

# Environment and Sustainable Resource Development—Systems to Regulate Dam Safety

## SUMMARY

### What we examined

Responsibility for the structural integrity and safety of dams rests with the dam owner. The Department of Environment and Sustainable Resource Development is responsible for regulating the safety of dams, including dams the department owns. Regulatory activities don't eliminate the risk of dam failure, but if processes are designed and operating effectively, that risk can be reduced—ideally, to an acceptable level. In the department, the Dam Safety group is responsible for regulating the safety of dams in Alberta.

Our audit was designed to determine whether the department has adequate systems to regulate dam safety in Alberta. Our approach included assessing whether important regulatory processes, such as monitoring, were in place and whether they were operating as intended. As part of our audit, we also focused additional attention on the dam safety regulatory processes applied to tailings ponds (considered dams based on regulatory definition) due to the nature of the structures and the contents that they store.

During the period of the audit, two significant events impacting dam safety occurred:

- The failure of a dam storing tailings at Obed Mountain Mine occurred in October 2013. Because the incident at Obed constitutes a dam failure, it provided a relevant example for examining how the department's regulatory processes performed.
- Alberta experienced unprecedented flooding in the spring of 2013. The flooding raised concerns about potential damage and added strain on dams in the flood zone. We explored what role the department played, as dam regulator, in carrying out the necessary work to identify and monitor potential risks to the dams impacted.

### What we found

The department does not have adequate systems to regulate dam safety in Alberta. A number of improvements to dam safety regulatory processes are needed. We found that critical elements of a well-functioning regulator are either not being performed or evidence is lacking that processes are being carried out as intended. This highlights the importance of a plan for dam safety outlining what needs to be done, who is doing it, what resources are required, and the implications of not carrying out certain activities. At present, the department is not completing foundational activities like a plan and the reporting of the results of regulatory activities.

The department's senior executive is not receiving the necessary information to assert that dams in Alberta are being appropriately regulated. At the most basic level, reporting should allow important questions to be answered, such as: Has the department completed enough work and received enough information from dam owners to conclude on the safety of dams? Are changes needed to regulatory activities based on risks identified? Currently, no performance metrics, results analysis or identification of areas for future improvement are being prepared on dam safety in Alberta.

At the process level, the department lacks a requirement for Dam Safety to document its work. Dam Safety attends inspections and reviews information from dam owners; however, the nature, frequency and the quality of this work cannot be verified appropriately, either by supervisors or outside scrutiny, as documentary evidence is lacking. Appropriately evidencing work is not a “nice to have” or simply a matter of initialling a piece of paper. Evidence provides a foundation for important decisions and supports the quality of work performed, especially in the face of challenges or significant events.

While the department does have a registry for dams, its completeness, accuracy and sustainability is lacking. At present, the database is not updated appropriately, information is missing, and is not being used to its full potential. For example, it is capable of but is not used to track inspections and deficiencies.

Dam Safety’s regulatory activities are primarily influenced by the consequence ratings of dams determined by dam owners. If the consequence rating for a dam is not significant or very high, Dam Safety’s reporting requirements range from minimal to none. We found dams and coal mine tailing ponds where the consequence rating was outdated, increasing the risk that the appropriate level of monitoring is not always taking place.

We found that coal mine tailing ponds have not been appropriately monitored by Dam Safety. The majority of coal mine tailing ponds hadn’t been inspected by Dam Safety since the 1980s and 1990s. Our examination of the monitoring of Obed Mountain Mine identified that the main tailings pond was inspected by Dam Safety in 2013, but the structure that failed on the mine site was not monitored by Dam Safety even though it appears to meet the definition of a dam.

