Intelligent Transport Systems
Master Plan

A strategic plan for intelligent use of technology to enable Main Roads WA’s 2020 vision of ‘Smart Roads, Safe Journeys’ delivering improved transport outcomes for all Western Australians
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Over the past five years Western Australia has experienced record population growth driven by an unprecedented investment in state infrastructure, development in the resources sector and strong economic growth.

Rapid advancements in technology are also changing the transport landscape with the resources sector now using driverless self-automated trucks, and autonomous cars being developed by manufacturers around the world. Advances in ITS (Intelligent Transport Systems) technology mean we already have vehicles that avoid collisions, park themselves and advise the driver of impending danger on our roads.

Transport will continue to play a crucial role in ensuring the strong, sustained development of our State; however, our recent successes have also highlighted new challenges. Our rapid population growth not only means more cars on our roads and an inevitable increase in congestion but also a steady increase in freight movements across the State, currently growing at 3.8 per cent per year.

Community expectations are also changing, with road users wanting more access to real-time, reliable and accurate travel information than ever before.

In response to these challenges and to better plan for the future transport capabilities of Western Australia, I was pleased to launch Main Roads’ 2020 Strategy in 2013. Our vision of ‘Smart Roads, Safe Journeys’ is at the core of everything we do ensuring an ever-present focus on road safety and the reliability of our network to encourage safe and efficient journeys for road users.

A key area of focus for the strategy is Making Technology Work for the Community which has led us, in part, to developing the Main Roads ITS Master Plan. The strategy drives us to make best use of available and emerging technology so we can optimise transport outcomes for the whole community.

We will do this through;

• investing in continual improvement for best practice road technology;
• optimising the performance of existing road assets and meeting future transport needs through the application of Intelligent Transport Systems;
• establishing a sustainable, secure and responsive Information Communication & Technology (ICT) infrastructure capable of supporting the dynamic nature of our operations now and into the future; and
• ensuring agility, integration and timeliness in adopting new technology.

I am pleased to deliver this ITS Master Plan, which is a key enabling strategic plan building upon Main Roads’ 2020 Strategy. It will help us to achieve a highly optimised and integrated state road network, enabling us to realise our ultimate vision of ‘Smart Roads, Safe Journeys’ by 2020.

Steve Troughton
Managing Director of Main Roads
1. Introduction

1.1 What are Intelligent Transport Systems?

Intelligent Transport Systems (ITS) have been in use on Western Australian roads since the introduction of traffic lights. Many people would be unaware of the electronics buried under the bitumen on our roads, or in grey boxes at intersections, which help monitor and manage traffic flows remotely through the control of traffic signals, and can be regarded as the first generation of ITS. Similarly, many people would be surprised at how long information technology has been improving and informing their rail travel.

ITS components can be grouped into three areas:

- **Intelligent infrastructure** such as traffic signals on roads, variable messaging signs to alert road users of hazards ahead and freeway ramp signals that work to keep freeways flowing;
- **Smart vehicles** such as automatic crash notification, intelligent speed assist, intelligent cruise control, reverse and forward collision warning, GPS navigational systems, and alcohol ignition interlocks; and
- **Information services** such as next-bus information on your mobile phone, in-car navigation systems receiving current traffic conditions to guide you around congestion hotspots, and the national Intelligent Access Program for trucks.

Sitting underneath these ITS applications are communication and control systems that are an essential foundation for ITS and can be the most critical, complicated and expensive component. Figure 1.1 below shows that communications technologies are an important part of connecting intelligent infrastructure, smart vehicles, information services and informed transport users.

1.2 What is an ITS Master Plan?

Main Roads has prepared this ITS Master Plan as part of its 2020 Strategy. This Master Plan sets out a strategic vision for ITS in Western Australia, focus areas for action and a high-level action plan. It will be complemented by a detailed implementation plan to be developed in early 2015. Together the Master Plan and the implementation plan will set out both the future of ITS in Western Australia and the multi-year plan for its future delivery.

1.3 ITS as an enabler

ITS is a powerful tool which will assist Main Roads and its partners to operate the road network more efficiently delivering high quality, integrated transport services to its users. ITS enables Main Roads to ‘Make Technology Work for the Community’ through better management of congestion and improved safety.

This Master Plan focuses on how ITS will enable Main Roads to undertake its core business in managing the road network, as this and not the technology itself is the ultimate objective.

It also recognises that ITS by itself is not the only solution but must be integrated as part of longer-term government strategies for development and management of the transport network to meet current and future needs for travel in Western Australia.

Figure 1.1 ITS components [1](source: VicRoads iTransport)
2. Drivers for action

2.1 International trends in ITS

Main Roads must adapt to an ever changing world to better deal with the challenges that arise and to take advantage of the opportunities that are presented. There are a number of major trends both driving and impacting on the ITS industry; these are happening not only in the large overseas markets of North America, Europe and Asia but can also be seen clearly within Australia. An overview of these trends is provided in this section, with further details available in the ITS International Trends Focus Paper, which is one of the technical reports providing more background information for this ITS Master Plan.

Changing role of a road agency

One of the most fundamental changes driving increased use of ITS has been in the role of the road agency in its provision of services to the community. Road agencies such as Main Roads were originally established to build and maintain a road network. Although some road expansion continues, over time the network has significantly matured, and the focus has shifted towards facilitating better transport use of the network (refer to Figure 2.1).

This Big Shift focusses attention onto how the community and the economy benefit from the use of the transport system and the service it provides. The attention on ‘getting more from less’ reflects the growing constraints on road development in relation to funding, availability of land and changing community expectations for sustainable growth. As congestion on Perth’s road network grows, it is even more imperative for Main Roads to focus on network operations initiatives that can deliver improved performance for all users.

Intelligent infrastructure

One of the key responses of road agencies to managing the increasing demand for road use and resulting congestion has been to actively manage the existing infrastructure to improve the productivity of the transport network.

Managed freeways (also known as managed motorways) have been implemented in Australia and internationally to get more capacity from the freeway network, particularly during times of high demand or incidents. This means moving people and goods through the network in a more efficient, safe and reliable manner. Managed freeways is a “tool kit” of traffic management and ITS, including coordinated ramp signalling, lane use management, variable speed limits, roadside traveller information and incident management systems. Main Roads’ estimates, based on Australian and international experience that managed freeways could deliver up to a 27% improvement in productivity at peak times. Significant development work has been undertaken to prepare Main Roads for successful implementation and operation of managed freeways in Perth.

Main Roads is also working to improve operation of the arterial road network, with the focus on making better use of existing traffic management tools such as traffic signals, to improve traffic and public transport efficiency and provide better access for pedestrians and cyclists.

Smarter vehicles

Vehicle technologies are rapidly improving, and this is already having a significant impact on road safety. Vehicle automation can range from a simple warning
function (such as lane departure or blind spot warnings) through to functional based warnings (such as electronic stability control, adaptive cruise control and lane keeping assistance) and right up to full self-driving automation. Electronic stability control is now a mandated requirement for all new passenger cars in Australia, and other technologies are becoming more common in newer vehicles. Vehicles are also becoming more connected to live information. Cooperative vehicles go one step further; they can communicate directly with other vehicles and roadside infrastructure to share information that facilitates more safe and efficient movement on the network.

**For Main Roads, the growth of smarter vehicles raises many questions; for example, in relation to changes in demand patterns, any retrofitting required for existing infrastructure and implications for road design and potential driver distraction.**

There are implementation challenges to cooperative ITS and the take-up may be slow without regulations to mandate its provision.

