Pipeline Performance BCOIL & Gas COMMISSION Summary



2020 Annual Report

Published June 2021



Role of the

BC OIL AND GAS COMMISSION

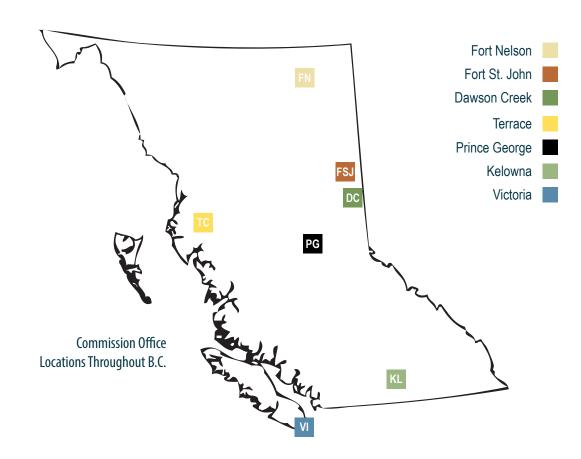
The <u>BC Oil and Gas Commission</u> (Commission) protects public safety and safeguards the environment through the sound regulation of oil, gas and geothermal activities in B.C.

From exploration through to final reclamation, we work closely with communities, First Nations, and land owners, and confirm industry compliance with provincial legislation.

We are committed to advancing reconciliation and establishing close working relationships with Indigenous peoples throughout the energy life cycle.

With more than 20 years' dedicated service, the Commission is committed to safe and responsible energy resource management for British Columbia.

For general information about the Commission, please visit bcogc.ca or phone 250-794-5200.



The Commission's workforce consists of over 280 employees operating out of seven locations - Fort Nelson, Fort St. John, Dawson Creek, Terrace, Prince George, Kelowna and Victoria, with the largest number of employees concentrated in Fort St. John, the heart of oil and gas activity in the province. The offices in Fort Nelson and Dawson Creek ensure the Commission's presence in the communities of Horn River Basin and Montney gas plays respectively.

OUR VISION

Safe and responsible energy resource development for British Columbia.

OUR MISSION

We provide British Columbia with regulatory excellence in responsible energy resource development by protecting public safety, safeguarding the environment and respecting those individuals and communities who are affected.

OUR VALUES

Respect Integrity

Transparency

Innovation

Responsiveness

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INTRODUCTION

PURPOSE OF REPORT

British Columbia's oil and gas industry depends on pipelines for the distribution of products such as natural gas, water and oil. Pipelines are recognized as a safe and efficient mode of transportation, and secure operation is essential to protecting public safety and the environment.

This report provides a statistical overview of pipelines regulated by the Commission in the 2020 calendar year. It includes data on types of pipelines, lengths, uses and overall pipeline incident rates. The multi-stage lifecycle of a pipeline is explained, and incident response protocols are outlined. It also summarizes the Integrity Management Program, a documented framework outlining the practices by which permit holders test and maintain pipelines to mitigate potential integrity issues.

Previous annual pipeline performance summaries can be found on the Commission's website at bcogc.ca/data-reports/reports/.

PIPELINE REGULATION

The Commission's jurisdiction extends to the majority of pipelines in British Columbia, as defined in legislation by the Oil and Gas Activities Act (OGAA). Activities regulated by the Commission extend throughout the lifecycle of a pipeline, and include pre-activity consultation and notification, permitting, construction, operation, maintenance and abandonment. Pipelines not under the Commission's jurisdiction include those crossing provincial and/or national borders and gas utility pipelines, are not addressed in this report.

Pipelines are regulated under the Pipeline Regulation, which states they must be operated and maintained in accordance with CSA Z662 – Oil and Gas Pipeline Systems. CSA Z662 is a national standard developed and maintained by the Canadian Standards Association (CSA) and covers the design, construction, operation and maintenance of oil and gas industry pipeline systems.

Permit holders are required to comply with other applicable regulations including the Environmental Protection and Management Regulation, Requirements for Consultation and Notification Regulation, Pipeline Crossings Regulation, and Emergency Management Regulation.

