

Energy—Alberta Energy Regulator— Systems to Regulate Pipeline Safety and Reliability in Alberta

SUMMARY

Pipelines are an essential component of the energy industry in Alberta. The primary responsibility for maintaining safe and reliable pipelines rests with their operators, who directly influence the condition and operation of a pipeline throughout its lifecycle. The Alberta Energy Regulator's (AER) role is to ensure pipeline operators comply with regulatory requirements, with public safety and the environment as their priority. Even an effective regulator cannot eliminate the risk of pipeline incidents, but what a regulator can do is have well-designed and effective systems to appropriately oversee industry operations and reduce the risk of incidents occurring. In June 2013, the AER began operating as a full lifecycle¹ energy regulator. The AER faced many challenges inherent with this transition—incorporating new people and processes, implementing a new oversight model, and making improvements to existing systems—all while trying to maintain the quality of existing regulatory processes. We believe our audit of AER's systems for regulating pipelines provides useful recommendations to assist in this ongoing transition and continuous improvement.

What we examined

To determine whether the AER has adequate systems to regulate the operation of pipelines in Alberta, we focused on activities that are essential for regulatory oversight:

- the risk management system to identify, assess and manage pipeline risks
- measuring performance, assessing results, and identifying learnings for improvement
- systems for collecting information from pipeline operators
- monitoring and enforcing of pipeline operator regulatory obligations
- responding to, investigating and reporting on pipeline critical incidents

What we found

The AER has well-functioning systems to regulate pipeline operations in Alberta. Albertans can be assured that the regulator is adequately performing its function of overseeing pipeline safety and reliability. Nonetheless, with the AER's goal to be a leading regulator, coupled with greater expectations and scrutiny on the AER's and industry performance, continuous improvement is necessary. Therefore, we identified a number of areas where the AER can make improvements:

- The enterprise risk management system is still under development. There isn't a clear link between the risk information and resource allocation activities that will help AER reach its targets.
- A skills gap analysis of pipeline staff has not been completed and a formal training program is not in place.
- A primary target of reducing incidents 4% by 2016 is in place, but this target does not encapsulate the severity of incidents. Overall, measures and targets could be enhanced and better aligned with individual staff performance goals.

¹ The AER is responsible for regulating all of the application, construction, production, abandonment, and reclamation activities in the energy sector. Previously, some elements of these regulatory functions were carried out by other government organizations.

- The AER collects a lot of data from pipeline operators, but it has not completed an evaluation of its present and future data needs to confirm it has all the information it requires to better regulate pipelines in an evolving industry.
- While the response and investigation of critical incidents are performed well, the AER did not go as far as it could have in highlighting contributing factors and sharing these lessons learned with industry.
- Pipeline operator integrity management programs² are a key component of keeping product safely in the pipeline. The AER does not have a defined process to evaluate the effectiveness of these programs.

During the course of the audit, we also identified a number of positive and noteworthy practices that the AER employs:

- The emergency response process in each of the five pipeline critical incidents we reviewed was strong and well-documented.
- The AER has a process to promptly post details of incidents that meet certain criteria.³ Such a process offers transparent and timely information to the general public and the industry.
- Based on past operator performance, the AER identified those that may pose a greater risk and met with their senior management to promote pipeline safety practices.
- The AER carried out its enforcement activities as stipulated by the rules and regulations. With the new enforcement framework that came into effect in 2014, the AER has more tools and powers; as such, continued operational effectiveness of this system will be critical.

Perhaps most importantly, through our interactions with AER staff, we observed a strong commitment to what the AER is trying to achieve. We also observed that the AER began the process of responding to our recommendations and findings while the audit was still underway – this willingness to improve will serve the AER well in reaching its goals.

What needs to be done

We made six recommendations to the AER to achieve continually better results from its pipeline regulatory systems:

- use its risk management activities to make informed decisions on allocating resources and determine the nature and extent of activities to oversee pipeline operations
- complete a skills gap analysis and formalize a training program for its core pipeline staff
- improve measures to assess pipeline regulatory and industry performance
- expand its analysis of incident contributing factors beyond primary causes and share lessons learned with industry and operators
- determine what data it needs from pipeline operators
- develop an approach to cost effectively assess integrity and safety and loss management⁴ systems

Why this is important to Albertans

Pipelines are a critical component of the energy industry in Alberta and Albertans expect pipelines to be safe and reliable as well as to deliver economic benefits. Albertans expect the AER to have well-functioning regulatory systems to oversee the energy industry and ensure its pipeline operators act responsibly. Protecting public safety and the environment is an integral responsibility of the energy industry and the AER.

² An integrity program is a documented process that pipeline operators would use to specify practices to ensure environmentally responsible, safe and reliable operation of the pipeline system.

³ <http://www.aer.ca/compliance-and-enforcement/incident-reporting>

⁴ The safety and loss management system is a complex system operating companies would design for the protection of people, the environment and property. The approach emphasizes the need to look at an overall process or system, including the combination of human, organizational, technical and environmental factors, rather than individual safety problems.

AUDIT OBJECTIVE AND SCOPE

Our audit objective was to assess whether the AER has adequate regulatory systems to help ensure the safe and reliable operation of the pipeline systems it oversees.

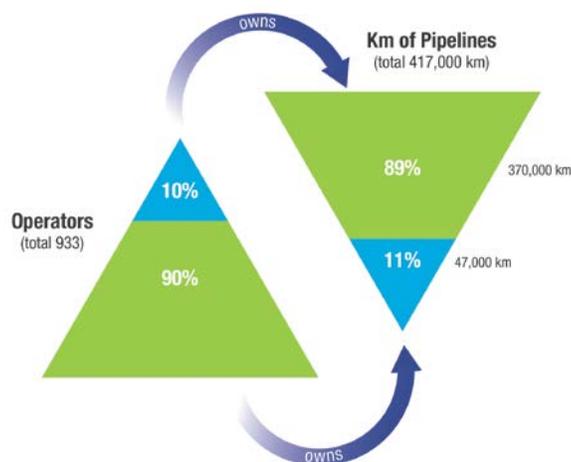
Our scope included the AER's core pipeline activities: surveillance, inspection, compliance, incident response and regulatory enforcement, as well as the foundational components of risk management and performance measurement. Our audit did not include the AER's systems for pipeline applications and abandonment. We did not assess the merits of the regulation that gives the AER the authority to regulate pipelines within Alberta. The government contracted a third party to assess the sufficiency of the pipeline safety regulation⁵ and prepare a report with recommendations.

As part of our audit, we met with and interviewed staff at various field offices and also accompanied AER inspectors to observe their inspections at selected operator sites. We also interviewed a variety of external parties and stakeholders about their interaction with the AER and the overall regulatory systems for pipelines. We engaged an expert to assist us during the course of the audit.

We conducted our field work between April and September 2014 and we substantially completed our audit on November 30, 2014. Our audit was done in accordance with the *Auditor General Act* and the standards for assurance engagements set by the Chartered Professional Accountants of Canada.

BACKGROUND

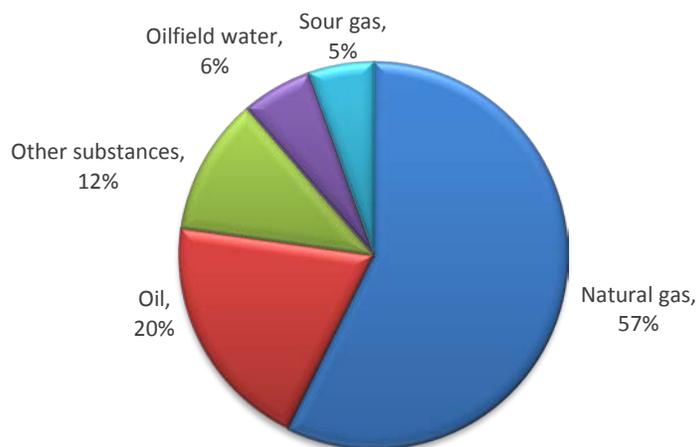
Pipelines are used to transport a variety of liquids and gases. They are often categorized as one of the safest, most efficient and reliable ways to move energy related products over long distances. In Alberta, the AER regulates about 417,000 kilometres of pipeline used to transport crude oil, bitumen, natural gas, sour gas, oil emulsion, and salt and fresh water. Ten per cent of the operators own 89 per cent of the 417,000 kilometres pipelines the AER regulates across Alberta (see figure below).



⁵ Alberta Pipeline Safety Review prepared by Group 10 Engineering for ERCB, December 7, 2012. <http://www.energy.alberta.ca/Org/pdfs/PSRfinalReportNoApp.pdf>

Pipelines are commonly made by welding together steel pipes in varying lengths, diameters, wall thicknesses and buried depths. More recently the industry has also used composite materials for pipelines. Compressors and pumps maintain the flow of liquids and gases in the pipelines, while valves control the flow. Most pipelines in Alberta are small gathering and feeder lines that carry production from individual wells to nearby processing facilities. The remaining pipelines are large transmission lines that carry oil and natural gas to distribution points within the province, to other provinces and internationally (Appendix A).

The following figure indicates the percentage of products that are transported using pipelines in Alberta.⁶



Significance of pipelines in Alberta

Oil and natural gas are an integral part of Alberta's economy. Pipelines are essential for carrying oil and gas from the wells and mines where they originate to storage, processing facilities and refineries, as well as to residential, commercial and industrial users. Increased energy production requires a corresponding increase in pipeline capacity. In effect, putting a limit on pipeline infrastructure would also limit growth in the energy sector and Alberta's economy. There are other methods, such as trucking and rail, to transport liquid energy products; however, pipelines are the most common method of transporting oil and liquids and are the exclusive method for natural gas.

