



Indiana Surface Water External Data Program

**Quality Assurance Project Plan
(QAPP)**

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Office: Water Quality
Branch: Watershed Assessment and Planning
Section: Technical and Logistical Services Section
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QAPP Summary

The Indiana Surface Water External Data Program QAPP for the Indiana Department of Environmental Management (IDEM), Office of Water Quality (OWQ), Watershed Assessment and Planning Branch (WAPB), supports the following programs, which provide OWQ with water quality data from external sources:

- OWQ's Clean Water Act Sections 319 and 205(j) Nonpoint Source (NPS) grant programs
- OWQ's Hoosier Riverwatch (HRW) volunteer program,
- Indiana Clean Lakes Program (CLP), administered by Indiana University School of Public and Environmental Affairs (IU SPEA) with funding through OWQ's NPS grant program, and
- Other external data submitted to the WAPB, including Indiana clients submitting existing water quality data to the OWQ External Data Framework (EDF) for use in assessing the state's water quality.

The WAPB support process for each external data generator is described herein and is comprised of four sections for each program:

- Project management,
- External data generation and acquisition,
- Assessment and oversight, and
- External data review, verification, validation, and usability determinations.

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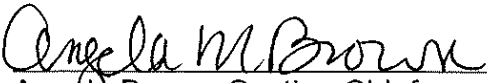
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A. Project Management

The elements under this section address basic project management (e.g., project history and objectives, roles, responsibilities of participants). These elements ensure the project has a defined goal, the participants understand the goal and the planned approach, and planning outputs are documented.

A.1. Title and Approval Sheet



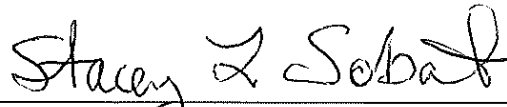
Angela Brown, Section Chief
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11/1/2023
Date



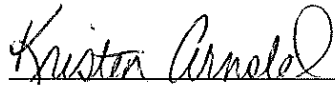
Stacey Sobat, Section Chief
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Date



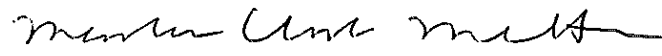
Caleb Rennaker, Section Chief
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Kristen Arnold, Branch Chief
OWQ Water Assessment and Planning Branch


11/8/2023
Date



Martha Clark Mettler, Assistant Commissioner
IDEM OWQ

11/14/2023
Date

The IDEM Quality Assurance (QA) Manager participated in the development of this Quality Assurance Project Plan (QAPP).



IDEM Quality Assurance Staff
Office of Program Support

11/20/2023
Date

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A.3. Distribution List

Electronic copies of this Quality Assurance Project Plan (QAPP) will be available to all staff listed below who will be notified of any changes in the External Data Program QAPP.

Table 1: Distribution List

Name	Position and Organization	Email
Martha Clark-Mettler	Assistant Commissioner, Indiana Department of Environmental Management (IDEM) Office of Water Quality (OWQ)	mclark@idem.IN.gov
Kristen Arnold	Branch Chief, IDEM OWQ Watershed Assessment and Planning Branch (WAPB)	karnold@idem.IN.gov
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Stacey Sobat	Chief, IDEM OWQ WAPB Probabilistic Monitoring Section (PMS)	ssobat@idem.in.gov
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Zoey Benton	NPS Program QAO, IDEM OWQ WAPB WPR	zbenton@idem.in.gov
Alyssa Henthorn	NPS Program QAO, IDEM OWQ WAPB WPR	dhenthor@idem.in.gov
Paul McMurray	Integrated Report (IR) Coordinator, IDEM OWQ WAPB	pmcmurra@idem.IN.gov
Cindy Jewell	External Data Framework (EDF) Coordinator, IDEM OWQ WAPB TLSS	cjewell@idem.in.gov
Dylan Allison	Hoosier Riverwatch (HRW) Coordinator, IDEM OWQ WAPB TLSS	djallison@idem.in.gov
Timothy Bowren	QA Lead, IDEM OWQ WAPB TLSS	tbowren@idem.in.gov
Sarah Powers	Volunteer Lake Monitoring Coordinator, Indiana Clean Lakes Program (CLP), Indiana University (IU) School of Public and Environmental Affairs (SPEA)	sarellis@indiana.edu
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A.4. Project or Task Organization

Figure 1: Project Organization

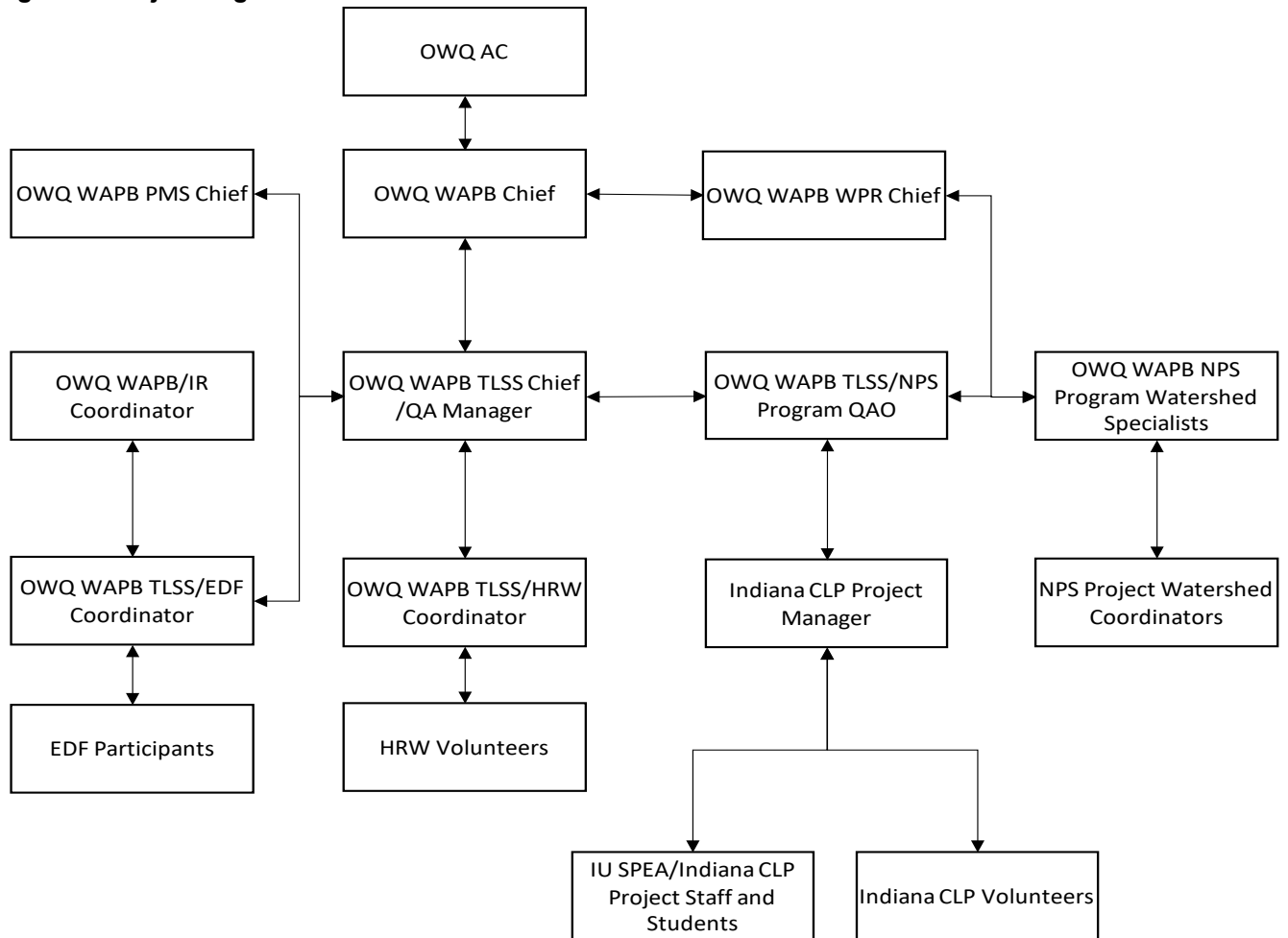


Table 2: Key QAPP Individuals

Name	Position and Affiliation	Role
IDEM Management and Staff		
Caleb Rennaker	Chief and QA Manager, IDEM OWQ WAPB TLSS	<ul style="list-style-type: none"> • Oversees the activities of the EDF coordinator, the HRW coordinator, the lead QAO, and the QAO responsible for assigning Data Quality Levels (DQL) to water chemistry data for NPS and other external data projects. • Oversees development of external data standard operating procedures (SOP). • Participates in the WAPB's Assessment Information Management System (AIMS) update meetings. • Oversees development of EDF program QAPP. • Oversees development and maintenance of the AIMS database. • Oversees uploads of external data from AIMS into U.S. EPA's Water Quality Portal database through the Water Quality Exchange (WQX) network. • Provides progress reports on the EDF program to WAPB Chief.
Timothy Bowren	Lead QAO, IDEM OWQ WAPB TLSS	<ul style="list-style-type: none"> • Reviews CLP data submittals. • Participates in AIMS update meetings. • Participates in Ecologik update meetings focusing on the HRW website, QAPP Tool, and EDF Portal. • Uploads CLP electronic data submissions into AIMS. • Sends CLP data via WQX to the Water Quality Portal. • Updates the WQX Submission Log.
Charles Hostetter	Water Chemistry QAO, IDEM OWQ WAPB TLSS	<ul style="list-style-type: none"> • Reviews NPS and other external water data submittals and assigns a DQL. • Reviews NPS and other external fish tissue data submittals and assigns a DQL. • Responsible for uploading NPS and other external data into AIMS. • Sends NPS and other external data via WQX to the Water Quality Portal. • Updates NPS Tracking on Sharepoint and the WQX Submission Log. • Participates in AIMS update meetings. • Participates in Ecologik update meetings focusing on the HRW website, QAPP Tool, and EDF Portal.

Name	Position and Affiliation	Role
Cindy Jewell	EDF Coordinator, IDEM OWQ WAPB TLSS	<ul style="list-style-type: none"> • Solicits EDF participants. • Oversees EDF participants' data submittals. • Establishes NPS projects, including geospatial information, in AIMS. • Prepares NPS AIMS Results Upload Template (ARUT) for electronic data submissions. • Oversees NPS grantees' data submittals. • Guides EDF participants through data submission processes. • Follows SOP(s) for the review of external data received through the EDF. • Notifies the respective QAOs (Water Chemistry; Fish or Macroinvertebrate Community) to review data submission and assign a data quality level after ARUT is received. • Updates NPS Tracking on Sharepoint. • Participates in Ecologik update meetings focusing on the HRW website, QAPP Tool, and EDF Portal.
Dylan Allison	HRW Coordinator, IDEM OWQ WAPB TLSS	<ul style="list-style-type: none"> • Solicits HRW program participants (volunteers and instructors) and provides training. • Educates the public. • Maintains the HRW database. • Maintains HRW website. • Maintains HRW monitoring supplies for program participants. • Participates in Ecologik update meetings focusing on the HRW website, QAPP Tool, and EDF Portal.
Angela Brown	Chief, IDEM OWQ WAPB WPR	<ul style="list-style-type: none"> • Oversees the NPS program. • Oversees the activities of the NPS QAO(s) and the Watershed Coordinators.
J.D. Sparks, Zoey Benton, Alyssa Henthorn	NPS Program QAO, IDEM OWQ WAPB WPR	<ul style="list-style-type: none"> • Maintains the QAPP Tool which helps external data clients create QAPP(s) that satisfy IDEM requirements. • Assists NPS clients with developing individual project QAPPs, which are required from every grantee conducting monitoring activities with grant funds. • Reviews NPS and CLP QAPPs. • Participates in Ecologik update meetings focusing on the HRW website, QAPP Tool, and EDF Portal.

