

Pipeline Performance in British Columbia in 2009



About the BC Oil and Gas Commission

The BC Oil and Gas Commission (Commission) is an independent, single-window regulatory agency with responsibilities for overseeing oil and gas operations in British Columbia, including exploration, development, pipeline transportation and reclamation.

The Commission's core roles include reviewing and assessing applications for industry activity, consulting with First Nations, ensuring industry complies with provincial legislation and cooperating with partner agencies. The public interest is protected through the objectives of ensuring public safety, protecting the environment, conserving petroleum resources and ensuring equitable participation in production.

Table of Contents

1. Executive Summary	Page 5
2. Report Scope	Page 6
3. Pipeline Inventory	Page 7
4. Pipeline Incidents	Page 8
5. Repairs and Investigations	Page 8
6. Integrity Management Programs (IMPs)	Page 9
6.1 IMPs in British Columbia	Page 9
7. Incident Statistics	Page 10
8. Pipeline Performance – Moving Forward	Page 17



1. Executive Summary

The BC Oil and Gas Commission (Commission) regulates more than 35,000 kilometres of pipelines that transport a variety of refined and unrefined products from wells to facilities and from facilities to end markets within British Columbia or other destinations. The safe and secure operation of these pipelines is essential to the preservation of the environment and the protection of British Columbians.

The Commission takes proactive measures to ensure the integrity of British Columbia's pipelines, which include a comprehensive application and review process, required Integrity Management Programs (IMPs) and notification of any operational changes to a pipeline. However, incidents can occur, and each one must be reported to the Commission, even if there is no spillage or release of products.



In 2009, there were 37 pipeline incidents reported to the Commission by Commission-regulated pipeline operators. The Commission investigated the incidents on a case-by-case basis, monitoring proper reporting procedures and determination of root cause, ensuring complete cleanup and performing on-site analysis when necessary. The majority of incidents were classified as minor. Three incidents, detailed in Section 7, accounted for the majority of products released in 2009, the most significant being an act of vandalism.

The purpose of IMPs is to identify hazards to the continued safe operation of a pipeline system and to apply appropriate mitigation to those hazards. When a pipeline leaks or otherwise fails, that incident represents a failure of the IMP. Within British Columbia, the predominant hazard for pipelines is internal corrosion, which accounted for approximately 40 per cent of incidents in 2009.

The overall incident frequency for 2009 was 1.03 incidents for every 1,000 km of pipeline. Of note, the second highest incident frequency occurred on pipelines carrying fluids categorized as "other" (2.95 incidents per 1,000 km). These fluids include sour effluent, acid gas and other highly corrosive products. The pipelines with the highest incident frequency were water pipelines, with an incident frequency of 8.43 incidents per 1,000 km.

Not all incidents are leaks. In 2009 there was a total of 21 leaks on pipelines regulated by the Commission. This translates to a leak frequency of 0.58 leaks for every 1,000 km of pipelines. Comparisons are difficult to make given the variance in products transported within other jurisdictions. The National Energy Board, which regulates a pipeline system carrying primarily refined and non-corrosive products, has reported a leak frequency of 1.2 leaks for every 1,000 km of gas pipelines for 2008 (pipe body leaks and operational leaks combined).

The Commission notes that no leak is acceptable regardless of the product type. In 2010, the Commission is rolling out its compliance assurance program for IMPs. Beginning in 2011, and continuing each year from that point forward, a number of pipeline companies will be randomly selected each year and asked to provide the Commission with an assessment of the adequacy and effectiveness of their IMPs. These assessments will be reviewed by Commission staff and may lead to further action ranging from field verifications to audits.

2. Report Scope

This report provides a statistical overview of the performance of all pipelines in British Columbia regulated by the Commission. The Commission's jurisdiction extends to all pipelines as defined in the definition section of the Pipeline Act.

"Pipeline" means a continuous conduit between two geographical locations through which oil, gas or solids is transported under pressure, and includes:

- A company pipeline.
- All gathering and flow lines used in oil and gas fields to transmit oil and gas.
- All water injection pipelines or other pipelines used to transmit water at working pressures in excess of 3,500 kilopascals (kPa) in oil and gas fields.
- All transmission lines used to transmit gas at working pressures in excess of 700 kPa (gauge) from a company pipeline to the distribution system of a public utility or a gas utility.

