May 2016



AN AUDIT OF COMPLIANCE AND ENFORCEMENT OF THE MINING SECTOR

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The Honourable Linda Reid
Speaker of the Legislative Assembly
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Dear Madame Speaker:

I have the honour to transmit to the Legislative Assembly of British Columbia my report, *An Audit of Compliance and Enforcement of the Mining Sector*.

We conducted this audit under the authority of section 11 (8) of the *Auditor General Act* and in accordance with the standards for assurance engagements set out by the Chartered Professional Accountants of Canada (CPA) in the CPA Canada Handbook – Assurance, and in accordance with Value-for-Money Auditing in the Public Sector.



Carol Bellringer, FCPA, FCA
Auditor General
Victoria, B.C.
May 2016

Cover Page - Tailings pond of Huckleberry open pit copper mine in northwestern British Columbia. Owned by Imperial Metals Corp. Source: Stock Photo.

AUDITOR GENERAL'S COMMENTS



Carol Bellringer, FCPA, FCA
Auditor General

The mining industry has a long history in British Columbia and continues to be an important source of employment for thousands of people. Government has stated its plan to continue to support and develop this industry by creating opportunities for new investment. However, the recent decline in commodity prices has left many mining companies struggling to survive. Regardless of whether the mining industry is experiencing growth or slow-down, protection of the environment needs to be ensured. This is only possible through strong regulatory oversight. We conducted this audit to determine whether the regulatory compliance and enforcement activities of the Ministry of Energy and Mines (MEM) and the Ministry of Environment (MoE), pertaining to mining, are protecting the province from significant environmental risks.

We found almost every one of our expectations for a robust compliance and enforcement program within the MEM and the MoE were not met.

We found major gaps in resources, planning and tools. As a result, monitoring and inspections of mines were inadequate to ensure mine operators complied with requirements. The ministries have not publicly disclosed the limitations with their compliance and enforcement programs, increasing environmental risks, and government's ability to protect the environment.

During the course of this audit, these risks became a reality and disaster occurred when the tailings dam at Mount Polley failed – releasing approximately 25 million cubic metres of wastewater and tailings into adjacent water systems and lakes. It may be many years before the financial, environmental and social implications are fully known.

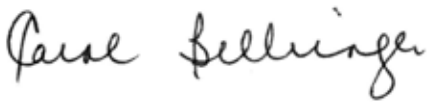
AUDITOR GENERAL'S COMMENTS

After the failure at Mount Polley and during our audit, we felt it necessary to review MEM's performance as regulator for this site. We noted the same issues in the Mount Polley file as we did throughout the audit – that is, too few resources, infrequent inspections, and lack of enforcement.

Our advice, to reduce the risk that unfortunate and preventable incidents like Mount Polley don't happen again, is for government to remove its compliance and enforcement program for mining from MEM. MEM's role to promote mining development is diametrically opposed to compliance and enforcement. This framework, of having both activities within MEM, creates an irreconcilable conflict. Because compliance and enforcement is the last line of defence against environmental degradation, business as usual cannot continue.

I am therefore disappointed in the resistance to this overall recommendation as it is consistent with many other jurisdictions' response to similar incidences. In addition, it is disconcerting that government will not be disclosing its rationale for decisions that it makes in the public's interest under section 137 of the *Environmental Management Act.* The next opportunity to discuss these and other areas of disagreement and the contents of this report, will be at a meeting of the Select Standing Committee on Public Accounts.

This was a very large and involved audit. I appreciate the dedication and commitment that everyone, both in the ministries and my Office, showed to see it through to completion.



Carol Bellringer, FCPA, FCA
Auditor General
May 2016

SUMMARY

Mining is an important economic driver for British Columbia. More than 30,000 people are employed in mining and related sectors, and in 2013, the total value of production at B.C. mines was about $7 billion and mineral exploration spending reached $476 million.

In B.C., there are 13 major coal and metal mines in operation, over 160 temporarily or permanently **closed mines**, and several mines moving through the permitting approvals process. While the degree of environmental risk varies for each mine, many sites will require ongoing oversight by government that includes a robust compliance and enforcement program to manage the risk.

The major risk to the environment from mining activities is water contamination from the chemical processes of **acid rock drainage** and **heavy metal and non-metal leaching**. Once these processes begin, they can continue indefinitely. In some cases, the only solution is water treatment and monitoring – in perpetuity – which can cost millions of dollars a year.

While most major mines will not require perpetual water treatment, government has estimated that approximately 10% of the major mines in B.C. either have water treatment facilities or will require them in the future (see sidebar). Industry is responsible for both building and maintaining these facilities indefinitely; however, the lifespan of mines and mining companies is finite, creating a risk that taxpayers may bear the costs. So, while the benefit from mining occurs for a limited time, the costs, including government's obligation to monitor these sites, may continue for a very long time.



Click on the terms that are **bold** and **blue** to go to the definition in the glossary (**Appendix B**).

Just over 10% of B.C. major mines have or will likely require long-term or perpetual water treatment.

- 14 major mines currently have water treatment facilities.
- Government has estimated that another 12 existing mines will require water treatment facilities.

Several laws apply to mining in B.C., but for this audit we focused on those that are the responsibility of the Ministry of Energy and Mines (MEM) and Ministry of Environment (MoE), as both of these ministries:

- are the primary permitting agencies for major mine operations in the province, and
- have environmental protection mandates and associated compliance and enforcement responsibilities under provincial legislation.

MEM's responsibilities apply generally *within the mine site*. MEM must ensure the mine is designed, built, operated and reclaimed to an acceptable standard. Under the *Mines Act*, MEM is empowered to require that mines provide a financial security deposit that is held by government. This deposit is designed to ensure that taxpayers will not have to contribute to

SUMMARY

mine reclamation costs if a company defaults on its environmental obligations.

MoE's responsibilities apply generally to regulating the impact of mining activities that *extend beyond the borders of the mine site*. MoE regulates the quantity and quality of any waste discharges from metal and coal mines to ensure the protection of the environment.

OVERALL AUDIT FINDINGS

MEM and MoE's compliance and enforcement activities of the mining sector are inadequate to protect the province from significant environmental risks

Overall findings of MEM's and MoE's regulatory program:

Planning

- MEM's mandate to promote the mining industry conflicts with its role as a regulator, thus reducing its regulatory effectiveness.
- MEM has a limited compliance and enforcement program and weak planning, and therefore its regulatory oversight activities are inadequate.
- Although MoE has adopted a compliance and enforcement framework, there are significant gaps in how the framework is applied.
- Neither ministry coordinates with the other on their compliance and enforcement activities.
- Both ministries lack sufficient resources and tools to manage environmental risks from mining activities.
- To meet the provincial goals for new mines and mine expansions, MEM and MoE are focusing on permit applications. As a result, there are few resources dedicated to the regulatory activities of monitoring, compliance and enforcement.

Permitting

- Neither ministry ensures that permits are consistently written with enforceable language.
- Neither ministry uses a permitting approach that reduces the likelihood taxpayers will have to pay costs associated with the environmental impacts of mining activities (known as the **polluter-pays principle**).
  - MEM is not holding an adequate amount of security to cover the estimated environmental liabilities at major mines. The ministry has estimated the total liability for all mines at more than $2.1 billion, yet has obtained financial securities for less than half that amount ($0.9 billion).
  - MoE has not reviewed or revised its fee schedule for pollutants issued under an *Environmental Management Act* permit since 2004. And, in some cases, the waste discharge fees do not reflect the environmental impacts.

SUMMARY

Compliance promotion

- Both MEM and MoE have created guidance documents and worked with stakeholders to promote compliance. However, neither ministry could demonstrate that its activities and guidance materials were effective in achieving voluntary compliance or government's environmental outcomes.

Compliance verification

- Neither MEM nor MoE are conducting adequate monitoring and site inspections and neither have assessed how this is impacting risks.

Enforcement

- Both MEM's and MoE's enforcement responses have significant deficiencies and MEM's enforcement tools are in some cases, ineffectual. This is resulting in delayed or unsuccessful enforcement by the ministries and inaction by industry in several instances.

Ensuring continuous improvement

- Neither MEM nor MoE have adequately evaluated the effectiveness of their regulatory programs. Both ministries are aware that deficiencies in their regulatory activities are resulting in risks to the environment. In at least two instances—the tailings breach at Mount Polley mine and the degradation of water quality in the Elk Valley—these risks have manifested into real environmental impacts.

Reporting

We found that the two ministries are not informing the public and legislators about the long-term risks from mining, the effectiveness of the agencies' regulatory oversight, and the overall performance of the companies being regulated.

SUMMARY

OTHER COMPLIANCE AND ENFORCEMENT MATTERS

The impacts of an ineffective regulatory regime are increased risks to the environment and the potential for deterioration of the province's water systems, loss of wildlife habitat, and damage to culturally significant areas and values. In recent years, this risk has become a reality and resulted in actual environmental damage, such as at the Mount Polley mine site and in the Elk Valley.

Compliance and enforcement at the Mount Polley Tailings Dam

On August 4, 2014, a breach occurred within the Perimeter Embankment of the **tailings storage facility (or tailings dam)** at the Mount Polley copper and gold mine in south-central B.C. The breach resulted in the release of an estimated 25 million cubic metres of wastewater and tailings. The mining company has since been working on the clean-up from this event, but the full extent of the environmental repercussions from the breach are still not known.

In response to this event, government convened an independent, expert, engineering investigation and review panel (panel) to determine the mechanics of ***how*** the dam failed. Their conclusion was that the primary cause of the breach was dislocation of a part of the Perimeter Embankment due to foundation failure. The specifics of the failure were triggered by the construction of the downstream rockfill zone at a steep slope. They noted that had the downstream embankment slope been flattened in recent years as proposed in the original design, failure would have been avoided.

Our assessment differed from the panel's review in that we focused on ***why*** the dam failed and the Ministry of Energy and Mines' (MEM) overall compliance and enforcement activities. We found that the ministry did not ensure that the tailings dam was being built or operated according to the approved design, nor did it ensure that the mining company rectified design and operational deficiencies. MEM continued to allow the mine to operate and to approve permit amendments to raise the tailings dam.

In relation to the Perimeter Embankment where the dam failed, MEM's weak regulatory oversight allowed inconsistencies with the intended dam design to persist over several years. This included: an over-steepened Perimeter Embankment slope and inadequate management of the tailings beach. At the Main Embankment, in addition to accepting a steep embankment slope and an inadequate tailings beach, MEM also did not ensure that buttressing was built to the height and extent included in the dam design.

We concluded that MEM did not enforce the design due to the following:

Over reliance on qualified professionals

It is not MEM's practice to carry out its own technical review (or to oversee an independent technical review) to confirm that tailings dams are built in accordance with the design.

SUMMARY

Inadequate standards to guide both inspectors and industry

We expected that MEM would have ensured that their design standards were clear for both industry and inspectors to enforce. However, MEM had adopted the Canadian Dam Association's Dam Safety Guidelines for dam construction that were not specific to the conditions in B.C. or specific to tailings dams. These guidelines were open to interpretation by the Engineer of Record and MEM inspectors, and this resulted in a tailings dam that was built below generally accepted standards for tailings dams.

Inspections did not meet policy

MEM performed no geotechnical inspections for a number of years, even though their policy requires a minimum of an annual inspection. Although these inspections would not have identified the weak foundation layer, staff could have identified that the operator was not actually building or operating the tailings dam to the prescribed design and was raising the dam without any long-term planning. Also, additional inspections would have provided MEM the opportunity for increased onsite vigilance.

Lack of enforcement culture

MEM has adopted a collaborative approach to compliance and enforcement that emphasizes cooperation and negotiation. In the case of Mount Polley, this approach failed to produce the desired results. MEM has the ability to compel a mining company to take corrective action when necessary, and has done so in the past using enforcement mechanisms under the Act, Code and permit. However, at Mount Polley, MEM did not use most of these enforcement mechanisms to compel the mine operator to build or operate the dam as designed and intended.

MoE has not publicly disclosed the risks associated with permitting coal mines in the Elk Valley

Lack of sufficient and effective regulatory oversight and action by MoE to address known environmental issues has allowed degradation of water quality in the Elk Valley. Coal mining, which has been underway in the area for over 100 years, has resulted in high concentrations of selenium in the water system. As selenium accumulates up the food chain, it can affect the development and survival of birds and fish, and may also pose health risks to humans.

For 20 years, MoE has been monitoring selenium levels in the Elk Valley and over that time has noted dramatic annual increases of selenium in the watershed's tributaries. MoE tracked this worsening trend, but took no substantive action to change it. Only recently, has the ministry attempted to control this pollution through permits granted under the *Environmental Management Act.*

We examined the Line Creek Expansion Permit, the Area-Based Management Plan and the Area-Based Management Permit (Valley Permit)[1] to understand how they support MoE's responsibility to minimize risks to the environment. We found that these documents do not address several risks, including the following:

- MoE staff, with input from external experts, concluded that the selenium levels in the

[1] Line Creek mine is one of five coal mines that Teck Resources Ltd. is operating in the Elk Valley.

SUMMARY

proposed Line Creek Expansion Permit were not likely protective of the environment. The statutory decision-maker could not approve the permit. Subsequently, the permit was granted by Cabinet. This was the first time that Cabinet used this approval process. The rationale for the decision was not publicly disclosed.

- The Line Creek Expansion Permit allows mining activities to be extended into an area inhabited by Westslope Cutthroat Trout, a species listed as being of "**special concern**" under the federal *Species at Risk Act*. This approved expansion of mining operations creates a risk of further decline of this species.
- The Area-Based Management Plan commits industry to developing six water treatment facilities in the Elk Valley. This creates a future economic liability for government to monitor these facilities in perpetuity and ensure that they are maintained.
- There is a risk that if MoE is unable to enforce the Area-Based Management Permit and the mine exceeds its permit limit for selenium at Lake Koocanusa, the outcome could be a violation of the 1909 *Treaty relating to boundary Waters and Questions arising along the Boundary between Canada and the United States* (the Treaty). The Treaty forbids the pollution of water bodies on either side of the border.
- The levels for selenium in the Area-Based Management Permit are inconsistent with the **precautionary principle**. The proposed targets over the next seven years show a reduction in selenium, but are still significantly higher than current concentrations creating a high risk of further environmental impacts.

The ministry has not disclosed these risks to legislators and the public.

Ultimately, despite the addition of water treatment facilities, the current permit levels of selenium are above the water quality guidelines set by B.C. to protect aquatic life, and for human health and safety. Selenium from both historical mining activities and the ongoing expansion is likely to continue to impact the environment far into the future.

SUMMARY OF RECOMMENDATIONS

We found over a decade of neglect in compliance and enforcement program activities within the Ministry of Energy and Mines, and significant deficiencies within the Ministry of Environment's activities. Overall, we concluded that compliance and enforcement activities of the two ministries are inadequate to protect the province from significant environmental risks.

The independent expert panel for Mount Polley stated clearly that "business as usual cannot continue." We reached a similar conclusion at the end of this audit regarding compliance and enforcement, and we have one overall recommendation.

OVERALL RECOMMENDATION

WE RECOMMEND THAT THE GOVERNMENT OF BRITISH COLUMBIA create an integrated and independent compliance and enforcement unit for mining activities, with a mandate to ensure the protection of the environment.

Given that the Ministry of Energy and Mines (MEM) is at risk of **regulatory capture**, primarily because MEM's mandate includes a responsibility to both promote and regulate mining, our expectation is that this new unit would not reside within this ministry.

Establishment of such a unit will:

- show all stakeholders concerned about regulatory oversight that government has put a sound system in place
- enable government to demonstrate that it will meet its public commitment to be a sound environmental steward

SUMMARY OF RECOMMENDATIONS

In addition to this overall recommendation, we have included 16 recommendations that provide further guidance to government in the development of this new unit. These recommendations are themed by activity: Planning, Permitting, Compliance Promotion, Compliance Verification, Enforcement, Evaluation and Adjustment, and Reporting.

Each recommendation was in response to specific findings. In some cases, the recommendation was made due to specific issues as a result of the Ministry of Environment's or the Ministry of Energy and Mines' performance, and in other cases, the recommendation was applicable to both ministries.

Planning

1.1 **Strategic planning**

We recommend that government develop a strategic plan that would detail the activities of an integrated and coordinated regulatory approach, and the necessary capacity, tools, training and expertise required to achieve its goals and objectives.

Permitting

1.2 **Permit language**

We recommend that government ensure both historical and current permit requirements are written with enforceable language.

1.3 **Security – adequate coverage**

We recommend that government safeguard taxpayers by ensuring the reclamation liability estimate is accurate and that the security held by government is sufficient to cover potential costs.

1.4 **Security – catastrophic events**

We recommend that government review its security mechanisms to ensure taxpayers are safeguarded from the costs of an environmental disaster.

1.5 ***Environmental Management Act* waste discharge fees**

We recommend that government review its fees under the *Environmental Management Act* and ensure that the fees are effective in reducing pollution at mine sites.

SUMMARY OF RECOMMENDATIONS

1.6 **Cost recovery**

We recommend that government adopt a cost recovery model for permitting and compliance verification activities that is consistent across all ministries in the natural resources sector.

1.7 **Decision-making – Use of section 137 of the *Environmental Management Act***

We recommend that government publically disclose its rationale for granting a permit under section 137 of the *Environmental Management Act*. Specifically, information should include how factors such as economic, environmental, and social attributes were considered in the determination of public interest.

Compliance Promotion

1.8 **Reclamation guidance**

We recommend that government develop clear and comprehensive reclamation guidance for industry.

1.9 **Incentives**

We recommend that government create effective incentives to promote environmentally responsible behavior by industry.

SUMMARY OF RECOMMENDATIONS

Compliance Verification

1.10 Risk-based approach

We recommend that government develop a risk-based approach to compliance verification activities, where frequency of inspections are based on risks, such as industry's non-compliance record, industry's financial state, and industry's activities (e.g., expansion), as well as risks related to seasonal variations.

1.11 Systematic compliance verification

We recommend that government systematically monitor and record compliance with high-risk mine permit requirements.

1.12 Qualified Professionals

We recommend that government establish policies and procedures for the use and oversight of qualified professionals (QP) across the natural resources sector. These policies and procedures should have the following:

- guidance for staff that outlines the specific nature and amount of oversight expected of a QP's work
- guidance for staff as to expected timeframe for review and response to QP reports
- updated guidance for staff for recognizing and responding to misconduct by a QP
- controls in place to ensure that there is no undue influence on the QPs by industry
- controls in place to ensure that recommendations by QPs are adhered to

1.13 Mine design

We recommend that government adopt appropriate standards, review mine designs to ensure that they meet these standards, and ensure that mines, as constructed, reflect the approved design and standards.

SUMMARY OF RECOMMENDATIONS

Enforcement

1.14 **Policies, procedures and tools**

We recommend that government develop policies, procedures and enforcement tools for responding to non-compliances when industry does not meet government's specified timeline.

Evaluation & Adjustment

1.15 **Evaluation & adjustment**

We recommend that government regularly evaluate the effectiveness of its compliance promotion, compliance verification, and enforcement activities and tools, and make changes as needed to ensure continuous improvement.

Reporting

1.16 **Public reporting**

We recommend that government report publicly the:

- results and trends of all mining compliance and enforcement activities
- effectiveness of compliance and enforcement activities in reducing risks and protecting the environment
- estimated liability and the security held for each mine

RESPONSE FROM GOVERNMENT

The Ministry of Energy and Mines (MEM) and Ministry of Environment (ENV) acknowledge receipt of the Auditor General's Report: An Audit of Compliance and Enforcement of the Mining Sector (Audit Report). Government wishes to thank the Auditor General for undertaking the audit and her staff for their efforts.

We note there are areas of agreement between the Audit Report's 16 sub-recommendations and the combined 26 recommendations by the Mount Polley Independent Expert Engineering Investigation and Review Panel (Expert Panel) and the regulatory investigation of the Chief Inspector of Mines. Government has accepted all of the recommendations put forward by the Expert Panel and Chief Inspector of Mines and implementation is well underway.

We accept the majority of the recommendations in the Audit Report; however, there are five points where we feel obliged to share our perspective for the public record.

APPROPRIATE STANDARDS

There is a lack of clarity in the Audit Report on what the operational effectiveness of the compliance and enforcement programs should be measured against. Often the measure or standard of expected performance stated in the Audit Report is unclear and/or unsupported by reference to an identified, established authority, such as the legislation and regulation that guides the actions of C&E staff in both ministries. This concern applies at various points in the Audit Report, with the Report's general reference to the Organisation for Economic Co-operation and Development or the International Network for Environmental Compliance and Enforcement rather than the laws of BC, the stated objectives of the Ministries, or Canadian industry standards.

As a specific example in relation to Mount Polley, the Province is criticized for adopting the Canadian Dam Association's (CDA) Dam Safety Guidelines which, the audit report states, "resulted in a tailings dam that was built below generally accepted standards for tailings dams." Not only do we disagree with this assertion of opinion, the CDA guidelines are in fact professionally recognized guidelines that are used throughout Canada by geotechnical engineers. Whether the guidelines could be improved is a separate question, one which the CDA is currently reviewing. Further, the Minister of Energy and Mines has struck a committee that is tasked with reviewing the Health, Safety and Reclamation Code for Mines in BC to determine whether and in what ways requirements may appropriately be improved or clarified.

RESPONSE FROM GOVERNMENT

PROFESSIONAL PUBLIC SERVANTS

The Audit Report suggests that professional public servants are unable to differentiate between mandate components or that they are unwilling to enforce existing regulations. The Audit Report contains no factual evidence that the current ministry structure results in any such risk, or in a mind-set of acquiescence on the part of staff involved. The Report lists a number of indicators of potential risk of regulatory capture. But there is nothing whatsoever in the Report to suggest any actual causal linkage. Specifically, there is no evidence that decisions were made at Mount Polley, in relation to the Elk Valley, or anywhere else to ease or enhance the position of the mining companies involved.

We do not accept that mere appearances are sufficient to warrant the act of removing compliance and enforcement from MEM. No one is more aware of the need to find the appropriate balance between promotion and regulation of mining in ministry decision-making than those who are asked to do so on a daily basis. It is the legislative framework in BC that drives compliance and enforcement activities not the organizational structure.

DISCLOSURE OF INFORMATION

The Audit Report implies that the Ministries failed in their duty to disclose information regarding decisions on mining operations.

In the instance of Mount Polley, there was no breach of any duty to disclose information to the public or to the Legislature. The Information and Privacy Commissioner recently ruled that there was no failure by MEM to meet the disclosure requirements of section 25 of the Freedom of *Information and Protection of Privacy Act* in relation to environmental risk at Mount Polley.

With respect to the permitting of mining operations in the Elk Valley, there was also no breach of any duty on the part of ENV and no failure on the part of Cabinet to disclose information to the public or to the Legislature. Before addressing that point, it may be of assistance for the government to set out the decision making process that did occur, the extensive consultations that were undertaken, and to clarify the legal authority under which decisions were made.

As the Audit Report notes, mining in this area has been going on for more than 100 years and over the past 20 years, ENV has been monitoring the health of the watershed with increasing concern. Emerging science began to indicate the potential effects of selenium and other water quality parameters in the Elk Valley watershed, including Fording River, Elk River and Lake Koocanusa. With ENV staff bringing these issues to the attention of the Minister of Environment,

RESPONSE FROM GOVERNMENT

the Minister used powers under the *Environmental Management Act* to issue an Order requiring the mining operator to immediately begin to stabilize and reverse the water quality trends.

The Order required the development of an Area Based Management Plan (ABMP) which meets specific environmental objectives and outcomes such as protection of aquatic ecosystems, protection of human health and protection of groundwater. The ABMP also sets out short, medium and long-term water quality targets. The ABMP lays out a schedule for the installation of nine active water treatment plants over the next 18 years. The long-term targets consider: 1) current contaminant concentrations, 2) current and emerging economically achievable treatment technologies, 3) sustained balance of environmental, economic and social costs and benefits, and 4) current and emerging science regarding the fate and effects of contaminants.

Substantial public and stakeholder consultations were undertaken during the development of the ABMP and after permits were granted, various news releases and media interviews by ministers set out for the general public the nature of government decisions. The ABMP was developed by a technical advisory committee with representatives from the mining operator, the local environmental group (Wildsight), the Province, Government of Canada, U.S. Government, the State of Montana, the Ktunaxa Nation, and an independent scientist from UBC. Parallel to the technical advisory committee work, the Province was engaged in a government-to-government process to ensure the Ktunaxa Nation's interests and concerns were addressed. The Ktunaxa Nation Council's public support for the ABMP and the subsequent Elk Valley permit is a reflection of the commitment of the Province, the Ktunaxa Nation and the mining operator to see water quality levels stabilize and improve.

In November 2014, the Minister of Environment approved the ABMP which became policy for the ministry statutory decision maker to consider when making permitting decisions in the Elk Valley. The comprehensive Valley permit, subsequently issued by the ministry statutory decision maker, authorizes water quality discharges and sets legal requirements for the mining company to install nine treatment plants and to implement widespread monitoring to ensure water quality trends are stabilizing and reversing. A tangible result of this unprecedented effort in problem solving and public and First Nations consultation is the recent announcement of the completion of the commissioning phase of the first treatment plant. The recognition of the ministry's efforts to effectively and responsibly address a historically generated water quality problem while balancing economic, social, cultural and environmental interests was not addressed in the Audit Report.

The Audit Report criticized Cabinet for approving the Line Creek Expansion Permit via an Order-in-Council (OIC) in 2013 on the grounds that the rationale for the decision was not publicly disclosed. Decisions, when they are issued in the form of OICs such as this one, are always published on the BC Laws website. Furthermore, section 137 of the *Environmental Management Act* specifically outlines what factors Cabinet may consider. These considerations extend to

factors such as social and economic needs and whether it is in the public interest to ensure a functioning industry so that longer term investments can continue to be made in areas such as research and development and water treatment technologies.

AUDIT SCOPE

The fourth point relates to audit planning decisions as to what was properly within or outside the audit scope.

For example, it is difficult for us to understand why, in a case study examining permitting in the Elk Valley in detail, the Audit Report failed to record the concerted efforts that ENV has undertaken in order to ensure these permits are complied with. After the Minister of Environment approved the ABMP in 2014, the ministry statutory decision maker approved a valley-wide permit for Teck Coal Limited that specified the regulatory requirements for reducing selenium levels. Permit requirements will bend down the curve of growth in selenium levels in Lake Koocanusa by requiring additional investment in water diversion and treatment facilities over the next two decades. The Audit Report does not comment on the extensive efforts by the ministry to ensure that Teck Coal Limited complies with these regulatory requirements. For instance, in 2014, ENV created a dedicated management position supported by two technical officers to oversee Teck Coal Limited. A compliance plan has been developed that specifies a schedule of inspection frequency and water sampling. The amount of resources and effort that has been focused on compliance of these five particular mines is significant and the ministry has no intention of reducing that attention.

We also wonder why, in examining whether compliance and enforcement activities of the mining sector are protecting the Province from significant environmental risk, the Audit Report did not consider the key role played by the Environmental Assessment Office (EAO) in upholding the *Environmental Assessment Act*. Many of the mines in British Columbia (new and expansions) have been subject to the Environmental Assessment process and received environmental assessment certificates with legally binding requirements. Permitting by MEM and ENV happens subsequent to that environmental review process. Additionally, the EAO has its own compliance and enforcement program, which includes oversight of mines and functions complementarily to MEM and ENV. The Auditor General recently reviewed EAO's progress in addressing the recommendations from the 2011 audit on the EAO's oversight of major projects. In that follow-up, the Auditor General acknowledged significant improvements in oversight of environmental assessments projects, including mines.

