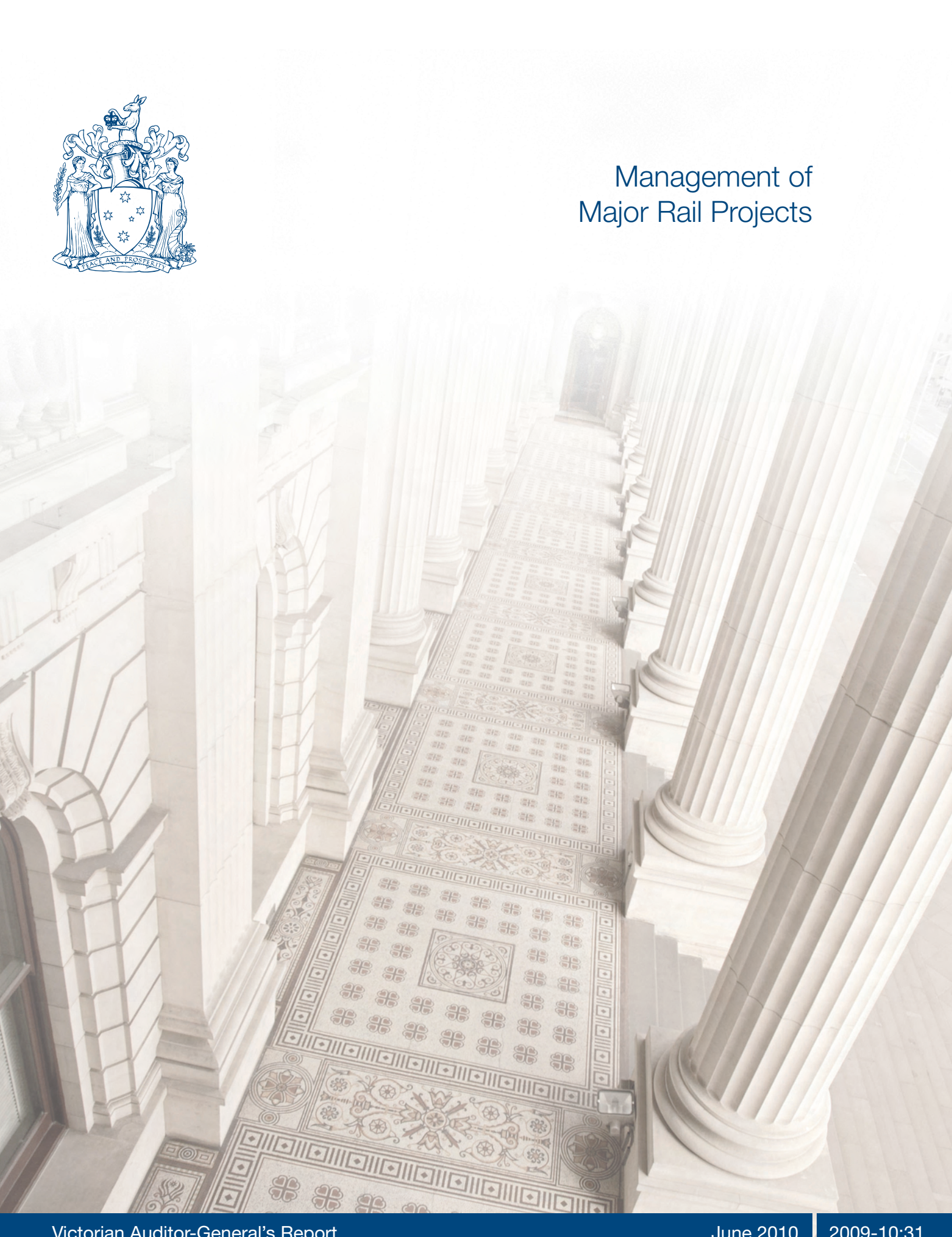
# Management of Major Rail Projects



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# Management of Major Rail Projects

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VAGO

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 *Management of Major Rail Projects.*

Yours faithfully

D D R PEARSON
*Auditor-General*

23 June 2010

# Contents

# Audit summary

## Background

The audit examined how well the Department of Transport (the department) had managed recent rail projects.

Effective management means:

- deciding whether a project should proceed and how it should be procured based on a sound understanding of the costs, benefits and risks
- managing risks to deliver the intended benefits on time and within budget
- using the experience to better manage future projects.

Previous VAGO rail audits found that the department had not effectively managed:

- the feasibility work because it underestimated the costs, overestimated the benefits and inadequately assessed the risks
- the projects' delivery because its response to emerging risks was inadequate
- the outcomes because there were cost and time overruns and, in two cases, it did not deliver the benefits as projected.

Since 2002 the department has changed how it manages rail projects.

This audit examined five recent projects to see whether the department had addressed past weaknesses. These were developed between 2004 and 2009 and included:

- **Middleborough Road grade separation**—completed in March 2007
- **Clifton Hill rail duplication**—completed in January 2010
- **Coolaroo Station**—completed in June 2010
- **Sunbury electrification project**—due for completion in December 2012
- **South Morang rail extension**—due for completion in September 2013.

## Conclusion

Improvements to the department's project development processes mean there is greater assurance that major projects are appropriately justified and provide value-for-money. However, the level of assurance is still short of that needed for projects of the scale and cost examined in this audit.

The department should strengthen the work that underpins final business cases and improve the quality of these documents so they provide adequate assurance that projects, if endorsed, are ready for implementation.

The department has significantly improved its management of project risks during delivery. However, it is still unable to reliably demonstrate how well projects realise their intended benefits.

# Findings

The use of business cases and structured reviews to check their content have been positive steps forward. The department needs to build on this foundation to further improve the quality of the business case documentation and the reliability of the information underpinning this.

In particular the department needs to improve the:

- rigour of the analysis of the costs, benefits and risks supporting the business case recommendations
- level of assurance provided in support of deciding to use project alliances
- comprehensiveness of the business case and procurement documentation.