The Commission is also responsible for provincial authorizations involving the Land Act, Water Sustainability Act, and the Forest Act for pipeline right-of-ways, roads, land clearing and other minor works.

The Legislation page of the Commission website provides the full list of acts and regulations governing oil and gas activities in the province.

PIPELINE INVENTORY

50,813 KILOMETRES

The Commission's annual Oil and Gas Reserves and Production report captures the general growing gas production in the province. This year saw a decrease in active pipelines as permit holders are appropriately deactivating and abandoning older pipelines.

Pipelines transport a number of refined and unrefined products including natural gas, sour natural gas, liquid hydrocarbons (such as crude oil and high vapour pressure hydrocarbons), water and other miscellaneous gases. Over 78 per cent of the total pipelines regulated by the Commission transport natural gas, while approximately 11 per cent carry liquid hydrocarbons. The remainder carry water or other gases or liquids. Pipeline definitions and product classifications are available on page 14.

As shown in Table 1, the total length of pipelines in the province in 2020 was 50,813 km. This is a net addition of approximately 767 km of total registered pipelines over the previous year. Deactivated pipelines increased by 302 km while abandoned pipelines increased by 1,214 km. Operating pipelines in 2020 decreased by 748 km. Commodity pricing and aging pipelines are contributing factors to an increase in deactivations and abandonment in the last couple of years.

TABLE 1: TOTAL LENGTHS OF PIPELINES BY TYPE AND STATUS (IN KILOMETRES)

TYPE	TOTAL	OPERATING	DEACTIVATED	ABANDONED		
Natural Gas	22,099	18,379	1,934	1,786		
Sour Natural Gas	17,751	12,449	3,628	1,675		
Water	4,408	3,541	482	385		
Liquid Hydrocarbons	5,681	4,139	950	592		
Other	874	559	218	97		
2020 GRAND TOTAL	50,813	39,067	7,212	4,535		
Natural Gas	21,672	18,437	1,896	1,339		
Sour Natural Gas	17,643	13,077	3,476	1,090		
Water	4,306	3,579	445	282		
Liquid Hydrocarbons	5,575	4,149	871	554		
Other	851	573	223	56		
2019 GRAND TOTAL	50,047	39,815	6,910	3,321		
Natural Gas	21,831	18,932	1,738	1,160		
Sour Natural Gas	15,056	11,365	2,923	768		
Water	4,144	3,516	372	256		
Liquid Hydrocarbons	5,213	3,904	805	504		
Other	823	558	214	51		
018 GRAND TOTAL	47,067	38,275	6,052	2,739		

PIPELINE LIFECYCLE

MULTI-STAGE PLANNING

From the creation of a preliminary pipeline plan, land survey, through construction and inspections, to deactivation, abandonment and final site restoration the lifecycle provided here depicts the multiple stages of a typical pipeline lifecycle.

At the outset, Commission decision makers conduct a comprehensive review of each pipeline application for engineering standards, legal requirements, and for environmental and public safety considerations. The Commission ensures proponents have conducted consultations with land owners and other rights holders on pipeline projects that will directly affect them, including the legal obligation to consult and accommodate Indigenous Nations.

If a pipeline application is approved,
Commission specialists may set permit
conditions as necessary to protect key
environmental assets, such as water, wildlife
and forest values. A significant component of
the Commission's framework for managing
the impacts of oil and gas development on the
environment is Area-based Analysis, described
on the Commission website.

The Commission verifies that the pipeline is constructed and operated in accordance with applicable regulations and monitors the project throughout its lifecycle. Should any deficiencies be identified at a site, the Commission may order the permit holder to cease activities as necessary until appropriate actions are performed to safely resume operations.

As detailed in the Commission's mandate, and considering the many stages of a pipeline's lifecycle, the protection of public safety is top priority. Permit holders are required to report to the Commission before, during and upon completion of their oil and gas activities. The framework under which pipelines are operated includes such initiatives as the pipeline Integrity Management Program (IMP), designed to help prevent spills. IMPs are described on page 8.