Name	Position and Affiliation	Role
Kathleen Hagan, Josh Brosmer, Kristi Todd, Lindsay Hylton Adams	Watershed Specialists (WSS), IDEM OWQ WAPB WPR	<ul style="list-style-type: none"> • Manage 319/205(j) projects. • Oversee project tasks. • Accountable for project completion, including receipt and storage of project documents. • Receive NPS project QAPPs for monitoring conducted under the NPS grant agreement. • Receive data provided in electronic format with the ARUT. • Serve as a QAPP liaison between NPS Project Watershed Coordinators and the NPS Program QAO.
Stacey Sobat	Section Chief, IDEM OWQ WAPB PRB (Probabilistic Monitoring)	<ul style="list-style-type: none"> • Oversees the Fish and Macroinvertebrate Community QAO(s) that review external data. • Participates in AIMS update meetings.
Kevin Gaston	SEM and Fish Community QAO, IDEM OWQ WAPB PRB	<ul style="list-style-type: none"> • Reviews NPS and other external fish community data submittals and assigns a DQL.
Mitchell Owens	SEM and Macroinvertebrate Community QAO, IDEM OWQ WAPB PRB	<ul style="list-style-type: none"> • Reviews NPS and other external macroinvertebrate community data submittals and assigns a DQL.
Paul McMurray	Integrated Report (IR) Coordinator, IDEM OWQ WAPB	<ul style="list-style-type: none"> • Assists the EDF Coordinator with administration of the EDF. • Maintains EDF Portal website. • Maintains EDF guidance documents. • Oversees development of EDF Program QAPP. • Oversees development of EDF standard operating procedures (SOPs). • Maintains the EDF QAPP. • Participates in Ecologik update meetings focusing on the HRW website, QAPP Tool, and EDF Portal.
Secondary Data Generators (external to IDEM)		
Sarah Powers	Indiana CLP Project Manager, IU SPEA	<ul style="list-style-type: none"> • Oversees all CLP activities and manage both monitoring programs (IU SPEA staff and volunteers). • Develops QAPP for both monitoring programs. • Manages monitoring data collected for CLP. • Manages online database for CLP volunteer data. • Assesses QA/QC. • Assigns qualifiers and flags to data. • Communicates with NPS program QAO. • Signs QA/QC Verification Letter. • Generates grant required report. • Submits data results to NPS QAO.
Indiana CLP Project Staff	Indiana CLP, IU SPEA	<ul style="list-style-type: none"> • Collect samples for CLP. • Conduct laboratory analysis of samples collected and sent in by CLP volunteers. • Assist the data entry and management of data in CLP database.

Name	Position and Affiliation	Role
Indiana CLP Volunteers	<ul style="list-style-type: none"> • Colleges or Universities • Indiana Municipalities • Watershed Groups • Lake Associations • Other Organizations • Individual Citizens 	<ul style="list-style-type: none"> • Conduct monitoring. • Collect and send water samples to IU SPEA laboratory for analysis. • Enter data into the CLP database.
NPS Project Watershed Coordinators	<ul style="list-style-type: none"> • 319 or 205(j) Grant recipients and contractors 	<ul style="list-style-type: none"> • Develop QAPPs for monitoring conducted as part of the NPS grant project. • Supervise the project's monitoring program. • Manage the data collected. • Assess quality assurance/quality control (QA/QC). • Assign qualifiers and flags to data. • Communicate with NPS program QAO. • Sign QA/QC Verification Letter.
HRW Program Participants	<ul style="list-style-type: none"> • Kindergarten through 12th Grade (K12) Educators and Students • Colleges or Universities • Indiana Municipalities • Indiana Permitted Facilities • Watershed Groups • Other Organizations • Individual Citizens 	<ul style="list-style-type: none"> • Attend HRW program training. • Conduct monitoring (field measurements and analyses). • Enter data into the HRW database.
EDF Participants	<ul style="list-style-type: none"> • K12 Educators and Students • Colleges or Universities • Indiana Municipalities • Indiana Permitted Facilities • Watershed Groups • Lake Associations • Other Organizations • Individual Citizens 	<ul style="list-style-type: none"> • Develop QAPP or other QA documentation (voluntary). • Conduct monitoring. • Conduct sample analysis or send samples to a laboratory for analysis. • Submit data to OWQ through the EDF Coordinator.

A.5. Problem Definition and Background

IDEM's Office of Water Quality (OWQ) Watershed Assessment and Planning Branch (WAPB) collects water quality data on surface waters throughout the state of Indiana to serve a variety of water resource management needs. The WAPB's primary data collection activities are supported by the [Quality Assurance Project Plan for Indiana Surface Water Programs](#) (the [Surface Water Programs QAPP](#)) (IDEM, 2023a).

Field data and results from laboratory analyses of data collected by the WAPB are stored in the WAPB's Assessment Information Management System (AIMS) database and are uploaded to the U.S. EPA [Water Quality Portal](#) database through the [Water Quality Exchange](#) (WQX) application.

Effective management of Indiana's water resources requires water monitoring data. OWQ continues to collect most of the data used to support OWQ programs. The increasing need for water monitoring data of known quality combined with static or decreasing funding for monitoring highlights the potential benefits of using external existing data, where possible, to meet multiple program objectives. OWQ developed the External Data Framework (EDF) process to provide a systematic, transparent, and voluntary means for external organizations and individuals to share water quality data with IDEM for consideration in various OWQ programs.

Within the OWQ, the WAPB receives external data from several sources. The four main programs are:

- External Data Framework (EDF) – administered through IDEM OWQ
- Nonpoint Source (NPS) – administered through IDEM OWQ
- Hoosier Riverwatch (HRW) – administered through IDEM OWQ
- Clean Lakes Program (CLP) – administered through the Indiana University (IU) School of Public and Environmental Affairs (SPEA) program

EDF, NPS, and CLP data are collected in accordance with the IDEM OWQ-approved [Surface Water Programs QAPP](#) (IDEM, 2023a) and submitted through a Microsoft Excel formatted AIMS Results Upload Template (ARUT) or Electronic Data Import (EDI) via e-mail to the EDF Coordinator.

CLP data are collected in accordance with the IDEM OWQ-approved [Surface Water Programs QAPP](#) (IDEM, 2023a) and submitted through a Microsoft Excel formatted Lakes Upload Template via e-mail to the EDF Coordinator.

HRW data are collected in accordance with the [HRW manual](#) (IDEM, 2022a) and submitted through the IDEM OWQ [HRW database](#).

External data, obtained from these sources, supplements data collected by the WAPB. External data may be used directly to support OWQ decision-making processes and indirectly to support other programmatic goals. Use of an external secondary data set, whether directly or indirectly, requires careful evaluation to ensure reliability for the current use. Because the sampling and analytical methods used to collect the external data were based on the needs of the original project, this data may or may not be appropriate for OWQ decision-making processes or to support other programmatic goals.

The [Surface Water Programs QAPP](#) (IDEM, 2023a) encompasses data collected by OWQ programs but does not specifically support external data collection. Therefore, this separate [Indiana Surface Water External Data Program QAPP](#) (the [External Data QAPP](#)) is needed to ensure external data is considered reliable for any direct or indirect OWQ uses. The [External Data QAPP](#) supports OWQ's use of external data by:

- Identifying the sources through which OWQ receives external data.
- Identifying the projects for which external data use may be considered by OWQ.
- Identifying the acceptance criteria for use of external data.
- Describing OWQ's processes for acquiring and evaluating the reliability of external data for those projects.
- Describing any limitations on the use of external data.

The four programs through which OWQ receives external data differ in terms of the type and quality of data produced. As a result, IDEM OWQ relies on the EPA quality system's graded approach principle (U.S. EPA, 2002) to allow differing acceptance criteria for the data used by each program, based on the intended use of the data provided.

A.6. Project or Task Description

The primary tasks associated with the external data program are to solicit, receive, categorize, or grade by conformance to acceptance criteria, and manage data provided by the external sources identified in Section A.4. External datasets are reviewed, verified, and validated for programmatic use.

Much of the information required for this QAPP can be found in the Technical Guidance for the External Data Framework document (EDF Technical Guidance) (IDEM, 2021a). The processes outlined in the EDF can be applied to any OWQ use of external data, regardless of the source. An excerpt of the EDF Technical Guidance showing the potential OWQ uses for external data is provided in Appendix A.

This section of the External Data QAPP provides descriptions of the four programs through which OWQ receives external data and the primary sources of external data acquired through each. The data, metadata, and any quality documentation submitted are used in the acceptance process. Specific acceptance criteria for the data from each program is described in Section A.7.

A.6.1. External Data Framework

The EDF process was developed by IDEM OWQ to provide a systematic, transparent, and voluntary means for external organizations and individuals to share water quality data with IDEM for consideration in various OWQ programs. Participation in the EDF is open to any individual or organization conducting ambient water quality monitoring in the state of Indiana. This includes, but is not limited to, individual citizens; primary and secondary schools; colleges and universities; municipalities; regulated facilities; watershed groups; and other grassroots organizations.

A.6.2. Nonpoint Source Program

The OWQ manages the NPS program through two federal pass-through grant programs: Section 319(h) and Section 205(j). Each grant program is named after the section of the Clean Water Act (CWA) that authorizes the program. Eligible organizations include nonprofit organizations; universities; and local, state, or federal government agencies. Eligible organizations that are sources of

external data may have applied for and received grant funds to conduct water quality monitoring.

A.6.3. Clean Lakes Program

The CLP is a lakes monitoring program administered by the IU SPEA with funding from OWQ's NPS program. The CLP conducts two different monitoring programs:

1. A program in which IU SPEA staff and students comprehensively monitor approximately 80 lakes each year. This program analyzes the collected samples and samples sent in by volunteers. The objective is to provide quality assured data that can be reliably used to:
 - Support OWQ's State NPS Management Plan.
 - Determine the condition of Indiana lakes and support OWQ's CWA Section 314 trend and trophic state assessments.
 - Support OWQ's CWA Sections 305(b) and 303(d) water quality assessments, and impaired uses listing and delisting processes.
 - Develop lake water quality assessment reports as updates to the Indiana Lake Classification System and Management Plan (IDEM, 1986).
2. A statewide volunteer monitoring program in which any individual citizen or organization (i.e., colleges, universities, watershed groups, lakes associations) can participate in the monitoring of Indiana lakes. The CLP volunteers collect Secchi depth measurements and enter the results in the CLP online database. Some volunteers also collect water samples, which are sent to the IU SPEA laboratory for total phosphorus and chlorophyll a analysis. The primary objectives of this program are to:
 - Augment the data collected by IU SPEA staff and students by providing samples from a larger number of lakes.
 - Increase public awareness of the importance of Indiana's lakes.

IU SPEA has produced QAPPs for the Clean Lakes Program (Indiana CLP, 2019a) and the Volunteer Lake Monitoring program (Indiana CLP, 2019b).

A.6.4. Hoosier Riverwatch

Data generated by the HRW is not intended for EDF Tier 2 or 3 purposes such as stream or lake assessments or watershed management planning (see Appendix A and Figures 2, 3 and 4). Rather, the HRW mission is to involve the citizens of Indiana in becoming active stewards of Indiana's water resources through watershed education, volunteer water monitoring, and clean-up activities.

Any participant that enters data into the HRW database, whether monitoring as part of an organization or as an individual, is a source of external data.

A.7. Quality Objectives and Criteria for OWQ Uses of External Data

Although OWQ's acceptance criteria for external data vary, OWQ's data quality objectives (DQO) for external data are the same across the four programs. OWQ's external data program grew out of the development of the EDF, which

established processes and decision criteria pertaining to the use of external data by OWQ programs.

As noted in Section A.5, the use of any external data set, whether directly or indirectly, requires careful evaluation to ensure reliability for the specified use. During the development of the EDF, OWQ conducted a systematic planning process, working with stakeholders within different OWQ program areas to:

- Identify the potential external data uses for each program.
- Understand the types of data needed for each program.
- Determine the minimum data quality requirements for each program.
- Develop a process for soliciting, receiving, and managing external data.
- Develop processes for data review, verification, and validation and for assigning a level of credibility (flagging it for appropriate use) to external data, based on the acceptance criteria used to ensure the data are reliable for the use considered.

Consistent with U.S. EPA's graded approach (U.S. EPA, 2002), OWQ's DQO are based on the potential use of external data, regardless of the source. The graded approach determines the specific DQO for a given data set.

