, many cities around the world choose to run buses to a transport hub instead where passengers can then change to another service or mode.

## The Issue of Congestion Charging

The concept of congestion charging is beyond the scope of this Decongestion Strategy since the main focus of the Strategy is on quick and easy solutions to managing traffic.

Unfortunately, the congestion charging concept also appears to be limiting many people's thinking on what is needed, today, to keep traffic moving in Sydney. By avoiding this issue, traffic congestion is only getting worse.

The current academic, and to some extent, political focus in Australia appears to be moving away from how to accommodate more people on roads, to instead focussing on congestion pricing - in essence, how to get fewer vehicles on roads in peak periods by pricing them off the road.

This would inevitably result in those who have no option other than to start work before 9:30am, paying extra fees and charges for using the roads. Clearly this is something that needs to be considered before contemplating any form of road user pricing.

A blunt congestion charge based on time of day would also impact on those who are already 'doing the right thing' by 'trip chaining', such as dropping children at child care or school, perhaps dropping a partner at a train station, and then continuing on to work. It would also impact on those who only use a car for part of their trip, for example, to get to their local train station in order to catch a train to work, and of course impact on those for whom public transport is not an option.

The one attempt at congestion pricing to date - time of day tolling on the Sydney Harbour Bridge and Tunnel (announced as part of the NSW Government Mini-Budget in 2008 and implemented in January 2009) - continues to result in motorists paying a 33% increase in tolls on both these roads during peak periods.

Whilst it has had a positive effect on Government revenue, it appears to have had only a marginal effect on traffic, not least because:
- ► other transport improvements were not put in place before the toll increase was introduced (in stark contrast to the way the London congestion charge was introduced),
- ► the majority of private sector workers do not have flexibility to travel to and from work outside peak periods, and
- ► no corresponding price reduction was given for those who were able to shift their travel to after 9:30am - the toll simply stayed at the original price of $3.

It is also unclear what impact the Harbour Bridge and Tunnel toll increase has had on the adjacent privately owned motorways both to the north (Lane Cove Tunnel and Hills M2 Motorway) and south (Eastern Distributor and Cross City Tunnel), or on investor perception in NSW.

This is a clear case of how Sydney's roads are currently considered only as isolated links instead of being managed as a network - the need for this network and corridor based approach is an ongoing theme throughout this Decongestion Strategy.

## Impact on Business

A number of studies around the world have shown that there is a compelling link between transport and economic activity.

Congestion impacts on business include increased costs, decreased productivity, and increased working hours for many Australians.

Large cities like Sydney play a vital role in encouraging economic growth, both in the wider region and in the smaller cities within Sydney (Lucci & Hildreth, 2008) - providing there is adequate infrastructure to connect them and support this growth.

According to London First[2], transport can impact overall economic output (GDP) in two key ways:
- ► inputs used – for example, transport can increase employment from greater access to labour or the creation of new jobs, and
- ► productivity – for example, by the increased efficiency of shorter journeys or by greater labour mobility that delivers larger returns on investment in skills.

NRMA's 2011 BusinessWise[3] survey found 78 per cent of businesses believe it takes longer to get to work than it did 12 months ago. Almost half (48%) have changed staff shift times to start earlier and or finish later.

The avoidable annual cost of congestion in Australia in 2005 was $9.4 billion, of this Sydney had the highest proportion at about $3.5 billion, a figure estimated to rise to $7.8 billion by 2020 (Bureau of Transport and Regional Economics, 2007).

According to a congestion report presented over two years ago to the Council of Australian Governments, "traffic levels in our cities will increase by some 37 per cent over the next 15 years" (Competition and Regulation Working Group, 2006), and in July 2010 *The Australian* said that Prime Minister Julia Gillard had "likened traffic in Sydney's western suburbs to Los Angeles, complaining that capital city traffic congestion was costing $10bn a year." (Stutchbury, 2010).

It is clear that the number of passenger and freight trips is increasing faster than the transport network capacity (Major Cities Unit, Infrastructure Australia, 2010), and that this is a heavy burden on the Australian, and Sydney's, economy.

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[2]  London First is an influential business membership organisation with the mission to make London the best city in the world in which to do business. It undertakes research on a range of London issues, developing incisive analysis based on current data, to help shape policy affecting London business.

[3]  NRMA BusinessWise provides Roadside Assistance and motoring support to over 21,000 fleet running businesses in NSW and the ACT.

## Why Sydney's Roads Are So Important

Sydney's roads cater for ¾ of all weekday journeys - ⅔ of these are by private vehicle, 5.8% by bus, 5.2% by train, and 0.6% by bicycle.

Those responsible for keeping traffic moving appear to have a thankless task. Sydney's roads carry three quarters (74.8%) of the 15.7 million journeys made each weekday across Sydney.

Two thirds (68.3%) of weekday journeys are by private vehicle (47% as driver and 21.3% as passenger), 5.8% by bus and 0.7% by taxi (NSW Transport Data Centre, 2010). Although many trains suffer from overcrowding, trains only account for 5.2% of total journeys. Walking (18.3%), cycling (0.6%), ferry (0.2%) and 'other' (0.8%) make up the remainder of trips.

The traditional focus on the Sydney CBD, whilst important, is only one part of the overall task - none of Sydney's worst traffic snarl-ups identified in NRMA's recent 'red-flag' survey are in the CBD (NRMA Motoring & Services, 2011).

The reality is that across Sydney our ever increasing desire for mobility, coupled with a rapidly expanding population and economic growth, will place roads under even greater pressure from growing numbers of public and private vehicles.

These days it seems that everyone complains about being stuck in traffic, everyone has an opinion on what needs to be done to fix it, and it has long since ceased to be simply a peak 'hour' problem.

Large sections of Sydney's road network experience heavy traffic volumes throughout much of the day, with peak periods expanding to four hours in the morning and the same in the evening on many routes. Weekends can offer little relief, with congestion on some roads just as challenging, if not worse than on weekdays.

When a crash on the F3 or a computer failure on the M5 East motorway results in massive delays to traffic, it is a sobering reminder of just how important our roads are in keeping Sydney moving.

When a crash on the F3 or a computer failure on the M5 East motorway results in massive delays to traffic, it is a sobering reminder of just how important our roads are in keeping Sydney moving.

It is not just commuters who are impacted - more and more trucks on the roads is clear evidence of how business and freight trips now make up almost a quarter of all journeys. It is not just bulk freight or deliveries to stores either - all those online purchases of food, books, and other items have significantly increased the numbers of deliveries.

However, the main focus by Government remains on the weekday AM and PM peaks and in particular on the critical morning peak hour between 8 and 9am. This is when the consequences of something going wrong can be catastrophic. Two employees at the NSW Government's Bureau of Transport Statistics have coined the special term "super peak" to describe this critical hour (Shaz & Corpuz, 2009).

## Why Cars are Important

As already outlined, 68.3% of weekday journeys across Sydney are by private vehicle.

A recent (2010) independent Auspoll survey for NRMA of Sydney residents found that:
- ► Motor cars remain the dominant form of transport - 74% of respondents were regular users (everyday or most days)
- ► Only 13% use a vehicle less than once a week or not at all (11% stated they do not have a motor vehicle).
- ► The main reasons for using a car include shopping (93%), and seeing family (81%) and friends (81%).
- ► Just more than half of the respondents use their vehicle to commute to work (54%) and 38% to take children to school.
- ► Only 19% of respondents were regular public transport users and 43% only used public transport a few times a year or not at all.
- ► The vast majority of respondents never use a bicycle. Only 6% were regular bike riders (at least once a week), with the main reason given for using a bicycle being for fitness or recreation.

The survey results also show that large numbers of people use their cars for trips that may not be well suited to public transport, for example, buying the weekly groceries and other purchases.

Even those electing to not own a car and instead use one of the car-share companies operating in the city are likely to be adding to congestion when they do drive on roads.

Encouraging people to use alternative modes of transport instead of the car, along with other initiatives such as travel plans for work places are all important tools to manage congestion, improve individual health and the environment. But so far public transport and other modes have not been able to get close to offering the same flexibility and level of personal comfort.

## How Bad is Congestion Getting?

Only the public seem to know how bad congestion is getting across Sydney. The RTA only collects travel time data on a few select roads, and has not published traffic volume data for the Sydney region since 2005 (Roads and Traffic Authority, 2008; Roads and Traffic Authority CEO, 2009).

# 1 A Renewed Focus on Managing Traffic by the new Integrated Transport Authority and the RTA

Over time, we seem to have come to accept that congestion is getting worse, without questioning whether those responsible for managing traffic and transport can do better.

Put simply, the road network largely operates by itself on a day to day basis - although this in no way means we are getting the most out of the roads.

Imagine what could be achieved if we managed the road network efficiently.

Imagine what could be achieved if we managed the road network efficiently.

## Key Findings

### There is no overall Government Policy or Strategy for Managing Sydney's Traffic

► Responsibility for traffic management within the RTA is fragmented and is split between staff in the RTA's corporate head office in North Sydney, staff at the RTA's Sydney Regional office in Parramatta and staff at Transport Management Centre (TMC) in Eveleigh.

The seven toll road operators and the operator of the M5 East motorway add another level of complexity to this structure.

Responsibility for the operational side of managing traffic is now split between the RTA and the TMC.

► RTA staff tend to be organised into discreet sections focussed on particular subjects, as opposed to working in multidisciplinary teams with responsibility for all traffic issues along a road corridor. Examples include traffic management, congestion management (pinch points), bus network efficiency, motorway operations, and network operations (traffic lights).

Efficient traffic management, however, requires roads to be managed as a network and is not conducive to a 'silo' approach.

*Solutions:*

*The new Integrated Transport Authority and the RTA should develop and adopt clear policies and strategies that recognise both the importance of keeping Sydney's roads moving and the importance of cars in the road network.*

*Refocus RTA resources to deliver on this strategy. Decide which transport mode(s) should have priority on which routes and at what time of day.*

*Develop teams to manage road corridors, along with clearly defined performance measures. This will help to ensure that major roads are operating to their full potential.*

*Appoint an influential new anti-congestion Director with the vision and accountability for reducing congestion on Sydney's major road network. Support this person with the necessary powers and resources to make a positive difference to Sydney's traffic.*

*Work with Local Government to identify the most congested locations on the local feeder road network and adopt a program to improve their operation.*

*Work with Local Government to ensure that Council's do not reduce the capacity of the feeder road network. Where changes are desirable to improve streetscape or to improve conditions for walking and cycling, alternatives should be provided to ensure there is no net loss of capacity.*

Appoint an influential new anti-congestion Director with the vision and accountability for reducing congestion on Sydney's major road network.

### Manage the Traffic at Weekends

► There is currently a very minimal focus on managing weekend congestion, even though weekend congestion in many parts of Sydney is now similar to that experienced on weekdays.

► RTA traffic engineers are not rostered to work either at weekends or at night and this, combined with a serious lack of traffic data, means that the RTA has only a very limited picture of what is actually happening on Sydney's roads.

The RTA has only a very limited picture of what is actually happening on Sydney's roads.

► The RTA's 'Pinch Point' strategy only targets what it terms 'peak hour traffic hot spots' (Roads and Traffic Authority, 2010).

► A recent Auspoll survey of Sydney residents undertaken for NRMA shows that even more people use their cars to go shopping and to visit family and friends than those who commute. Addressing weekend congestion would help to facilitate the high concentration of these trips at weekends.

*Solutions:*

*Commit to and implement a new focus dedicated to getting the most out of the road network, including a major new focus on managing weekend and motorway traffic.*

*Adopt a clear strategy for managing weekend congestion, including data collection and performance monitoring, and provide opportunities for traffic engineers to experience weekend traffic and develop solutions.*

## Managing Traffic for High Profile Events and Unplanned Incidents

Every day traffic management tends to take a back seat to managing traffic for high profile events - such as the V8 supercar event at Homebush and the Breakfast on the Bridge event.

► All these events require a high level of resourcing, particularly by the Transport Management Centre. In particular, it redirects traffic light staff away from managing the day to day operations of the road network.

► The focus the RTA places on managing incidents is reflected in the nine initiatives it has implemented for Parramatta Road as part of its 'Pinch Point' program - six new CCTV cameras, two relocated cameras, and one new electronic variable message sign.

The RTA lists all nine as being for 'incident management' - none are aimed specifically at improving the day to day operation of this key arterial road. There appears to be no strategy to address the bottleneck caused by on-street parking at places like Five Dock, for instance.

There have been no new initiatives, such as installing advance queue detectors to help the computerised traffic light system and its operators determine how much traffic is waiting at or approaching an intersection.

The camera images are only available for viewing by staff in the RTA's Transport Management Centre - traffic management staff in the RTA's Sydney regional office at Parramatta do not have access to the camera images.

*Solutions:*

*Provide a new focus on every day traffic management, backed up with performance requirements. Whilst managing incidents will continue to be important, this solution will avoid any tendency to overly focus on planned and unplanned incidents to the detriment of day to day traffic management.*

*Foster and reward ideas for innovative and smarter ways of managing traffic - encourage staff to 'think outside the square'. This will also help to assist the RTA to reinvent itself in the eyes of the public. A specific performance measure is required to encourage staff to develop new*

*ideas and new ways of doing things to improve the RTA and assist its customers.*

*Improve the communication between the Transport Management Centre and the RTA regional offices. At a basic level, provide all traffic management and road safety staff with access to CCTV camera images and also with access to electronic diagrams of intersection layouts and traffic light phasing via the RTA's computerised traffic light program - SCATS - to enable staff to view the current intersection layout.*

## Traffic Management is not sufficiently resourced for either the Department of Transport or its agency, the RTA, to take a more proactive role in managing traffic.

