2022 Fish Tissue Contaminants Monitoring WP

Quality Assurance Project Plan

B-055-OWQ-WAP-TGM-22-W-R0

Agency	Indiana Department of Environmental Management
Office	Office of Water Quality
Branch	Watershed Assessment and Planning Branch
Section	Targeted Monitoring Section
Contract Number	Professional Services Contract [#53618](#53618)

Principal Investigator Tim Fields

Original Effective Date July 1, 2022

Current Effective Date New

QAPP Revision Number R0

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A. Project Management

Elements A.1. through A.9. address basic project management (e.g., project history and objectives, roles, and responsibilities of participants, etc.). The elements ensure the project has a defined goal, the participants understand the goal and the planned approach, and planning outputs are documented.

A.1. Approvals

____Date 10/27/22

Ali Meils, Section Chief
Targeted Monitoring Section

____Date 10/27/22

Charles Hostetter, Project Quality Assurance Officer
Technical and Logistical Services Section

____Date 10/31/2022

Timothy Bowren, Project Quality Assurance Officer
Technical and Logistical Services Section

____Date 10/27/22

David Jordan, Project Quality Assurance Officer
Technical and Logistical Services Section

____Date 10/27/22

Kristen Arnold, Branch Chief, Branch Quality Assurance Coordinator
Watershed Assessment and Planning Branch

The IDEM quality assurance staff participated in the development of this quality assurance project plan.

____Date 31 Oct 2022

Quality Assurance Staff
Office of Program Support

Quality Assurance Project Plan Summary

The Fish Tissue Contaminants Monitoring Program's quality assurance project plan (QAPP) outlines environmental data collection from biological tissues as part of the Watershed Assessment and Planning Branch (WAPB), Office of Water Quality (OWQ), Indiana Department of Environmental Management (IDEM) water quality monitoring programs. The QAPP provides WAPB staff involved in the fish tissue monitoring program a format for environmental data collection targeted to achieve specific project data quality objectives (DQOs) and data usability identified by assigning one of four data quality assessment (DQA) levels for regulatory decisions. The QAPP describes procedures to implement for obtaining environmental data of known quality and adequate for decision-making.

The QAPP serves as a guide to WAPB project officers, field staff, and quality assurance (QA) staff charged with the collection and review of contaminants data in biological tissues. The QAPP also provides guidance for the contract laboratory charged with the analysis of OWQ environmental samples and provision of results meeting the DQOs for the individual project. The QAPP satisfies United States Environmental Protection Agency (U.S. EPA) requirements for environmental data collection projects funded in whole or in part by U.S. EPA grants. Successful collection of precise, accurate, and complete data provides IDEM and U.S. EPA with defensible data to make decisions for implementation of programs and improving and maintaining water quality in the state of Indiana.

QAPP Contact Information

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Laboratory accreditation and performance testing information

The Pace Analytical Services, LLC (Pace) Green Bay, Wisconsin (GB) laboratory offers organic and inorganic analysis, and a broad range of specialty services. Services include low level mercury, and U.S. EPA Contract Lab Program (CLP) level packages and electronic deliverables. In addition to routine environmental matrices, the Pace GB laboratory has expertise in sediment work, biological tissue analysis, and emergency response capabilities. The laboratory holds a broad base of analytical certifications in numerous programs (e.g., National Environmental Laboratory Accreditation Program (NELAP), and is certified in Wisconsin, Illinois, and other states).

The Pace Minneapolis, Minnesota (MN) laboratory performs Dioxin, PFAS and PCB congener analysis.

The Pace Duluth, Minnesota laboratory performs methyl mercury analysis using Method 1630 (EPA 2007b). No certification is available for the method.

All labs maintain multiple accreditations including accreditation to ISO 17025:2005 by the American Association for Laboratory Accreditation, NELAP, or both. Pace's certifications cover the following U.S. EPA test methods

- Method 8082A (EPA 2007a)
- Method 8081B
- Method 8081B (EPA 2007c)
- Method 8270D
- Method 6020A (EPA 2004)
- Method 1631E (EPA 2002)
- Method 1613B (EPA 1994a)
- Method 1668B
- Method PFAS DoD 35 (Pace 2020)

The Pace GB laboratory National Environmental Laboratory Accreditation Conference (NELAC) certification, issued by the Florida Department of Health Certificate Number E87948, expires June 30, 2023.

The Pace GB laboratory State of Wisconsin Department of Natural Resources Accreditation under NR 149 FID 405132750, expires on August 31, 2023.

The Pace MN laboratory NELAP certification, issued by the Oregon State Public Health Laboratory, Certificate Number MN300001, expires May 25, 2023.

Program QA staff

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A.2. Table of Contents

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A.3. Distribution List

Notify and copy IDEM staff listed in Table 1 by email on the most recent version of the project QAPP for each occurrence of:

- Revision and replacement by a more up-to-date version.
- Completion of a project QAPP's final report of findings and submission of the findings to data users and decision-makers. A project QAPP is only effective for the length of the project or one year and is for a specific time and location. Then preserve the QAPP document, as implemented, and link to the resultant data.

Table 1 QAPP Distribution List

Name	QAPP Tasks or Roles	Email
Kristen Arnold	WAPB Branch Chief	KArnold@idem.IN.gov
Ali Meils	Targeted Monitoring Section Chief	AMeils@idem.IN.gov
Caleb Rennaker	WAPB Technical and Logistical Section	CRennake@idem.IN.gov
Tim Fields	IDEM Principal Investigator (PI)	TFields@idem.IN.gov
Todd Davis	IDEM crew leaders – sample collection and data management	TDavis@idem.IN.gov
Tim Bowren Charles Hostetter David Jordan	WAPB QA staff – Review laboratory data results	TBowren@idem.IN.gov CJHostet@idem.IN.gov DJordan@idem.IN.gov
Ben Dickenson Dave Kittaka Tyler Delauder Seth Bogue Jeremy Price Andrew Bueltmann Dan Carnahan	Indiana Department of Natural Resources (IDNR) fisheries biologists – Sampling assistance and QAPP input	BDickinson@dnr.IN.gov DKittaka@dnr.IN.gov TDelauder@dnr.IN.gov SBogue@dnr.IN.gov JPrice@dnr.IN.gov ABueltmann@dnr.IN.gov DCarnahan@dnr.IN.gov
Mike Mettler Grace Bassett	Indiana Department of Health (IDOH) – Fish tissue data user	MMettler@isdh.IN.gov GBassett@isdh.IN.gov
James E. Bailey	IDEM QA manager – QAPP review and approval	JEBailey@idem.IN.gov

A.4. Project Organization

Program Area Management
The WAPB chief, as program manager, is the final authority and responsible for managing all WAPB surface water quality monitoring programs and projects. Each section chief, as project officer, guides and supervises planning of environmental data collection projects and is responsible for quality control (QC) procedure implementation and project data collection activities.

Quality Assurance
The WAPB QA manager (QAM) coordinates all QA and laboratory activities and assigns QA officers (QAOs) to projects. QAOs coordinate and audit QA and QC (QA/QC) activities, review program QAPPs, act as liaison to external laboratories, and report a project's QA aspects to management. QA staff perform data validation review, data assessment, data qualification, and internal performance and system audits for assigned projects under the direction of the QAM. Assigned QA staff review all work plans and standard operating procedures (SOPs) for compliance with the QAPP and verify DQOs are addressed by the respective work plan. Each laboratory performing data analysis for OWQ is responsible for data validation of results before reporting to WAPB. IDEM Requests for Quotation and Requests for Proposal (RFPs) require each contract analytical laboratory to appoint a QAO and have a written QA plan.

Field
The program manager is responsible for sampling and data collection efforts and assigns section staff to data collection duties. The project officer ensures section staff follow the QAPP during sampling and data collection activities, reports any nonconformities to the appropriate section chief, and documents and addresses the nonconformity through the corrective action process. The project officer notifies the QAO of the nonconformity and status of corrective action. The section chief typically assigns a technical staff member to document the nonconformity and institute required corrective actions.

Laboratory and Analytical Laboratories
IDEM RFPs set forth requirements and technical specifications for contract laboratory analysis of sediment and fish tissue samples for various contaminants or pollutants. Laboratories must have and maintain a documented QA/QC program capable of demonstrating data are a specified degree of precision and reliability. The Handbook for Analytical Quality Control in Water and Wastewater Laboratories, U.S. EPA 600/4-79/019 (EPA 1979) serves as a pattern for an acceptable QA/QC program. Laboratories must have the ability to validate each method used and each analysis performed using the method through the QA/QC program. Documenting QA/QC measures is a requirement. Laboratories must maintain all documentation and make available to OWQ for five years after the expiration date of the contract. Submission of QA/QC documentation is a

requirement. Laboratories must maintain and document continual evaluation of the accuracy and precision of an analytical procedure, and the ability of individual analysts to perform the laboratory procedure.

Table 2 identifies individuals or organizations with a role in this QAPP.

Table 2 Key QAPP Individuals

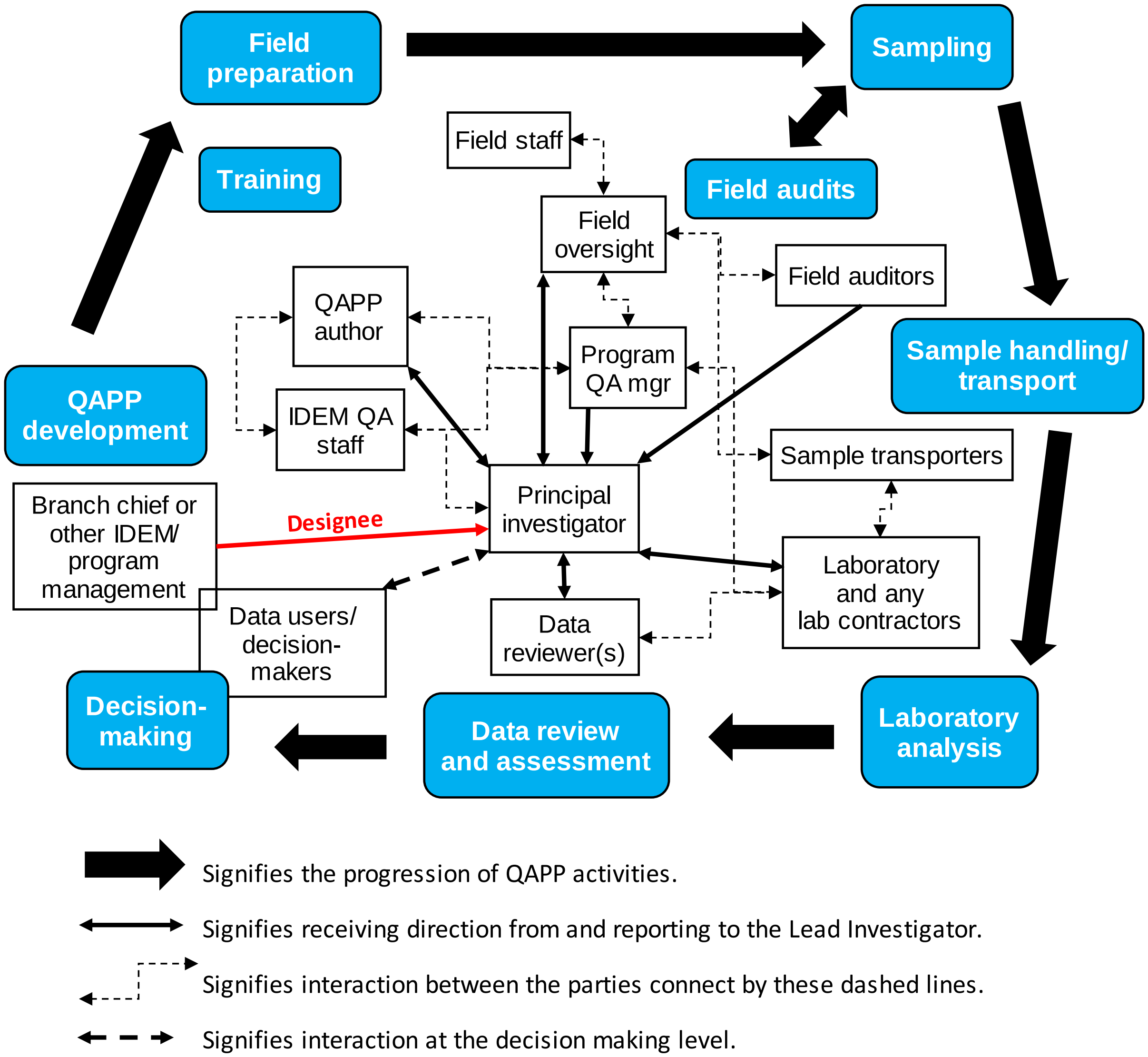
Role	Name	Affiliation	Phone	Email
Program area manager	Kristen Arnold	IDEM	317-308-3142	KArnold@idem.IN.gov
PI	Tim Fields	IDEM	317-308-3184	TFields@idem.IN.gov
Program area QAM	Tim Bowren	IDEM	317-308-3181	TBowren@idem.IN.gov
QAPP development team	Tim Fields	IDEM	317-308-3184	TFields@idem.IN.gov
QAPP field oversight lead	Tim Fields	IDEM	317-308-3184	TFields@idem.IN.gov
Lead field auditor	Ali Meils	IDEM	317-308-3204	AMeils@idem.IN.gov
Staff responsible for ensuring all involved staff have access to the most up-to-date version of the QAPP	Tim Fields James E. Bailey	IDEM	317-308-3184 317-234-8850	TFields@idem.IN.gov JEBailey@idem.IN.gov
Primary data user or decision-makers	Ali Meils Tim Fields Paul McMurray Grace Bassett	IDEM IDEM IDEM IDOH	317-308-3204 317-308-3184 317-308-3210 317-233-7183	AMeils@idem.IN.gov TFields@idem.IN.gov PMcMurra@idem.IN.gov GBassett@isdh.IN.gov
Lead data reviewer	David Jordan Charles Hostetter	IDEM	317-308-3100 317-308-3369	DJordan@idem.IN.gov CJHostet@idem.IN.gov
Contacts for the contracted laboratory	Mary Christie Tod Noltemeyer	Pace	612-751-1374 608-232-3300	Mary.Christie@pacelabs.com Tod.Noltemeyer@pacelabs.com

IDEM QAPP Lines of Authority (Figure 1) depicts the relationships and the lines of communication among the key project individuals (Table 2) throughout the various stages of QAPP implementation. The QAPP is a product of planning by the PI, and a team of program area staff. Program staff could include any of the staff depicted in Figure 1 or other program area staff with expertise in the topic of the QAPP.

Nearly all standard IDEM data operations (QAPPs) include the same basic staff relationships, with the primary exceptions of either:

- More than one person may staff some positions.
- One person may staff more than one position shown in Figure 1.

Figure 1 IDEM QAPP Lines of Authority



A.5. Background

A.5.1. The Study

OWQ environmental sample collection and analyses of fish tissues for various pollutants supports ongoing water quality monitoring activities. Indiana is required to assess and determine the designated use attainment status of all waters of the state. “Surface waters of the state are designated for full-body contact recreation and will be capable of supporting a well-balanced, warm water aquatic community” [327 IAC 2-1-3] and [327 IAC 2-1.5-5]. This project gathers data on bioaccumulating contaminants in fish.

Nine major river basins geographically divide the state for the purpose of contaminants monitoring, analysis, and assessment of surface water quality. Each year sample one or two major river basins and the associated watersheds. Every five years update water quality assessments based on biological tissue data for the entire state. OWQ expects completion of the current sampling rotation by 2026.

