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The Honourable Bill Barisoff
Speaker of the Legislative Assembly
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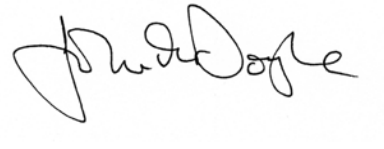
Dear Sir:

I have the honour to transmit herewith to the Legislative Assembly of British Columbia my 2008/2009 Report 12: Planning for School Seismic Safety.



John Doyle, MBA, CA
Auditor General of British Columbia

Victoria, British Columbia
December 2008

copy: Mr. E. George MacMinn, Q.C.
Clerk of the Legislative Assembly

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Auditor General's Comments

John Doyle
Auditor General

In British Columbia, there are nearly 750 schools in 39 school districts that have been identified as requiring seismic upgrading. Creating a seismic mitigation program to address this challenge is no small task. The technical challenges are great, as are the human ones.

There are many players involved: the Ministry of Education, school boards, municipalities, teachers, and of course the parents of children who attend school. Each group brings their own concerns and priorities to the table, and these are not always complementary. However, while there may be differences in how each group sets its priorities, one priority shared by all is to ensure British Columbia's children go to school in buildings that are safe.

Although my Office has looked at earthquake safety in the past, this is the first time we have looked specifically at this sensitive topic. I have begun by looking at how well the Ministry of Education has designed the processes needed to ensure that the seismic mitigation program for schools is managed and delivered in a timely and cost-effective way.

I found that the ministry and its partners have done well in developing technical processes for assessing the extent to which schools are at risk and for retrofitting buildings to improve their resistance to collapse. As well, the ministry is starting to develop a long-term capital planning model designed to enable it to make planning decisions that appropriately reflect all factors that affect capital priorities.

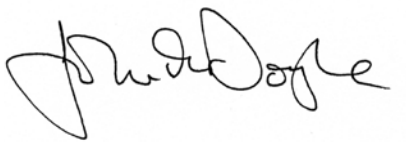
But there are still some significant challenges the ministry needs to address if the program is to succeed. The ministry has not yet finalized a program delivery model, nor has it integrated risk management activities for the program into a comprehensive plan covering both internal and external risks.

In particular, I am concerned about the erosion of the real purchasing power of the original program budget. I understand that the financial capacity to complete the program will be considered in future in the government's annual budgeting process. However, taking a realistic view of what the program can now deliver within the existing funding envelope is critical to informing these considerations. It is also helps make sure that future decisions about project priorities make sense in the context of the level of funding approved at that time.

Auditor General's Comments

I include in my report the formal comments I have received from the Ministry of Education on the issues discussed in the report. I note that the ministry has not questioned the relevance or practicality of my recommendations and, in the near future, I will be asking the ministry to provide me with an action plan for their implementation. I will look to this action plan as I consider a second report focusing on the implementation of seismic upgrades.

I commend those at the Ministry of Education, the boards of education and the technical partners of both for their commitment to protecting our students and teachers and thank them for their assistance as we carried out our work. I hope my report can assist in their efforts to provide our school children with a safe environment in which to learn and grow.



John Doyle, MBA, CA
Auditor General of British Columbia

Victoria, British Columbia
December 2008

Executive Summary

Executive Summary

Southwestern British Columbia is in an earthquake environment similar to that of the coasts of Japan, Alaska, and Central and South America. British Columbia governments have recognized since the late 1980s the need for ensuring that schools are seismically safe and have developed various programs to improve seismic safety.

While earthquakes cannot be prevented, steps can be taken to minimize — "mitigate" — their impacts. *Structural mitigation* focuses on strengthening the parts of the building that carry weight, such as load-bearing walls. *Non-structural mitigation* focuses on securing operational and functional parts of the building that might shift or fall during violent ground shaking. These parts include overhead lighting, bookcases and filing cabinets.

The current Seismic Mitigation Program delivered by the Ministry of Education covers both structural and non-structural mitigation. The original 2005 estimate of the cost of the structural component is $1.5 billion over 15 years and the program goals called for the remediation of over 700 schools in the zones of highest seismic risk in the province. In addition, the ministry currently provides $5 million annually for non-structural seismic mitigation to the boards of education located in the high-risk seismic zones.

Review Purpose and Scope

The purpose of this review was to determine how well the Ministry of Education has developed processes for managing the Seismic Mitigation Program. Specifically, we assessed the extent to which the ministry has set up:

1. a policy framework that provides adequate support, direction and guidance for structural and non-structural mitigation programs;
2. processes for making rational choices in seismic mitigation programs and for controlling the implementation of actions selected;
3. processes for adequately monitoring, evaluating and adjusting seismic mitigation programs; and
4. processes for creating a transparent and ongoing dialogue with stakeholders and the public.

Executive Summary

We visited a selection of boards of education (Vancouver, Greater Victoria, Comox Valley and Haida Gwaii) to learn about their seismic mitigation activities and to examine the boards' relationships with the ministry and other agencies. Our review did not include independent schools, as the ministry does not have a mandate to direct independent schools on seismic safety matters.

The design of new schools is referenced to the current edition of the British Columbia Building Code. The Code contains provisions that specifically relate to seismic safety of buildings and is periodically updated to reflect current knowledge of seismic conditions. Since the Seismic Mitigation Program focuses on upgrading existing schools, we did not include new schools in our scope.

We carried out the review from March to September 2008. Our examination was made in accordance with assurance standards established by the Canadian Institute of Chartered Accountants and accordingly included such tests and other procedures as we considered necessary in the circumstances.

We plan to conduct a second review to assess how well the ministry and boards of education are implementing the Seismic Mitigation Program. We expect to find that the areas for improvement identified in this report will have been addressed by the ministry.

Our Office has just delivered a report reviewing public participation in government decision processes. The recommendations from that report will likely be relevant to the public accountability dialogue among the ministry, the boards of education and the general public that we have discussed.

Review Conclusions

- The Ministry of Education and its partners have done well in developing the technical model for retrofitting BC schools. They have produced structural engineering guidelines for designing retrofit projects for schools and have developed construction industry capacity for using the guidelines.
- Boards of education are responsible for the construction phase of remediation projects, but boards themselves have varying levels of capacity to do this. The incremental capacity that each board needs should be accessible through a suitable program delivery

model. Although the ministry has tried to implement different models over the first four years of the program, it has not yet settled on one that is satisfactory to all stakeholders. We have recommended that an appropriate model be implemented without delay.

