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Maintaining the State's Regional Arterial Road Network

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Victorian Auditor-General's Office
Auditing in the Public Interest

The Hon. Robert Smith MLC
President
Legislative Council
Parliament House
Melbourne

The Hon. Jenny Lindell MP
Speaker
Legislative Assembly
Parliament House
Melbourne

Dear Presiding Officers

Under the provisions of section 16AB of the *Audit Act 1994*, I transmit my report on *Maintaining the State's Regional Arterial Road Network.*

Yours faithfully

DR PETER FROST
Acting Auditor-General

25 June 2008

Foreword

Victoria's network of major, arterial roads makes a critical contribution to the state's economy and our well being. This is particularly the case for people living in regional Victoria.

The challenge of adequately maintaining the condition of regional, arterial roads has grown over the last decade, with the expansion of the network and increases in the volume of traffic and the size of vehicles using these roads. Managing these greater demands places an increased emphasis on applying the right type and level of maintenance at the right time.

The audit found that VicRoads had adequately planned, delivered and evaluated the regional road maintenance program using the available resources. However, maintenance expenditure has failed to keep pace with inflation, the expansion and ageing of the asset base, higher traffic levels and raised expectations about maintaining the roadside environment. The infrastructure is under stress.

Consequently, the condition and performance of the regional road infrastructure has deteriorated in recent years. VicRoads has prioritised its maintenance activities to address the most pressing problems and this has limited the impact on road users. However, without further action, the condition and performance of the arterial road infrastructure will deteriorate to a point where the impacts will become increasingly evident to the travelling public.

The report recommends that VicRoads develops and publishes an enhanced suite of indicators to better represent the condition of road infrastructure. This will help the Victorian Government better understand the long-term implications of current maintenance resourcing decisions.

DR PETER FROST
Acting Auditor-General

25 June 2008

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1 Executive summary

1.1 Introduction

Victoria's road network is critical to the state, carrying more than 90 per cent of the person trips and more than 80 per cent of freight throughout Victoria. Over the last two decades the number of vehicles and amount of freight travelling on Victorian roads have increased sharply and this trend is expected to continue into the future.

Most of Victoria's road traffic is carried on the 22 000 kilometres of roads and 6 000 bridges that make up the arterial road network. These roads are designated freeways and major links connecting cities, towns and suburbs within Victoria and providing key routes for interstate travel. About 19 000 kilometres of this network are located outside Victoria's major cities and towns. For people living in regional Victoria the arterial road network is critical for their access to work and other services and to maintain social links with friends and families.

VicRoads is responsible for maintaining the arterial road infrastructure, which is made up of the following assets:

- the road pavement—the structure which carries traffic
- other structures—such as bridges, pathways, barriers and walls
- roadside assets—including engineering features, such as traffic signs, cuttings and embankments, and roadside vegetation
- traffic signs
- pavement markings
- street lighting, traffic signals and electronic road signs.

VicRoads spends around $300 million each year to maintain these assets across Victoria. The audit focused on the maintenance of the open road infrastructure of freeways and arterial roads outside Victoria's major cities and regional towns.

The objective of the audit was to examine the maintenance of the road infrastructure by determining how well VicRoads had:

- planned the road infrastructure maintenance program
- implemented the program using private contractors, local councils and in-house teams
- evaluated the outcomes and used this information to drive further improvements to the program.

1.2 Conclusion

Our overall finding was positive, in relation to VicRoads management of the regional road maintenance program. The audit describes, in parts 4, 5 and 6 of this report, how the program had, for the most part, been adequately planned, delivered as intended and regularly evaluated.

The audit also identified areas where VicRoads needs to improve performance. The most important areas for improvement are:

- the contracting and delivery of routine maintenance activities
- information systems that need upgrading to facilitate more effective asset maintenance.

Routine maintenance contracts are difficult and costly for VicRoads to manage. The audit found examples where these contracts had significant performance shortcomings. VicRoads has initiated a review process and needs to formulate and apply strategies to address these shortcomings.

VicRoads faces a challenge to link and analyse all the information needed to guide maintenance decisions. Currently, information is stored in a way that prevents holistic analysis. For example, VicRoads regions use the customer enquiry system to track individual enquiries from the public, but cannot use this information to identify trends and recurring problems. VicRoads has begun a major information systems project and must use this opportunity to address this situation.

While forming a favourable conclusion about VicRoads management of road maintenance, the audit concludes, in part 3 of the report, that the condition and performance of the regional road infrastructure has deteriorated in recent years. This trend is likely to continue.

Maintenance expenditure has failed to keep pace with inflation, the expansion and ageing of the asset base, higher traffic levels, and raised expectations about maintaining the roadside environment. Over time, funding has been secured for new or upgraded infrastructure without allowing for the adequate, ongoing maintenance of these assets.

VicRoads has made changes to improve the efficiency of the road maintenance program, but these gains have not, to any significant degree, redressed the gap created by these trends. A significant catch up program and a substantial increase in recurrent maintenance funding are required to regain and sustain target levels of service. Without further action the condition and the performance of the infrastructure will deteriorate and this will become increasingly clear to the travelling public.

On a positive note, for the first time, VicRoads current bids for road capital funding include an accompanying bid to meet the maintenance needs of these new or upgraded assets. This should become standard practice. In addition, VicRoads should enhance its published performance indicators to better inform government about the underlying condition of the road infrastructure. This will help to inform the government's funding decisions on the maintenance of the road infrastructure.

1.3 Recommendations

VicRoads should:

1.1 develop and publish an enhanced suite of indicators to better represent the condition of road infrastructure assets **(Recommendation 3.1)**

1.2 further develop the roadside asset strategy to define service levels that promote a consistent approach to manage risks and to set maintenance priorities across its regions **(Recommendation 4.1)**

1.3 better quantify and document the costs and benefits of alternative maintenance options as part of its decision making processes **(Recommendation 4.2)**

1.4 adopt as a standard practice in its funding bids for new road infrastructure an allowance for the recurrent resources required to maintain these assets **(Recommendation 4.3)**

1.5 develop ways to retain the practical knowledge of experienced staff regarding road maintenance **(Recommendation 4.4)**

1.6 formulate initiatives to improve how it delivers routine maintenance contracts and their performance **(Recommendation 5.1)**

1.7 use the current review of its information systems to make critical improvements to the enquiry tracking system **(Recommendation 6.1)**.

RESPONSE provided by Chief Executive Officer, VicRoads

It is pleasing to note the overall positive finding in relation to the management of the regional arterial road maintenance program.

As noted in the report, VicRoads has a Road Management Plan that sets out a road infrastructure management system and the road maintenance standards. The road maintenance standards include safety inspection frequency and road hazard response times. The inspections and response times are intended to ensure that VicRoads meets its statutory responsibilities and provides best value to the community for inspection, maintenance and repair of the arterial road network.

VicRoads uses an asset management approach to looking after the regional arterial road network. This approach takes into account the engineering aspects, the asset condition, the risks and the costs and benefits associated with treatment options. This approach enables appropriate treatments to be targeted towards greatest need.

RESPONSE by Chief Executive Officer, VicRoads – continued

The report draws attention to some emerging road maintenance challenges. VicRoads will prepare a business case which quantifies the long-term maintenance requirements.

VicRoads has commenced a review of the way in which routine maintenance is managed. This review is looking at the specification requirements, the relationship between client and contractor and enhancing the skills and capabilities of staff. The review will be expanded to address the points raised in the Audit.

VicRoads has also commenced a project (Connect) to significantly enhance the way in which data related to road assets is managed, analysed and presented. As noted in the Audit, improvements to the enquiry tracking system form a fundamental part of the Connect project.

Recommendations:

Recommendation 1.1 supported. An enhanced suite of outcome measures will be developed.

Recommendation 1.2 supported. The implementation of some of the recommendations from several reviews including the Parliamentary Inquiry into Crashes Involving Roadside Objects and the management of native vegetation will provide enhanced guidance in relation to service levels for the management of roadsides.

Recommendation 1.3 supported in principle. VicRoads has a process for review of all projects valued at greater than $500,000. This process will be enhanced, as far as is practical, to provide additional information in relation to the costs and benefits of alternative maintenance options.

Recommendation 1.4 supported. While this has been achieved for major projects, VicRoads will work to develop mechanisms to achieve this for smaller scale projects.

Recommendation 1.5 supported. As is noted in the report this is an issue affecting all road authorities VicRoads will continue to ensure staff are trained appropriately.

Recommendation 1.6 supported. The current internal review into the management of routine maintenance contracts will be expanded to include the points raised in the Audit.

Recommendation 1.7 supported. As noted in the Audit, improvements to the enquiry tracking system form a fundamental part of the Connect project. The scope of the project is expected to fully address the issues raised in the Audit report.

2 Road maintenance in Victoria

2.1 Victoria's regional arterial road network

2.1.1 The role and importance of road travel

Victoria's road network is critical to the state, carrying more than 90 per cent of the person trips and more than 80 per cent of freight throughout Victoria. Over the last two decades the number of vehicles and amount of freight travelling on Victorian roads have increased sharply and this trend is expected to continue into the future.

In particular people living in regional Victoria and in the outer suburbs of Melbourne are heavily reliant on the road network for journeys to access work and other services and to maintain social links with friends and families.

2.1.2 The arterial road infrastructure in regional Victoria

Victoria's road network covers 200 000 kilometres of roadways, ranging from major links connecting our largest cities and towns, to local roads and forest tracks. Most of Victoria's traffic is carried on the 22 000 kilometres of roads and 6 000 bridges that make up the arterial road network.

Arterial roads are designated freeways and major links connecting cities, towns and major suburbs within Victoria and also provide the key routes for interstate travel. Some 19 000 kilometres of the arterial network are located in regional Victoria, outside major cities and towns.

In 2006–07 VicRoads spent approximately $300 million on the maintenance of the state's freeway and arterial road infrastructure.

The audit examined the maintenance of open road infrastructure on arterial roads outside of Victoria's major cities and towns. The road infrastructure includes:

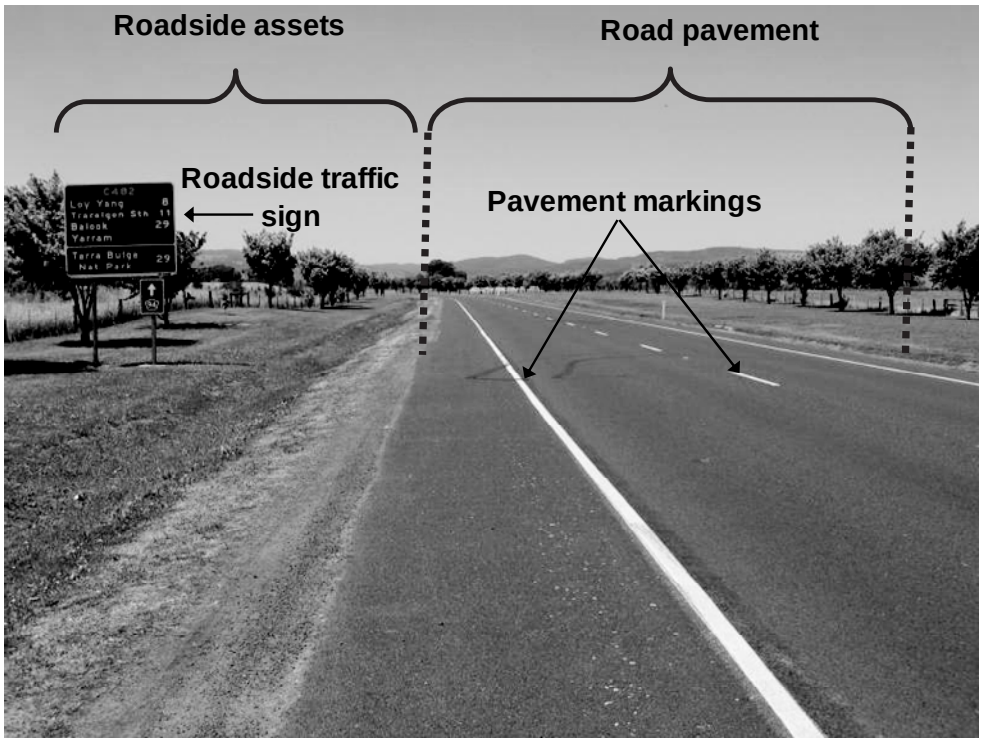
- the road pavement—the structure which carries traffic
- other structures—such as bridges, pathways, barriers and walls
- roadside assets—including engineering features, such as traffic signs and guideposts, cuttings and embankments and environmental features, such as vegetated areas situated within the boundaries of the road reserve

- roadside traffic signs—which regulate speed, warn of hazards and provide information
- pavement markings—designating the edges of the road and traffic lanes and providing directional and warning information.

