

# A Toxic Threat

## *Government Must Act Now on PFAS Contamination at Military Bases*

### HIGHLIGHTS

*Per- and polyfluoroalkyl substances, known as PFAS, are a group of synthetic compounds used in products ranging from firefighting foam to nonstick cookware. These chemicals have been linked with diseases including liver damage, kidney cancer, and ulcerative colitis. This fact sheet maps 131 active and formerly active US military installations to determine where PFAS contamination of groundwater and drinking water exceeds new Agency for Toxic Substances and Disease Registry risk levels. The data suggest that immediate action is needed to protect military personnel, their families, and others living near US military installations.*

In May 2018, the Union of Concerned Scientists (UCS) released documents obtained through the Freedom of Information Act that revealed that Trump administration officials had blocked the release of a draft government toxicology report on per- and polyfluoroalkyl substances, known as PFAS. These chemicals have been linked to cancers, developmental and reproductive toxicity, thyroid disease, immune system toxicity, and other health effects (ATSDR 2018). The documents revealed that the Trump administration was holding up the release of the scientific report about the hazards these chemicals posed because officials feared raising public health concerns the administration preferred to ignore. As one Trump administration official privately warned in an email, the report's release threatened to lead to a "public relations nightmare" (Halpern 2018).

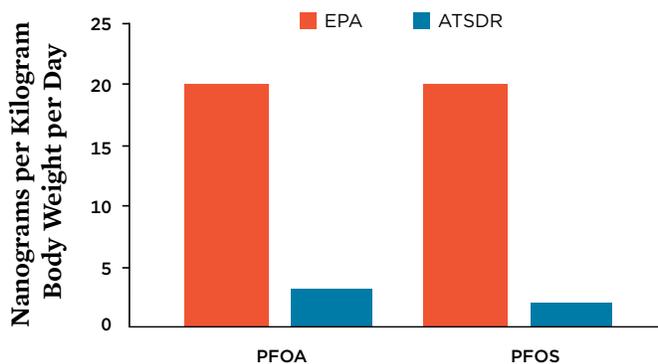
After significant bipartisan congressional pressure followed public exposure of this suppression, the report was released in June 2018 by the Agency for Toxic Substances and Disease Registry (ASTDR), a division of the Centers for Disease Control and Prevention at the US Department of Health and Human Services. The 852-page draft toxicology report analyzed the relevant peer-reviewed scientific data about 14 of the most common PFAS variants and determined that the risk levels for PFAS were 7 to 10 times lower than the EPA's current standards (see Figure 1, p. 2) (ATSDR 2018; Wittenberg 2018). The report's findings, suggesting that PFAS are potentially more hazardous than previously known, are particularly concerning because of these compounds' persistence in the environment and widespread prevalence—PFAS are extremely slow to biodegrade. Used in products to



Ken Weigh/USAF

*PFAS are a group of chemicals that pose significant threats to human health, including pregnancy complications and cancer. They can be found in many water supplies, but have recently been found in alarming amounts at US military bases, due in part to the military's heavy use of PFAS-containing firefighting foam.*

FIGURE 1. Comparing Agency Risk Levels for PFAS



*The EPA's reference dose and the ATSDR's minimal risk level are comparable measures of the amount of a chemical that a person can be exposed to in a day without an increased risk of negative effects during a lifetime. For the two most commonly found types of PFAS, the EPA's 2016 reference dose was 7 times higher for PFOA and 10 times higher for PFOS than the ATSDR's minimal risk level. The EPA's reference doses were used to set the drinking water health advisory threshold for both chemicals at 70 parts per trillion.*

SOURCES: ATSDR 2018; EPA 2016A; EPA 2016B.

repel oil, grease, and water, they have even been dubbed “forever chemicals” (Allen 2018). They are now found in many water supplies, and nationwide biomonitoring results indicate that nearly all Americans carry trace amounts in their bodies (CDC 2018). Despite long-standing health concerns about these chemicals, PFAS have largely managed to escape regulation, with the EPA issuing only a nonenforceable drinking water health advisory in 2016 for the two most common PFAS, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), at 70 parts per trillion (ppt) (EPA 2016a; EPA 2016b).

PFAS are remarkably widespread in drinking water and groundwater in the United States, sometimes at high concentrations, including on and near US military installations. In light of this new ATSDR scientific report, UCS has compiled this fact sheet to explain what PFAS are, what is known about their health effects, how widespread a contamination problem they pose, and which populations are most at risk from exposure to them. As we document here, PFAS pose a serious and immediate threat to military personnel and their families across the nation as well as to public health generally. Action is urgently needed to raise awareness of the potential threat this class of chemicals poses to human health, curb their manufacture and dissemination, and remediate their toxic contamination of water supplies around the country.

