# Induced Seismicity

## What is Induced Seismicity?

**Seismicity** refers to the geographic and historical distribution of earthquakes. **Induced seismicity** is a seismic event resulting from human activity, and can be caused by industries such as mining, dam impoundment and natural gas development.

## Measuring Earthquakes

Seismic activity in British Columbia is primarily recorded by the Canadian National Seismograph Network (CNSN). The CNSN data is analyzed by Natural Resources Canada (NRCan) and further enhanced with specialized seismic arrays. The Commission routinely reviews all available data to monitor for potential occurrences of induced seismicity.

## What is the Link to Hydraulic Fracturing?

**Hydraulic fracturing** is the process of injecting fluid (usually water) at high pressures to create fractures or open existing fractures in hydrocarbon-bearing rocks deep underground. A hard granular substance called proppant (usually sand), mixed with the fluid holds the cracks open once the pressure is lowered. Hydraulic fracturing allows the natural gas to flow from the formation to the wellbore. As hydraulic fracturing fluid is injected, micro-seismic events are created as the rock is fractured. In some cases, where there is a susceptible pre-existing fault, slippage on the fault plane can occur.


## Commission Led Studies

The Commission has taken a leadership role in the detection and mitigation of induced seismicity associated with unconventional gas development – in North America and globally. Commission studies in 2012 and 2014 led to regulatory and oversight enhancements such as increased seismic monitoring in northeast B.C.

Mitigation measures are in place, including regulations to shut down industry operations if seismic activity reaches a certain threshold, permit conditions requiring the measurement of ground motion and special project orders that require community engagement and seismic hazard pre-assessments.

### 2012 Observed Seismicity in the Horn River
### 2014 Observed Seismicity in the Montney Trend

The Commission has on-going research and collaboration with industry, academia and other agencies in the field of induced seismicity. The reports concluded seismic events in areas of the Horn River Basin (between 2009 and 2011) and the Montney Trend (2013 to 2014) were triggered by fluid injection during hydraulic fracturing and to a lesser extent disposal. All seismic events were low magnitude and no injuries or property damage were reported.

The findings from the 2014 study stated induced seismicity has occurred in association with hydraulic fracturing in the Montney, and at two deep wastewater disposal sites west/northwest of Fort St. John. These findings are consistent with our current state of knowledge.

BC Oil & Gas COMMISSION

For Further Information
Email ogc.communications@bcogc.ca or call 250-794-5200
24 Hour Incident Reporting for Industry 1-800-663-3456
This information is published by the BC Oil and Gas Commission and available online at www.bcogc.ca

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## How Are We Providing Oversight?

- **Seven new seismograph stations** installed in northeast B.C., add into the existing CNSN data, thus densifying the monitoring of seismicity in the region. Two more stations are planned for spring of 2019. Localized seismograph arrays have been installed by industry and academia as well.

- **Kiskatinaw Seismic Monitoring and Mitigation Area** is a special project order that came into effect May 14, 2018. It requires seismic hazard pre-assessments within the order area as well as community engagement.

- **Drilling and Production Regulation** province-wide require the immediate suspension of injection activities if a magnitude 4.0 or greater event is recorded and linked to the activity, as well as the mandatory reporting of felt events.

- **Additional permit conditions** as of June 1, 2016 and updated Jan. 1, 2018, requires the presence of ground motion monitoring during hydraulic fracturing activities for areas where previous seismic activity occurred, as well as reporting of events.

- **Risk assessments are required** for disposal wells, which operate under strict pressure and reporting conditions.

- **Strategic Partnership** with McGill University on a three year seismology project to research induced seismicity in the Doe-Dawson area of northeast B.C.

- In the evening of **Nov. 29, 2018**, a series of seismic events occurred that were linked to fracturing activities. When the first event occured, fracturing activities were immediately suspended. Although the initial event was widely felt, there was no damage associated with these seismic events.

## How Do We Proactively Regulate?

The Commission has the legislative authority to make decisions on proposed oil and gas activities.

Companies looking to explore, develop, produce, and market oil and gas resources in B.C. must apply to the Commission. The Commission reviews, assesses and makes decisions on these applications. This consolidated single-window authority provides not only a one-stop place for all oil and gas and associated activity requirements, but a consistent application, decision, regulatory and compliance authority. Stakeholders work with one agency; therefore, the Commission serves the public interest by having an all-encompassing review process for oil and gas activities.

## Incident Reporting

The Commission manages a 24/7 emergency service. The service includes 24-hour standby of a designated Emergency Officer who answers all calls and determines how the Commission responds to the complaint or emergency.

Complaints are important in helping reduce the risk of potential incidents, and the Commission commits to responding within two hours. In most cases, inspectors are dispatched to the location to determine the cause of the complaint and assist to resolve the situation.

## Emergency Response

The Commission plays an integral role in emergency management for natural gas and oil related activities, including:

- Receiving reported incidents and complaints.
- Confirming emergency response needed and assessing potential risks.
- Oversight of permit holders' response actions including the notification of appropriate land owners, stakeholders and/or other agencies.
- Liaising with and coordinating interagency emergency operations.
- Providing regular situation updates.
- Authorizing official stand down of emergency response.

**Public Concerns and Complaints**
**1-250-794-5200** (24-hour public number)
Report concerns such as odours, spills or noise.

**Incident Reporting for Industry**
**1-800-663-3456** (24-hour emergency number)
Report oil and gas related incidents.