The road infrastructure also includes street lighting and traffic management systems, such as traffic signals and electronic road signs. These assets are mostly located in urban settings and are not the focus of this audit.

Figure 2A shows a section of the Hyland Highway outside of Traralgon, marked up to show some of the key road infrastructure. The road pavement is the most significant type of road asset and currently consumes more than half of VicRoads annual maintenance expenditure.

Figure 2A
Road assets on the Hyland Highway near Traralgon



Source: http://www.travelvictoria.com.au/images/traralgon/photos/65.jpg.

2.2 Key asset maintenance concepts

2.2.1 Why assets need to be maintained

Public assets are created, maintained and valued because of the services they deliver to the community. At the most basic level, regional arterial roads provide the means for motor vehicles to travel between and within Victoria's major populated areas.

The community's requirements, however, go beyond the provision of this basic service, with expectations about the 'level of service'. For roads this quality dimension encompasses the speed, safety, comfort and convenience of travel.

VicRoads translates the state's objectives, with respect to these attributes, into a set of performance standards. The role of VicRoads is to maintain the performance of the road infrastructure in a way that minimises the 'whole-of-life costs', incurred over the life of the asset.

2.2.2 An illustration of these concepts for the road pavement

The road pavement is the structure that forms a running surface for motor vehicles and consists of a surface layer and up to two layers of supporting material which provide strength and shape. Over time, the passage of traffic and the effect of the elements cause the pavement to wear. Normal wear leads to cracks and holes in the pavement surface. If untreated, these defects grow into larger potholes and cracks allowing water to infiltrate the pavement and weaken the structure.

From the road users' perspective, road wear leads to a rougher driving surface and may also make the surface more slippery. For minor defects this will be hard for drivers to detect. However, as the surface deteriorates further, road users will notice increased vibrations and bumps and experience a measurable level of discomfort. Very rough roads also reduce fuel efficiency and increase vehicle wear and tear. Wear resulting in a loss of grip may pose a significant safety risk to vehicles, especially in wet conditions.

The level of surface roughness can be objectively measured in terms of the international roughness index (IRI). Community surveys have shown that road users view a level of roughness exceeding 4.1 IRI as unacceptable. VicRoads applies available resources to minimise the length of the road network exceeding this level of roughness, and to maintain the road surface, so it does not become slippery and unsafe.

There are three types of pavement maintenance activities:

- **routine maintenance** is a reactive maintenance to address minor defects. This includes fixing potholes and rough patches on the pavement at a cost of about $0.30 per square metre

- **periodic maintenance** to resurface and reseal the pavement to prevent water infiltrating the pavement structure, to address some aspects of surface roughness and to improve the traction of the pavement surface at a cost of between $4.50 to $20 per square metre
- **rehabilitation** involving a more significant treatment to improve the structural condition of the pavement and bring the surface back within an acceptable level of roughness and traction at a cost of between $35.00 to $100.00 per square metre.

If well maintained, with regular routine maintenance and timely periodic maintenance, the road pavement is expected to last 60 to 70 years before requiring rehabilitation. VicRoads aims to combine these activities to maintain the performance of the pavement in a way that minimises the 'whole-of-life costs'.

An over reliance on routine maintenance to fix problems may save money in the short-term, but will be more expensive and less effective in the longer-term. After a certain point these routine actions become less effective at preventing deterioration and more significant, periodic maintenance is required to improve performance. Failing to do this will lead to an increasing rate of deterioration to the point where the only remedy is a much more expensive rehabilitation treatment.

To achieve minimum performance standards cost-effectively, VicRoads needs to apply preventative periodic maintenance and rehabilitation when reactive treatments are no longer effective in achieving required levels of performance. The principle of making a timely, preventative investment—to avoid the much greater expense of having to remedy a future asset failure—aligns with better practice asset management principles.

2.3 Maintaining regional arterial roads in Victoria

2.3.1 Government policy, legislation and responsibilities

The government set out its approach to asset management in the *Sustaining our assets* policy document.[1] It is clear that asset decision making should:

- take into account the whole-of-life costs of alternative options
- be responsive to measures of the cost-effectiveness of past decisions.

The government's policy goals for roads are included in the *Transport Act 1983* and captured by VicRoads overall statement of purpose and aims: 'VicRoads purpose is to deliver social, economic and environmental benefits to communities throughout Victoria by managing the Victorian arterial road network and its use as an integral part of the overall transport system'.

[1] Department of Treasury and Finance 2000, *Sustaining our assets: government asset management policy statement*, Department of Treasury and Finance, Melbourne, pp. 7 and 11.

VicRoads aims may be summarised as:

- improving road safety by reducing the number and severity of road crashes
- improving the effectiveness and efficiency of the road system to assist economic development
- developing a more integrated and sustainable road transport system
- managing roads to minimise the adverse impacts of traffic on communities and the environment
- building effective customer relationships and providing the community with cost-effective services.

The effective maintenance of the road infrastructure makes an important contribution to the achievement of these objectives.

The *Road Management Act 2004* was developed to promote a more efficient and safer road network, and to provide for the responsible use of road reserves for other legitimate purposes. In relation to road maintenance, the Act aims to:

- clearly allocate responsibility for the maintenance of the road infrastructure between road authorities, such as VicRoads and local councils
- establish efficient and effective decision making processes in relation to infrastructure inspection, maintenance and repair.

VicRoads is responsible for maintaining the freeway and regional arterial road infrastructure. It responded to the legislation, by creating a Register of Public Roads and a Road Management Plan, which documented:

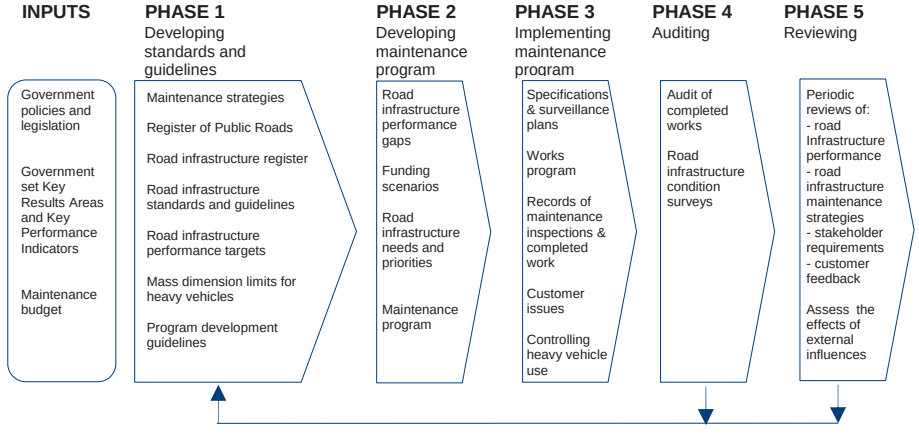
- VicRoads approach to meeting its maintenance responsibilities in the Road Infrastructure Management System (see Figure 2B)
- Road Maintenance Standards describing inspection frequencies for arterial roads and the maximum time allowed for responding to different types of hazards.

In the following sections we describe VicRoads approach to planning and implementing the road maintenance program.

2.3.2 Overview of the approach to road maintenance

Figure 2B summarises VicRoads approach to road maintenance.

Figure 2B
VicRoads road infrastructure management system



Source: VicRoads.

2.3.3 Planning the road maintenance program

Inputs

Road maintenance is framed by the obligations contained in the legislation, and constrained by the budget designated.

Phase 1: Developing standards and guidelines

Over time VicRoads has developed the following strategies to guide its maintenance program:

- *A Stitch in Time*, documenting VicRoads strategy for maintaining the road pavement
- *Linking Victoria: Victoria's Rural Arterial Road Network Strategy*, describing road standards for the arterial network
- *Victoria's Arterial Bridges: Critical Links for Transport Efficiency,* an asset management strategy for bridges on arterial roads
- *Victoria's Roadside Management Strategy*, describing VicRoads approach to managing roadside assets
- *Asset Management Strategy for Intelligent Transport System Assets,* documenting VicRoads framework for managing electronic on-road assets, such as traffic signals and traveller information systems.

In addition to these strategies, VicRoads has compiled information on the road infrastructure, standards and guidelines to inform the development of the road maintenance program.

The Road Maintenance Standards, set out as part of the Road Management Plan, form the basis for VicRoads routine maintenance program. These define inspection frequencies and the time allowed for dealing with a range of hazards, once identified.

Phase 2: Developing the maintenance program

The annual road maintenance program is developed through a collaborative process between the VicRoads head office and its seven regional offices.

The process includes:

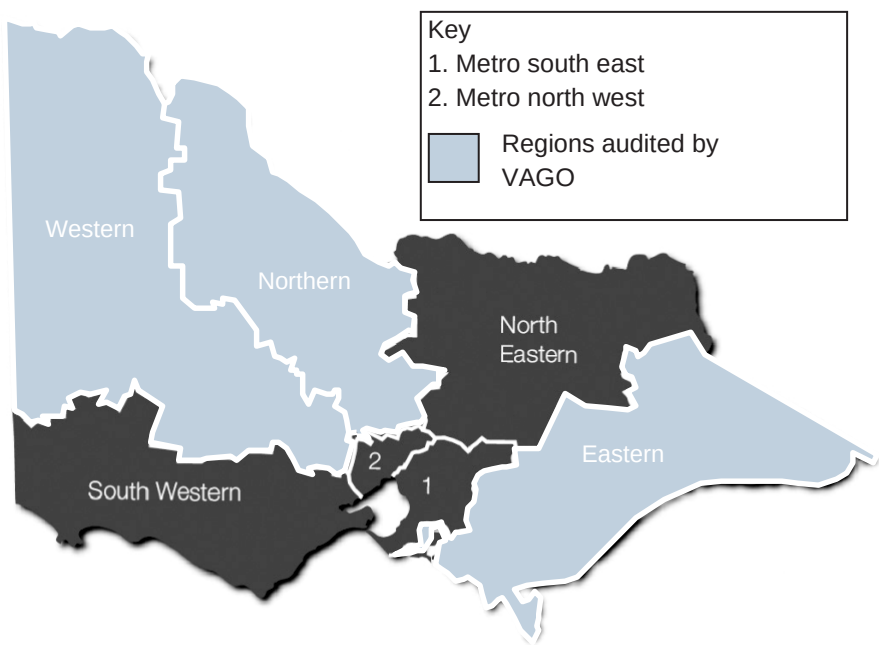
- identifying performance gaps through the analysis of condition information and feedback from VicRoads regions
- understanding needs, priorities and risks through the analysis of performance information and the review of business cases for maintenance projects
- determining a draft program based on the likely level of funding in a workshop involving head office and senior regional representatives
- presenting the draft program to VicRoads Management Committee for review and sign-off.