The study provides data to support decisions regarding aquatic life use impairment for total PCBs and total mercury based on the benchmarks outlined in Indiana's current Consolidated Assessment and Listing Methodology (CALM) (Table 3). The FCA classifications are based on the "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory for PCBs" (Anderson et. al. 1993) and addendum for mercury (McCann and Anderson 2007); and the "Best Practice for PFOS Guidelines" (McCann et. Al. 2019).

The 2017-2021 Water Quality Monitoring Strategy (WQMS) (IDEM 2017b) describes the current program which follows a five-year rotating basin schedule. Twenty-three fixed station program sites from the original fish tissue sampling network exist. The network began operating in the late 1970s in cooperation with the U.S. EPA. Prior to 1997, fish tissue sample collection occurred on a biennial basis for the sites. Post 1997, sampling at the original fish tissue sampling sites occurs once every five years in accordance with the WQMS (IDEM 2017b) rotating basin methodology. In addition to the fish tissue sampling network, target other sample sites based on historical environmental problems, waterbody access, use for fishing, date of last sampling event, potential contaminant sources, and monitoring recommendations by other agencies and entities.

A.5.2. The Goal

Collect and use fish tissue monitoring data for:

1. Determining the aquatic life use impairment for fish consumption, based on concentrations of total PCBs and mercury. The concentrations are ecological indicators in support of the Performance Partnership Agreement, Clean Water Act (CWA) § 305(b) reporting assessed waters, and CWA § 303(d) (2020b) listing and reporting impaired waters. (Primary objective)
2. Providing data for use by the Interagency Fish Consumption Advisory (FCA) work group supporting IDOH issuance, modification, or removal of fish consumption advisories for specific Indiana water bodies.
3. Developing tools for regional assessment and classification of bioaccumulating contaminants (Table 7) in Indiana waters.
4. Providing data supporting the understanding of the risks to piscivorous wildlife (Table 7).

5. Evaluating contaminant trends in fish.
6. Understanding the presence of emerging contaminants in Indiana wild fish.

Table 3 Target Constituents for Decision-making

Sample Target	Number of Samples	Action Threshold**
Total PCB	1 sample	>20 for ALUS >50 for FCA
Total Mercury	1 sample	>300 for ALUS >50 for FCA >160 for FCA
PFOS	1 sample	>20 for FCA

* ALUS=Aquatic Life Use Support
**micrograms per kilogram
@Sensitive populations include women under age 50; women who are pregnant, breastfeeding, or planning to become pregnant; people with compromised immune systems; and children under the age of 15.

Collect an average of 3 to 5 composite or individual fish tissue samples per site. In addition, accept samples from other agencies using the same WAPB techniques to collect, prepare, and preserve samples. Sometimes, other offices or agencies collect fish tissue samples for analysis under IDEM's laboratory services contract (IDOA 2021). Prepare samples using the whole fish or the edible portion (skin-on or skin-off fillets) of fish. Whether using whole fish or fillets depends upon the site location, and size and species of fish retrieved. Typically, only use whole fish when processing noncarp minnow species, or fish less than or equal to ten centimeters (four inches) in length.

A.5.3. Inputs to Use

Collect samples of fish from Indiana streams and lakes each year in each chosen major river basin for analysis of bioaccumulating pollutants. Use data from the fish tissue samples to locate and identify contaminant concentrations in the water column too low for easy detection with routine water sampling and analyses.

Compare data generated by this operation to the Table 4 standards to support the decisions using the data gathered.

Table 4 Standards for Decision-making

The source of the standard or limit upon which each decision is based.

Source of the Standard	Specific Citation	IDEM Derived Criteria values for 303(d) ALUS* Determination (µg/kg** ww)	Indiana FCA decision levels (µg/kg wet weight (ww))
ALUS	IDEM's Appendix G CALM (IDEM 2020c) Indiana Administrative Code ([327 IAC 2-1-3] and [327 IAC 2-1.5-5])	PCB > 20 ppb Mercury > 300 ppb	NA
PCB Action Level	Protocol For a Uniform Great Lakes Sport Fish Consumption Advisory	NA	>50 – 1900 limited consumption >1900 No consumption
Mercury Action Level	A Protocol for Mercury-based Fish Consumption Advice: An Addendum to the 1993 Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory (McCann and Anderson 2007)	NA	>50 – 950 limited consumption for sensitive populations @ >950 No consumption @ >160 limited consumption for the general population
Action Level	Great Lakes Consortium for Fish Consumption Advisories Best Practices for Perfluorooctane Sulfonate (PFOS) Guidelines (GLC 2019)	NA	>20-200 limited consumption >200 No consumption

ppb=parts per billion
* ALUS=Aquatic Life Use Support
**micrograms per kilogram
@Sensitive populations include women under age 50; women who are pregnant, breastfeeding, or planning to become pregnant; people with compromised immune systems; and children under the age of 15.

In addition to the standards in Table 4, other study inputs (e.g., field conditions, potential sources, etc.) include inputs listed in Table 5.

Table 5 Other Inputs into this Study

Variables to Record During Sample Collection	Record in These Units	Why the Variable is Relevant
Upstream or downstream location in comparison to a potential or historical contamination source	NA	Important for looking at trends and for source investigations

A.5.4. Study Parameters

For the 2022 program year, sampling efforts focus on sites from the East Fork White River and the Great Miami River basins. In addition, the IDNR Division of Fish and Wildlife (DFW) collects fish tissue samples from the Indiana waters of southern Lake Michigan for processing by the IDEM WAPB during IDNR planned studies.

For this program, the East Fork White River Basin (Figure 3) is geographically within the borders of Indiana contained in the 8-digit

Hydrologic Unit Codes (HUCs) 05120204, 05120205, 05120206, 05120207, and 05120208.

The pie charts in Figure 2 graphically depict the information for the following subbasins.

The Driftwood subbasin (05120204), located in central Indiana, drains approximately 1165 square miles upstream from the mouth of Flatrock River in Bartholomew County. Major tributaries in this subbasin include Big Blue River, Little Blue River, Brandywine Creek, Sugar Creek, Buck Creek, Youngs Creek, and Driftwood River. Using the 2011 National Land Cover Database for the United States, predominant land uses are cropland (68%), forest (12%), urban (12%), and pasture (5%) (Homer et al. 2015).

The Flatrock-Haw subbasin (05120205), located in central Indiana, includes the Flatrock River and Haw Creek draining approximately 598 square miles to the East Fork White River in Bartholomew County. Predominant land uses are cropland (81%), urban (9%), forest (7%), and pasture (3%) (Homer et al. 2015).

The Upper East Fork White subbasin (05120206), located in southeastern Indiana, drains approximately 812 square miles, excluding the previously listed Driftwood and Flatrock-Haw subbasins. Major tributaries in this subbasin include Clifty Creek, Sand Creek, and White Creek. Predominant land uses are cropland (62%), forest (23%), urban (8%), and pasture (6%) (Homer et al. 2015).

The Muscatatuck subbasin (05120207), located in southeastern Indiana, drains approximately 1140 square miles into the East Fork White River. Major tributaries in this subbasin include Otter Creek, Vernon Fork Muscatatuck River, Graham Creek, Big Creek, and Muscatatuck River. Predominant land uses are forest (46%), cropland (37%), pasture (10%), and urban (6%) (Homer et al. 2015).

The Lower East Fork White subbasin (05120208), located in south central Indiana, drains approximately 2027 square miles, excluding the previously listed subbasins into the White River near Petersburg in Pike County. Major tributaries in this subbasin include Lost River, Indian Creek, and Salt Creek. Predominant land uses are forest (58%), cropland (18%), pasture (14%), and urban (5%) (Homer et al. 2015).

For this program, the Great Miami River Basin (Figure 4) is geographically within the area contained in the 8-digit HUCs 05080001, 05080002, and 05080003. This area includes:

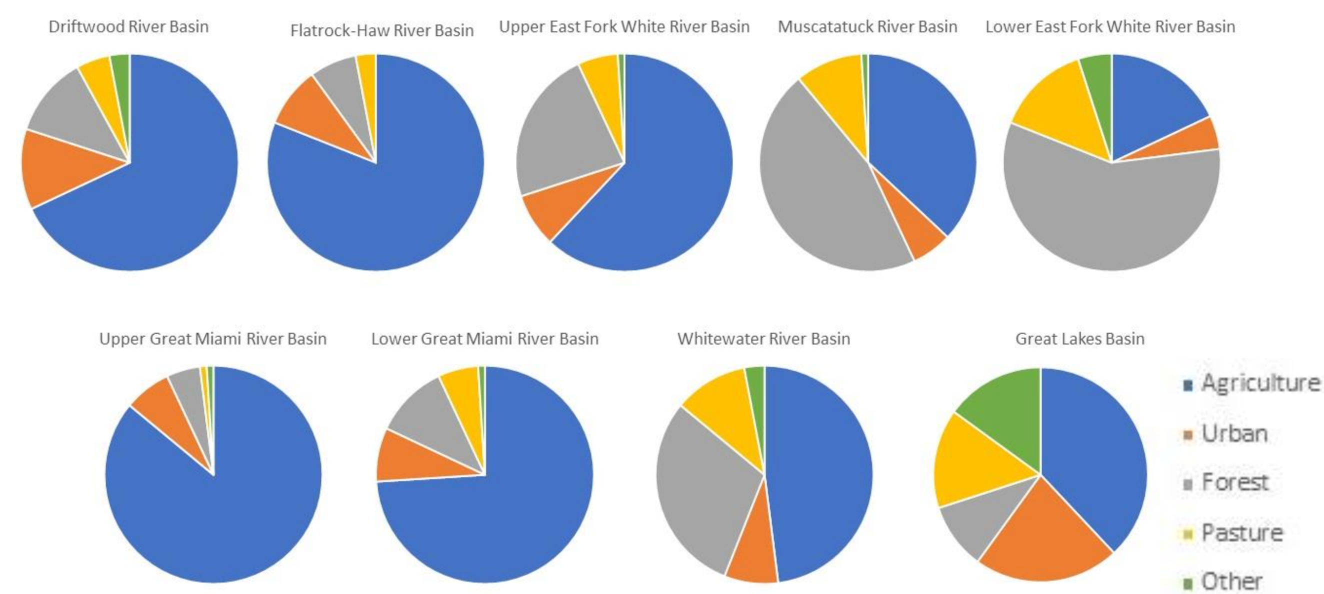
The Upper Great Miami subbasin (05080001), located in east central Indiana, drains approximately 32 square miles within Indiana. Using the 2011 National Land Cover Database for the United States, predominant land uses are cropland (86%), urban (7%), forest (5%), and pasture (1%) (Homer et al. 2015).

The Lower Great Miami subbasin (05080002), located in east central Indiana, drains approximately 63.3 square miles within Indiana. Predominant land uses are cropland (74%), forest (11%), urban (8%), and pasture (6%) (Homer et al. 2015).

The Whitewater subbasin (05080003), located in east central Indiana, drains approximately 1329.3 square miles within Indiana. Major tributaries in this subbasin include the East and West Forks of the Whitewater River. Predominant land uses are cropland (48%), forest (30%), pasture (11%), and urban (8%) (Homer et al. 2015).

The Great Lakes basin (Figure 4) is geographically within the borders of Indiana contained in the 8-digit HUCs 07120003, 04040001, 04050001, 04100003, 04100007, 04100004 and 04100005. The Great Lakes basin, located in northern Indiana, drains approximately 3200 square miles within Indiana borders. Using the 2018 Crop Data Layer, predominant land uses are cropland (38%), urban (22%) forest (10%), and pasture (15%) (Homer et. al. 2015).

Figure 2 2011 Sampling Basins' Land Uses National Land Cover Database for the Conterminous United States



Required field activities include collection of whole or edible portions of representative fish tissue samples within the geographical study basins.

Collect samples from July-October to ensure completion of contaminants' depuration during the spawning processes and active storage of fat by fish for the winter months.

Collect biological samples if the flow is not dangerous for staff to enter the stream (e.g., water levels at or below median base flow); barring any hazardous weather conditions (e.g., thunderstorms or heavy rain in the vicinity); or unexpected physical barriers to accessing the site. The field crew chief makes the final determination as to whether a waterbody is safe to enter.

A.5.5. Analytic Approach

This operation relies on analysis of samples gathered at the sites listed in A.6.2. and Table 6. The contract laboratory uses analytical methods listed in RFP 21-66919 to determine the presence and levels of PCBs, metals, PFAS, pesticides, and PAHs. Section B.4., Table 10, and Table 26 detail additional analytical methods information.

A.6. Project Description

This section provides a detailed overview of all work to perform, products to produce, and the schedule for QAPP implementation necessary for resolution of the problems addressed in A.5.

A.6.1. Sampling Plan

The program currently follows a five-year rotating basin schedule, as described in the 2017-2021 WQMS (IDEM 2017b). The sampling schedule includes twenty-three fixed station program sites (IDEM, 2001) from the original fish tissue sampling network. In addition to the fish tissue sampling network, target other sample sites based on historical environmental problems, waterbody access, use for fishing, date of last sampling event, potential contaminant sources, and monitoring recommendations by other agencies and entities.

A.6.2. Specific Sampling Locations

Table 6 and Figures 3 and 4 describe the tentative 2022sampling sites.

