

# Per- and Polyfluoroalkyl Substances in New Jersey Soils: A Statewide Investigation

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# Abstract

The primary goal of this study was to evaluate and quantify per- and polyfluoroalkyl substance concentrations in New Jersey soils. A total of 157 samples were collected from surficial soils in all 21 counties at locations spatially distant from known PFAS contamination or presumptive sources of potential PFAS contamination to investigate potential impacts from atmospheric deposition. Samples were analyzed for 40 PFAS compounds, and the synthetic precipitation leaching procedure was used to evaluate contaminant leachability. All measured concentrations were below the New Jersey Department of Environmental Protection (NJDEP's) current interim residential and non-residential soil remediation standards for PFAS compounds. The results also suggest that the large majority of samples would not exceed site-specific NJDEP's interim soil remediation standards for the migration to ground water exposure pathway.

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## Acronyms

AFFF	Aqueous film-forming foams
BEERA	Bureau of Environmental Evaluation and Risk Assessment
BEMSA	Bureau of Environmental Measurement and Site Assessment
BIS	Bureau of Information Systems
CSRR	Contaminated Site Remediation and Redevelopment
DSR	Division of Science and Research
EBK	Empirical Bayesian Kriging
FSPM	Field Sampling Procedures Manual
HFPO-DA	Hexafluoropropylene oxide dimer acid and its ammonium salt
GIS	Geographic Information Systems
MDL	Method detection limit
NJDEP	New Jersey Department of Environmental Protection
ODQ	Office of Data Quality
PFAS	Per- and polyfluoroalkyl substances
PFCA	Perfluoroalkyl carboxylic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
QAPP	Quality Assurance Project Plan
SPLP	Synthetic precipitation leaching procedure
SRS-ID	Soil remediation standard for the ingestion-dermal exposure pathway
SRS-MGW	Soil remediation standard for the migration to ground water exposure pathway
USEPA	United States Environmental Protection Agency

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# Introduction

Per and polyfluoroalkyl substances (PFAS) are a class of fluorinated chemicals first discovered in 1938. PFAS compounds, known for their water, stain, grease, and temperature-resistant properties, have been added to or used in the manufacture of a wide range of industrial and consumer products. PFAS compounds are also a major component of aqueous film-forming foams (AFFF) used to extinguish flammable fuel fires. Many PFAS compounds are highly persistent in the environment and PFAS have been detected in many environmental media (ITRC, 2023a). PFAS compounds can bioaccumulate in humans and wildlife and exposure to certain PFAS has been linked to negative health effects (Fenton et al., 2020).

This project began following the October 2022 release of the New Jersey Department of Environmental Protection's (NJDEP's) interim soil remediation standards for perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorooctane sulfonic acid (PFOS), and Hexafluoropropylene oxide dimer acid and its ammonium salt (HFPO-DA, also referred to as GenX chemicals). These interim standards, shown in *Table 1*, include numeric values for the ingestion-dermal exposure pathway (residential and non-residential) and site-specific soil remediation standards for the migration to ground water exposure pathway (SRS-MGW). Site-specific SRS-MGW are calculated using the synthetic precipitation leaching procedure (SPLP) and NJDEP's soil leachate remediation standards<sup>1</sup>. SRS-MGW are anticipated to be 1-2 orders of magnitude more stringent than the soil remediation standards for the residential ingestion-dermal exposure pathway (SRS-ID). Upon the release of these standards, the regulated community expressed concern about whether these standards would be attainable given the widespread use of PFAS compounds and the potential for soil contamination from non-localized sources including long-range atmospheric deposition. Given the long industrial history and high population density of New Jersey, an investigation of PFAS concentrations across the state was warranted. A supplemental part of the study was to determine whether there is a correlation between population density and concentrations of PFAS in soils (i.e., would concentrations be greater in more populated areas where there are more people using products containing PFAS?).

**Table 1:** NJDEP interim soil remediation standards for PFAS compounds. Interim soil remediation standards are presented in nanograms per gram (ng/g) and interim soil leachate remediation standards are presented in micrograms per liter (µg/L).

Contaminant	Ingestion-Dermal Residential (ng/g)	Ingestion-Dermal Nonresidential (ng/g)	Migration to Ground Water (ng/kg)	Soil Leachate (µg/L)
PFNA	47	670	Site-specific	0.26
PFOA	130	1800	Site-specific	0.28
PFOS	110	1600	Site-specific	0.26
HFPO-DA	230	3900	Site-specific	0.40

<sup>1</sup> Soil leachate remediation standards are calculated by multiplying NJDEP's ground water remediation standard by the NJDEP's default dilution attenuation factor of 20. Soil leachate standards are compared to field leachate concentrations which are calculated from SPLP sample results.

Other states in the Northeast United States including Maine, New Hampshire, and Vermont have previously conducted state-wide PFAS soil investigations. These studies found widespread PFAS impacts in surficial soils (0-6 inches below ground surface). PFOA and PFOS, historically two of the most utilized PFAS compounds, were detected at frequencies of 65% (ME), 96% (NH), and 91% (VT) for PFOA and 71% (ME), 100% (NH), and 100% (VT) for PFOS (Sanborn, Head & Associates, Inc., 2022; Santangelo et al., 2022; Zhu et al., 2019). The detection frequencies include all samples with concentrations above the method detection limit (MDL). It should be noted that the reported MDLs varied between studies. Thus, while these results demonstrate the high frequency of PFOA and PFOS detection in the Northeast United States, any quantitative comparison of detection frequencies between states should consider these differences.

The primary goal of this study was to quantify PFAS soil concentrations in New Jersey on a state-wide and county basis, evaluate the spatial distribution of PFAS across the State, and determine if there were statistically significant differences in PFAS concentrations in urban and rural areas based on the 2020 United States Census definition. Surficial samples were collected from locations spatially distant from known PFAS contamination or presumptive sources of potential PFAS contamination to evaluate potential soil impacts from atmospheric deposition. The surficial depth interval is expected to be impacted by atmospheric deposition and the collection of samples from this interval allows for comparison to other similar soil surveys. Samples were also analyzed using SPLP to determine sample-specific leachability to evaluate the potential for impacts to the underlying groundwater due to PFAS migration through unsaturated soils.

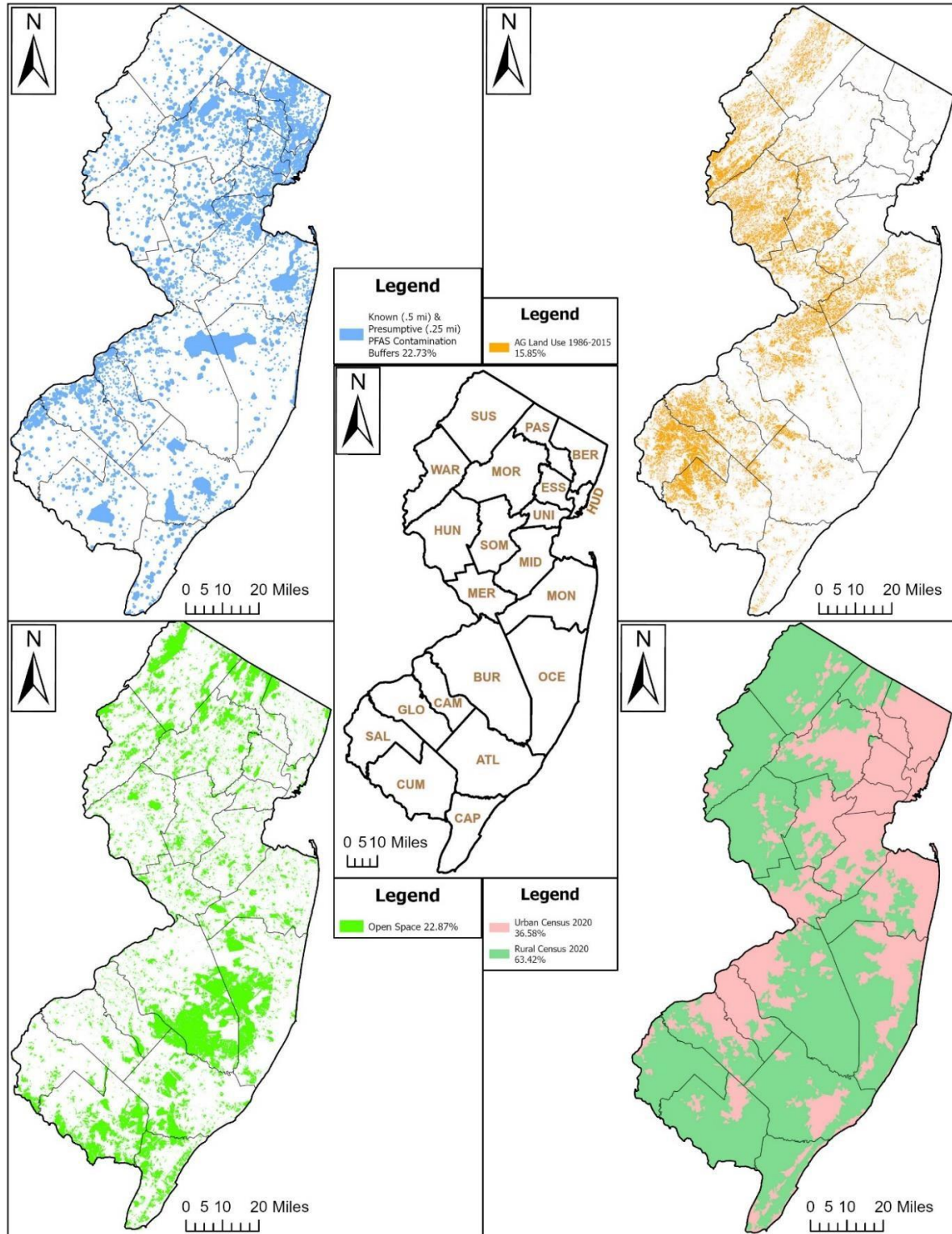
## Methodology

### *Sampling Location Selection*

Sample locations were selected from all New Jersey counties based on four primary considerations:

1. Spatial distance from known PFAS contamination or presumptive sources of potential PFAS contamination
2. Lack of historical agricultural use
3. Public accessibility
4. Population density (urban versus rural)

All available internal and external data relevant to known PFAS contamination and presumptive sources of potential PFAS contamination were reviewed and compiled into ArcGIS Pro. Identification of presumptive sources (e.g., firefighting training sites, landfills, certain industrial uses) has been proposed as a method to predict locations that are more likely to have localized PFAS contamination (Salvatore et al., 2022). A total of 19 known contamination and 9 presumptive contamination geographic information system (GIS) layers were identified (*Appendix B*). A one-half mile sampling exclusion buffer was placed around 3,028 known contamination data points and a one-quarter mile exclusion buffer was placed around 7,578 presumptive



**Figure 1:** Sample selection considerations. Top left: Buffered area (blue) based on known and presumptive PFAS contamination. Top right: GIS agricultural land use layer (yellow) from 1986-2015. Bottom left: Open space land in NJ (bright green). Bottom right: Urban (pink) and rural (green) areas of NJ based on the 2020 US Census definition (U.S. Census Bureau, 2022). The percentages listed in the legends represent the area of the state. Middle: NJ counties.

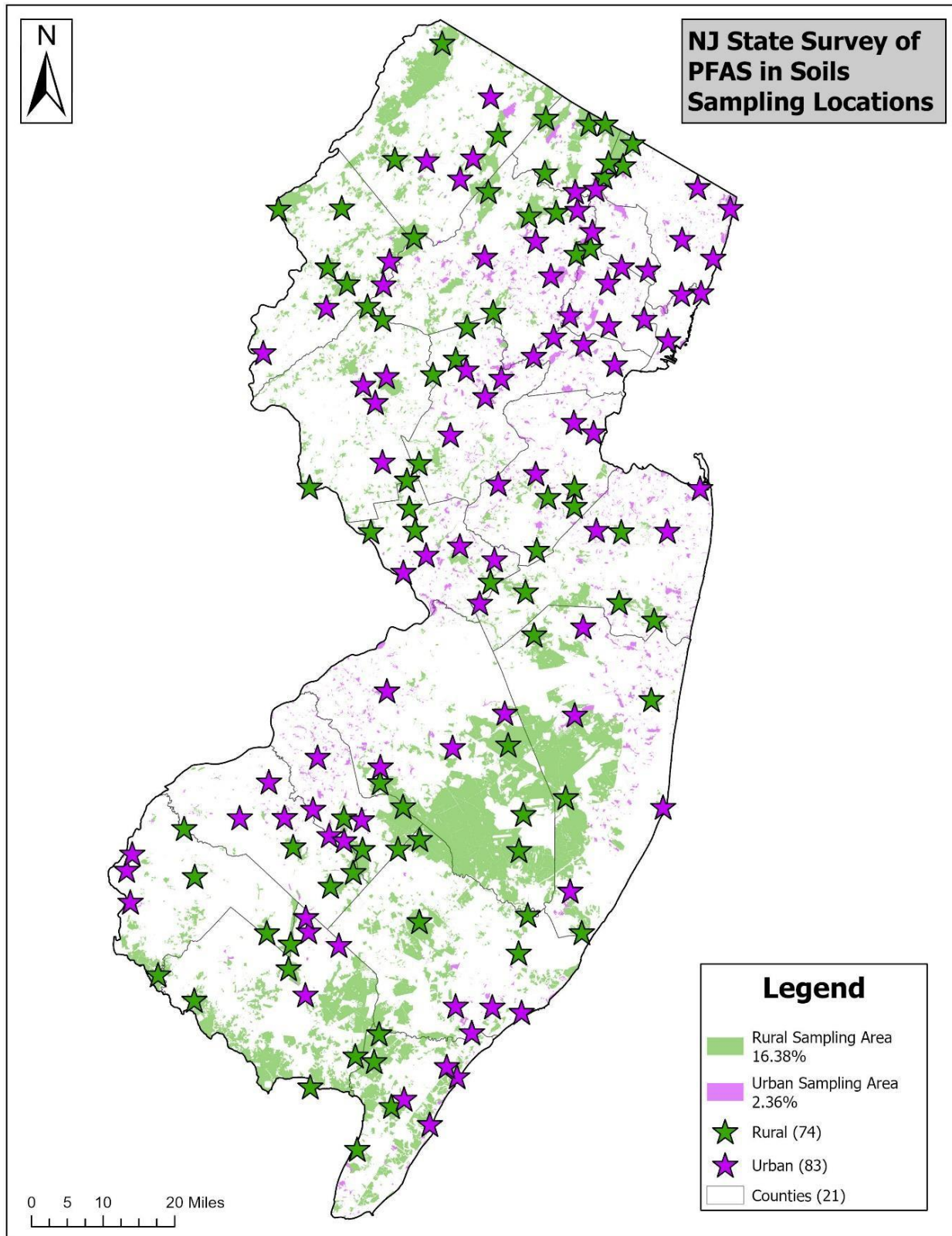
contamination data points, together accounting for 22.73% of the state (*Figure 1, Figure A1*). The intent of these buffers was to minimize the likelihood of sample collection in areas impacted by discrete, direct discharges (i.e., non-atmospheric). It should be noted that both field studies (Washington et al., 2020) and modeling (D'Ambro et al., 2023) suggest that PFAS atmospheric impacts from a point source can extend far beyond a 0.5-mile radius. A description and full citation list of the GIS layers used for presumptive and known contamination exclusion buffers can be found in *Appendix B*. No sample locations were selected from within the buffered areas with the exception of Hun-Rur-2 which was collected from within this area (1,458 feet into the buffered area) due to access issues at the originally designated sampling coordinates. The results from this sample did not indicate elevated PFAS concentrations relative to other sampling points and thus, this sample was not removed from the data set.

A major limitation in the sample location selection process was the inability to find data on historic biosolid applications to agricultural fields, a well-documented potential source of PFAS contamination (Johnson, 2022). Thus, a *1986-2015 Agriculture Land Use* GIS layer was used as an initial screening tool to prevent sample selection within or nearby current or historic agricultural fields (*Figure 1, Figure A2*). Aerial imagery dating back to the 1940s was used to confirm a lack of agricultural activity at selected sampling locations. Samples were removed or moved accordingly if they fell within an imagery layer showing agricultural use, historic buildings, or any major land disturbance.

All sample locations were selected from publicly accessible land (e.g., state parks, county parks, municipal parks, etc.), were at least 50 ft from roadways (AVG. 0.11 mi) and were at least two miles away from another sampling location (AVG. 4.42 mi) to ensure spatial distribution (*Figure 1, Figure A3*). Sampling sites were located an average distance of 0.73 mi away from a PFAS buffer. The latter proximity data was generated using a suite of near GIS tools. The *NJ Open Space* and *Parcels* GIS layers were used to determine public accessibility and ownership (*Appendix B*). Additional data layers were used from the New Jersey Geographic Information Network (NGIN) for identifying specific locations and determining accessibility (e.g., roads, parcels, etc.).

The 2020 United States Census definition was used to define urban and rural areas throughout the state (*Figure 1, Figure A4*). To be considered urban, an area must have at least 5,000 people or 2,000 housing units. Each area must also have at least one high-density nucleus of at least 1,275 housing units per square mile. A full definition can be found in the Federal Registrar (U.S. Census Bureau, 2022). Any area that does not qualify as urban is considered rural.

Based on these four considerations, 16.38% of the state was identified as meeting all criteria for rural sampling and 2.36% of the state was identified as meeting all criteria for urban sampling. A total of 160 urban and 142 rural potential sampling locations were identified from these areas. From the set of potential sample locations, eight samples (four urban and four rural) were randomly selected for each county. Fewer sampling locations were selected for Essex (two rural and four urban samples), Hudson (four urban samples), Salem (four rural and three urban samples), and Union (four urban samples) due to a lack of sampling sites that met the selection criteria of this study. This resulted in a total of 157 sampling locations statewide (*Figure 2, Table A2*).



**Figure 2:** Selected rural (green star) and urban (purple star) sampling locations. Shaded green and purple areas represent the available urban and rural sampling areas meeting the criteria of this study.

## *Sample Collection and Analysis*

Soil sample collection was completed by personnel from NJDEP's Bureau of Environmental Measurement and Site Assessment (BEMSA) in accordance with the NJDEP's Field Sampling Procedures Manual (FSPM) and the project-specific Quality Assurance Project Plan (QAPP) which can be found in *Appendix E*. Samples were collected from the surficial (0-6 inch) interval at each location. When present, vegetative ground cover was removed prior to sample collection, and the soil sample was collected from the six-inch interval below where the vegetation existed. Sampling occurred from August 23, 2023, through December 7, 2023. Photographs of all sampling locations can be found in *Appendix C*.

Samples were analyzed by a New Jersey certified laboratory, Pace Analytical, LLC (formally Alpha Analytical), using EPA method 1312 for SPLP and EPA method 1633, draft 2 for PFAS in soil and PFAS in the SPLP leachate. The laboratory was certified for the full list of 40 PFAS and all compounds were reported (*Table A3*).

## *Data Validation*

A data validation review of the results of the 40 PFAS analytes in soil samples and SPLP leachate samples was performed by the NJDEP's Office of Data Quality (ODQ). The data were validated using a data validation checklist created by the ODQ (*Appendix D*) that incorporated the requirements of USEPA Method 1633 (January 2024) and the laboratory's Standard Operating Procedure.

SPLP leachate results were negated during the data validation process for the following samples: CAP-URB-3 (6:2 FTS), CUM-RUR-2 (PFHxA), CUM-RUR-3 (6:2 FTS), CUM-URB-3 (PFHxA), HUD-URB-1 (PFHxA), MER-RUR-2 (PFHxA), MER-RUR-4 (PFHxA), MER-URB-1 (PFHxA), MER-URB-2 (PFHxA), MER-URB-4 (PFHxA), and UNI-URB-1 (PFHxA). Part of the validation process involves the comparison of method blank results to the results detected in environmental samples. When a compound's concentration in an environmental sample is less than three times the concentrations in an analytically associated method blank, the conventional conclusion made by the validator is that the environmental sample concentration is attributed to contamination unrelated to the actual sample and probably from laboratory processes. For the above noted samples and compounds, the results for the compounds were negated because the concentrations in the sample leachates for the compounds listed were less than three times the concentrations found in the corresponding method blanks.

## *Geospatial Mapping*

Various GIS spatial visualization methods were utilized to create maps detailing the results of the soil sampling. Empirical Bayesian Kriging (EBK) was used to create estimated concentration contour maps. EBK inputs were set to standard circular neighborhoods. EBK output was exported as polygon contours and clipped to the NJ boundary. Estimated concentration contour maps were created for total PFAS and individual contaminants at the state level. The purpose of the EBK

maps is not to estimate a specific PFAS concentration at an exact location. Instead, the EBK maps are intended to provide both a visual representation of the data and insight into potential PFAS concentrations in soil across a given area. A major limitation was the small sample size with respect to the sampling area. In addition, no samples were collected from areas close to known PFAS contamination or presumptive sources of PFAS contamination and thus, the EBK results may not be accurate in these areas.

Pie chart symbology was used as a statistical graphic to represent the ratio of PFAS compounds detected in each sampling point. All PFAS compounds detected in at least one-third of samples were included in the pie charts along with any PFAS compounds currently regulated by NJDEP or USEPA. The size of the pie chart was weighted based on the total PFAS detected in each sample. County level maps were created with the pie chart symbology overlaid with the EBK estimated concentration contours.

### *Statistical Analysis*

Samples were collected at 157 individual sites in both urban (n = 83) and rural (n = 74) areas. Instead of assuming a constant value (such as the detection limit, half of the detection limit, or zero) for the non-detect values, these PFAS measurements were included in the analysis as less than the reported method detection limit (MDL), instead of as a number. All other qualified measurements were treated as quantified real numbers.

Summary statistics, including mean, standard deviation (SD), standard error (SE), and percentiles, were calculated for each of the 40 PFAS using the Kaplan-Meier<sup>2</sup> method to allow inclusion of the left-censored values (i.e., values below detection). Although parametric summary statistics (mean, SD, and SE) were calculated, the data distributions were non-normally distributed because of the overabundance of low and censored measurements. Instead of a normal distribution, the PFAS concentrations followed a left-censored, skewed distribution. Therefore, nonparametric summary statistics (i.e., percentiles such as medians and quartiles) were more valid to describe the distribution of the data than parametric measures. Furthermore, the summary statistics for each PFAS were calculated separately for urban and rural samples.

To determine whether PFAS concentration varied between urban and rural areas, and by county, a Wilcoxon rank test was implemented with a Peto-Prentice weighting method. For each PFAS, the Wilcoxon test was utilized to determine whether the distributions of PFAS concentrations for each urban/rural or county were statistically similar or not. When a significant result was detected by the Wilcoxon test, pairwise, post-hoc Wilcoxon tests were performed to determine which counties had significantly higher concentrations of PFAS.

All statistical analyses were performed in program R (4.3.1), and the statistical models were fit using the NADA package (Lee, 2022) which allowed for the inclusion of the non-detects. Statistical significance was assumed when  $p \leq 0.05$ .

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<sup>2</sup> The Kaplan-Meier method is a non-parametric statistic that can be utilized to estimate summary statistics (e.g., means) with censored data by fitting the censored data to a survival curve.

## Results and Discussion

### *PFAS Detection Frequency and Concentration*

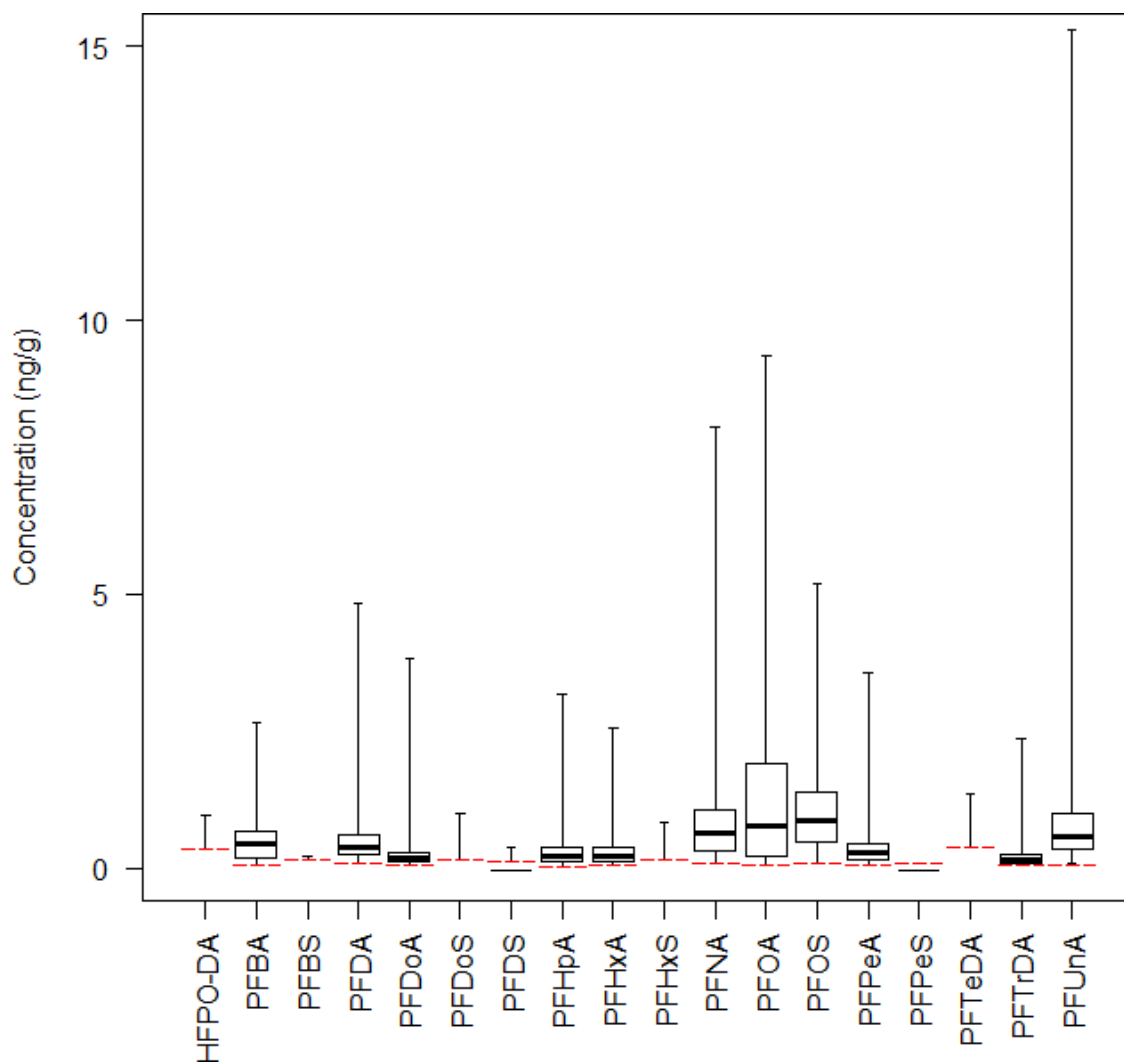
PFAS compound detection frequencies are reported in *Table 2*. Estimated values between the MDL and analytical reporting limit (RL) are reported as detections. The range of detection limits for each PFAS compound can be found in *Table A4*. In total, 23 PFAS compounds were measured above the MDL in at least one sample and 17 PFAS compounds were not detected in any sample. Perfluoroundecanoic acid (PFUnA) (98.7%), PFOS (98.1%), perfluorodecanoic acid (PFDA) (97.5%), PFNA (96.2%) and PFOA (94.3%) were the most frequently detected compounds. Perfluoroalkyl carboxylic acids (PFCAs), a PFAS subgroup characterized by a fully fluorinated carbon chain attached to a carboxylic acid head group (first 11 compounds listed in *Table 2*), were widely detected across chain lengths with the C4 perfluorobutanoic acid (PFBA) through C13 perfluorotridecanoic acid (PFTrDA) PFCAs all having a detection frequency above 88%. Except for PFOS and the aforementioned PFCAs, no other PFAS compound analyzed in this study had a detection frequency above 50%.

A full compilation of sample-specific results for each county can be found in *Tables A5-A25*. Statewide PFAS concentration statistics are displayed in *Figure 3* and *Table A26*. The compounds that were the most widely detected (PFCAs, PFOS) were also those with the highest median and maximum concentrations suggesting the widespread use and distribution of these compounds. All statewide median concentrations were below 1 nanogram per gram (ng/g) for individual PFAS compounds. Total PFAS concentration detected ( $\sum$ PFAS) at each sampling location was determined by summing only the concentrations of all qualified and quantified values above the reported detection limits. No estimation was made for concentrations reported as less than the MDL.  $\sum$ PFAS ranged from non-detect (sample Cumberland-Urban-4) to 34.11 ng/g (sample Salem-Urban-3), indicating the presence of localized areas of greater PFAS impacts.

These results share similarities with those reported by other Northeast states. Vermont reported detection frequencies above 50% for six PFCAs (perfluorohexanoic acid (PFHxA), perfluoroheptanoic acid (PFHpA), PFOA, PFNA, PFDA, and PFUnA), perfluorobutane sulfonic acid (PFBS), and PFOS while Maine reported detection frequencies above 50% for PFBA, PFOA, and PFOS and detections at or above 35% for six additional PFCAs (perfluoropentanoic acid (PFPeA), PFHxA, PFHpA, PFNA, PFDA, PFUnA) (Sanborn, Head & Associates, Inc., 2022; Zhu et al., 2019). It should be noted that the Vermont study did not include estimated values as detections while this study and the Maine study did. Given the industrial history of New Jersey, it was not unexpected that the New Jersey samples included more PFAS compounds with detection frequencies over 50% compared to Vermont and Maine given the population density and industrial history of the state. Collectively, these results suggest that PFCAs and PFOS are the most widely detected PFAS compounds in surficial soils in the Northeast United States at present.

**Table 2:** PFAS compounds detected in at least one sample above the method detection limit.

PFAS	Number of Samples	Number of Detects	Maximum Concentration Observed (ng/g)	Detection Frequency (%)	Method Detection Limit Range (ng/g)
PFBA	157	139	2.670	88.5	0.036 – 0.185
PFPeA	157	141	3.550	89.8	0.040 – 0.206
PFHxA	157	142	2.570	90.4	0.033 – 0.170
PFHpA	157	146	3.160	93.0	0.017 – 0.085
PFOA	157	148	9.350	94.3	0.037 – 0.191
PFNA	157	151	8.050	96.2	0.056 – 0.288
PFDA	157	153	4.830	97.5	0.054 – 0.276
PFUnA	157	155	15.300	98.7	0.037 – 0.188
PFDoA	157	148	3.830	94.3	0.029 – 0.150
PFTTrDA	157	145	2.350	92.4	0.038 – 0.194
PFTeDA	157	40	1.360	25.5	0.076 – 0.391
PFBS	157	78	0.224	49.7	0.031 – 0.159
PFPeS	157	6	0.087 J	3.8	0.017 – 0.085
PFHxS	157	29	0.833	18.5	0.043 – 0.217
PFHpS	157	3	0.049 J	1.9	0.026 – 0.135
PFOS	157	154	5.200	98.1	0.057 – 0.291
PFDS	157	9	0.379	5.7	0.023 – 0.118
PFDoS	157	25	1.010	15.9	0.028 – 0.141
6:2FTS	157	3	0.367 J	1.9	0.201 – 1.03
PFOSA	157	2	0.052 J F	1.3	0.031 – 0.159
NEtFOSAA	157	3	0.239	1.9	0.059 – 0.303
NMeFOSE	157	1	0.293 J	0.6	0.180 – 0.920
HFPO-DA	157	18	0.949	11.5	0.071 – 0.361
<p>“F” qualifier indicates a result that is an estimated maximum possible concentration.  “J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.</p>					



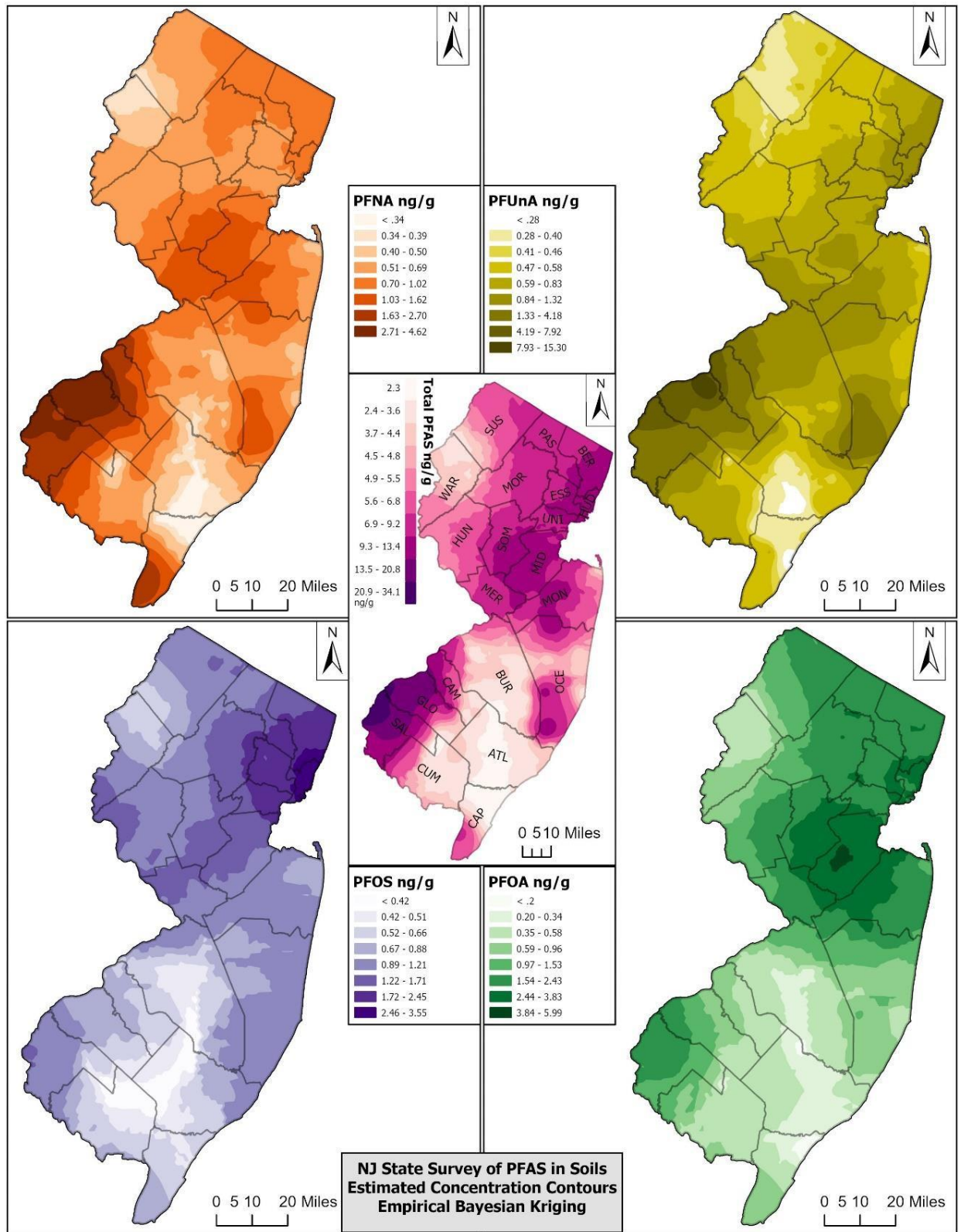
**Figure 3:** Summary percentiles of PFAS concentrations. The horizontal red dotted lines represent the highest detection limit for each PFAS (i.e., multiple detection levels were reported for each compound). Box plot: box, 25th-75th percentiles; center line, median; whiskers, minimum & maximum. Note: Only PFAS with sufficient detections (> 5) are displayed.

## *PFAS Spatial Distribution*

Concentration contour maps developed using Empirical Bayesian Kriging (*Figure 4, Figure A5*) and graduated symbol maps (*Figures A6-A7*) were used to visualize the distribution of PFAS across New Jersey. In general, the highest total PFAS concentrations were found along the New York to Philadelphia corridor (from Bergen County in the northeast to Salem County in the southwest), an area known for high population density and current and historic industrial activity (Johnson, 1987). The distribution of specific PFAS compounds varied across the state with the highest levels of PFCAs found in Gloucester County (max  $\sum$ PFCA = 30.93 ng/g) and Salem County (max  $\sum$ PFCA = 33.37 ng/g) in the southwestern portion of the state while PFOS concentrations were the highest in the industrial areas of northeast New Jersey (Essex max PFOS = 5.20 ng/g, Hudson max PFOS = 4.65 ng/g).

To further evaluate the spatial distribution of PFAS across New Jersey, median concentrations of each PFAS compound were calculated by county (*Table A27, Figure A8*). Statistically significant differences ( $p < 0.05$ ) between counties were observed for many PFAS compounds (*Table A28*). County-level maps (*Figures A9-A29*) further demonstrate the differences in PFAS occurrence throughout the state.

Sampling results were also analyzed to evaluate for any potential concentration differences between urban and rural areas (*Table A29*). Six PFAS compounds (PFOS, PFDS, PFDA, perfluorododecanoic acid (PFDoA), perfluorotetradecanoic acid (PFTeDa), PFTrDA) were found to have higher concentrations in urban areas ( $p < 0.05$ ) where there is increased industrial activity and denser population. This finding shares some consistency with the Maine study in which a statically significant difference between urban and rural areas was observed for PFOS and PFDA (Sanborn, Head & Associates, Inc., 2022).



**Figure 4:** Maps of estimated concentration contours generated using Empirical Bayesian Kriging for PFNA (top left), PFUnA (top right), PFOS (bottom left), PFOA (bottom right), and total PFAS (center).

## PFAS Leachability

The soil concentration results and the SPLP leachate results were used to estimate the leaching potential for each sample following the equations and procedures described in the NJDEP's *Alternative Remediation Standards Technical Guidance for Soil and Soil Leachate for the Migration to Ground Water Exposure Pathway* (NJDEP 2021). Sample-specific soil-water partitioning coefficients ( $K_d$  values) were calculated using the equation below:

$$K_d = \frac{(C_T * M_S - C_{SPLP} * V_L) / M_S}{C_{SPLP}} \quad \text{Equation 1}$$

where  $K_d$  is the soil-water partition coefficient in liters per kilogram (L/kg),  $C_T$  is the total concentration of the contaminant in the SPLP soil sample in milligrams per kilogram (mg/kg),  $M_S$  is the total weight of the soil sample submitted for SPLP analysis (~ 0.1 kg),  $C_{SPLP}$  is the concentration of contaminant in the SPLP leachate in milligrams per liter (mg/L), and  $V_L$  is the volume of the SPLP leachate (~ 2 L).

$K_d$  values could not be calculated when either the total soil concentration ( $C_T$ ) or the SPLP leachate concentration ( $C_{SPLP}$ ) were below the laboratory MDL. This includes situations in which both the soil and leachate concentrations were below the MDL, and in instances of very strong adsorption (PFAS only detected in soil) and very weak adsorption (PFAS only detected in leachate).  $K_d$  values for the four compounds currently regulated in New Jersey are shown below in *Table 3*. Full summary statistics for  $K_d$  values calculated for all evaluated PFAS compounds can be found in *Table A30*.

**Table 3:** Summary statistics for calculated  $K_d$  values (L/kg) for compounds currently regulated in New Jersey including sample size (n), mean, standard deviation (SD), standard error (SE), and percentiles (50 = median).

PFAS	n	Mean	SD	SE	Min	5	25	50	75	95	Max
PFOA	146	82.2	149.0	11.9	-2.3	10.3	25.0	44.8	75.1	253.0	1,410.0
PFNA	148	124.0	150.0	12.0	4.7	21.5	39.3	75.0	137.0	434.0	978.0
PFOS	151	206.0	171.0	13.7	10.5	49.9	101.0	151.0	251.0	530.0	1275.0
HFPO-DA	10	49.1	25.1	2.0	17.9	18.2	29.0	49.8	69.3	82.8	84.4

The  $K_d$  values can be used, along with other parameters, to calculate a SRS-MGW for a given PFAS compound:

$$SRS_{MGW} = GWRS * \frac{mg}{1000 \mu g} * \left( K_d + \frac{\theta_w + (\theta_a * H')}{\rho_b} \right) * DAF \quad \text{Equation 2}$$

where  $SRS_{MGW}$  is the soil remediation standard for the migration to ground water exposure pathway (noting that this can never be set lower than the analytical reporting limit per N.J.A.C. 7:26D-4.4),  $GWRS$  is the NJDEP ground water remediation standard for a given PFAS compound in micrograms per liter (0.014  $\mu\text{g/L}$  for PFOA, 0.013  $\mu\text{g/L}$  for PFNA, 0.013  $\mu\text{g/L}$  for PFOS, and 0.020  $\mu\text{g/L}$  for HFPO-DA),  $\theta_w$  is the water-filled soil porosity under natural field conditions (NJDEP default value = 0.23),  $\theta_a$  is the air-filled soil porosity under natural field conditions

(NJDEP default value = 0.18),  $H'$  is the dimensionless Henry's law constant,  $\rho_b$  is the bulk density of the soil in kilogram per liter (NJDEP default value = 1.5 kg/L), and  $DAF$  is the dilution-attenuation factor (NJDEP default value = 20).

For many PFAS compounds, information on Henry's Law constants is either lacking or highly variable with reported values spanning many orders of magnitude (ITRC, 2023b). Thus, this term was excluded from the soil criterion calculation for the migration to ground water exposure pathway, simplifying Equation 2 to the following:

$$SRS_{MGW} = GWRS * \frac{mg}{1000 \text{ kg}} * \left( K_d + \frac{\theta_w}{\rho_b} \right) * DAF \quad \text{Equation 3}$$

To examine the impact of the removal of the  $\theta_a * H'$  term, the dimensionless Henry's Law constants published on the EPA Regional Screening Level (RSL) tables were used to compare the SRS-MGW calculated using equations 2 and 3 (USEPA 2024). The removal of this term resulted in a <1% difference in calculated soil remediation standards for PFOA, PFNA, PFOS, and HFPO-DA, suggesting that for these compounds, the removal of the  $\theta_a * H'$  does not have a major effect on the calculation of SRS-MGW.

### *Comparison to NJDEP Standards*

The concentration results were compared to NJDEP's current interim soil remediation standards for PFOA, PFOS, PFNA, and HFPO-DA (*Table 1*). All measured concentrations for these compounds were below the NJDEP's interim residential and non-residential SRS-ID. The other 36 PFAS compounds evaluated in this study are not currently regulated by NJDEP and thus, measured concentrations could not be compared to regulatory soil remediation standards.

Interim SRS-MGW are to be calculated on a site-specific basis. Per NJDEP guidance, this requires, in most instances, SPLP analysis of a minimum of three samples from each site or area of concern (NJDEP 2021). Since only one sample was collected at each location and  $K_d$  values could not be calculated for all samples, the 5<sup>th</sup> percentile  $K_d$  value from the statewide data set was selected to evaluate the migration to ground water exposure pathway. This value would be representative of a soil with a high leaching potential and thus, a more stringent SRS-MGW. SRS-MGW of 2.9 ng/g for PFOA, 5.6 ng/g for PFNA, 13 ng/g for PFOS, and 7.3 ng/g for HFPO-DA were calculated using Equation 3 and the 5<sup>th</sup> percentile  $K_d$  values reported in *Table 3*. All measured PFOS and HFPO-DA concentrations in this study are below these SRS-MGW values. 26 PFOA (16.6%) and 1 PFNA (0.6%) samples had concentrations above these values. It should be noted that this analysis was done as an exercise to evaluate the migration to groundwater exposure pathway on a state-wide basis based on the results of this study. When examining sample-specific SRS-MGW (albeit calculated based on a single sample), only 9 PFOA (5.7%) samples had concentrations exceeding sample-specific SRS-MGW and no PFNA samples had concentrations exceeding sample-specific SRS-MGW. Overall, these results suggest that the vast majority of samples collected in this study had PFAS concentrations below the relevant SRS-MGW. However, it should also be noted that PFAS leachability is known to vary significantly based on soil properties and site-specific conditions could result in  $K_d$  values outside of the range reported in this study.

## Limitations

This study was designed as an initial investigation to survey PFAS concentrations in surficial soils throughout New Jersey. The following limitations should be considered when interpreting the results presented in this report:

- **Study design limitations:** This study was strategically designed to evaluate potential PFAS impacts due to atmospheric deposition, and all available internal and external data relevant to PFAS contamination were used to select sample locations spatially distant from currently known PFAS contamination or presumptive sources of potential PFAS contamination. However, it is important to note that it is impossible to fully rule out potential non-atmospheric contributions of PFAS at sampling locations (e.g., soil amendments, prior PFAS discharges not reported to the Department).
- **Temporal limitations:** The results represent PFAS soil concentrations at one point in time. The use of PFAS compounds has evolved with the phase out of legacy PFAS compounds (e.g., PFOA, PFOS) and the increased use of replacement PFAS compounds (e.g., PFBS, HFPO-DA). Given the potential for PFAS compounds, especially shorter chain PFAS, to migrate through the soil column, the full extent of PFAS contamination at a given location is likely not captured by evaluating surficial soils. To further understand historical and ongoing impacts, soil samples should be collected from multiple depth intervals along with collocated ground water sampling.
- **Spatial limitations:** The 157 samples collected in this study represent an average of one sample per 55.55 square miles in New Jersey. This sample distribution and frequency likely does not account for all variability in soil and geochemical conditions across the state, a factor known to influence PFAS retention in soils. Further, soil concentrations are likely impacted by proximity to sources of releases to the atmosphere and subsequent deposition. Thus, the range of concentrations reported in this study most likely does not capture all the variability in PFAS soil impacts from atmospheric deposition.
- **Analytical limitations:** This study only examined the 40 PFAS compounds included in EPA method 1633. This represents a very small subset of PFAS compounds and may not capture all PFAS related impacts at a given sampling location. Additional analyses such as non-target analysis would be needed to better understand the full extent of PFAS in New Jersey soils. It should also be noted that analytical MDLs and RLs varied by compound and by sample. For samples reported as being below the MDL (i.e., non-detect), results should be interpreted with care, as the concentration in non-detects can range from zero up to the MDL.
- **SPLP limitations:** Certain materials used in the SPLP methodology, such as filters and glass vessels, may adsorb PFAS. Any retention of PFAS on these materials would result in an underestimation of the SPLP leachate concentration. This is of particular concern for the more hydrophobic, longer-chain PFAS compounds.

## Conclusions

This study was designed to investigate PFAS soil impacts from atmospheric deposition in both urban and rural areas across New Jersey. Sampling locations were carefully selected in all counties based on criteria to ensure accessibility, to minimize proximity to known PFAS contamination or presumptive sources of potential PFAS contamination, and to avoid locations with current or historic agricultural activity due to the potential for PFAS contamination from biosolids application. In total, 157 samples were collected from surficial soils across the state.

Many PFAS compounds were detected in the collected samples with detection frequencies >50% for the C4-C13 PFCAs and PFOS. The composition and sum of total PFAS varied significantly across the state, with statistically significant differences in individual PFAS concentrations identified between many counties indicating the presence of localized areas with greater impacts. A statistically significant increase in PFAS concentration was also observed in urban areas relative to rural areas for a number of longer-chain PFAS compounds.

Despite the widespread occurrence of many PFAS compounds, no sample had concentrations exceeding NJDEP's current interim residential or non-residential SRS-ID for PFOS, PFOA, PFNA, and HFPO-DA. An evaluation of PFAS leachability also suggests that the vast majority of samples would not exceed a calculated area of concern/site-specific SRS-MGW for PFOS, PFOA, PFNA, and HFPO-DA. Thus, these results suggest that while PFAS compounds are prevalent in New Jersey soils, they are generally found at levels below current regulatory standards<sup>3</sup>.

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<sup>3</sup> Importantly, PFAS are human-made and not naturally occurring, and all PFAS contamination, including that resulting from atmospheric deposition, originated from an anthropogenic source. The New Jersey Department of Environmental Protection has therefore determined that there is no level of any PFAS compound in any environmental media that would constitute a background concentration of such a compound if and where it may be present. The Department is not precluding a person responsible for conducting remediation's (PRCR's) ability to document an off-site source (N.J.S.A. 58:10B-12.g.).