### What needs to be done

The department must determine whether its dam regulatory activities are achieving the intended outcomes. Our recommendations highlight what we believe to be important areas that the department should focus on to improve its systems for regulating dam safety. This improvement begins with a reliable registry, a plan for carrying out work, and informative reporting on dam safety in Alberta. Of critical importance, the department must also document its regulatory activities. Without this evidence, the department can’t prove it is doing what it should and fully support any conclusions that it makes regarding dam safety. And finally, the department needs to obtain sufficient information to assess the risks and consequences of dam failure, as this determines the extent of monitoring conducted.

### Why this is important to Albertans

Dams can pose a significant risk to those living downstream as well as to the environment and economy if they are not maintained and operated correctly. Dams can fail or malfunction, resulting in release of water and any other substances in the water. Although dam failures are infrequent, the impacts can be catastrophic, often far exceeding typical river flood events.

All forms of mining, whether it is coal, oil, uranium, potash or gold, produce tailings. Coal and bituminous sand are the principal outputs of mines in Alberta. Nearly half of Canada's coal production is mined in the province. Tailing pond dams can have a significant impact on the environment, the wildlife and water quality. In just the last couple of years, two tailings ponds in Canada have breached.

## AUDIT OBJECTIVE AND SCOPE

Our objective was to determine whether the department has adequate systems to regulate dam safety in Alberta. Adequate means that the department must be able to assert that it has identified any unsafe dams and has processes to monitor dam owners' management of the dams until the deficiencies are corrected. Unsafe dams are dams with deficiencies of such a nature that, if not corrected or managed, could result in the failure of the dam with potential subsequent loss of lives or substantial environmental and economic losses.<sup>1</sup>

We examined the department's regulating of dam safety during the period January 1, 2013 to March 31, 2014. We conducted our field work from January to October 2014. We substantially completed our audit on November 30, 2014. Our audit was conducted in accordance with the *Auditor General Act* and the standards for assurance engagements set by the Chartered Professional Accountants of Canada.

## BACKGROUND

Irrigation, flood control and tailings storage are among the most common uses for dams in Alberta. Therefore, dams play an important role for the economy, human safety, protection of property and the environment. There are over 1,500 dams in Alberta, varying in size, use and scope, including a number of tailings dams used primarily in the mining industry. A dam is constructed for the purpose of storing water, including water containing any other substance. Dams impound water for such uses as irrigation, electric-power generation, human consumption and flood control. They can also be constructed to store mine tailings, which are a mixture of fine mineral particles and water. Tailings pond dams are designed and built to prevent the uncontrolled release of tailings into the environment. These structures can include berms, dikes, in-pits and dug pits.

In order to construct and operate a dam in Alberta, an owner must have an approval and a licence from the department.<sup>2</sup> If the capacity of a structure is 30,000 cubic metres or more and at least 2.5 metres high, it is considered a dam, and the dam owner or operator must also comply with the *Water (Ministerial) Regulation*.<sup>3</sup> The department's records, at March 31, 2014, report 1,395 privately owned and 150 government owned dams in Alberta that are subject to the regulation. Part 6 of the regulation, dam and canal safety, requires dam owners to immediately inform all relevant authorities, including Dam Safety, of any conditions that could be hazardous to a dam and public safety. In the department, the dam safety manager has been named as a director for purposes of part 6 of the regulation.

With regards to the department's role, the regulation is non-prescriptive in nature. It gives the dam safety manager the authority to require the dam owner to submit any information needed to assess the condition of the dam. The dam safety manager also has the authority to require the dam owner to repair the dam, have safety assessments done or even suspend operations of the dam.

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<sup>1</sup> US Code of Federal Regulations, Corps of Engineers, US Department of the Army, Title 33 (Parts 200 –end), Navigation and Navigable Waters, Chapter II, Part 222.6, Page 308.

<sup>2</sup> 62/2013

<sup>3</sup> On dam and canal safety.

## RECOMMENDATION AND FINDINGS

### Developing a plan to regulate dams and corresponding reporting of results

#### Background

The department's Dam Safety group carries out regulatory activities for both publicly and privately owned dams; additionally, Dam Safety also provides support for the operation of government owned dams. At present, Dam Safety has eight full-time equivalent employees performing regulatory functions as well as supporting government owned dams.

