

Health and Environmental Issues Surrounding Hydraulic Fracturing: A Canadian Perspective

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Canada Eh?



Health and environmental issues ... what's driving them?

- ◉ Fear of the unknown
- ◉ The “information vacuum”
- ◉ Conflicting information
- ◉ Myths, media, and missteps



Fracking lawsuit against Alberta Environment can go ahead, judge rules

Jessica Ernst launched multimillion-dollar lawsuit in 2011 alleging well water was contaminated

[CBC News](#) Posted: Nov 12, 2014 12:48 PM MT Last Updated: Nov 12, 2014 1:01 PM MT

What Does the Anti-fracking Movement Mean for Canada?

The anti-fracking movement continues to pile up victories, even scoring one in the heart of Texas. Is Alberta next?

BY MARKHAM HISLOP

Fracking Criticism Spreads, Even In Alberta And Texas

CBC

Posted: 04/07/2015 9:04 am EDT Updated: 06/07/2015 5:59 am EDT

Oil firms face growing concerns over fracking

Investors demand disclosure on risk to environment





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Public Perceptions

	Natural <u>Gas</u>	Shale <u>Gas</u>
<u>Response</u>		
Positive	44%	12%
Neutral	39%	47%
Negative	17%	41%



Source: CAPP 2011

Region

% Opposed to Fracking

Alberta

26

Atlantic provinces

68

BC

43

Manitoba/Saskatchewan

56

Ontario

65

Quebec

64



62%

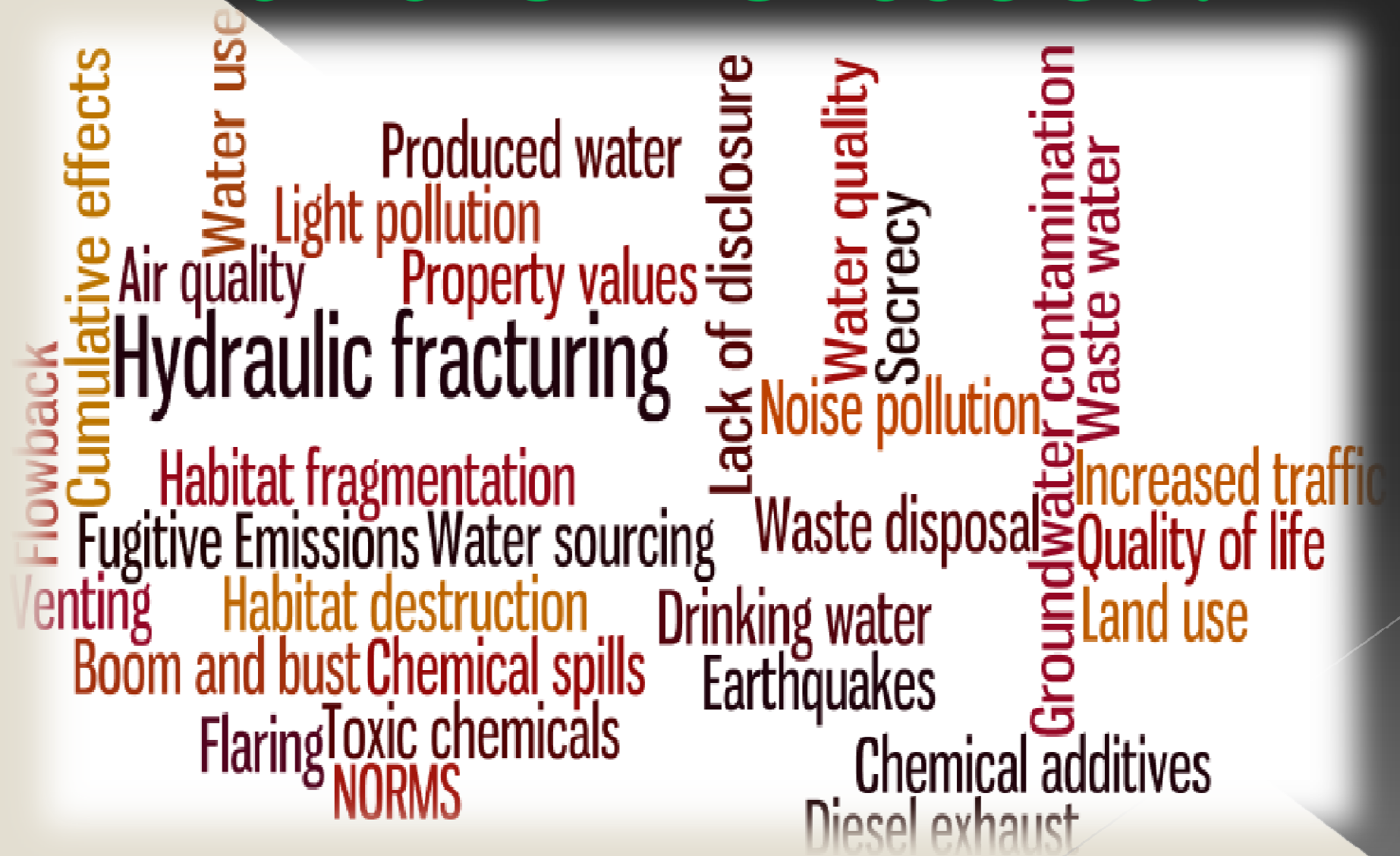
of Canadians support a
moratorium on all fracking for
natural gas until all federal and
provincial environmental
reviews are complete