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## **Appendix A: Additional Tables and Figures**

## Tables

**Table A1:** Abbreviations for counties in New Jersey.

<b>County</b>	<b>Abbreviation</b>
<b>Atlantic</b>	ATL
<b>Bergen</b>	BER
<b>Burlington</b>	BUR
<b>Camden</b>	CAM
<b>Cape May</b>	CAP
<b>Cumberland</b>	CUM
<b>Essex</b>	ESS
<b>Gloucester</b>	GLO
<b>Hudson</b>	HUD
<b>Hunterdon</b>	HUN
<b>Mercer</b>	MER
<b>Middlesex</b>	MID
<b>Monmouth</b>	MON
<b>Morris</b>	MOR
<b>Ocean</b>	OCE
<b>Passaic</b>	PAS
<b>Salem</b>	SAL
<b>Somerset</b>	SOM
<b>Sussex</b>	SUS
<b>Union</b>	UNI
<b>Warren</b>	WAR

**Table A2:** Sampling locations. Coordinates are reported in the New Jersey State Plane system.

Sample ID	X Coord	Y Coord	Location	Municipality
Atl-Rur-1	496382.2207	231282.3159	Absecon Wildlife Management Area	Galloway Township
Atl-Rur-2	423176.099	254478.5572	Makepeace Lake	Hamilton Township
Atl-Rur-3	423437.48	315125.6	Wharton State Forest	Mullica Township
Atl-Rur-4	503135.7806	259289.5295	Chestnut Neck Battle Monument	Port Republic City
Atl-Urb-1	449897.7621	192200.5899	Egg Harbor Township Regional Park	Egg Harbor Township
Atl-Urb-2	498549.3426	187522.4372	Titus Field Complex	Margate City
Atl-Urb-3	461858.5778	172610.7997	John F Kennedy Park	Somers Point City
Atl-Urb-4	476985.8667	191545.6814	Cove Avenue Park	Northfield City
Ber-Rur-1	573435.4248	811991.7778	Campgaw Mountain Reservation	Mahwah Township
Ber-Rur-2	559239.0228	803626.4077	Ramapo Mountain	Oakland Borough
Ber-Rur-3	562741.577	814076.653	Ringwood State Park	Mahwah Township
Ber-Rur-4	580484.218	828263.796	Ramapo Valley County Reservation	Mahwah Township
Ber-Urb-1	652518.8861	780350.1305	Palisades Park	Alpine Borough
Ber-Urb-2	639847.793	743776.7528	Flat Rock Brook	Englewood City
Ber-Urb-3	628470.9598	795866.9278	Cherry Brook Woods	River Vale Township
Ber-Urb-4	616948.5698	757667.3166	Staib Park	Hackensack City
Bur-Rur-1	496616.3088	306933.4845	Bass River State Forest	Bass River Township
Bur-Rur-2	499848.1288	333557.9663	Penn State Forest	Washington Township
Bur-Rur-3	394186.2072	356985.1409	Wharton State Forest	Medford Township
Bur-Rur-4	488666.6734	384754.7855	Brendan T Byrne State Forest	Woodland Township
Bur-Urb-1	486167.9724	408157.9034	Brendan T. Byrne State Forest	Pemberton Township
Bur-Urb-2	394393.5487	368658.7567	Centennial Woods	Medford Township
Bur-Urb-3	447755.5144	382914.4408	Rancocas Conservancy	Southampton Township
Bur-Urb-4	399270.79	424628.64	Rancocas State Park	Hainesport Township
Cam-Rur-1	367573.6102	330986.2999	New Brooklyn Park	Winslow Township
Cam-Rur-2	381274.4138	307710.6738	Winslow Wildlife Management Area	Winslow Township
Cam-Rur-3	411141.502	339230.8861	Wharton State Forest	Waterford Township
Cam-Rur-4	407496.4831	308053.9553	Wharton State Forest	Waterford Township
Cam-Urb-1	380690.0492	329538.8858	Tom Wells Road Park	Winslow Township
Cam-Urb-2	344750.561	337337.4017	Lake Mathilde	Gloucester Township
Cam-Urb-3	356684.1155	317983.3475	Winslow Township Oak Forest	Winslow Township
Cam-Urb-4	348140.7324	375672.3283	Cooper River Park	Lawnside Borough
Cap-Rur-1	377306.614	86512.62805	Dennis Creek Wildlife Management Area	Middle Township
Cap-Rur-2	393507.3959	171690.0036	Belleplaine State Forest	Upper Township
Cap-Rur-3	389819.9348	151266.7587	Belleplaine State Forest	Dennis Township
Cap-Rur-4	402567.5051	118185.4322	Beaver Swamp Wildlife Management Area	Dennis Township
Cap-Urb-1	430852.9397	104884.3492	Townsend's Inlet Park	Sea Isle City
Cap-Urb-2	450993.2599	140103.1406	Corson's Inlet	Ocean City
Cap-Urb-3	443403.7505	147574.8501	Cape May County Park North	Upper Township
Cap-Urb-4	411906.6833	123570.382	Dennis Township Recreation Center	Dennis Township
Cum-Rur-1	326726.682	219729.2944	Union Lake Wildlife Management Area	Downe Township
Cum-Rur-2	342686.8427	132551.3828	East Point Lighthouse Heislerville Wildlife Management Area	Maurice Township

<b>Sample ID</b>	<b>X Coord</b>	<b>Y Coord</b>	<b>Location</b>	<b>Municipality</b>
Cum-Rur-3	257180.3913	196483.439	Dix Wildlife Management Area	Fairfield Township
Cum-Rur-4	375982.9726	155374.4601	Belleplain State Forest	Maurice River Township
Cum-Urb-1	341502.66	247050.1318	Cunningham Park	Vineland City
Cum-Urb-2	363824.5612	237000.6092	Willow Oak	Vineland City
Cum-Urb-3	339142.4672	200414.0289	The Nature Conservancy	Millville City
Cum-Urb-4	339468.9266	257523.4652	Burnt Mill Pond	Vineland City
Ess-Rur-1	538980.0938	746629.7035	Great Piece Meadows	Fairfield Township
Ess-Rur-2	549348.216	751264.625	Great Piece Meadows	Fairfield Township
Ess-Urb-1	562962.6758	694086.7607	Ivy Hill Park	Newark City
Ess-Urb-2	562053.5208	725409.8936	Verona Park	Verona Township
Ess-Urb-3	572373.3508	737412.1015	Mills Reservation	Cedar Grove Township
Ess-Urb-4	534139.1412	701489.2354	East Orange Water Reserve	Livingston Township
Glo-Rur-1	374391.381	290715.445	Winslow Wildlife Management Area	Monroe Township
Glo-Rur-2	249717.8708	323108.7556	Woolwich Township Open Space	Woolwich Township
Glo-Rur-3	357578.2755	280653.785	White Oak Branch Wildlife Management Area	Franklin Township
Glo-Rur-4	330140.2051	309659.7303	Glassboro Wildlife Management Area	Glassboro Borough
Glo-Urb-1	367640.5362	314108.8864	Four Mile Branch Preserve	Monroe Township
Glo-Urb-2	290663.2427	331045.9661	Kings Lake	Harrison Township
Glo-Urb-3	323727.1854	331265.2357	Washington Lake Park	Washington Township
Glo-Urb-4	312203.6389	357452.0245	Glen Lake	Woodbury Heights Borough
Hud-Urb-1	589062.5284	698818.1452	West Hudson Park	Harrison Town
Hud-Urb-2	630951.9138	718326.307	James J Braddock Park	North Bergen Township
Hud-Urb-3	616548.7202	717109.9492	Schmidts Woods	Secaucus Town
Hud-Urb-4	606599.56	682946.43	Audubon Park	Jersey City
Hun-Rur-1	414032.9228	580000.9941	Sourland Mountain Preserve	East Amwell Township
Hun-Rur-2	342182.1432	574923.7999	Delaware & Raritan Canal State Park	Delaware Township
Hun-Rur-3	384962.4009	708297.5256	Point Mountain Musconetcong River Reserve	Lebanon Township
Hun-Rur-4	396075.438	698512.8981	Teetertown Ravine Nature Preserve	Lebanon Township
Hun-Urb-1	395983.493	593536.0864	Raritan Township Wooded Vacant Land	Raritan Township
Hun-Urb-2	381669.5728	650189.8307	Clinton Township Municipal Open Space	Clinton Township
Hun-Urb-3	390751.9388	637334.9037	Echo Hill Environmental Center	Clinton Township
Hun-Urb-4	398922.829	656443.9642	Round Valley Recreation Area	Lebanon Borough
Mer-Rur-1	415820.1938	559411.1124	Stony Brook Millstone Watershed	Hopewell Township
Mer-Rur-2	475704.327	504804.127	Assunpink Wildlife Management Area	Robbinsville Township
Mer-Rur-3	420117.72	543171.6199	Rosedale Park	Hopewell Township
Mer-Rur-4	387366.355	542044.61	Washington Crossing State Park	Hopewell Township
Mer-Urb-1	428227.4341	524860.5703	Nassau-Pine Knoll Rec	Lawrence Township
Mer-Urb-2	411399.1416	512186.5867	Cadwalader Park	Trenton City
Mer-Urb-3	478538.6297	521369.381	Bear Brook Greenway	East Windsor Township
Mer-Urb-4	453053.0537	531574.5752	Public Access	West Windsor Township
Mid-Rur-1	537577.4211	574378.421	Deep Run Preserve	Old Bridge Township

Sample ID	X Coord	Y Coord	Location	Municipality
Mid-Rur-2	509749.3527	528364.4671	Public Access	Monroe Township
Mid-Rur-3	518040.738	567378.3881	Jamesburg Park	East Brunswick Township
Mid-Rur-4	537511.0088	560702.683	John A Philips Preserve	Old Bridge Township
Mid-Urb-1	551692.1209	614984.2519	Washington Park	Perth Amboy City
Mid-Urb-2	481367.1073	577227.6965	Beach Woods Park	South Brunswick Township
Mid-Urb-3	509087.79	584903.567	Public Access	East Brunswick Township
Mid-Urb-4	537124.31	622668.13	Roosevelt Park	Edison Township
Mon-Rur-1	596309.1553	476736.5202	Allaire State Park	Wall Township
Mon-Rur-2	501493.5441	497701.7706	Assunpink Wildlife Management Area	Upper Freehold Township
Mon-Rur-3	570528.9244	489743.8387	Manasquan Reservoir Recreation	Howell Township
Mon-Rur-4	572138.7407	541954.7579	Big Brook Park	Colts Neck Township
Mon-Urb-1	606032.9436	542359.0303	Swimming River Natural Area	Tinton Falls Borough
Mon-Urb-2	467689.424	489281.9564	Heritage Park	Allentown Borough
Mon-Urb-3	553758.3375	543177.862	Marlboro Township Vacant Land	Marlboro Township
Mon-Urb-4	630212.389	573939.7	Mount Mitchell Scenic Overlook	Highlands Borough
Mor-Rur-1	477610.0016	703994.6273	Lewis Morris County Park	Mendham Township
Mor-Rur-2	474038.0209	792900.15	Mahlon Dickerson Reservation	Jefferson Township
Mor-Rur-3	524106.3007	777505.6079	Pyramid Mountain State Park	Kinnelon Borough
Mor-Rur-4	504016.3012	774968.3414	Wildcat Ridge Wildlife Management Area	Rockaway Township
Mor-Urb-1	520138.9218	730779.8881	Old Troy County Park	Parsippany-Troy Hills Township
Mor-Urb-2	509059.9755	756270.8748	Tourne County Park	Denville Township
Mor-Urb-3	471354.9059	744454.758	Hedden County Park	Dover Town
Mor-Urb-4	539719.9198	779137.5469	Mountainside Park	Pequannock Township
Oce-Rur-1	531059.6057	345871.898	Bass River State Forest	Barnegat Township
Oce-Rur-2	507761.6024	465929.0001	Colliers Mills Wildlife Management Area	Jackson Township
Oce-Rur-3	542983.087	246271.199	Great Bay Boulevard Wildlife Management Area	Little Egg Harbor Township
Oce-Rur-4	594245.8898	418130.8884	Cattus Island Park	Toms River Township
Oce-Urb-1	537778.3006	406821.2155	William Raws Monument	Manchester Township
Oce-Urb-2	534402.4622	276955.276	Mill Branch Open Space	Little Egg Harbor Township
Oce-Urb-3	602895.9925	338799.6569	Barnegat Lighthouse State Park	Barnegat Light Borough
Oce-Urb-4	543957.1823	471837.3066	New Jersey Conservation Foundation	Jackson Township
Pas-Rur-1	548084.428	842618.3672	Long Pong Ironworks State Park	West Milford Township
Pas-Rur-2	560322.2821	842800.4022	Parks & Forestry	Ringwood Borough
Pas-Rur-3	515660.4492	806673.0873	Echo Lake Recreational Facility	West Milford Township
Pas-Rur-4	516580.1599	846974.2288	Wawayanda State Park	West Milford Township
Pas-Urb-1	538182.0193	792784.8271	Friendship Park	Bloomington Borough
Pas-Urb-2	553346.7836	794520.3511	Ramapo Mountain State Forest	Oakland Borough
Pas-Urb-3	591791.1575	735014.7431	Veterans Memorial Park	Passaic City
Pas-Urb-4	550796.354	763374.2238	Wayne Area Park	Wayne Township

<b>Sample ID</b>	<b>X Coord</b>	<b>Y Coord</b>	<b>Location</b>	<b>Municipality</b>
Sal-Rur-1	328344.1105	237867.1351	Union Lake Wildlife Management Area	Pittsgrove Township
Sal-Rur-2	230490.6478	215214.7995	Mad Horse Creek Wildlife Management Area	Lower Alloways Creek Township
Sal-Rur-3	257535.6797	287698.8294	Pilesgrove Township Vacant Forested Land	Pilesgrove Township
Sal-Rur-4	310741.3515	246167.0017	Parvin State Park	Pittsgrove Township
Sal-Urb-1	207266.7001	292343.9346	Pennsville Township Vacant Forested Land	Pennsville Township
Sal-Urb-2	210042.0486	268861.3211	Salem River Wildlife Management Area	Elsinboro Township
Sal-Urb-3	211432.9074	304348.6327	Pennsville Township Vacant Forested Land	Pennsville Township
Som-Rur-1	433200.4753	657909.5295	Lamington Greenway	Bedminster Township
Som-Rur-2	458406.8977	693108.0861	Little Brook Sanctuary	Bernardsville Borough
Som-Rur-3	450084.6535	669216.2927	River Road Park	Bedminster Township
Som-Rur-4	422983.7766	592374.6009	Sourland Mountain Preserve	Hillsborough Township
Som-Urb-1	457778.2155	661308.5034	2nd Watchung Mountain	Bridgewater Township
Som-Urb-2	446051.0749	613383.3292	Public Access	Hillsborough Township
Som-Urb-3	471722.9826	641708.6673	Washington Valley Park West	Bridgewater Township
Som-Urb-4	483631.8587	655207.8942	Pond Brook Valley	Warren Township
Sus-Rur-1	419329.0047	759172.6131	Allamuchy Mountain State Park	Byram Township
Sus-Rur-2	439987.8223	902310.2497	High Point State Park	Montague Township
Sus-Rur-3	405146.7562	816648.0989	Swartswood State Park	Hampton Township
Sus-Rur-4	481422.0898	834506.5563	Hamburg Mountain Wildlife Management Area	Hardyston Township
Sus-Urb-1	462779.6908	817697.5161	Sterling Hill Preserve	Ogdensburg Borough
Sus-Urb-2	428460.338	815632.892	Paulinskill River Wildlife Management Area	Hampton Township
Sus-Urb-3	475685.766	862848.8618	Walkkill River	Vernon Township
Sus-Urb-4	453220.3933	802194.9398	Ungerman Park	Sparta Township
Uni-Urb-1	567225.6124	665236.3108	Carteret Park	Elizabeth City
Uni-Urb-2	522227.1854	685647.8235	Passaic River Park	New Providence Borough
Uni-Urb-3	507480.5987	671421.4674	Public Access	Berkeley Heights Township
Uni-Urb-4	544269.8296	680251.1371	Rahway River Parkway	Springfield Township
War-Rur-1	355599.0938	737245.7738	Jenny Jump State Forest	Liberty Township
War-Rur-2	319251.236	779969.257	Worthington State Forest	Hardwick Township
War-Rur-3	369928.7282	724930.6665	Pequest Wildlife Management Area	Mansfield Township
War-Rur-4	365972.0113	780776.9672	Limestone Ridge Preserve	Blairstown Township
War-Urb-1	354620.0997	707500.476	Pohatcong Creek	Washington Township
War-Urb-2	396692.7156	724141.0638	Municipal Park	Mansfield Township
War-Urb-3	401196.5623	741604.0472	Mount Rascal Preserve	Independence Township
War-Urb-4	308044.0104	673994.8337	Lock Street Park	Phillipsburg Town

**Table A3:** PFAS analyte list.

Acronym	Name	CAS Number	Formula
PFBA	Perfluorobutanoic acid	375-22-4	C <sub>4</sub> HF <sub>7</sub> O <sub>2</sub>
PFPeA	Perfluoropentanoic acid	2706-90-3	C <sub>5</sub> HF <sub>9</sub> O <sub>2</sub>
PFHxA	Perfluorohexanoic acid	307-24-4	C <sub>6</sub> HF <sub>11</sub> O <sub>2</sub>
PFHpA	Perfluoroheptanoic acid	375-85-9	C <sub>7</sub> HF <sub>13</sub> O <sub>2</sub>
PFOA	Perfluorooctanoic acid	335-67-1	C <sub>8</sub> HF <sub>15</sub> O <sub>2</sub>
PFNA	Perfluorononanoic acid	375-95-1	C <sub>9</sub> HF <sub>17</sub> O <sub>2</sub>
PFDA	Perfluorodecanoic acid	335-76-2	C <sub>10</sub> HF <sub>19</sub> O <sub>2</sub>
PFUnA	Perfluoroundecanoic acid	2058-94-8	C <sub>11</sub> HF <sub>21</sub> O <sub>2</sub>
PFDoA	Perfluorododecanoic acid	307-55-1	C <sub>12</sub> HF <sub>23</sub> O <sub>2</sub>
PFTTrDA	Perfluorotridecanoic acid	72629-94-8	C <sub>13</sub> HF <sub>25</sub> O <sub>2</sub>
PFTTeDA	Perfluorotetradecanoic acid	376-06-7	C <sub>14</sub> HF <sub>27</sub> O <sub>2</sub>
PFBS	Perfluorobutanesulfonic acid	375-73-5	C <sub>4</sub> HF <sub>9</sub> O <sub>3</sub> S
PFPeS	Perfluoropentanesulfonic acid	2706-91-4	C <sub>5</sub> HF <sub>11</sub> O <sub>3</sub> S
PFHxS	Perfluorohexanesulfonic acid	355-46-4	C <sub>6</sub> HF <sub>13</sub> O <sub>3</sub> S
PFHpS	Perfluoroheptanesulfonic Acid	375-92-8	C <sub>7</sub> HF <sub>15</sub> O <sub>3</sub> S
PFOS	Perfluorooctanesulfonic acid	1763-23-1	C <sub>8</sub> HF <sub>17</sub> O <sub>3</sub> S
PFNS	Perfluorononanesulfonic acid	68259-12-1	C <sub>9</sub> HF <sub>19</sub> O <sub>3</sub> S
PFDS	Perfluorodecanesulfonic acid	335-77-3	C <sub>10</sub> HF <sub>21</sub> O <sub>3</sub> S
PFDoS	Perfluorododecanesulfonic acid	79780-39-5	C <sub>12</sub> HF <sub>25</sub> O <sub>3</sub> S
4:2FTS	1H,1H,2H,2H-Perfluorohexanesulfonic Acid	757124-72-4	C <sub>6</sub> H <sub>5</sub> F <sub>9</sub> O <sub>3</sub> S
6:2FTS	1H,1H,2H,2H-Perfluorooctanesulfonic Acid	27619-97-2	C <sub>8</sub> H <sub>5</sub> F <sub>13</sub> O <sub>3</sub> S
8:2FTS	1H,1H,2H,2H-Perfluorodecanesulfonic Acid	39108-34-4	C <sub>10</sub> H <sub>5</sub> F <sub>17</sub> O <sub>3</sub> S
PFOSA	Perfluorooctanesulfonamide	754-91-6	C <sub>8</sub> H <sub>2</sub> F <sub>17</sub> NO <sub>2</sub> S
NMeFOSA	N-Methyl Perfluorooctane Sulfonamide	31506-32-8	C <sub>9</sub> H <sub>4</sub> F <sub>17</sub> NO <sub>2</sub> S
NEtFOSA	N-Ethyl Perfluorooctane Sulfonamide	4151-50-2	C <sub>10</sub> H <sub>6</sub> F <sub>17</sub> NO <sub>2</sub> S
NMeFOSAA	N-Methyl Perfluorooctanesulfonamidoacetic Acid	2355-31-9	C <sub>11</sub> H <sub>6</sub> F <sub>17</sub> NO <sub>4</sub> S
NEtFOSAA	N-Ethyl Perfluorooctanesulfonamidoacetic Acid	2991-50-6	C <sub>12</sub> H <sub>8</sub> F <sub>17</sub> NO <sub>4</sub> S
NMeFOSE	N-Methyl Perfluorooctanesulfonamido Ethanol	24448-09-7	C <sub>11</sub> H <sub>8</sub> F <sub>17</sub> NO <sub>3</sub> S
NEtFOSE	N-Ethyl Perfluorooctanesulfonamido Ethanol	1691-99-2	C <sub>12</sub> H <sub>10</sub> F <sub>17</sub> NO <sub>3</sub> S
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid	13252-13-6	C <sub>6</sub> HF <sub>11</sub> O <sub>3</sub>
ADONA	4,8-Dioxa-3h-Perfluorononanoic Acid	919005-14-4	C <sub>7</sub> H <sub>2</sub> F <sub>12</sub> O <sub>4</sub>
9Cl-PF3ONS	9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	756426-58-1	C <sub>8</sub> HClF <sub>16</sub> O <sub>4</sub> S
11Cl-PF3OUdS	11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic	763051-92-9	C <sub>10</sub> HClF <sub>20</sub> O <sub>4</sub> S
PFMPA	Perfluoro-3-Methoxypropanoic Acid	377-73-1	C <sub>4</sub> HF <sub>7</sub> O <sub>3</sub>
PFMBA	Perfluoro-4-Methoxybutanoic Acid	863090-89-5	C <sub>5</sub> HF <sub>9</sub> O <sub>3</sub>
PFEESA	Perfluoro(2-Ethoxyethane)Sulfonic Acid	113507-82-7	C <sub>4</sub> HF <sub>9</sub> O <sub>4</sub> S
NFDHA	Nonafluoro-3,6-Dioxaheptanoic Acid	151772-58-6	C <sub>5</sub> HF <sub>9</sub> O <sub>4</sub>
3:3FTCA	3-Perfluoropropyl Propanoic Acid	356-02-5	C <sub>6</sub> H <sub>5</sub> F <sub>7</sub> O <sub>2</sub>
5:3FTCA	2H,2H,3H,3H-Perfluorooctanoic Acid	914637-49-3	C <sub>8</sub> H <sub>5</sub> F <sub>11</sub> O <sub>2</sub>
7:3FTCA	3-Perfluoroheptyl Propanoic Acid	812-70-4	C <sub>10</sub> H <sub>5</sub> F <sub>15</sub> O <sub>2</sub>

**Table A4:** Average and range of reporting limits (ng/g) and method detection limits (ng/g) for each PFAS. Number of non-detects (n\_cen) for each PFAS are also depicted.

Analyte	n_cen	Reporting Limit		Method Detection Limit	
		Average (ng/g)	Range (ng/g)	Average (ng/g)	Range (ng/g)
PFBA	18	0.816	0.574 – 2.94	0.051	0.036 – 0.185
PFPeA	16	0.408	0.287 – 1.47	0.057	0.040 – 0.206
PFHxA	15	0.204	0.144 – 0.734	0.047	0.033 – 0.170
PFHpA	11	0.204	0.144 – 0.734	0.024	0.017 – 0.085
PFOA	9	0.204	0.144 – 0.734	0.053	0.037 – 0.191
PFNA	6	0.204	0.144 – 0.734	0.08	0.056 – 0.288
PFDA	4	0.204	0.144 – 0.734	0.077	0.054 – 0.276
PFUnA	2	0.204	0.144 – 0.734	0.052	0.037 – 0.188
PFDaA	9	0.204	0.144 – 0.734	0.042	0.029 – 0.150
PFTTrDA	12	0.204	0.144 – 0.734	0.054	0.038 – 0.194
PFTeDA	117	0.204	0.144 – 0.734	0.109	0.076 – 0.391
PFBS	79	0.204	0.144 – 0.734	0.044	0.031 – 0.159
PFPeS	151	0.204	0.144 – 0.734	0.024	0.017 – 0.085
PFHxS	128	0.204	0.144 – 0.734	0.06	0.043 – 0.217
PFHpS	154	0.204	0.144 – 0.734	0.038	0.026 – 0.135
PFOS	3	0.204	0.144 – 0.734	0.081	0.057 – 0.291
PFNS	157	0.204	0.144 – 0.734	0.043	0.030 – 0.156
PFDS	148	0.204	0.144 – 0.734	0.033	0.023 – 0.118
PFDoS	132	0.204	0.144 – 0.734	0.039	0.028 – 0.141
PFOSA	155	0.204	0.144 – 0.734	0.044	0.031 – 0.159
NMeFOSA	157	0.204	0.144 – 0.734	0.102	0.072 – 0.367
NEtFOSA	157	0.204	0.144 – 0.734	0.114	0.080 – 0.411
NMeFOSAA	157	0.204	0.144 – 0.734	0.102	0.072 – 0.367
NEtFOSAA	154	0.204	0.144 – 0.734	0.084	0.059 – 0.303
NMeFOSE	156	2.04	1.44 – 7.34	0.256	0.180 – 0.920
NEtFOSE	157	2.04	1.44 – 7.34	0.521	0.366 – 1.87
HFPO-DA	139	0.816	0.574 – 2.94	0.1	0.071 – 0.361
ADONA	157	0.816	0.574 – 2.94	0.149	0.105 – 0.538
9Cl-PF3ONS	157	0.816	0.574 – 2.94	0.2	0.141 – 0.720
11Cl-PF3OUdS	157	0.816	0.574 – 2.94	0.171	0.120 – 0.614
PFMPA	157	0.408	0.287 – 1.47	0.042	0.029 – 0.150
PFMBA	157	0.408	0.287 – 1.47	0.032	0.022 – 0.114
PFEESA	157	0.408	0.287 – 1.47	0.085	0.060 – 0.306
NFDHA	157	0.408	0.287 – 1.47	0.097	0.068 – 0.350
3:3FTCA	157	1.02	0.718 – 3.67	0.147	0.103 – 0.529
5:3FTCA	157	5.1	3.59 – 18.4	0.515	0.362 – 1.85

7:3FTCA	157	5.1	3.59 – 18.4	1.8	1.26 – 6.46
4:2FTS	157	0.816	0.574 – 2.94	0.083	0.058 – 0.297
6:2FTS	154	0.816	0.574 – 2.94	0.286	0.201 – 1.03
8:2FTS	157	0.816	0.574 – 2.94	0.395	0.278 – 1.42

**Table A5:** Atlantic County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	ATL-RUR-1	ATL-RUR-2	ATL-RUR-3	ATL-RUR-4	ATL-URB-1	ATL-URB-2	ATL-URB-3	ATL-URB-4
PFBA	0.235 J	< 0.049	0.083 J	< 0.049	0.072 J	0.158 J	0.116 J	0.324 J
PFPeA	0.181 J	< 0.054	0.105 J	< 0.054	0.059 J	0.094 J	0.083 J	0.192 J
PFHxA	0.126 J F	< 0.045	0.075 J F	< 0.045	0.056 J	0.097 J	0.067 J	0.141 J
PFHpA	0.166 J	< 0.023	0.042 J	< 0.022	0.045 J	0.085 J	0.080 J	0.121 J
PFOA	0.505	< 0.051	0.086 J	0.108 J	0.141 J	0.144 J	0.182 J	0.274
PFNA	0.476	< 0.076	0.193 J	0.309	0.145 J	0.235	0.41	0.604
PFDA	0.159 J	< 0.073	0.114 J	0.216	0.087 J F	0.281	0.232	0.279
PFUnA	0.186 J	0.135 J	0.331	1.21	0.126 J	0.461	0.217	0.866
PFDoA	< 0.040	< 0.040	0.060 J	0.199	0.064 J	0.188 J	0.065 J	0.109 J
PFTTrDA	< 0.052	< 0.051	0.057 J	0.192 J	< 0.052	0.115 J	< 0.052	0.078 J
PFTeDA	< 0.104	< 0.103	< 0.106	< 0.103	< 0.104	< 0.103	< 0.105	< 0.105
PFBS	< 0.042	< 0.042	< 0.043	< 0.042	< 0.042	< 0.042	< 0.043	< 0.043
PFPeS	< 0.023	< 0.023	< 0.023	< 0.022	< 0.023	< 0.022	< 0.023	< 0.023
PFHxS	< 0.058	< 0.058	< 0.059	< 0.057	< 0.058	< 0.057	< 0.058	< 0.058
PFHpS	< 0.036	< 0.036	< 0.037	< 0.036	< 0.036	< 0.036	< 0.036	< 0.036
PFOS	0.599	< 0.077	0.28	0.689	0.32	1.27	0.785	0.768
PFNS	< 0.041	< 0.041	< 0.042	< 0.041	< 0.041	< 0.041	< 0.042	< 0.042
PFDS	< 0.031	< 0.031	< 0.032	< 0.031	< 0.031	0.081 J	< 0.032	< 0.032
PFDoS	< 0.037	< 0.037	< 0.038	< 0.037	0.054 J F	< 0.037	< 0.038	< 0.038
4:2FTS	< 0.079	< 0.079	< 0.081	< 0.078	< 0.079	< 0.078	< 0.080	< 0.080
6:2FTS	< 0.273	< 0.272	< 0.280	< 0.270	< 0.274	0.367 J	< 0.275	< 0.275
8:2FTS	< 0.378	< 0.376	< 0.387	< 0.374	< 0.378	< 0.374	< 0.381	< 0.381
PFOSA	< 0.042	< 0.042	< 0.043	< 0.042	< 0.042	< 0.042	< 0.043	< 0.043
NMeFOSA	< 0.098	< 0.097	< 0.100	< 0.097	< 0.098	< 0.097	< 0.098	< 0.098
NEtFOSA	< 0.109	< 0.109	< 0.112	< 0.108	< 0.109	< 0.108	< 0.110	< 0.110
NMeFOSAA	< 0.098	< 0.097	< 0.100	< 0.097	< 0.098	< 0.097	< 0.098	< 0.098
NEtFOSAA	< 0.080	< 0.080	< 0.082	< 0.080	< 0.081	< 0.080	< 0.081	< 0.081
NMeFOSE	< 0.244	< 0.243	< 0.250	< 0.242	< 0.245	< 0.242	< 0.246	< 0.246
NEtFOSE	< 0.498	< 0.496	< 0.510	< 0.493	< 0.499	< 0.494	< 0.502	< 0.502
HFPO-DA	< 0.096	< 0.096	< 0.098	< 0.095	< 0.096	< 0.095	< 0.097	< 0.097
ADONA	< 0.143	< 0.142	< 0.146	< 0.141	< 0.143	< 0.142	< 0.144	< 0.144
9CI-PF3ONS	< 0.191	< 0.190	< 0.196	< 0.189	< 0.192	< 0.190	< 0.193	< 0.193

11Cl-PF3OUdS	< 0.163	< 0.162	< 0.167	< 0.162	< 0.163	< 0.162	< 0.164	< 0.164
PFMPA	< 0.040	< 0.040	< 0.041	< 0.039	< 0.040	< 0.039	< 0.040	< 0.040
PFMBA	< 0.030	< 0.030	< 0.031	< 0.030	< 0.031	< 0.030	< 0.031	< 0.031
PFEESA	< 0.081	< 0.081	< 0.083	< 0.080	< 0.081	< 0.080	< 0.082	< 0.082
NFDHA	< 0.093	< 0.093	< 0.095	< 0.092	< 0.093	< 0.092	< 0.094	< 0.094
3:3FTCA	< 0.140	< 0.140	< 0.144	< 0.139	< 0.141	< 0.139	< 0.142	< 0.142
5:3FTCA	< 0.492	< 0.490	< 0.504	< 0.488	< 0.493	< 0.488	< 0.496	< 0.496
7:3FTCA	< 1.72	< 1.71	< 1.76	< 1.70	< 1.72	< 1.70	< 1.73	< 1.73
Σ PFAS	2.63	0.135	1.43	2.92	1.17	3.58	2.24	3.76

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A6:** Bergen County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	BER-RUR-1	BER-RUR-2	BER-RUR-3	BER-RUR-4	BER-URB-1	BER-URB-2	BER-URB-3	BER-URB-4
PFBA	0.646 J	0.968	0.594 J	0.590 J	0.592 J	0.492 J	0.444 J	1.5
PFPeA	0.371 J	0.53	0.290 J	0.411	0.390 J	0.289 J	0.235 J	1.92
PFHxA	0.301	0.412	0.222	0.384	0.358 F	0.227	0.177 J	0.974
PFHpA	0.313	0.488	0.21	0.277	0.335	0.252	0.180 J	0.606
PFOA	2.89	3.52	0.714	1.48	1.94	0.561	0.43	2.66
PFNA	1.19	1.79	0.69	0.79	0.73	0.452	0.652	1.19
PFDA	0.724	0.874	0.712	0.443	0.714	0.904	0.895	1.23
PFUnA	0.639	0.762	0.747	0.524	0.853	0.968	0.8	0.602
PFDaA	0.281	0.373	0.32	0.22	0.464	0.537	0.397	0.416
PFTTrDA	0.265	0.341	0.282	0.216	0.322	0.372	0.323	0.239
PFTeDA	0.125 J	0.152 J	0.118 J	0.113 J	0.151 J	0.183 J	0.157 J	0.156 J
PFBS	0.055 J	0.203	0.102 J	0.069 J	0.082 J	0.053 J	0.078 J	0.162 J
PFPeS	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	0.087 J
PFHxS	< 0.058	< 0.059	< 0.059	< 0.058	< 0.059	< 0.058	< 0.059	0.833
PFHpS	< 0.036	< 0.036	< 0.037	< 0.036	< 0.037	< 0.036	< 0.037	< 0.036
PFOS	1.92	2.18	1.11	1.09	1.44	1.4	2.08	2.85
PFNS	< 0.041	< 0.042	< 0.042	< 0.041	< 0.042	< 0.041	< 0.043	< 0.042
PFDS	< 0.031	< 0.032	< 0.032	< 0.031	< 0.032	< 0.031	< 0.032	< 0.031
PFDoS	< 0.037	< 0.038	< 0.038	< 0.037	< 0.038	< 0.037	< 0.039	< 0.038
4:2FTS	< 0.079	< 0.080	< 0.080	< 0.079	< 0.081	< 0.079	< 0.081	< 0.079
6:2FTS	< 0.272	< 0.277	< 0.278	< 0.273	< 0.279	< 0.273	< 0.28	< 0.274
8:2FTS	< 0.377	< 0.382	< 0.384	< 0.377	< 0.386	< 0.377	< 0.388	< 0.379
PFOSA	< 0.042	< 0.043	< 0.043	< 0.042	< 0.043	< 0.042	< 0.043	< 0.042
NMeFOSA	< 0.097	< 0.099	< 0.099	< 0.097	< 0.100	< 0.097	< 0.100	< 0.098

NEtFOSA	< 0.109	< 0.111	< 0.111	< 0.109	< 0.112	< 0.109	< 0.112	< 0.110
NMeFOSAA	< 0.097	< 0.099	< 0.099	< 0.097	< 0.100	< 0.097	< 0.100	< 0.098
NEtFOSAA	< 0.080	< 0.081	< 0.082	< 0.080	< 0.082	< 0.080	< 0.083	< 0.081
NMeFOSE	< 0.244	< 0.247	< 0.248	< 0.244	< 0.249	< 0.244	< 0.251	< 0.245
NEtFOSE	< 0.497	< 0.504	< 0.506	< 0.497	< 0.508	< 0.497	< 0.511	< 0.499
HFPO-DA	< 0.096	0.098 J	< 0.098	< 0.096	< 0.098	< 0.096	< 0.099	< 0.096
ADONA	< 0.142	< 0.145	< 0.145	< 0.143	< 0.146	< 0.142	< 0.147	< 0.143
9Cl-PF3ONS	< 0.191	< 0.194	< 0.194	< 0.191	< 0.195	< 0.191	< 0.196	< 0.192
11Cl-PF3OUdS	< 0.163	< 0.165	< 0.166	< 0.163	< 0.166	< 0.163	< 0.168	< 0.164
PFMPA	< 0.040	< 0.040	< 0.041	< 0.040	< 0.041	< 0.040	< 0.041	< 0.040
PFMBA	< 0.030	< 0.031	< 0.031	< 0.030	< 0.031	< 0.030	< 0.031	< 0.031
PFEESA	< 0.081	< 0.082	< 0.083	< 0.081	< 0.083	< 0.081	< 0.083	< 0.081
NFDHA	< 0.093	< 0.094	< 0.094	< 0.093	< 0.095	< 0.093	< 0.095	< 0.093
3:3FTCA	< 0.140	< 0.142	< 0.143	< 0.140	< 0.143	< 0.140	< 0.144	< 0.141
5:3FTCA	< 0.491	< 0.499	< 0.501	< 0.492	< 0.503	< 0.492	< 0.506	< 0.494
7:3FTCA	< 1.71	< 1.74	< 1.74	< 1.71	< 1.75	< 1.71	< 1.76	< 1.72
Σ PFAS	9.72	12.7	6.11	6.61	8.37	6.69	6.85	15.4

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A7:** Burlington County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	BUR-RUR-1	BUR-RUR-2	BUR-RUR-3	BUR-RUR-4	BUR-URB-1	BUR-URB-2	BUR-URB-3	BUR-URB-4
PFBA	0.075 J	< 0.049	0.075 J	0.078 J	0.087 J	0.324 J	0.239 J	0.064 J
PFPeA	0.068 J	0.278 J	0.071 J	< 0.055	0.076 J	0.226 J	0.159 J	0.057 J
PFHxA	0.128 J	< 0.045	0.056 J	0.055 J	0.080 J	0.188 J F	0.156 J	< 0.046
PFHpA	< 0.023	< 0.023	0.038 J	0.036 J	0.054 J	0.159 J	0.122 J	0.044 J
PFOA	< 0.052	< 0.051	0.058 J	0.109 J	0.125 J	0.513	0.697	0.383
PFNA	0.158 J	< 0.077	0.198	0.198	0.266	1.16	1.17	0.268
PFDA	0.159 J	< 0.074	0.155 J	0.147 J	0.245	0.482	0.529	0.159 J
PFUnA	0.581	0.150 J	0.77	0.367	0.838	1.29	1.37	0.854
PFDoA	0.138 J	< 0.040	0.124 J	0.074 J	0.198	0.239	0.269	0.116 J
PFTTrDA	0.129 J	< 0.052	0.148 J	0.082 J	0.2	0.262	0.242	0.121 J
PFTeDA	< 0.106	< 0.104	< 0.102	< 0.105	< 0.105	< 0.104	< 0.106	< 0.105
PFBS	< 0.043	< 0.042	< 0.042	< 0.043	< 0.043	0.093 J	0.065 J	< 0.043
PFPeS	< 0.023	< 0.023	< 0.022	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023
PFHxS	< 0.059	< 0.058	< 0.057	< 0.059	< 0.058	< 0.058	< 0.059	< 0.059
PFHpS	< 0.037	< 0.036	< 0.035	< 0.036	< 0.036	< 0.036	< 0.037	< 0.036

PFOS	0.317	0.095 J	0.241	0.228	0.34	0.806	0.895	0.222
PFNS	< 0.042	< 0.041	< 0.041	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042
PFDS	< 0.032	< 0.031	< 0.031	< 0.032	< 0.032	< 0.031	< 0.032	< 0.032
PFDoS	< 0.038	< 0.038	< 0.037	< 0.038	< 0.038	0.104 J F	< 0.038	< 0.038
4:2FTS	< 0.081	< 0.079	< 0.078	< 0.080	< 0.080	< 0.079	< 0.081	< 0.080
6:2FTS	< 0.280	< 0.274	< 0.269	< 0.277	< 0.276	< 0.275	< 0.280	< 0.277
8:2FTS	< 0.388	< 0.378	< 0.372	< 0.383	< 0.381	< 0.380	< 0.387	< 0.383
PFOSA	< 0.043	< 0.042	< 0.042	< 0.043	< 0.043	< 0.042	< 0.043	< 0.043
NMeFOSA	< 0.100	< 0.098	< 0.096	< 0.099	< 0.098	< 0.098	< 0.100	< 0.099
NEtFOSA	< 0.112	< 0.109	< 0.108	< 0.111	< 0.110	< 0.110	< 0.112	< 0.111
NMeFOSAA	< 0.100	< 0.098	< 0.096	< 0.099	< 0.098	< 0.098	< 0.100	< 0.099
NEtFOSAA	< 0.083	< 0.081	< 0.079	< 0.082	< 0.081	< 0.081	< 0.082	< 0.082
NMeFOSE	< 0.251	< 0.245	< 0.241	< 0.248	< 0.246	< 0.246	< 0.250	< 0.248
NEtFOSE	< 0.511	< 0.499	< 0.491	< 0.505	< 0.502	< 0.501	< 0.510	< 0.505
HFPO-DA	< 0.099	< 0.096	< 0.095	< 0.097	< 0.097	< 0.097	< 0.098	< 0.097
ADONA	< 0.146	< 0.143	< 0.141	< 0.145	< 0.144	< 0.144	< 0.146	< 0.145
9Cl-PF3ONS	< 0.196	< 0.192	< 0.188	< 0.194	< 0.193	< 0.192	< 0.196	< 0.194
11Cl-PF3OUdS	< 0.167	< 0.163	< 0.161	< 0.165	< 0.164	< 0.164	< 0.167	< 0.166
PFMPA	< 0.041	< 0.040	< 0.039	< 0.040	< 0.040	< 0.040	< 0.041	< 0.040
PFMBA	< 0.031	< 0.031	< 0.030	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031
PFEESA	< 0.083	< 0.081	< 0.080	< 0.082	< 0.082	< 0.082	< 0.083	< 0.082
NFDHA	< 0.095	< 0.093	< 0.092	< 0.094	< 0.094	< 0.094	< 0.095	< 0.094
3:3FTCA	< 0.144	< 0.141	< 0.138	< 0.142	< 0.142	< 0.141	< 0.144	< 0.142
5:3FTCA	< 0.505	< 0.493	< 0.486	< 0.500	< 0.497	< 0.496	< 0.505	< 0.500
7:3FTCA	< 1.76	< 1.72	< 1.69	< 1.74	< 1.73	< 1.73	< 1.76	< 1.74
Σ PFAS	1.75	0.523	1.93	1.37	2.51	5.85	5.91	2.29

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A8:** Camden County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	CAM-RUR-1	CAM-RUR-2	CAM-RUR-3	CAM-RUR-4	CAM-URB-1	CAM-URB-2	CAM-URB-3	CAM-URB-4
PFBA	0.095 J	0.091 J	< 0.049	0.350 J	0.240 J	0.390 J	1.03	0.423 J
PFPeA	0.506	0.070 J	< 0.055	0.206 J	0.169 J	0.339 J	0.754	0.256 J
PFHxA	0.108 J	0.048 J	< 0.046	0.189 J	0.151 J	0.306	0.58	0.135 J
PFHpA	0.104 J	0.078 J	< 0.023	0.205	0.152 J	0.285	0.502	0.170 J
PFOA	0.32	0.069 J	< 0.051	0.779	0.416	1.02	1.6	0.161 J
PFNA	1.18	0.22	< 0.077	1.44	1.28	2.48	3.31	0.484

PFDA	0.355	0.184 J	0.082 J	0.529	0.309	0.36	0.765	0.282
PFUnA	1.06	0.361	0.274	1.36	0.938	1.71	2.58	1.53
PFDoA	0.104 J	0.067 J	0.064 J	0.185 J	0.109 J	0.129 J	0.272	0.142 J
PFTTrDA	0.090 J	0.068 J	0.082 J	0.179 J	0.133 J	0.218	0.29	0.251
PFTeDA	< 0.104	< 0.103	< 0.104	< 0.102	< 0.112	< 0.104	< 0.104	< 0.102
PFBS	< 0.042	< 0.042	< 0.042	0.049 J	< 0.046	0.063 J	0.061 J	< 0.042
PFPeS	< 0.023	< 0.022	< 0.023	< 0.022	< 0.025	< 0.023	< 0.023	< 0.022
PFHxS	< 0.058	< 0.057	< 0.058	< 0.057	< 0.063	< 0.058	< 0.058	< 0.057
PFHpS	< 0.036	< 0.036	< 0.036	< 0.035	< 0.039	< 0.036	< 0.036	< 0.036
PFOS	0.583	0.137 J	0.093 J	0.628	0.598	0.8	2.68	0.331
PFNS	< 0.042	< 0.041	< 0.042	< 0.041	< 0.045	< 0.042	< 0.041	< 0.041
PFDS	< 0.031	< 0.031	< 0.031	< 0.031	< 0.034	< 0.031	< 0.031	< 0.031
PFDoS	< 0.038	< 0.037	< 0.038	< 0.037	< 0.041	< 0.038	< 0.038	< 0.037
4:2FTS	< 0.079	< 0.078	< 0.079	< 0.078	< 0.085	< 0.079	< 0.079	< 0.078
6:2FTS	< 0.275	< 0.271	< 0.275	< 0.269	< 0.296	< 0.275	< 0.273	< 0.270
8:2FTS	< 0.380	< 0.375	< 0.380	< 0.372	< 0.409	< 0.380	< 0.378	< 0.373
PFOSA	< 0.042	< 0.042	< 0.042	< 0.042	< 0.046	< 0.042	< 0.042	< 0.042
NMeFOSA	< 0.098	< 0.097	< 0.098	< 0.096	< 0.106	< 0.098	< 0.098	< 0.096
NEtFOSA	< 0.110	< 0.108	< 0.110	< 0.108	< 0.118	< 0.110	< 0.109	< 0.108
NMeFOSAA	< 0.098	< 0.097	< 0.098	< 0.096	< 0.106	< 0.098	< 0.098	< 0.096
NEtFOSAA	< 0.081	< 0.080	< 0.081	< 0.079	< 0.087	< 0.081	< 0.080	< 0.079
NMeFOSE	< 0.246	< 0.242	< 0.246	< 0.241	< 0.264	< 0.246	< 0.244	< 0.241
NEtFOSE	< 0.501	< 0.494	< 0.501	< 0.491	< 0.539	< 0.501	< 0.498	< 0.492
HFPO-DA	< 0.097	< 0.095	< 0.097	< 0.095	< 0.104	< 0.097	< 0.096	< 0.095
ADONA	< 0.144	< 0.142	< 0.144	< 0.141	< 0.154	< 0.144	< 0.143	< 0.141
9Cl-PF3ONS	< 0.192	< 0.190	< 0.192	< 0.188	< 0.207	< 0.192	< 0.191	< 0.189
11Cl-PF3OUdS	< 0.164	< 0.162	< 0.164	< 0.161	< 0.176	< 0.164	< 0.163	< 0.161
PFMPA	< 0.040	< 0.040	< 0.040	< 0.039	< 0.043	< 0.040	< 0.040	< 0.039
PFMBA	< 0.031	< 0.030	< 0.031	< 0.030	< 0.033	< 0.031	< 0.031	< 0.030
PFEEA	< 0.082	< 0.081	< 0.082	< 0.080	< 0.088	< 0.082	< 0.081	< 0.080
NFDHA	< 0.094	< 0.092	< 0.093	< 0.092	< 0.100	< 0.094	< 0.093	< 0.092
3:3FTCA	< 0.141	< 0.139	< 0.141	< 0.138	< 0.152	< 0.141	< 0.141	< 0.139
5:3FTCA	< 0.496	< 0.488	< 0.495	< 0.486	< 0.533	< 0.496	< 0.493	< 0.487
7:3FTCA	< 1.73	< 1.70	< 1.73	< 1.69	< 1.86	< 1.73	< 1.72	< 1.70
Σ PFAS	4.51	1.39	0.595	6.10	4.50	8.10	14.4	4.17

Notes:

“<” indicates a value that was not detected above the method detection limit.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“J”) values.