Energy pipelines carry materials that can cause environmental damage and health and safety issues. In recent years, significant pipeline failures have also led to increased public concerns over the safe operation of pipelines. Although the probability of a single failure is low, each critical event has a potential for high impact and consequence to public safety and the environment. As Alberta's pipeline capacity has continued to grow, so has the attention placed on the industry's ability to operate with due care for the environment, health and safety. The prevalence and importance of pipelines, the large volumes transported and the associated risks make it necessary for Alberta to operate a strong regulatory environment to oversee pipeline operators.

⁶ Alberta Energy Regulator, Report 2013-B, Pipeline Performance in Alberta, 1990-2012, page 9.

Key risks related to pipeline failures

A number of factors impact pipeline regulatory processes and the risks related to pipelines:

- The provincial pipeline network has doubled in kilometres since 1996.⁷
- Alberta's pipeline infrastructure is aging.
- Pipelines are subject to internal and external corrosion.
- Public awareness of environmental and safety risks is growing, while tolerance for risk is not.
- Volatile energy prices may impact operator preventative maintenance.

The AER's 2012 Field Operations Provincial Summary reported 447 high risk compliance concerns in seven inspection categories. Pipeline operations accounted for 39 per cent of these compliance problems. Older infrastructure, if not properly maintained, contributes to the high probability of failure; 30 per cent of pipelines in Alberta were built more than 25 years ago (Appendix B).

Pipeline failures can be caused by construction damage, damage by individuals, earth movements, internal and external corrosion, joint failure, overpressure and operator error. These failures include leaking (a pipeline is losing product but continues to operate) and rupture (a pipeline cannot continue to operate). AER data shows that the main cause of pipeline failure is corrosion:

- Over 67 per cent of pipeline failures are due to internal and external corrosion.⁸
- 86 per cent of Alberta's pipelines are made of steel, which is corrosion prone.⁹

Critical incidents are matters that warrant immediate action by pipeline operators and the regulator due to the potential of significant public and environmental impacts. See Appendix C for examples of pipeline-related incidents.

Pipeline failure resulting in a puncture, rupture or leak can have significant environmental and public safety risks. The key risks include:

- **environment risks**—harm to plants and animals, soil and water quality
- **public safety risks**—explosions, drinking water contamination and damage to public lands
- **reputational risk**—reduced public confidence in the government's regulatory processes and the oil and gas industry's ability to operate responsibly; increased scrutiny and criticism of Alberta's approach to its natural resources
- **economic risk**—more complicated negotiations to approve and build the pipeline necessary to move more energy products to broader markets
- **financial risk**—impact on production and ability to deliver petroleum; cost of repair and clean up; litigation due to property damage and injuries; costly delays in approving and building pipelines

Responsibility for safe and reliable operation of pipelines in Alberta

Operators

The responsibility for safe and reliable pipeline operations resides with industry and operators. Safety, compliance, security and cost effectiveness are all critical considerations for operators. Operators need to have systems in place, including management control and integrity management systems, to ensure pipelines are operating safely and reliably.

⁷ Ibid.

⁸ Alberta Energy Regulator, Report 2013-B, Pipeline Performance in Alberta, 1990-2012, page 39.

⁹ Alberta Energy Regulator, Report 2013-B, Pipeline Performance in Alberta, 1990-2012, page iv.

Regulatory agencies

As a quasi-judicial agency¹⁰ of the Government of Alberta, the AER regulates and oversees oil and gas development activities throughout the province, including pipelines. Pipeline operators must comply with the government's *Pipeline Act* and regulation and the AER monitors and enforces their compliance.

The AER is responsible for regulating the lifecycle of pipeline systems, from design and construction to operations, maintenance and abandonment. A federal organization, the National Energy Board, regulates interprovincial and international pipelines (for example the proposed Northern Gateway and Energy East pipelines). The Alberta Utilities Commission regulates natural gas transmission lines within the utility sector. The AUC has an arrangement with the AER to carry out some responsibilities on AUC's behalf: surveillance and inspections, incident response, and failure investigations on the natural gas transmission lines.

Alberta's regulatory framework

The key elements supporting the Government of Alberta's regulatory framework are:

- *Pipeline Act* and regulation—This gives the AER the authority to regulate oil and gas pipelines that operate solely within Alberta's boundaries. Operators are to develop, operate and abandon pipelines used for energy development as prescribed in the *Act* and the pipeline regulation.
- AER directives, manuals and bulletins¹¹
- Canadian Standards Association standard for pipelines—An integral part of the AER's regulatory program is checking for compliance with a national standard, called CSA Standard Z662-11 Oil and gas pipeline systems,¹² developed by the Canadian Standards Association. This standard sets out minimum requirements in largely prescriptive terms to cover more than pipeline design. It encompasses construction and the safe operation of pipelines, including the requirement for operators to develop and maintain effective integrity management programs and safety and loss management systems.

In 2012 the government commissioned a review of Alberta's pipeline regulatory requirements and framework.¹³ Alberta's approach was compared to those in similar jurisdictions in Canada and beyond Canada's borders. The review concluded that Alberta's regulator provided the most thorough overall regulatory regime of all assessed Canadian jurisdictions.

Of the pipeline inventory across the province of Alberta, the AER regulates 417,000 kilometres of pipelines; NEB and AUC regulate 30,000 and 11,500 kilometres, respectively. The AER regulates about 900 operators for which it has issued licences to construct and operate pipelines. Most licensees in Alberta are oil and gas producers that operate feeder lines. In many cases, pipeline systems are not the core assets or the primary focus of the operator. Pipeline companies that operate transmission lines represent a smaller portion of licensed operators.

¹⁰ A quasi-judicial agency ascertains facts, holds hearings, weighs evidence, makes conclusions from facts, and exercises discretion of a judicial nature. Its adjudicative functions are performed outside of a court setting.

¹¹ <http://www.aer.ca/rules-and-regulations/by-topic/pipelines>

¹² The CSA Z662 standard is a consensus document reflecting the viewpoints of operators, regulators, contractors and consultants.

¹³ Alberta Pipeline Safety Review prepared by Group10 Engineering for ERCB, December 7, 2012. <http://www.energy.alberta.ca/Org/pdfs/PSRfinalReportNoApp.pdf>

The Alberta Energy Regulator’s operations and challenge

In June 2013, the *Responsible Energy Development Act* established the AER as the regulator of Alberta’s energy sector. The AER took over regulatory functions from the Energy Resources Conservation Board (ERCB) and energy development regulatory functions from the Ministry of Environment and Sustainable Resource Development (ESRD). The AER became Alberta’s single regulator of energy development— from application and exploration, to construction and development, to abandonment, reclamation and remediation.

The AER oversees a wide variety of pipeline types of varying size, complexity and age. The pipeline licensees also reflect this disparity in terms of their size and technical ability. This variety presents a considerable challenge to the AER both in assessing the level of resources to be applied and in taking a consistent approach to the oversight of pipeline operators. A “one size fits all” solution is unworkable.

Management fulfills the AER’s oversight responsibility for pipelines primarily through its Environment and Operational Performance branch (EOP), which includes:

- operations, emergency response and investigation group—responds to pipeline emergencies and investigates failures
- enforcement and surveillance group—inspects pipeline construction, operations and incident sites; monitors pipeline operations and incident responses
- operational staff at nine field centres located across the province—respond promptly to incidents

The AER receives and responds to all public complaints about industry activities. AER field surveillance staff log and investigate these complaints. See Appendix B for a trend analysis of public concerns from 2008 to 2012.

FINDINGS AND RECOMMENDATIONS

Risk management of pipeline regulatory activities

Background

The AER’s activities have to keep pace with the energy industry and respond to changing risks that may threaten public safety and the environment. Effective risk management is essential for the AER to achieve its regulatory objectives in this complex environment. In essence, risk management is a continuous, proactive process for:

- assessing the risk of uncertain outcomes
- ranking risks based on likelihood and potential impact
- preventing and reducing impact of incidents

The AER must manage risk at an enterprise level, as well as at operational levels directly related to pipeline safety. To fulfill its oversight role, the AER’s board must receive regular and meaningful information from management. For example, regular risk management reports are essential to help the board understand whether the regulator’s risk mitigation action plans are in line with its risk tolerance.

Operationally, the AER’s compliance and enforcement programs have a high focus on risk. The success of the regulator’s oversight through these programs depends on the AER having sufficient, well-trained and highly experienced staff to carry out their regulatory functions. The AER entrusts these staff to make critical judgments when performing inspections and investigations.

RECOMMENDATION 4: USE RISK MANAGEMENT ACTIVITIES TO MAKE INFORMED DECISIONS

We recommend that the Alberta Energy Regulator use its risk management activities to make informed decisions on allocating resources and determine the nature and extent of activities to oversee pipelines.

RECOMMENDATION 5: FORMALIZE TRAINING PROGRAM FOR CORE PIPELINE STAFF

We recommend that the Alberta Energy Regulator complete a skills gap analysis and formalize a training program for its core pipeline staff.

Criteria: the standards for our audit

The AER should use a risk management system to identify, assess and manage risks in fulfilling its regulatory duties over pipelines. Management's decisions for allocating resources should reflect the AER's priorities for managing risk at the operational level, including the allocation of appropriate staff resources. The regulator should also have sufficient, well-trained and experienced staff to carry out pipeline regulatory functions.

Our audit findings**KEY FINDINGS**

- The AER has not fully implemented its enterprise-wide risk management system.
- At an operational level, the AER lacks a formal process to fully assess the risks and its related resource requirements for various pipeline operational activities.
- The AER employs good practice by targeting certain non-routine operational risks as they arise.
- The system for ranking risks does not guide allocation of resources.
- The AER has not completed a skills gap analysis and does not have a formal training program for its core pipeline staff.