There are only 15 people in the RTA responsible for operating the entire network of over 4,000 traffic lights across the State, making it an impossible task for the RTA to actively manage these lights.

► There are only 15 people in the RTA responsible for operating the entire network of over 4,000 traffic lights across the State. The reality is that this makes it an impossible task for the RTA to actively manage these lights, and the operation is largely left to the RTA's computerised traffic light system 'SCATS'. [See Item 3 of this Decongestion Strategy for more recommendations on this issue].

► Much of the RTA's focus in recent years has shifted from managing traffic to a renewed focus on road safety, particularly 'speed', as a result of the RTA setting up the NSW Centre for Road Safety. This Decongestion Strategy highlights how improving traffic management can also improve road safety.

► The RTA's traffic management section at Parramatta has a number of dedicated and experienced staff but lacks the strategy, control, and resources to enable it to fulfil a pro-active role in managing traffic. A number of experienced staff have retired or will retire shortly.

► For too long the RTA has been a net exporter of traffic management skills. Those with the right traffic management skills and who want to work for the RTA have been increasingly hard to find. Unfortunately this means the RTA has often had to take what it has been given when recruiting. Skill levels in general have decreased as experienced staff have retired, but also due to staff becoming disillusioned with the lack of organisational vision, moving to the private sector, and due to the difficulties with finding the right staff. There are also many examples within the RTA and TMC where skills, experience, and remuneration are not matched to the task.

► Having said this, in spite of the problems the RTA faces, there are still people within the RTA who retain considerable skills and experience and remain committed to working for the organisation and the people of NSW.

More resources need to be allocated to traffic management and to developing and sharing skills and experience. This is a particular concern given that many experienced operators are reaching retirement age - nearly 25% of the RTA workforce is expected to retire in the next five years.

**The RTA does not appear to have a solution to the immediate issue of how to source enough experienced staff to manage the complex traffic light network.**

The RTA has tried to address this problem by putting in place its 'Knowledge Continuity' project and running mentoring programs to help capture and pass on the skills and knowledge of mature workers. However, some key areas of the RTA are struggling to find the right people with the right skills.

► Currently the RTA does not appear to have a solution to the immediate issue of how to source enough experienced staff to manage the complex traffic light network - particularly to the degree envisaged in Part 3 of this Decongestion Strategy if we are going to aim to get the most out of the road network.

**The RTA's 'pinch point' strategy does not target some of western Sydney's busiest roads, such as Pennant Hills Road, James Rouse Drive, or Silverwater Road.**

► It is difficult for the RTA to be proactive in terms of traffic management since resources are largely tied up in managing individual traffic issues, including assessing and responding to political requests, and liaison with local government on what often amount to relatively minor localised traffic issues.

► The RTA's 'pinch point' strategy does not target some of western Sydney's busiest roads, such as Pennant Hills Road, James Ruse Drive, or Silverwater Road. At this stage it is unclear if or when these roads will be targeted since there has been no commitment to extend the strategy or funding beyond its current five year term.

*Solutions:*

*Appoint someone with the vision to assess current skills, experience and resources within the RTA and match these with the task of keeping Sydney moving.*

*Adopt a strategic network and corridor based response to managing traffic to capture network wide benefits instead of the limited benefits from applying piecemeal solutions.*

*Adopt outcome focussed performance measures for managing the road network to enable the RTA to demonstrate to motorists how it is performing.*

*Set clear objectives for the network and monitor performance against them.*

**Appoint someone with the vision to assess current skills, experience, and resources within the RTA and match these with the task of keeping Sydney moving.**

*Consolidate traffic management and congestion management into a single section, along with allocated traffic light staff.*

*Target for recruitment those experienced RTA staff who have made the move to the private sector. These staff would be able to 'hit the ground running', would retain considerable knowledge of the RTA, and will have developed useful private sector skills including innovation, quickly identifying solutions and delivering projects on time and on budget.*

*Target for recruitment those who have contributed to the success of major transport agencies overseas, such as Transport for London, and those with other relevant national or international experience.*

*Commit to an ongoing 'pinch point' program to enable major roads such as Pennant Hills Road, James Ruse Drive, and Silverwater Road to be targeted for improvement.*

*Remove responsibility for speed cameras, road user behaviour, and education from the RTA to allow it to focus on the things it is historically good at – such as building and managing road infrastructure.*

**Remove responsibility for speed cameras, road user behaviour, and education from the RTA to allow it to focus on the things it is historically good at – such as building and managing road infrastructure.**

*It is no secret that the RTA name has become synonymous with speed cameras and this has taken much of the focus away from the positive work RTA staff are doing in the community, which is resented by many staff.*

*In Victoria, the Transport Accident Commission has been particularly successful in changing the behaviour of road users, the Justice Department is responsible for speed cameras, whilst VicRoads has been able to get on with the task of managing the road network.*

# 2 Manage the Motorways

Sydney's freeways and toll roads are the most critical components of Sydney's road network, carrying hundreds of thousands of vehicles a day.

> When a crash on the F3 Freeway or a computer failure on the M5 East Motorway paralyses large parts of Sydney, we are quickly reminded just how important the motorways are in keeping Sydney moving.

Considering the high costs involved in building Sydney's motorway network, and the cost to motorists in terms of tolls, delays, and fuel costs, it would make sense to ensure that traffic using them is properly managed.

Whilst motorways are statistically the safest roads on which to travel, many of Sydney's motorways were built years ago, well before the advent of safety features such as wire rope crash barriers and high tech line markings that are able to function at night and in the wet. They also had to contend with much lower traffic volumes than we experience today.

In 2010, NRMA highlighted how traffic jams on busy motorways can build at the rate of 1.5km a minute, and how 'shock waves' can travel for many kilometres back along a road causing 'phantom queues' where traffic slows or even stops for no apparent reason.

On a busy motorway, sometimes all it takes for these phantom queues to develop is for someone to merge incorrectly or to touch their brakes, causing those behind to also react and brake and setting off a domino effect. NRMA's studies also show that the busier Sydney's motorways get, the more crashes occur.

Victoria is leading the world in actively managing motorways through an integrated application of measures, ranging from real time traffic information to ramp signals, to properly manage traffic flow.

## Key Findings

### There is nobody within the RTA who appears to be accountable for managing the motorways efficiently

> There is nobody within the RTA who appears to be accountable for managing the motorways efficiently.

► The critically important motorway network suffers from the fragmented nature of managing traffic within the RTA. Importantly, there does not appear to be anyone with specific accountability for evaluating and managing motorway traffic and safety performance.

► The operational aspects of Sydney's toll roads are managed by RTA contract managers, as opposed to being managed by traffic and road safety specialists.

► This fragmentation of responsibilities may help to explain why so many of the issues identified in NRMA's 2010 motorway merging audit have remained undetected or unaddressed for so long, and why basic but critical safety features, such as line markings, are allowed to fall into such disrepair on certain motorways[4]. It may also explain why motorway management in Sydney has fallen so far behind best practice - as is clear when compared with Melbourne's M1 Motorway.

### Solutions

*A change in management philosophy is required to actively manage the motorways and to ensure they are operated as a network. We need to get away from the prevailing attitude that once a road is built, it will pretty much look after itself.*

*Consider recruiting external motorway management expertise to help demonstrate what is possible, achieve the required change in the way motorways are managed and make a positive difference to motorists travel.*

> We need to get away from the prevailing attitude that once a road is built, it will pretty much look after itself.

### Up to 25% of the capacity of our motorways is lost in peak periods due to the motorways being unmanaged or only partly managed

► A COAG review of Traffic Management Systems for Australian Urban Freeways in 2006 found that Australian urban freeways are often able to carry much less traffic than many overseas (up to 25% less) due to the way they are managed (ARRB Consulting and SJ Wright & Associates, 2006).

► The review outlines how there has been a 'Big Shift' towards proactive freeway management in Europe and the United States that has focussed considerably more attention on making the best use of the existing freeway infrastructure.

► The review outlines how the use of internationally proven traffic management tools and strategies could

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4   NRMA's recent audit of motorway merge points showed how problems at merges is the cause of significant traffic congestion and safety issues on the Sydney motorway network. The audit identified a high level of inconsistency in the signs and line markings at merge points along with obscured signs and poor delineation of line markings across both motorways and toll roads. Almost three quarters (73%) of the lanes had signs that were incorrect, inconsistent with other merges, poorly located or simply missing altogether. It also found almost one-quarter (22%) of merge lanes were too short. The M5 East's outbound on-ramp from Marsh Street (where two lanes merge to one lane before merging again with the already congested lanes in the tunnel) was singled out in the audit as a major problem. The resultant queue in the PM peak now not only impacts on traffic operations at the nearby international airport terminal, but is now also impacting 4km away at Sydney's domestic airport terminal.

recover much of this capacity and ensure that it remains 'locked in'. This would be extremely beneficial for Sydney's motorists.

► The RTA's current spending on motorways is focused on high-cost engineering works (widening M2/M5 toll roads, planning for new links) with the balance of funding going on maintenance.

► The RTA's main operational focus for motorways since the Transport Management Centre came into operation in 1999 has been on managing incidents such as crashes and breakdowns[5]. This is also the same focus the RTA places on the operational management of private toll roads. Only 20% of delays on busy motorways are caused by these types of incidents.

► Figures for the M4 motorway show that far from actively managing the motorway using automatic traffic speed, volume and incident detectors, the RTA instead has to rely on calls from the public to alert it to 42% of incidents (New South Wales' Transport Management Centre, 2005). It is unclear how many of these calls are made using hands free devices.

► Very limited priority is being given to improving the actual operational efficiency of motorways.

*Solution:*

> The RTA does not collect, use, or make available much of the necessary data to determine how the road network is actually performing.

*Embrace the 'Big Shift' proactive approach to motorway management and create a motorways management team with direct responsibility for getting the most out of the motorway and surrounding arterial road network.*

## Adopt specific performance measures for motorways

► An NRMA Freedom of Information request to the RTA revealed that the M5 East motorway was closed 72 times for planned maintenance and 45 times for unscheduled maintenance between July 2009 and July 2010 - refer to the case study "The Impact of M5 East Motorway Closures" at the back of this document. Clearly there are some major issues to be resolved on this motorway.

► The RTA does not collect, use, or make available much of the necessary data to determine how the road network is performing, or to evaluate the effect of its actions. The RTA's 2010 Annual Report acknowledges that the RTA only collects "some motorway data".

► Information made available to the public is closely controlled. For example, the latest traffic volume data for Sydney on the RTA's website remains as 2005 data (as at March 2011) (Roads and Traffic Authority, 2008). This is in spite of a commitment to NRMA to provide 2007 and 2008 data by the end of August 2009 (Roads and Traffic Authority CEO, 2009).

► This makes it almost impossible to scrutinize issues such as:
  ► the effect of time of day tolling charges on the Sydney Harbour Bridge and Tunnel,
  ► trends on other roads across Sydney,
  ► the impact of the Global Financial Crisis, and
  ► the effect of high petrol prices.
  ► the effect of new toll roads, such as the Cross City and Lane Cove tunnels, and the Westlink M7.

► In comparison, toll road companies typically report traffic volumes to shareholders on a quarterly basis (until recently, Lane Cove Tunnel volumes were reported monthly).

► The COAG review states that "In the absence of effective traffic data gathering systems, traffic authorities [in Australia] have difficulty setting realistic performance targets and have minimal awareness of what is happening on their freeways. As a result, freeway congestion has largely remained unnoticed and untreated, because it has become part of the accepted, daily traffic environment".

> Freeway congestion has largely remained unnoticed and untreated, because it has become part of the accepted, daily traffic environment.

*Solutions:*

*Adopt implicit performance measures for freeways and toll roads, as well as for key arterial roads.*

*Undertake much more thorough traffic data collection and analysis to get much more intelligence on how the motorways are operating both historically and in real time, proactively use this data to identify issues, implement an effective response and to advise motorists.*

*For example, the Transport Management Centre should identify unusual delays on motorways and actively manage the motorways to reduce these delays.*

*We would like the TMC to carry out a managed motorway project using the M4 Motorway to show how traffic can be kept moving on Sydney's motorways.*

Two case studies on the Eastern Distributor and the M5 East motorways are included at the end of this strategy.

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[5] NRMA highlighted in Item 1 of this Decongestion Strategy that much of the RTA's focus is on managing high profile events and other incidents. The COAG review highlights how the huge increase in capacity related congestion on motorways means that incidents probably account for little more than 20% of all current congestion. This means that 80% of congestion is caused by other factors that remain largely unaddressed.

# 3 Optimise the Operation of the Traffic Light Network

Poor traffic light operation has a very visible impact on congestion.

There is a strong case for trying to manage these delays and improve travel time reliability for road users. Increased travel time and frustration can impact on road safety, mean less time with family and friends, cost motorists more through increased fuel consumption and impact on the environment through increased vehicle emissions.

> Whether the focus is cars, buses, trucks, motorbikes, or bicycles, efficiently managing traffic lights is critical to managing Sydney's traffic.

Whether the focus is cars, buses, trucks, motorbikes, pedestrians, or bicycles, efficiently managing traffic lights is critical to managing Sydney's traffic.

As highlighted in Item 1 of this Decongestion Strategy, every day traffic management tends to take a back seat to managing traffic for high profile events - such as the V8 supercar event at Homebush and the Breakfast on the [Harbour] Bridge event.