**Table A9:** Cape May County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	CAP-RUR-1	CAP-RUR-2	CAP-RUR-3	CAP-RUR-4	CAP-URB-1	CAP-URB-2	CAP-URB-3	CAP-URB-4
PFBA	0.638 J	<0.049	0.118 J	0.178 J	<0.047	0.207 J	0.117 J	0.083 J
PFPeA	0.39	<0.054	0.077 J	0.109 J	<0.052	0.089 J	<0.056	<0.055
PFHxA	0.335	0.065 J	0.080 J	0.102 J F	<0.043	0.076 J	0.050 J F	<0.046
PFHpA	0.423	0.070 J	0.062 J	0.131 J	<0.022	0.094 J	0.068 J	0.049 J
PFOA	2.65	0.393 F	0.103 J	0.394	<0.048	0.119 J	0.110 J	<0.051
PFNA	3.94	0.208	0.229	0.917	<0.073	0.223	0.227	0.117 J
PFDA	0.411	0.148 J	0.108 J	0.363	<0.070	0.286	0.115 J	0.094 J
PFUnA	0.604	0.314	0.22	0.782	<0.047	0.557	0.295	0.204
PFDoA	0.157 J	0.088 J	0.075 J	0.177 J	<0.038	0.187 J	0.074 J	0.070 J
PFTrDA	0.076 J	0.067 J	0.062 J	0.131 J	<0.049	0.166 J	0.061 J	0.065 J
PFTeDA	<0.103	<0.103	<0.100	0.111 J	<0.098	<0.102	<0.106	<0.105
PFBS	<0.042	<0.042	<0.041	<0.041	<0.040	<0.042	<0.043	<0.043
PFPeS	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.023	<0.023
PFHxS	0.060 J	<0.057	<0.056	<0.056	<0.055	<0.057	<0.059	<0.058
PFHpS	<0.036	<0.036	<0.035	<0.035	<0.034	<0.035	<0.037	<0.036
PFOS	1.47	0.258	0.180 J	0.741	0.124 J	0.815	0.26	0.160 J
PFNS	<0.041	<0.041	<0.040	<0.04	<0.039	<0.041	<0.042	<0.042
PFDS	<0.031	<0.031	<0.030	<0.030	<0.030	<0.031	<0.032	<0.032
PFDoS	<0.037	<0.037	<0.036	<0.036	<0.036	<0.037	<0.038	<0.038
4:2FTS	<0.078	<0.078	<0.076	<0.077	<0.075	<0.078	<0.080	<0.080
6:2FTS	<0.270	<0.271	<0.262	<0.266	<0.259	<0.270	<0.278	<0.276
8:2FTS	<0.374	<0.375	<0.363	<0.368	<0.358	<0.373	<0.385	<0.382
PFOSA	<0.042	<0.042	<0.041	<0.041	<0.040	<0.042	<0.043	<0.043
NMeFOSA	<0.097	<0.097	<0.094	<0.095	<0.093	<0.096	<0.099	<0.099
NEtFOSA	<0.108	<0.108	<0.105	<0.106	<0.104	<0.108	<0.111	<0.110
NMeFOSAA	<0.097	<0.097	<0.094	<0.095	<0.093	<0.096	<0.099	<0.099
NEtFOSAA	<0.080	<0.080	<0.077	<0.078	<0.076	<0.079	<0.082	<0.081
NMeFOSE	<0.242	<0.242	0.293 J	<0.238	<0.232	<0.241	<0.249	<0.247
NEtFOSE	<0.493	<0.494	<0.478	<0.484	<0.472	<0.492	<0.507	<0.503
HFPO-DA	<0.095	<0.095	<0.092	<0.093	<0.091	<0.095	<0.098	<0.097
ADONA	<0.141	<0.142	<0.137	<0.139	<0.135	<0.141	<0.146	<0.144
9Cl-PF3ONS	<0.189	<0.190	<0.184	<0.186	<0.181	<0.189	<0.195	<0.193
11Cl-PF3OUdS	<0.162	<0.162	<0.157	<0.159	<0.155	<0.161	<0.166	<0.165
PFMPA	<0.039	<0.040	<0.038	<0.039	<0.038	<0.039	<0.041	<0.040
PFMBA	<0.030	<0.030	<0.029	<0.030	<0.029	<0.030	<0.031	<0.031
PFEESA	<0.080	<0.081	<0.078	<0.079	<0.077	<0.080	<0.083	<0.082
NFDHA	<0.092	<0.092	<0.089	<0.090	<0.088	<0.092	<0.095	<0.094
3:3FTCA	<0.139	<0.139	<0.135	<0.137	<0.133	<0.139	<0.143	<0.142

5:3FTCA	< 0.488	< 0.488	< 0.473	< 0.479	< 0.467	< 0.486	< 0.502	< 0.497
7:3FTCA	< 1.70	< 1.70	< 1.65	< 1.67	< 1.63	< 1.70	< 1.75	< 1.73
Σ PFAS	11.2	1.61	1.61	4.14	0.124	2.82	1.38	0.842

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A10:** Cumberland County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	CUM-RUR-1	CUM-RUR-2	CUM-RUR-3	CUM-RUR-4	CUM-URB-1	CUM-URB-2	CUM-URB-3	CUM-URB-4
PFBA	< 0.050	< 0.049	< 0.050	< 0.050	< 0.050	0.625 J	< 0.050	< 0.050
PFPeA	0.094 J	< 0.055	0.173 J	0.064 J	0.103 J	0.466	0.208 J	< 0.055
PFHxA	0.078 J F	< 0.046	0.220 F	0.086 J F	0.082 J F	0.704	0.160 J	< 0.046
PFHpA	0.069 J	< 0.023	0.22	0.123 J	0.055 J	0.586	0.179 J	< 0.023
PFOA	0.103 J	0.208	1.41	0.629	< 0.052	2.03	0.381	< 0.051
PFNA	0.275	0.617	1.21	0.585	0.125 J	1.5	0.66	< 0.077
PFDA	0.217	0.588	0.209	0.170 J	0.187 J	0.362	0.328	< 0.074
PFUnA	0.54	0.924	0.334	0.242	0.433	0.559	0.855	< 0.050
PFDaA	0.095 J	0.257	0.090 J	< 0.041	0.112 J	0.106 J	0.208	< 0.040
PFTTrDA	0.105 J	0.180 J	0.068 J	0.059 J	0.078 J	0.105 J	0.234	< 0.052
PFTeDA	< 0.106	< 0.104	< 0.106	< 0.106	< 0.106	< 0.105	0.132 J	< 0.104
PFBS	< 0.043	< 0.042	< 0.043	< 0.043	< 0.043	0.046 J	0.099 J F	< 0.042
PFPeS	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023
PFHxS	< 0.059	< 0.058	< 0.059	< 0.059	< 0.059	< 0.058	< 0.058	< 0.058
PFHpS	< 0.037	< 0.036	< 0.037	< 0.037	< 0.037	< 0.036	< 0.036	< 0.036
PFOS	0.186 J	1.63	0.758	0.523	0.244	0.704	0.389	< 0.078
PFNS	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042
PFDS	< 0.032	< 0.031	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.031
PFDoS	0.071 J F	< 0.038	< 0.038	< 0.038	< 0.038	< 0.038	0.039 J F	< 0.038
4:2FTS	< 0.080	< 0.079	< 0.080	< 0.080	< 0.080	< 0.080	< 0.079	< 0.079
6:2FTS	< 0.278	< 0.275	< 0.278	< 0.278	< 0.279	< 0.276	< 0.275	< 0.275
8:2FTS	< 0.384	< 0.380	< 0.384	< 0.385	< 0.385	< 0.381	< 0.381	< 0.380
PFOSA	< 0.043	< 0.042	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043	< 0.042
NMeFOSA	< 0.099	< 0.098	< 0.099	< 0.099	< 0.100	< 0.099	< 0.098	< 0.098
NEtFOSA	< 0.111	< 0.110	< 0.111	< 0.111	< 0.112	< 0.110	< 0.110	< 0.110
NMeFOSAA	< 0.099	< 0.098	< 0.099	< 0.099	< 0.100	< 0.099	< 0.098	< 0.098
NEtFOSAA	< 0.082	< 0.081	< 0.082	< 0.082	< 0.082	< 0.081	< 0.081	< 0.081
NMeFOSE	< 0.248	< 0.246	< 0.248	< 0.249	< 0.249	< 0.247	< 0.246	< 0.246
NEtFOSE	< 0.506	< 0.501	< 0.506	< 0.507	< 0.508	< 0.503	< 0.502	< 0.502

HFPO-DA	< 0.098	< 0.097	< 0.098	< 0.098	< 0.098	< 0.097	< 0.097	< 0.097
ADONA	< 0.145	< 0.144	< 0.145	< 0.145	< 0.146	< 0.144	< 0.144	< 0.144
9CI-PF3ONS	< 0.194	< 0.192	< 0.194	< 0.195	< 0.195	< 0.193	< 0.193	< 0.193
11CI-PF3OUdS	< 0.166	< 0.164	< 0.166	< 0.166	< 0.166	< 0.165	< 0.164	< 0.164
PFMPA	< 0.041	< 0.040	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040
PFMBA	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031
PFEEA	< 0.083	< 0.082	< 0.083	< 0.083	< 0.083	< 0.082	< 0.082	< 0.082
NFDHA	< 0.094	< 0.093	< 0.094	< 0.095	< 0.095	< 0.094	< 0.094	< 0.094
3:3FTCA	< 0.143	< 0.141	< 0.143	< 0.143	< 0.143	< 0.142	< 0.142	< 0.142
5:3FTCA	< 0.501	< 0.495	< 0.501	< 0.502	< 0.502	< 0.497	< 0.496	< 0.496
7:3FTCA	< 1.75	< 1.73	< 1.74	< 1.75	< 1.75	< 1.73	< 1.73	< 1.73
Σ PFAS	1.83	4.40	4.69	2.48	1.42	7.79	3.87	0.00

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A11:** Essex County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID					
	ESS-RUR-1	ESS-RUR-2	ESS-URB-1	ESS-URB-2	ESS-URB-3	ESS-URB-4
PFBA	0.709 J	0.863	0.181 J	0.193 J	0.799	0.526 J
PFPeA	0.523	0.449	0.186 J	0.126 J	0.45	0.309 J
PFHxA	0.614	0.448	0.151 J	0.097 J	0.397	0.323
PFHpA	0.695	0.492	0.168 J	0.104 J	0.353	0.362
PFOA	4.14	4.3	2.05	0.120 J	2.53	3.8
PFNA	1.02	0.882	0.501	0.138 J	0.702	0.651
PFDA	0.731	0.541	0.454	0.253	0.811	0.362
PFUnA	0.81	0.432	0.374	0.334	0.709	0.34
PFDoA	0.391	0.245	0.257	0.166 J	0.408	0.132 J
PFTTrDA	0.323	0.204	0.2	0.078 J	0.317	0.111 J
PFTeDA	0.181 J	0.111 J	0.121 J	0.118 J	0.213	< 0.108
PFBS	0.096 J	0.134 J	< 0.043	< 0.043	0.101 J	0.056 J
PFPeS	0.043 J	< 0.023	< 0.023	< 0.023	< 0.017	< 0.024
PFHxS	0.417	0.088 J	< 0.059	< 0.059	0.044 J	< 0.060
PFHpS	0.037 J	< 0.036	< 0.036	< 0.036	< 0.026	< 0.037
PFOS	5.2	1.89	1.33	0.203	2.42	1.42
PFNS	< 0.043	< 0.042	< 0.042	< 0.042	< 0.030	< 0.043
PFDS	0.081 J	< 0.032	< 0.032	< 0.032	< 0.023	< 0.033
PFDoS	< 0.039	< 0.038	< 0.038	< 0.038	< 0.028	0.092 J F
4:2FTS	< 0.081	< 0.080	< 0.080	< 0.080	< 0.058	< 0.082

6:2FTS	< 0.282	< 0.276	< 0.277	< 0.277	< 0.201	< 0.284
8:2FTS	< 0.390	< 0.382	< 0.382	< 0.382	< 0.278	< 0.393
PFOSA	< 0.044	< 0.043	< 0.043	< 0.043	<b>0.033 J F</b>	< 0.044
NMeFOSA	< 0.101	< 0.099	< 0.099	< 0.099	< 0.072	< 0.102
NEtFOSA	< 0.113	< 0.110	< 0.111	< 0.111	< 0.080	< 0.114
NMeFOSAA	< 0.101	< 0.099	< 0.099	< 0.099	< 0.072	< 0.102
NEtFOSAA	< 0.083	< 0.081	< 0.081	< 0.081	< 0.059	< 0.084
NMeFOSE	< 0.252	< 0.247	< 0.247	< 0.247	< 0.180	< 0.254
NEtFOSE	< 0.514	< 0.504	< 0.504	< 0.504	< 0.366	< 0.518
HFPO-DA	< 0.099	< 0.097	< 0.097	< 0.097	<b>0.082 J</b>	< 0.100
ADONA	< 0.147	< 0.144	< 0.145	< 0.145	< 0.105	< 0.149
9Cl-PF3ONS	< 0.197	< 0.193	< 0.194	< 0.194	< 0.141	< 0.199
11Cl-PF3OUdS	< 0.168	< 0.165	< 0.165	< 0.165	< 0.120	< 0.170
PFMPA	< 0.041	< 0.040	< 0.040	< 0.040	< 0.029	< 0.041
PFMBA	< 0.031	< 0.031	< 0.031	< 0.031	< 0.022	< 0.032
PFEESA	< 0.084	< 0.082	< 0.082	< 0.082	< 0.060	< 0.085
NFDHA	< 0.096	< 0.094	< 0.094	< 0.094	< 0.068	< 0.097
3:3FTCA	< 0.145	< 0.142	< 0.142	< 0.142	< 0.103	< 0.146
5:3FTCA	< 0.508	< 0.498	< 0.499	< 0.499	< 0.362	< 0.512
7:3FTCA	< 1.77	< 1.74	< 1.74	< 1.74	< 1.26	< 1.79
Σ PFAS	16.0	11.1	5.97	1.93	10.4	8.48

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A12:** Gloucester County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	GLO-RUR-1	GLO-RUR-2	GLO-RUR-3	GLO-RUR-4	GLO-URB-1	GLO-URB-2	GLO-URB-3	GLO-URB-4
PFBA	0.154 J	0.769 J	0.189 J	0.350 J	0.200 J	0.704 J	0.430 J	0.571 J
PFPeA	0.144 J	0.927	0.119 J	0.294 J	0.163 J	0.729	0.348 J	0.55
PFHxA	0.123 J	0.954	0.155 J	0.252	0.145 J	0.692	0.322	0.405
PFHpA	0.099 J	0.359	0.150 J	0.214	0.132 J	0.688	0.374	0.326
PFOA	0.345	0.334	0.165 J	0.523	0.225	1.46	1.18	1.09
PFNA	1.01	1.72	0.705	1.34	0.768	2.98	3.78	8.05
PFDA	0.365	1.73	0.435	0.26	0.373	0.755	0.772	1.47
PFUnA	1.23	8.58	1.11	0.936	2.01	2.58	3.66	15.3
PFDoA	0.131 J	1.21	0.185 J	0.095 J	0.194	0.32	0.288	0.672
PFTTrDA	0.174 J	1	0.171 J	0.129 J	0.262	0.372	0.465	2.35
PFTeDA	< 0.102	0.314	< 0.101	< 0.105	< 0.100	0.102 J	< 0.104	0.149 J

PFBS	0.045 J	< 0.043	< 0.041	0.045 J	0.062 J	0.078 J	0.053 J	0.073 J
PFPeS	< 0.022	< 0.023	< 0.022	< 0.023	< 0.022	< 0.022	< 0.023	< 0.022
PFHxS	< 0.057	< 0.059	< 0.056	< 0.059	< 0.055	< 0.057	< 0.058	< 0.056
PFHpS	< 0.035	< 0.036	< 0.035	< 0.036	< 0.034	< 0.036	< 0.036	< 0.035
PFOS	0.413	0.431	0.278	0.307	0.506	0.794	0.85	0.968
PFNS	< 0.041	< 0.042	< 0.040	< 0.042	< 0.040	< 0.041	< 0.042	< 0.040
PFDS	< 0.031	< 0.032	< 0.030	< 0.032	< 0.030	< 0.031	< 0.031	< 0.030
PFDoS	< 0.037	< 0.038	< 0.036	< 0.038	0.105 J F	0.094 J F	< 0.038	< 0.036
4:2FTS	< 0.077	< 0.080	< 0.077	< 0.080	< 0.076	< 0.078	< 0.079	< 0.076
6:2FTS	< 0.268	< 0.277	< 0.266	< 0.277	< 0.262	< 0.270	< 0.275	< 0.264
8:2FTS	< 0.370	< 0.383	< 0.368	< 0.383	< 0.362	< 0.373	< 0.380	< 0.365
PFOSA	< 0.041	< 0.043	< 0.041	< 0.043	< 0.040	< 0.042	< 0.042	< 0.041
NMeFOSA	< 0.096	< 0.099	< 0.095	< 0.099	< 0.094	< 0.096	< 0.098	< 0.094
NEtFOSA	< 0.107	< 0.111	< 0.106	< 0.111	< 0.105	< 0.108	< 0.110	< 0.106
NMeFOSAA	< 0.096	< 0.099	< 0.095	< 0.099	< 0.094	< 0.096	< 0.098	< 0.094
NEtFOSAA	< 0.079	< 0.082	< 0.078	< 0.082	< 0.077	< 0.079	< 0.081	< 0.078
NMeFOSE	< 0.239	< 0.248	< 0.238	< 0.248	< 0.234	< 0.241	< 0.246	< 0.236
NEtFOSE	< 0.488	< 0.505	< 0.485	< 0.505	< 0.477	< 0.492	< 0.501	< 0.481
HFPO-DA	< 0.094	< 0.097	< 0.093	< 0.097	< 0.092	< 0.095	< 0.097	< 0.093
ADONA	< 0.140	< 0.145	< 0.139	< 0.145	< 0.137	< 0.141	< 0.144	< 0.138
9Cl-PF3ONS	< 0.187	< 0.194	< 0.186	< 0.194	< 0.183	< 0.189	< 0.192	< 0.185
11Cl-PF3OUdS	< 0.160	< 0.166	< 0.159	< 0.165	< 0.156	< 0.161	< 0.164	< 0.158
PFMPA	< 0.039	< 0.040	< 0.039	< 0.040	< 0.038	< 0.039	< 0.040	< 0.038
PFMBA	< 0.030	< 0.031	< 0.030	< 0.031	< 0.029	< 0.030	< 0.031	< 0.029
PFEESA	< 0.080	< 0.082	< 0.079	< 0.082	< 0.078	< 0.080	< 0.082	< 0.078
NFDHA	< 0.091	< 0.094	< 0.090	< 0.094	< 0.089	< 0.092	< 0.093	< 0.090
3:3FTCA	< 0.138	< 0.142	< 0.137	< 0.142	< 0.135	< 0.139	< 0.141	< 0.136
5:3FTCA	< 0.482	< 0.500	< 0.479	< 0.500	< 0.472	< 0.486	< 0.495	< 0.476
7:3FTCA	< 1.68	< 1.74	< 1.67	< 1.74	< 1.65	< 1.70	< 1.73	< 1.66
Σ PFAS	4.23	18.3	3.66	4.75	5.15	12.3	12.5	32.0

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A13:** Hudson County Soil Sample Results (ng/g) at urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID			
	HUD-URB-1	HUD-URB-2	HUD-URB-3	HUD-URB-4
PFBA	0.454 J	0.899	0.536 J	0.478 J
PFPeA	0.336 J	0.841	0.502	0.406
PFHxA	0.175 J	0.881	0.324	0.278

PFHpA	0.139 J	0.742	0.382	0.234
PFOA	0.21	9.13	3.28	0.761
PFNA	0.401	1.11	1.34	0.655
PFDA	1.6	1.69	1.54	1.44
PFUnA	1.52	1.53	1.51	1.15
PFDoA	1.24	0.867	1.13	0.75
PFTrDA	0.892	0.842	0.857	0.481
PFTeDA	0.332	0.329	0.359	0.207
PFBS	< 0.041	0.134 J	0.071 J	< 0.043
PFPeS	< 0.022	< 0.023	< 0.023	< 0.023
PFHxS	< 0.057	0.128 J	0.080 J	< 0.058
PFHpS	< 0.035	0.049 J	< 0.036	< 0.036
PFOS	1.24	4.64	4.65	3.27
PFNS	< 0.041	< 0.042	< 0.042	< 0.042
PFDS	< 0.031	0.112 J	0.092 J F	< 0.032
PFDoS	< 0.037	< 0.038	< 0.038	< 0.038
4:2FTS	< 0.077	< 0.080	< 0.080	< 0.080
6:2FTS	< 0.268	< 0.277	< 0.276	< 0.276
8:2FTS	< 0.371	< 0.383	< 0.382	< 0.381
PFOSA	< 0.041	< 0.043	< 0.043	< 0.043
NMeFOSA	< 0.096	< 0.099	< 0.099	< 0.098
NEtFOSA	< 0.107	< 0.111	< 0.111	< 0.110
NMeFOSAA	< 0.096	< 0.099	< 0.099	< 0.098
NEtFOSAA	< 0.079	0.239	< 0.081	< 0.081
NMeFOSE	< 0.240	< 0.248	< 0.247	< 0.246
NEtFOSE	< 0.489	< 0.505	< 0.504	< 0.502
HFPO-DA	< 0.094	< 0.097	< 0.097	< 0.097
ADONA	< 0.140	< 0.145	< 0.145	< 0.144
9Cl-PF3ONS	< 0.188	< 0.194	< 0.194	< 0.193
11Cl-PF3OUdS	< 0.160	< 0.165	< 0.165	< 0.164
PFMPA	< 0.039	< 0.040	< 0.040	< 0.040
PFMBA	< 0.030	< 0.031	< 0.031	< 0.031
PFEESA	< 0.080	< 0.082	< 0.082	< 0.082
NFDHA	< 0.091	< 0.094	< 0.094	< 0.094
3:3FTCA	< 0.138	< 0.142	< 0.142	< 0.142
5:3FTCA	< 0.483	< 0.500	< 0.499	< 0.497
7:3FTCA	< 1.68	< 1.74	< 1.74	< 1.73
Σ PFAS	8.54	24.2	16.7	10.1

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A14:** Hunterdon County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	HUN-RUR-1	HUN-RUR-2	HUN-RUR-3	HUN-RUR-4	HUN-URB-1	HUN-URB-2	HUN-URB-3	HUN-URB-4
PFBA	0.229 J	0.353 J	0.656 J	0.692 J	0.381 J	0.526 J	0.157 J	0.855
PFPeA	0.208 J	0.192 J	0.394 J	0.361 J	0.232 J	0.337 J	0.100 J	0.406
PFHxA	0.326	0.120 J	0.287	0.237	0.218	0.319	0.081 J	0.253
PFHpA	0.233	0.137 J	0.221	0.249	0.29	0.395	0.091 J	0.341
PFOA	1.43	0.194	0.419	1	1.4	2.56	0.174 J	0.769
PFNA	0.845	0.232	0.556	0.906	1.11	0.624	0.22	0.634
PFDA	0.238	0.174 J	0.321	0.374	0.537	0.232	0.269	0.44
PFUnA	0.359	0.341	0.393	0.523	0.901	0.321	0.351	0.781
PFDoA	0.108 J	0.108 J	0.165 J	0.209	0.2	0.098 J	0.101 J	0.190 J F
PFTTrDA	0.079 J	0.091 J	0.150 J	0.150 J	0.184 J	0.097 J	0.110 J	0.245
PFTeDA	< 0.104	< 0.103	< 0.106	< 0.106	< 0.105	< 0.106	< 0.107	0.120 J
PFBS	< 0.042	< 0.042	< 0.043	0.063 J	0.055 J	0.074 J	< 0.044	< 0.043
PFPeS	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	0.023 J	< 0.023	< 0.023
PFHxS	< 0.058	< 0.058	< 0.059	< 0.059	< 0.059	0.092 J	< 0.060	< 0.059
PFHpS	< 0.036	< 0.036	< 0.037	< 0.037	< 0.036	< 0.037	< 0.037	< 0.037
PFOS	0.733	1.32	1.16	1.25	1.54	1.34	0.511	1.22
PFNS	< 0.042	< 0.041	< 0.042	< 0.042	< 0.042	< 0.042	< 0.043	< 0.042
PFDS	< 0.031	< 0.031	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032
PFDoS	< 0.038	< 0.037	< 0.038	< 0.038	< 0.038	< 0.038	< 0.039	< 0.038
4:2FTS	< 0.079	< 0.078	< 0.080	< 0.080	< 0.080	< 0.081	< 0.082	< 0.081
6:2FTS	< 0.275	< 0.272	< 0.278	< 0.278	< 0.277	< 0.279	< 0.282	< 0.279
8:2FTS	< 0.380	< 0.376	< 0.384	< 0.384	< 0.383	< 0.386	< 0.391	< 0.386
PFOSA	< 0.042	< 0.042	< 0.043	< 0.043	< 0.043	< 0.043	< 0.044	< 0.043
NMeFOSA	< 0.098	< 0.097	< 0.099	< 0.099	< 0.099	< 0.100	< 0.101	< 0.100
NEtFOSA	< 0.110	< 0.109	< 0.111	< 0.111	< 0.111	< 0.112	< 0.113	< 0.112
NMeFOSAA	< 0.098	< 0.097	< 0.099	< 0.099	< 0.099	< 0.100	< 0.101	< 0.100
NEtFOSAA	< 0.081	< 0.080	< 0.082	< 0.082	< 0.082	< 0.082	< 0.083	< 0.082
NMeFOSE	< 0.246	< 0.243	< 0.248	< 0.249	< 0.248	< 0.250	< 0.253	< 0.250
NEtFOSE	< 0.501	< 0.495	< 0.506	< 0.507	< 0.505	< 0.509	< 0.515	< 0.508
HFPO-DA	< 0.097	< 0.096	< 0.098	0.098 J F	< 0.097	< 0.098	< 0.099	< 0.098
ADONA	< 0.144	< 0.142	< 0.145	< 0.145	< 0.145	< 0.146	< 0.148	< 0.146
9Cl-PF3ONS	< 0.192	< 0.190	< 0.194	< 0.195	< 0.194	< 0.195	< 0.198	< 0.195
11Cl-PF3OUdS	< 0.164	< 0.162	< 0.166	< 0.166	< 0.165	< 0.167	< 0.169	< 0.167
PFMPA	< 0.040	< 0.040	< 0.041	< 0.041	< 0.040	< 0.041	< 0.041	< 0.041
PFMBA	< 0.031	< 0.030	< 0.031	< 0.031	< 0.031	< 0.031	< 0.032	< 0.031
PFEESA	< 0.082	< 0.081	< 0.083	< 0.083	< 0.082	< 0.083	< 0.084	< 0.083
NFDHA	< 0.094	< 0.092	< 0.094	< 0.095	< 0.094	< 0.095	< 0.096	< 0.095
3:3FTCA	< 0.141	< 0.140	< 0.143	< 0.143	< 0.142	< 0.144	< 0.145	< 0.143

5:3FTCA	< 0.496	< 0.490	< 0.501	< 0.501	< 0.499	< 0.503	< 0.509	< 0.503
7:3FTCA	< 1.73	< 1.71	< 1.74	< 1.75	< 1.74	< 1.75	< 1.78	< 1.75
Σ PFAS	4.79	3.26	4.72	6.11	7.05	7.04	2.17	6.25

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A15:** Mercer County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	MER-RUR-1	MER-RUR-2	MER-RUR-3	MER-RUR-4	MER-URB-1	MER-URB-2	MER-URB-3	MER-URB-4
PFBA	0.433 J	0.875	0.471 J	0.549 J	0.676 J	0.596 J	1.06	0.167 J
PFPeA	0.334 J	0.549	0.295 J	0.302 J	0.51	0.413	0.805	0.175 J
PFHxA	0.365	0.608	0.246	0.190 J	0.405	0.307 F	0.74	0.264
PFHpA	0.313	0.691	0.268	0.229	0.372	0.32	0.723	0.243
PFOA	1.9	4.12	1.57	0.514	1.74	0.957	3.9	1.71
PFNA	0.877	1.78	1.06	0.562	2.24	1.29	1.01	0.731
PFDA	0.382	0.754	0.463	0.44	0.796	0.592	0.4	0.306
PFUnA	0.704	1.34	1.16	1.21	1.19	1.01	0.462	0.531
PFDaA	0.178 J	0.367	0.232	0.265	0.371	0.217	0.156 J	0.164 J
PFTTrDA	0.148 J	0.409	0.246	0.261	0.29	0.178 J	0.168 J	0.157 J
PFTeDA	< 0.108	< 0.107	< 0.106	< 0.105	< 0.107	< 0.108	< 0.108	< 0.106
PFBS	< 0.044	0.105 J	< 0.043	0.080 J F	0.109 J	0.051 J	0.130 J	0.059 J
PFPeS	< 0.024	< 0.023	< 0.023	< 0.023	< 0.023	< 0.024	< 0.024	< 0.023
PFHxS	< 0.060	0.092 J	< 0.059	< 0.058	< 0.060	< 0.060	0.097 J	< 0.059
PFHpS	< 0.037	< 0.037	< 0.037	< 0.036	< 0.037	< 0.037	< 0.037	< 0.037
PFOS	0.864	1.24	0.947	1.04	2.72	1.58	0.822	0.679
PFNS	< 0.043	< 0.043	< 0.042	< 0.042	< 0.043	< 0.043	< 0.043	< 0.043
PFDS	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.033	< 0.032
PFDoS	< 0.039	< 0.039	< 0.038	< 0.038	< 0.039	< 0.039	< 0.039	< 0.038
4:2FTS	< 0.082	< 0.081	< 0.081	< 0.080	< 0.081	< 0.082	< 0.082	< 0.081
6:2FTS	< 0.284	< 0.281	< 0.279	< 0.276	< 0.282	< 0.283	< 0.285	< 0.280
8:2FTS	< 0.392	< 0.388	< 0.386	< 0.382	< 0.389	< 0.392	< 0.394	< 0.388
PFOSA	< 0.044	< 0.043	< 0.043	< 0.043	< 0.043	< 0.044	< 0.044	< 0.043
NMeFOSA	< 0.101	< 0.100	< 0.100	< 0.099	< 0.100	< 0.101	< 0.102	< 0.100
NEtFOSA	< 0.113	< 0.112	< 0.112	< 0.110	< 0.113	< 0.113	< 0.114	< 0.112
NMeFOSAA	< 0.101	< 0.100	< 0.100	< 0.099	< 0.100	< 0.101	< 0.102	< 0.100
NEtFOSAA	< 0.083	< 0.083	< 0.082	< 0.081	< 0.083	< 0.083	< 0.084	< 0.083
NMeFOSE	< 0.254	< 0.251	< 0.250	< 0.247	< 0.252	< 0.253	< 0.255	< 0.251
NEtFOSE	< 0.517	< 0.512	< 0.509	< 0.504	< 0.513	< 0.516	< 0.519	< 0.511

HFPO-DA	< 0.100	0.159 J	< 0.098	< 0.097	< 0.099	< 0.100	< 0.100	< 0.099
ADONA	< 0.148	< 0.147	< 0.146	< 0.144	< 0.147	< 0.148	< 0.149	< 0.147
9Cl-PF3ONS	< 0.198	< 0.196	< 0.195	< 0.194	< 0.197	< 0.198	< 0.199	< 0.196
11Cl-PF3OUdS	< 0.169	< 0.168	< 0.167	< 0.165	< 0.168	< 0.169	< 0.170	< 0.167
PFMPA	< 0.041	< 0.041	< 0.041	< 0.040	< 0.041	< 0.041	< 0.042	< 0.041
PFMBA	< 0.032	< 0.031	< 0.031	< 0.031	< 0.031	< 0.032	< 0.032	< 0.031
PFEEA	< 0.084	< 0.083	< 0.083	< 0.082	< 0.084	< 0.084	< 0.085	< 0.083
NFDHA	< 0.096	< 0.096	< 0.095	< 0.094	< 0.096	< 0.096	< 0.097	< 0.095
3:3FTCA	< 0.146	< 0.144	< 0.144	< 0.142	< 0.145	< 0.146	< 0.146	< 0.144
5:3FTCA	< 0.511	< 0.506	< 0.503	< 0.498	< 0.508	< 0.511	< 0.514	< 0.506
7:3FTCA	< 1.78	< 1.76	< 1.75	< 1.74	< 1.77	< 1.78	< 1.79	< 1.76
Σ PFAS	6.50	13.1	6.96	5.64	11.4	7.51	10.5	5.19

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A16:** Middlesex County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	MID-RUR-1	MID-RUR-2	MID-RUR-3	MID-RUR-4	MID-URB-1	MID-URB-2	MID-URB-3	MID-URB-4
PFBA	< 0.050	0.281 J	0.801	< 0.051	0.187 J	0.84	1.48	0.539 J
PFPeA	< 0.056	0.191 J	0.716	< 0.056	0.165 J	0.675	1.16	0.329 J
PFHxA	< 0.046	0.173 J F	0.559	< 0.047	0.132 J	0.702	0.926	0.370 F
PFHpA	< 0.023	0.204	0.388	< 0.023	0.069 J	0.401	0.582	0.336
PFOA	0.212	2.11	5.1	0.088 J	0.313	4.62	9.35	3.75
PFNA	0.108 J	0.513	3.2	0.098 J	0.194 J	1.91	2.57	0.831
PFDA	0.150 J	0.113 J	1.64	0.180 J	0.258	0.749	1.43	0.586
PFUnA	0.169 J	0.219	2.4	0.559	0.181 J	0.826	1.39	0.574
PFDoA	0.060 J	0.114 J	1.17	0.244	0.113 J	0.338	0.807	0.28
PFTTrDA	< 0.053	0.096 J	0.624	0.156 J	0.061 J	0.193 J	0.452	0.125 J
PFTeDA	< 0.106	< 0.106	0.42	< 0.106	< 0.106	0.142 J	0.307	0.108 J
PFBS	< 0.043	< 0.043	0.068 J	< 0.043	< 0.043	0.076 J	0.078 J	0.056 J
PFPeS	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023
PFHxS	< 0.059	< 0.059	< 0.059	< 0.059	< 0.059	0.120 J	0.083 J	< 0.059
PFHpS	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
PFOS	0.226	0.651	2.16	0.204	0.638	2.05	2.2	1.56
PFNS	< 0.042	< 0.042	< 0.042	< 0.043	< 0.042	< 0.043	< 0.042	< 0.042
PFDS	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032
PFDoS	< 0.038	< 0.038	< 0.038	< 0.039	< 0.038	< 0.039	< 0.038	< 0.038
4:2FTS	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081

6:2FTS	< 0.280	< 0.280	< 0.280	< 0.280	< 0.279	< 0.281	< 0.280	< 0.280
8:2FTS	< 0.387	< 0.387	< 0.386	< 0.388	< 0.386	< 0.388	< 0.388	< 0.387
PFOSA	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043
NMeFOSA	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
NEtFOSA	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112
NMeFOSAA	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
NEtFOSAA	< 0.082	< 0.082	< 0.082	< 0.083	< 0.082	< 0.083	< 0.083	< 0.082
NMeFOSE	< 0.250	< 0.250	< 0.250	< 0.251	< 0.250	< 0.251	< 0.251	< 0.250
NEtFOSE	< 0.510	< 0.510	< 0.510	< 0.511	< 0.509	< 0.512	< 0.511	< 0.510
HFPO-DA	< 0.098	0.101 J	0.597 J	0.192 J	< 0.098	0.209 J	0.949	0.336 J
ADONA	< 0.146	< 0.146	< 0.146	< 0.147	< 0.146	< 0.147	< 0.146	< 0.146
9Cl-PF3ONS	< 0.196	< 0.196	< 0.196	< 0.196	< 0.195	< 0.196	< 0.196	< 0.196
11Cl-PF3OUdS	< 0.167	< 0.167	< 0.167	< 0.167	< 0.167	< 0.168	< 0.167	< 0.167
PFMPA	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041
PFMBA	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031
PFEESA	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083
NFDHA	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095
3:3FTCA	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144
5:3FTCA	< 0.504	< 0.504	< 0.504	< 0.506	< 0.503	< 0.506	< 0.505	< 0.504
7:3FTCA	< 1.76	< 1.76	< 1.76	< 1.76	< 1.75	< 1.76	< 1.76	< 1.76
Σ PFAS	0.925	4.77	19.8	1.72	2.31	13.9	23.8	9.78

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A17:** Monmouth County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	MON-RUR-1	MON-RUR-2	MON-RUR-3	MON-RUR-4	MON-URB-1	MON-URB-2	MON-URB-3	MON-URB-4
PFBA	0.356 J	0.507 J	0.180 J	1.8	0.206 J	0.518 J	0.722 J	< 0.050
PFPeA	0.221 J	0.447	0.160 J	1.07	0.124 J	0.316 J	0.623	< 0.056
PFHxA	0.225	0.356	0.141 J	1.02	0.114 J	0.328	0.52	< 0.046
PFHpA	0.214	0.245	0.103 J	1.06	0.164 J	0.3	0.58	0.040 J
PFOA	1.03	1.24	0.413	6.49	0.205	0.726	5.44	0.156 J
PFNA	0.79	1.03	0.271	1.42	0.23	0.593	1.18	0.127 J
PFDA	0.33	0.591	0.398	0.692	0.334	0.492	0.488	0.179 J
PFUnA	0.513	1.24	0.65	0.98	0.587	0.724	0.709	0.119 J
PFDoA	0.148 J	0.332	0.232	0.223	0.258	0.177 J	0.338	< 0.041
PFTTrDA	0.148 J	0.299	0.285	0.205	0.213	0.153 J	0.241	< 0.053
PFTeDA	< 0.106	< 0.106	< 0.106	< 0.106	< 0.106	< 0.106	< 0.106	< 0.106

PFBS	0.059 J	< 0.043	< 0.043	0.066 J	< 0.043	< 0.043	0.156 J F	< 0.043
PFPeS	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023
PFHxS	< 0.059	< 0.059	< 0.059	0.080 J	< 0.059	< 0.059	0.104 J	< 0.059
PFHpS	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037
PFOS	0.955	0.688	0.479	1.08	0.437	0.636	2.13	0.439
PFNS	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042
PFDS	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032	< 0.032
PFDoS	< 0.038	0.119 J F	0.341 F	< 0.038	0.125 J F	< 0.038	0.100 J	< 0.038
4:2FTS	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081
6:2FTS	< 0.279	< 0.279	< 0.279	< 0.280	< 0.279	< 0.280	< 0.279	< 0.279
8:2FTS	< 0.386	< 0.386	< 0.386	< 0.387	< 0.386	< 0.387	< 0.386	< 0.386
PFOSA	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043
NMeFOSA	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
NEtFOSA	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112	< 0.112
NMeFOSAA	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
NEtFOSAA	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082
NMeFOSE	< 0.250	< 0.250	< 0.250	< 0.250	< 0.250	< 0.250	< 0.250	< 0.250
NEtFOSE	< 0.509	< 0.509	< 0.509	< 0.510	< 0.509	< 0.510	< 0.509	< 0.509
HFPO-DA	< 0.098	< 0.098	< 0.098	0.229 J	< 0.098	< 0.098	0.135 J	< 0.098
ADONA	< 0.146	< 0.146	< 0.146	< 0.146	< 0.146	< 0.146	< 0.146	< 0.146
9Cl-PF3ONS	< 0.195	< 0.195	< 0.195	< 0.196	< 0.196	< 0.196	< 0.196	< 0.196
11Cl-PF3OUdS	< 0.167	< 0.167	< 0.167	< 0.167	< 0.167	< 0.167	< 0.167	< 0.167
PFMPA	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041
PFMBA	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031
PFEESA	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083
NFDHA	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095
3:3FTCA	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144	< 0.144
5:3FTCA	< 0.503	< 0.503	< 0.503	< 0.504	< 0.504	< 0.504	< 0.504	< 0.504
7:3FTCA	< 1.75	< 1.76	< 1.76	< 1.76	< 1.76	< 1.76	< 1.76	< 1.76
Σ PFAS	4.99	7.09	3.65	16.4	3.00	4.96	13.5	1.06

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A18:** Morris County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	MOR-RUR-1	MOR-RUR-2	MOR-RUR-3	MOR-RUR-4	MOR-URB-1	MOR-URB-2	MOR-URB-3	MOR-URB-4
PFBA	0.598 J	0.93	0.446 J	0.856	0.724 J	0.657 J	0.401 J	0.370 J
PFPeA	0.363 J	0.599	0.312 J	0.463	0.264 J	0.393 J	0.298 J	0.191 J
PFHxA	0.364	0.664	0.281	0.373	0.276	0.368	0.271	0.153 J
PFHpA	0.273	0.543	0.204	0.525	0.262	0.461	0.216	0.142 J
PFOA	2.58	4.36	1.14	2.39	0.79	3.08	1.14	0.342
PFNA	0.743	1.05	0.423	0.814	0.497	0.923	1	0.598
PFDA	0.621	0.467	0.317	0.52	0.379	0.471	0.798	0.622
PFUnA	0.952	0.459	0.336	0.563	0.331	0.388	0.987	0.78
PFDoA	0.382	0.159 J	0.164 J	0.225	0.131 J	0.163 J	0.371	0.285
PFTTrDA	0.44	0.138 J	0.165 J	0.26	0.119 J	0.192 J	0.343	0.249
PFTeDA	< 0.109	< 0.106	< 0.106	< 0.106	< 0.102	< 0.106	< 0.106	< 0.107
PFBS	< 0.044	0.139 J	< 0.043	0.107 J	0.104 J	0.126 J	0.094 J	< 0.043
PFPeS	< 0.024	0.040 J	< 0.023	< 0.023	< 0.022	< 0.023	< 0.023	< 0.023
PFHxS	< 0.061	0.148 J	< 0.059	< 0.059	< 0.057	0.075 J	< 0.059	< 0.059
PFHpS	< 0.038	< 0.037	< 0.037	< 0.037	< 0.035	< 0.037	< 0.037	< 0.037
PFOS	1.6	1.48	0.944	1.12	1.04	1.52	1.69	1.15
PFNS	< 0.043	< 0.043	< 0.042	< 0.042	< 0.041	< 0.043	< 0.042	< 0.043
PFDS	< 0.033	< 0.032	< 0.032	< 0.032	< 0.031	< 0.032	< 0.032	< 0.032
PFDoS	< 0.039	0.217 F	< 0.038	< 0.038	< 0.037	< 0.038	< 0.038	0.066 J F
4:2FTS	< 0.083	< 0.081	< 0.080	< 0.081	< 0.077	< 0.081	< 0.081	< 0.081
6:2FTS	< 0.286	0.357 J	< 0.278	< 0.279	< 0.268	< 0.280	0.311 J	< 0.281
8:2FTS	< 0.396	< 0.388	< 0.385	< 0.386	< 0.371	< 0.388	< 0.388	< 0.389
PFOSA	< 0.044	< 0.043	< 0.043	< 0.043	< 0.041	< 0.043	< 0.043	< 0.043
NMeFOSA	< 0.102	< 0.100	< 0.099	< 0.100	< 0.096	< 0.100	< 0.100	< 0.100
NEtFOSA	< 0.114	< 0.112	< 0.111	< 0.112	< 0.107	< 0.112	< 0.112	< 0.112
NMeFOSAA	< 0.102	< 0.100	< 0.099	< 0.100	< 0.096	< 0.100	< 0.100	< 0.100
NEtFOSAA	< 0.084	< 0.083	< 0.082	< 0.082	< 0.079	< 0.083	< 0.083	< 0.083
NMeFOSE	< 0.256	< 0.251	< 0.249	< 0.250	< 0.240	< 0.251	< 0.251	< 0.251
NEtFOSE	< 0.522	< 0.511	< 0.507	< 0.509	< 0.489	< 0.511	< 0.511	< 0.512
HFPO-DA	< 0.101	< 0.099	< 0.098	< 0.098	0.112 J	< 0.099	< 0.099	< 0.099
ADONA	< 0.150	< 0.147	< 0.146	< 0.146	< 0.140	< 0.147	< 0.146	< 0.147
9Cl-PF3ONS	< 0.200	< 0.196	< 0.195	< 0.196	< 0.188	< 0.196	< 0.196	< 0.197
11Cl-PF3OUdS	< 0.171	< 0.168	< 0.166	< 0.167	< 0.160	< 0.167	< 0.167	< 0.168
PFMPA	< 0.042	< 0.041	< 0.041	< 0.041	< 0.039	< 0.041	< 0.041	< 0.041
PFMBA	< 0.032	< 0.031	< 0.031	< 0.031	< 0.030	< 0.031	< 0.031	< 0.031
PFEESA	< 0.085	< 0.083	< 0.083	< 0.083	< 0.080	< 0.083	< 0.083	< 0.084
NFDHA	< 0.097	< 0.095	< 0.095	< 0.095	< 0.091	< 0.095	< 0.095	< 0.096
3:3FTCA	< 0.147	< 0.144	< 0.143	< 0.144	< 0.138	< 0.144	< 0.144	< 0.144

5:3FTCA	< 0.516	< 0.506	< 0.502	< 0.504	< 0.484	< 0.506	< 0.505	< 0.507
7:3FTCA	< 1.80	< 1.76	< 1.75	< 1.76	< 1.69	< 1.76	< 1.76	< 1.77
Σ PFAS	8.92	11.8	4.73	8.22	5.03	8.82	7.92	4.95

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A19:** Ocean County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	OCE-RUR-1	OCE-RUR-2	OCE-RUR-3	OCE-RUR-4	OCE-URB-1	OCE-URB-2	OCE-URB-3	OCE-URB-4
PFBA	0.849 J	0.184 J	< 0.047	0.059 J	0.115 J	1.77 J	0.058 J	1.59 J
PFPeA	0.658 J	0.116 J	< 0.052	0.055 J	0.093 J	0.917 J	< 0.050	1.21
PFHxA	0.614	0.082 J F	< 0.043	0.047 J	0.082 J	0.858	< 0.041	1.22
PFHpA	0.741	0.086 J	< 0.022	0.056 J	0.053 J	0.623 J	0.049 J F	0.788
PFOA	2.61	0.258	0.088 J	0.226	0.106 J	1.76	0.102 J	5.03
PFNA	2.17	0.312	0.078 J	0.206	0.179 J	3.13	0.071 J	2.7
PFDA	1.04	0.286	0.109 J	0.243	0.156 J	1.26	0.076 J	1.64
PFUnA	1.95	0.817	0.152 J	0.359	0.584	3.88	0.223	1.87
PFDoA	0.504 J	0.203	0.061 J	0.127 J	0.132 J	0.984	0.066 J	0.58
PFTTrDA	0.579	0.223	< 0.049	0.114 J	0.164 J	0.717 J	0.056 J	0.432 J
PFTeDA	< 0.276	< 0.100	< 0.099	< 0.104	< 0.104	< 0.391	< 0.095	< 0.280
PFBS	< 0.112	0.044 J	< 0.040	< 0.042	< 0.042	< 0.159	< 0.038	< 0.114
PFPeS	< 0.060	< 0.022	< 0.022	< 0.023	< 0.023	< 0.085	< 0.021	< 0.061
PFHxS	< 0.154	< 0.056	< 0.055	< 0.058	< 0.058	0.264 J	< 0.053	0.171 J
PFHpS	< 0.096	< 0.035	< 0.034	< 0.036	< 0.036	< 0.135	< 0.033	< 0.097
PFOS	2.5	0.387	0.366	1.02	0.312	3.57	0.347	2.62
PFNS	< 0.110	< 0.040	< 0.040	< 0.042	< 0.042	< 0.156	< 0.038	< 0.112
PFDS	< 0.083	< 0.030	< 0.030	< 0.031	< 0.031	< 0.118	< 0.029	< 0.084
PFDoS	0.639 F	0.254 F	< 0.036	0.085 J	0.109 J F	< 0.141	< 0.034	1.01 F
4:2FTS	< 0.210	< 0.076	< 0.076	< 0.079	< 0.079	< 0.297	< 0.072	< 0.213
6:2FTS	< 0.727	< 0.263	< 0.262	< 0.275	< 0.274	< 1.03	< 0.249	< 0.738
8:2FTS	< 1.00	< 0.363	< 0.362	< 0.380	< 0.379	< 1.42	< 0.345	< 1.02
PFOSA	< 0.112	< 0.041	< 0.040	< 0.042	< 0.042	< 0.159	< 0.038	< 0.114
NMeFOSA	< 0.260	< 0.094	< 0.093	< 0.098	< 0.098	< 0.367	< 0.089	< 0.264
NEtFOSA	< 0.291	< 0.105	< 0.105	< 0.110	< 0.110	< 0.411	< 0.100	< 0.295
NMeFOSAA	< 0.260	< 0.094	< 0.093	< 0.098	< 0.098	< 0.367	< 0.089	< 0.264
NEtFOSAA	< 0.214	< 0.077	< 0.077	< 0.081	< 0.081	< 0.303	< 0.073	< 0.217
NMeFOSE	< 0.650	< 0.235	< 0.234	< 0.246	< 0.245	< 0.920	< 0.223	< 0.660
NEtFOSE	< 1.32	< 0.479	< 0.477	< 0.501	< 0.500	< 1.87	< 0.454	< 1.34

HFPO-DA	< 0.255	< 0.092	< 0.092	< 0.097	< 0.096	< 0.361	< 0.088	0.261 J
ADONA	< 0.380	< 0.137	< 0.137	< 0.144	< 0.143	< 0.538	< 0.130	< 0.386
9CI-PF3ONS	< 0.509	< 0.184	< 0.183	< 0.192	< 0.192	< 0.720	< 0.174	< 0.516
11CI-PF3OUdS	< 0.434	< 0.157	< 0.156	< 0.164	< 0.164	< 0.614	< 0.149	< 0.441
PFMPA	< 0.106	< 0.038	< 0.038	< 0.040	< 0.040	< 0.150	< 0.036	< 0.108
PFMBA	< 0.081	< 0.029	< 0.029	< 0.031	< 0.031	< 0.114	< 0.028	< 0.082
PFEEESA	< 0.216	< 0.078	< 0.078	< 0.082	< 0.082	< 0.306	< 0.074	< 0.219
NFDHA	< 0.247	< 0.089	< 0.089	< 0.094	< 0.093	< 0.350	< 0.085	< 0.251
3:3FTCA	< 0.374	< 0.135	< 0.134	< 0.141	< 0.141	< 0.529	< 0.128	< 0.380
5:3FTCA	< 1.31	< 0.474	< 0.472	< 0.496	< 0.494	< 1.85	< 0.449	< 1.33
7:3FTCA	< 4.57	< 1.65	< 1.64	< 1.73	< 1.72	< 6.46	< 1.57	< 4.64
Σ PFAS	14.9	3.25	0.854	2.60	2.09	19.7	1.05	21.1

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A20:** Passaic County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	PAS-RUR-1	PAS-RUR-2	PAS-RUR-3	PAS-RUR-4	PAS-URB-1	PAS-URB-2	PAS-URB-3	PAS-URB-4
PFBA	0.692 J	0.573 J	0.86	0.738 J	0.772 J	0.947	0.665 J	0.592 J
PFPeA	0.416	0.287 J	0.395	0.425	0.535	0.581	0.366 J	0.267 J
PFHxA	0.368	0.172 J	0.313	0.441	0.425	0.607	0.292 F	0.246
PFHpA	0.387	0.201	0.418	0.517	0.468	0.786	0.261	0.254
PFOA	1.95	0.847	1.7	3.69	3.35	4.08	0.558	0.409
PFNA	0.621	0.696	0.789	0.88	0.679	0.46	0.341	0.311
PFDA	0.413	0.419	0.452	0.686	0.518	0.142 J	0.543	0.661
PFUnA	0.38	0.407	0.594	0.334	0.715	0.091 J	0.43	0.857
PFDoA	0.132 J	0.166 J	0.223	0.105 J	0.366	< 0.041	0.281	0.431
PFTTrDA	0.146 J	0.150 J	0.205	0.097 J	0.382	< 0.052	0.219	0.326
PFTeDA	< 0.103	< 0.105	< 0.104	< 0.105	0.164 J	< 0.106	0.167 J	0.177 J
PFBS	0.072 J	0.049 J	0.110 J	0.127 J	0.128 J	0.082 J	0.097 J	0.074 J
PFPeS	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023
PFHxS	< 0.058	< 0.058	< 0.058	0.083 J	0.075 J	< 0.059	< 0.059	< 0.059
PFHpS	< 0.036	< 0.036	< 0.036	< 0.036	< 0.036	< 0.037	< 0.036	< 0.036
PFOS	0.846	0.9	1.02	1.25	1.14	0.632	0.938	1.77
PFNS	< 0.041	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042	< 0.042
PFDS	< 0.031	< 0.032	< 0.031	< 0.032	< 0.032	< 0.032	< 0.032	0.050 J
PFDoS	< 0.037	0.068 J F	0.071 J F	< 0.038	0.239 F	< 0.038	< 0.038	0.079 J F
4:2FTS	< 0.079	< 0.080	< 0.079	< 0.080	< 0.080	< 0.080	< 0.080	< 0.080

6:2FTS	< 0.272	< 0.276	< 0.275	< 0.277	< 0.277	< 0.278	< 0.277	< 0.276
8:2FTS	< 0.376	< 0.381	< 0.380	< 0.383	< 0.382	< 0.384	< 0.383	< 0.382
PFOSA	< 0.042	< 0.043	< 0.042	< 0.043	< 0.043	< 0.043	< 0.043	< 0.043
NMeFOSA	< 0.097	< 0.099	< 0.098	< 0.099	< 0.099	< 0.099	< 0.099	< 0.099
NEtFOSA	< 0.109	< 0.110	< 0.110	< 0.111	< 0.111	< 0.111	< 0.111	< 0.111
NMeFOSAA	< 0.097	< 0.099	< 0.098	< 0.099	< 0.099	< 0.099	< 0.099	< 0.099
NEtFOSAA	< 0.080	< 0.081	< 0.081	< 0.082	< 0.081	< 0.082	< 0.082	< 0.081
NMeFOSE	< 0.243	< 0.247	< 0.246	< 0.248	< 0.247	< 0.249	< 0.248	< 0.247
NEtFOSE	< 0.496	< 0.503	< 0.501	< 0.505	< 0.504	< 0.507	< 0.505	< 0.504
HFPO-DA	< 0.096	< 0.097	< 0.097	< 0.097	< 0.097	< 0.098	< 0.097	< 0.097
ADONA	< 0.142	< 0.144	< 0.144	< 0.145	< 0.145	< 0.145	< 0.145	< 0.144
9Cl-PF3ONS	< 0.190	< 0.193	< 0.192	< 0.194	< 0.194	< 0.195	< 0.194	< 0.194
11Cl-PF3OUdS	< 0.162	< 0.165	< 0.164	< 0.165	< 0.165	< 0.166	< 0.166	< 0.165
PFMPA	< 0.040	< 0.040	< 0.040	< 0.040	< 0.040	< 0.041	< 0.040	< 0.040
PFMBA	< 0.030	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031
PFEESA	< 0.081	< 0.082	< 0.082	< 0.082	< 0.082	< 0.083	< 0.082	< 0.082
NFDHA	< 0.093	< 0.094	< 0.093	< 0.094	< 0.094	< 0.095	< 0.094	< 0.094
3:3FTCA	< 0.140	< 0.142	< 0.141	< 0.142	< 0.142	< 0.143	< 0.142	< 0.142
5:3FTCA	< 0.491	< 0.497	< 0.495	< 0.500	< 0.499	< 0.501	< 0.500	< 0.498
7:3FTCA	< 1.71	< 1.73	< 1.73	< 1.74	< 1.74	< 1.75	< 1.74	< 1.74
Σ PFAS	6.42	4.94	7.15	9.37	9.96	8.41	5.16	6.50

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A21:** Salem County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID						
	SAL-RUR-1	SAL-RUR-2	SAL-RUR-3	SAL-RUR-4	SAL-URB-1	SAL-URB-2	SAL-URB-3
PFBA	< 0.046	0.368 J	1.85	0.168 J	1.03	0.251 J	2.67
PFPeA	< 0.051	0.356 J	2.5	0.172 J	1.54	0.319 J	3.55
PFHxA	< 0.043	0.329	2.37	0.139 J	2.43	0.235	2.57 F
PFHpA	0.031 J	0.238	2.26	0.104 J	2.11	0.225	3.16
PFOA	< 0.048	0.545	4.37	0.316	5.41	0.231	1.73
PFNA	< 0.072	2.43	3.75	0.482	4.69	0.638	2.66
PFDA	0.117 J	1.14	1.4	0.462	3.54	0.654	4.83
PFUnA	0.398	1.99	1.88	1.12	3.17	0.902	5.36
PFDoA	0.148 J	0.603	0.453	0.289	1.8	0.286	3.83
PFTTrDA	0.123 J	0.302	0.277	0.186 J	0.554	0.180 J	1.65
PFTeDA	< 0.098	0.2	0.180 J	< 0.100	0.467	< 0.104	1.36