The department's improved management of project risks during delivery has been reflected in better performance against planned time lines and approved budgets. The three completed projects had met the required time frames and two had delivered within their approved budgets.

However, the department is not able to demonstrate how well projects have realised their intended benefits. It also does not consistently document and apply the lessons learnt from past projects.

# Recommendations

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# *Audit Act 1994* section 16— submissions and comments

## Introduction

In accordance with section 16(3) of the *Audit Act 1994* a copy of this report, or relevant extracts from the report, was provided to the Department of Transport with a request for comments or submissions.

The comments and submissions provided are not subject to audit nor the evidentiary standards required to reach an audit conclusion. Responsibility for the accuracy, fairness and balance of those comments rests solely with the agency head.

## Submissions and comments received

***RESPONSE provided by the Secretary, Department of Transport***

The following is an extract of the response provided by the Secretary, Department of Transport. The full response is provided in Appendix A of this report.

*I am pleased to note your acknowledgement of the improvements to the Department's project development processes and its management of project risks.*

*I confirm the Department is continually implementing procedures and strategies to improve program and project management and structures to drive an increasingly commercial management culture. Especially, as we move further into implementing the VictorianTransport Plan.*

*To this end I accept your recommendations and note they are consistent with the Department's planned continual improvement process.*

# 1 Background

## 1.1 The role and importance of rail projects

The goal of the *Victorian Transport Plan* (the plan) is to improve the transport network to meet the state's growing transport needs. The plan aims to do this by investing $38 billion to significantly increase the capacity of the transport network, buy more trains and trams and run more services, more often to more places.

This transport investment is to be coordinated with future land development to reduce the public's need to travel while providing for the efficient movement of freight. The plan thus aims to contribute to the state's prosperity and liveability in a way that lowers transport's carbon footprint.

The plan includes over $15 billion in rail projects. If the plan is to be successful, it is important that these projects are managed effectively.

## 1.2 The role of the Department of Transport

The Department of Transport (the department) is responsible for overseeing the transport system. Its mission is to build a safer, fairer and greener transport system to create a more prosperous and connected community. Achieving this requires public transport to play a greater role in meeting the transport needs of Victorians.

The department needs to manage rail projects effectively if it is to achieve its mission. This means:

- making good decisions about the form and procurement of rail projects based on a sound understanding of the costs, benefits and risks
- managing project risks to achieve the intended outcomes on time and within the allocated funding
- using its experience to better manage future projects.

## 1.3 Problems with past rail projects

Previous VAGO audits on the restoration of country passenger rail services in 2004 and rail gauge standardisation and regional fast rail in 2006 highlighted that the department needed to improve how it plans, manages and delivers rail projects.

These audits found the department had not effectively managed:

- **the feasibility and preparatory work**—it underestimated the costs and time requirements, overestimated or mis-specified the benefits and inadequately assessed the risks
- **the projects' delivery**—its response to emerging risks was inadequate, it did not effectively engage with key stakeholders and it specified an ineffective contractual form for the fast rail project
- **the outcomes**—there were cost and time overruns and, in two cases, it did not deliver the benefits as projected in the projects' justification to government.

In November 2008 the Public Accounts and Estimates Committee (PAEC) published its review of the findings and recommendations of the Auditor-General's reports tabled between July 2006 and February 2007.

In response to the gauge standardisation and fast rail audits PAEC recommended that: 'The Auditor-General place on his audit plan, a review of the Department of Transport's project management framework and the supporting governance arrangements to ensure they are sufficiently robust.'

## 1.4 Actions to improve project management

The previously audited projects were developed between 2000 and 2002 and delivered between 2002 and 2006.

Since 2002 the department has set up:

- a Project Review Committee to oversee the development of projects to a final business case that described the objectives, outcomes and options and the costs, benefits and risks used to choose a preferred option
- governance mechanisms to monitor and steer projects once in delivery
- protocols, systems and guidelines to improve project development.

More recently the department:

- launched a Project Management Framework in 2007 that more clearly documented what project managers need to do to successfully develop and deliver projects
- established in 2009 a Delivery Coordination Division, a new review panel process and a steering committee to strengthen project oversight and review and apply the lessons learnt from the panel reviews.

In mid-2009, the department summarised the findings and recommendations made during the reviews of draft business cases for transport projects developed during 2008–09. The summary covered comments on 34 transport projects, including 13 public transport projects, of which nine involved rail-related investments.

The new metropolitan rail contract from November 2009 gives the franchisee a far greater role to develop and deliver rail projects. The department is updating its project governance and guidance to reflect the new franchise agreement.

## 1.5 Audit scope and objectives

This audit examined the effectiveness of the management of rail projects by assessing whether the department's governance and management framework has been used to:

- analyse the options, assess the risks and form a cost-benefit analysis that provides a sound basis for deciding if and in what form projects should proceed
- effectively monitor and manage the projects' risks during delivery
- demonstrate the achievement of the intended outcomes for completed projects.

The audit focused on the department as the agency responsible for the oversight and delivery of projects and examined the following more recent rail projects:

- **Middleborough Road grade separation** (Middleborough Road)—physically separating Middleborough Road from the Belgrave-Lilydale rail line at a budgeted cost of $56 million, developed between 2004 and 2005 and completed in March 2007
- **Clifton Hill rail duplication** (Clifton Hill)—full duplication of the track between Clifton Hill and Westgarth with a budget of $52 million, developed between 2005 and 2006 and completed in January 2010
- **Coolaroo Station** (Coolaroo)—construction of a new station at Coolaroo with a budget of $36 million, developed between 2005 and 2008 and completed in June 2010
- **Sunbury electrification project** (Sunbury)—replacing existing V/Line Sunbury services with electrified metropolitan services at a budgeted cost of $270 million, developed between 2007 and 2009 and due for completion in 2012
- **South Morang rail extension** (South Morang)—duplicating the track between Keon Park and Epping, extending the duplicated track from Epping to South Morang and selected works on the Hurstbridge line, budgeted at over $650 million, developed between 2005 and 2009 and due for completion in September 2013.