Risk management systems are being designed but are not yet fully implemented—The AER is in the process of developing the foundational components of an enterprise-wide risk management system. The AER has:

- compiled a corporate risk and opportunity register by seeking input from staff
- hired staff with risk management skills and experience
- set up a project team to support risk management activities
- identified four categories of risk in its corporate risk register: regulatory, corporate, strategic and governance

The AER's board also identified a number of risks, which it shared with the risk project team. In the fall of 2014, the team presented the board with findings on the key strategic risks and gave the board an overview of risk criteria and risk evaluation. However, the regulator has not yet fully developed its risk mitigation plans or defined its risk tolerance for the core areas of its regulatory functions, including pipelines. Regulatory oversight of pipelines is documented as one of the AER's high risk areas.

The regulator's oil and gas sector group completed a sector risk register, identifying pipeline related risks and rating those risks. Given the early stage of development of the risk management system, we could not see a clear link from the corporate risk activities to operational planning, such as a link between risks and resource allocation. Furthermore, formal risk reports that include reporting of pipeline risks to senior management and the board have not been developed.

The AER does not have a structured process to identify, rank and target key pipeline operational risks, and integrate them into the operational plan—Despite an enterprise risk management process that is in its early stages, the AER applies a certain degree of risk management at the operational level. This takes place mainly through routine and non-routine operational activities.

However, the AER has not completed a ranking and integration of risks in the following areas:

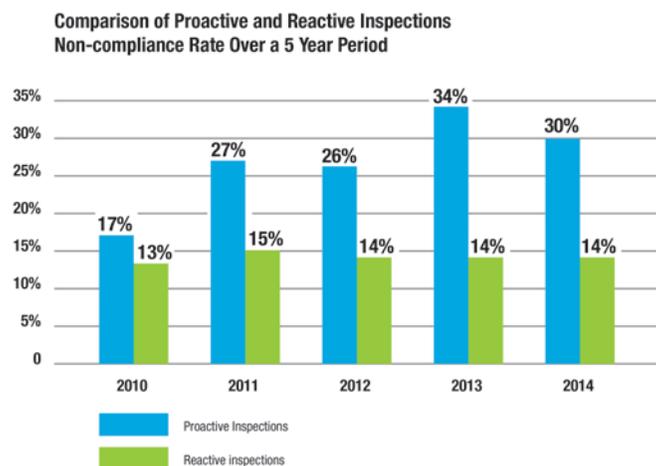
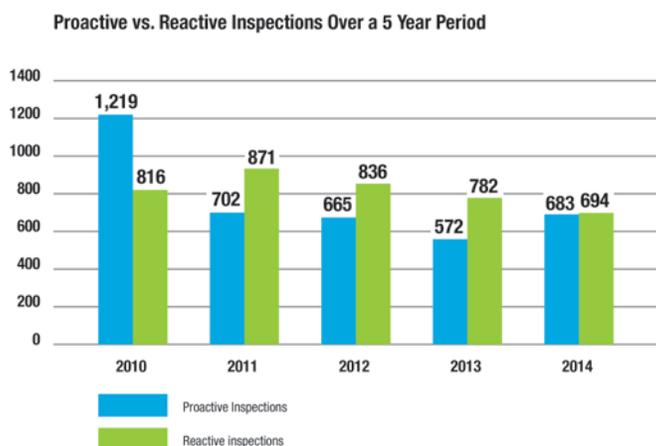
- proactive compared to reactive activities, to prioritize and align risks with regulatory compliance activities
- pipeline operational activities compared to managing risks in other regulatory areas
- incidents compared by volume of release and failure types, for example—All incidents are treated as equal in the AER’s annual planning process.

Routine activities—Proactive vs. reactive

The AER considers risks in two phases of its monitoring program, by:

- viewing all incidents and complaints as a risk and responding to 100 per cent of the related occurrences—This illustrates a reactive approach to risk.
- using pipeline data and information to consider risk in its annual plans for proactive monitoring—This represents a proactive approach to risk.

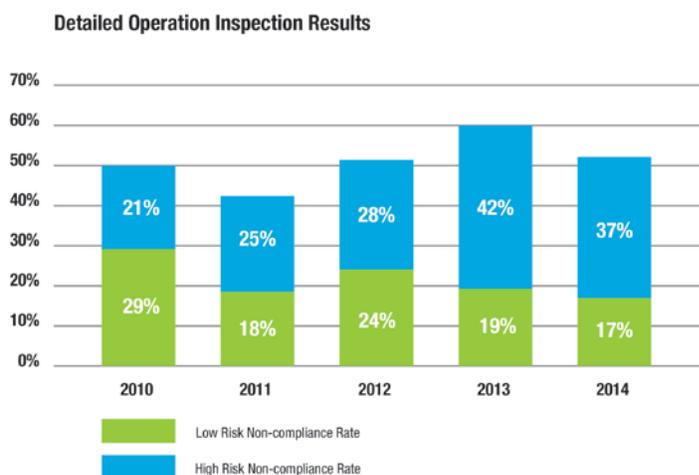
The figures below summarize the two types of routine activities and their corresponding discoveries of non-compliance.¹⁴



¹⁴ Annual period is from July 1 to June 30. Figures are compiled using pipeline data from the AER.

Proactive inspections discover higher non-compliance rates because they are generally broader and more exhaustive than reactive inspections. Of course, this also means that proactive inspections are more time consuming and costly. Proactive inspections can identify bad practices and “near misses” before they become critical. Reactive inspections have to be completed for incidents and complaints. As a result, reactive inspections take priority over proactive inspections in the allocation of resources. To get the most value from its regulatory work and appropriately respond to assessed risks, the AER should also determine an appropriate level of funding and resources for proactive activities.

Our further analysis of the AER’s proactive, detailed operation inspection program used data spanning the last five years. The figure below shows that at least half of the pipeline operators inspected by AER have one of more areas of non-compliance.¹⁵

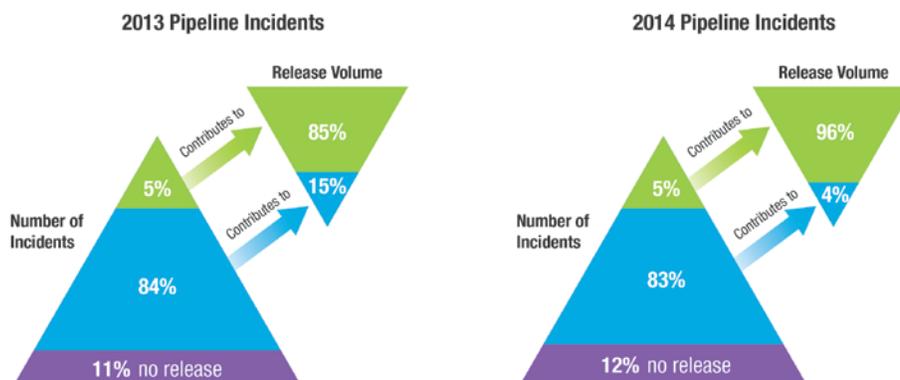


AER field staff view detailed operation inspections as a value added activity because discoveries of non-compliance lead industry to take corrective action before incidents happen.

The AER does not integrate or prioritize its annual planning for proactive activities at the provincial level. On occasion, field centres provide each other with short-term help upon request. However, the AER has not integrated or prioritized various risks and activity levels of its nine field centres. Management has not set inspection sample sizes for each field centre to reflect the risks and industry activity level in the area and to ensure that the centre has enough resources for the identified risks. Each field centre has different risk levels and factors, including the type of operators, geography, type and age of pipes, and seasonal activity. Each AER field centre considers its inspectors’ experience, activity level and understanding of risks in that area to select operators for detailed operation, construction and other inspections.

¹⁵ Annual period is from July 1 to June 30. Figures are compiled using pipeline data from the AER.

Not all incidents have equal impact. The graph below shows the annual analysis of product releases from pipeline incidents for 2013 and 2014.¹⁶ This further supports the importance of a proper risk ranking process in the AER's operational risk assessment.



Non-routine activities—Targeting specific risk areas

The AER follows good practices through its non-routine operational activities by identifying, targeting and responding to specific risks. However, the AER has not formalized its process for managing targeted risks, including the integration of these risks to the operational plan. These non-routine activities include:

- meeting with operators—An AER strategy is to meet with management of specific operators with past performance issues, to promote pipeline safety. This is a powerful tool to alter behaviours through relationship building, education, sharing best practices and enhancing management control systems.
- performing sweeps—Pipeline risks are attributable to various factors including weather, environment, geography, corrosion and the type of pipeline material. Operational areas across the province identify and target risks in varying degrees. For example, as a result of flood risk across Alberta in June 2013, staff in the Red Deer field centre swept the area through targeted inspections on operators that had lines crossing the Red Deer River.
- focusing on water crossings—The AER views pipelines with water crossing as a significant risk, which it has incorporated into its 2015 strategic plan. However, we were unable to see where risks at water crossings fit in the overall operational plan in comparison with other priorities. Management confirmed water crossing risks influence decisions at the proactive activity planning stage and for operational activities throughout the year. However, the ranking of this risk was not evident in the proactive operational planning process.

System for ranking risks does not guide allocation of resources—The AER could not demonstrate a clear link between the allocation of resources and the priority of risks identified. This process would support appropriate decisions and allow for better allocation of resources.

There is a high level of activity at various levels within the AER. However, we found no clear connection between its organizational goal to get the most value from its efforts and its approach to risk. A full risk assessment would enable the AER to maximize the benefits of its available resources, to support additional resource requirements as they occur, and to achieve the desired outcomes.

¹⁶ Annual period is from July 1 to June 30. Figures are compiled using pipeline data from the AER.

