

## Chapter 4

Ministry of Transportation

### Section 4.14

# Maintenance of the Provincial Highway System

Follow-up to VFM Section 3.14, *2004 Annual Report*

## Background

The Ministry of Transportation is responsible for maintaining the province's highways and bridges, which the Ministry estimates have a current replacement value of approximately \$40 billion (\$39 billion in 2003/04). In managing the highway system, the Ministry's primary goals are to contribute to economic development by maximizing highway capacity, efficiency, and safety and to protect highway infrastructure. To accomplish these objectives, the Ministry has organized highway programs into three major categories of work—maintenance, minor capital projects, and major capital projects, as described in Figure 1. In the 2005/06 fiscal year, the Ministry spent \$248 million on routine maintenance (\$241 million in 2003/04), such as snow removal and de-icing, and \$71.6 million on minor capital projects (\$62 million in 2003/04), such as filling and sealing pavement cracks. Most highway system maintenance activities are performed by private-sector contractors hired by the Ministry.

Our *2004 Annual Report* focused on maintenance and minor capital projects, since major capital projects had been recently examined by the

Ministry's Internal Audit Services. Our audit concluded that, while the Ministry's systems and procedures ensured that contractors bidding on routine maintenance and minor capital projects were qualified and that the services were acquired competitively, they were not sufficient to ensure that the province's highway assets were being maintained cost effectively. In particular, we noted that the Ministry's systems and procedures:

- did not ensure effective oversight and evaluation of the performance of contractors engaged to maintain provincial highways and that appropriate corrective action was taken when required;
- did not adequately prioritize the Ministry's capital projects to ensure that those with the highest benefit/cost ratio were performed first; in addition, although the Ministry was aware that the long-term financial impact of deferring preventive and preservation maintenance projects could be significant, only about half of the prevention and preservation projects that ministry engineers had identified for immediate attention were able to be done each year;

## Figure 1: Maintaining the Highway System

Source of data: Ministry of Transportation

<b>Maintenance</b>
<b>Moving people and goods safely and efficiently</b>
<ul style="list-style-type: none"> <li>Ongoing maintenance activities include snow and ice control (plowing, salting, sanding, and anti-icing), shoulder grading, line painting, grass cutting, filling in potholes, bridge and culvert cleaning and minor repairs, cleaning up after accidents and spills, and repairing guiderails after accidents.</li> </ul>
<b>Minor Capital Projects (less than \$1 million)</b>
<b>Protecting roads and bridges in order to prolong their useful lives</b>
<ul style="list-style-type: none"> <li><i>Prevention:</i> work that is done before the asset value reaches a threshold. These planned strategies extend the life of the asset or enhance its service potential. Work is undertaken on a small section or component of an asset.</li> <li><i>Holding:</i> action taken when the value of an asset reaches a threshold, but full rehabilitation/reconstruction is not undertaken. This will maintain acceptable levels of functionality or safety and prolong the life of the asset.</li> </ul>
<b>Major Capital Projects (\$1 million and more)</b>
<b>Maintaining and expanding the highway system's capacity and improving safety</b>
<ul style="list-style-type: none"> <li><i>Rehabilitation:</i> work done to renew the life of an asset when the threshold value of the asset has been reached (at the end of the asset's anticipated service life). This work restores serviceability and improves an asset to a condition of structural or functional adequacy.</li> <li><i>Reconstruction:</i> work performed at the end of the anticipated service life, but typically after two or three rehabilitation cycles. This work generally involves the complete or major removal and replacement of an asset.</li> <li><i>Expansion:</i> capital improvement that improves an asset's performance or capacity.</li> </ul>

- did not adequately ensure that all bridges, both provincially and municipally owned, were inspected at least once every two years as required by legislation; and
- were not sufficient to measure and report on the Ministry's performance in managing the province's highway assets efficiently and effectively—although we noted that the Ministry expected to complete, by 2007, the implementation of an Asset Management Business Framework that will address most of the gaps in performance information and measurement.

We also noted that ministry measures of bridge and pavement condition indicated that about 32% of provincial bridges and about 45% of highway pavements would require major rehabilitation or replacement within the next five years. Historical funding levels for rehabilitation and reconstruction—averaging about \$445 million per year over the last five years—will not be sufficient to address these needs.

We made a number of recommendations for improvement and received commitments from the Ministry that it would take action to address our concerns. We also noted that, in a 2003 internal-audit report on the management of major highway construction projects, the Ministry's Internal Audit Services Branch made a number of significant observations on the Ministry's processes for controlling the quality and cost of construction work.

### Current Status of Recommendations

Based on information we obtained from the Ministry of Transportation, significant progress has been made in addressing our recommendations and those relating to highway construction administration made by the Ministry's Internal Audit Services and included in our *2004 Annual Report*. However, it will take two to three years to fully implement a

few of the recommendations. The current status of action taken on each recommendation is as follows.

