2020 GLHHFTS Fish Tissue Data Dictionary for Mercury, PCBs, and PFAS Results
November 2023

The Office of Science and Technology (OST) is providing the fish tissue results from the 2020 Great Lakes Human Health Fish Fillet Tissue Study (GLHHFFTS). The specific chemical analyses include:

- Mercury (total)
- Polychlorinated biphenyls (PCBs) (all 209 congeners)
- Per- and polyfluoroalkyl substances (PFAS) (40 compounds)

This document represents the "data dictionary" for each type of chemical contaminant analysis. The field names and descriptions for the analytical results are similar for each type of chemical analysis, but results from some analyses include additional information that may not apply to all analysis types. OST is also providing information on the fish composite samples collected during the study and used to prepare the fillet tissue samples that were analyzed. The fish sample information for each contaminant data file is identical, so only one version of the dictionary for the sample information is provided after the dictionary for the results for each type of contaminant analysis.

Data Tab for Mercury, PCBs, and PFAS	
Field Name	**Description**
EPA Region	The EPA Region in which the sample was collected.
State	USPS 2-letter abbreviation for the state in which the sample was collected.
Lake	Name of the Great Lake from which the sample was collected.
Site ID	The identifier assigned by EPA to the site. The first three characters are "NGL," the next two are the site selection year (20), followed by the State abbreviation and the 4-digit site location.
EPA Sample ID	Unique 6-digit number assigned by EPA.
Tissue Type	An indication of the tissue used for the analysis. For the 2020 GLHHFFTS, all of the samples were prepared from composited fillet tissue.
% Lipids	The lipid content of the sample, measured independently of the chemical analysis.
Method	An identifier for the analytical method used for each chemical. For the mercury and PCB results, the identifiers refer to the following standardized EPA methods: *EPA Method 1631E, Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry*, EPA-821-R-02-019, August 2002. *EPA Method 1668C, Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS*, EPA-820-R-10-005, April 2010. For the PFAS results, there were no EPA methods for analysis of fish tissue at the time of the study, so fillet samples were analyzed by an in-house procedure developed by the commercial laboratory, utilizing liquid chromatography with tandem mass spectrometric detection (LC/MS/MS).
Chemical	Common name or abbreviation for the chemical. For PCBs, the abbreviation "PCB" is followed by the congener number (i.e., "PCB-7"). It is not practical to completely separate all 209 PCB congeners from one another during analysis, so congeners that elute from the gas chromatograph together are listed with a forward slash between each congener, in increasing congener number order, e.g., PCB-12/PCB-13. "Total PCBs" is the name given to the sum of the results for all 209 of the congeners (which includes the coeluting congener groups) reported in the fillet sample. This value was calculated by OST, using zero for any congener result that was "not detected" at the method detection limit. For PFAS, the chemical names are the commonly used abbreviations for the anion form of the chemical (e.g., the "ate" form). The full names of the PFAS chemicals are given in a table later in this document.

