



# UNDERSTANDING CO<sub>2</sub>: NORTH DAKOTA'S ROLE

## EMERGENCY MANAGERS FREQUENTLY ASKED QUESTIONS

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In North Dakota, we take great pride in our agricultural and energy heritage. As federal regulations are imposing stricter standards, our fossil fuel (oil, coal, gas) and ag producers are under increasing pressure to produce low- or no-carbon products and energy. While this shift brings challenges, it also creates great opportunity for North Dakota with an increase in demand across energy and ag sectors for capturing, using, and storing carbon dioxide (CO<sub>2</sub>) deep underground.

Our commitment to safety and responsible practices is, and continues to be, our top priority. As we navigate this shift in significant legal, regulatory, and economic conditions, our priority remains unwavering – ensuring safety and sustainability in every step we take. We are dedicated to finding the best ways to adapt, uphold our values, and continue our way of life while keeping a focus on the health and safety of our communities.





## HAS THIS BEEN DONE BEFORE?

Underground CO<sub>2</sub> injection first began more than 50 years ago in western Texas. Decades of data has helped us understand how CO<sub>2</sub> behaves deep underground, and how to safely transport it through pipelines. Today, millions of metric tons of CO<sub>2</sub> are safely transported across the country through 5,000+ miles of pipelines – including nearly 200 miles in North Dakota.

### CO<sub>2</sub> CAPTURE AND STORAGE IN ND

- **Red Trail Energy Ethanol Plant, Richardton**  
Began operations on June 16, 2022; captures and stores up to 180,000 metric tons of CO<sub>2</sub> annually.
- **Blue Flint Ethanol, Underwood**  
Began operations on October 28, 2023; captures and stores up to 220,000 metric tons of CO<sub>2</sub> annually.
- **Great Plains Synfuels Plant, Beulah**  
Began operations on February 2, 2024; captures and stores up to 2.7 million metric tons of CO<sub>2</sub> annually.

### CO<sub>2</sub> PIPELINES

- **Dakota Gas/Souris Valley Pipeline**  
Began operations in 2000. This 205-mile pipeline runs from Beulah, northwest past Tioga, and into Saskatchewan, Canada. It has been transporting up to 2 million metric tons of CO<sub>2</sub> annually for enhanced oil recovery (EOR) for nearly 25 years.
- **Denbury/ExxonMobile Pipeline**  
Began operations in 2022. The final 9 miles of this pipeline, which starts in Wyoming, delivers CO<sub>2</sub> to the Bowman area for enhanced oil recovery (EOR).

## WHAT REGULATIONS GOVERN CAPTURE AND STORAGE IN NORTH DAKOTA?

In 2018, the U.S. Environmental Protection Agency (EPA) granted North Dakota primacy (regulatory authority) of Class VI (CO<sub>2</sub> storage) injection wells within the state. As a result, North Dakota Industrial Commission's Department of Mineral Resources - Oil & Gas Division has authority over all CO<sub>2</sub> storage injection well activities. The North Dakota Public Service Commission approves the siting of transmission pipelines, including CO<sub>2</sub>, and the Pipeline Hazardous Materials Safety Administration (PHMSA) is accountable for safety in design, construction, and operation of CO<sub>2</sub> transmission pipelines.

## IS STORING CO<sub>2</sub> UNDERGROUND SAFE? IS IT HARMFUL TO CROPS OR WATER?

CO<sub>2</sub> capture, utilization and storage projects are designed to be safe for people, animals, plants, and the environment. Before a CO<sub>2</sub> storage project ever begins, scientists identify and evaluate acceptable sites based on their geological suitability to securely contain CO<sub>2</sub>. Ongoing monitoring helps detect and address any potential leaks or issues.

North Dakota's unique geology is perfectly suited for safe storage of CO<sub>2</sub> nearly a mile or more below the surface, and thousands of feet below the water table.

Similar to how oil reserves deep underground do not have an impact on the surface or water supply, CO<sub>2</sub> will also remain safely beneath an impervious cap rock and will not have an impact on the surface, water, soil, or plants thousands of feet above. Crops and grass can grow above these areas, and animals can safely graze.