## MANAGING MAINTENANCE

### Inspecting Maintenance Work, Measuring Contractor Performance, Signing the Code of Conduct, and Managing the Sanctions Process

#### Recommendation

*In order to manage maintenance contractors more effectively, the Ministry should:*

- *provide co-ordinators with more specific guidelines to assist them in performing inspections effectively;*
- *implement systems for managing and analyzing data regarding inspections, violations, complaints from and claims for damages by highway users, and service levels achieved;*
- *require staff to annually sign a code of conduct governing their relationship with the contractors that they manage; and*
- *take steps, such as reviews of regional procedures and records by head office, to ensure fairness and consistency throughout the province in the sanctions applied to contractors for violations.*

#### Current Status

With respect to this recommendation, the Ministry:

- provided us with a copy of the revised monitoring manual for area maintenance contracts that now includes guidance to co-ordinators on matters such as sampling size, frequency of inspections, documentation, and reporting; the Ministry advised us that a revised monitoring manual for managed outsourcing contracts would be completed by September 2006;
- advised us that it was in the process of designing a training program for contract co-ordinators on the revised procedures, with training to begin during the 2006/07 fiscal year;

- advised us that it had initiated a three-phase project, the Maintenance Program Information Project (MPIP), to improve the collection, retention, documentation, and reporting of maintenance data in order to provide the Ministry with better information for decision-making and for monitoring and managing maintenance operations (the Ministry provided us with the Phase 1 report on MPIP, which identified sources of data and set the scope of the project, and informed us that Phase 2 on system design and Phase 3 on building, testing, and implementing were expected to be completed in August 2008);
- advised us that it considers the procedures in place to ensure compliance with the conflict-of-interest provisions of the *Public Service Act* to be sufficient to address any potential conflict-of-interest risks; and
- advised us that a sanction-monitoring process and database had been developed and pilot-tested; the production database would be implemented as part of MPIP.

## Monitoring the Impact of Salt on the Environment

#### Recommendation

*In order to identify and better manage the impact of salt use on the environment, the Ministry should take steps to acquire the information and develop the analytical tools necessary to properly monitor salt use and work with the Ministry of the Environment to establish ongoing testing and tracking of the impact of changes in salt use on the local environment.*

#### Current Status

The Ministry advised us that in order to implement this recommendation it had:

- taken several steps to improve the quality of the information generated by its Automatic Vehicle Location system, such as more accurate measuring of salt usage and improved reporting from operators;

- initiated a project to develop a Winter Security Index to enable the Ministry to monitor salt usage, taking weather conditions into account, as well as participating in a national Winter Index study supported by the Transportation Association of Canada; and
- studied, in co-operation with the Ministry of the Environment, the feasibility of establishing a program capable of measuring the impact of a 20% reduction in salt use on the environment (the study suggested that a control test, having an estimated cost of \$150,000, be considered, but the decision whether to conduct this test had not yet been made).

## PRIORITIZING CAPITAL EXPENDITURES

### Recommendation

*In order to make the best use of available capital funds, the Ministry's prioritization process should allow preservation and prevention projects to compete with all other projects for the available funding based on a full analysis of their costs and benefits.*

### Current Status

The Ministry advised us that several actions were underway to address this recommendation:

- The five regional offices had started developing 25-year Corridor Investment Plans, which set out the life-cycle costs, for the approximately 52 distinct highway corridors (comprising 315 sub-corridors) that they manage. All Corridor Investment Plans are to be completed by 2010.
- The Ministry provided us with the draft request for proposals for a new system, the Provincial Highways Investment Management Suite (PHIMS), that would replace existing information systems. PHIMS will integrate pavement, bridge, and traffic data to support Corridor Planning and other decision-making processes. The project is to be awarded by the

end of 2006 and designed, built, tested, and implemented by 2009.

- Two analytical tools were being developed—the Trade-Off Analysis process and the Prioritized Economic Analysis Tool (PEAT). The Ministry advised us that the Trade-Off Analysis process, which is expected to be ready in 2007, will enable investment decisions regarding competing needs such as preservation, rehabilitation, and expansion to be made across corridors, programs, and regions. The Ministry provided us with the user guide for PEAT, which allows designers and planners to review and compare the benefit/cost ratio of various alternatives and their timing. PEAT will be incorporated into PHIMS.

## INSPECTING BRIDGES

### Recommendation

*In order to meet its responsibilities for complying with and enforcing the regulation of the Public Transportation and Highway Improvement Act dealing with inspections of bridges, the Ministry should:*

- ensure that its Bridge Management System (BMS) contains complete and accurate information needed for the inspection of each bridge—including details of recent structural and maintenance work done and the key aspects of each structure that must be inspected;
- ensure that the BMS can automatically generate reports on overdue inspections for management's attention; and
- take steps, perhaps in conjunction with stakeholders, to obtain adequate assurance that local governments have appropriate systems and procedures in place, including reliable bridge inventories, to comply with the regulation requiring bridges to be inspected every two years.