2.3.4 Implementing and refining the road maintenance program

Phase 3: Implementing the maintenance program

VicRoads regions are responsible for implementing the maintenance program activities within their areas of operation. Figure 2C shows how Victoria is divided into two metropolitan regions and five non-metropolitan regions. This audit is concerned with the maintenance of arterial roads outside the metropolitan area and in conducting the audit we examined the Eastern, Northern and Western regions.

Figure 2C
VicRoads regions



Source: VicRoads.

The regions contract out the program components to the private sector, VicRoads in-house delivery teams and local councils. The VicRoads in-house teams include:

- Sprayline, which is a wholly owned entity within VicRoads, offering specialist resealing and line marking services
- Road Services, which provides routine and periodic pavement and bridge maintenance services.

Figure 2D illustrates the relative importance of each type of service provider.

Figure 2D
Road maintenance by type of service provider for the Eastern, Northern and Western regions 2007–08

	Type of maintenance			
Organisation	**Routine**	**Periodic**	**Rehabilitation**	**Total**
Contract	39%	89%	48%	56%
VicRoads in-house	47%	11%	40%	35%
Councils	14%	0%	12%	9%
Total value ($000s)	**43 335**	**30 579**	**6 871**	**80 785**

Source: VicRoads, Eastern, Northern and Western regions road maintenance delivery plans.

Maintenance work, making up 56 per cent of the total value, will be contracted to the private sector for these three regions in 2007–08. VicRoads in-house teams will complete about one third of maintenance work by value, while councils will account for less than 10 per cent.

When entering into contracts, VicRoads must comply with directions issued by the Minister for Planning and the Minister for Transport. These set out procedures for the procurement of building and construction works and consultancy services.

In terms of contract administration, responsibilities are shared between the contract services group located in the VicRoads head office and regional offices. The contract services group is responsible for compiling standard contract specifications for different types of maintenance. Regions can then tailor these for contracts for the local situation.

VicRoads adopts a two-stage approach to letting contracts to external providers. Contractors must pre-qualify to bid for the routine, periodic or rehabilitation maintenance works. To pass the pre-qualification, companies must demonstrate that they have the capability, resources and track record to successfully complete maintenance work. Pre-qualified contractors then bid for specific work packages and the appointment is usually made on the basis of the lowest offer.

Before finalising contracts, VicRoads documents the scope, budget and timeline in which the project is to be delivered in a project sign-off plan. Once the contracts are awarded, VicRoads regions monitor the delivery of the outputs specified in the contract in a delivery plan.

Phases 4 and 5: Reviewing the maintenance program

VicRoads has processes to review the road maintenance program and refine its content to make it more effective.

In terms of monitoring and review, VicRoads:

- monitors progress through regular on-site surveillance
- records the delivery of outputs against the timeframes agreed in the delivery plan
- collects and reviews information on the condition of the road pavement and bridges, to understand whether the program has been effective
- monitors stakeholder information and customer feedback.

This information can then be applied in determining projects and priorities within the road maintenance program for the following year.

2.4 The audit

2.4.1 Our approach to the audit

The audit examined the maintenance of the regional arterial road network and focused on the open road infrastructure outside Victoria's major cities and regional towns. The assets examined were limited to the road related infrastructure within the road reserve.

The audit assessed the effectiveness, efficiency and economy of VicRoads maintenance of the regional arterial road infrastructure. To address this objective, the audit examined:

- the planning processes used to develop the road infrastructure maintenance program
- the contracting arrangements for delivering the road infrastructure maintenance program
- the implementation of the road infrastructure maintenance program
- the evaluation of the road infrastructure maintenance program and the use of this information to improve effectiveness, efficiency and economy.

In terms of the structure of the report:

- part 3 examines the emerging road maintenance challenges
- part 4 reports on the adequacy of the planning processes
- part 5 combines the findings for the maintenance program contractual arrangements and implementation
- part 6 presents the audit findings in relation to program evaluation.

The audit was performed in accordance with Australian auditing standards applicable to performance audits, and included tests and procedures sufficient to enable audit conclusions to be reached. The total cost of the audit was $335 000. This cost includes staff time, overheads and printing.

2.4.2 Acknowledgements

The audit team thanks those who participated in the audit, particularly the VicRoads head office and regional staff who were exemplary in providing access to the information that underpins the audit findings.

3 The emerging road maintenance challenges

At a glance

Background

VicRoads aims to sustain the condition and performance of the road infrastructure at acceptable levels over the long-term and to do this cost-effectively. This requires continual adaptation as the size and complexity of the asset base changes over time.

In this part we examine how the asset base and maintenance expenditures have changed and the implications of these trends continuing into the future.

Key findings

- Maintenance expenditure has failed to keep pace with inflation, the expansion and ageing of the asset base, higher traffic levels, and raised expectations about maintaining the roadside environment.
- VicRoads introduced programs that improved the effectiveness and efficiency of the road maintenance program.
- VicRoads initiatives have not been sufficient to redress the growing maintenance requirements and prevent the further deterioration of the condition and performance of the infrastructure.
- A significant increase in maintenance expenditure is required to meet and sustain target levels of service.
- VicRoads was unsuccessful in its bid for additional maintenance funding for 2008–09, but secured more resources to address a small number of urgent backlog items within the 2007–08 financial year.
- VicRoads has assessed the risks of the trends described in this part of the report.
- This year, for the first time, VicRoads current capital funding bids are accompanied by an application for additional recurrent funding to maintain upgraded or new assets.

Key recommendation

- VicRoads should develop and publish an enhanced suite of indicators to better represent the condition of road infrastructure assets **(Recommendation 3.1)**.

3.1 Background

VicRoads aims to sustain the condition and performance of the road infrastructure at acceptable levels over the long-term and to do this cost-effectively. This requires continual adaptation, as the size and complexity of the asset base changes over time.

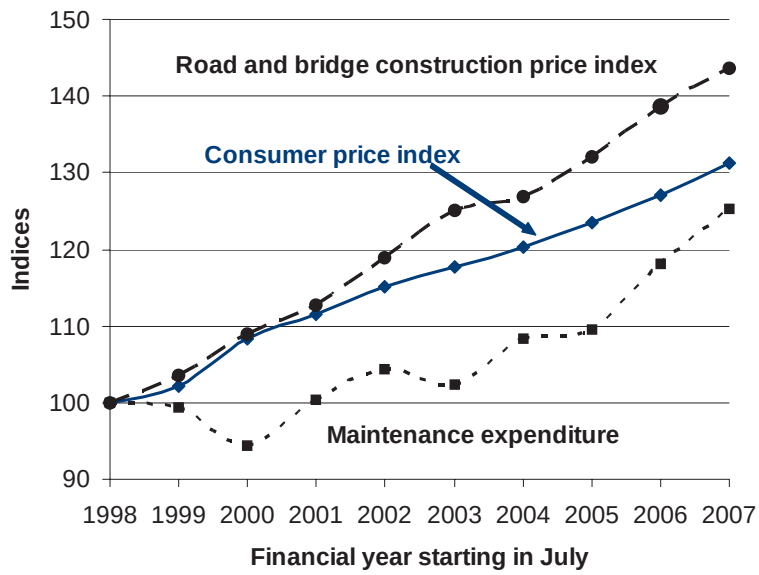
In this part we examine how the asset base and maintenance expenditures have changed and the implications of these trends continuing into the future. We focus specifically on the implications of these changes for the regional arterial network.

3.2 Recent trends in maintenance expenditure and maintenance requirements

3.2.1 Maintenance expenditure has failed to keep pace with inflation, the expansion and ageing of the asset base, higher traffic levels, and raised expectations about maintaining the roadside environment

The growth in maintenance expenditure has not matched the rate of inflation over the last nine years

Figure 3A
Changes in maintenance expenditure and price indices



Source: VicRoads (maintenance expenditure) and the Australian Bureau of Statistics (price indices).

Figure 3A shows that, since 1998–99, expenditure on the maintenance of the road pavement, structures and roadside assets increased by 25 per cent to 2007–08. VicRoads records show planned expenditure of $251 million in this year. The road and bridge construction price index best reflects the inflationary pressures affecting road maintenance and this increased by 44 per cent over the same time period.

If maintenance expenditure had kept pace with this index it would have reached $288 million in 2007–08, $37 million higher than budgeted expenditure in this year. Over the time period shown in figure 3A the average gap between maintenance expenditure and the funding required to keep pace with inflation was $38 million per year in 2007–08 prices.

Over the last decade new road assets have been created without adequate funding to maintain these assets

Since 1997, the area of road pavement has increased by 6 per cent, with an additional 2 900 lane kilometres or one million square metres of pavement requiring maintenance. During this time there were a number of major road upgrades and extensions.

Over the same time period, there has been a 22 per cent increase in the number of structures with the creation of an additional 1 000 bridges, major culverts, large signs and retaining walls. The number of major structures, such as bridges, is increasing at a rate of 20 per year, with the construction of rural bypasses and grade separations.

In addition, recent road safety initiatives have built modern, wire rope crash barriers into parts of the arterial road network and increased the quantity of pavement markings. These markings have recently been increasing at a rate of 5 per cent to 10 per cent per year. This growth and a recent $12.5 million initiative to mark the edges of all the lowest trafficked arterial roads, means the current rate of re-marking is not keeping pace with wear and deterioration.

In the past, funding bids to create or upgrade assets have not included additional, ongoing funding to cover maintenance. This has been the case for both small scale investments and for more significant investments. The 2008–09 State Budget marked a significant change in this approach with the forward funding of additional maintenance in relation to VicRoads successful bids for new road assets.

Many of Victoria's bridges have reached an age where they require extensive rehabilitation

VicRoads bridge inventory shows that arterial road bridges are, on average, now 40 years old. Many of these bridges have reached a stage where they will require major maintenance within the next decade to prolong their service life for another 40 to 50 years. These works include repainting to provide protection from corrosion, and the replacement of expansion joints and worn bearings. This will require a ramping up of the resources allocated to bridge maintenance.

The infrastructure has had to cope with more traffic and heavier vehicles and this trend is set to continue

We used statistics reported by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) to examine traffic growth in Victoria.[1] The total vehicle kilometres of travel in regional Victoria increased by 15 per cent between 1997 and 2004. Over the same time period, the tonnage of freight using roads in regional Victoria increased by 37 per cent. This was accompanied by a move towards the use of larger, heavier articulated vehicles.

BITRE forecasts that the size of the road freight task in Victoria will increase by a further 35 per cent over the next decade.[2] These trends will lead to greater pavement wear and deterioration requiring more frequent and intensive maintenance.