The report does not include piping on wellsites and in facilities.

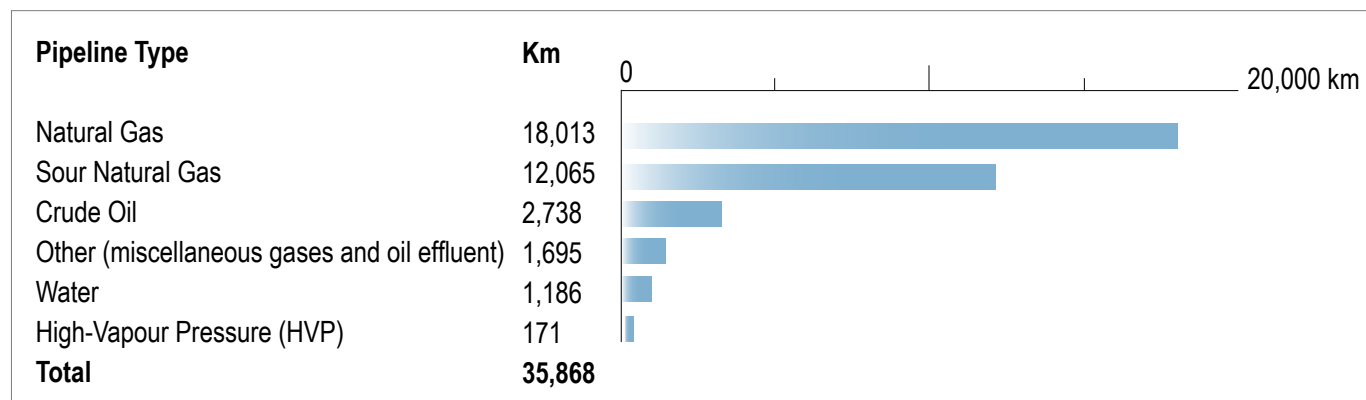
The data presented and analyzed in this report has been obtained from the Commission's KERMIT database and includes all operating and deactivated pipelines that have received Leave to Open (LTO) status from the Commission. Summary information for abandoned pipelines is included in the report for information, but has not been used for analysis of incident data.



3. Pipeline Inventory

Table 1 provides the length and type of pipelines under the Commission's jurisdiction in 2009¹. As of December 31, 2009 the total length of pipeline regulated by the Commission was 35,868 km. In the last three calendar years, an average of 1,360 km of new pipelines went into operation each year. Table 2 summarizes the length of abandoned pipelines, by type, as of December 31, 2009.

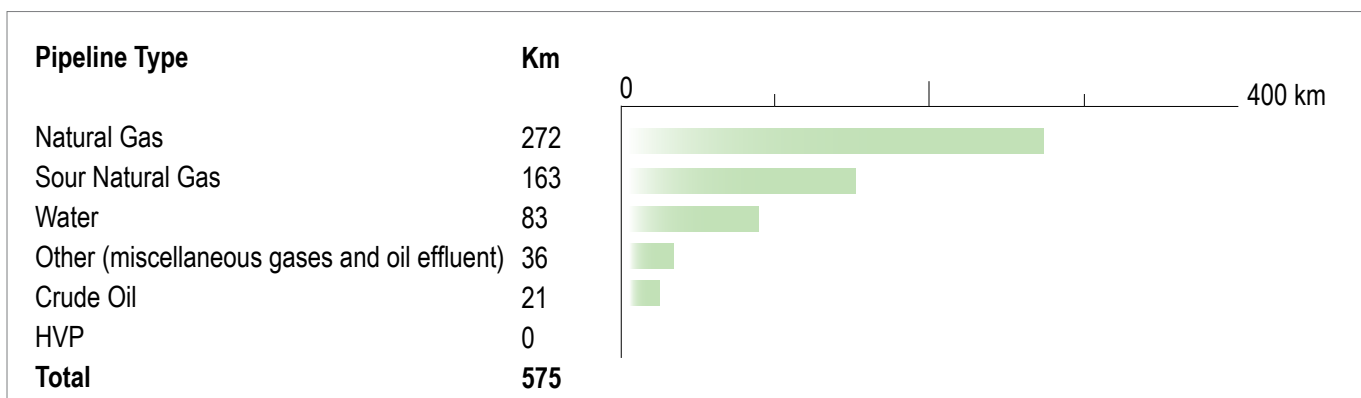
Table 1: Length of Pipeline By Type as of December 31, 2009