- The ministry and boards of education use assessments of seismic risk to select and prioritize seismic mitigation projects. However, aligning seismic priorities with components of the education capital program that reflect other government and board of education needs is a challenge. To respond to this, the ministry and boards of education are working toward longer term capital planning designed to enable them to better accommodate various capital needs. We have recommended that the ministry integrates seismic projects into a long-term capital planning framework.
- The ministry knows that the budget of $1.5 billion for structural mitigation will not be enough to remediate all the schools included in its original plan. We understand that this situation will be considered in the government's annual budgeting process. The ministry has not assembled its internal and external risk management activities for the program into a comprehensive risk management framework. It has developed processes for managing internal risks, but not for managing external risks such as construction cost inflation—a major contributor to the budget deficiency. We have made two recommendations to address these issues.
- The ministry is not providing the public and stakeholders with information that would help them understand how program choices are made and form reasonable expectations for the program's implementation. And, although the public has access to the boards of education through attendance at board meetings, there are no similar forums through which they can readily communicate with the ministry. As a result, we have recommended that the ministry work in partnership with boards of education to develop and implement an information plan and to facilitate public input on program objectives and priorities.

Executive Summary

Key findings

The ministry's policy framework supports the Seismic Mitigation Program in some areas but not in others

The ministry has, in the absence of a legislated requirement, taken the view that establishing a Seismic Mitigation Program for schools is good public policy. It has also set levels of seismic strength that retrofitting is intended to achieve. We found that the ministry has done well working with its partners to develop the technical methodologies and industry capacity to support the Seismic Mitigation Program. In three other areas, however, we found ministry support for the program needs improvement:

- The Seismic Mitigation Program announced in 2005 is significant in terms of budget ($1.5 billion), delivery period (15 years) and scope (747 public schools assessed at medium risk or higher). However, since the program was approved, costs of construction material and labour have escalated significantly and it is generally acknowledged that the cost of achieving the original program objectives will be much higher. We understand that these pressures on program costs will be considered in the government's annual budgeting process.
- As referred to below, the ministry has not yet found a fully satisfactory delivery model for the program and, until one is implemented, it will not be able to finalize the human resources it needs for the program.
- The ministry has not assembled its internal and external risk management activities for the program into a comprehensive risk management framework. This limits its ability to identify and proactively manage potential risks.

The ministry has processes for setting program priorities, but has not decided on a program delivery model and has not yet integrated the seismic program with other capital funding decisions

The Seismic Mitigation Program is a significant, multi-year program. Success requires clear planning processes, a suitable delivery model and clearly defined roles and responsibilities.

We found that the ministry has set required standards of safety for schools in the medium and higher risk categories, and has carried out seismic assessments to determine the vulnerability of schools in

the high hazard seismic zones of the province. As well, the ministry has adopted processes for recognizing boards of education priorities in the scheduling of projects. However, the ministry has not yet found a model to use for delivering the program that provides boards of education with ready access to the capacity they need for successfully planning and managing seismic projects. Consultation with boards of education on a model that would be satisfactory to all the parties involved is still in the early stages.

The ministry and the boards of education are working together on facility planning that will enable long-term capital plans to be prepared. These plans should make it easier for decisions on seismic priorities to reflect government's long-term objectives for education and other policy areas.

The ministry has processes for monitoring and evaluating the performance of structural remediation projects but not for non-structural projects

The ministry requires performance reports from the boards of education to demonstrate appropriate use of structural funding and progress on structural projects. The ministry also receives the results of due diligence reviews for high-value and high-risk projects, and has recently started to carry out post-implementation reviews.

The monitoring of, and accountability for, non-structural funding are not as well documented. The ministry does not set any targets for non-structural remediation nor does it gather information that would tell it how much has been accomplished system-wide.

The ministry has not established the basis for an effective accountability relationship with stakeholders and the public

Effective public participation plays a key role in helping governments develop policies and programs that best reflect the public interest. It builds public confidence in the soundness of government decision-making, and in the transparency and openness of how those decisions are implemented.

We found that while the ministry provides information to the public and other stakeholders regarding the status of the Seismic Mitigation Program, it does not have a strategy for informing the public about the factors that influence decisions about priorities and project scope. As well, the ministry does not offer any forums to enable a direct dialogue between it and the public on these and other issues.

Response from the Ministry of Education

There is nothing more important than the safety of British Columbia's students. That's why this government has committed $1.5 billion to make our schools safer in the event of an earthquake. This is the first-ever government to undertake a comprehensive school seismic upgrading program of this magnitude.

The Ministry of Education has taken a three-pronged approach to upgrading schools in seismic zones. The first is through the school seismic mitigation program and, to date, 80 seismic upgrade projects are complete, under construction or approved to proceed to construction. The second is an investment of $5 million per year to school districts in seismic-designated zones to complete "non-structural" seismic work. This includes attaching cabinets to walls, covering some windows with protective film and securing lights. Finally, each of the 73 new and replacement schools built since 2001 are modern, seismically-sound buildings.

The Ministry of Education is pleased to respond to the Office of the Auditor General's review entitled 'Planning for School Seismic Safety'.

In developing and implementing the school seismic mitigation program, the Ministry of Education worked with the Association of Professional Engineers and Geoscientists (APEGBC) to create a comprehensive method to assess and prioritize school seismic mitigation needs. The ministry has also worked closely with boards of education to manage a total of 153 school capital projects over the last seven years—that is more than 20 projects each school year. We continue to work closely with boards of education to ensure seismic projects are identified, prioritized, and effectively implemented.

The original structural program budget, developed based on the seismic risk assessments carried out in 2004, included estimates of the direct cost of seismically upgrading school buildings at that time. The extraordinary cost inflation we have experienced across the province over the last four years could not have been anticipated. Significant price increases in the provincial construction market have had a considerable impact on the cost of the seismic mitigation program. The ministry monitors these market trends each quarter and works with the Ministry of Finance to confirm seismic mitigation program priorities within the existing budget

envelope. With the current economic environment, it is important to consider that there may be deflationary effects such as lower commodity prices and lower interest rates that play a role in the cost of seismically upgrading schools.