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**The growth of Big Data**

This is a trend that extends beyond transport. Data is becoming ‘bigger’ in terms of volume, variety and responsiveness. While a big opportunity, the availability of Big Data can be overwhelming for road agencies in making sure they manage and make use of it effectively. To bring benefit, Big Data must help Main Roads do something better than previously, which may require transformation of the data into valuable information and at additional cost.

Big Data can help Main Roads better understand how the transport system is currently being used, match available capacity to changing demand and manage its assets through data from the vehicles themselves.

**Increased private sector traveller information**

Traveller information is now commonly integrated with other map-based information products such as Google Maps, GPS navigation systems and logistics management and dispatch systems. The private sector is providing an ever increasing number of services to both collect and disseminate information on travel conditions to road users. This information is becoming more personalised both in its content and how it is received, and there is growing customer expectation that it will be multi-modal and delivered for an end-to-end journey.

Private traveller information services are facilitated by the move of governments across Australia towards an Open Data approach. This means that the data which the government holds is made available for community use, both to provide value-added services and to support transparency in government. Western Australia has already partnered with the private sector to provide traveller information, as exampled in Section 3; however, it is one of only two Australian states yet to have developed a formal portal for Open Data. Main Roads needs to continue to understand how to take advantage of new data sources and dissemination platforms provided by the industry, while still assuring the overall quality and integrity of the information delivered to the public on travel conditions on the road network.

**Flexible technology platforms with ongoing software updates**

Technology is advancing rapidly, giving rise to a continuous battle to avoid obsolescence. One response to this challenge has been the development of powerful multi-purpose technology platforms that are flexible and scalable to future needs. This allows ongoing updates of software to provide new and improved functionality without replacing the underlying hardware.

Example platforms include portable devices such as smartphones and tablets, as well as in-vehicle infotainment operating systems. For portable platforms, new traveller information applications can be quickly distributed to the devices via telecommunications.
This is not yet common practice for in-vehicle systems, particularly in the Australian fleet which is on average about 10 years old.

These devices can also introduce new risks such as driver distraction. However, they are now a central part of people’s lives, so government and industry must work out how to maximise benefits while addressing any risks. For ITS within its direct control, Main Roads will look to maximise leverage of its investments and facilitate efficient operations by using a flexible, scalable platform approach where appropriate. For example, through procurement of STREAMS as a network-wide traffic management control system that will be the operational interface for Main Roads ITS-related services.

2.2 Managing transport in Western Australia

Western Australia is facing significant challenges in the transport domain to maintain and improve mobility in our growing state and urban environment, and to continually improve safety for its transport users.

The Government of Western Australia and its transport portfolio agencies have prepared strategic plans to respond to those challenges. ITS will assist in responding to those transport challenges. The following sections establish the strategic context for ITS in Western Australia.

A collaborative approach

The challenges and opportunities ahead for transport in Western Australia require a collaborative approach. Since 2010, Western Australia’s three key transport agencies have been integrated into the transport portfolio under a single Director General. Within this portfolio, Main Roads is responsible for the delivery and management of a safe and efficient main road network in Western Australia. This function is complemented by the Public Transport Authority (PTA)’s responsibility for the design, construction, maintenance and operation of regional and metropolitan public transport services and the Department of Transport (DoT)’s policy, regulatory and operational functions. In addition, Main Roads supports and works in close collaboration with the local governments, who have the primary responsibility for a more extensive local road network in the state.

Although this Master Plan is Main Roads’ Master Plan for Intelligent Transport Systems, it is designed to closely reflect a context of partnerships with all the above agencies as well as other government agencies and private enterprises delivering services to transport users.

Main Roads 2020 Strategy

During 2012 and 2013, Main Roads developed a 2020 Strategy to describe the strategic direction that Main Roads will take over the following eight years. The vision of the 2020 Strategy is for ‘Smart Roads, Safe Journeys’.

There are five areas of focus in the 2020 Strategy:

- Creating value
- Making technology work for the community
- Enhancing travel wellbeing
- Ensuring future capability, and
- Building strategic value.

Technology will assist Main Roads to deliver upon all five focus areas; however, it is the area of ‘Making Technology Work for the Community’ that primarily drives the ITS Master Plan. In this area, the 2020 Strategy requires Main Roads to optimise transport outcomes for the community through the best use of available and emerging technology. Within this focus area, the 2020 Strategy sets out a number of success factors, actions and initiatives.

Success factors

- Minimise whole-of-life-cycle costs; and
- Optimise road network performance through the use of ITS services and tools consistent with DoT transport strategies and plans.

The challenges and opportunities ahead for transport in Western Australia require a collaborative approach.
Actions
- Invest in continual improvement for best practice road technology;
- Optimise the performance of existing road assets to meet both the existing and future transport needs through the application of ITS;
- Establish a sustainable, secure and responsive Information Communication & Technology (ICT) infrastructure capable of supporting the dynamic nature of our operations now and into the future; and
- Ensure agility, integration and timeliness in adopting new technology.

Initiatives
- Implement an evidence-based framework that supports a robust whole-of-life-cycle cost;
- Develop an ITS Master Plan consistent with National ITS Architecture;
- Implement an ICT Strategy and Plan to upgrade the agency infrastructure and applications; and
- Implement a funded research and development program.

Moving People Network Plan
The Department of Transport has prepared a draft Moving People Network Plan (MPNP) to set out of the management of the metropolitan transport network over the coming decades. The MPNP identifies a key role for ITS across a number of outcome areas for the safety and mobility benefits that it can provide.

The role of ITS in the Moving People Network Plan
The transport challenges in meeting forecast growth cannot solely be addressed by traditional measures. By harnessing innovative technologies in the form of ITS, new solutions can be developed in response to these challenges. Such systems have been widely accepted by the public and private sectors worldwide as the way forward in achieving the goal of sustainable mobility while at the same time improving quality of life.

Well designed and deployed ITS can enhance the safety, efficiency and reliability of travel, reduce or delay the need for costly investment in new infrastructure and deliver improved productivity for the existing transport network. ITS can help improve connectivity and accessibility of the network for its users. In relation to the goals of the MPNP, ITS can be deployed in Western Australia to:
- Improve road safety and compliance in alignment with the Austroads’ Safe Systems approach and the Towards Zero – Road Safety Strategy (2008-2020) to reduce road trauma in Western Australia by helping to prevent crashes and minimise harm when crashes occur;
- Support road network operations through proactive monitoring and control of traffic flows to achieve optimal travel conditions, as well as through rapid detection and response to incidents and congestion to minimise disruption to road users;
- Facilitate movement of people and goods by providing priority access for high-occupancy or high value transport modes such as public transport and freight;
- Improve the provision and variety of real-time traveller information services to enable informed travel choices and support road agencies in managing traffic demand; and
- Improve cross-agency collaborative working practices, data exchange and shared facilities to enable delivery of integrated multi-modal transport services and end-to-end journey planning.

Importantly, ITS is a key enabler in delivering optimal road network performance and road user orientated services.
Moving Freight Transport Network Plan
The Department of Transport is also preparing a Perth Freight Transport Network Plan to set out the strategic direction for developing and operating Western Australia’s freight transport network over the coming decades. Using ITS to get better use out of the existing network and improve freight productivity is part of this high-level strategic plan.

Freight productivity and technology
Adoption of new technologies over the coming decades will have a number of positive effects on transport productivity, safety and travel behaviour.