The contents of each pipeline type are as follows:

- Pipeline type Natural Gas includes natural gas, sweet gas and fuel gas.
- Sour Natural Gas contains hydrogen sulphide (H₂S) in concentrations of one mole per cent or more.
- Pipeline type Other includes miscellaneous gases and oil effluent.
- Pipeline type Crude Oil includes crude oil, sour crude and LVP (low-vapour pressure).
- Pipeline type Water includes water, freshwater, produced water, salt water, and sour water.
- Pipeline type HVP includes ethylene, propane, pentanes and liquid ethane².

Table 2: Length of Abandoned Pipeline by Type as of December 31, 2009



¹ Inventory data executed May 3, 2010.

² HVP pipeline system is defined in CSA Z662: A pipeline system conveying hydrocarbons or hydrocarbon mixtures in the liquid or quasi-liquid state with a vapour pressure greater than 110 kPa absolute at 38C, as determined using the Reid method (see ASTM D 323).

4. Pipeline Incidents

It is a regulatory requirement that all pipeline incidents are reported to the Commission directly or through the Provincial Emergency Program (PEP). A reportable pipeline incident is any incident resulting in, or having potential to, damage a pipeline, even if there is no spillage of products or substances from the pipeline.

Incident reporting is required regardless of the status of a pipeline or the type of product released. Hits on deactivated or abandoned pipelines, leaks of freshwater from pipelines, or spills of any substances within the right-of-way of pipelines must be reported.

5. Repairs and Investigations

Pipeline permit holders in British Columbia are required to investigate all pipeline incidents to determine the cause and contributing factors, and to identify appropriate remedial actions and repairs to prevent a recurrence. The root cause, repair methods and any changes in the operation or status of the pipeline must be summarized in a Pipeline Incident Report (PL-201), which must be submitted by the permit holder(s) to the Commission within 60 days of an incident. In addition, permit holders must inform the Commission of any design or operational changes, as well as any change to the operating status of a pipeline, through submission of a Notice of Intent (NOI) application.



A line strike on a 10-inch pipeline.

6. Integrity Management Programs

Pipeline Integrity Management Programs (IMPs) provide a systematic approach for assuring pipeline integrity throughout the entire pipeline lifecycle including design, construction, operation and maintenance. IMPs have been a regulatory requirement for all pipeline systems in British Columbia since 1999.

In 2009, the Commission introduced a risk-based compliance assurance program for IMPs. The program is undergoing final review in 2010 in preparation for full implementation in 2011.

6.1 Integrity Management in British Columbia

April 1999 – Integrity Management Programs were introduced into the 1999 edition of Canadian Standard Association (CSA) Z662 - Oil and Gas Pipeline Systems and through adoption by reference became mandatory for all pipeline systems within British Columbia. Clause 10.10.3.2, of the 1999 edition required that:

“Operating companies shall establish an effective system for managing the integrity of the pipeline systems so that they are suitable for continued service, including procedures to monitor for conditions that may lead to failures and to eliminate or mitigate such conditions.”

December 2005 – CSA published Supplement Number 1 to CSA Z662-03, which included the non-mandatory Annex N - Guideline for Pipeline Integrity Management Programs, and the mandatory Annex M - Sour Service Pipelines. Pipelines subject to Annex M were required to follow Annex N.

April 2006 – The Commission proposed making Annex N mandatory for all pipeline systems in British Columbia.

August 2006 – Annex N was made mandatory by the Commission. All pipeline permit holders in British Columbia are required to develop and implement IMPs in accordance with Annex N for all pipelines operating under the jurisdiction of the Commission.

September 2009 – The Commission published draft self-assessment protocols for IMPs.



7. Incident Statistics

Table 3 shows the frequency of pipeline incidents in 2009. The data was compiled by taking the number of incidents recorded and dividing it by the cumulative length of pipelines at the end of 2009. Frequency of incidents is reported as the number of incidents per 1,000 km of pipeline.