Each potential OWQ use for external data is associated with one of three tiers (see Figure 2) in the EDF based on the minimum data quality requirements for that use.

OWQ's DQO are stated in the EDF Technical Guidance (IDEM, 2021a) for each tier by data type (e.g., field and chemistry data pages 63-67, Tables 17-18; biological data pages 67-74, Table 19, etc.). The above DQO apply to all external data regardless of source, as the EDF was built to accept any external data. Given this, the material in this section of the QAPP will focus on the different acceptance criteria for each of the four programs through which OWQ receives external data.

Figure 2: Relationship between the general data quality characteristics of the three data quality assessment (DQA) levels and the kinds of uses identified within their associated tiers of the External Data Framework (EDF) (IDEM, 2021a).

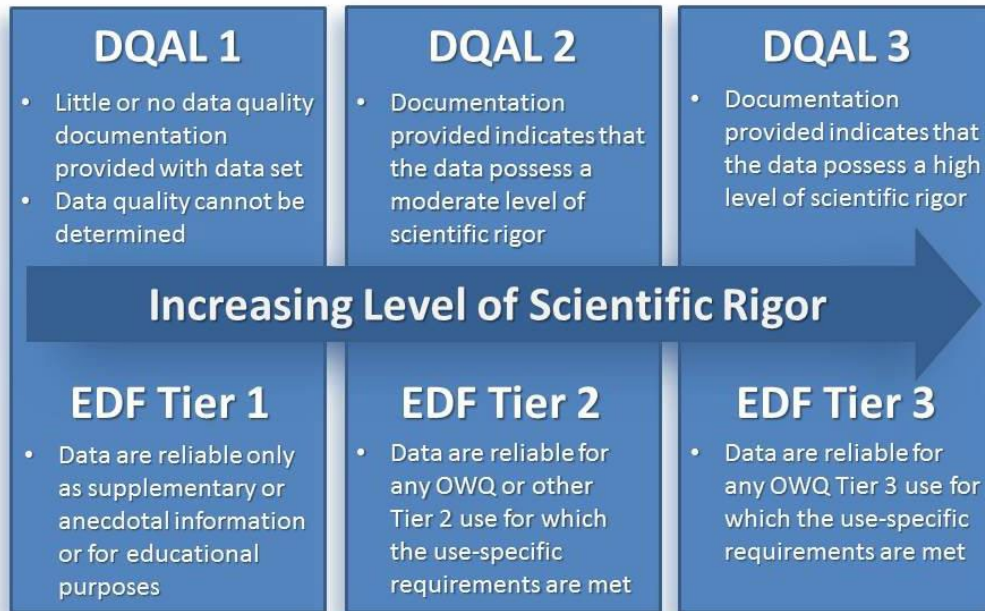


Figure 3: Office of Water Quality’s data quality assessment process (IDEM, 2021a).

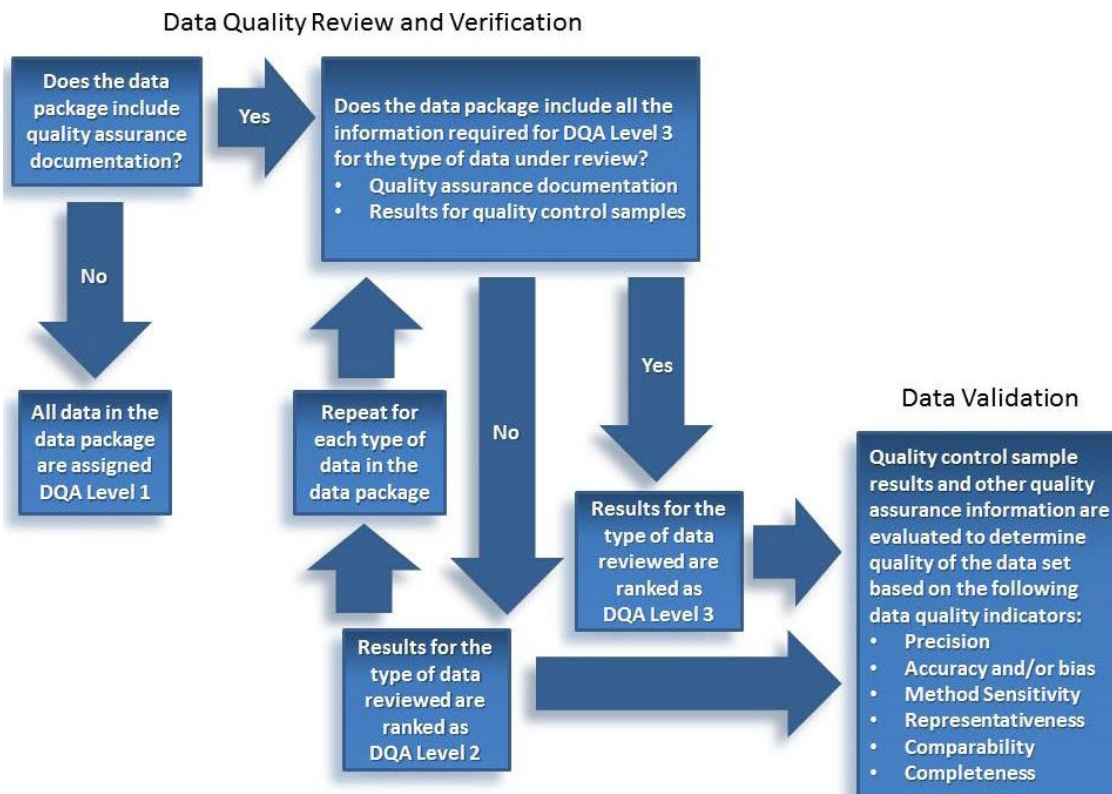
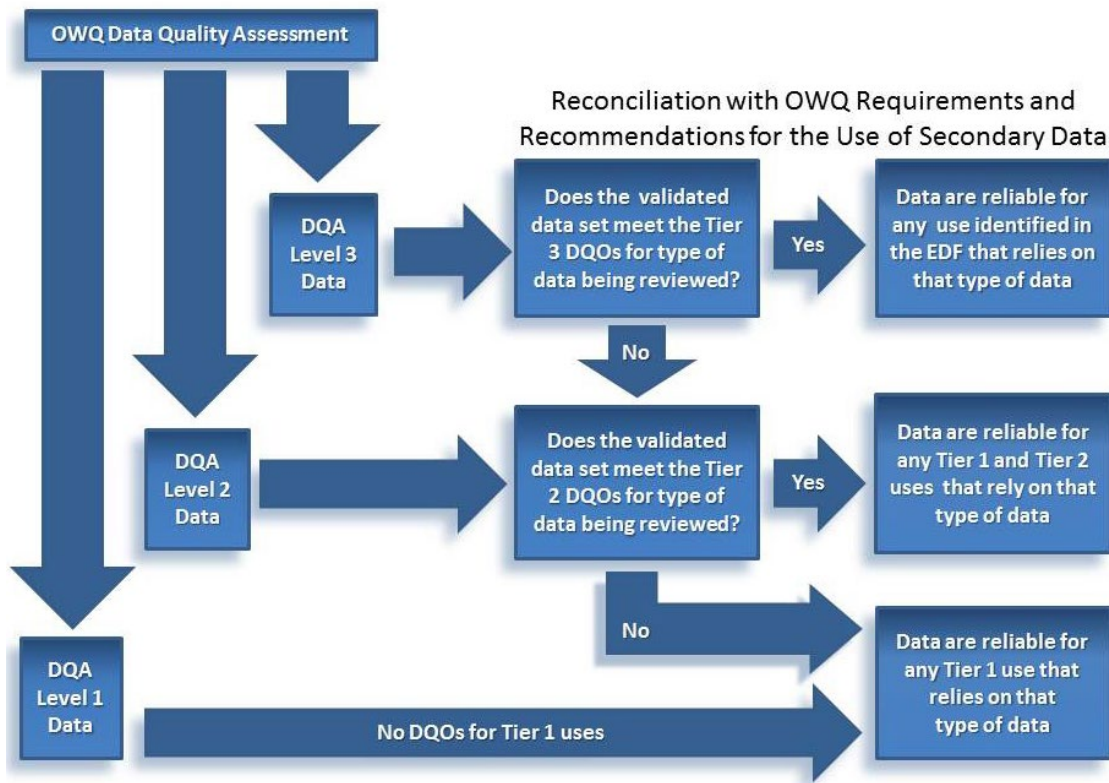


Figure 4: Office of Water Quality’s process for determining the reliability of a secondary data set for a given use, based on data quality objectives (IDEM, 2021a).



A.7.1. OWQ Acceptance Criteria for External Data Acquired Through the EDF

OWQ has two types of acceptance criteria for data submitted through the EDF database:

- Minimum criteria for data submittals, which are the same for all participants.
- Minimum data quality requirements, which vary based on the type of data submitted and the intended use of the data by OWQ.

One of the key features of the EDF is that participation is entirely voluntary. To encourage greater participation, the requirements for data submittals are intentionally kept to a minimum.

Due to the resources required to provide adequate review of the data received, the OWQ does not accept hardcopy data submittals through the EDF database. The EDF database offers two options for submitting data electronically, including:

- A Microsoft Excel formatted AIMS Result Upload Template (ARUT).
- A Microsoft Excel formatted Electronic Data Import (EDI).

While not required, OWQ encourages the submittal of QA documentation with each data set. In addition, OWQ is currently developing an [online tool to facilitate QAPP development](#), which is available to NPS program grantees. The

tool improves the data quality documentation of external data submitted through the NPS program.

OWQ's acceptance criteria for different types of data submitted through the EDF database and OWQ's intended uses of those data are detailed in the EDF Technical Guidance (IDEM, 2021a) for the program (pp. 58-74).

To consider an external data set for potential use in one or more OWQ programs, the dataset must undergo OWQ's data quality assessment process, which is described in the OWQ SOP, Methods and Procedures for the Assessment of Secondary Data (the Secondary Data SOP) (IDEM, 2023b) and consists of two parts:

1. Data Quality Review and Verification – The dataset evaluation determines whether all the information necessary to validate the data are included in the submittal. After the evaluation, a data quality assessment level (DQAL) is assigned to the data set (Figure 3).
2. Data Validation – Data validation characterizes the quality of the data set through a review of the individual results using quantitative and qualitative data quality indicators (e.g., precision, accuracy or bias, method sensitivity, representativeness) (Figure 4).

Each of OWQ's three DQALs corresponds to a tier (See Figure 2) in the EDF. The assigned tier identifies the potential uses and reliability of a data set. Acceptance criteria within each EDF tier are use-specific and are described in detail in the EDF Technical Guidance (Tables 7-19).

Several common uses for water quality data, including those for which OWQ may consider the use of external data, are identified in the EDF Technical Guidance (Appendix A of this document). Each of these uses is assigned an EDF tier based on the level of data quality (as indicated by the DQAL) that OWQ considers necessary to support the use.

By associating specific uses with DQALs through the tiered structure of the EDF, OWQ ensures that the quality of any external dataset received is commensurate with OWQ's intended uses regardless of the original purpose for collection.

A.7.2. OWQ Acceptance Criteria for Data Acquired from NPS-Funded Projects

NPS projects are administered through grant agreements that spell out the tasks, schedule, and budget for the project. Projects collecting water quality data are required to submit a QAPP, which must be approved by OWQ prior to the start of monitoring activities. Projects are also required to submit data in a format that allows OWQ to upload the data into the AIMS database.

Monitoring objectives vary from project to project. For each project, OWQ reviews the QAPP in accordance with the Reviewing Nonpoint Source (NPS) Grantee Quality Assurance Project Plans (QAPPs) SOP (IDEM, 2014) ensuring the resulting data will meet the project's objectives. OWQ's acceptance criteria for these data are that collection and analysis are performed in accordance with an approved QAPP. Therefore, when the data are received, OWQ reviews the

results to ensure that the project QAPP requirements are met before uploading the data into AIMS.

