



Flint Hills' North Pole Refinery Contaminated Site

Frequently Asked Questions

On dec.alaska.gov/spar/csp/sites/north-pole-refinery
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Recent Events

What is the status of DEC's review of a cleanup level for sulfolane?

The DEC Division of Spill Prevention and Response (SPAR) is continuing to review information regarding an appropriate cleanup level. New research recently begun by the National Toxicology Program (NTP) will address important questions regarding long-term exposure to sulfolane. DEC believes a comprehensive determination of an appropriate cleanup level cannot be complete until information is available from this research. A 2-year study will address unknowns regarding sulfolane's toxicity, including the effects of long-term exposure to sulfolane and effects on pregnancy, development, and the immune system. **(See the NTP fact sheet on DEC's website.)**

Currently there is no cleanup level for sulfolane. The former site-specific cleanup level of 14 parts per billion (ppb) was suspended in April 2014 by DEC's commissioner after Flint Hills Resources Alaska appealed that number. **(See the Commissioner's decision on DEC's website.)** Flint Hills then proposed a cleanup level of 362 ppb. The SPAR Division is continuing to review that proposal.

The SPAR Division believes that information on the effects of long-term exposure to sulfolane is critical to establishing a cleanup level, because adults and children will eventually be drinking water with

sulfolane at concentrations up to the cleanup level, potentially for their entire lives. However, the existing information on sulfolane toxicity does not include effects of long-term exposure.

Waiting for the results of new research is the safest and best course of action. Currently Flint Hills is providing alternative water to all properties with any detection of sulfolane in their drinking water. In addition, because the sulfolane plume continues to migrate, Flint Hills is providing water to residents in a "buffer zone" just beyond the plume boundary. It is prudent for DEC to delay setting a cleanup level to ensure continued protection of all residents.

What are the ramifications of not setting a cleanup level for an extended period of time?

While the NTP studies proceed and DEC investigates an appropriate groundwater cleanup level for the site, residents will be assured of a safe drinking water supply. During this process, DEC's statutory authority is in place to protect human health and the environment. In addition, Flint Hills is obligated to continue cleanup on the refinery property and provide alternate water supplies to affected properties.

The Alaska Department of Health and Social Services (DHSS) continues to recommend using the provided sulfolane-free water for drinking, some cooking, and gardening.

DEC will further ensure that impacts on construction projects are minimized. The agency will continue to work with parties on construction permits within the sulfolane plume, and discussions on a public water system will continue with state and local officials.

Why not use the TERA-recommended or EPA's PPRTV value to set a cleanup level?

A toxicity value, or reference dose, is a key component in setting a cleanup level. Toxicology experts have noted that the body of sulfolane toxicology information lacks critical studies, particularly on the effects of long-term exposure and impacts on development and the immune system. The National Toxicology Program has recently begun new research to address these unknowns. DEC feels this information is critical for establishing a cleanup level at the site, because adults and children will eventually be drinking water containing sulfolane at concentrations up to the cleanup level, potentially for their entire lives. The results of the new laboratory studies will give DEC more confidence when setting a final cleanup level.

Toxicology Excellence for Risk Assessment (TERA), under contract to DEC, conducted an expert panel review of sulfolane toxicity values in September 2014. TERA's December 2014 report states that none of the reference doses (or toxicity values) aligned perfectly with the recommendations of the expert panel. Although the report concluded that the value proposed by Flint Hills most closely aligns with the panel's conclusions, the experts identified a number of uncertainties about the toxicity of sulfolane, including the impacts of long-term exposure to sulfolane. **(TERA report available from DEC's website.)**

The Environmental Protection Agency (EPA) set a Provisional Peer Reviewed Toxicity Value (PPRTV) for the ingestion of sulfolane in 2012. DEC-SPAR used this value in developing the 14 ppb site-specific cleanup level in 2013. In 2015, EPA encouraged DEC to wait for NTP studies before establishing a cleanup level, given the uncertainty regarding the toxicity values associated with sulfolane and the high number of residents who potentially face direct exposure to the chemical in their drinking water.

What is DEC doing to ensure safe drinking water for North Pole residents?

Protection of human health and the environment remains DEC's priority, with provision of safe drinking water continuing to be a chief concern. Flint Hills is obligated to provide alternative water supplies to all affected properties. Discussions on an expanded public water system are ongoing between state, local and industry officials.

