



Minnesota  
Pollution  
Control  
Agency

# PFCs and Class B Firefighting Foam

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**W**hat do doughnut bags, outdoor clothing, stain-resistant carpet, non-stick frying pans, aircraft hydraulic oils, and certain firefighting foams have in common? They contain man-made chemicals called perfluorochemicals (PFCs). Many kinds of PFCs have been used for several decades to make products stain resistant, water repellent, slippery, and long lasting. Without PFCs, the cooking grease would seep through our fast-food bags, our car seats and carpets would be more stained, and fighting a petroleum fire might be more difficult.

In recent years, scientists have found that PFCs may cause long-lasting environmental contamination, including uptake into humans' bodies. Of particular concern is the possibility that PFCs in Class B firefighting foam may be able to travel from a fire training area to a city's municipal or private wells. Sampling will be done in 2009 to investigate that possibility.

## PFC Background

The Minnesota-based 3M Company in Cottage Grove developed PFCs in the late 1940's. PFCs have properties that make them great surfactants. Their chemical structure makes them extremely resistant to change or breakdown. Once released to the environment, they remain there for a very long time. They also travel long distances through soil and into the ground water in a relatively short time. As a result, PFCs have been found in soil, sediments, water, wildlife and humans throughout the world. The way PFCs have become so widespread is not well understood.

Because of the unexpected worldwide spread of PFCs, 3M discontinued manufacture of products containing PFOS and PFOA (two of the PFC chemicals) in 2002. 3M's Class B firefighting foam was included. PFC chemicals continue to be produced by other methods and in different forms by 3M and other companies across the world. Some of these products may

travel through air and breakdown to problematic PFCs.

Wastes from 3M's manufacturing processes were placed at several disposal sites in Washington County. PFCs have been found in the ground water in areas of Washington and Dakota Counties, and in surface water and wastewater effluent in other parts of the state. PFCs have also been found in some fish in the greater metropolitan area. Filters containing activated carbon or reverse osmosis units are now filtering PFCs from wells with PFC levels that exceed the Minnesota Department of Health's (MDH) health-based exposure limits. Fish consumption advisories have been issued for some lakes.

## Health Concerns

The potential health significance of PFCs in drinking water is under study at both the state and federal levels. Much of this research consists of toxicological studies in laboratory animals. At high concentrations, two types of PFCs, perfluorooctane sulfonic acid (PFOA) and perfluorooctonate sulfonate (PFOS), have been shown to cause harmful changes in the liver and developmental problems (e.g., delays in growth and maturation) in the offspring of rats and mice exposed during pregnancy. A limited number of other PFC chemicals are also being studied.

There are few studies of health effects in people. As part of its worker health and safety program, 3M routinely monitored the health of its workers. No significant or consistent health effects have been identified in these workers. Three studies of newborn babies and PFC levels in the mother's blood found a very small decrease in birth weight or other measures of growth with increasing PFC levels in the mother. A large health study of 70,000 people exposed to the type of PFC called PFOA in drinking water in Ohio and West Virginia is currently underway but it will be some time before results are available. In general, the

studies in people have shown that the levels of PFCs in the environment may be linked to changes in the body, but the studies have not shown specific illness in people.

## Firefighting Foam

There are many kinds of firefighting foam. The use of foam has saved many lives and prevented huge property losses. Many manufacturers have made firefighting foams, but the exact content of those foams is often not disclosed.

Class A foam has come into widespread use in recent years for wildfire, structure and other fires. A detergent-like “surfactant” in the Class A foam makes the firefighting water “wetter” and more able to penetrate combustible material. **Class A foams typically do not contain PFC chemicals.**

## PFCs and Class B foam training near wells

In the early 1960’s, 3M and the U.S. Navy developed Class B “aqueous film forming foam” (AFFF) type foams. Class B foams are used on flammable petroleum fires and spills. Some or most Class B foams have had PFCs as part of their formulation, in particular PFOS.

Some foam manufacturers have changed processes and materials to eliminate or minimize PFC content in foam. However many foam manufacturers may not know or reveal PFC content of current or past formulations.

As part of the overall investigation of PFCs in Minnesota, the Minnesota Pollution Control Agency (MPCA) and MDH have started looking at the pattern of firefighting foam training.

Most Minnesota cities use ground water as a drinking water source. Many municipal wells are near a fire station or fire training locations. There is a possibility that fire training sites where Class B foams were repeatedly used may have allowed PFCs to enter municipal or private drinking water wells.

In 2008 an MPCA contractor, Delta Environmental, surveyed Minnesota’s fire service on past foam use – two-thirds of fire departments provided information. Many departments have used and trained with Class B foam. The foam was usually used in small amounts; however, it may only take a small amount of chemical to affect ground water. MDH has taken the survey data and compared it to municipal well locations and characteristics. Most cities that use wells have wellhead protection plans that map the areas where spills and

pollution may reach a well. Fire chiefs should become familiar with these plans. Cities with wells that are vulnerable because of their shallow depth or coarse soils or their proximity to foam training locations have been identified. MDH will be sampling wells in many of those cities in spring of 2009. If PFCs are found, MDH will notify the water utility.

MPCA will be sampling soil near 25 or so Class B foam training sites in the spring of 2009 to see if PFCs remain in the soil and ground water. Fire chiefs will be notified before sampling to request site access and permission. Results will be provided back to the cities.

## Next Steps

Results from the first round of sampling are expected in summer 2009. In the meantime, the State Chiefs’ Association and the State Fire Marshal will be asked to help suggest guidance to Minnesota’s fire service on Class B foam. Likely, that guidance will include:

- using Class B foam on flammable liquids like gasoline, but not routinely using on other combustible liquids such as diesel or fuel oil
- using non-PFC training foams or detergents during training
- investigating PFC content of the currently sold Class B foams

Additional information about PFCs is available on the MPCA and MDH web pages at:

[www.pca.state.mn.us/cleanup/pfc/index.html](http://www.pca.state.mn.us/cleanup/pfc/index.html) or  
[www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html](http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html).

## Contact Information

If you need help or have a question, your MPCA contact can be reached at 651-296-6300 or 800-657-3864.

PFC technical information and MPCA’s sampling:  
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