Managed freeways is a set of traffic management and ITS strategies which optimise transport network performance. Solutions most notably include priority lanes and coordinated ramp signals which control access onto freeways to manage traffic flow, optimise speeds and minimise congestion, without requiring significant additional road capacity which is expensive and can be difficult to achieve in urban areas.

Managed freeways can be applied to give priority to freight vehicles at selected on-ramps through by-pass lanes, which would be of particular benefit near major industrial areas.

Main Roads has already invested in the necessary ITS foundation infrastructure, such as power and telecommunications, along with traffic monitoring devices, across the freeway and highway network. It is therefore well-placed to play a lead role in the future use of managed freeways. Plans for a managed freeways program have been developed and will be rolled out as part of future network optimisation measures for the freight network when funding allows.

‘Towards Zero’ Road Safety Strategy
Western Australia’s ‘Towards Zero’ Road Safety Strategy incorporates the Safe System approach, which aims to improve road safety through four cornerstones:
- Safe road use
- Safe roads and roadsides
- Safe speeds, and
- Safe vehicles.

ITS can assist road safety in each of these four areas. The strategy was formally endorsed in 2009, and at that time identified that technology was likely to make a significant contribution to improving road safety in the future.

In the period since the publication of ‘Towards Zero’, the principles of the Safe System approach remain to guide road safety in Western Australia, and the ability of technology to support this Safe System has further improved. This ITS Master Plan therefore looks to support the Safe System approach through well targeted use of technology, including the necessary enabling actions for technologies deployed by others such as smarter vehicles.

Strategic context summary
ITS will have an important role to play right across the activities of Main Roads and the transport portfolio in responding to transport challenges facing our state over the coming decades. This ITS Master Plan, along with Network Operations Plans and the Congestion Management Program being developed for our road network, set out Main Roads’ strategic response to optimise the existing road network in facing these transport challenges.

In Main Roads’ 2020 Strategy, the ITS Master Plan is linked to ‘Making Technology Work for the Community’ strategic focus area; however, it can also assist in ‘Creating Value’ and ‘Enhance Travel Wellbeing’ strategic focus areas. The growing role of ITS makes it an important part of Main Roads’ current and future business and capability.

2.3 Making technology work for our community and maximising customer value
‘Making Technology Work for the Community’ is one of the five focus areas of Main Roads’ 2020 Strategy and is the driver for the development of this ITS Master Plan. This strategic focus area requires us to understand what it is that works for our community, and particularly for our customers. We are not alone in this need as road and transport agencies around Australia are working to better understand customers and customer value. Queensland, Victoria and South Australia have undertaken research to identify customer segments with different needs. The Customer Experience division at Transport for New South Wales is developing customer value propositions to better understand what transport users really value. In Western Australia, Main Roads has established a Customer Service Charter and Customer Service Advisory Council and regularly monitors customer satisfaction.

Combining the needs for efficient service delivery and maximising customer value will drive us towards needing to better understand what it is that our customers value and how we can focus on those activities that provide that value. The insights from customer segmentation and customer value propositions tell us that the customers have different needs and wants. Our service provision must recognise these differences, and this moves us towards needing to facilitate the provision of more personalised services, particularly in the field of traveller information. This transition to personalised services is also supported by several of the international trends in ITS, including private sector traveller information and Big Data.
2.4 Working with stakeholders

As technology and data utilised on the transport network grows more complex, so does the requirement for interaction between stakeholders and systems.

Optimal road network operations is facilitated by a whole-of-network approach, whereby all agencies with a responsibility to manage, support and enforce safe and efficient road use, work together to improve road user experience across the entire network. This means working with the Transport Portfolio as well as other organisations such as local government, public transport and freight operators, police and emergency services, and vehicle breakdown and towing services.

Improved collaboration is also a necessity to enable systems to communicate, interface and even fully integrate, as required to deliver multi-modal and joint public-private network operations services. Such services are already being trialled in Western Australia; for example, to provide public transport priority at traffic signals and to disseminate Main Roads’ real-time road and traffic condition updates to freight vehicles operating in rural and remote areas via in-vehicle telematics. The new central control system, STREAMS, will also need to interface with some legacy systems to provide a single operating platform for the Traffic Operations Centre.

Main Roads will continue to contribute to the development of a National ITS Architecture, which will go some way to ensure system interoperability. However, early engagement and collaboration with both internal and external stakeholders will always be an important part of mitigating the risk of technology projects.

Further detail regarding how Main Roads engaged with its stakeholders including government and industry in the development and implementation of this plan is provided in Section 13.

Optimal road network operations is facilitated by a whole-of-network approach, whereby all agencies with a responsibility to manage, support and enforce safe and efficient road use work together to improve road user experience across the entire network.
Main Roads developed its first ITS Strategy in 2005, which was a five-year strategy for the period 2005 – 2010. Built upon five objectives and accompanying strategies to achieve those objectives, it helped streamlining and guiding the agency’s ITS planning and implementation with a strategic focus beyond the five-year period up to now. The five objectives include:

- Timely and accurate information to road users and managers;
- Effective control and road use;
- Improved road safety, access and compliance;
- ITS capability, resources and awareness of developments; and
- Minimise risk to government.

This ITS Strategy also helped to raise awareness of the role of ITS within the agency and increase the resources available for ITS.

This ITS Master Plan maps out the strategy and provides a high-level action plan for the six-year period up to 2020 shaping an even stronger future for ITS in our state. From network-wide ITS applications to trials of new technologies, Main Roads is already utilising ITS to deliver benefits not only to those living in the Perth metropolitan area but across its regions as well. This section outlines some of the progress to date in Western Australia to help us understand where we need to get to and what we can learn from the journey so far.

3. What has Main Roads done already?

Main Roads has a designated team to maintain and optimise the performance of over 900 signalised sites, controlled by 15 regional computers and a central management computer. A recent study by Road and Maritimes Services in New South Wales demonstrates that SCATS can deliver a 28% reduction in travel times and 15% reduction in carbon dioxide emissions, when compared with a fixed-time semi-adaptive traffic control system. Working closely with SCATS developers, Main Roads continues to improve traffic signal optimisation as a key component of a Congestion Management Program.

Electronic speed limit signs at schools

The Western Australian government has committed to a $36 million program to improve road safety around schools by further rollout of electronic speed limit signs (ESLS). With 650 signs already in operation at 143 sites across the state, this will make Western Australia’s ESLS program the largest in Australia.

ESLS help improve compliance with school-zone speed limits by activating only when the reduced speed limits apply, i.e. at school opening/closing times on school days. The electronic signs reduce driver confusion as to when the lower limits apply and also attract their attention (by
the flashing annulus) to the need to reduce their speed. ESLS have also been used to implement lower speed limits in strip shopping centres to improve safety for pedestrians in a mixed traffic environment.

**Kimberley flood warning signs**

Implementing ITS in regional Western Australia is a challenge but also an opportunity to deliver significant benefits to road users. Main Roads has successfully trialled a flood warning system in the Kimberley Region in the far north of the state including variable message signs (VMS), CCTV cameras, water-level sensors and communication systems.

The north of Western Australia is characterised by remoteness, long distances, few alternative routes and major flood events, meaning that in the rainy season accurate road status information can save travellers time as well as reducing the risk of being stranded. The trial in the Kimberley Region has provided positive feedback on the effectiveness of the system in assisting with road network operations, delivering traveller information and improving customer satisfaction. Work is ongoing to assess the need for similar traveller information systems in other regions.

