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Keystone XL Would Not Use Most Advanced Spill Protection Technology

It would cost less than \$10 million--roughly 0.2 percent of the Keystone XL's budget--to add safeguards to protect the crucial Ogallala aquifer from spills.

By Lisa Song, InsideClimate News

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Workers examine pipe being used for the southern leg of the Keystone XL pipeline. Credit: Steven DaSilva, Fredonia Rebel Post, flickr

In 1998, activists in Austin, Texas filed a lawsuit to protect their local aquifer from a proposed gasoline pipeline. By the time the project was built, the operator had been forced to add \$60 million in safety features, including sensor cables that could detect leaks as small as three gallons a day. Some say the Longhorn pipeline is the safest pipeline in Texas, or perhaps the nation.

Now a much larger pipeline—the Keystone XL—is being proposed across the Ogallala/High Plains aquifer, one of the nation's most important sources of drinking and irrigation water. Yet none of the major features that protect Austin's much

smaller aquifer are included in the plan. In fact, they haven't even been discussed.

The leak detection technology that will be used on the Keystone XL, for instance, is standard for the nation's crude oil pipelines and rarely detects leaks smaller than 1 percent of the pipeline's flow. The Keystone will have a capacity of 29 million gallons per day—so a spill would have to reach 294,000 gallons per day to trigger its leak detection technology.

The Keystone XL also won't get two other safeguards found on the 19-mile stretch of the pipeline over Austin's aquifer: a concrete cap that protects the Longhorn from

construction-related punctures, and daily aerial or foot patrols to check for tiny spills that might seep to the surface.

Experts interviewed by InsideClimate News estimate it would cost less than \$10 million —roughly 0.2 percent of the Keystone's \$5.3 billion budget—to add external sensor cables, a concrete cap and extra patrols to the 20 miles of the pipeline in Nebraska where a spill would be most disastrous. The water table in that area lies less than [20 feet below the surface](#) [3] and provides ranchers with a steady supply of fresh water.

TransCanada, the company that wants to build the Keystone XL, says the project meets or exceeds federal pipeline standards. In June, Russ Girling, TransCanada's president and CEO, said it will be "[the safest, most advanced pipeline ever built in North America](#) [4]."

Spokesman Shawn Howard said trained experts will monitor the pipeline 24/7 from a state-of-the-art control center. His colleague Grady Semmens said operators would shut down the pipeline within 10 minutes of detecting a problem.

TransCanada also has pledged to follow [57 conditions](#) [5] that it says exceed federal standards. That list doesn't include any of the three major safeguards that protect the Austin aquifer. And an analysis last year by the Natural Resources Defense Council found that [most of the 57 conditions](#) [6] are identical to existing federal regulations.

"TransCanada applies industry best practices, many of which exist due to the potential lack of federal regulations, advances in technology, construction practices and methodologies from both a safety and quality perspective," Howard said in an email.

Environmental groups and landowners have been fighting the Keystone XL project for years, but the possibility of adding safeguards like those used on the Longhorn pipeline hasn't been part of the debate.

Most environmental groups want the pipeline stopped altogether, primarily because the Canadian crude oil it will carry has a [much larger carbon footprint](#) [7] than conventional oil. NASA climate scientist James Hansen has famously called the pipeline a "fuse to the biggest carbon bomb on the planet."

Carl Weimer, executive director of the Pipeline Safety Trust, said many of the protective measures used on Longhorn could also improve safety on the Keystone XL, as well as other pipelines that cross vulnerable lands. His nonprofit, nonpartisan group has spent years advocating for stronger federal pipeline construction and safety rules. "We just assume pipelines will end up in a lot of places, so let's just make them as safe as possible."

The industry expects to build or repurpose more than [10,000 miles](#) [8] of pipelines over the next five years to transport heavy crude from Canada's oil sands region.

Weimer said it often takes years to change even a minor regulation, because the rule-making process is slowed by the "big gorilla in the room"—industry representatives who are part of the process and are reluctant to adopt changes that could impact their bottom line.

"Cost is the major factor," said Mohammad Najafi, a civil engineering professor at the University of Texas-Arlington and editor-in-chief of the *Journal of Pipeline Systems Engineering and Practice*. Najafi declined to comment on the Keystone XL, but said that, in general, operators "that don't take extra measures do so because they're private companies with investors, and they cut costs as much as they can."

But Najafi warned that increased spending doesn't automatically boost pipeline safety, because resources could be wasted on badly designed technologies.

