***How to Interpret my PFAS Laboratory Report and Understand How my Results Compare to MassDEP’s Guideline Levels***

*Reading laboratory data reports and interpreting their results can be confusing. This document will help you understand your laboratory report from the sampling of your water for PFAS (per- and polyfluoroalkyl substances) and how the results are used and compared to MassDEP’s PFAS guidance levels. Terminology and formatting of reports can vary between laboratories.*

# Reading the Results of your Lab Report

Lab reports typically have several sections, including: 1) the cover page, 2) definitions/glossary, 3) the case narrative, 4) the client sample results, and 5) several sections relating to laboratory quality assurance/quality control (QA/QC) practices.

In the client sample results section, you will find the analysis performed by the lab, the test results, and notes that indicate any problems encountered. These notes are called “qualifiers”. Most labs use a standard set of qualifiers, which are defined and discussed below. The example in Table 1 shows the result for two PFAS as reported in the “Client Sample Results” section of the lab report.

## Example Table 1 - showing test results and what the notation means

**ND = the contaminant has not been detected**

If a contaminant is not found in a sample, the “result” column in the laboratory report will show “ND” - not detected. ND means the chemical is not present in the sample at a high enough level for the laboratory equipment to detect.

**Result**

**7.5**

ND

**MDL = Method Detection Limit**

Each laboratory has the ability to detect chemicals down to a certain concentration, known as the MDL or “method detection limit”. Anything below the MDL would not have been found because it is below the test equipment’s ability to detect it.

**RL = Reporting Limit (also may appear as MRL)**

The reporting limit is the lowest concentration of the substance tested that can be reported reliably under normal laboratory conditions. This is sometimes also referred to as the limit of quantitation or “LOQ”.

 **RL**

 1.7

 1.7

**Qualifier**

**MDL Units**

0.21 ng/L

0.14 ng/L

**Analyte**

Perfluorooctanoic Acid (PFOA) Perfluorohexanesulfonic Acid (PFHxS)

Notes:

RL = reporting limit

MDL = method detection limit

ng/L = nanograms per liter (equal to parts per trillion)

In the example above, PFOA was detected at 7.5 ng/L and PFHxS was not detected, meaning PFHxS was not present in the sample above the MDL.

 may be that PFHxS was not present at all in the sample, or it could have been present but at a very low concentration, less than 0.14 ng/L.

**Data Qualifiers — “J” or “B” next to the result**

All laboratory information is reviewed by a chemist to ensure that it meets specific quality criteria. Sometimes “qualifiers” are applied to a sample result to note problems or irregularities that may have occurred during analysis. Most labs use a standard set of these qualifiers. The most common qualifiers found in PFAS laboratory reports are “B” and “J”. When the data have a qualifier, it means that there is an issue with the data. These situations often require resampling.

## Example Table 2- with data qualifiers

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Analyte** | **Result** |  **Qualifier** |  **RL** | **MDL** | **Units** |
| Perfluorohexanesulfonic Acid (PFHxS) | 2.1 | B | 1.7 | 0.21 | ng/L |
| Perfluorononanoic Acid (PFNA) | 0.5 | J | 1.7 | 0.22 | ng/L |
| Notes: |  |  |  |  |  |
| RL = reporting limit |  |  |  |  |  |
| MDL = method detection limit, ng/L = nanograms per liter (equal to parts per trillion) |

**“J” qualifier – used to note that the reported concentration is considered estimated.**

The “J qualifier is used whenever the measured concentration is lower than the RL but above the MDL. The “J” qualifier means that the reported result is estimated.

**“B” qualifier — means the chemical was found in both the sample and a “blank”.**

When chemicals are found in both the blank and the test sample, the reported value is qualified with a “B” to show the uncertainty in the source of the contamination. Such samples must be recollected and reanalyzed. In the example above, PFHxS was detected in the sample at a concentration of 2.1 ng/L but it was also detected in the blank, so it is uncertain whether the contamination was present in the water from the test area or whether it was accidently introduced by the laboratory or during sample collection. The full lab report should include the results of the blank analysis.

A field **blank** is a sample container filled with distilled water and preservatives at the laboratory and shipped to the sampling site along with an empty bottle. The filled field blank bottle must be opened at the sample site and transferred to the empty bottle. A blank should be non-detect for all chemicals, but because PFAS are commonly found in the environment, low-level detections of PFAS can occur in the blank. If a chemical is detected in both the sample and the blank, it is impossible to determine if the concentration reported is from the test area or some other source.

**MassDEP Lab Reporting Form**

The results appearing on the MassDEP lab reporting form will appear in a somewhat different format than those shown in the examples above.

**Example Table 3 - from the MassDEP lab reporting form**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAS#** | **REGULATED AND UNREGULATED****PFAS CONTAMINANTS** | **Labs must Report One of the Following** | **ORSG\*****μg/L** |  **MRL[[1]](#footnote-1)****μg/L** |
| **Results****μg/L** | **< MRL** | **< 1/3MRL** |
| 1763-23-1 | **Perfluorooctane Sulfonic Acid (PFOS)** | **0.020** |  |  | **0.020** | **0.002** |
| 335-67-1 | **Perfluorooctanoic Acid (PFOA)** |  |  |  | **0.020** | **0.002** |
| 355-46-4 | **Perfluorohexane Sulfonic Acid (PFHxS)** |  |  |  | **0.020** | **0.002** |
| 375-95-1 | **Perfluorononanoic Acid (PFNA)** | **0.030** |  |  | **0.020** | **0.002** |
| 375-85-9  | **Perfluorohepatanoic Acid (PFHpA)** | **0.020** |  |  | **0.020** | **0.002** |
| 335-76- | **Perfluorodecanoic acid (PFDA)** |  |  |  | - | **0.002** |
| 2375-73-5 | **Perfluorobutane sulfonic acid (PFBS)** |  |  |  | - | **0.002** |

**< MRL** (or < RL) is equivalent to a **“J”** value, but no estimated concentration is provided. The contaminant was detected but is not quantifiable.