**Real-time traveller information at roadwork sites**

As the Western Australian government embarks on major redevelopment programs across Perth, keeping travellers informed of delays during road works is paramount to improving the management of traffic and meeting growing customer expectations. In collaboration with the private sector, Main Roads has implemented a real-time traveller information service for the Gateway WA Perth Airport and Freight Access Project to keep traffic and freight moving during the multi-stage construction process.

For this project, near real-time travel times and road condition status for specific routes in the Gateway WA project area are derived from a combination of GPS probe data and SCATS data. This information is displayed on multi-colour portable VMS with graphic display capability, which were placed at strategic locations throughout the project area and also represented on an interactive map on the project website. The service can be kept running throughout the construction period, when other technologies such as in-pavement detectors are difficult to maintain.

**Intelligent Speed Assist**

Intelligent Speed Assist (ISA) is a safety technology that alerts drivers via audio or visual warnings when they exceed the posted speed limit. A pilot project of advisory ISA was conducted in Western Australia between 2007 and 2009, which used a static database of speed zones. The trial demonstrated the utility, benefits and scalability of ISA to stakeholders and contributed to development of government systems that would be necessary for future state-wide or national implementation. The pilot project experienced some technical issues, and at the time a feasibility study of available communication technologies was unfavourable. It is considered that advances in communication technologies since that time would now mean completion of the pilot is more feasible.
Bus priority at traffic signals

PTA and Main Roads commenced a trial of a real-time tracking system on 130 Transperth buses operating from Karrinyup bus depot, in October 2012. The system allows for real-time bus service information to be made available to users of the Karrinyup bus depot’s services via Transperth’s new smartphone application and soon to be released new website. The trial includes traffic signal priority for late running buses on six intersections in Scarborough Beach Road and Cambridge Street. The traffic signal priority system is designed to communicate with the Main Roads SCATS system to provide buses that are running late with green light priority through intersections to allow them to get back on schedule. Based on the positive results of the trial, a new real-time tracking system (including traffic signal priority and other improved functionality) will be rolled out across the entire Transperth bus fleet (currently over 1,300 buses) over the next 18 months to improve bus operations and reliability.

Intelligent Access Program

The Intelligent Access Program (IAP) provides heavy vehicles with access or improved access to the road network, in return for monitoring of compliance with specific access conditions. IAP technology is used to monitor a number of vehicle parameters, including vehicle identity, position, time and speed, while also allowing the driver to make declarations that include the vehicle configuration, mass and general comments. IAP is a means of utilising existing and new technologies in dealing with Australia’s growing freight task, meeting industry demands for greater productivity and more efficient use of infrastructure, and addressing issues of community, government and industry confidence.

Western Australia currently has two vehicles under the IAP operating on an oversize road-train permit, enabling transportation of pre-constructed 4.9 metre high accommodation huts from Perth to Onslow. Further expansion of the IAP to other permit and access arrangements is currently being considered by Main Roads.
4. How can Main Roads make a difference?

Main Roads’ traditional approach to deliver transport services to the community has been to directly invest in the creation, operation and maintenance of infrastructure. Over recent years, as part of the changing role of a road authority, the approach to providing road-user services has expanded to include providing information to travellers about their journey.

The number of ways that Main Roads can act to provide transport benefits to the community is increasing in line with increased variety of ITS-enabled services and benefits. To maximise value to the community at the lowest cost, Main Roads, in developing this ITS Master Plan, has considered a range of ways in which it can make a difference.

Main Roads as an investor

The traditional role of Main Roads as an investor in transport infrastructure and related services will still remain a central and essential part of Main Roads’ business. However, increasingly some of this investment will be focused on technological solutions supported with minor road improvements for real-time monitoring and control of traffic to improve transport outcomes.

Main Roads as a regulator

Main Roads will support the portfolio and other government agencies in developing and implementing the legislative framework to support the introduction of smarter vehicles on to the Western Australian road network, as well as to continue to manage safe access to and use of the network by large freight vehicles.

Main Roads’ role will also include implementing any changes to infrastructure and asset management standards as needed to enable smarter vehicles to operate safely on existing roads and to facilitate vehicle-to-infrastructure (V2I) and vice-versa communications where they will help deliver safety and efficiency benefits.

Main Roads as an advocate, facilitator and influencer

In addition to its functions as an investor and a regulator, Main Roads can also play an important role as an advocate, facilitator and influencer. This role can take a number of forms:

- Supporting and facilitating local governments and other stakeholders that also have a role in road network operations in progressing appropriate ITS solutions, and where appropriate jointly implementing area-wide network operation planning initiatives that promote a whole-of-journey approach;
- Advocating for the adoption of new technologies, including for nationally consistent regulations that support this adoption;
- Facilitating private-sector investment that improves transport outcomes, including Main Roads’ co-investment in the necessary supporting infrastructure and information;
- Educating the public on the benefits of new safety technologies and traveller information services; and
- Leading by example, including procuring for its fleet vehicles equipped with the latest safety technologies.
5. From issues to actions: The process to develop the ITS Master Plan

Development of the ITS Master Plan commenced after the 2013 release of Main Roads’ 2020 Strategy. Within the area of ‘Making Technology Work for the Community’, the 2020 Strategy included an action to ‘Develop an ITS Master Plan consistent with the National ITS Architecture’.

Main Roads started the Master Plan development by preparing two technical reports that summarise what has been achieved to date (ITS Master Plan Discussion Paper) and the changes happening internationally that are shaping the future that this Master Plan will need to work with (ITS International Trends Focus Paper). Development of these papers included a review of approaches taken by other national and international jurisdictions towards high-level ITS planning.

At the end of February 2014, Main Roads assembled key internal stakeholders to discuss the future of ITS in Western Australia. This discussion was informed by the technical reports already prepared and focussed on identifying a vision for the future and priority actions. The outcomes of this internal stakeholder workshop fed directly into the development of the preliminary draft ITS Master Plan, contributing to both the strategic vision and the focus areas for action. A high-level action plan was also developed to show what specific actions might be required in these focus areas in order for Main Roads to progress towards the strategic vision of intelligent use of technology to improve travel for Western Australians.

The preliminary draft of the Master Plan has subsequently undergone further stages of refinement as part of a consultative process to ensure the priorities and needs of other stakeholders are considered and incorporated to the plan as appropriate.

The preliminary draft plan was discussed at a second workshop held in early May 2014. This workshop was attended by both internal and external stakeholders, including representatives from the Transport Portfolio agencies, local government and other government agencies. This workshop provided opportunity to get feedback from stakeholders on the strategic vision for ITS, focus areas for action and the high-level action plan.

An updated draft ITS Master Plan was then released via Main Roads’ website and ITS Australia website seeking industry feedback. This industry feedback was incorporated in to the final version of the ITS Master Plan as appropriate.

This ITS Master Plan will be followed with a more detailed implementation plan and business cases where new funding would be required. It will then lead to implementation of the initiatives delivering improved transport safety, efficiency, productivity and sustainability outcomes to all Western Australians in the period up to 2020.

A summary of the development process is provided in Appendix A.
6. Strategic vision for ITS

Main Roads’ vision for 2020 is ‘Smart Roads, Safe Journeys’.

The strategic vision for this ITS Master Plan is ‘Intelligent use of technology to enable Main Roads’ 2020 vision, Smart Roads- Safe Journeys, delivering improved transport outcomes for all Western Australians’.