The Auditor General recommends that the ministry and boards of education work together to ensure future seismic projects are integrated into a long-term capital planning framework. The ministry does, in fact, require boards of education to develop long-term facility plans. These plans identify capital requirements for school expansion and consolidation; school replacement or upgrades based on building condition, seismic vulnerability and ongoing maintenance/life cycle costs; as well as new government initiatives such as early learning and neighbourhoods of learning. The ministry is working with school districts to better integrate seismic upgrading into their existing and future long-term capital plans. These fully integrated capital plans will better enable school districts to effectively plan and implement priority seismic projects.

The Auditor General also recommends that the ministry consolidate its current risk management activities into a comprehensive risk management framework, including the monitoring of significant external risks. He acknowledges that the ministry's capital planning and procurement process is designed in part to help manage internal risks and costs on all capital projects. The ministry monitors construction market trends and assesses the impact of those trends on specific capital projects and the broader capital program. Project and program level budget contingencies are maintained to address minor market fluctuations. Projects are managed and implemented according to priority ranking in order to address larger pressures which can arise from unanticipated spikes in the construction market. The ministry will continue to work with school districts to further improve its capital process and will seek out ways to better manage external project risks.

The planning and delivery of a seismic project is often complex due to a number of factors including relocating students and scheduling work around school hours. In an effort to identify the most efficient and expeditious delivery model, the ministry has piloted and reviewed a number of alternatives for improving the timeliness of seismic project delivery. The current delivery method is a co-managed approach, where the ministry provides funding and broad oversight for the school seismic mitigation program, while

boards of education are responsible for the physical delivery of individual capital projects. The ministry now provides boards with additional funding to secure resources and expertise dedicated to advancing seismic capital projects. The ministry is working closely with several school districts to add project management capacity to expedite seismic project delivery. Vancouver and Coquitlam are just two examples of districts where we have added this extra support.

The ministry is working with boards of education to improve planning and reporting for non-structural seismic upgrading of schools. Working with the ministry, boards of education will continue to identify and prioritize non-structural upgrading requirements in schools. The ministry and boards will improve the process by determining an overall implementation plan, identifying funding requirements and tracking work completion. In this way, the ministry can carefully check progress against priorities, while monitoring costs and funding levels. As well, the ministry will consider incorporating this process into the capital asset management system currently under development.

The safety of British Columbia's students is a priority for this government. The Province is working with education partners—school districts—to find the best way to move seismic upgrades more quickly while remaining thoughtful about the projects and fiscally prudent. The government recognizes that it is important to ensure parents, students, teachers and staff feel safe in B.C. schools.

The ministry will continue to communicate with education partners and the public about the seismic mitigation program and to explore ways to improve public engagement. The ministry will endeavour to build a better understanding of the complexities involved in large-scale construction projects and of the careful planning that is involved in each project. There are a number of opportunities for this discussion, including such venues as the education learning roundtable.

This government remains committed to the 15-year, seismic mitigation program—an unprecedented commitment in terms of its scope and size.

It is important to note that by the end of 2008-09, this government will have invested more than $3.1 billion in school capital and

maintenance projects across British Columbia. This investment comes at a time when enrolment has declined by about 50,000 students.

The Ministry of Education appreciates the Auditor General providing an outside perspective on our school seismic mitigation plan. By acknowledging the strengths of the seismic mitigation program as well as suggesting further improvement, this report helps us to continue to make improvements and increase our effectiveness which will build overall public confidence in the safety of students.

Detailed Report

The risk of a major or even catastrophic earthquake occurring in British Columbia is high. Most parts of the Lower Mainland, Vancouver Island and the northern islands fall into zones of greatest seismic hazard (Exhibit 1).

Southwestern British Columbia lies over the active Cascadia subduction zone in an earthquake environment comparable with that existing along the coasts of Japan, Alaska, and Central and South America. Earthquake activity is steady along the faults separating the three plates lying to the west of the North American continent. The stresses that arise between the North American and Juan de Fuca plates are especially strong. The city of Vancouver lies at the north end of a zone of high seismic activity, which extends to the south end of Puget Sound.

In British Columbia, governments have recognized since the late 1980s the need for ensuring that schools are seismically safe, and various programs have been developed to improve seismic safety.

What is Seismic Mitigation?

We cannot prevent earthquakes, but we can take steps to minimize their impacts when they do occur. These steps are known as "mitigation". Structural and non-structural mitigation can reduce the threat to the safety of citizens by making buildings and other infrastructure more resistant to damage caused by ground shaking.

The structural components of a building are those that resist gravity, earthquake, wind and other types of loads. These include columns (posts, pillars); beams (girders, joists); braces; floor or roof sheathing, slabs or decking; load-bearing walls (i.e., walls designed to support the building weight and/or provide lateral resistance); and foundations (mat, spread footings, piles).

The nonstructural portions of a building include every part of the building and all its contents with the exception of the structure. Common non-structural components include ceilings; windows; office equipment; filing cabinets; heating, ventilating and air conditioning equipment; electrical equipment; furnishings and lights.

Source: FEMA – 74: Earthquake Hazard Mitigation for Non-structural Elements

Detailed Report

A Brief History of School Seismic Mitigation in British Columbia

The Ministry of Education has recognized the need to address the seismic upgrading of public schools since the late 1980s, when it initiated seismic assessments of schools. Based on the results of these assessments, the ministry funded several structural seismic upgrading projects in Vancouver and Victoria in 1991 and 1992. However, a change in Treasury Board policy in 1993 reduced capital funding support for seismic upgrades, allowing renovations to proceed only as a component of an approved rejuvenation project.

In November 1997, the Office of the Auditor General of British Columbia issued "Report 1—Earthquake Preparedness" in response to which the Select Standing Committee on Public Accounts tabled a report on earthquake risk two years later.

As a result of one of the Committee's recommendations, the Ministry of Finance's Seismic Mitigation Program was approved as a pilot program in the 1999/2000 fiscal year. The mandate of the program was to protect life, property and essential operations in provincially owned or funded buildings through the mitigation of identified earthquake hazards. During the four-year term of this program, funding of over $63 million was provided to the 39 boards of education located in high seismic risk zones.