Figure 3 East Fork White River and Great Miami River Basins Sampling Locations

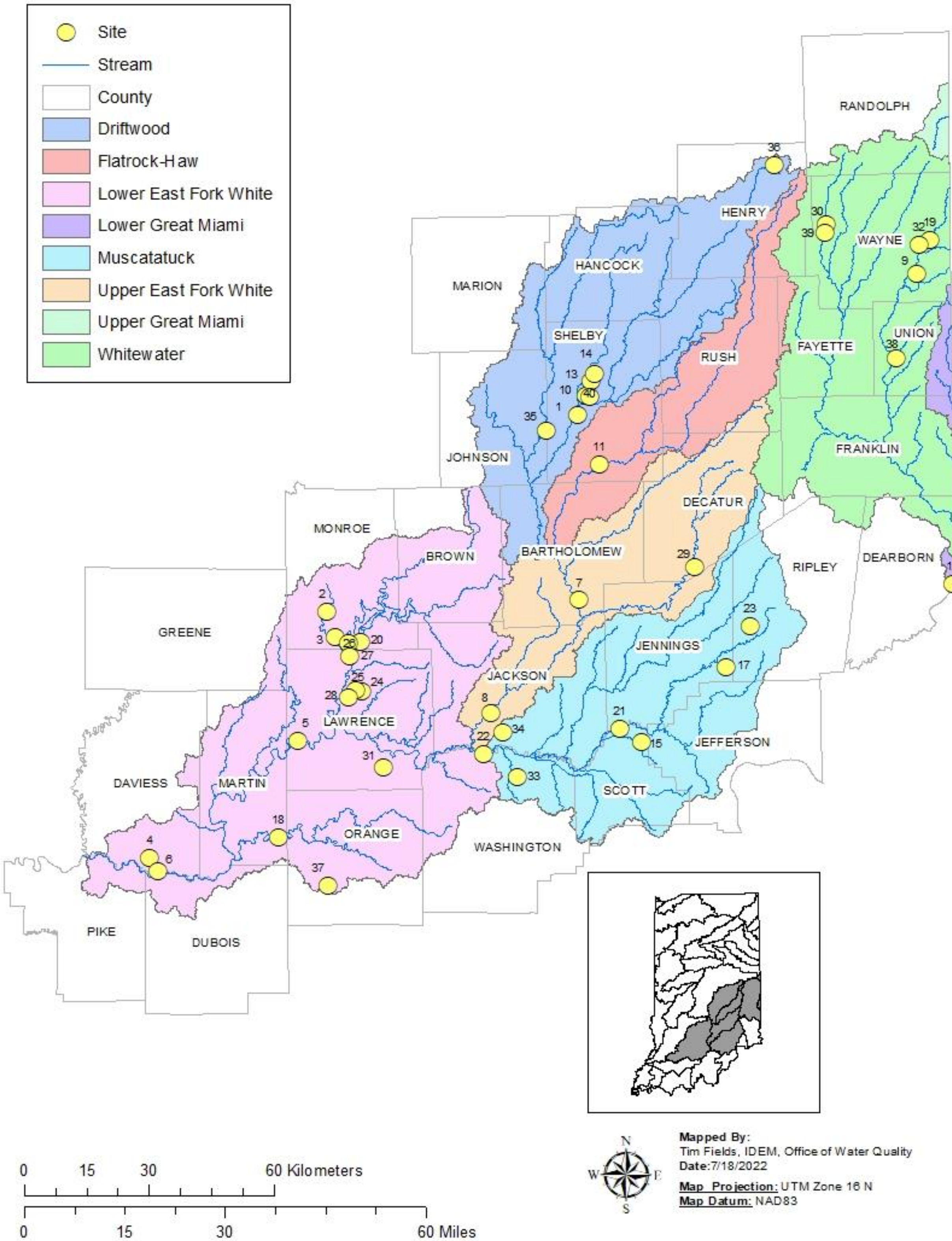


Figure 4 Lake Michigan Basin Sampling Location

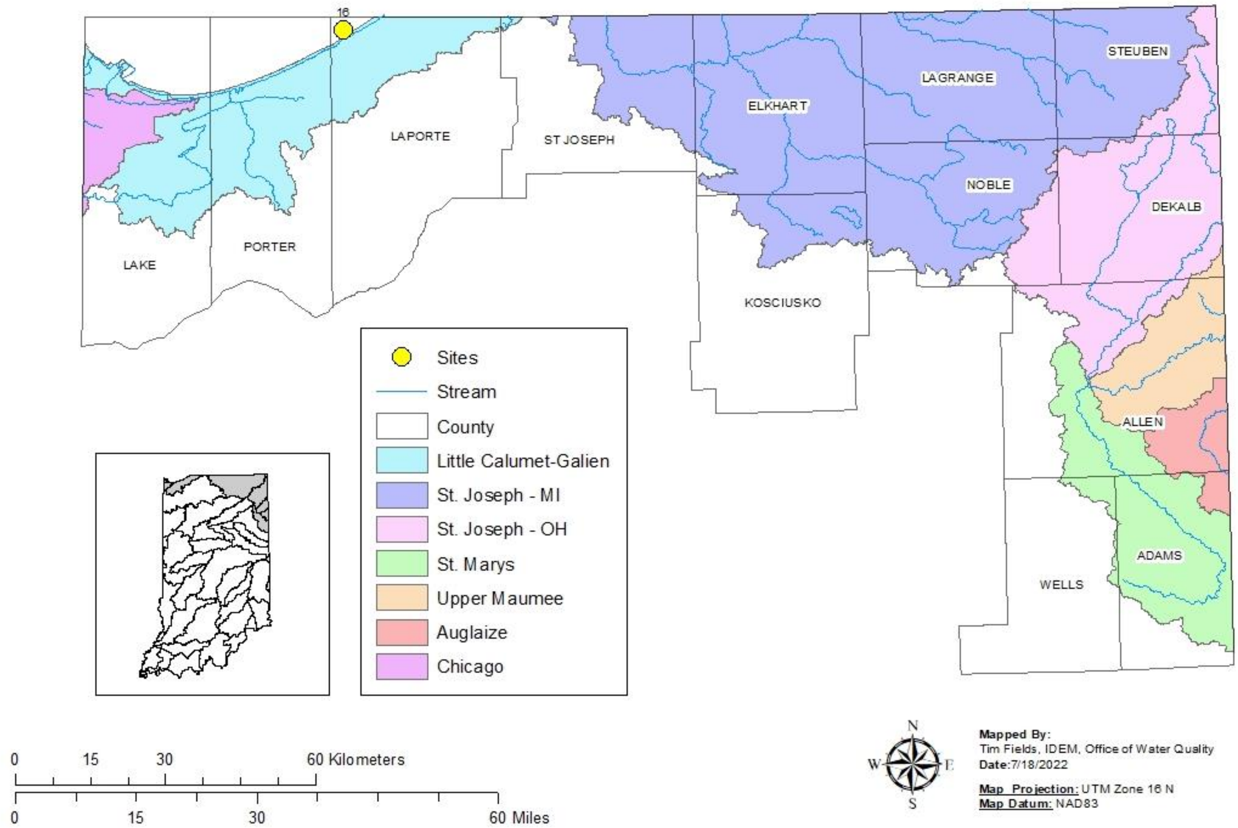


Table 6 Sample Collection Locations

Tables 7 through 10 identify the numerous variables of interest to the user for each sampling site.

Sample Site ID #[1]	Waterbody	Location[2]	Latitude	Longitude
1	Big Blue River	SR 44, S of Shelbyville	39.49639	-85.8653
2	Clear Creek	Fluckmill Road	39.07306	-86.5694
3	Clear Creek	Gore Road	39.01889	-86.5436
4	Dogwood Lake	Glendale Fish & Wildlife Area	38.54167	-87.0614
*5	East Fork White River	D/S Williams Dam	38.79556	-86.6494
6	East Fork White River	Glendale Fish & Wildlife Area	38.51194	-87.0378
7	East Fork White River	Jonesville Road	39.09478	-85.8684
8	East Fork White River	CR 375 West	38.85298	-86.1138
9	East Fork Whitewater River	Beeler Road Richmond	39.78833	-84.9092
10	Ed Clark Ditch	Boggstown Road	39.53633	-85.8407
11	Flatrock River	South Columbus Road	39.3871	-85.8056
12	Great Miami River	INDIANA PORTION, LAWRENCE	39.11528	-84.8272
13	Hankins Ditch	CR 300 North	39.5693	-85.8246
14	Hankins Ditch	CR 400 North	39.58419	-85.8142

Sample Site ID #[1]	Waterbody	Location[2]	Latitude	Longitude
15	Hardy Lake	Hardy Lake Fish & Wildlife Area	38.78667	-85.6994
16	Lake Michigan	Michigan City, IN (Trail Creek)	41.73544	-86.901
17	Little Graham Creek	H Road	38.94549	-85.4598
18	Lost River	Powell Valley Road	38.58639	-86.7026
19	Middle Fork Reservoir	U/S RICHMOND, IN	39.85944	-84.8686
20	Monroe Lake	Monroe Lake - Dam End Fairfax	39.00917	-86.4761
21	Muscatatuck River	Bogardus Road	38.81443	-85.7582
22	Muscatatuck River	Wheeler Hollow Road	38.7632	-86.1369
23	Old Timber Lake	Unnamed Rd off NE exit Rd	39.03354	-85.3931
24	Pleasant Run Creek	U/S GMC, MT. PLEASANT RD.	38.90069	-86.471
25	Pleasant Run Creek	D/S GMC, PEERLESS RD.	38.90333	-86.489
26	Salt Creek	Monroe Lake Tail Waters	39.00472	-86.5089
27	Salt Creek	Guthrie Rd	38.97741	-86.5062
28	Salt Creek	Oolitic Rd	38.88844	-86.5086
29	Sand Creek	Westport, IN Park	39.16333	-85.545
30	Scout Lake	Hagerstown, IN	39.89787	-85.1601
31	Spring Mill Park Lake	Spring Mill State Park	38.73694	-86.4122
32	Springwood Lake	South End	39.84972	-84.8997
33	Spurgeon Hollow Lake	Deep Hole	38.71252	-86.0442
34	Starve Hollow Lake	Starve Hollow State Recreation Area	38.81111	-86.0803
35	Sugar Cr	Sugar Creek Road	39.46315	-85.9535
36	Summit Lake	Summit Lake State Park	40.02877	-85.3013
37	Tucker Lake	Spring Valley Fish and Wildlife Area	38.48139	-86.5669
38	Whitewater Lake	Boat Ramp	39.6058	-84.9703
39	Whitewater River	Heine Road Hagerstown	39.88139	-85.1608
40	William Clark Ditch	Boggstown Road	39.534	-85.8298

*Historical Core Sampling Site
[1]Sample Site ID # is the number, specific to the QAPP, for each sampling location.
[2]Access to each site is approved by landowners or considered public access (ex. boat ramps, parks, etc.).

Table 7 Constituents or Characteristics to Sample

Sample Site ID #	Target Constituents or Parameters to Sample, Measure, and Record	Matrix from Which to Take Sample	Units in Which to Measure Constituents	Sampling SOP or Procedure to Follow
ALL	Lipids	Fish Tissue	%	Pace Lipid – uses same value as EPA 1630/1631E. (EPA 2007b, EPA 2002)
ALL	Total PCBs	Fish Tissue	µg/kg ww	U.S. EPA Method 8082A (EPA 2007a) and U.S. EPA Preparation 3540C (EPA 1996a)

Sample Site ID #	Target Constituents or Parameters to Sample, Measure, and Record	Matrix from Which to Take Sample	Units in Which to Measure Constituents	Sampling SOP or Procedure to Follow
ALL	PFAS	Fish Tissue	µg/kg ww	PFAS Method DoD 36 (Pace 2020)
ALL	Metals	Fish Tissue	µg/kg ww	U.S. EPA Method 1631, Revision E (EPA 2002, EPA 2001) and U.S. EPA Method 6020A (EPA 2004)
5, 16	Pesticides	Fish Tissue	µg/kg ww	U.S. EPA Method 8081B (EPA 2007c)
16	PAHs	Fish Tissue	µg/kg ww	U.S. EPA Method 8270D and Method 8310 (EPA 2017 and U.S. EPA 1986)

Table 8 Sampling Specifics

Sample Site ID #	Constituents	Type of Samples	Number of Samples	Frequency of Sampling	Type and Number of QC Samples[3]
2, 3, 13, 14, 24, 25, 40	Fish Tissue	Composite	2	1 event	MS/MSD 1 per 20 samples Duplicate 1 per 20 samples
16	Fish Tissue	Composite	12	1 event	MS/MSD 1 per 20 samples Duplicate 1 per 20 samples
All Other Sites	Fish Tissue	Composite	3-5	1 event	MS/MSD 1 per 20 samples Duplicate 1 per 20 samples

Table 9 Sample Collection Schedule

Sample Site ID #	Constituents	Date
4, 20, 34	Fish Tissue	March - June
All Other Sites	Fish Tissue	August - October

Table 10 Method of Analysis Employed in the Field or Lab*

Sample Site ID #	Parameter	Method of Analysis[4]	Analysis in Field or Lab?
ALL	Lipids	Pace Lipid - EnChemSVO-59 which is an equivalent to EPA 160.1 for fish tissues	Lab
ALL	Total PCBs	U.S. EPA Method 8082A (EPA 2007a) and U.S. EPA Preparation 3540C (EPA 1996a)	Lab
ALL	PFAS	PFAS Method DoD 35 (Pace 2020)	Lab
ALL	Metals	U.S. EPA Method 1631, Revision E (EPA 2002, EPA 2001) and U.S. EPA Method 6020A (EPA 2004)	Lab
ALL	Pesticides	U.S. EPA Method 8081B (EPA 2007c)	Lab

Sample Site ID #	Parameter	Method of Analysis[4]	Analysis in Field or Lab?
ALL	PAHs	U.S. EPA Method 8270D and Method 8310 (EPA 2017 and U.S. EPA 1986)	Lab

[4] Method of analysis could include lab method, field test kit, or a properly calibrated measurement instrument.
* Reporting limits are detailed in Table 13.

A.7. Quality Objective and Criteria

The project does not collect the minimum three samples per site needed to calculate a sampling location average or is NOT intended to measure or address a measure of the results compared to an action level by a statistical method. The QAPP instead drives the following “if/then” decision statements.

If the total PCBs concentration at a site is above 20 µg/kg ww (A.6.2., Table 7, established in the CALM), then IDEM will recommend the waterbody as not meeting the ALUS for fish consumption and list in the CWA Section 303(d) List of Impaired Waterbodies of Indiana (2020b).

If the determined total mercury trophic level consumption weighted arithmetic mean concentration at a site is above 300 µg/kg ww, (6.2.A., Table 7, and established in the CALM), then IDEM will recommend the waterbody as not meeting the ALUS for fish consumption and list in the CWA Section 303(d) List of Impaired Waterbodies of Indiana (2020b).

If the determined total PCBs concentration level at a site is above 50 µg/kg ww, (6.2.A., Tables 7, and established in Protocol For a Uniform Great Lakes Sport Fish Consumption Advisory), then IDEM will recommend the waterbody as having limited fish consumption on the Indiana FCA.

If the determined total mercury concentration at a site is above 50 µg/kg ww (6.2.A., Tables 7, and as established in A Protocol for Mercury-based Fish Consumption Advice: An Addendum to the 1993 Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory (McCann and Anderson 2007)), then IDEM will recommend the waterbody as having limited fish consumption on the Indiana FCA.

If the PFOS concentration at a site is above 20 µg/kg ww (6.2.A., Tables 7, and established in the Great Lakes Consortium for Fish Consumption Advisories Best Practices for PFOS Guidelines (GLC 2019)), then IDEM will recommend the waterbody as having limited fish consumption on the Indiana FCA.

Based on data results, take the following actions:

- If the concentration of total PCBs is above the threshold (20 µg/kg ww) in any sample from a site, report the stream reach as impaired in the integrated report to U.S. EPA.

- If the weighted site arithmetic average concentration of total mercury is above the threshold (300 µg/kg ww), report the stream reach as impaired in the integrated report to U.S. EPA.
- If two-thirds or more of the samples from a site contain PCBs, mercury, or PFOS concentrations above the limited consumption benchmark, IDEM recommends listing the waterbody as “Do Not Eat” on the FCA.
- If more than one-third of the samples from a site contain PCBs, mercury, or PFOS concentrations below the limited consumption benchmark, then recommend listing a consumption frequency on the FCA.
- Use estimates to assess trends of contaminants in fish.
- Use estimates to understand emerging contaminants.

Site specific ALUS for fish consumption includes program specific controls which identify analysis errors. Controls include laboratory blanks and duplicates, matrix spike and matrix spike duplicate (MS/MSD), laboratory control spikes (LCS), ongoing laboratory performance evaluations, and analytical chemistry data qualifiers and flags specified in the project RFP 21-66919 (IDEM 2021), the analytical services contract (IDOA 2021), the QC Requirements section of the Quality Assurance Project Plan for Indiana Surface Water Programs (Surface Water QAPP) (IDEM 2017a, B.5.2, pp. 170-172), and the agency Quality Management Plan (IDEM 2018a, p. 38). Table D3-1 of the Surface Water QAPP (IDEM 2017a, p. 184) outlines analytical chemistry data qualifiers and flags.

Use any data flagged as estimated on a case-by-case basis. Reanalyze fish tissue samples flagged as not meeting minimum QC requirements using the preserved sample material stored at the contract laboratory. Do not use any data rejected, due to analytical problems or errors, for water quality assessment decisions or in FCA determinations. Conduct further investigation in response to consistently rejected data to determine the source of error. If IDEM identifies a trend of consistently rejected data and if corrective action is warranted, the WAPB QA chemist directs the analytical laboratory to make corrections. Field techniques used during sample collection and preparation, and laboratory procedures are subject to periodic evaluation by both WAPB QA and field staff.