PFBS	< 0.040	< 0.041	0.132 J	< 0.041	0.113 J	< 0.042	0.044 J
PFPeS	< 0.021	< 0.022	< 0.022	< 0.022	< 0.022	< 0.023	< 0.023
PFHxS	< 0.054	< 0.057	0.112 J	< 0.056	0.087 J	< 0.058	< 0.059
PFHpS	< 0.034	< 0.035	< 0.036	< 0.035	< 0.035	< 0.036	< 0.036
PFOS	< 0.073	1.34	1.17	0.393	2.5	2.16	0.598
PFNS	< 0.039	< 0.041	< 0.041	< 0.040	< 0.041	< 0.042	< 0.042
PFDS	< 0.029	< 0.031	< 0.031	< 0.030	< 0.031	0.044 J	< 0.032
PFDoS	< 0.035	< 0.037	0.122 J F	< 0.036	< 0.037	< 0.038	0.102 J F
4:2FTS	< 0.074	< 0.077	< 0.078	< 0.076	< 0.077	< 0.079	< 0.080
6:2FTS	< 0.257	< 0.267	< 0.271	< 0.263	< 0.268	< 0.274	< 0.277
8:2FTS	< 0.355	< 0.370	< 0.374	< 0.364	< 0.370	< 0.379	< 0.383
PFOSA	< 0.040	< 0.041	< 0.042	< 0.041	< 0.041	< 0.042	< 0.043
NMeFOSA	< 0.092	< 0.096	< 0.097	< 0.094	< 0.096	< 0.098	< 0.099
NEtFOSA	< 0.103	< 0.107	< 0.108	< 0.105	< 0.107	< 0.110	< 0.111
NMeFOSAA	< 0.092	< 0.096	< 0.097	< 0.094	< 0.096	< 0.098	< 0.099
NEtFOSAA	< 0.076	< 0.079	< 0.080	< 0.078	< 0.079	< 0.081	< 0.082
NMeFOSE	< 0.230	< 0.239	< 0.242	< 0.235	< 0.239	< 0.245	< 0.248
NEtFOSE	< 0.468	< 0.487	< 0.494	< 0.480	< 0.488	< 0.500	< 0.505
HFPO-DA	< 0.090	< 0.094	< 0.095	< 0.093	< 0.094	< 0.096	< 0.097
ADONA	< 0.134	< 0.140	< 0.142	< 0.138	< 0.140	< 0.143	< 0.145
9Cl-PF3ONS	< 0.180	< 0.187	< 0.190	< 0.184	< 0.187	< 0.192	< 0.194
11Cl-PF3OUdS	< 0.153	< 0.160	< 0.162	< 0.157	< 0.160	< 0.164	< 0.165
PFMPA	< 0.037	< 0.039	< 0.040	< 0.038	< 0.039	< 0.040	< 0.040
PFMBA	< 0.029	< 0.030	< 0.030	< 0.029	< 0.030	< 0.031	< 0.031
PFEESA	< 0.076	< 0.079	< 0.081	< 0.078	< 0.080	< 0.081	< 0.082
NFDHA	< 0.087	< 0.091	< 0.092	< 0.090	< 0.091	< 0.093	< 0.094
3:3FTCA	< 0.132	< 0.137	< 0.139	< 0.135	< 0.138	< 0.141	< 0.142
5:3FTCA	< 0.463	< 0.482	< 0.488	< 0.475	< 0.483	< 0.494	< 0.499
7:3FTCA	< 1.62	< 1.68	< 1.70	< 1.66	< 1.68	< 1.72	< 1.74
Σ PFAS	0.817	9.84	22.8	3.83	29.4	6.13	34.1

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A22:** Somerset County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	SOM-RUR-1	SOM-RUR-2	SOM-RUR-3	SOM-RUR-4	SOM-URB-1	SOM-URB-2	SOM-URB-3	SOM-URB-4
PFBA	0.732 J	0.591 J	1.04	0.497 J	0.518 J	1.56	0.634 J	0.574 J
PFPeA	0.489	0.443	0.673	0.369 J	0.293 J	1.11	0.435	0.390 J
PFHxA	0.329	0.273	0.788	0.282	0.145 J	1.59	0.196 J	0.268
PFHpA	0.424	0.37	0.712	0.322	0.156 J	1.49	0.188 J	0.376
PFOA	1.66	1.69	3.12	1.48	0.334	8.8	0.526	1.81
PFNA	0.635	0.646	0.649	0.586	0.401 F	1.66	0.331	0.519
PFDA	0.385	0.302	0.43	0.363	0.492	0.649	0.286	0.438
PFUnA	0.498	0.278	0.432	0.585	1.02	0.458	0.466	0.472
PFDoA	0.146 J	0.137 J	0.138 J	0.184 J	0.357	0.139 J	0.164 J F	0.221
PFTrDA	0.119 J	0.075 J F	0.116 J	0.157 J	0.295	0.121 J	0.128 J	0.184 J
PFTeDA	< 0.104	< 0.108	< 0.104	< 0.108	0.152 J	< 0.106	< 0.106	< 0.109
PFBS	< 0.043	0.109 J	0.053 J F	0.182 J	< 0.043	0.147 J	< 0.043	0.063 J
PFPeS	< 0.023	< 0.024	< 0.023	0.038 J	< 0.023	0.047 J	< 0.023	< 0.024
PFHxS	< 0.058	< 0.060	< 0.058	0.144 J	< 0.059	0.23	< 0.059	< 0.061
PFHpS	< 0.036	< 0.037	< 0.036	< 0.037	< 0.037	0.042 J F	< 0.037	< 0.038
PFOS	0.86	0.824	1.26	1.03	0.991	1.97	0.468	1.17
PFNS	< 0.042	< 0.043	< 0.041	< 0.043	< 0.043	< 0.042	< 0.042	< 0.043
PFDS	< 0.031	< 0.033	< 0.031	< 0.032	< 0.032	< 0.032	< 0.032	< 0.033
PFDoS	< 0.038	< 0.039	< 0.038	< 0.039	< 0.039	< 0.038	< 0.038	< 0.039
4:2FTS	< 0.079	< 0.082	< 0.079	< 0.082	< 0.081	< 0.081	< 0.081	< 0.083
6:2FTS	< 0.275	< 0.285	< 0.273	< 0.283	< 0.281	< 0.279	< 0.279	< 0.286
8:2FTS	< 0.380	< 0.394	< 0.378	< 0.391	< 0.388	< 0.386	< 0.386	< 0.396
PFOSA	< 0.043	< 0.044	< 0.042	< 0.044	< 0.043	< 0.043	< 0.043	< 0.044
NMeFOSA	< 0.098	< 0.102	< 0.098	< 0.101	< 0.100	< 0.100	< 0.100	< 0.102
NEtFOSA	< 0.110	< 0.114	< 0.109	< 0.113	< 0.112	< 0.112	< 0.112	< 0.115
NMeFOSAA	< 0.098	< 0.102	< 0.098	< 0.101	< 0.100	< 0.100	< 0.100	< 0.102
NEtFOSAA	< 0.081	< 0.084	< 0.080	< 0.083	< 0.083	< 0.082	< 0.082	< 0.084
NMeFOSE	< 0.246	< 0.255	< 0.244	< 0.253	< 0.251	< 0.250	< 0.250	< 0.256
NEtFOSE	< 0.502	< 0.519	< 0.498	< 0.516	< 0.512	< 0.509	< 0.509	< 0.522
HFPO-DA	0.098 J	< 0.100	0.112 J	< 0.099	< 0.099	< 0.098	0.107 J	0.102 J
ADONA	< 0.144	< 0.149	< 0.143	< 0.148	< 0.147	< 0.146	< 0.146	< 0.150
9Cl-PF3ONS	< 0.193	< 0.199	< 0.191	< 0.198	< 0.197	< 0.196	< 0.195	< 0.201
11Cl-PF3OUdS	< 0.164	< 0.170	< 0.163	< 0.169	< 0.168	< 0.167	< 0.167	< 0.171
PFMPA	< 0.040	< 0.042	< 0.040	< 0.041	< 0.041	< 0.041	< 0.041	< 0.042
PFMBA	< 0.031	< 0.032	< 0.030	< 0.032	< 0.031	< 0.031	< 0.031	< 0.032
PFEESA	< 0.082	< 0.085	< 0.081	< 0.084	< 0.084	< 0.083	< 0.083	< 0.085
NFDHA	< 0.094	< 0.097	< 0.093	< 0.096	< 0.096	< 0.095	< 0.095	< 0.097
3:3FTCA	< 0.142	< 0.146	< 0.140	< 0.146	< 0.144	< 0.144	< 0.144	< 0.147

5:3FTCA	< 0.496	< 0.514	< 0.493	< 0.510	< 0.506	< 0.504	< 0.503	< 0.517
7:3FTCA	< 1.73	< 1.79	< 1.72	< 1.78	< 1.76	< 1.76	< 1.75	< 1.80
Σ PFAS	6.38	5.74	9.52	6.22	5.15	20.0	3.93	6.59

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A23:** Sussex County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	SUS-RUR-1	SUS-RUR-2	SUS-RUR-3	SUS-RUR-4	SUS-URB-1	SUS-URB-2	SUS-URB-3	SUS-URB-4
PFBA	0.610 J	0.658 J	0.357 J	0.754 J	0.326 J	0.852	1.26	0.358 J
PFPeA	0.282 J	0.352 J	0.144 J	0.340 J	0.156 J	0.273 J	0.665	0.216 J
PFHxA	0.23	0.329	0.134 J	0.254	0.181 J	0.203	0.447	0.207
PFHpA	0.265	0.389	0.140 J	0.312	0.228	0.229	0.66	0.181 J
PFOA	0.74	1.55	0.238	1.36	1.28	0.456	1.62	0.789
PFNA	0.469	0.544	0.307	0.56	0.476	0.398	1.13	0.4
PFDA	0.28	0.217	0.2	0.332	0.099 J	0.308	0.959	0.238
PFUnA	0.306	0.21	0.214	0.413	0.115 J	0.395	1.08	0.299
PFDoA	0.102 J	0.073 J	0.061 J	0.150 J	< 0.039	0.128 J	0.41	0.092 J
PFTTrDA	0.094 J	0.073 J	0.065 J	0.123 J	< 0.050	0.107 J	0.4	0.083 J
PFTeDA	< 0.101	< 0.110	< 0.104	< 0.118	< 0.101	< 0.101	0.192 J	< 0.100
PFBS	0.093 J	0.111 J	0.055 J	0.067 J	< 0.041	0.043 J	0.146 J	< 0.041
PFPeS	< 0.022	< 0.024	< 0.023	< 0.026	< 0.022	< 0.022	< 0.023	< 0.022
PFHxS	< 0.056	0.073 J	< 0.058	< 0.066	< 0.056	< 0.056	0.062 J	< 0.056
PFHpS	< 0.035	< 0.038	< 0.036	< 0.041	< 0.035	< 0.035	< 0.036	< 0.035
PFOS	0.555	0.822	0.356	0.951	0.454	0.707	2.22	0.936
PFNS	< 0.040	< 0.044	< 0.042	< 0.047	< 0.040	< 0.040	< 0.041	< 0.040
PFDS	< 0.031	< 0.033	< 0.031	< 0.035	< 0.030	< 0.030	< 0.031	0.040 J
PFDoS	< 0.037	< 0.040	< 0.038	< 0.043	< 0.036	0.080 J F	< 0.037	< 0.036
4:2FTS	< 0.077	< 0.084	< 0.079	< 0.090	< 0.077	< 0.077	< 0.079	< 0.076
6:2FTS	< 0.267	< 0.290	< 0.275	< 0.310	< 0.265	< 0.266	< 0.272	< 0.262
8:2FTS	< 0.369	< 0.401	< 0.380	< 0.429	< 0.366	< 0.367	< 0.377	< 0.363
PFOSA	< 0.041	< 0.045	< 0.042	< 0.048	< 0.041	< 0.041	< 0.042	< 0.041
NMeFOSA	< 0.095	< 0.104	< 0.098	< 0.111	< 0.095	< 0.095	< 0.097	< 0.094
NEtFOSA	< 0.107	< 0.116	< 0.110	< 0.124	< 0.106	< 0.106	< 0.109	< 0.105
NMeFOSAA	< 0.095	< 0.104	< 0.098	< 0.111	< 0.095	< 0.095	< 0.097	< 0.094
NEtFOSAA	< 0.079	< 0.085	< 0.081	< 0.091	< 0.078	< 0.078	< 0.080	< 0.077
NMeFOSE	< 0.238	< 0.260	< 0.246	< 0.277	< 0.237	< 0.238	< 0.244	< 0.235
NEtFOSE	< 0.486	< 0.529	< 0.501	< 0.566	< 0.483	< 0.484	< 0.497	< 0.478

HFPO-DA	< 0.094	< 0.102	< 0.097	< 0.109	< 0.093	< 0.093	< 0.096	< 0.092
ADONA	< 0.139	< 0.152	< 0.144	< 0.162	< 0.138	< 0.139	< 0.142	< 0.137
9Cl-PF3ONS	< 0.187	< 0.203	< 0.192	< 0.217	< 0.186	< 0.186	< 0.191	< 0.184
11Cl-PF3OUdS	< 0.159	< 0.173	< 0.164	< 0.185	< 0.158	< 0.159	< 0.163	< 0.157
PFMPA	< 0.039	< 0.042	< 0.040	< 0.045	< 0.039	< 0.039	< 0.040	< 0.038
PFMBA	< 0.030	< 0.032	< 0.031	< 0.035	< 0.030	< 0.030	< 0.030	< 0.029
PFEEA	< 0.079	< 0.086	< 0.082	< 0.092	< 0.079	< 0.079	< 0.081	< 0.078
NFDHA	< 0.091	< 0.099	< 0.094	< 0.105	< 0.090	< 0.090	< 0.093	< 0.089
3:3FTCA	< 0.137	< 0.149	< 0.141	< 0.160	< 0.136	< 0.137	< 0.140	< 0.135
5:3FTCA	< 0.481	< 0.523	< 0.496	< 0.559	< 0.478	< 0.479	< 0.491	< 0.473
7:3FTCA	< 1.68	< 1.82	< 1.73	< 1.95	< 1.66	< 1.67	< 1.71	< 1.65
Σ PFAS	4.03	5.40	2.27	5.62	3.32	4.18	11.3	3.84

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A24:** Union County Soil Sample Results (ng/g) at urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID			
	UNI-URB-1	UNI-URB-2	UNI-URB-3	UNI-URB-4
PFBA	0.440 J	0.405 J	0.385 J	0.606 J
PFPeA	0.466	0.308 J	0.189 J	1.15
PFHxA	0.463	0.259	0.281	0.775 F
PFHpA	0.441	0.272	0.302	0.56
PFOA	4.98	1.79	3.23	1.38
PFNA	0.921	0.323	0.768	0.994
PFDA	0.829	0.308	0.553	2.08
PFUnA	0.704	0.338	0.514	2.52
PFDoA	0.398	0.112 J	0.227	1.37
PFTTrDA	0.318	0.098 J	0.185 J	1.05
PFTeDA	0.182 J	< 0.105	< 0.107	0.466
PFBS	0.050 J	0.054 J	0.063 J	0.224
PFPeS	< 0.022	< 0.023	< 0.023	< 0.022
PFHxS	0.065 J	0.066 J	< 0.060	0.101 J
PFHpS	< 0.036	< 0.036	< 0.037	< 0.035
PFOS	3.36	1.08	1.51	3.44
PFNS	< 0.041	< 0.042	< 0.043	< 0.041
PFDS	0.053 J	< 0.032	< 0.032	0.379
PFDoS	< 0.037	< 0.038	< 0.039	< 0.037
4:2FTS	< 0.078	< 0.080	< 0.081	< 0.078
6:2FTS	< 0.271	< 0.275	< 0.281	< 0.269

8:2FTS	< 0.374	< 0.381	< 0.389	< 0.372
PFOSA	< 0.042	< 0.043	< 0.043	0.052 J F
NMeFOSA	< 0.097	< 0.098	< 0.100	< 0.096
NEtFOSA	< 0.108	< 0.110	< 0.112	< 0.107
NMeFOSAA	< 0.097	< 0.098	< 0.100	< 0.096
NEtFOSAA	0.099 J	< 0.081	< 0.083	0.104 J
NMeFOSE	< 0.242	< 0.246	< 0.252	< 0.240
NEtFOSE	< 0.493	< 0.502	< 0.513	< 0.490
HFPO-DA	< 0.095	< 0.097	< 0.099	< 0.094
ADONA	< 0.142	< 0.144	< 0.147	< 0.140
9Cl-PF3ONS	< 0.189	< 0.193	< 0.197	< 0.188
11Cl-PF3OUdS	< 0.162	< 0.164	< 0.168	< 0.160
PFMPA	< 0.039	< 0.040	< 0.041	< 0.039
PFMBA	< 0.030	< 0.031	< 0.031	< 0.030
PFEESA	< 0.080	< 0.082	< 0.084	< 0.080
NFDHA	< 0.092	< 0.094	< 0.096	< 0.091
3:3FTCA	< 0.139	< 0.142	< 0.145	< 0.138
5:3FTCA	< 0.488	< 0.497	< 0.507	< 0.484
7:3FTCA	< 1.70	< 1.73	< 1.77	< 1.69
Σ PFAS	13.8	5.41	8.21	17.3

Notes:

“<” indicates a value that was not detected above the method detection limit.

“F” qualifier indicates a result that is an estimated maximum possible concentration.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“F” and “J”) values.

**Table A25:** Warren County Soil Sample Results (ng/g) at rural (RUR) and urban (URB) sites. See Table A2 for list of analyte descriptions.

Analyte	Sample ID							
	WAR-RUR-1	WAR-RUR-2	WAR-RUR-3	WAR-RUR-4	WAR-URB-1	WAR-URB-2	WAR-URB-3	WAR-URB-4
PFBA	0.477 J	0.413 J	0.320 J	0.502 J	0.470 J	0.486 J	0.201 J	0.579 J
PFPeA	0.228 J	0.220 J	0.171 J	0.243 J	0.218 J	0.256 J	0.106 J	0.409
PFHxA	0.183 J	0.160 J	0.153 J	0.196 J	0.185 J	0.214	0.085 J	0.361
PFHpA	0.172 J	0.166 J	0.172 J	0.254	0.218	0.206	0.099 J	0.303
PFOA	0.376	0.137 J	0.358	0.597	0.522	0.848	0.275	0.946
PFNA	0.427	0.297	0.279	0.413	0.62	0.406	0.179 J	0.902
PFDA	0.305	0.411	0.22	0.251	0.419	0.24	0.163 J	0.61
PFUnA	0.512	1.02	0.393	0.345	0.638	0.282	0.218	0.818
PFDoA	0.135 J	0.355	0.106 J	0.102 J	0.2	0.087 J	0.071 J	0.262
PFTTrDA	0.135 J	0.317	0.083 J	0.119 J	0.193 J	0.091 J	0.074 J	0.233
PFTeDA	< 0.105	0.108 J	< 0.103	< 0.106	< 0.105	< 0.106	< 0.105	0.123 J
PFBS	0.048 J	0.060 J	< 0.042	< 0.043	0.044 J	< 0.043	< 0.043	< 0.042

PFPeS	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023
PFHxS	< 0.058	< 0.059	< 0.057	< 0.059	< 0.058	< 0.059	< 0.059	< 0.058
PFHpS	< 0.036	< 0.037	< 0.036	< 0.037	< 0.036	< 0.037	< 0.036	< 0.036
PFOS	0.526	0.845	0.552	0.686	0.982	0.598	0.313	2.16
PFNS	< 0.042	< 0.042	< 0.041	< 0.043	< 0.042	< 0.042	< 0.042	< 0.042
PFDS	< 0.032	< 0.032	< 0.031	< 0.032	< 0.032	< 0.032	< 0.032	< 0.031
PFDoS	< 0.038	< 0.038	< 0.037	< 0.039	< 0.038	< 0.038	< 0.038	< 0.038
4:2FTS	< 0.080	< 0.080	< 0.078	< 0.081	< 0.080	< 0.081	< 0.080	< 0.079
6:2FTS	< 0.276	< 0.278	< 0.272	< 0.280	< 0.276	< 0.279	< 0.277	< 0.275
8:2FTS	< 0.381	< 0.384	< 0.376	< 0.388	< 0.382	< 0.386	< 0.383	< 0.380
PFOSA	< 0.043	< 0.043	< 0.042	< 0.043	< 0.043	< 0.043	< 0.043	< 0.042
NMeFOSA	< 0.099	< 0.099	< 0.097	< 0.100	< 0.099	< 0.100	< 0.099	< 0.098
NEtFOSA	< 0.110	< 0.111	< 0.109	< 0.112	< 0.110	< 0.112	< 0.111	< 0.110
NMeFOSAA	< 0.099	< 0.099	< 0.097	< 0.100	< 0.099	< 0.100	< 0.099	< 0.098
NEtFOSAA	< 0.081	< 0.082	< 0.080	< 0.083	< 0.081	< 0.082	< 0.081	< 0.081
NMeFOSE	< 0.247	< 0.249	< 0.243	< 0.251	< 0.247	< 0.249	< 0.247	< 0.246
NEtFOSE	< 0.503	< 0.507	< 0.495	< 0.511	< 0.503	< 0.508	< 0.504	< 0.502
HFPO-DA	< 0.097	< 0.098	< 0.095	< 0.099	< 0.097	< 0.098	< 0.097	< 0.097
ADONA	< 0.144	< 0.145	< 0.142	< 0.147	< 0.144	< 0.146	< 0.145	< 0.144
9Cl-PF3ONS	< 0.193	< 0.195	< 0.190	< 0.196	< 0.193	< 0.195	< 0.194	< 0.193
11Cl-PF3OUdS	< 0.165	< 0.166	< 0.162	< 0.167	< 0.165	< 0.166	< 0.165	< 0.164
PFMPA	< 0.040	< 0.041	< 0.040	< 0.041	< 0.040	< 0.041	< 0.040	< 0.040
PFMBA	< 0.031	< 0.031	< 0.030	< 0.031	< 0.031	< 0.031	< 0.031	< 0.031
PFEESA	< 0.082	< 0.083	< 0.081	< 0.083	< 0.082	< 0.083	< 0.082	< 0.082
NFDHA	< 0.094	< 0.095	< 0.092	< 0.095	< 0.094	< 0.095	< 0.094	< 0.094
3:3FTCA	< 0.142	< 0.143	< 0.140	< 0.144	< 0.142	< 0.143	< 0.142	< 0.142
5:3FTCA	< 0.497	< 0.501	< 0.490	< 0.506	< 0.498	< 0.503	< 0.499	< 0.496
7:3FTCA	< 1.73	< 1.75	< 1.71	< 1.76	< 1.74	< 1.75	< 1.74	< 1.73
Σ PFAS	3.52	4.51	2.81	3.71	4.71	3.71	1.78	7.71

Notes:

“<” indicates a value that was not detected above the method detection limit.

“J” qualifier indicates a result that is estimated because the concentration is below the RL but above the MDL.

“Σ PFAS” includes estimated (“J”) values.

**Table A26:** Summary statistics for PFAS (ng/g) including mean, standard deviation (SD), standard error (SE), and percentiles (50 = median). Summary statistics were not estimated when there were less than five detections (--). n\_cen represents the number of samples reported below the detection level or “censored”.

PFAS	n	n_cen	Mean	SD	SE	Min	25	50	75	90	95	99	Max
PFBA	157	18	0.496	0.419	0.033	0.046	0.178	0.444	0.665	0.93	1.48	1.85	2.67
PFPeA	157	16	0.373	0.425	0.034	0.05	0.144	0.289	0.435	0.716	1.11	2.5	3.55
PFHxA	157	15	0.328	0.39	0.031	0.041	0.12	0.227	0.365	0.702	0.954	2.43	2.57
PFHpA	157	11	0.315	0.385	0.031	0.022	0.104	0.228	0.376	0.623	0.742	2.26	3.16
PFOA	157	9	1.467	1.784	0.142	0.048	0.231	0.761	1.9	4.08	5.03	9.13	9.35
PFNA	157	6	0.911	1.026	0.082	0.071	0.309	0.634	1.05	2.17	3.13	4.69	8.05
PFDA	157	4	0.54	0.576	0.046	0.07	0.238	0.382	0.622	1.14	1.6	3.54	4.83
PFUnA	157	2	0.948	1.506	0.12	0.047	0.351	0.585	0.987	1.71	2.58	8.58	15.3
PFDoA	157	9	0.283	0.392	0.031	0.038	0.108	0.178	0.288	0.504	0.984	1.8	3.83
PFTrDA	157	12	0.235	0.273	0.022	0.049	0.096	0.165	0.262	0.432	0.717	1.65	2.35
PFTeDA	157	117	0.133	0.119	0.009	0.095	--	--	0.108	0.181	0.314	0.467	1.36
PFBS	157	79	0.065	0.035	0.003	0.038	--	0.043	0.074	0.113	0.139	0.203	0.224
PFPeS	157	151	0.024	0.006	0.001	0.017	--	--	--	--	--	0.047	0.087
PFHxS	157	128	0.062	0.076	0.006	0.044	0.044	0.044	0.044	0.088	0.128	0.417	0.833
PFHpS	157	154	--	--	--	--	--	--	--	--	--	--	--
PFOS	157	3	1.1	0.913	0.073	0.073	0.468	0.86	1.4	2.2	2.85	4.65	5.2
PFNS	157	157	--	--	--	--	--	--	--	--	--	--	--
PFDS	157	148	0.044	0.03	0.002	0.023	--	--	--	--	0.044	0.112	0.379
PFDoS	157	132	0.061	0.1	0.008	0.028	--	--	--	0.092	0.122	0.639	1.01
4:2FTS	157	157	--	--	--	--	--	--	--	--	--	--	--
6:2FTS	157	154	--	--	--	--	--	--	--	--	--	--	--
8:2FTS	157	157	--	--	--	--	--	--	--	--	--	--	--
PFOSA	157	155	--	--	--	--	--	--	--	--	--	--	--
NMeFOSA	157	157	--	--	--	--	--	--	--	--	--	--	--
NEtFOSA	157	157	--	--	--	--	--	--	--	--	--	--	--
NMeFOSAA	157	157	--	--	--	--	--	--	--	--	--	--	--
NEtFOSAA	157	154	--	--	--	--	--	--	--	--	--	--	--

NMeFOSE	157	156	--	--	--	--	--	--	--	--	--	--	--
NEtFOSE	157	157	--	--	--	--	--	--	--	--	--	--	--
HFPO-DA	157	139	0.098	0.088	0.007	0.082	0.082	0.082	0.082	0.098	0.159	0.597	0.949
ADONA	157	157	--	--	--	--	--	--	--	--	--	--	--
9Cl-PF3ONS	157	157	--	--	--	--	--	--	--	--	--	--	--
11Cl-PF3OUdS	157	157	--	--	--	--	--	--	--	--	--	--	--
PFMPA	157	157	--	--	--	--	--	--	--	--	--	--	--
PFMBA	157	157	--	--	--	--	--	--	--	--	--	--	--
PFEESA	157	157	--	--	--	--	--	--	--	--	--	--	--
NFDHA	157	157	--	--	--	--	--	--	--	--	--	--	--
3:3FTCA	157	157	--	--	--	--	--	--	--	--	--	--	--
5:3FTCA	157	157	--	--	--	--	--	--	--	--	--	--	--
7:3FTCA	157	157	--	--	--	--	--	--	--	--	--	--	--
-- Too many censored values to estimate													

**Table A27:** Median PFAS concentration (ng/g) in each of New Jersey’s counties. See Table A1 for county abbreviations.

PFAS	ATL	BER	BUR	CAM	CAP	CUM	ESS	GLO	HUD	HUN	MER	MID	MON	MOR	OCE	PAS	SAL	SOM	SUS	UNI	WAR
PFBA	0.083	0.592	0.075	0.24	0.117	--	0.526	0.35	0.478	0.381	0.549	0.281	0.356	0.598	0.115	0.692	0.368	0.591	0.61	0.405	0.47
PFPeA	0.083	0.371	0.071	0.206	--	0.094	0.309	0.294	0.406	0.232	0.334	0.191	0.221	0.312	0.093	0.395	0.356	0.435	0.273	0.308	0.22
PFHxA	0.067	0.301	0.056	0.135	0.065	0.082	0.323	0.252	0.278	0.237	0.307	0.173	0.225	0.281	0.082	0.313	0.329	0.273	0.207	0.281	0.183
PFHpA	0.045	0.277	0.038	0.152	0.068	0.069	0.353	0.214	0.234	0.233	0.313	0.204	0.214	0.262	0.056	0.387	0.238	0.37	0.229	0.302	0.172
PFOA	0.141	1.48	0.109	0.32	0.11	0.208	2.53	0.345	0.761	0.769	1.71	2.11	0.726	1.14	0.226	1.7	0.545	1.66	0.789	1.79	0.376
PFNA	0.235	0.73	0.198	1.18	0.223	0.585	0.651	1.34	0.655	0.624	1.01	0.513	0.593	0.743	0.206	0.621	2.43	0.586	0.469	0.768	0.406
PFDA	0.159	0.724	0.159	0.309	0.115	0.209	0.454	0.435	1.54	0.269	0.44	0.258	0.398	0.471	0.243	0.452	1.14	0.385	0.238	0.553	0.251
PFUnA	0.217	0.747	0.77	1.06	0.295	0.433	0.374	2.01	1.51	0.359	1.01	0.559	0.65	0.459	0.584	0.407	1.88	0.466	0.299	0.514	0.393
PFDoA	0.064	0.373	0.124	0.109	0.075	0.095	0.245	0.194	0.867	0.108	0.217	0.244	0.223	0.164	0.132	0.166	0.453	0.146	0.092	0.227	0.106
PFTTrDA	--	0.282	0.129	0.133	0.065	0.078	0.2	0.262	0.842	0.11	0.178	0.125	0.205	0.192	0.164	0.15	0.277	0.121	0.083	0.185	0.119
PFTeDA	--	0.151	--	--	--	--	0.118	--	0.329	--	--	--	--	--	--	--	0.18	--	--	--	--
PFBS	--	0.078	--	--	--	--	0.056	0.045	--	--	0.059	--	--	0.094	--	0.082	--	0.053	0.055	0.054	--
PFPeS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFHxS	--	--	--	--	--	--	0.044	--	--	--	--	--	--	--	--	--	--	--	--	0.065	--
PFHpS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFOS	0.599	1.44	0.241	0.583	0.258	0.389	1.42	0.431	3.27	1.22	0.947	0.651	0.636	1.15	0.387	0.938	1.17	0.991	0.707	1.51	0.598
PFNS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFDS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFDoS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.109	--	--	--	--	--	--
4:2FTS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6:2FTS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8:2FTS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFOSA	--	--	--	--	--	--	0.033	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NMeFOSA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NEtFOSA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NMeFOSAA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NEtFOSAA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NMeFOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NEtFOSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HFPO-DA	--	--	--	--	--	--	0.082	--	--	--	--	0.192	--	--	--	--	--	--	0.098	--	--
ADONA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

9Cl-PF3ONS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11Cl-PF3OUdS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFMPA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFMBA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFEESA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NFDHA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3:3FTCA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5:3FTCA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7:3FTCA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Table A28:** Pair-wise comparisons of PFAS concentrations by county (see Table A1 for abbreviations). When a *p*-value is highlighted in red, one of the two counties has significantly higher PFAS concentrations than the other county being compared. See Table A26 for median values by county.

PFAS	County	ATL	BER	BUR	CAM	CAP	CUM	ESS	GLO	HUD	HUN	MER	MID	MON	MOR	OCE	PAS	SAL	SOM	SUS	UNI	WAR
PFBA	ATL	--	0	0.875	0.087	0.713	0.048	0.004	0.006	0	0.002	0.001	0.105	0.021	0	0.463	0	0.027	0	0	0	0.001
	BER	0	--	0	0.005	0.002	0.002	0.61	0.053	0.329	0.205	0.603	0.246	0.136	0.835	0.286	0.315	0.558	0.755	0.834	0.071	0.005
	BUR	0.875	0	--	0.034	0.528	0.02	0.004	0.004	0	0.002	0.001	0.132	0.025	0	0.494	0	0.032	0	0	0	0.001
	CAM	0.087	0.005	0.034	--	0.245	0.014	0.184	0.319	0.017	0.206	0.022	0.601	0.374	0.021	0.958	0.007	0.352	0.003	0.053	0.098	0.087
	CAP	0.713	0.002	0.528	0.245	--	0.036	0.007	0.016	0.009	0.005	0.005	0.132	0.052	0.001	0.529	0.001	0.053	0.002	0.001	0.017	0.01
	CUM	0.048	0.002	0.02	0.014	0.036	--	0.002	0.003	0.009	0.002	0.002	0.019	0.01	0.001	0.007	0.001	0.008	0.001	0.001	0.017	0.007
	ESS	0.004	0.61	0.004	0.184	0.007	0.002	--	0.359	0.833	0.559	0.899	0.799	0.436	0.703	0.434	0.371	0.888	0.525	0.703	0.534	0.346
	GLO	0.006	0.053	0.004	0.319	0.016	0.003	0.359	--	0.21	0.603	0.206	0.917	0.917	0.089	0.456	0.011	0.643	0.04	0.139	0.611	0.675
	HUD	0	0.329	0	0.017	0.009	0.009	0.833	0.21	--	0.384	0.869	0.61	0.386	1	0.384	0.134	0.705	0.191	1	0.14	0.21
	HUN	0.002	0.205	0.002	0.206	0.005	0.002	0.559	0.603	0.384	--	0.347	0.835	0.677	0.171	0.395	0.026	0.817	0.138	0.347	0.867	0.675
	MER	0.001	0.603	0.001	0.022	0.005	0.002	0.899	0.206	0.869	0.347	--	0.464	0.345	0.917	0.339	0.203	0.816	0.404	0.917	0.258	0.137
	MID	0.105	0.246	0.132	0.601	0.132	0.019	0.799	0.917	0.61	0.835	0.464	--	0.917	0.343	1	0.201	0.562	0.246	0.343	0.867	1
	MON	0.021	0.136	0.025	0.374	0.052	0.01	0.436	0.917	0.386	0.677	0.345	0.917	--	0.169	0.564	0.029	0.686	0.077	0.206	0.736	0.917
	MOR	0	0.835	0	0.021	0.001	0.001	0.703	0.089	1	0.171	0.917	0.343	0.169	--	0.286	0.248	0.637	0.531	0.754	0.259	0.109
	OCE	0.463	0.286	0.494	0.958	0.529	0.007	0.434	0.456	0.384	0.395	0.339	1	0.564	0.286	--	0.286	0.322	0.286	0.286	0.49	0.391
	PAS	0	0.315	0	0.007	0.001	0.001	0.371	0.011	0.134	0.026	0.203	0.201	0.029	0.248	0.286	--	0.637	0.4	0.345	0.022	0
	SAL	0.027	0.558	0.032	0.352	0.053	0.008	0.888	0.643	0.705	0.817	0.816	0.562	0.686	0.637	0.322	0.637	--	0.483	0.816	0.705	0.907
	SOM	0	0.755	0	0.003	0.002	0.001	0.525	0.04	0.191	0.138	0.404	0.246	0.077	0.531	0.286	0.4	0.483	--	0.677	0.05	0.002
	SUS	0	0.834	0	0.053	0.001	0.001	0.703	0.139	1	0.347	0.917	0.343	0.206	0.754	0.286	0.345	0.816	0.677	--	0.514	0.135
	UNI	0	0.071	0	0.098	0.017	0.017	0.534	0.611	0.14	0.867	0.258	0.867	0.736	0.259	0.49	0.022	0.705	0.05	0.514	--	0.867
WAR	0.001	0.005	0.001	0.087	0.01	0.007	0.346	0.675	0.21	0.675	0.137	1	0.917	0.109	0.391	0	0.907	0.002	0.135	0.867	--	
PFPeA	ATL	--	0	0.835	0.052	0.453	0.637	0.002	0.004	0	0.001	0.001	0.105	0.021	0	0.527	0	0.018	0	0.002	0.001	0.002
	BER	0	--	0	0.11	0.002	0.003	0.702	0.601	0.386	0.089	0.755	0.399	0.343	0.678	0.24	0.677	0.908	0.27	0.069	1	0.005
	BUR	0.835	0	--	0.123	0.459	0.917	0.007	0.008	0	0.008	0.001	0.165	0.06	0.001	0.675	0	0.022	0	0.012	0.004	0.03
	CAM	0.052	0.11	0.123	--	0.05	0.169	0.519	0.466	0.098	0.677	0.138	0.917	0.795	0.245	0.752	0.085	0.218	0.052	0.603	0.291	0.958
	CAP	0.453	0.002	0.459	0.05	--	0.282	0.002	0.002	0.001	0.005	0.001	0.06	0.015	0.002	0.167	0.001	0.018	0.001	0.005	0.004	0.007
	CUM	0.637	0.003	0.917	0.169	0.282	--	0.027	0.023	0.004	0.034	0.004	0.201	0.087	0.007	0.674	0.003	0.053	0.002	0.022	0.013	0.029
	ESS	0.002	0.702	0.007	0.519	0.002	0.027	--	0.899	0.275	0.43	0.613	1	0.701	0.798	0.43	0.61	0.574	0.374	0.604	0.52	0.179
	GLO	0.004	0.601	0.008	0.466	0.002	0.023	0.899	--	0.386	0.676	0.6	0.835	0.756	0.753	0.241	0.599	0.352	0.291	0.639	0.491	0.341
	HUD	0	0.386	0	0.098	0.001	0.004	0.275	0.386	--	0.026	0.384	0.291	0.212	0.098	0.384	0.49	0.852	0.866	0.035	0.568	0.004

	HUN	0.001	0.089	0.008	0.677	0.005	0.034	0.43	0.676	0.026	--	0.169	0.834	0.917	0.347	0.456	0.023	0.485	0.008	0.917	0.373	0.602
	MER	0.001	0.755	0.001	0.138	0.001	0.004	0.613	0.6	0.384	0.169	--	0.529	0.402	0.603	0.336	0.917	0.728	0.465	0.138	0.866	0.011
	MID	0.105	0.399	0.165	0.917	0.06	0.201	1	0.835	0.291	0.834	0.529	--	0.835	0.712	0.596	0.524	0.292	0.339	0.917	0.611	0.833
	MON	0.021	0.343	0.06	0.795	0.015	0.087	0.701	0.756	0.212	0.917	0.402	0.835	--	0.6	0.49	0.398	0.266	0.168	1	0.384	0.6
	MOR	0	0.678	0.001	0.245	0.002	0.007	0.798	0.753	0.098	0.347	0.603	0.712	0.6	--	0.391	0.345	0.642	0.112	0.248	0.729	0.022
	OCE	0.527	0.24	0.675	0.752	0.167	0.674	0.43	0.241	0.384	0.456	0.336	0.596	0.49	0.391	--	0.391	0.155	0.241	0.336	0.291	0.456
	PAS	0	0.677	0	0.085	0.001	0.003	0.61	0.599	0.49	0.023	0.917	0.524	0.398	0.345	0.391	--	1	0.295	0.052	1	0.001
	SAL	0.018	0.908	0.022	0.218	0.018	0.053	0.574	0.352	0.852	0.485	0.728	0.292	0.266	0.642	0.155	1	--	0.815	0.239	0.715	0.153
	SOM	0	0.27	0	0.052	0.001	0.002	0.374	0.291	0.866	0.008	0.465	0.339	0.168	0.112	0.241	0.295	0.815	--	0.008	0.736	0.001
	SUS	0.002	0.069	0.012	0.603	0.005	0.022	0.604	0.639	0.035	0.917	0.138	0.917	1	0.248	0.336	0.052	0.239	0.008	--	0.287	0.4
	UNI	0.001	1	0.004	0.291	0.004	0.013	0.52	0.491	0.568	0.373	0.866	0.611	0.384	0.729	0.291	1	0.715	0.736	0.287	--	0.09
	WAR	0.002	0.005	0.03	0.958	0.007	0.029	0.179	0.341	0.004	0.602	0.011	0.833	0.6	0.022	0.456	0.001	0.153	0.001	0.4	0.09	--
PFHxA	ATL	--	0	0.793	0.086	0.917	0.341	0.002	0.001	0	0.002	0	0.063	0.013	0	0.527	0	0.012	0	0	0	0.001
	BER	0	--	0	0.03	0.001	0.007	1	0.602	0.741	0.138	0.678	0.528	0.464	0.917	0.286	0.677	0.728	0.755	0.207	0.49	0.011
	BUR	0.793	0	--	0.205	0.793	0.461	0.007	0.006	0.001	0.004	0	0.105	0.029	0.001	0.527	0	0.018	0.001	0.001	0	0.008
	CAM	0.086	0.03	0.205	--	0.134	0.53	0.124	0.089	0.061	0.246	0.011	0.462	0.27	0.03	0.833	0.022	0.108	0.04	0.136	0.035	0.343
	CAP	0.917	0.001	0.793	0.134	--	0.341	0.004	0.002	0.009	0.01	0.001	0.082	0.021	0.001	0.397	0.001	0.027	0.003	0.005	0.004	0.007
	CUM	0.341	0.007	0.461	0.53	0.341	--	0.056	0.04	0.019	0.068	0.007	0.288	0.109	0.015	0.833	0.01	0.053	0.011	0.039	0.009	0.15
	ESS	0.002	1	0.007	0.124	0.004	0.056	--	1	0.833	0.179	0.799	0.899	0.701	0.897	0.392	1	0.673	1	0.429	0.52	0.227
	GLO	0.001	0.602	0.006	0.089	0.002	0.04	1	--	0.611	0.345	0.566	0.755	0.677	0.753	0.241	0.601	0.562	0.639	0.676	0.386	0.291
	HUD	0	0.741	0.001	0.061	0.009	0.019	0.833	0.611	--	0.287	0.867	0.61	0.736	1	0.291	0.867	0.715	0.867	0.377	0.777	0.095
	HUN	0.002	0.138	0.004	0.246	0.01	0.068	0.179	0.345	0.287	--	0.07	0.673	0.528	0.07	0.524	0.054	0.289	0.248	1	0.06	0.241
	MER	0	0.678	0	0.011	0.001	0.007	0.799	0.566	0.867	0.07	--	0.528	0.345	0.835	0.336	0.959	0.907	0.835	0.07	0.607	0.004
	MID	0.063	0.528	0.105	0.462	0.082	0.288	0.899	0.755	0.61	0.673	0.528	--	0.917	0.833	0.752	0.753	0.35	0.529	1	0.493	0.673
	MON	0.013	0.464	0.029	0.27	0.021	0.109	0.701	0.677	0.736	0.528	0.345	0.917	--	0.402	0.525	0.402	0.382	0.531	0.835	0.386	0.461
	MOR	0	0.917	0.001	0.03	0.001	0.015	0.897	0.753	1	0.07	0.835	0.833	0.402	--	0.336	0.639	0.907	0.677	0.087	0.542	0.013
	OCE	0.527	0.286	0.527	0.833	0.397	0.833	0.392	0.241	0.291	0.524	0.336	0.752	0.525	0.336	--	0.391	0.154	0.201	0.391	0.384	0.391
	PAS	0	0.677	0	0.022	0.001	0.01	1	0.601	0.867	0.054	0.959	0.753	0.402	0.639	0.391	--	0.907	0.601	0.11	0.603	0.008
	SAL	0.012	0.728	0.018	0.108	0.027	0.053	0.673	0.562	0.715	0.289	0.907	0.35	0.382	0.907	0.154	0.907	--	0.683	0.318	1	0.19
	SOM	0	0.755	0.001	0.04	0.003	0.011	1	0.639	0.867	0.248	0.835	0.529	0.531	0.677	0.201	0.601	0.683	--	0.225	0.736	0.046
	SUS	0	0.207	0.001	0.136	0.005	0.039	0.429	0.676	0.377	1	0.07	1	0.835	0.087	0.391	0.11	0.318	0.225	--	0.019	0.169
	UNI	0	0.49	0	0.035	0.004	0.009	0.52	0.386	0.777	0.06	0.607	0.493	0.386	0.542	0.384	0.603	1	0.736	0.019	--	0.004
	WAR	0.001	0.011	0.008	0.343	0.007	0.15	0.227	0.291	0.095	0.241	0.004	0.673	0.461	0.013	0.391	0.008	0.19	0.046	0.169	0.004	--

PFHpA	ATL	--	0	0.599	0.052	0.53	0.341	0.001	0.002	0.001	0.001	0	0.131	0.011	0	0.246	0	0.013	0	0	0	0.001
	BER	0	--	0	0.03	0.003	0.011	0.696	0.602	1	0.295	0.499	0.529	0.345	0.755	0.391	0.404	1	0.402	0.532	0.493	0.017
	BUR	0.599	0	--	0.029	0.166	0.164	0.001	0.002	0.001	0.001	0	0.082	0.004	0	0.11	0	0.013	0	0	0	0.001
	CAM	0.052	0.03	0.029	--	0.097	0.463	0.124	0.248	0.146	0.205	0.011	0.675	0.295	0.07	0.792	0.016	0.175	0.023	0.088	0.019	0.345
	CAP	0.53	0.003	0.166	0.097	--	0.754	0.007	0.007	0.009	0.015	0.003	0.341	0.04	0.002	0.754	0.002	0.039	0.002	0.005	0.004	0.011
	CUM	0.341	0.011	0.164	0.463	0.754	--	0.057	0.069	0.035	0.039	0.003	0.427	0.139	0.029	0.675	0.007	0.055	0.011	0.016	0.017	0.168
	ESS	0.001	0.696	0.001	0.124	0.007	0.057	--	0.437	0.833	0.231	0.898	0.363	0.437	0.898	0.357	0.525	0.832	0.527	0.603	0.834	0.134
	GLO	0.002	0.602	0.002	0.248	0.007	0.069	0.437	--	0.38	0.835	0.293	0.754	0.876	0.532	0.336	0.111	0.562	0.139	0.754	0.291	0.428
	HUD	0.001	1	0.001	0.146	0.009	0.035	0.833	0.38	--	0.38	0.865	0.491	0.61	1	0.291	0.411	0.855	0.74	0.731	0.568	0.197
	HUN	0.001	0.295	0.001	0.205	0.015	0.039	0.231	0.835	0.38	--	0.112	0.917	0.917	0.403	0.391	0.041	0.643	0.088	0.678	0.035	0.291
	MER	0	0.499	0	0.011	0.003	0.003	0.898	0.293	0.865	0.112	--	0.343	0.168	0.346	0.286	0.677	0.725	0.601	0.125	0.736	0.002
	MID	0.131	0.529	0.082	0.675	0.341	0.427	0.363	0.754	0.491	0.917	0.343	--	0.755	0.432	0.834	0.171	0.295	0.249	0.676	0.291	0.672
	MON	0.011	0.345	0.004	0.295	0.04	0.139	0.437	0.876	0.61	0.917	0.168	0.755	--	0.602	0.461	0.203	0.486	0.206	0.603	0.21	0.676
	MOR	0	0.755	0	0.07	0.002	0.029	0.898	0.532	1	0.403	0.346	0.432	0.602	--	0.391	0.603	0.816	0.531	0.755	0.291	0.088
	OCE	0.246	0.391	0.11	0.792	0.754	0.675	0.357	0.336	0.291	0.391	0.286	0.834	0.461	0.391	--	0.286	0.157	0.201	0.336	0.49	0.391
	PAS	0	0.404	0	0.016	0.002	0.007	0.525	0.111	0.411	0.041	0.677	0.171	0.203	0.603	0.286	--	0.815	0.755	0.171	0.736	0.005
	SAL	0.013	1	0.013	0.175	0.039	0.055	0.832	0.562	0.855	0.643	0.725	0.295	0.486	0.816	0.157	0.815	--	1	0.816	0.705	0.289
	SOM	0	0.402	0	0.023	0.002	0.011	0.527	0.139	0.74	0.088	0.601	0.249	0.206	0.531	0.201	0.755	1	--	0.206	1	0.021
	SUS	0	0.532	0	0.088	0.005	0.016	0.603	0.754	0.731	0.678	0.125	0.676	0.603	0.755	0.336	0.171	0.816	0.206	--	0.147	0.088
	UNI	0	0.493	0	0.019	0.004	0.017	0.834	0.291	0.568	0.035	0.736	0.291	0.21	0.291	0.49	0.736	0.705	1	0.147	--	0.004
WAR	0.001	0.017	0.001	0.345	0.011	0.168	0.134	0.428	0.197	0.291	0.002	0.672	0.676	0.088	0.391	0.005	0.289	0.021	0.088	0.004	--	
PFOA	ATL	--	0	0.917	0.185	0.917	0.398	0.006	0.006	0.004	0.004	0	0.011	0.004	0	0.294	0	0.032	0	0.001	0	0.008
	BER	0	--	0.001	0.017	0.002	0.017	0.18	0.017	0.729	0.111	0.677	0.597	0.462	0.835	0.109	0.677	0.417	0.959	0.246	0.289	0.012
	BUR	0.917	0.001	--	0.205	0.917	0.528	0.004	0.041	0.009	0.008	0	0.023	0.008	0.001	0.248	0.001	0.094	0.002	0.002	0	0.053
	CAM	0.185	0.017	0.205	--	0.343	0.835	0.01	0.403	0.144	0.207	0.004	0.087	0.208	0.008	0.676	0.012	0.382	0.008	0.089	0.001	0.754
	CAP	0.917	0.002	0.917	0.343	--	0.713	0.007	0.086	0.019	0.029	0.003	0.041	0.016	0.008	0.466	0.002	0.122	0.008	0.015	0.004	0.086
	CUM	0.398	0.017	0.528	0.835	0.713	--	0.006	0.464	0.06	0.207	0.011	0.053	0.171	0.017	0.532	0.017	0.293	0.023	0.109	0.009	0.6
	ESS	0.006	0.18	0.004	0.01	0.007	0.006	--	0.022	0.834	0.052	0.18	0.899	0.43	0.433	0.107	0.232	0.472	0.23	0.022	0.834	0.022
	GLO	0.006	0.017	0.041	0.403	0.086	0.464	0.022	--	0.279	0.532	0.006	0.241	0.532	0.031	0.673	0.017	0.562	0.01	0.139	0.001	0.754
	HUD	0.004	0.729	0.009	0.144	0.019	0.06	0.834	0.279	--	0.375	0.865	0.869	0.49	1	0.21	0.866	0.567	0.863	0.596	0.775	0.199
	HUN	0.004	0.111	0.008	0.207	0.029	0.207	0.052	0.532	0.375	--	0.041	0.244	0.917	0.112	0.599	0.112	0.818	0.069	0.677	0.019	0.205
MER	0	0.677	0	0.004	0.003	0.011	0.18	0.006	0.865	0.041	--	0.673	0.243	0.917	0.166	0.835	0.417	0.678	0.022	0.382	0.001	
MID	0.011	0.597	0.023	0.087	0.041	0.053	0.899	0.241	0.869	0.244	0.673	--	0.677	0.752	0.187	0.673	0.568	0.752	0.336	1	0.241	