This strategic vision for ITS identifies what travel might look like for Western Australians in 2020 and how ITS will contribute to realise this future state. It is based around three key premises explored in the development of this ITS Master Plan:

- Transport pressures will continue to grow in Western Australia.
- Some significant changes in technology are occurring as part of international trends that will influence what 2020 looks like, and
- ITS is an enabler for transport outcomes.

**What might ‘Smart Roads, Safe Journeys’ look like in 2020?**

- People and freight move more efficiently and reliably on roads that are more productive through active management
- Reduced crashes through smarter vehicles and roads
- Informed travel choices through personalised and proactive traveller information
- Reduced car dependency and higher vehicle occupancy through more flexible and varied mobility options
- Improved connectivity and cooperation between vehicles, roads and travellers

This detail on what the vision of ‘Smart Roads, Safe Journeys’ might look like in 2020 draws upon Western Australian transport strategies, the technical papers and workshop discussions. The contribution of ITS-enabled solutions and services set out below is directly linked to this vision of the future, but with greater specificity about how ITS will make a difference.

**How will ITS-enabled solutions and services contribute to this future?**

- Expand proactive management of the freeway and arterial road network to optimise performance of the existing road networks for all road users
- Aide the four corner stones of the Safe Systems approach of the ‘Towards Zero’ Strategy
- Enhance the resilience of the road transport network by improving incident management and post-incident recovery
- Provide improved and proactive real-time information to assist informed travel decisions by transport users and enhance travel wellbeing
- Support demand management by facilitating alternative transport modes and transport integration
- Accelerate adoption of increasingly automated and connected vehicles that can substantially reduce crashes and increase network capacity

In order to realise this vision of ‘Smart Roads, Safe Journeys’, Main Roads will need to continue to develop and mature its approach to ITS. A customer focus and delivery of solutions-based services that work seamlessly across transport modes from a customer perspective will form part of this approach. To support this, Main Roads will need to continue to update its capability and processes.

**What will Main Roads’ approach to ITS look like in 2020?**

- A network operator that delivers transport user focussed services and is engaged with all its customers
- A key contributor to multi-model journey management across a more integrated transport network
- An informed purchaser of ITS-enabled services with the right: people and capability; processes; procurement approaches; technology platforms; data and information; and stakeholder partnership and engagement, for optimum outcomes.
7. Focus areas for action

The focus areas for action identified in this Master Plan cover both the delivery of ITS-enabled services and solutions (external focus) and improving Main Roads’ approach to whole of ITS (internal focus).

External focus areas for action: New ITS-enabled services and solutions

Support the Congestion Management Program by implementing active management tools on freeways and arterials

Promote inter-agency collaboration and private sector investment, particularly in collection and dissemination of real-time traveller information

Encourage and facilitate adoption of smarter, safer vehicle and road technologies

It is important to note that these external focus areas are for new services and solutions; in other words, they are new priorities additional to Main Roads’ core business-as-usual activities in ITS. Two of the three action areas for new services and solutions seek to leverage investment from other than traditional government sources.

Internal focus areas for action: Efficient and effective service delivery

Identify funding opportunities and improve ITS planning and business cases to support and strengthen investment in effective and efficient ITS solutions

Review, focus and strengthen system reliability and security to ensure that our ITS works when we most need it

Reduce costs and complexity through standardisation, including supporting and adopting national standards and architectures

Review and update arrangements for ITS governance, management, procurement and operations to reflect growing and changing needs

Further develop Main Roads’ skills, resource and knowledge in identified priority areas

Collect and manage data efficiently and make it open and accessible to maximise business value

This combination of internal and external focus areas will assist Main Roads to ‘Make technology work for the community’ to deliver ‘smart roads and safe journeys’ with improved transport outcomes.
8. High-level action plan

The multi-year, high-level action plan included in Appendix B of this document is a representation of how Main Roads might move from the current state of ITS in Western Australia towards the desired vision for ‘Intelligent use of technology to enable Main Roads’ 2020 vision, Smart Roads, Safe Journeys, delivering improved transport outcomes for all Western Australians’. This action plan maps out actions against each of Main Roads’ focus areas for action identified in Section 6 of this report.

The high-level action plan will be complemented by a detailed implementation plan. This will include specific details for each action. Further information on the development of the implementation plan can be found in Section 11 of this report.

8.1 Prioritising actions

The high-level action plan includes actions that cover each of the internal and external focus areas for action. In prioritising actions for inclusion in the Master Plan, a simple prioritisation framework was used, as set out in Table 8.1 below, which considers benefits, costs and risk.

<table>
<thead>
<tr>
<th>Level of priority</th>
<th>Description</th>
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<tbody>
<tr>
<td>High priority</td>
<td>Strong benefits and low risk</td>
</tr>
<tr>
<td>Medium priority</td>
<td>Possible strong benefits, some risk and relatively lower costs</td>
</tr>
<tr>
<td>Low priority</td>
<td>Possible strong benefits, some risk and relatively higher cost</td>
</tr>
<tr>
<td>No priority</td>
<td>Limited benefits</td>
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</tbody>
</table>

Table 8.1 Prioritisation framework for ITS-enabled initiatives.

Only actions rated as high or medium have been included in the action plan. The priorities assigned in the action plan reflect the outcomes of an initial screening process; further assessment and updates may be undertaken during development of the detailed implementation plan.

8.2 Using demonstrations and pilots to manage risk

The 2020 Strategy commits Main Roads to ‘Optimise transport outcomes for the community through best use of available and emerging technology’. The inclusion of emerging technology in this commitment provides early access to benefits for Western Australian transport users but heightens the need for appropriate risk management in implementation of new ITS technologies.

One approach that will be considered in the forthcoming implementation plan to assist to manage such risks of emerging technologies is the use of demonstrations and pilots.

Demonstrations are small scale activities that allow Main Roads and the wider community to gain some exposure to emerging technologies and to learn through this exposure how to best use the technology to maximise benefits and manage risks. Demonstrations are generally undertaken in controlled environments for a limited time.

Pilots are larger in scale than demonstrations and provide an initial implementation of an emerging technology to allow for lessons to be learned before a wider rollout. Pilots are normally for an extended duration and used in real operations with transport users, thereby providing direct benefits to users during the pilot phase.

Before-and-after studies of demonstrations and pilots are needed to provide a robust evaluation of impacts and to better understand the level of benefits that can be realised by new technologies.

One approach that will be considered in the forthcoming implementation plan to assist to manage such risks of emerging technologies is the use of demonstrations and pilots.
9. Building upon success and meeting emerging needs

Section 3 of this Master Plan includes a number of case studies of successful ITS implementation in Western Australia. In some of these cases, the high-level action plan provides for a significant update to the approach used to deliver these services to account for both changing needs and emerging technology opportunities. Two of these examples are explored below.

9.1 Traveller information

During 2014, the Western Australian Government has significantly improved the information available to transport users through the launch of the Right Move Perth and Transperth apps. Both apps provide improved access to real-time information that transport users need to plan their trips and allow users to customise the app to better meet their needs.

This ITS Master Plan and its supporting technical reports have identified clear opportunities to further leverage private sector investment in improving traveller information, particularly in relation to the following aspects:

- Provide a more common user experience nationally and internationally by using established platforms to provide access to the greatest number of users;
- Go beyond intermodal information to also integrate with other aspects such as calendars to become increasingly personalised and proactive, and
- Support flexible travel options including booking and payment of demand responsive services.