A.7.1. Precision

Precision measures the degree to which two or more measurements agree. Calculate relative percent difference (RPD) for each pair of duplicates using:

$$RPD = \frac{|(S - D)| \times 100}{(S + D) / 2}$$

Where:

S = First sample value (original or MS value)
D = Second sample value (duplicate or MSD value)

This calculation applies to RPD calculations for lab duplicates, field duplicates, and MS/MSD QC samples.

The laboratories use the following quality indicators for analysis.

Table 11 Precision Objectives by Measurement Type

Measurement	Units	Precision Objective
General Chemistry		
Lipid	%	RPD ≤ 20%
Moisture	%	RPD ≤ 10%
PFAS		
Perfluoro-1-octanesulfonate (C8, PFOS)	µg/kg ww	RPD ≤ 40%
Perfluoro-1-butanesulfonate (C4, PFBS)	µg/kg ww	RPD ≤ 40%
Perfluoro-1-hexanesulfonate (C6, PFHxS)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-octanoic acid (C8, PFOA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-butanoic acid (C4 PFBA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-pentanoic acid (C5, PFPeA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-hexanoic acid (C6, PFHxA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-heptanoic acid (C7, PFHpA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-nonanoic acid (C9, PFNA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-decanoic acid (C10, PFDA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-undodecanoic acid (C11, PFUnA)	µg/kg ww	RPD ≤ 40%
Perfluoro-n-dodecanoic acid (C12, PFDoA)	µg/kg ww	RPD ≤ 40%
Perfluoro-1-octanesulfonamide (PFOSA)	µg/kg ww	RPD ≤ 40%
Perfluorotridecanoic acid (PFTrDA)	µg/kg ww	RPD ≤ 40%
Perfluorotetradecanoic acid (PFTeDA)	µg/kg ww	RPD ≤ 40%
Perfluorohexadecanoic acid (PFHxDA)	µg/kg ww	RPD ≤ 40%
Perfluorooctandecanoic acid (PFODA)	µg/kg ww	RPD ≤ 40%
Perfluoropentanesulfonic acid (PFPeS)	µg/kg ww	RPD ≤ 40%
Perfluoroheptanesulfonic acid (PFHpS)	µg/kg ww	RPD ≤ 40%
Perfluorononanesulfonic acid (PFNS)	µg/kg ww	RPD ≤ 40%
Perfluorodecanesulfonic acid (PFDS)	µg/kg ww	RPD ≤ 40%
Perfluorododecanesulfonic acid (PFDoS)	µg/kg ww	RPD ≤ 40%
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	µg/kg ww	RPD ≤ 40%
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	µg/kg ww	RPD ≤ 40%
N-methylperfluorooctane sulfonamide (NMeFOSA)	µg/kg ww	RPD ≤ 40%
N-ethylperfluorooctane sulfonamide (NEtFOSA)	µg/kg ww	RPD ≤ 40%
N-methyl perfluorooctanesulfonamidoacetic acid - br/lin (NMeFOSAA)	µg/kg ww	RPD ≤ 40%
N-ethyl perfluorooctanesulfonamidoacetic acid - br/lin (NEtFOSAA)	µg/kg ww	RPD ≤ 40%
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg ww	RPD ≤ 40%
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/kg ww	RPD ≤ 40%
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg ww	RPD ≤ 40%
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg ww	RPD ≤ 40%

Measurement	Units	Precision Objective
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	µg/kg ww	RPD ≤ 40%
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	µg/kg ww	RPD ≤ 40%
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	µg/kg ww	RPD ≤ 40%
Metals		
Chromium	µg/kg ww	RPD ≤ 20%
Lead	µg/kg ww	RPD ≤ 20%
Mercury	µg/kg ww	RPD ≤ 20%
Selenium	µg/kg ww	RPD ≤ 20%
Arsenic	µg/kg ww	RPD ≤ 20%
PCBs		
Total PCBs	µg/kg ww	RPD ≤ 40%
Organochlorine Pesticides		
Aldrin	µg/kg ww	RPD ≤ 43%
BHC, alpha-	µg/kg ww	RPD ≤ 40%
BHC, beta-	µg/kg ww	RPD ≤ 40%
BHC, delta-	µg/kg ww	RPD ≤ 40%
BHC, gamma-	µg/kg ww	RPD ≤ 40%
Chlordane, gamma	µg/kg ww	RPD ≤ 40%
Chlordane, alpha	µg/kg ww	RPD ≤ 40%
DDD, o,p’-	µg/kg ww	RPD ≤ 40%
DDD, p,p’-	µg/kg ww	RPD ≤ 40%
DDE, o,p’-	µg/kg ww	RPD ≤ 40%
DDE, p,p’-	µg/kg ww	RPD ≤ 40%
DDT, o,p’-	µg/kg ww	RPD ≤ 40%
DDT, p,p’-	µg/kg ww	RPD ≤ 50%
Dieldrin	µg/kg ww	RPD ≤ 38%
Endosulfan I	µg/kg ww	RPD ≤ 40%
Endosulfan II	µg/kg ww	RPD ≤ 40%
Endosulfan sulfate	µg/kg ww	RPD ≤ 40%
Endrin	µg/kg ww	RPD ≤ 45%
Endrin aldehyde	µg/kg ww	RPD ≤ 40%
Endrin ketone	µg/kg ww	RPD ≤ 40%
Heptachlor	µg/kg ww	RPD ≤ 31%
Heptachlor epoxide	µg/kg ww	RPD ≤ 40%
Hexachlorobenzene	µg/kg ww	RPD ≤ 40%
Methoxychlor	µg/kg ww	RPD ≤ 40%
Mirex	µg/kg ww	RPD ≤ 40%
cis- Nonachlor	µg/kg ww	RPD ≤ 40%
trans- Nonachlor	µg/kg ww	RPD ≤ 40%
Oxychlordane	µg/kg ww	RPD ≤ 40%
Pentachloroanisole	µg/kg ww	RPD ≤ 40%
Toxaphene	µg/kg ww	RPD ≤ 40%
PAHs		

Measurement	Units	Precision Objective
Naphthalene	µg/kg ww	RPD ≤ 19%
1-Methyl Naphthalene	µg/kg ww	RPD ≤ 24%
2-Methyl Naphthalene	µg/kg ww	RPD ≤ 12%
Acenaphthylene	µg/kg ww	RPD ≤ 21%
Acenaphthene	µg/kg ww	RPD ≤ 16%
Fluorene	µg/kg ww	RPD ≤ 12%
Phenanthrene	µg/kg ww	RPD ≤ 10%
Anthracene	µg/kg ww	RPD ≤ 16%
Chrysene	µg/kg ww	RPD ≤ 17%
Fluoranthene	µg/kg ww	RPD ≤ 17%
Pyrene	µg/kg ww	RPD ≤ 15%
Benzo (a) anthracene	µg/kg ww	RPD ≤ 15%
Benzo (b) fluoranthene	µg/kg ww	RPD ≤ 14%
Benzo (k) fluoranthene	µg/kg ww	RPD ≤ 13%
Benzo (a) pyrene	µg/kg ww	RPD ≤ 13%
Dibenzo (a,h) anthracene	µg/kg ww	RPD ≤ 15%
Benzo (g,h,i) perylene	µg/kg ww	RPD ≤ 14%
Indeno (1,2,3-c,d) pyrene	µg/kg ww	RPD ≤ 13%

A.7.2. Accuracy

Accuracy is the degree to which an observed value and an accepted reference value agree. Calculate percent reference standard recovery (%R) using:

$$\%R = [(A - B) \times 100] / C$$

Where:

A = Analyte concentration determined experimentally with known quantity of reference material added.
B = Background determined in the laboratory by separate (unspiked) sample analysis, or in the field from a blank.
C = True value of reference standard added.

Use accuracy (% Recovery) wherever comparing a measured value to a reference value.

QC samples using %R include LCS or LFB, CCV, ICV, certified reference standards, MS (LFM), and MSD (LFMD).

Laboratories use different accuracy goal ranges based on QC sample type (i.e., LCS, LFB, CV, CR, STDs, MS/MSDs). Therefore, the accuracy objectives may vary based on the QC sample type. In this work plan use MS/MSDs to determine accuracy.

Table 12 contains accuracy goals with acceptance limits for applicable analytical methods.

Table 12 Accuracy Objectives by Measurement Type

Measurement	Units	Accuracy Objective
General Chemistry		
Lipid	%	70 ≤ %R ≤ 130
Moisture	%	70 ≤ %R ≤ 130
PFAS		
Perfluoro-1-octanesulfonate (C8, PFOS)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-1-butanesulfonate (C4, PFBS)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-1-hexanesulfonate (C6, PFHxS)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-octanoic acid (C8, PFOA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-butanoic acid(C4 PFBA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-pentanoic acid (C5, PFPeA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-hexanoic acid (C6, PFHxA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-heptanoic acid (C7, PFHpA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-nonanoic acid (C9, PFNA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-decanoic acid (C10, PFDA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-undodecanoic acid (C11, PFUnA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-n-dodecanoic acid (C12, PFDoA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoro-1-octanesulfonamide (PFOSA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluorotridecanoic acid (PFTrDA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluorotetradecanoic acid (PFTeDA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluorohexadecanoic acid (PFHxDA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluorooctandecanoic acid (PFODA)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoropentanesulfonic acid (PFPeS)	µg/kg ww	70 ≤ %R ≤ 130
Perfluoroheptanesulfonic acid (PFHpS)	µg/kg ww	70 ≤ %R ≤ 130
Perfluorononanesulfonic acid (PFNS)	µg/kg ww	70 ≤ %R ≤ 130
Perfluorodecanesulfonic acid (PFDS)	µg/kg ww	70 ≤ %R ≤ 130
Perfluorododecanesulfonic acid (PFDoS)	µg/kg ww	70 ≤ %R ≤ 130
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	µg/kg ww	70 ≤ %R ≤ 130
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	µg/kg ww	70 ≤ %R ≤ 130
N-methylperfluorooctane sulfonamide (NMeFOSA)	µg/kg ww	70 ≤ %R ≤ 130
N-ethylperfluorooctane sulfonamide (NEtFOSA)	µg/kg ww	70 ≤ %R ≤ 130
N-methyl perfluorooctanesulfonamidoacetic acid - br/lin (NMeFOSAA)	µg/kg ww	70 ≤ %R ≤ 130
N-ethyl perfluorooctanesulfonamidoacetic acid - br/lin (NEtFOSAA)	µg/kg ww	70 ≤ %R ≤ 130
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg ww	70 ≤ %R ≤ 130
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/kg ww	70 ≤ %R ≤ 130
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg ww	70 ≤ %R ≤ 130
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg ww	70 ≤ %R ≤ 130
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	µg/kg ww	70 ≤ %R ≤ 130

Measurement	Units	Accuracy Objective
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	µg/kg ww	70 ≤ %R ≤ 130
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	µg/kg ww	70 ≤ %R ≤ 130
Metals		
Chromium	µg/kg ww	75 ≤ %R ≤ 125
Lead	µg/kg ww	75 ≤ %R ≤ 125
Mercury	µg/kg ww	75 ≤ %R ≤ 125
Selenium	µg/kg ww	75 ≤ %R ≤ 125
Arsenic	µg/kg ww	75 ≤ %R ≤ 125
PCBs		
Total PCBs	µg/kg ww	70 ≤ %R ≤ 130
Organochlorine Pesticides		
Aldrin	µg/kg ww	34 ≤ %R ≤ 142
BHC, alpha-	µg/kg ww	70 ≤ %R ≤ 130
BHC, beta-	µg/kg ww	70 ≤ %R ≤ 130
BHC, delta-	µg/kg ww	70 ≤ %R ≤ 130
BHC, gamma-	µg/kg ww	70 ≤ %R ≤ 130
Chlordane, gamma	µg/kg ww	70 ≤ %R ≤ 130
Chlordane, alpha	µg/kg ww	70 ≤ %R ≤ 130
DDD, o,p’-	µg/kg ww	70 ≤ %R ≤ 130
DDD, p,p’-	µg/kg ww	70 ≤ %R ≤ 130
DDE, o,p’-	µg/kg ww	70 ≤ %R ≤ 130
DDE, p,p’-	µg/kg ww	70 ≤ %R ≤ 130
DDT, o,p’-	µg/kg ww	70 ≤ %R ≤ 130
DDT, p,p’-	µg/kg ww	23 ≤ %R ≤ 134
Dieldrin	µg/kg ww	31 ≤ %R ≤ 134
Endosulfan I	µg/kg ww	70 ≤ %R ≤ 130
Endosulfan II	µg/kg ww	70 ≤ %R ≤ 130
Endosulfan sulfate	µg/kg ww	70 ≤ %R ≤ 130
Endrin	µg/kg ww	42 ≤ %R ≤ 139
Endrin aldehyde	µg/kg ww	70 ≤ %R ≤ 130
Endrin ketone	µg/kg ww	70 ≤ %R ≤ 130
Heptachlor	µg/kg ww	35 ≤ %R ≤ 130
Heptachlor epoxide	µg/kg ww	70 ≤ %R ≤ 130
Hexachlorobenzene	µg/kg ww	70 ≤ %R ≤ 130
Methoxychlor	µg/kg ww	70 ≤ %R ≤ 130
Mirex	µg/kg ww	70 ≤ %R ≤ 130
cis- Nonachlor	µg/kg ww	70 ≤ %R ≤ 130
trans- Nonachlor	µg/kg ww	70 ≤ %R ≤ 130
Oxychlordane	µg/kg ww	70 ≤ %R ≤ 130
Pentachloroanisole	µg/kg ww	70 ≤ %R ≤ 130
Toxaphene	µg/kg ww	70 ≤ %R ≤ 130
PAHs		
Naphthalene	µg/kg ww	31 ≤ %R ≤ 146

Measurement	Units	Accuracy Objective
1-Methyl Naphthalene	µg/kg ww	16 ≤ %R ≤ 162
2-Methyl Naphthalene	µg/kg ww	43 ≤ %R ≤ 116
Acenaphthylene	µg/kg ww	18 ≤ %R ≤ 146
Acenaphthene	µg/kg ww	32 ≤ %R ≤ 129
Fluorene	µg/kg ww	32 ≤ %R ≤ 106
Phenanthrene	µg/kg ww	49 ≤ %R ≤ 111
Anthracene	µg/kg ww	16 ≤ %R ≤ 113
Chrysene	µg/kg ww	24 ≤ %R ≤ 123
Fluoranthene	µg/kg ww	27 ≤ %R ≤ 126
Pyrene	µg/kg ww	33 ≤ %R ≤ 123
Benzo (a) anthracene	µg/kg ww	23 ≤ %R ≤ 112
Benzo (b) fluoranthene	µg/kg ww	30 ≤ %R ≤ 116
Benzo (k) fluoranthene	µg/kg ww	32 ≤ %R ≤ 112
Benzo (a) pyrene	µg/kg ww	34 ≤ %R ≤ 110
Dibenzo (a,h) anthracene	µg/kg ww	24 ≤ %R ≤ 114
Benzo (g,h,i) perylene	µg/kg ww	27≤ %R ≤ 109
Indeno (1,2,3-c,d) pyrene	µg/kg ww	33 ≤ %R ≤ 113

Like precision, accuracy is susceptible to variations in technique. Minimize such variation by using SOPs; correct field and laboratory technique; and qualified individuals (A.8.).