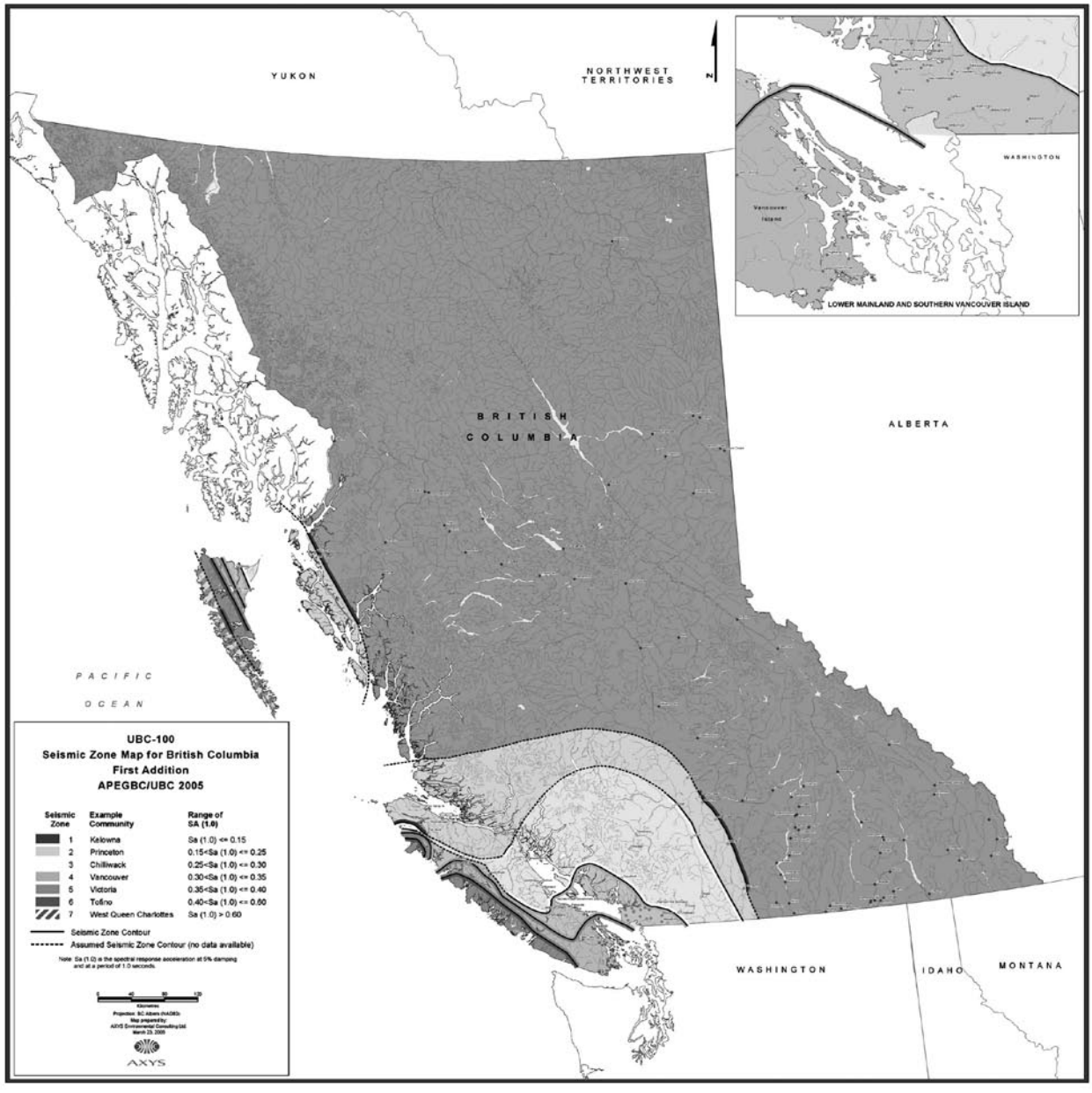
The Ministry of Finance's Seismic Mitigation Program ended in 2003 and the primary responsibility for seismic mitigation of schools was transferred back to the Ministry of Education.

The Ministry of Education's Seismic Mitigation Program

In 2004, the Ministry of Education provided funding for structural seismic risk assessments of schools located in the high-risk seismic zones of the province (see Exhibit 1 on the following page). Based on these assessments, the ministry formally launched the Seismic Mitigation Program in March of 2005.

Exhibit 1

Map of seismic zones in British Columbia



Source: Ministry of Education

Prior to announcing the launch of the program, the ministry had approved 11 individual seismic remediation projects. These projects were intended to be part of the broader Seismic Mitigation Program and are being funded from the program's budget. A major project in this group is Vancouver Technical, illustrated below. The status of these projects, as of October 31, 2008, is shown in the "Earlier projects" column in Exhibit 2.

Seismic Upgrade of Vancouver Technical, Vancouver School District

Source: Vancouver Board of Education

The March 2005 news release announcing the Seismic Mitigation Program said that "more than 700 schools will be upgraded over the next 15 years or sooner" as part of a $1.5 billion plan. The release also referred to "the first 80 schools to be upgraded over the next three years" and stated, "The Province has budgeted $254 million for improvements to the eighty [80] schools." Of the 80 schools initially included in the first phase, 56 were located in the Lower Mainland, 19 on Vancouver Island and five in other coastal communities. The ministry and boards of education of Coquitlam, Greater Victoria and North Vancouver continued to work together to add a number of projects at the time the Seismic Mitigation Program was announced. This work resulted in an additional 15 schools, expanding the number to 95 schools. The ministry identified these 95 schools as the first phase of the Seismic Mitigation Program. These schools are shown in the "Announced 2005 (first phase)" column in Exhibit 2.

The amount of $254 million represented the total estimated cost of structurally remediating the first phase schools based on the 2004 assessments and on cost and scope assumptions at that time. This estimate did not provide for future cost inflation. While the estimates had value as an initial approximation of remediation costs based on the assumptions used, they were not regarded by the ministry as precise enough to form detailed project targets or to support contractual arrangements with the boards of education.

As of October 31, 2008, first phase project agreements had been signed for 53 schools and involved project budgets amounting to $234 million. The 2004 estimated cost for these 53 schools was $116 million. The difference between these figures highlights how much the projected cost of the work changed—an increase of 102% over the 2004 estimate. Two significant factors caused the change:

- the significant increase in construction costs since the original cost estimates for the program were prepared; and
- changes to project scope resulting from later, more accurate risk assessments and a more detailed consideration of other remediation needs.