Najmedin Meshkati, a University of Southern California civil engineering professor who studies workplace safety culture, said even the best technology can't guarantee safety. "The human factor is really where the rubber meets the road....No piece of hardware can replace [a] good safety culture."

How the Austin Aquifer Got Extra Protections

Longhorn opponents had two major advantages in their lawsuit to protect Austin's aquifer: money and popular opinion.

The lawsuit was filed by the city of Austin, the Barton Springs/Edwards Aquifer Conservation District and several landowners. But most if not all of the funding came from Holly Corp., a Texas refinery owner that saw Longhorn's gasoline pipeline as a competitive threat to its business. (Longhorn later sued Holly for antitrust violations. Holly then countersued alleging unfair competition.)

Without Holly's money, it would have been difficult for the pipeline opponents to finance their battle against Longhorn—a partnership of oil giants BP Amoco, Exxon and other companies. Renea Hicks, who represented the Conservation District in the case, said Holly's funding allowed the opponents to hire top-notch experts and to persist for the three years it took to settle the suit.

The case also had wide support among the politically active and environmentally conscious residents of Austin, a city of 600,000 at the time and a liberal enclave in a largely conservative state. The fuels carried by the Longhorn are highly flammable and spread quickly when spilled into water. Not only does the Edwards aquifer supply drinking water to the Austin area, it also feeds a popular swimming hole in the city's Zilker Park.

"Everyone got involved," Hicks said. "The purity of that [spring] is kind of a symbol in Austin."

Kirk Holland, a geologist and general manager of the Conservation District, said that in the end, Longhorn "essentially had to make those extraordinary commitments in order to operate [in this area]. That pipeline is the best-protected, most monitored pipeline in Texas—and maybe the nation."

"Keystone XL deserves more, probably, in my personal opinion," Holland added.

Although the Keystone XL would run 1,200 miles across the nation's heartland, the area of greatest concern has always been Nebraska, where it crosses 222 miles of the Ogallala aquifer. Last year, TransCanada agreed to move the line out of Nebraska's Sandhills region, a fragile landscape that became a symbol for the project's opponents. But the new route still goes through 20 miles of Nebraska where the water table is less than 20 feet below ground—high enough for groundwater to bubble to the surface during the spring. An additional 70 miles crosses areas where the water table is 20 to 50 feet underground.

Last year, just weeks before TransCanada agreed to the Sandhills reroute, the company offered to build a concrete containment structure around a pump station planned for a sensitive area of Holt County. It also agreed to post a [\\$100 million bond](#) [9] to be used if the company failed to clean up an oil spill in the Sandhills. TransCanada withdrew both offers after the pipeline was rerouted.

"Those commitments were specific to the area that went through the Nebraska Sandhills where the aquifer was at or near the surface," said Howard, the company spokesman. "Since the new route will go through an area that is not part of the defined Nebraska Sandhills, those measures are not required."

The federal Pipeline and Hazardous Materials Safety Administration (PHMSA) requires operators to follow more stringent rules in High Consequence Areas, or HCAs, which are considered especially vulnerable to the effects of an oil spill. Pipelines that could affect HCAs are built with thicker walls and the insides are inspected at least once every five years.

Najafi, the University of Texas engineer, said the entire aquifer under Nebraska should qualify as an HCA.

"Nebraska is a sensitive area, and they need to treat it like that," he said. "In Nebraska, they need extra measures to protect the water. We can't live without water."

PHMSA doesn't release the locations of HCAs to the public due to security reasons, so it's unclear how much of the Ogallala aquifer falls within an HCA.

According to Howard, only three miles of the route in Nebraska crosses an HCA. But he said that TransCanada would exceed PHMSA requirements by running an inspection device through the entire pipeline, including areas outside HCAs.

Little Known About How a Spill Might Affect the Aquifer

The Keystone XL was originally supposed to run from Alberta, Canada to the Texas Gulf Coast. But in January 2012 the Obama administration turned down TransCanada's application for the State Department permit it needed to cross the U.S.-Canada border, and TransCanada split the project in two. The segment from Cushing, Okla. to Texas, which did not need a federal permit, is already under construction. A decision on the northern segment is expected in early 2013.

Much of the opposition to the Keystone XL has focused on the type of oil it would carry: Bitumen is a particularly heavy form of crude oil extracted from Canada's tar sands region. It is so thick that it can't flow through pipelines until it's diluted with liquid chemicals to form what's known as [diluted bitumen](#) [10] or "dilbit."