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Data Tab for Mercury, PCBs, and PFAS	
Field Name	**Description**
CAS Number	Chemical Abstracts Service Registry Number assigned by CAS to the chemical. CAS Numbers do not exist for the groups of coeluting PCB congeners. For PFAS, this is the CAS Number of the parent acid or amide form, because the anions do not have separate CAS Numbers.
Amount	Concentration of the chemical, if detected. If this field is blank, then the chemical was not detected in the fillet sample. In order to accommodate the range of concentrations in these samples, all the results are presented with the same number of decimal places for a chemical (mercury) or chemical class (PCBs and PFAS). For mercury, the amount field is presented to 1 decimal place. For the PCBs, the amount fields are presented to 5 decimal places. For PFAS, the amount field is presented to 3 decimal places. However, these results have at most 3 significant figures, regardless of the number of decimal places (for example, a PFAS value of 19.000 does not imply 5 significant figures).
MDL	The nominal method detection limit for the chemical, based on the procedure in 40 CFR part 136, not adjusted for actual sample size, in the units shown in the Units column. For mercury, MDLs are reported to 2 decimal places. For PCBs, MDLs are reported to 6 decimal places. For PFAS, MDLs are reported to 3 decimal places.
QL	The nominal quantitation limit (QL) or "Minimum Level" for the chemical, based on the lowest calibration standard analyzed, not adjusted for sample size, in the units shown in the Units column.
Units 1	The weight/weight units of nanograms per gram or ng/g
Units 2	The "parts per billion" notation ppb, which is equivalent to ng/g
Lab Flag	The data qualifier flag(s) applied by the laboratory. *For mercury, no lab qualifier flags were required.* U = Chemical not detected J = Result between the MDL and the QL B = Chemical also present in the method blank D = Result is from a diluted analysis K = Ion abundance ratio is outside of the acceptance limits, but the chemical meets all the other identification criteria NQ = Not quantified
SCC Code	Qualifiers applied by the Sample Control Center staff at GDIT during data validation. The individual SCC codes applied to the PCB and PFAS results are identified and defined in the tables of SCC codes below. *For mercury, no SCC codes were required.*
Comments	A text translation of the SCC code combinations applied to each result.
Sort Order	Applies only to PCBs and PFAS. A field used to sort the chemical names in a consistent order within each chemical group. For PCBs, the values in this field range from 1 to 169. For PFAS, the values in this field range from 1 to 40.

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Sample Information Tab	
Field Name	**Description**
EPA Region	The EPA Region in which the sample was collected.
State	USPS 2-letter abbreviation for the state in which the sample was collected.
Site ID	The identifier assigned by EPA to the site. The first three characters are "NGL," the next two are the site selection year (20), followed by the State abbreviation and the 4-digit site location.
Lake	Name of the Great Lake from which the sample was collected.
Latitude	Latitude, in decimal format, to 5 decimal places.
Longitude	Longitude, in decimal format, to 5 decimal places.
EPA Sample ID	Unique 6-digit number assigned by EPA.
Sample Collection Date	Actual sampling date, in MM/DD/YYYY format.
Sample Specimen ID	The 6-digit EPA Sample ID, followed by a decimal point and a value between 1 and 10. The decimal portion identifies the number assigned to the individual fish specimen in the composite sample.
Spec Sort	A specimen sorting field designed to account for the fact that samples with more than 9 specimens do not sort properly (i.e., XX.10 sorts before XX.2).
Species - Scientific Name	Latin name (Genus and species) based on Nelson *et al.* (2004), *Common and Scientific Names of Fishes from the United States, Canada, and Mexico*, Sixth Edition.
Species - Common Name	Generally accepted common name based on Nelson *et al.* (2004).
Family	Latin name of the Family based on Nelson *et al.* (2004).
Tissue Type	The type of fish tissue used to prepare the sample. For the GLHHFFTS, all of the samples were prepared from fillet tissue.
Total Length (mm)	Length of each individual specimen in millimeters (mm).
Included in Fillet Composite?	This field indicates if the specimen was included in the tissue sample for analysis or not. The options are either "Yes" or "No" and the rationale is explained in the "Instructions" field to the far right.
Predator or Bottom Dweller	Classification of the species as either: P = Predator species, or BD = Bottom-dweller species
Composite Classification	Routine vs. Non-routine composite, based on the fish composite sample criteria specified in the human health fish sampling procedures.
Deviation	For non-routine composites, the nature of the deviation from the criteria (e.g., number of fish, fish length, or both).
Fillet Sample Preparation Instructions	Instructions from EPA/OW/OST to the sample preparation laboratory regarding which specimens to include in the fillet composite sample for analysis, based on specimen length, species, etc.