Environics Research Poll – January 2013

Moratoriums



What are the issues?



A word cloud illustrating various issues associated with hydraulic fracturing. The words are arranged in a circular pattern, with 'Hydraulic fracturing' at the center. The words are color-coded in shades of green, yellow, and orange. The issues listed include:

- Flowback
- Cumulative effects
- Water use
- Produced water
- Light pollution
- Air quality
- Property values
- Hydraulic fracturing
- Lack of disclosure
- Water quality
- Secrecy
- Noise pollution
- Groundwater contamination
- Waste water
- Increased traffic
- Quality of life
- Land use
- Chemical additives
- Diesel exhaust
- Earthquakes
- Drinking water
- Waste disposal
- Waste sourcing
- Water sourcing
- Habitat fragmentation
- Habitat destruction
- Chemical spills
- Toxic chemicals
- Flaring
- Boom and bust
- Venting
- Fugitive Emissions



What are the issues?

- Water ... quantity and quality
- Air quality
- Quality-of-life
- Disclosure

Chemicals

- ◉ Drilling fluids
- ◉ Hydraulic fracturing fluids
- ◉ Flow-back/produced water
- ◉ Waste water
- ◉ Air emissions
 - Diesel exhaust
 - Venting and flaring
 - Fugitives



FracFocus

- Joint initiative of Groundwater Protection Council and Interstate Oil & Gas Commission.
- Well-by-well listing of chemicals delivered down-hole.
- BC Oil & Gas Commission, Alberta Energy Regulator and National Energy Board of Canada subscribers to FracFocus.ca
- www.fracfocus.org and www.fracfocus.ca

CAPP Principles & Practices

CAPP Hydraulic Fracturing Operating Practice: BASELINE GROUNDWATER TESTING

OVERVIEW

To support CAPP's Guiding Principles for Hydraulic Fracturing, six Operating Practices have been developed in collaboration with CAPP member companies. These Operating Practices strengthen industry's commitment to continuous performance improvement in shale gas and tight gas development.

The Baseline Groundwater Testing Operating Practice supports the Guiding Principles: "We will safeguard the quality and quantity of regional surface and groundwater resources, through sound wellbore construction practices, sourcing fresh water alternatives where appropriate, and recycling water for reuse as much as practical"; and "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

WHAT DOES THIS PRACTICE MEAN?

CAPP and its member companies are committed to protecting fresh groundwater sources. This practice outlines the requirements for companies to test domestic water wells within 100 metres of shale or tight gas development, and to participate in longer term regional groundwater monitoring programs. The purpose of these programs is to establish baseline characteristics of the groundwater pre-development. Some of these programs have been in place for many years.

CAPP Hydraulic Fracturing Operating Practice: FRACTURING FLUID ADDITIVE DISCLOSURE

OVERVIEW

To support CAPP's Guiding Principles for Hydraulic Fracturing, six Operating Practices have been developed in collaboration with CAPP member companies. These Operating Practices strengthen industry's commitment to continuous performance improvement in shale gas and tight gas development.

The Fracturing Fluid Additive Disclosure Operating Practice supports the Guiding Principles: "We will support the disclosure of fracturing fluid additives."

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WHAT DOES THIS PRACTICE MEAN?