The AER has not completed a skills gap analysis and does not have a formal training program for its core pipeline staff—Management has not completed a province-wide skills gap analysis, nor is there a coherent strategy in place to manage the training needs for core pipeline staff. This process would help management identify gaps that pose a risk to the AER objective, and should include a formal, comprehensive training plan and a plan to cover talent loss due to attrition.

Like many organizations in the energy sector, the AER has challenges in attracting and retaining both inspection and professional engineering staff. For example, we observed the loss of some very experienced pipeline inspection staff during the course of our audit. We recognize that employees who leave the AER to work for pipeline operators bring regulatory experience and will be keen to promote safe industry practices—a positive outcome. However, the industry’s gain is the regulator’s loss.

The pipeline CSA Z662 standard is an integral part of the AER’s compliance program; all pipeline inspections rely on this standard. Yet we found, by means of a survey, that only five out of 16 inspectors and coordinators had received any form of training on the use and requirements of this standard. Only one of the six investigators had received training in the CSA Z662 standard, which includes a significant clause on safety and loss management systems. In addition, as the CSA Z662 standard continues to place more emphasis on safety and loss management systems, the AER will have to ensure skill sets and experience are in place to fulfill the CSA Z662 requirements. The AER should consider making it mandatory for staff to receive training in the use of the CSA Z662 standard, given its significance to the AER’s compliance program.

Currently, training is done through mentorship by a more experienced inspector. As well, the inspectors and investigators self-identify their skills gaps on an ad hoc basis, through the AER’s performance management and development assessment process. An informal approach to training can be a vulnerability both in terms of maintaining credibility with operators and ensuring continuity in essential monitoring and enforcement activities. These risks can best be managed through a formal training program for the regulator’s core pipeline staff.

Training budgets, while available, appear to be fragmented and locally under the control of field centre managers. This level of discretion reflects the absence of a strategy for monitoring core pipeline staff training requirements. The small amount of funding available per person makes attendance at external courses difficult.

On a positive note, the AER recently developed a pipeline training manual. The overall manual content is good; however, the learning process appears to be self-directed and lacks a formal, in-depth assessment to verify that the material has been understood.

Implications and risks if recommendation not implemented

By not using risk management activities to inform operations activities, the AER risks not focusing on the highest impact activities and may not meet its pipeline regulatory requirements effectively.

Without a skills gap analysis and a formal and comprehensive training program for its core pipeline staff, the AER risks not having all the skilled staff necessary to carry out its current and planned activities.

Measuring performance of pipeline operations

Background

Performance measurement systems help decision makers evaluate whether outcomes are being achieved, assess what needs to change, and influence how to make changes and improve future plans. They are designed to evaluate the effectiveness of business plans. In the AER context, performance

measurement should focus on the effectiveness of monitoring and compliance oversight. Ideally, performance information should provide the basis for periodically evaluating the success of the AER's oversight of such things as pipeline operators' integrity related efforts and its own controls over risk mitigation.

The AER prepared a strategic plan for its priorities and goals for 2014–2017. Pipeline safety is an AER priority. The regulator's Environment and Operational Performance branch (EOP) is charged with achieving operators' compliance. Its operational plan for 2014–2015 sets out strategic outcomes, as well as performance measures and targets, for core business areas.

RECOMMENDATION 6: IDENTIFY PERFORMANCE MEASURES AND TARGETS

We recommend that the Alberta Energy Regulator identify suitable performance measures and targets for pipeline operations, assess the results obtained against those measures and targets, and use what it learns to continue improving pipeline performance.

Criteria: the standards for our audit

The AER should have performance measures and targets for pipeline operations, assess results against those measures and targets, and incorporate the outcomes to enhance future pipeline performance.

Our audit findings

KEY FINDINGS

- The AER has defined one, high level performance measure in its strategic plan: a four per cent reduction in pipeline incident rates by 2016. This measure does not consider the severity and risk of incidents; it treats all incidents as if they were the same.
- Not all AER pipeline business areas have quantifiable measures and targets.
- We found a weak correlation between individual goals and plans for working toward the four per cent reduction in pipeline incident rates.
- The AER can improve the analysis of its operational performance and should use what it learns from the evaluation to improve its programs.
- The AER has not clearly defined its internal and external reporting of performance information.

Pipeline target for reducing incidents does not consider severity or risk—We found a limited amount of information about the regulator's safety and integrity targets. One high level metric of reducing the rate of pipeline incidents four per cent by 2106 made no reference to how the measure relates to severity or risk reduction. We could not find documentation to explain how and why the AER decided on its four per cent target.

Not all pipeline areas have quantifiable measures and targets—The AER measures the amount of inspection activity. However, it has not set a quantifiable target for all such activity. Further, the EOP's operational plan mentions a target for the “number and type of pipeline incidents, including volumes and substances related” but does not set a measurable target. The measure reported for pipeline incidents is “reduce pipeline incident rate by two per cent compared to 2013–2014. Focus on inspections/audits and education efforts on high risk pipelines.” This appeared more in the nature of a target than a specific performance measure; its link to strategies designed to achieve the desired outcomes was also unclear.

The Report 2013-B: Pipeline Performance in Alberta 1990–2012 provides a good baseline for measuring improvement in a number of areas. One difficulty in comparing the performance of AER licensees with those in other jurisdictions arises from a lack of consensus in defining what constitutes an incident. This presents an opportunity for the AER to take the lead with its peers in the Western Canada Regulatory

Forum, to establish clear definitions. The AER is also undertaking a review of performance measures through the “best in class” project it announced in November 2014.¹⁷

Individual employee goals are not strongly aligned with corporate goals—Through interviews with operational staff we learned that they were uncertain how their individual planned activity level would contribute to the four per cent reduction in the pipeline incident rate. While the AER has a strategic plan for achieving its objectives, there isn’t a clear link to staff performance plans at all levels. We examined the Performance Management Development Assessment process the AER uses to document individual performance goals and provide supervisor support for achieving them. Based on a sample of assessments for pipeline staff, we could not see a strong alignment with corporate goals. Staff assessments referred to pipeline operational plans and activity levels that were virtually the same as in preceding years.

Data analysis to support decisions and performance measurement is not formalized—The EOP extracts and analyzes data for decision making, informally and as requested. To make informed decisions, management needs to rely on good data analysis to identify the trends and detect where the key risks lie. It is important that the data is sufficient and accurate at the granular level to support good decision making and measurement of performance. Our testing of inspection files found that inspection results are not consistently documented in the Field Inspection System. This could compromise the accuracy of the data management uses for decision making. In addition, risks can change over time, which is why it is important to have the right data: to identify changing trends and determine the appropriate risk mitigation strategy. This process also serves as an input to a performance metric on whether the AER is achieving optimal outcomes for the effort expended.

Internal reporting and follow-up are informal and not clearly documented—In various operational functions, the AER extracts data and reviews it for resource allocation and decision making. However, the process is informal. For example, EOP directors extract and review data monthly to monitor the targeted four per cent reduction in pipeline incident rate. The response and decisions management takes as a result of this review and analysis are not formally documented.

At the time of our audit, the required level of internal reporting was not defined. We found that senior management did not consistently receive an appropriate level of reporting. The AER would benefit from a formal process that clearly identifies the reports needed by various levels of management. The AER should also document key management decisions that arise from analysis of the reports. Subsequent to our field work being completed, the EOP released an internal report that provided an update on activities and achievements of EOP staff. We did not have the opportunity to verify the sufficiency of this report to determine if it is meeting the AER’s internal pipeline performance reporting requirements.

The type and frequency of external reporting of performance information has not been determined—The AER has historically reported publicly on pipeline performance in Alberta, most recently in Report 2013-B: Pipeline Performance in Alberta 1990-2012, and previously through the ST 57—Field Surveillance and Operations Branch Provincial Summary. These reports included detailed information on pipeline incidents and a considerable amount of other pipeline statistics.

At present, the AER has not determined:

- the future intent, process and timing of external reporting
- the target audience for this type of reporting
- roles and responsibilities of individuals involved with external reporting
- its external reporting requirements for pipeline information
- who is accountable for preparing, reviewing and publishing these reports

¹⁷ <http://www.aer.ca/documents/news-releases/AERNR2014-21.pdf>

Implications and risks if recommendation not implemented

Management does not have all of the relevant tools it needs to make good decisions and evaluate the results of its pipeline oversight function. In the absence of meaningful performance measures and targets, Albertans cannot readily know if the regulator is achieving its pipeline goals effectively.

Response, investigation and reporting of pipeline critical incidents

Background

Critical pipeline incidents can have considerable impact on the public, environment and industry. The AER's role is to oversee and, where appropriate, to help operators with remediation. Operators are responsible for being fully prepared and capable of responding to all levels of emergencies.

The AER classifies an incident as critical when it is in the level 1, 2 or 3 emergency category. Emergency levels escalate as the severity of the situation increases and de-escalate as mitigation strategies take effect. Response actions are determined based upon the assessed emergency level.

There are a number of methods by which an incident is reported to the AER. The most common—and the AER's preferred method—is through the Government of Alberta's Coordination and Information Centre. The centre enables the consistent and appropriate handling of incidents in Alberta. Centre staff receive, track, assess and prioritize incoming calls, and communicate the information to AER staff. Upon receiving information about an incident, an AER employee assesses the incident together with the operator, to determine the emergency level. This is key to ensuring sufficient resources are available to respond to the incident.

Incident response and investigation—The AER has a formal First Incident Response Support Team (FIRST) and an investigation team. Both teams have dedicated resources across the province. The FIRST team includes representatives from various field centres to help coordinate the response during an incident. This team fills four key roles: incident response coordinator, consequence management officer, incident investigator and provincial response team. When the emergency situation is contained, the FIRST team transfers its responsibility to the closest field centre. That field centre oversees the operator's continued remedial action. Responsibility for the oversight of long-term remediation of the environment resides with the Department of Environment and Sustainable Resource Development.