A.7.3. OWQ Uses of the Data Collected by NPS Projects (Other than the CLP Program)

The NPS program's primary goal is to help eligible organizations collect the data needed to support the organization's individual project goals, which include but are not limited to:

- Background or baseline monitoring for the purpose of identifying critical areas for watershed management plans (WMP) at HUC 10 and HUC 12 level projects.
- Trend monitoring to identify changes resulting from Best Management Practices (BMP) installations.
- Educational monitoring designed to educate, involve, and include the public with the goal for the public to take watershed ownership.

Once uploaded into AIMS, the external data collected by NPS grantees are available by request to anyone within or outside of IDEM. As with other types of external data, OWQ staff in various programs may use NPS project data to support a variety of uses identified in Tiers 1, 2, or 3 of the EDF (Appendix A), provided the associated data meet quality requirements.

A.7.4. OWQ Acceptance Criteria for Data Received through the Clean Lakes Program

Like all NPS-funded projects, the Indiana CLP is administered through a grant agreement that spells out the tasks, schedule, and budget for the project. Unlike other NPS projects, the Indiana CLP is funded on an ongoing basis to support OWQ's needs for water quality data for Indiana lakes and serves as OWQ's program for lakes monitoring. As with other NPS-funded projects, OWQ's acceptance criteria for the data collected and analyzed is in accordance with an approved QAPP. When the data are received, OWQ reviews the results to ensure the project QAPP requirements are met prior to upload into the AIMS database.

A.7.5. OWQ Uses of the Data Collected by the Indiana Clean Lakes Monitoring Program and CLP Volunteers

OWQ uses Indiana CLP data to support:

- CWA Section 314 trend and trophic state assessments.
- CWA Sections 305(b) and 303(d) water quality assessments and listing processes.
- Research conducted for the development of water quality criteria.

The Indiana CLP makes all data collected by IU SPEA and through the volunteer monitoring program available online through an [interactive map](#). The Indiana CLP's grant agreement requires that OWQ receive an electronic copy of the data in a Microsoft Excel formatted Lakes Upload Template. This template allows for a more thorough review to ensure the data submitted meets all data quality requirements specified in the program's QAPP. The Lakes Upload

Template was developed by the WAPB to facilitate uploads of lakes data from the CLP into AIMS.

Once uploaded into AIMS, the data are available by request to anyone within or outside of IDEM. As with other types of external data, OWQ staff in various programs may use Indiana CLP data to support a variety of uses identified in Tiers 1, 2, or 3 of the EDF (Appendix A), provided the data meets the associated data quality requirements.

A.7.6. OWQ Acceptance Criteria for Data Acquired through the Hoosier Riverwatch (HRW) Program

The monitoring goals of individual volunteers or the affiliated organizations can vary. Given HRW's educational mission, the HRW has no specific data quality requirements. OWQ's acceptance criteria for HRW data is that HRW methods were followed, and data is entered by a volunteer who has completed the HRW training necessary for certification.

HRW program goals include:

- Educate citizens on watersheds and the relationship between land use and water quality.
- Train citizens on the basic principles of water quality monitoring and physical testing.
- Promote opportunities for involvement in water quality issues.
- Provide water quality information to individuals or groups working to protect water resources.
- Support volunteer efforts through technical assistance, providing monitoring equipment, networking opportunities, and educational materials.

The HRW program accomplishes these goals in part by providing in-person training and the HRW manual (IDEM, 2022a). The program also makes all data entered into the database available to the public. The [HRW online database](#) provides the ability to query and download the data, and the visualization tools needed to support data analysis.

In addition to providing a means for greater sharing of volunteer monitoring data outside of IDEM through the database, OWQ may also use Hoosier Riverwatch data directly for any Tier 1 use identified in the [EDF Technical Guidance](#) (IDEM, 2021a) (Appendix A).

A.8. Special Training or Certifications

A.8.1. Education and Experience Requirements for OWQ Staff

OWQ external data education and experience requirements vary by role and by the types of data received.

- Data review, verification, and validation of field data and chemistry (including fish tissue contaminants) results (completed by water chemistry or lead QAO, EDF coordinator, IR coordinator and HRW coordinator) requires:
 - Educational background in chemistry
 - Experience in or knowledge of ambient water sampling techniques

- Experience in or knowledge of analytical laboratory water analysis
- Training in the Secondary Data SOP (IDEM, 2023b) required for the review and verification of external field data and chemistry results
- Training in U.S. EPA DQO process (U.S. EPA, 2006)
- Data review, verification, and validation of biology results (completed by macroinvertebrate and/or fish community QAO, EDF coordinator, IR coordinator and HRW coordinator) requires:
 - Educational background in biology
 - Experience in or knowledge of biological community sampling methods and taxonomy
 - Training in the Secondary Data SOP (IDEM, 2023b) required for the review and verification of external biological data
 - Training in U.S. EPA DQO process (U.S. EPA, 2006)
- External data management (completed by NPS program QAO, water chemistry or lead QAO, EDF coordinator, IR coordinator and HRW coordinator) requires:
 - Proficiency in Microsoft Excel
 - Database experience

Providing technical assistance to external data providers (completed by NPS QAO, water chemistry or lead QAO, EDF coordinator, HRW coordinator and watershed specialists) requires all the above plus training in U.S. EPA DQO process and QAPP development.

A.8.2. Education and Experience Requirements for External Data Providers

Organizations collecting data generally determine the training and experience required for data collectors based on the project's requirements.

Projects submitted to IDEM through the EDF may vary in the scope and complexity of the monitoring which was performed. Determining the level of education and experience of the individuals providing data through the EDF is part of OWQ's data review and verification process and may be ascertained through documentation materials submitted with the data.

NPS program monitoring can also vary in scope and complexity between projects. Requirements regarding education and experience are identified in the NPS required grant QAPPs.

Training requirements for SPEA students and volunteers participating in the CLP and the Volunteer Lake Monitoring Program is outlined in the respective QAPP for each program (Indiana CLP, 2019a, 2019b). CLP program participants are generally graduate students enrolled in SPEA's Master of Science program and are expected to have a general prior knowledge of environmental sampling procedures; additional specialized training is provided by the program director and laboratory manager. Participants in the Volunteer Lake Monitoring Program are trained by the CLP project manager or the program's volunteer coordinator using the CLP [Volunteer Lake Monitoring Manual](#) (Indiana CLP, 2022).

The HRW program employs a train-the-trainer approach in which OWQ's HRW coordinator provides instructor training and certification to individual volunteers. Volunteers are then expected to train others, thus expanding the number of volunteers more than would otherwise be possible. All HRW training is based on and uses the most current version of the Hoosier Riverwatch Volunteer Stream Monitoring Manual (the HRW Training Manual) (IDEM, 2022a).

A.9. Documents and Records

This section of the QAPP provides information regarding the documents and records produced through OWQ's solicitation, acquisition, management, and use of external data.

A.9.1. External Data Framework

EDF participants submit results to the EDF coordinator in one of two ways:

- A Microsoft Excel formatted AIMS Result Upload Template (ARUT)
- A Microsoft Excel formatted Electronic Data Import (EDI)

Copies of all data sets, QA and other documentation accompanying external data submitted through the EDF, are maintained by the EDF coordinator in electronic format in a folder on a shared OWQ server in the following location: S:\IGCN\OWM\External Data Framework\EDF_Data Submissions.

A.9.2. Nonpoint Source Program

NPS projects submit data to the NPS Program QAO through an ARUT. The water chemistry and fish and macroinvertebrate community QAOs will upload and import the results into AIMS after all data has been reviewed and data quality levels are assigned. Data in AIMS is backed up daily to prevent loss of records. The results are then available by request to anyone within and outside of IDEM OWQ.

NPS project QAPPs are stored electronically on a shared IDEM OWQ network server in the following location: S:\IGCN\OWM\WMS\QAPPs Info. This server is backed up daily to prevent loss of records and documentation. A hard copy of each QAPP is also retained as described in the [Nonpoint Source \(NPS\) Data Management SOP](#) (IDEM, 2023c).

A.9.3. Clean Lakes Program

Most CLP volunteers submit field data to IU SPEA by entering data directly online into the [CLP volunteer database](#) although some volunteers provide paper forms to CLP staff, who then enter those results into the database. Field data and results from the samples IU SPEA staff and students collect through the Clean Lakes Monitoring Program (e.g., water chemistry; zooplankton and algae identification) are entered into a Microsoft Access database developed by IU SPEA for the CLP. Laboratory results from phytoplankton samples are emailed to IU SPEA from the contract laboratory and then entered into the CLP database.

All raw data and data analysis results generated by the CLP, whether through the Volunteer Monitoring Program or the Clean Lakes Monitoring Program, are

submitted to the NPS program through a Lakes Upload Template to facilitate upload into AIMS.

The CLP retains digital electronic copies of all documentation, including QAPPs, monitoring results, and project progress reports indefinitely.

A.9.4. Hoosier Riverwatch

HRW volunteers enter results into data sheets provided in the [HRW Training Manual](#) (IDEM, 2022a). Given the voluntary nature of the program, there are no requirements that completed data sheets be retained by volunteers, nor does the HRW program request sheets from volunteers.

HRW volunteers that attend a training prior to collecting data are given login credentials, which allow entry of results directly into the [HRW online database](#).

B. Data Generation and Acquisition

B.1. Sampling Process Design (Experimental Design)

Most of the data OWQ receives through the EDF is generated for purposes other than those of the OWQ. Exception for OWQ's NPS program projects, OWQ does not specify exactly how the individuals and organizations using the EDF design monitoring programs. Rather, the goal of OWQ's programs is to facilitate broader monitoring on Indiana waters than OWQ can accomplish given resource constraints. Where possible, monitoring is performed in a way that supports both the needs of the organization conducting the monitoring and OWQ needs.

This section describes the variety of data OWQ receives through external data pathways. This section will describe in general terms the types of monitoring conducted and the timelines on which the data are provided by the individuals and organizations that share data with OWQ.

OWQ's review, verification, and validation methods for external data are discussed in Section D of this QAPP.

B.1.1. Sampling Designs Employed by EDF Participants

1. Parameters and Types of Waterbodies Monitored by EDF Participants

Waterbody-specific water quality data may be submitted through the EDF for surface waters throughout the state of Indiana. The EDF was developed to accommodate water quality data collected from flowing waters (rivers and streams) as well as lentic waterbodies (lakes and reservoirs). The EDF cannot accommodate water quality data from wetlands or groundwater at this time. While the EDF is not designed to accommodate statistical results, submittal of waterbody specific data used to generate statistical results is encouraged.

The parameters for which data are accepted through the EDF are generally limited to those for which OWQ has a numeric water quality criterion codified in [Indiana's water quality standards](#) (327 IAC 2-1-6, 327 IAC 2-1.5-8) or a water quality assessment methodology articulated in OWQ's Integrated

Report [Consolidated Assessment and Listing Methodology \(CALM\)](#) (IDEM, 2022b). However, OWQ will accept any data set an organization or individual is willing to share provided the data set is supplied electronically by one of the two methods provided. The full list of parameters for which data may be submitted through the EDF are provided in the [EDF Technical Guidance](#) document (IDEM, 2021a).

2. *Timelines for Data Submittals to the EDF*

Data may be submitted to the EDF at any time for consideration by the OWQ for potential use in programs. OWQ programs may access data submitted through the EDF at different times depending on varying needs.

B.1.2. Sampling Designs Employed by NPS Projects

The NPS program's goal in grant funded projects is to support locally led watershed planning and implementation of practices aimed at reducing NPS pollution and improving water quality. Because water quality problems and monitoring needs vary from project to project, the NPS Program allows considerable latitude for projects to develop monitoring plans that meet unique needs.

1. *Parameters and Types of Waterbodies Monitored by NPS-Funded Projects*

The NPS program has developed a guidance document to assist NPS projects in developing monitoring plans: [Monitoring Water in Indiana: Choices for Nonpoint Source and Other Watershed Projects](#) (Purdue University, 2012). The guidance identifies the core chemical and physical parameters required for all NPS monitoring projects receiving grant funds. The document also describes additional parameters that may be collected, such as biological community data (fish or macroinvertebrates) or Trophic State Indices based on individual project goals. Other aspects of the study design (e.g., locations, methods, frequency) are determined by the project grantee. Projects may collect any other parameters that they wish, although only those listed in the AIMS protocol list (Appendix B) will be considered for upload through the EDF. NPS projects generally monitor rivers and streams, although lakes and reservoirs may also be monitored.

