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A TWO-DAY JOURNAL SPECIAL REPORT

URANIUM MINING A BIG DECISION FOR THE BLACK HILLS

Editor's note: Whether to allow a proposed uranium mine in Western South Dakota may be the most important environmental decision to face the region in decades. In advance of initial permit hearings that begin in Rapid City on Monday, the Journal has taken a deeper look at the proposal and the process to advance the knowledge of all those involved in the debate and decision-making process.

In situ mining:
foolproof or
full of risk?

Daniel Simmons-Ritchie
Journal staff

An "in situ" uranium mine isn't the open-pit mine that your grandparents may remember: backers say it is clean, safe, virtually hidden from view, and does not scar the earth.

For seven years that has been the promise of Powertech, a Canadian company that is proposing to build South Dakota's first in situ leach uranium mine — a \$51 million project that would draw uranium from beneath the surface of the land near Edgemont.

But as the company reaches a critical stage in its permitting process, that promise has come under increasing fire from critics in South Dakota worried about the project's possible environmental impact. The result has been a tense back and forth this year between Powertech and its opponents, with each side accusing the other of spinning the truth and manipulating the facts.

To separate fact from fiction, the Journal spent the past month investigating the claims of both Powertech and project critics. The Journal interviewed more than a dozen sources, from hydrologists to regulators, from environmental lawyers to industry spokespeople, and reviewed scores of academic reports, newspaper clippings, and state records on the environmental impacts of ISL uranium mines.



Chris Huber, Journal staff
Dayton Hyde, owner of the Wild Horse Sanctuary south of Hot Springs, is worried Powertech's proposed uranium mine north of Edgemont could contaminate the water supply on his land.

The newspaper's findings include:

- While no mining venture can prevent all risk, some in situ mines have had a dubious track record of regulatory compliance; from a mine in Texas that exposed workers in the 1980s to dangerously high levels of

radiation, to a mine in Wyoming in 2008 that earned a \$1.4 million fine from the state for failing to restore contaminated groundwater as promised.

- There is consensus among federal regulators that, despite

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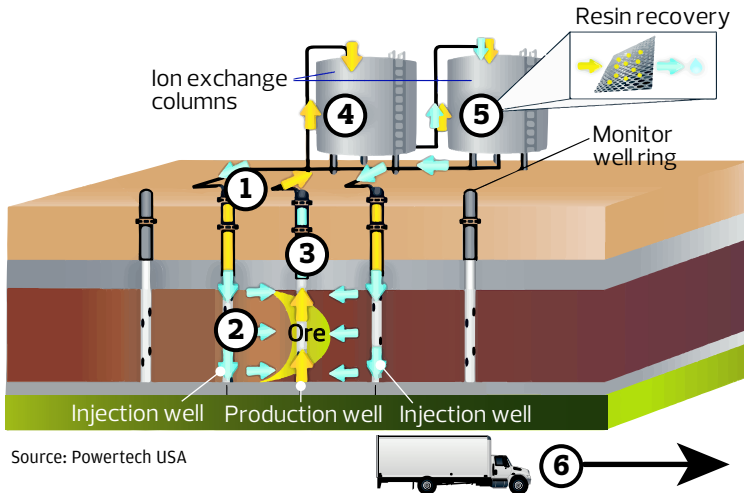
YESTERDAY: How the state has eased regulations to favor mining companies.

TODAY: A closer look at problems at existing or previous in situ mine operations.

THIS WEEK: Stay with the Journal for coverage of the minerals board hearings this week, and for our ongoing coverage of this important regional issue over the coming months.

In situ leach mining: how does it work?

A mining company is proposing to use a new and cheaper technique to extract uranium from the ground near Edgemont. Unlike an open-pit mine, an "in situ leach" mine pumps water into the ground and sucks it back up to extract uranium. The company says the technique is environmentally friendly, but opponents fear it has the potential to contaminate groundwater.



Source: Powertech USA

Troubled history

Review shows in situ mining has track record of environmental problems

Daniel Simmons-Ritchie
Journal staff

Powertech, a Canadian company that is proposing to begin mining uranium near Edgemont, has worked for years to reassure South Dakotans that its mine will not only be environmentally friendly, but that there are plenty of other mines across the country to prove that safety record.

But a closer look shows that hasn't always been true.