CAPP and its member companies support and encourage greater transparency in industry development. To ensure Canadians about the safe application of hydraulic fracturing technology, this practice outlines the requirements for companies to disclose fluid additives and the chemical ingredients in those additives that are identified on the Material Safety Data Sheet (MSDS).

HOW WILL THIS WORK?

Under this Operating Practice, companies will disclose, either on their own website or on a third-party website, the chemical ingredients in their fracturing fluid additives which are identified on the Material Safety Data Sheet (MSDS).

CAPP Hydraulic Fracturing Operating Practice: FRACTURING FLUID ADDITIVE RISK ASSESSMENT AND MANAGEMENT

OVERVIEW

To support CAPP's Guiding Principles for Hydraulic Fracturing, six Operating Practices have been developed in collaboration with CAPP member companies. These Operating Practices strengthen industry's commitment to continuous performance improvement in shale gas and tight gas development.

The Fracturing Fluid Additive Risk Assessment and Management Operating Practice supports the Guiding Principles: "We will support the development of fracturing fluid additives with the least environmental risks"; and "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

The Fracturing Fluid Additive Risk Assessment and Management Operating Practice supports the Guiding Principles: "We will support the development of fracturing fluid additives with the least environmental risks"; and "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

WHAT DOES THIS PRACTICE MEAN?

CAPP and its member companies are committed to reducing the environmental risks associated with the additives in fracturing fluids. This practice outlines the requirements for companies to better understand the potential environmental risks of the additives used in their fracturing fluids.

CAPP Hydraulic Fracturing Operating Practice: FLUID TRANSPORT, HANDLING, STORAGE AND DISPOSAL

OVERVIEW

To support CAPP's Guiding Principles for Hydraulic Fracturing, six Operating Practices have been developed in collaboration with CAPP member companies. These Operating Practices strengthen industry's commitment to continuous performance improvement in shale gas and tight gas development.

The Fluid Transport, Handling, Storage and Disposal Operating Practice supports the Guiding Principles: "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

WHAT DOES THIS PRACTICE MEAN?

CAPP and its member companies are committed to reducing the risk of adverse spills of fracturing fluids and associated materials. This practice outlines the requirements for companies to develop and implement spill prevention and response plans for fluid transport, handling, storage and disposal.

HOW WILL THIS WORK?

Under this Operating Practice, companies will implement policies and procedures to: identify, evaluate and mitigate potential risks related to fluid transport, handling, storage and disposal; and respond to and contain any spills of fluids (including remediation of the spill site). These practices are effective to an appropriate level of risk (including remediation of the spill site). These practices include:

- Following applicable federal, provincial and municipal regulations for fluid transport, including transportation of Dangerous Goods (TDG) regulations;
- Implementing time-frame and safety protocols to address the risks associated with fluid transport, handling, storage and disposal;
- Reducing fluid transport by risk in large scale development projects where possible;
- Controlling and operating pipelines that transport fluids in accordance with applicable regulations;
- Sourcing natural gas from fluids prior to storage;
- Following applicable regulatory requirements for fluid storage;
- Reducing wellbore access to fluid storage sites;
- Safety disposing of fluids that are no longer needed at approved waste management facilities.

CAPP Hydraulic Fracturing Operating Practice: WATER SOURCING, MEASUREMENT AND REUSE

OVERVIEW

To support CAPP's Guiding Principles for Hydraulic Fracturing, six Operating Practices have been developed in collaboration with CAPP member companies. These Operating Practices strengthen industry's commitment to continuous performance improvement in shale gas and tight gas development.

The Water Sourcing, Measurement and Reuse Operating Practice supports the Guiding Principles: "We will safeguard the quality and quantity of regional surface and groundwater resources, through sound wellbore construction practices, sourcing fresh water alternatives where appropriate, and recycling water for reuse as much as practical"; "We will measure and disclose fluid water use with the goal of reducing our impact on the environment"; and "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

The Water Sourcing, Measurement and Reuse Operating Practice supports the Guiding Principles: "We will safeguard the quality and quantity of regional surface and groundwater resources, through sound wellbore construction practices, sourcing fresh water alternatives where appropriate, and recycling water for reuse as much as practical"; "We will measure and disclose fluid water use with the goal of reducing our impact on the environment"; and "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

WHAT DOES THIS PRACTICE MEAN?