All NPS grant-funded projects that conduct monitoring must develop a QAPP. OWQ approval is required prior to the initiation of monitoring activities. The NPS program provides a number of useful resources on the [Quality Assurance Project Plan Guidance](#) page to help grantees develop the required QAPPs. The QAPP Guidance page includes a QAPP template, instructions, and a checklist to ensure completeness prior to submittal.

The NPS QAO reviews all project QAPPs to ensure the NPS program informational requirements are met and to identify any problems in the sampling design that might prevent the project from meeting monitoring objectives. The QAO will also provide technical assistance to projects in developing or revising monitoring designs, if needed.

2. *Schedule and Timelines for NPS Project Data Submittals*

The NPS program conducts one grant solicitation each year. Funded projects run from 2 to 4 years. Projects generally begin monitoring activities within 3 to 6 months following the award notification. This allows for OWQ's contracting process and QAPP development. However, specific timelines for monitoring activities vary from project to project as do the data submittals.

B.1.3. Sampling Designs Employed by the Clean Lakes Program

1. *Parameters and Types of Waterbodies Monitored*

The Indiana CLP monitoring programs focus specifically on Indiana's natural and manmade lakes. Monitoring by IU SPEA staff and students (the Indiana CLP proper) is conducted primarily on public waters, defined as having boat access owned and managed by the Indiana Department of Natural Resources. CLP monitoring includes a variety of physical and chemical parameters including chlorophyll *a* (an indicator of phytoplankton abundance and biomass) and algal communities.

The Volunteer Lake Monitoring Program includes both public and private lakes, and the extent of the program is based on the availability of interested volunteers with access rights. Most volunteers collect Secchi depth (transparency) measurements. However, a subset of volunteers also take temperature, dissolved oxygen measurements, and collect water samples. The water samples are sent to IU SPEA for chlorophyll *a* and total phosphorus analysis.

The Indiana CLP has developed two QAPPs to support the monitoring conducted through both programs, which is required as part of the grant agreement with OWQ's NPS program. These QAPPs are updated with each new grant award (about every 3 to 4 years) and when changes are made to either monitoring plan (e.g., a change in methods, sampling approach). More detailed information on the parameters monitored by each program can be found in the programs' QAPPs:

- [Quality Assurance Project Plan for the Volunteer Lake Monitoring Program: A Component of the Indiana Clean Lakes Program](#). (Indiana Clean Lakes Program, 2019b).
- [Quality Assurance Project Plan for Indiana Clean Lakes Program](#), which covers the monitoring conducted by IU SPEA (Indiana Clean Lakes Program, 2019a).

2. *Schedule and Timelines for CLP Data Submittals*

CLP monitoring conducted by IU SPEA staff and students occurs July-September each year, when the most stressed lake water quality conditions are presumed. Data collected by IU SPEA staff and students are submitted to IDEM for the previous sampling year prior to the start of the next sampling season. CLP volunteers also typically monitor lakes during the summer, although monitoring may be conducted at any time.

B.1.4. Sampling Designs Employed by Hoosier Riverwatch Volunteers

Given the HRW program's educational mission, the program does not prescribe or require HRW volunteers to develop or follow any specific monitoring design.

The HRW provides training to volunteers who may monitor as individuals or on behalf of an organization. Volunteers may choose to monitor up to nine different water quality parameters. The number of sites sampled, and the frequency of monitoring varies based on the project objectives.

1. Parameters and Types of Waterbodies Monitored by HRW Program Participants

HRW volunteers monitor wadeable streams. Any combination of the water quality parameters included in the HRW Training Manual (IDEM, 2022a) may be monitored. Parameters include physical and chemical test methods; macroinvertebrate community sampling and analysis; and habitat evaluation.

The HRW Training Manual (IDEM, 2022a), provided to program participants during training workshops, is also [available online](#). The manual provides guidance on sampling design and describes sampling procedures for volunteers to follow in the field. The HRW coordinator is also available to assist volunteers with questions regarding sample design.

Volunteers are not required to submit sampling designs for review by OWQ. However, volunteers wishing to share data with OWQ through the EDF are strongly encouraged to document the study design and submit that documentation with the EDF submittal.

2. Schedule and Timelines for HRW Data Acquisition

While most of the monitoring conducted by HRW participants occurs in the warmer months, the HRW program is ongoing and imposes no specific timelines on volunteers for data collection or data entry.

B.2. Sampling Methods

The sampling methods used by the four primary entities submitting external data to IDEM OWQ WAPB include:

B.2.1. Sampling Methods Used by External Data Framework Participants

The sampling methods employed by EDF participants may vary significantly from project to project as may the amount of data quality documentation provided with submitted data. Decisions regarding sampling and analytical procedures are driven by an organization's intended use for the data, which may or may not result in data that are directly comparable to those collected by OWQ.

OWQ's data quality review and verification process includes the review of any quality documentation provided with the data. The documentation review determines whether the sampling methods used by EDF participants can produce representative data for one or more OWQ programs. OWQ offers two guidance documents for assisting participants in the process of designing or altering a monitoring program to provide higher EDF tier data:

1. [General Guidance for the Office of Water Quality External Data Framework](#) (IDEM, 2021b) – Provides a general overview of the EDF and addresses some of the more common questions regarding the structure, policies, and participation in the EDF.
2. [Technical Guidance for the Office of Water Quality External Data Framework](#) (IDEM, 2021a) – Provides a detailed description of EDF requirements and recommendations. External organizations can use these guidelines to develop monitoring plans, improve the quality of collected data, and determine whether submitted data sets may be usable by one or more OWQ programs.

OWQ is currently in the process of developing [online QAPP tools](#) which will streamline the development of QAPPs and improve the QA documentation submitted with data by EDF participants.

B.2.2. Sampling Methods Used by NPS Program Grant Projects

The sampling methods employed by NPS projects vary from project to project and are described in detail in the respective project QAPPs. The NPS program provides a number of useful resources on the [Quality Assurance Project Plan Guidance](#) page to help grantees develop a QAPP. Resources include a QAPP template, instructions, and a checklist to ensure the completeness of the QAPP prior to submittal.

OWQ is currently in the process of developing [online QAPP tools](#) which will streamline the development of QAPPs and improve the QA documentation submitted with data by NPS projects.

In addition, the NPS program has developed a guidance document to assist NPS projects in developing monitoring plans: [Monitoring Water in Indiana: Choices for Nonpoint Source and Other Watershed Projects](#) (Purdue University 2012). This document identifies the core parameters all NPS monitoring projects are required to collect and supplemental parameters that may be added, based on individual project goals. Appendix B of this QAPP provides a list of all analytical and field methods and protocols used in the NPS program.

B.2.3. Sampling Methods Used by Clean Lakes Program Participants

The sampling methods for both the Clean Lakes Monitoring Program and the CLP Volunteer Monitoring Program are described in detail in their respective QAPPs (Indiana Clean Lakes Program, 2019a; 2019b). In addition, the program has developed the [Volunteer Lake Monitoring Manual](#), which provides instructions to volunteers on how to conduct monitoring for the program ([Indiana CLP, 2022](#)). Appendix B of this QAPP provides a list of all analytical and field methods and protocols used in the CLP.

B.2.4. Sampling Methods Used by Hoosier Riverwatch Volunteers

Most of the parameters monitored by HRW volunteers are analyzed in the field using test kits. The exceptions are *E. coli* samples, which must be plated and incubated for 24 hours, and biochemical oxygen demand (BOD) samples, which must be stored for five days prior to taking a reading.

The [Hoosier Riverwatch Volunteer Stream Monitoring Training Manual](#) (IDEM, 2022a) provides the primary guidance for volunteers. The manual contains information on the different monitoring tests and procedures HRW volunteers may use and includes examples to help volunteers correctly complete data collection sheets. Appendix B of this QAPP provides a list of all analytical and field methods and protocols used in the HRW program.

B.3. Sample Handling and Custody

The sample handling and custody practices followed by the four primary entities submitting external data to IDEM OWQ WAPB include:

B.3.1. External Data Framework Sample Handling and Custody Procedures

Chain of custody, sample storage, and sample preservation procedures vary depending on the EDF participant. Providing the electronic documentation for these procedures is voluntary. The ARUT provides documentation of sample times, dates, and locations.

The OWQ data quality review and verification process reviews any quality documentation provided with the data set to determine what procedures were used and the extent to which these procedures were followed.

B.3.2. Nonpoint Source Project Sample Handling and Custody Procedures

Chain of custody, sample storage, and sample preservation procedures are documented in the project QAPP. The ARUT provides documentation of sample times, dates, and locations.

The OWQ data quality review and verification process reviews the project's QAPP to determine the extent to which the documented procedures were followed.

B.3.3. Clean Lakes Program Sample Handling and Custody Procedures

Chain of custody, sample storage, and sample preservation procedures are documented in the project QAPPs for both the Clean Lakes Monitoring Program and the Volunteer Monitoring Program (Indiana CLP, 2019a, 2019b). The CLP Lakes Upload Template provides documentation of sample times, dates, and locations.

The OWQ data quality review and verification process evaluates the project's QAPP to determine the extent to which the documented procedures were followed.

B.3.4. Hoosier Riverwatch Sample Handling and Custody Procedures

Given the educational mission of the HRW program, volunteers are not required to document sample handling and custody procedures. Volunteers wishing to share data through the EDF are encouraged and provided technical assistance in developing a QAPP. The QAPP includes sample custody, handling, and preservation procedures.

The [HRW Training Manual](#) (IDEM, 2022a) does provide field sample handling instructions. However, custody procedures are unnecessary as most of the

parameters monitored are analyzed through test kits by volunteers in the field. The exceptions are *E. coli* samples, which must be plated and incubated for 24 hours, and BOD samples, which must be stored for five days prior to taking a reading. Analysis of these samples is an extension of the monitoring and analysis conducted by a volunteer in the field. Samples are rarely, if ever, passed to another person or laboratory for analysis.

B.4. Analytical Methods

The analytical methods employed by the four primary entities submitting external data to the IDEM OWQ WAPB include:

B.4.1. Analytical Methods Used by External Data Framework Participants

The analytical methods employed by EDF participants may vary significantly from project to project as may the amount of data quality documentation provided with submitted data. Decisions regarding sampling and analytical procedures are driven by an organization's intended use for the data, which may or may not result in data that are directly comparable to those collected by OWQ.

OWQ's data quality review and verification process includes the review of any quality documentation provided with the data. The documentation review identifies and evaluates the analytical methods used by EDF participants to determine the capability of producing representative data for one or more OWQ programs. OWQ's data quality review and verification process includes the review of any quality documentation provided with the data. The documentation review determines whether the sampling methods used by EDF participants can produce representative data for one or more OWQ programs.

B.4.2. Analytical Methods Used for Nonpoint Source Program Grant Projects

The analytical methods employed by NPS projects may vary significantly from project to project. The project QAPP describes the analytical methods in detail.

In addition to identifying core and supplemental parameters for NPS projects, the guidance document [Monitoring Water in Indiana: Choices for Nonpoint Source and Other Watershed Projects](#) (Purdue University, 2012) also provides suggested analytical procedures for those parameters. The choice of analytical methods lies with the individual project but is generally limited to those identified in the AIMS Protocol List (Appendix B).

B.4.3. Analytical Methods Used by the Clean Lakes Program

Unlike other NPS projects, the CLP is funded, in part, to provide data for use in OWQ programs. Therefore, the analytical methods used by the CLP program are more prescribed than for other NPS projects. Analytical methods for both the Clean Lakes Monitoring Program and the Volunteer Monitoring Program are identified in the respective QAPPs (Indiana CLP 2019a, 2019b). Like all NPS projects, any changes to either program's analytical methods must be approved by OWQ and reflected in that program's QAPP.

The Clean Lakes Monitoring Program analyzes chemistry samples using either the most current U.S. EPA methods (40 CFR § 136.3) or the Standard Methods for the Examination of Water and Wastewater, 21st Edition (APHA, 2005), depending on the parameter. Algal, zooplankton and phytoplankton identifications follow published taxonomic references, which are identified in the project QAPP.

