



CANADIAN ASSOCIATION  
OF PETROLEUM PRODUCERS

Canada's Oil and Natural Gas Producers

BEST MANAGEMENT PRACTICE

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# **Guide for Designated Pipeline Sections in High-impact Areas**

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July 2015

Publication 2015-0011

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce about 90 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a national industry with revenues from oil and natural gas production of about \$120 billion a year. CAPP's mission, on behalf of the Canadian upstream oil and gas industry, is to advocate for and enable economic competitiveness and safe, environmentally and socially responsible performance.

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## Overview

This *Best Management Practice Guide* provides an industry standard for the design, construction and operation of designated pipelines in high-impact areas. Operating companies may choose to add to or build on these practices in response to their corporate objectives.

This *Best Management Practice Guide* is based on a performance- and risk-management approach. It is not intended to be prescriptive, but rather sets out the principles and a series of implementation steps that CAPP member companies can follow. These steps allow flexibility for each company to apply their own business principles and risk models within the overall framework established for the identification and management of designated pipelines in high-impact areas.

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## 1 Background

Upstream oil and gas producers in Alberta operate an extensive network of approximately 415,000 km<sup>1</sup> of small diameter (majority < 12 inches) pipelines. These pipelines gather production from wells throughout the province and transport it safely to storage and/or processing facilities and ultimately to customers and consumers.

The network of small diameter pipelines in Alberta has been built over several decades and spans all areas and environments in the province. Approximately 65 per cent of Alberta's 415,000 km of pipelines transport natural gas, 5 per cent sour gas, 4 per cent crude oil, 12 per cent multiphase products, and the remainder transport produced water and other products.

These pipeline systems are regulated by the Alberta Energy Regulator (AER) in accordance with Alberta's high safety performance standards. Pipelines in Alberta must meet the requirements of the *Pipeline Act* and regulation, AER's directives and manuals, and CSA Z662. The March 2015 report of the Auditor General recognizes the effectiveness of the AER's regulation in saying "Albertans can be assured that the regulator is adequately performing its function of overseeing pipeline safety and reliability."

The primary responsibility for maintaining safe and reliable pipelines lies with industry. Our industry performance record is good, but we continue to strive to improve operations, safety, and protection of the environment. The number of pipeline incidents per 1,000 km of pipeline in Alberta has fallen steadily in the past 20 years from 5.0 incidents/1,000 km of pipeline in 1990 to 1.4 incidents/1,000 km in 2013. Incidents of all types are reported to the AER, including small spills, hydrotest failures, and third party contacts with pipelines which may or may not result in a release of product. From 2004-2013, less than 7 per cent of incidents were considered Priority 1 Events<sup>2</sup>, requiring immediate response to release of product and 1 per cent involved releases to flowing water. In the same period, nearly 80 per cent of incidents resulted in either no release of product or a release of small volumes that were contained at the site.

In 2011-12, several high profile pipeline incidents occurred in Alberta that resulted in unacceptable impacts to people, property and the environment. In response, the government commissioned the Alberta Pipeline Safety Review to identify areas where improvement by regulators and by companies may be needed.

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1 <https://www.aer.ca/rules-and-regulations/by-topic/pipelines>

2 A Priority 1 Event may involve a release of >200 m3 of product and has the most serious potential to affect people and the environment.

The recommendations of the Alberta Pipeline Safety Review focuses on the need for risk assessment of pipeline systems and improving practices in “high-consequence areas”, including water bodies. These recommendations have prompted CAPP and its member companies to develop this *Best Management Practice Guide*.

This Guide sets out our commitments to specific principles and practices that will continue to improve industry operations in general, and provide greater protection for areas considered “high-consequence” or “high-impact”. The practices set out here are specifically targeted to designated pipeline sections in high-impact areas and are in addition to current best practices that apply throughout our pipeline systems.

## 2 Our Principles

We will

- design, construct and operate new pipelines to prevent high-impact incidents,
- operate and maintain existing pipelines to prevent high-impact incidents,
- commit to an annual target of zero high-impact incidents,
- establish enhanced emergency response plans for high-impact areas: resource and implement the plans to minimize consequences resulting from pipeline emergencies in high-impact areas and
- communicate our practices and commitments to regulators, stakeholders and the public; encourage and be responsive to their feedback.

## 3 Identifying Designated Pipeline Sections in High-impact Areas

The *Best Management Practice Guide* provides an industry standard for operation of designated pipelines in high-impact areas. Operating companies may choose to add to or build on these practices in response to their corporate objectives or to address specific interests and concerns of their landowners and neighbours.

A “Designated Pipeline” is a pipeline which carries a fluid in sufficient quantity that is highly deleterious (hazardous) to the receptor in the specific “High-impact Area” that the pipeline crosses, and has a risk of causing a high-impact release.

A “High-impact Area” (HIA) is a location where a particular pipeline incident, if it occurred, could potentially result in unacceptable or intolerable effects, such as danger to people or infrastructure, adverse effects to a water body and the surrounding environment, or both.