Also as of October 31, 2008, in addition to the earlier projects and the first phase projects, the ministry had funded 17 other smaller seismic projects brought forward from future phases of the Seismic Mitigation Program. These schools are shown in the "Brought forward from future phases" column in Exhibit 2.

Exhibit 2

Status of school seismic projects as of October 31, 2008 (part of $1.5 billion)

	Earlier projects	Announced 2005 (first phase)	Brought forward from future phases	Total
Completed:	3	19	8	30
Under construction:	1	24	8	33
Project funding approved:	2	10	1	13
Schools with project agreements in place:	6	53	17	76
Feasibility studies completed/ongoing:	5	35		40
Not proceeding:		7		7
Total	**11**	**95**	**17**	**123**

Source: Ministry of Education

Managing funding is a major challenge, but long-term capital planning and program decision-making are also complex tasks. The ministry and boards of education have to achieve a balance between meeting public expectations of what progress should be made and ensuring that the decisions made are in the best long-term interests of the public over a wide range of educational and other issues.

Also of note is how the ministry chose to interpret "upgrading". Once a project agreement is signed, the board of education assumes responsibility for the development phase, that being the design, construction and completion of the project. Therefore, the ministry counts as an upgrade those projects where a board has assumed these responsibilities, not where the project has actually been completed.

The ministry has not yet decided what it will include in the second phase of the seismic program. However, it is likely that these decisions will benefit from improvements in the long-term capital planning processes that are under way, and which we refer to later in this report.

In 2004, the ministry started providing non-structural mitigation funding to boards of education for making internal fixtures such as lighting, bookcases and heavy furniture more secure. The total funding provided to boards of education for non-structural work by the Ministry of Education has been $19 million over the last four years.

Who are the players in the Seismic Mitigation Program?

The Ministry of Education

The ministry is accountable for the successful delivery of the Seismic Mitigation Program. It is also responsible for:

- working with boards of education to identify seismic priorities;
- supporting the boards with the preparation of five-year capital plans for submission to the ministry; and
- securing from Treasury Board the funding required for the seismic program.

When the planning and approval processes for a supported project have been completed, the ministry signs a project agreement with the board of education. The board then assumes responsibility for bringing the project to completion.

Boards of Education

Boards of education are responsible for identifying seismic remediation priorities for their schools and reflecting these in their five-year capital plans provided to the ministry. In most cases, the board is responsible for the contract tendering and construction process through to project completion, and assumes the risks inherent in these activities.

Partnerships BC

Partnerships BC was created by government to bring together ministries, agencies and the private sector to develop projects through public-private partnerships. Any government capital project with an estimated cost of $50 million or more (recently increased from a threshold of $20 million) must be referred first to Partnerships BC to allow a public-private delivery option to be explored.

Capital Planning Secretariat

Looking to the future, the secretariat, attached to the Ministry of Finance, will provide advice to government on short- and long-term capital decisions across government. It will work closely with ministries and others to establish priorities and consolidate and manage information on capital projects (including those for seismic remediation). The secretariat is still determining how best to implement its mandate, so has had little involvement to date with the Seismic Mitigation Program.

Source: Compiled by the Office of the Auditor General from government sources

Detailed Report

Findings

The ministry's policy framework supports the Seismic Mitigation Program in some areas but not in others

The Seismic Mitigation Program needs a sound policy framework to set the necessary direction, specify constraints and identify the supports required to ensure that the program is successfully delivered.

We expected to find:

- a well-articulated rationale for the Seismic Mitigation Program;
- standards for seismic remediation;
- processes for developing capacity;
- appropriate funding and human resources committed; and
- a risk management process.

We found that the ministry has provided a sound rationale for the seismic program and set clear standards for seismic remediation. However, the costs of delivering the program are now significantly higher than those incorporated in the original program budget of $1.5 billion. We understand that how best to address this challenge will be considered in the government's annual budgeting process. We further found that the ministry has not consolidated its risk management activities into a fully developed risk management framework that identifies, evaluates and monitors all risks.

The government's rationale for the Seismic Mitigation Program is that it constitutes good public policy

No legislation explicitly requires the government to create seismic mitigation programs or provides direction for the implementation of such programs. Nevertheless, Section 3 of the School Act requires that children between 5 and 16 years of age attend education programs. The ministry has interpreted this provision as meaning that the government has a responsibility for ensuring that the environment in which these programs are delivered is a safe one for students and school staff. Meeting this responsibility calls for,

among other things, providing school buildings that will offer protection from death or injury in all but the most catastrophic earthquakes.

The public policy position taken by the ministry is consistent with that endorsed by the Organization for Economic Cooperation and Development (OECD), whose 2004 report *Keeping Schools Safe in Earthquakes* states:

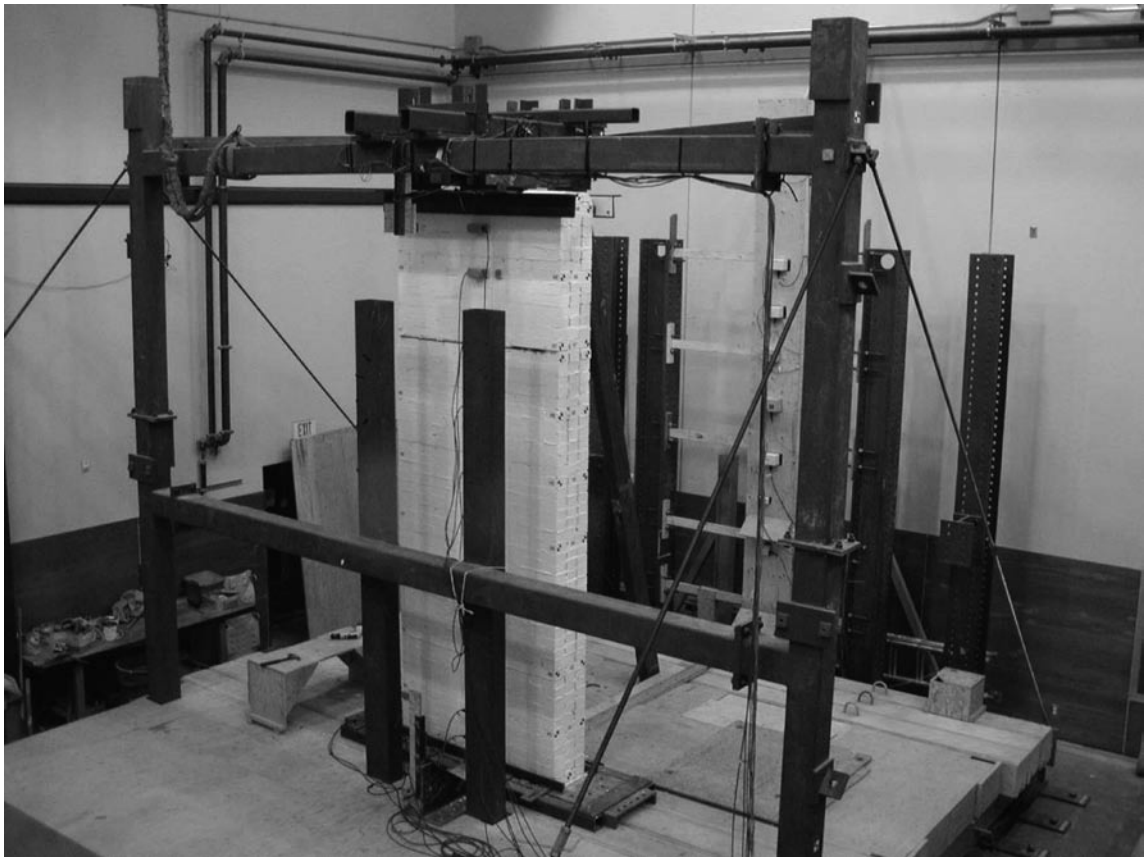
> "The education of children is essential to maintaining free societies, the social and economic progress of nations, and the welfare of individuals and their families. As a result, most nations make education compulsory. However, a state requirement for compulsory education, while allowing the continued use of seismically unsafe buildings, is an inconsistent and unjustifiable practice."

The ministry and its partners have worked well on developing technical capacity

The ministry and its partners, the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) and the Earthquake Engineering Research Facility at the University of British Columbia (UBC), have developed processes for creating and developing the methodologies, tools and engineering capacity needed to support the Seismic Mitigation Program.

Since 2004, the ministry has contracted with the APEGBC to develop seismic assessment tools and retrofit guidelines (known as the "Bridging Guidelines") for school buildings. The Bridging Guidelines, drafted to complement the 2005 edition of the National Building Code of Canada, provide a method for the cost-effective retrofit of existing buildings.

The Department of Civil Engineering at UBC provides extensive review of the content of the Bridging Guidelines. At UBC's "shake table" facility, various design solutions for different types of building structures are exhaustively tested to assess how well each solution is likely to meet the required standard.



Unreinforced masonry wall tests on the shake table at UBC's Earthquake Engineering Research Facility

Source: APEGBC

Under its agreement with the ministry , the APEGBC has been holding training workshops for professional engineers and geoscientists on the use of the assessment tools and the Bridging Guidelines. The workshops were also web cast and are available on CD.

A Technical Review Board will be created in late 2008 to provide advisory and technical assistance to the ministry and to consultants employed by the boards of education. The Technical Review Board will consist of structural engineers who will respond to questions about the application of the Bridging Guidelines. The engineers will also identify innovative seismic retrofit techniques that should proceed to formal testing by UBC.

The approved program budget will not cover the current costs of achieving the original program objectives

The funds for the government's $1.5 billion Seismic Mitigation Program are allocated by the Treasury Board through the annual budgeting process.

The original structural program budget, developed based on seismic risk assessments carried out in 2004, identified only the direct cost of seismic upgrades to buildings and standard construction contingencies. The model did not provide for the potential effect of inflation on program costs over the fifteen year duration of the program. Since 2004, the ministry and its partners have been upgrading the assessment tools and cost models for technical components by, for example, recognizing the impact on risk of the differing soil classifications included in the 2005 BC Building Code. However, the fact that current cost estimates for the 53 projects that have passed the project agreement stage are 102% greater than the 2004 cost estimates for them demonstrates the impact increased costs and scope changes can have.

As a result, the approved budget of $1.5 billion will likely fall far short of the amount required to retrofit the at-risk schools identified in the original assessments. Treasury Board has in the past sought confirmation from the ministry that the program can be managed within the original budget. We understand that how best to respond to increasing cost pressures will be considered as part of the government's annual budgeting process.

Deciding on remediation priorities over the term of the program will be difficult if it is not clear what the program can reasonably accomplish with the funding available. The lack of clarity in program objectives will be a significant problem when priorities need to be set among a large number of schools assessed as medium/high and medium risk.

For these reasons, we consider the ministry needs to identify how much of the program it can deliver within the available budget, based on realistic cost estimates. Two initiatives now under way are designed to enhance the accuracy of these estimates:

- *the development of an updated seismic risk assessment tool for assigning priority to the remaining schools assessed in 2004 at the medium risk or higher and not yet scheduled for remediation* — This tool should reflect the most current knowledge concerning retrofitting methodology and local conditions. It should therefore provide more accurate assessments of each school's exposure to seismic risk, and as a result, increase the accuracy of cost estimates for delivering the program.
- *the ministry's encouragement for each board of education to develop a long-term facility plan* — This longer-term approach to capital planning should result in a more accurate projection of required future capacity. This will help boards of education plan what future action is appropriate for their seismically at-risk schools and what priorities to assign to those actions.

Both of these initiatives will likely enable the ministry to strengthen its capital planning processes and in the long term more accurately assess the exposure to physical and financial risk. However, in the short term, they also increase current uncertainty about the final cost of future seismic work required.

The process for funding non-structural mitigation also needs attention. The ministry currently provides $5 million each year to boards of education located in the high-risk seismic zones of the province for non-structural remediation of schools. This amount is allocated in proportion to each board of education's annual facility grant, a grant intended to maintain the capacity of the school infrastructure. The allocation is not, therefore, related to an assessment of what the funding needs for non-structural mitigation might be.

We recommend that the ministry identify how much of the program it can deliver within the available budget, and use this information to confirm future priorities and funding for the structural program.

We recommend that the ministry confirm whether the current levels of funding to school districts for non-structural remediation are sufficient to address non-structural needs.