The AER conducts investigations based on the criticality and severity of the incident. Following an investigation, a report undergoes an approval process before being made public. In the course of our audit, we reviewed five pipeline critical incidents.¹⁸

RECOMMENDATION 7: REVIEW PIPELINE INCIDENT FACTORS

We recommend that the Alberta Energy Regulator:

- expand its analysis of pipeline incident contributing factors beyond the primary causes
- promptly share lessons learned from its investigations with industry and operators

¹⁸ 1) Pace Oil and Gas Ltd. Wellhead Piping Failure, May 19, 2012.
 2) Pembina Pipeline Corporation Crude Oil Pipeline Failure, June 15, 2008.
 3) Pengrowth Energy Corporation Pipeline Failure, June 26, 2011.
 4) Plains Midstream Canada ULC NPS 20 Rainbow Pipeline Failure, April 28, 2011.
 5) Plains Midstream Canada ULC NPS 12 Rangeland South, Pipeline Failure and Release into the Red Deer River, June 7, 2012.

Criteria: the standards for our audit

The AER should promptly and thoroughly respond to, investigate and report pipeline critical incidents.

Our audit findings**KEY FINDINGS**

- The AER quickly and effectively handled the first response to all five pipeline critical incidents we reviewed.
- Greater benefit could have been extracted from the extensive investigative efforts by examining, in further detail, the contributing factors for critical incidents.
- Lessons learned from an investigation are not consistently shared with operators and the industry.
- The AER conducted an effective follow-up safety and loss management system audit with a pipeline operator.
- The final investigation report review process was time consuming.
- Action items in post-incident assessments were not followed up.

Emergency response and remediation process was effective and timely—The various processes for the response, remediation and containment of emergency situations were well-designed and operating as intended. We reviewed five closed investigation files of pipeline critical incidents going back over the past six years.

Invariably, the first response of the regulator (then ERCB, now AER) to all five incidents was timely and effective. The regulator made sure that sufficient resources were available to respond to these five incidents. Although the responsibility to notify stakeholders rests with the operators, the regulator helped the operators notify these stakeholders, as evidenced in all the files we reviewed.

The AER has also recently implemented a process to post—on its website within 24 hours of the incident—details of incidents that meet certain criteria. Such a process widens awareness of an incident, as well as providing transparent and timely information to the general public and the industry.

Contributing factors deeper than initial root cause were not fully explored—For some of the incidents we reviewed, the regulator identified root causes. However, the regulator did not expand its efforts to further analyze the contributing factors. As a result, it missed an opportunity to improve overall pipeline safety.

For some incidents we reviewed, the regulator relied significantly on root cause analysis reports prepared by the operator or its third party consultants. We found that most of these reports focused on metallurgical or structural reasons for failure and did not probe into contributing factors. Therefore, the reports often left the regulator’s investigators with a narrow view of the root cause.

In a few investigations, the regulator could have probed the contributing factors in more detail. For example, it was uncommon to find documentation indicating that the AER had examined and discussed the management system failure aspect of the reviewed incidents with the operator. In the following section, we outline a few examples we identified:

Manual valve control—For one pipeline critical incident, the investigation report referred to the placement of valves and concluded the operator was not in compliance with the CSA Z662 standard. The operator did not have isolation valves close to both sides of a river crossing. However, the report did not state—but we learned from interviews with the investigators—that it appeared the upstream valve could not be operated remotely. The manual shut down of these valves resulted in an 80 minute delay, which contributed to a larger spilled volume. The investigative report rightly concluded that the absence of isolation valves near the river was a contributing factor. However, the report did not discuss the effectiveness of the control room response or whether the 80 minute delay was appropriate.

In practice, some operators have rules in place to isolate a system if the control room readings cannot be interpreted and reconciled within a pre-defined period of time. For operators that have control room operations, it would be useful for them to become aware—through facilitated, shared learning—of factors that contribute to failures in the isolation of the system.

Deficiency in control system—In another pipeline critical incident, the operator failed to understand deficiencies in its SCADA¹⁹ system. The primary causes of failure were inadequate inspection of construction practices; an inability to identify and remediate construction faults; and over-pressuring of equipment after a multiple pump restart that followed an electrical substation power failure. Had there been adequate SCADA protocols in place in the event of power loss, the over-pressuring of the pipes as result of power start up may not have occurred. If this underlying contributing factor had been dealt with at the design stage and properly validated during commissioning, the environmental impact of the incident would likely have been significantly reduced or eliminated.

The investigation report drew attention to the need for operational procedures that anticipate potential problems and the implementation of processes to properly respond to them. However, we found no recommendation in the report, or in the AER's Field Inspection System, of a need to raise awareness of the possibility of faulty pump control logic, or the need to consider providing backup power to the broader pipeline community.

Overall, the critical incidents we examined all had an underlying management system failure on the part of the operator. This emphasizes the need on the part of operators to assess the effectiveness of their integrity management programs and safety and loss management systems. It also speaks to the AER's need for a process to verify that this is the case.

Lessons learned from investigations are not consistently shared—The AER does not have a formal process for sharing lessons learned from incidents with the operators and the industry. Given that contributing factors are important findings from an investigation, sharing this information is an important way to prevent similar incidents from happening in the future. The AER placed the onus for sharing findings with the broader industry on the operator. However, the AER has no process to verify if a finding has been shared with the industry or not. This limits the sharing of lessons learned and opportunities for continuous improvement with the operators and industry at large. The AER would benefit from a mechanism for sharing with the operators and the broader community the lessons it learns from all types of pipeline incidents. We believe the AER can balance the public interest through timely sharing of lessons learned with the industry, while still protecting the investigation process.

Good use was made of a safety and loss management system audit to follow up on a pipeline incident—To respond to an underlying management system failure in one instance, the AER conducted

¹⁹ SCADA (Supervisory Control and Data Acquisition), a type of industrial control system, is a system operating over communication channels to provide control of remote equipment. SCADA or programmable logic controllers systems are in widespread use in the pipeline industry.

a focused safety and loss management system audit (on Plains Midstream Canada ULC). The results of the audit were posted on the AER’s external website in late 2014. For this audit, the AER supplemented its internal expertise by engaging external consultants. This useful practice can add value to the investigation process, especially in situations where the AER may require resources to expand on the breadth and extent of the root cause and factors contributing to a significant incident.

Reporting was comprehensive, but review activities were drawn out—AER investigations vary in detail and complexity. For the incidents we reviewed, the timeline from the initial investigators’ report to the final report required an average of eight months. Overall, the incident report review process was time consuming and in need of streamlining to ensure a prompt release of the results of the investigation.

Action items in post-incident assessments were not followed up—Some incident files included a post-incident assessment. This assessment identifies lessons learned from the incident process to enhance the AER’s internal processes. We found no evidence that AER staff or management had followed up on action items in these assessments. The AER has not defined when it requires a post-incident assessment nor does it have a process to track its own follow-through on the action items.

Implications and risks if recommendation not implemented

If pipeline incidents are not fully investigated for contributing factors, the regulator, industry and the public cannot be sufficiently satisfied that everything reasonably possible is being done to avoid similar incidents in the future.

Collecting information from pipeline operators

Background

The *Pipeline Act*, the pipeline regulation and various AER directives outline the type of information and records that operators must possess. Some information must be submitted proactively, for the AER’s review and approval. Other information, relating to material properties and test pressures, for example, must be kept and maintained by the pipeline operators for a period of time, and made available upon request by the AER.

The AER, through its monitoring and enforcement activities, verifies the accuracy of the information it requires operators to maintain. The AER mainly uses its Field Inspection System (FIS) to capture information about pipeline compliance activities.

RECOMMENDATION 8: ASSESS CURRENT PIPELINE INFORMATION

We recommend that the Alberta Energy Regulator complete an assessment of its current pipeline information needs to support effective decision making and determine the type and extent of data it should collect from pipeline operators, through a proactive, risk-based submission process.

Criteria: the standards for our audit

The AER should collect appropriate, sufficient and timely information from pipeline operators, to enable it to carry out its regulatory functions.

Our audit findings

KEY FINDINGS

- The AER is collecting and reviewing information as prescribed in the pipeline regulation and directives.
- An assessment of current and future pipeline information needs has not been completed.
- The AER has not mitigated risks of operator transfer of ownership.
- The AER is taking a proactive approach to incident reporting requirements.
- An assessment of key information systems' ability to meet AER's regulatory needs is not complete.

Pipeline data collection and review of regulatory prescribed information is being completed—The AER is collecting and reviewing pipeline information, as prescribed in its pipeline regulatory functions, and noting deficiencies. We confirmed that the AER has a process to verify the information it requires operators to maintain. For example, emergency response plans have to be submitted proactively by operators that meet certain criteria. Our examination of the AER's review and approval process for these plans indicates that it is operating effectively.

Pipeline data needs assessment has not been completed—The AER has not assessed whether the data it collects from pipeline operators is adequate for managing its risk as a regulator. A full assessment of its pipeline data needs would help the AER find out if the information it receives is helping the AER to make informed decisions and achieve its goals and objectives. This process would allow the AER to identify whether it needs to define further data requirements from the industry and have the information submitted proactively.

With constant change—including but not limited to technology, materials and the environment—data the AER collected in the past may not be relevant for decisions it makes today. For example, since steel pipelines are more prone to internal and external corrosion, the industry has recently increased its use of composite materials. However, these new materials have failure types other than corrosion. AER staff have observed a trend of increasing failures caused by improper construction of composite pipelines. Thus, data on construction schedules of composite pipelines might be useful information.

