

Attachment 4: Groundwater Fact Sheet

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Braidwood Generating Station Groundwater Fact Sheet

What happened at Braidwood?

In November 2005, an environmental monitoring program at the Braidwood Generating Station in Braceville, Ill., found higher than background concentrations of tritium in groundwater close to an underground pipe inside the plant's northern boundary. Subsequent environmental testing and monitoring in 2006 found higher than background levels of tritium in groundwater in six separate locations, three of which extended beyond Exelon property.

What is tritium?

Tritium is an isotope of hydrogen that produces a very low level of radiation. It is produced naturally in the upper atmosphere when cosmic rays strike atmospheric gases and is produced in larger quantities as a by-product of the nuclear energy industry. When combined with oxygen, tritium has the same chemical properties as water. Tritium can be found at very low levels in nearly all water sources.

How is tritium in the environment measured?

Tritium is measured based on how much is in a given liter of water, expressed in "picocuries per liter" of water (a picocurie is one trillionth of a curie).

Are low levels of tritium in water harmful?

The U.S. Environmental Protection Agency (USEPA) sets standards for acceptable public drinking water. Under those standards, any concentration of tritium up to 20,000 picocuries per liter (pCi/l) is within EPA acceptable limits for safe drinking water. According to the USEPA, if a person drinks two liters of water per day for a year with tritium at 20,000 (pCi/l), that person would receive four millirem of additional radiological exposure from the tritium. To put this into context, this is equivalent to the amount of exposure a person would receive on a single cross-country airplane flight. The typical American is exposed to between 300 to 350 millirem per year overall from sources that include consumer products, cosmic radiation, rocks, and soil.

Where did the tritium at Braidwood come from?

The tritium came from leaking valves from an underground pipe that, as part of normal plant operations, carries water containing diluted tritium produced in the plant to the Kankakee River for discharge under state and federal regulations.

How did the tritium leak from the pipe?

The tritium leaked from valves called “vacuum breakers,” which are float-operated valves that open to admit air when the pipe is not full of liquid. On several occasions in the past, the valves failed to close or became damaged, causing the leaks. The pipe and vacuum breakers have since been modified to protect against future leaks.

What did Exelon do when it found the tritium in November 2005?

After testing showed the potential for elevated tritium levels off site in late November 2005, Exelon notified the Illinois EPA, as well as the Nuclear Regulatory Commission (NRC), the Illinois Emergency Management Agency, public officials and potentially affected residents.

Is there a health or safety hazard for people living near the plant?

No. Independent consultants and representatives from federal and state agencies have confirmed that the concentrations of tritium in private wells do not pose a health or safety hazard to the public. No municipal water supplies are affected, and tritium concentrations in all drinking wells are well below the USEPA’s comparison value for a safe level in public drinking water.

What is Exelon doing to address the problem?

First and foremost, all unplanned releases of tritium are unacceptable to Exelon, and Exelon is fully committed to cleaning up the area. Here is what Exelon is doing to address the issue:

- Started interim remediation in June 2006 to reduce the extent and concentrations of tritium in the groundwater.
- Launched an environmental investigation to fully map out the areas of contamination. Environmental consultants and engineers installed more than 300 monitoring and test wells and collected more than 700 water samples from them. Exelon also placed a permanent sample well adjacent to each vacuum breaker and at the midpoints between vacuum breakers to monitor the groundwater. Exelon will continue to sample monitoring and test wells on a quarterly basis.
- Completed an extended sampling program of drinking water wells of more than 370 residents in the surrounding area. All samples tested well within the USEPA drinking water standard; none of the tritium concentrations pose a health or safety hazard. Exelon will continue to monitor some of the private wells near the area of contamination during remediation.
- Created an ongoing aggressive public information program to make sure that people in the communities near the plant understand the issue and receive the most up-to-date news and can ask questions through designated contacts.

Has Exelon been successful at removing tritium from the groundwater?

Yes. Since June 2006, Exelon has been pumping down a pond adjacent to the plant. As the pond level lowers, the groundwater adjacent to the pond, which has tritium in it, flows toward the pond. While that happens, Exelon pumps water from the pond to keep it at the lowered level.

The water pumped out of the pond goes into the existing blowdown line, as modified, and is then discharged into the Kankakee River under state and federal regulations.

What progress has Exelon made with remediation?