The audit selected projects because:

- all had a documented final business case
- some had been completed, so we could examine project outcomes
- they were representative of the types of rail projects anticipated within the *Victorian Transport Plan*.

All the selected projects were developed through the department's Project Review Committee. The Sunbury and South Morang projects also benefited from the more recent improvements to project management introduced since 2007.

The audit was conducted in accordance with the Australian Auditing and Assurance Standards.

The cost of the audit was $330 000.

## 1.6 Structure of the report

Part 2 assesses project development by examining the adequacy of project business cases.

Part 3 assesses the management of project risks during delivery and the achievement of intended outcomes.

# 2 Developing sound projects

## At a glance

### Background

A business case documents a project's development to inform decisions about whether and how a project should proceed. VAGO's previous rail audits found that the project development was inadequate.

### Conclusion

The Department of Transport (the department) has made steady progress to address the weaknesses that affected the management of earlier rail projects.

However, not all identified weaknesses have been addressed appropriately and decisions about the preferred project and procurement strategies can be better informed. The department needs to improve the quality of the work behind final business cases so the documents adequately assure that projects, if endorsed, are ready to begin.

### Recommendations

The Department of Transport should:

- better analyse, substantiate and document the investment need, project objectives, cost estimates, risk assessments, critical success factors and measures of project benefits
- improve the scope and rigour of project cost estimates and risk assessments
- strengthen quality assurance and improve the documentation of the cost-benefit analyses
- clearly document procurement decisions and their supporting information
- when considering project alliances:
  - compare the risk-weighted costs of alternative procurement options, including the estimated direct procurement costs
  - independently review the procurement decisions.

## 2.1 Introduction

A final business case should document a project's development and provide the information needed to:

- decide if, and in what form, the project should go ahead
- determine how to procure the project
- understand the intended outcomes and how these will be delivered.

Previous VAGO audits of country passenger services, rail gauge standardisation and regional fast rail, found the Department of Transport (the department) developed projects inadequately.

These earlier projects did not have the depth of planning and documentation needed to adequately inform decisions about the preferred projects and their procurement. They:

- did not fully describe the problems, objectives and key measures of success
- underestimated the costs and failed to adequately assess the risks or document a plan to manage them
- incorrectly estimated the benefits and costs so that cost-benefit analyses did not adequately reflect the projects' economic value
- made procurement decisions that led to time and budget overruns.

Many of the adverse project outcomes were connected to these weaknesses.

This part examines whether the business cases for the projects reviewed for this audit are adequate and whether the department has corrected past weaknesses.

## 2.2 Conclusion

The department has made steady progress in addressing the weaknesses that affected the development of earlier rail projects.

However, not all identified weaknesses have been addressed appropriately and decisions about the preferred project and procurement strategies can be better informed. The department needs to improve the quality of the work behind final business cases so the documents adequately assure that projects, if endorsed, are ready to begin.

The department's analysis for the 2008–09 draft business case reviews is consistent with the audit findings.

## 2.3 Determining the preferred project

Since 2002 the department has improved how it develops rail projects by requiring the preparation of business cases and subjecting these to structured reviews.

However, it can further strengthen its project development by:

- improving how the investment objectives and benefits are defined and measured
- more rigorously analysing the costs and risks in the business case
- quality assuring the calculations behind the cost-benefit analysis and adequately documenting the assumptions and results.

### 2.3.1 Investment objectives and benefits

Business cases should show how an investment fits with government policy and:

- quantify the problems that are driving the need for an investment
- describe the objectives or reasons for the investment in response to these drivers
- identify the benefits and describe how to measure them.

Achieving the department's mission of building a safer, fairer and greener transport system requires public transport to play a greater role. The reasons for investing in rail include growing patronage and reducing road congestion by:

- retaining and attracting passengers through quicker, more reliable, safer and more convenient services
- adding capacity to accommodate and encourage patronage growth
- extending services to offer a viable public transport alternative.

These objectives point clearly to the type of measurable, critical success factors documented in the department's Project Management Framework, including:

- **service provision**—increased capacity, frequency, hours of operation
- **service benefits**—improved reliability, shorter journey times, less overcrowding and more satisfied passengers
- **higher-level benefits**—more passengers and less congested roads.

#### Understanding and quantifying the problems

All the audited projects described the problems driving the investment need and gave some quantitative evidence to support it. However, none of the business cases had:

- sufficient information for the reader to properly understand the nature and extent of these problems
- presented enough information to adequately quantify the problems and set a base for measuring project success.

For example:

- The Clifton Hill business case identified unreliability and delays along the rail corridor as the main reasons for the investment. The proposed capacity improvement would remove one bottleneck and directly address some of the reasons for delays. The business case, however, did not thoroughly analyse the reasons for current delays and did not set a baseline to measure the project-specific benefits.
- The South Morang and Sunbury business cases did not establish baseline information to measure progress in reducing road congestion by attracting people to use rail. This was an important project objective.

## Defining clear and measurable objectives

The projects included objectives that covered the main reasons for investing, but these could have been more precise, clearly structured and streamlined.

Some project objectives were not specific, measurable reasons for the investment. For example:

- Middleborough Road had 14 objectives, some of which were not reasons for the investment but constraints and risks, such as 'minimise disruption to communities'. Other objectives were duplicated and some were too vague to be measurable—'improve transport economic viability'.
- Sunbury's objectives included avoiding the need to replace V/Line locomotives and allowing V/Line to concentrate on its core business. They diffused the focus on the most important reasons for the investment, which were to increase capacity and offer a better service.

## Identifying intended benefits and how they will be measured

Properly measuring success and learning from past experience about what works is important if the department is to be more effective. However, none of the projects examined had done the necessary preparatory work during development.