**< 1/3 MRL** is equivalent to

 Non-detect

**μg/L** = micrograms per liter Always check the units shown in the report. In this case they are different than the Example in Table 2 above.

**Comparison of Data to State Guidelines**

**Please Note: We encourage all PWSs to create a compliance table for their own use like the ones below when reviewing laboratory data. A compliance table will ensure that PWSs correctly evaluate all PFAS results according to MassDEP guidance.**

In 2018, MassDEP established a drinking water Guideline (ORSG) level for five (5) PFAS chemicals: PFOS, PFOA, PFNA, PFHxS, and PFHpA. The guideline was 70 parts per trillion (ppt) (0.07 micrograms per liter (ug/L)), and applied to each of the individual compounds and also to the total summed level of all five (5) compounds. On January 27, 2020, MassDEP updated the ORSG to 20 ppt for six (6) PFAS chemicals: PFOS, PFOA, PFNA, PFHxS, PFHpA and PFDA. In December 2019 MassDEP also proposed revisions to the state’s drinking water regulations to establish a Massachusetts Maximum Contaminant Level (MMCL) of 20 ppt for the total concentrations of the same six PFAS compounds in drinking water.

The calculation for comparing results reported by a laboratory with state guidelines may take place in a separate table (e.g., Tables 4 and 5). Summing the results is straightforward when all six PFAS are detected in a sample above the RL. However it is more complicated if one of these substances is reported as estimated with a “J” value or as “greater than or equal to 1/3 the MRL and < MRL”. In that case, a value of one-half the MRL is used for the concentration of that compound in the summation column. Substances reported as “< 1/3 MRL” should be assigned a value of zero (Table 5).

Table 5 illustrates the case when a reported value (1.3) is < 1/3 MRL value of 5 ppt. A value of “0” is used in the summation. The total of the six compound concentrations is greater than the guideline of 20 ppt.

**Example Table 4 – Compliance Determination for < MRL Result, But Total < ORSG**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| PFAS | Results, ppt | Qualifier | MRL | Value Used in Summation | MassDEP ORSG Guideline | Greater than ORSG? |
| **PFDA** | **8.0** |   |  5 |  8.0 | 20  | N |
| **PFHpA** | **20.4** |  | 5 | 20.4 | 20 | Y |
| **PFHxS** | **3** | **J\*** | 5 | 2.5 | 20 | N |
| **PFNA** | <MRL\* |  | 5 | 2.5 | 20 | N |
| **PFOS** | **14.6** |  | 5 | 14.6 | 20 | N |
| **PFOA** | **29.0** |  | 5 | 29.0 | 20 | Y |
| **PFHxA** | **21.2** |  | 5 |  |  |  |
|  |  |  | **TOTAL** | **77.0** | 20 | Y |

Each of these six individual concentrations is subject to the 20 ppt guideline.

This compound is not one of the six PFAS in the MassDEP Guideline and therefore not part of the sum.

The sum of concentrations of the 6 compounds is **77.0** ppt which is greater than the MassDEP guideline limit of 20 ppt.

\* MassDEP uses ½ MRL. The MRL in this example is 5, therefore 2.5 is used in the calculation for Table 4**.**

**Example Table 5 – Compliance Determination for < MRL Results, But Total > ORSG**

Each of these six individual concentrations is subject to the 20 ng/L ORSG and the total of **79.7** is greater than the ORSG

This compound reported as a “J” value at 3 ppt. Therefore 0.5 MRL (0.5 x 5 = 2.5) is used in the summation for that compound

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| PFAS | Results, ppt | Qualifier | MRL | Value Used in Summation | MassDEP ORSG Guideline | Greater than ORSG? |
| **PFDA** | **8.0** |   | 5  | 8.0 |  20 | N |
| **PFHpA** | **40.6** |   | 5 | 40.6 | 20 | Y |
| **PFHxS** | **3** | **J\*** | 5 | 2.5 | 20 | N |
| **PFNA** | **1.8** **(≥1/3 MRL and** **<MRL)** |  | 5 | 2.5 | 20 | N |
| **PFOS** | **1.3** |   | 5 | 0 | 20 | N |
| **PFOA** | **26.1** |   | 5 | 26.1 | 20 | Y |
| **PFHxA** | **21.2** |   | 5 |  |  |  |
|  |  |  | **TOTAL** | **79.7** | 20 | Y |

This value of 1.8 as reported is between 1/3 MRL and the MRL. Therefore 0.5 MRL (0.5 x 5 = 2.5) is used in the summation for that compound

Value as reported is < 1/3 MRL, therefore a value of “0” is used in calculation /summation

**For More Information**

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**To learn more, visit:**

**MassDEP’s PFAS website**: https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas

**MassDEP’s fact sheet on PFAS for PWS** https://www.mass.gov/doc/per-and-polyfluoroalkyl-substances-pfas-in-public-drinking-water-supplies-questions-and-answers

**U.S. EPA’s website** https://www.epa.gov/pfas

**ATSDR’s PFAS fact sheet**: https://www.atsdr.cdc.gov/pfc/docs/pfas\_fact\_sheet.pdf

1. As included in proposed MMCL Regulation at https://www.mass.gov/lists/development-of-a-pfas-drinking-water-standard-mcl [↑](#footnote-ref-1)