## IS IT SAFE TO TRANSPORT CO<sub>2</sub> IN UNDERGROUND PIPELINES?

When federal pipeline regulations are followed, pipelines outperform the safety standards of both rail and truck transit. Pipelines are designed to safely operate under the pressures (between 1200-2200 psi) required for "dense phase" CO<sub>2</sub> transport. Before any CO<sub>2</sub> is transported, pipelines are filled with fresh water or inert gas at a pressure of 125% of their maximum operating pressure to ensure structural integrity.

Pipelines and storage sites have stringent regulations, monitoring, and mitigation requirements. North Dakota prioritizes significant planning, research, training, and technology to be prepared for any unexpected scenarios.

Local emergency responders play a crucial role in ensuring public safety near CO<sub>2</sub> pipelines. Even though a CO<sub>2</sub> pipeline leak is extremely rare, it is important that first responders have the information they need to prepare for and respond to all potential situations.

Pipeline operators are required to work closely with responders to develop and review emergency response plans and conduct regular training and drills.

## HOW DO WE KNOW CO<sub>2</sub> IS INJECTED TO THE RIGHT DEPTH OR ROCK LAYER?

A CO<sub>2</sub> injection well is constructed with a minimum of three layers of steel protection to prevent any underground discharge into the water supply.

The first layer is set below the deepest underground source of drinking water, and cemented back to the surface. The second layer is set into the injection formation nearly a mile or more below the surface, and is cemented in place. The third layer is injection tubing running from the surface to the injection zone. These casings ensure CO<sub>2</sub> only flows to the target formation, and will remain within the porous rock bed layer, covered by a solid cap rock, trapping the CO<sub>2</sub> deep underground.

## WHAT SAFEGUARDS ARE IN PLACE TO PREVENT AND IDENTIFY LEAKS?

Safety is ensured through rigorous site selection, extensive monitoring, and regulatory oversight. North Dakota requires extensive review and approval of plans to operate pipeline and storage facilities and inject CO<sub>2</sub>. All CO<sub>2</sub> storage projects must include:

- Class VI well construction with surface casing/ cementing protecting water resources, cementing from the surface to the injection point, and corrosion-resistant casing and cement
- Next-Level Monitoring: multi-layer, multi-protection, multi-action 24/7/365
- Operational monitoring for temperature and pressure changes that could indicate early anomalies
- Leak detection and alerts
- Deep underground monitoring to ensure that the CO<sub>2</sub> remains securely in the storage zone
- Surface and near surface monitoring to ensure no environmental effects
- Surface water, groundwater and soil regular testing
- Shutoff requirements
- Risk assessment and mitigation including comprehensive manuals at each site and control center with actions for various scenarios
- Liability on storage facility owner, not landowner
- Post injection site care and closure
- Continuous monitoring after injection ends and CO<sub>2</sub> stops moving (at least 10 years)

CO<sub>2</sub> storage facility operators must have the proper financial instruments and ability in place to cover the cost of any necessary corrective action, injection well plugging, post-injection site care/facility closure, and emergency and remedial response. These instruments must remain in place until the CO<sub>2</sub> storage facility is approved for closure.

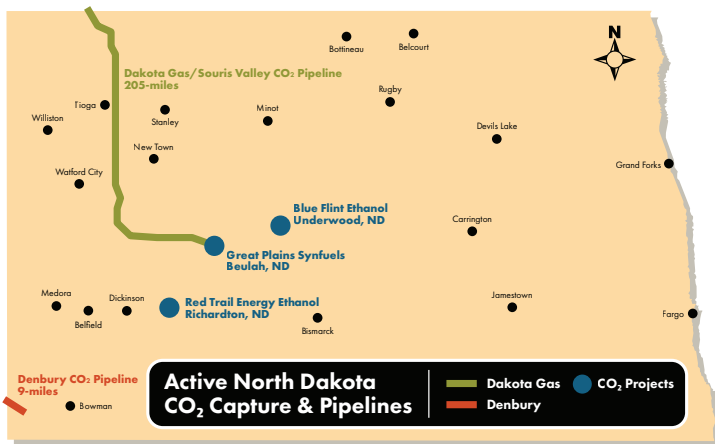


## WHAT HAPPENED WITH THE 2020 CO<sub>2</sub> PIPELINE FAILURE IN SATARTIA, MISSISSIPPI?

First, the pipeline operator was cited for violating multiple regulations. Second, the soil where the pipeline was installed was unstable, and susceptible to movement from high rainfall. The incident followed heavy rains (7.5-13.5 inches above average) that resulted in a landslide, rupturing the pipeline as the ground shifted. Lastly, weather conditions, lack of wind, and the density/volume of CO<sub>2</sub> released slowed its dissipation; the operator models underestimated the potential affected area; the operator did not adequately inform emergency responders; and the pipeline did not contain pure CO<sub>2</sub>, resulting in this "worst-case" scenario.