OIL AND GAS ACTIVITY STAGES

- 1 LAND SURVEY

 Land measured to establish property boundaries, topography, and land features, and to develop surface maps.
- PIPELINE PLAN
 A preliminary pipeline plan is prepared, utilizing survey data to propose a safe, informed and responsible pipeline route.
- 3 CONSULTATION AND NOTIFICATION
 Stakeholder engagement begins; the Commission engages the appropriate stakeholders and ensures consultation is appropriate and adequate.
- 4 SITE ASSESSMENT
 The pipeline route is determined, taking into account such matters as soil handling and conservation, aquifer protection, archaeological sites, and eventual site restoration considerations.

PERMIT APPLICATION SUBMISSION Applications undergo a thorough technical screening to ensure the

plans are safe and designs are compliant with regulations prior to

being considered for approval.

EMERGENCY PLANNING ZONES Are established around facilities, pipelines, and wells, and predetermined Emergency Response Plans are created.

SITE PREPARATION, CONSTRUCTION AND INSPECTION At any point during construction, the Commission reserves the right to inspect the construction process, watching for compliance with legislation and any permit approval conditions.

GOING LIVE

The Commission receives notice the pipeline has been properly tested and the transporting of petroleum, natural gas, solids, water or other substances to destinations such as refineries, processing plants, or shipping points begins.

SAFE PIPELINE OPERATION

Safety considerations begin at the initial design stage and are expected to be maintained through abandonment and final restoration.

INTEGRITY MANAGEMENT PROGRAM REVIEW During the full lifecycle of the pipeline, the Commission will review a company's IMP and any incidents and repairs that occur.

DEACTIVATION

The Commission evaluates deactivation requests for appropriate maintenance and monitoring measures, to prevent or minimize adverse effects while the pipeline remains idle.

DECOMMISSIONING

The Commission reviews abandonment (removal from service) requests to ensure safety considerations and habitat and land restoration plans are fully incorporated.

REMEDIATION

Soil stability, productivity and vegetation are restored as required under legislation.

For more details regarding oil and gas activity stages, a Land Owner's Information Guide is available on the Commission website.

INTEGRITY MANAGEMENT PROGRAM

COMPLIANCE ASSURANCE

To ensure public safety, environmental protection, and operational reliability, the Pipeline Regulation requires all pipeline permit holders in the province to implement an Integrity Management Program (IMP). A pipeline IMP is a preventative and documented framework specifying the processes and practices used by pipeline permit holders to anticipate hazards and analyze and manage risks throughout the entire lifecycle of pipelines. The IMP incorporates a management system approach.

Section 7 of the Pipeline Regulation is a mandatory requirement for every pipeline permit holder planning, designing, constructing, operating, maintaining and abandoning pipeline infrustructure to have an implemented IMP program. A compliance assurance protocol is available to permit holders, outlining Commission Compliance Assurance Integrity Management Program's expectations and operating requirements, and provides guidance

for developing, implementing and maintaining effective IMPs. Details of the compliance assurance process and the scope of the protocol can be viewed on the Commission website. The 2020 IMP Compliance Assurance Summary report is also on the website.

The Commission has been evaluating the compliance of permit holders' IMP programs to our regulations and expectations since 2011. The pipeline IMP compliance assurance process is standardized and consists of four phases. In the preliminary phase, all permit holders are required on a biannual basis, to complete self-assessments and submit them to the Commission within a set timeline. In phase one, permit holders are annually selected for the audit based on the Commission's criteria, notified and requested to submit IMP workbooks and records for the audit. The second phase consists of audits involving systematic review of permit holders' IMP processes, records

and documents in order to verify compliance and generate audit findings. The third phase allows for corrective action plans and follow-ups to address any noncompliance findings determined through the audits.

Where non-compliances were identified, permit holders are required to develop and implement corrective actions to rectify the deficiencies within a timeframe specified and agreed by the Commission. Each corrective action is monitored and assessed to ensure all findings of non-compliance are fully resolved through a structured oversight process.