Exelon has made significant progress since remediation began in June 2006. Hydrogeologists have confirmed that the remediation is having the intended effect of capturing the flow of groundwater and reversing outward flow back into the pond. The area with the highest concentration of tritium in the groundwater has been reduced by more than 97 percent as of September 2008. Water taken from a test well located north of Smiley Road on the southeast edge of the pond showed 230,000 pCi/l in December 2005. As of September 2008, the concentration has decreased by more than 97 percent to 6,250 pCi/l, providing further evidence that the clean up plan is working effectively.

What is Exelon doing with the water that it is pumping out of the pond?

The company is sending this water to the blowdown pipe, where it mixes with water from the plant and the cooling lake before being sent to the Kankakee River, where the low levels of tritium are discharged under state and federal regulations.

Is this the same blowdown pipe that previously leaked?

Yes. When the tritium issue came to light in November 2005, Exelon stopped putting any tritium into the pipe, saying the company would not reintroduce tritium until it could be sure of the pipe's integrity. Since that time, the company has made significant enhancements to be sure that neither the pipe nor the vacuum breakers will leak. Exelon has worked very closely with the Nuclear Regulatory Commission, the Illinois EPA and the Illinois Attorney General's Office on this plan.

How has Exelon ensured that the pipe will operate properly?

Exelon has made significant improvements to ensure the integrity of the blowdown pipe and vacuum breakers. All of the vacuum breaker vaults have been sealed with impermeable liners, and eight of the 11 vacuum breakers have been closed to prevent any water from escaping through the valves. The blowdown line is also being operated at a positive pressure to make certain that the in-use vacuum breakers remain sealed during operation. Exelon has also installed leak detection devices in each vacuum breaker vault, installed 21 monitoring wells along the blowdown line and also performs weekly inspections of the line. Moreover, outside experts conducted acoustical testing of the entire blowdown pipe and reported no leaks.

In normal operation, what else is in the discharge pipe besides tritium?

The discharge pipe carries mostly lake water from the Braidwood cooling lake. About twice a week, tritiated water left over from the production process is injected into the pipe where it mixes with the lake water and is diluted and carried to the Kankakee River. There, the water is discharged according to the plant's NRC license and environmental permits. Lake water that had mixed with tritiated water inside the pipe is what leaked in the past.

The water discharged from the pipe also typically includes very low levels of other radioactive material besides tritium, including Cobalt-60, Cesium-137 and similar reactor-produced radionuclides. These low levels are well within the federal NRC license for discharge concentration and present no health or safety hazard.

Should I have my well sampled?

Not necessary. Based upon extensive sampling of hundreds of wells involving thousands of samples, Exelon has developed “plume” maps detailing the on-site and off-site locations and extent of tritium in groundwater. To provide assurance to residents, the company has sampled approximately 370 private wells outside of the immediately affected area, and results show no elevated levels of tritium outside of this identified area.

This page has various [offsite maps](#) of the tritium groundwater location as well as both private drinking wells and wells drilled to characterize the tritium in the groundwater.

A separate, independent report issued in August 2006 by the Will County Health Department confirmed that there are no tritium-related health risks in the groundwater near the station.

Are there other radionuclides present in the groundwater samples that tested positive for tritium?

No. Tests of water samples from the private drinking water wells, monitoring and test wells showed no radionuclides present in the groundwater other than tritium. This was a standard test that looks for plant-produced and naturally occurring radioactive substances.

How is Exelon ensuring the integrity of the well sampling?

Exelon hired an environmental and engineering consulting group to sample private and test wells. The samples are sent to a private accredited laboratory for analysis. This consulting group reports results of private well samples directly to owners and shares the information with Exelon. The collected samples are also split with the Illinois Emergency Management Agency and the NRC; levels of tritium are independently confirmed by these agencies.

If there are no health or safety hazards from tritium, then why is Exelon funding a new water system for Godley?

Both Exelon’s and the Will County Health Department’s reports confirm that there are no tritium-related health risks in the groundwater near Braidwood Station. However, the test results did show that Godley residents face water quality issues – but not as a result of tritium. Instead, many of the wells contain unacceptable amounts of bacteria and other pollutants from nearby septic systems and run off water.

As a separate initiative and as part of its commitment to the local community, Exelon has set aside up to \$11.5 million for the Village of Godley to build a municipal water system. The funds were placed in an escrow account and are sufficient to cover construction of any of several water system options that the Godley Water District selects. The Godley Water District announced a

winning bid in September 2008 and hopes to have the new water system completed within 18 months.

Additionally, Exelon will continue a free bottled water program for Godley residents until the end of 2009 or until the water system is operational, whichever comes first. Extensive testing by Exelon and the Will County Department of Health has shown there is no tritium contamination in Godley's wells; Exelon is continuing this program as a goodwill gesture.