One misconception is that this pipeline "exploded." However, CO<sub>2</sub> is non-flammable and non-explosive. Rather, the pipeline experienced "explosive decompression." This happens when a pipe that carries gas or liquid breaks very quickly - like blowing up a balloon and popping it with a pin. The material escapes quickly, causing a powerful rush and noise, disturbing the ground immediately around the break point.





## WHAT HAPPENS IF THE CO<sub>2</sub> MIXES WITH WATER (H<sub>2</sub>O)?

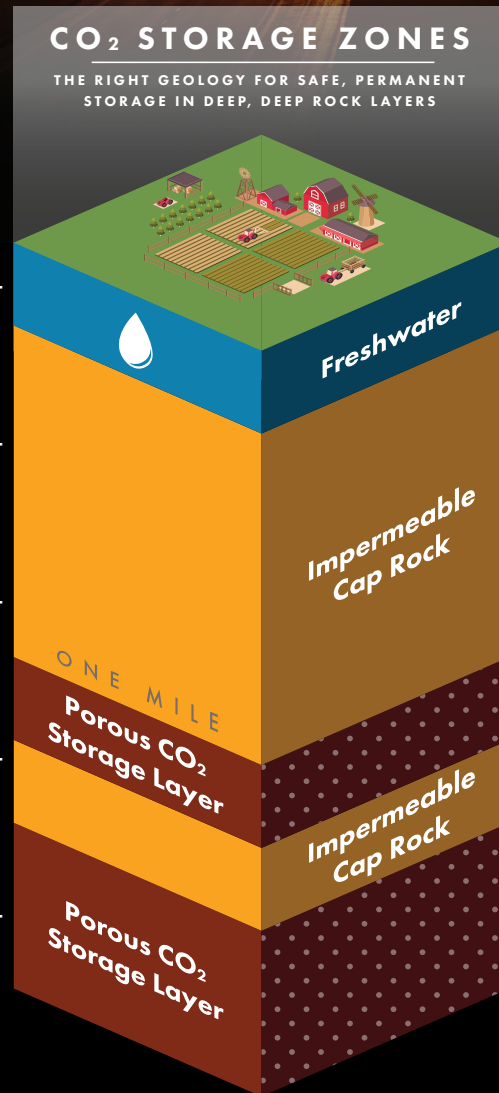
While water and CO<sub>2</sub> combined may be corrosive, systems are designed to incorporate dehydration, so no free water touches the pipeline. Several additional steps are taken to ensure pipeline and equipment integrity through all conditions, including:

- Using corrosion-resistant materials
- Applying protective coatings or linings
- Using corrosion inhibiting chemicals
- Using cathodic (electrical currents) protection
- Regular monitoring and maintenance

## WHAT HAPPENS IF A LEAK IS DETECTED?

Unlike natural gas and liquid petroleum - which are transported through millions of miles of pipelines across the U.S. - CO<sub>2</sub> is not flammable or explosive. In the unlikely occurrence CO<sub>2</sub> escapes from a pipeline or through the surface, it will become dry ice or go back to a gaseous state. While prolonged exposure to high concentrations of CO<sub>2</sub> can cause breathing difficulty, the gas typically quickly evaporates into the air and requires little to no clean-up. In the event of a leak, pipeline systems are designed to automatically shutdown, ceasing all operations until the cause is determined and repaired, and a reporting process through North Dakota's Unified Spill Reporting System is triggered.

Manuals are required at every facility and call center that outline action steps and emergency protocol for any possible leak scenario.



NORTH  
**Dakota** | Industrial Commission

If you're interested in learning more about CO<sub>2</sub> and North Dakota's role, visit

**CarbonND.com**