MOUNT POLLEY

The Audit Report contains the inference that MEM might have been able to, through proper exercise of their regulatory powers, act to prevent the dam failure at Mount Polley. The Audit opinion is contrary to the Expert Panel finding of cause and is not reflective of the regulatory regime in place at the time. Specifically:

The Panel found that inspections of the TSF would not have prevented failure and that the regulatory staff are well qualified to perform their responsibilities. The Panel found that the performance of the Regulator was as expected.

RESPONSE FROM GOVERNMENT

It is important to understand that mine design, at Mount Polley just as at mines around the world, is not static and evolves throughout the life of operation. This is appropriate engineering practice. Operating mines evolve their designs over time regularly, all with the approval of licensed engineers. Starting in 1995, there were nine design stages over the life of the Tailings Storage Facility (TSF) at Mount Polley. All stages, including the design stage in place at the time of the breach had been approved by the design engineer. Each stage of construction was certified by the Engineer of Record (EOR) in the as-built reports. MEM authorized permit amendments for each stage of the TSF. The failure of the TSF was not a compliance and enforcement issue.

It is also important for the reader to understand the difference in design, actions and recommendations for each of the three embankments: Perimeter Embankment, Main Embankment, and South Embankment. Specifically, the Audit Report seems to suggest that items identified by both the EOR and ministry staff at the Main Embankment can be translated, or are somehow related, to the failure of the Perimeter Embankment. Such inferences are not supported by facts or engineering and do not offer supporting evidence that the breach of the Perimeter Embankment was somehow preventable through compliance and enforcement actions.

The Ministry appreciates that the purpose and process of the audit may have been different than those of the Expert Panel and the regulatory investigation of the Chief Inspector of Mines. We are nonetheless concerned about the different findings on fundamental facts that have come out of these processes. The Expert Panel, which was empowered in its Terms of Reference to examine any matters it deemed necessary, including the "regulatory oversight by the Ministry of Energy and Mines and the Ministry of Environment" and "to comment on what actions could have been taken to prevent this failure and to identify practices or successes in other jurisdictions that could be considered for implementation in BC" concluded:

The Panel finds that the MEM Geotechnical Staff and the Contract Inspectors are well qualified to perform their responsibilities. The team is well organized and has clear targets and schedules for annual inspections. The Panel considers the technical qualifications of the MEM Geotechnical Staff as among the best that it has encountered among agencies with similar duties.

The Panel further concluded:

Additional inspections of the TSF would not have prevented the failure.

Similarly, the extensive investigation by the Chief Inspector of Mines, which considered over 100,000 pages of documents and hundreds of hours of interviews, did not find that the company breached its obligations under the *Mines Act*, the Health, Safety and Reclamation Code for Mines in British Columbia, its permit conditions or any orders to prosecute. This is the regulatory framework that governs the Ministry's compliance and enforcement actions. We of course await the results of the Ministry of Environment's investigation of potential breaches of its legislation.

RESPONSE FROM GOVERNMENT

The Audit Report states that "government has adopted an approach to reduce the regulatory burden on industry." The public relies on Qualified Professionals in many areas. Examples of qualified professionals include architects, accountants, lawyers, physicians, pharmacists and engineers. In each case, the qualified professionals are regulated by their respective governing body or association to ensure members meet their association's standards of conduct or code of ethics. If qualified professionals do not adhere to these standards or codes, then the associations are responsible for disciplinary actions. This is the system that holds professional engineers accountable across Canada. The OAG concern about over-reliance on qualified professionals is a criticism of professional bodies' ability to regulate their professions.

Furthermore, the Audit Report's assertion that there is over-reliance on qualified professionals is not substantiated in the context of mining. Reliance on engineers and other qualified professionals in the mining industry has been a fact of life in British Columbia for decades. The long standing model used in engineering throughout the world relies on professional engineers to prepare and seal designs; government then reviews these plans. Through legislation like the *Engineers and Geoscientists Act,* government has created technical bodies to formalize accountability and protect the public interest.

Just as the original design for the Mount Polley TSF was prepared and signed by a Professional Engineer in 1995 and then reviewed by government staff, this was the same for subsequent lifts. In fact, the Expert Panel found:

MEM geotechnical engineers addressed significant issues during the reviews and inspections of the Mount Polley TSF. They had insightful questions for the designers at many instances during their review of the design documents, as noted above. The EOR responded to these questions based on their observations and understanding of site conditions. The EOR is responsible for the overall performance of the structure as well as the interpretation of site conditions. The Regulator has to rely on the expertise and the professionalism of the EOR as the Regulator is not the designer.

Both the Expert Panel and the CIM investigation concluded that the fundamental cause of the Mount Polley failure was the lack of appropriate subsurface site characterization when the dam was designed and built. We respectfully point out that this was not a question of the number of ministry staff on the ground, the number of inspections performed, or an increase in professional reliance since.

In conducting the Mount Polley case study, the audit team – quite understandably – augmented their own knowledge of environmental principles, geotechnical engineering and regulatory law. They did so by consulting a panel of subject matter experts, comprising an environmental academic, environmental lawyer, engineer and a former employee. We understand this to be consistent with normal audit practice.

However, proceeding in that manner did not give the Ministries the opportunity to know who was on the panel, what data the panel may have considered on specific points, what opinions they might have offered, or to challenge the thinking of panel members with additional engineering evidence and/or competing legal or scholarly opinions.

RESPONSE FROM GOVERNMENT

Government wishes to thank the Auditor General for undertaking the audit and her staff for their efforts. In particular, we appreciate the extended processes by which the Audit Team allowed the Ministries to raise and discuss factual and legal concerns arising in connection with successive drafts of the Audit Report.

The Audit Team responded to many of our concerns, but points of disagreement remained which we believed could not be left unanswered. While we do not accept that the Ministries have been deficient in protecting the environment, or the recommendation to reorganize the compliance and enforcement programs within a separate agency, we do believe the 16 sub-recommendations provide meaningful and constructive guidance that will complement current initiatives already underway.

PART 1: RECOMMENDATIONS FOR GOVERNMENT

Recommendation by OAG	Ministry Response
RECOMMENDATION 1.0 *—**Overall:** We recommend that the Government of British Columbia create an integrated and independent compliance and enforcement unit for mining activities, with a mandate to ensure the protection of the environment. Given that the Ministry of Energy and Mines is at high risk of **regulatory capture**, primarily because MEM's mandate includes a responsibility to both promote and regulate mining, our expectation is that this new unit would not reside within this ministry.*	It is the legislative framework in BC that drives compliance and enforcement activities not the organizational structure. Many provincial governments across Canada have agencies and ministries with the role of promoting and regulating an industry. In the absence of evidence by the Auditor General that this has compromised the integrity of the ministry or its staff, Government does not support the need for a reorganization of the ministries, however we are prepared to further discuss this with the OAG. Government will establish a Mining C&E Board that will address the need for greater integration between the ministries, as well as with the Environmental Assessment Office.

RESPONSE FROM GOVERNMENT

PART 2: RECOMMENDATIONS FOR MINISTRY OF ENERGY AND MINES AND MINISTRY OF ENVIRONMENT	
Recommendation by OAG	Ministry Response
RECOMMENDATION 1.1 ***Strategic Planning***—*We recommend that government develop a strategic plan that would detail the activities of an integrated and coordinated regulatory approach, and the necessary capacity, tools, training and expertise required to achieve its goals and objectives.*	A Mining C&E Board will be established to oversee an integrated and coordinated regulatory approach to mining in the Province of B.C. The Board will be accountable to the Deputy Minister of Energy and Mines, the Deputy Minister of Environment and the Associate Deputy Minister of the Environmental Assessment Office. The Board will develop compliance and enforcement plans to map out proactive annual activities based on a risk-based approach. The board will also be responsible for furthering longer term strategic improvements in other areas such as: enhancing training; developing policies, procedures and tools; conducting evaluations; and expanding public reporting. MEM will appoint a new Deputy Chief Inspector of Mines for compliance and enforcement to oversee and implement improved C&E.
RECOMMENDATION 1.2 ***Permit Language***—*We recommend that government ensure both historical and current permit requirements are written with enforceable language.*	The ministries agree that permits must be written with measureable and enforceable requirements. Both ministries will develop policy to ensure enforceable and measurable requirements are used in all new and amended permits.
RECOMMENDATION 1.9 ***Incentives***—*We recommend that government create effective incentives to promote environmentally responsible behavior by industry.*	The ministries agree that it is useful to consider incentives as part of the compliance and enforcement regime governing mines and will continue to consider additional opportunities to recognize and reward good environmental performers. Furthermore, it is expected that expanded public reporting of compliance and enforcement activities will serve as a very effective incentive for promoting environmentally responsible behaviour.
RECOMMENDATION 1.10 ***Risk-Based Approach***— *We recommend that government develop a risk-based approach to compliance verification activities, where frequency of inspections are based on risks such as industry's non-compliance record, industry's financial state, and industry's activities (e.g., expansion), as well as risks related to seasonal variations.*	Compliance verification activities conducted by the ministries are founded on a risk-based approach; however, the ministries commit to review policies in this regard. The annual compliance and enforcement planning that will take place at the Mining C&E Board, established under recommendation 1.1, will also be risk-based to optimize the capacity and effectiveness of the ministries' collective compliance and enforcement resources.

RESPONSE FROM GOVERNMENT

PART 2: RECOMMENDATIONS FOR MINISTRY OF ENERGY AND MINES AND MINISTRY OF ENVIRONMENT	
Recommendation by OAG	Ministry Response
RECOMMENDATION 1.12 ***Qualified Professionals***—*We recommend that government establish policies and procedures for the use and oversight of qualified professionals (QP) across the natural resources sector. These policies and procedures should have the following:* ◆ *guidance for staff that outlines the specific nature and amount of oversight expected of a QP's work* ◆ *guidance for staff as to expected timeframe for review and response to QP reports* ◆ *updated guidance for staff for recognizing and responding to misconduct by a QP* ◆ *controls in place to ensure that there is no undue influence on the QPs by industry* ◆ *controls in place to ensure that recommendations by QPs are adhered to*	MEM's efforts are guided by the *Mines Act* and the Health, Safety and Reclamation Code for Mines in British Columbia. In particular, the Code Review currently underway is considering specific matters such as the need for a qualified individual designated as a mine dam safety manager to oversee all work associated with a tailings storage facility and will clarify the roles and responsibilities of the Engineer of Record at a mine. The Mining C&E Board, established under recommendation 1.1, will consider how MoE and MEM can strengthen the use and oversight of qualified professionals in the mining sector specifically. The Ministry of Forests, Lands and Natural Resource Operations has established a Qualified Persons in the Natural Resource Sector Framework. This framework guides the development and implementation of Qualified Persons policies and procedures specifically for the mining sector. The framework is based on the three essential components of guidance, competency and accountability and ensures the interests of government, resource users, qualified persons and other stakeholders are recognized and addressed.
RECOMMENDATION 1.14 ***Policies, Procedures and Tools***—*We recommend that government develop policies, procedures and enforcement tools for responding to non-compliances when industry does not meet government's specified timeline.*	The ministries agree on the importance of clear policies, procedures and tools to aid in their compliance and enforcement activities. The ministries will review these in light of the recommendations. The establishment of the Mining C&E Board, under recommendation 1.1, will serve to further inter-ministry collaboration and sharing of best practices. Government will also introduce amendments to the *Mines Act* to provide for Administrative Monetary Penalties in the spring 2016 legislative session.

RESPONSE FROM GOVERNMENT

PART 2: RECOMMENDATIONS FOR MINISTRY OF ENERGY AND MINES AND MINISTRY OF ENVIRONMENT	
Recommendation by OAG	Ministry Response
RECOMMENDATION 1.15 ***Evaluation and Adjustment***—*We recommend government regularly evaluate the effectiveness of its compliance promotion, compliance verification, and enforcement activities and tools, and make changes as needed to ensure continuous improvement.*	Annual compliance and enforcement planning and reporting will provide a means to evaluate the effectiveness of the program, to ensure ongoing improved targeting of areas of concern and recognition of strong performers. The ministries will address this recommendation through the establishment of a Mining C&E Board under recommendation 1.1.
RECOMMENDATION 1.16 ***Public Reporting***—*We recommend that government report publicly the:* ◆ *results and trends of all mining compliance and enforcement activities* ◆ *effectiveness of compliance and enforcement activities in reducing risks and protecting the environment* ◆ *estimated liability and the security held for each mine.*	The ministries support public reporting and have been making progress in this area. The Ministry of Environment has been reporting its enforcement actions for many years through published reports and an online searchable database. It reports all of its enforcement actions including orders, administrative sanctions, administrative monetary penalties, violation tickets and court prosecutions. The ministry will work with Ministry of Energy and Mines to explore including their enforcement actions in the reporting. In 2012, the Ministry of Environment published all of its permits for industrial and municipal facilities that discharge waste into the environment, including mines. This dataset provides the opportunity for citizens to access province-wide data on those facilities, including information on fees, locations and discharges. The Ministry of Energy and Mines published all dam safety inspections, emergency response plans and related documents online in 2015. The ministry will continue to publish further documents for all major mines in British Columbia. The ministries will report on trends and effectiveness of C&E in the mining sector.

RESPONSE FROM GOVERNMENT

PART 3: RECOMMENDATIONS FOR MINISTRY OF ENERGY AND MINES	
Recommendation by OAG	Ministry Response
RECOMMENDATION 1.3 ***Security—Adequate Coverage***—*We recommend that government safeguard taxpayers by ensuring the reclamation liability estimate is accurate and that the security held by government is sufficient to cover potential costs.*	As seen in the 2014 Chief Inspector's Annual Report, "In the past few years, the value of security deposits has increased to reflect more closely the true costs of reclamation. The total value of securities held by the Province has risen from $10 million in 1984 to more than $773 million by the end of 2014."
RECOMMENDATION 1.4 ***Security—Catastrophic Events***—*We recommend that government review its security mechanisms to ensure taxpayers are safeguarded from the costs of an environmental disaster.*	Environmental disasters, like the one seen as a result of the Mount Polley tailing facility breach, can result in damage both on and off a mine site. It is the responsibility of the mine operator to ensure sufficient environmental liability insurance is held to meet the risk of such disasters. The *Environmental Management Act* contains authority for spill response actions and cost recovery to require persons in possession or control of any polluting substance to prepare contingency plans and to implement those plans at their expense in the event of a spill. The Act also provides for the recovery of costs should action to respond to a spill be declared by the Minister. This Act is being amended to proactively require potential polluters to pay into a spill preparedness and response organization. These amendments are due for introduction to the Legislature this year.
RECOMMENDATION 1.8 ***Reclamation Guidance***—*We recommend that government develop clear and comprehensive reclamation guidance for industry.*	Internal work has begun on developing additional guidance materials on a range of reclamation aspects, including erosion and sediment control plans, closure management manuals, reclamation security, etc.
RECOMMENDATION 1.11 ***Systematic Compliance Verification***—*We recommend that government systematically monitor and record compliance with high-risk mine permit requirements.*	As with Recommendation 1.10 above, a risk-based approach to compliance and enforcement workforce planning will uncover poor performers for closer scrutiny.

RESPONSE FROM GOVERNMENT

PART 3: RECOMMENDATIONS FOR MINISTRY OF ENERGY AND MINES	
Recommendation by OAG	Ministry Response
RECOMMENDATION 1.13 ***Mine Design***—*We recommend that government adopt appropriate standards, review mine designs to ensure that they meet these standards, and ensure that mines, as constructed, reflect the approved design and standards.*	This recommendation is presented at the conclusion of the Audit Report section on the Mount Polley TSF breach. There had been nine design stages over the life of the TSF at Mount Polley Mine. All stages, including the design stage in place at the time of the breach had been prepared by the design engineer; a qualified professional. MEM reviewed and authorized permit amendments for each stage of the TSF. Each stage of construction was certified by the Engineer of Record in the as-built reports. The failure of the TSF was not an enforcement issue. Through legislation like the *Engineers and Geoscientists Act,* government has created technical bodies to formalize accountability and protect the public interest. As appropriate in their role, in response to the Expert Panel findings on Mount Polley the Association of Professional Engineers and Geoscientists BC is developing professional practice guidelines for dam site characterization assessments. Government is also undertaking a review of the Mining Code with labour, First Nations and industry representatives to determine how best to implement the expert panel findings.

RESPONSE FROM GOVERNMENT

PART 4: RECOMMENDATIONS FOR MINISTRY OF ENVIRONMENT	
Recommendation by OAG	Ministry Response
RECOMMENDATION 1.5 ***Environmental Management Act Waste Discharge Fees***—*We recommend that government review its fees under the Environmental Management Act and ensure that the fees are effective in reducing pollution at mine sites.*	The Ministry of Environment is committed to reviewing the fee structure for waste discharges under the *Environmental Management Act*. Work has already been initiated to assess current fees, as well as conduct a cross-jurisdictional scan of fees imposed by other provinces and territories.
RECOMMENDATION 1.6 ***Cost Recovery***—*We recommend that government adopt a cost recovery model for permitting and compliance verification activities that is consistent across all ministries in the natural resources sector.*	The Ministry of Environment recognizes that other natural resource sector ministries, including the Environmental Assessment Office, have begun imposing fees on industry for permitting and compliance verification activities. The ministry will be examining the imposition of fees for these activities. Effective April 1, 2015 permit fees were introduced under the *Mines Act* and the existing inspection fees were raised. This enabled a budget increase of approx. $9.3M to the Ministry of Energy and Mines in Budget 2016.
RECOMMENDATION 1.7 ***Decision Making—Use of section 137 of the Environmental Management Act***—*We recommend that government publically disclose its rationale for granting a permit under section 137 of the Environmental Management Act. Specifically, information should include how factors such as economic, environmental, and social attributes were considered in the determination of public interest.*	As provided for in Section 137 of the *Environmental Management Act*, Cabinet may consider factors that are in the public interest and beyond those that a ministry director may consider. Discussions underlying the approval of an OIC are a matter of Cabinet confidentiality. However, the results of Cabinet decisions, when they are issued in the form of OICs, are published on the BC Laws website.

BACKGROUND

MINING IN B.C.

MINING HAS BEEN a part of B.C.'s economy since the mid-1800s. Starting with coal mines on Vancouver Island and gold **placer mining** in the Cariboo, mining has expanded to all parts of the province.

Today, mining is a key driver of B.C.'s economy. Coal and metal mines are the largest revenue-generating commodities, and mining and related sectors employ more than 30,000 people. In 2013, the total value of production at B.C. mines was about $7 billion. Mineral exploration spending was $476 million in 2013 and $338 million in 2014. Currently in operation, are six coal mines, seven metal mines, more than 30 industrial mineral mines, and hundreds of quarries and aggregate pits.

B.C. is Canada's largest copper producer, largest exporter of metallurgical coal, and the only producer of molybdenum. Coal and metal mines are referred to as *major mines* and are the focus of this report (see Exhibit 1).

Mining is a temporary activity: it only lasts as long as the economically extractable resource (e.g. coal, copper) is available. This could be up to 30 years or more. Mining is also a volatile industry that relies on commodity prices, resulting in cycles of "boom and bust." Currently, B.C. mines are being affected by a sharp decline in commodity prices.

In addition to the 13 operating major mines, the province has about 160 others that are temporarily closed or permanently closed. Over one-third of these **closed mines** are still the responsibility of the mining companies and continue to have environmental obligations under their permits. Government's role, through continued monitoring and inspections, is to ensure that mine operators meet these obligations.

The remaining sites are generally older, smaller mines that predate 1969 – the year that government enacted legislation requiring mine operators to meet more stringent environmental standards. For these older mines, government could be left with the full cost of remediation if water quality issues were to develop at these mine sites.

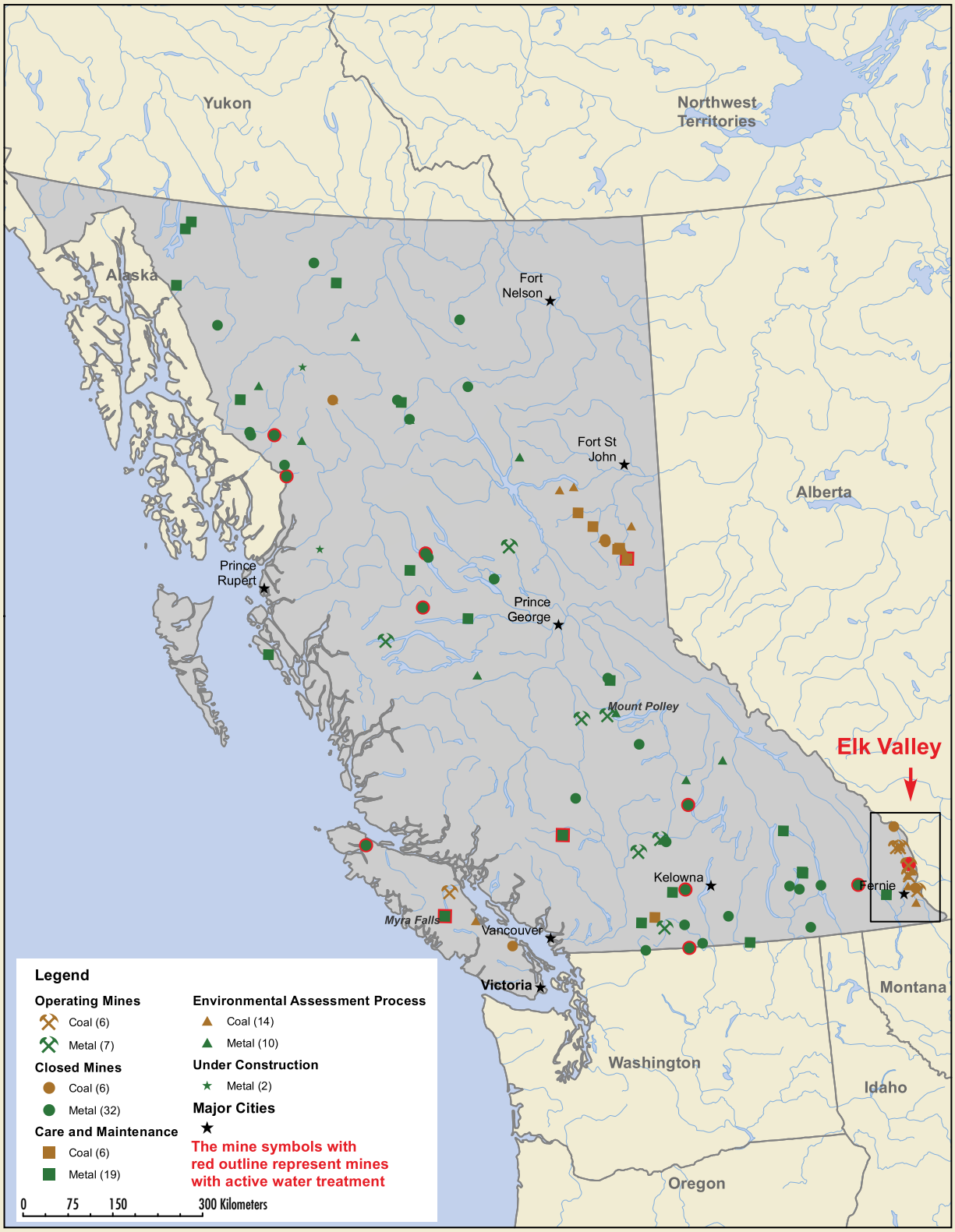
The Government of B.C. supports the continued growth of the mining industry, as indicated in the 2012 BC Jobs Plan. That plan included a target of having eight new major mines in operation by the end of 2015 and expanding nine existing mines. MEM reported in June 2015 that two new mines had started operation and seven had expanded. The ministry cited that low commodity prices during 2014/15 impacted the rate of mine expansions.



Click on the terms that are **bold** and **blue** to go to the definition in the glossary (**Appendix B**).

BACKGROUND

Exhibit 1: Major mines in British Columbia as of August 2015



Source: Created by GeoBC for the Office of the Auditor General of British Columbia

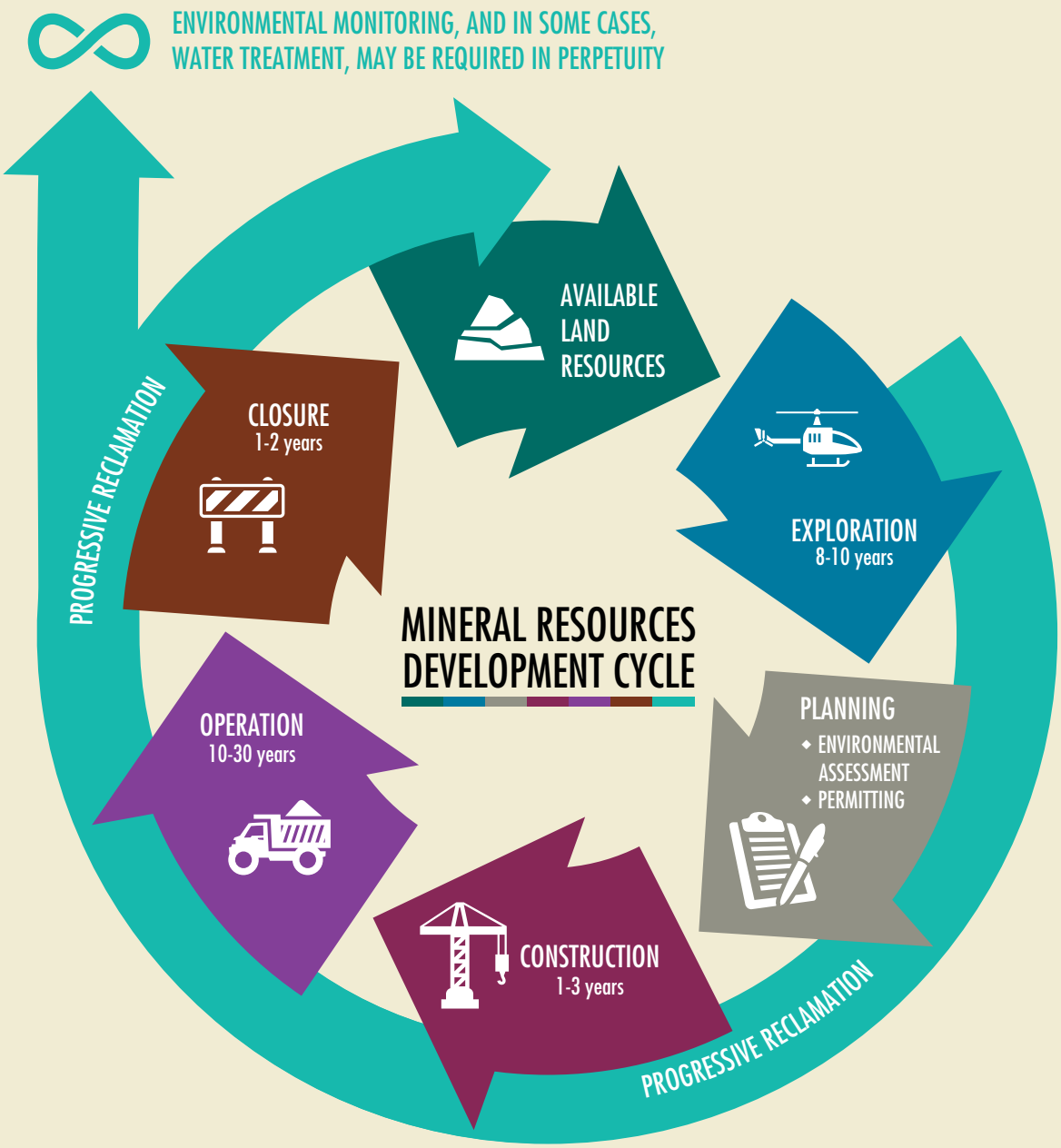
BACKGROUND

At the same time, government has a long-standing commitment to ensure that mining activities protect the province's environmental values. There is a tension between fulfilling this commitment and working to grow the economy and create jobs, but government has stated that it embraces this dynamic. Mining activities inherently involve several environmental risks such as erosion, loss of habitat, carbon emissions, dust and sedimentation. However, the greatest environmental risk from mining is water contamination.