VicRoads has had to devote more resources to meet its obligations for maintaining the roadside environment

The *Road Management Act 2004* has more clearly defined required levels of service and VicRoads maintenance obligations.

In addition, other legislation and the activities of other government agencies have raised expectations in terms of the impact of VicRoads activities on the roadside environment. Roadside vegetation requiring protection is now better defined and this means VicRoads must adapt its practices. For example, when disposing of debris from road maintenance works, VicRoads must be careful not to contaminate or damage a site that has valuable, native vegetation.

VicRoads is at risk of prosecution if it does not control the spread of roadside weeds.

3.3 VicRoads initiatives to address these trends

3.3.1 VicRoads introduced programs that improved the effectiveness and efficiency of the road maintenance program

Over the past decade VicRoads has introduced a range of maintenance improvement initiatives

These include:

- developing asset management strategies for the major assets making up the regional arterial road infrastructure

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[1] Bureau of Infrastructure, Transport and Regional Economics, 2008, *Australian Transport Statistics Yearbook 2007*, Bureau of Infrastructure, Transport and Regional Economics, Canberra ACT.

[2] Bureau of Transport and Regional Economics 2006, *Freight Measurement and Modelling in Australia. Report 112*, Bureau of Transport and Regional Economics, Canberra ACT.

- monitoring the effectiveness of maintenance treatments and amending these to be more cost-effective through innovation, adjustments to standards and the adoption of new technologies
- introducing more area-wide, performance-based contracts to take advantage of economies of scale and to encourage a longer-term approach to road maintenance
- implementing formal, quality assurance requirements within maintenance contracts to reduce VicRoads supervisory overheads.

There are clear examples where these initiatives have reduced the whole-of-life maintenance costs while sustaining or improving effectiveness

One area of clear improvement is in the maintenance of the road pavement. The 1993 '*A Stitch in Time'* strategy created a sustainable and efficient approach to pavement maintenance. This used objective evidence to define the combination of routine and periodic maintenance and rehabilitation which would efficiently sustain minimum levels of surface roughness over the long-term.

VicRoads monitored the impact of these treatments and found that the frequency of periodic maintenance could be reduced without compromising road condition. VicRoads reduced the target rates for the percentage of the rural arterial road network which should be resurfaced each year from 10–11 per cent to 7 per cent. For metropolitan arterial roads the target rate was set to 5.5 per cent implying a combined coverage rate for all roads of 6.6 per cent.

We examined the figures and found that VicRoads savings estimate of around $30 million per year was reasonable. VicRoads implemented this reduced coverage target in 2003–04.

3.3.2 VicRoads initiatives have not been sufficient to redress the growing maintenance requirements and prevent the further deterioration of the condition and performance of the infrastructure

The condition of the road pavement has deteriorated as VicRoads has scaled back periodic maintenance and rehabilitation below the minimum coverage levels required

The '*A Stitch in Time'* strategy saw an increase in pavement maintenance funding in 1993 and the adoption of sustainable rates of periodic maintenance and rehabilitation. Since this time these essential activities have fallen to levels which will not sustain the current condition of the road pavement.

Over the last four years the rates of periodic maintenance have been below the revised minimum levels required to cost-effectively maintain the road pavement over the long-term. The 2008–09 State Budget continues this trend and we estimate that planned periodic maintenance will cover 5.7 per cent of all arterial roads compared to the target rate of 6.6 per cent. VicRoads estimates that the cost of raising periodic maintenance coverage by 1 per cent across the state is approximately $15 million.

Between 2001–02 and 2007–08 the maintenance program allowed for the rehabilitation of between 0.2 and 0.5 per cent of the Victorian arterial road network. In 2007–08 the coverage rate of 0.2 per cent implied an effective life of 500 years for these pavements. VicRoads estimates that works in other parts of the 2007–08 roads program increased the rehabilitation rate to about 0.45 per cent, implying a pavement life of 220 years. In the 2008–09 budget pavement rehabilitation coverage is similar to the level funded in 2007–08.

A more realistic figure for the time road pavements can perform adequately between rehabilitation treatments is around 70 years. Adopting this standard would require the rehabilitation of an additional 0.95 per cent of the arterial road network. VicRoads preliminary estimates indicate that the cost of raising rehabilitation coverage by 1.2 per cent across the State's arterial roads is approximately $80 million.

We found that VicRoads target periodic maintenance and rehabilitation coverage rates are consistent with sustaining the condition and performance of the road pavement over the long-term. We examined VicRoads maintenance program costs to estimate that an additional $77 million per year would be needed to achieve the required levels of coverage. This includes about:

- $14 million to raise periodic maintenance coverage from 5.7 to 6.6 per cent
- $63 million to raise rehabilitation coverage from 0.45 to 1.4 per cent.

By targeting the available resources to the worst sections of the arterial road network, VicRoads has kept the percentage of the pavement exceeding the maximum allowable level of roughness to around 14 per cent. However, there is a build up in the percentage of the network with surface roughness approaching the maximum allowable level. Other measures of the underlying road pavement condition indicate escalating deterioration, even in the short-term.

As the road pavement condition deteriorates, major maintenance work is required, but budget constraints mean these defects have to be addressed through the routine maintenance program. Without additional funding, a greater proportion of the available resources will be directed towards routine maintenance leading to further reductions in periodic maintenance and rehabilitation. This cycle has the potential to substantially increase the cost to maintain an asset over its life.

The age profile of bridges and the increase in the number of structures means that there is a significant backlog of structures requiring rehabilitation

Many of the bridges built in the 1950s and 1960s were designed for light rural traffic. With the advent of 'B-double' goods vehicles, VicRoads created a database to monitor traffic levels across bridges which might require strengthening to handle heavier goods vehicles. This process identified over 500 bridges to be considered for strengthening. The available funding was prioritised for bridges where load limits were likely to have most impact on freight travel.

VicRoads will need to complete additional strengthening work for many of Victoria's regional arterial road bridges if the network is to accommodate the next generation of heavier goods vehicles. VicRoads will need to formulate a business case to apply for the additional funding required to upgrade these assets.

VicRoads is formulating a risk-based approach to best use its available resources. Current funding patterns are likely to place restrictions on access to some regional arterial bridges by heavier vehicles.

VicRoads has focussed on treating high risk roadside assets and the backlog of other assets requiring maintenance continues to grow

VicRoads has prioritised the treatment of high risk roadside assets but is not currently able to address the following lower risk roadside maintenance issues:

- the parts of the road network where vegetation has encroached on the clearance envelope required for road vehicles
- the backlog of sites where there are low to moderate geotechnical risks (for example, from a rock fall). The moderate risk sites could escalate to the high risk category in adverse weather conditions requiring a much higher cost treatment when compared with early prevention
- the renewal and repair of aged or failed landscape treatments particularly at the entrances to townships
- the removal of graffiti from roadside signs, bridges, noise walls and roadside furniture, although this is not a major concern on the regional network.

The number of road signs not visible at night is increasing

The number of road signs increases each year in response to the community's expectation for improved road safety and roadside information. When VicRoads becomes aware of inadequate signage it prioritises the treatment of those signs which represent the greatest risk to road users. For example, VicRoads would immediately replace a defective stop sign because of the road safety implications. VicRoads rarely replaces signs that represent a lower risk to road users when they are worn, damaged or vandalised. Many signs are not visible at night because their reflective properties have deteriorated.

A large proportion of the line markings on the road network do not meet the minimum standard of night time reflectivity

The current line remarking program cannot keep pace with the rate of wear for existing line markings. VicRoads surveyed the line markings across one of its regions. The research found that 36 per cent of these markings fell short of the minimum standard of reflectivity required to guide night time drivers. Similar to the approach to replacing damaged signs, VicRoads uses the available budget to treat as a priority the line markings that pose the greatest risk to road users.

3.4 The implications of these changes in maintenance demands and expenditure

3.4.1 VicRoads has assembled information to estimate the impacts of a continuation of these trends

The lengths of the Victorian road network where the road pavement is very rough or shows signs of distress and structural weakness will increase

VicRoads preliminary estimate is that in ten year's time if current trends continue:

- the percentage of the network where the surface roughness exceeds VicRoads tolerable maximum is expected to increase from 14 per cent to 25 per cent
- the length of distressed pavement will increase from 6 per cent to 9 per cent of the total network.

Beyond this point and with no additional resources, the growth in the lengths of rough and distressed pavements is likely to accelerate because of the available resources being directed to essential routine maintenance at the expense of longer-term preservation works.

Roadside maintenance will be limited to addressing road safety issues and statutory responsibilities

Resources will be directed towards dealing with high-risk safety issues, such as unstable roadside rock faces and meeting minimum statutory requirements in controlling roadside vegetation.

The night time visibility of road signs and the legibility of line markings is likely to deteriorate

Visible signs and pavement markings are important visual cues promoting the safe use of the road especially when it is dark. The prioritisation of more urgent maintenance tasks is likely to reduce the performance of these assets, with a consequent, but unquantifiable reduction in road safety.

3.4.2 A significant increase in maintenance expenditure is required to meet and sustain target levels of service

The backlog of maintenance required to meet and sustain the performance of the infrastructure has grown over the last decade

The average gap between maintenance expenditure and the funding required to keep pace with inflation was $38 million per year over the nine years between 1998–99 and 2007–08. This shortfall has been partly offset by improvements to the road maintenance program. For example, the adoption of a lower, but still effective rate of periodic maintenance coverage has saved approximately $30 million per year over the last five years.

However the scale of the backlog has been further increased by:

- the expansion of the asset base with 6 per cent more road pavement and a 22 per cent increase in the number of structures
- increased wear and tear because the infrastructure has had to cope with more traffic and heavier vehicles
- levels of pavement periodic maintenance and rehabilitation falling well short of those required to cost-effectively maintain the infrastructure over the long-term.

The scale of these additional factors may be illustrated by our earlier estimate that, across Victoria, expenditure on periodic maintenance and rehabilitation of the road pavement in 2007–08 fell short of sustainable levels by approximately $77 million. This type of shortfall will result in an increasing proportion of the road pavement urgently requiring periodic maintenance or major rehabilitation.

Current maintenance expenditure will not cost-effectively deliver the required levels of infrastructure performance

The evidence we reviewed points to an ongoing requirement for additional road maintenance expenditure of over $100 million across all government roads and asset classes (the road pavement, structures, roadside assets, line markings and electronic equipment). While the factual evidence supports a figure of this scale, VicRoads needs to develop and endorse a business case which quantifies the long-term maintenance requirements.

VicRoads has used the available resources to successfully achieve target levels of performance by addressing the highest priority risks. However, there is a limit to how long this performance can be sustained. For example, assessment against the underlying measures of road pavement condition show clear signs of deterioration and this is likely to lead to diminished performance and the need for costly remediation in the next few years.

3.4.3 VicRoads was unsuccessful in its bid for additional maintenance funding for 2008–09, but secured more resources to address a small number of urgent backlog items within the 2007–08 financial year

VicRoads made the case for an additional $25 million of maintenance funding in 2008–09 to start addressing the backlog of high priority works. This bid was unsuccessful.

Late in 2007 VicRoads secured an additional $10 million in one-off funding towards the completion of road maintenance works in 2007–08. This one-off addition will address some high priority works but make little difference to the overall condition of the infrastructure.