All these events require traffic light staff to be redirected away from managing the day to day operations of the road network.

This Decongestion Strategy outlines how to improve the traffic lights by:

► Re-allocating resources within the Transport Management Centre - more sustained resources must be devoted to traffic lights and to the professionals who design, operate and maintain them.

► Providing training - Well-trained traffic management staff are required and in particular, traffic light technicians are needed to properly operate and maintain the traffic lights and to make the most of the investment in the traffic light infrastructure and the RTA's computerised traffic light system – 'SCATS'.

► Invest in new technology - make wise investments in traffic light controllers to enable Sydney to keep moving when there is a power cut or emergency and in wireless detectors to enable traffic to be detected.

► Adopting performance measures for the RTA road network.

## Key Findings

**The RTA is not in a position to proactively manage the 4000 traffic lights across NSW with the current level of resources**

The first section of this Decongestion Strategy called for a renewed focus on managing traffic within the RTA.

It highlighted how there are only 15 people in the RTA responsible for operating the entire network of 2800 traffic lights across Sydney and the 4000 traffic lights in total across NSW.

> There are only 15 people in the RTA responsible for operating the entire network of 2,800 traffic lights across Sydney and the 4,000 traffic lights in total across NSW.
> In comparison, the RTA now has 11 *policy* staff in its head office working on sustainable transport.

In comparison, the RTA now has 11 policy staff in its head office working on sustainable transport - this does not include the operational staff responsible for putting this policy into practice.

The reality is that this team of 15 people (no matter how dedicated) would have an impossible task if the RTA was to move to actively managing traffic lights across the road network.

The ever increasing numbers of traffic lights, combined with staff resourcing issues, means that traffic light staff are by necessity increasingly having to operate in a reactive 'fire fighting' mode. As a consequence, traffic light operation is largely left to the RTA's computerised traffic light system 'SCATS' (Sydney Co-ordinated Adaptive Traffic System).

Although SCATS is often promoted as being hi-tech, it is certainly not a 'fit and forget' option. Manual supervision and intervention is still very much required if the traffic lights are to be operated efficiently. Without proper staffing and training, the RTA will be unable to exploit the real potential from the SCATS computer system.

SCATS is only as good as the information that it is given - if it does not know how much traffic is waiting in the queue, then it has no way of knowing how much 'green light time' to allocate to each leg or traffic movement at an intersection.

### Solutions

*Additional traffic light staff are needed, with the necessary experience and knowledge to provide more coverage of the road network, to be more hands on and to deliver on this Decongestion Strategy.*

*We recommend:*
► *As a matter of urgency, recruit experienced operators to make up for the immediate shortfall due to the impending retirement of senior traffic light staff (and in sufficient time to enable an effective handover).*
► *Source an additional five traffic light technicians over the next 12 months.*
► *Source an additional five staff over the next four years (to ensure that staff with the right skills and experience can be obtained (and avoid any pressure to settle for second best).*
► *Increasing traffic light staff coverage of the road network to 16 hours per day, 7 days per week.*

**The same resourcing issues are impacting on regional areas.**

The majority of traffic lights across regional NSW are currently managed from Sydney. This means that staff must travel from Sydney to really appreciate the local traffic issues.

> Traffic lights in regional centres such as Wollongong, Parkes, Wagga Wagga, and Grafton, and also the growing Northern region of New South Wales, including Coffs Harbour, Tweed Heads, Kempsey, Macksville, Tamworth, and Armidale, are all managed from Sydney.

*Solution:*

*Recruit regional traffic light staff to manage traffic lights in the regions.*

**Cost savings can be found from within the RTA's Transport Management Centre**

We believe that remuneration should be aligned to skills, experience and performance and that there is a strong case to rationalise positions and functions within the TMC to find cost savings that can then be redirected towards managing traffic.

The RTA does not need more people, but a rearrangement of resources - as was highlighted in the first section of this Decongestion Strategy - 'A renewed focus on managing traffic within the RTA'.

> There is a strong case to rationalise positions and functions within the TMC to find cost savings that can then be redirected towards managing traffic.

We also believe that the Transport Management Centre needs to reprioritise traffic management to enable it to properly fulfil its stated function of monitoring and managing the RTA road network 24 hours a day, seven days a week (Roads and Traffic Authority).

Since the Olympics the RTA has recruited a highly remunerated team of incident planners, many of whose experience is in managing planned incidents such as parades, running and cycling races. This experience is not particularly suited to responding quickly and decisively to operational issues, or to unplanned events.

We believe that operational staff within the RTA should have the necessary skills and experience and also be given the opportunity, perhaps through a regular rotation, to work across the board on traffic management issues, whether this be on day to day traffic management issues, planned or unplanned events.

In effect it is all 'traffic management' and this approach would ensure staff are recruited and retained with the appropriate skills and experience and would help to break down the current 'silos' within the RTA.

*Solutions*

*Reassess current skills, experience and remuneration within the TMC to identify cost savings and skills gaps.*

*Rotate staff to enable traffic management skills and experience to be fully utilised across the RTA and to ensure remuneration is properly aligned to skills, experience, tasks and performance.*

**The RTA will be unable to reduce delays and improve travel time reliability at a network level without finding a solution to the impending loss of traffic management and traffic light staff.**

> The RTA will be unable to reduce delays and improve travel time reliability at a network level without finding a solution to the impending loss of traffic staff.

Already this year, two of the 15 traffic light staff have been seconded to Brisbane to help advise the City Council on traffic light operations following the Council's recent purchase of a SCATS system from the RTA.

Unfortunately for the RTA and Sydney's road users, things are about to get a whole lot worse since the RTA's traffic light manager along with three of the most experienced traffic light staff (two in Sydney and one in Hunter region) are retiring this year.

To make matters even more challenging, there does not appear to be an easy quick fix to this problem. Unfortunately, more staff cannot simply be recruited from elsewhere within the RTA, or from the private sector, since those with the skills to manage the complex SCATS system are few and far between.

There is no single training course that can teach people to manage traffic lights. This means the skills need to be acquired over time. In some countries, such as the UK, traffic light operations have largely been contracted out to the private sector. The problem for NSW is that very few people in the private sector in Australia have detailed experience with the RTA's traffic light system – 'SCATS' – although it is used extensively overseas.

In the meantime, more and more traffic lights are being installed.

Both New Zealand and Tasmania have recently recruited traffic light staff from overseas, but in general English speaking overseas staff are typically not trained in using SCATS – the UK, for example, uses a very different computer model called SCOOT. The RTA is not alone in finding that Sydney's high cost of living can make it difficult to compete for staff compared with other States and Territories or other countries such as New Zealand.

## Reinvest in traffic light infrastructure

Given the staff resourcing constraints for managing traffic lights within the RTA, it is imperative that the RTA's computerised traffic light system, SCATS, has access to the best information to enable it to manage the lights.

The RTA's SCATS computer system has a number of blind spots that could be fixed by the installation of new wireless detectors towards the rear of left and right turn bays, and in advance of intersections. This would enable SCATS to detect how much traffic is waiting on each approach to an intersection and can significantly improve the operation of the intersection.

Currently, detectors are normally placed immediately behind the Stop line at the intersection (visible as a rectangular outline cut into the road surface). SCATS has no way of knowing how much traffic is waiting on each approach to the intersection – it is unable to differentiate between one car waiting at the Stop line or the ten cars queued behind. For this reason, SCATS tends to be backwards looking, basing its decisions on what it believes was the traffic demand over the last few traffic light cycles.

Advance queue detectors, using new wireless technology, would enable SCATS to count how much traffic has entered a right turn bay, for instance, and then to allocate the appropriate amount of 'green' light time to clear the bay, or to allocate more time if available during the next traffic light cycle. This would help to avoid the problem of traffic queuing out of a left or right turn bay and blocking through traffic.

Installing new 'PUFFIN' pedestrian crossings (pedestrian user-friendly intelligent crossing), enabling SCATS to detect when pedestrians are waiting to cross the road, can reduce delays for pedestrians and motorists, and also improve safety by reducing jaywalking.

### Solution:

*Install advance queue detectors using wireless technology on the approach to all intersections on the RTA's principle traffic routes and at other key intersections to help the RTA to manage the traffic demands.*

*Install PUFFIN pedestrian crossings at mid-block traffic light crossings across Sydney.*

## It should no longer be accepted that traffic lights on key routes are blacked out whenever the electricity goes out

It should no longer be accepted that traffic lights on key routes are blacked out whenever the electricity goes out.

Each set of traffic lights has what is termed a traffic light 'controller' to manage the timings for the lights. This determines how much green, amber and red light time will be provided to each approach to the intersection.

When the link between the controller and the traffic lights is lost the lights flash amber. When the power is cut the lights are blacked out. A major power blackout, such as across the Sydney CBD, quickly results in traffic gridlock that will impact on emergency response times and stretches police and RTA resources to the limit.

Many traffic light controllers in NSW have reached the end of their design life and are due for renewal.

Traffic light controllers with an uninterruptable power supply (UPS) are now available in Australia but have yet to be adopted by the RTA. The controllers work by having back up batteries and are able to continue functioning for a number of hours until the power can be restored.

### Solutions

*Install traffic light controllers with an uninterruptable power supply to enable traffic lights to continue to function along all principle traffic routes (such as Parramatta Road, Pacific Highway, and Hume Highway) and key detour routes around Sydney's road tunnels (such as Forest Road and Stoney Creek Road).*

*Install traffic light controllers with UPS in Sydney CBD and other critical locations.*

*Consider linking CCTV cameras and the public address system to this same UPS. This would enable the TMC to maintain remote vision of critical intersections and enable Sydney's Emergency Management System (loudspeakers etc) to continue to function in the event of a power outage in the CBD.*

# 4 Quick Clearance of Traffic Incidents

Traffic incidents, such as accidents, have been estimated to account for as much as 30% of traffic congestion and delay. This helps to explain the RTA's focus on managing incidents.

NRMA also plays a key role in keeping traffic moving around Sydney by responding to incidents such as breakdowns. Even a broken down car parked by the side of the road can impact on the capacity of the road by as much as 200 vehicles per hour (Charles, 2007). Obviously if a vehicle is blocking a traffic lane the impact is even greater.

Clearing incidents rapidly is crucial to managing congestion, reducing the likelihood of further crashes and keeping emergency workers and motorists safe.

The importance of quickly clearing incidents is also shown by the $3.6 million cost borne by the community as a result of the protracted closure of the F3 freeway in April 2010 (based on a figure of $2000 per minute per closed lane (Clennell & Noone, 2010)).

> Too many traffic incidents across NSW are not being managed effectively and in doing so are unnecessarily delaying motorists.

► The recent increases in salary awarded to select TMC staff to align them with the new Department of Transport structure appear to be an unforeseen consequence of the recommendation by the F3 Moroney Inquiry for the TMC to report to Transport NSW (now Department of Transport) - particularly when these have been awarded to senior staff who were responsible for managing traffic on the day of the F3 incident (and subsequent incidents such as the F3 issue on 26 March outlined above). Other key staff have not benefited in the same way.

## Key Findings

**Too many traffic incidents across NSW are not being managed effectively and in doing so are unnecessarily delaying motorists.**

► $28M of public money has been invested in new incident response infrastructure for the F3 (Transport NSW, 2010), but the way that incidents are managed continues to be a major cause for concern.

► All too often, there appears to be no sense of urgency in keeping traffic moving (West, 2010).

► It is simply not acceptable that it should take 18 hours to remove a section of concrete that fell off the back of a truck on the F3 freeway on 26 March 2011 (the day of the NSW State election), or for this to escalate to the point of requiring the costly traffic contraflow system to be put in place.

► This incident is believed to have commenced at approximately 3am and was not resolved until 9pm. There has been no explanation as to why the incident took so long to clear, and no public apology to motorists.

► Having said this, there are numerous examples of where incidents are managed very well, but these tend not to make the headlines and tend to be dealt with by experienced Traffic Commanders on the ground, as opposed to involving multiple levels of management.

► This serves to highlight the diverse range of personalities, skills and experience within the RTA. Salary and/or position are not reliable indicators of how incidents will be managed.



Figure 2: Examples of apologies given to London train commuters.
Source: Annie Mole, Going Underground, http://london-underground.blogspot.com/

*Solutions*

*Review skills, experience and remuneration within the Transport Management Centre.*

*Implement a detailed evaluation of team and individual performance and a proper evaluation of all significant incidents to ensure there is effective accountability, lessons are learnt and mistakes are not repeated.*

*We encourage the new NSW Government to ensure that key agency staff acknowledge when incidents could have been managed more effectively, and where appropriate, apologise to transport users.*

> Ensure that key agency staff acknowledge when incidents could have been managed more effectively, and where appropriate, apologise to transport users.

## The performance target for clearing traffic incidents adopted in the NSW State Plan is nowhere near stringent enough

► Today we continue to accept roads being closed for longer than is necessary. Whenever there is a lengthy road closure, the price for road incidents not being effectively managed is borne by the road users on the day.

► The former General Manager of the RTA's Transport Management Centre argues that road based 'emergencies' do not need to last for many hours, we make them do so.

► He contends that once the immediate threat to life, property or the environment passes we can essentially deal with the consequences so as to minimise the disruption to the community. The recovery of vehicles, the clean up and investigations whilst important and sometimes sensitive, become of secondary importance as traffic and transport are restored.[6]

► The NSW State Plan Performance Report from November 2010 (for the period July 2009 to June 2010) states that the RTA cleared traffic incidents within 31.5 minutes on average. This is almost 25% better than the target of 40 minutes set out in the State Plan.