Given the tension and these risks, a robust compliance and enforcement program is essential to ensure that the environment is protected.

BACKGROUND

Exhibit 2: The life cycle of a mine
MEM supports the concept of progressive reclamation – that is, pro-active and ongoing reclamation that begins early in mine development and continues over the life of the mine. In many cases, reclamation continues after closure for a defined period (until closure obligations are met by the mine operator). However, a mine that is generating, or has the potential to generate, contaminated water must be monitored indefinitely by the mine operator, and may require long-term or perpetual water treatment.



Source: Office of the Auditor General of British Columbia, adapted from Mineral Resources Education Program of BC

BACKGROUND

ENVIRONMENTAL CONCERNS WITH MAJOR MINES

The mining process

The life cycle of a mine begins with geoscience surveys and exploration to discover valuable coal or mineral deposits. Discovery leads to construction, operation and eventual closure when the extractable resource is depleted or no longer economically viable to extract (see Exhibit 2).

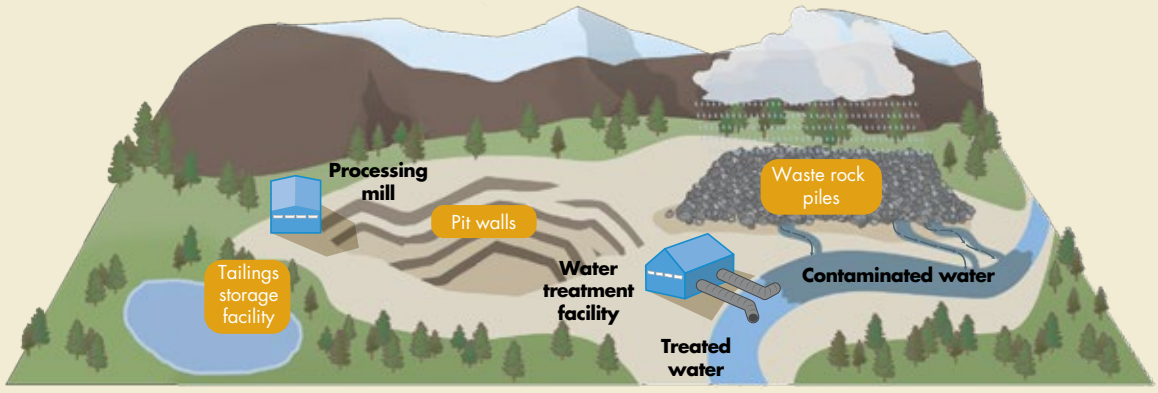
How the mining process can generate pollution

Ore is mineralized rock containing a valued metal (such as gold or copper) or other mineral substances (such as coal). In **open pit** mines, ore is extracted from an excavated open pit. Acid and metals, if contained in exposed pit walls, can leach into the surrounding environment. The extracted ore also includes large quantities of waste rock (material not containing the target mineral) that gets stored at the mine site. These waste rock piles, which may contain acid-generating sulphides, heavy metals and other contaminants, can become a source of **pollution**.

The ore that contains the valued metal or mineral is crushed and ground into fine particles the size of sand or silt. This ore is then processed using various chemicals and separating methods to extract the final desired metal or mineral. The by-products of this process are the **tailings**. Mine tailings often contain the same potentially toxic heavy metals and acid-forming minerals as waste rock, and may also contain the chemical agents used in processing, such as cyanide or sulphuric acid. Tailings are usually stored above ground in containment areas or ponds.

Both waste rock and tailings, if improperly secured, can leach out contaminants into surface water and groundwater, resulting in significant pollution and adverse effects (see Exhibit 3).

Exhibit 3: Potential sources of water pollution in an open pit mine: pit walls, waste rock piles and tailings



Source: Office of the Auditor General of British Columbia, adapted from the International Network for Acid Prevention's *Global Acid Rock Drainage Guide* and adapted from the *Elk Valley Water Quality Plan*.

BACKGROUND

Advances in mechanization and technology in the mining industry make it profitable for companies to mine more materials than ever before. The result, however, is that mine waste in some of Canada's larger mines has multiplied enormously – from 100s of tonnes per day in the early 1900s to 100,000–200,000 tonnes a day in some of Canada's larger mines now. This creates a greater potential source of pollution (see Exhibit 4).

In B.C., metal mines are typically low grade, meaning greater quantities of waste material are now being generated in order to extract target minerals (see Exhibit 5).

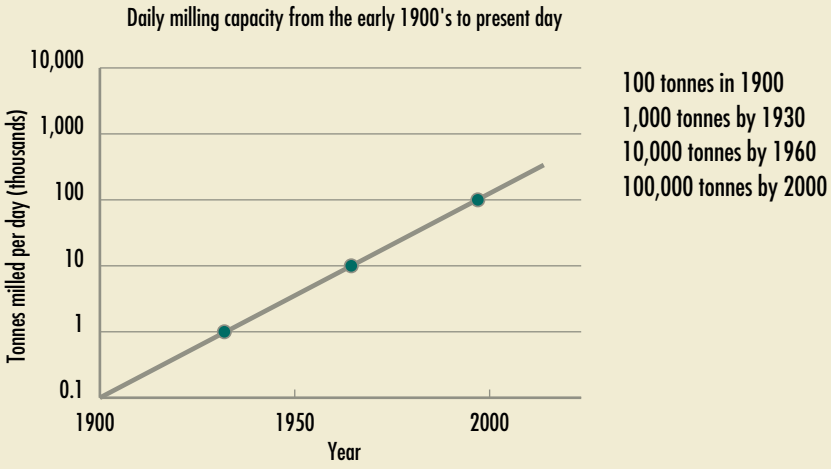
Exhibit 4: Growth of production in Canada's largest mines



Coal mining in the early 1900's
Source: www.brooklineconnection.com



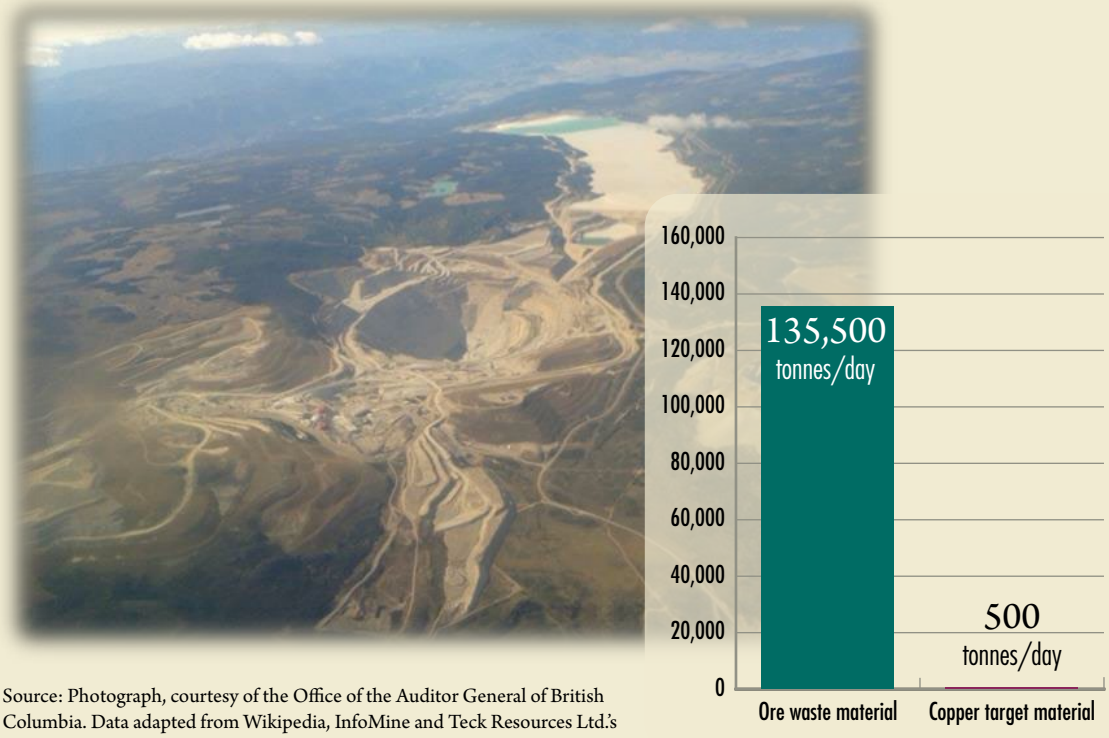
Present-day haul trucks have the capacity to move hundreds of tonnes of material.
Source: Stock image



Source: Office of the Auditor General of British Columbia, adapted from Robertson GeoConsultants Inc., *Mine Water Solutions in Extreme Environments*

BACKGROUND

Exhibit 5: Highland Valley copper mine's production



Source: Photograph, courtesy of the Office of the Auditor General of British Columbia. Data adapted from Wikipedia, InfoMine and Teck Resources Ltd.'s 2014 *Annual Report*

Water pollution and environmental impacts from mining

The most serious environmental issues facing the mining industry, government and the public is water contamination resulting from the chemical processes associated with **acid rock drainage** (ARD) and **heavy metal and non-metal leaching** (leaching).

ARD can occur when mineral deposits are excavated from an open pit or exposed in an **underground mine** and then react with air and water to produce acid (see Exhibit 6). While ARD is a natural process, the scale can be magnified as a result of mining activities. ARD has the potential to severely degrade water quality, kill aquatic life and make water virtually unusable.

Leaching can occur when minerals containing heavy metals and non-metals (such as arsenic, copper, cadmium, lead, zinc and selenium) in excavated rock or exposed mine walls come into contact with water and then seep from the rock into the environment. Metal and non-metal dissolving and transportation may be accelerated in the acidic conditions created by ARD.

BACKGROUND

Exhibit 6: Acid rock drainage on land and in water



Source: iStock (top) and Office of the Auditor General of British Columbia (bottom)

The contaminants that result from ARD and leaching can be carried from a mine site and deposited into streams, rivers, lakes and groundwater. The result can be a slow, but severe, degradation of water quality and subsequent damage to fish populations and aquatic life. In the case of a sudden tailings dam breach, the result can be immediate and cause catastrophic damage.

Within the U.S. and Canada, ARD and leaching have contaminated rivers, caused significant ecological damage, loss of aquatic life and resulted in multimillion-dollar clean-up costs for industry and government (see Exhibit 7).

Challenges in dealing with ARD and leaching

Planning and working to prevent ARD and leaching is an important part of avoiding environmental degradation and declining quality of aquatic habitat and drinking water. From a regulatory and environmental risk perspective, considerable emphasis in mine development is placed on preventing or mitigating ARD and leaching. There are various provincial and national committees focused on conducting research and sharing good practices between government and industry.

In recent years, technological advances and improvements to mining practices have helped in this regard, though significant environmental risks remain. ARD and leaching are dynamic and complex chemical processes that are challenging to predict. The actual environmental impact varies, depending on factors such as the size and location of the mine and the characteristics of the surrounding environment. Furthermore, the rates and timing of ARD and leaching onset vary in response to a wide range of site-specific mining, geological and environmental factors. For example, at some mine sites, onset is instantaneous; at others, it has taken anywhere from 10 to 20 years.

BACKGROUND

Exhibit 7: The Faro Mine, Yukon



The Faro Mine, located in south central Yukon, is one of the largest and most complex contaminated sites in Canada. It was an open-pit lead-zinc mine from 1969 until it went into receivership in 1998 and ultimately closed. The site covers approximately 2,500 hectares and includes nearly 400 million tonnes of tailings and waste rock. These materials contain high levels of heavy metals that could leach into the environment in the absence of remediation. Yukon taxpayers will pay an estimated $700 million for the clean up of this site.

Source of photograph: Aboriginal Affairs and Northern Development Canada

Once initiated, these processes can persist for hundreds or even thousands of years (see Exhibit 8).

Mine companies can mitigate the effects of ARD and leaching, but there is no walk-away solution. A mine that is generating, or has the potential to generate, contaminated water must be monitored indefinitely, and may require long-term or perpetual water treatment.

A common practice in B.C. to prevent ARD and reduce leaching is to store the acid-generating rock under water in tailings ponds to minimize the oxidation process. These ponds must remain permanently flooded. There are other mitigation options, such as surface covers, but MEM's ARD and leaching guidelines state that these options are less reliable than underwater storage. Where other strategies are unsuccessful, drainage collection and chemical treatment may be the only feasible means of preventing impacts. MEM also states in these guidelines that water treatment should generally be the mitigation strategy of last resort.

In practice, however, water treatment is not unusual in B.C., and government does approve mines that require water treatment from the outset — 14 major mines currently have water treatment facilities. MEM has

BACKGROUND

ranked 45 additional mines as having moderate to high potential of ARD and/or leaching, and has estimated that 12 of these mines will require perpetual water treatment.

While water treatment is a common practice in B.C. and other jurisdictions, some areas – the Northwest Territories, Manitoba and Wisconsin – do not allow mining operations that require long-term water treatment. This is due to the increased risk that taxpayers will ultimately be left with the cost of remediation.

These water treatment plants (see Exhibit 9) must be monitored by industry and government, maintained and periodically replaced, in perpetuity. This assumes that mining companies are willing and able to take on these costs indefinitely – a risky assumption given the boom and bust nature of mining and the reality that companies do not exist forever.

If industry is unable to maintain and replace these facilities or fulfill the environmental obligations in their permit, there is a risk that the taxpayer will have to bear these costs. In B.C., to reduce the possibility of taxpayers being left with the financial burden of these facilities and environmental **reclamation** costs of mine sites, mining companies must provide a **financial security deposit**. This deposit is designed to ensure, with "reasonable assurance" (as decided by the Chief Inspector of MEM), that taxpayers will not have to contribute to reclamation costs if a company defaults on its reclamation obligations. This includes any ongoing requirements for management and monitoring to achieve environmental protection.

Exhibit 8: Roman era mine in Spain dating back 2,000 years, but still producing acidic wastewater.



Source: The International Network for Acid Prevention's Global Acid Rock Drainage Guide

BACKGROUND

GOVERNMENT'S ROLE AS AN ENVIRONMENTAL PROTECTION REGULATOR

Under existing B.C. legislation and policies, mining companies are fully responsible for environmental protection and reclamation at their mine sites. The companies must demonstrate that their plans for the development, operation and closure phases of the mines will be effective. It is government's role to ensure that the activities undertaken by the mine operators are protecting the environment.

Legislation and regulations under several agencies apply to mining in B.C. For this audit, however, we focused on those that are the responsibility of MEM and MoE because these two ministries:

- are the primary permitting agencies for major mine operations, and
- have environmental protection mandates and associated compliance and enforcement responsibilities under provincial legislation.

While their mandates overlap somewhat, there are also key differences.

MEM's responsibilities apply generally *within the mine site*. The Chief Inspector of Mines, appointed by the Minister of Energy and Mines, administers the *Mines Act* and the Health, Safety and Reclamation Code for Mines in British Columbia to ensure the protection and reclamation of the land and watercourses affected by the mine. MEM grants a permit under the *Mines Act* to ensure mines are designed, built, operated and reclaimed to an acceptable standard. MEM collects a financial security deposit from mining companies to help ensure that reclamation obligations are kept.

MoE's responsibilities are generally defined as *extending beyond the borders of the mine site*. MoE regulates, through the granting of a permit under the *Environmental Management Act*, the quantity and quality of any waste discharges from metal and coal mines to ensure the protection of the environment.

Exhibit 9: The water treatment facility at Equity Silver Mine in central B.C.



Source: Office of the Auditor General of British Columbia

This mine operated from 1980 to 1994, and did not include a plan for water treatment, as ARD was not predicted to become an issue. However, ARD did occur and the costs to treat it have continued to grow, even though the mine is closed. Costs include $8 million to build the new water treatment facility shown above, and increasing lime costs to neutralize the acid. The mining company has borne these costs. A security deposit is currently held by MEM of $62 million which provides a safety net for taxpayers.

AUDIT OBJECTIVE AND CONCLUSION

WE CONDUCTED THIS audit to determine whether the regulatory compliance and enforcement activities of the Ministry of Energy and Mines and the Ministry of Environment pertaining to the mining sector are protecting the province from significant environmental risks.

We expected the compliance and enforcement program of the two ministries to have the seven key elements – defined by good practice – that would make such a program effective (shown below). We also expected that MEM and MoE would be working together to achieve their combined objective of protecting the environment. (For more details on the audit expectations and scope, see Appendix A).

We concluded that MEM and MoE's compliance and enforcement activities of the mining sector are inadequate to protect the province from significant environmental risks.

The following two sections of the report address our key audit findings for each ministry. The first section pertains to MEM and the second section to MoE.

Seven key elements of a comprehensive compliance and enforcement program



Source: Office of the Auditor General of British Columbia, adapted from the Organisation for Economic Co-Operation and Development's *Ensuring Environmental Compliance: Trends and Good Practices* and MOE's *Compliance Management Framework*

PART 1: MINISTRY OF ENERGY AND MINES

MEM CONCLUSION

We concluded that the Ministry of Energy and Mines' compliance and enforcement activities of the mining sector are inadequate to protect the province from significant environmental risks.

SUMMARY OF KEY FINDINGS

MEM's compliance and enforcement program is limited. As a result, the ministry is deficient in carrying out most of the expected regulatory activities, such as creating guidance documents, undertaking inspections, monitoring data provided by industry, and enforcing non-compliance. The ministry lacks the resources, training and tools necessary for compliance and enforcement. Furthermore, MEM does not coordinate its compliance and enforcement activities with those of MoE. MEM has not publicly reported on the effectiveness of its regulatory oversight. MEM has estimated that its financial security deposits for major mines are under-secured by more than $1.2 billion, yet the ministry has not disclosed this to the public or to legislators, or communicated the potential risk this poses.

MEM'S ROLES AND RESPONSIBILITIES

MEM's service plan has two goals:

- Goal 1: Globally competitive energy and mining sectors that create jobs and grow the economy
- Goal 2: Safe, environmentally and socially responsible energy and mineral resource development and use

To achieve these goals, MEM has two main regulatory tools: the *Mines Act*, which governs all activities that occur on mine sites; and the Health, Safety and Reclamation Code (Code) for Mines in British Columbia, which regulates all mining activities. The purpose of the *Mines Act* and the Code is to:

- Protect the health and safety of workers and public from mining activities.
- Protect and reclaim the land and watercourses affected by mining.
- Support and monitor the efficient development of the Crown's mineral and coal resources, while managing environmental impacts.
- Facilitate successful reclamation (see sidebar) and closure of mine operations.
- Regulate environmental and reclamation liabilities at mines through permitting and bonding to ensure that public funds will not be required to pay the costs of mine clean up.

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Health, Safety and Permitting Branch

Within MEM's Health, Safety and Permitting Branch is the permitting group. Unlike MoE, staff responsibilities within this group include both permitting and compliance and enforcement. There are two sections within this group: geotechnical and reclamation.

The geotechnical section is responsible for many activities, including:

- technical review of proposed mining projects
- geotechnical review of incidents and responding to mine inquiries
- geotechnical advice and policy development
- inspections that focus on a range of activities, including the performance of tailings dams, waste rock dumps, open pit slopes and underground openings

The reclamation section is responsible for many activities, including:

- technical review of proposed mining projects
- conducting ARD and leaching (water quality) assessments
- review of various environmental plans and reports
- administering reclamation security deposits on behalf of the province
- inspections of mine reclamation activity

As of July 2015, the permitting group consisted of nine staff, including two geotechnical engineers, two reclamation scientists, four environmental geoscientists specializing in geochemistry and water quality, plus the Deputy Chief Inspector of Mines.

WHAT IS RECLAMATION?

Mining companies are required to reclaim all lands disturbed by mining. While MEM has not defined what it means to *reclaim all lands*, MEM has established broad reclamation standards within the Health, Safety and Reclamation Code for revegetation, growth media, metal uptake, landforms, watercourses, water quality, disposal of chemicals and reagents, and monitoring and post-closure land use.

The Act and the Code require that mine or mineral exploration operators place an adequate financial security in trust with the province before receiving their permit to operate. This security is returned only after reclamation is completed to a level deemed satisfactory by the Chief Inspector. It ensures that the costs of reclamation will not be borne by taxpayers if a mining company defaults on its obligations. Companies continually reclaim land throughout the life of a mine in order to reduce their reclamation liability at closure.

MEM must collect sufficient security for mines that require long-term or perpetual management, which includes monitoring and maintenance of water treatment facilities and waste rock dumps.

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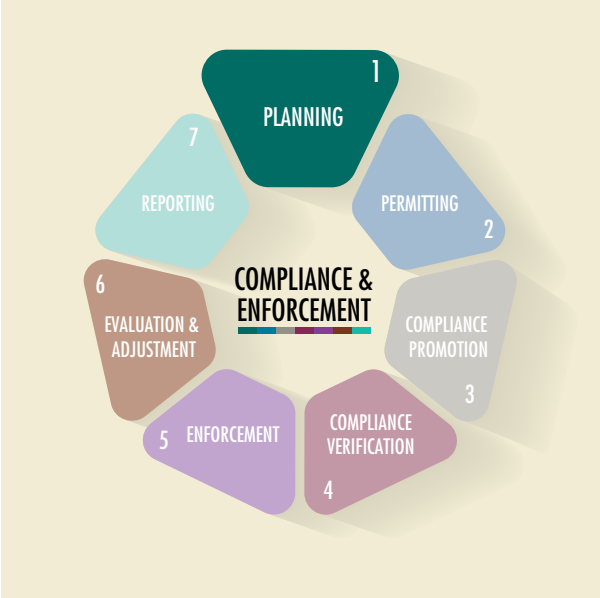
OUR EXPECTATIONS

We expected MEM to have a strategic plan that would detail the activities of the ministry's regulatory approach, including how MEM works with the Ministry of Environment (MoE). This plan would demonstrate how these activities intend to achieve MEM's objective of ensuring the protection of the environment; and, it would include all the elements – defined by good practice – that are critical to ensuring compliance (see page 28). Such practices include:

- setting regulatory requirements that are enforceable
- promoting compliance (to achieve high rates of voluntary regulatory compliance)
- verifying compliance (to ensure that industry is meeting government's regulatory requirements)
- enforcing regulatory requirements to compel the mining industry to swiftly return to compliance.

As well, we expected MEM to be ensuring continuous improvement of its compliance and enforcement program through evaluation and adjustment, and to be reporting out to the Legislature and the public on the results of their activities.

DETAILED KEY FINDINGS



1. Planning

We expected MEM to have an overall compliance and enforcement program underpinned by a strategic plan. This plan would set goals, objectives and performance indicators; in addition, it would indicate how MEM was working with MoE to achieve the objective of protecting the environment. We also expected MEM's strategic plan to be supported by the resources, training, expertise and tools needed to make an effective compliance and enforcement program.

We found, however, that MEM lacks strategic direction, goals, objectives and performance indicators to provide a framework for an effective compliance and enforcement program that ensures the protection of the environment.

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MEM has not focused on developing a compliance and enforcement program. Most of MEM's efforts are devoted to supporting the development of mining through processing permits for new and existing mines. This emphasis reflects MEM's mandate to promote the development of mining in B.C. However, we found that this emphasis on mining promotion combined with a weak compliance and enforcement program creates the risk of regulatory capture for the ministry (see sidebar).

We found that MEM exhibits most of these signs which can give rise to a reasonable perception of, and increase the actual risk of, regulatory capture.

REGULATORY CAPTURE

Regulatory capture occurs when the regulator, created to act in the public interest, instead serves the interests of industry.

Possible signs of regulatory capture can include:

- The regulator is located within the agency responsible for promoting the economic interests of the industry.
- In agency publications, environmental protection is merely one goal alongside others such as economic development.
- The regulator has a low level of prosecution activity.
- The legislation applying to the regulator gives the regulator wide discretion to act.
- The regulator's budget and resources are not comparable with those in the industry.
- The regulator shows a marked preference for giving informal recommendations and advice, which are not properly recorded.
- There is a high shift of enforcement officers from the agency to the industry, where they are able to earn significantly more than they did working as enforcement officers.
- Regulatory work often takes place in isolated regional communities, and there is frequent social collaboration between industry and the regulator.

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OVERALL RECOMMENDATION

WE RECOMMEND THAT THE GOVERNMENT OF BRITISH COLUMBIA: create an integrated and independent compliance and enforcement unit for mining activities, with a mandate to ensure the protection of the environment.

Given that the Ministry of Energy and Mines (MEM) is at risk of **regulatory capture**, primarily because MEM's mandate includes a responsibility to both promote and regulate mining, our expectation is that this new unit would not reside within this ministry.

Coordination with MoE

In 2009, the provincial government introduced a policy for a coordinated and integrated approach to natural resource management in the mineral exploration and mining sectors of B.C. Because both MEM and MoE have an overlapping mandate of protecting the environment, a protocol agreement between the ministries was created in 2009 and updated in 2014. It states, "In the interests of efficiency, efforts will be made to coordinate through the inspector of mines, inspection and monitoring activities relating to tailings impoundments."

We therefore expected the ministries to be coordinating their compliance and enforcement planning work and activities. Instead, however, we found that MEM's inspection planning is not coordinated with that of MoE, nor does MEM regularly advise MoE of non-compliances, and subsequent enforcement actions that it has taken. And although the two ministries have developed a "Memorandum of Understanding for the Environmental Management of Mining Projects," this document has been in draft form since 2012.

This lack of coordination may reduce the effectiveness and efficiency of MEM's compliance and enforcement actions, and creates a risk that environmental impacts are not being addressed.

Resources, expertise, training and tools

To do their work effectively, regulatory authorities need access to the physical, technical and financial resources they require to meet their mandate and scope of work. Management should therefore aim to attract and retain qualified and experienced program staff by offering reasonable remuneration and professional development opportunities. As well, management should ensure that staff have the necessary tools to do their work effectively.

Resources

We expected MEM to have determined the resources it needs to undertake an effective compliance and enforcement program. We found this was not the case. MEM had not completed comprehensive analyses to identify its required resources.