A plan, in a regulatory context, is critical for outlining “how” compliance will be monitored. This would include strategies for achieving compliance (e.g., document submission, inspection), risk assessment, targeted coverage of the dam population and frequencies of work performed. A plan should also include staffing levels, budget and information technology requirements. Ideally, it should be designed to include both strategic (long range goals) and operational components.

Reporting, including an analysis of results, metrics on performance, and lessons learned, is the corresponding piece to a well-prepared plan. It helps coalesce and summarize all the work performed, assess whether objectives and priorities have been fulfilled, and if not, what may need to change in the future. Importantly, it enables those in charge of oversight to conclude whether dam safety is being appropriately regulated.

#### **RECOMMENDATION 14: DEVELOP PLAN TO REGULATE DAMS**

We recommend that the Department of Environment and Sustainable Resource Development develop a plan to regulate dams and report on the results of its regulatory activities.

#### Our audit criteria

For effective regulation of dam safety, the department should:

- establish the goals and objectives of the regulatory function
- develop a plan that lays out how the department will assess whether dams are safe and operated safely
- report to executive management on the results of regulatory work.

#### Our audit findings

##### **KEY FINDINGS**

- The department does not have a plan to perform its regulating activities.
- Dam Safety spends the majority of its time assisting with government owned dams.
- Oversight of regulatory activities is insufficient.
- Public information on dam safety in Alberta is limited.

#### A plan for regulatory activities is not in place

The primary purpose of a dam regulator is to verify that dam owners are carrying out their responsibilities to ensure the safety of dams they operate. A regulatory framework for dam safety in Alberta exists. Legislation is in place to enable Dam Safety to carry out regulatory work. However, Dam Safety does not have a plan that outlines what regulatory activities will enable it to assert that dam owners are doing what they should to ensure the safety of dams. In other words, a description of the goals, priorities, risks and activities planned to assess how dam owners are performing and whether dams are safe and operated safely has not been documented.

Dam Safety also needs this plan to outline the resources it requires to conduct the necessary monitoring, and if those resources aren't available, what tasks can't be completed, have to be deferred, or aren't necessary. Throughout the audit, we got the sense that Dam Safety is pulled in many directions; much-needed improvements in its processes take a back seat to day-to-day responsibilities. While resource constraints are a factor, a catch-22 also emerges: process improvements can enhance the efficient use of resources, but resources aren't available to make the necessary improvements. Thus, the department should clearly establish what the priorities are and what is expected of Dam Safety.

Dam Safety's monitoring plan does not consider all dams. Dam Safety performs inspections where the dam owner does not have the expertise or training or do the inspection. However, there is no list of which dams are monitored under the small dam inspection program. We noted that Dam Safety does not plan to inspect about 650 dams unless requested by the owner.

#### Dam Safety spends the majority of its time assisting with government owned dams

Dam Safety is responsible for activities related to the safety of the department's dams, such as contracting for dam safety reviews and performing inspections. This work is unquestionably important, but it also results in limiting the time directed at regulating the safety of both private and public dams. Dam Safety analyzed how it spends its time and found that safety engineers spend over half of their time assisting with government owned dams. The time required to perform these other key tasks should be well understood in the planning process because it impacts the time available for the necessary regulatory activities.

The department should also be aware that Dam Safety could be or appear to be in a conflict of interest because it assists government owned dams and is expected to regulate those same dams. Dam Safety reports to a director of infrastructure operations who is responsible for the government dams. The effectiveness of a regulatory function is potentially comprised if individuals are performing some of the functions of the dam owner and then regulating those same structures. Therefore, appropriate divisions or "firewalls" should be in place to protect against any actual or perceived conflict. While the department has created such divisions from an information technology perspective, it has not demonstrated how it has done this from a personnel perspective.