A detailed schedule would allow the AER to plan its construction site visits to target risk areas. This emphasizes the need for the AER to recognize industry trends, assess the relevance of current information to the identified trends, and determine if changes in data requirements should follow.

The AER has not mitigated risks of operator transfer of ownership—Risks associated with the transfer of ownership occur when complete records are not transferred at the time of the sale, and when there is improper ongoing maintenance in the period immediately before the sale. There have been pipeline failures as a result of the previous owner not maintaining internal corrosion mitigation operations. The AER is aware of this issue and is looking for a way to have the seller deal with them before allowing the transfer of ownership. The Liabilities and Closure group indicated the AER has the capabilities to achieve this; however, the process is manual and labour intensive. To date, this level of oversight has not been applied to any operators who are selling assets.

The AER is taking a proactive approach to incident reporting requirements—The AER, as part of the CSA Z662 committee, has been proactive in recognizing current incident details to be added to the CSA Z662 standard. Part of CSA Standard Z662-11 Oil and gas pipeline systems, Annex H—spells out requirements for incident reporting. Work is underway on the 2015 version of the CSA Z662 standard. If approved, this revision is intended to provide much more detailed information and a better descriptor of incidents. The new incident reporting requirements will provide better and more consistent reporting, to allow for the appropriate trending analysis to support regulators' decisions.

Assessment of Field Inspection System’s ability to meet AER’s regulatory needs is not complete—

The AER’s FIS system may not be able to do everything the AER wants or needs it to do. The AER relies on the FIS as its source of record for detailed information about well sites, pipelines and other oil and gas infrastructure. The AER also relies on it for new and more detailed reporting to meet changes in its organizational goals and objectives. Once the AER has a clear IT strategy that aligns with and supports its overall goals, objectives and future needs, it can define and then implement the technology and processes needed to meet its regulatory goals and objectives. The AER confirmed that it is considering how to deal with the risk that the FIS system may not, in its present form, support its present and future needs.

Implications and risks if recommendation not implemented

Without a proper assessment of its data needs, the AER is at risk of not having sufficient and relevant information to make informed decisions. This in turn puts the AER at a greater than necessary risk of not fulfilling its regulatory duties effectively.

Monitoring of pipeline operations**Background**

The AER’s regulatory duties are outlined in the *Pipeline Act*, rules and regulation. Procedures and manuals, based on the act and rules, also help AER staff carry out their monitoring activities. Key monitoring activities are separated into reactive and proactive categories. Inspection is the main tool for both proactive and reactive monitoring. The AER conducts incident response, detailed operation, construction, baseline and random inspections. The Field Information System is the main operational system it uses to track the results of monitoring activities.

Reactive activities—These include responding to public complaints and incidents. These activities consume substantial AER staffing resources. The AER is mandated to respond to all pipeline incidents (which may be failures) and public complaints.

Proactive monitoring activities—The key proactive activities are detailed operation inspections and construction inspections. Planning for proactive monitoring is done annually by the Provincial Pipeline Technical Specialist. The AER allocates resources first to its reactive activities, assigning the remaining resources to proactive activities.

Integrity management programs and safety and loss management systems—The AER adopted CSA Standard Z662-11 Oil and gas pipeline systems as mandatory in fulfilling its pipeline regulatory functions. The CSA Z662 standard provides the foundation for the AER’s inspection program—Manual 005. In addition, all pipeline inspections are conducted with reference to this standard. Clause 3.1 and 3.2 in the CSA Z662 standard require operators to develop and implement effective safety loss and integrity management systems. All such programs and systems have, at their core, the central theme of continuous improvement, as well as to serve the main purpose of keeping the products in the line. As long as the transported fluid remains within the pipeline, its integrity is assured, the public is kept safe and the environment remains protected. Annex N—Guidelines for pipeline system integrity management programs in CSA Z662 is also mandatory for operators.

RECOMMENDATION 9: IMPLEMENT RISK-BASED COMPLIANCE PROCESS

We recommend that the Alberta Energy Regulator implement a cost effective risk-based compliance process to evaluate the adequacy and effectiveness of pipeline operators' integrity management programs, and safety and loss management systems.

Criteria: the standards for our audit

The AER should have systems to manage, fulfill and enhance its pipeline monitoring activities.

Our audit findings**KEY FINDINGS**

- The AER carries out its core pipeline monitoring activities in accordance with provincial and federal regulatory requirements.
- There is no formal process to evaluate the effectiveness of operator safety and loss management systems and integrity management programs.
- AER response to pipeline integrity requirements is pending.

The AER carries out its core monitoring activities in accordance with the pipeline regulatory requirements—We tested a representative sample of the various types of inspections files and found the AER conducted them appropriately. We also verified that staff had correctly evaluated the reported incidents and complaints and had responded to these issues appropriately.

As part of the audit, we visited three of the nine field centres in the province. The main purpose of these visits was to understand the monitoring processes and procedures that AER staff follow in carrying out their regulatory duties and to verify their consistent application. From our visits and audit sampling of the proactive and reactive activities, we confirmed that AER staff have been consistently following the pipeline processes and procedures. We also attended a detailed operation inspection and a new construction inspection and found the staff had appropriately followed the processes and procedures when conducting these inspections.

The AER lacks a formal process to assess integrity management programs and safety and loss management systems—The AER requires operators to adopt the CSA Z662-03—Annex N standard to develop and implement effective integrity management programs and safety and loss management systems. However, the AER does not have a risk based process to assess the effectiveness of these programs and systems, whether through operator self-assessment, audits or by other means. In addition, qualified and adequate resources need to be available to assess the adequacy of licensees' integrity management and safety and loss management programs and systems. The regulator's detailed operation inspections test some elements of these programs and systems; however, they lack sufficient depth to assess the adequacy and effectiveness of safety and loss management systems.

A "one size fits all" approach to verify the effectiveness of these systems isn't tenable. Alberta's large pipeline operators have internal resources and the means for developing and self-assessing programs. Smaller operators lack these resources. In some circumstances, it may not be practical for smaller operators to develop and maintain integrity management programs to the same extent as larger operators. However, the underlying integrity concepts set out in the CSA Z662 standard are scalable. It behooves smaller operators to have in place procedures that are both fit for purpose over the life of a pipeline and capable of achieving the desired end result from a regulatory perspective.

Furthermore, very few operators actually have pipeline transportation as their principal business activity. For most it is an ancillary part of their energy development activity, even though it is essential to the sustainability of the overall process as these smaller gathering systems connect the well head to

batteries and processing. Treating pipeline operation as non-core to their business can have a negative effect on their approach to staff resourcing and management commitment.

AER response to pipeline integrity requirements is pending—In 2007 the Energy Utilities Board (a predecessor of the AER) developed a self-assessment tool—Pipeline Integrity Management Program Assessment Forms and Guidelines. As a pilot project, three operators did self-assessments of their integrity management programs using this form. The experience from this project was used to improve the self-assessment tool. Following this, a voluntary audit was completed with one operator. Deficiencies were identified as a result of the audit and the EUB worked with the operator to correct them.

The opportunity to expand this program to other operators, however, was put on hold. Staff told us this was because of constraints on resources. The project has not been revisited since that time. Scenarios such as this, where the value of the activity is acknowledged but its implementation is resource constrained, demonstrate the need for applying risk to drive resource allocation.

Implications and risks if recommendation not implemented

Without a risk-based compliance process to assess the effectiveness of operator integrity management programs, and safety and loss management systems, the AER is at risk of missing an opportunity to enhance pipeline safety and achieving its objectives and targets for incident reduction.

Enforcement of pipeline operations

Background

Before July 1, 2014, the EOP branch followed Directive 19—Compliance Assurance to enforce non-compliance identified as a result of inspections and other monitoring activities. Subsequent to July 1, 2014, the EOP branch began to follow a new enforcement framework to deal with non-compliance it identifies through monitoring activities. One significant change is that non-compliance results from inspections are treated as abatements for which the AER requires operators to remediate deficiencies within a set timeframe. All non-compliance identified from monitoring activities are now triaged for investigation. Furthermore, the new compliance framework introduces a punitive investigation process.

Criteria: the standards for our audit

The AER should have systems to discharge and enhance its pipeline enforcement activities.

Our audit findings

KEY FINDINGS

- Enforcement of non-compliance process was appropriately followed.
- The AER provides important presentations to industry to facilitate compliance.

Enforcement process was appropriately followed—Based upon our examination of a representative sample covering a wide range of enforcement categories, we found the AER had complied with Directive 19 in its non-compliance enforcement process. Specifically, in situations where the non-compliance qualified for an escalation, the AER appropriately escalated the issue and ensured the enforcement requirements were met within a set timeframe. We also tested a sample of appeals and found the overall appeal processes were reasonable, including workgroup discussion at the field centre level and at the Calgary head office level.

The AER is finalizing a new compliance framework. It has completed an analysis of the ERCB and ESRD compliance frameworks and applied lessons learned to its new framework. Given that the

implementation date of the new process was July 1, 2014, not enough time had passed and not enough completed files were available to demonstrate the effectiveness of the process. As a result, we did not assess controls over the new process. During our follow-up audit, we will include the new process as part of our scope.