In the run-up to today's state permitting hearing in Rapid City,

the Journal compiled a list of some of the worst environmental issues at in situ leach uranium mines across the country. The data was collected from newspaper clippings, state records, federal records, and academic reports published over the past 40 years.

The Journal sent its list to Powertech last week and asked how the company would prevent incidents that occurred at other mines. The company responded with an 8-page letter describing the mine's safety features, mitigation procedures, and how its operation would be regulated. The company also noted that the Journal didn't provide sourcing to

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INSIDE

High school soccer

Stevens boys soccer team bounces back from last season.

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THE BIG NUMBER

\$2M

Amount of money Tom Steyer has spent fighting the Keystone XL oil pipeline.

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Method

the promises of mining companies, groundwater at a mining site cannot be restored to its pre-mining condition. In every instance, regulators have had to relax restoration standards because escalated concentrations of certain chemicals, like uranium and arsenic, could not be reduced.

- There is relatively little research on the movement of chemicals, like uranium, in groundwater once mining is finished. An analysis of groundwater samples by a hydrologist in Texas this year shows the first potential evidence of uranium flowing into a livestock well from a nearby mine. The state of Texas disputes those findings.

- The regulation of in situ mining varies from state to state, but South Dakota could be particularly vulnerable to environmental risks due to a weakening of regulations and the state's abandonment of its rights to regulate the mine operations.

Mark Hollenbeck, local project manager of Powertech, maintains that the claims against in situ mining operations are largely based around fear of the unknown.

He said in situ mining has become the preferred method to extract uranium across the country over the past 40 years, largely due to its benign impact on the environment. Rather than digging down to reach uranium as in conventional strip mining, an in situ operation instead pumps water into the ground and redraws that water, then laced with uranium, back to the surface.

That uranium is then transported to a processing plant where it is transformed into uranium rods to fuel nuclear power plants.

Hollenbeck argues that not only is the project beneficial to American energy independence, it will be an economic boon for the southern Black Hills.

“Any time you add 100 jobs in a rural area in South Dakota it's a big deal,” he said. “And these aren't minimum-wage jobs, these are jobs you can raise a family with.”

But critics, including an array of environmental groups and area residents, say those short-term benefits aren't worth the long-term risks.

Beginning today at the Best Western Ramkota hotel in Rapid City, dozens of attorneys, activists, and area residents will offer public testimony against Powertech's proposed mine. The hearing, held by the State Board of Minerals and Environment, is expected to last all week.

For Bruce Ellison, an attorney for the Clean Water Alliance who is testifying, it's a showdown that he believes every South Dakotan should be closely watching.

“Hopefully we are going to show there's too many unanswered questions,” he said. “Why should we put our water at risk?”

Past in situ problems

South Dakotans don't have to look far to see how in situ mines have operated in other communities.

While uranium mining is a niche industry, in situ mines are largely clustered around the uranium-rich lands of Wyoming. South Dakota's western neighbor hosts three of the six in situ sites currently operating in the U.S.

For in situ critics like Shannon Anderson, an organizer based in Sheridan, Wyo. for the Powder River Basin Resource Council, Wyoming's experience demonstrates the problems with in situ mining.

“I think it's important that if you're getting into this industry you know the history of what's happened in other states,” she said.