The Commission will continue to undertake IMP audits for all B.C. pipeline permit holders and engage with companies to improve the design, construction, operation and maintenance of pipelines.



INCIDENT RESPONSE

AND ENFORCEMENT ACTIONS

An incident is defined as a present or imminent event or circumstance, resulting from an oil and gas activity that is outside the scope of normal operations, and may or may not be an emergency. Permit holders must communicate all reportable incidents to the Commission. Non-minor incidents must be reported immediately (within one hour), and minor incidents must be reported within 24 hours. The Commission's Incident Classification Matrix outlines spill reporting criteria, and how incident levels are assessed, determined and reported.

Any person aware spillage is occurring, or believes there is the potential for spillage, can provide assistance by calling the operating company indicated on the on-site signage and identifying the location of the pipeline, or by calling the Commission's 24/7 emergency number at 1-800-663-3456.

The Commission responds to all incidents, establishing communication with the permit holder, confirming the incident level, and assessing the permit holder's response. Commission staff further determine what remedial actions must be taken, whether a pipeline can continue to operate safely, and whether compliance or enforcement actions are required.

Subsequent incident investigations allow the Commission to confirm the cause and any contributing factors, and whether repairs or solutions should be broadly communicated to all other permit holders to prevent similar incidents from occurring. Inspections may also be triggered by public enquiries and incidents reported to the Commission.

When required, orders, tickets and/or penalties are issued to the permit holder. The Commission posts its enforcement actions in a timely manner on its Compliance and Enforcement webpage. Prior to March 2017, enforcement actions were communicated through quarterly enforcement action summary publications.



ORDERS - issued if a permit holder fails to comply with OGAA, associated regulations, permits or authorizations, a previous order, or to deal with issues of public safety or protection of the environment.

TICKETS - issued under the authority of provincial acts, including the Water Sustainability Act.

ADMINISTRATIVE PENALTIES - levied in the event of a contravention of OGAA.

CHARGES - recommended to Crown counsel for prosecution and possible court conviction.

PIPELINE INCIDENTS

AND EMERGENCY RESPONSE PROGRAMS

To coordinate and prepare for incidents in advance, permit holders must develop and maintain emergency response programs (ERPs) and response contingency plans, as directed in the Emergency Management Regulation (EMR).

Emergency response programs guide the creation, management and implementation of a permit holder's ERPs, allowing for quick access to critical information, coordination of multiple-responder activities, and identification of predetermined equipment and services available for deployment in an emergency. They equip incident responders with hands-on training and emergency response exercises, ensuring personnel understand their incident command structure, communication methods, and responsibilities in an emergency event.

The Commission's Security and Emergency
Management Branch regularly audits ERPs to ensure
consistent compliance with the EMR, and oversees
and may participate in permit holder emergency
response exercises. Should a permit holder's
emergency protocols fail to meet requirements,
the Commission may utilize compliance and
enforcement actions, which can include issuing
orders, penalties, or shutting-in a pipeline system.

The requirements in the EMR are designed to create a framework for the protection of the public, emergency responders, property and the environment from incidents occurring due to oil and gas activities. Although emergency preparation,

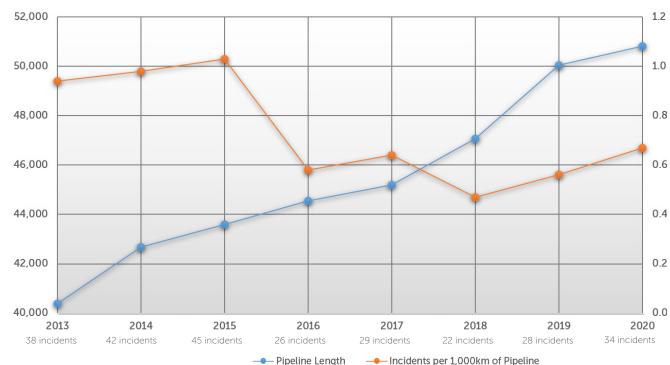
equipment and protocols help reduce the rate of incidents, the Commission strives to continually improve emergency management measures.