## What Are PFAS?

PFAS are a group of synthetic chemicals, sometimes also called highly fluorinated chemicals, known for their extreme persistence even at high temperatures (Buck et al. 2011). Their resistance to breaking down and ability to repel oil, grease, and water have led to their use in products ranging from firefighting foam and nonstick cookware to stain-resistant carpets and microwavable popcorn packaging (GSPI n.d.).

At least 4,700 PFAS variants are available on the global market (OECD 2018). Some of the oldest are PFOA, which DuPont once used in Teflon cookware, and PFOS, which 3M used in Scotchgard fabric protector (Lerner 2018a).

## How Dangerous Are PFAS to Human Health?

A growing body of scientific data suggests we should be concerned about the effects of PFAS on human health. According to the ATSDR draft toxicological report, findings have consistently shown PFAS to be associated with various diseases, including ulcerative colitis, thyroid disease, and hypertension in pregnant women (see Table 1). In particular, a number of studies have confirmed a link between the oldest and most widely used variants—PFOA and PFOS—and increased incidence of testicular and kidney cancers (IARC 2017; EPA 2016a; EPA 2016b; Barry, Winqvist, and Steenland 2013; Steenland and Woskie 2012). Scientific evidence suggests that children may be especially vulnerable to exposure to PFAS; findings associate exposure with elevated cholesterol levels, decreased response to vaccines, increased asthma risk, and damage to kidney function (Rappazzo, Coffman, and Hines 2017). The ATSDR report also documented worrying findings about a dozen of the other most common PFAS. We should therefore be concerned that the entire PFAS category may pose public health dangers.

PFOA and PFOS molecules have exceedingly strong bonds between long chains of carbon and fluorine atoms, which is why they are slow to degrade. Responding to growing concerns regarding the health effects of these two prevalent PFAS, companies have phased them out of their products and replaced them with “short-chain” PFAS, although PFOA and PFOS are still found in drinking and groundwater supplies across the country (EPA 2018; Lerner 2018b). And while the chemical industry claims that the short-chain replacements are safer, emerging data on some of these compounds suggest otherwise, and some may be even harder to remove from contaminated water than the long-chain compounds (ATSDR 2018; Lerner 2018c; Xiao et al. 2017).

TABLE 1. Negative Health Effects Associated with Exposure to PFAS

Health Impact	PFOA	PFOS	PFHxS	PFNA	PFDeA
Decreased Antibody Response to Vaccines	X	X	X		X
Increased Risk of Asthma Diagnosis	X				
Increased Risk of Impaired Fertility	X	X			
Increased Risk of Thyroid Disease	X	X			
Increases in Cholesterol	X	X		X	X
Kidney Cancer	X	X			
Liver Damage	X	X	X		
Pregnancy-Induced Hypertension/Preeclampsia	X	X			
Small Decreases in Birth Weight	X	X			
Testicular Cancer	X	X			
Ulcerative Colitis	X	X			

The ATSDR’s review of the health data on PFOA, PFOS, and other PFAS found that these chemicals are associated with a range of detrimental human health effects.

Note: PHHxS, PFNA, and PFDeA stand for perfluorohexane sulfonic acid, perfluorononanoic acid, and perfluorodecanoic acid, respectively.

SOURCES: ATSDR 2018; EPA 2016A; EPA 2016B.

## How Widespread Are PFAS Contamination and Exposure?

As scientific evidence linking PFAS with adverse effects on human health grows, so, too, does evidence of widespread environmental contamination and human exposure to these chemicals, sometimes at alarming concentrations, especially at or near US military installations.

## Manufacturers Hid PFAS Risks

For decades, chemical companies hid the dangers of PFAS by employing tactics found in the “disinformation playbook” used by many industries to deceive and misinform the public about other dangers, including tobacco and asbestos (UCS n.d.). Health problems linked to PFAS came to wider public attention only after Ohio attorney Rob Bilott took on a case in 1998 for a Parkersburg, West Virginia, family whose cattle were suffering unexplained illnesses (Rich 2016). Bilott’s work ultimately led to the release of thousands of documents by DuPont, whose Parkersburg plant produced an early type of PFAS known as PFOA. The documents revealed that DuPont had concealed internal research from as far back as 1961 linking PFOA to negative health effects and had hidden test results showing PFOA contamination of the local water supply (Rich 2016). In 2017, DuPont agreed to pay \$671 million to settle more than 3,000 personal injury claims stemming from the leak of PFOA in Parkersburg; overall, the company has paid more than \$1 billion to people affected by this contamination (Lerner 2018a; Nair 2017).