A.7.3. Representativeness

Unlike precision and accuracy, representativeness tends to be a qualitative measurement. Essentially, the measurement describes how similar the analytical data are in essential characteristics to the parent population of interest. Many factors influence how representative a sampled area's analytical results are. The factors include:

- Selection of appropriate analytical procedures
- The sampling plan
- Matrix heterogeneity
- The procedures and protocols used to collect, preserve, and transport samples

In this case, choice of sampling locations and techniques, and use of OWQ SOPs provide confidence in the representativeness of the results.

A.7.4. Completeness

Completeness is a quantitative measure of the number of valid items versus the total number of items processed. (e.g., number of samples collected versus number of samples planned; number of samples producing valid results versus the planned number of samples to analyze). The percent completeness for both field and laboratory analyses is:

$$\% \text{ Completeness} = \frac{(\text{number of valid measurements}) \times 100}{(\text{number of measurements planned})}$$

Where: "valid measurements" refers to numbers of investigational samples obtained or to be obtained for a specific purpose, or to satisfy a particular project objective.

In this case, the overall completeness goal is 100% for samples analyzed for the project. Therefore, collect all planned samples, analyze all samples collected, and all samples should yield analytical data usable for the intended purpose.

If a result is flagged as rejected, do not consider it a valid measurement for this calculation.

A.7.5. Comparability

Comparability is a qualitative measure of dataset equivalency. If two datasets are not readily comparable, using the datasets may make drawing inferences or making comparisons difficult. To assure comparability, use common variables, standardized collection and analysis techniques, and satisfy the requirements of the other measurement quality objectives. Project comparability is largely addressed due to all sample collection utilizing the exact same OWQ collection methods and laboratory analytical methods to collect and analyze Indiana fish tissue data.

A.7.6. Sensitivity

Sensitivity is related to the reporting limit (RL). In this context, sensitivity refers to the capability of a method or instrument to detect a given analyte at a given concentration and reliably quantitate the analyte concentration. The investigator's concern is whether the instrument or method is sensitive enough to quantitate a result less than or equal to one-third times the standard (≤1/3*standard). In general, RLs are less than the applicable standard or screening level. Do not use analytical results for samples which are nondetect for a particular analyte, and when the instrument's, or method's RLs are greater than the applicable standards or screening levels to demonstrate compliance with the applicable standards or screening levels.

Table 13 Sensitivity Objectives by Measurement Type
Expressed as IDEM RL

Measurement	Units	Reporting Limit
General Chemistry[5]		
Lipid	**%**	0.1
Moisture	**%**	0.1

Measurement	Units	Reporting Limit
PFAS[6]		
Perfluoro-1-octanesulfonate (C8, PFOS)	µg/kg ww	0.231
Perfluoro-1-butanesulfonate (C4, PFBS)	µg/kg ww	0.221
Perfluoro-1-hexanesulfonate (C6, PFHxS)	µg/kg ww	0.227
Perfluoro-n-octanoic acid (C8, PFOA)	µg/kg ww	0.250
Perfluoro-n-butanoic acid (C4 PFBA)	µg/kg ww	0.250
Perfluoro-n-pentanoic acid (C5, PFPeA)	µg/kg ww	0.250
Perfluoro-n-hexanoic acid (C6, PFHxA)	µg/kg ww	0.250
Perfluoro-n-heptanoic acid (C7, PFHpA)	µg/kg ww	0.250
Perfluoro-n-nonanoic acid (C9, PFNA)	µg/kg ww	0.250
Perfluoro-n-decanoic acid (C10, PFDA)	µg/kg ww	0.250
Perfluoro-n-undodecanoic acid (C11, PFUnA)	µg/kg ww	0.250
Perfluoro-n-dodecanoic acid (C12, PFDoA)	µg/kg ww	0.250
Perfluoro-1-octanesulfonamide (PFOSA)	µg/kg ww	0.250
Perfluorotridecanoic acid (PFTrDA)	µg/kg ww	0.250
Perfluorotetradecanoic acid (PFTeDA)	µg/kg ww	0.250
Perfluorohexadecanoic acid (PFHxDA)	µg/kg ww	0.250
Perfluorooctandecanoic acid (PFODA)	µg/kg ww	0.250
Perfluoropentanesulfonic acid (PFPeS)	µg/kg ww	0.250
Perfluoroheptanesulfonic acid (PFHpS)	µg/kg ww	0.237
Perfluorononanesulfonic acid (PFNS)	µg/kg ww	0.240
Perfluorodecanesulfonic acid (PFDS)	µg/kg ww	0.241
Perfluorododecanesulfonic acid (PFDoS)	µg/kg ww	0.242
N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	µg/kg ww	0.250
N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	µg/kg ww	0.250
N-methylperfluorooctane sulfonamide (NMeFOSA)	µg/kg ww	0.250
N-ethylperfluorooctane sulfonamide (NEtFOSA)	µg/kg ww	0.250
N-methyl perfluorooctanesulfonamidoacetic acid - br/lin (NMeFOSAA)	µg/kg ww	0.250
N-ethyl perfluorooctanesulfonamidoacetic acid - br/lin (NEtFOSAA)	µg/kg ww	0.250
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg ww	0.233
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/kg ww	0.237
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg ww	0.241
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg ww	0.241
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	µg/kg ww	0.236
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	µg/kg ww	0.232
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	µg/kg ww	0.235
Metals[7]		
Chromium[7]	µg/kg ww	10
Lead[7]	µg/kg ww	70
Mercury[10]	µg/kg ww	50

Measurement	Units	Reporting Limit
Selenium[7]	µg/kg ww	110
Arsenic[7]	µg/kg ww	1000
PCBs[8]		
Total PCBs	µg/kg ww	50
Organochlorine Pesticides[9]		
Aldrin	µg/kg ww	8
BHC, alpha-	µg/kg ww	8
BHC, beta-	µg/kg ww	8
BHC, delta-	µg/kg ww	8
BHC, gamma-	µg/kg ww	8
Chlordane, gamma	µg/kg ww	8
Chlordane, alpha	µg/kg ww	8
DDD, o,p’-	µg/kg ww	10
DDD, p,p’-	µg/kg ww	10
DDE, o,p’-	µg/kg ww	10
DDE, p,p’-	µg/kg ww	10
DDT, o,p’-	µg/kg ww	10
DDT, p,p’-	µg/kg ww	10
Dieldrin	µg/kg ww	10
Endosulfan I	µg/kg ww	20
Endosulfan II	µg/kg ww	20
Endosulfan sulfate	µg/kg ww	20
Endrin	µg/kg ww	10
Endrin aldehyde	µg/kg ww	10
Endrin ketone	µg/kg ww	10
Heptachlor	µg/kg ww	8
Heptachlor epoxide	µg/kg ww	8
Hexachlorobenzene	µg/kg ww	10
Methoxychlor	µg/kg ww	20
Mirex	µg/kg ww	5
cis- Nonachlor	µg/kg ww	8
trans- Nonachlor	µg/kg ww	8
Oxychlordane	µg/kg ww	8
Pentachloroanisole	µg/kg ww	2.5
Toxaphene	µg/kg ww	10
PAHs		
Naphthalene	µg/kg ww	100
1-Methyl Naphthalene	µg/kg ww	16
2-Methyl Naphthalene	µg/kg ww	16
Acenaphthylene	µg/kg ww	67
Acenaphthene	µg/kg ww	33
Fluorene	µg/kg ww	3.3
Phenanthrene	µg/kg ww	3.3
Anthracene	µg/kg ww	3.3
Chrysene	µg/kg ww	3.3

Measurement	Units	Reporting Limit
Fluoranthene	µg/kg ww	5
Pyrene	µg/kg ww	3.3
Benzo (a) anthracene	µg/kg ww	3.3
Benzo (b) fluoranthene	µg/kg ww	3.3
Benzo (k) fluoranthene	µg/kg ww	3.3
Benzo (a) pyrene	µg/kg ww	3.3
Dibenzo (a,h) anthracene	µg/kg ww	6.7
Benzo (g,h,i) perylene	µg/kg ww	6.7
Indeno (1,2,3-c,d) pyrene	µg/kg ww	6.7

[5] ASTM D2974-87 and Pace Analytical Lipid Method
[6] Pace Analytical DoD 36 (Pace 2020)
[7] EPA Preparation 3540C (EPA 1996a) and EPA Method 8082A (EPA 2007a)
[8] EPA Method 6020A (EPA 2004)
[9] EPA Method 8081B (EPA 2007c)
[10] EPA Method 1631, Revision E (EPA 2002, EPA 2001)

A.8. Specialized Training or Certification

A.8.1. through A.8.3. and Table 14 describe required specialized trainings, qualifications, or certifications required to perform project work. All contractors are chosen through a bidding process. The process only considers contractors with the ability to adequately achieve all requirements in the project specifications including documented staff biographies and past project accomplishments. All contractors must comply with the terms of the RFP, associated contract, and the QAPP.

A.8.1. IDEM PI

Tim Fields, B.S. in Chemistry from Indiana University, has experience in environmental measurement, data QC, fish tissue collection, and has overseen a variety IDEM monitoring projects for 10 years.

A.8.2. IDEM QA reviewer

James Bailey possesses a significant amount of experience in QA matters. He served as the ISO 9001 quality management system coordinator at several companies prior to working at IDEM.

A.8.3. IDEM OWQ field staff

All training is conducted in-house, utilizing existing SOPs and equipment operating manuals. OWQ typically conducts on-the-job training where an experienced staff mentor or field crew chief accompanies new or less experienced staff.

Specialized training or certifications needed by staff to successfully complete the specific project or task identified in the QAPP include:

Table 14 Specialized Training or Certifications

Role	Training and Experience Requirement	Training References	Training Notes
All staff participating in fish tissue sample collections	-Basic First Aid and CPR	-A minimum of 4 hours of in-service training provided by WAPB (IDEM 2010)	-Staff lacking 4 hours of in-service training or appropriate certification require accompaniment in the field by WAPB staff meeting Health and Safety Training requirements
	-Personal Protective Equipment Policy -Memorandum “Use of Personal Flotation Devices (PFD) by Branch Personnel” dated February 29, 2000	-IDEM 2008 -February 29, 2000 WAPB internal memorandum regarding use of approved PFDs	-Indiana Code 14-8-2-27 requires a high intensity whistle and Safety of Life at Sea (SOLAS) certified strobe light when working on cojurisdictional waters or during hours of darkness
	-IDEM Injury and Illness Resulting from Occupational Exposure Policy (IDEM 2016a)	-Hazard Communication Manual (IDEM 2019)	
	-Compliance with Indiana boating safety requirements	-State of Indiana Boating Safety Requirements (U.S. PS 2017) and the DNR approved online Boating Safety Course	-Staff lacking 2 years field experience require accompaniment in the field by WAPB staff meeting the boating safety requirements
Field crew chief	-DNR issued scientific collectors permit		-At least one staff member on a field crew must obtain a permit

A.9. Documents and Records

IDEM QA staff post and maintain the most up-to-date versions of each agency QAPP and SOP in the SharePoint IDEM QA Library. All program managers direct staff participating in data operations or QAPP implementation to the IDEM QA Library. Also, the most up-to-date versions of all active agencywide and program SOPs documenting QAPP activities are available through the agency extranet page links, Standards, Policies, and Mailcodes, under Standard Operating Procedures (SOPs) links to the IDEM QA Library. Table 2 contains Key QAPP Individuals contact information.

A.9.1. The QAPP Report

Table 15 contains information associated with implementation of the QAPP:

- The QAPP for a completed project, covering work performed under the QAPP, is stored in the IDEM QA library archives.
- SOPs referenced in the QAPP are similarly stored. Current or future interested parties may contact the appropriate IDEM program area QAM or the IDEM QAM for date specific copies of the QAPP or any referenced SOPs.
- All completed forms generated during implementation of the data operation are cataloged in a QAPP, or data report.

Table 15 Records Associated with the 2022 Fish Tissue Contaminants Monitoring

Record Type	Where Records are Stored
Completed project QAPP	S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\Sampling Plans\2022
Sample collection forms	AIMS database
Field logs	S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\ SMPLELOG\2022
Field recon forms	AIMS database
Chain of custody forms	S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\ SMPLELOG\2022
EDI file from laboratory	S:\IGCN\OWQ\AIMS\EDIFiles\EnChem\2022
Related laboratory contracts	S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\ RFP\2021
Laboratory reports	S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\ SMPLELOG\2022
QA reports	S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\SMPLELOG\2022

A.9.2. Field Activities

Attachment 1 contains a copy of the Field Record for Biological Tissue Contaminants Monitoring Program. Scan completed field sheets and save as an attachment to the project in AIMS. Blank field sheets are on the IDEM SharePoint site. QA staff audit field data reduction, validation, and reporting procedures as a component of performance audits described in Surface Water QAPP Section C1.1, WAPB Field Performance and System Audits.

A.9.3. Laboratory Activities

IDEM's OWQ receives the analytical results from Pace. Per the Surface Water QAPP (2017a), the data is subject to the Laboratory Reporting Requirements including receipt of data in the electronic data interface specified in Appendix I of the Surface Water QAPP (IDEM 2017a). Pace submits a laboratory report in electronic portable document format (PDF) format for each batch of samples (sample set) which consists of Contract Laboratory Chain of Custody Form (Attachment 2), spreadsheets of results, and the QC report in accordance with the contract requirements. In addition, Pace submits an electronic data import (EDI) file containing laboratory data and lab QC for each sample set. The EDI file must comply with the Surface Water QAPP (IDEM 2017a, Appendix I). WAPB uploads the EDI files into the AIMS database. Data results in the laboratory reports shall meet requirements of Surface Water QAPP (IDEM 2017a, pp. 182-183) DQA Level 4. Submit reports to the Technical and Logistical Services Section for review. Section D.3.1 contains additional information.

A.9.4. QA Records and Reports

The IDEM principal project investigator ensures the appropriate project staff have the most current approved version of the QAPP. Keep QA, project, and site managers up to date on any revisions and edits made to the QAPP during the term of the project. The data report package shall include field logs available in hard copy and electronic formats. As with other project reports, store any QA records or reports generated in electronic format on the IDEM server shared drive (S Drive).

A.9.5. Retention Time and Location of Records and Reports

Retain all hard copy files of data and reports, for a minimum of three years, in accordance with the State of Indiana Records Retention Policy (General State of Indiana Schedule and the IDEM specific schedule). Maintain hard copy records at the IDEM Shadeland office currently located at 2525 N Shadeland Avenue, Indianapolis, IN 46219. Store an electronic copy of all data files on the IDEM server shared drive (S Drive) in the 2022 project folder (S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\SMPLELOG\2022) for a period of not less than three years after the conclusion of the project.

B. Data Generation and Acquisition

The elements of B. Data Generation and Acquisition address all aspects of project design and implementation. Implementation of the elements ensures employment and proper documentation of appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities.