VicRoads 2008–09 maintenance program assumes an increase broadly in line with the increase in CPI. This will not allow VicRoads to deal with a growing maintenance backlog.

3.5 Responding to these trends

3.5.1 VicRoads has assessed the risks of the trends described in this part of the report

VicRoads has acted appropriately to document the risks of continuing with current funding levels and has estimated the resources required to achieve target service levels. It used this information to formulate an initial funding bid.

This year, for the first time, VicRoads current capital funding bids for 2008–09 were accompanied by an application for recurrent funding to maintain upgraded or new assets. VicRoads should adopt this as a standard practice.

3.5.2 VicRoads should develop and publish an enhanced suite of indicators to better represent the condition of road infrastructure assets (Recommendation 3.1)

VicRoads reports annual performance indicators relating to:

- the quantity of road pavement and bridge maintenance
- the timely completion of the road maintenance program
- the quality of the road infrastructure in terms of the percentage of travel on smooth roads and the percentage of bridges in poor condition.

For the road pavement, VicRoads tracks additional indicators which provide a more comprehensive insight into the condition of the infrastructure. These shed light on the sustainability of the performance against the published indicators. VicRoads needs to develop and publish a wider set of maintenance-related performance indicators so that the government and the wider community can understand the longer-term implications for asset condition of current resourcing decisions.

4 Planning for road maintenance

At a glance

Background

To be effective a road maintenance program needs to:

- be guided by asset strategies that have clearly defined goals and priorities
- have a program designed to implement these priorities in a cost-effective way.

To assess road maintenance planning, we examined VicRoads strategies for managing the road infrastructure and the processes used to translate these strategies into a maintenance program.

Key findings

- VicRoads has developed adequate strategies for maintaining key regional road infrastructure such as the road pavement and bridges.
- While sharing some of the good attributes of the road pavement and bridge strategies, elements of the roadside management strategy should be improved.
- VicRoads has applied its resources to where they are most needed, by setting priorities consistent with its maintenance strategies.
- While VicRoads takes account of the whole-of-life costs in making maintenance decisions, the application and documentation of this approach can be improved.
- In some cases the design and implementation of new road projects did not pay sufficient attention to the impacts on the long-term costs of maintaining the assets.
- Maintenance decisions relating to the road pavement and bridges were based on reliable and easily accessible information on the location, condition and the past maintenance history of the assets.
- The information underpinning decisions about roadside assets is not as comprehensive or refined as that used to manage the road pavement.
- VicRoads reviewed its asset information requirements and is developing new systems to support asset management.
- A key challenge for VicRoads is the retention of staff knowledge and expertise required to plan and deliver the road maintenance program effectively.

At a glance – *continued*

Key recommendations

VicRoads should:

- further develop the roadside asset strategy to define service levels that promote a consistent approach to manage risks and to set maintenance priorities across its regions **(Recommendation 4.1)**
- better quantify and document the costs and benefits of alternative maintenance options as part of its decision making processes **(Recommendation 4.2)**
- adopt as a standard practice in its funding bids for new road infrastructure an allowance for the recurrent resources required to maintain these assets **(Recommendation 4.3)**
- develop ways to retain the practical knowledge of experienced staff regarding road maintenance **(Recommendation 4.4)**.

4.1 Background

For a road maintenance program to be effective it needs to:

- be guided by asset strategies that have clearly defined goals and priorities
- have a program designed to implement these priorities in a cost-effective way.

To assess road maintenance planning, we examined:

- VicRoads strategies for managing the road infrastructure
- the business planning and prioritisation processes used to translate these strategies into a maintenance program
- the information systems supporting these planning processes
- the retention of staff skills and capabilities required to plan the maintenance program.

4.2 VicRoads asset management strategies

4.2.1 VicRoads has developed adequate strategies for maintaining key regional road infrastructure such as the road pavement and bridges

To assess how well road maintenance is being planned in Victoria, we reviewed VicRoads key strategies and plans for road infrastructure management, as described in Part 2 of this report.

VicRoads has developed strategies for these assets based on:

- clear objectives that align with the government's goals for the arterial road network
- a good understanding of stakeholder interests
- an objective understanding of asset condition and the type of maintenance required to cost-effectively maintain these assets
- performance indicators that are measurable and monitored
- clearly defined levels of service.

These strategies feature a risk-based approach to achieving target levels of service, while taking account of the whole-of-life costs.

Our work in three of VicRoads regions showed that these strategies have been consistently applied across the organisation. For example, each region uses the same approach to monitor road and bridge infrastructure condition and to manage the risks relating to these assets.

4.2.2 While sharing some of the good attributes of the road pavement and bridge strategies, elements of the roadside management strategy should be improved

The current roadside management strategy is an interim document providing a framework to manage roadside assets

Victoria's Roadside Management Strategy was designed by VicRoads to be an interim document, with the intention of updating and developing it as better practices became evident.

The strategy defines three key outcomes for roadside asset management, namely:

- improving safety
- protecting environmental and cultural heritage values
- enhancing amenity and access.

The strategy recognises the importance of state and federal legal and statutory requirements, such as the protection of native flora and fauna. The strategy also sets out the aims and performance objectives required to achieve the strategy's stated outcomes.

The lack of detailed and clear guidance about how to apply the strategy has led to VicRoads regions developing different approaches

VicRoads has documented guidelines for the overall management of roadside assets. These recommend that regions develop: an asset register and, processes to inspect and document asset condition and manage the risks relating to this asset group.

The regions we audited have developed different approaches to establish inventory, inspection and condition assessment for some roadside assets. For example, one region established an inventory of safety barriers in 2004–05. This inventory identified individual assets, assessed their condition and the probability and consequences of failure. The other two regions we examined did not have a similar systematic approach.

Clear guidance is needed so that regions adopt a consistent approach to the management of risks associated with these assets by drawing on regional best practice and overall VicRoads priorities. Decisions to develop and apply improved systems should take account of the likely costs and benefits to VicRoads.

4.2.3 VicRoads should further develop the roadside asset strategy to define service levels that promote a consistent approach to manage risks and to set maintenance priorities across its regions (Recommendation 4.1)

The diverse assets within the roadside assets portfolio present very different types of risk:

- the most significant risks relate to the failure of embankments and rock faces, where failure is likely to be costly and result in severe road safety and traffic delay consequences
- a middle category of risks includes the failure of safety barriers to perform as intended in a crash situation and a failure in the parts of the drainage system situated within the roadside
- the lowest level of risks relate to the maintenance of assets such as roadside vegetation, which can lapse for some time without significant consequence.

VicRoads classifies and monitors the most serious risks relating to embankment failures, landslides and rock falls. The approach to other assets needs further development to define required service levels as the basis for a consistent, state-wide approach to managing the risks and setting priorities.

Recommendation 4.1 means that VicRoads should:

- develop the current strategy to better manage roadside assets
- focus on those higher-risk assets where consistent measures of performance and risk are not currently in place
- disseminate better practices by drawing from existing practices.

4.3 VicRoads business planning and prioritisation processes

4.3.1 VicRoads has applied its resources to where they are most needed, by setting priorities consistent with its maintenance strategies

VicRoads prepared comprehensive guidelines for regions to develop their bids for maintenance projects

VicRoads prepares strategic guidelines each year to help regions develop their bids for maintenance funding. Over time the guidelines have been updated in response to comments from the regional offices and to better reflect policy priorities. Our review of the planning documents and interviews with officers in three regions showed that these guidelines had been understood and effectively applied.

VicRoads documented and applied a prioritisation process to guide the allocation of funding within the road maintenance program

The prioritisation process was guided by a risk management approach, balancing the achievement of the government's objectives and meeting the community's expectations within the available budget.

The guidelines cover maintenance programs for the road pavement and bridges and roadside assets. These categories are further divided into sub-categories for routine and more major periodic maintenance and rehabilitation.

The allocation of budget to each maintenance program area is made on the basis of:

- historic funding trends
- the value of the asset class
- an assessment of the levels of maintenance required to sustain performance
- an assessment of the risks of asset failure.

Within each program, projects are given a risk ranking, through formulas taking into account traffic volume, asset condition, likely rates of deterioration, potential improvement expected from the proposed treatment option, expected life of the treatment and cost. The approach is fine tuned to take account of specific policy guidelines. For example, the maintenance of some roads with less traffic is prioritised because they are key rural freight routes.

VicRoads determines the final maintenance program using a collaborative approach with senior management oversight. The overall state-wide maintenance program combines the regional bids through a collaborative process so the available resources are aligned with state-wide priorities.

4.3.2 While VicRoads takes account of the whole-of-life costs in making maintenance decisions, the application and documentation of this approach can be improved

We found evidence that VicRoads considers the long-term cost-effectiveness of alternative treatments when making maintenance decisions

Our review of VicRoads strategies and program documentation and our interviews with VicRoads regional staff showed a consistent emphasis on timely preventative maintenance.

The regional staff we interviewed demonstrated that they identified a range of treatment options to address a particular maintenance issue. They demonstrated an awareness of the most cost-effective option, but the level of resourcing and competing demands sometimes meant this option was not recommended. This option selection process was not always transparent in the business case documentation accompanying the regional project bids.

For some assets, the program development guidelines provided useful rules to encourage the choice of the most cost-effective option. For example, when the cost of routinely maintaining a pavement section exceeds 5 per cent of the cost of a periodic treatment, this indicates the need for periodic maintenance.

4.3.3 VicRoads should better quantify and document the costs and benefits of alternative maintenance options as part of its decision making processes (Recommendation 4.2)

The basis for choosing a particular maintenance treatment option needs to be clearly documented. This should provide evidence that the feasible options had been considered and identify the basis for choosing the preferred option. The documentation should clearly identify where a less cost-effective option has been preferred and the reasons for making this decision.

There is also room to better quantify the costs and benefits of alternative maintenance options. These figures should include the long-term maintenance costs and the costs to road users in terms of vehicle operation and traffic delays. The improved quantification of these costs would make for more transparent and consistent decision making.

VicRoads should apply this recommendation to those projects where the choice of one of many feasible options is likely to have a significant impact on the outcomes in terms of the whole-of-life costs and road user impacts.

4.3.4 In some cases, the design and implementation of new road projects did not pay sufficient attention to the impacts on the long-term costs of maintaining the assets

It is important to consider the maintenance implications and costs when deciding on the design of new road assets. The specific design, construction quality and the type of materials used, all impact on the maintenance requirements and costs.

Prior to 2007, VicRoads major projects division was responsible for building new assets and the regional services division was responsible for ongoing maintenance.

VicRoads is now developing processes to make sure that the ongoing maintenance requirements are fully considered in the design and construction of new road infrastructure. The following examples illustrate the type of problems that occur in the absence of such processes:

- some projects included innovative design features requiring specialist maintenance skills and equipment, which the regional services division did not possess. Examples included the installation of water treatment facilities, wire rope barriers and some electrical assets
- VicRoads sometimes applied different standards in terms of the expected useful life of assets. Projects provided less durable assets than would be expected when rehabilitating assets within the maintenance program. This could result because of a design decision or because a budgetary overrun had forced the project to compromise on the original design. For example, some bridges were constructed with expansion joints which had a shorter life than those used when maintaining the bridge
- major new road projects did not include a funding component related to the increased demands placed on the maintenance program.