### Current Status

The Ministry advised us that the BMS database had been reconciled to the Ministry's paper records

and legacy system databases, and the inventory for bridges had been verified. This work would also be completed for culverts by autumn 2006.

The Ministry also provided us with a status report for the next release of the BMS, scheduled for autumn 2006, which would allow details of structural and maintenance work to be recorded on the system and for the system to report when biennial inspections are due.

With respect to municipal bridges, while the Ministry maintains its position that municipalities are responsible for accurately inventorying their bridges and performing any required maintenance, the Ministry has taken the following steps to address the recommendation:

- The application form for Canada-Ontario Municipal Rural Infrastructure program funding now highlights the regulation requiring bridges to be inspected every two years.
- A memorandum of understanding (MOU) with the Ontario Good Roads Association (OGRA), representing Ontario's 445 municipalities, was signed in June 2005 for the development of an accurate inventory of municipal roads and bridges. The Ministry provided us with a copy of the MOU, which called for the Ministry to provide OGRA with \$50,000 in funding on completion of certain project deliverables. The Ministry also advised us that it had made the BMS available to municipalities at no cost.

The Ministry also noted that the 2006 Ontario Budget provided \$400 million to municipalities for bridge and road repair.

## MEASURING AND REPORTING ON PERFORMANCE

### Recommendation

*To better support decision-making and strengthen accountability to the public the Ministry should:*

- *implement performance measures dealing with the condition of assets under management and the cost-effectiveness with which resources have been employed in managing the province's highway system and report annually on the results; and*
- *ensure that proposals for expansion projects contain information on the costs of maintaining the new highways.*

### Current Status

The Ministry advised us that it had adopted a performance measurement strategy that would cover preservation of pavement and structures, safety, mobility, and accessibility and had taken the following actions:

- The Ministry had implemented three performance measures that address system conditions: Average Time Taken to Regain Bare Pavement (implemented in 1997/98); Percentage of Highway Pavement in Good Condition (implemented in 2005/06); and Percentage of Bridges in Good Condition (implemented in 2004/05). Studies were underway to develop appropriate performance measures for safety and mobility (travel time and reliability of travel time), which the Ministry expected to complete in 2008.
- Cost-efficiency measures were being investigated. In the meantime, the Percentage of Highway Capital Spent on Actual Construction, Highway Asset Value, and the ratio of Current Asset Value to Replacement Value were being tracked.
- The second point in the recommendation was being addressed through the Corridor Investment Plans, which identify the full life-cycle cost including ongoing maintenance of highways. Also, these life-cycle costs were considered during the design phase of expansion projects and were included with expansion project proposals in the Ministry's annual Infrastructure Plan.

## INTERNAL AUDIT OF HIGHWAY CONSTRUCTION

In our *2004 Annual Report* we noted that the Ministry's Internal Audit Services had made a number of significant recommendations relating to the Ministry's highway construction practices. We indicated that we would follow up on the Ministry's progress in addressing these recommendations in our 2006 follow-up work.

### Quality of Work by Design Consultants

Internal Audit Services recommended that the Ministry revise its management processes governing project design and cost estimation in order to reduce the need for change orders and additions.

#### Current Status

The Ministry advised us that it had taken a number of steps to improve management processes for project scoping, scheduling, and costing:

- An Engineering Management System is to be implemented in 2006 that is to enable the Ministry to allocate adequate time to project-development and design work and ensure that all steps are completed.
- Cost estimation is to be improved through enhancements to the Highway Costing System that is to be completed in 2006 and delivered, through better training, via a new course.
- A tracking system for change orders had been implemented to identify any trends or recurring problems that needed to be addressed at the design stage.
- Work was proceeding, in conjunction with the Consulting Engineers of Ontario, on a quality-control review process for project designs.

### Quality of Work by Contract Administrators

Internal Audit Services recommended that the Ministry require proper documentation and checklists

from contract administrators to ensure that it is receiving value for money.

#### Current Status

The Ministry advised us that revisions to the manual for contract administrators to clarify documentation and data-capture requirements were completed in 2005.

### Testing the Quality of New Pavement

Internal Audit Services recommended that the Ministry conduct a comprehensive review of the effectiveness of laboratory testing procedures and the accuracy of test results.

#### Current Status

The Ministry advised us that it had conducted a review of the effectiveness of laboratory testing procedures and the accuracy of test results in autumn 2005 and had formed working groups to review each of the recommendations. The working groups would report in summer 2006.

### Construction Warranties

Internal Audit Services recommended that the Ministry strengthen the wording of warranty provisions in its construction contracts, implement procedures for ensuring consistency in warranty administration throughout the province, and pilot-test the use of extended warranties.

#### Current Status

The Ministry advised us that it had issued guidelines for staff to follow in administering warranties and had reviewed the wording of warranty provisions in contracts. The Ministry also advised us that it was pilot-testing seven-year warranties in two 2006 construction contracts.