Table 4 shows the frequency of incidents by pipeline type. Incidents such as vandalism are considered non-operational incidents and are thus excluded. There were three non-operational incidents in 2009. The three non-operational incidents include a vandalism incident that involved a pipeline bomb; an accident during the decommissioning of an aerial crossing pipeline and a non-operational incident in which the operator found liquid on the right-of-way, but after lab analysis the liquid was found to be natural groundwater that followed the pipeline and rose to the ground.



Pipeline cleaning pig

Table 3: Total Number of Incidents per 1,000 km of Pipeline Inventory

	2009
Length of Pipelines Total (km)	35,868
Number of Incidents	37
Incident Frequency (Incidents/1,000 km)	1.03

Table 4: Total Number of Incidents per 1,000 km of Pipeline Inventory By Type³

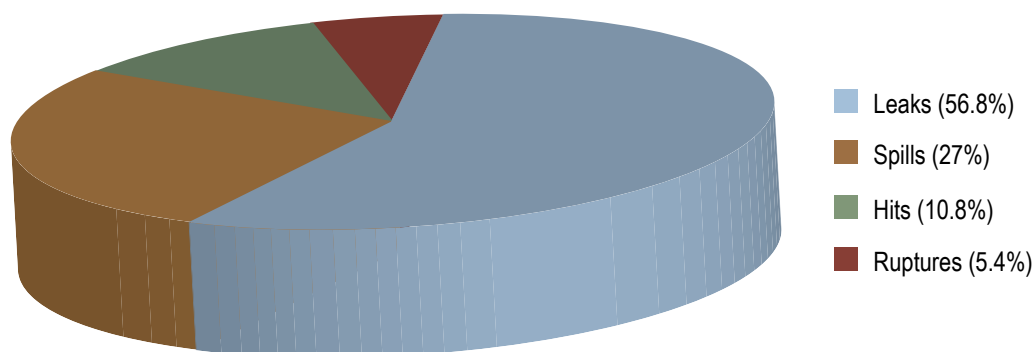
Type of Pipeline	Length of Pipelines (km)	Number of Incidents	Frequency
Crude Oil	2,738	1	0.37
Other (miscellaneous gases and oil effluent)	1,695	5	2.95
Water	1,186	10	8.43
Natural Gas	18,013	7	0.39
Sour Natural Gas	12,065	11	0.91
HVP	171	0	0.00

³ Excluding non-operational incidents.

Figure 1 shows the overall distribution of incident types in 2009, and includes all pipeline incidents (leaks, ruptures, hits and spills) from January 1 to December 31. The definitions of each pipeline incident type are as follows⁴:

- Hit: Line strike due to ground disturbance activities (for example, excavation) resulting in pipeline damage, but does not necessarily cause product release.
- Leak: Openings, cracks or holes in a pipeline that involve the release of products, but do not immediately impair the operation of the pipeline.
- Rupture: Tearing or breaking of the pipeline, which immediately impairs operation.
- Spill: Release of liquids or gases from a pipeline or the pipeline right-of-way not resulting from pipe damage (for example, improper operations that result in product release).

Figure 1: Pipeline Incidents By Type of Incident⁵



⁴ Definitions for incident types (hit, leak and rupture) are based on definitions used in the Energy Resources Conservation Board (ERCB) Performance Report 2008.

⁵ The causes and definitions of incidents in Figure 3 are classified with reference to CSA Z662-07 Annex H. The distribution of pipeline incident causes is discussed in the following sections.