The DEC is continuing to review the FHRA proposal of a 362 parts per billion cleanup level for sulfolane. At present, a cleanup level for sulfolane does not exist. DEC believes a comprehensive review and determination of an appropriate cleanup level cannot be complete until information from the NTP studies is available. Until a cleanup level is set, residents with detectable levels of sulfolane will be provided alternative drinking water.

In the meanwhile, DEC will continue to keep the community involved and informed by hosting Open House meetings and publishing newsletters. A newsletter providing an overall project status update is in preparation for release this summer. An Open House will be held in North Pole in late summer to provide an opportunity for community members to visit with experts in the field, and discuss project issues in-depth.

If my house is in the sulfolane plume, will I still receive safe drinking water?

While NTP studies proceed, residents will be assured of a safe drinking water supply. Flint Hills is obligated to provide alternate water supplies to affected properties.

DHSS continues to recommend using the provided sulfolane-free water for drinking, cooking when the water is consumed, and gardening. State and federal health agencies have worked collaboratively on the questions of sulfolane's health effects since the discovery of sulfolane in private wells in 2009.

Health

Should I use my impacted well water for fruit or vegetable gardening?

State health officials in the Department of Health and Social Services (DHSS) continue to recommend using the provided water with no detectable level of sulfolane for growing fruits and vegetables until more is known. Limited garden fruit and vegetable studies conducted by the Technical Project Team in the summer of 2010 provided some valuable information for North Pole residents:

1. Edible garden plants can take up sulfolane present in water.
2. Sulfolane was found at low levels in all parts of plants sampled (leaves, fruits, flowers, stems and roots). The highest levels were found in the leafy part of the plant.

DHSS concluded that the levels of sulfolane found in edible plants from the North Pole gardens were low and not likely to harm health. To be on the safe side, however, state health officials continue to recommend using the provided alternative water source for growing those foods, until more is known.

What do we know about the health effects of sulfolane?

No studies have looked for health effects in people who have been exposed to sulfolane. Most of what we know comes from studies in which laboratory animals were exposed to high levels of sulfolane for

short periods of time. High levels of sulfolane (much above what is seen in the groundwater off the refinery in North Pole) were shown to affect the central nervous system, immune system and the liver, kidneys, and spleen of test animals. Animal studies suggest that sulfolane at very high levels may cause developmental and reproductive problems in mice.

No long-term, or chronic, studies have been conducted in animals to determine if sulfolane might cause cancer. In most laboratory tests with bacteria or animal cells, sulfolane did not cause cancer-like changes to the cells. New research began in May 2015 by the National Toxicology Program (NTP) to evaluate the effects of long-term exposure to sulfolane. The NTP is an expert interagency program housed within the United States Department of Health and Human Services that evaluates the toxicity of chemicals of public health concern. **(See the NTP fact sheet on DEC's website for more details.)**

The Alaska Division of Public Health staff reviewed the state's cancer and birth defects registries in response to community concerns. Rates for all types of cancer combined were not significantly higher in North Pole. Similarly, mothers who lived in North Pole at the time of delivery were not more or less likely to give birth to a child with a birth defect than mothers who lived elsewhere in the Fairbanks North Star Borough or the rest of the state.

A more detailed review of the scientific literature on sulfolane can be found on DEC's website on the Human Health and Toxicology page.

What will the NTP studies tell us?

Most of what we know about how toxic chemicals might affect human health comes from studies on laboratory animals. The NTP is studying sulfolane toxicity, including impacts of long-term exposure to sulfolane and pregnancy and development in animals. Also, the effects of sulfolane on the immune system will be investigated.

Studies are underway by the NTP to address these unknowns. A 28-day toxicity study has been completed and the report is pending. The 28-day study evaluated species sensitivity and dosing, and the results were used to design the longer-term studies. A two-year study began in May 2015 to evaluate the effects of long-term exposure on laboratory animals. In addition, some of the animals from the two-year study will be assessed after 90 days to look at effects on the immune system and development. **(See the NTP fact sheet on DEC's website for more details.)**

How many people are affected by the sulfolane plume?

All residents with sulfolane detections in their water currently have been offered an alternate drinking water source. Additionally, residents in a "buffer zone" just beyond the current area of sulfolane impact have been offered bottled water. As of October 2014, an estimated 1,500 people have been provided alternative drinking water by Flint Hills.