In 2020 there were 34 incidents on pipelines regulated by the Commission; however, not all led to the release of a product. Figure 1 shows an overall incident frequency of 0.67 for every 1,000 km of pipelines, an increase from 0.56 in 2019.

As stated, not all incidents result in a spill or release of a product. In 2010, the implementation of OGAA led to broader reporting criteria, meaning all incidents – including those that have the potential to affect the integrity of a pipeline but did not cause spillage – must be reported.

Additional information regarding emergency response and management, including guidelines and forms, is available on the Commission's Emergency Response and Safety webpage.

FIGURE 1: YEAR TO YEAR INCIDENT FREQUENCY VS. PIPELINE LENGTH



¹These incidents apply only to events on operating pipelines. Incidents that occur prior to a line going active (such as during construction or pressure testing) and some near misses have not been included.

The Commission conducted 3,365 pipeline inspections in 2020, an increase of 38 per cent compared to 2019. A pipeline may be comprised of one or more segments of pipeline or a group of pipelines, including gathering lines.

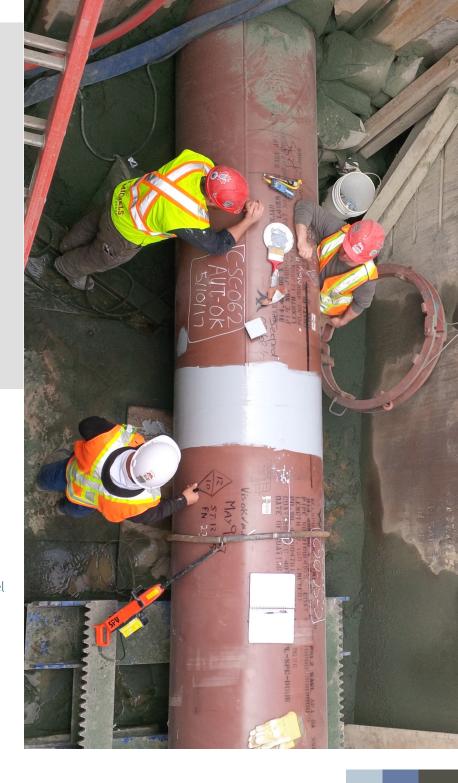
In 2020, there were 34 incidents on pipelines regulated by the Commission, less than two above average over the past seven years.

The Commission responds to **urgent** safety complaints within 30 minutes, 24/7, year-round.

The number of reported incidents in 2020 was 0.67 per every 1,000 km of pipeline.

If an incident results in spillage, the following actions must be taken (Sec. 37, OGAA):

- PREVENT Spillage.
- PROMPTLY REPORT any damage or malfunction that could cause spillage.
- REMEDY the cause or source of spillage if any occurs.
- CONTAIN AND ELIMINATE the spillage.
- REMEDIATE any affected land or body of water.
- REPORT LOCATION AND SEVERITY of spillage and any contributing damage or malfunction.
- ON-CALL EMERGENCY OFFICER confirms severity and determines appropriate level of Commission response.
- COMMISSION INSPECTORS MAY ATTEND onsite during the response, depending on the nature of the incident.
- DAMAGE REPAIR is conducted.
- SITE CLEANUP AND REMEDIATION must be approved by the Commission, and incident causes investigated and resolved prior to pipeline operations resuming.
- POST-INCIDENT REPORTS must be submitted by the permit holder within 60 days identifying the root cause of the failure and any repair methods, operational changes, or design modifications that may be required.



RELEASES AND SPILLS

2020 STATISTICS

For incidents involving a release or spill, Table 2 shows the highest number of releases occurred on pipelines categorized as natural gas or other with eight incidents each. Adjusted for total length of pipelines, pipelines classified as other or water had the highest incident frequency per 1000 km of pipeline with 9.15 and 1.59, respectively.

The category 'Other' contains miscellaneous liquids and gases such as oil emulsion and can also include service liquids and gases. Water products can be composed of various fresh water resources as well as produced water.