The same federal standards that apply to gasoline and crude oil pipelines also apply to pipelines carrying dilbit—even though dilbit doesn't behave like conventional crude oil when it spills into water.

The nation's first major dilbit spill occurred in July 2010, when a ruptured pipeline released a million gallons of dilbit into the Kalamazoo River. As the light, liquid chemicals in dilbit began evaporating, the heavy bitumen sank into the river. Nearly two and a half years later, Enbridge Inc., the Canadian company that owns the ruptured pipeline, is [still struggling](#) [11] to clean up the Kalamazoo. The current cost of clean up exceeds \$800 million.

The Enbridge accident showed what happens when dilbit spills into a river. But little is known about how dilbit might behave in an aquifer, said Wayne Woldt, a University of Nebraska-Lincoln professor who studies groundwater management.

Once an aquifer is contaminated, it's virtually impossible to restore it to its pristine condition, Woldt said. The extent of damage would depend on the size of the spill and on how the dilbit moves within the aquifer.

"Some say it would pollute the Ogallala aquifer a tremendous amount. Others say it wouldn't be a big deal. I don't know, because I haven't found the research that would answer this question," Woldt said. "I think we're all operating in a vacuum of information."

[Woldt has tried](#) [12] without success since June 2011 to secure funding for a study modeling the effects of dilbit on the Ogallala aquifer.

Most Sensors Detect Only Major Pipeline Ruptures

TransCanada ran newspaper ads in Nebraska last summer assuring residents that the Keystone XL will be protected by 21,000 sensors that relay information to the company's control center once every five seconds. But a recent examination of PHMSA data by InsideClimate News showed that between 2002 and July 2012, only five percent of U.S. crude oil pipeline spills were detected by leak detection systems like those planned for the Keystone XL. Those systems detect major pipeline ruptures, not the "weeps and seeps" that can accumulate into large spills. That means the Keystone system is unlikely to detect spills smaller than hundreds of thousands of gallons per day.

The technology used on the Longhorn pipeline is more sophisticated. In addition to a standard leak detection system, hydrocarbon-sensing cables are attached to the pipeline's exterior, where they can trigger an alert if the pipeline's contents drip out. According to Longhorn, they can detect spills as small as three gallons a day.

Because external sensors are more expensive, they are used on less than one percent of the nation's oil pipelines. They're usually found on small stretches over sensitive river crossings, aquifers and other areas where an oil spill could be disastrous.

PHMSA requires operators to "have a means to detect leaks" on their pipelines, but it sets no standards for how effective the systems must be. The agency is in the midst of a two-year study on leak detection, but it could be years before the results are incorporated into regulations.

Weimer, the Pipeline Safety Trust director, said that while PHMSA supports advances in pipeline technology, the agency "is hesitant to ever tell the industry what kind of system they need to use." As a result, it takes a long time for new safety technologies to percolate through the industry.

Longhorn purchased its sensor cables from Houston-based Tyco Thermal. Ken McCoy, general manager of the group that designed the cable, said his product costs more per mile than the typical leak detection technology used for oil pipelines. He refused to compare prices directly but estimated that installing his company's sensors on 20 miles of the Keystone XL would raise the project's \$5.3 billion price tag by less than 0.13 percent. He said that price includes the added cost of adapting the technology for Nebraska's high water table.

TransCanada has no plans to add external sensors. Howard, the company spokesman, said external sensing technology "is not the best method to use" on the Keystone XL, because it is "subject to localized conditions such as water table and soil conditions and therefore reliability and maintenance can be an issue."

TransCanada's concerns are valid but not insurmountable, said Richard Kuprewicz, a pipeline safety expert who is president of the consulting firm Accufacts, Inc. Kuprewicz has worked with TransCanada in the past, but is not involved with the Keystone XL.

TransCanada could choose from a variety of external sensors, including fiber optics or acoustic sensing technology, Kuprewicz said. Investing in these technologies might make good business sense if concerns about oil spills are holding up a multi-billion dollar project, he said. "If you can't solve a problem, either reroute the line, or come up with a solution that has a high degree of expectation it'll do its job."

Howard said TransCanada is involved in an industry research group that has undertaken a "multi-year effort to identify and quantify improved capabilities for the detection of small leaks," and that the design of Keystone XL "positions us well to leverage evolving technologies in the future."

Other safeguards on the Longhorn—including concrete caps and more frequent foot and aerial patrols—do not involve expensive technology.