B.1. Sampling Process Design

The design of site selection captures profiles of major rivers and tributaries located within the East Fork White River and Great Miami River basins. Selected sites include historical sites for trend analysis and new site locations to increase information availability in the basins. Targets are larger tributaries to ensure the collection of filletable size fish. The number of sites and the samples collected from each site are highly variable and based on availability of WAPB resources and funding for the laboratory service contract. No collection of field duplicates nor carrying of field blanks will occur during the fish tissue sampling and sample preparation processes. The site selection process criteria:

- Historical sampling locations
- Location in relation to municipalities
- Current FCA status
- New locations of interest with no previous sampling
- Public access locations
- Rivers and streams having a stream order of 2 or greater
- Known contaminated areas
- Sampling requests by other programs within and external to IDEM
- Special studies

The Fish Tissue Contaminants Monitoring program follows a five-year basin rotation design. The rotating basin approach facilitates a more comprehensive estimation of an impairment's extent within the basin. The number of sites and the samples collected from each site are highly variable and based on resources and funds, Surface Water QAPP (IDEM 2017a, p. 73). Sampling may also occur in watersheds outside the targeted basins to support IDEM ALUS assessment, or other agency programs. Other targeted locations may include special studies for other program areas. In addition, WAPB accepts samples collected during IDNR DFW study projects. The agency partnership increases sampling efficiency, while also reducing the stress on biological communities caused by multiple sampling events on the same waterbody. This includes samples from natural lakes, streams, or Indiana waters of Lake Michigan. The locations may not necessarily be in the target basin of the 2017 – 2021 WQMS (IDEM 2017b). To handle and process the fish, IDNR staff training includes the U.S EPA guidance (EPA 2000), the Sport Fish Advisory Protocols (Anderson et. al. 1993), the IDEM Fish Community Field Collection Procedures (IDEM 2018b), and the procedures described in this work plan.

Sampling Design and Rationale, also references A.6.1. and A.7.

Table 16 Sample Schedule and Characteristics

Sampling schedule	Fish tissue collections can occur year-round. Although the most desirable sampling period is from late summer to early fall (i.e., August through October). For the study, collect samples from August to November. Many species lipid content, which is a reservoir for many lipophilic bioaccumulating organic pollutants, is generally highest during this period. Also, water levels are typically lower during this time, thus simplifying collection procedures (EPA 2000).
Sampling frequency	One sampling event per site
Constituent to be sampled	Lipids, moisture, total PCBs, metals, pesticides, PFAS, PAHs
Sampling matrix	Fish tissue
Sampling procedure	Attachment C
Sample volume	Examine fish collected and select a predetermined number of samples for the site, generally between three and five samples. One to 12 fish of the same species may comprise a sample, depending on size. For total lengths, the preferred length difference between the largest and smallest is 90% of largest individuals of any composite sample. To obtain an adequate composite sample, a minimum difference in lengths as low as 75% is tolerable.
Preservation measures	Place samples in the dry ice chest and cover with dry ice for tissue preservation. Upon return to the office, place all processed tissue samples in the chest style analytical-grade freezer located in the IDEM WAPB laboratory or the upright commercial-grade freezer, located in building 41. Once prepared for individual or composite fish tissue samples, store at approximately -80°C for long term storage and -26°C for temporary storage in WAPB laboratory room 124 and building 41 laboratory freezers.
Container size	Drain excess water and double wrap the fillets in clean aluminum foil to make a package. For whole fish, all individual fish of a composite sample should be double wrapped together if possible.
Maximum holding time	IDEM requires analysis and reporting to occur within 90 days from the initial shipping date.

B.2. Sampling Methods

Gather the required samples using SOPs or standard scientific methodologies. Sample containers, preservatives, and maximum holding times must comply with the requirements of the applicable laboratory test method.

Table 17 Sampling SOPs or Standard Scientific Methodologies

Tables 17 through 20 contain numerous variables of user's interest for each method or SOP.

Method or SOP #[6]	Name of Method or SOP	Doc Version Number	Document Location
B-001-OWQ-WAP-XXX-15-T-R0	Global Positions System (GPS) Data Creation	R0	Global Positioning System Data Creation B-001-OWQ-WAP-XXX-15-T-R0.docx
S-004-OWQ-WAP-TL-20-T-R0	EDI Import to AIMS II	R0	EDI Import to AIMS II S-004-OWQ-WAP-TL-20-T-R0.docx
CSP2C01	Principles and Techniques of Electrofishing	NA	https://www.fws.gov/training/CSP2C01-principles-and-techniques-of-electrofishing-online
Sample Collection Procedure	Sample Collection Procedure	NA	Attachment 3
EPA Guidance Document	Guidance for Assessing Chemical Contaminant	Volume 1	https://www.epa.gov/sites/default/files/2015-06/documents/volume1.pdf

Table 18 Sampling SOPs or Standard Scientific Methodologies History and Related Information

Method or SOP # (Table 17 continuation)	Method or SOP Source	Date Approved
B-001-OWQ-WAP-XXX-15-T-R0	IDEM	2015
S-004-OWQ-WAP-TL-20-T-R0	IDEM	2020
CSP2C01	U.S. FWS	2018
Sample Collection Procedure	IDEM	2021
EPA Guidance Document	U.S. EPA	2000

Table 19 Sampling SOPs or Standard Scientific Methodologies, Related Details

Method or SOP # (Table 17 continuation)	Equipment Requiring Decontamination	Decontamination Process	Method of Decontamination Product Disposal
B-001-OWQ-WAP-XXX-15-T-R0	NA	NA	NA
S-004-OWQ-WAP-TL-20-T-R0	NA	NA	NA
CSP2C01	Watercraft, anodes, cathodes, nets, electrofishing gloves, PPE	Spray with 2% bleach solution	Safe to pour down the drain
Sample Collection Procedure	Knives, cutting boards, scalers, buckets, scale, measuring board, table	Wash equipment with Alconox	Safe to pour down the drain
EPA Guidance Document	Watercraft, anodes, cathodes, nets, electrofishing gloves, PPE	Spray with 2% bleach solution	Safe to pour down the drain

Table 20 Sampling SOPs or Standard Scientific Methodologies; Sampling Details

Method or SOP # (Table 17 continuation)	Sample Volume	Sample Preservation Type	Holding Time to Analysis
B-001-OWQ-WAP-XXX-15-T-R0	NA	NA	NA
S-004-OWQ-WAP-TL-20-T-R0	NA	NA	NA
CSP2C01	NA	NA	NA
Sample Collection Procedure	100 grams tissue material	Ice in the field and solid state at <32 degrees Celsius in the laboratory	1 year
EPA Guidance Document	200 grams tissue material	Ice in the field and solid state at <32 degrees Celsius in the laboratory	1 year

Table 21 Types of Samples Collected

Constituents	Type of Samples	Number of Samples	Frequency of Sampling	Type and Number of QC Samples[11]
Fish Tissue	Composite	TBD	1 sampling event per site	1 per 20

[11]The general rule is that 10 percent of all samples should be QC samples.

If a failure, disruption, or other breakdown occurs during the implementation of the sampling plan take corrective action. Any technical staff may identify a nonconformity. Once identified, the individual section chief, project officer, or QAO is responsible for corrective action for the one or more programs within their responsibility. The section chief, project officer, or QAO is responsible for documenting the nonconformity, working with relevant staff members to develop corrective actions, and notifying the QAM of corrective action progress. Depending on the nonconformity and associated corrective actions either the section chief or the QAO approves the final corrective action.

B.3. Sample Handling and Custody

Chain of custody is the chronological documentation or paper trail, showing the seizure, custody, control, transfer, analysis, and disposition of physical or electronic evidence. To accomplish full documentation, keep a combination of field and laboratory records demonstrating possession and transfer of custody.

WAPB requires each laboratory performing analytical tests to provide copies of SOPs upon request. Confirm availability of laboratory SOPs through laboratory proposal review and onsite audit during the RFP process and annually thereafter. Require written SOPs for all test methods and standard procedures including sample preparation and cleanup methods, if separate from the determinative SOP; determinative test methods; initial and continuing calibrations and frequencies; and confirmatory methods. A.7.6. Table 13 lists the RLs and acceptable U.S. EPA analytical test methods for each analyte.

B.3. discusses procedures for chain of custody, laboratory activities, and final evidence files.

Tables 22 through 25 contain the requirements for sample handling and custody in the field, transport, and laboratory.

Table 22 Sample Handling in the Field

Sample Collection Location	Sample Constituent of Concern	Container Type and Size	Package Temperature or Special Condition
All	All	48-quart cooler	Buried in wet ice

Table 23 Sample Transport Details

Carrier	Means of Transport	Allowable Time from Carrier Pick-up to Lab	Days of the Week when Shipping is Unavailable
Pace supplies a commercial carrier to transport samples directly to the laboratory. Carrier is Special Dispatch, Inc.	Carrier vans	24 hours	None

Table 24 Sample Handling in the Laboratory

Lab Location	Lab Contact Info	Time Span Lab is Open for Sample Receipt	Sample Storage – Where and How, Until Analysis
Pace – GB	Tod Noltemeyer – tod.noltemeyer@pacelabs.com	Monday through Wednesday	The laboratories store all samples at a maximum temperature of -10°C

The laboratory will preserve all samples, as agreed in the analytical services contract, until IDEM chemists and WAPB QAO approve all sample data for the sampling year.

Attachment 3 contains agency or program area SOPs which include additional information on sample package handling.

The analytical laboratory provides laboratory chain of custody forms. Forms are available at Forms: S:\IGCN\OWQ\WSP\OWM\Biological Studies\Fish tissue and Sediments\SMPLELOG\2022

The laboratory contact for information on sample receipt, storage, handling, and preparation is Tod Noltemeyer, Tod.Noltemeyer@pacelabs.com.

Table 25 Sample Handling System

Responsible person or laboratory group

Sample Collection, Packaging, and Shipment
Sample collection: Tim Fields
Sample packaging: Tim Fields
Coordination of shipment: Tim Fields; Tod. Noltemeyer – Pace
Type of shipment: Courier – Kristi Howard or Tammy Sipes for Special Dispatch, Inc.
Sample Receipt and Analysis

Responsible organization: Pace
Sample receipt: Pace
Sample custody and storage: Pace
Sample preparation: Pace
Sample determinative analysis: Pace
Sample Archiving
Field sample storage: Tim Fields
Sample extract or digestate Storage: Pace
Sample Disposal
Responsible organization: Pace
Responsible staff: Pace

B.4. Analytical Methods

Table 10 identifies analytical methods by number, date, and regulatory citation.

The contract laboratory QA Manual describes analytical methods-related variables and may be proprietary.

B.5. Quality Controls

A.7.1. Table 11 identify the needed field sampling QC activities to follow. Table 28 contains a list of major equipment used for field measurement. Do not collect QC samples in the field.

The WAPB's expectation for each contract laboratory providing analytical services is to meet the statement of work and technical specifications of the IDEM RFP in compliance with contract requirements. Find laboratory QC checks for biological samples in the IDEM RFP Technical Specifications (Appendix H6 of IDEM RFP 21-66919 (IDEM 2021)). Table 27 summarizes the laboratory QC checks for test method procedures. Refer to individual test methods for specific requirements.

Table 26 Quality Controls for Laboratory Analysis

Sample Site ID #	Matrix	Analytical Parameter	Analytical Method or SOP Reference
All	Tissue	Metals	6020A
All	Tissue	Hg	1631E
All	Tissue	Pesticides	8270D, 8081B
All	Tissue	PCBs	1668B, 8270D, 8082A
All	Tissue	PFAS	DoD QSM 5.3, WDNR PFAS Guidance, DoD Guidance for PFAS Analysis in Biota, and USEPA Method 537.1
All	Tissue	PAHs	8270D

Sample Site ID #	Matrix	Analytical Parameter	Analytical Method or SOP Reference
All	Tissue	PBDEs	1614A
All	Tissue	Dioxins and Furans	1613

Table 27 Quality Controls for Laboratory Analysis

Parameters	Calibration[12] or Verification	Sample Lab Duplicate	MS/MSD[13]	LCS	Method Blank	External QC Standard	Surrogate	Serial Dilution	Interference Check
Metals	1/10	1/20	1/20	1/20	1/run	1/20	n/a	1/run w/dilution	2/run
Pesticides	every day	1/20	1/10	1/10	1/20 or 1/extract batch	4/day	every sample	n/a	n/a
PCBs	every day	1/20	1/10	1/10	1/20 or 1/extract batch	4/day	every sample	n/a	n/a
PFAS	every day	1/20	1/10	1/10	1/20 or 1/extract batch	4/day	every sample	n/a	n/a
PAHs	every day	1/20	1/10	1/10	1/20 or 1/extract batch	4/day	every sample	n/a	n/a
PBDEs	every day	1/20	1/10	1/10	1/20 or 1/extract batch	4/day	every sample	n/a	n/a
Dioxins and Furans	every day	1/20	1/10	1/10	1/20 or 1/extract batch	4/day	every sample	n/a	n/a
General Chemistry	n/a	1/20	n/a	1/run	1/run	n/a	n/a	n/a	n/a

[12]Continuing calibration verification standards (CCVs) shall be run according to the test method or at the beginning and end of a run batch and at a rate of 5%, whichever is greater.
[13]Laboratories shall analyze MS/MSDs at a rate of 1 per batch or 5%, whichever is greater.

B.6. Instrument and Equipment Testing, Inspection, and Maintenance

All equipment receives a visual inspection on every day of use to ensure maintenance of crew safety and efficient sampling effort. Inspect, maintain, and test instruments and equipment for implementation of the data operation (Table 28).

Table 28 Equipment Testing, Inspection, and Maintenance

Equipment Type	Inspection	Maintenance	Frequency	Testing
Boat	Day of use	Maintenance or repair	As needed	Annually
Boat motor	Day of use	Maintenance of engine oil, lower gear lube, propellers, state of turn engine	Annually	Annually
Boat trailer	Day of use	Inspection, repack wheel bearings, check lights, bunks, and tires	Annually	Annually
Electroshock box	Day of use	Factory calibration	Every two years	Annually
Electroshock backpack	Day of use	Factory calibration	Every two years	Annually
Fire extinguisher	Day of use	Inspection	Annually	Annually
Generator	Day of use	Maintenance	Annually	Annually
GPS unit – Trimble Juno	Day of use	Update software	As new software becomes available	Annually
Weighing scale	Day of use	Calibration	Every two years	Every two years

OWQ requires each analytical laboratory, in accordance with IDEM RFP, to have preventive maintenance procedures with set frequencies for all analytical instruments and measurement equipment used in the performance of analytical services. The IDEM RFP Technical Specifications require each contract laboratory to have written SOPs demonstrating the contract laboratory's capability to provide the services requested. Preventive maintenance is an element of laboratory system audits, testing, and inspection.

B.7. Instrument and Equipment Calibration and Frequency

Measurement equipment require periodic calibration or standardization to reliably produce accurate results. IDEM requires contract labs to follow this QAPP and WAPB RFP 21-66919 (IDEM 2021). Both documents require a quality system which includes standards for calibration and corrective actions. In addition, IDEM may elect to request pertinent QA data, including calibration standards.

Contract laboratories (Pace) providing analytical services to the WAPB water quality monitoring programs must document calibration procedures and frequency in compliance with WAPB RFP 21-66919 (IDEM 2021). The requirements specify a QA system is in place and QA/QC data related to the project must be available to IDEM.

Table 29 Instrument and Equipment Calibration and Frequency

Equipment Type	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Responsible Staff
Weighing Scale	Coordinate with Weights and Measures	Every two years	Approval by IN Weights and Measures	WAPB Staff

B.8. Inspection and Acceptance of Critical Supplies

To reliably produce accurate results requires QA of consumable supplies, IDEM requires contract laboratories follow this QAPP and WAPB RFP 21-66919 (IDEM 2021). Both documents require a quality system which includes standards for consumables and corrective actions for nonconformities. In addition, IDEM may elect to request pertinent QA data, including inspection criteria for supplies, upon request.

No critical field elements require inspection or approval prior to the use for sample collection activities.