Most of the monitoring conducted by volunteers consists of field parameter measurements. Any collected chemistry samples are sent to the IU SPEA laboratory for analysis using the methods described above for the Clean Lakes Monitoring Program.

B.4.4. Analytical Methods Used by Hoosier Riverwatch Volunteers

Most of the parameters monitored by the HRW program are analyzed by volunteers in the field using test kits. The exceptions are *E. coli* samples, which must be plated and incubated for 24 hours, and BOD samples, which must be stored for five days prior to taking a reading.

The HRW Training Manual (IDEM, 2022a) contains a list of all analytical and field methods and protocols. (See Appendix B)

B.5. Quality Control

The QC practices of the various entities submitting external data to IDEM OWQ include:

B.5.1. External Data Framework

Decisions regarding number and type of data quality control (QC) samples collected are driven by an organization's intended use of the data. The resulting data may or may not be directly comparable to data collected by OWQ.

Organizations or individuals collecting QC samples submit the results in the ARUT along with the rest of the shared data. The project information table in the ARUT is designed to collect QC results for data quality indicators used by the OWQ to determine the sensitivity, accuracy, precision, representativeness, and comparability of the data set.

As part of the data quality review and verification process, OWQ reviews any quality documentation provided with the data set to identify and evaluate any QC results provided with the data set.

B.5.2. Nonpoint Source Program

The number and type of QC samples NPS projects incorporate into studies varies from project to project and are described in detail in the respective project QAPPs. The NPS program encourages projects to consult the [Volunteer Monitor's Guide to Quality Assurance Project Plans](#) (U.S. EPA, 1996) to determine the QC samples needed to meet the project goals.

All NPS projects are required to submit QC sample results in the ARUT along with the rest of the collected data. The project information table in the ARUT is designed to collect QC results for data quality indicators used by the OWQ to

determine the sensitivity, accuracy, precision, representativeness, and comparability of the data set.

B.5.3. Clean Lakes Program

The number and type of QC samples collected by the Clean Lakes Monitoring Program are described in detail in the programs QAPPs (Indiana CLP 2019a, 2019b).

The Volunteer Monitoring Program does not require quality control samples as most volunteers only take field measurements. Volunteers that collect water chemistry samples for IU SPEA analysis are not required to collect QC samples. All volunteers are trained in several quality control procedures to ensure the precision and accuracy of field measurements. Likewise, volunteers collecting water chemistry samples are trained to ensure the samples collected are representative.

B.5.4. Hoosier Riverwatch

The number and type of QC procedures incorporated into monitoring conducted by HRW program volunteers is determined by each volunteer. In training, volunteers are introduced to quality control and the importance to the quality of the data collected.

The HRW Training Manual (IDEM, 2022a) contains information on how to obtain standards for the provided chemistry tests to determine the accuracy or bias of the results. The manual provides instructions on collection and use of replicate measurements to determine precision.

To help ensure representativeness in biological monitoring, volunteers are encouraged to sample at three locations within the same area and then combine the samples.

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

The equipment testing, inspection and maintenance of the various entities submitting data to IDEM OWQ include:

B.6.1. External Data Framework

The procedures for testing, inspecting, and maintaining sampling and analytical equipment used in the collection of data submitted through the EDF varies from participant to participant. All EDF participants are encouraged to include this information in the documentation provided with the data set or through a QAPP.

B.6.2. Nonpoint Source Program

The types of instruments and equipment used by NPS projects varies from project to project. Procedures for testing, inspecting, and maintaining equipment and instruments are provided in the project QAPP.

As part of the project's grant agreement, OWQ maintains the right to conduct inspections of monitoring activities. A project's quarterly reports are sent to the project's OWQ Project Manager. The reports provide a timely mechanism for reporting any issues experienced during monitoring activities.

B.6.3. Clean Lakes Program

The CLP provides instrument and equipment testing, inspection, and maintenance information in the program QAPPs (Indiana CLP, 2019a, 2019b). For the Clean Lakes Monitoring Program, this includes all the sampling equipment used in the field, and the laboratory equipment used for sample analysis. For the Volunteer Monitoring Program, this includes the Secchi disks used by volunteers to measure transparency, and the multi-metric (e.g., dissolved oxygen and water temperature) meters provided to some volunteers conducting expanded monitoring.

As with other NPS projects, OWQ may inspect the monitoring activities of either program at any time to ensure respective QAPP procedures are documented and followed.

B.6.4. Hoosier Riverwatch

The HRW Training Manual (IDEM, 2022a) provides information for volunteers on maintaining sampling equipment and how often inspections should be performed.

B.7. Instrument and Equipment Calibration and Frequency

The entities submitting external data to the IDEM OWQ implement instrument calibration schedules as follows:

B.7.1. External Data Framework

Sampling and analysis instrumentation used by EDF participants varies across projects as do calibration procedures and frequency. All EDF participants are encouraged to include this information in the documentation provided with submitted data sets or through a QAPP.

B.7.2. Nonpoint Source program

The types of instruments and equipment used by NPS projects varies across projects. Project QAPPs provide information regarding the calibration procedures and frequency for any instruments and equipment used in the field or laboratory.

B.7.3. Clean Lakes Program

The CLP QAPPs (Indiana CLP, 2019a, 2019b) describes the program's procedures for the calibration of instruments and equipment, and the frequency of calibrations.

For the CLP, this includes the multi-metric meters used in the field and the laboratory equipment used for sample analysis. For the Volunteer Monitoring Program, this includes the multi-metric meters provided to some volunteers performing expanded monitoring.

B.7.4. Hoosier Riverwatch

The equipment used by HRW volunteers does not require calibration.

B.8. Inspection and Acceptance of Supplies and Consumables

The entities submitting external data to the IDEM OWQ use the following practices regarding inspection and acceptance of field supplies and consumables:

B.8.1. External Data Framework

The types of supplies and consumables used by EDF participants varies across projects. EDF participants are encouraged to include this information in the documentation provided with the data set or through a QAPP.

B.8.2. Nonpoint Source Projects

The types of supplies and consumables used by NPS monitoring projects varies across projects. The inspection and acceptance procedures are described in the respective QAPPs.

B.8.3. Clean Lakes Program

The QAPP for the Clean Lakes Monitoring Program (Indiana CLP, 2019a) describes the supplies and consumables used, and procedures and timelines for inspections.

This is not addressed in the QAPP for the Volunteer Monitoring Program (Indiana CLP, 2019b), because volunteers do not use any supplies or consumables that require inspection.

B.8.4. Hoosier Riverwatch

The HRW Training Manual (IDEM, 2022a) provides volunteers with information for reagent inspections and inspections of other consumable supplies.

B.9. Non-direct Measurements

The term “non-direct measurements” refers to data generated for a specific project or purpose and is subsequently used for an additional purpose. The focus of this QAPP is the use of data collected by various external data sources as additional non-direct measurements for IDEM OWQ WAPB programs. This QAPP provides information on how OWQ acquires, manages, reviews, and evaluates all external data received; and potential uses by the OWQ programs.

OWQ accepts only data collected directly by the participants in the four programs listed in this QAPP. OWQ will not accept non-direct measurements submitted by participants in any of the four programs discussed in this QAPP if these measurements were not directly gathered by participants in those programs.

B.10. Data Management

B.10.1. External Data Framework

All EDF participants submit data in one of two ways:

1. Upload of data in the form of an ARUT –The EDF Coordinator provides participants with an ARUT which includes the sites and protocols that were outlined in the project QAPP. Participants enter results into the ARUT and send it directly to the EDF Coordinator. WAPB can then review and upload

project results into AIMS. Once in AIMS, the data is available by request to anyone within and outside the OWQ and IDEM.

2. Electronic Data Import (EDI) – An EDI is an electronic file formatted to facilitate direct upload of data into AIMS.

B.10.2. Nonpoint Source Program

All NPS projects are required to submit data in an ARUT, provided by the NPS QAO. When an ARUT is received (currently through an email directly to the EDF coordinator or NPS QAO), the water chemistry QAO uploads and imports the results into AIMS after data review and DQL assignment.

Detailed instructions for preparing ARUTs for NPS projects and EDF participants request through the Secondary Data Portal are provided in the [AIMS Results Upload Template Instructions](#) SOP (IDEM, 2022c). Instructions for uploading the ARUT into AIMS is provided in the [AIMS User Guide](#) (IDEM, 2022d).

B.10.3. Clean Lakes Program

Unlike other NPS Projects, the CLP provides data to IDEM OWQ through an Excel formatted Lakes Upload Template file. The spreadsheet is stored in a CLP project folder, in the same location on the shared server as other NPS project information (S:\IGCN\OWQ\AIMS\EDIFiles\CleanLakes Imports).

B.10.4. Hoosier Riverwatch

HRW volunteers enter results into data sheets provided in the [HRW Training Manual](#) (IDEM, 2022a). Given the voluntary nature of the program, there are no requirements that completed data sheets be retained by volunteers, nor does the HRW program request data sheets from volunteers.

HRW volunteers that choose to share data with OWQ enter results directly into the [Hoosier Riverwatch database](#) online. The HRW database application and data is stored on a dedicated Linux server with a commercial hosting provider (<https://www.hostmysite.com/>). The HRW database cannot be housed on IDEM servers due to limitations imposed by IDEM's security policies and firewalls installed on IDEM servers. The server is backed up nightly with each backup held for seven days, allowing IDEM the ability to retrieve any data lost within the previous week. OWQ maintains administrative access to the database at all times and retains ownership of the HRW database and the contents through a contractual agreement with the developer.

Data collected by HRW volunteers is not currently being uploaded from the HRW database into AIMS, because the HRW data lacks much of the information required by AIMS. However, the data are still available to OWQ for potential use in programs through access to the HRW database.

C. Assessment and Oversight

The following assessment activities are planned to track implementation of the data operation to ensure the plan is implemented as prescribed.

C.1. Assessments and Response Actions

C.1.1. External Data Framework

The assessment of data submitted by EDF participants differs based on the mode of data entry chosen:

1. Upload of data in the form of an ARUT – Participants using an ARUT submit it via email directly to the EDF coordinator. The EDF coordinator will then review the data to identify any problems and will work toward a resolution with the participant.
2. Submittal through an EDI – Participants using an EDI will format their data as a comma separated value (CSV) file and submit it via email to the EDF coordinator. The EDF coordinator can upload the file directly into AIMS (IDEM, 2020).

C.1.2. Nonpoint Source projects

Prior to beginning monitoring, all NPS projects are required to submit a QAPP for review and approval. If the QAPP has insufficient information or other issues, the NPS QAO works with the project managers to resolve the issues and approve the QAPP.

Throughout the duration of the project's monitoring program, discrepancies, changes, or issues associated with the method analysis are documented and reported and then discussed during quarterly OWQ WSS visits or reported in the project's quarterly report. The NPS QAO reviews all quarterly reports to determine if any monitoring issues warrant additional attention, such as the delivery of technical assistance.

Except for the CLP, all NPS projects are required to submit results in an ARUT. NPS projects are expected to document any discrepancies, changes, or problems associated with laboratory analyses by adding information into the qualifiers and flags or in the ARUT comment fields in accordance with the instructions provided.

When the respective QAO (water chemistry; fish tissue; fish or macroinvertebrate community) receives the data submittal, the ARUT is reviewed in accordance with the [AIMS Results Upload Template Instructions](#) SOP (IDEM, 2022). This ensures all the information necessary for upload into AIMS is present.

The QAO reviews the ARUT and the verification letter upon submittal in accordance with [Methods and Procedures for the Assessment of Secondary Data Administrative Standard Operating Procedure](#) (IDEM, 2023b). If any issues found warrant follow-up actions, the QAO may:

1. Request additional information from the project.
2. Remove results not meeting the ARUT requirements.
3. Remove results derived from methods judged by the NPS QAO to not be true to procedure.
4. Audit the project.

C.1.3. Clean Lakes Program

Assessments of and response actions to the CLP's monitoring programs differ from other NPS projects because the CLP does not submit data for either program using the ARUT. The CLP provides monitoring results to OWQ in a Lakes Upload Template electronic spreadsheet.