	MON	0.004	0.462	0.008	0.208	0.016	0.171	0.43	0.532	0.49	0.917	0.243	0.677	--	0.4	0.294	0.463	0.732	0.246	0.602	0.144	0.205
	MOR	0	0.835	0.001	0.008	0.008	0.017	0.433	0.031	1	0.112	0.917	0.752	0.4	--	0.135	0.917	0.416	1	0.169	0.21	0.008
	OCE	0.294	0.109	0.248	0.676	0.466	0.532	0.107	0.673	0.21	0.599	0.166	0.187	0.294	0.135	--	0.109	0.488	0.136	0.456	0.098	0.524
	PAS	0	0.677	0.001	0.012	0.002	0.017	0.232	0.017	0.866	0.112	0.835	0.673	0.463	0.917	0.109	--	0.417	0.603	0.109	0.491	0.012
	SAL	0.032	0.417	0.094	0.382	0.122	0.293	0.472	0.562	0.567	0.818	0.417	0.568	0.732	0.416	0.488	0.417	--	0.42	0.907	0.239	0.642
	SOM	0	0.959	0.002	0.008	0.008	0.023	0.23	0.01	0.863	0.069	0.678	0.752	0.246	1	0.136	0.603	0.42	--	0.068	0.382	0.011
	SUS	0.001	0.246	0.002	0.089	0.015	0.109	0.022	0.139	0.596	0.677	0.022	0.336	0.602	0.169	0.456	0.109	0.907	0.068	--	0.004	0.069
	UNI	0	0.289	0	0.001	0.004	0.009	0.834	0.001	0.775	0.019	0.382	1	0.144	0.21	0.098	0.491	0.239	0.382	0.004	--	0
	WAR	0.008	0.012	0.053	0.754	0.086	0.6	0.022	0.754	0.199	0.205	0.001	0.241	0.205	0.008	0.524	0.012	0.642	0.011	0.069	0	--
PFNA	ATL	--	0.001	0.958	0.045	0.794	0.184	0.024	0	0.009	0.022	0	0.203	0.111	0.002	0.715	0.008	0.015	0.008	0.078	0.009	0.249
	BER	0.001	--	0.016	0.674	0.038	0.136	0.254	0.054	0.738	0.138	0.294	0.833	0.319	0.531	0.39	0.089	0.477	0.029	0.011	0.74	0.004
	BUR	0.958	0.016	--	0.045	0.958	0.316	0.356	0.004	0.06	0.201	0.016	0.401	0.169	0.081	0.565	0.081	0.045	0.05	0.081	0.144	0.199
	CAM	0.045	0.674	0.045	--	0.184	0.319	0.308	0.249	0.625	0.262	1	0.755	0.317	0.336	0.496	0.24	0.451	0.461	0.163	0.417	0.107
	CAP	0.794	0.038	0.958	0.184	--	0.371	0.234	0.011	0.06	0.134	0.021	0.602	0.109	0.038	0.958	0.081	0.107	0.064	0.064	0.06	0.2
	CUM	0.184	0.136	0.316	0.319	0.371	--	0.607	0.006	0.386	0.755	0.053	0.602	0.755	0.4	0.958	0.53	0.137	0.676	0.597	0.384	0.675
	ESS	0.024	0.254	0.356	0.308	0.234	0.607	--	0.013	0.383	0.898	0.055	0.899	0.8	0.613	0.699	0.516	0.395	0.43	0.23	0.52	0.137
	GLO	0	0.054	0.004	0.249	0.011	0.006	0.013	--	0.124	0.006	0.27	0.138	0.031	0.016	0.087	0.002	0.566	0.001	0.001	0.089	0.001
	HUD	0.009	0.738	0.06	0.625	0.06	0.386	0.383	0.124	--	0.245	0.511	0.868	0.493	0.596	0.49	0.283	0.467	0.239	0.095	0.568	0.058
	HUN	0.022	0.138	0.201	0.262	0.134	0.755	0.898	0.006	0.245	--	0.031	0.916	0.835	0.532	0.524	0.835	0.193	1	0.339	0.382	0.168
	MER	0	0.294	0.016	1	0.021	0.053	0.055	0.27	0.511	0.031	--	0.459	0.139	0.07	0.336	0.008	0.554	0.016	0.002	0.197	0.002
	MID	0.203	0.833	0.401	0.755	0.602	0.602	0.899	0.138	0.868	0.916	0.459	--	0.917	0.916	0.677	0.833	0.352	0.916	0.673	0.868	0.527
	MON	0.111	0.319	0.169	0.317	0.109	0.755	0.8	0.031	0.493	0.835	0.139	0.917	--	0.753	0.752	0.833	0.193	1	0.597	0.868	0.461
	MOR	0.002	0.531	0.081	0.336	0.038	0.4	0.613	0.016	0.596	0.532	0.07	0.916	0.753	--	0.391	0.171	0.346	0.246	0.052	0.868	0.012
	OCE	0.715	0.39	0.565	0.496	0.958	0.958	0.699	0.087	0.49	0.524	0.336	0.677	0.752	0.391	--	0.456	0.218	0.391	0.456	0.49	0.713
	PAS	0.008	0.089	0.081	0.24	0.081	0.53	0.516	0.002	0.283	0.835	0.008	0.833	0.833	0.171	0.456	--	0.193	0.754	0.4	0.199	0.11
	SAL	0.015	0.477	0.045	0.451	0.107	0.137	0.395	0.566	0.467	0.193	0.554	0.352	0.193	0.346	0.218	0.193	--	0.193	0.052	0.467	0.038
	SOM	0.008	0.029	0.05	0.461	0.064	0.676	0.43	0.001	0.239	1	0.016	0.916	1	0.246	0.391	0.754	0.193	--	0.169	0.367	0.111
	SUS	0.078	0.011	0.081	0.163	0.064	0.597	0.23	0.001	0.095	0.339	0.002	0.673	0.597	0.052	0.456	0.4	0.052	0.169	--	0.279	0.345
	UNI	0.009	0.74	0.144	0.417	0.06	0.384	0.52	0.089	0.568	0.382	0.197	0.868	0.868	0.868	0.49	0.199	0.467	0.367	0.279	--	0.058
	WAR	0.249	0.004	0.199	0.107	0.2	0.675	0.137	0.001	0.058	0.168	0.002	0.527	0.461	0.012	0.713	0.11	0.038	0.111	0.345	0.058	--
PFDA	ATL	--	0	0.714	0.022	0.794	0.319	0.001	0.001	0	0.02	0	0.112	0.001	0	0.205	0.002	0.004	0	0.089	0	0.023
	BER	0	--	0.001	0.002	0	0	0.074	0.399	0	0	0.017	0.242	0.001	0.011	0.336	0.002	0.558	0.001	0.005	0.616	0
	BUR	0.714	0.001	--	0.151	0.372	0.37	0.011	0.008	0	0.108	0.016	0.137	0.022	0.011	0.402	0.053	0.019	0.038	0.292	0.004	0.108

CAM	0.022	0.002	0.151	--	0.169	0.404	0.107	0.041	0	0.835	0.068	0.753	0.345	0.053	0.917	0.135	0.028	0.245	0.4	0.058	0.755	
CAP	0.794	0	0.372	0.169	--	0.371	0.007	0.002	0	0.069	0.002	0.054	0.008	0.001	0.227	0.001	0.002	0.006	0.293	0.004	0.06	
CUM	0.319	0	0.37	0.404	0.371	--	0.014	0.004	0	0.246	0.005	0.402	0.04	0.005	0.601	0.029	0.013	0.022	0.566	0.019	0.247	
ESS	0.001	0.074	0.011	0.107	0.007	0.014	--	0.527	0.002	0.04	1	0.798	0.436	0.898	0.514	0.699	0.154	0.356	0.038	0.269	0.04	
GLO	0.001	0.399	0.008	0.041	0.002	0.004	0.527	--	0.034	0.041	0.754	0.247	0.247	0.834	0.203	0.528	0.352	0.246	0.011	0.606	0.023	
HUD	0	0	0	0	0	0	0.002	0.034	--	0	0	0.009	0	0	0.009	0	0.235	0	0	0.238	0	
HUN	0.02	0	0.108	0.835	0.069	0.246	0.04	0.041	0	--	0.019	0.673	0.111	0.012	0.917	0.052	0.018	0.138	0.498	0.017	0.917	
MER	0	0.017	0.016	0.068	0.002	0.005	1	0.754	0	0.019	--	0.599	0.466	0.602	0.391	1	0.094	0.208	0.015	0.279	0.031	
MID	0.112	0.242	0.137	0.753	0.054	0.402	0.798	0.247	0.009	0.673	0.599	--	1	0.673	0.716	0.916	0.243	0.915	0.601	0.291	0.675	
MON	0.001	0.001	0.022	0.345	0.008	0.04	0.436	0.247	0	0.111	0.466	1	--	0.404	0.524	0.531	0.07	0.716	0.066	0.199	0.169	
MOR	0	0.011	0.011	0.053	0.001	0.005	0.898	0.834	0	0.012	0.602	0.673	0.404	--	0.391	0.755	0.119	0.138	0.01	0.367	0.012	
OCE	0.205	0.336	0.402	0.917	0.227	0.601	0.514	0.203	0.009	0.917	0.391	0.716	0.524	0.391	--	0.597	0.126	0.423	0.754	0.21	0.917	
PAS	0.002	0.002	0.053	0.135	0.001	0.029	0.699	0.528	0	0.052	1	0.916	0.531	0.755	0.597	--	0.094	0.206	0.05	0.199	0.059	
SAL	0.004	0.558	0.019	0.028	0.002	0.013	0.154	0.352	0.235	0.018	0.094	0.243	0.07	0.119	0.126	0.094	--	0.026	0.019	0.585	0.018	
SOM	0	0.001	0.038	0.245	0.006	0.022	0.356	0.246	0	0.138	0.208	0.915	0.716	0.138	0.423	0.206	0.026	--	0.029	0.09	0.111	
SUS	0.089	0.005	0.292	0.4	0.293	0.566	0.038	0.011	0	0.498	0.015	0.601	0.066	0.01	0.754	0.05	0.019	0.029	--	0.027	0.532	
UNI	0	0.616	0.004	0.058	0.004	0.019	0.269	0.606	0.238	0.017	0.279	0.291	0.199	0.367	0.21	0.199	0.585	0.09	0.027	--	0.019	
WAR	0.023	0	0.108	0.755	0.06	0.247	0.04	0.023	0	0.917	0.031	0.675	0.169	0.012	0.917	0.059	0.018	0.111	0.532	0.019	--	
PFUnA	ATL	--	0.064	0.111	0.012	0.917	0.463	0.291	0.001	0.001	0.244	0.013	0.295	0.166	0.151	0.112	0.528	0.004	0.166	0.917	0.098	0.245
	BER	0.064	--	0.754	0.104	0.008	0.085	0.053	0	0	0.029	0.201	0.398	0.53	0.244	0.916	0.022	0.018	0.01	0.007	0.403	0.085
	BUR	0.111	0.754	--	0.168	0.04	0.206	0.162	0.004	0.004	0.137	0.531	0.601	0.531	0.403	0.835	0.169	0.029	0.203	0.053	0.739	0.206
	CAM	0.012	0.104	0.168	--	0.008	0.022	0.071	0.079	0.549	0.029	0.461	0.138	0.109	0.085	0.601	0.038	0.243	0.084	0.017	0.511	0.04
	CAP	0.917	0.008	0.04	0.008	--	0.374	0.142	0	0	0.166	0.006	0.402	0.069	0.069	0.111	0.293	0.001	0.291	0.917	0.098	0.249
	CUM	0.463	0.085	0.206	0.022	0.374	--	0.949	0	0	0.917	0.017	0.638	0.169	0.404	0.345	0.959	0.006	0.754	0.245	0.384	0.917
	ESS	0.291	0.053	0.162	0.071	0.142	0.949	--	0.001	0.002	1	0.019	0.799	0.226	0.528	0.447	0.949	0.007	0.481	0.107	0.52	0.899
	GLO	0.001	0	0.004	0.079	0	0	0.001	--	0.417	0	0.016	0.006	0.002	0.001	0.031	0	0.303	0	0	0.05	0
	HUD	0.001	0	0.004	0.549	0	0	0.002	0.417	--	0	0.017	0.034	0.001	0	0.49	0	0.713	0	0	0.238	0
	HUN	0.244	0.029	0.137	0.029	0.166	0.917	1	0	0	--	0.006	0.752	0.168	0.466	0.37	0.835	0.001	0.462	0.135	0.486	0.959
	MER	0.013	0.201	0.531	0.461	0.006	0.017	0.019	0.016	0.017	0.006	--	0.343	0.247	0.023	0.752	0.008	0.193	0.012	0.001	0.452	0.017
	MID	0.295	0.398	0.601	0.138	0.402	0.638	0.799	0.006	0.034	0.752	0.343	--	0.754	0.917	0.532	0.677	0.041	0.752	0.293	0.608	0.835
	MON	0.166	0.53	0.531	0.109	0.069	0.169	0.226	0.002	0.001	0.168	0.247	0.754	--	0.464	0.753	0.138	0.028	0.066	0.038	0.867	0.246
	MOR	0.151	0.244	0.403	0.085	0.069	0.404	0.528	0.001	0	0.466	0.023	0.917	0.464	--	0.601	0.466	0.009	0.917	0.052	0.608	0.678
	OCE	0.112	0.916	0.835	0.601	0.111	0.345	0.447	0.031	0.49	0.37	0.752	0.532	0.753	0.601	--	0.402	0.126	0.527	0.111	1	0.464

	PAS	0.528	0.022	0.169	0.038	0.293	0.959	0.949	0	0	0.835	0.008	0.677	0.138	0.466	0.402	--	0.004	0.461	0.203	0.382	0.917
	SAL	0.004	0.018	0.029	0.243	0.001	0.006	0.007	0.303	0.713	0.001	0.193	0.041	0.028	0.009	0.126	0.004	--	0.013	0.001	0.201	0.004
	SOM	0.166	0.01	0.203	0.084	0.291	0.754	0.481	0	0	0.462	0.012	0.752	0.066	0.917	0.527	0.461	0.013	--	0.029	0.281	0.875
	SUS	0.917	0.007	0.053	0.017	0.917	0.245	0.107	0	0	0.135	0.001	0.293	0.038	0.052	0.111	0.203	0.001	0.029	--	0.035	0.206
	UNI	0.098	0.403	0.739	0.511	0.098	0.384	0.52	0.05	0.238	0.486	0.452	0.608	0.867	0.608	1	0.382	0.201	0.281	0.035	--	0.382
	WAR	0.245	0.085	0.206	0.04	0.249	0.917	0.899	0	0	0.959	0.017	0.835	0.246	0.678	0.464	0.917	0.004	0.875	0.206	0.382	--
PFDaA	ATL	--	0	0.109	0.168	0.459	0.461	0.004	0.008	0	0.069	0.004	0.014	0.021	0.008	0.031	0.052	0.001	0.029	0.463	0.004	0.053
	BER	0	--	0.001	0	0	0	0.097	0.221	0	0	0.008	0.243	0.012	0.017	0.336	0.027	0.485	0.002	0.002	0.736	0.002
	BUR	0.109	0.001	--	0.677	0.293	0.291	0.04	0.089	0	0.835	0.053	0.203	0.152	0.07	0.403	0.319	0.001	0.267	0.373	0.141	1
	CAM	0.168	0	0.677	--	0.602	0.466	0.018	0.026	0	0.602	0.011	0.11	0.067	0.016	0.345	0.169	0.001	0.087	0.403	0.034	0.677
	CAP	0.459	0	0.293	0.602	--	0.6	0.007	0.006	0	0.053	0.004	0.04	0.029	0.012	0.205	0.077	0.001	0.069	0.958	0.009	0.171
	CUM	0.461	0	0.291	0.466	0.6	--	0.009	0.02	0	0.245	0.008	0.023	0.039	0.011	0.138	0.087	0.001	0.038	1	0.014	0.375
	ESS	0.004	0.097	0.04	0.018	0.007	0.009	--	1	0.002	0.018	0.604	0.798	0.517	0.361	0.651	0.437	0.086	0.138	0.016	0.831	0.08
	GLO	0.008	0.221	0.089	0.026	0.006	0.02	1	--	0.009	0.11	0.835	0.835	0.677	0.639	0.532	0.466	0.199	0.29	0.016	0.606	0.139
	HUD	0	0	0	0	0	0	0.002	0.009	--	0	0	0.019	0	0	0.004	0	0.235	0	0	0.238	0
	HUN	0.069	0	0.835	0.602	0.053	0.245	0.018	0.11	0	--	0.023	0.086	0.067	0.088	0.462	0.245	0.002	0.343	0.137	0.017	0.876
	MER	0.004	0.008	0.053	0.011	0.004	0.008	0.604	0.835	0	0.023	--	0.917	0.64	0.754	0.597	0.531	0.052	0.062	0.007	0.476	0.053
	MID	0.014	0.243	0.203	0.11	0.04	0.023	0.798	0.835	0.019	0.086	0.917	--	0.565	1	0.835	0.603	0.126	0.597	0.088	0.733	0.206
	MON	0.021	0.012	0.152	0.067	0.029	0.039	0.517	0.677	0	0.067	0.64	0.565	--	0.917	0.916	0.835	0.033	0.203	0.074	0.373	0.291
	MOR	0.008	0.017	0.07	0.016	0.012	0.011	0.361	0.639	0	0.088	0.754	1	0.917	--	0.752	0.677	0.039	0.27	0.01	0.367	0.089
	OCE	0.031	0.336	0.403	0.345	0.205	0.138	0.651	0.532	0.004	0.462	0.597	0.835	0.916	0.752	--	0.794	0.097	0.832	0.154	0.49	0.53
	PAS	0.052	0.027	0.319	0.169	0.077	0.087	0.437	0.466	0	0.245	0.531	0.603	0.835	0.677	0.794	--	0.021	0.752	0.097	0.287	0.347
	SAL	0.001	0.485	0.001	0.001	0.001	0.001	0.086	0.199	0.235	0.002	0.052	0.126	0.033	0.039	0.097	0.021	--	0.006	0.002	0.363	0.004
	SOM	0.029	0.002	0.267	0.087	0.069	0.038	0.138	0.29	0	0.343	0.062	0.597	0.203	0.27	0.832	0.752	0.006	--	0.029	0.19	0.201
	SUS	0.463	0.002	0.373	0.403	0.958	1	0.016	0.016	0	0.137	0.007	0.088	0.074	0.01	0.154	0.097	0.002	0.029	--	0.035	0.32
	UNI	0.004	0.736	0.141	0.034	0.009	0.014	0.831	0.606	0.238	0.017	0.476	0.733	0.373	0.367	0.49	0.287	0.363	0.19	0.035	--	0.06
	WAR	0.053	0.002	1	0.677	0.171	0.375	0.08	0.139	0	0.876	0.053	0.206	0.291	0.089	0.53	0.347	0.004	0.201	0.32	0.06	--
PFTrDA	ATL	--	0	0.021	0.012	0.337	0.181	0.005	0.001	0	0.022	0.001	0.038	0.007	0.001	0.038	0.015	0.001	0.011	0.164	0.009	0.012
	BER	0	--	0.002	0.006	0	0	0.061	0.874	0	0.001	0.087	0.081	0.017	0.166	0.456	0.066	0.564	0.001	0.007	0.502	0.002
	BUR	0.021	0.002	--	0.795	0.06	0.152	0.396	0.023	0	0.755	0.061	0.959	0.205	0.139	0.496	0.434	0.041	0.716	0.184	0.205	0.835
	CAM	0.012	0.006	0.795	--	0.008	0.154	0.436	0.054	0	0.754	0.187	0.917	0.465	0.171	0.601	0.532	0.056	0.835	0.205	0.144	1
	CAP	0.337	0	0.06	0.008	--	0.372	0.004	0.001	0	0.016	0.001	0.167	0.013	0.002	0.121	0.025	0.001	0.03	0.344	0.004	0.016
	CUM	0.181	0	0.152	0.154	0.372	--	0.033	0.004	0	0.168	0.008	0.318	0.045	0.006	0.184	0.122	0.003	0.086	0.876	0.033	0.17

ESS	0.005	0.061	0.396	0.436	0.004	0.033	--	0.205	0.002	0.179	0.798	0.518	1	0.611	0.8	0.899	0.482	0.287	0.078	0.67	0.326	
GLO	0.001	0.874	0.023	0.054	0.001	0.004	0.205	--	0.144	0.008	0.247	0.07	0.169	0.207	0.248	0.112	0.909	0.008	0.002	0.741	0.023	
HUD	0	0	0	0	0	0	0.002	0.144	--	0	0	0.001	0	0	0.004	0	0.062	0	0	0.238	0	
HUN	0.022	0.001	0.755	0.754	0.016	0.168	0.179	0.008	0	--	0.016	0.754	0.109	0.023	0.342	0.317	0.009	0.638	0.138	0.057	0.958	
MER	0.001	0.087	0.061	0.187	0.001	0.008	0.798	0.247	0	0.016	--	0.242	0.567	0.917	0.834	0.345	0.294	0.035	0.005	0.6	0.068	
MID	0.038	0.081	0.959	0.917	0.167	0.318	0.518	0.07	0.001	0.754	0.242	--	0.494	0.343	0.639	0.715	0.159	0.917	0.223	0.291	0.876	
MON	0.007	0.017	0.205	0.465	0.013	0.045	1	0.169	0	0.109	0.567	0.494	--	0.677	0.794	0.754	0.294	0.136	0.056	0.48	0.245	
MOR	0.001	0.166	0.139	0.171	0.002	0.006	0.611	0.207	0	0.023	0.917	0.343	0.677	--	0.753	0.466	0.418	0.047	0.007	0.864	0.079	
OCE	0.038	0.456	0.496	0.601	0.121	0.184	0.8	0.248	0.004	0.342	0.834	0.639	0.794	0.753	--	0.565	0.418	0.527	0.15	0.608	0.53	
PAS	0.015	0.066	0.434	0.532	0.025	0.122	0.899	0.112	0	0.317	0.345	0.715	0.754	0.466	0.565	--	0.244	0.345	0.095	0.49	0.346	
SAL	0.001	0.564	0.041	0.056	0.001	0.003	0.482	0.909	0.062	0.009	0.294	0.159	0.294	0.418	0.418	0.244	--	0.014	0.005	0.853	0.056	
SOM	0.011	0.001	0.716	0.835	0.03	0.086	0.287	0.008	0	0.638	0.035	0.917	0.136	0.047	0.527	0.345	0.014	--	0.068	0.134	0.958	
SUS	0.164	0.007	0.184	0.205	0.344	0.876	0.078	0.002	0	0.138	0.005	0.223	0.056	0.007	0.15	0.095	0.005	0.068	--	0.035	0.187	
UNI	0.009	0.502	0.205	0.144	0.004	0.033	0.67	0.741	0.238	0.057	0.6	0.291	0.48	0.864	0.608	0.49	0.853	0.134	0.035	--	0.144	
WAR	0.012	0.002	0.835	1	0.016	0.17	0.326	0.023	0	0.958	0.068	0.876	0.245	0.079	0.53	0.346	0.056	0.958	0.187	0.144	--	
PFTeDA	ATL	--	0	--	--	0.317	0.317	0.002	0.144	0	0.317	--	0.027	--	--	--	0.064	0.016	0.317	0.317	0.033	0.144
	BER	0	--	0	0	0	0.001	0.48	0.021	0	0.001	0	0.163	0	0	0.003	0.24	0.724	0.002	0.007	0.862	0.001
	BUR	--	0	--	--	0.317	0.317	0.002	0.126	0	0.317	--	0.027	--	--	--	0.064	0.016	0.317	0.317	0.033	0.144
	CAM	--	0	--	--	0.35	0.317	0.002	0.106	0	0.317	--	0.029	--	--	--	0.064	0.016	0.317	0.317	0.033	0.158
	CAP	0.317	0	0.317	0.35	--	0.927	0.004	0.282	0	0.927	0.317	0.095	0.317	0.317	0.429	0.188	0.04	0.927	0.886	0.099	0.538
	CUM	0.317	0.001	0.317	0.317	0.927	--	0.015	0.44	0	0.927	0.317	0.095	0.317	0.317	0.429	0.188	0.04	0.927	0.927	0.099	0.644
	ESS	0.002	0.48	0.002	0.002	0.004	0.015	--	0.126	0.006	0.009	0.002	0.51	0.002	0.002	0.012	0.197	0.83	0.015	0.025	1	0.02
	GLO	0.144	0.021	0.126	0.106	0.282	0.44	0.126	--	0.001	0.44	0.144	0.4	0.144	0.126	0.127	0.61	0.226	0.538	0.318	0.295	0.783
	HUD	0	0	0	0	0	0	0.006	0.001	--	0	0	0.034	0	0	0.001	0	0.235	0	0	0.238	0
	HUN	0.317	0.001	0.317	0.317	0.927	0.927	0.009	0.44	0	--	0.317	0.095	0.317	0.317	0.429	0.188	0.04	0.927	0.927	0.099	0.538
	MER	--	0	--	--	0.317	0.317	0.002	0.144	0	0.317	--	0.027	--	--	--	0.064	0.016	0.317	0.317	0.033	0.144
	MID	0.027	0.163	0.027	0.029	0.095	0.095	0.51	0.4	0.034	0.095	0.027	--	0.027	0.029	0.051	0.645	0.462	0.133	0.143	0.712	0.203
	MON	--	0	--	--	0.317	0.317	0.002	0.144	0	0.317	--	0.027	--	--	--	0.064	0.016	0.317	0.317	0.033	0.144
	MOR	--	0	--	--	0.317	0.317	0.002	0.126	0	0.317	--	0.029	--	--	--	0.064	0.016	0.317	0.317	0.033	0.158
	OCE	--	0.003	--	--	0.429	0.429	0.012	0.127	0.001	0.429	--	0.051	--	--	--	0.143	0.031	0.429	0.429	0.056	0.248
	PAS	0.064	0.24	0.064	0.064	0.188	0.188	0.197	0.61	0	0.188	0.064	0.645	0.064	0.064	0.143	--	0.137	0.188	0.371	0.312	0.369
	SAL	0.016	0.724	0.016	0.016	0.04	0.04	0.83	0.226	0.235	0.04	0.016	0.462	0.016	0.016	0.031	0.137	--	0.04	0.059	0.699	0.08
	SOM	0.317	0.002	0.317	0.317	0.927	0.927	0.015	0.538	0	0.927	0.317	0.133	0.317	0.317	0.429	0.188	0.04	--	0.927	0.099	0.674

PFBS	SUS	0.317	0.007	0.317	0.317	0.886	0.927	0.025	0.318	0	0.927	0.317	0.143	0.317	0.317	0.429	0.371	0.059	0.927	--	0.171	0.709
	UNI	0.033	0.862	0.033	0.033	0.099	0.099	1	0.295	0.238	0.099	0.033	0.712	0.033	0.033	0.056	0.312	0.699	0.099	0.171	--	0.196
	WAR	0.144	0.001	0.144	0.158	0.538	0.644	0.02	0.783	0	0.538	0.144	0.203	0.144	0.158	0.248	0.369	0.08	0.674	0.709	0.196	--
	ATL	--	0	0.144	0.064	--	0.144	0.008	0.003	0.033	0.064	0.003	0.027	0.064	0.01	0.206	0	0.046	0.01	0.003	0	0.064
	BER	0	--	0.005	0.002	0	0.002	0.447	0.012	0.253	0.005	0.403	0.02	0.016	0.753	0.001	0.876	0.059	0.269	0.227	0.405	0.001
	BUR	0.144	0.005	--	0.899	0.144	1	0.076	0.179	0.295	0.799	0.055	0.399	0.611	0.044	0.696	0.002	0.407	0.131	0.062	0.06	0.899
	CAM	0.064	0.002	0.899	--	0.064	0.61	0.115	0.208	0.312	0.81	0.058	0.353	0.763	0.075	0.354	0.001	0.722	0.141	0.08	0.026	0.646
	CAP	--	0	0.144	0.064	--	0.144	0.008	0.003	0.033	0.064	0.003	0.027	0.064	0.01	0.206	0	0.046	0.01	0.003	0	0.064
	CUM	0.144	0.002	1	0.61	0.144	--	0.076	0.116	0.295	0.61	0.03	0.334	0.524	0.06	0.696	0.002	0.407	0.079	0.054	0.009	0.703
	ESS	0.008	0.447	0.076	0.115	0.008	0.076	--	0.346	0.744	0.115	0.897	0.239	0.331	0.697	0.059	0.444	0.452	0.896	0.897	0.833	0.082
	GLO	0.003	0.012	0.179	0.208	0.003	0.116	0.346	--	1	0.327	0.241	0.789	0.383	0.231	0.034	0.006	0.472	0.558	0.459	0.212	0.076
	HUD	0.033	0.253	0.295	0.312	0.033	0.295	0.744	1	--	0.431	0.732	0.712	0.562	0.606	0.189	0.24	0.677	0.731	0.733	0.568	0.312
	HUN	0.064	0.005	0.799	0.81	0.064	0.61	0.115	0.327	0.431	--	0.076	0.418	0.857	0.075	0.38	0.002	0.695	0.216	0.115	0.121	0.673
	MER	0.003	0.403	0.055	0.058	0.003	0.03	0.897	0.241	0.732	0.076	--	0.158	0.207	0.833	0.029	0.346	0.404	0.958	0.885	0.866	0.032
	MID	0.027	0.02	0.399	0.353	0.027	0.334	0.239	0.789	0.712	0.418	0.158	--	0.645	0.116	0.191	0.008	1	0.444	0.333	0.384	0.295
	MON	0.064	0.016	0.611	0.763	0.064	0.524	0.331	0.383	0.562	0.857	0.207	0.645	--	0.235	0.337	0.015	0.897	0.342	0.228	0.147	0.673
	MOR	0.01	0.753	0.044	0.075	0.01	0.06	0.697	0.231	0.606	0.075	0.833	0.116	0.235	--	0.064	0.677	0.468	0.957	0.726	0.866	0.075
	OCE	0.206	0.001	0.696	0.354	0.206	0.696	0.059	0.034	0.189	0.38	0.029	0.191	0.337	0.064	--	0.002	0.277	0.059	0.043	0.002	0.428
	PAS	0	0.876	0.002	0.001	0	0.002	0.444	0.006	0.24	0.002	0.346	0.008	0.015	0.677	0.002	--	0.098	0.341	0.205	0.403	0
	SAL	0.046	0.059	0.407	0.722	0.046	0.407	0.452	0.472	0.677	0.695	0.404	1	0.897	0.468	0.277	0.098	--	0.397	0.406	0.104	0.647
	SOM	0.01	0.269	0.131	0.141	0.01	0.079	0.896	0.558	0.731	0.216	0.958	0.444	0.342	0.957	0.059	0.341	0.397	--	1	0.548	0.098
	SUS	0.003	0.227	0.062	0.08	0.003	0.054	0.897	0.459	0.733	0.115	0.885	0.333	0.228	0.726	0.043	0.205	0.406	1	--	0.734	0.058
UNI	0	0.405	0.06	0.026	0	0.009	0.833	0.212	0.568	0.121	0.866	0.384	0.147	0.866	0.002	0.403	0.104	0.548	0.734	--	0.004	
WAR	0.064	0.001	0.899	0.646	0.064	0.703	0.082	0.076	0.312	0.673	0.032	0.295	0.673	0.075	0.428	0	0.647	0.098	0.058	0.004	--	
PFPeS	ATL	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
	BER	0.317	--	0.317	0.317	0.317	0.317	0.916	0.317	0.48	0.927	0.317	0.317	0.317	0.927	0.317	0.317	0.35	0.644	0.317	0.48	0.317
	BUR	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
	CAM	--	0.317	--	--	--	--	0.248	--	--	0.35	--	--	--	0.317	--	--	--	0.144	--	--	--
	CAP	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
	CUM	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
	ESS	0.248	0.916	0.248	0.248	0.248	0.248	--	0.248	0.414	0.692	0.248	0.248	0.248	0.749	0.361	0.248	0.28	0.721	0.248	0.414	0.248
	GLO	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
HUD	--	0.48	--	--	--	--	0.414	--	--	0.48	--	--	--	0.48	--	--	--	0.302	--	--	--	

	HUN	0.317	0.927	0.317	0.35	0.317	0.317	0.692	0.317	0.48	--	0.429	0.317	0.317	0.886	0.429	0.317	0.35	0.376	0.386	0.48	0.317
	MER	--	0.317	--	--	--	--	0.248	--	--	0.429	--	--	--	0.317	--	--	--	0.144	--	--	--
	MID	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
	MON	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
	MOR	0.317	0.927	0.317	0.317	0.317	0.317	0.749	0.317	0.48	0.886	0.317	0.317	0.317	--	0.429	0.317	0.35	0.538	0.317	0.48	0.317
	OCE	--	0.317	--	--	--	--	0.361	--	--	0.429	--	--	--	0.429	--	--	--	0.248	--	--	--
	PAS	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
	SAL	--	0.35	--	--	--	--	0.28	--	--	0.35	--	--	--	0.35	--	--	--	0.172	--	--	--
	SOM	0.144	0.644	0.144	0.144	0.144	0.144	0.721	0.144	0.302	0.376	0.144	0.144	0.144	0.538	0.248	0.144	0.172	--	0.144	0.302	0.144
	SUS	--	0.317	--	--	--	--	0.248	--	--	0.386	--	--	--	0.317	--	--	--	0.144	--	--	--
	UNI	--	0.48	--	--	--	--	0.414	--	--	0.48	--	--	--	0.48	--	--	--	0.302	--	--	--
	WAR	--	0.317	--	--	--	--	0.248	--	--	0.317	--	--	--	0.317	--	--	--	0.144	--	--	--
PFHxS	ATL	--	0.317	--	--	0.317	--	0.088	--	0.033	0.317	0.144	0.144	0.144	0.144	0.144	0.144	0.117	0.144	0.129	0.005	--
	BER	0.317	--	0.317	0.317	0.927	0.317	0.474	0.317	0.267	0.927	0.644	0.644	0.644	0.644	0.644	0.644	0.564	0.644	0.615	0.081	0.317
	BUR	--	0.317	--	--	0.317	--	0.088	--	0.033	0.317	0.144	0.144	0.144	0.144	0.144	0.144	0.117	0.144	0.129	0.005	--
	CAM	--	0.317	--	--	0.35	--	0.088	--	0.033	0.317	0.144	0.144	0.144	0.144	0.144	0.144	0.117	0.144	0.142	0.005	--
	CAP	0.317	0.927	0.317	0.35	--	0.317	0.273	0.317	0.099	0.927	0.44	0.44	0.44	0.411	0.411	0.44	0.359	0.411	0.383	0.01	0.317
	CUM	--	0.317	--	--	0.317	--	0.088	--	0.033	0.317	0.144	0.144	0.144	0.144	0.144	0.144	0.117	0.144	0.129	0.005	--
	ESS	0.088	0.474	0.088	0.088	0.273	0.088	--	0.088	0.812	0.367	0.746	0.625	0.625	0.625	0.777	0.511	0.727	0.746	0.534	0.5	0.088
	GLO	--	0.317	--	--	0.317	--	0.088	--	0.033	0.317	0.144	0.144	0.144	0.144	0.144	0.144	0.117	0.144	0.129	0.005	--
	HUD	0.033	0.267	0.033	0.033	0.099	0.033	0.812	0.033	--	0.171	0.412	0.412	0.352	0.412	0.759	0.295	0.508	0.692	0.208	1	0.033
	HUN	0.317	0.927	0.317	0.317	0.927	0.317	0.367	0.317	0.171	--	0.487	0.538	0.538	0.538	0.411	0.644	0.456	0.44	0.615	0.046	0.317
	MER	0.144	0.644	0.144	0.144	0.44	0.144	0.746	0.144	0.412	0.487	--	1	1	1	0.716	0.783	0.882	0.783	0.809	0.176	0.144
	MID	0.144	0.644	0.144	0.144	0.44	0.144	0.625	0.144	0.412	0.538	1	--	0.89	1	0.716	0.836	0.882	0.783	0.809	0.255	0.144
	MON	0.144	0.644	0.144	0.144	0.44	0.144	0.625	0.144	0.352	0.538	1	0.89	--	1	0.716	0.89	0.766	0.783	0.809	0.255	0.144
	MOR	0.144	0.644	0.144	0.144	0.411	0.144	0.625	0.144	0.412	0.538	1	1	1	--	0.716	0.945	0.882	0.89	0.809	0.255	0.144
	OCE	0.144	0.644	0.144	0.144	0.411	0.144	0.777	0.144	0.759	0.411	0.716	0.716	0.716	0.716	--	0.716	0.814	0.859	0.742	0.42	0.144
	PAS	0.144	0.644	0.144	0.144	0.44	0.144	0.511	0.144	0.295	0.644	0.783	0.836	0.89	0.945	0.716	--	0.654	0.783	0.809	0.176	0.144
SAL	0.117	0.564	0.117	0.117	0.359	0.117	0.727	0.117	0.508	0.456	0.882	0.882	0.766	0.882	0.814	0.654	--	0.882	0.679	0.356	0.117	
SOM	0.144	0.644	0.144	0.144	0.411	0.144	0.746	0.144	0.692	0.44	0.783	0.783	0.783	0.89	0.859	0.783	0.882	--	0.809	0.349	0.144	
SUS	0.129	0.615	0.129	0.142	0.383	0.129	0.534	0.129	0.208	0.615	0.809	0.809	0.809	0.809	0.742	0.809	0.679	0.809	--	0.078	0.129	
UNI	0.005	0.081	0.005	0.005	0.01	0.005	0.5	0.005	1	0.046	0.176	0.255	0.255	0.255	0.42	0.176	0.356	0.349	0.078	--	0.005	
WAR	--	0.317	--	--	0.317	--	0.088	--	0.033	0.317	0.144	0.144	0.144	0.144	0.144	0.144	0.117	0.144	0.129	0.005	--	

PFHpS	ATL	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	BER	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	BUR	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	CAM	--	--	--	--	--	--	0.28	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	CAP	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	CUM	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	ESS	0.248	0.248	0.248	0.28	0.248	0.248	--	0.248	0.643	0.248	0.248	0.248	0.248	0.28	0.361	0.248	0.28	0.958	0.317	0.414	0.248
	GLO	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	HUD	0.157	0.157	0.157	0.157	0.157	0.157	0.643	0.157	--	0.157	0.157	0.157	0.157	0.157	0.264	0.157	0.186	0.504	0.157	0.317	0.157
	HUN	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	MER	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	MID	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	MON	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	MOR	--	--	--	--	--	--	0.28	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	OCE	--	--	--	--	--	--	0.361	--	0.264	--	--	--	--	--	--	--	--	0.429	--	--	--
	PAS	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--
	SAL	--	--	--	--	--	--	0.28	--	0.186	--	--	--	--	--	--	--	--	0.35	--	--	--
	SOM	0.317	0.317	0.317	0.317	0.317	0.317	0.958	0.317	0.504	0.317	0.317	0.317	0.317	0.317	0.429	0.317	0.35	--	0.317	0.48	0.317
SUS	--	--	--	--	--	--	0.317	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--	
UNI	--	--	--	--	--	--	0.414	--	0.317	--	--	--	--	--	--	--	--	0.48	--	--	--	
WAR	--	--	--	--	--	--	0.248	--	0.157	--	--	--	--	--	--	--	--	0.317	--	--	--	
PFOS	ATL	--	0.001	0.344	0.835	0.462	0.566	0.015	0.917	0.001	0.023	0.011	0.293	0.465	0.001	0.294	0.016	0.265	0.022	0.248	0.001	0.603
	BER	0.001	--	0	0.005	0.001	0.001	1	0	0.053	0.053	0.04	0.293	0.003	0.206	0.286	0.008	0.204	0.012	0.005	0.476	0.003
	BUR	0.344	0	--	0.53	1	0.602	0.015	0.11	0	0.002	0.002	0.11	0.016	0	0.017	0.001	0.052	0.002	0.011	0	0.04
	CAM	0.835	0.005	0.53	--	0.754	0.755	0.055	0.917	0.001	0.039	0.007	0.205	0.294	0.007	0.403	0.01	0.382	0.029	0.247	0.004	0.434
	CAP	0.462	0.001	1	0.754	--	0.755	0.017	0.166	0.001	0.022	0.008	0.089	0.109	0.001	0.041	0.011	0.156	0.011	0.068	0.001	0.109
	CUM	0.566	0.001	0.602	0.755	0.755	--	0.026	0.464	0.001	0.029	0.011	0.171	0.206	0.005	0.247	0.011	0.175	0.016	0.112	0.004	0.169
	ESS	0.015	1	0.015	0.055	0.017	0.026	--	0.022	0.383	0.074	0.18	0.516	0.073	0.289	0.604	0.052	0.315	0.073	0.073	0.672	0.073
	GLO	0.917	0	0.11	0.917	0.166	0.464	0.022	--	0	0.004	0.006	0.29	0.17	0	0.399	0.006	0.193	0.006	0.207	0	0.206
	HUD	0.001	0.053	0	0.001	0.001	0.001	0.383	0	--	0.017	0.006	0.017	0.001	0.017	0.019	0.004	0.017	0.004	0.001	0.391	0.001
	HUN	0.023	0.053	0.002	0.039	0.022	0.029	0.074	0.004	0.017	--	0.754	0.832	0.052	0.53	0.524	0.37	0.862	0.402	0.086	0.09	0.085
MER	0.011	0.04	0.002	0.007	0.008	0.011	0.18	0.006	0.006	0.754	--	0.598	0.111	0.225	0.528	0.836	0.729	0.836	0.1	0.035	0.053	
MID	0.293	0.293	0.11	0.205	0.089	0.171	0.516	0.29	0.017	0.832	0.598	--	0.53	0.832	0.676	0.916	0.864	0.916	0.835	0.144	0.565	

	MON	0.465	0.003	0.016	0.294	0.109	0.206	0.073	0.17	0.001	0.052	0.111	0.53	--	0.021	0.832	0.169	0.56	0.169	0.917	0.006	1	
	MOR	0.001	0.206	0	0.007	0.001	0.005	0.289	0	0.017	0.53	0.225	0.832	0.021	--	0.456	0.087	0.644	0.137	0.01	0.205	0.01	
	OCE	0.294	0.286	0.017	0.403	0.041	0.247	0.604	0.399	0.019	0.524	0.528	0.676	0.832	0.456	--	0.711	0.954	0.672	0.916	0.147	0.833	
	PAS	0.016	0.008	0.001	0.01	0.011	0.011	0.052	0.006	0.004	0.37	0.836	0.916	0.169	0.087	0.711	--	0.907	0.917	0.11	0.019	0.052	
	SAL	0.265	0.204	0.052	0.382	0.156	0.175	0.315	0.193	0.017	0.862	0.729	0.864	0.56	0.644	0.954	0.907	--	0.862	0.562	0.104	0.484	
	SOM	0.022	0.012	0.002	0.029	0.011	0.016	0.073	0.006	0.004	0.402	0.836	0.916	0.169	0.137	0.672	0.917	0.862	--	0.11	0.019	0.109	
	SUS	0.248	0.005	0.011	0.247	0.068	0.112	0.073	0.207	0.001	0.086	0.1	0.835	0.917	0.01	0.916	0.11	0.562	0.11	--	0.004	0.755	
	UNI	0.001	0.476	0	0.004	0.001	0.004	0.672	0	0.391	0.09	0.035	0.144	0.006	0.205	0.147	0.019	0.104	0.019	0.004	--	0.004	
	WAR	0.603	0.003	0.04	0.434	0.109	0.169	0.073	0.206	0.001	0.085	0.053	0.565	1	0.01	0.833	0.052	0.484	0.109	0.755	0.004	--	
PFNS	ATL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	BER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	BUR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	CAM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	CAP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	CUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	ESS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	GLO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HUD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HUN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MID	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MON	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MOR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	OCE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	PAS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SAL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SOM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
SUS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
UNI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
WAR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
PFDS	ATL	--	0.317	0.317	0.317	0.317	0.317	0.832	0.317	0.099	0.317	0.317	0.317	0.317	0.317	0.429	0.927	1	0.317	0.927	0.171	0.317	
	BER	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	BUR	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	

	CAM	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	CAP	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	CUM	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	ESS	0.832	0.248	0.248	0.248	0.248	0.248	--	0.248	0.174	0.248	0.248	0.248	0.248	0.361	0.749	0.82	0.248	0.749	0.289	0.248	
	GLO	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	HUD	0.099	0.033	0.033	0.033	0.033	0.033	0.174	0.033	--	0.033	0.033	0.033	0.033	0.046	0.099	0.131	0.033	0.099	1	0.033	
	HUN	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	MER	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	MID	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	MON	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	MOR	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	OCE	0.429	--	--	--	--	--	0.361	--	0.046	--	--	--	--	--	0.429	0.398	--	0.429	0.056	--	
	PAS	0.927	0.317	0.317	0.317	0.317	0.317	0.749	0.317	0.099	0.317	0.317	0.317	0.317	0.429	--	1	0.317	0.927	0.099	0.317	
	SAL	1	0.285	0.285	0.285	0.285	0.285	0.82	0.285	0.131	0.285	0.285	0.285	0.285	0.398	1	--	0.285	0.845	0.131	0.285	
	SOM	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
	SUS	0.927	0.317	0.317	0.317	0.317	0.317	0.749	0.317	0.099	0.317	0.317	0.317	0.317	0.429	0.927	0.845	0.317	--	0.099	0.317	
	UNI	0.171	0.033	0.033	0.033	0.033	0.033	0.289	0.033	1	0.033	0.033	0.033	0.033	0.056	0.099	0.131	0.033	0.099	--	0.033	
	WAR	0.317	--	--	--	--	--	0.248	--	0.033	--	--	--	--	--	0.317	0.285	--	0.317	0.033	--	
PFDoS	ATL	--	0.317	0.927	0.317	0.317	0.538	0.749	0.44	0.48	0.317	0.317	0.317	0.071	0.44	0.014	0.071	0.359	0.317	0.927	0.48	0.317
	BER	0.317	--	0.317	--	--	0.144	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
	BUR	0.927	0.317	--	0.317	0.317	0.644	0.916	0.538	0.48	0.317	0.317	0.317	0.095	0.538	0.021	0.161	0.456	0.317	0.927	0.48	0.317
	CAM	0.317	--	0.317	--	--	0.158	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
	CAP	0.317	--	0.317	--	--	0.144	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
	CUM	0.538	0.144	0.644	0.158	0.144	--	0.857	0.783	0.302	0.144	0.144	0.144	0.143	0.89	0.024	0.203	0.654	0.144	0.709	0.302	0.144
	ESS	0.749	0.248	0.916	0.248	0.248	0.857	--	0.593	0.414	0.248	0.248	0.248	0.136	0.721	0.055	0.297	0.501	0.248	0.749	0.414	0.248
	GLO	0.44	0.144	0.538	0.144	0.144	0.783	0.593	--	0.302	0.144	0.144	0.144	0.181	1	0.051	0.471	0.766	0.144	0.44	0.302	0.144
	HUD	0.48	--	0.48	--	--	0.302	0.414	0.302	--	--	--	--	0.117	0.302	0.055	0.117	0.267	--	0.48	--	--
	HUN	0.317	--	0.317	--	--	0.144	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
	MER	0.317	--	0.317	--	--	0.144	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
	MID	0.317	--	0.317	--	--	0.144	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
	MON	0.071	0.027	0.095	0.027	0.027	0.143	0.136	0.181	0.117	0.027	0.027	0.027	--	0.277	0.413	0.575	0.364	0.027	0.071	0.117	0.027
	MOR	0.44	0.144	0.538	0.144	0.144	0.89	0.721	1	0.302	0.144	0.144	0.144	0.277	--	0.056	0.277	0.882	0.144	0.538	0.302	0.144
	OCE	0.014	0.007	0.021	0.007	0.007	0.024	0.055	0.051	0.055	0.007	0.007	0.007	0.413	0.056	--	0.115	0.107	0.007	0.014	0.055	0.007

	PAS	0.071	0.027	0.161	0.027	0.027	0.203	0.297	0.471	0.117	0.027	0.027	0.027	0.575	0.277	0.115	--	0.603	0.027	0.161	0.117	0.027
	SAL	0.359	0.117	0.456	0.117	0.117	0.654	0.501	0.766	0.267	0.117	0.117	0.117	0.364	0.882	0.107	0.603	--	0.117	0.359	0.267	0.117
	SOM	0.317	--	0.317	--	--	0.144	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
	SUS	0.927	0.317	0.927	0.317	0.317	0.709	0.749	0.44	0.48	0.317	0.317	0.317	0.071	0.538	0.014	0.161	0.359	0.317	--	0.48	0.317
	UNI	0.48	--	0.48	--	--	0.302	0.414	0.302	--	--	--	--	0.117	0.302	0.055	0.117	0.267	--	0.48	--	--
	WAR	0.317	--	0.317	--	--	0.144	0.248	0.144	--	--	--	--	0.027	0.144	0.007	0.027	0.117	--	0.317	--	--
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	UNI	0.157	0.157	0.157	0.157	0.157	0.221	0.157	0.317	0.157	0.157	0.157	0.157	0.157	0.157	0.264	0.157	0.186	0.157	0.157	--	0.157
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HFPO-DA	ATL	--	0.285	--	--	--	--	1	--	--	0.285	0.317	0.003	0.144	0.317	0.285	--	--	0.014	--	--	--
	BER	0.285	--	0.317	0.317	0.285	0.285	0.45	0.285	0.45	1	0.645	0.006	0.463	0.645	0.831	0.285	0.317	0.035	0.355	0.513	0.317
	BUR	--	0.317	--	--	--	--	1	--	--	0.317	0.317	0.003	0.144	0.317	0.285	--	--	0.015	--	--	--
	CAM	--	0.317	--	--	--	--	1	--	--	0.317	0.317	0.003	0.144	0.317	0.285	--	--	0.017	--	--	--
	CAP	--	0.285	--	--	--	--	1	--	--	0.285	0.317	0.003	0.144	0.317	0.285	--	--	0.014	--	--	--
	CUM	--	0.285	--	--	--	--	1	--	--	0.285	0.317	0.003	0.144	0.317	0.285	--	--	0.014	--	--	--
	ESS	1	0.45	1	1	1	1	--	1	1	0.45	0.386	0.011	0.206	0.386	0.355	1	1	0.04	1	1	1
	GLO	--	0.285	--	--	--	--	1	--	--	0.285	0.317	0.003	0.144	0.317	0.285	--	--	0.014	--	--	--
	HUD	--	0.45	--	--	--	--	1	--	--	0.45	0.48	0.037	0.302	0.48	0.45	--	--	0.075	--	--	--
	HUN	0.285	1	0.317	0.317	0.285	0.285	0.45	0.285	0.45	--	0.645	0.006	0.463	0.645	0.831	0.285	0.317	0.035	0.355	0.513	0.317
	MER	0.317	0.645	0.317	0.317	0.317	0.317	0.386	0.317	0.48	0.645	--	0.009	0.538	0.927	0.796	0.317	0.35	0.227	0.317	0.48	0.317
	MID	0.003	0.006	0.003	0.003	0.003	0.003	0.011	0.003	0.037	0.006	0.009	--	0.041	0.009	0.036	0.003	0.006	0.074	0.004	0.037	0.003
	MON	0.144	0.463	0.144	0.144	0.144	0.144	0.206	0.144	0.302	0.463	0.538	0.041	--	0.44	0.817	0.144	0.172	0.532	0.144	0.302	0.144
	MOR	0.317	0.645	0.317	0.317	0.317	0.317	0.386	0.317	0.48	0.645	0.927	0.009	0.44	--	0.796	0.317	0.35	0.203	0.317	0.48	0.317
	OCE	0.285	0.831	0.285	0.285	0.285	0.285	0.355	0.285	0.45	0.831	0.796	0.036	0.817	0.796	--	0.285	0.317	0.264	0.285	0.45	0.285

	PAS	--	0.285	--	--	--	1	--	--	0.285	0.317	0.003	0.144	0.317	0.285	--	--	0.014	--	--	--	
	SAL	--	0.317	--	--	--	1	--	--	0.317	0.35	0.006	0.172	0.35	0.317	--	--	0.021	--	--	--	
	SOM	0.014	0.035	0.015	0.017	0.014	0.014	0.04	0.014	0.075	0.035	0.227	0.074	0.532	0.203	0.264	0.014	0.021	--	0.021	0.087	0.015
	SUS	--	0.355	--	--	--	1	--	--	0.355	0.317	0.004	0.144	0.317	0.285	--	--	0.021	--	--	--	
	UNI	--	0.513	--	--	--	1	--	--	0.513	0.48	0.037	0.302	0.48	0.45	--	--	0.087	--	--	--	
	WAR	--	0.317	--	--	--	1	--	--	0.317	0.317	0.003	0.144	0.317	0.285	--	--	0.015	--	--	--	
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**Table A29:** Summary statistics for PFAS (ng/g) in rural and urban areas including mean, standard deviation (SD), standard error (SE), and percentiles (50 = median). Sample size (n) and number of non-detects (n\_cen) are also included. Statistics could not be estimated for some compounds because there were too many censored values (--). When a *p*-value is highlighted in red, there was a significant difference between PFAS concentration in urban and rural areas. For some compounds a *p*-value could not be estimated because there were too many censored values (-).