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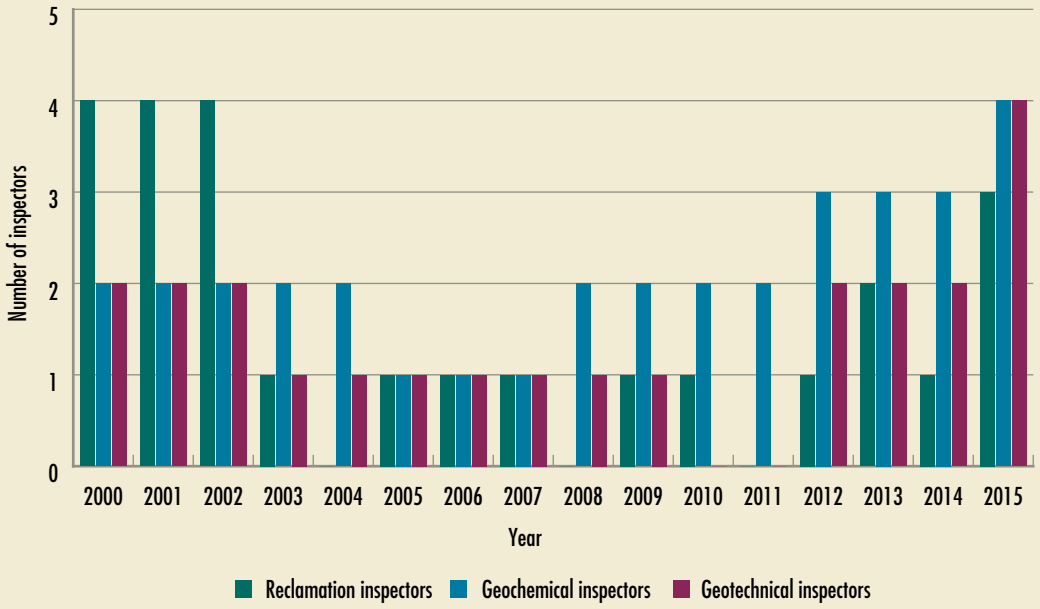
Exhibit 10: The number of inspectors in the Ministry of Energy and Mines' permitting group, 2000–2015



Source: Office of the Auditor General of British Columbia, adapted from MEM data

In the early 2000s, MEM dramatically reduced its number of inspectors,[2] by 50% – from nearly 80 in 2001 to about 40 in 2006. Specifically, in the permitting group, staffing levels dropped from eight full-time employees in 2001 to a low of two in 2011. By the end of 2015, there were 11 inspection staff in the permitting group (see Exhibit 10). The geotechnical manager position was vacant for over three years until being filled in 2011. As of Spring 2015, the position was again vacant (although, MEM had temporarily placed a senior geotechnical staff member in an acting manager position).

Throughout these years of declining full-time staff at MEM, the number and complexity of permit applications increased substantially. MEM used contractors to assist with workloads, which required significant oversight to ensure consistency of approach between projects, and consistency with provincial policy. The demand on staff time through this approach resulted in increased stress and workload.

From 2011 to 2015, MEM did not receive adequate funding for its programs and relied on **contingency funding** to supplement its budget. In 2015, MEM received a substantial increase to its budget to create a Major Mines Permitting Office and to create additional capacity.

Click on the terms that are **bold** and **blue** to go to the definition in the glossary (**Appendix B**).

[2] As stated in MEM's *Annual Chief Inspector Report* (2006), this includes Health and Safety Inspectors, in addition to specialist inspectors, such as Electrical, Mechanical, Geotechnical, Reclamation, Ergonomic and Occupational Health.

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Expertise and training

Mining is a complex and constantly changing industry that requires knowledge and expertise in many technical disciplines. We expected all MEM staff to have the necessary qualifications and experience to carry out inspections and enforcement and to review industry's self-reporting data. We found that staff in MEM's permitting group during the period of 2012–2014 were qualified for their positions and did have the required technical expertise. Nevertheless, we also noted that MEM has struggled to fill vacant positions and to retain individuals with experience in mining – a challenge the ministry has attributed to the more competitive salaries offered by industry.

We also found MEM's training in compliance and enforcement was inadequate in that the ministry does not have a formal inspector training program. Budget constraints have created limited opportunities for training in this area.

Tools

We expected MEM inspectors to have necessary and appropriate tools, such as data tracking systems, and policy and guidance, to perform their compliance and enforcement roles. The ministry's data system to track compliance and enforcement activities has been in place since 2000, but we found it was incomplete, cumbersome and does not link to other natural resource sector systems.

As well, tracking of permit requirements is difficult, because MEM's does not incorporate amendments into the overall permit, and instead, creates an addendum to the original permit. This results in a stack of documents that together make up the mine permit. The eight mines in our audit sample each had between 6 and 80 amendment documents. This practice can make it difficult to understand the permit requirements in detail, especially when the amendments can span several decades.

We also found that MEM has provided staff with little policy and guidance about its overall approach to compliance and enforcement. The ministry's inspection procedures are broad and include vague statements without clear guidance for staff or contractors. For example: "Reclamation inspectors should ***satisfy themselves*** that the company is fulfilling the requirements of their reclamation plan;" and, "closed mines should be inspected ***from time to time*** as practical."

RECOMMENDATION 1.1

Strategic planning—*We recommend that government develop a strategic plan that would detail the activities of an integrated and coordinated regulatory approach, and the necessary capacity, tools, training and expertise required to achieve its goals and objectives.*

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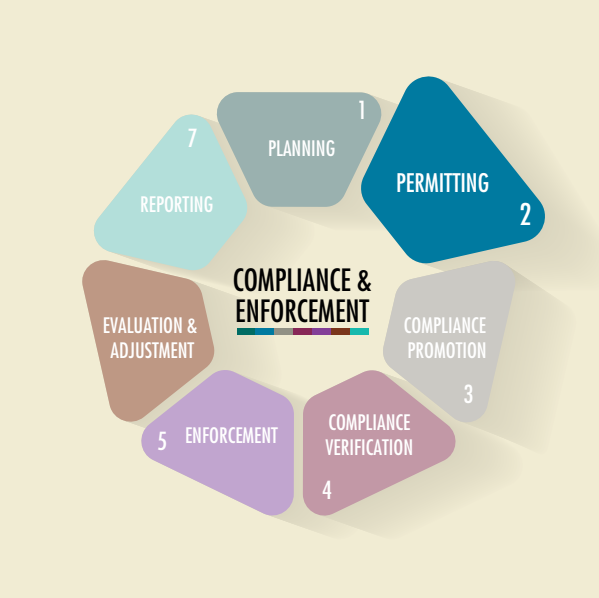


2. Permitting

Most of MEM's efforts are devoted to supporting mine development through processing permits for new and existing mines in the province. The ministry has stated that its focus on permitting plays a crucial role in preventing and reducing environmental risk. We therefore expected MEM to ensure permits are consistently written with enforceable language.

We also expected that permits would help to ensure that taxpayers would be safeguarded from having to pay costs associated with environmental impacts.

Enforceability

We selected a sample of MEM's mine permits and reviewed the wording of the requirements. We expected to find consistent use of regulatory language and measureable criteria, such as thresholds and timing. However, for all of the permits we reviewed, we found examples of vague phrasing and inconsistent use of regulatory language that would make permit requirements difficult to implement, measure and enforce.

For some permit requirements, discretion is left to the Chief Inspector of Mines to assess the mine's performance, such as: "All drainage collection and treatment facilities shall be operated and maintained for as long as is necessary to achieve environmental protection requirements, as required by the Chief Inspector." There is no clear guidance for how the Chief Inspector makes (or delegates) decisions, nor are the decisions clearly documented. This lack of transparency may lead to inconsistencies in the enforcement of permits.

We also found that MEM does not regularly evaluate or review permits to identify areas that might create barriers to enforcement. This lack of review is concerning, especially for permits that are for older mines that may not have been designed to adequate environmental standards.

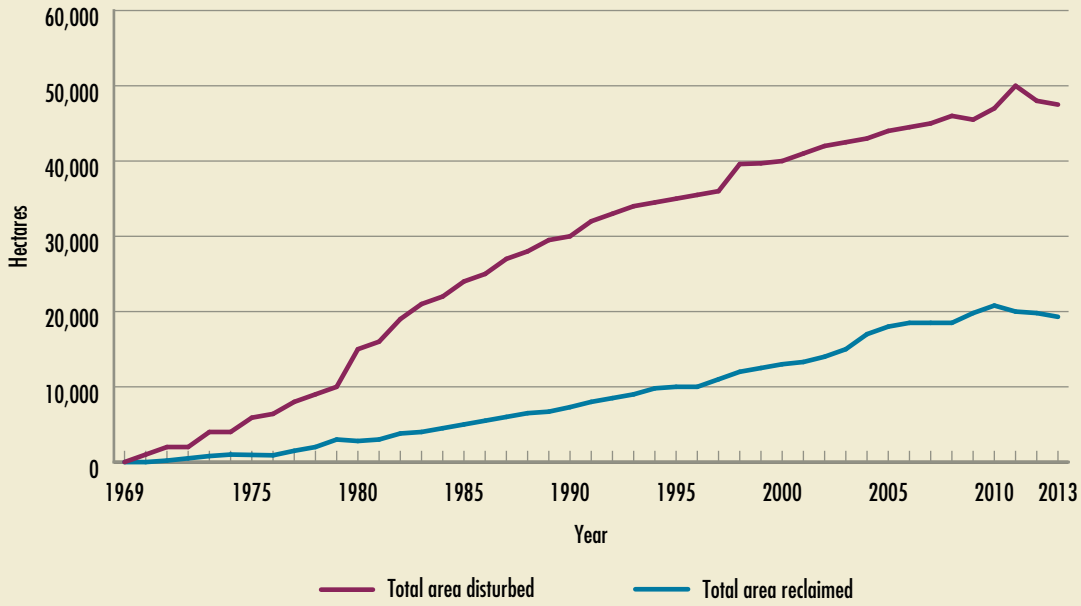
RECOMMENDATION 1.2

Permit language—*We recommend that government ensure both historical and current permit requirements are written with enforceable language.*

Safeguarding taxpayers

The polluter-pays principle states that the party responsible for environmental damage should bear the associated costs of the clean up. Consistent with this principle, MEM's policies aim to provide assurance

Exhibit 11: Area disturbed and area reclaimed (hectares) by metal and coal mines in B.C., 1969–2013



Source: Office of the Auditor General of British Columbia, adapted from MEM data

that certain costs will be borne by the mining company, and not the public, through the collection of a financial security deposit - a condition of a *Mines Act* permit. This security is returned only after reclamation is completed to a level deemed satisfactory by the Chief Inspector of Mines.

The security is designed to ensure that the company returns land, watercourses and cultural heritage resources to a safe and environmentally sound state after operations have ended. It is also intended to ensure that the taxpayers will not have to contribute to reclamation costs and any potential on-going monitoring costs if a company defaults on its permit obligations.

As shown in Exhibit 11, the total amount of land disturbed by mining in B.C. has been steadily growing over the past 50 years. Some of these areas will be reclaimed, but there are areas that can never be reclaimed, such as some pit mine walls and pit lakes.

The amount of the security required for each mine (including any later amendments) is set in the ministry's mine permit. Although MoE also has the power, under the *Environmental Management Act*, to set its own requirement for security, it usually relies on MEM to collect the entire security for each mine.

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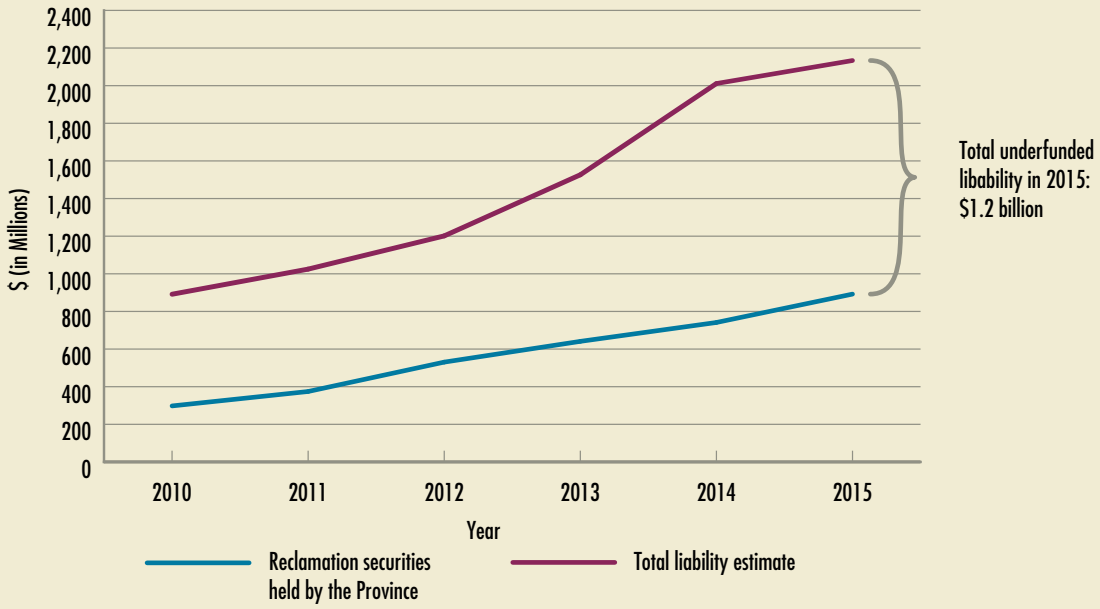
Exhibit 12: The total reclamation security deposit held by the Province compared to the total liability estimated, 2010–2015



Source: Office of the Auditor General of British Columbia, adapted from MEM data

We found that MEM could not provide evidence that government is holding an adequate amount of security to cover the reclamation costs, including any ongoing management and monitoring to achieve environmental protection. MEM has estimated the total liability (costs of outstanding reclamation) for all mines at more than $2.1 billion, yet MEM has stated that it is holding less than half that amount ($0.9 billion) in total security (see Exhibit 12).

We found that $730 million of the total under-funded liability ($1.2 billion) is for mines that will require water treatment. This is contrary to MEM's policy requiring full security on mines that require long-term water treatment.

The consequence of not collecting enough security from mining companies is that the taxpayer may be left to cover the costs, if the reclamation costs exceed the mining company's ability to pay. The Britannia Mine is an example of what can happen when the Province is left to pay remediation costs that include water treatment. In this case, taxpayers are estimated to have paid $46 million in order for the site to be remediated, including installing a water treatment plant that has an operating cost of over $3 million/year. The plant is expected to operate in perpetuity (see Exhibit 13).

We also found that the calculation of the liability may not represent the actual risk. Specifically:

- there is uncertainty with predicting and calculating the long-term costs for perpetual water treatment.
- MEM provides limited oversight in terms of confirming the accuracy of the liability estimates that are provided by the mining company.

We found that not all mining companies reported annually their liability estimates, updated reclamation costs or an update on the total area they had reclaimed. MEM staff review these reports, but provide only limited scrutiny. The ministry does not have a designated costing specialist to assess the accuracy of the values provided by industry and the sufficiency of the security deposit.

RECOMMENDATION 1.3

Security—adequate coverage—*We recommend that government safeguard taxpayers by ensuring the reclamation liability estimate is accurate and that the security held by government is sufficient to cover potential costs.*

Exhibit 13: The Britannia Mine



Source: Office of the Auditor General of British Columbia

This closed copper mine, located 50 kilometres north of Vancouver, operated from the early 1900s to 1974. As a result of the mining activity, the surface and groundwater flowing from the mine site became acidic; and every day, for over 70 years, the mine released about 600 kilograms of metals into Howe Sound. This made the mine one of the largest sources of metal pollution, and one of the most contaminated areas, in North America.

In the mid-1990s, the Government of British Columbia pursued the former mine owners to pay for the costs of remediating the mine site. The province accepted a $30 million settlement that absolved the owners from any future liability. However, this settlement covered only a small portion of the $76 million Britannia Mine Remediation Project.

A water treatment plant constructed in 2005 has resulted in plant and animal life returning to Howe Sound. The annual operating cost of over $3 million will be borne by taxpayers in perpetuity.

Moreover, if an environmental disaster occurred and industry was unable to pay for the clean-up, MEM has no funding mechanism to cover the costs of taking action. Western Australia recently adopted a mandatory Mining Rehabilitation Fund that covers the rehabilitations of existing sites. The interest earned on the monies (paid by industry) is used to rehabilitate historical or abandoned sites. Such interest could, perhaps, also be used to offset the cost of environmental emergencies where a company does not have the ability to pay.

RECOMMENDATION 1.4

Security— catastrophic events—*We recommend that government review its security mechanisms to ensure taxpayers are safeguarded from the costs of an environmental disaster.*

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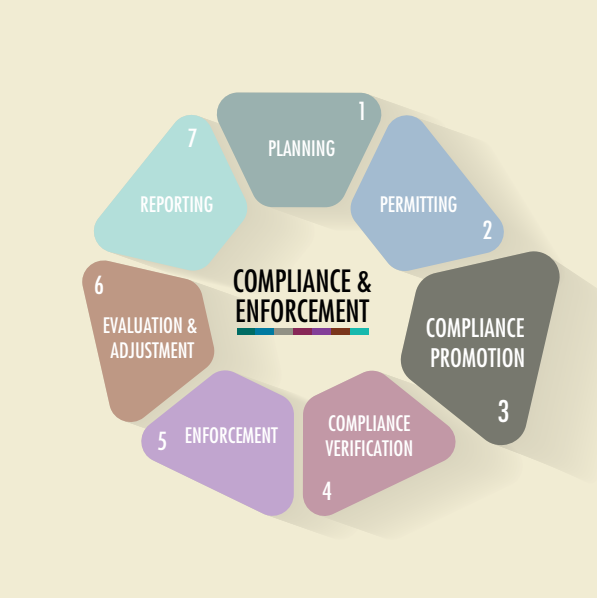

3. Compliance Promotion

Compliance promotion refers to any activity that educates and increases awareness about regulations, or that motivates or encourages voluntary changes in behaviour to comply with regulatory requirements.

It is a preventative strategy that includes both compliance assistance and compliance incentive programs.

Given the reduction in government resources, most countries recognize the growing importance of compliance promotion. We therefore expected MEM to have established an effective promotion program incorporating compliance assistance and compliance incentives.

Compliance assistance

We found that MEM organizes and actively participates in provincial and national committees that are focused on conducting research and sharing good practices with government and industry. While the ministry has created documents for industry to guide geotechnical and acid rock drainage/metal leaching work at mines, it has not established guidance for reclamation plans and activities. Guidance could provide more specific expectations to help industry meet the broad standards in the Health, Safety and Reclamation Code for Mines in British Columbia. It could also help government confirm whether industry is meeting the standards.

RECOMMENDATION 1.8

Reclamation guidance—*We recommend that government develop clear and comprehensive reclamation guidance for industry.*

Compliance incentives

In collaboration with other agencies, MEM created two annual award incentives to industry: the BC Mining and Sustainability Award and the BC Mining Reclamation Award. However, MEM has not assessed how effective these incentives have been in promoting compliance in the mining sector. We also found that, overall, the ministry could not demonstrate that its promotional activities and guidance materials were achieving voluntary compliance.

RECOMMENDATION 1.9

Incentives—*We recommend that government create effective incentives to promote environmentally responsible behavior by industry.*

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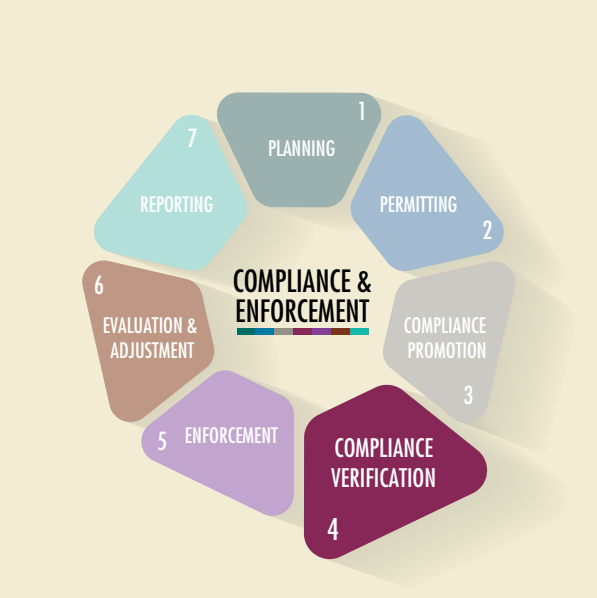


4. Compliance Verification

Compliance verification refers to monitoring and inspection to determine whether a mining company is in compliance with legislative and regulatory requirements, including the conditions of its permit. We expected MEM to be:

- applying a risk-based approach to planning its compliance verification activities,
- carrying out site inspections that meet its own policies, and
- monitoring industry reporting on compliance.

We found that MEM was deficient in all of these areas.

Risk-based planning

According to good practices, inspections should be based on a schedule that considers risk (impact to the environment and the likelihood of occurrence). Our expectation was therefore that MEM would be planning its inspections based on identified risks.

Instead, we found that the permitting group does not have a comprehensive, risk-based approach for its inspection planning and no policy that required one. The geotechnical and reclamation sections assessed risk and prioritized inspections separately and informally, based on criteria such as:

- policy to inspect all major operating mines each year
- dam risk classification
- length of time since last visit
- inputs from other staff
- complaints
- gaps in knowledge areas

Also missing was any clearly organized analysis that could be used to inform the annual planning of mine inspections based on risk to the environment. For example, MEM had ranked 45 mines as having moderate to high potential impacts on water quality; however, there was not a clearly documented rationale for these risk-ranking decisions nor a clear link between mine risk and planned annual inspections.

On several occasions in the last 10 years, ministry staff told higher-level management that inadequate monitoring and inspection, due to insufficient staffing levels, was putting the province at risk. However, we could not determine whether ministry executives fully knowingly assumed and accepted this risk, given that MEM does not have an internal risk management framework. Such a framework would include an

annual process for compiling risks identified by staff, developing a plan to address key risks, and informing executive decision-makers about the remaining residual risks.

RECOMMENDATION 1.10

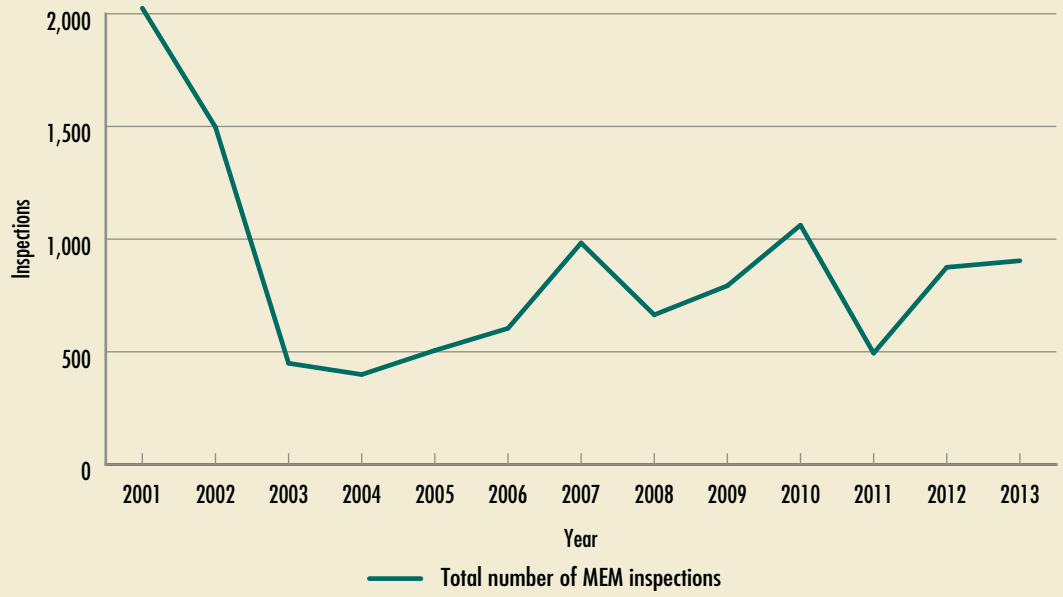
Risk-based approach—*We recommend that government develop a risk-based approach to compliance verification activities, where frequency of inspections are based on risks, such as industry's non-compliance record, industry's financial state, industry's activities (e.g., expansion), as well as risks related to seasonal variations.*

Site inspections

The ministry's reported data shows that the total number of MEM inspections across the entire Health, Safety and Permitting Branch has declined significantly since the early 2000's (see Exhibit 14).

While this graph may show a trend for the broader organization, this audit focused specifically on geotechnical and reclamation inspections. In these areas, the data MEM provided to us indicates that geotechnical and reclamation inspections at major operating mines fluctuated significantly for the years 2005-2014. Overall, inspections fluctuated from a high of nearly 20 (for both types of inspections) to a low of zero geotechnical inspections in 2010. This includes five years of single digit inspections for both types of inspections.

Exhibit 14: Total number of inspections by the Ministry of Energy and Mines, 2001–2013.
These inspections include Health and Safety inspections, in addition to specialist inspections such as Electrical, Mechanical, Geotechnical, Reclamation (includes geochemical inspections), Ergonomic and Occupational Health



Source: Office of the Auditor General of British Columbia, adapted from MEM data

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We reviewed MEM's reclamation and geotechnical inspection records for 2012, 2013 and 2014 for all major operating mines. In addition, we performed a detailed analysis of eight mines for those three years. Our sample consisted of four operating mines and four closed mines.

We found that MEM does not systematically evaluate whether a mine is compliant with its permit requirements; therefore, there is a risk that some permit conditions are not being complied with.

Below are the findings, based on our sample, for reclamation and geotechnical inspections at major operating mines and closed mines.

Reclamation inspections

MEM did not meet the minimum requirement of its policy to conduct reclamation inspections at all major mines at least annually, nor did it indicate where it had increased inspections as a result of continued non-compliance. Each of the four operating mines in our sample should have received one inspection for each of the three years sampled. Instead, we found that from 2012 to 2014, MEM conducted four reclamation inspections of the expected 12 for major operating mines in our sample. Of note:

- Gibraltar mine received an inspection in 2012, but it had not been inspected since 2008.
- Myra Falls mine has not received a reclamation inspection since 2006.

Over half the reclamation inspections that we reviewed were not completed according to the ministry's inspection procedures. For example, we were unable to determine (for any inspections) if the inspector had ensured the company was "fulfilling the requirements of their reclamation plan and complying with all the conditions of their reclamation permit in regard to stockpiling till or overburden; land use objectives; productivity; and acid mine drainage provisions."

Geotechnical inspections

In most cases, the geotechnical inspections were completed according to MEM's inspection procedures. For the three years that we reviewed (2012–2014), we found that the ministry generally met its policy of inspecting all the major mines annually. However, before this period, MEM did not consistently meet the policy. For example, the ministry performed only one geotechnical inspection in 2010 and six in 2011 (which corresponds with the absence of a geotechnical manager). The number of inspections increased in 2012 after a geotechnical manager was hired. However, in spring 2015, this manager left MEM and the ministry has not been able to permanently fill the position.

Closed mines inspections

We found that the number of inspections of closed major mines were inadequate, given the risks that are associated with these sites. In our sample of four closed mines, only one reclamation inspection and five geotechnical inspections occurred over the three year period of our review. According to its policy, MEM is responsible for ensuring that safe conditions prevail at closed or non-operating mines. This responsibility includes preventing pollution of land and water.

However, the policy states that inspection frequency at these mines should be "from time to time as practical."

This lack of a specific timeline, coupled with the reduction of staff, has resulted in MEM inspections of closed mines being insufficient to identify significant risks.