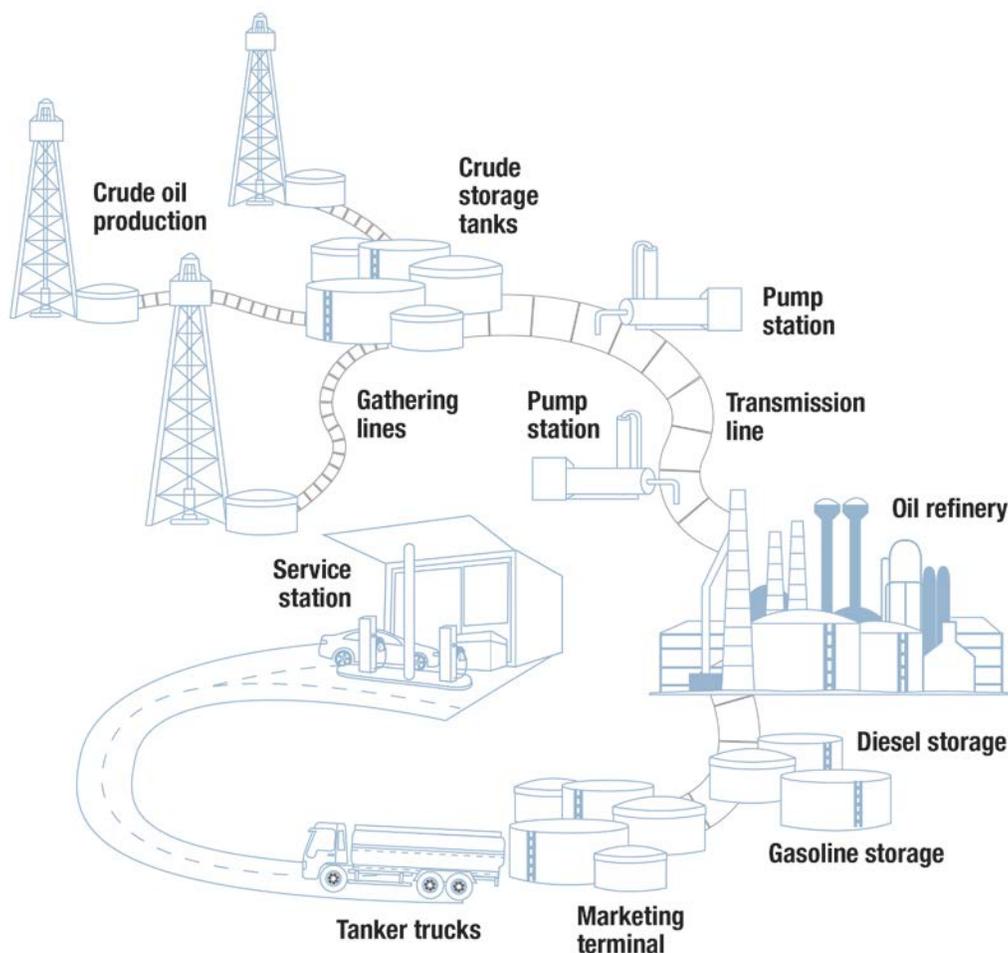
The AER provides important presentations to industry to facilitate compliance—Education is a key component of the compliance framework. The AER offers presentations to industry stakeholders, to clarify the AER’s regulatory processes, procedures and agreements, and educate the industry on common issues to prevent them from reoccurring. The presentation topics include emergency response overviews, ground disturbance requirements, release reporting requirements, pipeline operator awareness sessions and pipeline performance. The AER also invited industry participants to present in the sessions. This encouraged the sharing of best practices among stakeholders.

PIPELINE INFORMATION

Liquid pipelines

These pipelines transport crude oil and natural gas from producing fields to refineries. Powerful pumps spaced along the transmission lines (largest pipelines) push the refined petroleum products to terminals and distribution centres. Refined petroleum products include gasoline, diesel, jet fuel and heating oil. The figure below illustrates the crude oil delivery network.²⁰

The crude oil delivery network

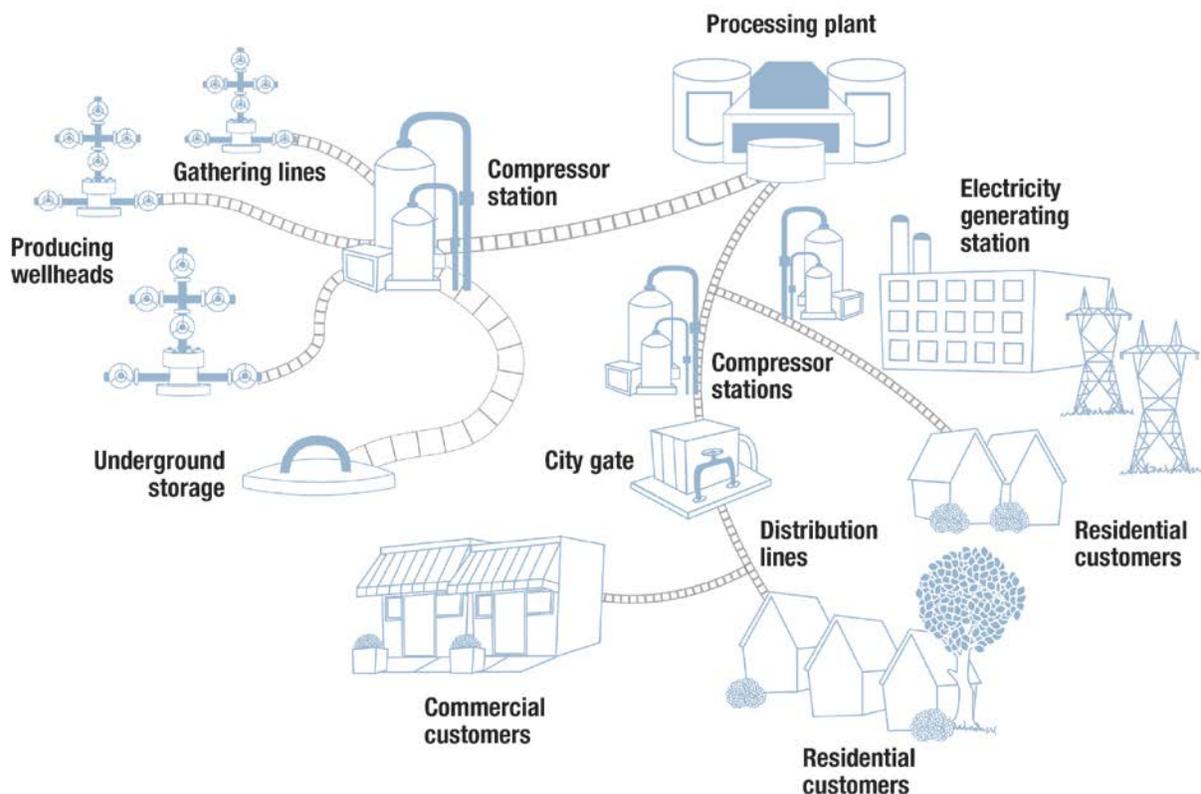


²⁰ <http://www.cepa.com/about-pipelines/types-of-pipelines/liquids-pipelines>

Natural gas pipelines

These pipelines transport natural gas from gas wells to processing plants for the removal of impurities, water and other gases. Natural gas liquids (NGLs) are also extracted from gas plants and transferred to oil refineries for processing. The refined natural gas is then transferred through the pipelines using compressors that have the “pushing” effect, from areas of high pressure to low pressure, then to distribution systems where the products are delivered directly to residential and commercial customers. The figure below illustrates the natural gas delivery network.²¹

The natural gas delivery network



²¹ <http://www.cepa.com/about-pipelines/types-of-pipelines/natural-gas-pipelines>

PIPELINE STATISTICS

Liquid pipelines

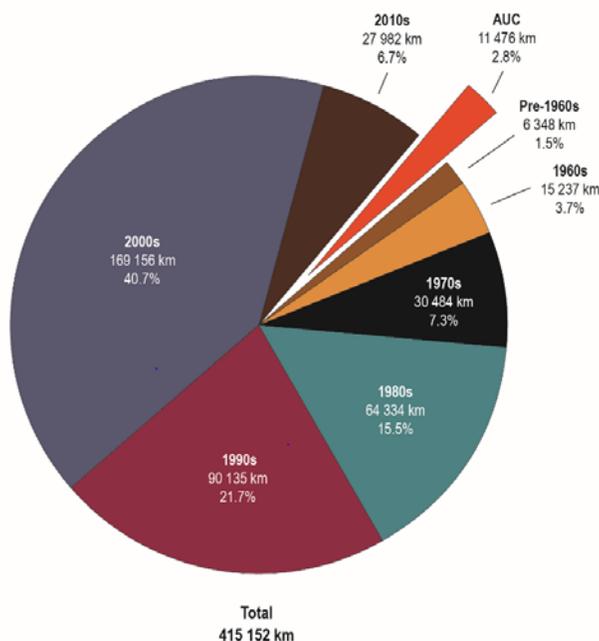
Length of Alberta pipelines

In 2012, the length of different pipeline types was as follows in Alberta.²²

PIPELINE TYPE	LENGTH (KM)
Alberta Utilities Commission (AUC) natural gas utility pipelines	11 476
Crude oil pipeline	20 272
Multiphase pipeline	61 576
Natural gas pipeline	238 582
Other pipeline	36 161
Sour gas pipeline	22 612
Water pipeline	24 473
Total	415 152

Alberta pipeline by decade of construction

Here is how pipelines have developed in Alberta, from the pre-1960s to the present decade.²³ The following chart identifies provincial pipeline that is still in use. (The AUC pipeline added in this decade reflects the chart’s original source, not our audit focus.)