CAPP and its member companies recognize that water is a resource we all share. We put great emphasis on the need to use and manage water responsibly in our operations. For shale gas and tight gas development, water is typically only required for well drilling and completion and not for the actual production of the gas. Some of the water injected during fracturing operations is recovered with the gas, and is either reused to ensure water supply or disposed of according to regulations. This practice requires companies to ensure water supply sources, measure water use and reuse water as much as practical in hydraulic fracturing operations.

HOW WILL THIS WORK?

Under this Operating Practice, companies will implement policies and procedures to:

- Measure and disclose water quantity through assessment and measurement of water sources (including recycled water, and with an industrial pipeline, the volume of water that can be withdrawn is approved by the provincial regulator to ensure sustainability of the resource);
- Complying with withdrawal limits and reporting requirements of water (boreholes/parts, also, collecting and reporting water use data through CAPP's Responsible Canadian Energy™ Program);
- Implementing a decision-making framework to evaluate and understand available water status;
- Monitoring surface water and groundwater quality data, as required to demonstrate sustainability of the water source and collaborating with other companies on water practices.

CAPP Hydraulic Fracturing Operating Practice: WELLBORE CONSTRUCTION AND QUALITY ASSURANCE

OVERVIEW

To support CAPP's Guiding Principles for Hydraulic Fracturing, six Operating Practices have been developed in collaboration with CAPP member companies. These Operating Practices strengthen industry's commitment to continuous performance improvement in shale gas and tight gas development.

The Wellbore Construction and Quality Assurance Operating Practice supports the Guiding Principles: "We will safeguard the quality and quantity of regional surface and groundwater resources, through sound wellbore construction practices, sourcing fresh water alternatives where appropriate, and recycling water for reuse as much as practical"; and "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

The Wellbore Construction and Quality Assurance Operating Practice supports the Guiding Principles: "We will safeguard the quality and quantity of regional surface and groundwater resources, through sound wellbore construction practices, sourcing fresh water alternatives where appropriate, and recycling water for reuse as much as practical"; and "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

WHAT DOES THIS PRACTICE MEAN?

CAPP and its member companies recognize that sound wellbore design and construction is fundamental to protecting groundwater resources and to maintaining the integrity of the wellbore. This practice outlines the requirements for companies to develop and implement wellbore design and construction standards that are consistent with applicable regulatory requirements and industry best practices.

HOW WILL THIS WORK?

Under this Operating Practice, companies will implement policies and procedures to:

- Complying with applicable regulatory requirements and using good engineering practices to ensure the integrity of the wellbore;
- Isolating and cementing surface casing to surface to ensure a continuous cement barrier, which is consistent with applicable regulatory requirements and industry best practices;
- Designing wellbores using a wellbore design and construction standards that are consistent with applicable regulatory requirements and industry best practices;
- Implementing a decision-making framework to evaluate and understand available water status;
- Monitoring surface water and groundwater quality data, as required to demonstrate sustainability of the water source and collaborating with other companies on water practices.

CAPP Hydraulic Fracturing Operating Practice: ANOMALOUS INDUCED SEISMICITY: ASSESSMENT, MONITORING, MITIGATION AND RESPONSE

OVERVIEW

To support CAPP's Guiding Principles for Hydraulic Fracturing, seven Operating Practices have been developed in collaboration with CAPP member companies. These Operating Practices strengthen industry's commitment to continuous performance improvement in shale gas, tight gas and light oil development.

The Anomalous Induced Seismicity: Assessment, Monitoring, Mitigation and Response Operating Practice supports the Guiding Principles: "We will continue to advance, collaborate on and communicate technologies and best practices that reduce the potential environmental risks of hydraulic fracturing."