4.3.5 VicRoads should adopt as a standard practice in its funding bids for new road infrastructure an allowance for the recurrent resources required to maintain these assets (Recommendation 4.3)

VicRoads has recognised this as an issue and has taken some initial actions to mitigate the impacts. In 2007 the network and asset planning division was created and part of its role is to improve the coordination of asset building and maintenance. Bids for new road infrastructure in 2008–09 now include a recurrent funding bid to cover the additional maintenance costs. This should be adopted as VicRoads standard practice.

4.4 Information systems supporting planning

4.4.1 Maintenance decisions relating to the road pavement and bridges were based on reliable and easily accessible information on the location, condition and the past maintenance history of the assets

VicRoads records maintenance works and the condition of the road pavement and bridges in its Road Asset System

VicRoads has a network-wide system of monitoring the network's roughness, cracking and rutting (the pavement condition surveys). In addition, it has an area-wide condition monitoring (surface inspection rating) carried out at the regional level for project-based decisions. Information from both processes is stored in the road asset system database.

This information provides comprehensive and reliable information on the condition of the road pavement. VicRoads uses this information to apply resources to where they will have the most impact on performance. Condition monitoring is addressed in part 6 of this report.

4.4.2 The information underpinning decisions about roadside assets is not as comprehensive or refined as that used to manage the road pavement

VicRoads regions applied a consistent approach to the collection and use of information for only a portion of the roadside assets. Section 4.2.3 explained that this is the case for risks relating to the failure of embankments and rock faces where failure may result in injury and serious damage.

For other important roadside assets, such as safety barriers and drainage systems, there was a lack of consistency across the three VicRoads regions we examined. The information requirements and supporting systems underpinning the management of this asset class needs to be further developed.

4.4.3 VicRoads reviewed its asset information requirements and is developing new systems to support asset management

VicRoads has a number of disparate, unconnected databases for road system management. VicRoads recognised this in an internal review that stated 'the business information VicRoads needs to provide community road infrastructure services is currently held in over 530 disparate ageing applications that are poorly integrated and, in the main, incompatible'.[1]

We found that:

- information held within different databases did not have a common reference point to allow the matching of information to form a more complete picture of asset condition and performance
- the information on treatment costs is not stored within the core asset database containing information on the assets, their treatment histories and condition.

This has limited VicRoads ability to carry out useful analysis on the impacts and cost-effectiveness of the road maintenance program.

VicRoads began the Connect Project in 2007–08. The project aims to:

- create a single comprehensive registration of assets information for strategic and operational planning and management
- provide easier access to the asset information needed to manage the delivery of maintenance services
- create a single location referencing system that provides consistent and reliable asset location information
- create a single source of accurate and reliable business information for strategic and operational reporting.[2]

The Connect Project will be developed and implemented over the next four years.

4.5 Retaining skills and capabilities

4.5.1 A key challenge for VicRoads is the retention of staff knowledge and expertise required to plan and deliver the road maintenance program effectively

Each of the three regions we visited had experienced some degree of difficulty in resourcing the maintenance development and delivery teams. The reasons for this are:

- increased demand for experienced personnel from other parts of VicRoads, the public sector and private industry

[1] VicRoads Connect Project Management Plan version 1.0, 12 November 2007, page 6.

[2] Ibid, page 6.

- transition from a more engineering-based role to an administrative role focusing on contract management, while requiring engineering knowledge. This is perceived as being less attractive to qualified engineers
- ageing and retirement of experienced staff. For example, a high proportion of surveillance officers across the regions are over 55 years old.

VicRoads has acknowledged this challenge and developed a number of measures to specifically address retention and the development of knowledgeable maintenance staff including:

- creating an asset management career path within VicRoads
- starting a cadetship program to train new surveillance officers
- profiling existing staff to identify gaps in skills and capabilities
- developing training opportunities for staff to develop their skills and add to their experience.

More generally VicRoads, and other Australian road authorities, have engaged AustRoads to develop a joint capability framework.

4.5.2 VicRoads should develop ways to retain the practical knowledge of experienced staff regarding road maintenance (Recommendation 4.4)

VicRoads relies on the skills and accumulated experience of its staff to make best use of asset-related information in making maintenance decisions

We found in our interviews that senior personnel within VicRoads drew extensively on their accumulated knowledge and experience when recommending maintenance treatments and deciding how best to implement them.

While some of this information is accessible through documentation, other information relevant to maintenance decisions is less likely to be recorded including:

- an awareness of road conditions through personal observation
- past, first hand experience of the effectiveness of a range of maintenance treatments
- an understanding of the strengths and weaknesses of local and more major contractors.

We saw evidence that VicRoads is aware of the need to pass this essential information and experience on to the next generation of maintenance engineers. We noted in section 4.5.1 the positive actions VicRoads has taken in relation to this. VicRoads needs to continue this development and strengthen its written documentation to better describe how experienced personnel used their knowledge in making maintenance decisions.

5 Delivering road maintenance

At a glance

Background

Good plans translate into an effective program when actions are delivered as needed. In this part, we examined the adequacy of the maintenance contracting and implementation arrangements by assessing whether VicRoads had:

- complied with the applicable contracting guidelines
- applied processes so that road maintenance contracts provided value for money
- delivered maintenance activities on-time and within the allocated budgets
- applied processes to establish the quality of the contractual outputs.

Key findings

- VicRoads has complied with the Ministerial Directions governing road maintenance contracts.
- Arrangements for periodic maintenance and rehabilitation contracts have encouraged competition and delivered the intended outputs.
- VicRoads has used its in-house teams and local councils to deliver routine maintenance in more remote areas.
- VicRoads has identified some challenges in relation to the cost-effectiveness of routine maintenance contracts.
- VicRoads regions have developed processes to track the quality and progress of maintenance projects.
- VicRoads maintains the quality of contract outputs by pre-qualifying contractors, specifying the contract requirements and regularly monitoring performance.
- The quality assurance processes have worked well for periodic maintenance and rehabilitation contracts.
- Challenges with a small number of routine maintenance contracts have highlighted areas of the quality assurance process which should be reviewed.

Key recommendation

- VicRoads should formulate initiatives to improve how it delivers routine maintenance contracts and their performance **(Recommendation 5.1)**.

5.1 Background

Good plans translate into an effective program when actions are delivered as needed. In this part, we examined the adequacy of the maintenance contracting and implementation arrangements by assessing whether VicRoads had:

- complied with the applicable contracting guidelines
- applied processes so that road maintenance contracts provided value for money
- delivered maintenance activities on-time and within the allocated budgets
- applied processes to establish the quality of the contractual outputs.

In section 2.3.4 of the report we provided an overview of VicRoads contracting responsibilities and processes.

5.2 Compliance with contracting guidelines

5.2.1 VicRoads has complied with Ministerial Directions governing road maintenance contracts

Directions issued by the Minister for Planning and the Minister for Transport, set out the contracting requirements, with which VicRoads must comply.

VicRoads has documented processes that conform to the requirements of the Ministerial Directions and provides training in their use

VicRoads has produced a procurement toolkit that guides VicRoads staff to apply appropriate processes across the range of maintenance contracts. The toolkit describes the roles, and responsibilities for those managing the different stages of the contracting process.

VicRoads provides training so that its staff can properly apply these processes. We found that internal training was in place and the staff we interviewed demonstrated a good understanding of how to apply the procurement toolkit.

VicRoads contract management staff had consistently and correctly applied the contract management guidelines

At the three regions visited, we reviewed the documentation for 28 contracts planned for delivery in 2006–07. We chose these contracts to represent a cross-section of maintenance projects in terms of:

- asset types
- contract value and length
- type of provider (external contractors, in-house teams and local councils).

Our review of the documentation showed that the relevant guidelines had been consistently and properly applied.

5.3 Processes to deliver value for money

Value for money, in the context of contracting, means delivering specified outcomes at the lowest possible price. In achieving value for money through its maintenance contracts, VicRoads has to contract across a range of different situations in terms of the level of market competition and the need to encourage a minimum number of participants in the long-term.

For larger periodic maintenance and rehabilitation projects in the more populated areas of the state, many large, established companies compete. For smaller projects in the more remote parts of the state fewer companies compete. In these cases VicRoads sometimes relied on its in-house groups or local councils to provide road maintenance services.

In Figure 2D, we showed that private companies account for 56 per cent of VicRoads contract spending, in-house teams 35 per cent and local councils for the remaining 9 per cent.

In this section we examine whether the contract arrangements have delivered value for money.

5.3.1 Arrangements for periodic maintenance and rehabilitation contracts have encouraged competition and delivered the intended outputs

VicRoads has packaged works and structured contracts to encourage competition

In our visits to three VicRoads regions, the contract management staff demonstrated a good understanding of the capabilities and modes of operation of local and larger-scale providers. VicRoads used this knowledge to enhance competition by:

- creating area-wide works packages to attract greater competition and realise economies of scale
- completing maintenance planning and issuing invitations to bid early in the new financial year as soon as the maintenance budget has been confirmed. There is more competition at the start of the year, as contractors are keen to fill their order books. This quick response takes advantage of this
- packaging some projects to sustain local suppliers with specialist skills. VicRoads judges that longer-term cost-effectiveness is best served by sustaining local specialists in areas such as bridge maintenance. We accept the need to sustain these local specialists and this is consistent with government's policy to grow the whole State of Victoria.

VicRoads system of pre-qualification and price based competition has worked to deliver outputs of the required quality

For these types of maintenance activities:

- VicRoads can precisely specify the contractual requirements, including the use of materials and construction methods
- bidders are able to accurately predict the resources required and feasible completion timelines
- VicRoads can monitor progress and the adequacy of the outputs on completion against clear milestones and criteria.

These attributes are suited to the approach VicRoads adopts to tendering. For the regions we visited we found that there were few problems in delivering outputs meeting the contract specifications. VicRoads regular, on-site inspections and dispute resolution processes have provided the mechanisms to effectively identify and resolve any performance issues. These contracts also include a two-year liability period on these works. This mitigates the risks of poor workmanship.

5.3.2 VicRoads has used its in-house teams and local councils to deliver routine maintenance in more remote areas

VicRoads faces a particular challenge in delivering smaller-scale road maintenance services in the more remote areas of Victoria. To address the lack of local service providers VicRoads enters into service level agreements with its in-house roads services group and with local councils. These are direct agreements mostly for routine maintenance work.

VicRoads has entered into sole supplier, lump-sum contracts with some councils to continue with the routine maintenance work they did prior to the *Road Management Act 2004*. These arrangements conform to the Ministerial Directions and had to be justified on a case-by-case basis. The prices for these contracts were based on allocations previously provided to councils for routine maintenance.

Most of the service level agreements with the road services group and councils cover the more remote areas of the state, where VicRoads expects very limited competition for routine maintenance contracts.

In terms of providing value for money we reviewed evidence showing that:

- councils' unit costs for routine maintenance are at the lower end of the bids provided by private contractors for similar types of maintenance in the same region
- VicRoads road services group costs were often above comparable contractor costs for different parts of the region but provided higher quality routine maintenance services than comparable private sector contractors. For example, the eastern region surveillance staff found that road services were much more thorough in addressing routine maintenance hazards.

In addition the in-house teams provide VicRoads with other benefits including:

- the availability of a specialist resource to respond immediately to emergencies
- a capability to complete small, specialist, maintenance tasks where it is not cost-effective to go through a competitive bid process
- the retention of a core set of specialist road maintenance skills within VicRoads.