DuPont was not the only company to engage in disinformation about PFAS. In early 2018, after settling a PFAS contamination lawsuit against the chemical giant 3M for \$850 million, the Office of the Minnesota Attorney General released documents showing the company also knew about—but concealed or downplayed—the dangers of PFAS for more than 40 years. 3M, which invented PFOA and used a related compound known as PFOS in its popular Scotchgard product, had conducted scientific studies in the 1970s that documented the chemicals’ toxicity. But, for more than two decades, it failed to give that evidence to the EPA (Lerner 2018a).

While water and diet are believed to be the most common pathways to human exposure to PFAS, PFAS disposal on land has also likely contributed to human exposure (Lerner 2016; Trudel et al. 2008). And, as noted above, the persistence and longevity of PFAS heighten the chances of human exposure as PFAS move through the environment.

Both the EPA and the US Department of Defense (DOD) have conducted some testing to determine the extent of PFAS contamination in drinking water and groundwater (Sullivan 2018; EPA 2012). Perhaps most alarming are DOD data indicating shockingly high PFAS concentrations in groundwater at some military installations. Using the EPA’s methods

TABLE 2. Ten Military Sites with Highest Detected PFAS Levels in Groundwater

Contamination Site	State	Maximum PFAS Level Found (ppt)
England AFB*	Louisiana	10,970,000
China Lake Naval Air Weapons Station	California	8,000,000
Patrick AFB	Florida	4,300,000
Dover AFB	Delaware	2,800,000
Myrtle Beach AFB*	South Carolina	2,640,000
Joint Base Langley-Eustis	Virginia	2,200,000
Chanute AFB*	Illinois	2,098,000
Eielson AFB	Alaska	2,000,000
Jacksonville Naval Air Station	Florida	1,397,120
Dallas Naval Air Station*	Texas	1,247,000

DOD testing of groundwater at its military installations reveals that at 10 sites, the maximum concentrations of combined PFOA and PFOS in groundwater were more than 100,000 times the ATSDR’s risk level.

\* indicates a site that is no longer active

SOURCES: ATSDR 2018; SULLIVAN 2018.

to determine its drinking water health advisory, we translated the ATSDR’s risk levels into drinking water guidelines of 7 ppt and 11 ppt for PFOS and PFOA, respectively (ATSDR 2018; EPA 2016a; EPA 2016b). A UCS analysis of DOD testing data reveals that 10 US military sites had PFAS contamination at concentrations more than 100,000 times the ATSDR risk level of 11 ppt (see Table 2). PFAS concentrations at the former England Air Force Base (AFB) in Alexandria, Louisiana, for example, were roughly 1 million times the ATSDR risk level (Sullivan 2018).

Such PFAS concentrations pose a threat of high-dose exposure to military personnel, their families, and those living nearby, especially where private wells are common, and raise immediate concerns that all these populations may be at increased risk for adverse health effects. While these higher concentrations have been found at military bases, according to an Environmental Working Group analysis, some 1,500 drinking water systems across the United States, servicing at least 110 million people, are estimated to be contaminated with PFAS of at least 2.5 ppt (Andrews 2018).

## UCS Findings: High Levels of PFAS at More than 100 US Military Installations

UCS mapped PFAS contamination of groundwater and drinking water at 131 active and formerly active US military sites across 37 states (see Figure 2). Using DOD data from tested military installations released in 2018 and additional records from the Northeastern University Social Science Environmental Health Research Institute (SSEHRI) PFAS Contamination Site Tracker, we found all these sites but one exceeded the ATSDR risk level of 11 ppt derived using ATSDR and EPA data (see appendix for the full method).