#### Oversight of dam safety regulatory activities is insufficient

We found little evidence that executive management is receiving the necessary information to apply effective oversight of dam safety. Executive management confirmed that consistent and informative reporting from the Dam Safety group is not taking place. Fundamentally, the information is not being provided to allow executive management to assert:

- that regulatory activities are being carried out as intended
- that the department understands the impacts of those activities
- whether any changes are necessary to improve its oversight of dam safety

Dam Safety did provide us with examples of ad hoc briefing notes prepared for executive management that highlight when significant events emerge (e.g., flooding). This is important, but does not preclude the need for consistent sharing of information about the results of Dam Safety's work.

At present, the department does not have a way to measure the success of dam regulation, or lack thereof. Certainly, the absence of any critical incidents is a vitally important indicator of success, but interpreted in isolation, it is a purely reactive signal.

**Public information on dam safety is limited**

The department's website does not have information on the location of dams, contact information for questions or concerns about dams, guidance to Albertans on public safety precautions required for dams or what someone should do if faced with a dam related emergency. In the past this information was available, but it was unclear to us why it was removed.

**Implications and risks if recommendation not implemented**

Without a plan, the department is likely to use its resources inefficiently or ineffectively. Without a report, the minister and public cannot hold the department accountable for its regulatory responsibilities.

**Improving dam regulatory activities****Background**

Under the current legislation, the Dam Safety group has discretion to decide how to regulate dam safety in Alberta. But Dam Safety does not determine the consequence of a dam failure with respect to loss of life, the environment, infrastructure and the economy; dam owners are required to do that. The owner's consequence classification drives the extent of work performed by Dam Safety and dictates what dam owners must submit or complete. Consequence ratings are used to determine whether Dam Safety attends the dam owner's inspection.

Dam owners may be requested by Dam Safety to:

- submit a dam safety review performed by independent engineers to assess the safety of the dam and identify safety deficiencies
- submit an Annual Performance Report that confirms the safety of the dam or the dam owner's progress in correcting deficiencies
- inspect the dam annually or at any time
- submit an operational plan describing how they will manage a safety deficiency until it is corrected

Dam Safety may also perform the inspection. Dam Safety has a small dam inspection program in which Dam Safety staff inspect dams about every 10 years. The department does not have a list of small dams. What distinguishes these dams is not simply size but rather the ability of the dam owner to perform the inspection, that is, expertise and training necessary to perform the inspection.

The department is responsible for regulating the structural safety of oilsands and coal mine tailings ponds in accordance with the 1994 Dam Safety Accord and the 1996 Memorandum of Understanding between the former ERCB and the Department of Environment and Sustainable Resource Development. These documents define responsibilities of Dam Safety in the context of coal and oilsand tailings ponds. Effective April 1, 2014, the responsibility for performing the monitoring of the safety of tailings ponds at oilsand and coal mine sites began to be transferred to the Alberta Energy Regulator. This process is still underway.

**RECOMMENDATION 15: IMPROVE DAM REGULATORY ACTIVITIES**

We recommend that the Department of Environment and Sustainable Resource Development improve its dam regulatory activities by:

- maintaining a reliable registry of dams
- obtaining sufficient information to assess the risk and consequences of dam failure
- retaining evidence of regulatory activities performed
- following up to ensure that owners correct deficiencies or manage them until they are corrected

### Our audit criteria

For effective regulation of dam safety the department should:

- have a complete and accurate inventory of dams that are subject to regulation
- retain sufficient and appropriate evidence of regulatory work completed
- follow up to ensure that owners correct the deficiencies or manage them until they are corrected

### Our audit findings

#### KEY FINDINGS

- The dam registry is missing information and is out of date.
- Consequence ratings for some dams and coal mine tailing ponds are outdated.
- Coal mining tailing ponds are not appropriately monitored.
- Documentary evidence of many regulatory tasks was lacking.
- Better clarity on deficiency reporting and tracking deficiencies is needed.
- Update to guidelines provided to dam owners is currently underway.