RECOMMENDATION 1.11

Systematic compliance verification—*We recommend that government systematically monitor and record compliance with high-risk mine permit requirements.*

Monitoring of industry reports

Over the last decade, the government has adopted an approach to reduce the regulatory burden on industry. This approach has increased dependence on **qualified professionals** employed by industry to do the work needed to meet government's various mandates.

As *professional reliance* has grown, we expected that MEM, at a minimum, would be ensuring that reports required under permits were received and reviewed by the ministry in a timely manner, and would put into place policies and guidance about working with qualified professionals. Overall, MEM has not established any policy regarding qualified professionals. Specifically:

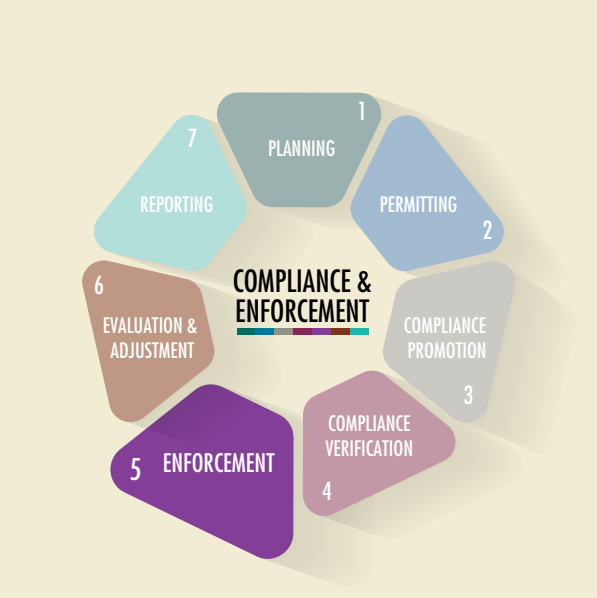
- MEM has not established guidance for its staff regarding what the ministry considers an appropriate level of oversight of the professionals employed by mining companies.
- MEM did not have a policy for tracking and reviewing all industry self-reported data. Staff do review some industry self-reports but, because of resourcing constraints, are unable to review every one that is submitted.
- MEM is not ensuring that mining companies submit reports – as required under the Health, Safety and Reclamation Code for Mines in British Columbia – in a timely manner, or even at all. For example, we found that only a little over half of all mining companies submitted their annual reclamation report in 2013 and 2014 (55% and 56%, respectively). Ministry staff point out that they have no enforcement tools to compel mining companies to submit reports.
- While MEM expects the mine operator to address the recommendations that qualified professionals include in their reports, there is no explicit, mandatory requirement requirement compelling all the mine operators to carry out the recommendations.

RECOMMENDATION 1.12

Qualified Professionals—*We recommend that government establish policies and procedures for the use and oversight of qualified professionals (QP) across the natural resource sector. These policies and procedures should have the following:*

- *guidance for staff that outlines the specific nature and amount of oversight expected of a QP's work*
- *guidance for staff as to expected timeframe for review and response of QP reports*
- *updated guidance for staff for recognizing and responding to misconduct by a QP*
- *controls in place to ensure that there is no undue influence on the QPs by industry*
- *controls in place to ensure that recommendations by QPs are adhered to*

PART 1: MINISTRY OF ENERGY AND MINES



5. Enforcement

Enforcement is the backbone to any compliance program. It is the final line of defence against environmental degradation. According to good practice, strategies involving education, assistance, incentives, monitoring and inspections are effective only if backed by a credible threat of enforcement sanctions.

To be effective, enforcement programs must involve:

- swift and predictable responses to violations
- responses that include appropriate sanctions

Swift responses to violations

MEM has no policy that requires its inspectors to ensure that mines return to compliance. From our sample of mines, we found that the ministry has not been systematically tracking either industry's compliance with permit requirements or industry's response to MEM's identified non-compliance. Therefore, we could not conclude whether MEM had identified all cases of non-compliance and, for those cases identified, whether there was a timely return to compliance.

We did note, however, several instances in which significant non-compliance persisted for years. For example, MEM failed to compel the mine operator to address the issue of seismic safety at the Myra Falls mine on Vancouver Island for 14 years (see Exhibit 15). Had a major earthquake (Magnitude 7 or higher) occurred before 2013, there was a risk that the dam could have failed.

Predictable responses to violations

Regulators can adopt various strategies when responding to non-compliance, ranging from strict responses to more cooperative approaches. We found that MEM has generally adopted the latter, emphasizing cooperation rather than confrontation. Its aim is to prevent environmental harm using such tools as bargaining, persuasion and negotiation. For example, we noted instances where MEM gave industry extensions to respond to non-compliance because of company claims of financial hardship.

The ministry's rationale is that a mine that is allowed to remain open and functioning will remain accountable and is more likely to follow through with undertaking environmental mitigation measures and responding to other regulatory requests. If the mine is shut down (as an enforcement response), it cannot generate revenue, and so, is likely to be less able to undertake

remediation work. That increases the risk of the liability falling to the province, especially if the mine is under-secured – a common situation, as discussed earlier in this report.

We understand that this collaborative strategy is viable in some circumstances, but it assumes that the majority of mining companies are willing to comply voluntarily. As we found for most of the mines we reviewed for this report, this is not the case. For the inspections reports we reviewed, there were incidences of non-compliance in most cases.

Responses to violations varied by type of inspection. We found that when non-compliance was identified in geotechnical inspections by MEM staff, the inspectors followed a predictable response and issued a direct enforcement order (although deadlines were not always assigned to the activities in the enforcement orders). Reclamation inspections rarely met MEM's procedures for enforcement.

Most of the actions specified for non-compliance had no timelines associated with them, and the inspection reports used weak or permissive language in directives to industry (such as "should" and "it is recommended," as opposed to "must" and "shall"). MEM staff have indicated that they use this language when there is no contravention to the Act, Code or permit, but recognize that action is needed. However, the mine is not required to undertake actions that are merely suggested. A lack of clear directives can leave mining companies wondering whether action is actually warranted and it may tempt them to disregard the directive.

Exhibit 15: Fourteen-year timeline for seismic upgrades at the Myra Falls mine

Date	Activities at Myra Falls
In the early 1990s	MEM requests a seismic stability review
1996	
1997	Myra Falls recognizes the need to improve seismic stability
1998	
1999	MEM amends the permit to require seismic upgrades
2000	
2001	MEM approves the mine operator's request to extend completion of the seismic upgrade until 2005 due to financial difficulties. This extension was granted contrary to the advice provided by MEM's geotechnical staff.
2002	
2003	
2004	
2005	The mine receives an additional extension to 2007 from MEM to complete the seismic upgrades
2006	
2007	
2008	
2009	
2010	The seismic berm is near completion
2011[3]	
2012	MEM receives notification that the site is too wet to complete construction. An extension is granted until August 31, 2013
2013	**On July 31, 2013, the seismic berm is completed**

Source: Office of the Auditor General of British Columbia, adapted from MEM data

[3] In 2011 the mine was acquired by another company.

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Responses that include appropriate sanctions

The enforcement tools that MEM inspection staff have at their immediate disposal are two extremes:

- written orders that compel the mine to act
- temporary suspension or shut-down

For mine operators with a history of non-compliance, written orders are sometimes ineffective as a deterrent. MEM usually avoids issuing a temporary suspension or shut-down because of the social and economic implications. Plus, this measure has little effect if the mine is already temporarily shut down or permanently closed (see sidebar).

MEM does have other tools available to it under the *Mines Act*, such as fines, penalties, imprisonment and Supreme Court orders. However, these tools include the burden of prosecution – that is, they require investigation time, resources and expertise to produce evidence suitable for court and for a successful conviction under the *Mines Act*. Unlike MoE, which has an independent agency (the Conservation Officer Service) to enforce compliance with environmental legislation, MEM does not have an independent body to do the required investigative work. The Chief Inspector of Mines has the power under the *Mines Act* to carry out investigations, but has rarely done so.

SHASTA-BAKER MINE

Shasta-Baker mine is located 450 kilometres north of Prince George. Sable Resources Limited initiated operation there in 1989 and by 2007, had produced over 20,000 ounces of gold and 1.1 million ounces of silver. The mine has a history of repeated non-compliances and violations. MEM issued a shut-down order in 2013 as a result of dam safety concerns related to unresolved notices of non-compliance.

In a letter to Sable Resources in December 2014, MEM states that the company must meet MEM's requirements to properly manage the mine site, and that this inability has been "an increasing concern to MEM over the last several years." The letter continues, "Your inaction has increased the risk of an environmental incident." In that same month, the ministry also ordered the company to pay an additional reclamation security bond of $150,000.

In January 2015, the company responded that it would be unable to pay the bond. MEM replied that it would reconsider its decision requiring the additional bond. However, as of July 2015, the Chief Inspector of Mines had not yet provided a response to the company. In addition, MEM could not provide evidence that the company had complied with the order for more security.

The reclamation security bond for this site is currently $226,500, although MEM has estimated that the reclamation and closure costs are $1.11 million.

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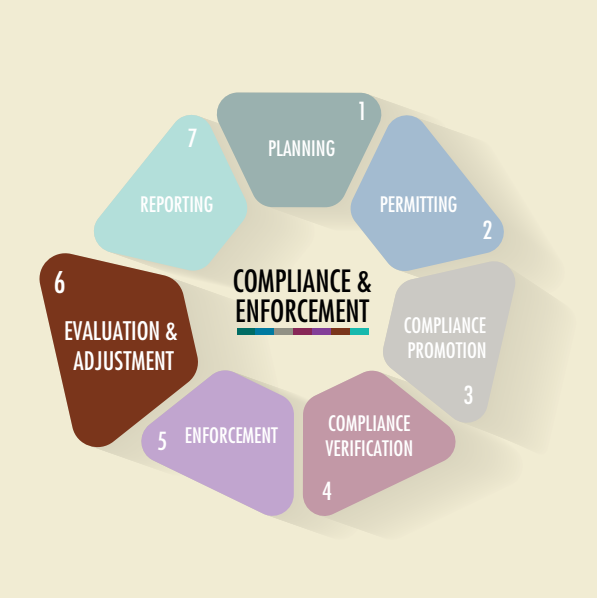
Overall, we concluded that MEM's enforcement approach does not convey to non-compliant mining companies that the ministry has a strong enforcement culture. For example, the Chief Inspector of Mines recently issued letters to the Myra Falls mine operator after repeated requests by MEM staff that the operator adhere to orders. An October 2014 letter states, "The ministry is becoming increasingly concerned with Nystar's [mine owner] lack of compliance with respect to Ministry orders and geotechnical requirements for its tailings facilities" and warns that further enforcement action might be taken if the mine owner does not respond accordingly. To date, no return to compliance has resulted. This was also the case with the Shasta-Baker mine, which still remained non-compliant seven months after the ministry issued an order.

RECOMMENDATION 1.14

Policies, procedures and tools—
We recommend that government develop policies, procedures and enforcement tools for responding to non-compliances when industry does not meet government's specified timeline.



6. Evaluation & Adjustment

Evaluation is a critical yet often overlooked part of environmental management that leads to greater awareness of whether regulators are successfully achieving the desired environmental outcomes, such as preventing water contamination, improving mine reclamation results, and deterring violators.

We expected MEM to be regularly evaluating the permitting, compliance promotion, compliance verification and enforcement aspects of its program, and to be making adjustments as needed to achieve continuous improvement. We found, however, that the ministry does not have a formal process to evaluate the effectiveness of any of these activities.

MEM has not taken the steps necessary to create a meaningful evaluation program. Those steps include systematically collecting and tracking environmental performance and compliance actions, and then analyzing the data to identify trends, successes, areas of underachievement, and shifts in goals. MEM has stated that its limited resources do not allow for this work.

Without a commitment to evaluation, MEM is unable to:

- determine whether its activities are effective and aligned with government's goals, and whether improvements are necessary
- report to government or the public on the effectiveness or impact of its activities.

RECOMMENDATION 1.15

Evaluation & adjustment—*We recommend that government regularly evaluate the effectiveness of its compliance promotion, compliance verification, and enforcement activities and tools, and make changes as needed to ensure continuous improvement.*

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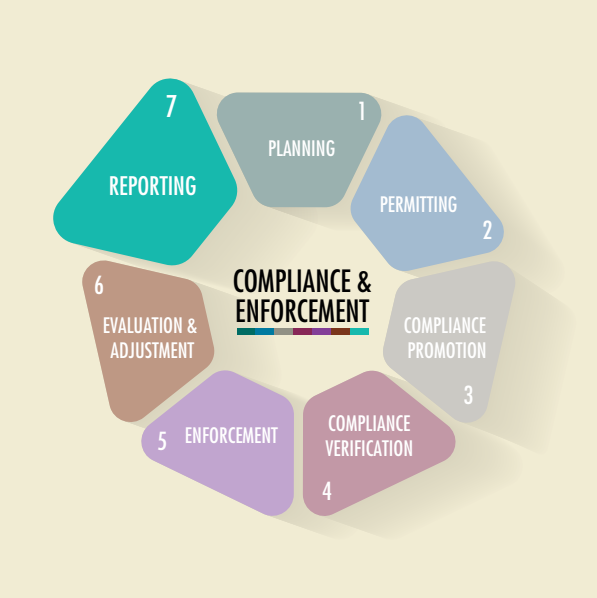

7. Reporting

Regular, timely and fair reporting of results to the Legislative Assembly and the public is important to maintaining confidence in the activities of a compliance and enforcement program. We therefore expected MEM to be reporting on its performance as a regulator and on the performance of the mining industry.

We found instead a poor record of reporting by the ministry.

A legislative requirement of MEM is that "The chief inspector must publish an annual report showing results during the previous year in achieving the purpose of this Act." However, we found that the annual reports of the Chief Inspector do not fully describe how the ministry's compliance and enforcement activities were protecting the province from significant environmental risks – a key part of MEM's mandate.

We found that MEM:

- did not include specifics on how the ministry facilitated successful reclamation and closure of mine operations, managed its environmental and reclamation liabilities, and protected and reclaimed the land and water affected by mining,
- did not inform the public of the long-term environmental risks associated with managing water contaminants,
- did not disclose the amount of liability for mining sites and the risks associated with underfunding, and
- did not include basic details of its compliance and enforcement activities and the environmental performance of regulated parties (such as inspections completed, rates of non-compliances, and enforcement actions).

MEM attributes these gaps to its lack of appropriate records management and information management systems.

However, as a result of the tailings dam breach at Mount Polley in August 2014, MEM has publicly posted all the dam safety reports for the first time. Furthermore, government has publicly committed to updating its information systems to enable this reporting to continue.

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We concluded that MEM's lack of meaningful environmental reporting may mean that the public and the Legislative Assembly do not have a complete understanding of the ministry's performance as a regulator, or of the environmental performance of B.C.'s mining sector.

RECOMMENDATION 1.16

Public reporting—*We recommend that government report publicly the:*

- *results and trends of all mining compliance and enforcement activities*
- *effectiveness of compliance and enforcement activities in reducing risks and protecting the environment*
- *estimated liability and the security held for each mine*

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COMPLIANCE AND ENFORCEMENT AT THE MOUNT POLLEY TAILINGS DAM

Summary

On August 4, 2014, a breach occurred within the Perimeter Embankment of the **tailings storage facility (or tailings dam)** at the Mount Polley copper and gold mine in south-central B.C. The breach resulted in the release of an estimated 25 million cubic metres of wastewater and tailings. The mining company has since been working on the clean-up from this event, but the full extent of the environmental repercussions from the breach are still not known.

In response to this event, government convened an independent, expert, engineering investigation and review panel (panel) to determine the mechanics of ***how*** the dam failed. Their report identified the mechanics of the failure. Their conclusion was that the primary cause of the breach was foundation failure due to a weak layer in the Perimeter Embankment foundation materials. However, the panel also concluded that, had the downstream embankment slope been flattened in recent years as proposed in the original design, failure would have been avoided.

Our examination differed from the panel's review in that we focused on ***why*** the dam failed and the Ministry of Energy and Mines' (MEM) overall compliance and enforcement activities. We found that the ministry did not ensure that the tailings dam was being built or operated according to the approved design, nor did it ensure that the mining company rectified design and operational deficiencies. MEM continued to approve permit amendments to raise and continue operating the tailings dam.

In relation to the Perimeter Embankment where the dam failed, MEM's weak regulatory oversight allowed inconsistencies with the intended dam design to persist over several years. This included: an over-steepened Perimeter Embankment slope and inadequate management of the tailings beach. At the Main Embankment, in addition to accepting a steep embankment slope and an inadequate tailings beach, MEM also did not ensure that buttressing was built to the height and extent included in the dam design.

We concluded that MEM did not enforce the design due to the following:

Over reliance on qualified professionals

It is not MEM's practice to carry out its own technical review (or to oversee an independent technical review) to confirm that tailings dams are built in accordance with the design.

Inadequate standards to guide both inspectors and industry

We expected that MEM would have ensured that their design standards were clear for both industry and inspectors to enforce. However, MEM had adopted the Canadian Dam Association's Dam Safety Guidelines for dam construction that were not specific to the



Click on the terms that are **bold** and **blue** to go to the definition in the glossary (**Appendix B**).

conditions in B.C. or specific to tailings dams. These guidelines were open to interpretation by the Engineer of Record and MEM inspectors, and this resulted in a tailings dam that was built below generally accepted standards for tailings dams.

Inspections did not meet policy

MEM performed no geotechnical inspections for a number of years, even though their policy requires a minimum of an annual inspection. Although these inspections would not have identified the weak foundation layer, staff could have identified that the operator was not actually building or operating the tailings dam to the prescribed design and was raising the dam without any long-term planning. Also, additional inspections would have provided MEM the opportunity for increased onsite vigilance.

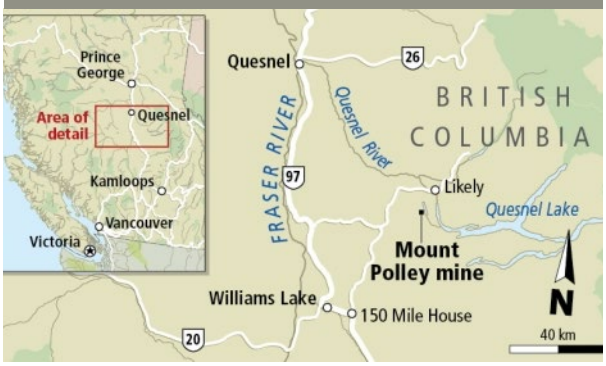
Lack of enforcement culture

MEM has adopted a collaborative approach to compliance and enforcement that emphasizes cooperation and negotiation. In the case of Mount Polley, this approach failed to produce the desired results. MEM has the ability to compel a mining company to take corrective action when necessary, and has done so in the past using enforcement mechanisms under the Act, Code and permit. However, at Mount Polley, MEM did not use most of these enforcement mechanisms to compel the mine operator to build or operate the dam as designed and intended.

Background

The Mount Polley mine is an open-pit copper and gold mine located in south-central B.C., 56 kilometres northeast of Williams Lake (see Exhibit 16). It began operation in 1997, was temporarily closed from September 2001 to March 2005, and then reopened, continuing to operate until the failure of the tailings dam in 2014.

Exhibit 16: Location of the Mount Polley mine



Source: *Times Colonist*, August 5, 2014

On August 4, 2014, there was a breach within the Perimeter Embankment of the approximately 4 kilometre long tailings dam (see Exhibit 17).

The tailings dam at the Mount Polley **tailings storage facility** is subdivided into three sections referred to as the Main Embankment, the Perimeter Embankment and the South Embankment. The photo in Exhibit 17 was taken after the breach at the Perimeter Embankment.

Following the incident, government reported that approximately 17 million cubic metres of wastewater and 8 million cubic metres of tailings entered adjacent

Exhibit 17: Description of Mount Polley dam embankments



The tailings dam at the Mount Polley **tailings storage facility** is subdivided into three sections referred to as the Main Embankment, the Perimeter Embankment and the South Embankment. This image was taken after the breach at the Perimeter Embankment.

Source: Terrasaurus Ltd., Photography

water systems and lakes (see Exhibit 18). The full extent of the environmental repercussions from the breach is still not known. Estimates reported in July 2015 indicate that the initial cleanup cost the company $67 million, and the Ministry of Environment, $6 million. Long-term clean-up, however, will take years.

Shortly after the incident, the provincial government convened an independent, expert, engineering investigation and review panel (panel), directing them to "investigate into and report on the cause of the failure of the tailings storage facility." On January 30, 2015, the panel released its report, titled: *Report on Mount Polley Tailings Storage Facility Breach.*

The panel's conclusion was that the primary cause of the breach was dislocation of a part of the Perimeter Embankment due to foundation failure. The specifics of the failure were triggered by the construction of the downstream rockfill zone at a steep slope. They noted

Exhibit 18: The Mount Polley mine site before the tailings pond dam breach (July 24, 2014) and after (August 5, 2014)



Source: NASA Earth Observatory images by Jesse Allen, using Landsat data from the U.S. Geological Survey

that had the downstream embankment slope been flattened in recent years as proposed in the original design, failure would have been avoided.

Management and regulation of tailings storage facilities

Professional engineers – Engineers of Record (EOR), hired by mining companies – are responsible for on-going design, construction, operation and performance monitoring of the dam. The results of an EOR's monitoring are documented in the EOR's annual Dam Safety Inspection Report, which is a standard requirement for major mines. The EOR also issues recommendations to the mining company in its annual reports (and from time to time as is necessary or appropriate) for actions that, from the EOR's perspective, the company should implement to address dam safety and stability concerns. **However, EORs have no legal authority to compel mining companies to implement their recommendations. Enforcement can only be done by MEM.**

It is MEM's responsibility for *regulating* all mining-related activity in B.C., including design, construction, operation, closure, and reclamation. The Chief Inspector of Mines is given significant power and discretion during all these phases. These powers include ensuring the safety and stability of tailings storage facilities.

Our Audit

The planning work for our audit on compliance and enforcement in mining began several months before the Mount Polley breach. When the breach occurred, we considered but decided against including the mine in our original audit sample. There was already increased scrutiny from other agencies, and we did not want to overlap with the investigations underway. However, as our audit progressed and we noted gaps with how MEM addresses mining non-compliances, we became concerned that these gaps may have a relationship with the failure at Mount Polley.

We also noted that there was limited scrutiny by the panel on MEM's regulatory oversight. It therefore became evident that we could not exclude an assessment of the ministry's compliance and enforcement performance concerning the Mount Polley tailings dam.

Our audit differed from the investigation of the panel. The panel's primary mandate was to investigate and report on the cause of the failure. As a result, their report was highly technical and provided a thorough explanation of the mechanics of the failure. In terms of regulatory oversight, the panel focused mainly on one aspect – inspections – and the panel reported that overall the performance by the regulator (MEM) was "as expected."

However, our assessment included a comprehensive review of all seven components of an effective compliance and enforcement program (see Exhibit 19). In the case of MEM's oversight of the Mount Polley mine, our significant findings are in relation to MEM's enforcement.

We focussed our audit on MEM, and not MoE, as MEM has primary responsibility for the regulatory oversight of the geotechnical components of the tailings storage facility.

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Specifically, we focused on MEM's actions as they related to three significant and known dam deficiencies on the Main Embankment and the Perimeter Embankment. They were:

1. inadequate tailings beaches (both embankments)
2. over-steepened dam slopes (both embankments)
3. insufficient buttress (Main Embankment only)

Exhibit 19: Seven key elements of a comprehensive compliance and enforcement program



Source: Office of the Auditor General of British Columbia, adapted from the Organisation for Economic Co-Operation and Development's *Ensuring Environmental Compliance: Trends and Good Practices* and MOE's *Compliance Management Framework*

Audit Findings

Enforcement is the backbone to any compliance program. It is the final line of defence against environmental degradation. Good practices suggest that strategies involving education, assistance, monitoring, inspections and incentives are only effective if backed by a credible threat of enforcement sanctions.

We expected MEM to be monitoring mine compliance with permit requirements, the *Mines Act*, the Health, Safety and Reclamation Code for Mines in British Columbia and the EOR recommendations; and, to be enforcing instances of non-compliance. We also expected that MEM's enforcement response would be swift and predictable, include appropriate sanctions, and result in a timely return to compliance.

MEM made nearly 850 documents (emails, industry reports, inspections) available publicly that discuss geotechnical details related to Mt. Polley. However, these documents do not demonstrate how MEM was ensuring that all of the permit requirements were being met. It is not MEM's practice to systematically track compliance with permit conditions. As a result, the ministry did not have comprehensive and readily accessible compliance records of Mount Polley that we could review.

> *"Something had to give, and the result was over-steepened dam slopes, deferred buttressing, and the seemingly ad hoc nature of dam expansion that so often ended up constructing something different from what had originally been designed."*
>
> ~Panel report, page 75

Specifically, MEM was unable to demonstrate how the mine performed against its permit requirements for the last two decades. Over several design stages, the panel identified departures from the approved design of the tailings storage facility. These departures related to the dam slope and beach on the Main and Perimeter embankments, and the buttress on the Main Embankment. In particular, the panel concluded that, had the downstream slope on the Perimeter Embankment been flattened in recent years as proposed in the original design, failure would have been avoided.

> *"The specifics of the failure were triggered by the construction of the downstream rockfill zone at a steep slope of 1.3 horizontal to 1.0 vertical. Had the downstream slope in recent years been flattened to 2.0 horizontal to 1.0 vertical, as proposed in the original design, failure would have been avoided."* ~Panel report, page iv

MEM accepted over-steepened downstream embankment slopes

An over-steepened Perimeter Embankment slope contributed to the tailings dam failure at Mount Polley. According to the panel, had the embankment slope been consistent with the original design for the Perimeter Embankment, failure would have been avoided (see quote above).

The original design for Mount Polley's tailings storage facility specified a downstream embankment slope of 2.0 horizontal to 1.0 vertical (2H:1V) for all the embankments (see Exhibit 20).

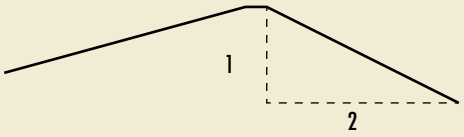
The Stage 5 design, approved by MEM in 2006, allowed the amended design to include a steeper "interim slope" of 1.4 horizontal to 1 vertical (1.4H:1V) for the Main and Perimeter embankments.

The mine operator stated that this *interim* 1.4H:1V slope would be returned to the more moderate 2H:1V slope once the stage 5 lift was completed. We expected that MEM would have ensured compliance with this permitted design – the return to a 2H:1V slope. Instead, the mine operator never flattened the slope, and MEM continued to approve subsequent dam raises.

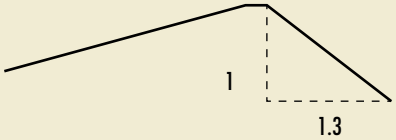
In 2011, during the stage 7 dam raise, all dam embankments were built to an even steeper slope of

Exhibit 20: Downstream dam slope[4]

A) Lower risk: Original design for Mount Polley dam slope 2.0 horizontal (H) to 1.0 vertical (V)



B) Higher risk: Over-steepened slope of Mount Polley dam at 1.3 horizontal (H) to 1.0 vertical (V)



Source: Office of the Auditor General of British Columbia

[4] This exhibit is only intended to conceptualize the Mount Polley dam slope design and construction. It is not intended to depict the actual design, construction, or scale of the Mount Polley tailings storage facility.