The CLP project manager reviews the data prior to OWQ submission and must submit all data collected prior to the contract end data. The program provides a comprehensive report of the program's monitoring activities at the end of the project term.

When the data are received, the lead QAO reviews the data set for completeness and works directly with the CLP project manager to resolve any issues.

C.1.4. Hoosier Riverwatch

Due to the educational mission of the HRW program, data quality assessments and response actions are minimal and geared toward helping volunteers understand the results obtained. The HRW manual provides instructions for creating graphs and charts. Volunteers may use the graphs and charts to compare results obtained by other HRW volunteers. The manual discusses potential causes for seemingly anomalous results. The training manual also provides detailed instructions on how to enter data into the HRW online database.

On the OWQ side, the HRW coordinator reviews data entered into the online database for missing information and any apparently anomalous values. When such issues are identified, the HRW coordinator will work toward resolution with the volunteer.

C.2. Reports to Management

This section of the QAPP is not applicable. The primary purpose of OWQ's External Data Program is to solicit and make available external data of known quality for potential use in OWQ programs. Requirements regarding how external data may be used and how that use must be reported are not dictated by the External Data QAPP. Rather, external data may be expected to vary from OWQ program to program and between the different potential uses within a given program.

D. Determining Data Usability

Once data packets are returned from the laboratory after the data collection or generation phase of the project, the OWQ, WAPB will perform data review, verification, and validation.

D.1. Verification of External Data Sets

Verification of external data is the process of evaluating the data set as a whole to ensure that the submittal is complete, and the data package contains all the information necessary to validate the data and assign a data quality level.

OWQ's verification methods for external data, regardless of the source, are discussed in detail in the EDF Technical Guidance (IDEM, 2021a) and include:

- Review of the QA documentation submitted with the data.
- Review of the results for any quality control procedures implemented.

For data submitted by EDF participants or NPS Projects in an ARUT, verification includes review of the data set to determine whether all the informational elements necessary for upload into AIMS are included.

D.2. Data Validation

Validation of external data is the process of characterizing the quality of the data set. OWQ's data validation process for external data, regardless of the source, are discussed in detail in the EDF Technical Guidance (IDEM, 2021a).

To determine the data quality characteristics of the data set, OWQ evaluates the results for each type of data provided in the data set for quantitative and qualitative data quality indicators, including:

- Precision
- Accuracy or bias
- Method sensitivity
- Representativeness
- Comparability

D.3. Reconciliation with User Requirements

Results validated through OWQ's data quality assessment process are considered potentially reliable for OWQ uses. The validated QA data and provided information are compared with the DQOs established for a given EDF tier for the type of data under consideration.

DQOs are based on qualitative and quantitative characteristics of a data set that describe the data quality needed to support the intended use. To use external data that has been validated, OWQ must reconcile the data set with the requirements specific to the intended use. For example, Tier 3 data may be used to make CWA 303(d) listing decisions. While there may be two Tier 3 data sets available, the type of data in one is not the correct type for the use to be assessed.

The primary goal of the EDF is to provide a process for making data of known quality from external sources available to OWQ programs. While OWQ receives data from different sources, this process applies to all external data, regardless of the source. Applying the EDF process for data verification, validation, and reconciliation with user requirements, which vary from program to program, achieves consistency with U.S. EPA's graded approach (U.S. EPA, 2002). This ensures any external data used by OWQ programs is reliable.

E. References

40 CFR § 136.3. Identification of Test Procedures.

APHA, 2005. Standard Methods for the Examination of Water and Wastewater, 21st Edition. American Public Health Association: Washington DC.

Indiana Administrative Code (IAC). http://iac.iga.in.gov/iac/iac_title?iact=327

Indiana Department of Environmental Management. 1986. Indiana Lake Classification System and Management Plan. Office of Water Quality: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2014. [Reviewing Nonpoint Source \(NPS\) Grantee Quality Assurance Project Plans \(QAPPs\)](#) SOP (S-001-OWQ-WAP-TL-13-S-R0). Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2020. [EDI Import to AIMS II](#) TSOP (S-004-OWQ-WAP-TL-20-T-R0). Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2021a. [Technical Guidance for the Office of Water Quality External Data Framework](#). Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2021b. [General Guidance for the Office of Water Quality External Data Framework](#). Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2022a. [Volunteer Stream Monitoring Training Manual 2022](#). Office of Water Quality Hoosier Riverwatch Program: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2022b. [2022 Indiana Integrated Water Monitoring and Assessment Report to the U.S. EPA. Appendix G: IDEM's 2022 Consolidated Assessment and Listing Methodology](#). Indiana Department of Environmental Management, Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2022c. [Assessment Information Management System Results Upload Template Instructions](#) SOP (B-004-OWQ-WAP-TL-22-S-R1). Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.

Indiana Department of Environmental Management. 2022d. [The AIMSII User Guide](#). SharePoint, Technical Logistical Services Section, OWQ, IDEM, Shared Documents.

Indiana Department of Environmental Management. 2023a. [Quality Assurance Project Plan \(QAPP\) for Indiana Surface Water Programs](#) (Rev. 5, July 2023). (B-001-OWQ-WAP-XX-23-Q-R5).

- Indiana Department of Environmental Management. 2023b. [Nonpoint Source \(NPS\) Data Management TSOP](#) (S-002-OWQ-WAP-TL-23-T-R1). Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.
- Indiana Department of Environmental Management. 2023c. [Methods and Procedures for the Data Quality Assessment of Secondary Data TSOP](#) (B-007-OWQ-WAP-XX-23-T-R0). Office of Water Quality, Watershed Assessment and Planning Branch: Indianapolis, Indiana.
- Indiana Clean Lakes Program. 2019a. [Quality Assurance Project Plan for Indiana Clean Lakes Program \(2019-2020\) Contract # 31746, Final Draft, June 7 2019](#). School of Public and Environmental Affairs, Indiana University: Bloomington, Indiana.
- Indiana Clean Lakes Program. 2019b. [Quality Assurance Project Plan for The Volunteer Lake Monitoring Program: A Component of the Indiana Clean Lakes Program, Contract # 31746, Draft 1, June 2019](#). School of Public and Environmental Affairs, Indiana University: Bloomington, Indiana.
- Indiana Clean Lakes Program. 2022. [Volunteer Lake Monitoring Manual](#). School of Public and Environmental Affairs. Indiana University: Bloomington Indiana.
- Purdue University. 2012. [Monitoring Water in Indiana: Choices for Nonpoint Source and Other Watershed Projects](#). Department of Agricultural and Biological Engineering. Purdue University. February 2012.
- U.S. Environmental Protection Agency. 1996. [The Volunteer Monitor's Guide to Quality Assurance Project Plans](#) EPA 841-B-96-003. September 1996.
- U.S. Environmental Protection Agency. 2002. [Overview of the EPA Quality System for Environmental Data and Technology](#). EPA/240/R-02/003 November 2002.
- U.S. Environmental Protection Agency. 2006. [Guidance on Systematic Planning Using the Data Quality Objectives Process](#). EPA QA/G-4. February 2006.

Appendix A

Potential uses for data received through the External Data Framework (taken from Table 1 in IDEM, 2021a).

EDF Tier	Use Key	EDF Data Uses	Waterbody Type(s)
OWQ Uses (identified in the Use Key with an "A")			
3	A1	Clean Water Act (CWA) Section 305(b) aquatic life use support assessments and Section 303(d) listing decisions (within the Great Lakes Basin)	Streams
3	A2	CWA Section 305(b) aquatic life use support assessments and Section 303(d) listing decisions (outside the Great Lakes Basin)	Streams
3	A3	CWA Section 305(b) recreational use support (human health) assessments and Section 303(d) listing decisions	Lakes and Streams
3	A4	CWA Section 305(b) fishable use support assessments and Section 303(d) listing decisions	Lakes and Streams
3	A5	CWA Section 305(b) drinking water use support assessments and Section 303(d) listing decisions (within the Great Lakes Basin)	Streams
3	A6	CWA Section 305(b) drinking water use support assessments and Section 303(d) listing decisions (outside the Great Lakes Basin)	Streams
3	A7	Water quality modeling for total maximum daily load (TMDL) development	Lakes and Streams
3	A8	Demonstrating effectiveness of watershed restoration efforts funded by OWQ's Nonpoint Source (NPS) Program	Lakes and Streams
3	A9	Determining representative background conditions for the purpose of developing National Pollutant Discharge Elimination System (NPDES) permits	Streams
3	A10	Classifying waters for the purpose of applying antidegradation rules in Indiana's Water Quality Standards	Streams
2	A11	CWA Section 305(b) recreational use support (aesthetics) assessments and Section 303(d) listing decisions for lakes	Lakes
2	A12	CWA Section 314 assessments of trophic status and trends in lakes	Lakes
2	A13	Supplementary information for use in planning and prioritizing OWQ monitoring efforts for TMDL development, MS4 program development and prioritization, watershed characterization studies and other projects	Lakes and Streams
2	A14	Demonstrating the effectiveness of watershed management plan and/or TMDL implementation over time (incremental improvements that meet U.S. EPA performance measures)	Lakes and Streams
2	A15	Establishing need for low interest loans to assist with formation of regional sewer and water districts (RSWDs)	Lakes and Streams
2	A16	Supplementary information for use in evaluating loan applications for drinking water and wastewater infrastructure improvements through the Indiana State Revolving Loan Fund (SRF)	Lakes and Streams
2	A17	Supplementary information for use in evaluating CWA Section 401 applications and isolated wetland permit applications, and identifying potential wetland mitigation sites	Streams
1	*	Supplementary information for use in TMDL development	Lakes and Streams
1	*	Supplementary information for OWQ's Integrated Report	Lakes and Streams

Appendix A

Potential uses for data received through the External Data Framework (taken from Table 1 in IDEM, 2021a). (cont.)

EDF Tier	Use Key	EDF Data Uses	Waterbody Type(s)
Non-OWQ Uses (identified in the Use Key with a "B")			
2	B1	Watershed management planning	Lakes and Streams
2	B2	Demonstrating the effectiveness of measures recommended in a watershed management plan or an approved TMDL to increase public awareness, support, and involvement	Lakes and Streams
2	B3	Demonstrating effectiveness of minimum control measures specified in municipal separate storm sewer system (MS4) storm water quality management plans, permits or improvements over time to increase public awareness, support, and involvement	Streams
2	B4	Demonstrating the effectiveness of measures implemented as part of a community's long-term combined sewer overflow (CSO) control plan	Streams
2	B5	Screening for potential recreational use issues related to human health	Lakes and Streams
2	B6	Screening for potential recreational use issues related to aesthetics	Lakes
2	B7	Water quality modeling for total maximum daily load (TMDL) development	Lakes
2	**	Determining water quality trends over time	Lakes and Streams
1	*	Education and raising awareness of water resource issues	Lakes and Streams
1		Supplementary information for use in NPDES permits development	
3		Information submitted in support of an antidegradation demonstration developed in accordance with 327 IAC 2-1.3-5	
3		Outstanding State Resource Water designation proposals under IC 13-18-3-2	
3		Conducting a Use Attainability Analysis for purposes of changing a designated use under 327 IAC 2-1-10 or 2-1.5-18	

*No key is provided because Tier 1 of the EDF is associated with data of unknown quality (see Figure 2). As such, this guidance does not articulate any requirements or recommendations for these uses.

**No key is provided because water quality results for any parameter are potentially usable for these purposes. Note that while the same is true for the uses keyed to B1 and B2, they are keyed to the more common parameters for which water quality data are needed at the local level.

Appendix B – Standard methods used by NPS, HRW, CLP participants in water quality analysis.