Government will retain an important role in traveller information, acting as necessary to assist the market to deliver the solutions and services that users need. This involvement will include a strengthened focus on collecting and making available information to be used by innovative private sector apps. In some cases, government will continue to directly provide traveller information services to transport users, particularly where the market is not providing the desired outcomes.

9.2 Traffic signal priority

The management of traffic signals to provide safe, efficient and reliable travel for all road users will be a central part of increasingly actively managing the road network to achieve more from the existing road space.

Network operation planning recognises that it is not always possible to optimise performance for all road users at all locations at all times on the road network; instead it provides a framework for the prioritisation of different road users on different routes at different times of the day. This helps network operators understand when and where some road users should be prioritised over others and what level of priority they should be given.

The bus signal priority solution currently being trialled in Perth draws upon the available technology to improve the service received at intersections for this mode.

The need to provide priority at signalised intersections for different road users will increase over time, and is likely to extend also to light rail in the future, police and emergency services vehicles and some heavy trucks. The frequency of public transport services will also continue to increase, as will the need to provide strong levels of priority on key public transport corridors. This combination of increasing numbers of users requiring traffic signal priority and the levels of priority required will significantly complicate traffic signal operations.

Currently available technology solutions appear to be limited in their ability to achieve overall optimisation of road network performance while also catering for such frequent signal priority interventions. Additionally, as vehicle-to-infrastructure and vice versa communications becomes standard on new vehicles, many vehicles on the road will gain the ability to communicate with traffic signals to advise of their approach and to receive signal phase and timing data in response.

To meet these emerging complex challenges and to benefit from technologies still under development, the high-level action plan includes an action to investigate smarter traffic signal priority. This will assist Main Roads to build upon the success of the current bus signal priority implementation and cater for the growing demands of the future.
10. What will this Master Plan mean for our customers and stakeholders?

This ITS Master Plan sets out a range of actions for each focus area to progress Main Roads towards the vision of ‘Smart Roads, Safe Journeys’ by 2020. Most actions provide benefits for a number of customer and stakeholder groups, and this section of the report highlights some of the benefits for different customer and stakeholder groups.

An important supporting initiative for the action plan will be engagement with the community to educate road users about the use and benefits of ITS. This will help facilitate a safe and compliant behavioural response to on-road interventions and maximise the benefits that can be delivered.

10.1 Pedestrians and cyclists

In different contexts, pedestrian and cyclists are referred to as both ‘active’ road users to recognise sustainability and health benefits of their travel and as ‘vulnerable’ road users to recognise that they are not afforded the crumple zones that vehicle users benefit from. This Master Plan will support achieving the benefits of active transport while also managing the potential risks to vulnerable road users.

The vision of ‘Smart Roads, Safe Journeys’ in Main Roads’ 2020 Strategy includes both ‘flexible and tailored mobility choices’ and ‘personalised and proactive traveller information’. This pairing is enabled by an approach of leveraging private sector innovation and investment to deliver information services to users in ways that enhance benefits to those users. Together they will enhance the travel wellbeing of pedestrians and cyclists.

Some ITS initiatives are already improving safety for vulnerable road users, such as variable speed limits outside schools and in shopping centres. These will be complemented by the adoption of smarter vehicle technologies with on-board sensors increasingly seeking to detect pedestrians and cyclists as part of crash avoidance and mitigation solutions.

10.2 Public transport users

Similar to pedestrians and cyclists, public transport users benefit from the vision of ‘Smart Roads, Safe Journeys’ in 2020 of ‘flexible and tailored mobility choices’ and ‘personalised and proactive traveller information’. These are complemented by Main Roads’ approach to ITS appearing to customers as seamless, state-wide and multi-modal.

Users of on-road public transport will also benefit from arterial road operational reviews, and smarter traffic signal priority will contribute to an improved level of service for public transport, reducing travel times and improving reliability. Smarter traffic signal priority will be necessary in order to provide improved service in an environment of increasing complexity and demands, catering for the differing needs of priority users while still optimising overall performance.

10.3 Freight and logistics

Freight will move more easily and efficiently around Western Australia as the key freeways and arterial roads are optimised through active management. The focus on personalised and proactive traveller information that leverages private sector innovation and investment will assist the integration of real-time traveller information into logistics planning and management systems, not only in Perth but throughout the state.

Further expansion of the IAP and the adoption of smarter, safer vehicle and road technologies will lead to smarter trucks that are safer, and also assist the realisation of improved operating efficiencies and more efficient use of infrastructure.

10.4 Motorcyclists, car drivers and passengers

While the priority of other users has received greater recognition in recent years, a key driver of ITS is congestion management, which will benefit large numbers of motorists in Perth every day. As the key freeways and arterial roads are optimised through active management, motorists will benefit from improved travel-time reliability. Better traveller information on the causes and effects of delays will help to reduce frustration while improving route choices.

The adoption of smarter, safer vehicle and road technologies including automated vehicles and cooperative ITS will in particular help reduce the risk of road crashes. As cars become more aware of what is around them and can intervene to prevent collisions, they will provide a significant increase in protection to vulnerable road users as well as the vehicle occupants.
10.5 Operational partners

The road is also a workplace for road operation and maintenance workers, as well as operational partners such as police and other emergency services responding to incidents.

The addition of active management regimes such as managed freeways to key parts of the road network will assist to provide a safer work environment for these road workers and service personnel. Tools such as variable speed limits and lane use management systems on freeways can improve worksite safety. Priority access to and from incident locations can also be provided through these dynamic traffic management tools as well as through smarter traffic signal priority.

The move towards personalised and proactive traveller information can also assist operational partners, for example allowing for the easier integration of real-time information into despatch and tracking systems for emergency response.

10.6 ITS industry

The ITS industry already plays a leading role in many areas of ITS in Australia, for example: collecting real-time traffic condition data; providing traveller information via different platforms; vehicle automation applications; fleet management applications; vehicle safety applications; and traffic management control software.

The realisation of the vision identified in this ITS Master Plan will depend to some degree on the active participation of the Australian and international ITS industry. This Master Plan recognises that industry will have an increasing role in providing ITS-enabled benefits directly to road users in areas as ranging from traffic information to vehicle automation.

Main Roads is already working productively with a number of industry partners, and the commitment to effective and efficient ITS will mean further ongoing improvements in how Main Roads works with the ITS industry, for example:

- Supporting development and adoption of the national ITS architecture will provide greater clarity for some interoperability challenges;
- Embedding Systems Engineering approach in Main Roads’ practices will improve management of ITS throughout the lifecycle; and
- Developing a multi-year investment plan for ITS will provide greater clarity and confidence for industry to plan complementary investment.

The realisation of the vision identified in this ITS Master Plan will depend to some degree on the active participation of the Australian and international ITS industry.

10.7 The community

The community in general will benefit from the economic, environmental and societal dividends of congestion management through improved efficiency, productivity and resilience of the road network, as well as improved road safety.

On freeways, improved management of traffic flows and reduced stop-start conditions will reduce accidents as well as fuel consumption and greenhouse gas emissions. A more productive freeway and arterial road network will facilitate economic and urban growth in the metropolitan area as well as provide better transport links for economic centres in the regions that contribute to national productivity and international trade.

Better utilisation of public funds through more targeted and effective investment in ITS, and also delay or reduced scope of large capital investment as a result of potential additional operational capacity that could be realised through ITS, will also be another benefit to the community in general.

ITS enables more flexible use of the available road space, so that going forward as community priorities change the use of the road can evolve to match. The function of a road is not always just about movement, it can also function as a ‘place’ and ITS can help contribute to improved amenity and use of roads as part of public spaces. For example, by helping to slow traffic and improve pedestrian and cycling access within busy urban activity centres, as well facilitating road closures to support community events such as festivals, carnivals and sporting events.