The ministry has not finalized its human resourcing requirements for the Seismic Mitigation Program

The ministry is currently assessing its human resource needs for delivering the schools' capital program, of which seismic mitigation is a part. This assessment anticipates an increase in ministry staffing to provide effective program oversight and adequate support to boards of education in planning and carrying out seismic and other capital projects in schools.

The ministry anticipates that it will have reached staffing goals within the coming year.

The ministry has not assembled its risk management practices into a comprehensive risk management framework

Since the program's inception, the ministry has carried out risk management activities in a number of areas. However, these activities have not been carried out in the context of an overall risk management strategy that identifies all the internal and external risks that have a significant effect on program scope and costs and ensures that strategies are developed to manage such risks.

Many internal risks are being managed. The development of methodology and capacity to guide the performance of the work is noted above. As well, the ministry's latest proposed version of the Project Procurement Procedures and Guidelines (Procurement Guidelines) addresses significant internal risks that affect the cost and timing of a project. For example, the planned process recommends the requirements to:

- set out a clear statement of project responsibilities and of how risk and its costs will be shared between the ministry and the boards of education;
- develop capital plans, including seismic projects, to be based on a long-term facilities plan to ensure that the project is relevant to future capacity needs;
- document project definition to establish clarity around scope, methodology and budget;
- recognize project risk by establishing a project risk management plan;

- establish a project budget that includes a contingency reserve for specific risks that may materialize; and
- institute post-implementation reviews to learn and share project experience that might help others assess risk more accurately.

One matter not addressed in the Procurement Guidelines is the ministry's need to be satisfied that the quality of construction work meets the requirements of the retrofit design. We consider that the ministry should identify what information it needs to satisfy itself on this matter and should set up processes to gather and evaluate this information.

We did not see evidence that the ministry had a process for monitoring the impact of major external risks—such as socio-economic trends and views/actions of stakeholders—on an ongoing basis. These risks significantly affect project costs and timing. Two examples we consider should be tracked are:

- trends in construction costs and how these might affect future capital priorities, project timing and the ability to achieve seismic program goals; and
- the impact of public concern for preserving heritage schools on the timeliness and affordability of seismic remediation projects.

We recommend that the ministry consolidate its current risk management activities into a comprehensive risk management framework, including the monitoring of significant external risks.

The ministry has processes for setting program priorities, but has not decided on a program delivery model and has not yet integrated the seismic program with other capital funding decisions

Achieving the goals of a significant, multi-year program requires making informed choices about how best to deliver it and about roles and responsibilities for those involved in its delivery.

We expected to find:

- consistency of program objectives and choices with the policy framework;
- detailed research and analysis supporting program choices;
- clear lines of accountability; and
- processes for making rational decisions for prioritizing projects.

We found that the objectives of the ministry's program are consistent with the government's policy goals. Accountabilities between the ministry and the boards of education are also well documented and understood. However, the ministry has still not found a program delivery model that is satisfactory to all the participants in the Seismic Mitigation Program. As well, it has not completed the development of a longer term capital planning process that would allow it to integrate seismic goals with other government priorities.

The ministry has not yet found a satisfactory program delivery model

With 747 schools originally identified at risk, the Seismic Mitigation Program has to focus on improving the seismic strength of existing schools, by either retrofitting or replacing them with new ones. Still, there are choices to be made as to how the program will be delivered and we would expect these choices to be adequately researched and documented.

The program proposal approved by the Minister of Education in 2004 included four delivery options:

- ministry project delivery — the ministry funds within the current project delivery framework;
- central agency — central agency established to implement the program and manage the projects;

- long-term school board — the ministry develops a long-term implementation plan and performance contracts with individual school boards to implement the program; and
- long-term public/private — government develops a long-term implementation plan providing opportunities for the private sector to deliver the program.

Ministry management recommended that the fourth option, a public-private partnership, be chosen to deliver the program, but did not include an evaluation of each of the options.

Since 2004, the ministry has explored different ways of managing the Seismic Mitigation Program and of providing support for boards of education. Among the options tried has been the use of a public-private partnership for delivering projects across school districts as originally planned and, when that did not prove viable, contracting with other government agencies for project oversight services.

However, after more than three years, the ministry has still not identified a delivery model that meets the needs of all stakeholders. The ministry is exploring a model designed to provide additional oversight while providing funding and resources to boards of education to help them build capacity to effectively manage their seismic projects.

We recommend that the ministry:

- ***make it a matter of urgency to implement a program delivery model and commit sufficient resources to it; and***
- ***fully evaluate all options before deciding on how the program will be delivered.***

The ministry has not looked to other jurisdictions to develop formal benchmarks. In our view, selecting appropriate benchmarks can be a useful means of evaluating performance and finding ways to improve. The ministry might benefit from considering what other jurisdictions with seismic programs have done in establishing processes for target setting, program duration, retrofit standards, replacement values and delivery methods.

The ministry has clearly established roles and responsibilities for its relationship with the boards of education

The capital project procurement process clearly sets out the roles and responsibilities of the ministry and the boards of education.

- Boards of education are responsible for providing effective project management of capital projects in three key areas: cost-effective design and construction; competent project management and cost control through all project phases; and development of capital assets that will meet provincial guidelines.
- The ministry is responsible for the development and maintenance of provincial standards, monetary safeguards, and reporting requirements to ensure public accountability in the delivery of capital projects.

Ministry and boards of education processes for selecting and prioritizing projects have still to be integrated with other capital funding decisions

Selecting and prioritizing projects involves balancing a number of factors. The process must respect the constraints imposed by policy, yet still try to achieve the most effective use of funds in pursuing program objectives that may reside in a number of government policy initiatives.

At the outset of the program, the ministry needed to decide whether priorities should be established on a province-wide basis (where ranking is based solely on assessed risk regardless of location) or whether the 39 boards of education in the high risk zones should have an opportunity to identify projects based on seismic assessments and within guidelines provided by the ministry. The ministry chose a co-managed approach which supported projects that boards identified, based on the seismic assessment, and also took into account local needs and priorities.

Program success depends on a number of conditions. One is having sound assessment tools on which to base remediation decisions. The civil engineering department at UBC is updating a risk ranking assessment tool intended to assist the ministry in making appropriate planning, budgeting and approval decisions based on the most accurate assessment available of the seismic vulnerability of schools.