In the event of a pipeline gas release or liquid spill, the Commission ensures complete clean up and remediation by the company, and that all problems are fixed before operations resume. The largest gas release from a pipeline in 2020 was a 13,000 m³ release of sour natural gas and nitrogen on a pipeline on the outskirts of Taylor, B.C. The failure occurred due to sluffing of the slope that caused geotechnical strain and led to a wrinkle in the pipe and the subsequent release. The pipeline was depressurized as soon as the leak was discovered, gas control was notified and the pipeline was repaired shortly after.

The largest liquid spill from a pipeline in 2020 was 500 m³ of produced water 100 km outside of Fort St. John due to internal corrosion. Remediation activities included excavating and appropriate disposal of impacted materials, verification of remediation by post-excavation sampling and restoration with clean backfill. The pipeline is currently decommissioned.

TABLE 2: TOTAL NUMBER OF INCIDENTS WITH RELEASE PER 1,000 KM BY TYPE OF PIPELINE IN 2020

TYPE OF	# OF INCIDENTS	LENGTH OF	FREQUENCY
PIPELINE	WITH RELEASE	PIPELINE (KM)	(PER 1,000 KM)
SOUR NATURAL GAS	2	17,751	0.11
NATURAL GAS	8	22,099	0.36
LIQUID HYDROCARBONS	3	5,681	0.53
WATER	7	4,408	1.59
OTHER	8	874	9.15

INCIDENT CAUSES

Table 3 shows metal loss (corrosion) was the leading cause of pipeline incidents in 2020, contributing to 19 incidents. Five of these incidents occurred during decommissioning operations of pipeline assets and resulted in minor spills. Four incidents occurred during integrity and verification activities, three of these were a discovery of a corrosion feature while testing the pipeline. An increase in decommissioning and integrity activities is a positive trend in safely abandoning past-life assets and integrity activities indicate an appropriate level of due diligence in maintenance and verification of pipelines and equipment. The interactive web-based BCOGC Incident Map provides the location of pipeline incidents dating back to 2009. It includes data on pipeline spills, releases, and damage to active and discontinued pipelines, including the status of incidents.

MOVING FORWARD

The Commission's priority is continual improvement in safety standards and reduction of incidents in order to serve the public and the environment while fostering responsible development.

As tools are developed and operationalized to elevate pipeline performance, spill preparedness and emergency response capabilities, lessons learned will continue to be shared across the Commission and with stakeholders and experts throughout industry to successfully meet the demands of a strong safety culture.

TABLE 3: CLASSIFICATION OF PIPELINE FAILURES

INCIDENT CASE	DEFINITION	2020	2019	2018	2017	2016	2015	2014	2013
METAL LOSS	WALL THICKNESS REDUCTION DUE								
	TO CORROSION OR OTHER CAUSES								
CORROSION METAL LOSS		19	16	10	15	12	25	21	22
PIPELINE/EQUIPMENT FAILURE									
CRACKING IN PIPE	MECHANICALLY DRIVEN OR ENVIRONMENTALLY ASSISTED CRACKING OF THE PIPE	0	2	0	0	1	0	3	0
PIPE FITTINGS/JOINT FAILURE	FAILURE IN VALVE, WELD, FLANGE, ETC.	2	4	3	3	3	1	0	4
MISC EQUIPMENT	FAILURE IN TANK, COMPRESSOR, ETC.	0	0	0	0	0	4	0	0
TOTAL PIPELINE/EQUIPMENT FAILURE		2	6	3	3	4	5	3	4
EXTERNAL INTERFERENCE	EXTERNAL ACTIVITIES CAUSING DAMAGE TO PIPE								
THIRD PARTY INTERFERENCE	INTERFERENCE BY SOMEONE OTHER THAN OPERATING COMPANY OR ITS EMPLOYEES/CONTRACTORS	1	3	3	5	5	3	1	5
COMPANY	INTERFERENCE BY OPERATING COMPANY OR ITS EMPLOYEES/CONTRACTORS	3	1	0	4	2	4	8	4
VANDALISM	INTERFERENCE CAUSED WILLFULLY BY SOMEONE THROUGH ATTEMPTED THEFT OF SERVICE FLUID	0	0	0	0	0	0	0	0
TOTAL EXTERNAL INTERFERENCE		4	4	3	9	7	7	9	9
MATERIAL MANUFACTURING OR CONSTRUCTION	DEFECTS IN THE FITTING, CONSTRUCTION, OR COMPONENTS	1	0	2	0	1	1	1	2
GEOTECHNICAL FAILURE	LOSS OF INTEGRITY DUE TO GEOTECHNICAL EFFECT, FOR EXAMPLE, SLOPE MOVEMENT OR WEATHER	3	1	1	1	1	2	8	1
OTHER CAUSES									
IMPROPER OPERATION	DECISION ERROR MADE BY OPERATING COMPANY DURING SERVICE	4	1	2	0	1	5	0	0
OVERPRESSURE	FAILURE CAUSED DUE TO OVERPRESSURE OF PIPE	1	0	1	1	0	0	0	0
TOTAL OTHER CAUSES		5	1	3	1	1	5	0	0
TOTAL INCIDENTS		34	28	22	29	26	45	42	38

