Sulfolane Contamination in Alaska

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Summary

Sulfolane, an industrial solvent used in the production of gasoline, has been detected since 2000 in groundwater located near the North Pole oil refinery, with the sulfolane slowly spreading outside the refinery boundaries. In 2009 sulfolane was discovered in higher than expected levels in numerous drinking wells and the municipal water supply of North Pole, Alaska. Very little is currently known about the human health impact of sulfolane, though several negative effects of high, short-term exposures have been shown in lab animals. Ongoing efforts to address the problem include cleanup, procurement of alternative water supplies and litigation,

Green marks sulfolane between 10 (the detection limit) and 25 parts per billion. Yellow includes concentrations between 26 and 200 ppb. Orange is 201 to 1000 ppb. Patterns of contamination in individual wells are variable - for more information see the detailed results from the DEC. (http://

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dec.alaska.gov/spar/csp/sites/north-pole-refinery/map.htm) Google Earth file for map available here (/webmapper/maps/151/sulfolane-contamination/).

Background

Located in North Pole, a community near Fairbanks, Alaska, the North Pole Refinery has been in operation since 1977 and processes around 220,000 barrels of crude oil per day. The facility was purchased by Flint Hills Resources in 2004 from Williams Alaska Petroleum Inc. and produces gasoline, jet fuel, heating oil, diesel, gasoil and asphalt for Alaskan markets.

A company groundwater monitoring program first detected an unidentified chemical in the water in 2000. This chemical was soon identified as sulfolane (http://en.wikipedia.org/wiki/Sulfolane), an industrial solvent used in the production of gasoline which is soluble in water. At the time of this discovery there were no state or federal regulations regarding sulfolane, and it was not considered to be a health hazard. The levels of sulfolane found in the groundwater were presumed to arise from the combined effects of numerous documented and undocumented spills over the life of the refinery.

When Flint Hills Resources purchased the property in 2004, they were instructed by the Alaska Department of Conservation (DEC) to prepare a “Corrective Action Plan” to address growing concerns about sulfolane. At this time the DEC set the groundwater cleanup level to 350 parts-per-billion (ppb), based on recommendations from Canada and available toxicity data.

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Some remediation in sulfolane levels occurred, with the issue more-or-less considered resolved since the levels at the refinery boundary were below 350 ppb and sulfolane had not yet been detected in any drinking water.

However, in 2009 higher than expected levels of sulfolane were discovered at the refinery boundary, which led to the discovery of sulfolane in the City of North Pole municipal drinking water as well as in a number of residential drinking wells. Based on new information about the possible toxicity of sulfolane, and advice from Federal and State agencies, the DEC lowered the cleanup limit to 25 ppb. There are still no Federal guidelines regarding sulfolane levels, but EPA regulations are currently in the works (http://dec.alaska.gov/spar/csp/sites/north-pole-refinery/docs/investigation_update.pdf). Since 2009, sulfolane has been detected in at least 285 private wells (http://www.alaskapublic.org/2012/01/23/sulfolane-contamination-found-in-285-north-pole-wells/) in the area (about half of the wells tested). Amounts of sulfolane in these wells ranged from 10 ppb (the limit of detection) to 443 ppb (http://www.epi.alaska.gov/eh/sulfolane/DHSSHealthConsultSulfolaneGroundwater.pdf).

In February 2013 the DEC established 14 ppb (http://dec.alaska.gov/spar/csp/sites/north-pole-refinery/docs/newsletters/Sulfolane%20Investigation%20Update%20-%20February%202013.pdf) as the “cleanup level” for the contaminated groundwater.

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Sulfolane Exposure and Health Concerns

Relatively little is known about the health effects of sulfolane. Animal studies (http://www.epi.hss.state.ak.us/eh/sulfolane/ATSDRSulfolaneHC_2010.pdf) have demonstrated that very high levels of exposure cause a variety of acute health problems, including hyperactivity, convulsions, hypothermia, and sometimes death. Most of these studies were done with exposures of more than 200 parts-per-million (ppm) sulfolane, a level which is 8000-fold higher than the current drinking water limit of 25 parts-per -billion (ppb). Only one study has looked at the medium-term effects of sulfolane. This study found lowered white blood cell counts as well as negative effects on the liver, kidneys, and spleen of test animals. High levels of exposure have also been shown to have an impact on the fetus of pregnant test animals.

Work on sulfolane exposure has shown that it is rapidly absorbed into the bloodstream after ingestion, but is also rapidly excreted from the body. It is not easily absorbed through the skin, and has not been shown to irritate the skin or eyes of test animals. Recent testing by the DEC has shown sulfolane to be present in edible plant tissues taken from gardens in North Pole, but “below levels of health concern”.