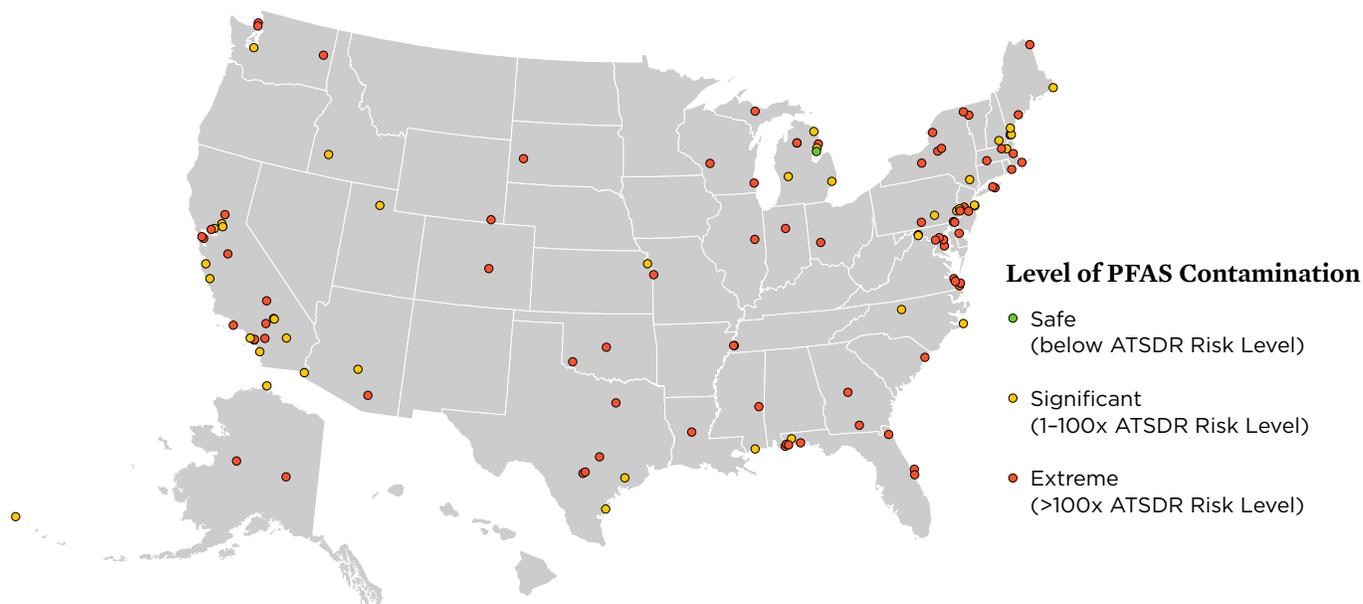
- More than half of the 32 sites with direct drinking water contamination had PFAS concentrations that were at least 10 times higher than the ATSDR risk level.
- At 118 of the sites—more than 90 percent—PFAS concentrations were at least 10 times higher than the ATSDR risk level.
- At 87 of the sites—roughly two-thirds—PFAS concentrations were at least 100 times higher than the ATSDR risk level.

The data suggest that immediate action is needed to protect military personnel, their families, and others living near US military installations.

While we do not yet know the full extent of the PFAS contamination problem, knowledge of toxic contamination on and near military bases is not new. The EPA has designated nearly 900 military-affiliated sites as Superfund sites (NCI 2010). It is known that pollution at military bases has exposed base personnel and nearby communities to toxins, including benzene and the solvents trichloroethylene (TCE) and perchloroethylene (PCE) (Hamilton 2016). The ATSDR has found sufficient evidence to link TCE to kidney cancer, non-Hodgkin lymphoma, and cardiac defects; PCE to bladder cancer; benzene to leukemias and non-Hodgkin lymphoma; and vinyl chloride to liver cancer (ATSDR n.d.). In one of the most notable cases of military base pollution, TCE, PCE, benzene, and vinyl chloride seeped into the drinking water at Camp Lejeune, a Marine Corps base in North Carolina, from the

***PFAS concentrations at a former air force base in Alexandria, Louisiana, were roughly 1 million times the ATSDR risk level.***

FIGURE 2. PFAS Contamination at US Military Installations



All but one of the 131 DOD sites that have been tested for PFAS contamination of groundwater and drinking water exceeded the ATSDR risk level. Though this risk level is not an enforceable standard for drinking water or groundwater, it is an estimate of the maximum daily human exposure to PFAS that is likely to be associated with no risk of adverse health effects. Two-thirds of sites had levels of contamination more than 100 times higher than that risk level.

Note: The ATSDR Risk Level represents the Agency for Toxic Substances and Disease Registry’s findings on the minimum amount of PFAS that pose a risk to human health, translated to drinking water guidelines using the EPA’s method for determining drinking water health advisories.

SOURCES: SSEHRI 2018; SULLIVAN 2018.

1950s until the mid-1980s (ATSDR 2017). Nearly 1 million people were exposed to drinking water having TCE concentrations as much as 3,400 times higher than safe levels (McConnell 2017; SCVA 2011).