Contract laboratories (Pace), providing analytical services to the WAPB water quality monitoring programs, demonstrate proficiency through past performance and response to RFP 21-66919 (IDEM 2021). In addition, all contract laboratories must have a QA plan which includes acceptance criteria for consumables and supplies. The IDEM PI reviews invoices submitted from the contract laboratories for reasonableness, including monitoring for unwarranted or excessive usage of consumable supplies.

B.9. Nondirect Measurements

Pool historical IDEM fish tissue data collected in the target basins with 2022 data for FCA determinations. Keep the data in the WAPB AIMS II electronic database. The QAPP will not use any other existing data.

B.10. Data Management

The Indiana Office of Technology determines state hardware and software requirements outlined in Section 6 of the IDEM Quality Management Plan (IDEM 2018a). Section A.9. Documents and Records and Section D contain more detailed information.

Preserve records generated by the data operation as described in Section A.9. (Table 15).

Table 30 Mechanism for Avoiding Errors

Potential Data Errors	Mechanism for Avoiding Errors and Data Loss
Database uploads	Per **6.4.4. Data Security Standards,** of the U.S. EPA R5 approved IDEM 2018 Quality Management Plan (IDEM 2018a), the Indiana Office of Information Technology provides an Information Security Network which secures all IDEM information assets.

Potential Data Errors	Mechanism for Avoiding Errors and Data Loss
Hand-entered data	All data entered goes through two rounds of QC to minimize errors in the transcription process.
Lab reports	WAPB chemists review the data packages to ensure reports are complete and meet all DQOs.

C. Assessment and Oversight

IDEM's PI is ultimately responsible for conducting assessments and response actions ensuring the project is implemented in such a manner as to accomplish the project objectives. The WAPB operates a robust QA system, including a mechanism for performing system audits, and reporting and addressing observed nonconformities. The system also extends to laboratory contracts principally overseen by WAPB staff, such as with Pace.

WAPB conducts two kinds of audits verifying QC procedures are followed and the QA system is functioning effectively. The performance audit is an independent review of internal QC checks and procedures. The system audit, on the other hand, is an onsite review and evaluation of facilities, instrumentation, QC practices, data validation, and documentation practices. WAPB staff evaluate data quality after each sampling event to assess data usability. Field performance measurements include:

- Precision — RPD between field duplicate measurements
- Accuracy — %R of field references
- Completeness — % planned samples collected, analyzed, reported, and useable for each project

WAPB QA staff perform a system audit once a year before or at the beginning of the field season. Perform specific system audits throughout the field season on data collection and sampling procedures to ensure continuity of data acquisition and determine variability among staff. System audits include, but may not be limited to:

- Reviewing sampling work plans, including DQOs and target parameters
- Equipment calibration, maintenance, and frequency
- Field data collection procedures
- Sample collection and chain of custody procedures

Conduct field audits to ensure sampling activities adhere to approved SOPs. WAPB staff systematically conduct audits which include all WAPB staff engaged in field sampling activities. Staff trained in the associated sampling SOPs and in the processes related to conducting an audit, evaluate WAPB field staff involved with sample collection and preparation. Produce an evaluation report documenting each audit for review by field staff audited, as well as WAPB management. As a result of the audit process, communicate corrective actions to field staff which implement corrective action.

Audit analytical laboratory results for performance using QC checks. QA staff audit reported results, which include data deliverables, at 100% frequency. Review each sample set and determine data usability. Laboratory performance measurements include:

Precision	%R of MSs, LCS, or surrogates
Accuracy	% of samples delivered to the laboratory
Completeness	which are analyzed, reported, and
RPD of (LCS/LCSD) or (MS/MSD) pairs	useable for each project

QAO or designee performs laboratory system audits at the beginning of a laboratory contract and at least once a year during the contract. Report results to the WAPB QAO. The system audit includes any or all operational QC elements of the laboratory's QA system. Address all applicable elements and the laboratory contract requirements including, but not limited to, activities in Table 34.

Table 31 identifies the planned assessment activities to track implementation of the data operation to ensure the prescribed plan's implementation.

Table 31 Data Operation Tracking

Targeted Assessment Activities	Type of Planned Assessment[14] (What it will consist of)	Assessor[15]	Number of Assessments	Report Findings to?	Corrective Actions (CAs) Anticipated
Field performance and system audits	Sample collection and handling	WAPB program expert	1 per year	Field crew chief	Section C.1.
Contract laboratory performance and system audits	Sample handling; sample analysis, record keeping, preventative maintenance, proficiency testing, staff requirements, and training	Pace program expert	1 per year	PI	Section C.1.

[14]The assessment types may be supervisory surveillance, management systems reviews, readiness reviews, technical systems audits, audits of data quality, or DQAs.
[15]Assessors must be independent of the group with interest in the data operation.

C.1. Assessments and Response Actions

Any WAPB technical staff may identify and report a field or laboratory nonconformity. Once reported, the project PI is responsible for corrective action in concert with the pertinent WAPB section chief or QAO. The PI works with the section chief, QAO, or other pertinent staff to document the nonconformity, and then develop and implement corrective actions. Depending on the nonconformity and associated corrective actions, a WAPB section chief or the QAO may need to approve the final corrective action.

For field corrective actions, the field crew chief assigned to the sampling event is responsible for all field decisions, including corrective action. Bring any unusual or unexpected occurrence during data or sample collection to the attention of the crew chief. The crew chief decides the necessary immediate actions to take and the follow up actions, if any. The field crew chief has discretion on field corrective actions and documents the action upon return to the office. The section chief assigns a staff member to follow up and document any further required action.

If a failure, disruption, or other breakdown occurs in the laboratory analytical system take corrective action. Each analytical or contract laboratory must maintain a corrective action program as indicated in the Technical Specifications of IDEM Requests for Quotation, or RFP. The laboratory must document any corrective actions taken because of problems during the handling, preparation, analysis, or reporting of analytical data to the WAPB. Document corrective actions in the case narrative section of the report for each sample set. Problems indicating the laboratory QA system may be out of control will trigger a system audit by the QAO or a designee.

Laboratory corrective actions require each analytical or contract laboratory, conducting analyses for OWQ, to maintain a corrective action program as indicated in the technical specifications of WAPB RFP 21-66919 (IDEM 2021). The laboratory must document any resulting corrective actions taken for problems during the handling, preparation, analysis, or reporting of analytical data to the WAPB. Document corrective actions in the case narrative section of the report for each sample set. Problems, indicating the laboratory QA system may be out of control, trigger a system audit by the QAO or a designee.

Report significant nonconformities to the IDEM project PI within 14 days, in accordance with the contract. Once identified, the project PI is responsible for ensuring implementation of the corrective action. If the contractor and the IDEM PI cannot come to an agreement on corrective actions or project progress is irreparably harmed, IDEM may refuse payment or conduct other corrective actions through the contract agreement. Several clauses in the state of Indiana contract legal boilerplate language apply and are paraphrased:

- Substantial Performance – The contract is deemed to be substantially performed only when fully performed according to its terms and conditions and any written amendments or supplements.
- Termination for Default – The state may terminate the contract in whole or in part if the contractor fails to:
    - Correct or cure any breach of the contract.
    - Deliver the supplies or perform the services within the time specified in the contract or extension.
    - Make progress endangering performance of the contract.
    - Perform any other contract provisions.
- Waiver of Rights – In part, the contractor shall be liable to the state in accordance with applicable law for all damages to the state caused by the contractor’s negligent performance of any of the services furnished.
- Work Standards – The contractor shall apply the highest professional and technical guidelines and standards. Further, if the state becomes dissatisfied with the work product of or the working relationship with staff assigned to work on the contract, it may request in writing the replacement of any or all such staff.

Finally, in the event any problem is identified with QA, or any changes are necessary to the QAPP, make recommendations to the PI and QAM. Communicate any necessary changes to the project team.

C.2. Reports to Management

WAPB QAO submits QA reports, upon completion of the dataset data validation to the program manager (project PI). This ensures investigation and correction of problems arising during the sampling and analysis phases of the project. Each report addresses:

- Data assessment and qualification results since the last report.
- Field and laboratory audits performed since the last report.
- Significant QA system and QC task problems.
- Recommended solutions, and status of corrective actions.
- Status of the extent to which project DQOs are satisfied.

Bring problems arising during data assessment and qualification due to any contract laboratory or QA actions to the project PI's attention. The PI will work with other staff as necessary to determine whether immediate corrective action is required. Implement laboratory corrective actions according to the respective IDEM RFP and contract requirements.

The QAM, relevant WAPB section chief, project PI, any technical staff working on corrective actions, and QA staff receive copies of the progress reports when new developments arise. Store corrective actions progress reports along with the project correspondence in IDEM's Virtual File Cabinet which provides availability to any interested parties.

Table 32 Distribution of Assessment Reports and Corrective Actions

Assessment Report Recipient	Why Recipient is Receiving the Assessment Results
Targeted Monitoring Section Chief	Oversight of program
Project PI	Oversight of program and directly responsible for annual project
QA staff	Oversight of laboratory data

D. Determining Data Usability

Upon return of data packets from the laboratory after the data collection or generation phase of the project, WAPB staff performs data review, verification, and validation.

D.1. Data Verification

Data Review

The data review precedes evaluation (data verification, validation, and assessment) of this project and includes review of the items in Table 33.

Table 33 Data Review

Principal Actions, Steps, or Processes to Review Which Could Impact Data Quality	Documents or Forms to Review to Determine Deficiencies or Missing or Incomplete Data
Entering datasheets into AIMS	Field Record for Biological Tissue Contaminants Monitoring Program – Attachment 1
EDI review and import to AIMS per "EDI Import to AIMS II S-004-OWQ-WAP-TL-20-T-R0" and the AIMS User Guide.	MS Access used to export data to a MS Excel spreadsheet for further data validation and use in the QA Review Report.
QA Review of each contract lab report	A MS Word QA review report is created for each lab report. A checklist of items reviewed are provided in each QA report. Deficiencies are communicated with the lab project manager for corrections if possible.

The data verification process for this data operation includes review of the items in Table 34.

Table 34 Data Verification[16]

Factors or Characteristics to use for Verification	Specifications to Verify Performance	How to Note Errors
Two rounds of QC for datasheet entry into database	100% data transcription accuracy	Errors are corrected in the AIMS database

[16]Additional information covered in the AIMS User Guide (IDEM 2022) and EDI Import to AIMS II S-004-OWQ-WAP-TL-20-T-R0 (IDEM 2020d).

Table 35 Data Verifiers

Staff Assigned to Verify Data	Other Roles They May Have with the Project
PI and other technical WAPB field staff	Sample collection and oversight
WAPB QA staff	Workplan review

D.2. Verification and Validation Methods

Data validation is the process of qualifying analytical or measurement data on the performance of the field and laboratory QC measures incorporated into the sampling and analysis procedures.

WAPB field staff apply several levels of verification to the project data. Upon field data capture, one staff takes the observation and reads the result aloud to the other staff, who records the data. The recorder then verifies the result is correctly recorded by reading the value aloud back to the observer.

Prior to entering data into AIMS II database, run a completeness check on the field data sheets. The check also verifies filling of all applicable fields and legibility to both field staff conducting observations. Finally, double key the data into the AIMS II database from the original field data sheets. Then resolve any discrepancies. In addition, data collection in the field is subject to the QC checks described in B.5 and the calibration checks described in B.7.

Analytical laboratories are responsible for validating data from samples analyzed in the laboratory. WAPB QA staff review laboratory validation results and perform an additional level of data validation for 100% of the data received from a contract laboratory. Conduct this independent validation based on data flags and other QA/QC information obtained from the contract laboratories.

Data reporting is the detailed description of the data deliverables used to completely document the calibration, analysis, QC measures, and calculations. Only report data acquired in the field after the responsible technical staff perform reduction and validation. Report WAPB contract laboratory analyses data, after the laboratory reports the data by reviewing, assessing for QA, and determining the data usability identified by assigning one of four DQA Levels to the data. A.9. contains a list of project records and documents.

D.3. Laboratory Results for Data Validation Process

In lieu of the data validation table identifying the analytes to validate and the DQIs to use to compare how analyte results aligned with measurement quality objectives, as would be done using the data quality objective process. The Fish Contaminants Monitoring Program uses the following data qualifiers to establish data usability.

Table 36 Data Validators

Staff Assigned to Validate the Data	How They are Independent of the Project
WAPB Chemists	WAPB chemists do not participate in planning, sampling, or data interpretation activities for this project.

QA staff review and qualify laboratory data by using U.S. EPA CLP guidance for data validation. Data flags consist of two parts, a cause (U, Q, D, B, or H) and an action (R or J). For WAPB projects, assign data qualifiers and flags and enter them into AIMS II. Use flags for both the individual test result and QA/QC Review Reports. Table 37 lists data qualifiers and Table 38 lists data quality flags for analytical results.

Table 37 WAPB Data Qualifiers

Qualifier	Description
R	**Rejected.** Result is not acceptable for use in decision-making processes.
J	**Estimated.** The use of the result in decision-making processes are determined on a case-by-case basis.
UJ	**Estimated (Between MDL and RL).** The parameter result is above the MDL but below the Laboratory RL and are estimates.

Table 38 WAPB Data Flags

Flags	Description
Q	**QC Checks or Criteria.** One or more of the QC checks or criteria are out of control
D	**RPD for Duplicates.** The RPD for a parameter result is outside the acceptable control limits. Consider the parameter an estimate or rejected on the basis listed below: 1) If either the sample or duplicate value is less than the RL and the other value exceeds 5 times the method detection limit (MDL), then the sample result is an estimate. 2) If the RPD is outside the established control limits (max. RPD) but below two times the established control limits (max. RPD), then the sample result is an estimate. 3) If the RPD is twice the established control limits (max. RPD) or greater, then reject the sample result.
H	**Holding Time.** The performance of the analysis for this parameter is out of the holding time. Estimate or reject the results on the basis listed below: 1) If performance of the analysis is between the holding time limit and 1.5 times the holding time limit, estimate the result. 2) If performance of the analysis is outside 1.5 times the holding time limit, reject the result.
B	**Blank Contamination** This parameter is found in a field or a lab blank. Whether to accept, estimate, or reject the result is based upon the level of contamination listed below: If the result of the sample **is greater than the RL** but **less than five times** the blank contamination, **reject** the result. 1) If **the result of the sample is** between five and ten times **the blank contamination,** estimate **the result**. **2) If the result of the sample is less than the RL or greater than ten times the blank contamination, accept the result**.

D.4. Reconciliation with User Requirements

DQA is the process of determining the scientific and statistical quality of data collected to satisfy the project DQOs. Assess field data and laboratory results for usability regarding each specific project DQO (A.7; Section D.1 Data Verification; D.2. Verification and Validation; C.1. Assessments and Response Actions; C.2. Reports to Management; and Section C.). On performance and system audits describe the procedures used to produce data and to evaluate the data production system's effectiveness.

Report data from WAPB contract laboratory analyses after the laboratory reports the data are reviewed, assessed for QA, and the data usability determined and assigned one of four DQA Levels to the data.

DQA Level 1 **Screening Data** The results are usually generated onsite with no QC checks. This category includes analytical results with no QC checks, precision or accuracy information, or detection limit calculations. Use is primarily onsite data for presurvey and for preliminary rapid assessment.

DQA Level 2 **Field Analysis Data** Data is recorded in the field or laboratory on calibrated or standardized equipment. Field duplicates are measured on a regular periodic basis. Calculations may be done in the field or later at the office. The category includes analytical results with limited QC checks. Detection limits and ranges are set for each analysis. The QC checks information for field or laboratory results and are useable for estimating precision, accuracy, and completeness for the project. Data from this category are used independently for rapid assessment and preliminary decisions.