While no studies have ever been performed on the long-term health effects on humans of sulfolane, lab cell culture tests have shown no evidence that it is carcinogenic or mutagenic. To date, there has been no change in cancer rates or in numbers of birth

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defects in North Pole residents when compared to the rest of the borough or the state (http://www.epi.alaska.gov/eh/sulfolane/DHSSHealthConsultSulfolaneGroundwater.pdf).

Community and Company Actions

Several lawsuits have arisen out of the sulfolane issue, including private lawsuits against both Flint Hills Resources and Williams Alaska Petroleum Inc., the previous refinery operator. Flint Hills and Williams Alaska have also sued each other (http://www.newsminer.com/view/full_story/7795816/article-Tainted-water-defendants-in-North-Pole-sue-each-other?instance=home_most_popular5)over responsibility for the contamination.

Flint Hills has offered a variety of options to affected residents, including bottled water delivery and installation of water filters and water tanks. In addition, the City of North Pole has drilled new municipal drinking wells outside the affected area.

Some residents have also accepted one-time payments of $20,000 from Flint Hills in return for waiving their right to pursue future litigation against the company. This has prompted concern in the community, both about these payments as “hush money” (http://en.wikipedia.org/wiki/Hush_money) and about the taxable status of the payment.

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Current Status

In June 2013, the mayor of North Pole asked for (http://www.newsminer.com/news/local_news/hopkins-seeks-federal-help-with-sulfolane/article_15d67cca-deff-11e2-80e9-0019bb30f31a.html) $30 million in federal funding to expand the city water system to areas affected by the contaminated groundwater.

In January 2014, Flint Hills asked (http://fm.kuac.org/post/refinery-owner-asks-state-consider-lower-cleanup-level-tainted-groundwater) the DEC to reduce the cleanup level required by the state by 25-fold arguing that it was “unnecessarily stringent”. This was followed in early February by the announcement (http://www.alaskadispatch.com/article/20140204/blow-fairbanks-economy-flint-hills-says-it-will-close-down-north-pole-refinery) by Flint Hills that they planned to close the refinery, which complicates (http://www.alaskadispatch.com/article/20140205/shutdown-decision-turns-flint-hills-sulfolane-cleanup-political-issue) the cleanup picture. In March, the governor of Alaska announced that (http://www.newsobserver.com/2014/03/04/3673062/parnell-flint-hills-liable-for.html) Flint Hills would still be responsible for cleanup even if the plant were to change hands. This was followed by months of debate (http://www.alaskadispatch.com/article/20140405/state-dec-head-rejects-agencys-sulfolane-spill-ruling) and lawsuits over what the appropriate cleanup level should be. The start of a cost-sharing plan to pipe drinking water to affected residences was mooted (http://www.alaskajournal.com/Alaska-Journal-of-Commerce/July-

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Issue-3-2014/State-to-partner-on-North-Pole-contaminated-wells-study/) in July 2014. By October 2014 the state and Flint Hills had reached a cleanup agreement (http://www.newsminer.com/news/local_news/alaska-flint-hills-reach-agreement-on-sulfolane-cleanup-at-refinery/article_071b1808-58c5-11e4-a442-001a4bcf6878.html), which was soon followed by a lawsuit (http://www.newsminer.com/news/local_news/north-pole-files-lawsuit-over-sulfolane-contamination/article_343cf2ee-75cf-11e4-a15a-3f6ce1701935.html) against the company by North Pole. In December 2014 an outside study was released (http://www.adn.com/article/20141225/study-backs-argument-flint-hills-seeking-more-lenient-pollution-standard), supporting the position that the current cleanup levels were overly stringent.

Further Reading

> Alaska Department of Environmental Conservation (DEC) Spill Prevention and Response Contaminated Sites Program page on North Pole Refinery (http://dec.alaska.gov/spar/csp/sites/north-pole-refinery/)

> "Health Consultation - Sulfolane Plume in Groundwater: Evaluation of Community Concerns about Sulfolane in Private Water Wells NORTH POLE, ALASKA" (2012) prepared by the AK Department of Health and Human Services (DHHS) (http://www.epi.alaska.gov/eh/sulfolane/DHSSHealthConsultSulfolaneGroundwater.pdf)

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> "Health Consultation – Sulfolane" (2010) prepared by the Federal Agency for Toxic Substances and Disease Registry (ATSDR) (http://www.epi.hss.state.ak.us/eh/sulfolane/ATSDRSulfolaneHC_2010.pdf)

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