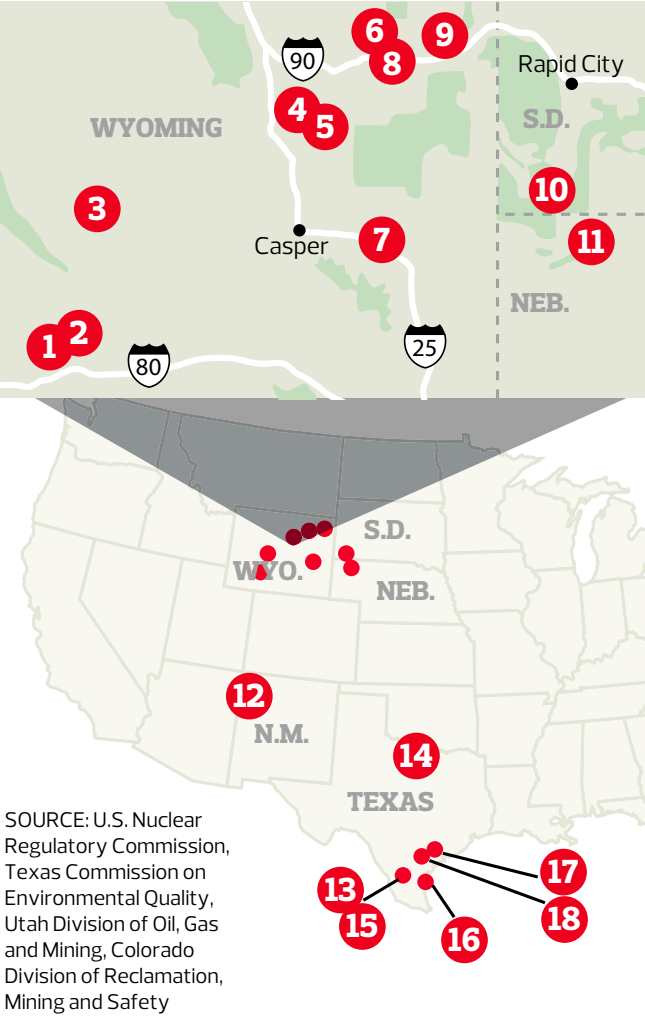
Among the biggest issues, Anderson says, is the incident that led to a \$1.4 million settlement the state reached with one mining company in 2008 over frequent violations.

At the Smith Ranch-Highland site, in Eastern Wyoming, the state found an “inordinate number of spills, leaks and other releases.” The state also found that the company, Power Resources, was significantly under-budgeting for reclamation and that it was shirking its promises to restore contaminated groundwater.

At that mine and others in Wyoming, Anderson is particularly concerned about violations relating to what the industry calls “excursions.” An excursion is an early warning signal that chemicals pumped into the ground, or loosened by the pumping process,

ISL uranium mines in U.S.

If approved by state and federal agencies, a proposed uranium mine in Western South Dakota will join a growing number of similar mines in a few Western states. While the uranium-rich region once brimmed with strip mines in the 1950s, faltering uranium prices led most to shut down. Today, thanks to rising uranium prices and the development of a cheaper technique for extracting uranium, called in situ leaching (ISL), the region is seeing a resurgence of interest in uranium mining.



On the Web: For comprehensive coverage of uranium mining, visit rapidcityjournal.com/uranium for current Journal articles and those going back 10 years; photos of the mine site and other images; key documents and links to reports on Powertech and uranium mining; and letters written by readers. To submit your own letter to the editor, send an email to letters@rapidcityjournal.com.

ISL - ACTIVE

- 1 Lost Creek ISR, LLC, Sweetwater County, Wyo.
- 5 Uranium One U.S.A., Johnson and Campbell counties, Wyo.
- 7 Power Resources, Inc., Douglas, Wyo.
- 11 Crow Butte Resources, Inc., Chadron, Neb.
- 13 Uranium Energy Corp., Duval County, Texas
- 14 Mestena Uranium LLC, Brook County, Texas

ISL - PERMITTED, NON ACTIVE

- 4 Uranerz Energy Corporation, Campbell and Johnson counties, Wyo.
- 6 Uranium One Americas, Inc., Campbell County, Wyo.
- 12 Hydro Resources, Inc., Crownpoint, N.M.
- 15 Uranium Resources, Inc., Duval County, Texas (two sites)
- 16 Uranium Resources, Inc., Kleberg County, Texas
- 17 Uranium Energy Corp., Goliad County, Texas
- 18 Signal Equities, Bee and Live Oak Counties, Texas

ISL - PROPOSED

- 2 Uranium One, Sweetwater County, Wyo.
- 3 Wildhorse Energy, Fremont County, Wyo.
- 8 AUC LLC, Campbell County, Wyo.
- 9 Strata Energy, Inc., Crook County, Wyo.
- 10 Powertech Uranium Corporation, Custer and Fall River counties, S.D.

“The NRC license application was accepted for detailed technical review by NRC, signifying that it met the acceptance criteria for this site characterization monitoring,” the company wrote in a statement.

Asked to comment on federal findings that water can not be restored to pre-mine quality, Powertech officials said the company is committed to restoring groundwater within rules set by the NRC.

The company also reiterated that within its proposed mining area, there are no drinking water wells and that the water exceeds South Dakota health standards.

Can it migrate?