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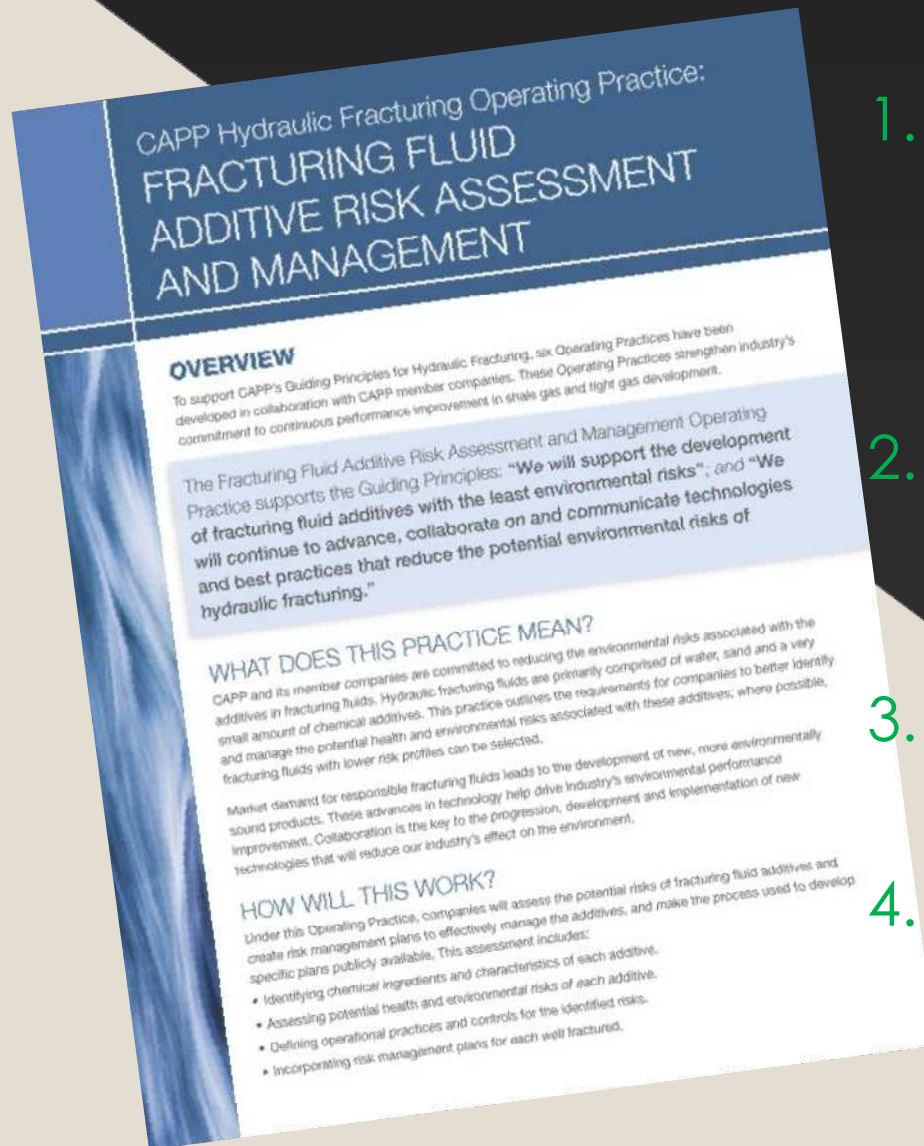
WHAT DOES THIS PRACTICE MEAN?

CAPP and its member companies support and encourage greater transparency in industry development. To ensure Canadians about the safe application of hydraulic fracturing technology, this practice outlines the requirements for companies to develop and implement policies and procedures to assess the potential for anomalous induced seismicity and, where necessary, establish appropriate monitoring procedures and procedures to mitigate and respond to anomalous induced seismicity in shale gas, tight gas and light oil development areas.

HOW WILL THIS WORK?

Under this Operating Practice, companies will implement policies and procedures to:

- Assessing the potential for anomalous induced seismicity using available engineering, geologic and geophysical data;
- Complying with applicable regulatory requirements and implementing sound wellbore construction practices;
- Evaluating wellbore placement and drilling design to account for geologic conditions;
- Communicating with onsite personnel, establishing procedures and preparedness for the possibility of anomalous induced seismicity;
- Establishing procedures to monitor for induced seismicity during hydraulic fracturing operations;
- Implementing procedures to mitigate and respond to anomalous induced seismicity.



1. Identify chemical ingredients and characteristics of each additive.
2. Assess potential health and environmental risks of each additive.
3. Define operational practices and controls.
4. Develop and implement risk management plans.

Summary

- Overall public perception of hydraulic fracturing in Canada is mixed to negative.
- A number of health and environmental issues continue to surface ... many of which match concerns in the U.S.
- Chemicals remain a significant concern to the general public.
- Regulators are responding, with actions ranging from moratoriums to special reviews to tighter rules to stricter oversight.
- Industry now responding with awareness programs, codes-of-practice, and research initiatives.