Cleanup

Is the plume growing or shrinking?

The sulfolane plume is currently approximately 3.5 miles long, 2 miles wide and over 300 feet deep. It is the largest contaminated groundwater plume in the state. Recent sampling results indicate that the

sulfolane plume is not stable but continues to migrate towards the north-northwest, impacting new properties as it migrates. Sulfolane concentrations in some areas of the plume are decreasing but increasing in others. FHR continues to track plume movement by periodic sampling of groundwater monitoring wells located throughout and outside of the sulfolane plume. As of December 2013, over 500 monitoring wells had been installed, over 1,000 soil samples collected, and over 7,000 groundwater samples collected.

What is Flint Hills doing to clean up the contamination?

To address contamination on the refinery property, DEC approved an Onsite Cleanup Plan on October 16, 2014. Under the provisions of this plan, Flint Hills will remove accessible soil contamination (planned for summer 2015) and continue operating the onsite groundwater treatment system. **(See Onsite Cleanup Plan on the DEC website.)**

The groundwater treatment system on the refinery property has been improved and continues to remove fuel and sulfolane from the groundwater. The system includes a series of wells that pump contaminated groundwater out of the ground and a treatment system that removes petroleum and sulfolane from the water. The system was upgraded several times between 2011 and 2014 to increase the amount of water being treated and add additional treatment steps to better remove sulfolane. Flint Hills reports that the upgraded system spans the entire width of the sulfolane plume. Fuel is completely contained on the refinery property, and the amount of sulfolane migrating off of the refinery continues to decrease.

As a condition of plan approval, Flint Hills is also required to continue to provide alternative water supplies to properties affected by sulfolane.

Will the lack of a cleanup level impact re-use or re-sale of the refinery property?

Prospective Purchaser Agreements (PPAs) are agreements that limit financial liability of the new owner for contamination from historical spills. The state has specifically offered a PPA for prospective purchasers of the North Pole Refinery.

Cleanup and groundwater treatment will continue regardless of reuse or resale of the property. Flint Hills and any other identified responsible parties are financially responsible for the cost of cleanup.

Background

What is sulfolane?

Sulfolane is an industrial solvent used to separate aromatic compounds from hydrocarbon mixtures and to purify natural gas. Sulfolane has been the primary solvent used in an extraction unit at the North Pole Refinery since 1985. Shell Oil Company developed this organic compound in the 1960s.

Sulfolane easily dissolves in water. When released into the environment, it tends to move into groundwater, dilute and spread out, traveling with the groundwater flow. This creates a "plume" of contaminated groundwater. Sulfolane is much less likely to attach to soil particles or stay in pure form than to dissolve in water. An even smaller amount of it will dissolve in hydrocarbons (components of fuel). **(Read more on DEC's website on the Site History page.)**

Staying Informed

How does DEC communicate with people affected by sulfolane in the groundwater?

DEC has used an email list since 2010 to provide updates to interested parties. **To join our list, email us (see contact information on last page or go to DEC's website.)** DEC created this website in November 2009 outlining the current status and progress. DEC has continued to post fact sheets, reports, any relevant information **on the Documents page on DEC's website.** DEC also maintains a call-in number direct to DEC offices: 907-451-2182. The State's project staff has stayed in communication with local and state officials and others interested in the status of the project.

In addition, in 2009 DEC formed a collaborative Technical Project Team of government and industry representatives to provide comprehensive and coordinated oversight for the investigation. From 2010 to 2013 the Technical Project Team held nine open house events, issued quarterly newsletter updates, kept state and local officials up to date, and conducted public surveys to discern public sentiment, concerns and/or issues. The TPT ceased operations in 2013, although DEC continues to take the lead on open houses and other outreach efforts.

A newsletter providing an overall project status update is in preparation for release in summer 2015. An Open House will be held in North Pole in late summer 2015 to provide an opportunity for community members to visit with experts in the field, and discuss project issues in-depth.

We encourage people to contact us with any questions and concerns.

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Information on the status of the cleanup project, current and future actions, newsletters, fact sheets and other project documents for the sulfolane investigation at the Flint Hills Refinery in North Pole can be found on the DEC website:

dec.alaska.gov/spar/csp/sites/north-pole-refinery