The latest scientific evidence suggests that PFAS contamination deserves more attention as yet an additional threat to the health of these populations. The military’s ongoing use of PFAS-containing firefighting foam in its operations and training is a significant problem. Non-PFAS foams can be highly effective. As of February 2018, at least 77 airports, 47 corporations (including 3M), the Norwegian and Danish air forces, and many worldwide fire brigades have switched to using fluorine-free foam. However, after heavy lobbying by makers of foam containing PFAS, the US military has not yet moved to PFAS-free foams. Rather, it is switching to foams containing shorter-chain PFAS molecules (Lerner 2018c).

Some military families and affected civilians are fighting back to protect themselves from further harm. A long fight led by veterans and military family members resulted in

Congress passing a law in 2012 providing health care for Marines and their families who had lived at Camp Lejeune between 1957 and 1987 and who suffered specific illnesses (Schoof 2014). In recent years, as more military communities have discovered PFAS contamination in their drinking water, local groups have worked to provide resources, information, and more. Testing for Pease, a community action group created by residents affected by PFAS contamination from the former Pease AFB in New Hampshire, provides educational materials and advocates for long-term health solutions (Testing for Pease n.d.). In May 2018, the ATSDR announced that Pease would be included in its first multisite study on PFAS exposure, in part due to community members’ advocacy work (McMenemy 2018).

The DOD, meanwhile, has taken some steps to reduce the exposure of individuals currently living in areas where water contamination has been confirmed. But it has not done enough. For example, it has spent at least \$200 million studying and testing on-base water supplies and providing filters,



*Despite the DOD's own findings of unsafe levels of PFAS in military installation drinking water, there are no requirements to inform military families who once lived on military bases that they may have been exposed to these toxins for years.*

alternative wells, or bottled water to address contamination (Copp 2018). But it has so far prioritized other contamination sites over those with PFAS contamination because the EPA health advisory underestimates the actual risk indicated by the latest scientific evidence (ATSDR 2018; Copp 2018). In addition, the DOD is in the process of approving military sites to serve as detention centers for migrant families, potentially putting more children at risk for PFAS exposure. While several approved sites have PFAS levels lower than the EPA's voluntary limit, they may have higher PFAS levels than the ATSDR report suggests are safe. (Lu 2018).

Also, there are no requirements to inform people who once lived on contaminated military bases that they may have been exposed to unsafe PFAS levels. Military families and other affected communities surely have the right to know if the water they drank—maybe for decades—contained dangerous PFAS levels, potentially posing significant risks to their health.

## Recommendations

Given the scientific evidence reviewed in the recently released ATSDR toxicology report and the pervasive PFAS contamination of water across the country—especially on and near US military bases—it is unacceptable for this class of chemicals to remain virtually unregulated. A national-scale government effort is urgently needed to control the use and disposal of PFAS and to clean up existing PFAS contamination.

Government officials must put the health of the public—including US military personnel—ahead of public relations concerns. They should be informed by and follow the

mounting scientific evidence of harm caused by these toxic chemicals and prioritize the regulation of PFAS. Equally important, individuals who have been exposed to PFAS must be notified, public awareness of the threat posed by PFAS must be increased, and contamination sites must be remediated.

We recommend that the federal government take the following immediate steps:

- ban all new variants of PFAS and new uses for this class of chemicals;
- ban the use of PFAS in firefighting foams used at military installations and airports and switch to alternative chemicals;
- set enforceable drinking water standards for total PFAS;
- mandate reporting of PFAS releases, investigate drinking water contamination, and disclose all key information to the public;
- add the entire class of PFAS to the EPA's toxic pollutant list and hazardous substance list;
- provide support to states to clean and filter contaminated water sources, including standardized test methods for a broad range of legacy and replacement PFAS;
- demand accountability from PFAS manufacturers, including ensuring their full responsibility for cleaning up contamination caused by these compounds;
- notify retired and active military personnel and their families about any potential PFAS exposure in drinking water and groundwater and protect them from further exposure, and offer them the option of free routine medical monitoring for health effects associated with PFAS at any VA hospital;
- remediate contamination of water supplies on or near military installations caused by the US military's use of and/or disposal of PFAS-containing firefighting foams; and
- support scientific research on the health effects of a broad range of PFAS.

For more information on the methodology of this analysis, see the appendix at [www.ucsusa.org/toxicthreat](http://www.ucsusa.org/toxicthreat).

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