How many areas are affected?

Certain areas (called plumes) show evidence of groundwater contamination. The largest plume originally covered about 2,000 feet by 2,000 feet adjoining the plant property to the north near Vacuum Breakers 2 and 3. Exelon's clean up plan has been successful at reducing the extent of this plume's contamination.

Four smaller plumes are approximately 200 feet across along the underground pipe that runs east to the Kankakee River. Two of these plumes have migrated to a portion of the Will County Forest Preserve property. The sixth plume is on plant property on the west side of the turbine building.

Where are the four smaller plumes along the pipe located?

There are four smaller plumes located near vacuum breakers along the underground pipe. Sample results indicate that these vacuum breakers were the source of the elevated tritium levels that have been detected in the groundwater. Contamination from these plumes is not affecting private wells.

- The first of these plumes is approximately 500 yards east of Comet Drive in a small area of the Will County Forest Preserve, near Vacuum Breaker 4. The tritium concentrations in this area were between less than 200 and 10,000 pCi/L. The USEPA standard for safe drinking water is 20,000 pCi/L. This plume, however, has not affected anyone's drinking water. The nearest residents are about 300 yards away and will not be affected because the groundwater movement will carry the plume away from their property.
- The second plume is located on company property about 800 yards east of Essex Road near an area that borders the Will County Forest Preserve, near Vacuum Breaker 7. Sampling showed tritium levels of approximately 4,100 pCi/L, 20 percent of the USEPA drinking water standard.
- The third plume is also on company property, approximately 350 yards east of Essex Road, near Vacuum Breaker 6. Sampling at this location tested at 2,000 pCi/L, or 10 percent of the EPA drinking water standard.
- The fourth plume near Vacuum Breaker 1 is located about 600 feet east of the switchyard, on Exelon property. Initial sampling showed the highest concentration of tritium of about 30,000 pCi/L.

* Note: Remediation continues to help reduce the concentration levels in these plumes, which are now all well below the USEPA standard of 20,000 pCi/L.

Did the leaks impact the cooling lake?

No. The leakage occurred in the pipe vacuum breakers that carry water away from the cooling lake to the river.

What was the highest concentration of tritium found in groundwater?

Water taken from a test well located north of Smiley Road on the southeast edge of the pond showed 230,000 pCi/l in December 2005. As of September 2008, the concentration has decreased by more than 97 percent to 6,250 pCi/l, providing further evidence that the clean up plan is working effectively.

Are those levels a hazard to public health?

No. These are concentrations in groundwater and do not currently present a hazard to the public.

What will prevent the tritium from reaching my property?

Under Exelon's remediation program, water from a pond adjacent to the plant is being pumped down to reverse the northerly flow of the groundwater. Based upon continued sampling data and groundwater modeling, Exelon has determined that the flow has been successfully reversed and has not affected any additional properties (i.e., the effects of the impact to the groundwater has been minimized). In conjunction with remediation efforts, Exelon continues to test monitoring wells and some of the closer private wells.

The smaller plumes near vacuum breakers 4, 6 and 7 to the east of the larger plume are not affecting any private wells. Clean-up efforts continue to address the areas near vacuum breakers 1, 2 and 3 using a combination of the pond pumping system and recovery wells. Due to the distance of the recovery wells from the nearest private wells, hydrogeologists expect no impact to private wells and will continue to monitor wells as part of remediation project.

How is Exelon communicating with its neighbors?

As part of the company's good neighbor commitment, Exelon is dedicated to keeping the community informed. Exelon has launched an extensive public outreach program to provide residents with the most updated information. These actions include:

- **Engaging in ongoing conversations with inquiring residents**
- **Establishing a Web site containing updated information, fact sheets, maps, and other documents, including the Illinois EPA Notice of Violation and the Company's response. The address is <http://www.braidwoodtritium.info>**
- **Holding meetings with residents at which questions and concerns were addressed.**
- **Sponsoring Community Information Nights that provide residents with updated information and an opportunity to have one-on-one conversations with Exelon representatives and experts.**
- **Issuing news releases and press briefings.**
- **Engaging in continued conversation with local officials regarding new information.**

- **Participating in ongoing discussions and meetings with regulatory agencies including the Illinois EPA, the NRC, the Illinois Emergency Management Agency, the Illinois Department of Public Health, and the Will County Public Health Department.**

Exelon's highest concern is the safety and well being of the public.

Please feel free to direct your questions to any of the following:

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