AIMS Substance Protocol Identifier	Substance Name	Substance CAS No.	Analytical Method	Test Location	User		
					NPS	HRW	CLP
Algal Biomass							
7126	AFDM	E-AFDM	SM10200I(5)	LAB	X		
5869	AFDM	E-AFDM	USGS B352085	LAB	X		
4570	Chlorophyll a	479-61-8	SM10200H	LAB			X
5867	Phytoplankton Chlorophyll-a	E-PHYTO-C	445.0	LAB	X		
6674	TPCN	7440-44-0	USGS 440.0	LAB	X		
Bacteriology							
7173	Anatoxin-a	64285-06-9	546	LAB	X		
7094	Anatoxin-a	64285-06-9	ABRAXIS-520060	LAB	X		
7315	E. coli	ECOLI	AOAC 991.14	LAB	X	X	
6635	E. coli	ECOLI	COLISCAN EASYGEL 35C	LAB	X	X	
6636	E. coli	ECOLI	COLISCAN EASYGEL AMBIENT	LAB	X		
4811	E. coli	ECOLI	EPA 1103.1	LAB	X		
6637	E. coli	ECOLI	EPA 1603	LAB	X		
363	E. coli	ECOLI	SM9222B	LAB	X		
365	E. coli	ECOLI	SM9223B	LAB	X		
7309	Microcystin (total)	77238-39-2	546	LAB	X		
7314	Microcystin (total)	77238-39-2	ABRAXIS-520022	LAB	X		
7172	Microcystin-LR	101043-37-2	546	LAB	X		
7132	Microcystin-LR	101043-37-2	ABRAXIS-520011	LAB	X		
7175	Saxitoxin	35523-89-8	546	LAB	X		
General Chemistry							
4952	% Sat	E-%SAT	SM4500-OG	BOTH			X
5753	% Water Column Oxic	L-WCOXIC	SM4500-OG	FIELD			X
5752	1% Light Level	L-LightLev1	LIGHTMETER	FIELD			X

AIMS Substance Protocol Identifier	Substance Name	Substance CAS No.	Analytical Method	Test Location	User		
					NPS	HRW	CLP
5751	Light Trans @ 3 ft.	L-TRANS3	LIGHTMETER	FIELD			X
4642	Alkalinity (as CaCO3)	E-14506	SM2320B	LAB			X
5842	Chloride	16887-00-6	325.2	LAB	X		
4654	Chloride	16887-00-6	325.3	LAB	X		
6641	DO	E-14539	360.1	BOTH	X		
6639	DO	E-14539	ASTM D888-87	LAB	X		
6638	DO	E-14539	CHEMETRICS DO KIT K 7512	FIELD	X	X	
361	DO	E-14539	SM4500-OG	BOTH	X		
6643	DO, Winkler	E-14539	EPA 360.2	BOTH	X		
4763	DO, Winkler	E-14539	SM4500-OC	BOTH	X		
6642	DO, Modified Winkler	E-14539	EPA 360.2 M	BOTH	X		
4954	DO, Modified Winkler	E-14539	HACH OX-2P	FIELD	X		
546	Oil and Grease	E-10140	1664	LAB	X		
547	Oil and Grease	E-10140	413.1	LAB	X		
4767	Oil and Grease	E-10140	SM5520C	LAB	X		
7107	pH	E-00400	150.1	FIELD	X		
6618	pH	E-00400	150.2	FIELD	X		X
6684	pH	E-00400	SM 4500H	FIELD	X		
6619	pH	E-00400	SM4500H-B	FIELD	X		
6685	pH	E-00400	WATER WORKS PH STRIPS	FIELD	X		
4629	pH	E-10139	150	LAB	X		
6686	pH	E-10139	EPA 9041A	LAB	X		
5750	Secchi Depth	SECCHI	Secchi	FIELD	X		X
593	Solids, Suspended Total, (TSS)	E-10151	160.2	LAB	X		
7240	Solids, Suspended Total, (TSS)	E-10151	I-3765-85	LAB	X		
4631	Solids, Suspended Total, (TSS)	E-10151	SM2540D	LAB	X		

AIMS Substance Protocol Identifier	Substance Name	Substance CAS No.	Analytical Method	Test Location	User		
					NPS	HRW	CLP
594	Solids, Total (TS)	E-10151	160.3	LAB	X		
4630	Solids, Total (TS)	E-10151	SM2540B	LAB	X		
7233	Solids, Total (TS)	E-10151	SM2540G	LAB	X		
7096	Solids, Total Dissolved (TDS) - Calculated as NaCl	E-10173	SM2510A	FIELD	X		
6668	Specific Conductance	E-10184	120.1	FIELD	X		
6669	Specific Conductance	E-10184	HACH 8160	FIELD	X		
6670	Specific Conductance	E-10184	SM2510A	FIELD	X		
4771	Specific Conductance	E-10184	SM2510B	LAB			X
6663	Suspended Sediment Conc.	E-17164666	ASTM D3977-97	LAB	X		
6671	Temperature	E-TEMPERATURE	EPA 170.1	FIELD	X		
5176	Temperature	E-TEMPERATURE	SM2550B(1)	BOTH	X		
4950	Temperature	E-TEMPERATURE	SM2550B(2)	BOTH	X		X
7170	Turbidity	E-10617	ISO 7027	FIELD	X		
4951	Turbidity	E-10617	SM2130B Mod	FIELD	X		
6675	Turbidity	E-10617	Transparency Tube	FIELD	X		
659	Turbidity (Lab)	E-10617	180.1	LAB	X		
4637	Turbidity (Lab)	E-10617	SM2130B	BOTH	X		
Indices							
7130, 7135	Fish IBI		IN IDEM FISH COMMUNITY	FIELD	X		
6650	Habitat		CQHEI	FIELD	X		
6651	Habitat		IN IDEM QHEI	FIELD	X		

AIMS Substance Protocol Identifier	Substance Name	Substance CAS No.	Analytical Method	Test Location	User		
					NPS	HRW	CLP
6682	mIBI		EPA 841-B-99-002 JULY 1999	FIELD	X		
7129, 7136	mIBI		IN IDEM HESTER-DENDY	FIELD	X		
7128, 7137	mIBI		IN IDEM KICK	FIELD	X		
7127, 7138	mIBI		IN IDEM MHAB	FIELD	X		
6662	Pollution Tolerance Index Rating		PTIR	FIELD	X		
6681	Water Quality Index		WQI	FIELD	X		
Nutrients							
119	CBOD5	E-10106C5	405.1	LAB	X		
898	CBOD-LR	E-10106CU	SM5210C	LAB	X		
4625	COD	E-10117	410.4	LAB	X		
4808	COD	E-10117	ASTM D1252-00 (B)	LAB	X		
4495	Nitrogen, Ammonia (Total)	7664-41-7	350.1	LAB	X		X
5834	Nitrogen, Ammonia (Total)	7664-41-7	350.3	LAB	X		
4497	Nitrogen, Ammonia (Total)	7664-41-7	SM4500NH3-D	LAB	X		
4496	Nitrogen, Ammonia (Total)	7664-41-7	SM4500NH3-F	LAB	X		
6697	Nitrogen, Ammonia (Total)	7664-41-7	SM4500NH3-G	LAB	X		
517	Nitrogen, Nitrate (Total)	14797-55-8	352.1	LAB	X		
4179	Nitrogen, Nitrate (Total)	14797-55-8	SM4500NO3-D	LAB	X		
4180	Nitrogen, Nitrate (Total)	14797-55-8	SM4500NO3-E	LAB	X		
6652	Nitrogen, Nitrate (Total)	14797-55-8	WATERWORKS TESTSTRIPS #480009	FIELD	X	X	
7313	Nitrogen, Nitrate+Nitrite (Dissolved)	E-10128	300.0	LAB	X		
4628	Nitrogen, Nitrate+Nitrite (Total)	E-10128	353.1	LAB	X		
4627	Nitrogen, Nitrate+Nitrite (Total)	E-10128	353.2	LAB	X		X
6657	Nitrogen, Nitrate+Nitrite (Total)	E-10128	EPA 353.3	LAB	X		

AIMS Substance Protocol Identifier	Substance Name	Substance CAS No.	Analytical Method	Test Location	User		
					NPS	HRW	CLP
7171	Nitrogen, Nitrate+Nitrite (Total)	E-10128	SM4500NO3-H	LAB	X		
4786	Nitrogen, Nitrite (Total)	14797-65-0	353.2	LAB	X		
520	Nitrogen, Nitrite (Total)	14797-65-0	354.1	LAB	X		
4185	Nitrogen, Nitrite (Total)	14797-65-0	SM4500NO2-B	LAB	X		
6653	Nitrogen, Nitrite (Total)	14797-65-0	WATERWORKS TEST STRIPS #480009	FIELD	X	X	
7312	Nitrogen, Total (Dissolved)	E-52450988	ASTM D8083-16	LAB	X		
7311	Nitrogen, Total (Total)	E-52450988	ASTM D8083-16	LAB	X		
7237	Nitrogen, Total (Total)	E-52450988	HACH 10071	LAB	X		
7177	Nitrogen, Total (Total)	E-52450988	SM4500P-J	LAB	X		X
4174	Phosphorus, ortho (Dissolved)	14265-44-2	300.0	LAB	X		
4755	Phosphorus, ortho (Dissolved)	14265-44-2	365.1	LAB	X		X
4784	Phosphorus, ortho (Total)	14265-44-2	365.2	LAB	X		
6659	Phosphorus, ortho (Total)	14265-44-2	ASTM D515-82	LAB	X		
6660	Phosphorus, ortho (Total)	14265-44-2	CHEMETRICS KIT K 8510	FIELD	X	X	
6661	Phosphorus, ortho (Total)	14265-44-2	SM4500P-C	LAB	X		
4176	Phosphorus, Total (Total)	7723-14-0	365.1	LAB	X		
4503	Phosphorus, Total (Total)	7723-14-0	SM4500P-E	LAB			X
122	TBOD5	E-10106T5	405.1	LAB	X		
6628	TBOD5	E-10106T5	CHEMETRICS DO KIT K 7512	LAB		X	
121	TBOD5	E-10106T5	SM5210B	LAB	X		
4636	TKN	E-10264	351.2	LAB	X		X
4655	TKN	E-10264	351.4	LAB	X		
6654	TKN	E-10264	SM 4500N(ORG)-B	LAB	X		
6655	TKN	E-10264	SM 4500N(ORG)-C	LAB	X		
4635	TKN	E-10264	SM4500N(ORG)-B	LAB	X		

AIMS Substance Protocol Identifier	Substance Name	Substance CAS No.	Analytical Method	Test Location	User		
					NPS	HRW	CLP
6698	TKN	E-10264	SM4500N(ORG)-D	LAB	X		
4908	TOC	E-10195	SM5310C	LAB	X		
897	UBOD	E-10106TU	SM5210C	LAB	X		
Physical							
6645	Flow	E1643212	ASTM D3858-95	FIELD	X		
6646	Flow	E1643212	ASTM D4408	FIELD	X		
6647	Flow	E1643212	EPA VOLUNTEER	FIELD	X		
6648	Flow	E1643212	RATING CURVE	FIELD	X		
6649	Flow	E1643212	USGS	FIELD	X		
6644	Flow	E1643212	WDV ROUGHNESS COEF	FIELD	X		
7097	Precipitation	E1644459	GRADUATED RAIN GAUGE	FIELD	X		
7099	Precipitation	E1644459	STANDARD NWS RAIN GAUGE	FIELD	X		
7098	Precipitation	E1644459	TIPPING BUCKET WITH HEATER	FIELD	X		
7104	Precipitation 24hr prior to monitoring event amount	E-323366	GRADUATED RAIN GAUGE	FIELD	X		
7103	Precipitation 24hr prior to monitoring event amount	E-323366	STANDARD NWS RAIN GAUGE	FIELD	X		
7105	Precipitation 24hr prior to monitoring event amount	E-323366	TIPPING BUCKET WITH HEATER	FIELD	X		
7101	Precipitation 48hr prior to monitoring event amount	E-323367	GRADUATED RAIN GAUGE	FIELD	X		
7100	Precipitation 48hr prior to monitoring event amount	E-323367	STANDARD NWS RAIN GAUGE	FIELD	X		
7102	Precipitation 48hr prior to monitoring event amount	E-323367	TIPPING BUCKET WITH HEATER	FIELD	X		

AIMS Substance Protocol Identifier	Substance Name	Substance CAS No.	Analytical Method	Test Location	User		
					NPS	HRW	CLP
6678	Water Levels		ASTM D5413A	FIELD	X		
6679	Water Levels		ASTM D5413B	FIELD	X		
6680	Water Levels		ASTM D5413C	FIELD	X		