Opponents of Powertech's proposal maintain that all prior evidence from in situ mines suggests that concentrations of chemicals like uranium in water will escalate.

There biggest fear is not simply that those contaminants will remain in the groundwater after mining has finished, but where they will flow after that.

For mining companies and industry regulators, that concern is easily dismissed.

The NRC said in a statement that based on its historical licensing information there is no evidence that domestic wells, livestock wells, or nearby groundwater sources have been impacted by an in situ mine.

The Texas Commission on Environmental Quality said in a statement that there is no evidence that water supplies had been contaminated outside of an in situ mine's permitted boundaries.

“Texas regulations that apply to in situ mining of uranium are designed to protect underground sources of drinking water from contamination from such mining,” spokesman Terry Clawson wrote.

But environmental watchdogs contend that those conclusions are based on a lack of data.

Geoff Fettus, a senior attorney for the Natural Resources Defense Council, said that another of the flaws in federal in situ regulation is a lack of long-term monitoring.

If the companies and regulators don't continue extensive sampling at a decommissioned site, he and other environmental activists argue, no one else can.

“We don't have the resources as a federal agency does to go mine by mine and see the spread of contaminants – if any,” he said.

And while state and federal regulators contend otherwise, there is evidence at least one well in the country may have been contaminated due to its proximity to an in situ mine.

George Rice, a private hydrologist based in San Antonio, Texas, has found escalated concentrations of uranium at a livestock well about 1,000 feet away from the Kingsville Dome mine in Texas. The mine began production in 1988 but is currently inactive.

Rice said that while the uranium concentrations at the livestock well he analysed have always been unsafe for humans, the concentrations have tripled since the mine began operating in the area.

Now, Rice said, the well water is unsafe for livestock too.

Rice has submitted his findings to the Texas Commission on Environmental Quality and the operator of the Kingsville Dome mine, Uranium Resources, for review.

“This is the first case that I'm aware of that contaminants from an in situ mine have moved from a property and effected a domestic well,” he said.

Asked for comment on Rice's findings, the Texas Commission on Environmental Quality said it was aware of the uranium concentration at that well, but disagreed with Rice's conclusion.

In a statement, the department said the groundwater is naturally high in uranium and that, based on an analysis by Uranium Resources, the concentrations only appear elevated because of changes to sampling procedures.

But Rice said the state's argument doesn't explain the higher concentrations of uranium. He said he had already explained in his report to the state that changes in sampling procedures couldn't adequately explain such a drastic increase in uranium levels.

“It's an easy bureaucratic response that doesn't cause any trouble,” he said. “So they are not rocking any boats by simply repeating what the mine says.”

Rich Abitz, the Cincinnati geo-chemist who has studied in situ mines, has looked at Rice's

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Problems

its list and therefore it was unable to verify all of the listed problems. Because Powertech’s response was too long for print publication, the Journal has published it online. The Journal has also provided links to documents that formed the basis of its list.

Below is a look at those incidents, listed by mine name, the mine’s location, the company involved, and what happened:

• **Willow Creek mine, Johnson & Campbell Counties, Wyo. (Uranium One):** An active mine that has operated under different companies since the late 1970s. Today it is divided between two sites: the Irigaray plant and the Christensen Ranch satellite facility. When the operation was under the ownership of Wyoming Mineral Corporation in the late 1970s and early 1980s, the state found the Irigaray site experienced repeated fires, migrations of injection solution in groundwater, and that basic tests were also not being performed.

In 2011, the state issued a violation after it was discovered that 7,000 to 10,000 gallons of sodium chloride brine was released into a dry ephemeral stream at the Irigaray site. The company took two weeks to notify the state, when notification should have occurred in 24 hours. In 2010, the state found problems with contaminants migrating through groundwater from the Christensen Ranch site. Glenn Mooney, a geologist for the Wyoming Department of Environmental Quality, sent a letter to the company and noted that uranium levels were “over 70 times” the maximum contaminate threshold in groundwater near the mine’s permit boundary. Mooney wrote that the finding “is a major concern to WDEQ.” In 2011, the state issued a violation after discovering the company was failing to properly conduct groundwater tests.

• **Bruni mine, Bruni, Texas (Cogema Mining):** A now decommissioned mine that operated through the 1970s and 1980s. Between 1975 and 1981, the state recorded 23 incidents of leachate spills. Between 1978 and 1981, the state also recorded four such spills of waste ponds on the mine surface or in shallow areas above the uranium deposit.