GLOSSARY

DEFINITIONS AND CLASSIFICATION

PIPELINE: pipelines regulated by the Commission are defined in OGAA (except in Section 9) as piping through which any of the following is conveyed or transported:

- Petroleum or natural gas.
- Water produced in relation to the production of petroleum or natural gas or conveyed to or from a facility for disposal into a pool or storage reservoir.
- Solids.
- Substances prescribed under Section 133(2)(v) of the Petroleum and Natural Gas Act.
- Other prescribed substances.

The scope of the definition also includes installations and facilities associated with the piping, but does not include:

- Piping used to transmit natural gas at less than 700 kilopascals (kPa) to consumers by a gas utility as defined in the Gas Utility Act.
- A well head
- Anything else that is prescribed.

ABANDONED PIPELINE: pipelines removed from service and not maintained for a later return to service

DEACTIVATED PIPELINE: pipelines removed from service but maintained for a later return to service.

OPERATING PIPELINE: pipelines actively used for the transport of fluids related to oil and gas operations, and piping that has been suspended from service for less than 18 months but not formally deactivated.

CRUDE OIL: crude oil, sour crude and low-vapour pressure hydrocarbons.

NATURAL GAS: includes natural gas, sweet gas, and fuel gas. Consisting mostly of methane, natural gas is a colourless, odourless, flammable gaseous hydrocarbon.

OTHER: miscellaneous gases and liquids, condensate and oil emulsion/effluent.

SOUR NATURAL GAS: natural gas with a hydrogen sulphide (H_2 S) partial pressure greater than 0.3 kilopascals.

HIGH-VAPOUR PRESSURE (HVP) HYDROCARBONS:

examples include ethylene, propane, pentanes and liquid ethane. These products can quickly convert to gaseous form at atmospheric pressure.

INCIDENT: for the purposes of this report, a present or imminent event or circumstance, resulting from an oil and gas activity that is outside the scope of normal operations, and may or may not be an emergency.

LOW-VAPOUR PRESSURE (LVP) HYDROCARBONS:

these products flow through pipelines in liquid or quasi-liquid form at a lower pressure than HVP hydrocarbons. Examples include oil, heavy oil, and synthetic oil.

 m^3 : a measure of volume - cubic metres; $1m \times 1m \times 1m$; 1,000 litres.

PIPELINE PERMIT: a permit that includes permission to construct, maintain, and operate a pipeline.

SHUT-IN: the isolation or closure of a well zone, a pipeline or a facility. For example, the temporary shutin of a well allows for the analysis of such factors as a well's productive capacity, pressure, and permeability.

SPILL: as defined in OGAA; petroleum, natural gas, oil, solids or other substances escaping, leaking, or spilling from a pipeline, well, shot hole, flow line, or facility (or any source apparently associated with any of those substances).

WATER: fresh water, produced water, salt water and sour water.