

Methods and Procedures for the Data Quality Assessment of Secondary Data

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Technical Standard Operating Procedure

Office: Office of Water Quality

Branch: Watershed Assessment and Planning Branch

Section: N/A

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Purpose

This technical standard operating procedure (TSOP) provides guidance to the Quality Assurance (QA) staff of the Watershed Assessment and Planning Branch (WAPB) of the Indiana Department of Environmental Management (IDEM). It is intended for use when assigning data quality levels (DQLs) to verify the quality of a data set. Subsequent evaluation of quantitative or qualitative data quality indicators (DQIs) identify errors and determine the analytical quality of the data set. This TSOP is for data sets that are collected from sources not covered under the WAPB [Quality Assurance Project Plan \(QAPP\) for Indiana Surface Water Programs](#) (IDEM, 2017) or Quality Assurance Project Plan (QAPP) for Biological Community and Habitat Measurements (IDEM, 2019). Data from external sources are considered secondary data for IDEM purposes.

The scope of the methods and procedures contained in this TSOP cover evaluation of a given data package by determining the completeness of its supportive metadata, assignment of DQLs, assessment of DQIs, and the assignment of data quality flags. This TSOP establishes formal criteria for evaluating data received through any of the following programs: Nonpoint Source Program (NPS), External Data Framework (EDF), Hoosier Riverwatch Program (HRW), Indiana Clean Lakes Program (CLP), and any other data sets to which the WAPB QAPP does not directly apply.

Scope

This TSOP should be used by Office of Water Quality (OWQ), WAPB Quality Assurance staff who provide assessments of data and environmental measurements generated by external customers. This service is provided as part of IDEM's ambient surface water quality monitoring program.

Method Summary


The quality assessment process requires that the assigned quality assurance officer (QAO) determine whether a given data set furnishes sufficient metadata to assign a DQL and apply flags to the results according to the DQI criteria established for the data type in the project. The metadata may be supplied either with the data submission, in the Project QAPP or Work Plan, or through other additional documentation. The QAO maintains the flow of information during this process, with the outcome of providing quality-assessed data from secondary data projects for permanent storage. The QAO retains sole responsibility for final acceptance and decision-making authority for any information submitted.

This SOP describes chronological steps for the review and qualification of secondary data. It provides a consistent data review process which validates data sets that have the potential to be uploaded into the WAPB Assessment Information Management System (AIMS) database to be used for WAPB assessment purposes. Each data set that is received by the WAPB will be subjected to the steps described in this

TSOP and will be evaluated in accordance with established criteria before receiving a DQL assignment. This TSOP includes the DQL definitions used for assigning quality levels to each parameter in each data set, an evaluation of DQL assessments, and a final report summarizing the data quality status. Data usability is covered in the document [Technical Guidance For the Office of Water Quality External Data Framework](#) (IDEM, 2021a).

Authorizing Signatures

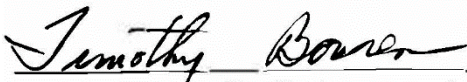
I approve and authorize this technical standard operating procedure (TSOP):



Caleb Rennaker, Chief, WAPB Quality Assurance Manager
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6/20/2023


Date



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6-28-23

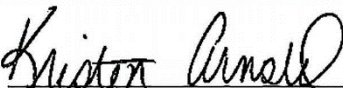
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Kevin Gaston, Fish Community Program Manager
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6/27/2023

Date




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6/20/2023

Date

This technical standard operating procedure is consistent with agency requirements.