PFAS	Type	n	n_cen	Mean	SD	SE	Min	25	50	75	90	95	99	Max	P-value
PFBA	Urban	83	5	0.542	0.453	0.05	0.047	0.201	0.47	0.676	1.03	1.5	--	2.67	0.2
	Rural	74	13	0.445	0.373	0.043	0.046	0.091	0.368	0.658	0.86	0.968	--	1.85	
PFPeA	Urban	83	6	0.422	0.49	0.054	0.05	0.163	0.298	0.466	0.841	1.16	--	3.55	0.2
	Rural	74	10	0.318	0.333	0.039	0.051	0.109	0.278	0.411	0.549	0.716	--	2.5	
PFHxA	Urban	83	6	0.371	0.44	0.048	0.041	0.141	0.253	0.405	0.775	0.974	--	2.57	0.1
	Rural	74	9	0.281	0.323	0.038	0.043	0.086	0.196	0.335	0.608	0.788	--	2.37	

PFHpA	Urban	83	2	0.353	0.439	0.048	0.022	0.132	0.252	0.395	0.66	0.786	--	3.16	0.1
	Rural	74	9	0.273	0.311	0.036	0.022	0.086	0.21	0.359	0.525	0.712	--	2.26	
PFOA	Urban	83	4	1.634	2.028	0.223	0.048	0.274	0.79	2.03	4.08	5.41	--	9.35	0.3
	Rural	74	5	1.282	1.453	0.169	0.048	0.212	0.597	1.7	3.69	4.36	--	6.49	
PFNA	Urban	83	2	1.008	1.204	0.132	0.071	0.331	0.638	1.16	2.57	3.13	--	8.05	0.5
	Rural	74	4	0.801	0.772	0.09	0.072	0.279	0.617	1.01	1.72	2.43	--	3.94	
PFDA	Urban	83	2	0.649	0.714	0.078	0.07	0.269	0.454	0.765	1.44	1.64	--	4.83	0.01
	Rural	74	2	0.418	0.33	0.038	0.073	0.2	0.355	0.467	0.731	1.14	--	1.73	
PFUnA	Urban	83	2	1.104	1.82	0.2	0.047	0.374	0.709	1.08	2.01	3.17	--	15.3	0.1
	Rural	74	0	0.773	1.032	0.12	0.135	0.341	0.523	0.936	1.24	1.95	--	8.58	
PFDoA	Urban	83	5	0.349	0.498	0.055	0.038	0.113	0.2	0.371	0.75	1.13	--	3.83	0.02
	Rural	74	4	0.209	0.199	0.023	0.04	0.102	0.15	0.232	0.373	0.504	--	1.21	
PFTrDA	Urban	83	7	0.283	0.341	0.037	0.049	0.107	0.193	0.318	0.481	0.857	--	2.35	0.02
	Rural	74	5	0.181	0.15	0.017	0.049	0.083	0.146	0.216	0.317	0.44	--	1	
PFTeDA	Urban	83	55	0.15	0.156	0.017	0.095	--	--	0.142	0.207	0.332	--	1.36	0.007
	Rural	74	62	0.119	0.047	0.006	0.098	--	--	--	0.118	0.181	--	0.42	
PFBS	Urban	83	37	0.067	0.036	0.004	0.038	--	0.051	0.078	0.126	0.146	--	0.224	0.1
	Rural	74	42	0.063	0.034	0.004	0.04	--	--	0.067	0.11	0.134	--	0.203	
PFPeS	Urban	83	80	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	71	--	--	--	--	--	--	--	--	--	--	--	
PFHxS	Urban	83	64	0.067	0.095	0.01	0.044	0.044	0.044	0.044	0.097	0.128	--	0.833	0.2
	Rural	74	64	0.069	0.046	0.005	0.054	--	--	--	0.08	0.112	--	0.417	
PFHpS	Urban	83	81	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	73	--	--	--	--	--	--	--	--	--	--	--	
PFOS	Urban	83	1	1.296	1.008	0.111	0.078	0.598	0.982	1.77	2.68	3.36	--	4.65	0.009
	Rural	74	2	0.882	0.74	0.086	0.073	0.387	0.758	1.12	1.6	2.16	--	5.2	
PFNS	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	
PFDS	Urban	83	75	0.046	0.041	0.004	0.023	--	--	--	--	0.053	--	0.379	0.03
	Rural	74	73	--	--	--	--	--	--	--	--	--	--	--	
PFDoS	Urban	83	68	0.061	0.113	0.012	0.028	--	--	--	0.094	0.105	--	1.01	0.5
	Rural	74	64	0.086	0.081	0.009	0.035	--	--	--	0.071	0.217	--	0.639	
4:2FTS	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	

6:2FTS	Urban	83	81	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	73	--	--	--	--	--	--	--	--	--	--	--	--	-
8:2FTS	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
PFOSA	Urban	83	81	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
NMeFOSA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
NEtFOSA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
NMeFOSAA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
NEtFOSAA	Urban	83	80	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
NMeFOSE	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	73	--	--	--	--	--	--	--	--	--	--	--	--	-
NEtFOSE	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
HFPO-DA	Urban	83	74	0.101	0.107	0.012	0.082	0.082	0.082	0.082	0.082	0.135	--	0.949	0.7	
	Rural	74	65	0.109	0.064	0.007	0.09	--	--	--	0.098	0.159	--	0.597		
ADONA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
9Cl-PF3ONS	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
11Cl-PF3OUdS	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
PFMPA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
PFMBA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
PFEESA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-
NFDHA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	--	-

3:3FTCA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	-
5:3FTCA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	-
7:3FTCA	Urban	83	83	--	--	--	--	--	--	--	--	--	--	--	-
	Rural	74	74	--	--	--	--	--	--	--	--	--	--	--	-

**Table A30:** Summary statistics for K<sub>d</sub> values including sample size (n), mean, standard deviation (SD), standard error (SE), and percentiles (50 = median). Data were not summarized when sample size was less than five.

PFAS	n	Mean	SD	SE	Min	1	5	10	25	50	75	90	95	99	Max
PFBA	94	133	162	12.9	-0.1	2.5	10.7	17.6	31	72.8	172	345	421	795	893
PFPeA	90	130	207	16.5	-4.6	-2.8	12.7	19.7	32.6	71.2	156	280	369	778	1,741.00
PFHxA	120	119	191	15.2	-1.4	3.2	10.6	15.2	27.2	58.6	125	249	350	1,026.00	1,319.00
PFHpA	142	82.6	147	11.7	-6.4	-0.5	6.6	9.8	21.5	42.5	75.2	165	361	526	1,386.00
PFOA	146	82.2	149	11.9	-2.3	0.6	10.3	12.8	25	44.8	75.1	169	253	672	1,410.00
PFNA	148	124	150	12	4.7	10.4	21.5	29.4	39.3	75	137	265	434	733	978
PFDA	100	331	317	25.3	34.8	35.3	40.8	58.8	119	235	456	686	792	1,470.00	1,828.00
PFUnA	54	711	701	56	27.7	56.5	114	133	229	507	916	1,385.00	1,865.00	3,139.00	4,065.00
PFDoA	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFTrDA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFTeDA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFBS	53	50.4	28.4	2.3	6.2	8.1	14	19.9	29.7	44.7	63.7	85.4	105	131	142
PFPeS	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFHxS	22	72.5	62.9	5	7.1	7.4	8.8	18.2	32.3	48.8	100	152	200	239	248
PFHpS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFOS	151	206	171	13.7	10.5	26.8	49.9	61.1	101	151	251	406	530	729	1,275.00
PFNS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFDS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFDoS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFOSA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NMeFOSA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NEtFOSA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NMeFOSAA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NEtFOSAA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NMeFOSE	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NEtFOSE	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HFPO-DA	10	49.1	25.1	2	17.9	18	18.2	18.5	29	49.8	69.3	81.3	82.8	84.1	84.4
ADONA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9Cl-PF3ONS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11Cl-PF3OUdS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFMPA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFMBA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PFEESA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NFDHA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3:3FTCA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5:3FTCA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7:3FTCA	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4:2FTS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6:2FTS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8:2FTS	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Figures

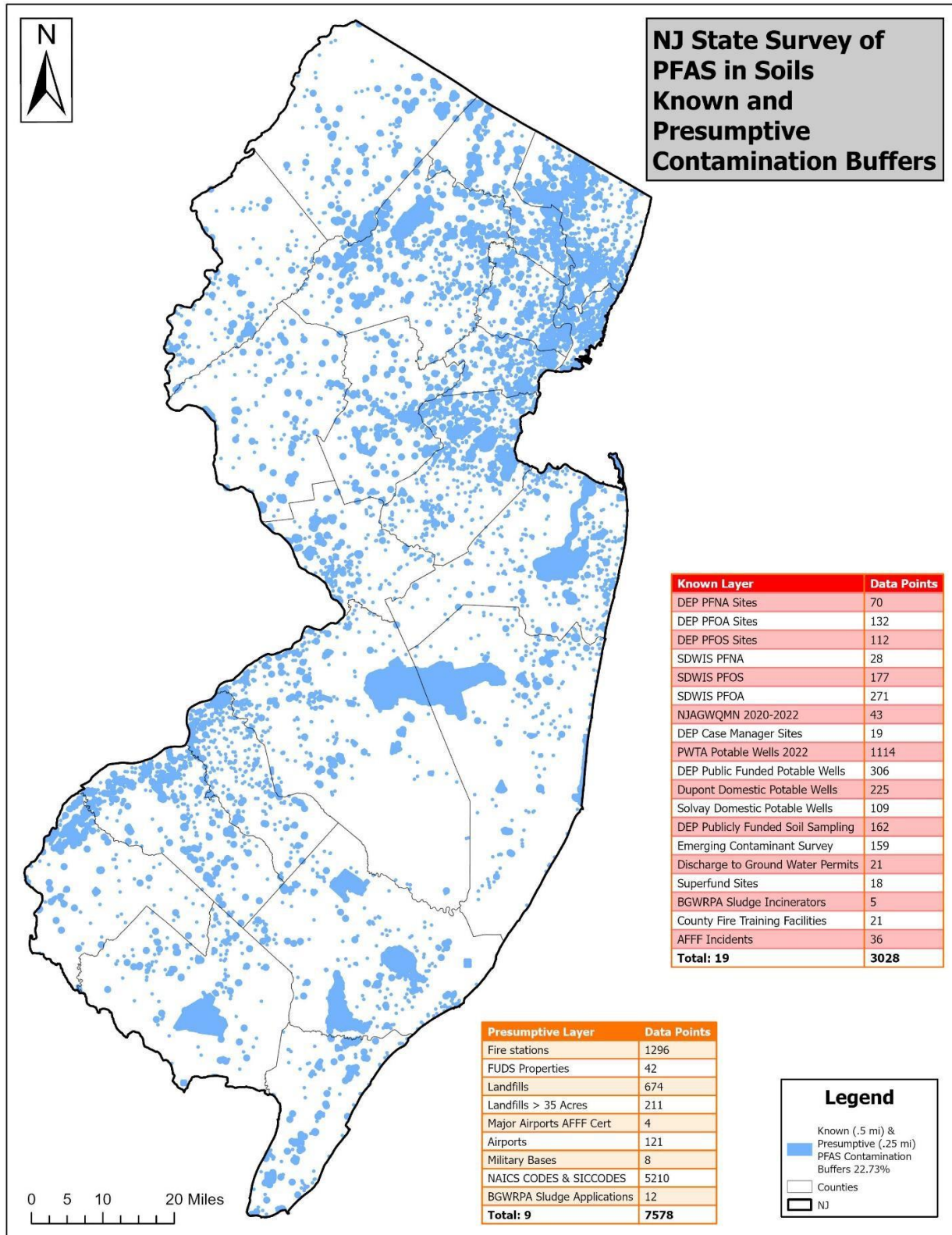
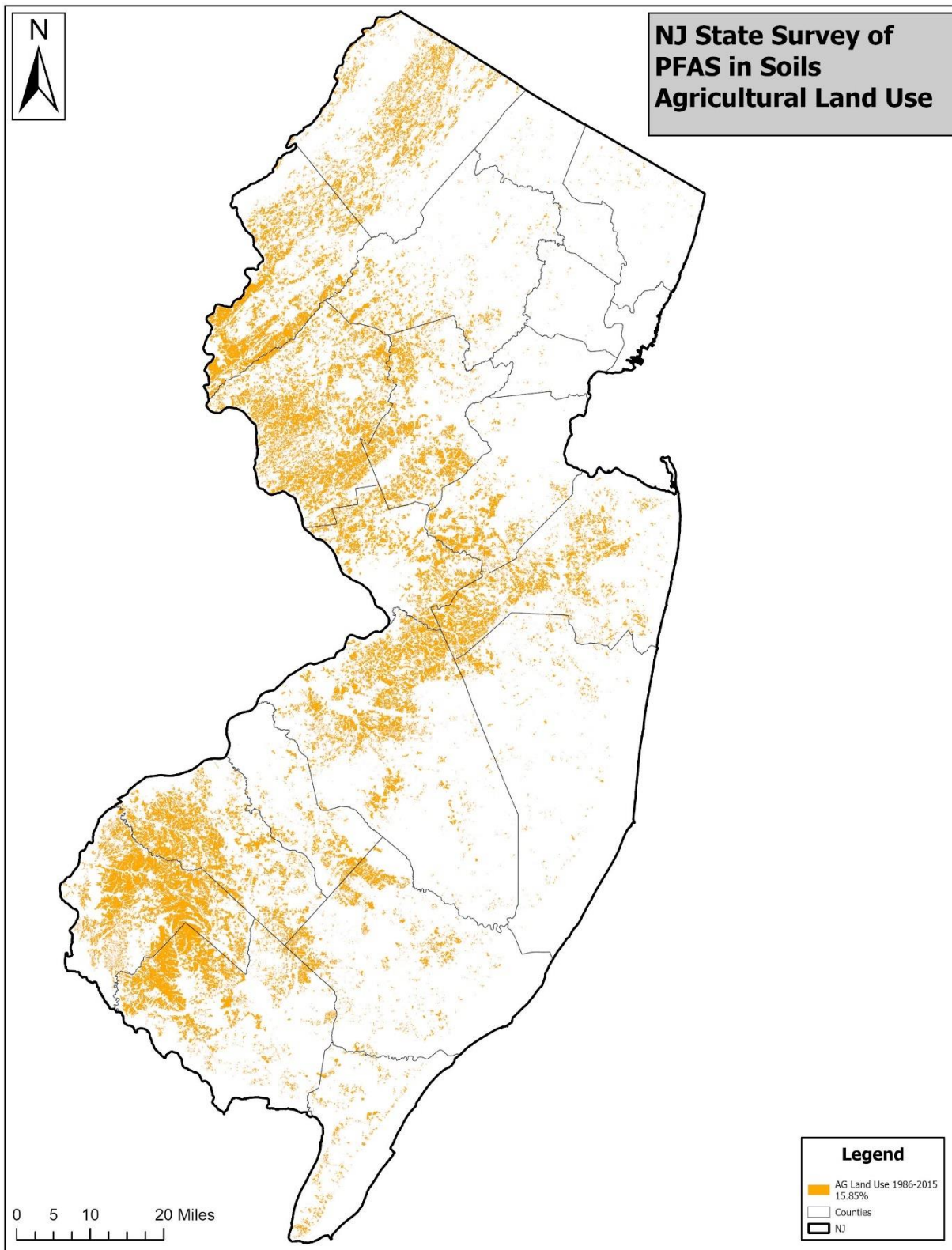
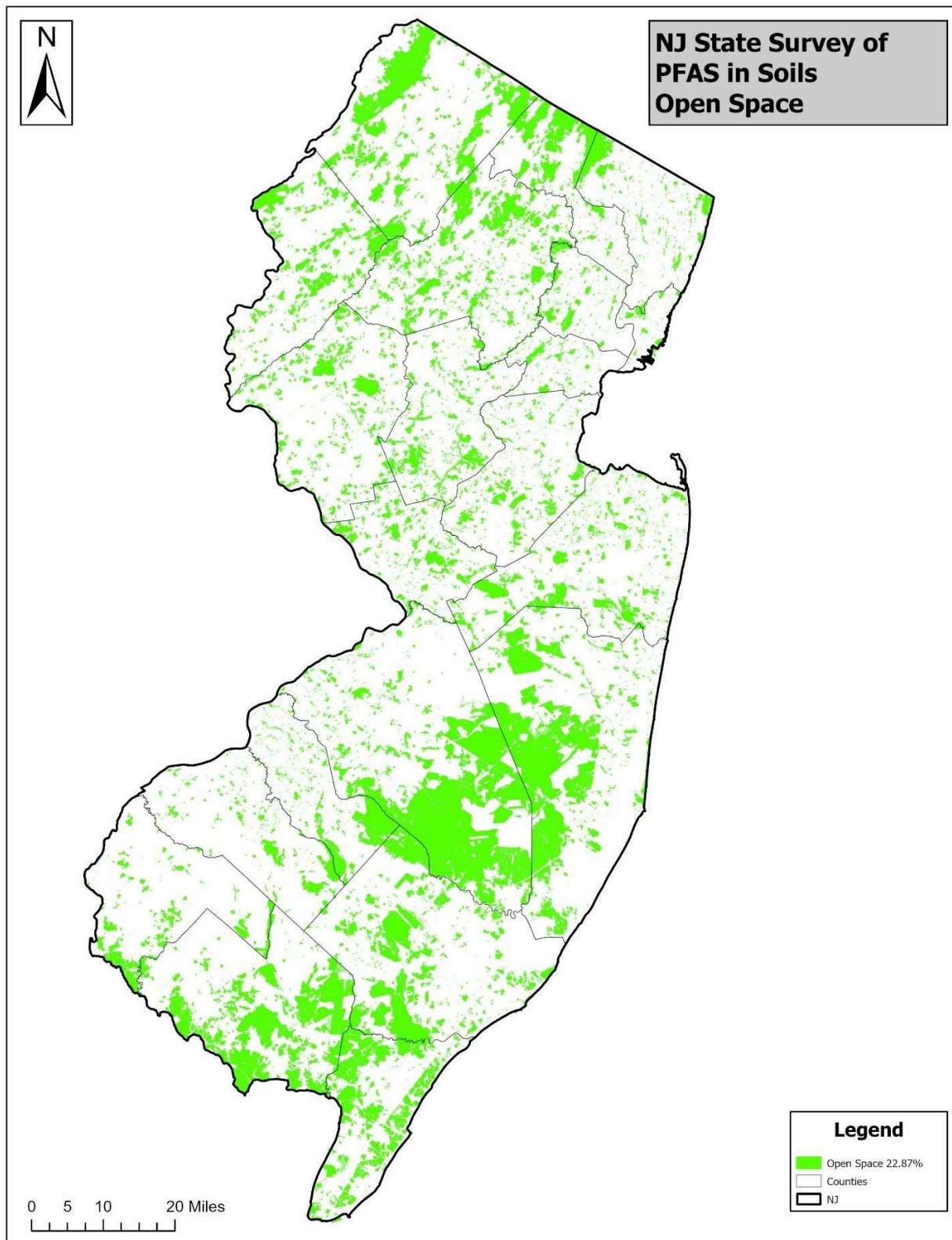


Figure A1: Buffered area based on known PFAS contamination and presumptive PFAS contamination sources.

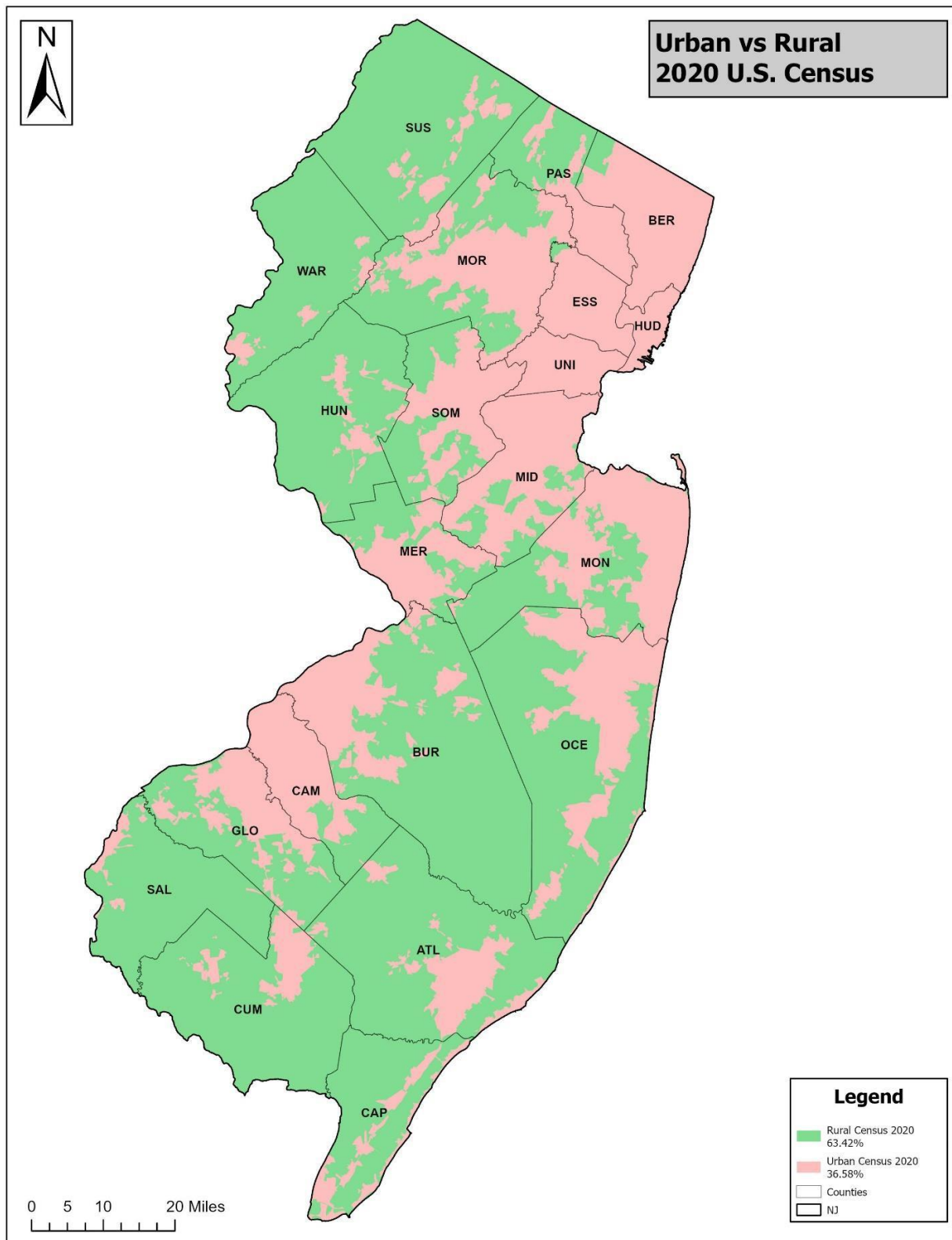
20 Miles



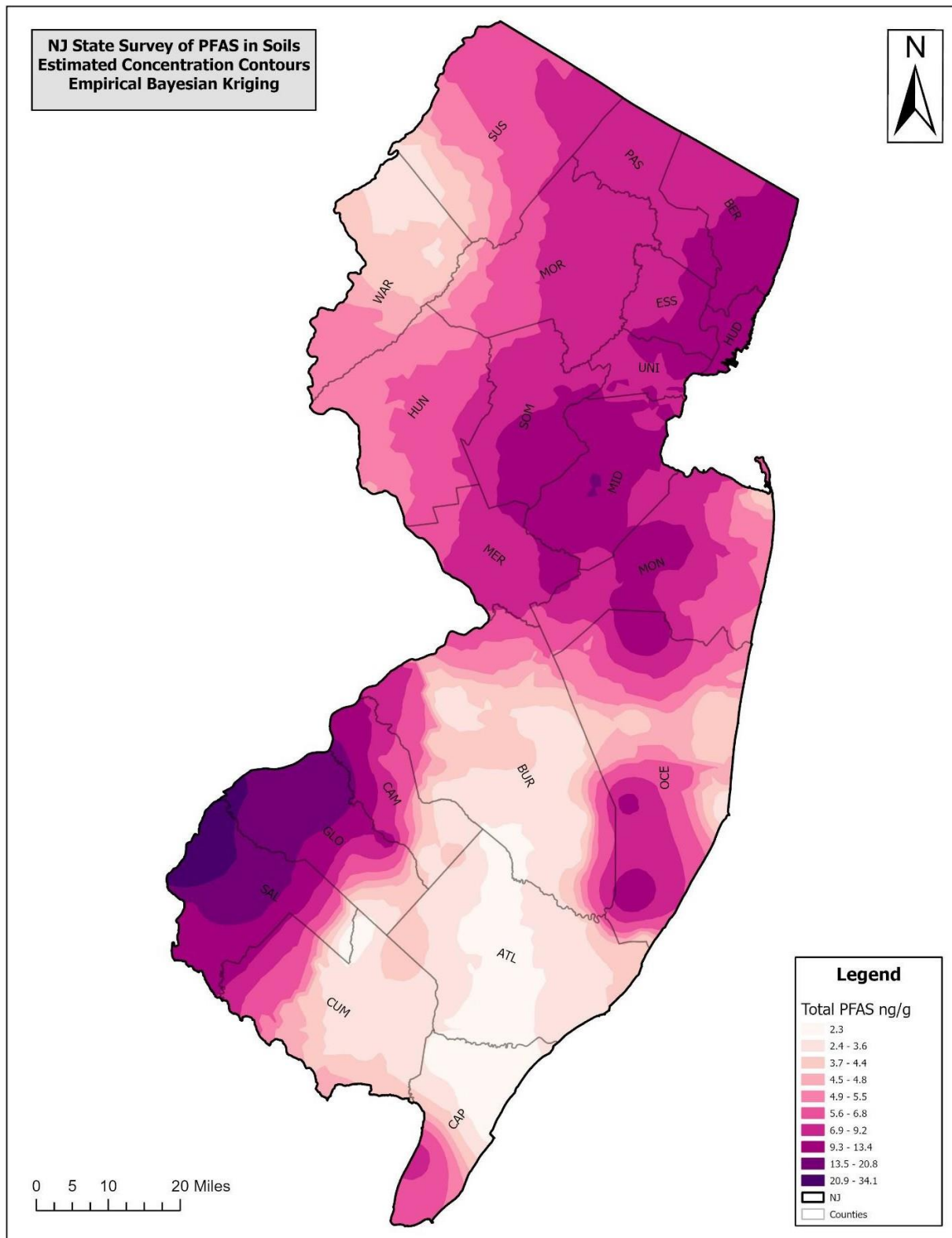
**Figure A2:** GIS agricultural land use layer (yellow) from 1986-2015.



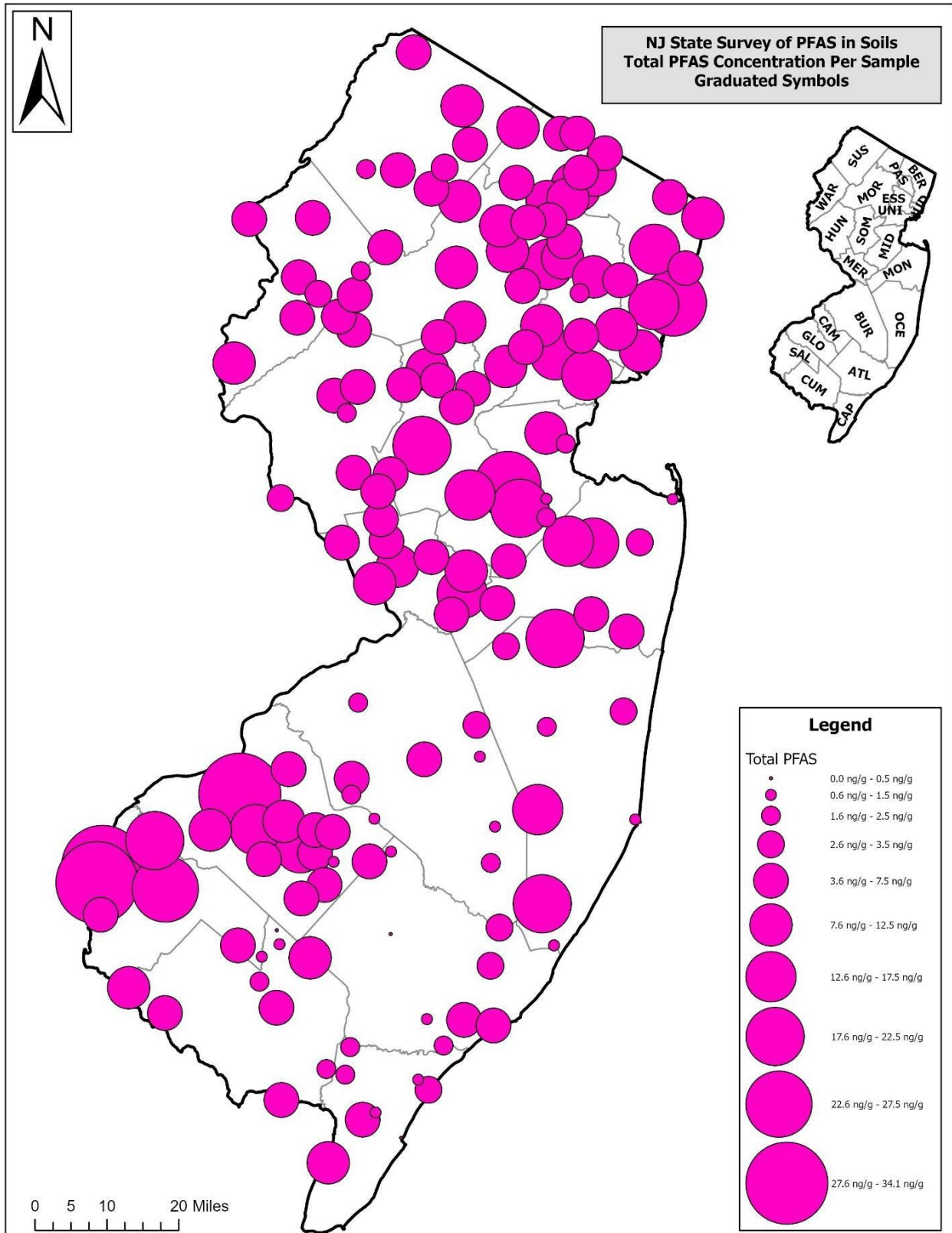
**Figure A3:** Open Space land in NJ.



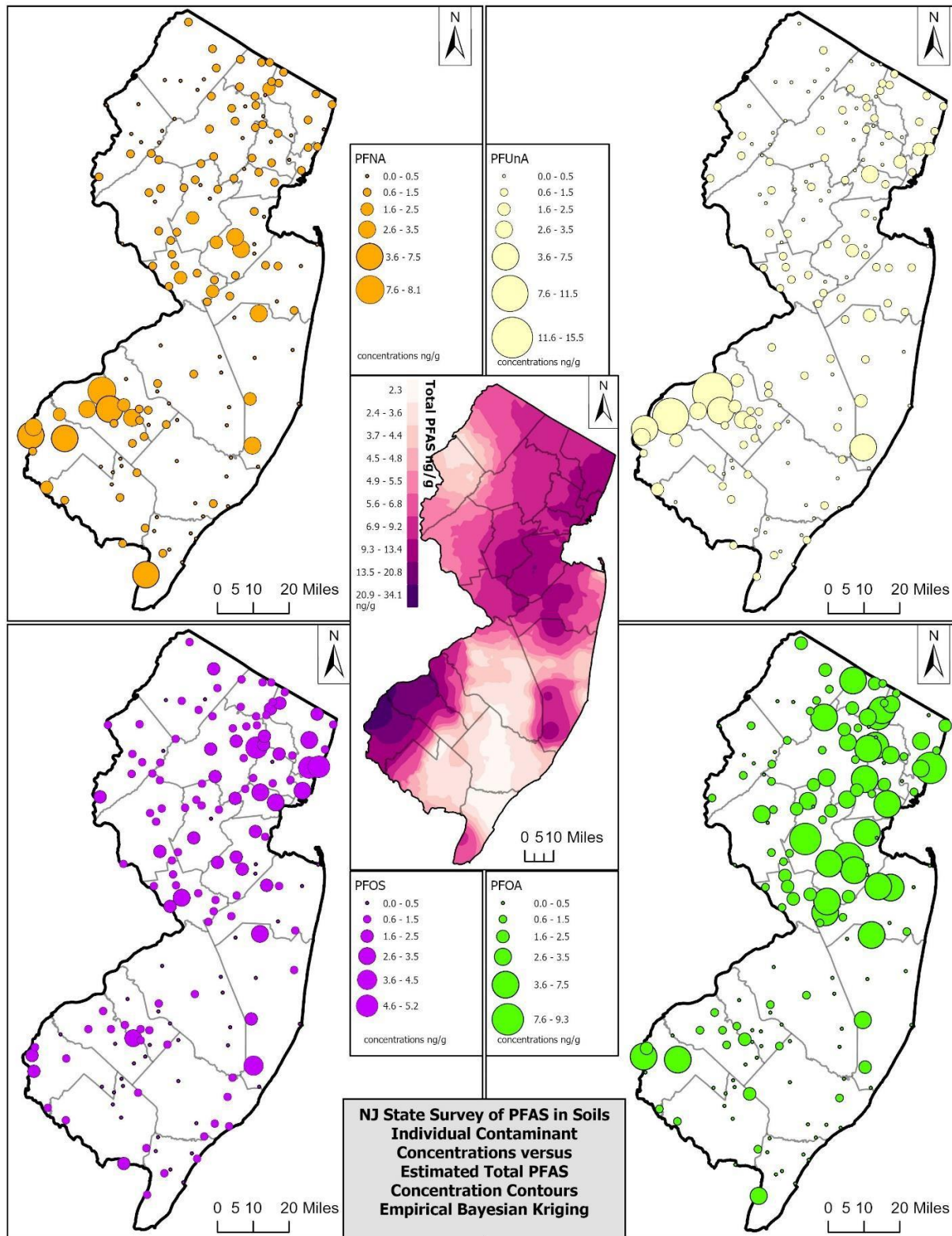
**Figure A4:** Urban (pink) and rural (green) areas of NJ based on the 2020 US Census definition (U.S. Census Bureau, 2022).



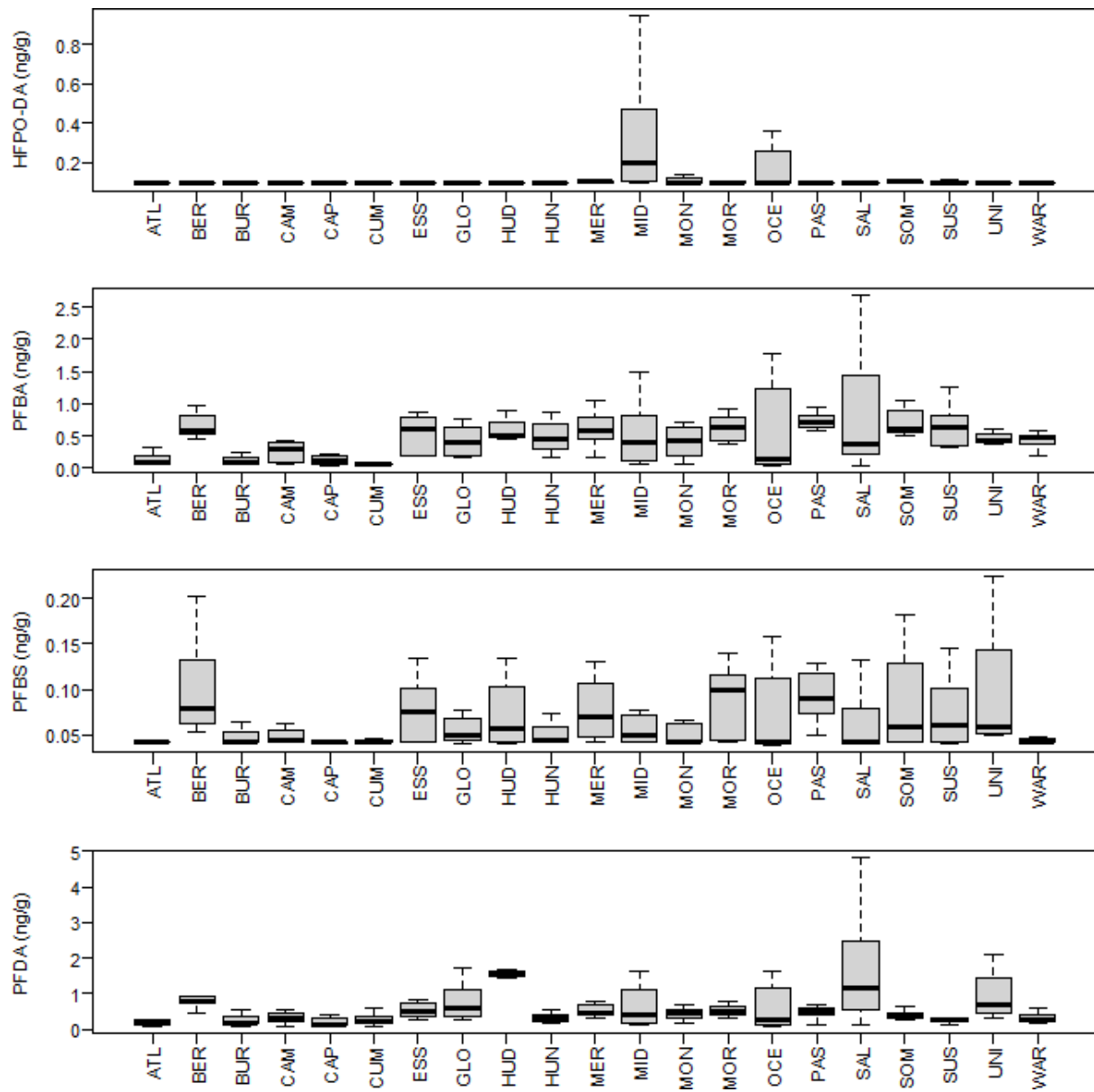
**Figure A5:** Map of estimated concentration contours generated using Empirical Bayesian Kriging for total PFAS.



**Figure A6:** Graduated symbol map depicting total PFAS concentration at each sampling location. Larger symbols represent higher total PFAS concentrations.



**Figure A7:** Graduated symbol maps depicting sample-specific concentrations for PFNA (top left), PFUnA (top right), PFOS (bottom left), PFOA (bottom right), and the map of estimated concentration contours generated using Empirical Bayesian Kriging for total PFAS (center). Larger symbols represent higher total PFAS concentrations.



**Figure A8:** Boxplots of PFAS concentrations by county. Figure continued on the next four pages. Box plot: box, 25th-75th percentiles; center line, median; whiskers, minimum & maximum. Note: scale is truncated. See Table A1 for county abbreviations.

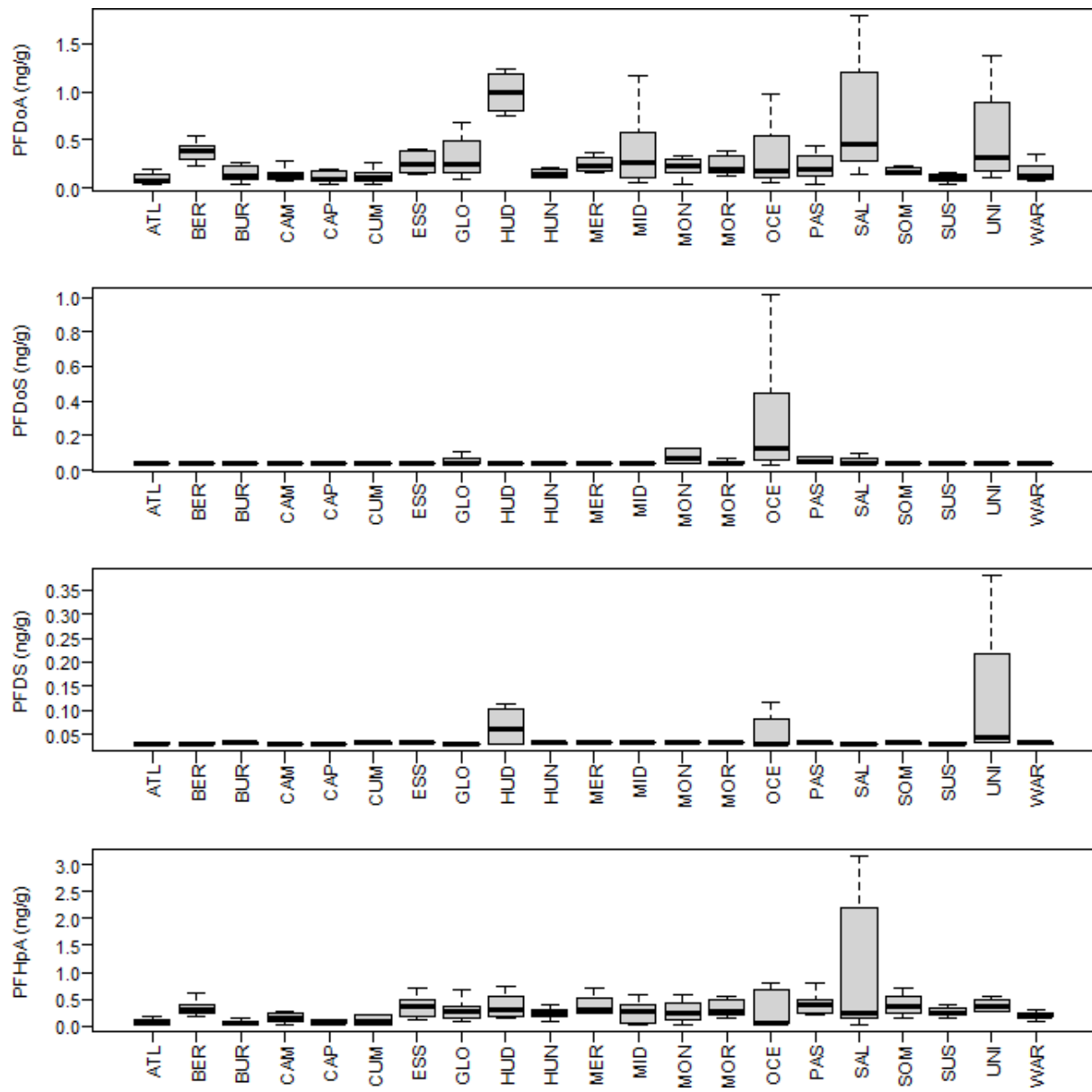


Figure A8 Cont.

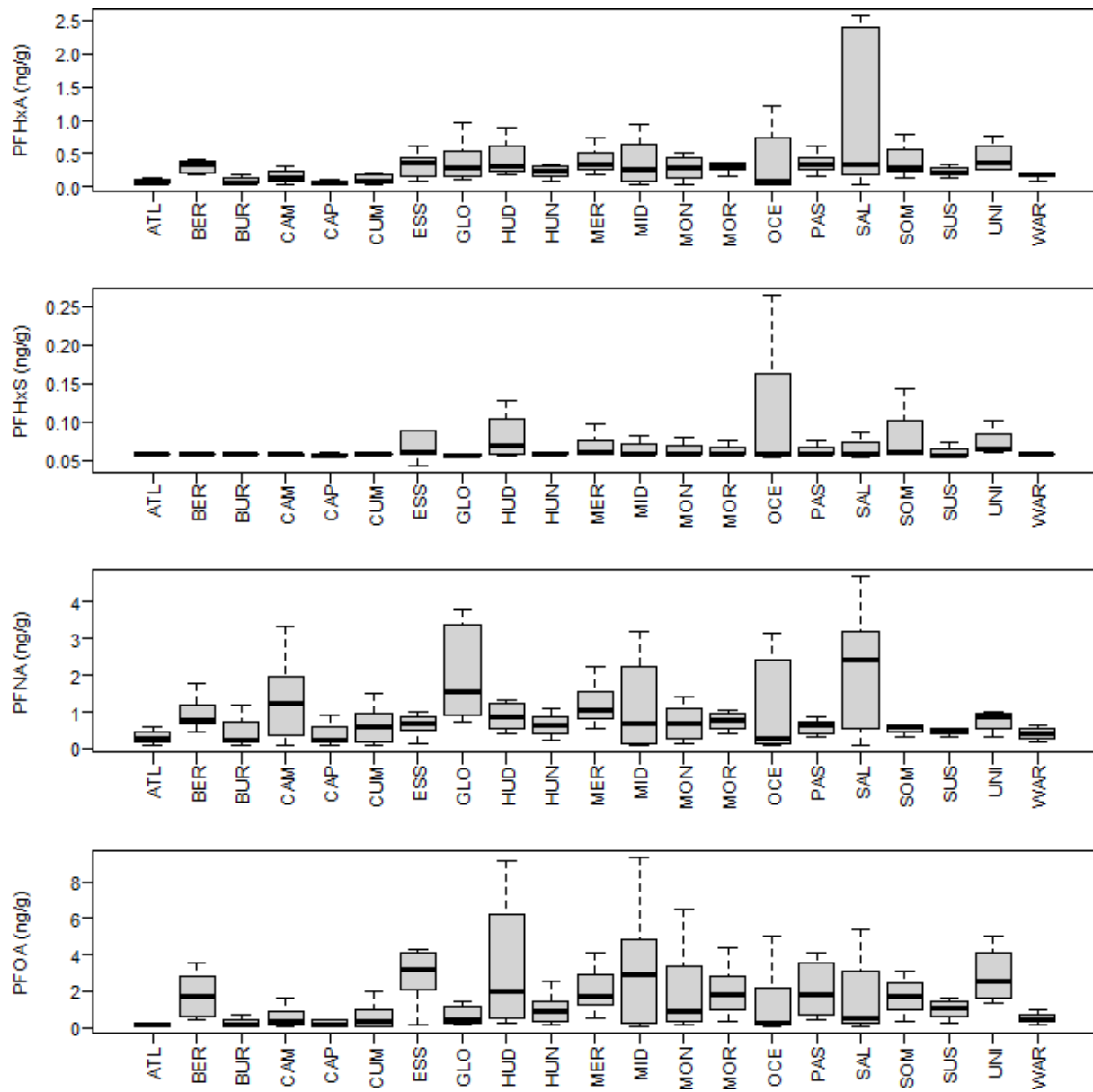


Figure A8 Cont.

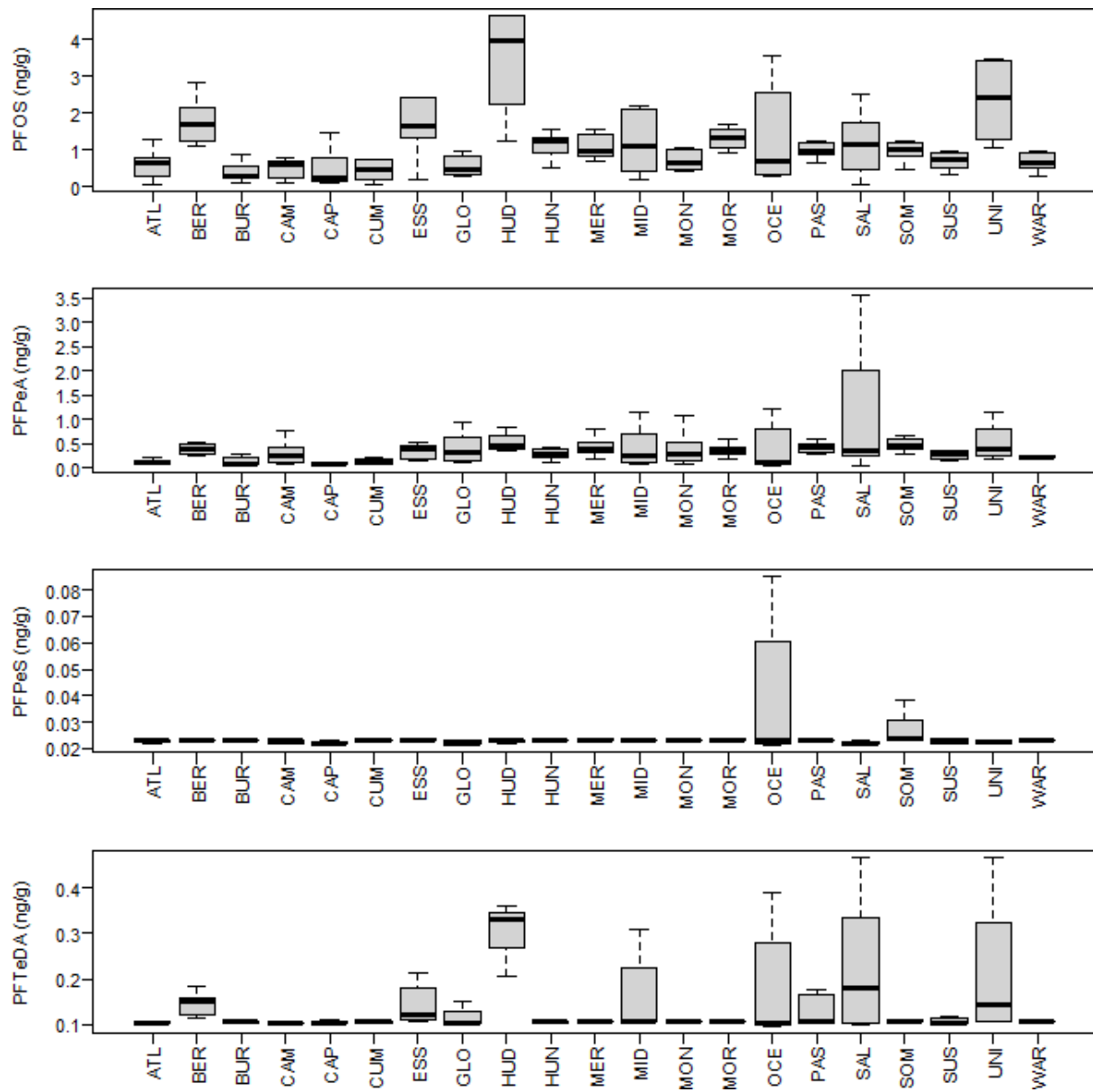


Figure A8 Cont.