Individual SCC Codes Applied to the PCB Results		
SCC Code	**Comments**	**Implication**
B, RMAX	Blank Contamination, Result is a Maximum Value	Blank contamination was observed and the target chemical was reported in the sample at a concentration between 5 and 10 times higher than the blank value. The result was considered to be of acceptable quality, but data users are cautioned that it may be a maximum value due to possible influence of contamination.
B, RNAF	Blank Contamination, Result is Not Affected	Blank contamination was present but was not considered to adversely impact the sample result. The presence of the chemical in the blank is not considered to adversely affect the data in cases where the sample results are more than 10 times the associated blank results or where the chemical is not detected in associated samples.
HRPD, J	High RPD, Estimated	The relative percent difference (RPD) between the results in the parent sample and the laboratory duplicate is above the acceptance limit. This may be due to inhomogeneity in the bulk sample or analytical variability. When high RPD was observed for a chemical, all the detected results for that chemical in any of the samples in the batch with the duplicate sample were qualified as estimated values.
HRPD, RNAF	High RPD, Result is Not Affected	The relative percent difference (RPD) between the results in the parent sample and the laboratory duplicate is above the acceptance limit. This may be due to inhomogeneity in the bulk sample or analytical variability. However, when high RPD was observed for a chemical, the non-detected results for that chemical were not affected, and the RNAF flag was applied.
J	Estimated	When applied alone, this code indicates that the result is at or above the MDL, but below the QL. This flag also may be applied in conjunction with other flags to indicate the potential for greater uncertainty.

Note: Commas are used to separate related parts of a single code (e.g., "B, RNAF" is considered one code), while semicolons are used to separate different codes (e.g., "B, RNAF; J" is the combination of two codes).

Individual SCC Codes Applied to the PFAS Results		
SCC Code	**Comments**	**Implication**
B, RMAX	Blank Contamination, Result is a Maximum Value	Blank contamination was observed and the target chemical was reported in the sample at a concentration between 5 and 10 times higher than the blank value. The result was considered to be of acceptable quality, but data users are cautioned that it may be a maximum value due to possible influence of contamination.
B, RNAF	Blank Contamination, Result is Not Affected	Blank contamination was present but was not considered to adversely impact the sample result. The presence of the chemical in the blank is not considered to adversely affect the data in cases where the sample results are more than 10 times the associated blank results or where the chemical is not detected in associated samples.
B, RNON	Blank Contamination, Result Reported as a Non-detect	When the sample result is less than five times the blank result, there are no means by which to ascertain whether or not the presence of the chemical may be attributed to contamination. Therefore, the result is reported in the database as a non-detect at the MDL, adjusted for sample size and dilution.
HIAR, J	High Ion Abundance Ratio, Estimated	Each chemical is identified and quantified based on the instrumental response for two specific ions and the ratio of those two ions was above the upper acceptance limit, suggesting a potential interference that may affect the sample result. Therefore, the result also is flagged as an estimated value.

Individual SCC Codes Applied to the PFAS Results		
SCC Code	**Comments**	**Implication**
HLBL, J	High Labeled Compound Recovery, Estimated	The labeled analog of the target chemical was recovered above acceptance criteria, suggesting the possible presence of matrix interferences. Isolated instances of high recovery are not uncommon, and patterns across multiple samples are more of a concern.
HLBL, RNAF	High Labeled Compound Recovery, Result is Not Affected	The labeled analog of the target chemical was recovered above acceptance criteria, suggesting the possible presence of matrix interferences. Isolated instances of high recovery are not uncommon, and patterns across multiple samples are more of a concern. If the chemical was not detected in a field sample, there is no concern and the RNAF is added to the HLBL flag.
HLCS, RNAF	High Lab Control Sample Recovery, Result is Not Affected	The recovery in the LCS was high, but the chemical was not detected in the associated fillet tissue sample, so there was no high bias concern and the RNAF flag was applied.
HVER, J	High CALVER, Estimated	The results for the calibration verification associated with the chemical were above the acceptance limit, suggesting a possible high bias. Detected chemicals also are considered estimated values.
HVER, RNAF	High CALVER, Result is Not Affected	The results for the calibration verification associated with the chemical were above the acceptance limit, suggesting a possible high bias. If the chemical was not detected in a field sample, there is no concern and the RNAF is added to the HVER flag
J	Estimated	When applied alone, this code indicates that the result is at or above the MDL, but below the QL. This flag also may be applied in conjunction with other flags to indicate the potential for greater uncertainty.
LLBL	Low Labeled Compound Recovery	The labeled analog of the target chemical was recovered below acceptance criteria, suggesting the possible presence of matrix interferences or incomplete recovery of both the labeled compound and target chemical during the extract cleanup processes used in the analytical procedure. The use of isotope dilution quantitation automatically corrects the results for the target chemical, even when the labeled compound recovery is below expectations. This flag is applied when the chemical associated with the labeled analog is not detected in the sample.
LLBL, J	Low Labeled Compound Recovery, Estimated	The labeled analog of the target chemical was recovered below acceptance criteria, suggesting the possible presence of matrix interferences or incomplete recovery of both the labeled compound and target chemical during the extract cleanup processes used in the analytical procedure. The use of isotope dilution quantitation automatically corrects the results for the target chemical, even when the labeled compound recovery is below expectations. When the chemical associated with the labeled analog is detected in the sample, the result is also flagged as an estimated value.
LLCS	Low LCS result	The lab control sample (LCS) was a clean reference matrix. If recovery in the LCS was low, there may be a low bias for that chemical. When low LCS recovery was observed for a chemical, the results for that chemical were qualified in all of the samples in the batch with the LCS.
LVER, J	Low CALVER, Estimated	The results for the calibration verification associated with the chemical were below the acceptance limit, suggesting a possible low bias. Detected chemicals also are considered estimated values.
NQ	Not Quantified	The chemical could not be quantified by isotope dilution and was reported as a non-detect at the MDL.