Quality Assurance Program, Planning and Assessment
Indiana Department of Environmental Management

7/5/23

Date

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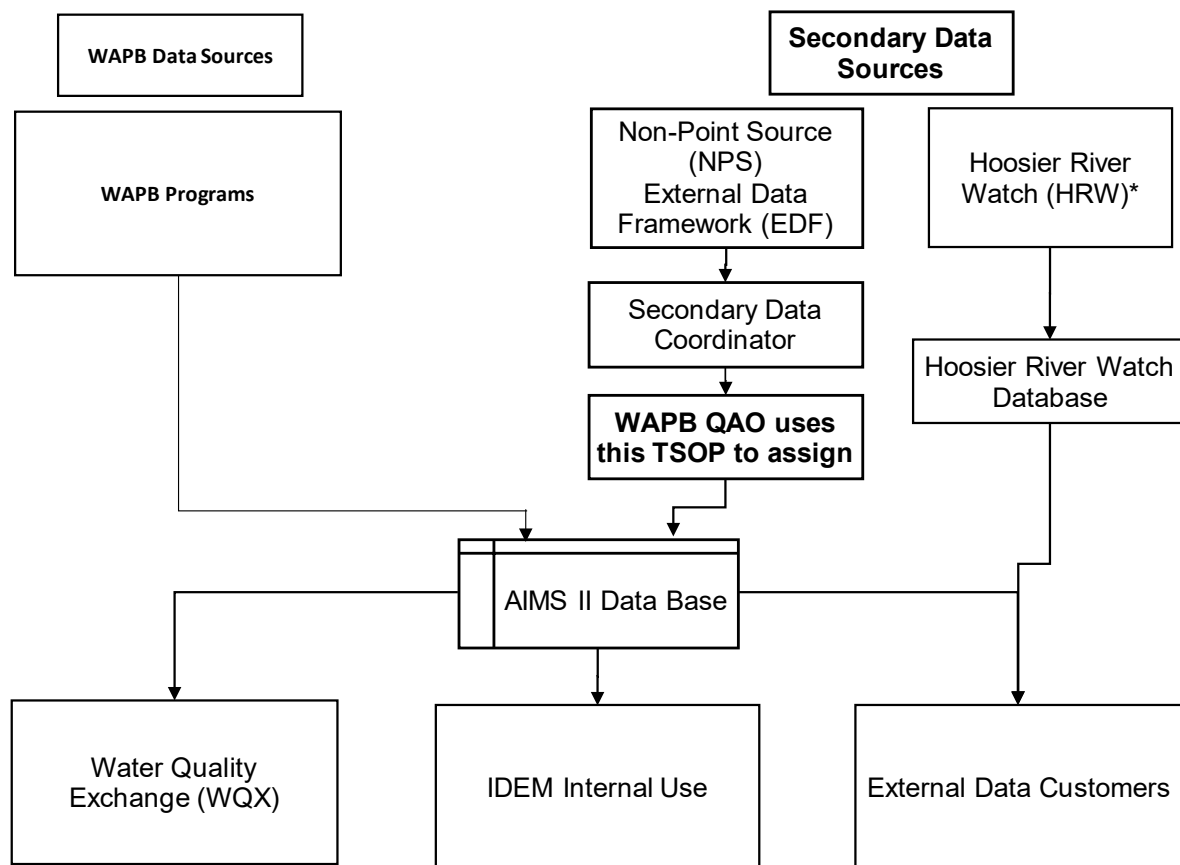
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1.0 Quality Assurance System Overview

Secondary data projects produce data that is generated under a Quality Assurance Project Plan (QAPP) other than a WAPB QAPP. Secondary data may be stored in the AIMS database for subsequent use by the WAPB, external data customers, and eventual upload into EPA's Water Quality Exchange (WQX) database.

Data quality assurance is an iterative process that systematically evaluates a data set until all elements of the qualification procedure have been satisfied.

Flowchart 1: WAPB Overall Quality Assurance Process



* Hoosier River Watch data may be included in NPS projects and stored in ARUT(s).

Description of Flowchart 1 process:

- A. Project Manager submits data package as a secondary data source to IDEM through the Secondary Data Coordinator. Hoosier Riverwatch (HRW) data submitters enter their data directly into the Hoosier Riverwatch database.
- B. Secondary data coordinator assigns data package to QAO.
- C. QAO evaluates data package using this TSOP.
- D. QAO assigns DQL to data package using this TSOP.
- E. QAO evaluates DQI data quality indicators and assigns data quality flags using this TSOP.
- F. Secondary data coordinator or QAO uploads data into the AIMS database.