In summary, VicRoads has used service level agreements in situations where there is likely to be limited competition, to deliver value for money.

5.3.3 VicRoads has identified some challenges in relation to the cost-effectiveness of routine maintenance contracts

Routine maintenance contracts present some specific challenges when compared to periodic maintenance and rehabilitation contracts

Routine maintenance contracts mostly involve regular inspections and reactive work to address hazards and defects as they are identified. In contrast to the periodic maintenance and rehabilitation, routine maintenance contracts are more difficult for:

- VicRoads to specify, because the demands are reactive and uncertain
- VicRoads to monitor, because the contractor must react to demands that may arise at short notice so much more intensive surveillance is required
- contractors to accurately estimate the resources required, because the demands are uncertain.

We found that two of the three VicRoads regions we examined had experienced difficulties in managing these contracts

Making sure that contractors adhered to the contract specification was an ongoing challenge for a small number of these contracts. We found examples where VicRoads surveillance showed that contractors had not identified, or addressed in time, road defects and hazards.

In one case the contractor had bid a price significantly below the other bidders and VicRoads estimate of the likely resource requirements. This contributed to ongoing performance shortcomings.

Routine maintenance contracts required intensive surveillance and the VicRoads administration costs were often high

To address these issues VicRoads regions had to maintain a high level of surveillance to monitor the performance of routine maintenance contractors. For example, one regional surveillance officer identified 170 defects and hazards that required a routine maintenance response. The contractor had only identified 20 defects along the same section of road.

Instances such as this demonstrate that VicRoads administration costs can often be high. In some cases we found that the relationship between VicRoads and the routine maintenance contractor was adversarial, with the contractor trying to do the minimum maintenance necessary. For a minority of these contracts, this situation is likely to diminish value for money and stretch VicRoads local staffing resources.

Further comment on these issues can be found in section 5.5.3 of this report.

5.3.4 VicRoads should formulate initiatives to improve how it delivers routine maintenance contracts and their performance (Recommendation 5.1)

As part of its regular state-wide meetings on road maintenance VicRoads formed a working group to review the delivery and direction of routine maintenance over the next decade.

VicRoads should use this work to formulate initiatives for improving how routine maintenance is specified, delivered and monitored. This review should include an examination of the effectiveness of:

- the current tendering arrangements, including a review of the pre-qualification process
- the performance monitoring arrangements (VicRoads has started to explore alternative contract forms to establish more collaborative arrangements)
- the contract evaluation processes and how these affect the pre-qualification status of contractors.

VicRoads should also periodically review the practices of its in-house teams to confirm that they are delivering appropriate services efficiently.

The review should also examine the adequacy of the current mechanism used to raise concerns about the appointment of a lowest price bidder, where the pricing appears to be unsustainable.

5.4 Delivering against timeframes and budgets

5.4.1 VicRoads regions have developed processes to track the quality and progress of maintenance projects

In three regions, over a three year period to June 2007, we found 91 per cent of contracts were delivered within 10 per cent or less of the allocated budgets

VicRoads allows a variance of ± 10 per cent of project budgets to account for allowable variations which cannot be fully captured in the contracts. VicRoads sets an internal target of delivering 90 per cent of projects within this benchmark. The maintenance program delivery has exceeded this target.

VicRoads actively manages these variations re-allocating under-runs to projects with over-runs or to new, high priority projects.

Over the same time period 81 per cent of contracts were delivered on or before the specified delivery date, but the reasons for non-compliance showed this had little effect on the delivery of the maintenance program

At first glance the on-time delivery does not look as impressive. However, our analysis shows that the reasons for non-compliance were unlikely to affect the delivery of the maintenance program.

The major reasons for projects being recorded as late were:

- project practically completed but recorded as late. For example, where rehabilitation consists of a first stage to make the road fit for purpose and a second stage resealing scheduled for a later date. The system can record this project as being behind schedule when there is a planned delay
- changes to scheduling within a group of packaged projects. When several projects are gathered into a single package, the contractor might re-order the completion dates. While the whole package might be completed on-time, this reordering will register some projects as behind schedule
- some projects are less than a week late and very few are significantly delayed.

VicRoads completes a very high proportion of the planned works in the financial year in which those works were scheduled.

5.5 Quality assurance

5.5.1 VicRoads maintains the quality of contract outputs by pre-qualifying contractors, specifying the contract requirements and regularly monitoring performance

The pre-qualification examines the financial viability, technical capability and track record of contractors wanting to bid for VicRoads maintenance contracts. This is a pre-cursor to the award of contracts based on the lowest price.

VicRoads contract specifications are specific whenever it is possible to be precise about a required treatment in terms of the material and methods which should be used. This promotes a level of consistency in the outputs.

Once begun VicRoads regional staff monitor the contract and inspect the works on-site. Staff are also required to document contract performance in regular evaluation reports.

5.5.2 The quality assurance processes have worked well for periodic maintenance and rehabilitation contracts

Earlier in this part of the report we explained how these types of contract are more open to precise specification and are easier to monitor and evaluate. This means that the pre-qualification system and other assurance processes are more likely to work well for these types of contract.

5.5.3 Challenges with a small number of routine maintenance contracts have highlighted areas of the quality assurance process which should be reviewed

The pre-qualification scheme did not always mitigate the risks of poor quality contract outputs

In some cases the pre-qualification process did not avoid poor quality or financially unsustainable outcomes. We found examples where, a contractor did not adhere to quality assurance systems indicated in its pre-qualification submission and, another contractor went into liquidation because it was losing money on the contract.

Monitoring and evaluating the performance of routine maintenance contracts

These contracts, requiring continuous inspection and reaction to hazards, are more difficult to monitor because they are reactive in nature and less predictable. Contractors also have more latitude to place limits on their responsiveness, especially if competition has forced them to commit to a tightly priced contract.

This places pressure on the regional staff responsible for monitoring these projects and in some cases has created an adversarial relationship between VicRoads and the contractor.

VicRoads requires that contractor performance is evaluated every six months during the contract term and also when the contract is completed. The results are documented and contractors have the right to review and respond to these reports.

In practical terms, we found it was difficult to remove a contractor from the pre-qualified list. Contractors strongly oppose any negative findings and it is unlikely that pre-qualification will be revoked. To date, there is only one case where the contractor's pre-qualification has been revoked and that was when the company went into liquidation.

VicRoads has recognised that the pre-qualification system can be improved. VicRoads is trialling a new template for the performance evaluation reports which appears to have support from industry. It will score contractor performance between zero and four in 12 different categories, with justification comments included. Low scores will trigger VicRoads Contract Management Services to review the contractor's pre-qualification, with the possibility of lowering the pre-qualification level or removing it altogether in the case of under performing contractors.

6 Evaluating road maintenance

At a glance

Background

Properly maintaining infrastructure requires the ability to adapt to changing circumstances and demands over time. To do this VicRoads needs to evaluate the impacts of its road maintenance activities and translate these findings into improved practices.

In this part, we assess whether VicRoads has:

- adequately monitored the performance of key assets
- adequately measured the performance of the maintenance program
- used the information to improve the road maintenance program and its practices.

Key findings

- VicRoads has put in place adequate processes to monitor the condition of the road pavement and bridges.
- VicRoads needs to better assess the condition of and risks to some of the roadside assets.
- The information VicRoads collects provides an adequate basis to track the performance of the maintenance program against its key objectives.
- VicRoads complied with its safety inspection and hazard response obligations.
- We found evidence that VicRoads had used the condition monitoring results and research projects to improve the road maintenance program.
- VicRoads is reviewing its asset information systems and should use this opportunity to improve the analysis and use of asset data.
- VicRoads has in place a web-based enquiry system for tracking and resolving customer enquiries, which needs to be improved.

Key recommendation

- VicRoads should use the current review of its information systems to make critical improvements to the enquiry tracking system **(Recommendation 6.1)**.

6.1 Background

Properly maintaining infrastructure requires the ability to adapt to changing circumstances and demands over time. To do this VicRoads needs to evaluate the impacts of its road maintenance activities and translate these findings into improved practices.

In this part, we assess whether VicRoads has:

- adequately monitored the performance of key assets
- adequately measured the performance of the maintenance program
- used the information to improve the road maintenance program and its practices.

We examined the content and use of the key information sources used to inform VicRoads evaluation of the road maintenance program.

6.2 Evaluating the infrastructure maintenance program

6.2.1 VicRoads has put in place adequate processes to monitor the condition of the road pavement and bridges

VicRoads monitoring provides a comprehensive picture of pavement condition

VicRoads monitors the pavement condition through:

- pavement condition surveys
- surface inspection rating investigations.

The annual road pavement condition surveys cover about half of the Victorian arterial road network and measure pavement roughness, cracking and rutting. These surveys are completed with a contract let for a three-year period. VicRoads recognises the need to keep consistency in the survey methods when re-contracting, if it selects a new provider.

The surface inspection rating investigations involve the manual inspection of about one-third of the road pavement by VicRoads staff. They score seven factors (five for asphalt) based on a rating scale. These inspections focus on verifying road pavement condition to inform decisions on the priorities within the maintenance program.

This information is captured in the road asset system database. This electronic database is available to VicRoads staff via the intranet. It records information about:

- the condition of the road pavement and bridges at each inspection
- the history of maintenance activities for each road asset
- recommendations about how and when the asset should next be treated.

VicRoads bridge inspection regime provides adequate information on bridge condition

VicRoads adopts a risk management approach to determine inspection frequencies and levels, where:

- level 1 consists of a six-monthly routine inspection performed by a bridge maintenance team according to a pre-prepared checklist
- level 2 includes a periodic structural condition inspection undertaken on a two to five-year cycle depending on the condition at the previous inspection. The inspection is performed by an accredited structural engineer
- level 3 involves further investigation by an experienced engineer when a structural condition inspection identifies a major structural problem.

The results from these inspections are used to update the bridge inventory, which records all bridge maintenance activities. All information collected by VicRoads about arterial road bridges, such as the structure identification number, location, condition and dates of inspection is also stored in the road asset system database. Bridges in very poor or poor condition will be programmed for priority maintenance.

6.2.2 VicRoads needs to better assess the condition of and risks to some of the roadside assets

The assets contained within the roadside asset group are diverse and therefore complex to monitor and manage. We raised the issue of developing a consistent approach across regions to this asset group in section 4.4.2 of this report.

VicRoads currently rates the condition and risks related to assets where failure would result in significant danger and damage. For example, geotechnical risks related to landslides and rock falls are rated as low, medium or high risk.

For other assets, VicRoads has not yet developed a common condition rating system and prioritisation approach across its regions. This is illustrated by the range of approaches used to monitor the condition of road safety barriers.

6.2.3 The information VicRoads collects provides an adequate basis to track the performance of the maintenance program against its key objectives

VicRoads key objectives for the road maintenance program include contributing to road safety, lowering vehicle operating costs, improving ride comfort and achieving these outcomes cost-effectively.

The information collected on the road pavement, bridges and the higher-risk roadside assets provides an adequate basis to understand the impact of road maintenance on the objectives of the road maintenance program.