Note: Commas are used to separate related parts of a single code (e.g., “B, RNAF is considered one code), while semicolons are used to separate different codes (e.g., “B, RNAF; J” is the combination of two codes).

PFAS Abbreviation	PFAS Name
Perfluoroalkyl carboxylic acids	
PFBA	Perfluorobutanoic acid
PFPeA	Perfluoropentanoic acid
PFHxA	Perfluorohexanoic acid
PFHpA	Perfluoroheptanoic acid
PFOA	Perfluorooctanoic acid
PFNA	Perfluorononanoic acid
PFDA	Perfluorodecanoic acid
PFUnA	Perfluoroundecanoic acid
PFDoA	Perfluorododecanoic acid
PFTrDA	Perfluorotridecanoic acid
PFTeDA	Perfluorotetradecanoic acid
Perfluoroalkyl sulfonic acids	
PFBS	Perfluorobutanesulfonic acid
PFPeS	Perfluoropentansulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFHpS	Perfluoroheptanesulfonic acid
PFOS	Perfluorooctanesulfonic acid
PFNS	Perfluorononanesulfonic acid
PFDS	Perfluorodecanesulfonic acid
PFDoS	Perfluorododecanesulfonic acid
Fluorotelomer sulfonic acids	
4:2FTS	1*H*,1*H*, 2*H*, 2*H*-Perfluorohexane sulfonic acid
6:2FTS	1*H*,1*H*, 2*H*, 2*H*-Perfluorooctane sulfonic acid
8:2FTS	1*H*,1*H*, 2*H*, 2*H*-Perfluorodecane sulfonic acid
Perfluorooctane sulfonamides	
PFOSA	Perfluorooctanesulfonamide
NMeFOSA	N-methyl perfluorooctanesulfonamide
NEtFOSA	N-ethyl perfluorooctanesulfonamide
Perfluorooctane sulfonamidoacetic acids	
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
	Perfluorooctane sulfonamide ethanols
NMeFOSE	N-methyl perfluorooctanesulfonamidoethanol
NEtFOSE	N-ethyl perfluorooctanesulfonamidoethanol
Per- and Polyfluoroether carboxylic acids	
HFPO-DA	Hexafluoropropylene oxide dimer acid
ADONA	4,8-Dioxa-3*H*-perfluorononanoic acid
PFMPA	Perfluoro-3-methoxypropanoic acid
PFMBA	Perfluoro-4-methoxybutanoic acid
NFDHA	Nonafluoro-3,6-dioxaheptanoic acid
Ether sulfonic acids	
9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
11Cl-PF3OUdS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
PFEESA	Perfluoro(2-ethoxyethane)sulfonic acid
Fluorotelomer carboxylic acids	
3:3FTCA	3-Perfluoropropyl propanoic acid
5:3FTCA	2*H*,2*H*,3*H*,3*H*-Perfluorooctanoic acid
7:3FTCA	3-Perfluoroheptyl propanoic acid