



## All About Critical Sour Wells

This fact sheet explains what a critical sour well is, the special safeguards such a well requires, and how these safeguards protect Albertans from sour gas blowouts.

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- » **What is a critical sour well?** A critical sour well is a sour gas well that could potentially release large quantities of hydrogen sulphide ( $H_2S$ ), causing significant harm to nearby people. When deciding if a sour gas well should be considered critical, the Alberta Energy Regulator (AER) examines factors such as how complex the drilling will be and how many people live in the community.
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- » **What is sour gas?** Sour gas is natural gas that contains some amount of  $H_2S$ .
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- » **What is  $H_2S$ ?**  $H_2S$  is the chemical formula for hydrogen sulphide, a toxic gas formed by the breakdown of organic materials. It can be found in natural gas, oil, sewage, swamps, and stockyards and in the processing of pulp and paper. The gas is colourless, but you can recognize its “rotten egg” smell even at low concentrations.
- At higher concentrations, it stops people and animals from breathing, so if it's not handled properly, it can be deadly. Because  $H_2S$  is heavier than air, it tends to accumulate in low-lying areas.
- All applications to the AER to drill oil or gas wells must take into account the possibility of encountering sour gas. If the AER's first



evaluation shows that there may be H<sub>2</sub>S, then the application is examined further.

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» **How is the decision made to classify a well as critical?**

The AER considers the following two major criteria to determine if a sour well is to be classified as critical:

- the distance of the well from an urban centre or public facility, such as a major recreational facility and
- the potential H<sub>2</sub>S release rate during the drilling stage.

The potential H<sub>2</sub>S release rate is determined by both the percentage of H<sub>2</sub>S in the gas and the rate at which H<sub>2</sub>S can be delivered to the surface. This is measured in cubic metres per second at standard pressure and temperature.

For example, a well may have both a weak flow of gas with only 1 per cent H<sub>2</sub>S content but still be critical if it is very close to a town. But a gas well with 10 per cent H<sub>2</sub>S content that is located in a remote location without people nearby might not be classified as critical.

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» **What special planning is required for a critical well?**

A critical well requires a detailed drilling plan that addresses all aspects of a proposed operation. The plan must be reviewed and approved by the AER before a critical well is licensed. Once a well is classified as critical, drilling preparations must meet all operational and safety-related requirements set out by the AER.

A drilling plan for a critical well includes

- well design,
- equipment,
- drilling procedures,
- training and supervision,
- inspections, and
- emergency response planning.

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» **How does an operator prevent equipment failure?**

The equipment used when drilling a critical well must be able to resist the harmful effects of sour gas and must contribute to blowout prevention. For example, the drill pipe used for critical wells must be of high quality and must be inspected to ensure that it meets the latest standards.

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» **What is a blowout?**

A blowout is an uncontrolled flow of gas, oil, or other well fluids from a wellbore into the atmosphere. A blowout usually results from a combination of factors, such as human error and equipment failure.

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» **In case equipment does fail, do critical wells have backup equipment?**

Yes. Backup equipment provides a second line of defence to ensure that problems with a well are controlled early on, before they lead to a full-scale blowout. Two examples illustrate such safeguards: first, there must normally be a second or backup degasser on site (a device that removes unwanted gas from drilling fluids), and second, there must be twice as much drilling mud in reserve at the site as will be needed. Mud is the liquid mixture circulated through the wellbore during drilling that is so important in holding back subsurface pressure.

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» **Can human error be prevented?**

No amount of regulation can guarantee that workers at a critical well will never make a mistake. However, errors can be reduced with proper training and supervision. The basic rule is that critical wells must be drilled by well-qualified and experienced drilling crews. Rig managers and supervisors must have a current Enform Second Line Supervisor BOP Well Control certificate. All supervisors, rig managers, and drillers must have H<sub>2</sub>S Alive certification and experience drilling sour wells.

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» **Who inspects critical wells?**

The responsibility for inspection rests primarily with the company drilling the well and the well-site supervisor. Daily and weekly inspections are conducted both by company personnel and by the drilling contractor.

AER field staff check the company's ongoing inspection records and conduct independent inspections as well. At most critical wells, there is at least one AER inspection before or during drilling in a critical zone. Critical well inspections are quite detailed. If serious problems are found, drilling operations are suspended if safe to do so until the deficiencies have been corrected. For more information on AER inspections, see EnerFAQs *Inspections and Enforcement of Energy Developments in Alberta*.