The largest leak contaminated groundwater for a year before it was found and repaired. The state also found the company was improperly storing radioactive material. In 1977, the state tried to fine the company and eventually reached an out-of-court settlement of \$42,500. After retiring the mine, the company struggled to return the groundwater to its pre-mine chemical composition. The company, like many other in situ mining operators in Texas, requested that the state lower its restoration standards.

• **Clay West and Burns mines, George West, Texas (U.S. Steel):** A pair of now decommissioned mines that were run by U.S. Steel from 1975. The state found workers were frequently exposed to unsafe levels of radiation. An inspection in 1980 found gamma radiation levels were so high they “pegged the meter” due to problems containing uranium dust in the plant loading area. The company would later discover that uranium fluid was leaking into the ground, saturating the soil around the plant, and coating its drainage field and septic tank in uranium. In 1985, the state discovered that workers for three companies in Corpus Christi were exposed to unsafe levels of radiation while repairing a machine for the company. Overall, due to pipe ruptures, the company reported more than 22 surface spills at the site, releasing an estimated 1,199,647 gallons of radioactive and toxic chemicals.

• **Mt Lucas mine, Dinero, Texas (Everest Exploration):** A now decommissioned mine run by



Alan Rogers, Casper Star-Tribune file

A worker walks between tanks in the main processing facility Friday, Aug. 31, 2012, at Cameco's Smith Ranch-Highland uranium operation near Glenrock, Wyo. Smith Ranch-Highland is the largest uranium production facility in the U.S.



Chris Huber, Journal staff

A petition in support of the Powertech uranium mine sits on the bar at the Hat Creek Grill in Edgemont. Support for the mine is strong in the town of Edgemont.

Everest Exploration. The company was given permission to dispose of untreated radioactive wastewater by Lake Corpus Christi. Between 1984 and 1986, the company irrigated the waste on a 22-acre patch of land 300 yards from the lake. In 1987, radioactivity was 47 times above normal and six times higher than allowed by the company’s operating license. The state found half of the irrigation water had percolated into the water table, potentially endangering surface and groundwater.

• **Goliad exploration wells, Goliad County, Texas (Uranium Energy Corp):** A recently permitted but presently inactive mine in Goliad County. Two residents sued Uranium Energy Corp in 2008 after the company conducted exploratory drilling in the area. The lawsuit charged that the company drilled 70 exploratory bore holes but failed to close them properly, allowing storm runoff to flow into them and contaminate the county’s groundwater. A group of residents say the well water in their area became slimy and discolored and only returned to normal after drilling stopped. A federal judge dismissed the lawsuit and advised the county to pursue the matter through the state courts or a state administrative body. The county filed two new lawsuits this year. The first lawsuit was filed against the Texas Department of Environmental Quality for improper testing and analysis of groundwater. The second lawsuit was filed against the Environmental Protection Agency for similar reasons.

• **Smith Ranch-Highland mine, Douglas, Wyo. (Cameco Resources):** Cameco, under a subsidiary called Power Resources, has been mining in the area since 1988 and the operation remains active. In 2007, the state discovered the

This week's permit hearings

State Board of Minerals and Environment hearings:

SEPT. 23: The first day of the large-scale mine permit hearings starts at 10 a.m. MDT at the Best Western Ramkota Hotel and Conference Center in Rapid City in the Sylvan I and II rooms. Public testimony will occur between 10 a.m. and noon on this day only.

SEPT. 24 TO 26: Case between Powertech and opponents continues each morning at 8:30 a.m. at the Best Western Ramkota Hotel and Conference Center.

SEPT. 27: Case between Powertech and opponents continues at 8:30 a.m., at the Rushmore Plaza Civic Center’s Alpine Ponderosa Room, in Rapid City.

company was violating its agreements to restore groundwater to pre-mining condition. The state also found that the company had experienced an “inordinate number of spills, leaks and other releases” and that it was failing to detect, report and track spills as it should be. That included, in that year alone, a surface spill of 3,700 gallons of fluid containing uranium and trace minerals (although the company managed to recover 3,500 gallons). The company also spilled 11,600 gallons of disposal solution.