► Since this performance target is being comfortably met and traffic incidents such as accidents and breakdowns account for as much as 30% of traffic congestion and delay (Charles, 2007), it appears that the State Plan target should be amended. Importantly, the current target provides no direct incentive to drive innovations and efficiencies in managing traffic incidents (in conjunction with the emergency services and others such as crane or tow-truck operators).

► By adopting only an 'average' performance target in the State Plan, it masks issues such as the 12 hour delay experienced by motorists on the day of the F3 freeway incident in April 2010.

► It is unclear what the Transport Management Centre has learnt and applied from this incident. The recent F3 incident involving a concrete beam falling off the back

By adopting only an 'average' performance target in the State Plan, it masks issues such as the 12 hour delay experienced by motorists on the day of the F3 Freeway incident in April 2010.

of a truck that started at 3am on the day of the NSW election, required a contra-flow to be put in place for traffic, and took 18 hours to resolve. In this instance there appears to have been no immediate threat to life or the environment – it was simply a large piece of concrete.

► The current performance measures do not reflect the benefits expected from the recent $3 million upgrade of the Transport Management Centre, or the $28 million investment in infrastructure to manage incidents on the F3.

### *Solutions*

*We encourage the NSW Government to:*

*Adopt for the first time a maximum target time of 3 hours to clear major traffic incidents in Sydney.*

*Amend the State Plan to reduce the target time for clearing road traffic incidents in Sydney to 25 minutes.*

*Adopt for the first time a target time for clearing general incidents on key regional roads, such as the Pacific, Hume, Newell, and Princes Highways, and to also adopt a maximum target time for clearing major incidents on these roads.*

We encourage the NSW Government to adopt for the first time a maximum target time of three hours to clear major traffic incidents in Sydney.

*Changes to these performance measures will help drive efficiencies and innovative responses to incidents by the RTA and TMC, in conjunction with the emergency services.*

*Increasing accountability will help avoid the possibility of incidents, such as that on the F3 in April 2010, to escalate to a 12 hour closure of the freeway.*

*Install Global Positioning Systems (GPS) in all incident response vehicles to help effectively manage resources, and provide a more effective response to incidents, including hot-spots (NRMA's own patrol vans incorporate GPS for these reasons).*

### Get more from road incident information

Road incident information is a very valuable resource that is currently not well managed.

For example, the Transport Management Centre (TMC) does not routinely collate information either on the location or type of incidents (Roads and Traffic Authority CEO, 2009). This severely limits its ability to identify 'hot-spots' and to prioritise resources where they are most needed.[7]

If the TMC was to identify those locations where vehicles are routinely parking in clearways then it could direct tow

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[6]   Advice provided to NRMA Motoring & Services by the former General Manager, NSW Roads and Traffic Authority Transport Management Centre (TMC), Mr Charles Casuscelli. As the TMC's Project Director, he was responsible for the building and commissioning of the new facility. As its inaugural General Manager, he was responsible for the delivery of a range of road transport operations services, including incident management across NSW, for the period 1997 to 2001 (encompassing the Sydney Olympic Games in 2000).

[7]   The RTA response to an NRMA request for incident data stated that "The RTA does not as a normal function aggregate the data in the form the NRMA is seeking, and to do so would require substantial effort. However, the RTA can provide the incident data requested at a cost of $3,500. It is estimated to take up to one month for this data to be collated and verified."

trucks to patrol these locations. This data could also be used to highlight where clearway signs and markings need to be improved to deter illegal parking from taking place – this would proactively reduce congestion and improve road safety.

*Solutions*

*Implement a database of road incident information to enable congestion 'hotspots' and trends to be identified and acted upon.*

*Deploy TMC resources not on geographical areas but instead focused on congestion areas or on particular problem areas and continually evaluate the effect of these actions.*

## Keep the Sydney CBD Moving



Figure 3: Example of queuing across new yellow markings at George/Hunter Streets, Sydney CBD.
Source: NRMA Motoring & Services 2011

As roads become more congested so does frustration, and the instances of vehicles blocking intersections also increases. This makes it impossible to operate the traffic lights efficiently and can also be dangerous, particularly for vulnerable road users such as pedestrians and cyclists.

The TMC has over 700 closed circuit television (CCTV) cameras across NSW to help it manage incidents and monitor traffic flows.

However, its 'Live Traffic' website gives access to only four CCTV cameras near the CBD. Surprisingly, the RTA does not have a camera at the critical York/Margaret Street intersection at Wynyard to help it manage traffic around the York Street bus/rail interchange.

The City of Sydney now has a network of over 80 'Street Safety' cameras positioned across Central Sydney, including one at York/Margaret Street, that are monitored 24 hours a day by security personnel in a control centre at Sydney Town Hall (City of Sydney, 2011). Unfortunately the RTA does not have access to these cameras to assist it in remotely managing traffic and also pedestrian crossings in the CBD, although the RTA does exchange images with the Sydney Harbour Foreshore Authority during major events.

NRMA made a number of recommendations to improve accessibility for all road users in our submission to the Premier's CBD Mobility Forum in 2008 (NRMA Motoring & Services, 2008).



Figure 4: RTA cleaning traffic light lanterns at Wynyard
Source: Mark Wolstenholme, NRMA Motoring & Services

We highlighted how pedestrian priority at traffic lights could be improved at certain intersections, such as Margaret and York Streets, particularly outside the AM and PM peak periods. We pointed out that this would assist movement around the city during the day, improve amenity by removing pedestrian frustration and improve safety by discouraging jaywalking. The same issues remain today.

The RTA has recently adopted NRMA's recommendation to install yellow markings at key intersections to deter traffic from queuing across intersections.

But the RTA has yet to adopt our recommendation to back up the markings with both a high profile public education campaign and with a visible police presence. Without these, the markings are unlikely to have any lasting benefit.



Figure 5: Picture showing a vehicle parked on footpath on York Street and workers changing an advertising sign during the AM peak at Wynyard transport interchange, 15 March 2011
Source: Mark Wolstenholme, NRMA Motoring & Services

Figures 4 and 5 are examples of how maintenance work can contribute to congestion and delay. They represent examples of how we need to be much smarter in the way we manage existing infrastructure and avoid maintenance work during peak hours wherever possible.

Figure 4 shows the RTA cleaning traffic light lanterns at Wynyard in the CBD during the critical AM peak, and Figure 5 illustrates how closing half the footpath at Wynyard bus

interchange in the AM peak should be an act of last resort. A vehicle was parked on the footpath at the main passenger drop off zone in York Street at Wynyard along with half the footpath cordoned off, to enable a new advertisement to be installed into the side of a bus shelter.

> Establish a specialist Police and TMC Traffic Incident Flying Sqaud to respond to incidents and abnormal road conditions in the CBD.

*Solutions*

*We encourage the Department of Transport and the RTA to:*

► *Establish a specialist Police and TMC Traffic Incident flying squad to respond to incidents and abnormal road conditions in the CBD, including enhanced clearway obstruction removal and clearing intersections blocked by traffic.*

► *Implement a marketing campaign to explain what the yellow markings at junctions are meant to achieve, and to back this up with an ongoing visible police presence.*

► *Explore the possibility (with the appropriate privacy safeguards in place) for the TMC to obtain images from certain City of Sydney's Street Safety Cameras (similar to the arrangement between the RTA and the Sydney Harbour Foreshore Authority.*

   *Shared access would be very useful during peak traffic periods at certain CBD intersections. For example, if the RTA was to obtain camera images from the City of Sydney camera installed at the corner of York and Margaret Streets, it would significantly improve the RTA's capability to manage this key intersection and the large numbers of bus, car and pedestrian movements at Wynyard.*

   *This would also help to avoid any duplication of resources through both agencies having to install cameras.*

► *Review provisions for loading / unloading in the CBD and tackle CBD hotspots.*

► *Minimise non-urgent maintenance workk during peak traffic periods.*

# 5 Give Motorists Reliable and Up to Date Travel Information

The public's confidence in the ability of the Transport Management Centre (TMC) to manage incidents was shaken by the events that led to the 12 hour closure of the F3 Freeway in April 2010 that subsequently led to the Moroney Inquiry.

Traditionally, motorists in NSW have only been given limited access to journey planning tools for checking travel conditions. Sydney continues to lag behind Melbourne in this respect where motorists have had access to travel time information via roadside signs for years.

> The public's confidence in the ability of the Transport Management Centre (TMC) to manage incidents was shaken by the events that led to the 12 hour closure of the F3 Freeway in April 2010.

There are real opportunities to provide much more relevant information to users of the transport network. This can help people and companies to make informed decisions that can reduce travel times and improve travel time reliability, reduce congestion and reduce vehicle emissions.

The NRMA continues to advocate for the TMC to provide travel time information in real time so motorists can see how long a trip will take, whether there are any delays on a particular route, and whether they should re-route, delay their trip or even use another mode of travel.

Recently there have been some positive signs of change, such as the announcement that the RTA will now report quarterly travel times (but still not real time information) on 100 roads across Sydney, instead of the usual seven roads.

There has also been the travel time pilot on the F3 freeway (now to be expanded to the M4 and M7 motorways by the end of 2011 (The Hon David Borger MP, Minister for Roads,

2011)), but this will still only be for three roads and motorists are still not able to view this information on the RTA's 'Live Traffic' website. This means the RTA is missing much of its potential target audience.

Unfortunately, it took yet another major incident on the F3 freeway for the RTA to embrace a new customer focus and adopt some of NRMA's recommendations on how to provide better information to motorists. In spite of this, the RTA has so far refused NRMA's recommendation to make the most of the opportunities from the M2 motorway upgrade (now under construction) to provide travel time information to motorists.

No commitment or timetable has been provided to extend travel time information to other roads, or to provide historical information to assist motorists with journey planning.

## Key Findings

**NRMA urges the Department of Transport and the RTA to manage the major roads, including Sydney's toll roads, as an integrated network, instead of as discreet links**

The Transport Management Centre needs to become much more proactive in the way it manages incidents and in collating and sharing information with motorists.

The TMC now has a number of tools at its disposal for communicating information on traffic problems in real time, including via an extensive network of over 200 electronic variable message signs and via its 'Live Traffic' website (Roads and Traffic Authority, 2010).

Whether these will help avoid a repeat of incidents, such as the 12 hour delays experienced by motorists on the F3 following a truck collision in April 2010, and a number of similar incidents on the F3 Freeway in 2008 and 2009, and again on 31 August 2010, will depend on how effectively they are managed.
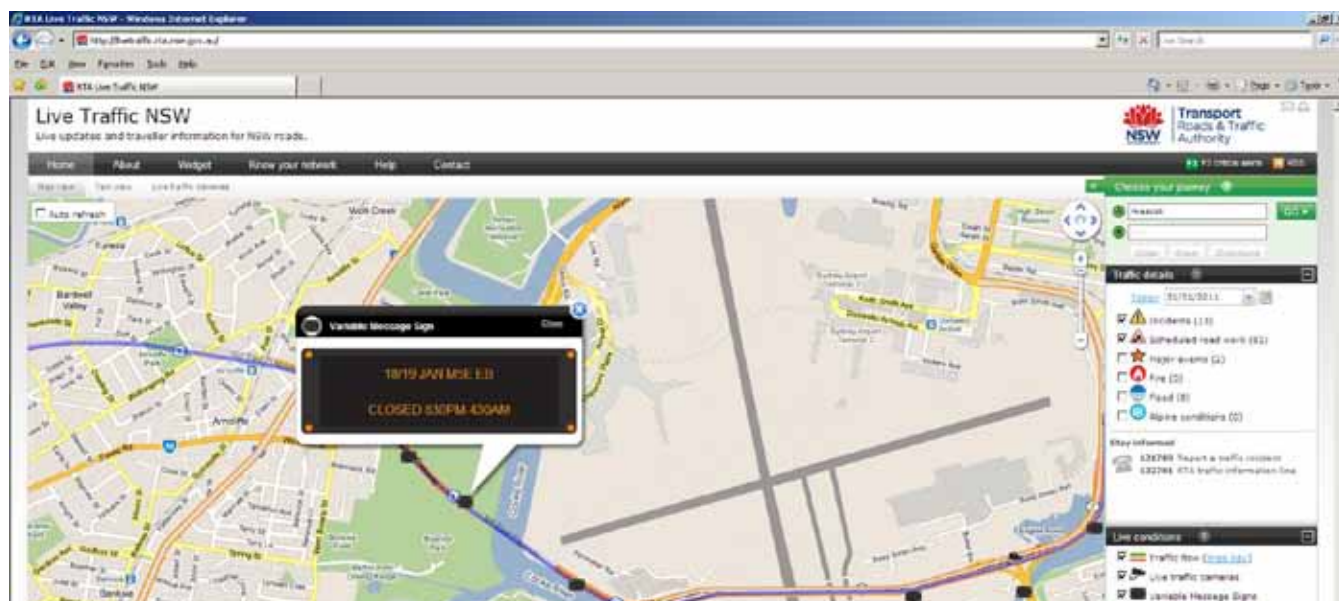


Figure 6: The need for the TMC to provide motorists with credible, reliable information is highlighted by this screenshot taken from the TMC's Live Traffic website on 31 January 2011 showing information still being displayed for 18/19 January 2011.

## Provide real world information to travellers in real time

The day to day information that is useful to travellers includes:

► How long will my trip take?
► Will it take longer today than yesterday?
► Are there any issues such as crashes or breakdowns affecting my route?
► How does my route compare with an alternative route?