2.0 QA Procedure Overview

2.1 Assignment of Data Quality Levels

This TSOP applies to secondary data collected by entities outside of IDEM's WAPB and is a part of the Indiana Surface Water Secondary Data Program QAPP (hereafter referred to as the "Secondary Data QAPP"). Data included in this process are assigned to one of three DQLs. The purpose of assigning DQLs is to confirm the validity of the data for use in WAPB assessment activities.

Each dataset and/or parameter therein, is assigned a DQL of 1, 2 or 3 by the QAO. The QAO assigns a DQL based on the quantity and quality of Quality Assurance (QA) elements submitted with the data package, as well as the amount of documentation of Quality Control (QC) procedures performed during laboratory and/or field analysis. In addition to the assignment of the DQL, the secondary data will have a prefix acronym assigned within the AIMS database that represents the source of the data. This will allow for better data management and identification and will assist WAPB staff in retrieving secondary data from AIMS. Datasets submitted as a requirement of a Nonpoint Source grant agreement will have the prefix "NPS" to compliment the DQL. All other secondary data received by external data generators will have the prefix "EDF" in front of the DQL.

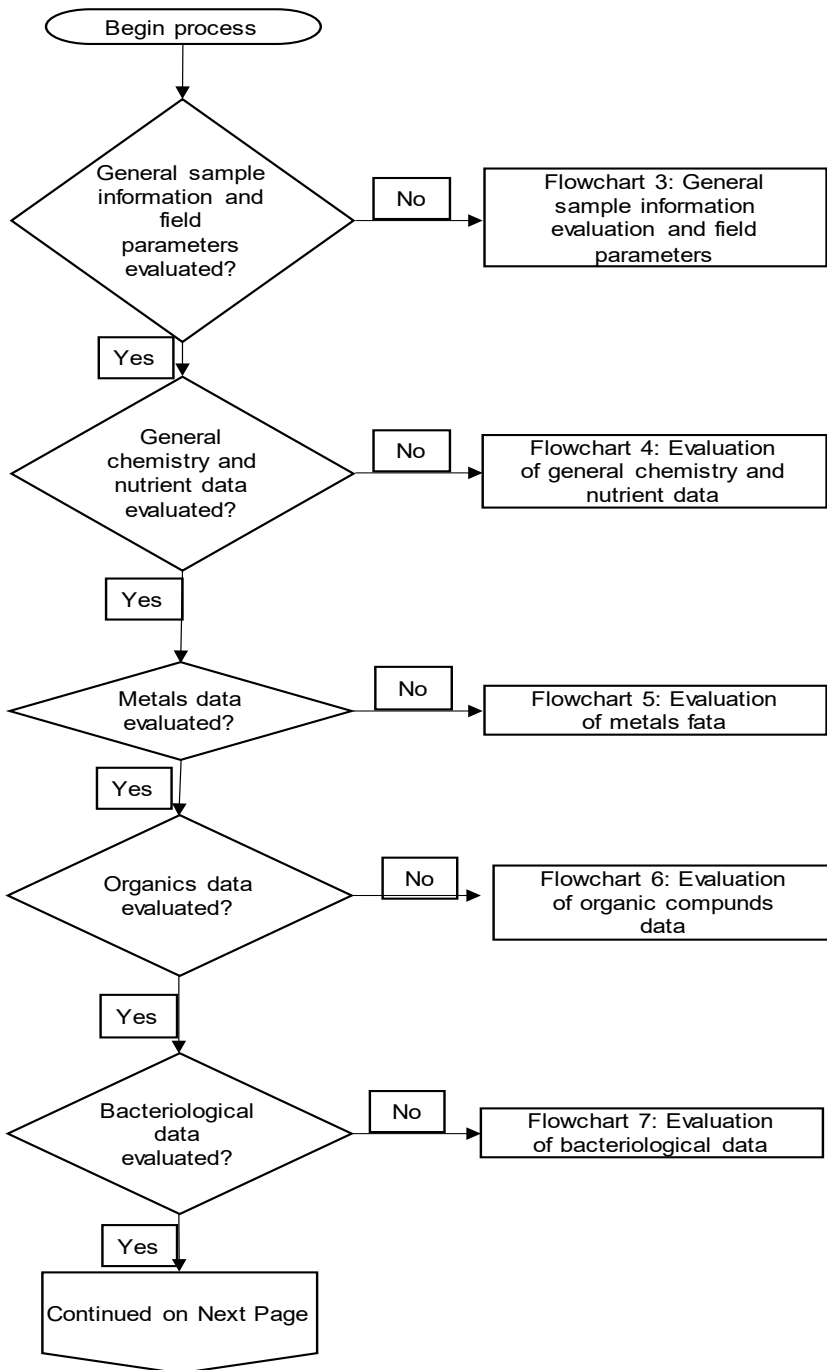
Following DQL assignment the data are submitted to DQL evaluation and data quality flags are assigned to individual results as appropriate (Section 2.2).