Since October 2007, the department's Project Management Framework recommended the preparation of an outcomes realisation plan be part of a business case. In 2009 this became mandatory. The plan should:

- explain how project outputs, such as new rail capacity, will be managed to achieve the project benefits—improved service levels, more passengers and reduced road congestion
- outline how to measure these benefits by defining benefit indicators and setting a baseline describing the situation without the project
- allocate responsibility for completing the work.

While business cases included objectives and critical success factors, none had documented an adequate approach to measuring success. The mandating of outcomes realisation plans, if applied, should improve the adequacy of future business cases. However, this new practice came too late to influence the final business cases of the projects examined in this audit.

For example:

- The critical success factors for South Morang and Sunbury had no measures for important benefits, such as road decongestion or overcrowding. The proposed measure of journey time performance is inappropriate, as it should be measured from actual journey times rather than the scheduled timetable.
- Coolaroo proposed assessing service outcomes for people who might use the station by measuring an output—whether the station had been built as intended—rather than directly measuring the service outcomes.
- Middleborough Road had specific accident and travel time reduction targets for road users, but no detail on when and how to measure success against these targets.

### 2.3.2 Project costs and risks

The final business case should provide the necessary information to be reasonably assured about the need for the project and the preferred method of procurement. A thorough, detailed and reliable understanding of costs and risks is critical for instilling this type of assurance in the decision-making process.

The department has improved the cost estimates and risk assessments for more recent rail projects, compared with the projects developed from 2000 to 2002. However, some parts of the cost and risk analysis remain underdeveloped.

#### Progress compared with earlier rail projects

The department has progressed in:

- better guiding project teams about how to assess risks
- improving project oversight and review arrangements
- access to expertise covering the assessment of needs, risk management, cost estimation and the cost-benefit analysis.

All the audited projects followed departmental guidelines for assessing high-level risks and some had employed specialists to estimate and verify costs.

The department set up the Project Review Committee in 2002 to review business cases. Over time the committee became the central mechanism for reviewing business cases, including all the projects in this audit. All the selected projects were developed through the department's Project Review Committee. The Sunbury and South Morang projects also benefited from the more recent improvements to project management introduced since 2007.

In late 2008 the department replaced the committee with an interim steering committee and set up the Delivery Coordination Division (the division) in early 2009 to support project development and delivery. The division provides:

- coaching of project teams in developing business cases
- access to expertise covering the assessment of needs, risk management, cost estimation and the cost-benefit analysis
- project-specific review of the business cases by a panel of experts before they are endorsed by the department
- a learning branch to coordinate the implementation of outcomes realisation plans and lessons learned after project completion.

## Areas for further improvement

Several of the business cases reviewed did not have enough information on the costs and risks.

This meant in some cases—for example, Clifton Hill and South Morang—that decisions about the preferred project and its procurement were delayed until the department had addressed these deficiencies. The Middleborough Road final business case did not adequately assess the risks or plan for their management. It was not evident that this deficiency was addressed before the project went into delivery.

### *Clifton Hill—achieving greater certainty about project costs*

The first business case presented to government for funding was rejected because the analysis of project risks and costs was underdeveloped. The work required to address this meant that the business case was resubmitted as part of the following year's funding cycle, which delayed the approval of funding.

The government rejected the February 2006 final business case for Clifton Hill because the project cost of $49.7 million included a risk allowance of $12 million. This was considered too high given the level of certainty required for a project that should have been ready to start.

The department used development funding of $4 million to finalise a revised business case in December 2006 for funding of $52 million, including a reduced allowance of $4 million to cover project risks. The government accepted this business case and funded the project.

### *South Morang—better informing the procurement decision*

In early 2008 the department secured $10.4 million funding to establish a strong business case for its preferred public transport solution and anticipated completing this work by November 2009.

The final business case of February 2009 formed the basis for a successful funding bid, but did not adequately cover risk management. The project should have had a detailed risk assessment, including a risk management plan and detailed risk register. The department addressed this deficiency by late 2009, but not before it had delayed the confirmation of a project alliance as the preferred procurement route.

The Department of Treasury and Finance's Gateway reviews of February and August 2009 confirmed this deficiency. The February review, at the time of the final business case, found that the absence of a consolidated risk management plan and detailed register had:

- contributed to a lack of structure for managing project risks
- resulted in overlaps between risk allowances and contingencies for some cost components
- made it difficult to accurately estimate the impact of risks on costs and time lines.

The August Gateway review found the project was in a critical situation because the department had not made sufficient progress given its scale, significance and planned time lines. The department needed to act immediately on several issues, including having no effective risk management plan.

By December 2009 the project had addressed these issues, including the recommendations about the assessment of risks. It had employed a full-time risk manager and developed a risk management plan.

The business case recommended a project alliance in February 2009 but the project steering committee was not convinced until this advice was underpinned by a detailed risk assessment in late 2009.

### *Middleborough Road—better preparing for project delivery*

VicRoads did not include an adequate approach to risk management in the final business case. It did not fully address this deficiency throughout the project and this impacted, to some extent, on its management of the project costs.

VicRoads and the department endorsed the final business case in September 2005, which gained funding of $56 million. The endorsed project was to separate the railway and road over 18 months through a design and construct contract.

By May 2006, VicRoads' Chief Executive and the Minister for Roads and Ports approved changing the project by:

- completing the major construction works during a six-week shutdown of the crossing to rail and road traffic from late December 2006
- procuring the project through an alliance because this was considered to be the best way of managing the risks of the compressed construction time lines.

The requirements in 2006 meant VicRoads did not have to resubmit the business case for departmental review or update the final business case material to reflect the changes.