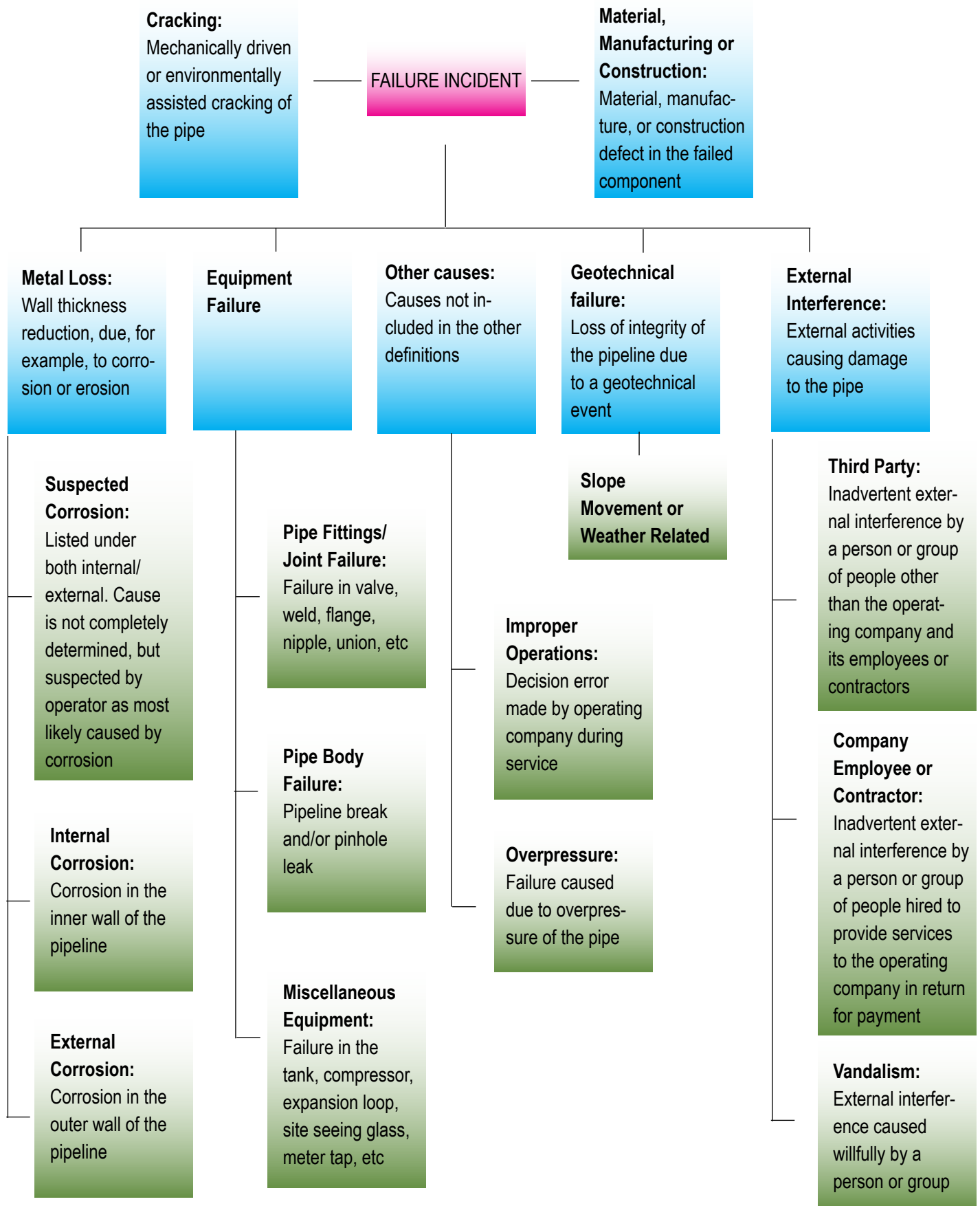


Figure 2: Possible Causes of Pipeline Failures

Table 5, and Figures 3 and 4, provide the distribution by type for all pipeline incidents for 2009. The most common cause of pipeline failure in 2009 was metal loss from internal corrosion.

Table 5: Pipeline incidents by cause in 2009

Pipeline incidents by cause	2009
Metal Loss	17
• Internal Corrosion	15
• External Corrosion	1
• Suspected Corrosion	1
Cracking	2
Material, Manufacturing, Construction Defects	3
External Interferences	4
• Company Employee/Contractor	3
• Third Party	0
• Vandalism	1
Geotechnical Failure	3
• Slope Movement/Weather Related	3
Other Cause	7
• Improper Operation	7
• Overpressure	0
• Undetermined	0
Equipment Failure	1
• Valve and Fittings	1
• Pipe Body Failure	0
• Miscellaneous Equipment	0
Total	37