DQA Level 3 **Laboratory Analytical Data** Analytical results include QC check samples for each batch of samples from which precision, accuracy, and completeness can be determined. Method detection limits have been determined using 40 CFR Part 136 Appendix B. Additionally, all reporting information required in the laboratory contract, and in the Surface Water QAPP, especially Table A9-1, are included in the analytical data reports. Raw data, chromatograms, spectrograms, and bench sheets are not included as part of the analytical report but are maintained by the contract laboratory for easy retrieval and review upon request from WAPB. Data can be elevated from DQA Level 3 to DQA Level 4 by inclusion of this information in the data report and the QC data are reported using U.S. EPA required CLP forms or CLP format. Data falling under this category are considered as complete, legally defensible, and used for regulatory decisions.

DQA Level 4 **Enforcement Data** Analytical results mostly meet the CLP data analysis, contract-required quantification limit, and validation procedures. QC data are reported on CLP forms or CLP format. Raw data, chromatograms, spectrograms, and bench sheets are included as part of the analytical report. Additionally, all reporting information required in the laboratory contract, and in the Surface Water QAPP, especially Table A9-1 (2017a), are included in the analytical data reports. Data falling under this category are considered as complete, legally quantitative in value, and used for regulatory decisions.

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* All hyperlinks were current as of 05 Oct 2022. References not available via hyperlink are stored by the WAPB on the agency shared (S:) drive and backed up by the Indiana Office of Technology. Please contact the branch by telephone at (317) 308-3173 for further information.

F. Attachments

The blank field forms, checklists, and other materials used by staff implementing the QAPP include:

Attachment 1 Field Record for Biological Tissue Contaminants Monitoring Program

Attachment 2 Contract Laboratory Chain of Custody Form

Attachment 3 Sample Collection Procedure

Attachment 4 List of Acronyms

Attachment 5 Definitions

Attachment 1 Field Record for Biological Tissue Contaminants Monitoring Program

Indiana Department of Environmental Management
Office of Water Quality - Watershed Assessment and Planning Branch

Field Record for Biological Tissue Contaminant Monitoring Program

Site ID:________________________ Sampling Date and Time:________________________
Sample ID:________________________ (mm/dd/yyyy) (24hr clock)

SITE LOCATION
Waterbody Name:________________________
County________________________Fipscode____________Lat./Long.:________________________
Location:________________________
Waterbody Type: RIVER LAKE RESERVOIR WETLAND
Site Description:________________________

____
Collection Method:________________________
Collector's Name(s):________________________
Agency:________________________Phone:(____) ________________________

FISH (or other organism) COLLECTED

Composite Sample #:________________________Number of Individuals:__________ Lab ID ________________
Species Name:________________________
Sample Preparation: SKIN-ON SCALELESS SKIN-OFF WHOLE OTHER:________________

Fish#	Length(mm)	Weight(gm)	Sex(M,F)	Fish#	Length(mm)	Weight(gm)	Sex(M,F)
001				007			
002				008			
003				009			
004				010			
005				011			
006				012			

(min length/max length)x 100 = _________% **Composite mean length** __________ **mm**
(min wt/max wt)x 100= _________% **Composite mean weight**__________ **gm**
Notes (e.g., DELT anomalies)________________________

____

Composite Sample #:________________________Number of Individuals:__________ Lab ID ________________
Species Name:________________________
Sample Preparation: SKIN-ON SCALELESS SKIN-OFF WHOLE OTHER:________________

Fish#	Length(mm)	Weight(gm)	Sex(M,F)	Fish#	Length(mm)	Weight(gm)	Sex(M,F)
001				007			
002				008			
003				009			
004				010			
005				011			
006				012			

(min length/max length)x 100 = _________% **Composite mean length** __________ **mm**
(min wt/max wt)x 100= _________% **Composite mean weight**__________ **gm**
Notes (e.g., DELT anomalies)________________________

Attachment 2 Chain of Custody / Analytical Request Document

Pace Analytical™
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A **Required** Client Information:		Section B **Required** Project Information:	Section C Invoice Information:
Company:		Report To:	Attention:
Address:		Copy To:	Company Name:
			Address:
Email To:		Purchase Order No.:	Pace Quote Reference:
Phone:	Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:		Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ ROUND WATER D☐ NKING WATER
☐ UST ☐ RA OTHI☐

Site Location
STATE:

Requested Analysis Filtered (Y/N)

Section D **Required** Client Information

Valid Matrix Codes MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

ITEM #	SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	TIME	COMPOSITE END/GRAB DATE	TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Y/N ↓ Analysis Test ↓													Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1																																
2																																
3																																
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE	
PRINT Name of SAMPLER:	
SIGNATURE of SAMPLER:	DATE Signed (MM/DD/YY):

Attachment 3 Sample Collection Procedure

The following is a general summary of procedures for collection, preparation, and preservation of all fish tissue samples collected for contaminant analysis.

Step 1. Sample the fish community using electrofishing gear following sampling equipment SOPs (U.S. FWS 1998, IDEM 1992a). In some cases, lakes will be sampled using gill nets (IDEM 1992a).

Step 2. Examine fish collected and select the predetermined number of samples for the site (generally between three and five samples). A sample may be comprised of 1-12 fish of the same species, depending on size. The preferred total lengths of the smallest and largest individuals of any composite sample should be within 90% of each other. Total lengths as low as 75% will be tolerated in order to obtain an adequate composite sample.

Samples collected from a site preferably consist of: (1) species collected historically from the site, (2) different size classes of predator species, or (3) Common Carp. In addition, species and size classes listed in Indiana Fish Consumption Advisories, should be targeted to support updates to the advisory’s information.

Representative samples from sites, with no historical species samples, should target a bottom feeder species (e.g., Common Carp), a predator game fish species (e.g., Largemouth Bass, Channel Catfish, or Flathead Catfish), and a panfish species commonly consumed by humans (e.g., sunfish species, crappie species, Rock Bass).

In addition, samples from sites targeted based on potential or known contamination, should include fish species with small home ranges to ensure the data results are indicative of the conditions in the stream at the site. All other fish captured during the sampling effort should be released back into the water.

Step 3. Fish selected as samples should be placed in a cooler and euthanized by covering with ice to prevent decomposition prior to sample processing. Using a piece of label tape, tag the outside of the cooler with site information, including the sample number (AB Number), site location, date, waterbody, and county information.

Step 4. Determine whether samples are going to be processed in the field or the laboratory (e.g., overnight travel necessitates field processing)?

Step 5. In the laboratory, place fish from one site into the laboratory sink, and sort fish into composite samples by matching total lengths for each species.

- If samples are processed in the field, fish species should be sorted in the cooler by length, as described above.

Step 6. Complete the site ID, event ID, date and time, and site location information on the Field Record for Biological Tissue Contaminant Monitoring Program form (Appendix 1).

Step 7. In the FISH (or other organism) COLLECTED section of the Field Record for Biological Tissue Contaminant Monitoring Program form (Appendix 1), fill out the composite sample number (AB number-taxon ID-species sample number e.g., AB24997-043-01), the number of fish in the composite sample, the species name, and the preparation method (whole fish, skin-on scaleless fillets, skin-on scales-on fillets, skin-off fillets, beheaded and gutted, etc.).

Step 8. Measure and record the total length in millimeters (to the nearest millimeter) and weight in grams (to the nearest gram) of each fish within a composite sample. Also note any individual fish anomalies, such as deformities, eroded fins, lesions, or tumors (DELTs).

Step 9. Are there more composite samples?

- Yes, repeat Step 8.
- No, proceed to Step 10.

Step 10. Prepare filleting stations by setting out dedicated food grade plastic low density polyethylene cutting boards or covering workstation with clean aluminum foil. Set out the fish scale removers, scalpel, fish skinning pliers, and stainless-steel fillet knives used for filleting. Sharpen knives as necessary to reduce ragged cuts and slippage, which often occurs when dull knives require increased pressure during cutting. Staff should wear new nitrile or latex gloves for each site in order to minimize the potential of contaminants transferring from hands to tissue samples.

Step 11. Fish fillet samples will be prepared as **skin-on scaleless** fillets, for scaled species and **skin-off** fillets, for scaleless species (Anderson et. al. 1993). Remove scales from both sides of the fish, back, and belly areas, if necessary. Fillet the fish so as to include all flesh from the back of the head to the tail and from the top of the back down to and including the belly flap area of the fish. Fins, tail, head, viscera, and major bones are to be removed. If sampling at a historically contaminated site or investigating possible source of contamination and the fish sample is to be analyzed whole, the composite sample consisting of these fish does not have to be filleted. Place each fillet from the composite sample into the same stainless-steel bucket containing tap water, or ambient water, if processing in the field. The water in the bucket is used to rinse off any soil, scales, or mucous adhering to the sample.

Step 12. Drain excess water and **double wrap** the fillets in clean aluminum foil to make a package. For whole fish, all individual fish of a composite sample should be double wrapped together if possible. Using a blunt tip black permanent marker, label the outside of the package with the following information:

- Sample number (e.g., AB49005-121-01)
- Number of individuals in the sample
- Species of fish (common name)
- Sample preparation (e.g., scaleless, skin-on fillets; scaleless, skin-off fillets; scaleless, whole fish)
- Waterbody name
- County
- Location description
- Date of collection (format: 01-March-2015)
- Package count if more than one package per sample (e.g., 1 of 2, 2 of 2)

Example

AB13201-043-01

3-Common Carp, skin-on fillets, scaleless

East Fork White River

Martin Co.

Shoals

21 Aug 2017

Step 13. Each foil package will be placed individually into an appropriate size zip-lock type bag or other food grade plastic bag and sealed. Using a blunt tip black permanent marker, label the outside of the package with the following information:

- Sample number (e.g., AB49005-121-01)
- Package count if more than one package per sample (e.g., 1 of 2, 2 of 2)

Step 14. Tissue samples need to be frozen as soon as possible. Is the processing taking place in the field?

- If yes, it may be necessary for field staff to bring dry ice for overnight field trips. Use a dry ice chest with dry ice for storage of the fish tissue. Dry ice will be provided by the contracted analytical services laboratory for the project. However, the laboratory needs to be notified at least a week in advance so the contract laboratory can make arrangements for dry ice delivery to the Western Select Building’s office location before staff depart for the field. Place the double wrapped and bagged samples in the dry ice chest underneath the dry ice for preservation of the tissue. Upon return to the office, place all processed tissue samples in the chest style analytical-grade freezer located in the IDEM WAPB laboratory or the upright commercial-grade freezer, located in building 41.

- If no, place double wrapped and bagged samples in the chest style analytical-grade freezer located in the IDEM WAPB laboratory room 124 or the upright commercial-grade freezer located in building 41 of the Western Select Building.

Step 15. Are there more composite samples to be processed?

- If yes, proceed to Step 11.
- If no, proceed to Step 16.

Step 16. Wash all stainless-steel buckets, stainless steel filleting knives, scalers, sharpening steels, mass scales, measuring boards, cutting boards, and coolers with ALCONOX® detergent (laboratory quality environmental cleaning product), and a scrub brush. Then thoroughly rinse. Wipe down countertops with an ALCONOX® soaked rag. Throw away used nitrile or latex gloves.

Step 17. Are there more sites to be processed?

- If yes, proceed to Step 5.
- If no, proceed to Step 18.

Step 18. Handling cleaned equipment:

- If processing samples in the laboratory, put all cleaned processing equipment on the drying racks or in the storage bins with lids. Clean out the sink, mop the floor, and take trash bags full of fish carcasses to the dumpster. Leave the laboratory in the condition found so as not to disrupt the function of other staff programs.
- If processing samples in the field, sample processing equipment will be put into the storage bins and placed into the truck. Leave the processing area, usually near the boat ramp or nearshore, in the condition found as much as possible. Pick up as many fish scales as possible. Do not leave fish waste (i.e., entrails, filleted fish carcasses) or trash behind.

Step 19. Field sampling crew leader shall complete any missing information on the Field Record for Biological Tissue Contaminants Monitoring Program form (Appendix 1); calculate the composite length and weight; and the percent ranges for length and weight on all field data forms. Also, the crew leader should log all processed samples into the Nalgene® field sample logbook.

Step 20. The Field Record for Biological Tissue Contaminants Monitoring Program form (Appendix 1) is ready for entry into the AIMS II database.

Attachment 4 List of Acronyms

AIMS	Assessment Information Management System
ALUS	Aquatic Life Use Support
CAS	Chemical Abstract Service
CLP	Contract Laboratory Program
CRQL	Contract-Required Quantification Limit
CWA	Clean Water Act
DFW	Division of Fish and Wildlife
DQA	Data Quality Assessment
DQO	Data Quality Objective
FCA	Fish Consumption Advisory
IAC	Indiana Administrative Code
IDNR	Indiana Department of Natural Resources
IDOH	Indiana Department of Health
IUPAC	International Union of Pure and Applied Chemistry
OWQ	Office of Water Quality
PCB	Polychlorinated biphenyl
PI	Principal Investigator
QA	Quality Assurance
QA/QC	Quality Assurance and Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
RFP	Request for Proposals
SOP	Standard Operating Procedure
U.S. EPA	United States Environmental Protection Agency
WAPB	Watershed Assessment and Planning Branch
WQMS	Indiana Water Quality Monitoring Strategy
WW	Wet Weight

Attachment 5 Definitions

Bioaccumulate	To accumulate a substance, such as a toxic chemical, in various tissues of a living organism.
Cojurisdictional waters	According to 312 IAC 5-2-47, the Indiana waters of Lake Michigan, the Ohio River, the Wabash River (where it forms the Indiana-Illinois border), and the Great Miami River.
Contaminant	A biological, chemical, physical, or radiological substance which, in sufficient concentration, can adversely affect living organisms through air, water, soil, or food.
Dry weight	The weight of the sample, corrected for the moisture content.
Emerging contaminant	New compounds or molecules which were not previously known or were just recently appeared in the scientific literature; Contaminants of emerging interest which were known to exist but for which the environmental contamination issues were not fully realized or apprehended; Emerging issues about old (legacy) contaminants (i.e., situations where new information is jostling our understanding of environmental and human health risks related to legacy contaminants) (Sauvé and Desrosiers 2014).
Fillet	The flesh of the fish, which is composed of the skeletal muscles and fat, as opposed to the bones and internal organs.
Composite sample	A fish tissue sample comprised of two or more individual organisms of the same species collected at a particular site, of similar size (smallest individual within the composite is no less than 75% of the total length of the largest individual) and analyzed as a single sample.
Hydrologic Unit Code (HUC)	A numeric U.S. Geological Survey code which corresponds to a watershed area. Each area also has a text description associated with the numeric code and based on the area of land which drains into a hydrologic feature such as a stream, river, or lake.

Legacy contaminant	Pollutants, often used or produced by industry, which remain in the environment long after they were first introduced (Smith and Young 2009).
Piscivorous	A carnivorous animal which eats primarily fish.
Total length	A measurement from the anterior-most part of the fish to the longest caudal fin ray when the lobes of the caudal fin are compressed dorsoventrally (EPA 2000).
Waters of the state	As defined by IC 14-8-2-307, a lake; reservoir; marsh; waterway; other water under public ownership, jurisdiction, or lease; or has been used by the public with the acquiescence of any or all riparian owners.
Watershed	An area or region drained by a river, river system or other body of water.
Wet weight	The as-is weight, which includes the solid and liquid portion of the sample.