1.3H:1V, thus exceeding the *interim* slope. During this time when the slope became steeper across all the embankments, MEM did not provide the required oversight. MEM's inspection procedures require at least one geotechnical inspection per year; however, no such inspection were carried out for 2009, 2010 and 2011.

The result was that the steep slope was allowed to persist, reaching a level that was described by the panel as "unprecedented" (see Exhibit 21).

As the regulator, it was MEM's responsibility to ensure that the dam was being built as designed, including with the intended embankment slope. This, MEM did not do.

MEM did not enforce the development of an adequate tailings beach

An above-water tailings beach is a gently sloping surface of tailings against the upstream face of a tailings dam embankment (see Exhibit 22).

A wide beach was included as a fundamental design element for all embankments at the Mount Polley dam, deemed necessary for dam stability. The absence of a beach adjacent to the Perimeter Embankment was noted as a fundamental flaw by the panel. The panel stated, *"Had the water level been even a metre lower and the tailings beach commensurately wider, this last link might have held until dawn the next morning, allowing timely intervention and potentially turning a fatal condition into something survivable."*

Exhibit 21: Perimeter Embankment slope with area stripped for buttress, submitted by the EOR to MEM in March, 2014



Source: Tailings Storage Facility Stage 9 2013 As-Built and Annual Review Report

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We expected MEM to ensure that the tailings beaches adjacent to the dam embankments were maintained. Instead, we found a lack of oversight by MEM to adequately address what became a chronic issue along all the embankments of the facility.

The Dam Safety Review in 2006 noted a lack of adequate beach development that represented *"a deficiency that should be rectified as soon as practical."* The report further explained at length that adequate beaches along all the embankments are generally considered an integral requirement of the design. The report included a recommendation for the mine to *"aggressively create a beach."*

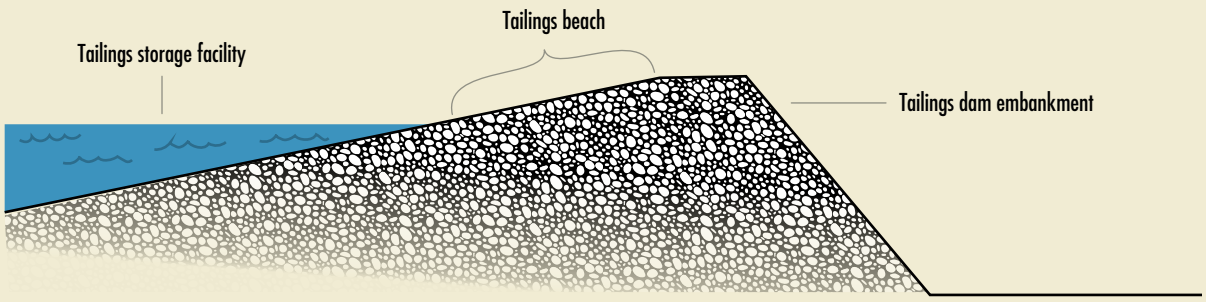
In 2008, a MEM geotechnical inspector identified the lack of tailings beach at the Main Embankment. It was noted as a deficiency that contravened the permitted design, and an enforcement order was issued, stating: *"The design requires that an above water beach be developed against the upstream face of the dam. There was no beach observed in the vicinity of the SE corner of the Main Embankment. A beach shall be re-established as soon as possible in this area to meet the design objectives."*

We did not find evidence that MEM followed up on the order from the 2008 inspection report.

Two years later, in the 2010 Annual Dam Safety Inspection Report sent to MEM, the mine operator was reminded of the beach deficiency, again, by the EOR: *"Develop a tailings deposition plan to deposit tailings around the perimeter of the facility to facilitate the development of tailings beaches and manage the location of the tailings pond. The lack of tailings beach development was a deficiency identified in a 2008 geotechnical inspection by the Ministry of Energy, Mines, and Petroleum Resources (MEMPR)."* We did not find evidence that MEM enforced the 2010 recommendation of the EOR. No further MEM inspections took place until 2012.

As the regulator, it was MEM's responsibility to ensure that the dam was being built as designed, including with the intended tailings beach. MEM did not provide adequate oversight and enforce the requirement to consistently maintain a wide tailings beach against all the embankments.

Exhibit 22: Example of a tailings beach[5]



Source: Office of the Auditor General of British Columbia

[5] This exhibit is only intended to conceptualize a beach feature. It is not intended to depict the actual design, construction, or scale of the Mount Polley tailings storage facility.

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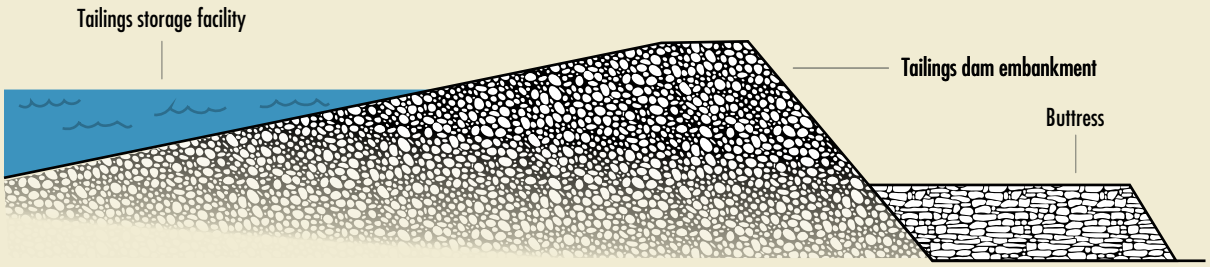
MEM did not enforce the establishment of buttressing, as designed, along the Main Embankment

A buttress is a support constructed outside of a structure (such as a tailings storage facility) to increase stability (see Exhibit 23). In the original 1995 tailings dam design, a buttress along the Main Embankment was contemplated as a possible requirement for stability at the final dam elevation. In 2007, a buttress was incorporated into the mine permit to address stability concerns. However, the buttress was never built to the height and extent of the intended design. MEM allowed the mine operator to continually defer construction of the buttress, and the buttress was never extended along the entire length of the Main Embankment.

Throughout the life of the dam, the Mount Polley dam engineers and other expert reviewers were concerned with the possibility that there may be a weak layer in the dam foundation materials. However, as noted by the panel, the site investigations by the mine operator over the years were insufficient to identify any weaknesses. This became more of a concern as the dam was built higher and steeper. Moreover, engineering reports identified greater risks with the stability of the Main Embankment due to factors such as its large height in comparison to the other two embankments.

As the dam was raised, buttressing along the Main Embankment was eventually deemed necessary and partially constructed in Stage 5. In 2007, the Stage 6 design to raise the dam included the construction of a buttress along the entire Main Embankment to account for a potentially weak layer in the dam foundation materials. MEM issued a permit on the basis of this design in 2007. Consistent with all of MEM's permits, it also stated that the company was to notify the Chief Inspector, in writing, of any intention to depart from the design plan to any substantial degree. We expected MEM to ensure that the requirements specified in the design and permit were upheld.

Exhibit 23: Example of a buttress[6]



Source: Office of the Auditor General of British Columbia

[6] This exhibit is only intended to conceptualize a buttress feature. It is not intended to depict the actual design, construction, or scale of the Mount Polley tailings storage facility.

Instead, we found that MEM did not ensure that the mine operator established a buttress along the Main Embankment in accordance with the design. The height was approximately 5m lower than the design specifications, and the buttress did not extend along the entire length of the embankment. We found no evidence that the mine operator notified the Chief Inspector in advance about the proposed departure, as required in the permit. The EOR reported the design contravention to MEM in the 2010 Annual Dam Safety Inspection Report. However, we found no evidence that MEM followed up to enforce compliance with the required buttressing. Instead, MEM continued to permit subsequent raising of the dam for Stages 7, 8 and 9.

As the regulator, it was MEM's responsibility to ensure that the dam was being built as designed and permitted, including with the intended buttress.

While the dam was out of compliance with its 2007 permit by not completing the intended buttress on the Main Embankment, the buttress that was in place at this embankment did provide some support. As the panel stated: *"the steep slopes were effectively flattened by the addition of its buttress, which explains why the failure did not occur at the highest part of the dam."* There was no buttressing on the Perimeter Embankment, and the EOR did not recommend buttressing until 2013.

> By 2013, as the panel noted, *buttressing could no longer be deferred for either embankment."* ~Panel report, page 71

Why did MEM not enforce the tailings storage facility design at Mount Polley?

For many years before the breach happened, there were structural and operational deficiencies (beach, buttressing and slope) that contravened the permitted design, but MEM did not enforce the correction of those flaws.

We concluded that MEM did not enforce the design due to the following factors:

Over-reliance on qualified professionals

MEM relies on the EOR's confirmation (signed and sealed "as-built" report) that tailings storage facility construction is consistent with the design. It is not MEM's practice to carry out its own technical review (or to oversee an independent technical review) to confirm that tailings dams are built in accordance with the design and government standards. In the case of Mount Polley, MEM failed to carry out its own regulatory oversight resulting in a dam that was not being built as designed.

MEM relies on an EOR to design a mine that is safe and to confirm it is operating as intended. However, MEM should not delegate its regulatory responsibilities to the EOR. Furthermore, as the panel noted, the designer cannot be presumed to act correctly in every case, which is why, it is MEM's responsibility to apply appropriate regulatory oversight.

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Inadequate standards to guide both inspectors and industry

We expected MEM would have ensured that their design standards were clear for both industry and inspectors to enforce. However, MEM had adopted the Canadian Dam Association's Dam Safety Guidelines for tailings dam construction that were not specific to the conditions in B.C. or specific to tailings dams. These guidelines were open to interpretation by the EOR and the inspector, and this resulted in a tailings dam that was built below generally accepted standards for tailings dams.

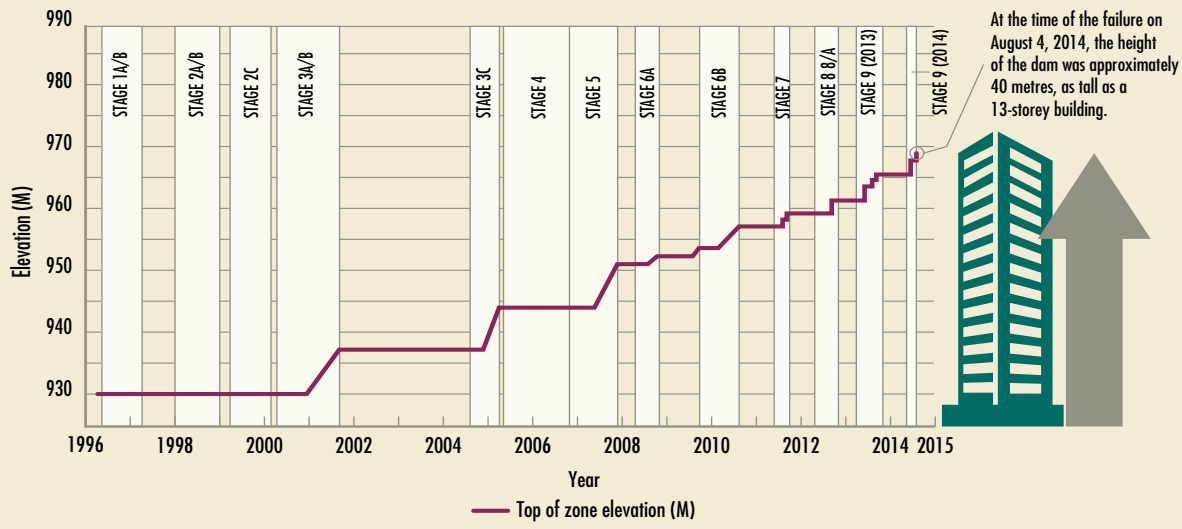
Inspections did not meet policy

According to MEM's inspection procedures, all major producing metal and coal mines must receive a geotechnical inspection at least once a year, or more often as necessary. However, we found that MEM performed no geotechnical inspections for the years 2002, 2003, 2004, 2009, 2010 and 2011, even though the tailings dam was being raised during many of these years. Construction of the Mount Polley tailings dam began in 1996. The height of the dam was later increased in nine stages, as shown in Exhibit 24, until it reached a height of approximately 40 metres - about as tall as a 13-storey building.

The panel concluded that additional inspections of the tailings storage facility would not have identified the weak foundation materials beneath the dam. However, additional inspections would have provided MEM the opportunity for increased onsite vigilance.

Furthermore, MEM's inspection procedures require that a geotechnical inspector review the current mine

Exhibit 24: Elevation increases in the Mount Polley tailings dam, 1996–2014



Source: Office of the Auditor General of British Columbia, adapted from *Independent Panel Report on Mount Polley Tailings Storage Facility Breach*

plan with the mine manager, review any proposed activity related to existing or future approvals, and note any cases of non-compliance with the approval. Had MEM followed this procedure in the required annual inspections, ministry staff would have had an opportunity to formally identify that the mine operator was not actually building the dam to the prescribed design, and was raising the dam without any long-term planning.

Lack of enforcement culture

MEM has adopted a collaborative approach to compliance and enforcement that emphasizes cooperation and negotiation. This type of an enforcement culture may, in some circumstances, motivate a mining company to return to compliance, but the approach depends on the company's willingness to meet government's standards and regulatory requirements, and to implement the EOR recommendations. In the case of Mount Polley, MEM's culture of collaboration failed to produce the desired results.

MEM has the ability to compel a mining company to take corrective action when necessary. This enforcement action, typically in the form of an order, must be directly related to a requirement of the *Mines Act*, the Code or the particular mine permit. MEM must also take enforcement action if there is an imminent danger posed to workers or the environment.

We found specific enforcement mechanisms under the Act, Code and permit that MEM has used in the past for other mines. These could have been used to compel the mine operator to build and operate the Mount Polley tailings dam to the intended, and prudent, design specifications.

MEM can enforce EOR recommendations

As noted earlier, EORs have no legal authority to compel mining companies to implement their recommendations. This type of enforcement can only be done by the regulator: MEM. However, EOR recommendations are not always linked to a pre-existing regulatory requirement or a perceived imminent danger–making enforcement challenging. In these cases, MEM still has a mechanism to act. Under the *Mines Act*, the Chief Inspector and the Minister of Energy and Mines have broad, discretionary powers, including the ability to impose additional conditions in the permit at any time. As a result, EOR recommendations can be included as a condition of the permit which would make them enforceable by MEM staff. This has been done in the past for other mines.

MEM can enforce design requirements

MEM's permits have standard clauses, including "Departure from Approval." It states that the permit-holder shall notify the Chief Inspector, in writing, of any substantial departure from approval and shall not proceed to implement the proposed changes without the authorization of the Chief Inspector. This is also a requirement in the Health, Safety and Reclamation Code for Mines in British Columbia under Section 10.1.11. We found no evidence that the Chief Inspector

of Mines approved departures from the intended design related to the beach, buttressing and dam slope. Had MEM noted that there was a departure from the approved design, they could have enforced this non-compliance.

MEM has broad powers to enforce dam safety

MEM staff have also made the argument to us that under the Health, Safety and Reclamation Code for Mines in British Columbia, if an inspector notes an issue that is not explicitly stated as a requirement in the permit, the inspector has broad powers to compel the company to take action. Specifically, section 1.1.2 of the Code states: "Notwithstanding the absence of a specific code requirement, all work shall be carried out without undue risk to the health or safety of any person."

To summarize:

the Mount Polley mine operator made substantial changes to the design of its tailings dam, did not build the dam to the design, and did not operate the tailings dam as was intended. In all of these instances, MEM, as the regulator, had a responsibility to require the mining company to complete the dam as designed. No other government or private actor has that ability or responsibility.

RECOMMENDATION 1.13

Mine design—*We recommend that government adopt appropriate standards, review mine designs to ensure that they meet these standards, and ensure that mines, as constructed, reflect the approved design and standards.*

PART 2: MINISTRY OF ENVIRONMENT

CONCLUSION

We concluded that the Ministry of Environment's compliance and enforcement activities of the mining sector are not protecting the province from significant environmental risks.

SUMMARY OF KEY FINDINGS

MoE has a compliance and enforcement program, but it is deficient in carrying out most of the expected regulatory activities, such as undertaking inspections, reviewing monitoring data provided by industry and enforcing where there is non-compliance. The ministry lacks the resources, expertise and training and tools necessary to pursue compliance and enforcement. Furthermore, it does not coordinate its compliance and enforcement activities with those of the Ministry of Energy and Mines (MEM), which has led to inefficiencies and a lack of overall effectiveness in protecting the environment.

MoE has not disclosed to the public and legislators the effectiveness of its regulatory oversight and the impacts that have resulted. We looked at the degradation of the water quality in the Elk Valley and MoE's response. We found that MoE was slow to regulate rising selenium levels in this area and has not publicly disclosed the ongoing risks that the ministry's recent Elk Valley Permit is posing on the environment.

MoE'S ROLES AND RESPONSIBILITIES

MoE's objective is the effective management of environmental risks through the monitoring and enforcement of environmental laws and regulations (see sidebar).

MINISTRY OF ENVIRONMENT SERVICE PLAN

Goal 2: Clean and safe water, land and air

Objective 2.4: Effective management of environmental risks

- Implement new compliance approaches that allow the Ministry to improve response to environmental risks and provide increased public accountability
- Minimize creation of future contaminated sites and manage remediation of high-risk contaminated sites
- Conduct investigations into non-compliance with regulatory requirements designed to protect the environment, human health and public safety

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Key among the enabling legislation is the *Environmental Management Act*, which includes requirements ensuring the protection of the environment through the monitoring and enforcement of the quantity and quality of any waste discharges from metal and coal mines.

Because both MoE and MEM have a responsibility to ensure the protection of watercourses, we expected the two ministries to be working together to achieve this objective.

Regional Operations Branch

MoE's Regional Operations Branch within the Environmental Protection Division is responsible for: reviewing *Environmental Management Act* permit applications for new and existing mines; conducting environmental assessment application reviews; conducting inspections; and, taking administrative action to enforce, or support the enforcement of, the Act.

The Regional Operations Branch includes environmental quality specialists, biologists, meteorologists, engineers, and environmental management analysts who live and work across the province. In 2014, the branch was reorganized. This resulted in Environmental Protection Officers being assigned to a number of different groups, including two that focus on mining:

- The Mining Operations Team is responsible for issuing mine permits. At the time of our audit it had 33 full-time-staff.
- The Provincial Compliance Team is responsible for planning province-wide compliance activities and inspecting all permits issued under the *Environmental Management Act* – permits that apply to about 70 types of industries or activities including mining. This team had 13 full-time staff.

Important to note in this new model is that the inspectors for mines no longer carry out dual roles of permitting and compliance work. This is one of the material differences between MoE's approach and that of MEM's. At MEM, inspectors issue permits and carry out compliance work.

Another notable difference between MoE's regulatory framework and that of MEM's, is enforcement. MoE's compliance staff may use administrative sanctions or penalties to enforce non-compliance. MoE may also use an independent investigation unit, housed in the Conservation Officer Service, to investigate suspected cases of non-compliance (by using searches, evidence seizures, surveillance, interviewing witnesses), to issue tickets or recommend formal charges to Crown counsel.

Within the Conservation Officer Service, the Major Investigations Unit specializes in investigating industrial non-compliance. This unit currently has 10 full-time staff and 6 vacancies.

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OUR EXPECTATIONS

A comprehensive compliance and enforcement program should have, in keeping with recognized good practices, seven key elements (see diagram on page 40).

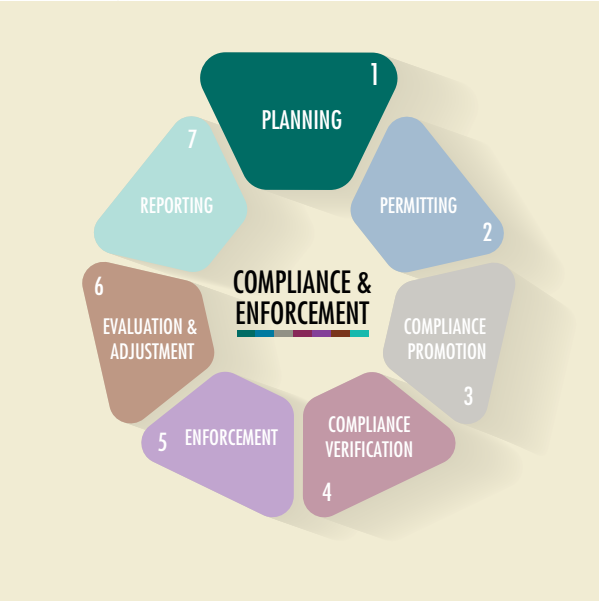
We expected MoE to have a strategic plan that would detail the activities of MoE's regulatory approach, including how the ministry intended to work with MEM. The plan would show how MoE's activities would achieve the objective of ensuring the protection of the environment. We also expected these activities to be:

- setting regulatory requirements that are enforceable,
- promoting regulatory compliance (aimed at achieving high rates of voluntary compliance),
- verifying compliance (aimed at ensuring that industry is meeting government's regulatory requirements), and
- enforcing requirements (aimed at compelling the mining industry to meet all compliance requirements).

In addition, we expected MoE to be ensuring continuous improvement of its compliance and enforcement program through evaluation and adjustment, and to be reporting the results of its activities to the Legislature and the public.

PART 2: MINISTRY OF ENVIRONMENT

KEY FINDINGS



1. Planning

We expected MoE's compliance and enforcement program to be based on a clear strategic plan that included goals, objectives and performance indicators. It would also describe how the ministry was coordinating its activities with MEM. We also expected MoE's strategic plan to be supported by appropriate resources, training, expertise and tools.

We found that MoE has developed a compliance management framework that outlines its approach to ensuring compliance. This program structure, which has been in place since 2007, includes the principles, goals and objectives that guide compliance-related work. The ministry has also established policies and objectives for setting permit requirements, promoting compliance, verifying compliance and enforcing requirements. However, we found that MoE's implementation of these activities for mining has been constrained by limited resources.

Coordination with MEM

In 2009, the provincial government introduced a policy for a coordinated and integrated approach to natural resource management in the mineral exploration and mining sectors of B.C. We expected MoE and MEM to coordinate their compliance and enforcement planning and activities because they have an overlapping mandate to protect the environment. Instead, however, we found that MoE's inspection planning is not coordinated with that of MEM, nor does MoE regularly advise MEM of the non-compliance and enforcement actions it has taken. Although MoE and MEM have developed the "Memorandum of Understanding for the Environmental Management of Mining Projects," that document has been in draft form since 2012.

This lack of coordination reduces the effectiveness and efficiency of MoE's compliance and enforcement actions and increases the likelihood of environmental risks not being addressed.

Resources, expertise, training and tools

To do their work effectively, regulatory authorities need access to the physical, technical and financial resources they require to meet their mandate and scope of work. Management should therefore aim to attract and retain qualified and experienced program staff by offering reasonable remuneration

and professional development opportunities. As well, management should ensure that staff have the necessary tools to do their job.

Resources

We expected MoE to have determined the resources it needs to undertake an effective compliance and enforcement program. We found this was not the case.

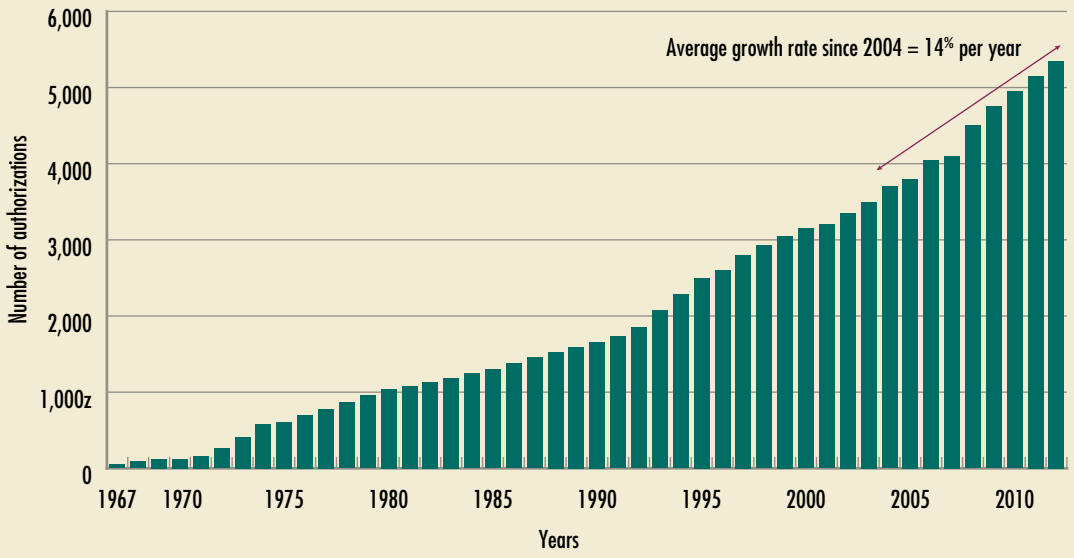
Over the past decade, workloads within the Regional Operations Branch have been increasing, and resources decreasing. According to the branch, its number of full-time employees in 2014 was a 29% drop from 2012 levels. At the same time, the number of authorizations under the *Environmental Management Act* has been increasing since 1967, by an average of 14% a year (see Exhibit 25).

We found numerous examples of declining staff morale. Many of the staff we interviewed indicated that this decline was due to increasing workloads and their inability to adequately meet the ministry's mandate of protecting the environment.

MoE reorganized the branch in 2014 to create a dedicated compliance team. The 13 members of the team are tasked with ensuring compliance in dozens of complex industries, from municipal sewage management and pulp and paper, to oil and natural gas and mining. These industries account for more than 5,500 *Environmental Management Act* authorizations, meaning each compliance team member could have around 400 authorizations to monitor and/or inspect.

We found that inspectors are not managing this workload. For instance, inspectors are not meeting

Exhibit 25: Total authorizations issued under the *Environmental Management Act*, 1967–2012*



*This includes total authorizations issued related to permit amendments, Codes of Practice and Regulations, and Operation Certificates. It also includes abandoned, cancelled, expired, suspended, and withdrawn transations.

Source: Office of the Auditor General of British Columbia, adapted from MoE data

MoE's policy to annually inspect mine sites. We concluded that MoE's resourcing levels are likely the causation.

Expertise and training

Mining is a complex and constantly changing industry that requires knowledge and expertise in many technical disciplines. We expected MoE staff to have the necessary qualifications and experience to carry out inspections and enforcement and to review industry's self-reporting data. We found that MoE's compliance team, as a whole, has an insufficient level of expertise in mining. Under the ministry's compliance and enforcement model, staff are expected to inspect a range of industries: there is no requirement for inspectors to have experience in mining.

MoE has recently seen an exiting of staff with mining experience, the result of both natural attrition (such as retirements) and in some cases, low-morale issues. As a cost-saving measure, the ministry had filled some positions with less experienced staff. This was due to the requirements of MoE's available funding and the inability to attract experienced individuals within a highly competitive mining sector.

Training for MoE staff in mining is also inadequate, and while the ministry states that it relies on mentoring, it has no formal mentorship program. According to some new staff, they are concerned that lack of training is hampering their abilities to carry out inspections.

Tools (data systems, guidance)

We expected that MoE inspectors would have necessary and appropriate tools, including data tracking systems, and policy and guidance, to perform their compliance and enforcement roles.