In addition, the state found the company was only budgeting \$40 million for reclamation when the state calculated it would cost \$150 million. The company reached a \$1.4 million settlement with the state over the permit violations



Chris Huber, Journal staff

Water settles in a low area near the proposed Powertech uranium mine north of Edgemont. Some opponents of the mine cite the possibility of water contamination.

and doubled the company’s bond from \$40 million to \$80 million. Despite the settlement, the state has continued to find violations on a routine basis at the mine over the past five years. From September 2008, the state has fined the company a total of \$88,000 for improperly capping drill holes, incorrectly reporting its capping practices, failing to perform certain groundwater tests, and operating outside its permit boundaries. In March this year, the state issued a violation for the migration of injection fluid through groundwater outside the mining area, but it has not issued a fine yet.

• **Crow Butte site, Crawford, Neb. (Cameco Resources):** Nebraska’s sole in situ leach mine was opened in 1991 and remains active. In 2008, a district court in Nebraska imposed a \$50,000 penalty for violations including a surface spill and for constructing wells between 2003 and 2006 in an area that had the potential to contaminate underground drinking water. The company waited for more than a month and half to tell the state when it realized it was mining where it shouldn’t.

• **Kingsville Dome, Kleberg County, Texas (Uranium Resources Inc.):** A permitted but currently inactive mine that was opened in 1988. A hydrologist commissioned by Kleberg County released a report in 2006 on how groundwater was effected by the mine. George Rice found that the water quality didn’t meet drinking standards before mining began, but the quality had worsened in most of the site after mining and despite restoration efforts. While Rice found that no domestic wells had been affected by the contaminated water, he believed it could migrate outside of the mining boundaries if not properly restored.

This year Rice wrote a paper, as yet unpublished, that he says shows that contaminants, particularly uranium, have moved about 1,000 feet from a production site and into a well used for livestock. Rice says while the concentration of uranium in the well was always unsafe for human consumption, but it has now tripled. He believes it will continue to spread with the groundwater’s natural flow. The state of Texas acknowledges the high level of uranium, but disputes Rice’s conclusion.

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work and believes his conclusion is sound. He also believes that similar findings would be discovered at other in situ mines if extensive sampling was done.

However, Abitz cautioned, that doesn’t mean that contaminants like uranium will spread hundreds of miles with groundwater flows.

He said chemicals like uranium are mobilized because they’ve been oxygenated by the in situ process. When they reach an area without oxygen, they will eventually become immobile. In addition, the contaminants will

disperse as they travel.

That means that the uranium from the Kingsville Dome mine will likely only travel a few miles with the natural flow of the groundwater. And, because groundwater tends to move slowly, it will take decades for the contaminants to travel that distance. It is unlikely, he said, that contaminants will reach the town of Kingsville, population 26,000, about 10 miles away.

However, Abitz said that anyone living in the immediate groundwater path of the Kingsville Dome mine, or any other in situ mine, should be concerned about the impact to their well water. In dry states like Texas

where water is scarce, that is no small issue. “The thing is,” he said, “you have destroyed a large volume of water.”

A project in motion

For Lilius Jarding, an organizer with the Clean Water Alliance, that risk of groundwater contamination isn’t worth taking.

Although Powertech’s proposed site is in a rural area of ranch land, and migration of contaminants might potentially reach only a few miles outside of the site, she said that could still make dozens of wells unusable for generations.

Jarding pointed to one of the company’s permit applications,

which showed 43 livestock wells and 18 domestic wells in a 1.2-mile radius of the site.

But Jarding believes the stakes at this week’s permit hearing, where she will be testifying, are bigger than that. If the project is approved, Jarding believes it will open the floodgates for other mining companies interested in uranium deposits in the Black Hills and east of the Missouri River.

“It’s potentially an issue for the whole state in terms of control of our water,” she said.

Hollenbeck maintains that those concerns are groundless. He said there is still no confirmed evidence that contaminants have

spread from an in situ uranium site into neighboring water supplies. He also reiterated that opponents are overstating the quality of the groundwater in the immediate site.

“This pristine water?” Hollenbeck said. “This is not pristine. This is lousy quality water.”

As Powertech’s representatives sit down in the same room as opponents this week for permit hearings, Hollenbeck said he’s confident that the company will cut through the spin.

“When we go to hearings and use facts and science,” he said. “You are going to find out most of what they are saying is not true.”