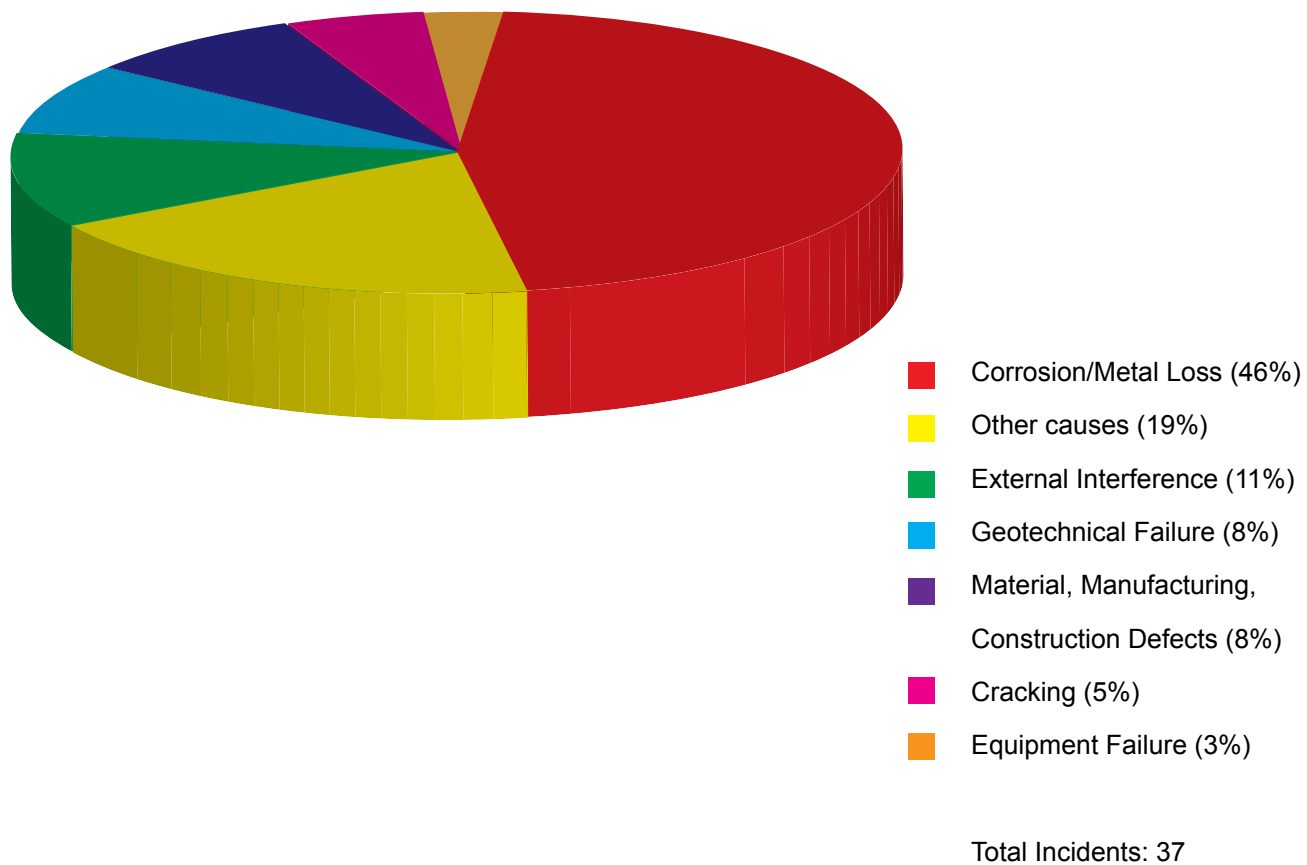


Figure 3: 2009 Pipeline Incidents by Immediate Cause

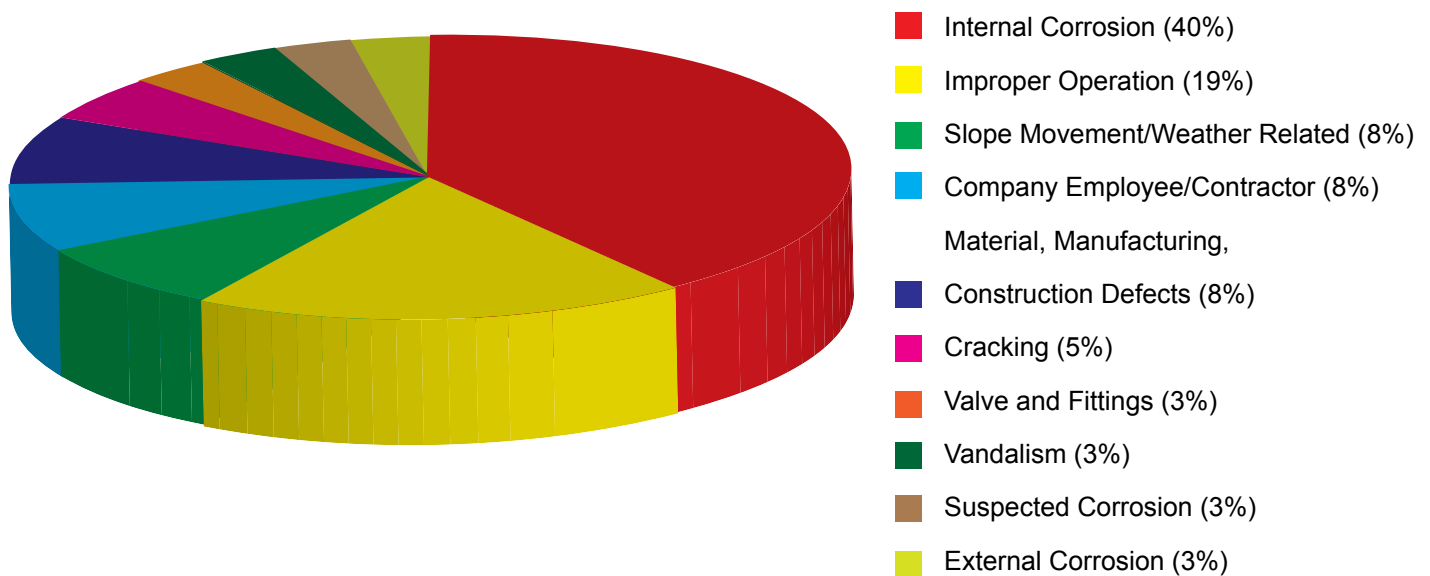


Figure 4: 2009 Pipeline Incidents by Sub-Cause

Figure 5 provides the number of pipeline incidents by product carried by a pipeline where no leak occurred, and released by a pipeline where a leak did occur. Numbers differ slightly from Table 4 as there is the potential that the product released is not aligned with pipeline type (for instance, sometimes companies will be doing a pressure test in their pipelines and a leak occurs, that spilled material would not be the same as the pipeline type). In 2009, there were five incidents where material released differed from pipeline type. In three of the incidents, the product released were listed as “other” (condensate, methanol and emulsion, respectively), but the pipelines were sour natural gas. In two other incidents, natural gas was released from pipelines listed as sour natural gas.

Figure 5: Pipeline Incidents By Product
(Includes all leaks, ruptures, hits and spills)