#### Registry of dams is missing information and is out of date

One of the basic requirements for a regulator is to have a complete and accurate registry. We found that Dam Safety’s database is missing pertinent information and is not updated appropriately. Dam Safety cannot produce a current, comprehensive and consolidated listing of all dams in Alberta. Location information for 84 dams and consequence classifications for 956 dams was missing from the database. Dam Safety stated that these dams don’t have consequence classifications because they are “small dams.” However, Dam Safety did not have supporting information to verify this claim. Furthermore, updating of the database is inconsistent. Important tracking information, such as inspection dates, cannot be relied upon because information isn’t updated consistently. While examining the department’s processes for regulating the safety of small dams, we found the department had a list that reported approximately 100 dams had been inspected in 2013, but only 66 of those dams had inspection dates in the database. Through our discussions with Dam Safety, it was acknowledged that considerable time and effort will be required to update the database.

In order to determine whether any dams were missing from the database, we selected a sample of water licences issued for structures that met the definition of a dam. We identified one tailings pond that was not included in Dam Safety’s database. Dam Safety agreed that they should have been regulating the tailings pond but the licence had not been provided to Dam Safety by the department’s licensing staff.

The missing information and the lack of rigor in updating the database renders the database less useful and increases the risk that incorrect information is relied upon. The department also maintains another system where it keeps records on government owned dams.

#### Consequence ratings for some dams and tailing ponds are out of date

For dams where Dam Safety does not have a recent dam safety review, the consequence ratings provided by dam owners may be outdated. For example, the size of the dam may have changed. Tailing ponds may grow over a number of years as the need for tailings storage increases. Dam Safety has not asked dam owners to confirm whether the consequence rating is appropriate. Because the consequence rating impacts the extent of monitoring, this is potentially a significant risk.

#### Coal mine tailing ponds are not appropriately monitored

The department’s registry at March 31, 2014 includes 16 licences with 22 dams at coal mining sites – some of the structures are described as tailings ponds and a variety of other descriptions, including lake dam, pre-settling and sediment dam.

We found that most coal mine tailing ponds haven't been inspected by Dam Safety since the 1980s and 1990s. Further, the department did not have on file any of the dam safety reviews for the 22 coal mine tailing ponds. Thus, the present consequence ratings are not informed by any type of current review. Overall, the monitoring of structures by Dam Safety on coal mine sites has been inadequate.

Dam Safety selected two coal mine tailing ponds to inspect during 2013. One selection was the main tailings pond at the Obed Mountain Mine in August 2013, which we detail below. The other licence selected for inspection was a mine site that had been previously reclaimed; thus, it was erroneously in Dam Safety's database.

#### Obed Mountain Mine was not appropriately monitored by Dam Safety

On October 31, 2013, a structural failure of the "Green Pit" caused the wastewater in it to flow into the Main Tailings Pond, which then overtopped, while some of the mine wastewater in the Green Pit discharged directly into the environment.<sup>4</sup> This released water containing coal tailings into the Athabasca River. As of February 2015, the government has not released its report on the cause of the structural failure of the Green Pit. The Obed Mountain Mine began operations in 1984. Fluctuating coal prices resulted in the mine closing in 2003, reopening in 2009, and closing again in 2012. At the time of the breach in October 2013, the mine was operating at reduced capacity.

We verified that the department registry included the main tailings pond at the Obed Mountain Mine site, as well as three other structures. But the registry did not include the "Green Pit." Based on the volume and size of the structure, it appears to meet the definition of a dam. It is not clear why it is not on the registry.

Dam Safety inspected the main tailings pond in August 2013. We could not find any evidence that any other inspections were performed on the main tailings pond since 1996. No other structures at the mine were mentioned in the inspection report. The Dam Safety staff assigned to do the Obed inspection was a technologist, not an engineer, and did not have expertise or training with tailings pond structures. There was no safety review on file for the main tailings pond. Annual performance reports were not received for 2012 or 2013, even though this was a requirement of the most recent licence issued in 2011.