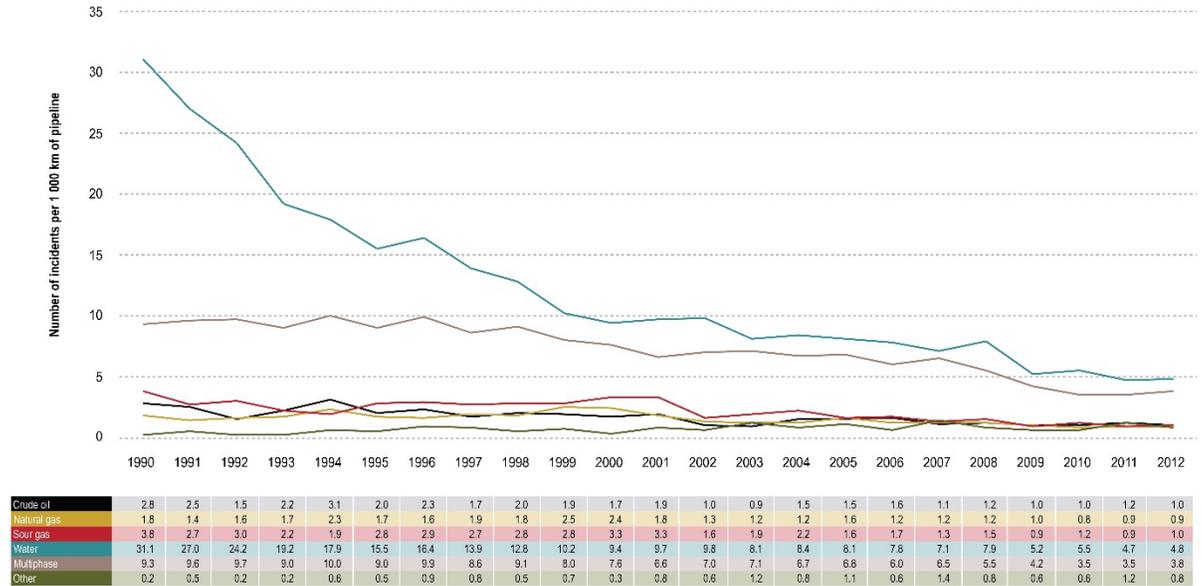
²² Energy Resources Conservation Board, ST57-2013, Field Surveillance and Operations Branch—Field Operations Provincial Summary 2012, page 9.

²³ Report 2013-B: Pipeline Performance Information in Alberta, 1990-2012, August 2013, page 11.

Average frequency of pipeline incidents by year and pipeline substance

All pipeline incidents from January 1, 1980 to December 31, 2012 (includes all hits, leaks and ruptures) are included in the following graph.²⁴

Figure 27. Average frequency of pipeline incidents by year and pipeline substance
 All pipeline incidents from January 1, 1990, to December 31, 2012 (includes all hits, leaks, and ruptures)



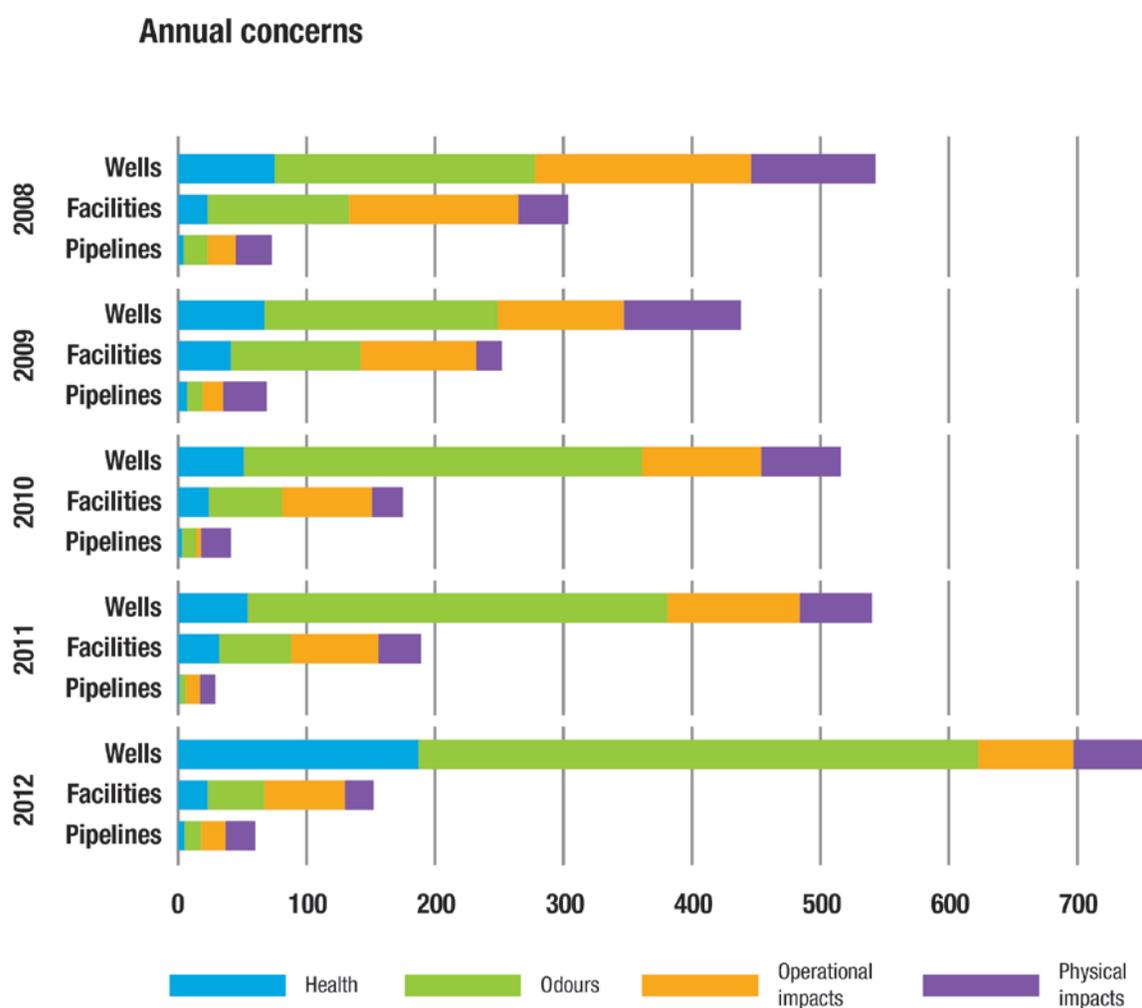
²⁴ Report 2013-B: Pipeline Performance Information in Alberta, 1990-2012, page 91.

Public complaints—annual concerns from 2008 to 2012

Public concerns include the following:

- **health**—possible impacts on human or animal health by upstream oil and gas activities
- **odours**—all odour types (e.g., H₂S, SO₂)
- **operational**—effects of facility operations (e.g., explosion, fire, flare, smoke, spill, uncontrolled flow, nuisance, noise, dust)
- **physical**—possible impacts on public safety, land, water wells, or other (e.g., lease management, public hazard, property damage, water wells)

The following chart illustrates the total number and categories of concerns from 2008 to 2012.²⁵



²⁵ Energy Resources Conservation Board, ST57-2013, Field Surveillance and Operations Branch—Field Operations Provincial Summary 2012, page 3.

Appendix C

PIPELINE INCIDENTS INFORMATION

Alberta oil spills

The following outlines notable Alberta oil pipeline spills from 2006 to 2012. The information is based on incident data extracted from the AER Field Inspection System.

INCIDENTS	INCIDENT DATE	DETAILS	RELEASE VOLUME
1 2012 Enbridge Pipelines (Athabasca) Inc. oil pipeline spill	June 18, 2012	Enbridge reported the Athabasca pipeline spill of heavy crude oil at a pumping station at Elk Point, Alberta.	~230 m ³ of crude oil
2 2012 Plains Midstream Canada ULC pipeline crude oil spill	June 7, 2012	Sundre Petroleum Operators Group, a not-for-profit society, informed Plains Midstream Canada of an oil pipeline spill into Jackson Creek, a tributary of the Red Deer River located north of Sundre, Alberta.	~500 m ³ of crude oil
3 2012 Pace Oil and Gas Ltd pipeline oil spill	May 19, 2012	Plains Midstream Canada notified Pace Oil and Gas that a spill was occurring at one of its water disposal wells in the Rainbow Lake Oil Field. The spill was about 20 kilometres southeast of the Rainbow Lake townsite.	~800 m ³ of crude oil
4 2011 Pembina Pipeline Corporation crude oil spill	July 19, 2011	Pembina Pipeline Corporation reported a crude oil spill on its pipeline north of Swan Hills, Alberta.	~200 m ³ of crude oil
5 2011 Pengrowth Energy Corporation explosion and oil spill	June 26, 2011	Pengrowth Energy reported an explosion and oil pipeline spill that leaked combination of crude oil and produce water into Judy Creek in the Swan Hills area. There were also some gas being released.	~5 m ³ of crude oil 10 m ³ of gas production 95 m ³ of salt/produced water
6 2011 Plains Midstream Canada ULC Rainbow pipeline oil spill	April 29, 2011	Plains Midstream Canada detected a massive pipeline rupture of crude oil on the Rainbow pipeline near Little Buffalo, Alberta.	~4,500 m ³ of crude oil

INCIDENTS	INCIDENT DATE	DETAILS	RELEASE VOLUME
7 2008 Suncor Energy Inc. diesel fuel pipeline spill	July 15, 2008	Suncor reported a pipeline leak and spill of diesel fuel in Fort McMurray area.	~ 200 m ³ of diesel oil
8 2008 Pembina Pipeline Corporation oil pipeline spill	June 15, 2008	Pembina Oil Pipeline reported oil pipeline rupture into the Red Deer River.	~ 28.1 m ³ of crude oil
9 2008 Penn West Petroleum Ltd oil pipeline spill	April 30, 2008	Penn West pipeline released crude oil into the Otawau River and Slave River, near the towns of Smith and Athabasca.	~ 20 m ³ of crude oil
10 2006 Rainbow Pipeline Corporation oil pipeline spill	October 10, 2006	Rainbow Pipeline reported a major crude oil pipeline spill that leaked into a series of ponds and beaver lodges.	~ 1,200 m ³ of crude oil