



STATE OF MICHIGAN
DEPARTMENT OF HEALTH AND HUMAN SERVICES
LANSING

RICK SNYDER
GOVERNOR

NICK LYON
DIRECTOR

August 1, 2017

Denise Bryan, Health Officer
District Health Department No. 2
630 Progress Street
West Branch, MI 48661

Dear Ms. Bryan:

The Michigan Department of Health and Human Services Division of Environmental Health (MDHHS) has evaluated per- and polyfluoroalkyl substance (PFAS, sometimes called perfluorinated chemical [PFC]) analytical data for surface water from and foam observed on Van Etten Lake in Oscoda (Iosco County), Michigan, and sampled on July 13, 2017.

MDHHS has determined that incidental swallowing of PFAS-containing lake water or foam is not expected to harm human health.

This conclusion has the following limitations:

1. This was a one-time sampling event of four surface water samples and one dissolved-foam sample that consisted of three containers of foam gathered and allowed to settle 24 hours, resulting in about one container of liquid.
2. Field staff indicated that the foam sample likely contained surface water as well, which would have diluted the concentration of PFAS detected in the foam (i.e., the results may have been biased low).
3. While there is information regarding how much surface water a person may swallow during recreational activities, it is difficult to estimate the amount of foam a person could swallow.
4. This evaluation assumes swallowing the water or foam on a daily basis. It is unlikely that foam would occur, or that a child would be at the beach, on a daily basis.
5. Data from future sampling events, when foam occurs on surface waters near the former Wurtsmith Air Force Base (WAFB), may show higher concentrations of PFAS in the water or foam. This may result in MDHHS's conclusions and recommendations changing.
6. There are other potential exposure pathways to PFAS near WAFB, such as eating locally-caught non-migratory fish or drinking water from wells that have elevated concentrations of PFAS. When considering all pathways to which people may be exposed to PFAS coming from WAFB, the cumulative dose could increase the risk of harm. However, if people are following already-existing fish consumption guidelines and private-well drinking water recommendations for the area, then there is less exposure concern.

Based on the conclusion above, and its limitations, MDHHS recommends the following:

- It is not necessary to post a “no-contact” advisory. Skin contact with PFAS is not a significant exposure pathway. As already stated, incidental swallowing of lake water or foam is not expected to harm human health.
- MDEQ should continue sampling and analyzing foam found in waterbodies near WAFB to determine an expected range of PFAS content.

The attached discussion shows the details of the evaluation of the data.

If I can be of further assistance in this matter, please do not hesitate to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Christina Rose Bush".

Christina Bush, Section Manager (Acting)
Toxicology and Response Section
Division of Environmental Health

CC: MDEQ
MDNR
Oscoda Township
U.S. Air Force
ATSDR

Technical Review Evaluating Potential Exposure to Per- and Polyfluoroalkyl Substances (PFAS) in Foam and Surface Water at Van Etten Lake, Oscoda (Iosco County), Michigan

Prepared by Christina Bush, Acting Manager for Toxicology and Response Section
Michigan Department of Health and Human Services, Division of Environmental Health
August 1, 2017

On July 13, 2017, the Michigan Department of Environmental Quality (MDEQ) was supporting a “STEM” (Science, Technology, Engineering, and Mathematics) program, as an outreach and education effort by the agency, in which students were conducting environmental sampling. At a beach along the west shore of Van Etten Lake, the field team observed foam built up along the water’s edge. The STEM team sampled surface water near the foam and at several other locations (a total of four samples at 250 milliliters [ml] each). MDEQ collected split samples of the surface water and also sampled the foam. MDEQ collected three 250-ml containers of foam, since the matrix of the foam consisted of both air and liquid and liquid volume would likely be only a fraction of the total volume. After a 24-hour settling period, the foam had dissolved to just liquid, about 200 ml. Sample locations are shown on the attached map.

The samples were analyzed for 19 individual PFAS and two individual fluorotelomer sulfonates (a group within the PFAS family). MDHHS considered three PFAS for this evaluation: perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorohexane sulfonate (PFHxS). The U.S. Environmental Protection Agency (EPA) has set a Lifetime Health Advisory (LTHA) in drinking water for PFOA and PFOS¹ but not for other PFAS. MDHHS included PFHxS in its evaluation because PFHxS occurs frequently at sites like WAFB, where aqueous film-forming foam (AFFF) has been released to the environment: the fingerprint for AFFF plumes can consist of high levels of PFHxS, as well as PFOA and PFOS. MDHHS used the results for the surface water sample with the highest concentration of PFOA and PFOS combined, which was also the sample with the highest PFOA, PFOS, and PFHxS combined, and the results for the foam sample for this evaluation.

Table 1. Concentrations (nanograms per liter [ng/L]) of select PFAS in surface water and foam sampled from Van Etten Lake, Oscoda (Iosco County), Michigan on July 13, 2017.