#### Evidence of regulatory activities performed is lacking

Dam Safety is collecting a significant volume of information from dam owners, including dam safety reviews and annual performance reports. However, the nature and extent of the analysis and review completed and the conclusions reached by Dam Safety on this information is not apparent. Dam Safety does not have a requirement for appropriate documentation of the work it has performed. In essence, Dam Safety cannot demonstrate to either internal or external scrutiny that it is carrying out its responsibilities.

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<sup>4</sup> Environmental Protection and Enhancement Order No. EPO-2013/34-CR

This same issue applies to the attendance of inspections. For each of the inspections Dam Safety completed there was an accompanying inspection report that documented the work completed, findings, and conclusions. We could not verify whether the department attended dam owners' safety inspections because it does not have copies of the inspections it attended and did not document its attendance or conclusions. Based on discussions with Dam Safety staff, and other supporting information like expense claims, we believe the department is attending these inspections. However, the lack of documentation precludes the ability to assess the nature and outcome of Dam Safety's attendance at the inspections.

#### Better clarity on deficiency reporting and tracking of deficiencies is needed

The department does not specify what the dam safety review must include. However, we confirmed that most dam safety reviews were either prepared in accordance with the guidelines issued by the Canadian Dam Association or in accordance with the terms of the contract issued by the dam owner for the work. Dam Safety staff apply professional judgment to conclude whether the dam safety review was performed in accordance with best practices and includes sufficient information on the safety deficiencies identified.

We found that some dam safety reviews only list the deficiencies, some rank them in descending order of criticality, and some provide timelines by which the deficiency should be corrected. Thus, Dam Safety is not receiving deficiency information in a consistent and comparable form.

Even dam safety reviews prepared in accordance with the guidelines issued by the Canadian Dam Association are not required to provide timelines by which the deficiency should be corrected. They are only required to conclude whether:

1. all safety requirements are met,
2. some are not met, or
3. it is uncertain which are not met, and what the preparer would need in order to decide.

Through our analysis of dam safety reviews for the highest consequence dams, we noted about 200 safety deficiencies classified as high priority. Dam Safety did not have evidence of how it assessed whether the dam owner should correct the deficiency or take any other action. This information was not tracked on the registry or a central system and it was not clear how Dam Safety would follow up to ensure the dam owner was fulfilling their responsibilities.

#### Update of guidelines to dam owners is currently underway

Dam Safety communicates its requirements to dam owners through formal and informal communication, such as direct requests to dam owners, conditions that are included in licences, and workshops.

The department last issued guidelines to dam owners and operators in 1999, but acknowledged that the 1999 guidelines were outdated. In April 2014, the department contracted to update the 1999 guidelines. The department acknowledged that because "the regulation is not prescriptive, a set of guidelines should be provided to dam owners and operators so that they have a clear understanding of the Regulation and the regulatory requirements to ensure understanding of their roles and responsibilities to safely operate the dams." The department expects to have this work completed by March 31, 2015.

#### Implications and risks if recommendation not implemented

Without making these improvements to its processes the department cannot demonstrate it is fully meeting its regulatory responsibilities.

## **Response to 2013 floods**

### **Background**

Over the past 20 years, there have been five major flood events in Alberta – most recently in 2013. The department’s Flood Response Coordination Plan (October 2007) describes its processes to prepare for and respond to floods. Dam Safety is responsible for having the necessary Emergency Preparedness Plans and tracking that post flood inspections were completed for dams with the highest failure consequence.

### **Our audit findings**

Overall, Dam Safety fulfilled its requirements under the department’s Flood Response Coordination Plan. Dam Safety used a mapping tool to identify all impacted dams in the flood zone and asked owners of the highest consequence dams to inspect the dams. In addition, Dam Safety also performed inspections of 64 private dams and assisted owners with inspections if the owner did not have the requisite expertise.