Recent evidence suggests the RTA is making a concerted effort to be more responsive to the community at a corporate strategic level, but there remain some basic issues that still need to be addressed at an operational level.

For example, the F3 freeway travel time information trial must be extended to other roads such as the Pacific Highway through North Sydney and Pennant Hills Road if the intention is to inform motorists of problems and enable them to divert well before they reach the F3.

The provision of travel time, congestion and incident information to mobile phones, via the web and via variable message signs are all extremely valuable ways for the TMC to communicate with motorists. It would enable motorists to make informed decisions that can help to reduce travel times but also importantly improve travel time reliability, as well as reduce congestion and vehicle emissions.

In contrast to the current information made available to motorists on the TMC's Live Traffic website, the UK's Highways Agency provides much more comprehensive information on its website, including length of delays (hours / minutes), and expected time until normal traffic conditions can be expected.

The TMC states that the best way to provide advice to motorists is via their car radio (Transport Management Centre, 2005). There is real potential to provide more information via the internet and radio to transport users of the road, train, ferry and light rail networks, even before commuters have left home or work.

### Solutions

*We call upon the Department of Transport to adopt a similar philosophy to that employed by the UK Highways Agency:*

> *"The Highways Agency is dedicated to making your journey as smooth as possible. Where delays occur, planned or otherwise, we want to get you the information you need as quickly and easily as possible, to help you make informed decisions about your travel plans".*

*We urge the TMC to extend its pilot of travel time information for the F3 Freeway to cover all major routes, including toll roads, without further delay, and to include 7 day / 24 hour historical and predictive information to assist with journey planning (NSW Government, 2010 and (Roads and Traffic Authority, 2011).*

*Explore the possibility of the Department of Transport having a dedicated traffic and transport radio channel that gives much more frequent updates than that provided by current radio stations.*

*Explore the opportunities for real time downloads*

*increasingly available on the most popular GPS navigation systems.*

*We call upon the TMC to proactively use the network of electronic variable message signs at its disposal along with other technology such as the radio rebroadcast system that enables road tunnel operators to override the light on your car radio to communicate traffic and safety issues to motorists.*

*Fix the problems with the Live Traffic website. The website has been criticised for being slow, unresponsive and out of date[8]. Provide information similar to that provided on the UK Highways Agency website.*

*We call upon the TMC to provide a new service to motorists in the form of a twice daily free email notification of traffic information on particular routes to help with journey planning – similar to that available from the UK Highways Agency (Highways Agency, 2011).*

*We would like the RTA to use mobile phone probe data or to set up a network of electronic tag readers on key routes across Sydney, and potentially extended to the Central Coast, Wollongong and to key regional routes (similar to the technology adopted by the RTA for the F3 freeway travel time pilot).*

*For the first time this would enable the Integrated Transport Authority and RTA to really start to understand the demand for travel, for example, where people are going from and to, when and how much traffic. They would provide the Government with useful traffic data all day, every day, instead of having to rely on census data and the occasional travel survey.*

*This would also enable the RTA to make a fundamental change by providing motorists with travel time information. It would ensure that travel time information is not just limited to providing information on 100 roads, four times a year as announced by the previous NSW Government in February 2011.*

*Using tag readers would be a smart way for the NSW Government to leverage off the RTA's existing 1.2 million tags in circulation, at a cost of just $3,000 per reader.*

## Provide historical travel time information to assist with journey planning

Historical travel time information can be useful for people who may be unfamiliar with travelling a route during peak hours, for example, those using the F3 freeway to head to the Central Coast for a weekend break, or the M5 to head to tourist destinations such as the Southern Highlands or the snow.

If the TMC was to provide historical information, it could be used to demonstrate that a two hour trip by road between Sydney and the Central Coast in the evening peak can be reduced to a 1 hour 15 minutes trip if a motorist was to leave by 4.30pm or after 6.30pm.

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8   On 31 January 2011 the information on the Live Traffic website showed the electronic variable message signs around the M5 East as displaying 'M5 East closed 9pm - 5am 18/19 January'. Not only is this information out of date, but the actual signs around the motorway were not displaying this information at this time.

*We call upon the TMC to provide links to historical traffic information from its Live Traffic website to help people plan their journeys in advance. Historical information can help to encourage a proportion of people to adjust their departure times to avoid congestion, helping to reduce delays across the road network.*

> We call on the TMC to provide a free mobile phone application to enable live traffic feeds to be accessed via mobile phone.

## Enable real time traffic information to be accessed via mobile telephones

More than eight months after the September 2010 announcement of the TMC's Live Traffic website (The Hon David Borger MP, Minister for Roads, 2010), traffic information still cannot be accessed via mobile phones.

NRMA's submission to the F3 Freeway Inquiry into the 12 hour closure of the F3 in April 2010 highlighted how the provision of travel time, congestion and incident information to mobile phones would be an extremely valuable way for the TMC to communicate with motorists before they even commence their trip (with the appropriate warnings given to remind motorists not to use mobile phones whilst driving[9]) (NRMA Motoring & Services, 2010).

*Solution:*

*We call on the TMC to provide a free mobile phone application to enable live traffic feeds to be accessed via mobile phones.*



Figure 7: Example of a variable message sign on Marsh Street near Sydney's International Airport terminal. Electronic signs such as this should be proactively used to warn motorists of issues on the Eastern Distributor and the Harbour Bridge and Tunnel.
Source: Google Maps, 2011.

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[9]  The free Live Traffic Info mobile phone application produced by the UK's Highway Agency advises 'Remember NEVER use your mobile phone while driving!' and the words 'Do Not Use Your Mobile While Driving' are permanently displayed in red on the screen.

## Make more effective use of electronic Variable Message Signs (VMS)

One consequence of the roads being managed as isolated links, instead of as a network, is that the VMS are not being used effectively.

The problems highlighted in the case study on the Eastern Distributor closure at the end of this Decongestion Strategy are not limited to this road but are typical of the way that traffic is managed on the surrounding road network.

There is an undue focus within the Transport Management Centre on creating incident response plans, just in case an incident arises, instead of making sure the correct protocols are in place to manage the roads as a network.

All too often, VMS are not being used effectively, for example, VMS on motorways routinely cause unnecessary distractions by displaying generic messages that have no relevance to motorway driving. These include messages advising motorists that school zone hours are in operation, or to watch out for turning trucks at intersections.

Motorists have become so used to the generic messages that the RTA uses flashing lights on the signs to alert motorists of real incidents and the Sydney Harbour Tunnel operator has been forced to go one step further and by installing a flashing border around its VMS.

Too many VMS are located where motorists have already committed to using a particular road and other signs are simply not there. For example:
► If VMS were installed on Fairford Road in advance of the M5 motorway, motorists would be able to both avoid congestion, and avoid adding to queues.
► In Sydney's CBD motorists attempting to access the Eastern Distributor tunnel from Macquarie Street to head south are given no advance warning in the CBD of any traffic issues that exist either in the tunnel or further to the south. Since motorists are not given any prior warning, they are likely to have contributed to congestion in the CBD in attempting to access this point.

*Solutions*

*Undertake an audit of VMS locations and ensure that all new VMS are positioned to enable a driver to read, understand and react to a message in advance of major decision points such as motorway entry ramps.*

*Undertake a review of the effectiveness of the TMC's Incident Planning Unit to plan for incidents, including its ability to consider the roads as a network.*

*Restrict the use of generic messages on VMS where they may cause an unnecessary distraction, particularly those positioned on high speed motorways.*

*Introduce a positive aspect to VMS messages, for example, "Please get home safely tonight" could be displayed when it is raining- a refreshing alternative to the standard stock of overwhelmingly negative messages – 'Bus lanes in operation – fines apply for illegal use', 'Report traffic incidents 131700' [how about saying please instead?].*

*Review the frequency, duration and impact of M5 east motorway closures on traffic and the community to minimise adverse impacts.*

*Adopt a system to proactively advise trucking and taxi companies of road closures and evaluate its effectiveness.*

*Proactively use all resources, including VMS and radio rebroadcast systems in road tunnels to inform motorists.*

*Seek feedback on the effectiveness of the TMC's advice from motorists and stakeholder groups, such as NRMA, the Australian Trucking Association and the NSW Taxi Council.*

## Stop spending scarce resources on 20th Century technology

The saying "a picture tells a thousand words" is particularly relevant for traffic signs since motorists often need to recognise, process and respond quickly to information displayed on the signs. Adopting electronic variable message signs (VMS) that are able to display pictures would be especially useful for road users who find word comprehension difficult, including people for whom English is a second language, have dyslexia, or other literacy deficiencies.

Picture VMS, such as that shown in Figure 8, are increasingly being used across Europe and the Middle East. So far, the RTA has chosen not to adopt NRMA's recommendations for picture VMS and is continuing with its traditional approach of installing text only versions.



Figure 8: Picture VMS from roadtraffic-technology.com, by SES (Securite and Signalisation) Technologies
http://www.roadtraffic-technology.com/contractors/driver_info/ses/ses3.html

### Solution:

*We call upon the RTA to adopt 21st century information systems by ensuring that all new electronic variable message signs (VMS) are capable of displaying colour picture messages in addition to the standard amber coloured text.*

## Improved transport associated with Sydney Airport

Sydney Airport is Australia's busiest airport. In 2009 the airport was used by 33.0 million passengers – an average of 90,000 passengers each day. The airport also provides more than 75,000 direct jobs and handles more than 310,000 tonnes of time sensitive airfreight.

An efficient Sydney Airport is an essential prerequisite to Sydney's continued global city status and is vitally important to the future of the state and national tourism industries (Sydney Airport, 2010 and Sydney Airport, 2009).

> It would make sense to warn travellers in advance of issues affecting the strategic transport routes and modes around Sydney Airport.

Since the airport is a large traffic generator, it would make sense to warn travellers in advance of issues affecting the strategic transport routes and modes around the airport.

### Solutions

*We call upon the Department of Transport to work with Sydney Airport Corporation Ltd to ensure that:*

► *Road traffic information for key routes radiating from the airport is given to motorists at the exits to both the International and Domestic terminals, initially by using electronic signs to provide incident and travel time information*

► *Taxi drivers are provided with easily accessible traffic information immediately prior to them exiting the holding pens at both airports*

Taking this concept one step further, airline passengers could be given travel information to enable them to decide which mode of travel to take to and from the airport, and information on flight arrivals and departures. This information could be provided both within the airport terminal and at key locations such as at Wynyard, Circular Quay, St James, Museum and Central railway stations and those along the airport line.

In 2010 VicRoads (the RTA's equivalent in Victoria) was awarded the Australian Smart Infrastructure Project Award[10] for the M1 Freeway Management System which includes travel time information. The provision of real time travel information associated with Sydney airport (possibly extended to include Sydney Port) would appear to be an ideal project for a smart infrastructure program for Sydney.

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[10]  Australian Smart Infrastructure Awards showcase innovative, technology-driven solutions to infrastructure challenges in Australia.

# 6 Promote Flexible Working Hours and Practices to Reduce Peak Congestion

Relatively small changes in travel can have a big effect on keeping Sydney moving. Imagine what could happen if we could reduce or flatten travel demand, particularly during peak periods.

A small reduction in the amount of passengers during peak hours can sometimes make the difference between being able to squeeze onto a bus or train, or not, and for some it can make getting a seat on the bus or train a real possibility.

From a motorist's perspective, relatively small reductions in car travel could help some of those commuters who have to get up at 5:30am just to 'beat the traffic' or those trying to reduce the cost of their travel by avoiding the toll hikes imposed on motorists using the Harbour Bridge and Tunnel. The challenge, as with other improvements to the transport system, often lies in how to sustain these improvements over time.

In terms of roads, as a rule of thumb, when traffic on congested roads reduces by 5%, traffic speeds increase 50% (even if this only means going from 20 to 30km/h).

> A small reduction in the amount of passengers during peak hours can sometimes make the difference between being able to squeeze onto a bus or train, or not, and for some it can make getting a seat on the bus or train a real possibility.

School holidays are an obvious example of how traffic can suddenly start flowing in the AM and PM peaks, due to a reduction of between 5 and 10% (depending on the holiday) in the volume of traffic. Of course, anyone trying to get to a shopping centre during school holidays can sometimes face a traffic nightmare, but that's a separate issue.

Conversely, traffic tends to be at its worst during "Mad March" when everyone is back at work and students are all back at schools and universities.

This section of the Decongestion Strategy outlines how adopting more flexible working hours and work practices can reduce or flatten travel demand and make a significant difference to the operation of Sydney's transport, particularly during the critical AM and PM peak periods.

## Key Findings

**If a small percentage of people could be encouraged to travel outside peak hours on a normal weekday it would make a serious dent in congestion and help to keep Sydney moving.**

▶ Rather than forcing people to pay more to travel on roads during peak times (as those in favour of congestion charging advocate), similar results can be achieved by encouraging people to travel at different times.

> If a small percentage of people could be encouraged to travel outside peak hours on a normal weekday, it would make a serious dent in congestion and help to keep Sydney moving.

▶ Reducing or flattening travel demand during peak times is a key component of this Decongestion Strategy since it means we can make much more effective use of existing transport infrastructure (roads, trains, buses etc.).

It also provides one possible remedy to the funding constraints facing the new NSW Government that continue to impact on investment in transport infrastructure - and can be achieved at minimal cost to Government.

▶ Clearly, creating incentives for those who would be willing to travel outside the traditional AM and PM peaks would not suit everybody, or all employers or occupations.