Our audit found that the documentation underpinning the risk assessment and management was deficient and this was consistent with the following Gateway recommendations:

- **May 2006**—noted the innovative nature of this project and the fact that the risk planning did not appear to be comprehensive. It made several recommendations designed to address this gap
- **September 2006, three months before construction**—confirmed the absence of a comprehensive risk register and adequate treatment plans and recommended that they should be developed promptly
- **September 2007, six months after project completion**—found that VicRoads had not acted on the earlier recommendations and the assessment of risk remained ad hoc throughout the delivery of the project.

It is important to set a solid foundation for managing project risks in the final business case. In this case the deficiencies were not completely addressed before the project was delivered and this affected the management of project costs.

### 2.3.3 Cost-benefit analysis

The cost-benefit analysis should conform to the *National Guidelines for Transport System Management* and the department's internal Guidelines for Cost-Benefit Analysis.

The national guidelines recommend that a final business case includes information on a proposal's full range of impacts, shows how it meets government objectives and is appropriately rigorous. This includes adequately documenting the cost-benefit results and the assumptions and analysis behind them.

The department is responsible for documenting the cost-benefit analysis and providing assurance that the results reliably indicate net economic benefit. The audit:

- reviewed the business case documentation for the selected projects
- analysed the detailed cost-benefit assumptions and calculations behind the Sunbury and South Morang business cases.

The department had not adequately documented or assured the cost-benefit results in that:

- business cases did not include sufficient information to provide assurance about the reliability of the results
- reviews focused on the business case material and did not adequately check the underlying assumptions, data and calculations.

The department needs to strengthen the way it assures quality and documents cost-benefit analyses.

## Documenting the cost-benefit analysis

We expected to see sufficient information in final business cases to assure that the department had applied appraisal guidelines properly and the results were reliable. For the most part this was not the case.

Figure 2A shows the audit's assessment of the business case documentation.

**Figure 2A**
**Assessment of cost-benefit documentation in business cases**

| Methodology step | Assessment |
|---|---|
| Specifying project objectives | Partly met |
| Developing the base case (current demand and growth, committed works) | Not met |
| Determining key variables (discount rate, appraisal period, price base) | Met |
| Estimating capital costs | Partly met |
| Estimating operating costs | Not met |
| Developing demand forecasts | Not met |
| Estimating project passenger benefits | Not met |
| Estimating other transport user benefits | Not met |
| Estimating safety and environmental benefits | Partly met |
| Discounting and calculating summary economic results | Met |
| Assessing risk and uncertainty | Not met |
| Concluding and recommending the preferred option | Not met |

*Source:* Victorian Auditor-General's Office based on the Department of Transport's Guidelines for Cost-Benefit Analysis.

For five of these twelve steps business case documentation met or partly met the documentation requirements.

However, the documentation did not adequately explain the following steps:

- **developing the base case**—lack of clarity about current demand across all time periods, lack of detail on the nature and scale of the problems, lack of justification about improvements included in the base
- **estimating operating costs**—unclear how these had been calculated
- **developing demand forecasts**—methods for estimating the impact of a project on demand were not explained adequately
- **estimating passenger benefits**—listed the discounted benefits but did not explain how this total was consistent with changes in demand and levels of service
- **estimating other transport user benefits**—calculation of the benefit of reduced road congestion was not well explained, yet was critical to the economic outcomes

- **assessing risk and uncertainty**—the sections on project risk only included factors affecting costs and ignored the demand side risks. The sensitivity tests on the cost-benefit analyses were not explained and there was little comment on the significance of the results
- **recommending the preferred option**—some of the business cases had no concluding comments or recommendation on the preferred option.

## Quality assuring the cost-benefit calculations

The audit reviewed the workbooks containing the detailed cost-benefit calculations for the Sunbury and South Morang projects. The department had difficulty in locating the workbooks for Clifton Hill and Middleborough Road and the delay meant the audit was not able to analyse these projects within the available time frame.

The detailed calculations:

- were not documented adequately within the workbooks or supported by material that fully explained them
- had not been reviewed in such a way as to assure the rigour and reliability of the results.

Our audit of the detailed calculations raised issues about the:

- **assumptions**—questioning the validity of some assumptions and the consistency of others with national and departmental guidelines
- **comprehensiveness of the costs and benefits**—finding that some costs and benefits had been left out
- **accuracy of the benefit and cost estimates**—identifying some calculation errors
- **consistency**—questioning differences in cost and benefit totals between the workbooks and the final business cases and between the approaches adopted for different projects.

The department satisfactorily explained some issues but they should have been better documented. Other issues are unresolved. For example:

- **assumptions**—the approaches for estimating maintenance and operating costs were not clearly documented and not consistent across projects
- **comprehensiveness of the costs and benefits**—the congestion impacts of increased park and ride for the Sunbury project should have been included
- **accuracy of the benefit and cost calculations**—a small number of errors were confirmed. For example, the V/Line savings in infrastructure maintenance for Sunbury were miscalculated
- **consistency**—some areas of inconsistency, such as South Morang including the residual value of assets as a benefit, while Sunbury did not include this.

The department could therefore not adequately assure the reliability of cost-benefit calculations. It needs to strengthen its processes to provide the necessary level of assurance.

### 2.3.4 Assessing the project options

The scope of the options considered for several of the projects we examined had been constrained by government policy decisions. For example, the government announced and funded projects to:

- build a train station at Coolaroo
- grade separate Middleborough Road where it crossed the Belgrave and Lilydale rail lines
- extend the railway to South Morang and extend the electrified rail network to Sunbury as part of the *Victorian Transport Plan*.

The assessment of options was satisfactory. However, in some cases the information presented in the final business cases was not sufficient to verify the decisions made.

Middleborough Road is an example of a thorough options analysis. The project had to decide how best to separate the railway and Middleborough Road. It appraised the options by considering the economic and social impacts and the effect each option had on other projects, such as expanding corridor rail capacity.

The option of building a rail underpass was preferred because it represented the most cost-effective way of achieving the project objectives, while allowing for the future expansion of track capacity to serve Ringwood.