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» **How do I find out if a well near me is critical?**

The best place to start is with the company drilling the well. If you know the company name, call its nearest office. However, if you would like more information, contact the nearest AER field centre.

As part of the detailed emergency plan for a critical well, each company must contact everyone within a certain distance of the proposed well site. The company should provide you with information about its plans and seek your input. The company will not receive a drilling licence until this work has been completed.

If the company cannot satisfy your concerns or answer all your questions, contact the nearest AER field centre and they will assist you.

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- » **What if the worst happens and a critical well does blow out?**
- If, for any reason, blowout prevention procedures fail, a series of complementary emergency response plans are triggered to protect people's health and safety. This may include igniting the well (setting it on fire). Ignition converts the H<sub>2</sub>S to sulphur dioxide, which disperses more effectively because the heat carries it up, resulting in lower ground-level concentrations.
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- » **Am I protected by the emergency response plan (ERP)?**
- Every company drilling or operating critical sour wells is required to have a site-specific emergency response plan (ERP). If you live in an area where sour gas drilling is likely, be assured that no company will receive permission from the AER to drill a critical well until it has prepared an ERP tailored to the specific circumstances of that well, with detailed attention to such things as weather patterns, terrain, nearness of people, and anticipated release of H<sub>2</sub>S.
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- » **How is the emergency planning zone (EPZ) around a critical well determined?**
- An emergency response zone (EPZ) is the area around a well where full-time residents and visitors to the area, such as campers and hunters, would be at risk in the event of a blowout. The size of the EPZ depends on the potential release rate of H<sub>2</sub>S and other specific circumstances. If you live inside an EPZ, the company will meet with you to discuss what measures should be taken in an emergency and any special needs you may have, such as transportation or special health considerations.
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- » **What if I live outside the EPZ? How am I protected in case of a blowout?**
- If a blowout should occur, the AER will establish an emergency operations centre to coordinate the work of the provincial emergency response team. The AER will keep people in the general area informed of any action that may be required to protect their health and safety.
- One of the first activities initiated in a sour gas blowout is the monitoring of air quality downwind from the well. Mobile equipment is set up to track the plume and to identify concentrations of gas both inside and outside the EPZ. If the emergency response team determines that there is a danger, residents will be evacuated or the well ignited to protect the public.
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- » **What happens once a critical well has been drilled? How am I protected then?**
- The emergency provisions in place for drilling critical wells also extend to their ongoing operation and maintenance. Once a critical well is ready to be placed on production, you will be protected by an emergency response plan designed to suit this phase of development.

## » Why drill critical sour gas wells at all?

The AER must decide if a company should be allowed to drill a critical well having regard for the broad public interest—that is, what is best for all Albertans—while still being concerned about possible negative impacts on individuals.

The sour gas industry is a vital part of Alberta's economy. Natural gas heats our homes, generates electricity, and supplies us with an array of valuable consumer products. Sulphur, a by-product of sour gas, is used in making fertilizers and many other chemical products. Canada is one of the world's largest exporters of sulphur. Drilling is the only sure way to find and produce natural gas and to determine how much Alberta has in reserve to meet future needs.

## » Additional Information

For more information on the AER and its processes or if you wish to speak to your local field centre or have general questions about oil and gas in the province of Alberta, contact the AER's Customer Contact Centre: Monday to Friday (8:00 a.m. to 4:30 p.m.) at 1-855-297-8311 (toll free).

This document is part of the EnerFAQs series, which explains the AER's regulations and processes as they relate to specific energy issues. Please visit [www.aer.ca](http://www.aer.ca) to read more of the EnerFAQs series.

Every year the AER collects, compiles, and publishes a large amount of technical data and information about Alberta's energy development and resources for use by both industry and the general public. This includes raw data, statistics, hearing materials, and information on regulations, policies, and decisions.

Publications may either be viewed at the AER library or obtained from the Information Product Services Section (IPSS). Both are housed on the tenth floor of the AER head office in Calgary. Publications may also be downloaded free of charge from the AER website [www.aer.ca](http://www.aer.ca).

To obtain a print or CD copy of a specific publication, contact IPSS by phone (403-297-8190), fax (403-297-7040), or e-mail ([infoservices@er.ca](mailto:infoservices@er.ca)).

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