A Toxic Threat

Government Must Act Now on PFAS Contamination at Military Bases

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Appendix: Methodology

Union of Concerned Scientists

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DATA SOURCES

Data for the analyses described below were gathered from two sources: the US Department of Defense (DoD) and Northeastern University's Social Science Environmental Health Research Institute (SSEHRI).

Point data for the map of per- and polyfluoroalkyl substances (PFAS) contamination was collected from the SSEHRI PFAS Contamination Site Tracker (SSEHRI 2018), a database run by the SSEHRI. Records within the database are classified as either civilian or military and were current as of May 7, 2018.

The military records within the SSEHRI dataset (n=133) are associated with contamination due to firefighting foams, the majority of which (n=127) were reported by DoD in its 2018 report on groundwater and drinking water (Sullivan 2018). It is important to note that the DoD used the EPA's drinking water health advisory of 70 parts per trillion (ppt) as the PFAS detection level, so there are likely unreported data with contamination lower than 70 ppt (Lustgarten 2018; Sullivan 2018). The additional bases included within the SSEHRI dataset (n=6) were compiled using state PFAS testing data or were reported by local media. The testing at the majority of sites (n=118) occurred in 2017; an additional 13 sites were tested between 2013 and 2016. Our final dataset (n=131) removed two duplicate entries for Grand Prairie and Wilmington Dover Air Force Base (AFB) which are represented by former Naval Air Station (NAS) Dallas and Dover AFB, respectively.

GEOGRAPHIC COORDINATES

All layers and geographic analyses were conducted using the GCS North American 1983 geographic coordinate system. If a given layer was not projected in the GCS North American 1983 geographic coordinate system, the Project tool in ArcGIS 10.6 was used to project the layer into the correct coordinate system. Coordinates for military contamination sites associated with the SSEHRI database were not provided. Instead, descriptive information—primarily military base name—within each record was used to find the coordinates of the contamination sites using Google Maps. A point layer was then created by importing these coordinates and the associated records into ArcGIS.

PFOS/PFOA VALUES USED FOR PFAS CONTAMINATION MAP

Many records within the SSEHRI database contain only combined perfluorooctanesulfonic acid/perfluorooctanoic acid (PFOS/PFOA) values without additional information regarding the breakdown of PFOS and PFOA contributing to these larger values. For SSEHRI records that had combined PFOS/PFOA values as well as separate PFOS/PFOA values, the final PFOS/PFOA values used for the analysis are the maximum between the PFOS/PFOA values recorded as part of the original record and the PFOS/PFOA values calculated from the sum of individual PFOS and PFOA measurements within each record.

For SSEHRI records with multiple sampling sites and ranges of PFOS/PFOA concentrations associated with these sampling sites, the maximum concentration associated with all ranges provided was used for analysis to account for potential health effects related to acute PFAS exposure during periods associated with these higher concentrations.

Since combined PFOS/PFOA values were used to designate whether a site falls within the green/yellow/orange/red categorizations, a conservative approach was used and 11 ppt was divided into the combined PFOS/PFOA value to determine the number of times a contamination site's PFOS/PFOS levels are above the ATSDR draft toxicological profile risk level. These calculations were made using the ATSDR's minimal risk levels (MRLs) for PFOS and PFOA and using them in place of a reference dose(RfD) in the EPA's formulas for deriving the health advisories for PFOS and PFOA (ATSDR 2018; EPA 2016a; EPA 2016b.) Eleven parts per trillion is the ATSDR MRL for PFOA, while seven parts per trillion is the MRL for PFOS (ATSDR 2018). No sites were affected by this more conservative threshold.

The contamination sites featured in UCS's map cover both groundwater and drinking water. The calculation of 11 ppt for the ATSDR's risk level in water is most applicable to drinking water exposure, but it is important to note that wells drawing water from groundwater sources are also PFAS exposure routes (Hu et al. 2016; Maupin et al. 2014).

DATES ASSOCIATED WITH CONTAMINATION SITES

Dates associated with SSEHRI data indicate the date of discovery of PFAS compounds at that site.

REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2018. *Toxicological profile for perfluoroalkyls (draft for public comment).* Atlanta, GA: US Department of Health and Human Services. Online at *www.atsdr.cdc.gov/toxprofiles/tp200.pdf*, accessed August 10, 2018.

Environmental Protection Agency (EPA). 2016a. Drinking water health advisory for perfluorooctanoic acid (PFOA). Washington, DC. Online at *www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final-plain.pdf*, accessed March 3, 2017.

Environmental Protection Agency (EPA). 2016b. Drinking water health advisory for perfluorooctane sulfonate (PFOS). Washington, DC. Online at *www.epa.gov/sites/production/files/2016-05/documents/pfos_health_advisory_final-plain.pdf*, accessed March 3, 2017.

Hu, X.C., D.Q. Andrews, A.B. Lindstrom, T.A. Bruton, L.A. Schaider, P. Grandjean, R. Lohmann, C.C. Carignan, A. Blum, S.A. Balan, C.P. Higgins, E.M. Sunderland. 2016. Detection of poly- and perfluoroalkyl substances (PFASs) in US drinking water linked to industrial sites, military fire training areas, and wastewater treatment plants. *Environmental Science & Technology Letters* 3(10):344–350. doi:10.1021/acs.estlett.6b00260.

Lustgarten, A. 2018. How the EPA and the Pentagon downplayed a growing toxic threat. *ProPublica*, July 9. Online at *www.propublica.org/article/how-the-epa-and-the-pentagon-downplayed-toxic-pfas-chemicals*, accessed August 20, 2018.

Maupin, M.A., J.F. Kenny, S.S. Hutson, J.K. Lovelace, N.L Barber, and K.S. Linsey. 2014. Estimated use of water in the United States in 2010. Reston, VA: US Geological Survey. Online at *https://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf*, accessed August 20, 2018.

Social Science Environmental Health Research Institute (SSEHRI). 2018. SSEHRI PFAS contamination site tracker. Boston: Northeastern University. Online at *https://docs.google.com/spreadsheets/d/1HxLAzOmFdMh7V-mey4ExTPsnNKarEcGG6klBWZH8auA/edit#gid=878733437*, accessed June 7, 2018.

Sullivan, M. 2018. Addressing perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). Online at *https://partner-mco-archive.s3.amazonaws.com/client_files/1524589484.pdf*, accessed August 2, 2018.