Other projects had to resolve significant issues about the preferred option after the final business cases were submitted. The department should aim to include this type of work within the final business case. For example:

- The department endorsed the preferred option for Coolaroo but the government rejected it as it cost more than the allocated funding. The preferred option was subsequently changed, with the revised design and procurement method costing 75 per cent of the rejected business case estimate.
- For South Morang there were significant changes to the design of Epping Station after the final business case. Some stakeholders were not adequately consulted before finalising the business case. Their subsequent input led to a revised design that improved local transport connections and amenity and reduced the risk of community opposition.

The department should plan to complete the work critical to the choice of a preferred option before finalising business cases.

### 2.3.5 Department's review of 2008–09 business cases

The audit findings about business case development are consistent with the findings from the department's analysis of the 2008–09 draft business case reviews. Four of the audit findings were listed as among the review's top-five issues. They were:

- a lack of clarity about project objectives and critical success factors
- insufficient information on the problems and business need
- problems with the contingencies used when estimating capital costs
- inadequacies with the identification and management of project risks.

The lack of detailed information on the cost-benefit analysis and the need for greater clarity about the economic assumptions also emerged as an important issue. The review noted that 24 of the 34 business cases had issues relating to the economic analysis.

## 2.4 Determining the preferred procurement method

The department has improved the way it procures rail projects by developing guidelines as part of its Project Management Framework and strengthening oversight of procurement processes.

It can improve further by:

- completing detailed cost estimates and risk assessments in final business cases
- improving how it documents procurement decision making
- strengthening the checks to confirm the use of project alliances.

### 2.4.1 Improvements since 2002

The regional fast rail audit criticised the project's approach to procurement. The department entered a fixed fee design and construct contract without adequately managing the risks of reaching an agreed, final design. This meant the contractors could claim significant variation payments because they did not bear the risks of changes made while agreeing a final design.

Since then the department has strengthened its procurement processes by:

- documenting procurement guidelines as part of its Project Management Framework
- developing procurement processes that are consistent with the Department of Treasury and Finance's *Investment Lifecycle Guidelines*
- using specialist staff to facilitate procurement workshops.

## 2.4.2 Further improvement opportunities

### Refining cost estimates and risk assessments

It takes a good understanding of the project costs and risks to recommend with confidence how to procure a project. Part 2.3.2 concluded that some costs and risks in the business cases examined were underdeveloped and that this affected the timing and certainty of procurement decisions.

The department needs to include detailed cost estimates and risk assessments in final business cases to inform the procurement decision adequately.

### Documenting procurement decisions

Three of the projects reviewed did not clearly document key procurement decisions. We expected to see a clear sign-off by the project steering committee of the procurement decision and any subsequent variations.

For Clifton Hill the final business case recommended that the department collaborate with the rail manager to develop a detailed design before awarding the construction to a single contractor. However, the final form of the procurement split the work into two contracts, one with the rail manager and the other with a contractor. The department provided a reasonable verbal explanation for this change. However, the steering committee endorsement for this rationale was not available.

For South Morang and Sunbury the department decided to use project alliances. Minutes of the projects' steering committee, however, did not record the endorsement of these decisions or the information the department relied on in arriving at these decisions.

### Verifying the use of project alliances

Three of the projects examined used project alliances. The documentation did not provide sufficient information to fully explain why an alliance gave better value-for-money than options promoting more competition.

#### *Alliances and when they should be used*

The Department of Treasury and Finance states that alliances are a way to procure major capital assets, whereby a state agency works collaboratively with private sector parties. Participants aim to work together in good faith, act with integrity and make best-for-project decisions. Working as an integrated team, they are expected to make unanimous, principle-based decisions on all key project issues.

Project alliances are normally used for delivering larger, complex and high-risk infrastructure projects, where risks cannot be appropriately dimensioned and quantified in the business case or soon afterwards, and are best managed collectively. While alliances encourage cooperation, avoid disputes and are a good way of managing risks that are difficult to define, they reduce price competition.

A premium price may be paid if an alliance is used for a project where the risks could be effectively managed through other forms of procurement that allow more competition. Therefore it is critical that alliances are chosen only after a careful and knowledgeable analysis of project characteristics, costs, risks and benefits and market conditions.

In the past some projects used alliances to fast-track development to meet an imposed deadline. Such situations need a strong business case so decision-makers understand the cost implications of fast-tracking.

### *Providing assurance about the decision to use an alliance*

For three of the five projects examined—Middleborough Road, South Morang and Sunbury—VicRoads or the department decided to use project alliances. The documents justifying these decisions did not provide sufficient information about their value-for-money implications.

For Middleborough Road, VicRoads decided that a short, intense construction period and an alliance procurement best met the project objectives, compared with using a longer construction period using a design and construct procurement because:

- the rail operator's analysis and advice was that a short, complete shutdown would reduce the impacts on rail safety and passenger delays
- an alliance would be the most cost-effective way of managing the risks associated with this short construction period, particularly impacts affecting the local community and the operation of train services.

The final report that documented the reasons for these decisions did not compare the quantifiable costs, benefits and risks of the procurement alternatives.

For South Morang, the steering committee confirmed the alliance decision in late 2009, after the project team had done a detailed risk assessment, and some nine months after it had endorsed the final business case.

The procurement process followed the Department of Treasury and Finance's alliance guidelines. Participants at a workshop in November 2009 scored the alternatives against value-for-money criteria and favoured an alliance by a small margin. However, this assessment was not informed by a comparison of the options' risk-adjusted costs, including the costs of different forms of procurement.

For Sunbury, the project followed the alliance guidelines and options were assessed in a procurement workshop. However, the documented arguments were not convincing or complete—they did not convey the cost implications of using this form of procurement. For example, the Strategic Procurement Plan did not adequately document risks about site access, cultural heritage and flora and fauna issues, which were important reasons for pursuing an alliance.