Shaz and Corpus (2009) reveal that "a higher proportion of flex-time workers are 'managers, administrators or professionals'…. conversely, a smaller proportion of flex-time workers are 'tradespeople, technicians or labourers… This implies that flexible working hours cater to certain occupations more so than others."

However, if just a small percentage of people were encouraged to start work outside the standard peak periods, such as after 9am, this would make a difference to keeping Sydney moving.

Other positive effects could include a better work / life balance, reduction in stress, reduction in the number of road crashes (and their flow on effects to other users of the road system), lower fuel consumption and improvements in air quality through reductions in vehicle emissions. The success of these depends to a varying degree on whether the benefits are able to be locked in and how quickly they are eroded over time.

▶ The RTA currently runs programs to promote the use of public transport, cycling and walking, however, whilst these are important they do not offer a real solution to those who have to drive.

As highlighted in the introduction to this Decongestion Strategy, the relatively small increases seen to date in the numbers of people cycling to and from work have largely been derived from people who previously used public transport to get to work. This can be an attractive way to reduce the pressure on the public transport system but so far appears to have had little effect on car use.

*Increase the availability of flexible working hours and promote their benefits to both the public and private sector, including the positive benefits to employers stemming from increased employee satisfaction / staff retention.*

*Increase the availability of compressed work weeks - where an employee is able to compress 10 day's work into 9, or 5 days work into 4.*

*Promote 'purchased leave' and make it easier for employees to take this leave without necessarily having to lock it in at the start of the financial year. A growing number of companies offer the opportunity to sacrifice salary in return for the equivalent number of extra weeks of leave per year*

*Promote the benefits of teleworking - working from an alternative work site or from home.*

## Why promote flexible working hours?

Flexible working hours can improve staff satisfaction, engagement and help companies to retain key knowledge and skills.

Whilst flexible working hours do not suit all employees or all occupations, if just a small percentage of people were encouraged to start work outside the critical peak times, this would make a big difference to keeping Sydney moving.

Shaz and Corpuz (2009) in their Paper 'Making a Molehill out of a Mountain – Spreading the Morning Peak with Flexible Working Hours' outline how:
► In 2007 there were 2.7 million workers in Sydney, only 3% of which had formal flexible working hours.
► Nearly half (46%) of fixed time workers are required to start work during the 'super-peak' between 8:01am and 9am
► Roughly half of flex-time workers are in government administration and defence, compared with 5% of all workers
► "A sizeable percentage (23%) are required to start in the pre-peak shoulder (7:01am - 8am) while a small proportion (5%) are required to start in the post-peak shoulder (9:01am - 10am)."

Although the concept of working flexible hours within Government is well established, there does not appear to be any explicit government policy to encourage flexi-time workers to travel outside the peaks and reduce the pressure felt by many workers to arrive by 9am.

## Why promote purchased leave and compressed work weeks?

Purchased leave schemes typically range from two to four weeks. The NSW State Government permits its employees to take up to four weeks purchased leave on top of their normal annual leave allocation (otherwise known as 48/52). A number of private companies offer similar options.

Shaz and Corpuz (2009) outline how "rather than potentially spreading the peak, compressed work weeks have the capability of reducing all commute trips by 10%-20%".

They cite research by Zhou and Winters (2008) from

Washington State and conclude that "the take-up for compressed work weeks was higher for those living further from work, thus having an even greater impact on reducing demand on the network…".

Spending hours commuting to and from work which may also necessitate getting up early / getting home late can have a big effect on someone's life and can also impact on families and friends.

As well as these social issues, reducing the amount of travel would also have economic and environmental benefits such as reduced fuel consumption.

Unfortunately, the current public transport ticketing system tends to work against the take up of compressed work weeks. Rather than being based on actual numbers of journeys, it is instead based on time (weekly, fortnightly, monthly etc.). It incorrectly assumes that everyone is travelling to the same workplace each day. Industry analysis of electronic toll tag usage reveals that this is certainly not the case.

This issue should hopefully be alleviated with the proposed Sydney integrated ticketing system which after much delay is currently scheduled to begin being rolled out on public transport in Sydney in late 2012 (Public Transport Ticketing Corporation, 2011).

## What the future holds

Changes to current work practices are inevitable and will significantly change the time, type and amount of travel that is undertaken across Sydney.

These changes are being driven by factors such as better technology, a new generation of technically savvy entrants to the workforce who are not rusted to the notion of a 9am - 5pm working day, along with issues such as sustainability through reducing travel, and reducing the cost of office space. In an era of smart phones, laptops and tablet computers, high speed broadband and free wi-fi networks, there is even less need for staff to be tied to a particular physical workplace.

For Generation Y, the concept of working 9-5 is almost entirely alien and many companies are starting to acknowledge that to attract and retain staff, they need to be flexible in when staff are required to start work. In addition, management culture is progressively changing from supervision and measuring attendance at the office to measuring output and not input – an acceptance by management of results rather than supervision.

Two Australian banks – Macquarie and the Commonwealth are pioneering this change to what has been termed activity based working (ABW). ABW is "an approach to work that does not require a traditional office, but a 'hybrid' environment' that provides a place for people with shared amenities and spaces" (Ross, undated).

It appears likely, therefore, that the future will lead to a reduction in travel to the traditional workplace, particularly during the AM and PM peak periods. This will have positive implications for managing peak period congestion.

# 7 Improve the forgotten transit lanes

Transit lanes, along with bus lanes, are important components to reliably moving people around Sydney's increasingly crowded road network.

Transit lanes (also known as T2 or T3 lanes) provide improved travel for buses, taxis and other vehicles carrying multiple occupants. They may also be used by emergency vehicles, motorcycles and bicycles.

Transit lanes enable more commuters to make use of the roads. They also help to moderate traffic growth by providing improved reliability for car sharing which in turn can encourage less single occupant vehicles, as well as reducing pollution.



Figure 9: End T2 Transit Lane Sign
Source: RTA

## Key Findings

**The transit lane network has been left largely unmanaged in recent years**

► Having once been a world leader in transit lanes, the RTA now oversees an increasingly disjointed transit lane network.
► The transit lane network and the associated signs and line markings have not been reviewed since the 2000 Olympics.
► Poor design, a lack of consistency, along with enforcement issues are impacting on their effectiveness.
► There is no mention of transit lanes in either the NSW State Plan or the Metropolitan Transport Plan, although the RTA website states the Government supports car pooling because of the environmental and community benefits.
► Neither the Department of Transport or its agency, the RTA appears to be promoting transit lanes or improving the network – this is in direct contrast to the number of bus initiatives underway.

*Having once been a world leader in transit lanes, the RTA now oversees an increasingly disjointed transit lane network.*

► The RTA's 2010 annual report shows the RTA in fact intends to reduce the length of transit lanes by 18% between 2007/08 and 2010/11.
► Often, the conversion from transit lanes to bus lanes cannot be justified in terms of the number of buses using a particular route – for example, NRMA and the community successfully challenged a proposal to replace a transit lane with a bus lane on Pittwater Road in Sydney's north last year which would have increased congestion travel time for transit vehicles and general congestion - with no real benefit for buses.
► Transit lanes are increasingly being installed in the USA and have recently been introduced into the UK to both encourage and reward car sharing.
► The only new transit lanes installed in Sydney in recent years have all been associated with toll road projects – the William Street / Kings Cross Tunnel all day transit lane above the Cross City Tunnel, the Gore Hill transit lane as part of the Lane Cove Tunnel project, and the proposed new short section of transit lane on the M2 motorway as part of the M2 upgrade.
► All of these new sections of transit lane are of limited value as they either do not form part of a transit network, or, like the William Street transit lane, are too difficult to enforce due to the frequency of side streets - motorists are legally permitted to enter the transit lane for up to 100 metres to turn into a side street.

*Solutions*

*A new approach, both to the appearance of the lanes, and to the way in which they are promoted is required if we are to start actively managing Sydney's transit lanes.*
*This will help to deter illegal usage and avoid motorists becoming immune to the same old negative messages such as "don't get busted in a bus lane – fines and demerit points apply".*

*The 'London bus lane' campaign (see Figure 10) is an example of an effective, positive campaign which could inspire a change of approach in NSW and encourage a change in motorist's behaviour.*

*Transit lanes must be considered as part of a consistent route – the T3 transit lane on Epping Road that changes to a bus lane above the Lane Cove Tunnel and then to a T2 transit lane on the Gore Hill Freeway in Sydney's north, does nothing to encourage car sharing – see case study at the end of this Decongestion Strategy.*

*Good advertising can help compliance.*

Figure 10: The 'London Bus Lane' Campaign

### How to improve the appearance of transit lanes and improve compliance

► Many transit lanes fail because the way they have been installed can make them difficult to police and also because of confusing signs and markings. In contrast, bus lanes can be painted red and enforced using automatic cameras.

► The M4 motorway transit lane that was removed last year had not been designed to enable safe police enforcement and was largely ignored by motorists.

► Widespread illegal usage of transit lanes not only erodes any benefit derived from car sharing, but also encourages noncompliance with other traffic management and safety measures across the road network.

#### Solutions

► *Road markings and signs need to be improved to encourage greater compliance and to reduce confusion about when transit lanes are in force and when motorists may enter or use lanes.*

*Just as bus lanes are highlighted in red and bicycle lanes in green, transit lanes also need a specific colour and could be highlighted by using orange (or yellow) pavement. Transit lane signs could also be positioned directly above the lane.*

*This would go a long way towards highlighting the transit lanes and people's perception of these lanes,*

*but it also needs to be backed up with education and enforcement.*

► *Improve road markings, in conjunction with an education campaign, so motorists know exactly when they can legally enter a bus or transit lane.*

*For example, if the unbroken white line separating the bus or transit lane from a normal traffic lane was changed to a broken white line for 100m prior to a major intersection, motorists would clearly be able to see where they are allowed to legally enter the lane in order to turn left at an intersection.*

*This would avoid traffic queuing out into the adjacent through lane and blocking traffic, as frequently happens on Elizabeth Street at Market Street in Sydney's CBD.*

► *Compliance could be further improved by enhanced enforcement for instance by incorporating enforcement bays where police can safely enforce the traffic rules.*

*To date, the RTA has not adopted NRMA's recommendation for an enforcement bay to be provided for the new transit lane being installed as part of the M2 motorway upgrade.*

► *Installing orange road pavement and transit lane signs positioned directly above the lane could also help in situations where enforcement bays have not been provided.*



Figure 11: Orange Road Pavement
Source: Safe T Surfaces (STS)
www.safetsurfaces.com.au



Figure 12: Yellow Road Pavement
Source: Safe T Surfaces (STS)
www.safetsurfaces.com.au



Figure 13: Green Road Pavement
Source: Safe T Surfaces (STS)
www.safetsurfaces.com.au



Figure 14: Example of painting only the start of the bus lane in red, and also painting the line separating the bus lane from the adjacent traffic lane.
Brisbane City Council has adopted this approach.
Source: Safe T Surfaces (STS) www.safetsurfaces.com.au

# 8 Remove Inaccurate Traffic Signs and Declutter the Roads

Clear and accurate traffic signs are a simple and effective way to reduce congestion.

Motorists need to be able to quickly and effortlessly read traffic signs so that they can redirect their attention back to the roadway and concentrate on driving.

All too often, the cheap and simple 'solution' to an apparent traffic problem is to install another sign.



Figure 15: Incorrect sign on the Western Distributor, northbound (towards Sydney Harbour Bridge) immediately after the Allen Street on-ramp.
Source: Mark Wolstenholme, NRMA Motoring & Services, 2011

## The Findings

Very few signs are ever removed, presumably because this would require an analysis of whether the original issue to be addressed by the sign still exists.

Our analysis has found that:

► Some signs are simply wrong
► Some signs are poorly located or are a hazard to road users
► Some signs have been superseded
► Some signs are faded and should be removed or replaced
► Some signs are too confusing

## Some signs are simply wrong

Incorrect signs can be found on some of our busiest roads – even in locations where it is critical that motorists are given the best guidance.

Figure 15 is of the Western Distributor between the Anzac and Harbour Bridges. The sign incorrectly tells motorists to move to the right hand lane to access the Harbour Bridge. Another sign incorrectly advises traffic from Allen Street to merge across two lanes of traffic from the Western Distributor (Anzac Bridge) to the right hand lane in order to access the Harbour Bridge.

All too often, the cheap and simple 'solution' to an apparent traffic problem is to install another sign.

There is in fact no need to merge at all, since the lane markings allow traffic to access the bridge from either the middle or right hand lane.

Motorists unfamiliar with this situation will needlessly change lanes and in doing so, contribute to delays and safety issues both at the merge and upstream along this strategic transport corridor. Somewhere back along the Anzac Bridge, the resultant 'shockwave' caused by this issue can cause cars, buses and trucks to grind to a halt.

This is not an isolated case, similar issues exist elsewhere on the strategic road network, for example:

► Princes Highway southbound at Acacia Road, Sutherland
► M5 motorway westbound at the toll plaza toll plaza at Hammondville
► Captain Cook Drive westbound at Taren Point Road, Taren Point

### Solutions

*Audit signs on major roads across Sydney*

*Encourage the Department of Transport and RTA staff to report issues with signs.*

*Encourage the public to report incorrect, faded, redundant or confusing signs - perhaps by means of a competition to encourage participation.*

## Some signs are too confusing

Parking signs need to be easy to read. Motorists slowing down or stopping to read a sign causes extra delays for road users.