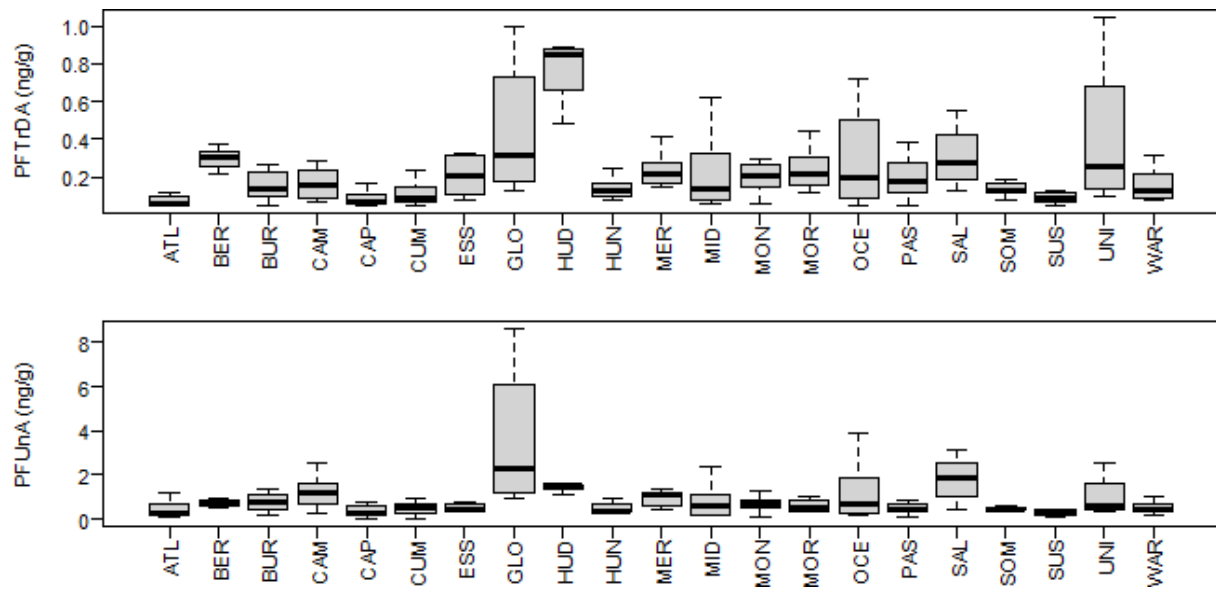
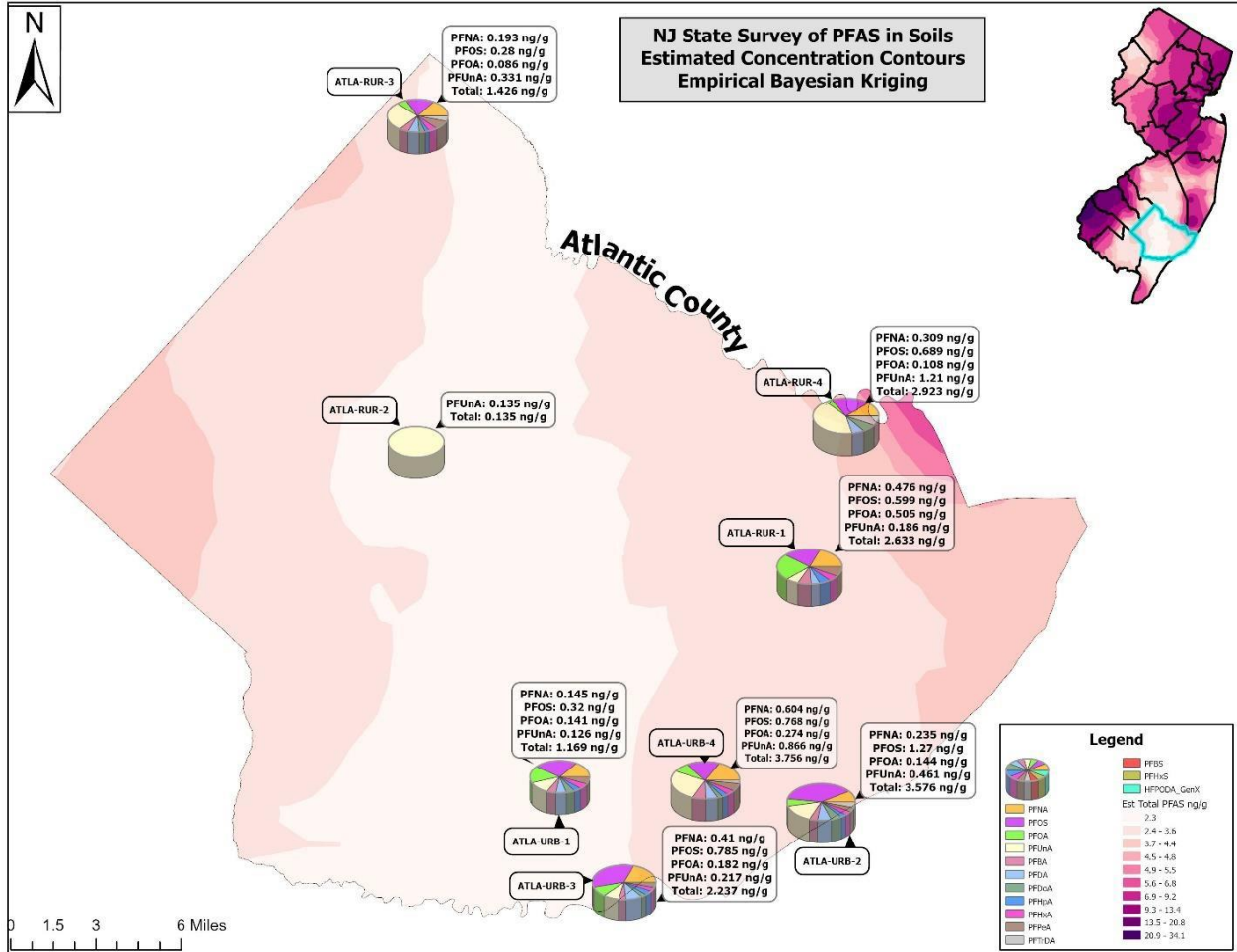
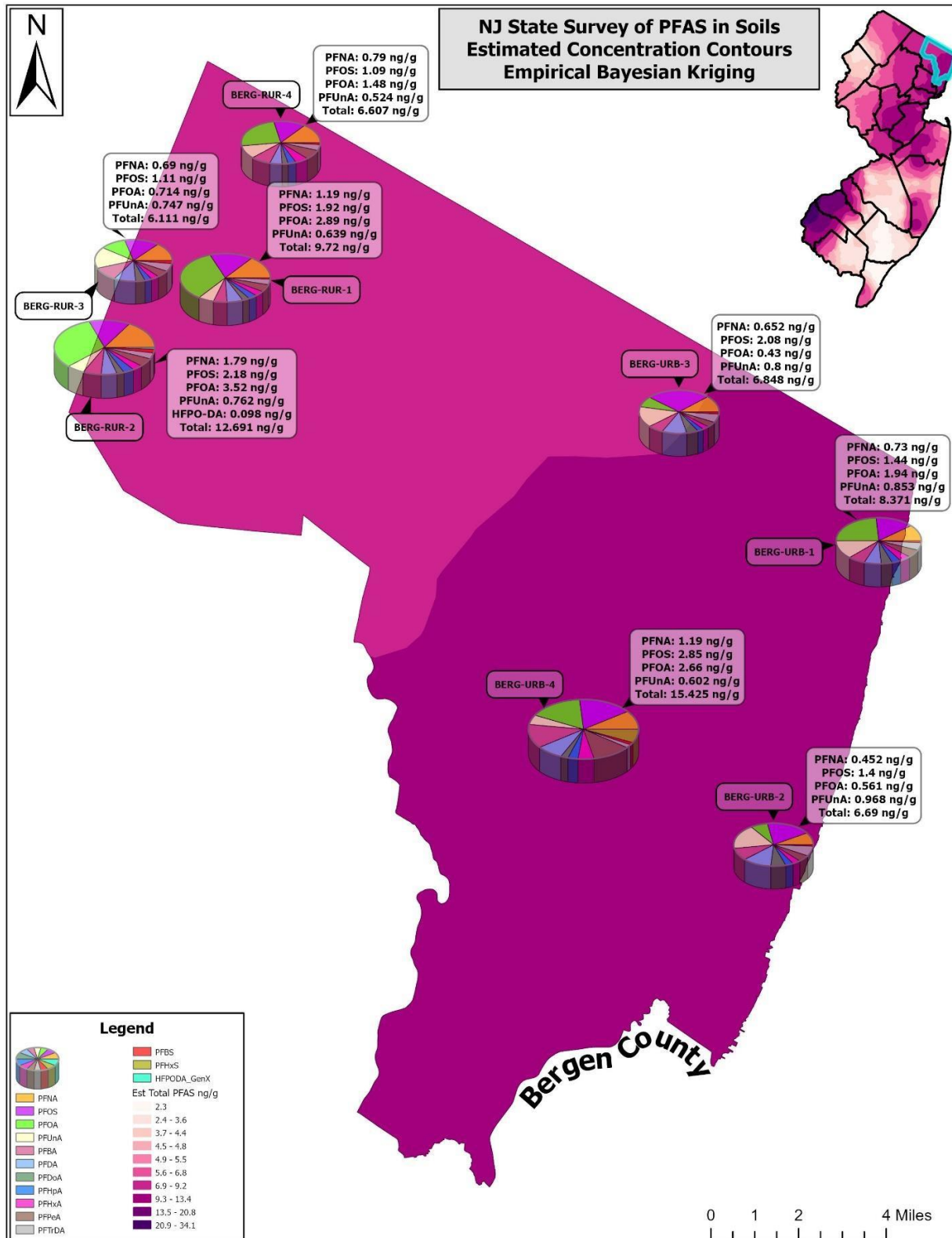


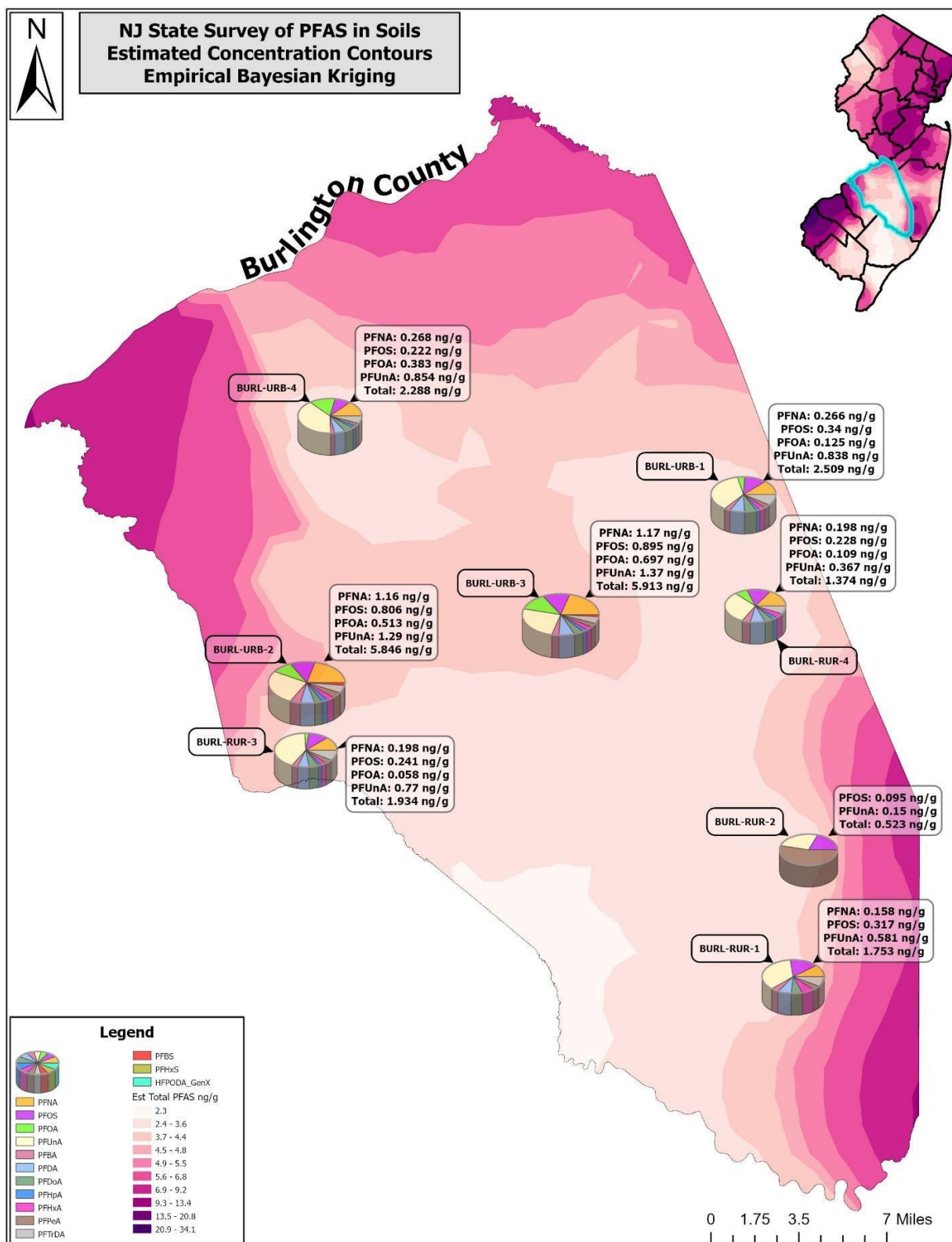
Fig. A8 Cont.



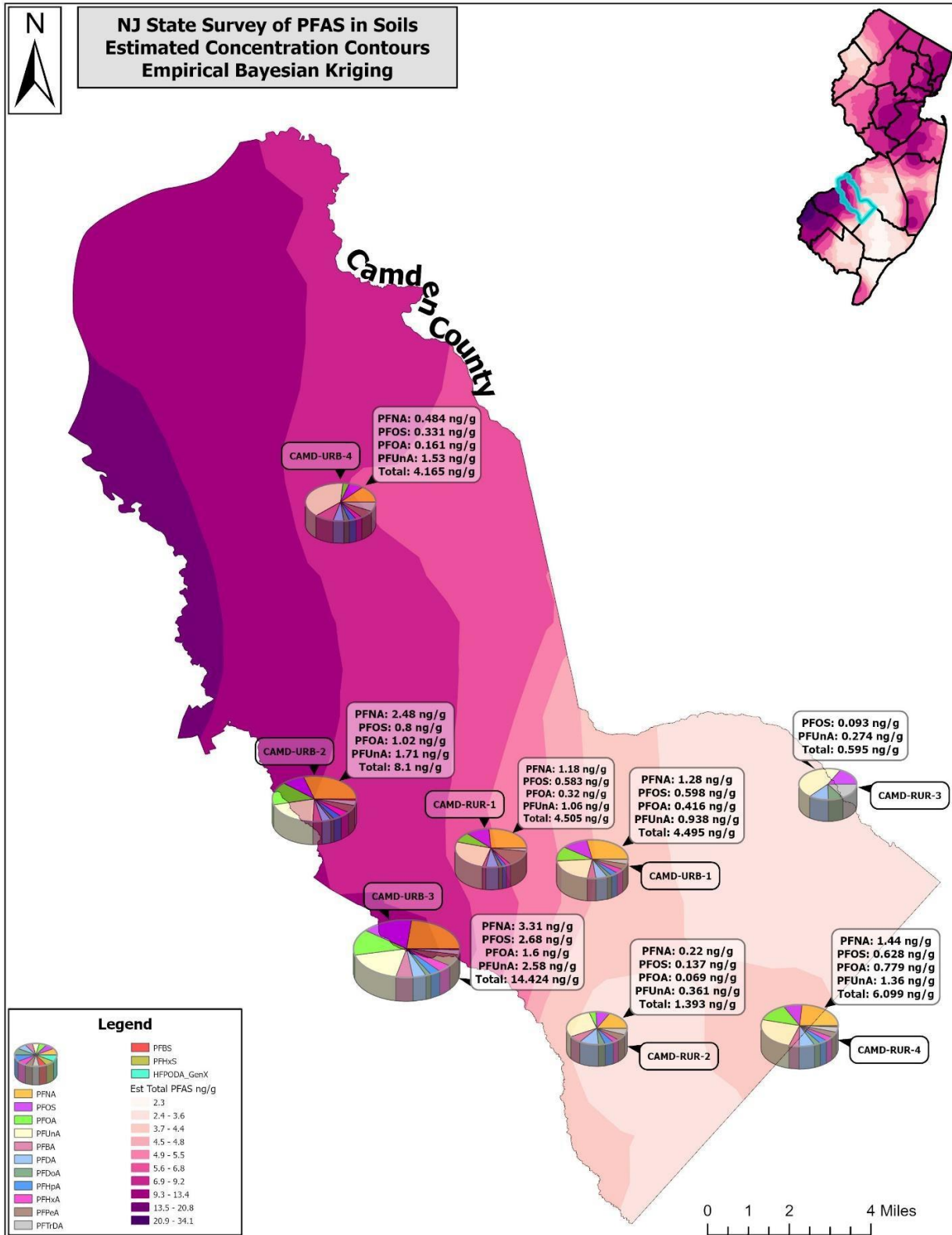
**Figure A9:** Atlantic County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



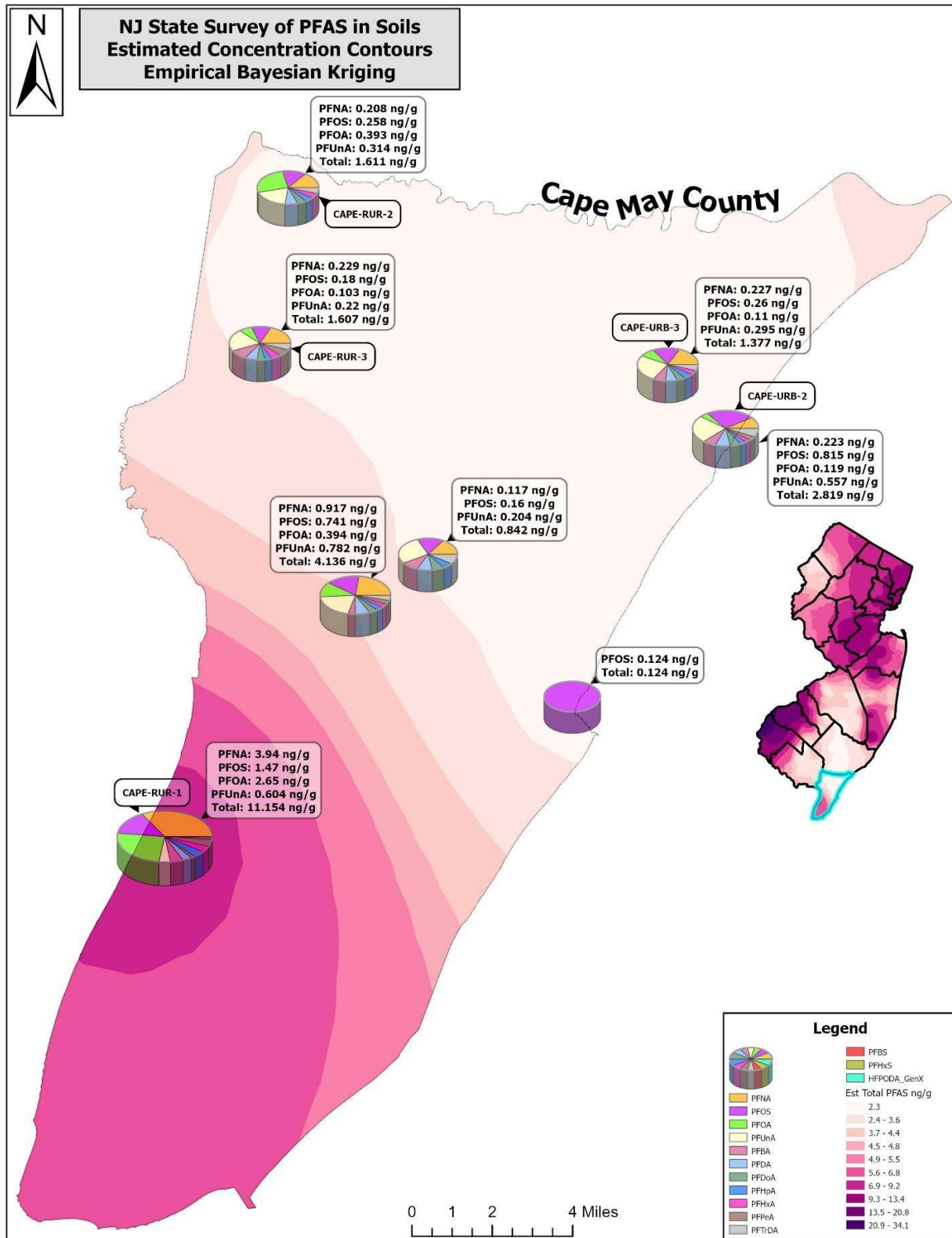
**Figure A10:** Bergen County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



**Figure A11:** Burlington County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.

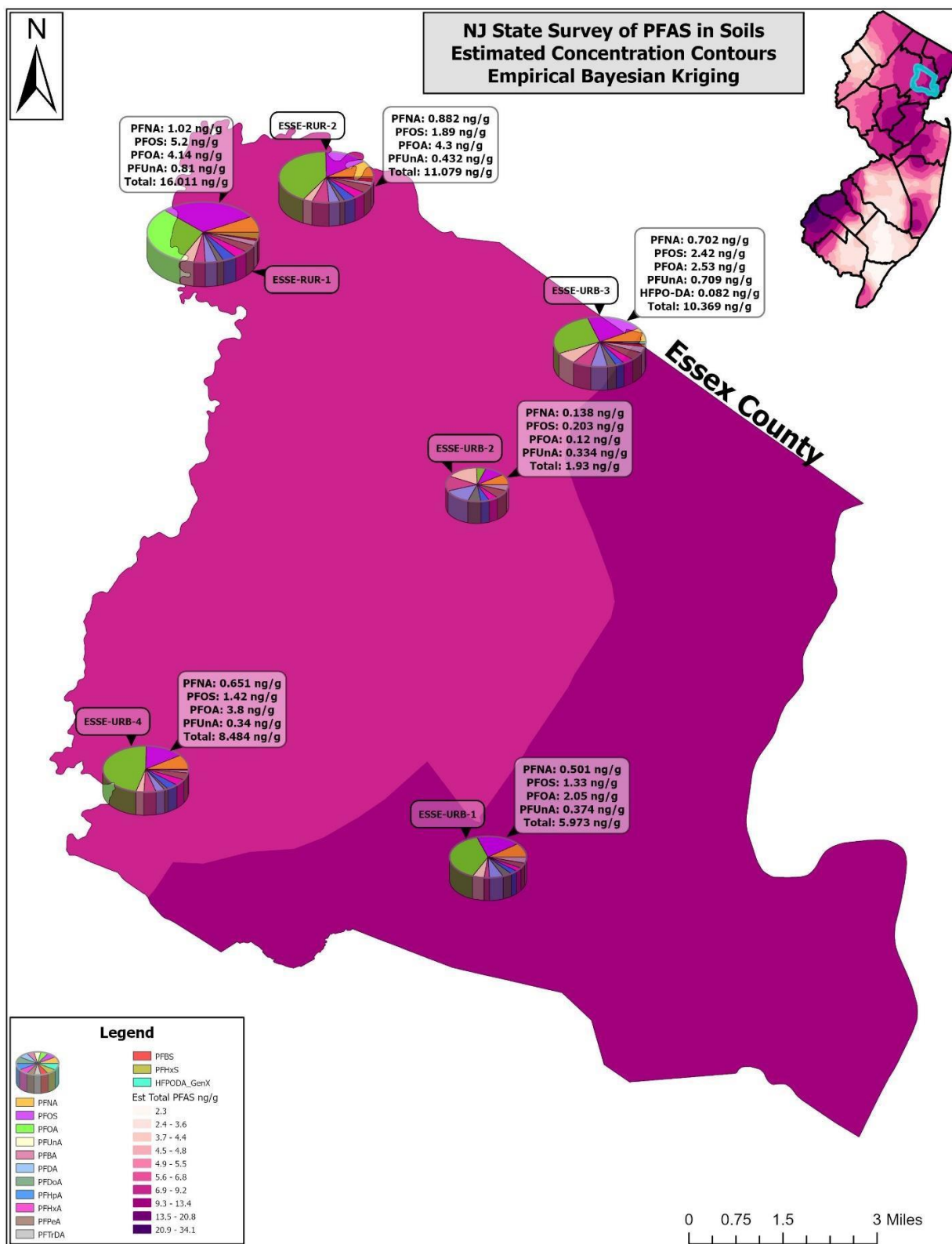


**Figure A12:** Camden County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.

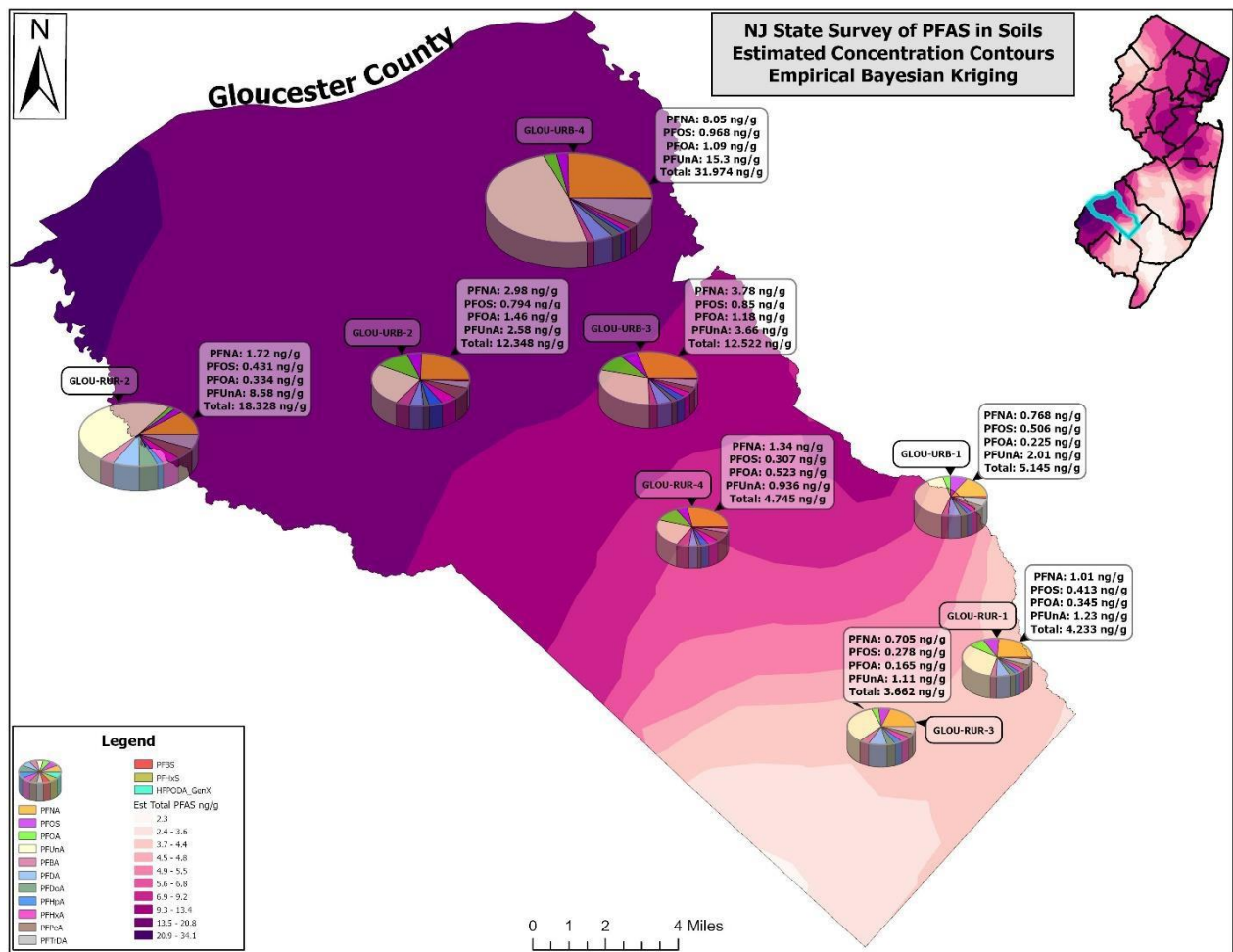


**Figure A13:** Cape May County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.

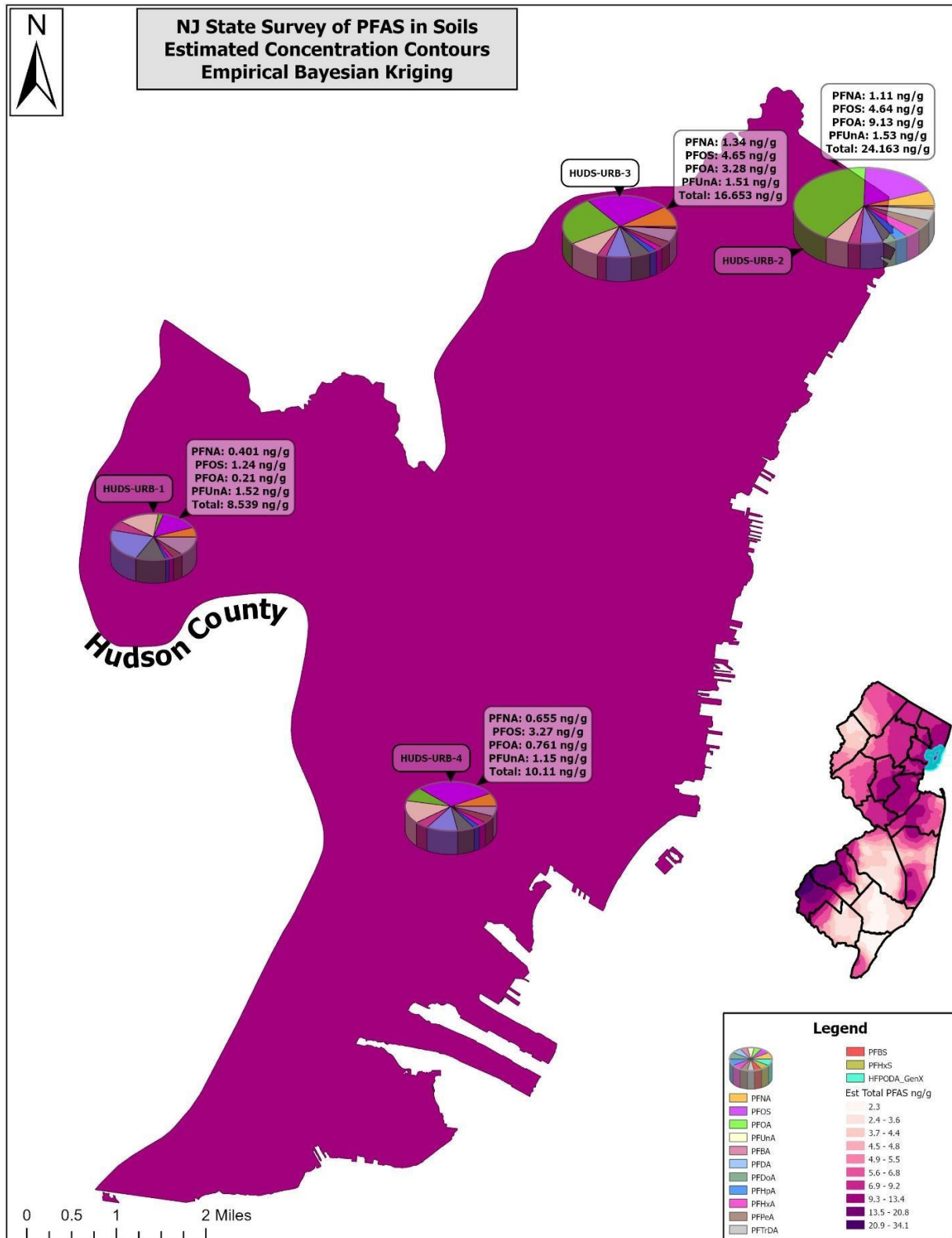




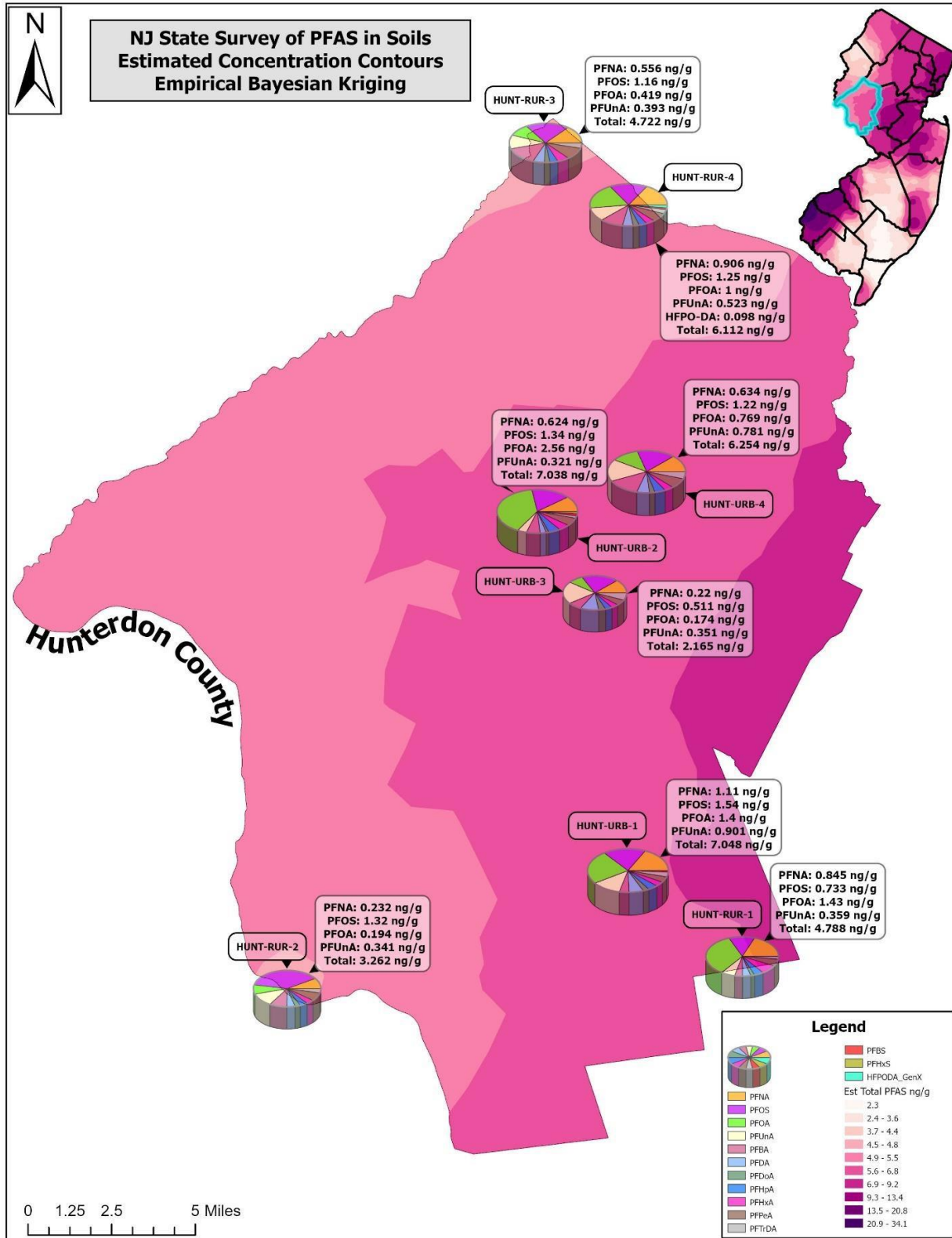
**Figure A15:** Essex County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



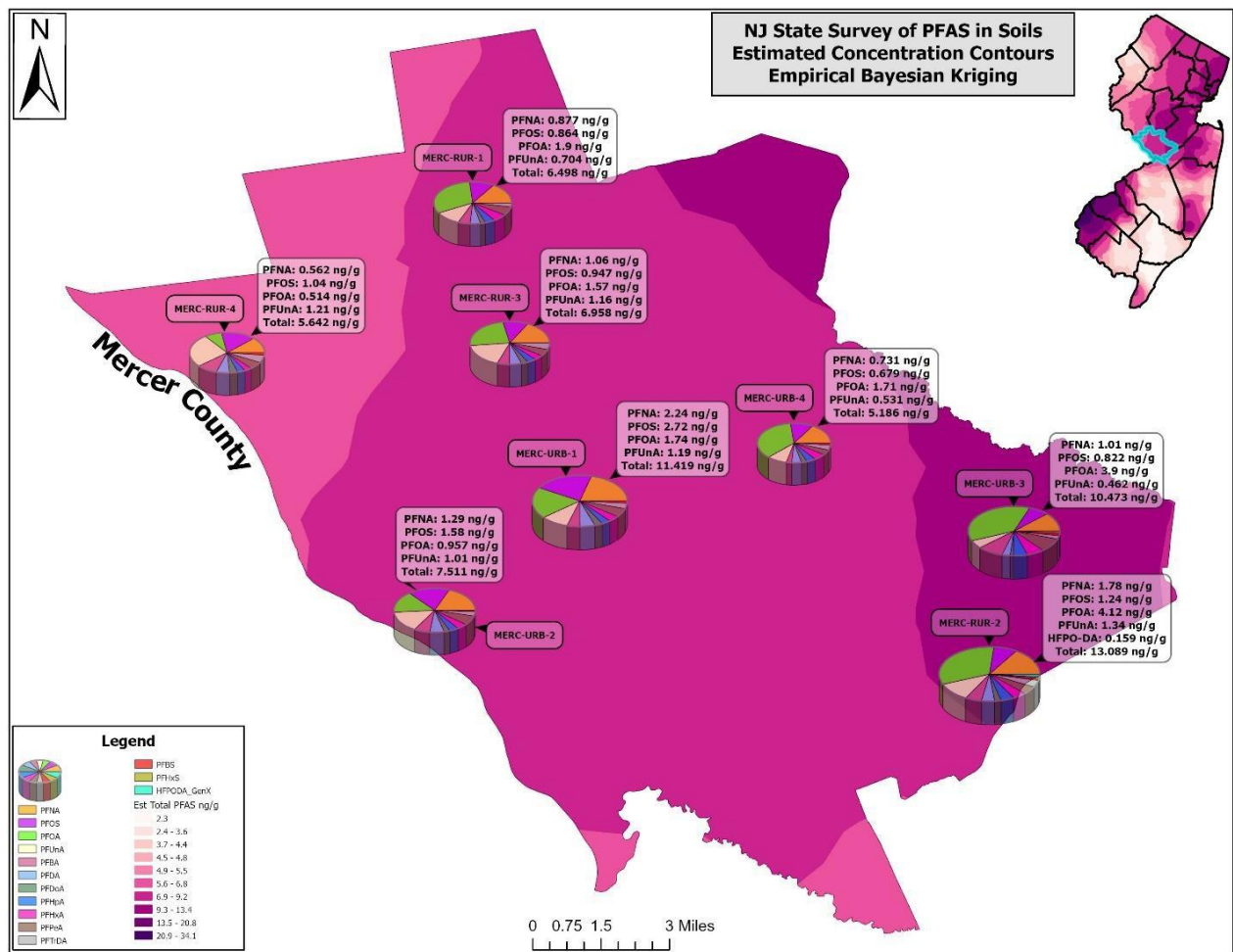
**Figure A16:** Gloucester County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



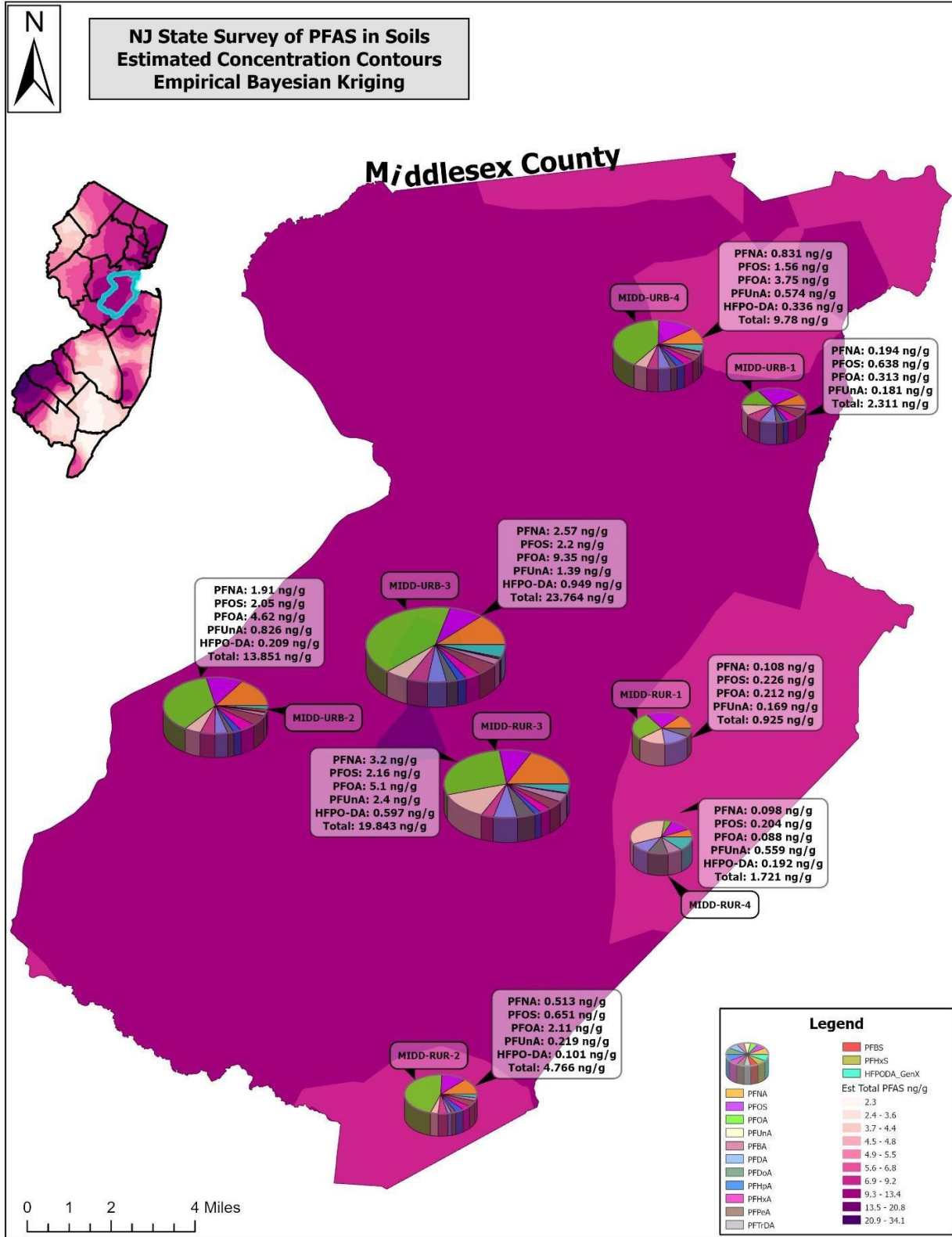
**Figure A17:** Hudson County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



**Figure A18:** Hunterdon County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.

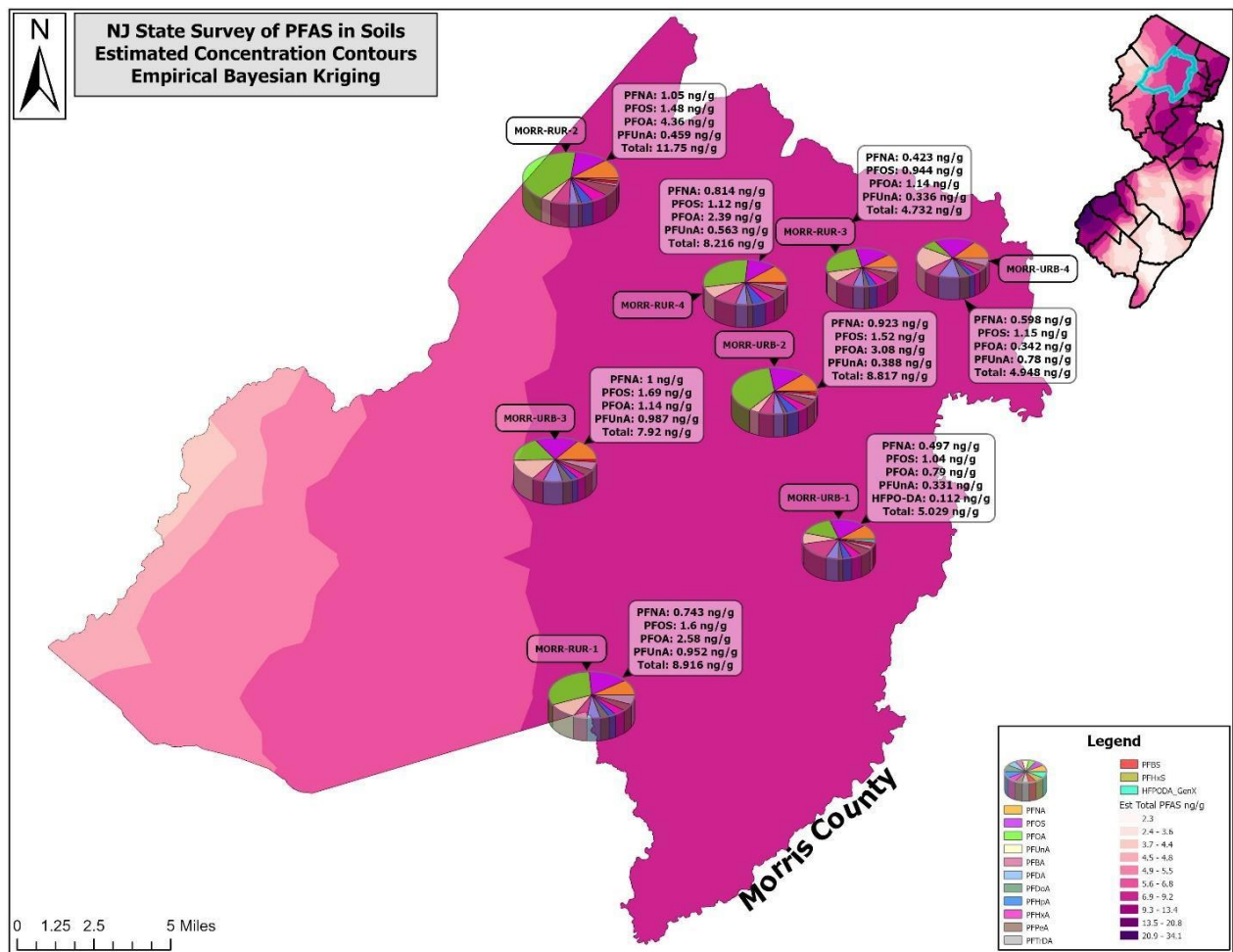


**Figure A19:** Mercer County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.

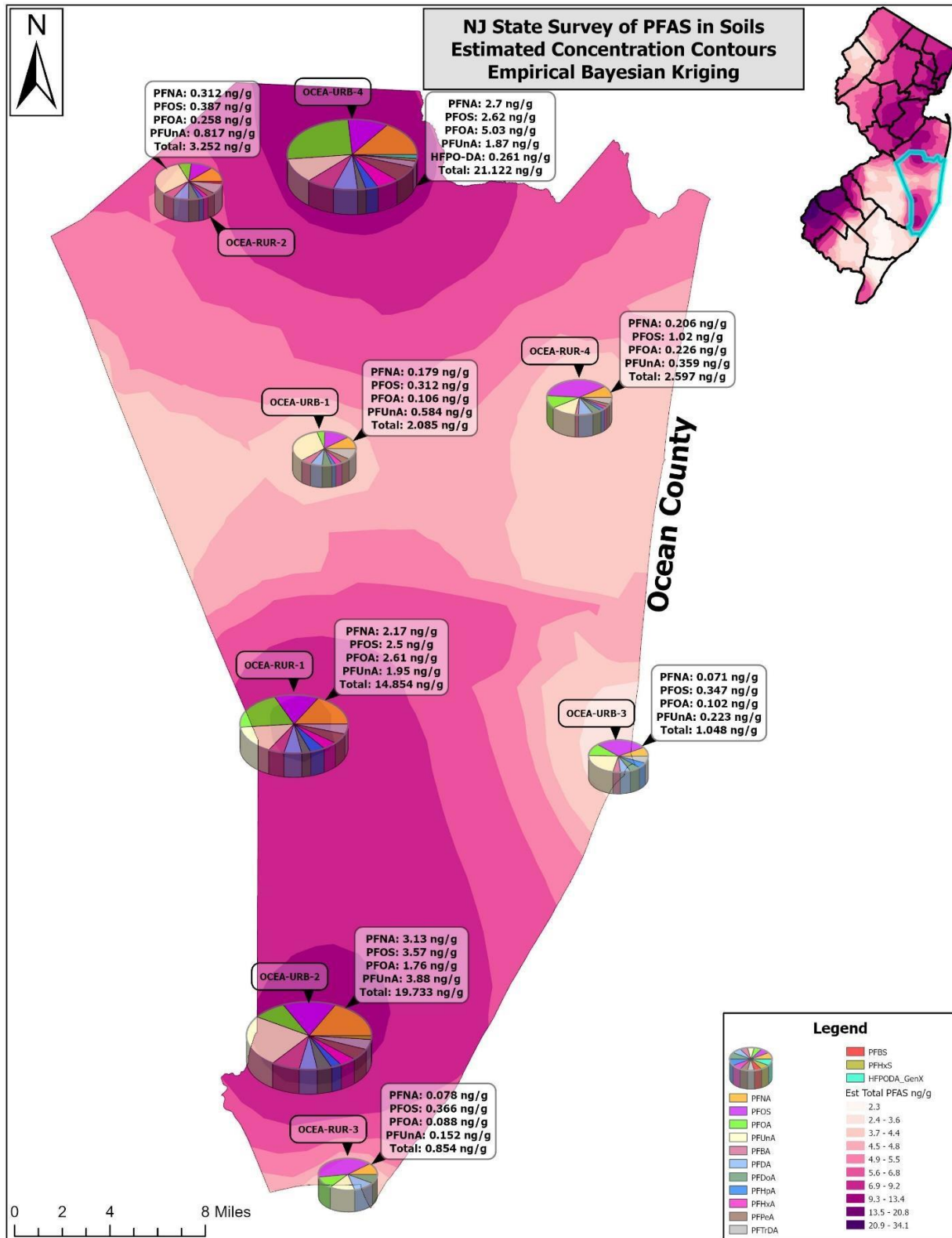


**Figure A20:** Middlesex County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.

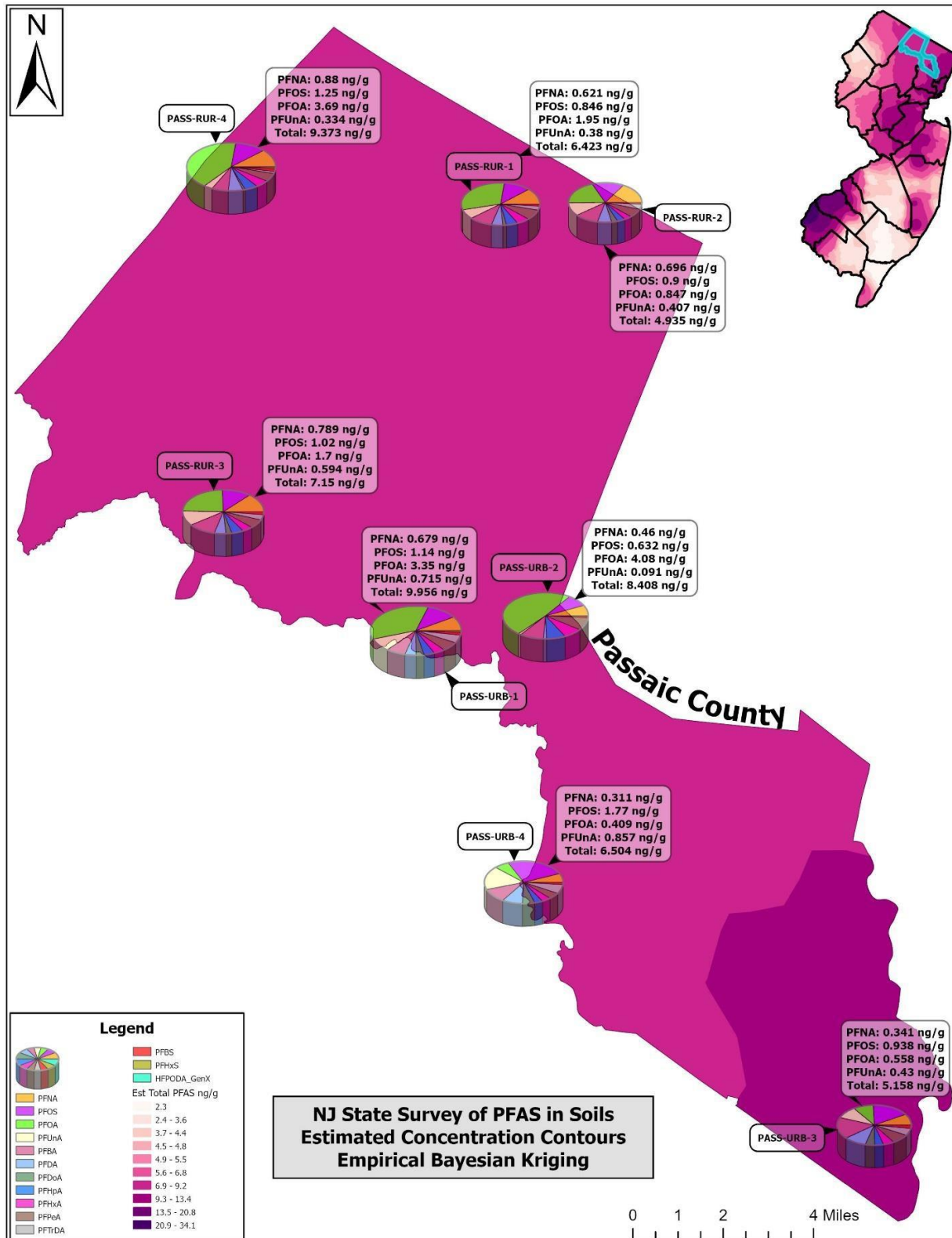




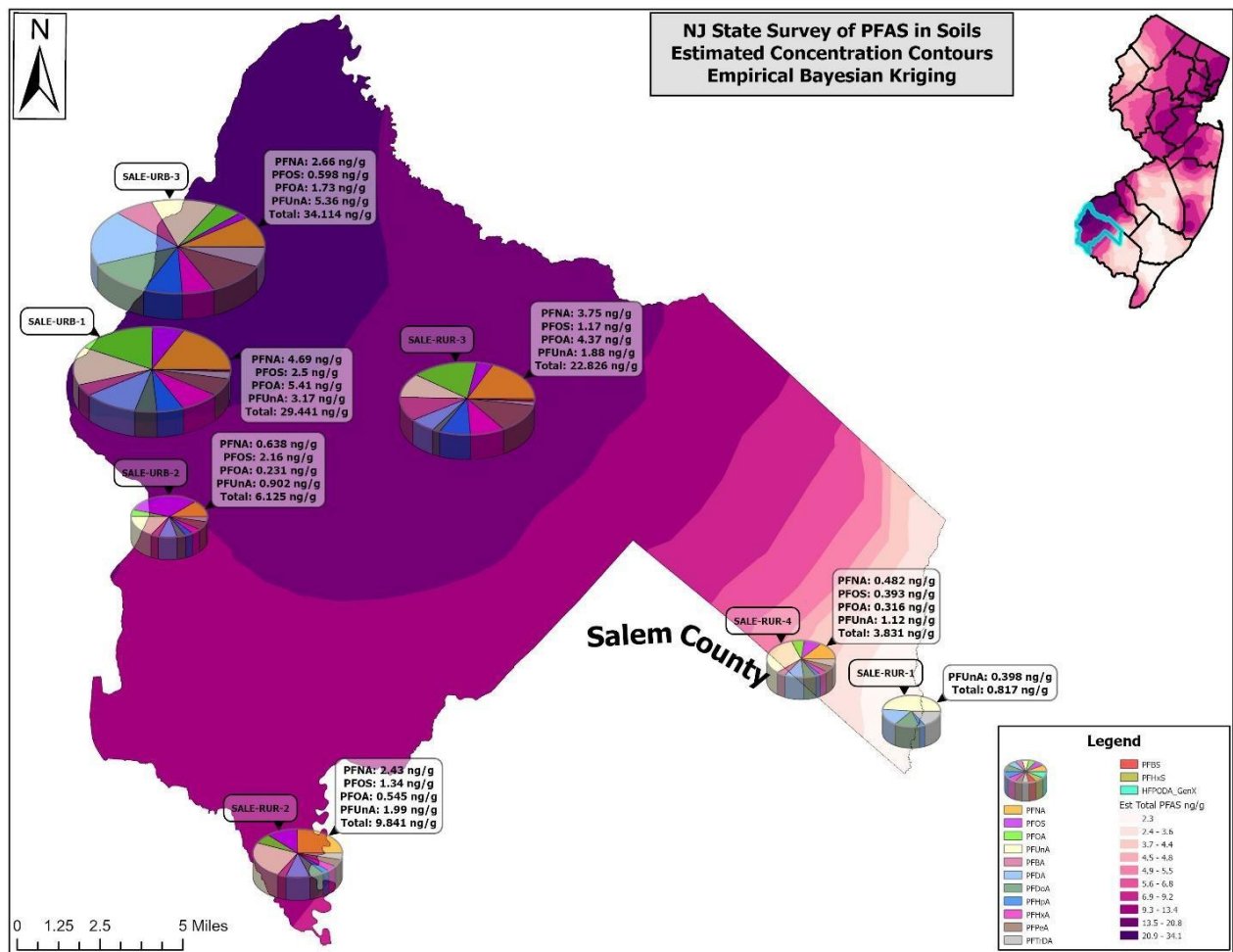
**Figure A22:** Morris County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