It is increasingly apparent that a second success factor is having an integrated capital planning framework—one that enables decisions to reflect multiple current demands, the capacity of the boards of education to manage projects, and long-term program and policy objectives. For example, planning decisions may have to recognize a number of renovation and remediation needs for the same school, such as asbestos, building envelope, mould and seismic. The ministry also has to recognize the needs of other government programs, such as the "Neighbourhoods of Learning" and "Early Learning" initiatives, and any government policy decisions and trends in demographics that might affect the number of student places that the system has to provide. And lastly, there may be other social policy considerations to keep in mind, such as preserving heritage buildings. These complexities emphasize the need for comprehensive facility planning to enable boards of education and the ministry to develop capital plans that respond to the many demands on the seismic program.

The ministry has taken a number of steps to address these pressures. A procurement process review has recognized some of the challenges boards of education are facing in attempting to coordinate seismic upgrading projects with other renovation projects. As well, the procurement process anticipates that boards of education will develop long-term facilities plans to provide a solid basis for board and ministry capital planning. However, the benefits of these planning improvements can only be realized when the ministry implements an effective program delivery model for seismic remediation.

We recommend that the ministry and boards of education work together to ensure future seismic projects are integrated into a long-term capital planning framework.

The ministry has processes for monitoring and evaluating the performance of structural remediation projects but not for non-structural projects

Collecting information about program and project status, progress and experience provides an important means for confirming the continued relevance of program objectives, assumptions and methodology and allows for informed decision-making.

We expected to find that the ministry had:

- identified the nature and sources of information needed to monitor program performance; and
- established processes for obtaining appropriate accountability reporting from the boards of education about their seismic projects.

We found that the ministry has designed reasonable processes for gathering information about program and project performance for structural projects, but that it lacks information from the boards of education to evaluate the status of their non-structural programs.

The ministry has processes in place for monitoring and evaluating structural mitigation projects

Monitoring and evaluating projects has two main goals. First, information about the progress of specific projects is needed for accountability purposes, such as ensuring adherence to budget and timelines. Second, information gathered at the program level is needed so that management can determine how well the project processes are achieving their goals and whether adjustments are needed.

We found that the ministry's capital project procurement process establishes reasonable reporting requirements to mark the status and progress of capital projects. Reports provided by boards of education to the ministry must demonstrate the appropriate use of funding and the progress on the projects. As well, the ministry and boards of education are currently determining what minimum reporting requirements should be formalized in the project agreements to better enable both the ministry and the boards to fulfil their respective roles.

Another initiative recently begun is the performance of post-implementation reviews. These reviews:

- evaluate capital expenditures;
- ensure projects comply with government approvals, policies and standards; and
- ensure lessons learned are factored into the design and future elements of the program.

Post-implementation reviews can also be used to provide the ministry with assurance that the work carried out fully meets project objectives.

Seismic Upgrade of Mount Douglas Secondary, Greater Victoria School District

Source: Office of the Auditor General

The ministry does not have processes in place for monitoring and evaluating non-structural mitigation projects

The ministry has not set objectives for non-structural remediation to help boards of education in turn set targets for their non-structural program. Moreover, the ministry has not asked boards of education to provide information about the status of their non-structural remediation programs. Therefore, not knowing whether the overall state of non-structural remediation is on track or not, the ministry is unclear about whether it needs to take action to accelerate the rate of non-structural activity in the system.

We recommend that the ministry:

- ***require boards of education to collect information about the progress and status of non-structural mitigation programs; and***
- ***use this information to assess whether the status and rate of progress of non-structural mitigation is acceptable and whether funding is adequate.***

The ministry has not established the basis for an effective accountability relationship with stakeholders and the public

Effective public participation is now widely accepted as a constructive component of public sector governance. The form of such participation ranges from informing and educating the public to engaging the public in identifying common ground for actions and solutions.

We expected to find that the ministry had instituted:

- processes to inform stakeholders and the public about seismic hazard and risk, and about how these influence government policy decisions; and
- opportunities for stakeholders and the public to provide input for consideration in the design and implementation of seismic programs.

We found that although the ministry invests much time in communicating with stakeholders and the public, it does not have a comprehensive plan to proactively explain the key issues and constraints that affect the Seismic Mitigation Program. There are few ministry forums through which the public might play a role in shaping the program. However, the public does have better access to the boards of education at the local level to participate in discussions around seismic issues.

The ministry does not provide sufficient information to stakeholders and the public about the factors driving the Seismic Mitigation Program

Effective communication between the government and the public is more likely when the discussion is supported by a common understanding of what the program context is, what challenges are faced and how the decision-making process works.

The ministry spends considerable time communicating with the public and other stakeholders about the Seismic Mitigation Program on matters such as status of projects and the impact of seismic mitigation work on other matters of public interest.

We found, however, that the ministry has not developed a strategy for informing the public about matters such as how seismic priorities are determined, what competing interests and trade-offs must be considered in making these decisions or what risks might influence the extent to which program goals can be achieved. As a result, public perceptions and expectations about the program and its progress may not be grounded in a solid understanding of all the issues.

The ministry does not have a formal process for periodically seeking public input

Although public concern about the seismic vulnerability of British Columbia schools was a major factor in creating the Seismic Mitigation Program, the ministry does not seek input from the public on key issues that may affect how seismic remediation projects are delivered. The ministry has set up forums to discuss specific issues such as the Bridging Guidelines, but has held no specific forum to gauge the views of the public regarding matters such as selection, prioritization and remediation options for schools at seismic risk.

One example of the importance of promoting an informed public discussion around seismic mitigation is the issue of heritage schools in the Vancouver school district. Engaging the public at an early stage in a discussion about how to reconcile the potentially competing goals of making schools safer and preserving heritage values might have increased the chances of reaching a consensus and avoided construction delays.

Boards of education provide the public with greater access to elected officials and the administration to obtain information about seismic mitigation projects. Open sessions at board meetings give the public opportunities to communicate their views and concerns to the trustees and the district administration and to receive responses from them.

We recommend that the ministry work in partnership with boards of education to:

- *develop and implement an information plan that will inform the public about seismic hazard, risk and the constraints around the program; and*
- *give the public opportunities to provide input on future program objectives and priorities.*