Parking signs need to be easy to read. Motorists slowing down or stopping to read a sign cause extra delays for road users.

In Sydney's CBD, motorists can often be seen driving slowly whilst trying to decipher parking signs, or stopping traffic in order to reverse into a parking space, only to then discover that parking is prohibited between certain hours.

Often the same motorists can be spotted circulating around the CBD , adding to congestion, whilst searching for that elusive on-street parking space.

The recent introduction of the AM Clearway restrictions to the parking sign (Figure 16) has added yet another level of complexity to this sign.

The new bus zone appears to have been provided as a layover for buses - it cannot be used to pick up or set down passengers since the bus doors are on the opposite side to the footpath. But bus drivers are now unwittingly flouting the new Clearway restrictions. The removal of the No Parking area in the AM peak has meant that enforcement of the new restrictions is now working against two main groups:

► those car sharing in the AM peak and dropping off at Wynyard, and

► car passengers changing to a train or bus at Wynyard interchange.

The nearest alternative set down area is at the main bus interchange in Carrington Street – this simply adds to the existing congestion at the Wynyard bus / rail interchange.



Figure 16: How many signs is too many? Signs in York Street, outside Wynyard Railway Station, Sydney CBD.
Source: Mark Wolstenholme, NRMA Motoring & Services, 2011

### Some signs are poorly located or are a hazard to road users

Some signs always seem to get knocked over, typical examples being 'Keep Left' signs on traffic islands on local streets. When this happens the sign usually juts dangerously into the traffic lane, before eventually being removed.

Often all that is left is the dangerous sign stump and in the meantime, motorists are given no warning of the hazard the signs was supposed to protect. Eventually a vigilant member of the public may complain and the sign may get replaced, only for the whole process to start again.

When signs are hit at higher speeds the consequences can unfortunately be fatal. Over 40,000 sign posts have been installed across the UK that absorb a vehicle's energy if they get hit. We should use them here.

The standard approach in NSW is now to protect signs structures with a barrier but this adds cost, both in terms of the cost of the barrier and in widening the road



Figure 17: This photograph from the UK shows the unfortunate consequences of hitting a solid sign structure. Note the rigid crash barrier is also a hazard.
Source: Passive Safety UK, http://www.ukroads.org/passivesafety

shoulder to accommodate the barrier. In addition, the barrier itself can become a hazard – a vehicle may collide with a barrier when in fact it may have missed colliding with the sign that the barrier is meant to protect.

Wire rope barriers have around a 15% casualty rate, frangible sign posts such as the Lattix signs illustrated in the photographs so far have a 0% casualty rate. There have been over 150 reported crashes into Lattix installations around the world, resulting in zero deaths and zero serious injuries.

**When signs are hit at higher speeds the consequences can unfortunately be fatal.**



Figure 18: The first accident involving a UK-type sign post in Australia occurred when a vehicle travelling on the Kwinana Freeway south of Perth, Western Australia. No injuries were sustained in this crash.
Photo courtesy of ASP Group Pty Ltd



Figure 19: Example of Frangible sign recently installed in Victoria.
Photo courtesy of ASP Group Pty Ltd

Figure 21: To date, the Ballina bypass is the only road where these types of signs have been installed in NSW. These were installed over two years ago by the contractor building the road - Leighton Contractors.
Photo courtesy of ASP Group Pty Ltd



Figure 20: The driver of a vehicle travelling on Reservoir Rd, in a suburb of Cairns, lost control, spun and slid sideways into a Lattix sign post. No-one was injured in the accident.
Photo courtesy of ASP Group Pty Ltd

Over 40,000 sign posts have been installed across the UK that absorb a vehicle's energy if they get hit. We should use them here.

*Solutions*

*Fixing basic problems such as this would significantly reduce the number of incidents, deaths and injuries on our roads. Apart from these obvious benefits they would also help to keep traffic moving.*

*Improve safety and reduce costs on lower speed urban roads by adopting signs with flexible bases that withstand crashes.*

*Adopt signs for higher speed roads that absorb vehicle energy on impact instead of forming a solid barrier.*

## Some signs have been superseded

There are examples across the State where signs have been superseded, but no action has been taken to remove the sign.

This, along with a proliferation of other signs has led to 'sign clutter'. Apart from being an eyesore, this can have serious road safety consequences by distracting and confusing road users, as well as being a hazard for vehicles and pedestrians.

*Solutions*

*RTA and local government to undertake audits of signs to identify and remove redundant signs.*

*Rationalise signs and remove sign clutter.*



Figure 22: Redundant school sign at Bardwell Park
Source: Mark Wolstenholme, NRMA Motoring & Services, 2011

# 9 Review Parking Restrictions

The location and availability of parking is a critical part of keeping Sydney moving. All vehicle trips start and end with parking and driving around seeking out that elusive on-street parking space can be a significant contributor to general congestion.

Having said this, there are many locations where on-street parking needlessly interferes with cars, buses, trucks, motorcyclists, cyclists and pedestrians, impacting both on traffic flow and road safety.

Compared with building new roads, parking restrictions are an extremely cheap way to get more from the existing road network. The challenge when considering parking restrictions is often in maintaining acceptable access for residents and businesses.

In these situations it may be necessary to look outside the square – for example by giving something back to the local community, such as upgrading a local park – and enhancing the identity of a shopping strip, perhaps through 'Welcome to Heathcote' type gateway treatments -particularly if these encourage motorists to stop, since this can reduce any impact on local businesses. Providing clear guidance to alternative parking, or even purchasing land to offset a loss in parking may be other possibilities.

## Key Findings

> The last major review of clearways and parking on major transport routes was conducted in the lead-up to the 2000 Olympic Games. Clearly traffic patterns and demand have changed since then.

The last major review of clearways and parking on major transport routes was conducted in the lead-up to the 2000 Olympic Games. Clearly traffic patterns and demand have changed since then.

There have been no changes to Clearway restrictions since 2000, other than a few examples of weekend clearways, such as Bondi Road's weekend clearway over summer, a small section of Military Road at the top of Spit Hill and a very limited weekend clearway over summer on the Princes Highway at Heathcote.

Just one driver stopping in a clearway can quickly clog the road. Enforcement of parking restrictions on these routes needs to be fast and uncompromising.

As outlined in Section 4 of this Decongestion Strategy - 'Quick Clearance of Traffic Incidents', the RTA's Transport Management Centre does not maintain records of where vehicles can regularly be found parking contrary to the clearway or other parking restrictions.

Often the problem of vehicles parking in these locations could be easily fixed with clearer signs or road markings at a particular location, but without records to show the extent of the problem, all too often nothing is done and the problem continues.

Prior to the adoption of the Australian Road Rules in 1998, parking on main roads opposite a standard T-intersection (no traffic lights etc.) in NSW was specifically prohibited by regulations.

No evaluation appears to have been undertaken of the effect this road rule has had on traffic flow and road safety – see case study at the end of this Decongestion Strategy.

### Solutions

► *Undertake a general audit of clearways and other parking restrictions along with an assessment against current traffic flows to make parking restrictions more targeted to actual demands.*

► *Consider how to direct motorists to alternate parking arrangements on side streets or consider the provision of purpose built parking to accommodate special (and demonstrable) local needs.*

► *Seek to enhance the identity of local shopping strips where parking needs to be removed by creating a gateway effect through signs and other features that can help to differentiate the area. Invest in local community infrastructure, such as local park, particularly if these can also encourage motorists to stop and patronise local businesses.*

► *We recommend the Transport Management Centre collate, map using GPS co-ordinates and evaluate information on traffic incidents associated with parking on major roads across Sydney. This will assist in effectively managing the roads. This would require the RTA to adopt install GPS in each TMC incident response vehicle as recommended in Item 4 of this Decongestion Strategy – 'Quick clearance of traffic incidents'*

► *Undertake high profile enforcement of illegal parking within Clearways on strategic routes using easily recognisable TMC vehicles with new reflective markings.*

► *Undertake an advertising campaign similar to the London Buses campaign highlighted in Item 7 of this Decongestion Strategy to encourage motorists to think about the consequences of illegal parking.*

► *We recommend the RTA's Transport Management Centre review and establish "performance based" clearway towing contracts, including "target" removal timeframes.*

► *Revert to the position of prohibiting traffic from parking opposite T-intersections on major roads by using regulatory parking signs in all situations, except where there are extenuating local circumstances.*



Figure 23: Car parked opposite intersection, and car turning right block the road, causing major congestion in Bexley
Source: Mark Wolstenholme, NRMA Motoring & Services, 2011

# 10 Adopt Meaningful and Challenging Performance Measures

Performance measures provide an indication of the quality of service provided. They represent a useful tool by which the Government and agencies such as the RTA can communicate with the public.

It is essential that the RTA, whose performance impacts on a large sector of the NSW population, is able to recognise its accountability and mark achievements through the regular collection and reporting of relevant performance measures.

> It is essential that the RTA, whose performance impacts on a large sector of the NSW population, is able to recognise its accountability and mark achievements through the regular collection and reporting of relevant performance measures.

## Key Findings

### Adopt outcome focused performance measures

In general, NRMA believes road users are more interested in outcome as opposed to output measures.

They have little interest in how much maintenance or reconstruction expenditure has occurred on State roads per kilometre of roadway, or the change in urban traffic volume as a percentage change on the previous year (both of which are reported in the RTA's annual report (Roads and Traffic Authority, 2010)).

These can, however, be useful internal performance measures for the RTA to judge how well its own staff and programs are performing.

Motorists would certainly be interested in how long it takes the RTA to identify and fix potholes, or respond to complaints about potholes from motorists, however, this is not currently reported.

In general, however, motorists are much more interested in outcome measures such as travel time, travel time reliability and travel time predictability – in other words, how long will it take, will it take longer today than yesterday and are there any issues such as crashes or breakdowns affecting my route?

*Solutions*

*Adopt explicit outcome performance measures for managing the road network and ensure that these are not only limited to the AM and PM peak periods.*

*This would help the RTA to demonstrate its renewed commitment to its customers and how it cares about the quality of service being delivered. It could also be useful in driving and recognising innovation by RTA staff.*

*This Decongestion Strategy also outlines a number of new performance measures. If adopted, these would:*
- ► *help to facilitate the quick clearance of incidents by instilling a sense of urgency to reduce the likelihood of a recurrence of last year's 12 hour closure of the F3, or the F3 delays on the day of the NSW election*
- ► *make those in the Transport Management Centre accountable in their role of serving the public by requiring them to justify their actions (or inaction in the case of the latest F3 incident)*

*Fundamentally, they would help to keep traffic moving.*

### Respond to correspondence in a timely manner and ensure that commitments are actioned

There are positive signs that the RTA is changing its customer focus in response to the issues surrounding the 12 hour closure of the F3 freeway in April 2010.

However, underlying issues such as responding to correspondence in a timely manner remain (Jones, 2009).

RTA commitments to NRMA to provide information are often not acted upon – for example, the provision of up to date traffic volumes for the Sydney region, as part of NRMA's call for an evaluation of time of day tolling on the Harbour Bridge and Tunnel, or implementing a simple fix to a sight-distance problem on the M5 East detour route.

*Solutions*

*Adopt a central customer request management system to track and manage issues identified by RTA staff and external customers, to enable customers and staff to identify the status of requests and proposed course of action. Sutherland Shire Council has adopted this approach in Sydney's south.*

*This would assist with mainstreaming both traffic management and road safety through the RTA by helping to ensure issues are dealt with efficiently and enabling the RTA to compile data on various topical issues.*

# Case Studies

## Manage the Motorways

### Sydney Harbour Bridge – new electronic variable speed limit signs

In 2010 the RTA changed the fixed speed limit on the Harbour Bridge to a variable speed limit. In theory, these should enable the Transport Management Centre to vary the speed limit to provide the optimum speed for the conditions and to actively manage traffic flow.

Unfortunately, this opportunity has so far been lost since the speed limits are only being used to manage roadwork safety and not to actively manage traffic flow.

In fact, an even greater opportunity has been overlooked – linking the variable speed limit signs on the Harbour Bridge signs to existing signs on the Gore Hill Freeway and Lane Cove Tunnel and to extend these across both the Western and Eastern Distributor's to better manage traffic flow along these strategic corridors.

Under this scenario, there may even be an opportunity for the speed limit on the Anzac Bridge to revert back to 70km/h outside peak times by using variable speed limit signs.

### Managing Motorway Roadworks

The night time closures of Sydney's Eastern Distributor motorway for road works at the end of January 2011[11] is a clear example of how the TMC needs to change the way in which it communicates messages. The Eastern Distributor is a key strategic road route between Sydney's south, airport, port, city, east and to the north shore.

It is simply too late for the TMC to inform motorists that the road tunnel is closed when they are funnelled into Southern Cross Drive approaching the Eastern Distributor, as was identified by the NRMA in January / February 2011.

This approach does nothing to minimise traffic congestion and the associated frustration, delay and cost (including taxi fares) caused by re-routing traffic through the city. It does not have to be this way.

At the same time, electronic variable message signs on both 30th and 31 January around the M5 East motorway were either:
► blank,
► advising motorists to contact the M5 website for information on the M5 east, or
► displayed a long term message advising motorists not to queue across an intersection at Marsh Street.

On Southern Cross Drive between the Eastern Distributor and the M5 East the signs were displaying a typical generic message - 'watch out for turning trucks and buses'.

The TMC should be proactively using all of these VMS and others around the network to manage traffic and reduce delays.