In later discussions, the department explained the reasons for choosing an alliance for Sunbury. These included:

- complex stakeholder relationships involving two rail operators and three councils
- uncertainty about the new metropolitan rail franchise terms
- the project deadline of December 2012, which meant that the team did not consider the new rail franchisee delivering the project
- uncertainty about the ownership transfer and safety standards for the newly electrified line
- difficulties in accessing the corridor to finish the construction
- unknown environmental and cultural heritage risks along the corridor.

These arguments were not documented and it is not evident that they, nor the risk-adjusted cost implications, had informed the steering committee's decision to support a project alliance.

## Recommendations

The Department of Transport should:

1. Better analyse, substantiate and document the investment need, project objectives, cost estimates, risk assessments, critical success factors and measures of project benefits.
2. Improve the scope and rigour of project cost estimates and risk assessments.
3. Strengthen quality assurance and improve the documentation of the cost-benefit analyses.
4. Clearly document procurement decisions and their supporting information.
5. When considering project alliances:
   - compare the risk-weighted costs of alternative procurement options, including the estimated direct procurement costs
   - independently review the procurement decisions.

# 3 Managing risks and achieving intended outcomes

## At a glance

### Background

Previous rail audits found that the Department of Transport (the department) had not effectively managed the risks during project delivery or achieved the intended outcomes.

### Conclusion

The department has significantly improved its management of project risks during delivery, which is reflected in better performance against planned time lines and approved budgets.

However, the department has not demonstrated how well the projects have realised their intended benefits or consistently documented and applied the lessons learnt from past projects. The department is working to address these weaknesses.

### Recommendation

The Department of Transport should apply outcomes realisation plans and post-implementation reviews for the projects examined in this audit and other rail projects completed after the department mandated these in November 2009.

## 3.1 Introduction

In previous VAGO audits of rail projects the Department of Transport (the department) had not adequately managed the risks that led to adverse project outcomes. It had not developed plans to manage risks and its oversight mechanisms were not effective in responding to the risks that materialised.

The department had also not shown whether the projects had achieved the benefits set out in the feasibility studies that justified them.

This part examines whether the three completed projects—Middleborough Road in 2007 and Clifton Hill and Coolaroo in 2010—had:

- effectively monitored and managed the risks during delivery
- achieved the intended project outcomes.

## 3.2 Conclusion

The department has significantly improved its management of project risks during delivery, which is reflected in better project performance against planned time lines and approved budgets.

However, the department has not demonstrated how well the projects have realised their intended benefits or consistently documented and applied the lessons learnt from past projects. The department is working to address these weaknesses.

## 3.3 Performance against time lines and budgets

### Overview of performance

Figure 3A reports the performance of the three completed projects.

**Figure 3A**
**Performance against time lines and budgets**

| | Completion date | | | Capital costs ($mil) | | |
|---|---|---|---|---|---|---|
| Project | Original | Revised | Actual | Final business case | Original | Actual |
| Middleborough Rd | Jun 09 | Jun 07 | Mar 07 | 56.5 | 61.2 | 72.5 |
| Clifton Hill | Mar 10 | n/a | Jan 10 | 52.0 | n/a | 49.3 |
| Coolaroo | Jun 10 | n/a | Jun 10 | 45.1 | 36.0 | <36.0 |

*Source:* Victorian Auditor-General's Office.

In summary:

- Clifton Hill was delivered two months early and almost $3 million under budget.
- Coolaroo was delivered on schedule and under budget.
- Middleborough Road was practically completed for trains to resume operations in January 2007 and fully completed in March 2007—three months ahead of schedule and two years earlier than the completion date in the final business case. However, the final cost of $72.5 million exceeded the business case estimate by $16 million and the revised budget by $11.3 million.

### Explanation of Middleborough Road overrun

In late 2006 the approved budget was increased from $56.5 million to $61.2 million. The main reason for this was a $3.2 million increase in the cost of signalling because VicRoads only received one tender for the provision and installation of the upgraded signalling system.

In March 2007, three months after practical completion, VicRoads successfully applied to the Treasurer for funding of $11.3 million to cover additional costs incurred during the construction. The main reasons for the overrun were:

- Inadequacies and errors in the design because there was insufficient time to refine the design. These limitations affected the accuracy of the cost estimates.
- Lower than expected plant utilisation.
- Higher than anticipated premiums from material suppliers and subcontractors for working 24 hours a day, seven days a week in January 2007.
- Short procurement time frames.

The overruns were, in part, a result of the project's inadequate assessment of the risks and costs. The project lacked sufficient time for planning in the period preceding the construction, which was highlighted by the Gateway reviews. The review in September 2006 also highlighted the independent estimator's view that the contingency allowances within the approved budget of $61.2 million were low. VicRoads advised that the $11.3 overrun was covered by savings from other VicRoads projects.

## 3.4 Monitoring and managing risks

### Department's actions to improve risk management

The department's management of risks during delivery improved between the Middleborough Road project in 2007 and the Coolaroo and Clifton Hill projects in 2010.

In part this reflected the improvements the department made by:

- developing risk management guidelines as part of its Project Management Framework
- documenting detailed risk management procedures
- providing specialist resources helping project teams run risk workshops and develop consistent risk registers and management plans.

The Clifton Hill and Coolaroo projects effectively monitored and managed risks by:

- preparing robust risk management plans and detailed risk registers
- actively monitoring risks during delivery
- acting decisively when risks materialised.

The earlier Middleborough Road project was challenging because it planned to complete a major construction in a six-week window. The revised time line would see the project completed two years ahead of the schedule set in the final business case. While it was delivered according to this revised time line, other risks materialised and were not as well managed, particularly relating to the cost of the project. Risk planning was deficient and the processes for detecting and responding to cost overruns were not effective.

The adequate risk planning and good communication between the project teams and steering committees contributed to the success of the Coolaroo and Clifton Hill projects. The lack of comprehensive risk planning moderated the success of the Middleborough Road project.