	PFOA + PFOS (ng/L)	PFOS + PFOS + PFHxS (ng/L)
Surface water (STEM L3)	56	121.8
Foam	2,237	2,353

The 2011 U.S. EPA’s Exposure Factors Handbook² reports that a typical amount of water that a child less than the age of 18 would incidentally swallow while swimming for about 45 minutes is **0.037 liters (L) per event** (or per day, for this evaluation³), which is about one-quarter cup.

To be most protective, MDHHS considered a child up to the age of one year sitting at the water’s edge playing in the water or the foam. The ATSDR recommends using a body weight

¹ See https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf.

² Available at https://rais.ornl.gov/documents/EFH_2011.pdf.

³ Note that it is unlikely that foam would occur or that a child would be at the beach on a daily basis. “Per day” was used so that units (days) would carry forward for comparison to the Reference Dose.

for a 0-1 year old of **7.8 kilograms** (kg),⁴ which is about 17 pounds. While this scenario is not a child swimming, it may represent what an infant or toddler playing on the beach by the water line might swallow.

To calculate the exposure dose, one multiplies the concentration of the chemical in water by the ingestion rate (the amount swallowed), then dividing by the body weight:

$$Dose = \frac{Concentration \times Ingestion Rate}{Body Weight}$$

The calculated exposure doses are shown in Table 2.

Table 2. PFAS exposure doses calculated for incidental swallowing of surface water in or foam on Van Etten Lake, Oscoda (Iosco County), Michigan.

	PFOA + PFOS (ng/kg-day)	PFOS + PFOS + PFHxS (ng/kg-day)
Surface water	0.26	0.58
Foam	10.6	11.2

MDHHS then compared the exposure doses to the Reference Dose that EPA derived for PFOA and PFOS for the LTHA. Note that the Reference Dose is not the LTHA (a water concentration) but the amount of a chemical per body weight, within an order of magnitude, that is estimated not to cause harm over a lifetime of exposure, even in sensitive groups such as children and fetuses. The Reference Doses for PFOA and PFOS are the same: 0.00002 milligrams/kg-day, which is equivalent to **20 ng/kg-day**. As stated earlier, the EPA has not set a LTHA for PFHxS and therefore has not developed a Reference Dose for that PFAS. MDHHS included PFHxS in the comparison to the PFOA and PFOS Reference Dose in this evaluation to be protective.

Dividing the exposure dose by the Reference Dose results in a Hazard Quotient. A Hazard Quotient greater than one indicates that further evaluation of the exposure is necessary. A Hazard Quotient less than one indicates that further evaluation may not be necessary. The Hazard Quotients for this evaluation are shown in Table 3.

Table 3. PFAS Hazard Quotients (exposure dose divided by Reference Dose) for incidental swallowing of surface water in or foam on Van Etten Lake, Oscoda (Iosco County), Michigan.

	PFOA + PFOS (unitless)	PFOS + PFOS + PFHxS (unitless)
Surface water	0.01	0.03
Foam	0.53	0.56

As calculated, a 0-1 year old child swallowing about one-quarter cup of lake water while playing near the water's edge at Van Etten Lake would not be expected to be harmed by this exposure.

⁴ ATSDR. 2016. Exposure Dose Guidance for Body Weight. Atlanta, GA: US Dept Health and Human Services, Public Health Service, October 26.

Similarly, a 0-1 year old child swallowing the amount of foam that would equal one-quarter cup of liquid while playing near the water's edge at Van Etten Lake would not be expected to be harmed by this exposure. Follow-up sampling conducted by MDEQ, during which more care was taken to obtain only foam and no surface water, suggested that the volume of foam, when allowed to dissolve down to just liquid, would reduce 5-10 times rather than three, as happened during the first sampling event. Therefore, rather than needing three times the amount of foam to equal a certain volume of liquid, it would take 5-10 times. This translates to 1-1/4 cups to 2-1/2 cups of foam to dissolve down to one-quarter cup of liquid. It is not known if a child would swallow this volume of foam.

There are other potential exposure pathways to PFAS near WAFB: eating locally-caught non-migratory fish or drinking from wells that have elevated concentrations of PFAS. The cumulative exposure risk from multiple pathways could cause public health concerns. In 2012, MDHHS issued fish consumption guidelines pertaining to PFAS in fish for several waterbodies in the area and, in 2016, recommended that homeowners with drinking water wells downgradient of the base obtain alternate water through District Health Department No. 2.⁵ If people are following recommendations, then there is less exposure concern.

There may be future foam events at Van Etten Lake or in other waterbodies impacted by the PFAS contamination from WAFB. Additional sampling data may cause MDHHS to change conclusions and resultant recommendations regarding exposure to the foam.

⁵ See www.michigan.gov/wurtsmith.

Legend

Surface Water and Foam Sample Location

- 7/13/2017
- 7/27/2017

Foam Observation Area (7/13/2017 and 7/27/2017)

- Foam Observed

Groundwater Impact

- 1 - 50
- 51 - 300
- 301 - 1,000
- 1,000 - 5,000
- > 5,000

- Road
- Surface Water

2017 Surface Water Sampling and Foam Observations on Van Etten Lake (VEL)

Former Wurthsmith Air Force Base
Iosco County, Michigan