We learned that before 2012, MoE relied on Excel spreadsheets and hard copies of records to track its inspection and enforcement activities. A new data system was adopted in 2013, but was created on a limited budget and, as a result, had several problems:

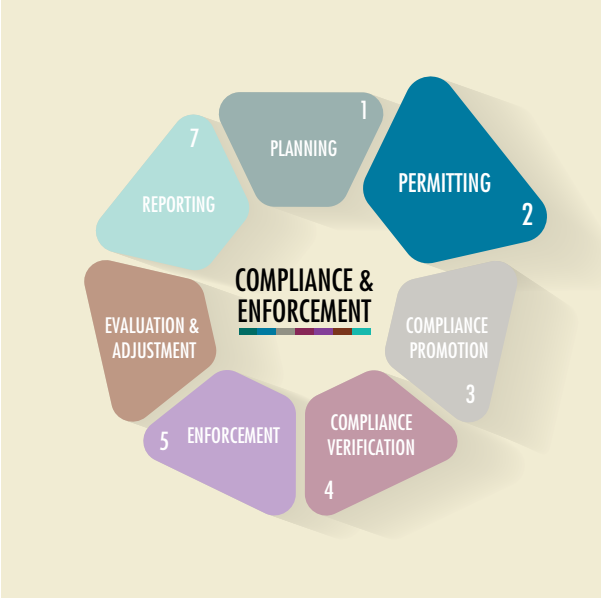
- it contained only a partial history of compliance and enforcement activities
- it was time consuming to use
- it did not connect to other data systems
- it was missing critical information, such as industry response to findings of non-compliance

MoE does provide general guidance to its compliance staff on the procedural steps necessary to complete an inspection under the *Environmental Management Act* and on the appropriate enforcement action, given prescribed circumstances. In addition, we found that MoE does have specific guidance for mine sites; however, it was developed by senior inspectors on their own initiative and has not been formally adopted as policy across all regions.

RECOMMENDATION 1.1

Strategic planning—*We recommend that government develop a strategic plan that would detail the activities of an integrated and coordinated regulatory approach, and the necessary capacity, tools, training and expertise required to achieve its goals and objectives.*

PART 2: MINISTRY OF ENVIRONMENT



2. Permitting

We expected permit requirements to reflect the purpose of the *Environmental Management Act* – namely, protection of the environment – and, for MoE to ensure permits are consistently written with enforceable language. We also expected that permits would ensure taxpayers are safeguarded from having to pay costs associated with the environmental impacts of mining activities (known as the **polluter-pays principle**).

In fact, we found the permits were not consistently written with enforceable language, and we found examples where the polluter-pays principle was not upheld.

Enforceability

We selected a sample of MoE's mine permits to review the wording of the requirements. We expected to see consistent use of regulatory language and measureable criteria such as thresholds and action timelines. We found that permit conditions relating to monitoring and reporting do generally include measureable criteria; however, we also found examples of imprecise and ambiguous language, such as, "in a timely fashion" and "appropriately qualified." Although MoE has a project underway to standardize clauses for new permits and amendments, little progress has been made and there are no plans to systematically review and update all historical permits.

RECOMMENDATION 1.2

Permit language—*We recommend that government ensure both historical and current permit requirements are written with enforceable language.*

Polluter-pays principle

Under the *Environmental Management Act*'s Waste Discharge Regulation, industry is charged a fee for each type of pollutant it discharges into the environment (see Exhibit 26).

This fee is intended to reflect the environmental impact of the pollutant. We found that the fee schedule has not been reviewed or revised since 2004. Thus, for some pollutants, the fees do not reflect MoE's current assessment of the environmental impacts. For example, although the element selenium can be toxic in trace amounts, MoE still classifies it as a metal and calculates the fee at the tonnage level. As a result, the fee charged to industry for discharging selenium is not proportional to the impact the element is having on the environment.

Click on the terms that are **bold** and **blue** to go to the definition in the glossary (**Appendix B**).

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Exhibit 26: Excerpt from the Waste Discharge Regulation, Table 3: Contaminant fees for effluent

Contaminant	Fee per tonne discharged		
	if payment date before March 31, 2005	if payment date between April1, 2005 - March 31, 2006	if payment date after April 1, 2006
Ammonia	$90.09	$96.50	$102.91
AOX	$239.20	$256.22	$273.24
Arsenic	$239.20	$256.22	$273.24
BOD	$18.07	$19.36	$20.64
Chlorine	$239.20	$256.22	$273.24
Cyanide	$239.20	$256.22	$273.24
Fluoride	$90.09	$96.50	$102.91
Metals	$239.20	$256.22	$273.24
Nitrogen and Nitrates	$36.01	$38.57	$41.13
Oil and Grease	$60.06	$64.33	$68.61

Source: Office of the Auditor General of British Columbia, from the *Environmental Management Act* - Waste Discharge Regulation

RECOMMENDATION 1.5

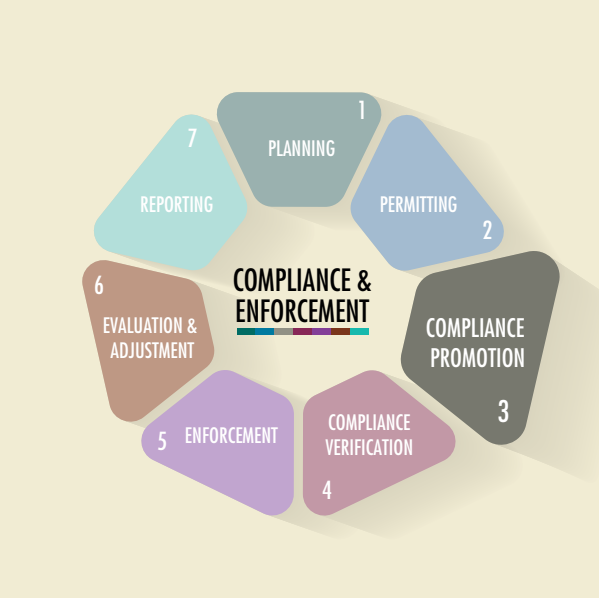
Environmental Management Act waste discharge fees—*We recommend that government review its fees under the Environmental Management Act and ensure that the fees are effective in reducing pollution at mine sites.*

The Regional Operations Branch does not recover from mine operators the cost of permitting or the cost of MoE compliance verification activities. The base fee for all *Environmental Management Act* permits is a nominal $100. This is in contrast to the province's Environmental Assessment Office, which charges a partial cost recovery for a range of services, including application assessments ($25,000–75,000), inspections ($1,700–6,500) and review of industry compliance reports ($75). The Environmental Assessment Office reports that the fees provide partial recovery of the costs incurred in delivering a high-quality program and to maintain appropriate staffing levels.

RECOMMENDATION 1.6

Cost recovery—*We recommend that government adopt a cost recovery model for permitting and compliance verification activities that is consistent across all ministries in the natural resources sector.*

PART 2: MINISTRY OF ENVIRONMENT



3. Compliance Promotion

Compliance promotion is any activity that educates and increases awareness about regulations, or that motivates or encourages voluntary changes in behaviour to comply with regulatory requirements. It is a preventative strategy that includes both compliance assistance and compliance incentive programs.

Globally, given the reduction in government resources, most countries recognize the growing importance of compliance promotion. We therefore expected MoE to have established an effective promotion program that included both compliance assistance and compliance incentives.

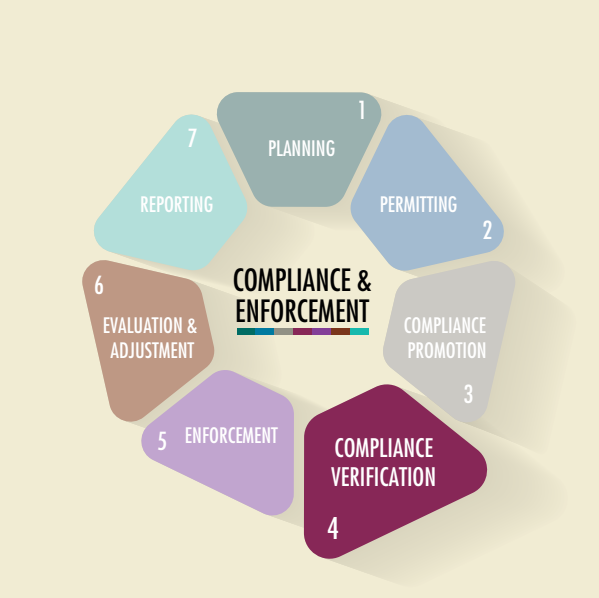
We found that, while MoE has created guidance documents to help promote industry compliance, the ministry does not know whether these materials are effectively resulting in voluntary compliance or achievement of B.C.'s environmental objectives.

We also found that MoE offers no incentives to industry, despite the *Environmental Management Act,* which allows government to create regulations "for the purpose of providing economic incentives to promote environmentally responsible behaviour."

RECOMMENDATION 1.9

Incentives—*We recommend that government create effective incentives to promote environmentally responsible behavior by industry.*

PART 2: MINISTRY OF ENVIRONMENT



4. Compliance Verification

Compliance verification refers to monitoring and inspection activities used to determine whether a mine is in compliance with legislative and regulatory requirements, including the conditions of its permit. We expected MoE to be:

- applying a risk-based approach to planning its compliance verification activities
- carrying out site inspections in keeping with its own policies
- monitoring industry reporting on compliance

We found that MoE was deficient in all these areas.

Risk-based planning

According to good practices, inspections should be based on a schedule that considers risk (weighing actual or potential impact to the environment and the likelihood of occurrence) and the need to maintain an appropriate level of contact with the regulated parties. Our expectation was that MoE would be planning its inspections based on identified risks. We recognized that MoE would be limited in addressing all the risks identified, but we expected it to identify key risks for dealing with and reporting on the residual risks.

We found that MoE used to prioritize sites based on analysis using an electronic risk-ranking tool. However, in 2014, MoE determined that staff were applying the tool inconsistently across the regions and finding it complicated and subjective to use. In the summer of 2015, MoE implemented a new risk-based planning tool to assess the risks of permits under the *Environmental Management Act*; however, it is too soon for us to conclude on the effectiveness of this new tool.

In 2014, MoE shifted its resources to assessing compliance of high risk mining operations. This focus limited MoE's ability to inspect other industries that also have *Environmental Management Act* permits – a situation that poses a risk to the ministry's overall regulatory performance.

In 2015, MoE identified this risk in its risk register, stating that there was a high risk that regulatory requirements are not adequately verified and enforced. Shifting of resources to mining has left minimal to no resources for addressing low to moderate risk activities, such as agriculture and sewage. MoE also stated that its existing mitigations to address these issues are inadequate to address this risk.

PART 2: MINISTRY OF ENVIRONMENT

Site inspections

We reviewed MoE's inspection records for 2012, 2013 and 2014 in a sample of eight mines. Among our key findings:

- MoE did not meet the minimum requirement of its policy to inspect high-priority sites annually. Only three of the eight mines we examined had received an onsite inspection by the ministry for all three years. For example, Myra Falls mine had no site inspection for 2012, 2013 or 2014 – a finding of particular concern given this site is located in a provincial park and is close to drinking water sources.
- Inspection reports were completed to the standard described in MoE's *Inspectors Manual*. However, although the manual states that such reports should be sent to the mine operator in a "timely" manner, "timely" is not defined. Some reports we reviewed were not sent to operators for months.
- An average of three different MoE inspectors conducted inspections at each of the eight mines. Given the complexity of these sites, this lack of continuity creates a risk that an inspector may not know the history of the site, and therefore may not follow up on a non-compliance issue. In addition, this situation creates the potential for inefficiencies – both for MoE staff and for mine site staff. However, this turnover of inspectors may have been the result of MoE's 2014 branch re-organization.

MoE rarely shared with MEM staff inspection plans, the findings of MoE inspections, or MoE enforcement actions taken.

We also found, from our review of four closed mines, that only one had been inspected between 2012 and 2014. For example, Shasta-Baker mine received no inspections, despite a history of significant non-compliance issues (see sidebar on page 60).

RECOMMENDATION 1.10

Risk-based approach—*We recommend that government develop a risk-based approach to compliance verification activities, where frequency of inspections are based on risks such as industry's non-compliance record, industry's financial state, and industry's activities (e.g., expansion) as well as risks related to seasonal variations.*

Monitoring of industry reports

We expected that MoE would, at a minimum, ensure that reports required under each permit were being received and reviewed in a timely manner and would have policies and guidance around Qualified Professionals (QP).

Each effluent permit for a mine has reporting requirements that include annual, quarterly and/or monthly reporting. We found that MoE does not have a clear process for MoE staff that identifies when and to what level of scrutiny a mine's self-reported data, typically prepared by QPs, is reviewed. In the sample of mines we reviewed, all were missing MoE reviews of either the annual or quarterly reports submitted by

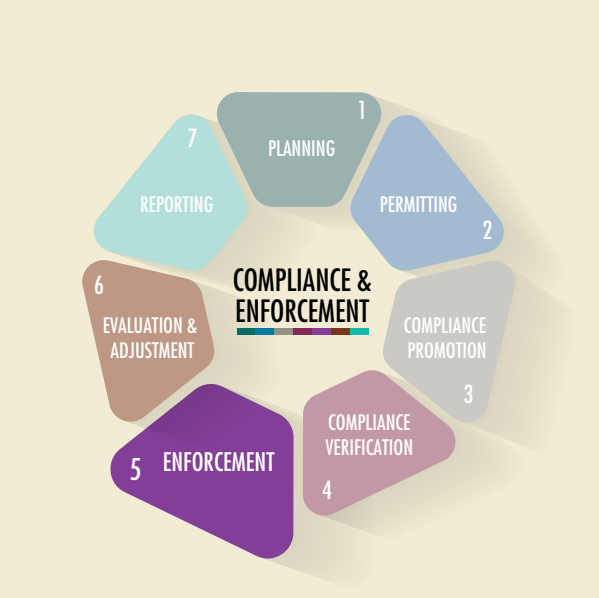
industry. We could not determine statistics for monthly reports, as they were not logged into MoE's system. The ministry was also not ensuring that all reports submitted by QPs were received according to the timeline specified in the permits. MoE told us that it does not have the resources to review all reports submitted by industry.

RECOMMENDATION 1.12

Qualified Professionals—*We recommend that government establish policies and procedures for the use and oversight of qualified professionals (QP) across the natural resource sector. These policies and procedures should have the following:*

- *guidance for staff that outlines the specific nature and amount of oversight expected of a QP's work*
- *guidance for staff as to expected timeframe for review and response to QP reports*
- *updated guidance for staff for recognizing and responding to misconduct by a QP*
- *controls in place to ensure that there is no undue influence on the QPs by industry*
- *controls in place to ensure that recommendations by QPs are adhered to*

PART 2: MINISTRY OF ENVIRONMENT



5. Enforcement

Enforcement is the backbone to any compliance program. It is the final line of defence against environmental degradation. According to good practices, strategies involving education, assistance, monitoring, inspections and incentives are effective only if backed by a credible threat of enforcement sanctions.

To be effective, enforcement programs must involve:

- swift and predictable responses to violations, and
- responses that include appropriate sanctions.

Swift responses to violations

We concluded that MoE generally does not have a swift response to non-compliance. In our sample of mines, only half of the enforcement responses specified timeframes as to when the ministry expected remedy actions to be completed. However, because MoE's inspection policy and procedures do not call for inspectors to track an industry's timely return to compliance, we cannot conclude whether even those timelines from the sample were met.

RECOMMENDATION 1.14

Policies, procedures and tools—*We recommend that government develop policies, procedures and enforcement tools for responding to non-compliances when industry does not meet the timeline specified by the ministry.*

Predictable responses to violations

MoE has a number of guidance documents that assist inspectors in applying a predictable response appropriate for a particular infraction. We noted that MoE relied heavily on notifications and warnings of future enforcement actions rather than applying a stronger tool, such as an order, that would require immediate action to remedy the non-compliance.

MoE's own review of compliance responses from 2012 to 2014 indicates that advisories and warnings in response to infractions identified during mining inspections accounted for an average of 89% of all enforcement actions.

Responses that include appropriate sanctions

MoE has a range of tools available to address non-compliance (see Exhibit 27). Until recently, this suite of tools did not include the ability to impose a financial penalty without going to court.

In 2014, the ministry addressed this gap by adding administrative penalties – where penalties for contravention can range from $2,000 to $75,000 a day. Previously, MoE staff could only issue a ticket with a maximum financial penalty of $575.

Bringing these administrative penalties into effect took over 30 years: they were recommended by the Auditor General in 1981 and were also suggested by staff in MoE's *Pollution Prevention Review* in 2001.

We cannot comment on the effectiveness of this new tool as MoE had not yet used it, at the time of our audit.

In MoE's compliance model, Environmental Protection Officers who carry out the inspection of mine sites are empowered to issue only advisories or warnings. Higher levels of enforcement – such as orders, administrative sanctions and administrative monetary penalties – must be authorized by the Director (statutory decision-maker). Other actions, such as tickets or an investigation that may lead to prosecution, are directed to the Conservation Officer Service.

The Major Investigations Unit of the Conservation Officer Service may receive enforcement referrals on mining-related issues from the Environmental Protection Officers. As noted earlier, this unit currently has 10 full-time staff and six vacancies. During our audit, six of these staff members were working full time on the Mount Polley mine investigation. This level of staffing creates a risk that enforcement actions at other mine sites will not be swift and non-compliances may persist.

Exhibit 27: Ministry of Environment's tools to address non-compliance

Advisory: Written notice sent to a non-compliant party about the non-compliance and with the expected course of action often recommended.

Warning: Similar to an advisory; however, warnings differ in that they warn of the possibility of an escalating response should non-compliance continue.

Order: Written legal instruments issued by designated ministry officials. Non-compliance with an order creates an offence and may be prosecuted accordingly.

Administrative sanction: Revocation or suspension of a ministry-issued permit, licence and other administrative instrument.

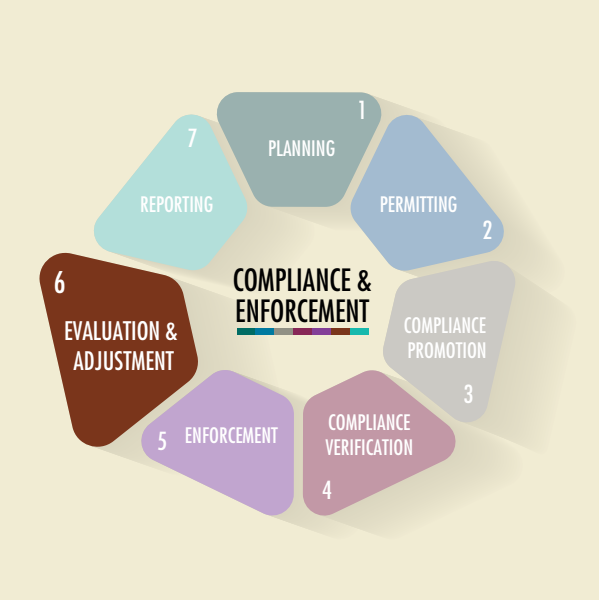
Administrative monetary penalty (NEW): Discretionary financial penalty that can be imposed by designated ministry statutory decision-makers on those failing to comply with a particular provision of a statute, regulation or the terms of an authorization. These penalties can be administered with less onerous procedural and legal requirements than done by a court.

Restorative justice: Uses dispute resolution principles to create an inclusive forum designed to promote offender accountability, repair the harm caused by the offence, and restore compliance.

Ticket: A summary means of dealing effectively and quickly with the most minor offences.

Court prosecution: A legal proceeding that is recommended by the Ministry of Environment but initiated by Crown counsel to hold accountable a person or company alleged to have committed an offence.

PART 2: MINISTRY OF ENVIRONMENT



6. Evaluation & Adjustment

Evaluation is a critical, yet often overlooked part of environmental management that leads to greater awareness of whether regulators are successfully achieving the desired environmental outcomes.

We expected MoE to be regularly evaluating the permitting, compliance promotion, compliance verification and enforcement aspects of its program, and to be making adjustments as needed to achieve continuous improvement.

We found, however, that the ministry does not have a formal process to evaluate the effectiveness of any of its activities in compliance promotion, compliance verification or enforcement. While MoE does track the outputs of its compliance verification activities, it has not developed performance measures and does not track the effectiveness of those activities.

Ministry staff have indicated that because they do not have the resources for evaluation, identifying key performance indicators and evaluating performance information is not a priority.

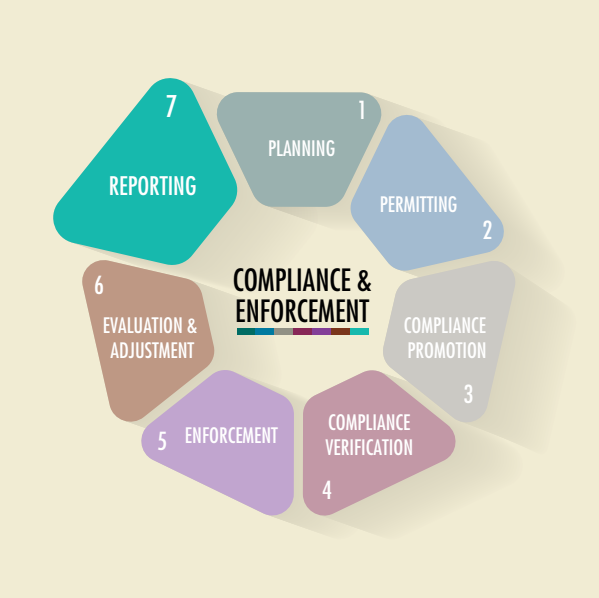
We concluded that MoE, by not having a commitment to formal evaluation, is:

- not meeting the good practices it has set for itself (for example, MoE's 2012 *Compliance Summary* states, "Compliance activities must be linked to the effectiveness of the existing tools, the effectiveness of the preventative measures taken, and the assurance that significant pollution concerns are identified on an on-going basis"),
- unable to determine whether its activities are effective and aligned with government's goals, and whether improvements are necessary, and
- unable to report to government or the public on the effectiveness or impact of its activities.

RECOMMENDATION 1.15

Evaluation & adjustment—*We recommend that government regularly evaluate the effectiveness of its compliance promotion, compliance verification, and enforcement activities and tools, and make changes as needed to ensure continuous improvement.*

PART 2: MINISTRY OF ENVIRONMENT



7. Reporting

Regular, timely, and fair reporting of results to the Legislative Assembly and the public is important to maintaining confidence in the activities of the environmental management program. We therefore expected MoE to be reporting on its performance as a regulator and on the performance of the mining industry.

We found that MoE publicly reports the enforcement actions it takes on cases of non-compliance that meet the ministry's test of administrative fairness (orders, administrative sanctions, administrative monetary penalties, tickets, restorative justice forums, and court convictions). However, MoE does not publicly report on its annual compliance activities, or on the performance of regulated parties in a comprehensive and meaningful manner.

For example, MoE does not report on the number and type of inspections completed, rates of non-compliance, enforcement actions, or effectiveness of its activities in reducing non-compliance and in mitigating environmental impacts of non-compliance. Most importantly, MoE does not communicate the long-term environmental risks associated with managing water contamination.

All of these deficiencies in reporting are inconsistent with MoE's compliance and enforcement framework.

RECOMMENDATION 1.16

Public reporting—*We recommend that government report publicly the:*

- *results and trends of all mining compliance and enforcement activities*
- *effectiveness of compliance and enforcement activities in reducing risks and protect ting the environment*
- *estimated liability and the security held for each mine*

PART 2: MINISTRY OF ENVIRONMENT

DEGRADED WATER QUALITY IN THE ELK VALLEY

Summary

The lack of sufficient and effective regulatory oversight and action by the Ministry of Environment (MoE) to address known environmental issues has allowed degradation of water quality in the Elk Valley (located in southeastern B.C.).

Coal mining in the area for over 100 years, has resulted in high concentrations of selenium in the water system. As selenium accumulates up the food chain, it can affect the development and survival of birds and fish, and may also pose health risks to humans.

For 20 years, MoE has been monitoring selenium levels in the Elk Valley and over that time has noted dramatic annual increases of selenium in the watershed's tributaries. MoE tracked this worsening trend, but took no substantive action to change it. Only recently, has the ministry attempted to control this pollution through permits granted under the *Environmental Management Act*.

We examined the Line Creek Expansion Permit, the Area-Based Management Plan and the Area-Based Management Permit (Valley Permit)[7] to understand how they support MoE's responsibility to minimize risks to the environment. We found that these documents do not address several risks, including the following:

- MoE staff, with input from external experts, concluded that the selenium levels in the proposed Line Creek Expansion Permit were not likely protective of the environment. The statutory decision-maker could not approve the permit. Subsequently, the permit was granted by Cabinet. This was the first time that Cabinet used this approval process. The rationale for the decision was not publicly disclosed.
- The Line Creek Expansion Permit allows mining activities to be extended into an area inhabited by Westslope Cutthroat Trout, a species listed as being of "special concern" under the federal *Species at Risk Act*. This approved expansion of mining operations creates a risk of further decline of this species.
- The Area-Based Management Plan commits industry to developing six water treatment facilities in the Elk Valley. This creates a future economic liability for government to monitor these facilities in perpetuity and ensure that they are maintained.
- There is a risk that if MoE is unable to enforce the Area-Based Management Permit and the mine exceeds its permit limit for selenium at Lake Koocanusa, the outcome could be a violation of the 1909 *Treaty relating to boundary Waters and Questions arising along the Boundary between Canada and the United States* (the Treaty). The Treaty forbids the pollution of water bodies on either side of the border.
- The levels for selenium in the Area-Based Management Permit are inconsistent with the **precautionary principle**.a

[7] Line Creek mine is one of 5 coal mines that Teck is operating in the Elk Valley.

The ministry has not disclosed these risks to legislators and the public.

Ultimately, despite the addition of water treatment facilities, the current permit levels of selenium are above the water quality guidelines set by B.C. to protect aquatic life, and for human health and safety. Selenium from both historical mining activities and the ongoing expansion is likely to continue to impact the environment far into the future.

Background

The Elk Valley is located in the southeastern corner of B.C. and includes the communities of Elkford, Sparwood and Fernie. Within the valley's watershed is Lake Koocanusa, which extends south, crossing the Canada–U.S. border into Montana and feeding into the Columbia River system. Some of the river systems in the valley support the Westslope Cutthroat Trout, a species officially listed under the federal *Species at Risk Act* as being of "special concern."

Coal has been mined in the Elk Valley for over 100 years, but only in the past four decades has large-scale extraction resulted in open pits and massive waste dump sites. Currently, there are five major coal mines operating in the valley (see Exhibit 28). In 2008, Teck, which owned a minor stake in the Elk Valley Coal Partnership, purchased all of these coal mines. Several of these mines were operating for many years before Teck's purchase. Both past and recent mine operations and expansions have resulted in a significant increase in the concentration of selenium in river and tributaries in the Elk Valley.

Exhibit 28: Location of the five operating coal mines in the Elk Valley



Source: Office of the Auditor General of British Columbia, based on Teck Coal Ltd.'s Elk Valley Area-Based Management Plan

While selenium is naturally occurring and trace amounts are necessary for the health of many organisms, including humans, it is toxic in excess amounts.