A “High-impact Incident” is a release that occurs from a “Designated Pipeline” in a “High-impact Area”

CAPP-member companies have worked together to develop the following framework to identify high-impact areas across our operating systems. A flowchart is also provided in Appendix A for reference.

### 3.1 Step 1 – Screening

Apply the high-impact areas screening criteria to the existing pipeline system or in areas where new pipelines are planned (see Table 1). This first step assists operators to identify areas that should be reviewed further for potential “high-impact area” status. Screening can be done using a GIS-based approach or by other means.

**Table 1: Screening Criteria for Defining Designated Pipeline Sections in High-impact Areas**

<b>High-impact Area Criteria</b>	<b>Applicable Product Carried to determine if pipeline is Designated<sup>3</sup></b>	<b>Example Data Sources for Defining Pipeline Sections</b>
<b>Proximity to Populated Areas</b> (Pipeline CSA Class 2 or greater)	All products, other than sweet low pressure gas <sup>4</sup>	Internally generated by operators following CSA design requirements
<b>Primary Highways Crossings</b> (e.g., Hwy 1, Hwy 63)	Pipelines containing > 1 per cent H <sub>2</sub> S	IHS dataset
<b>Water crossings<sup>5</sup></b>	Liquids <sup>6</sup>	AltaLIS data base or GEOBASE  Should include all “navigable waters” listed in Schedule 2 of Navigation Protection Act
<b>Internationally Significant Environmental Areas</b> (e.g., National Parks)	Liquids <sup>6</sup>	AESRD

<sup>3</sup> Products carried include natural gas, sour gas, and liquids (low-vapour pressure fluids, crude oil, multiphase, salt water, and miscellaneous liquids). Freshwater and dense phase CO<sub>2</sub> are not included.

<sup>4</sup> Low-pressure gas is defined as natural gas and fuel gas with a maximum operating pressure less than 700 kPa. Sweet gas is defined in CSA Z662

<sup>5</sup> Water crossings are defined as perennial streams. (If using the AltaLIS database: <20 m width, rivers >20m width, reservoirs, lakes, lagoons, oxbows, canals. Apply a similar definition when using other GIS databases)

<sup>6</sup> Liquid lines are typically those that are licensed as low-vapour pressure fluids, crude oil, multiphase, salt water, and miscellaneous liquids. Excludes fresh water.

### **3.2 Step 2 – Verification**

Use field inspection, recent aerial imagery, or other direct observation tools to verify the conditions present in the areas that have been screened as potentially high-impact. Given the wide variation in environmental conditions across Western Canada, this step is necessary to confirm the site-specific applicability of the general HIA criteria. This may result in some areas being removed from the list due to a dry streambed, for example. It may also result in some areas being added, based on the judgment of operators. A minor stream crossing may be added to the list because it is a direct tributary to a much larger watercourse or is proximal to a wetland used by migratory birds. The outcome of this step is a verified and revised list of potential high-impact areas on the pipeline system.

### **3.3 Step 3 – Apply Risk Model**

Not all incidents in a high-impact area are high-impact incidents. Therefore, it is important to apply your company's risk assessment model to the potential high-impact areas. The risk assessment model should include identifying specific potential hazards, estimating the risks and their significance, documenting the results, and evaluating the options for addressing pipeline integrity in those areas. This *Best Management Practice Guide* sets out several options that may be appropriate. Your company's risk assessment model reflects your corporate risk tolerance profile.

CSA Z662 (Annex N) requires every operator to have management programs and systems in place that ensures pipeline integrity and achieve regulatory compliance. Annex B of CSA Z662 provides guidance on risk assessment concepts, processes, and significance. Additionally, it sets out the important role of risk assessment in the design of pipeline integrity management programs, including prioritization of maintenance, inspection, and repair activities. The outcome of Step 3 is a risk-informed list of designated pipelines on a specific pipeline operator's system.

### **3.4 Step 4 – Prioritization and Implementation**

Use the results of Step 3 for risk-based prioritization of actions and/or controls to support or enhance pipeline integrity management. The outcome is a schedule of maintenance and investigative actions to minimize risk for applicable pipeline sections in high-impact areas. The risk assessment needs to be repeated regularly until the resulting mitigated risk is deemed acceptable. The risk assessment and resulting mitigation plan may also need to be adjusted as required to reflect the results of pipeline maintenance programs, external events (e.g., floods, fire), regulatory changes, new learnings and stakeholder concerns.

*Note: The above steps are intended to mirror the processes and decision making as outlined in figure N.1 of CSA Z662.*

## 4 Design and Construction of New Pipeline Sections in High-impact Areas

Designing and building new pipelines provides the opportunity to incorporate the newest materials, technologies and construction practices to ensure safe operations over the life of the pipeline and to facilitate monitoring and control of hydrocarbons through the pipeline systems.