6.2.4 VicRoads monitors its compliance with the Road Management Plan by regularly reporting on safety inspections and road hazard response times

In response to the requirements of the *Road Management Act 2004*, VicRoads, as part of its Road Management Plan, has documented minimum standards in relation to:

- **safety inspections**—these involve the routine maintenance contractor driving the network at specified frequencies and recording any hazards, as well as situations which have the potential to cause harm to the health and safety of road users
- **responding to road hazards**—once identified, contractors are required to rectify hazards that fall within their responsibility as part of routine maintenance. A required response time is set depending on the hazard and road maintenance category.

VicRoads records information about these activities and reports quarterly on the levels of compliance to VicRoads management committee.

We examined VicRoads records to determine whether it had complied with the Road Management Plan's requirements.

6.2.5 VicRoads regions complied with the safety inspection requirements

Figure 6A shows compliance levels exceeded 97 per cent for all non-metropolitan regions for the period April to June 2007. VicRoads receives regular reports from contractors confirming that they have completed the required inspections. VicRoads staff also inspect parts of the network to make sure that the contractor inspections have identified defects and hazards.

Figure 6A
Safety inspection compliance levels for all non-metropolitan regions between April and June 2007

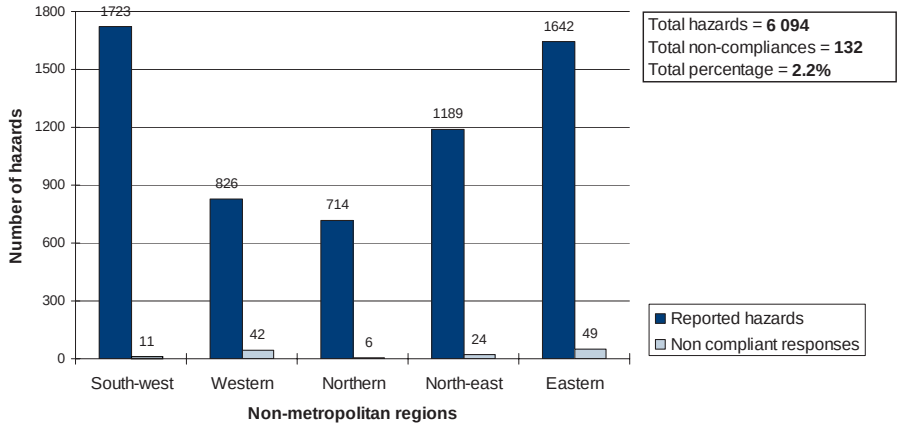
Arterial road category	Required safety inspection frequency	% Compliance
1	Daily	100.0%
2	Twice weekly	99.0%
3	Weekly	97.3%
4	Every second week	97.1%
5	Monthly	99.1%

Source: VicRoads.

6.2.6 VicRoads regions complied with the required hazard response times

Figure 6B shows that there were a total of 6 094 reported hazards for VicRoads non-metropolitan regions between 1 April 2007 and 30 September 2007. For these hazards, VicRoads reported that around 98 per cent were addressed within the required response times. VicRoads conducted an audit of a sample of these responses to verify that hazards had been correctly coded and checked what percentage of hazards were addressed within the allocated time.

Figure 6B
Compliance with hazard response times, non-metropolitan regions, April to September 2007



Source: VicRoads.

Some of the cases of non-compliance were explained by:

- limitations of the enquiry tracking system where a VicRoads employee cannot record the response as compliant if the hazard was addressed on time but the database was updated after this deadline
- unavoidable delays where an asset, such as an unusual sign, is subject to delivery delays.

6.3 Improving the road maintenance program

In this section of the report, we examine how VicRoads makes use of the information it collects on the road maintenance program to drive further improvement. This information includes:

- the condition and performance data described in section 6.2
- further research results from studies commissioned to investigate specific aspects of asset performance
- customer enquiries, which are an important source of feedback on the success of the road maintenance program.

6.3.1 We found evidence that VicRoads used the condition monitoring results and research projects to improve the road maintenance program

Over time VicRoads has made use of condition monitoring data to set minimum levels of routine and periodic maintenance and rehabilitation for road pavements. VicRoads understands the need to continuously monitor the outcomes and the developments in road pavement technology. These provide the basis for refining the program to make it more cost-effective.

We found VicRoads had applied credible research to improve the cost-effective maintenance of the road pavement by:

- reducing periodic maintenance coverage rates from 10 per cent to 7 per cent, following the results of a research project into the durability of treatments
- adopting the use of more effective materials when they are identified.

6.3.2 VicRoads is reviewing its asset information systems and should use this opportunity to improve the analysis and use of asset data

As discussed in section 4.4 of this report, VicRoads existing asset information systems are disparate and poorly integrated. Information on asset treatments, program costs and program outcomes is stored in unconnected databases and this makes it difficult to systematically analyse the impacts of the program.

VicRoads has started the Connect Project to review and improve its information systems. This review identified that the current databases are ageing, poorly integrated and incompatible.

VicRoads should develop a single location referencing system for use across all asset databases. This would help to identify the location of assets and cross reference treatment types, costs and effectiveness data. This would improve VicRoads understanding of the impact of its maintenance activities.

6.3.3 VicRoads has in place a web-based enquiry system for tracking and resolving customer enquiries, which needs to be improved

It is important that VicRoads is alert to customer enquiries and warnings about road hazards

Information from the travelling public often provides critical, real time information on road hazards and risks. In addition, repeated reports of hazards in the same location may point VicRoads to ongoing problems requiring urgent treatment. Customer information is an important complement to VicRoads ongoing condition and performance monitoring activities.

The importance of customer information and matching this with VicRoads other information sources was illustrated through a coroner's report into a fatal accident on the South Gippsland Highway in 2001.

The cause of the accident was the deterioration of the surface making the pavement unsafe in wet conditions. The owner of a trucking company had contacted VicRoads several months prior to the accident to inform it that some of his trucks were suddenly losing control in the wet in the general area of the accident. VicRoads pavement condition information verified the risk at this location. However, VicRoads systems were not able to respond to these clear messages.

The coroner recommended that:

- 'improvements need to be made to the data collection and computer software systems at VicRoads to ensure that all data collected whether from the public, internal reports on problems with maintenance or the state of the road, accident information, etc, be able to be automatically cross referenced to ensure that, as a minimum, the extent of the problem is recognised and the risk evaluated and managed (within the bounds of practicality and resources)' [1]
- 'it is essential that the systems actually work to pro-actively identify and manage the information in a timely way'.[2]

In response to these recommendations, VicRoads developed the enquiry tracking system (ETS).

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[1] State Coroner Victoria 2003, 'Inquest into the death of William Pettet, Cherylynn Pettet, Robert Pettet, Sharnie Pettet and Rosa Guajardo: Findings', State Coroners Office, Melbourne, page 77.

[2] Ibid, page 77.

6.3.4 VicRoads should use the current review of its information systems to make critical improvements to the enquiry tracking system (Recommendation 6.1)

We examined the adequacy of the enquiry tracking system by:

- reviewing the system documentation
- observing its operation at the VicRoads traffic management centre
- interviewing VicRoads head office and regional staff about its capabilities and operation.

The system adequately records the occurrence and tracks the resolution of individual customer enquiries

When a complaint is logged in regard to road hazards or defects, the ETS will notify the appropriate staff member in the relevant region who has been assigned responsibility for assessing the risk, organising the work order and closing the call off when appropriate responses have been taken.

If a complaint is logged after the normal office hours and is deemed to be of high risk, the staff dealing with the complaint can access emergency contacts and arrange for an immediate response to the hazard.

ETS staff first classify each enquiry received by type (i.e. pavement maintenance/ sealed surface/pothole patching), and then assign a risk category to the enquiry. The ETS automatically provides a target timeline for the enquiry to be resolved. The target timeline complies with VicRoads Road Management Plan.

We viewed the working of the system and examined VicRoads material on the regular internal audits of the system. We found that the system was adequate to capture customer enquiries and track their resolution. In particular, this makes sure that important complaints do not lie unresolved.

We found some ways in which the practical operation of the ETS could be improved

System inflexibilities meant that some enquiry responses were recorded as late when in fact they were resolved on time. If a customer enquiry is resolved after office-hours on a particular day, the ETS does not allow staff to record this on the following working day. There are also strict rules around who can close out the work orders. For example, if an enquiry is resolved but the responsible person is away sick, the completion date recorded will be after the actual date of completion when the person returns.

In logging an enquiry, the operator assigns it a risk category based on the available information. Local staff may want to change this category based on more complete information. For example, a site inspection may show the problem is not as severe and urgent as first thought. It is difficult to process this change and we found instances when staff would simply process the enquiry based on its initial risk definition. This meant directing resources to a lower priority task.

VicRoads regional staff were not able to generate reports analysing overall customer enquiry trends

According to the ETS user manual, the system is 'capable of logging, tracking, reporting and monitoring the majority of VicRoads external customer enquiries'. From the examples provided in the manual, it appeared that the ETS is capable of reporting:

- the volume of road hazards and defects that have been received in relation to a particular road and municipality, for a particular period
- trends describing frequencies and locations of different types of hazards and defects, for example, potholes
- aggregate reports of response status and on-time closure.

However, we found that VicRoads regional staff were unable to produce these reports. This type of reporting is important in identifying clusters and patterns of hazards that signal a more significant underlying problem. This is the type of analysis referred to in the coroner's report quoted in section 6.3.3.

It is essential that VicRoads develops this capability by addressing any system limitations and providing adequate training to regional staff.

VicRoads is developing new business information systems to provide an integrated approach to road maintenance monitoring and reporting

The aims of VicRoads Connect Project are to develop, integrate and simplify information systems so they better meet VicRoads needs. The project documentation acknowledges the following:

- information deficiencies identified in the findings from the Coroner's Court
- regional services must be able to modify, downgrade and close risks by region, asset type or contractor. Any changes to a risk should be tracked and a history of risk modification made.

VicRoads must ensure that the Connect Project delivers on these requirements.

Auditor-General's reports

Reports tabled during 2007-08

Report title	Date tabled
Program for Students with Disabilities: Program Accountability (2007-08:1)	September 2007
Improving our Schools: Monitoring and Support (2007-08:2)	October 2007
Management of Specific Purpose Funds by Public Health Services (2007-08:3)	October 2007
New Ticketing System Tender (2007-08:4)	October 2007
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Parliamentary Appropriations: Output Measures (2007-08:8)	November 2007
Auditor General's Report on the Annual Financial Report of the State of Victoria, 2006-07 (2007-08:9)	November 2007
Funding and Delivery of Two Freeway Upgrade Projects (2007-08:10)	December 2007
Results of Financial Statement Audits for Agencies with 30 June 2007 Balance Dates (2007-08:11)	December 2007
Local Government: Results of the 2006-07 Audits (2007-08:12)	February 2008
Agricultural Research Investment, Monitoring and Review (2007-08:13)	February 2008
Accommodation for People with a Disability (2007-08:14)	March 2008
Records Management in the Victorian Public Sector (2007-08:15)	March 2008
Planning for Water Infrastructure in Victoria (2007-08:16)	April 2008
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Planning Scheme Amendment: Assessment Checklist (2007-08:20)	May 2008
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Implementation of the Criminal Justice Enhancement Program (2007-08:26)	June 2008
Performance Reporting in Local Government (2007-08:27)	June 2008

Report title	Date tabled
Services to Young Offenders (2007-08:28)	June 2008
Local Government Performance Reporting: Turning Principles into Practice (2007-08:29)	June 2008
Performance Reporting by Public Financial Corporations (2007-08:30)	June 2008
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