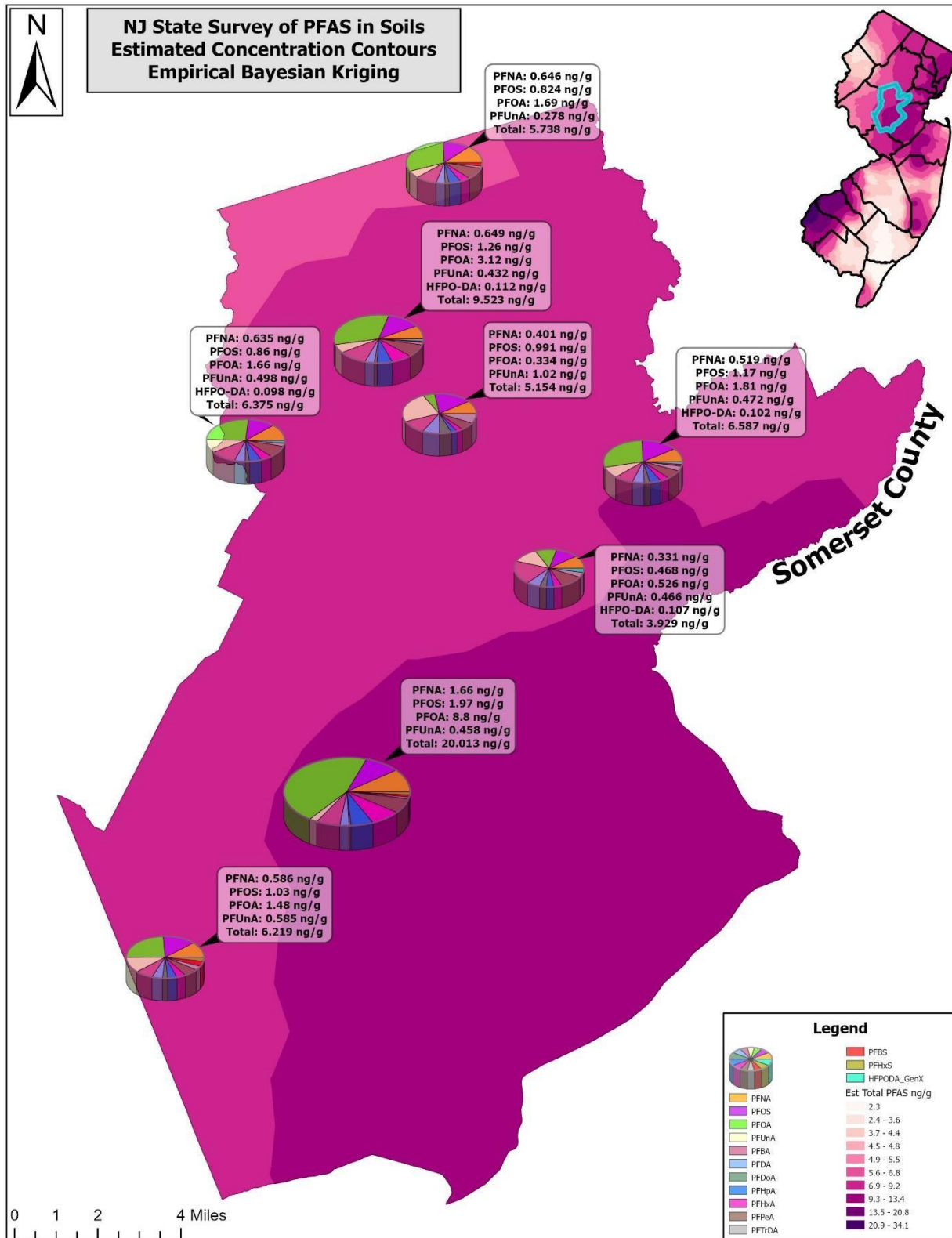
**Figure A23:** Ocean County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



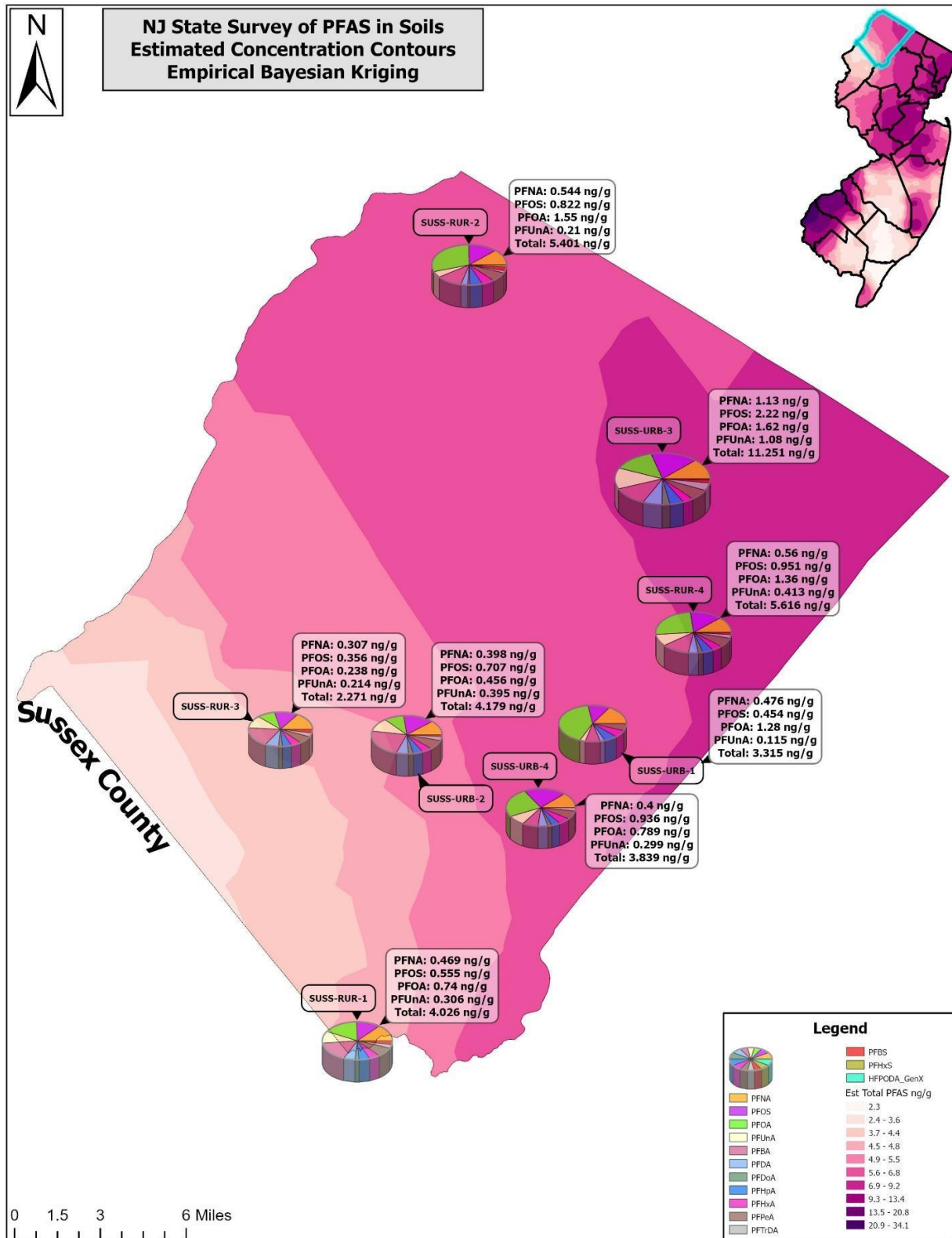
**Figure A24:** Passaic County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



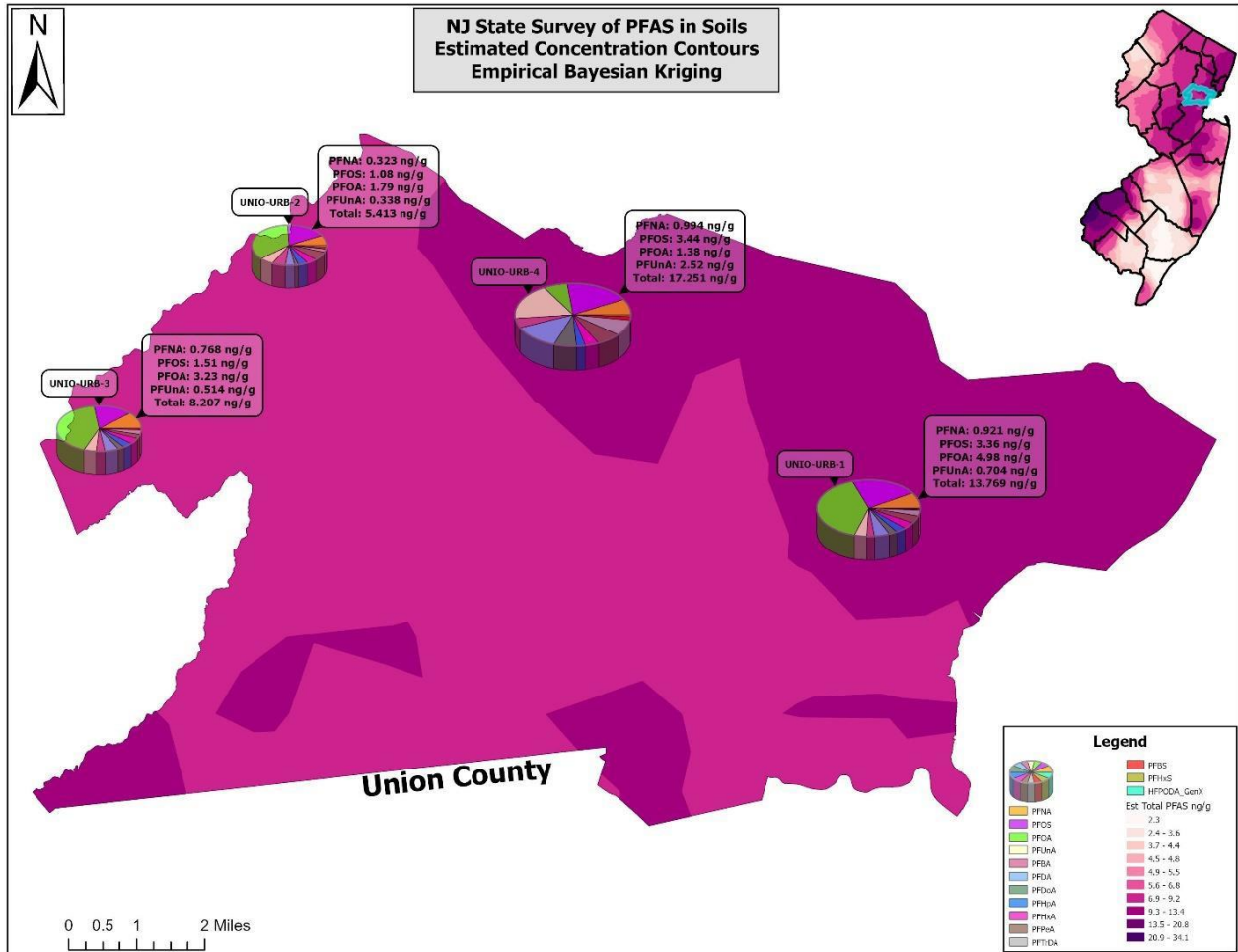
**Figure A25:** Salem County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



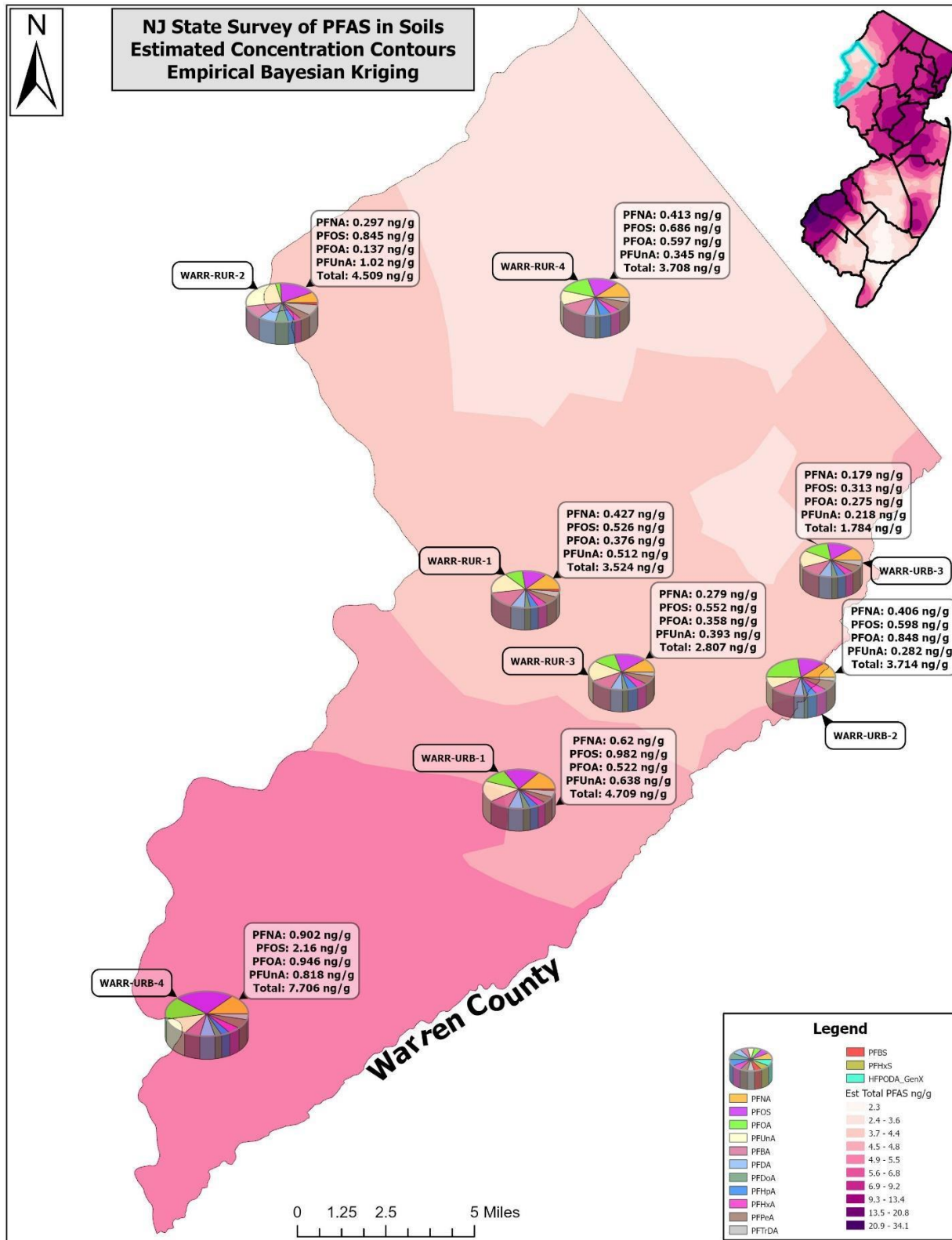
**Figure A26:** Somerset County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



**Figure A27:** Sussex County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



**Figure A28:** Union County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.



**Figure A29:** Warren County sampling results. Larger pie charts represent higher total PFAS concentrations. The detected PFAS compounds vary by county. The total PFAS concentration contours (pink) are based on the range of concentrations observed across the entire state. Certain ranges are not represented in all counties.

## **Appendix B: GIS Data Layer Citations**

**Table B1:** Known PFAS contamination categories used to determine sampling exclusion buffers.

<b>Known Sources</b>	<b>Data Points</b>
NJDEP PFNA Sites	70
NJDEP PFOA Sites	132
NJDEP PFOS Sites	112
Safe Drinking Water Information System (SDWIS) PFNA	28
SDWIS PFOA	177
SDWIS PFOS	271
NJ Ambient Ground Water Quality Monitoring Network	43
NJDEP Case Manager Sites	19
NJ Private Well Testing Act	1114
NJDEP Publicly Funded Potable Wells	306
Dupont Domestic Potable Wells	225
Solvay Domestic Potable Wells	109
NJDEP Publicly Funded Soil Sampling	162
NJDEP Emerging Contaminant Survey	159
NJDEP Discharge to Ground Water Permits	21
Superfund Sites	18
Sludge Incinerators	5
County Fire Training Facilities	21
AFFF Incidents	36
<b>Total</b>	<b>3028</b>

**Table B2:** Presumptive PFAS contamination source categories used to determine sampling exclusion buffers.

<b>Presumptive Sources</b>	<b>Data Points</b>
Fire Stations	1296
Formerly Utilized Defense Sites	42
Landfills	674
Landfills >35 Acres	211
AFFF Certified Major Airports	4
Airports	121
Military Bases	8
NAICS Codes and SIC Codes	5210
Sludge Application Sites	12
<b>Total</b>	<b>7578</b>

## References

Bureau of Transportation Statistics, United States Department of Transportation. (2023). *Military Bases*. (Accessed: August 2023). [Military Bases | Geospatial at the Bureau of Transportation Statistics \(arcgis.com\)](https://www.arcgis.com).

This dataset contains the boundaries of Department of Defense sites including installations, ranges, training areas, bases, forts, camps, armories, and centers. This list does not necessarily represent a comprehensive collection of all Department of Defense facilities, and only those reported in the Fiscal Year 2021 Base Structure Report (BSR). The boundary location datasets are intended for planning purposes only, and do not necessarily represent the legal or surveyed land parcel boundaries.

Federal Aviation Administration (FAA), United States Department of Transportation. (June 15, 2023). *Part 139 Airport Certification Status List Layer*. (Accessed: August 2023). [https://www.faa.gov/airports/airport\\_safety/part139\\_cert/part\\_139\\_airport\\_certification\\_status\\_list](https://www.faa.gov/airports/airport_safety/part139_cert/part_139_airport_certification_status_list).

This layer was created from the FAA database and includes all New Jersey airports (4) with a Title 14, Code of Federal Regulations (CFR), Part 139 (14 CFR Part 139) certificate. Certification requirements include a required AFFF certification for airports serving scheduled air carrier operations in an aircraft designed for more than 9 passengers. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Environmental Evaluation and Risk Assessment (BEERA). (August 2023). *DEP Case Manager Sites*. (Accessed: August 2023).

BEERA distributed a PFAS survey to NJDEP case managers from various bureaus to evaluate if PFAS contamination was present at their site. Responses were cross referenced with NJDEP (PFNA, PFOS, PFOA) sites to close any data gaps. Sites that were not represented in other data sets were organized into a *DEP Case Manager Sites* layer. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Environmental Measurements and Site Assessment (BEMSA). (March 2023). *DEP Publicly Funded Potable Wells*. (Accessed: August 2023).

This layer was created from data collected for publicly funded potable well investigations conducted by BEMSA. The data layer was queried to only include potable wells that exceed the current NJDEP ground water quality standards for PFNA, PFOS, and/or PFOA. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Environmental Measurements and Site Assessment (BEMSA). (March 2023). *DEP Publicly Funded Soil Sampling*. (Accessed: August 2023).

This layer was created from data collected for publicly funded soil sampling investigations conducted by BEMSA. The data layer includes soil sample results above the lowest applicable interim soil remediation standard for PFNA, PFOS, and/or PFOA. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Geographical Information Systems (BGIS). (January 10, 2023). *1986-2015 Agriculture Land Use*. (Accessed August 2023).

This layer was created through the querying and merging of the available BGIS Land Use and Land Cover layers from 1986-2015 to show only agricultural use. The following years were used: 1986, 1995-1997, 2002-2007, 2012, 2015. This layer captures lands that are or were previously used for agricultural purposes from 1986-2015.

New Jersey Department of Environmental Protection, Bureau of Geographical Information Systems (BGIS). (January 1, 2002). *Airports in New Jersey*. (Accessed: August 2023). [Airports - Overview \(state.nj.us\)](#).

This layer is comprised of the Public Use Airports database for aircraft landing facilities derived from the FAA's National Airspace System Resource Aeronautical Data Product (Effective 21 February 2002). This data set was adjusted to only include airports in New Jersey and corrected by NJDEP for better accuracy. This version will not be consistent with the publicly available FAA version.

New Jersey Department of Environmental Protection, Bureau of Geographical Information Systems (BGIS). (May 17, 2022). *Sewage Sludge Management Systems (Environmental Justice Stressors) in New Jersey*. (Accessed August 2023). [Sewage Sludge Management Systems \(Environmental Justice Stressors\) in New Jersey - Overview \(arcgis.com\)](#).

This layer was imported from the Bureau of Ground Water Residuals and Permit Administration (BGWRPA) tool and includes New Jersey's sewage sludge management systems that incinerate sludge. The original layer included all sewage sludge management facilities but was queried for the purpose of this project. This class of facilities includes Major Publicly Owned Treatment Works (POTW) Receiver, Beneficial Use Class A, Beneficial Use Class B, and Incinerators. This layer does not include the Residual Transfer Stations category. The status of each facility is defined as either Not Operational, Operational and Accepting Sewage Sludge Customers, and/or Operational and Not Accepting Sewage Sludge Customers. All types of statuses were included to account for historical activities. The layer was queried by facility type to create two layers titled *BGWRPA Sludge Incinerators* and *BGWRPA Sludge Applications (Non-Incinerator)*.

New Jersey Department of Environmental Protection, Bureau of Geographical Information Systems (BGIS). (June 1, 1992). *Solid Waste Landfills in New Jersey*. (Accessed: August 2023).

This data layer represents the location of landfills within New Jersey that are regulated by the Division of Sustainable Waste Management. The dataset includes only landfills that

are regulated under New Jersey Solid Waste Management Act, Comprehensive Regulated Medical Waste Management Act, Statewide Mandatory Source Separation and Recycling Act, and federal Resource Conservation and Recovery Act. This dataset does not include all landfills in the State of New Jersey and locations are represented by feature points placed at the center of the block and lot.

New Jersey Department of Environmental Protection, Bureau of Geographical Information Systems (BGIS). (February 3, 2012). *Solid Waste Landfill Sites (35 Acres and Above) in New Jersey*. (Accessed: August 2023). [Solid Waste Landfills Sites over 35 Acres - Overview \(state.nj.us\)](https://state.nj.us).

This layer is comprised of data from the Solid Waste Landfills layer but only includes parcels or parcel groups approximately 35 acres or greater in size. Feature polygons are used to include the entire landfill boundary, unlike the Solid Waste Landfills layer. The points delineated in this data were originally taken from original paper topographic quads marked by field personnel, and location data developed by the NJDEP Site Remediation Program. These delineations were later refined using site plans, tax parcel data, and aerial photography by employees of the Solid and Hazardous Waste Program.

New Jersey Department of Environmental Protection, Bureau of Geographical Information Systems (BGIS). *State, Local and Nonprofit Open Space of New Jersey*. (Accessed August 2023). <https://gisdata-njdep.opendata.arcgis.com/datasets/njdep::state-local-and-nonprofit-open-space-of-new-jersey/about>.

This New Jersey Open Space dataset contains Green Acres encumbered and unencumbered protected open space and recreation areas. They are owned in simple fees of interest by either the state, county, municipality, or a nonprofit agency. Examples of open space property in this data layer include parks, conservation areas, preserves, historic sites, recreational fields, and beaches. The data was derived from a variety of mapped sources which vary in scale and level of accuracy. These sources include, but are not limited to, tax maps, surveys, deeds, digital aerial photography, as well as United States Geological Survey topographic maps.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (November 26, 2019). *AFFF Incidents*. (Accessed: 2023).

This layer represents situations involving the application of Alcohol Resistant Aqueous Film-Forming Foam (AR AFFF). Locations were derived from New Jersey Environmental Management System (NJEMS) Incidents Data, International Navigation Association (INA) History Data, and Google Search. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS), Division of Science and Research (DSR). (2009). *County Fire Training Facilities*. (Accessed: 2023).

BIS queried the parcels lot and block data base with a list of county fire training facilities provided by DSR. BIS also ran a web search and identified several other locations. The parcels layer was used to create a polygon layer of county fire fighting training facilities. Note this layer does not capture all current firefighting training facilities. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (January 9, 2020). *Dupont Domestic Potable Wells*. (Accessed: August 2023).

This layer was created by BIS from data collected as part of the Dupont off-site potable well investigation conducted by NJDEP in Carney's Point, NJ. The data layer was queried to only include potable wells that exceed the GWQS for PFNA, PFOS, and/or PFOA. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (August 2023). *Emerging Contaminant Survey*. (Accessed: August 2023).

This layer was created by reviewing an emerging contaminant survey included on questionnaire forms submitted by Person(s) Responsible for Conducting the Remediation (PRCR) as part of the NJDEP Contaminated Site Remediation & Redevelopment program. A list serv notification was sent out in January 2020 informing all Responsible Partys (RPs) that an emerging contaminants survey would need to be filled out with all remedial phase reports and workplans. The survey specifically asked whether PFNA, PFOS, or PFOA were contaminants of concern for the site. Accessed: August 2023). This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). *NAICS/SICODES*. (Accessed: 2023).

The *NAICS/SICODES* layer was created by BIS and based on two data sets. The North American Industry Classification System (NAICS) data was used to identify specific industries that potentially use PFAS. The list of industries is broad and may also include manufacturers of products unrelated to PFAS. The NAICS list was taken from the Association of State Drinking Water Administrator's PFAS Source Water Protection Guidance Project. The older and less specific Standard Industrial Classification (SIC) System was taken from the EPA PFAS Handling Industry List. The NJDEP database *NJEMS* was queried to identify sites with the matching NAICS code and/or SIC Code. This layer is not accessible to the public.

## NAICS Code Table PFAS Source Water Protection Project

NAICS Code	Index Entry
325510	Water repellant coatings for wood, concrete and masonry manufacturing*
325520	Pipe sealing compounds manufacturing
325611	Soap and other detergent manufacturing
325612	Polish and other sanitation good manufacturing
325613	Surface active agent manufacturing
325620	Toilet preparation manufacturing
325998	Foundry core oil, wash, and wax manufacturing*
326111	Trash bags, plastics film, single wall or multiwall, manufacturing*
326112	Packaging film, plastics, single web or multiweb, manufacturing*
326113	Photographic, micrographic, and x-ray plastics, sheet, and film (except sensitized), manufacturing*
326119	Motor vehicle moldings and extrusions, plastics, manufacturing*
326150	Cushions, carpet and rug, urethane and other foam plastics (except polystyrene), manufacturing*
32619	Other plastics product manufacturing
32629	Other rubber product manufacturing
332215	Nonstick metal cooking utensils*
33281	Coating, engraving, heat treating, and allied activities
332812	Hot dip galvanizing metals and metal products for the trade*
	Coating of metal and metal products with plastics for the trade*
	Powder coating metals and metal products for the trade*
332813	Chrome plating metals and metal products for the trade*
333241	Bakery ovens manufacturing*
333242	Semiconductor making machinery manufacturing*
333318	Cooking equipment (e.g., fryers, microwave ovens, ovens, ranges) commercial- type manufacturing*
33351	Metalworking machine manufacturing
333517	Chemical milling machines, metalworking, manufacturing*
334413	Semiconductor memory chips manufacturing*
334419	Rectifiers, electronic component-type (except semiconductor), manufacturing*
334515	Semiconductor test equipment manufacturing*
335210	Ovens, portable household-type (except microwave and convection ovens), manufacturing*
335220	Microwave ovens (including portable), household-type, manufacturing*
335999	Semiconductor high-voltage power supplies manufacturing*
336412	Aircraft turbines manufacturing*
339114	Dental wax manufacturing*
339920	Sporting and athletic goods manufacturing

NAICS Code	Index Entry
<b>Waste Management and Remediation Services</b>	
561990	Firefighting services as a commercial activity*
562111	Solid waste collection
562112	Hazardous waste collection
562119	Other waste collection
562211	Hazardous waste treatment and disposal
562212	Solid waste landfill
562213	Solid waste combustors and incinerators
562219	Other nonhazardous waste treatment and disposal
562991	Septic tank and related services
<b>Educational Services</b>	
611519	Fire fighter training schools*
<b>Public Administration</b>	
922160	Fire protection

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (November 21, 2022). *National Priorities List Sites*. (Accessed August 2023).

This is an internal layer developed by NJDEP BIS. This GIS layer depicts site boundaries for all proposed and final National Priority List (NPL) sites within New Jersey. The purpose of this GIS layer was to provide the physical extent of the property boundaries, as opposed to point locations, for the NPL sites that have been identified in New Jersey. The boundaries were derived from various data sources which are identified in the attribute table. This layer was joined with the USEPA’s *PFAS Superfund Sites* layer to create a polygon layer showing the boundaries of superfund sites with PFAS contamination in New Jersey. There was a discrepancy in total features (n = 21) from the USEPA data set and NJDEP data set (n = 18). Thus, 3 sites were not represented in new layer but were cross referenced with the PFAS buffers. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (January 2023). *Safe Drinking Water Information System (SDWIS) PFNA*. (Accessed: 2023).

The data layer consists of community, non-transient noncommunity, and transient noncommunity supply well sampling results. The entities operating the supply wells are required to submit the results to the NJDEP Bureau of Safe Drinking Water. The layer includes only samples that exceed the GWQS for PFNA. The data layer is not accessible to the public but well results can be found at [https://www-dep.nj.gov/DEP\\_WaterWatch\\_public/](https://www-dep.nj.gov/DEP_WaterWatch_public/).

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (January 2023). *Safe Drinking Water Information System (SDWIS) PFOA*. (Accessed: 2023).

The data layer consists of community, non-transient noncommunity, and transient noncommunity supply well sampling results. The entities operating the supply wells are required to submit the results to the Bureau of Safe Drinking Water. The layer includes only samples that exceed the GWQS for PFOA. The data layer is not accessible to the public but well results can be found at [https://www-dep.nj.gov/DEP\\_WaterWatch\\_public/](https://www-dep.nj.gov/DEP_WaterWatch_public/).

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (January 2023). *Safe Drinking Water Information System (SDWIS) PFOS*. (Accessed: 2023).

The data layer consists of community, non-transient noncommunity, and transient noncommunity supply well sampling results. The entities operating the supply wells are required to submit the results to the Bureau of Safe Drinking Water. The layer includes only samples that exceed the GWQS for PFOS. The data layer is not accessible to the public but well results can be found at [https://www-dep.nj.gov/DEP\\_WaterWatch\\_public/](https://www-dep.nj.gov/DEP_WaterWatch_public/).

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (December 27, 2019). *Solvay Domestic Potable Wells*. (Accessed: August 2023).

This layer was created by BIS from data collected as part of the Solvay Specialty Polymers USA off-site potable well investigation conducted by NJDEP. The site is located in West Deptford, NJ. The data layer was queried to only include potable wells that exceed the GWQS for PFNA, PFOS, and/or PFOA. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (January 26, 2021). *SRP PFNA COMPASS GW Site Summary*. (Accessed August 2023). [SRP PFNA COMPASS GW Site Summary - Overview \(state.nj.us\)](#).

This GIS layer is based on a structured query language (SQL) query of the groundwater HAZSITE data that resides in COMPASS, the Department's Oracle data repository, for each active Site Remediation case. Once the raw groundwater HAZSITE data is extracted from COMPASS, it is summarized such that a maximum concentration for the contaminant is derived for the year preceding the last sampling event (samp\_last\_max\_conc) and a maximum concentration is also generated for all sampling events (all\_max\_conc). Each active Site Remediation case is included in the GIS layer. This layer was queried to only include sites with exceedances of the GWQS exceedances for PFNA and renamed *DEP PFNA Sites*. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (January 26, 2021). *SRP PFOA COMPASS GW Site Summary*. (Accessed August 2023). [SRP PFOA COMPASS GW Site Summary - Overview \(state.nj.us\)](#).

This GIS layer is based on a SQL query of the groundwater HAZSITE data that resides in COMPASS for each active Site Remediation case. Once the raw groundwater HAZSITE data is extracted from COMPASS, it is summarized such that a maximum concentration for the contaminant is derived for the year preceding the last sampling event (*samp\_last\_max\_conc*) and a maximum concentration is also generated for all sampling events (*all\_max\_conc*). Each active Site Remediation case is included in the GIS layer. This layer was queried to only include sites with exceedances of the GWQS exceedances for PFOA and renamed *DEP PFOA Sites*. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Bureau of Information Systems (BIS). (January 26, 2021). *SRP PFOS COMPASS GW Site Summary*. (Accessed August 2023). [SRP PFOS COMPASS GW Site Summary - Overview \(state.nj.us\)](#).

This GIS layer is based on a SQL query of the groundwater HAZSITE data that resides in COMPASS for each active Site Remediation case. Once the raw groundwater HAZSITE data is extracted from COMPASS, it is summarized such that a maximum concentration for the contaminant is derived for the year preceding the last sampling event (*samp\_last\_max\_conc*) and a maximum concentration is also generated for all sampling events (*all\_max\_conc*). Each active Site Remediation case is included in the GIS layer. This layer was queried to only include sites with exceedances of the GWQS exceedances for PFOS and renamed *DEP PFOS Sites*. This layer is not accessible to the public.

New Jersey Department of Environmental Protection, Division of Science and Research (DSR), Bureau of Information Systems (BIS). (January 10, 2023). *Private Well Testing Act (PWTA) PFAS Data*. [NJDEP| Private Wells | Private Well Testing Act \(PWTA\)](#).

The PWTA is a consumer information law that requires sellers (or buyers) of property with potable wells in New Jersey to test the water for a variety of different health parameters. The collection of PWTA data for PFNA, PFOS, and PFOA started in December 2021 when the contaminants were added to the list of health parameters. This layer was queried to only include potable well data that exceeds the GWQS for PFNA, PFOS, and/or PFOA. This data is not available to the public. This layer is not accessible to the public.

New Jersey Office of Information Technology, Office of Geographic Information Systems (OGIS). (September 19, 2008). *HSIP New Jersey Fire Stations*. (Accessed: August 2023). [Fire Stations - Overview \(state.nj.us\)](#).

This data set was produced as part of the Homeland Security Infrastructure Program sponsored by the National Geospatial Intelligence Agency and the National States Geographic Information Council. Tabular "starter" data was provided by the New Jersey Department of Community Affairs, Office of the State Fire Marshall. The data consists of fire stations in New Jersey where fire fighters are stationed or based out of, or where

equipment is stored for carrying out their jobs. Fire departments not having a permanent location are included, in which case their location has been depicted at the city/town hall or at the center of their service area if a city/town hall does not exist. This dataset also includes locations primarily engaged in forest or grasslands firefighting, fire lookout towers currently in use, and firefighting training academies. This dataset includes both private and governmental entities.

U.S. Army Core of Engineers. (2022). *Formerly Used Defense Sites (FUDS) Property Polygon*. (Accessed: August 2023). [https://geospatial-usace.opendata.arcgis.com/datasets/3f8354667d5b4b1b8ad7a6e00c3cf3b1\\_4/about](https://geospatial-usace.opendata.arcgis.com/datasets/3f8354667d5b4b1b8ad7a6e00c3cf3b1_4/about).

This layer includes facilities or sites that were under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to contamination by hazardous substances. Properties must be located within the United States. This layer was queried to only include FUDS properties located in or bordering the state of New Jersey.

United States Environmental Protection Agency, Office of Land and Emergency Management (OLEM). (2023). *Enforcement and Compliance History Online (ECHO) PFAS Analytical Tool: PFAS Superfund Sites*. (Accessed: August 2023). [https://awsedap.epa.gov/public/extensions/PFAS\\_Tools/PFAS\\_Tools.html](https://awsedap.epa.gov/public/extensions/PFAS_Tools/PFAS_Tools.html).

The *Superfund Sites* layer was downloaded from the USEPA *PFAS Analytical Tool*. The sites in the database were found to have “PFAS present in the environment” based on data collected under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This layer was queried and joined with the *National Priorities List* polygon layer to create a polygon layer showing the boundaries of superfund sites with PFAS contamination in New Jersey. There was a discrepancy in total features ( $n = 21$ ) from the USEPA data set and NJDEP data set ( $n = 18$ ). Thus, 3 sites were not represented in new layer but were cross referenced with the PFAS buffers. This layer is not accessible to the public.

## **Appendix C: Sampling Location Photos**

















































































## **Appendix D: PFAS Data Validation Checklist**

**Office of Data Quality Reviewer Checklist for USEPA Method 1633: PFAS in Aqueous, Solid, Biosolids and Tissue by LCMSMS**

Soil and SPLP samples. 40 Target Analytes. USEPA Method 1633 notes refer to draft 4 version.

**Site:** NJ PFAS Soil Survey

**Job Code:**

**Laboratory:** Alpha Analytical

**PI#:**

**Case/Site Manager:**

**ODQ Reviewer:**

**Date of Review:**

**Method:** Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. Draft EPA Method 1633, EPA Document 821-D- 22-001, June 2022. **NOTE:** 2<sup>nd</sup> draft is cited in the data package; however, this review will reference the most recent draft of method 1633, draft 4.

“SOP” throughout this document refers to Alpha Analytical, Inc. SOP, ID No: 45852. Method 1633 Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids and Tissue Samples by LC-MS/MS.

**Lab Sample SDG IDs:**

**Trip Blank:**

**Field Blank:**

**Sampling date:**

**Extraction date:**

**Analysis date:**

**Temp/Preservation:** \_\_\_\_\_ °C (per sample receipt) / \_\_\_\_\_

**Dilutions:** \_\_\_\_\_ **Yes No**  
(If needed, use additional comments section for potential sample volume changes)

**1. Holding time, extraction within 90 days, if stored properly** \_\_\_\_\_ **Yes No**  
(Note: alternate requirements if NFDHA is compound of concern)

**2. Is analysis within 90 days of extraction, if stored properly?** \_\_\_\_\_ **Yes No**

**3. Was instrument tuned prior to analysis and acceptable?** \_\_\_\_\_ **Yes No**  
(perform annually and on as-needed bases, Mass calibration is found at the end of ICAL section)

**4. Initial calibration date:**

**4a. Per method 1633, at least 6 calibration points (Per SOP, are at least 5 calibration concentrations used)?** \_\_\_\_\_ **Yes No**

**4b. Is low standard at or below the laboratory's MRL?** \_\_\_\_\_ **Yes No**

**4c. Is linear fit acceptable? (RSD or RSE for each target analyte  $\leq$  20%)** \_\_\_\_\_ **Yes No**  
**Outliers:** \_\_\_\_\_

**4d. Are standards within 70-130% of true value (50-150% for lowest std)?** \_\_\_\_\_ **Yes No**  
*(This is not required by method 1633, only recommended to use 70-130%. Alpha Analytical does not use calibration points with recoveries outside 70-130%). NOTE: Per method 1633,  $r$  and  $r^2$  shall not be used in conjunction with the method (only RSD and RSE) and other calculation approaches (besides response factors and response ratios) may be used such as weighted linear regression or non-linear regression, based on the capability of the data system. If used, the regression must be weighted inversely proportional to concentration and must NOT be forced through zero.*

**5. Is an Instrument Blank submitted?** \_\_\_\_\_ **Yes No**  
*(required daily and prior to analysis for each sample batch)*

**Were Instrument Blanks run until all compounds were less than the method detection limit (MDL)?** \_\_\_\_\_ **Yes No**

**6. Is instrument sensitivity check acceptable?** \_\_\_\_\_ **Yes No**  
*(Per method 1633, perform daily prior to analysis, 3:1 S/N ratio for quantitation and confirmation ions or 10:1 if only quantification ion used. Per section 7.3.4, the ISC at a concentration of the lowest standard within the quantitation range must be analyzed at the beginning of the analytical run).*

*NOTE: The lowest standard ISC analyzed prior to analytical runs was not performed in this data package; however, this was not a requirement in the SOP, only method 1633. Based on observation of the CCV peaks, the SOP 3:1 S/N requirements were met. The laboratory uses a low-level CCV as an ISC and does not report numerical S/N ratios. A visual observation was made.*

**7. Retention time windows acceptable?** \_\_\_\_\_ **Yes No**  
*Per method 1633: perform after ICAL and at beginning of analytical sequence. Analyte RTs must fall within 0.4 min of predicted RT based on the midpoint of ICAL or initial daily CV. Analytes with isotopically labeled analogs must be within 0.1 min of the EIS. These apply to samples, blanks, QC standards, etc.*

*NOTE: Retention times are provided in the raw data. Target analytes, extracted internal standards (EIS), and non-extracted internal standard (NIS) retention times are grouped separately (TA and*

EIS RTs are on separate pages). Summary tables of RTs were not provided. Only chromatograms of individual peaks were provided.

Update: The amended data package provided RT summary tables.

**8. Qualitative Identification Standards acceptable?** \_\_\_\_\_ **Yes No**  
(Per method 1633, analyze a qualitative standard, once daily at the beginning of the run, to confirm retention times of each linear and known branched isomer group. **NOTE:** The lab analyzes a “technical reference standard (TRS) containing the branched isomers with every sequence, but it is not reported as part of the package. Only the TRS run with the ICAL is currently reported as part of the data package.” Per 01/02/2024 email from the laboratory).

**9. Was a bile salt inference check performed and acceptable?** \_\_\_\_\_ **Yes No**  
(performed after ICAL and before each analytical sequence, bile salt retention must fall at least 1 minute outside the retention time window for any of the linear or branched PFOS isomers).

**10. Opening Continuing Calibration Verification (OCV; must be at or below MRL)**  
**Are standards within 70-130% of true value?** \_\_\_\_\_ **Yes No**  
(**NOT REQUIRED** by method 1633 or SOP but low level OCV is provided in data package).

**11. Continuing Opening and Closing Calibration (every 10 field samples)**  
**Are concentrations within 70-130% of true value?** \_\_\_\_\_ **Yes No**

**12. Soils Method Blank (one per preparation batch)**  
**Are all compounds less than the MDL?** \_\_\_\_\_ **Yes No**

**13. SPLP Method Blank (one per preparation batch)**  
**Are all compounds less than the MDL?** \_\_\_\_\_ **Yes No**

**14. Ongoing precision and recovery (OPR) within 40-150% QC limits?** \_\_\_\_\_ **Yes No**  
(one per preparation batch; **NOTE:** the laboratory’s in-house QC limits are 40-150% recovery for OPR and LLOPR. The OPR/LLOPR QC criteria from the most current method at the time of data validation was utilized (the January 2024 version of USEPA Method 1633).

**15. Matrix Spike/Matrix Spike Duplicate within 40-150% (data package QC limits)?** \_\_\_\_\_ **Yes No NA**  
(one per preparation batch, if required). **NOTE:** SPLP MS/MSD were not performed in this study.

**16. Is field duplicate (LFSMD if no FD) analyzed & within 30% RPD?** \_\_\_\_\_ **Yes No NA**

**17. Extraction Internal Standard (“Surrogate”) recoveries within the EIS QC limits from the January 2024 version of USEPA method 1633?** \_\_\_\_\_ **Yes No**

(24 extraction standards. **NOTE:** the laboratory's in-house EIS QC limits ranged from 20-150%; however, the EIS QC criteria from the most current method at the time of data validation was utilized (the January 2024 version of USEPA Method 1633).

**18. Non-extracted internal standards areas within 50-200% of the area of the calibration verification standard run at the beginning of the analytical sequence? \_\_\_\_\_ Yes No**

Per method 1633: Instrument Sensitivity:  $Area\ Ratio_{NISi} (\%) = 100 \times \frac{Area\ of\ NISi\ in\ the\ spl}{Mean\ Area_{NISi}}$

*Mean Area<sub>NISi</sub> = mean area for a NIS from the most recent initial calibration*

*\*Method 1633 section 14.9 provides an instrument sensitivity equation relative to the mean area of the initial calibration but the 50-200% range mentioned is relative to the CV.*

**NOTE:** this laboratory (Alpha Analytical) uses the mean area of the ICAL.

Per method 1633 (n=7): <sup>13</sup>C<sub>3</sub>-PFBA, <sup>13</sup>C<sub>2</sub>-PFHxA, <sup>13</sup>C<sub>4</sub>-PFOA, <sup>13</sup>C<sub>5</sub>-PFNA, <sup>13</sup>C<sub>2</sub>-PFDA, <sup>18</sup>O<sub>2</sub>-PFHxS, <sup>13</sup>C<sub>4</sub>-PFOS

**18. Sample Target Hits (ng/g)**

**PFNA Ingestion-Dermal SRS:** Residential- 47. Non-residential: 670.

**PFOA Ingestion-Dermal SRS:** Residential- 130. Non-residential- 1800.

**PFOS Ingestion-Dermal SRS:** Residential- 110. Non-residential- 1600.

**GenX Ingestion-Dermal SRS:** Residential- 230. Non-residential: 3900.

Soil (ng/g)

SPLP (ng/L)

**19. Additional Comments**

**20. Calculations**

(Note: the equation depends on the calibration type used (may vary by analyte, linear, average of response factor, quadratic weighing, etc.). The EIS concentration also varies by EIS.

Average of Response Factor Calibration type

$$\frac{Area\ of\ TA}{Area\ of\ EIS} = m \frac{Concentration\ of\ TA}{Concentration\ of\ EIS}$$

$$(\text{---}) = ( ) \frac{Concentration\ of\ TA}{ng/mL}$$

**EXAMPLE:** Concentration of TA (PFOS) = 0.89 ng/mL = calculated. Raw data reports 0.891 ng/mL

The 0.899 slope for PFOS is from ICAL20542, 11/10/2023

Please note the “concentration of the EIS” is the expected concentration not the recovered concentration. The expected concentration was not provided in the ICAL section, so it was calculated based on the recovered concentration and reported EIS percent recovery. Concentration ng/mL/77.3% = 2.4

$0.89 \text{ ng/mL} \times (4000 \text{ } \mu\text{L} \text{ or } 4 \text{ mL extract volume}) / 6.22 \text{ g} \times 0.83 \text{ (sample amount} \times \text{percent solids reported on the results summary, form 1)} = 0.69 \text{ ng/g dw calculated result}$

The reported result is 0.689 ng/g.