The industry standard for design, construction and safe operation of pipelines in Canada is *CSA Z662 – Oil and Gas Pipeline Systems*. This comprehensive standard is the basis of the design, construction, operation and maintenance of all pipelines in Canada. It is the foundation of the integrity management programs that each company must maintain and implement, and it is the basis of regulatory oversight by the AER and other regulators throughout Canada.

CAPP's commitment is to design and build new pipelines in such a way that high-impact areas are protected, high-impact incidents are prevented, and their effects are minimized should they occur. This will be accomplished through compliance with CSA Z662 and risk-based consideration of additional measures in high-impact areas as applicable to the type of service and circumstances. These additional measures may include the following:

- selecting routes to avoid high-impact areas where practical
- where unavoidable, routing through high-impact areas supported by appropriate risk assessment and geotechnical analyses to confirm site-specific design requirements for safe operation
- increasing the safety factor of pipelines in high-impact areas through more robust design including thicker wall or stronger pipe, and other specifications as appropriate
- designing for use of enhanced leak detection techniques
- designing the pipeline to allow for the use of in-line inspection tools and maintenance cleaning pigs
- using internal liners, internal coatings or non-metallic materials in very corrosive services
- designing with use of block valves, check valves or line break control valves on either side of a high-impact area to allow rapid response and shutdown in the event of an incident
- using construction specifications in high-impact areas that focus on increased QA/QC at all stages, greater oversight and inspection during installation, additional field testing, and communicating these requirements with all construction personnel

## **5 Operation and Maintenance of Designated Pipeline Sections in High-impact Areas**

Each operator will identify where their applicable operating pipelines cross defined high-impact areas and adjust their operation and maintenance activities accordingly to provide a greater level of oversight, inspection, and integrity management of these facilities.

This will be achieved by risk-based consideration of the following, as appropriate for the type of service and circumstances:

- implementing enhanced integrity management plans for pipelines in high-impact areas as part of corporate integrity management programs – including auditing of existing programs, reporting on key performance indicators and greater senior management accountability
- increasing the use of in-line inspections (where possible), Internal Corrosion Direct Assessments, External Corrosion Direct Assessments, pressure testing, increased right-of-way inspections, enhanced leak detection methods, and over line surveys as applicable
- increasing use of depth-of-cover surveys, flood monitoring, and hydrologic assessments of watercourse crossings
- undertaking more detailed pipeline corrosion assessments and implementing enhanced corrosion inhibition and pigging programs where required
- undertaking more frequent emergency response exercises in high-impact areas to ensure emergency preparedness

## **6 Commit to an Annual Goal of Zero High-impact Incidents**

CAPP and its member companies believe that the only reasonable annual goal for performance in high-impact areas is zero high-impact incidents.

## **7 Establish and Implement an Enhanced Emergency Response Plan for Designated Pipelines in High-impact Areas**

Emergency Response Plans are an integral element in every operating pipeline system and a regulatory requirement. They are based on considerations of risk, likelihood, potential incident scenarios, site-specific knowledge of the environment, emergency zones for public notification and evacuation, and protocols for rapid and effective response with appropriate equipment in the event of an incident.

The commitments made previously in this Guide for design, construction, operation and maintenance in high-impact areas must be supported by equally focused plans for emergency response in the event of an incident on an applicable pipeline in a high-impact area.

This will be achieved by:

- conducting site visits of high-impact areas to assess site-specific features that could restrict effective emergency response
- collaborating with other operators to develop cooperative emergency response capability in high-impact areas where multiple companies have facilities
- ensuring appropriate training and preparedness through desktop emergency response exercises – both among our member companies and with the Regulator
- communicating and working effectively with local first responders and the public
- conducting frequent ERP drills for high-impact areas

## **8 Implementation of the Best Management Practice Guide for Designated Pipeline Sections in High-impact Areas**

This *Best Management Practice Guide* provides every CAPP-member company with a clear statement of the commitment and guidance on ways to achieve it. Many companies already have specific plans, procedures, and management actions in place for pipeline sections in high-impact areas as part of their risk management processes. Other companies will use this Guide to upgrade their current practices. Some companies will go beyond the practices recommended here to meet their own corporate commitments to achieve excellence in risk management.

This *Best Management Practice Guide* is based on a performance- and risk-management approach. It is not intended to be prescriptive, but rather sets out the principles and a series of implementation steps that CAPP member companies can follow. These steps allow flexibility for each company to apply their own business principles and risk models within the overall framework established for designated pipelines in high-impact areas. The objectives are common and unchanged, however, the pathways by which each company will achieve those objectives can be crafted to meet their own requirements for effective risk management, reflecting the composition of their pipeline assets, current and past performance, regulatory direction, and stakeholder expectations. This performance-based approach has been highlighted by the Alberta Auditor General in its recent review of AER practices, and CAPP believes it is appropriate for application in high-impact areas.

**Appendix A      Identification Framework for Designated Pipeline Sections  
in High-impact Areas**