## Clifton Hill and Coolaroo

Clifton Hill, which reached practical completion in January 2010, had robust plans for monitoring and managing risks. The final business case had a detailed risk management plan. By the time the project reached construction the department had clearly allocated responsibility and appropriate resources for risk management. The work to simulate the impact of risks on costs provided a sound basis for setting contingencies.

The project team regularly reported emerging risks to the steering committee and responded to them effectively.

The approach proved effective and the department's actions and the cost contingencies were adequate to deal with situations where risks materialised, without compromising time lines or the overall budget.

Figure 3B shows how the project managed contaminated land risk during delivery.

**Figure 3B**
**Management of contamination risk in Clifton Hill**

The project team discovered that there was more contaminated soil than expected and the clean-up cost would exceed the $50 000 budgeted. The team reported this to the steering committee and explored mitigation measures.

For one particular contamination risk, reports to the steering committee suggest that removal could have cost as much as $1 million. The team minimised removal of contaminated soil by:

- using existing soil as fill
- where possible, raising the finished surface level of landscaped areas to incorporate more fill
- creating soil mounds along the rail corridor
- moving contaminated soil stockpiles around the site, rather than taking it offsite.

These measures helped cut the mitigation cost from $1 million to $434 609.

The final cost for contamination went well over the $50 000 allocated to this risk but the team managed it within the overall project contingency and time lines.

The project team kept the steering committee informed throughout the process.

*Source:* Victorian Auditor-General's Office.

Coolaroo Station opened in June 2010. There were five separately procured packages and the department was responsible for managing their coordination. The department managed the interface risk effectively. Some risks materialised, which the department dealt with promptly without compromising the overall project budget or schedule.

## Middleborough Road

The Middleborough Road project in 2007 was innovative, but the risk management was mixed. Completing the project in such a short time represented a considerable achievement. However, this was not managed within the approved budget.

The project team did not complete the level of risk planning required for this type of project before construction started because it did not fully assess the likely cost impacts of the project risks should they materialise. This compromised the ability to adequately monitor or manage some project risks. For example:

- design errors emerged during construction which had not been previously identified or had been underestimated and these led to additional earthworks and changes to structures that increased the costs
- the focus on managing the risks to deliver on time impacted on the effective management of the project costs.

The lack of comprehensive risk planning and adequate monitoring of all risks meant that VicRoads did not manage the project costs as well. The final cost of the project exceeded the approved budget of $61.2 million by $11.3 million. VicRoads did not know the scale of these overruns until after the 28 day occupation was completed and applied for a funding extension to cover the overrun three months after this expenditure had been incurred.

## 3.5 Embedding the lessons from past projects

All project teams should evaluate their performance and the lessons learnt so future projects can benefit from their experience.

VicRoads completed a comprehensive post-implementation review for Middleborough Road. The report described the main lessons and recommended future approaches. VicRoads informed us that these lessons have been applied to the Springvale Road grade separation.

The department advised that it is completing an outcomes realisation plan and a post-implementation review for Clifton Hill. This process should also apply to Coolaroo.

## 3.6 Measuring the intended benefits

As a matter of good practice all project sponsors should evaluate the extent to which their projects have achieved their objectives. The department acknowledges this as an area of weakness and mandated the completion of outcomes realisation plans for all projects developed since 2009.

None of the completed projects had adequate documentation on how to measure project benefits. It is not evident that any of these projects have since documented an adequate plan to do this, although the department plans to use Clifton Hill to pilot a good practice in benefits measurement.

For Middleborough Road:

- the project business case had no plan to measure benefits
- VicRoads reported that it had started to collect data on two of the key benefits—travel time and vehicle operating-cost savings
- VicRoads has not documented a plan to measure the benefits.

For Clifton Hill:

- the project team intends to collect reliability data from 2010 and to measure the benefits from May 2010, when a new timetable is introduced
- the project will be used to pilot the department's approach to post-implementation reviews and benefit management.

Coolaroo's approach to benefits measurement was inadequate during the project development and has not improved since.

The department is working to address this area of weakness by:

- publishing detailed guidance in its Project Management Framework
- requiring all business cases under development from late 2009 to include outcome realisation plans
- creating a corporate team to help projects identify, monitor and measure benefits.

## Recommendation

The Department of Transport should:

6. Apply outcomes realisation plans and post-implementation reviews for the projects examined in this audit and other rail projects completed after the department mandated these in November 2009.

# Appendix A.

# *Audit Act 1994* section 16—submissions and comments

## Introduction

In accordance with section 16(3) of the *Audit Act 1994* a copy of this report was provided to the Department of Transport with a request for comments or submissions.

The comments and submissions provided are not subject to audit nor the evidentiary standards required to reach an audit conclusion. Responsibility for the accuracy, fairness and balance of those comments rests solely with the agency head.

# Submissions and comments received

***RESPONSE provided by the Secretary, Department of Transport***

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Our Ref: FOL/08/19214
File: DOC/10/332818

Mr D D R Pearson
Auditor-General
Victorian Auditor-General's Office
Level 24, 35 Collins St
**MELBOURNE VIC 3000**

Dear Mr Pearson

**PROPOSED AUDIT REPORT-*MANAGEMENT OF MAJOR RAIL PROJECTS***

I refer to your letter of 31 May 2010 enclosing the proposed report on the audit of *Management of Major Rail Projects.*

In particular, I am pleased to note your acknowledgement of the improvements to the Department's project development processes and its management of project risks.

I confirm the Department is continually implementing procedures and strategies to improve program and project management and structures to drive an increasingly commercial management culture. Especially, as we move further into implementing the Victorian Transport Plan.

To this end I accept your recommendations and note they are consistent with the Department's planned continual improvement process.

Yours sincerely

**JIM BETTS**
Secretary

10 / 6 / 2010

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| The Community Building Initiative (2009–10:25) | May 2010 |
| Administration of the Victorian Certificate of Education (2009–10:26) | June 2010 |
| Hazardous Waste Management (2009–10:27) | June 2010 |
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