Most of the 700-mile Longhorn pipeline route is inspected once a week, but the 19-mile section over Austin's aquifer is inspected every day.

TransCanada will meet the federal requirement of at least 26 inspections per year for the Keystone XL. According to Howard, aerial surveys will be conducted about once every two weeks, along with "'on foot' inspections [that] occur more frequently as part of our operators' regular tasks and routine."

The Keystone XL will not include a concrete cap like the one used for Longhorn.

Weimer said concrete caps could prevent excavation damage, a leading cause of serious pipeline accidents. But the cap may be of limited use along the Keystone, he said, because most of the pipeline runs through sparsely populated regions that are unlikely to see much construction activity.

The Longhorn pipeline is now owned by Magellan Midstream Partners, which plans to convert the line to carry crude oil. A Magellan spokesman said the company will continue to use and maintain all of Longhorn's safety features.

Keystone Protest Continues

On Feb 17, Keystone XL opponents will gather for their fourth large protest outside the White House in hopes of persuading President Obama to stop the project. For now there is little talk about what they will do if the pipeline is approved. Anthony Swift, a policy analyst for the Natural Resources Defense Council, said it's "premature" to discuss whether his organization would push for stronger pipeline protections if that happens.

As the debate over the project continues, the National Academy of Sciences is analyzing existing research studies to determine whether dilbit corrodes pipelines more

quickly than conventional crude oil. But the National Academy report isn't due until next summer, and by then it will be too late for it to have much impact on the construction of the Keystone XL. The administration is expected to make its decision in early 2013, and TransCanada has said it is prepared to begin work immediately.

Links:

- [1] <http://insideclimatenews.org/author/lisa-song>
- [2] http://insideclimatenews.org/sites/default/files/keystonexlpipeline2_0.jpg
- [3] <https://www.documentcloud.org/documents/422735-keystone-xl-route-sept-2012.html#annotation/a73848>
- [4] <http://www.transcanada.com/6059.html>
- [5] <http://keystonepipeline-xl.state.gov/documents/organization/182257.pdf>
- [6] <http://insideclimatenews.org/news/20110919/keystone-xl-pipeline-safety-regulations-phmsa-transcanada-oil-sands-bitumen>
- [7] <http://insideclimatenews.org/news/20120522/adam-brandt-tar-oil-sands-canada-europe-low-carbon-fuel-directive-greenhouse-gases>
- [8] <http://insideclimatenews.org/news/20120430/exclusive-map-tar-sands-pipeline-boom>
- [9] <http://insideclimatenews.org/news/20111028/transcanada-oil-spill-bond-nebraska-session-Heineman-keystone-xl-pipeline>
- [10] <http://insideclimatenews.org/news/20120626/dilbit-primer-diluted-bitumen-conventional-oil-tar-sands-Alberta-Kalamazoo-Keystone-XL-Enbridge>
- [11] <http://insideclimatenews.org/news/20121011/epa-dilbit-enbridge-6b-pipeline-kalamazoo-river-cleanup-tar-sands-oil-sands-keystone-xl-landowners-environment>
- [12] <http://insideclimatenews.org/news/20110615/nebraska-scientists-Keystone-XL-pipeline-risk-sandhills-water-supply-ogallala-Transcanada-Hillary-EPA>
- [13] <http://insideclimatenews.org/news/20121119/keystone-xl-oil-sands-pipeline-protesters-obama-rejection-state-department-environment-climate-change-carbon-bomb>
- [14] <http://insideclimatenews.org/news/20120919/few-oil-pipeline-spills-detected-much-touted-technology>
- [15] <http://insideclimatenews.org/topic/dilbit>
- [16] <http://insideclimatenews.org/reuters-topics/green-energy>
- [17] <http://insideclimatenews.org/topic/keystone-xl>
- [18] <http://insideclimatenews.org/topic/pipeline-safety>
- [19] <http://insideclimatenews.org/topics/tar-sandsoil-sands>
- [20] <http://insideclimatenews.org/topic/dilbit-disaster>
- [21] <http://insideclimatenews.org/special-focus-topics/water-watch>
- [22] <http://insideclimatenews.org/topics/water-and-oceans>
- [23] <http://insideclimatenews.org/about/comment-policies>
- [24] <http://insideclimatenews.disqus.com/?url=http%3A%2F%2Finsideclimatenews.org%2Fnews%2F20121217%2Fkeystone-xl-longhorn-pipeline-safety-ogallala-edwards-aquifer-nebraska-texas-austin-tar-sands>