One important community consideration is around privacy. This Master Plan identifies the benefits to be derived from sharing of data with other government agencies and the private sector as part of delivery of ITS services that facilitate improved traveller information and mobility options. However, this must be managed carefully through appropriate standards and protocols that ensure protection of personal data and mitigate any privacy risks, in alignment with government regulatory requirements.
11. Next step: Multi-year implementation plan

Following the ITS Master Plan, the next step will be the development of a multi-year implementation plan.

The implementation plan will provide a much greater level of detail around each action included in the high-level action plan, including clear statements of scope, deliverables, responsibilities, interdependencies, stakeholders and funding sources. It will also consider supporting initiatives required to facilitate effective ITS implementation, such as community education, network improvements to support ITS-enabled services and future-proofing of infrastructure projects to allow for retrofitting of ITS.

As such, the implementation plan will become a key part of transforming the vision and concepts in this Master Plan into reality.
12. Supporting technical reports

The preparation of this ITS Master Plan has drawn upon two technical reports that were developed to facilitate engagement with internal and external stakeholders and to lead into collaborative discussion sessions at the two stakeholder workshops held. These reports should be read in conjunction with the ITS Master Plan for context and more background information. A brief overview of these supporting documents is provided below.

12.2 ITS International Trends Focus Paper

This paper provides further details of the international trends identified in Section 2.1 of this document. It identifies what is happening for each trend and what it might mean to Main Roads for future development of ITS in Western Australia.

12.2 ITS Master Plan Discussion Paper

The identification and selection of initiatives that include ITS is often driven from external imperatives resulting from broader government strategies, major projects, external market dynamics and evolving technologies.

This discussion paper captures the environment in which the ITS Master Plan was developed, including the strategic context for investing in ITS, more details on examples of current ITS in Western Australia and the potential impacts of an Australian National ITS Architecture. The paper was used to initiate discussions with stakeholders around priorities, enablers and desired outcomes for ITS.
13. Acknowledgement

Main Roads acknowledge the contribution made by many agencies, both public and private, in the stakeholder consultation process to the development of this ITS Master Plan, in particular the following:

**Transport portfolio and other public sector agencies**

Department of Transport
Public Transport Authority
City of Perth
Department of Fire and Emergency Services
Fremantle Ports
St. John Ambulance
WA Police

**Industry**

AECOM
Cohda Wireless
DownerMouchel
IBM
MetroCount
Royal Automobile Club (Western Australia)
14. Contacts

If you have any feedback or questions about this ITS Master Plan, please contact:

Kamal Weeratunga
Network Operations Planning Manager
(08) 9323 4348
kamal.weeratunga@mainroads.wa.gov.au
## Appendix A  ITS Master Plan development process

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<td>Penultimate draft ITS Master Plan</td>
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Appendix B  High-level action plan

The action plan included in this appendix is in two parts:

- New ITS-enabled initiatives (externally focussed); and
- Improving Main Roads’ service delivery (internally focused).

Within each part, the actions are organised by the relevant focus area for action. For example, under Part 1 (New ITS-enabled initiatives), a list of actions is determined for each of the external focus areas outlined in Section 7. For Part 2 (Improving Main Roads’ service delivery), a list of actions is determined for each of the internal focus areas outlined in Section 7.

The action plan also identifies, for each sub-list of actions, which elements of the strategic vision in Section 6 they feed into and will contribute to the realisation of following implementation.

<table>
<thead>
<tr>
<th>External or internal focus area for action</th>
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<tbody>
<tr>
<td>Action</td>
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Contribution to achieve Strategic Vision

Figure A.1  Structure of the action plan
## Action Plan Part 1: New ITS-enabled services and solutions

Support the Congestion Management Program by implementing active management tools on freeways and arterials

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
<th>Priority</th>
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<tbody>
<tr>
<td>Implement a managed freeways pilot project</td>
<td>The first trial of active management of freeways in Western Australia. Substantial development work completed. Project will be submitted to government for funding consideration.</td>
<td>High</td>
</tr>
<tr>
<td>Implement arterial road operational reviews using a network operations planning approach</td>
<td>Arterial road operational reviews assist Main Roads to make better use of Perth’s major arterial corridors. Early results have been encouraging and show the potential to provide improved performance through low-cost improvements, including changes to traffic signal operations, minor infrastructure upgrades and behavioural change programs.</td>
<td>High</td>
</tr>
<tr>
<td>Implement multimodal priority systems for signal and lane-use operations</td>
<td>Responding to the Moving People Network Plan’s “Transpriority” (road use priority) approach requires the ability for traffic management control systems to provide priority for different user groups, while maintaining overall network optimisation. Main Roads’ systems will require development and investment to support this growing need. Current approaches are able to cater for the most immediate needs but are inadequate for future operations.</td>
<td>Medium</td>
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<tr>
<td>Explore options for use of predictive analytics and modelling to improve operations</td>
<td>Opportunity exists to implement in conjunction with traffic signal operational reviews.</td>
<td>Medium</td>
</tr>
<tr>
<td>Incorporate relevant managed freeway requirements into all freeway projects</td>
<td>Managed freeways policy, design standards and governance are being incorporated into freeway projects to achieve the appropriate level of active management for each section of network, while working towards a fully managed freeway network.</td>
<td>Medium</td>
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<tr>
<td>Develop further managed freeway proposals</td>
<td>Further proposals are being developed to use active management techniques to move more people and freight on key sections of Perth’s freeways.</td>
<td>Medium</td>
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<tr>
<td>Explore opportunities to enhance safety and efficiency of travel in remote regional areas through ITS</td>
<td>ITS can support Main Roads in detection, early warning and response to major weather events and other incidents affecting travel on its regional road network. Such systems can deliver considerable safety and efficiency benefits to customers and improve multi-agency emergency management services. For example, the flood detection and monitoring system trialled in the Kimberley Region. Other potential applications will be explored.</td>
<td>Medium</td>
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People and freight move more efficiently and reliably on roads that are more productive through active management
### Promote inter-agency collaboration and private sector investment, particularly in collection and dissemination of real-time traveller information

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<thead>
<tr>
<th>Action</th>
<th>Description</th>
<th>Priority</th>
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<tbody>
<tr>
<td>Explore procurement of additional sources of traffic data and integration into corporate systems</td>
<td>Further action is required to expand sourcing of alternative data sources, such as probe data, Bluetooth and Automatic Number Plate Recognition (ANPR) and to integrate this data into the traffic management control system.</td>
<td>High</td>
</tr>
<tr>
<td>Implement an Open Data policy to facilitate innovation and value creation towards dynamic network management and improved traveller information</td>
<td>Establishing an Open Data policy and approach is a key enabler to access the benefits of increased private sector investment in the collection and dissemination of traveller information. To maximise benefits of Open Data, Main Roads will need to improve its system interfaces for providing and receiving data.</td>
<td>Medium</td>
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<tr>
<td>Provide real-time travel times and traffic condition information at major roadwork sites</td>
<td>Main Roads is using privately sourced data to provide travel times to road users in the Gateway WA project area, via roadside portable variable message signs and an interactive map on the project website. Further action is required to extend this to other projects.</td>
<td>Medium</td>
</tr>
<tr>
<td>Encourage private sector investment in flexible mobility options</td>
<td>Flexible mobility options assist transport users to reduce their dependency on cars for getting around Perth, for example through car and ride sharing schemes. There are a number of potential opportunities; however, further work is required to identify how Main Roads can best add value to support these developments.</td>
<td>Medium</td>
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<tr>
<td>Undertake proof-of-concept trials with government and industry R&amp;D partners to provide tailored traveller information to specific road user groups</td>
<td>Mains Roads is exploring a number of proof-of-concept trials to address specific road user needs for improved traveller information. For freight users, potential trials include providing truck warning at railway crossings, disseminating regional traveller information on road closures and destination intelligence for freight hubs such as ports. There also opportunities for vulnerable road users, such as a trial of pedestrian countdown timers at busy signalised intersections.</td>
<td>Medium</td>
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**Informed travel choices through personalised and proactive traveller information**