If the RTA and TMC were to adopt a network wide approach to managing traffic, motorists using roads such as the M5 East, those travelling to and from the domestic and international airport, and trucks using Sydney port, can all make informed decisions.

If the TMC had provided motorists with this information, a proportion of motorists heading towards the city or across the harbour on the nights the Eastern Distributor was closed would simply have chosen to take an alternative route to avoid the extensive delays. Instead they were forced to join the queue of traffic trying to weave its way through congested CBD streets and potentially also impacting on road safety in the CBD, particularly along Oxford Street.

Discussions with taxi drivers at the Wynyard taxi rank in Carrington Street in Sydney's CBD on the night of the closure also reveal that none were aware the Eastern Distributor was closed.

## Give motorists reliable and up to date travel information

### Case study on using SMS text alerts

The SMS alert to motorists on 17 February 2011 regarding a truck crash at Wyong simply advised motorists to "Delays significant. Stay away. Delay journey". 40 minutes later the Live Traffic website was advising that all lanes were now open, but it took another 15 minutes for the same message to be communicated via SMS: "All lanes are open. Nil delays".

### The Impact of M5 East Motorway Closures

On Thursday 17 February anyone checking the 'Map view' section of the TMC's Live Traffic website for advance information on road works on the M5 East would have been advised of "eastbound lane closures" on the M5 east motorway in Sydney's south between 8:30pm and 4:30am. However, another section of the same website – the 'Text view' section – was advising "road closed in both directions".

On the same day, electronic signs around the M5 east were displaying conflicting messages – some advised the tunnel would be closed at 8:30pm and others at 9pm.

8:30pm closures are 1.5 hours earlier than the 10pm closure permitted in the Eastern Distributor outlined in the previous Case Study. No special traffic measures appear to be in place to manage the traffic diversion on the surrounding surface streets around the M5 east, or the associated noise impacts on residents through suburbs such as Kyeemagh, Brighton and Bexley. One of the regular results of the M5 east closures is a 3km queue of traffic stretching along Forest Road all the way from Bexley to the Princes Highway.

Advice provided to NRMA by the RTA shows the M5 east was closed 72 times for planned maintenance and 45 times for unscheduled maintenance in the 12 month period between July 2009 and July 2010[12].

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11    "The Eastern Distributor will be closed in the Northbound (Citybound) direction Sunday, 30th January, commences after 10pm, ends before 5am. The Eastern Distributor will be closed in both directions on Monday 31st January after 10pm, ends before 5am. (Eastern Distributor Closure Schedule, http://www.easterndistributor.com/closures.htm)

12    Roads and Traffic Authority response dated 11 October 2010 provided under *Government Information (Public Access) Act 2009* to an application made by NRMA Motoring & Services regarding the closures of the M5 East Motorway between July 2009 and July 2010.

One of NRMA's suggestions to the 2010 F3 Freeway Inquiry was that in addition to advising general motorists, the TMC should adopt a system to proactively advise trucking and taxi companies of road closures (NRMA Motoring & Services, 2010).

The motorway case studies outlined at the end of this Decongestion Strategy demonstrate how the way in which motorists are informed of motorway closures is not working and the impact on traffic is causing significant congestion, particularly when closures are allowed to commence at 8:30pm.

It again raises issues about the effectiveness of the TMC's 'planned incident unit' to fulfil the role required in this Decongestion Strategy.

## Improve the forgotten transit lanes

### A Disjointed Transit Lane Above the Lane Cove Tunnel

► The transit lane on Epping Road alongside the M2 motorway initially requires three occupants (T3), before turning into a bus lane above the Lane Cove Tunnel, then becomes a T2 lane on the Gore Hill Freeway.
► The proposed new T2 transit lane on the M2 motorway will add to this disjointed network. Poorly designed transit lanes do nothing to encourage car sharing and may even have the opposite effect.
► NRMA has demonstrated that whilst the bus lane installed on Epping Road as part of the Lane Cove Tunnel project is carrying a large volume of bus passengers from Sydney's north west, the lane is clearly not being used anywhere near its full capacity and could easily be converted to a transit lane without causing undue delays for buses.
► In fact, there is significant spare capacity in the Epping Road bus lane (above the Lane Cove Tunnel) to enable it to be converted instead to a T2 lane without adversely affecting bus operation.[13] This would enable a continuous transit link from the M2 and Epping Road to the Gore Hill Freeway.
► NRMA's recommendation to the NSW Government to negotiate for the completion of this key missing link in the transit lane network as part of the toll road operator Transurban's acquisition of the Lane Cove Tunnel and its proposed upgrade of the M2 motorway appears to have been lost. Construction has recently commenced on the M2 upgrade.

## Review parking restrictions

### Case study of parking on the M5 East detour route

The designated M5 East motorway detour route for dangerous goods vehicles includes Forest Road through Bexley. It is also a designated route for B-double trucks and the detour route for whenever the M5 east tunnel is closed.

A single vehicle parked in Forest Road opposite Westminster Street not only requires all vehicles to change lane, but also requires all traffic to come to a complete standstill when a vehicle is waiting to turn into Westminster Street. In this particular situation, ample unrestricted parking is available 20 metres away in Herbert Street.

## A renewed focus on managing traffic by the new Integrated Transport Authority and the Roads & Traffic Authority (RTA)

### The Rockdale Local Government Area

The recent road narrowing and traffic calming in New Illawarra Road at Bexley Road, Bexley North has adversely impacted not just on general traffic, but also on the new M41 high frequency Metrobus between Hurstville and Macquarie Park, and on local buses.

It has significantly lengthened the queue of traffic in New Illawarra Road and increased the traffic using the 'detour' route. In particular the volume of traffic using the Left Turn on Red from Barnsbury Grove to Bexley Road is causing delays and is likely to adversely impact on road safety at the intersection with Bexley Road. To compound the issue, poorly positioned speed humps have significantly impacted on ride quality.

Rockdale Council's traffic engineer has advised that no traffic modelling was undertaken to determine the impact of this project and that the RTA did not object since the project was not on a State road.

## The Public Transport Challenge

### The 400 Bus between Bondi Junction and Burwood

The 400 Bus via the airport could operate as a shuttle service between Rockdale bus/rail interchange instead of having to run right across some of Sydney's most congested inner suburbs. This would avoid passengers west of Rockdale being impacted by delays around the airport and also reduce the likelihood of buses all arriving bunched together, followed by long gaps resulting in passengers have to wait for long periods.

### The Inner West Busway

A consistent theme throughout this Decongestion Strategy is the need for both a network and corridor based approach to managing roads.

An example of how adopting a corridor approach could benefit bus users can be seen from the Inner West Busway project on Victoria Road. Travel times and reliability may well have improved for the 200,000 bus passengers using Victoria Road each week and this may ultimately attract more users.

But it appears that nothing has been done to address the lack of facilities at the key departure stop in Druitt Street outside the City of Sydney Council building in Sydney's CBD.

Here, thousands are still forced to stand exposed to the elements whilst waiting for a bus, due simply to the lack of a bus shelter. A bus shelter in this location would provide bus passengers with both a tangible and lasting benefit.

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[13] In May 2010, NRMA commissioned a midweek traffic survey of vehicles using Epping Road, above the Lane Cove Tunnel. The survey showed that the Epping Road bus lanes were used by 10 city bound and 6 outbound buses between 6:30 and 7am, by 53 city bound buses and 20 outbound buses between 7 and 8am, by 47 city bound and 40 outbound buses between 8 and 9am, and by 26 city bound and 38 outbound buses between 9 and 10am. In the PM peak period, the bus lanes were used by 31 city bound and 18 outbound buses between 3 and 4pm, 43 city bound and 43 outbound between 4 and 5pm, by 31 city bound and 38 outbound between 5 and 6pm, and by 20 city bound and 37 outbound buses between 6 and 7pm.

# References

ARRB Consulting and SJ Wright & Associates. (2006). *Traffic Management Systems for Australian Urban Freeways*. Council of Australian Governments - Review of Urban Congestion Trends, Impacts and Solutions.

Bureau of Transport and Regional Economics. (2007). *Estimating urban traffic and congestion cost trends for Australian cities*, Working Paper 71. Canberra: Commonwealth of Australia.

Charles, P. (2007). *Traffic Incident Management: Best Practice*. Canberra: Austroads.

City of Sydney. (2011, March 7). *Street Safety Camera Program*. Retrieved March 4, 2011, from City of Sydney: http://www.cityofsydney.nsw.gov.au/community/safety/streetsafetycameraprogram.asp#Downloads

Clennell, A., & Noone, R. (2010, September 1). Another Crash Shuts F3 Freeway and Costs $2.9m. *The Daily Telegraph*.

Competition and Regulation Working Group. (2006). *Review of Urban Congestion Trends, Impacts and Solutions*. Canberra: Council of Australian Governments.

Edwards, T., & Smith, S. (2008). *Transport Problems Facing Large Cities*. Sydney: NSW Parliamentary Library Research Service.

Highways Agency. (2011). *Traffic Information*. Retrieved from Highways Agency: http://www.highways.gov.uk/traffic/traffic.aspx

Jones, G. (2009, August 19). Quick-Write Queen puts RTA to Shame. *The Daily Telegraph*.

Mees, P., Sorupia, E., & Stone, J. (2007). *Travel to work in Australian capital cities, 1976-2006: an analysis of census data*. Melbourne: GAMUT (Australasian Centre for the Governance and Management of Urban Transport) and University of Melbourne.

NRMA Motoring & Services. (2010). *Response to the Inquiry into the Roads and Traffic Authority's Response to an Accident on the F3 near Jolls Bridge on 12 April 2010*. Sydney.

NRMA Motoring & Services. (2011). *Seeing Red on Roads*. Retrieved April 8, 2011, from NRMA Motoring & Services: http://www.mynrma.com.au/seeingred.htm

NRMA Motoring & Services. (2008). *Submission to NSW Premier's CBD Mobility Forum*. Sydney.

NSW Government. (2010, November 16). F3 Travel Time Pilot Starts Today. Retrieved March 4, 2011, from NSW Government: http://www.nsw.gov.au/news/travel-time-pilot-starts-f3-today

NSW Urban Taskforce. (2007). *What Infrastructure? A report into how infrastructure levies are crippling land release in Western Sydney*. Sydney: NSW Urban Taskforce.

Public Transport Ticketing Corporation. (2011). Retrieved April 2, 2011, from Public Transport Ticketing Corporation: http://www.pttc.nsw.gov.au

Residential Development Council. (2009, July 1). *Media Release: Sydney's population to swell 23% in next 20 years*. Retrieved April 8, 2011, from Property Council of Australia: http://www.propertyoz.com.au/rdc/Article/Resource.aspx?p=21&media=1430

Roads and Traffic Authority. (2010). *2009-10 Annual Report*. Sydney: Roads and Traffic Authority.

Roads and Traffic Authority. (2008, November 6). *Annual Average Daily Traffic (AADT) Data*. Retrieved April 4, 2011, from Roads and Traffic Authority: http://www.rta.nsw.gov.au/trafficinformation/downloads/aadtdata_dl1.html

Roads and Traffic Authority CEO. (2009, August 4). Letter to NRMA Group CEO.

Roads and Traffic Authority. (2011, March 15). *F3 Freeway Travel Time Pilot*. Retrieved April 28, 2011, from Roads and Traffic Authority: http://www.rta.nsw.gov.au/usingroads/f3_freeway/traveltime/index.html

Roads and Traffic Authority. (n.d.). *Keeping You Informed, Keeping You Moving*. Retrieved April 2, 2011, from Roads and Traffic Authority: http://www.rta.nsw.gov.au/usingroads/managingtraffic/transportmanagementcentre

Ross, P. (undated). *Activity Based Working - The Hybrid Organisation: Buildings*. London.

Shaz, K., & Corpuz, G. (2009). *Making a Molehill out of a Mountain – Spreading the Morning Peak with Flexible Working Hours*. Proceedings of the 32rd Australasian Transport Research Forum (ATRF). Auckland: ATRF.

Sinclair Knight Merz. (2008). *Public Bicycle System in Melbourne - Feasibility Study*. Melbourne: Sinclair Knight Merz.

Sydney Airport. (2010). *Factsheet: Sydney Airport - An Overview*. Sydney.

Sydney Airport. (2009). *Factsheet: Sydney Airport's Economic Impact*. Sydney.

The Hon David Borger MP, Minister for Roads. (2010, September 10). *Media Release. $3 million Digital Upgrade of Transport Management Centre and new Live Traffic Website*. Sydney.

The Hon David Borger MP, Minister for Roads. (2011, March 8). *Media Release. Travel Time Pilot to be Extended to M4 and M7*. Sydney.

Transport Data Centre. (2010). *2008/09 Household Travel Survey Summary Report, 2010 Release*. Sydney: Transport NSW.

Transport Management Centre. (2005). *Hands on Control*. Retrieved April 8, 2011, from Roads and Traffic Authority: http://www.rta.nsw.gov.au/trafficinformation/downloads/tmcbrochure.pdf

Transport NSW. (2010, August 31). *F3 Freeway - $28m Eight Point Plan Status Report*. Retrieved from Transport NSW: http://www.transport.nsw.gov.au/sites/default/files/publications/2010_08_31_f3_2008_work_statusreport_2.pdf

West, A. (2010, April 15). For Chaos Control, Try Moscow or Mumbai. *The Sydney Morning Herald*.

Zhou, L., & Winters, P. (2008). An Empirical Analysis of Compressed Workweek Choices Transportation Research Record. *Journal of the Transportation Research Board*, 2046, 61-67.