The accumulation of selenium occurs over time as water leaches the element from the waste rock generated by mining activities. Once selenium gets into streams, lakes and other waterways, it is carried up the food chain, becoming more concentrated in the process. The result in fish is reduced growth,

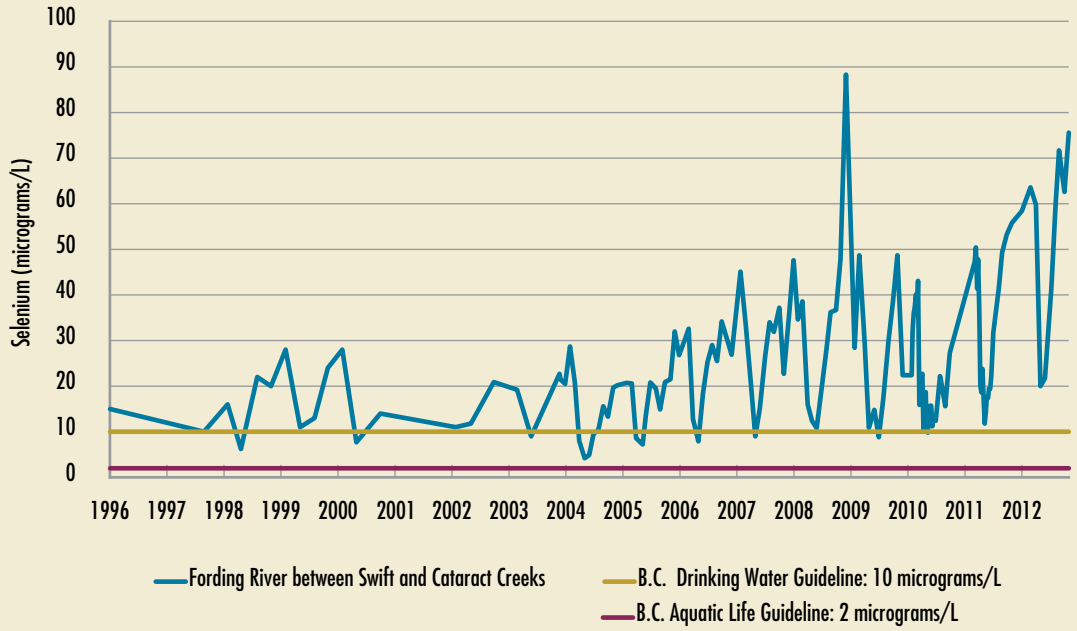
behavioural changes, greater incidence of deformity and increased rates of mortality. For birds, the result is reduced egg hatchability and greater incidence of deformity in the chicks that do hatch.

Selenium was not identified by MoE as an environmental issue in the Elk Valley until 1995, even though studies from the U.S. were citing it as a concern as early as the 1970s. In 1996, MoE began a selenium monitoring program and in 1998 established the Elk Valley Selenium Task Force (EVSTF) - a group consisting of representatives from MoE, MEM, Environment Canada and the mine company.

The EVSTF commissioned an independent group to monitor selenium levels in the valley and conduct research over the next 10 years. In 2008, the EVSTF held a workshop to determine regulatory limits for selenium in the Elk Valley. It then recommended, as its highest priority, site-specific water quality objectives. None of these objectives were put into the permits until 2014.

MoE monitoring data from 1996 to 2012 shows that selenium levels in the Fording River are increasing annually at a rate of approximately 13% within the Fording River, and 8% within the Elk River. These levels are well above B.C.'s guidelines for drinking water and aquatic life (see Exhibit 29).

Exhibit 29: Selenium levels in the Fording River, Elk Valley, 1996–2012



Source: Office of the Auditor General of British Columbia, adapted from MoE data

PART 2: MINISTRY OF ENVIRONMENT

In 2009, Teck proposed to expand its mine at Line Creek. This expansion, on top of growing MoE and public concern about pollution in the area, prompted the Minister of Environment to issue a ministerial order in April 2013, calling for the mine company to develop an Elk Valley Area-Based Management Plan. This plan (and associated management permit) was to apply to all of the company's mines in the valley.

The plan was approved by the Minister of Environment and the permit was approved by the Director in 2014. The permit directs the mine company to:

- immediately take action to stabilize water quality concentrations of selenium
- in the medium term, set targets for the progressive reduction in water quality concentrations of selenium
- in the longer term, take action to reduce concentrations of selenium further
- sets timelines for the establishment of water treatment plants
- set out monitoring and reporting requirements

The desired outcomes of the plan and permit include protection of the health of aquatic ecosystems, groundwater and humans.

Our Audit

Permit requirements are the means through which outcomes, such as the protection of the environment, are expected to be achieved.



Click on the terms that are **bold** and **blue** to go to the definition in the glossary (**Appendix B**).

The Line Creek mine in the Elk Valley was one of the mines our Office selected to sample for this audit. Early in our review, we learned that Line Creek was part of a larger government initiative to better manage the selenium issue in the entire Elk Valley region. That initiative, the creation of an Area-Based Management Plan and resulting Valley Permit, was a new undertaking for MoE.

We therefore reviewed the permits and the Area-Based Management Plan to determine whether the regulatory requirements would enable the ministry, through its compliance and enforcement of these permits, to achieve its objective of protecting the environment.

We expected MoE to be proactive in setting **precautionary** limits in the permits, and to be writing the permits in a way that supports enforceability and reflects the polluter-pays principle.

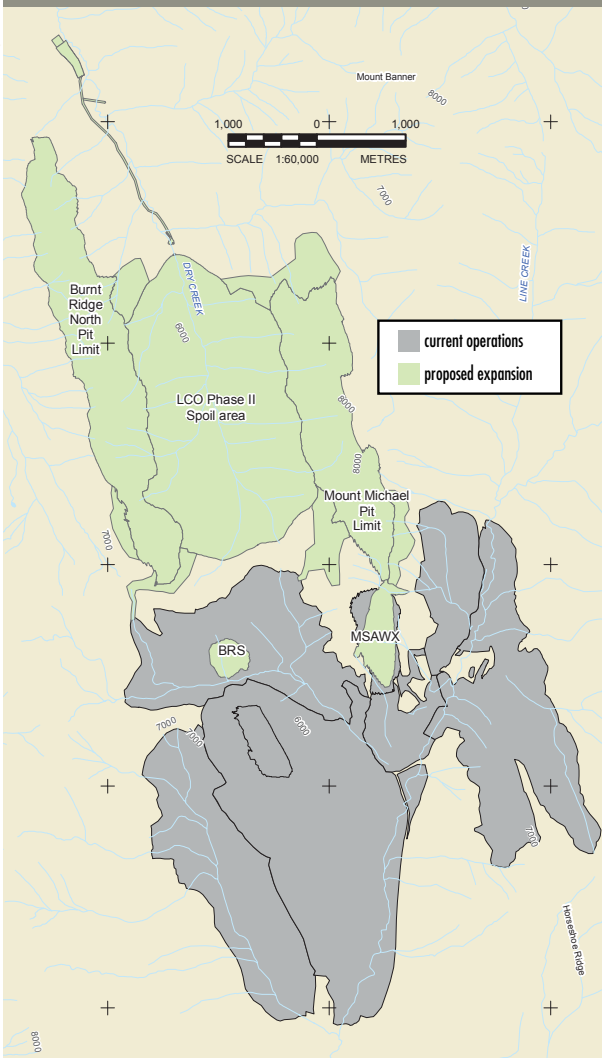
Line Creek Expansion Permit

The Line Creek operation is located about 25 kilometres north of Sparwood. It has been in production for the past 33 years and produces 3.5 million tonnes of coal annually. The permit would allow an extension of the current operation and would extend the life of the mine for an estimated additional 18 years (see Exhibit 30).

The Line Creek Expansion Permit allows mine development into an area that is currently not affected by selenium accumulation. This area also provides habitat to Westslope Cutthroat Trout, a fish species listed under the federal *Species at Risk Act* as being

PART 2: MINISTRY OF ENVIRONMENT

Exhibit 30: Map of Line Creek Expansion

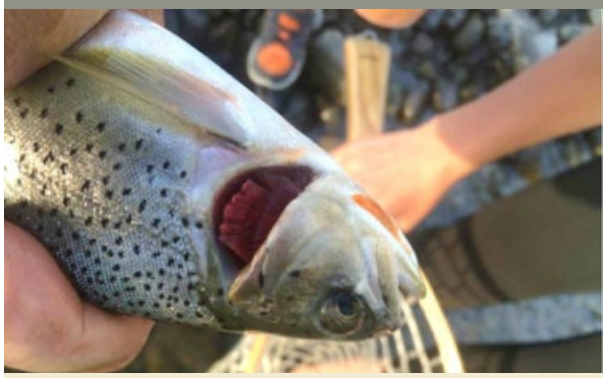


Source: Office of the Auditor General of British Columbia, adapted from Teck's Environmental Assessment Office Application in 2011

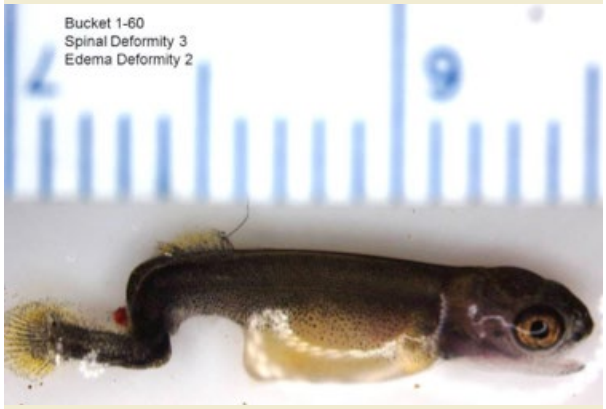
of "**special concern**." Both MoE and Environment Canada have identified other areas of the Elk Valley where the trout are impacted by selenium (see Exhibit 31).

When MoE scientists reviewed the selenium levels proposed for the Line Creek expansion, they concluded that the levels "are not likely protective of environmental resources in the Elk Valley." These concerns were echoed by the U.S. Environmental Protection Agency and other scientific experts.

Exhibit 31: The impact of selenium on Westslope Cutthroat Trout in the Elk Valley



Missing gill cover in Westslope Cutthroat Trout



Spinal skeletal deformity in Westslope Cutthroat Trout fry

Source: Environment Canada, *Environmental Sampling in Areas Affected by Coal Mining in the Elk and Fording River Watersheds of South Eastern British Columbia, 2012–2014*

PART 2: MINISTRY OF ENVIRONMENT

The "statutory decision-maker" (see sidebar) could not approve the permit under section 14 of the *Environmental Management Act* (EMA) which states that the statutory decision-makers may authorize a permit only if it includes *requirements for the protection of the environment.*

ROLE OF THE STATUTORY DECISION-MAKER

> *"Statutory Decision-Makers must be impartial and independent. They are required to make decisions fairly and in accordance with the applicable legislation. They cannot be fettered in the exercise of their statutory powers; they must make decisions independently, free from undue influence of any party within or external to the Ministry."* ~ Source: Ministry of Environment, Statutory Decision-Making Handbook, 2013

Subsequently, a decision was made by government to approve the permit under section 137 of EMA. This clause, which allows Cabinet to approve a permit where it is in the public interest to do so, had never been used before. There is no definition in the *Environmental Management Act* as what defines "public interest," but the Act states that Cabinet may consider factors outside the scope or mandate of the Act. Cabinet did not provide the public or legislature with the rationale for why the permit was in the public interest. This creates a risk that the public or legislature will not be informed about what factors (economic, environmental, social) were considered in decision-making.

We also found that the Line Creek Expansion Permit has a site performance objective for selenium that allows five times the amount set in B.C.'s water quality guidelines for aquatic fish. We concluded that government, in granting the permit, did not publicly disclose the implications these permit levels will have in this area where the expansion will extend the life of this mine for an additional 18 years and produce an additional 3.5 million tonnes of coal annually.

As well, we expected MoE's permits to reflect the polluter-pays principle. We found, however, that under the Line Creek Expansion Permit, the mine company is charged only about $5,000 a year for emitting selenium pollution. This is not reflective of the known environmental impact of selenium.

The Area-Based Management Plan

Under the ministerial order, Teck was directed to create an Area-Based Management Plan. The plan commits the mine company to building six water treatment facilities in the Elk Valley, one of which has already been constructed at the cost of $105 million to the company. Teck and the Province anticipate that these water treatment facilities will operate in perpetuity, resulting in long-term obligations for both parties. The mine company must maintain these facilities, and the province must monitor the facilities to ensure that permit conditions are met. In addition, the provincial government has oversight of these activities and would accept additional responsibilities if the mine operator was to default on its obligations.

PART 2: MINISTRY OF ENVIRONMENT

The Area-Based Management Permit

The Area-Based Management Permit was meant to reflect the ministerial order of stabilizing and reducing selenium. We therefore expected the levels of selenium set in the permit to reflect the order. Instead, we found that the permit levels of selenium for most areas exceed the known historical levels in the Elk Valley (see Exhibit 32).

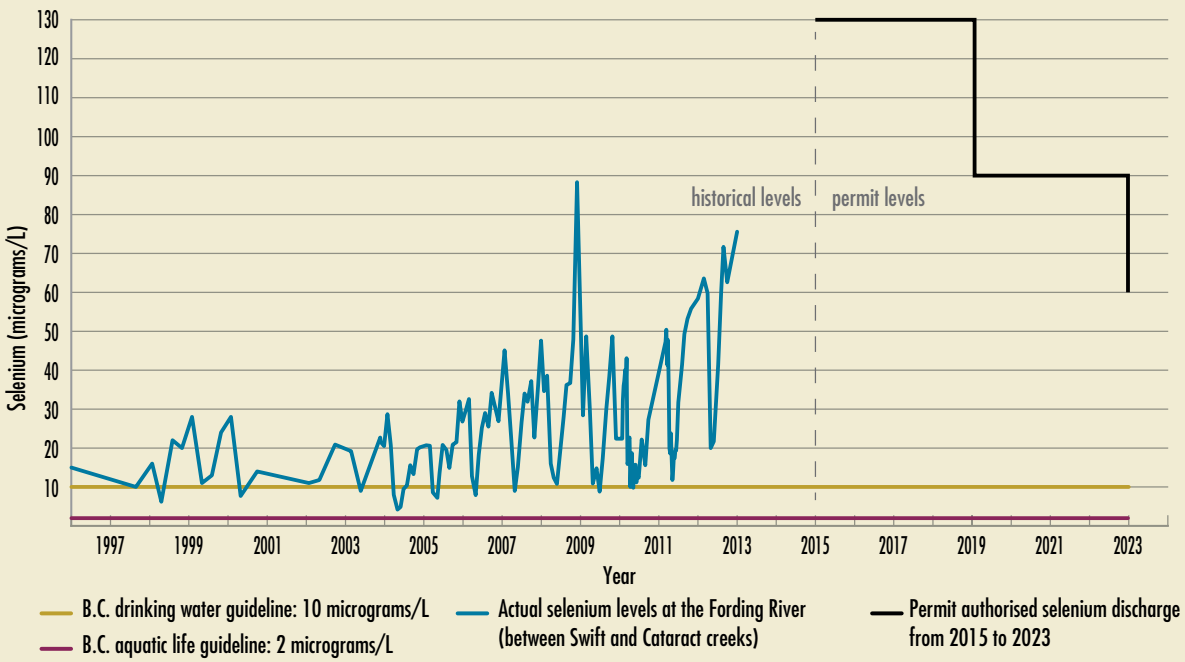
MoE has stated that this increase in permitted level is necessary because of greater leaching of selenium from old waste rock. However, this permitted level was modelled based on data not only for historic sites – but also for the planned expansion, which will see a doubling, by the year 2034, of the waste rock in the Elk Valley from 2012 levels.

Once water treatment facilities are in place there will be a reduction in the permitted selenium; however, the selenium levels allowed in the permit for 2023 still range from being 10 to 30 times the ministry's aquatic guidelines of 2 micrograms of selenium per litre of water (see Exhibit 33).

It is not clear how these high selenium levels will meet government's objective to protect the health of aquatic ecosystems, groundwater and humans in the Elk Valley.

The Area-Based Management Permit sets out the amount of selenium that the mine company is permitted to discharge into the Elk Valley. Rivers in the valley drain into Lake Koocanusa, which spans the

Exhibit 32: Historical levels and permitted levels of selenium in the Fording River[8]



Source: Office of the Auditor General of British Columbia, adapted from the MoE data and the Elk Valley Permit

[8] The historical and permit levels are not from the exact same site on the Fording River.

Canada–U.S. border. The Area-Based Management Permit creates a risk that if MoE is unable to enforce the permit and the mine company exceeds its permit limit for selenium at Lake Koocanusa, the outcome could be a violation of the 1909 Treaty relating to boundary Waters and Questions arising along the Boundary between Canada and the United States (the Treaty) that forbids the pollution of water bodies on either side of the border.

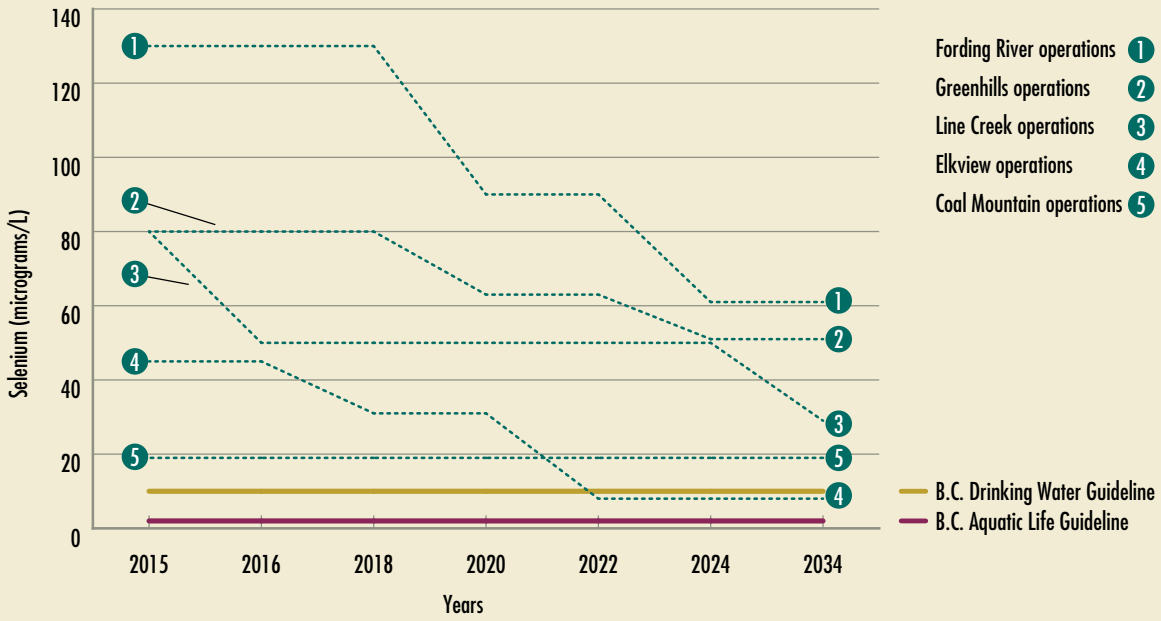
Over the past three years, the U.S. Environmental Protection Agency (EPA) has written to MoE with concerns about the cumulative effect of contaminants from the coal mines in the Elk Valley on Lake Koocanusa and the Kootenai River in Montana. The EPA has stated that the current limit for selenium of 2 micrograms per litre (in freshwater) specified in the valley-wide permit is higher than the current average selenium concentrations in the lake. According to the EPA, the selenium levels contemplated by the B.C. government will result in an increase in selenium in the area, not a stabilization or reversal of levels, as was promised in the ministerial order issued in 2013.

These risks have not been clearly reported to legislators or the public.

RECOMMENDATION 1.7

Decision-making—Use of section 137 of the Environmental Management Act—
We recommend that government publicly disclose its rationale for granting a permit under section 137 of the Environmental Management Act. Specifically, information should include how factors such as economic, environmental, and social attributes were considered in the determination of public interest.

Exhibit 33: Permitted selenium (monthly averages) for all Teck mines in the Elk Valley



Source: Office of the Auditor General of British Columbia, based on MoE's Permit 107517 (for Teck)

APPENDIX A: AUDIT EXPECTATIONS AND SCOPE

Exhibit A1: Seven key elements of a comprehensive compliance and enforcement program



Source: Office of the Auditor General of British Columbia, adapted from the Organisation for Economic Co-Operation and Development's *Ensuring Environmental Compliance: Trends and Good Practices* and MoE's *Compliance Management Framework*

OUR EXPECTATIONS

In this audit, we expected the Ministry of Energy and Mines (MEM) and Ministry of Environment (MoE) to have strategic plans that would detail the activities of their compliance and enforcement programs, including how the two ministries intended to work together. We also expected the plans to demonstrate how the ministries were achieving their objectives of ensuring the protection of the environment. We looked for activities that would include all the elements of what good practice states are crucial to ensure compliance (see Exhibit A1). Such practices include:

- setting regulatory requirements that are enforceable
- promoting compliance (to achieve high rates of voluntary compliance)
- verifying compliance (to ensure that industry is meeting government's regulatory requirements)
- enforcing requirements (to compel the mining industry to swiftly return to compliance)

As well, we expected MEM and MoE to be ensuring continuous improvement of their compliance and enforcement program through evaluation and adjustment, and to be reporting out to the Legislative Assembly and the public on the results of their activities.

We based our audit expectations on:

- regulatory requirements of the *Ministry of Energy and Mines Act*, the *Mines Act*, the Health, Safety and Reclamation Code for Mines in British Columbia, the *Environmental Management Act*, and the *Waste Discharge Regulation*
- MEM's and MoE's policies and guidance
- advice of subject matter experts
- international good practice, including that of the International Network for Environmental Compliance and Enforcement

APPENDIX A: AUDIT EXPECTATIONS AND SCOPE

AUDIT SCOPE

We conducted this audit in accordance with the standards for assurance engagements set out by the Chartered Professional Accountants of Canada (CPA) in the CPA Handbook – *Assurance and Value-for-Money Auditing in the Public Sector*, Section PS 5400, and under the authority of section 11(8) of the *Auditor General Act*.

We carried out our work between November 2014 and July 2015. This included a detailed examination of compliance and enforcement activities that took place at a sample of mines from 2012 to 2014. However, the long and complex history of mining meant that we reviewed documentation outside this timeframe.

Our work involved:

- interviewing:
  - MEM and MoE executives and program area staff
  - Natural Resources Canada staff
  - First Nations Energy and Mining Council staff
  - mining company employees
  - qualified environmental professional contractors
  - mining engineers
- verifying MEM and MoE policies, business practices and processes
- reviewing mine permits, inspection reports, enforcement actions and other documentation
- making site visits to a selection of regional MEM and MoE offices, and operating and closed mines in B.C.

APPENDIX A: AUDIT EXPECTATIONS AND SCOPE

The scope of our audit work is summarized below:

	In Scope	Out of Scope
Entities	MoE (mainly the Environmental Protection Division) and MEM (Permitting Branch)	◆ The Ministry of Forests, Lands and Natural Resource Operations ◆ Environmental Assessment Office
Program area	Provisions in the *Mines Act*, the Health, Safety and Reclamation Code for Mines in British Columbia, and the *Environmental Management Act* related to the protection of the environment	◆ Health and safety of mine workers ◆ Cultural heritage resources
Mine phases	operation/production and closure	◆ exploration, development/construction ◆ abandoned mines (i.e. permit obligations have been satisfied and the mineral claims have reverted to the government) ◆ closed mines that predated 1969 (when reclamation was added to the *Mining Act*)
Mine type	Major mines (metal and coal)	◆ Small mines (Gravel pits, quarries, industrial, and placer mines)

APPENDIX B: GLOSSARY

Abandoned mines: As defined under the *Mines Act*, mines are classified as abandoned when all permit obligations have been satisfied and mineral claims have reverted to government.

Acid rock drainage: Acid rock drainage is formed by the natural oxidation of sulfide minerals when they are exposed to air and water. Activities that involve the excavation of rock with sulfide minerals, such as metal and coal mining, accelerate the process.

Beach: A gently sloping surface of tailings against the upstream face of a tailings dam embankment. Beaches can serve as a buffer to maintain separation between water in the tailings pond and the embankment structure.

Buttress: An external support built to reinforce a structure (such as a tailings storage facility) by increasing stability.

Closed mine: As defined under the *Mines Act*, mines are classified as closed when all mining activities have ceased; however, the permit holder remains responsible for compliance with the legislated requirements and the permit.

Contingency fund: Funding that government sets aside to accommodate the financial consequences of unanticipated events.

Financial security deposit: The Government of British Columbia collects a financial security deposit from mining companies that can be used if a company defaults on its reclamation obligations. This security is only returned once the mine site has been reclaimed to a satisfactory level and there are no ongoing monitoring or maintenance requirements. The intent of the government's reclamation legislation is to help ensure that modern mine sites in B.C. do not leave an ongoing legacy or require public funds for clean-up activities.

Heavy metal and non-metal leaching: Leaching can occur when minerals containing heavy metals and non-metals (such as arsenic, copper, cadmium, lead, zinc and selenium) in excavated rock or exposed mine walls come into contact with water and then seep from the rock into the environment. Metal and non-metal dissolving and transportation may be accelerated in the acidic conditions created by acid rock drainage.

Mine operator: The mining company, under Section 21 of the *Mines Act*, appoints a mine operator to be responsible for the management and operation of mine

Ore: Mineralized rock containing a valued metal (such as gold or copper) or other mineral substances (such as coal).

Open pit mining: A method of surface mining that can be utilized when valued substances are found near the surface—it involves extracting rock or minerals from open pits.

APPENDIX B: GLOSSARY

Pollution: The presence in the environment of substances or contaminants that substantially alter or impair the usefulness of the environment.

Polluter-pays principle: States that the party responsible for environmental damage should bear the associated costs of the clean up.

Placer mining: A type of mining that involves mining stream bed deposits for minerals. Placer mining is frequently used for precious metal deposits, particularly gold and gemstones.

Precautionary principle: When human activities may lead to unacceptable harm that is scientifically plausible but uncertain, the precautionary principle states that actions should be taken to avoid or diminish the harm.

Reclamation: The process of restoring land, watercourses and cultural heritage resources that have been mined to a safe and environmentally sound state and to an acceptable, productive end use. For successful site reclamation, activities must be carried out concurrently with mining activities, rather than being left until mine closure; this is referred to as progressive reclamation. Since 1969 in British Columbia, mining companies have been required by law to reclaim all lands disturbed by mining and related activities. There are broad reclamation standards within the Health, Safety and Reclamation Code (Part 10.7) for revegetation, growth media, metal uptake, landforms, watercourses, water quality, disposal of chemicals and re-agents, and monitoring and post-closure land use.

Regulatory Capture: This is the process by which regulatory agencies eventually come to be dominated by the very industries they were charged with regulating. Regulatory capture happens when a regulatory agency, formed to act in the public's interest, eventually acts in ways that benefit the industry it is supposed to be regulating, rather than the public.

Qualified professional: For the purposes of this report, qualified professionals are individuals employed or contracted by a mining company that are qualified to practice in B.C. in their relevant professional discipline (engineers, biologists, etc…).

Species of "special concern:" Under the federal *Species at Risk Act*, a species of special concern is wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Tailings: A by-product of the mining process that is left over after separating the valuable materials from the uneconomic portion of ore. Tailings are typically a mixture of sandy silt with a trace of clay particles.

Tailings Storage Facility: A structure built for the purpose of storing tailings. Conventional facilities typically consist of one or more embankments.

Underground mining: A mining method that is used when minerals occur deep below the Earth's surface and require tunneling.

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