**Reduced car dependency and higher vehicle occupancy through flexible and varied mobility choices**
## Encourage and facilitate adoption of smarter, safer vehicle and road technologies

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<tr>
<th>Action</th>
<th>Description</th>
<th>Priority</th>
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<tr>
<td>Expand the rollout of electronic speed limit signs</td>
<td>Main Roads has established a network of electronic speed limit signs at schools and shopping centres. There is a government election commitment to fund a multi-million three-year rollout of school zone signs, to be complete in 2015/16. Signs will continue be considered for shopping centre strips where they will deliver safety benefits.</td>
<td>High</td>
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<tr>
<td>Explore other speed and hazard warning roadside technologies</td>
<td>Opportunities exist for WA to further explore ITS solutions, including Cooperative ITS (C-ITS). Collision warning at intersections and voluntary Intelligent Speed Assist (ISA) are of particular interest. Updated digital speed zone maps need progressing through relevant working groups.</td>
<td>High</td>
</tr>
<tr>
<td>Continue cooperation with relevant national bodies, industry and advocacy groups in regard to safer, smarter vehicles</td>
<td>Western Australian Government support ANCAP (Australian New Car Assessment Program) and UCSR (Used Car Safety Rating). This also feeds into regulation implication statements for federal government with carriage for national regulation standards. WA is aware of the plans of Transport Accident Commission (Victoria) to develop a national campaign to promote automated emergency braking and will support this when rolled out.</td>
<td>Medium</td>
</tr>
<tr>
<td>In collaboration with Department of Transport and other stakeholders, develop strategy to facilitate the adoption of automated and connected vehicles</td>
<td>A strategy is required to identify and address any barriers to wider adoption of automated and connected vehicle technologies that can deliver safety and efficiency benefits. The strategy should also consider requirements for monitoring of any impacts of such technologies.</td>
<td>Medium</td>
</tr>
<tr>
<td>Identify high priority vehicle safety technology and implement required changes to infrastructure standards</td>
<td>The performance of some technologies, such as lane departure warning and sign recognition, can be dependent on infrastructure characteristics and changes to Main Roads standards and practices may be required to maximise benefits of these technologies in Western Australia.</td>
<td>Medium</td>
</tr>
<tr>
<td>Implement road side units at high priority locations</td>
<td>Road side units (RSUs) allow for communication between infrastructure and vehicles (V2I). The approach is to ensure that the communications network supports future RSUs to be followed by implementing back-end changes to allow for V2I applications and installing RSUs at key locations.</td>
<td>Medium</td>
</tr>
<tr>
<td>Expand ITS control system functionality to allow for benefits from cooperative and multi-modal systems</td>
<td>Following implementation of the new ITS control system, there is opportunity to expand its functionality to meet existing needs. This is likely to commence with an expanded focus on different types of road user followed by applications to benefit from cooperative systems such as V2I.</td>
<td>Medium</td>
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</table>

### Reduced crashes through smarter vehicles and roads

- Improved connectivity and cooperation between vehicles, roads and travellers
### Action Plan Part 2: Improving Main Roads’ service delivery

<table>
<thead>
<tr>
<th>Focus area</th>
<th>Action</th>
<th>Priority</th>
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</thead>
<tbody>
<tr>
<td>Identify funding opportunities and improve ITS planning and business cases to support and strengthen investment in effective and efficient ITS solutions</td>
<td>Continue to develop business cases for ITS initiatives</td>
<td>High</td>
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<td></td>
<td>Develop a multi-year investment plan for ITS</td>
<td>High</td>
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<td>Implement robust before-and-after evaluation including appropriate key performance indicators</td>
<td>High</td>
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<td>Increasingly make ITS a central part of Main Roads’ business and investment planning</td>
<td>Medium</td>
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<tr>
<td>Review, focus and strengthen system reliability and security to ensure that our ITS works when we need it to</td>
<td>Implement a maintenance management information system</td>
<td>High</td>
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<td>Improve corporate reporting of ITS system availability</td>
<td>Medium</td>
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<td></td>
<td>Update processes to ensure planning and acquisitions minimise whole-of-life service delivery costs</td>
<td>Medium</td>
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<td>Increasingly focus on reliability-centred maintenance</td>
<td>Medium</td>
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<tr>
<td>Reduce costs and complexity through standardisation, including supporting and adopting national standards and architectures</td>
<td>Implement a new ITS control system to increase opportunities to access continuing improvements</td>
<td>High</td>
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<td></td>
<td>Support development and adoption of the national ITS architecture</td>
<td>Medium</td>
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<tr>
<td>Review and update arrangements for ITS governance, management, procurement and operations to reflect growing and changing needs</td>
<td>Embed Systems Engineering approaches within Main Roads’ ITS practices and project delivery</td>
<td>High</td>
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<td>Improve governance, management and procurement arrangements to enhance delivery of ITS</td>
<td>High</td>
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<tr>
<td>Further develop Main Roads’ skills, resource and knowledge in identified priority areas</td>
<td>Continue to develop staff capability and corporate resources and processes for ITS delivery</td>
<td>High</td>
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<td>Develop a Centre of Excellence to provide state leadership in ITS and Network Operations</td>
<td>Medium</td>
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<tr>
<td>Collect and manage data efficiently and make it open and accessible to maximise value</td>
<td>Improve data quality management</td>
<td>High</td>
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<td>Transition to a Business Intelligence environment</td>
<td>Medium</td>
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<td></td>
<td>Identify need for additional Main Roads’ data collection where commercial data is unavailable, unsuitable or uneconomic</td>
<td>Medium</td>
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<tr>
<td>Focus area</td>
<td>Action</td>
<td>Priority</td>
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<td>Strengthen engagement with all internal and external stakeholders as well as industry and the community as part of effective change management to maximise the benefits of ITS</td>
<td>Establish and update a community engagement strategy for ITS</td>
<td>Medium</td>
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<td>In relevant projects, include and implement road user engagement plans</td>
<td>Medium</td>
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<tr>
<td></td>
<td>In relevant projects, include and implement change management plans</td>
<td>Medium</td>
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<tr>
<td>Continue investment in common ITS foundations (platforms and networks) where this will lower overall service delivery costs</td>
<td>Review the approach to planning, implementing and managing ITS foundation infrastructure to take advantage of opportunities resulting from emerging and changing technologies and market structures</td>
<td>Medium</td>
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</tbody>
</table>

**A network operator that delivers transport user focussed services and is engaged with all its customers**

**A key contributor to multi-modal journey management across a more integrated transport network**

**An informed purchaser of ITS-enabled services and solutions with the right: people and capability; processes; procurement approaches; technology platforms; data and information; and stakeholder partnerships and engagement, for optimum outcomes.**
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