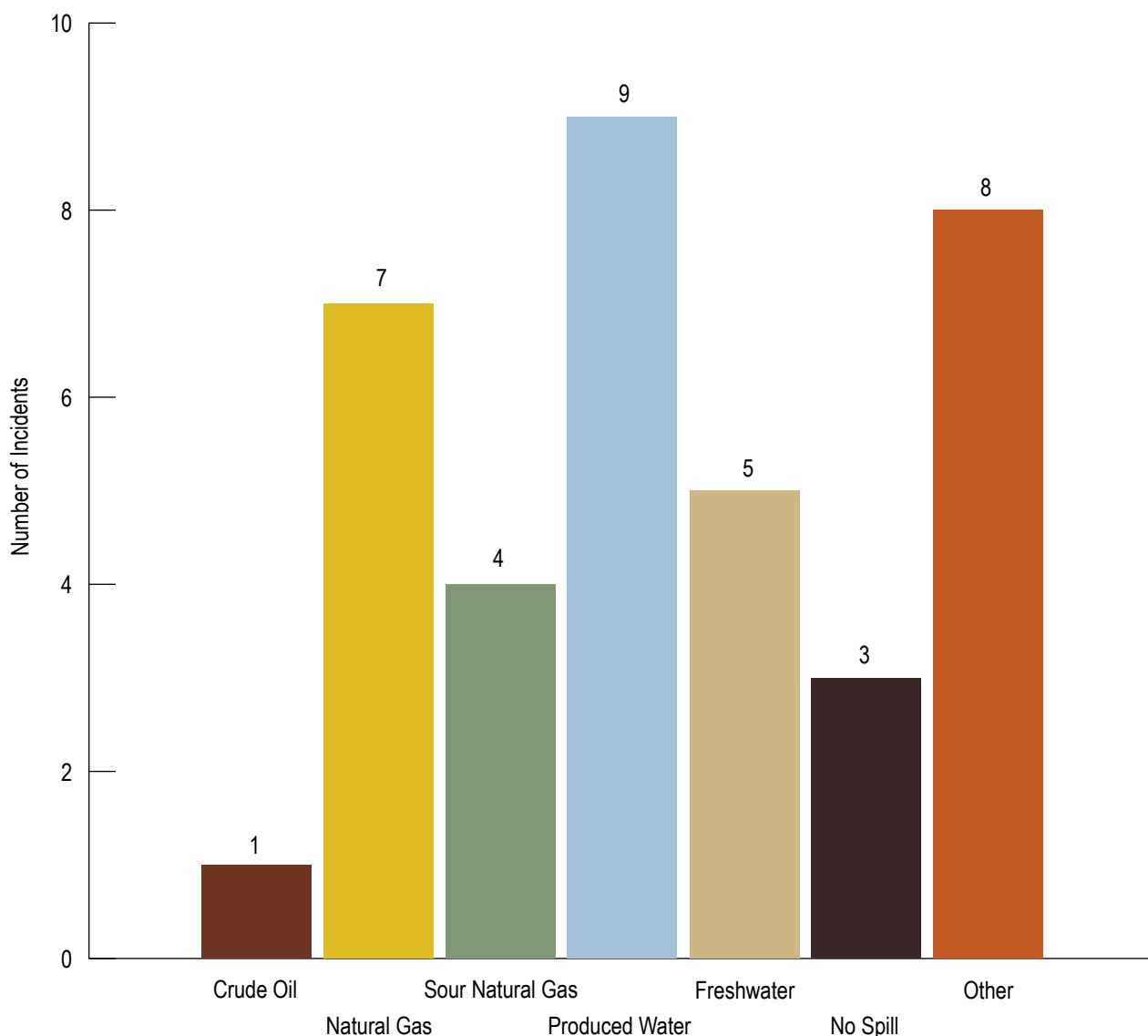


Table 6 shows the type of products included in the “Other” category and the number of incidents related to those materials.

Table 6: Materials Released Under Product Category “Others” in Figure 5

Materials	Incidents in 2009
Emulsion	1
Condensate	2
Methanol	1
Sour Oil Well Effluent	1
Oil Extraction Fluid	0
Miscellaneous Liquids	3

Table 7 shows the total volume of liquid spills by type of product in 2009. There was a significant spill in 2009 that resulted in 2,500 m³ of spilled produced water. This rupture occurred as a result of environmentally assisted cracking on a flange stud. Contamination to the local environment was removed and the line has been repaired. As a precautionary measure, three similar flange locations were examined. The examination showed no evidence of additional cracking. The studs and nuts were replaced as a preventative measure.

Table 7: Liquid Spill Volume by Product in m³

Liquid	Volume (m3)
Crude Oil	20
Other	14.1
Produced Water	2,555
Freshwater	5.5

Table 8 shows the total volume of gas released by type of product in 2009. One significant incident resulted in a 10,000 m³ natural gas release. This incident was caused by internal corrosion. The line was temporarily decommissioned. The line was blinded, purged and has been repaired. A pipeline bombing incident on a sour natural gas line released 31,000 m³ of sour natural gas. Investigation of this incident is under the jurisdiction of the RCMP.

Table 8: Gas Release Volume by Product in m³

Liquid	Volume (m ³)
Natural Gas	12,803
Sour Natural Gas	31,001

8. Pipeline Performance – Moving Forward

Regulating pipeline activity in British Columbia is a key role of the Commission, and the integrity of the pipelines is paramount in ensuring safe and environmentally responsible operations.

Pipeline Performance in British Columbia in 2009 is a first annual report that provides a transparent look at all Commission-regulated pipeline activity in the province. It is another tool the Commission will use to continually improve its reporting procedures and make information widely available to British Columbians.

We welcome your comments on this report as well as suggestions to improve future reporting.