A. Determine if Evaluation of the Data Package is Complete

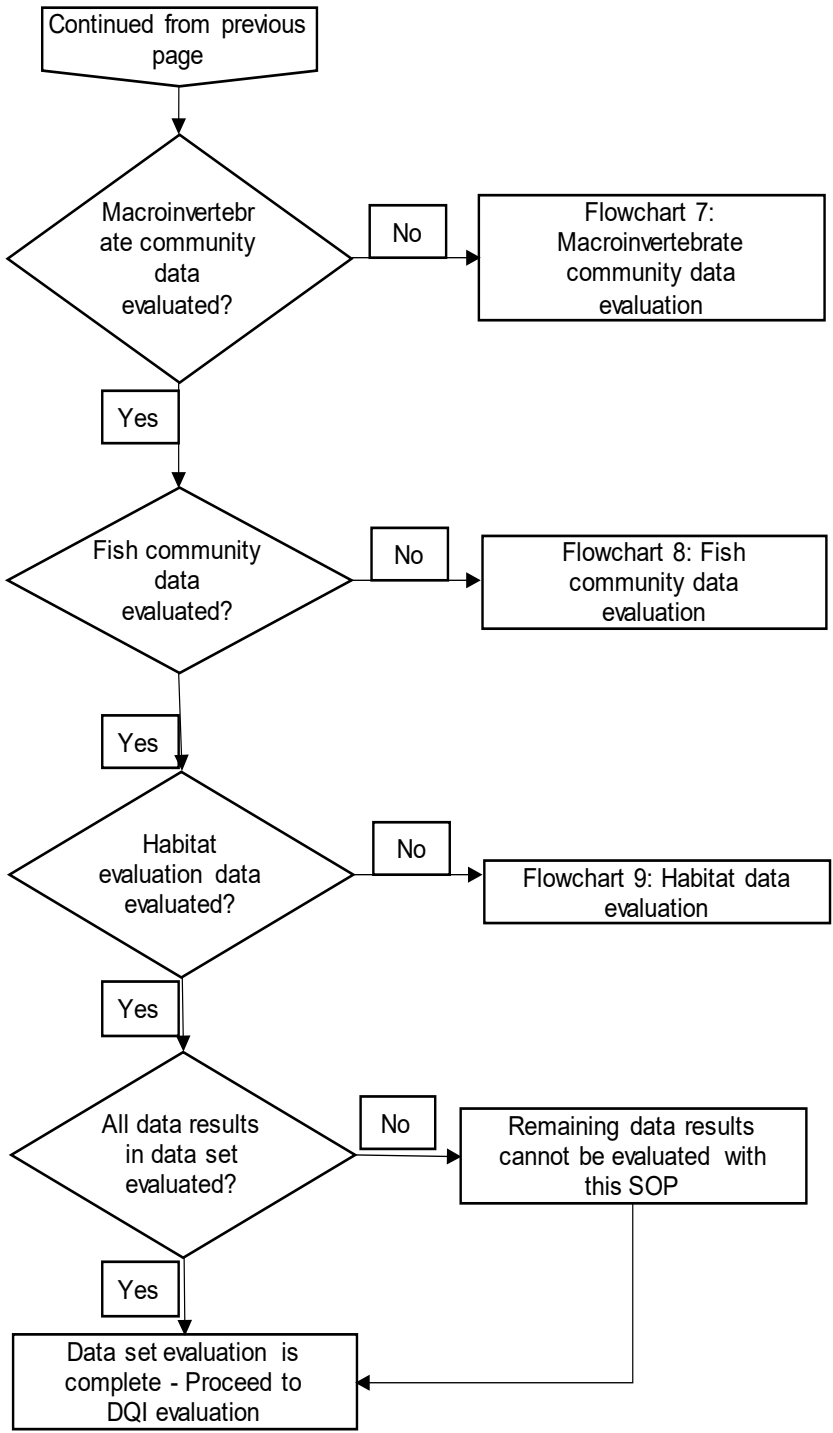
The QAO will determine if the Data Qualification process is complete for each secondary data package using Flowchart 1. The following types of data can be evaluated by this SOP:

1. General sample information and field parameters
2. General chemistry and nutrients
3. Metals
4. Organics
5. Bacteriological
6. Macroinvertebrate community
7. Fish community
8. Fish Tissue
9. Habitat

Flowchart 2: Data Set Evaluation



Flowchart 2 Data Set Evaluation (continued)



B. Determine if Evaluation of General Sample Information and Field Parameters is Complete

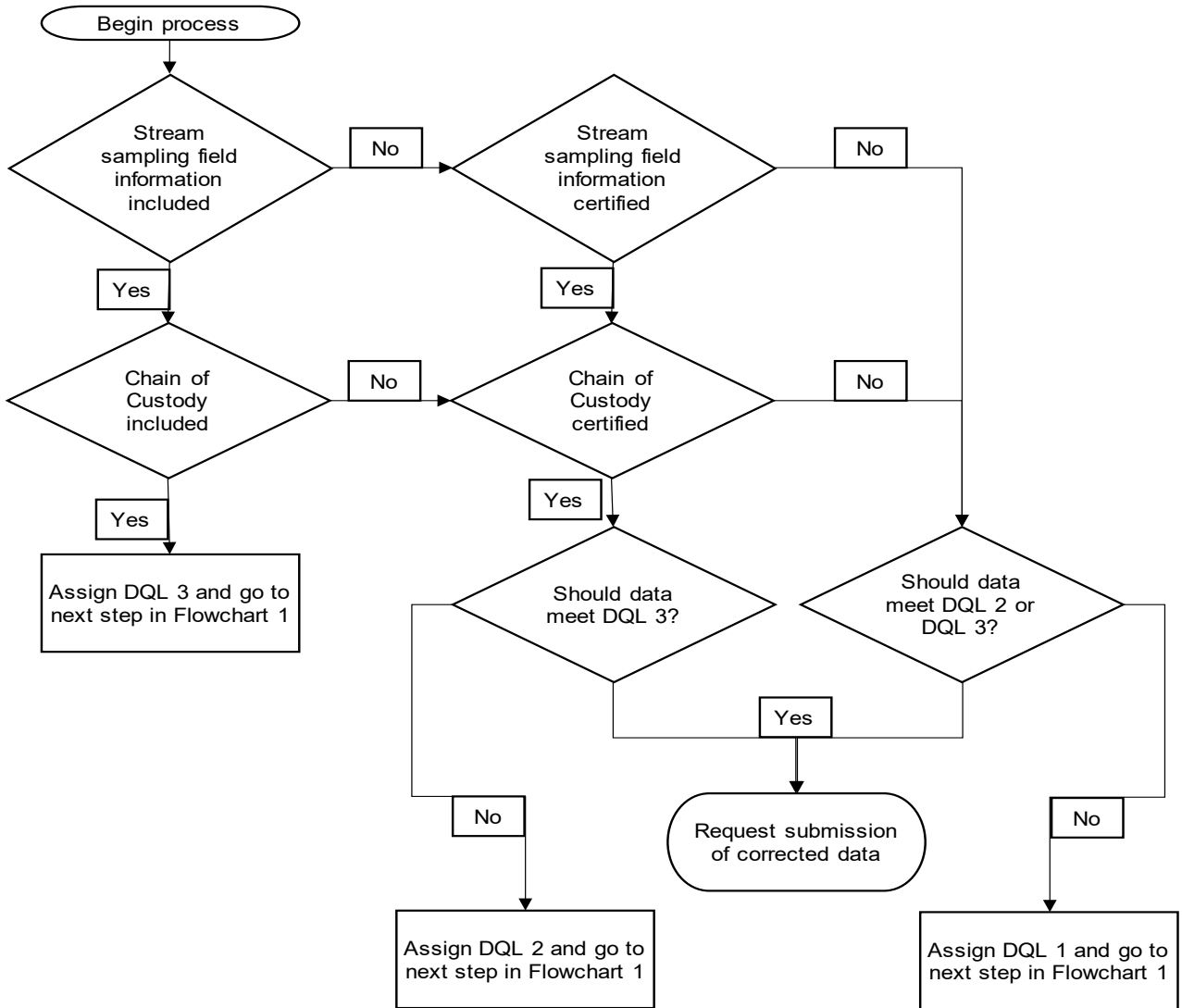
The QAO will review general sample information and field parameter data submissions and determine if the information provided meets minimum criteria for DQL assignment (Flowchart 2). More information on completing the Stream Sampling Field Information and Chain of Custody forms can be found in IDEM, 2020. Submitted data packages typically require the following general sample information to be included for the assignment of a DQL:

1. Stream Sampling Field Information form (example Appendix 9.1)
 - a. Sample date and time
 - b. Stream name with citation for source of stream name
 - c. Site description including the nearest road
 - d. Latitude and longitude with citation for source of coordinates
 - e. Drainage area (square miles) and gradient (feet/mile) (if applicable)
 - f. Sample number with a unique event identifier to link all other information
 - g. Sample type: normal, duplicate, revisit
 - h. The following parameters with protocols and detection limits
 - Temperature (degrees Celsius)
 - Dissolved oxygen (milligrams/liter)
 - pH (standard units)
 - Specific conductance (μ mhos/cm)
 - Turbidity (NTU)
 - i. Field calibration checks
 - j. Field duplicates
 - k. List of preservatives used in the samples, per each individual container
2. Chain of Custody form (Appendix 9.2)
 - a. Sample number with a unique event identifier to link all other information
 - b. Date and time samples were collected in the field
 - c. Sample type (e.g., water, fish, macroinvertebrate, etc.) and number of containers
 - d. Signature of field staff who collected the samples
 - e. Date, time, and signature of laboratory custodian who accepted custody of samples with legible and intact labels
 - f. Date and time samples were placed in storage (include address/room number)
3. Fish Tissue Sample Information Needed (fish tissue samples only)
 - a. Species name
 - b. Fish prep type
 - c. Fish count
 - d. Weight (g) and length (mm) of each individual fish

Note: Fish tissue sample evaluation also follows the same process as water chemistry evaluation (See Flowcharts 4 – 6 when applicable)
4. Analytical Method
 - a. For general chemistries and nutrients, metals, organics, and bacteriological analyses the analytical method must be provided and compliant with 40 CFR part 136. Noncompliant method data is automatically assigned DQL 1.

These elements should be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package may be assigned DQL 1 as determined by the QAO. Information may be provided in the work plan or project QAPP, in the data submission and/or in separate documentation provided by the data submitter.

Flowchart 3: General Sample Information Evaluation Field Parameters



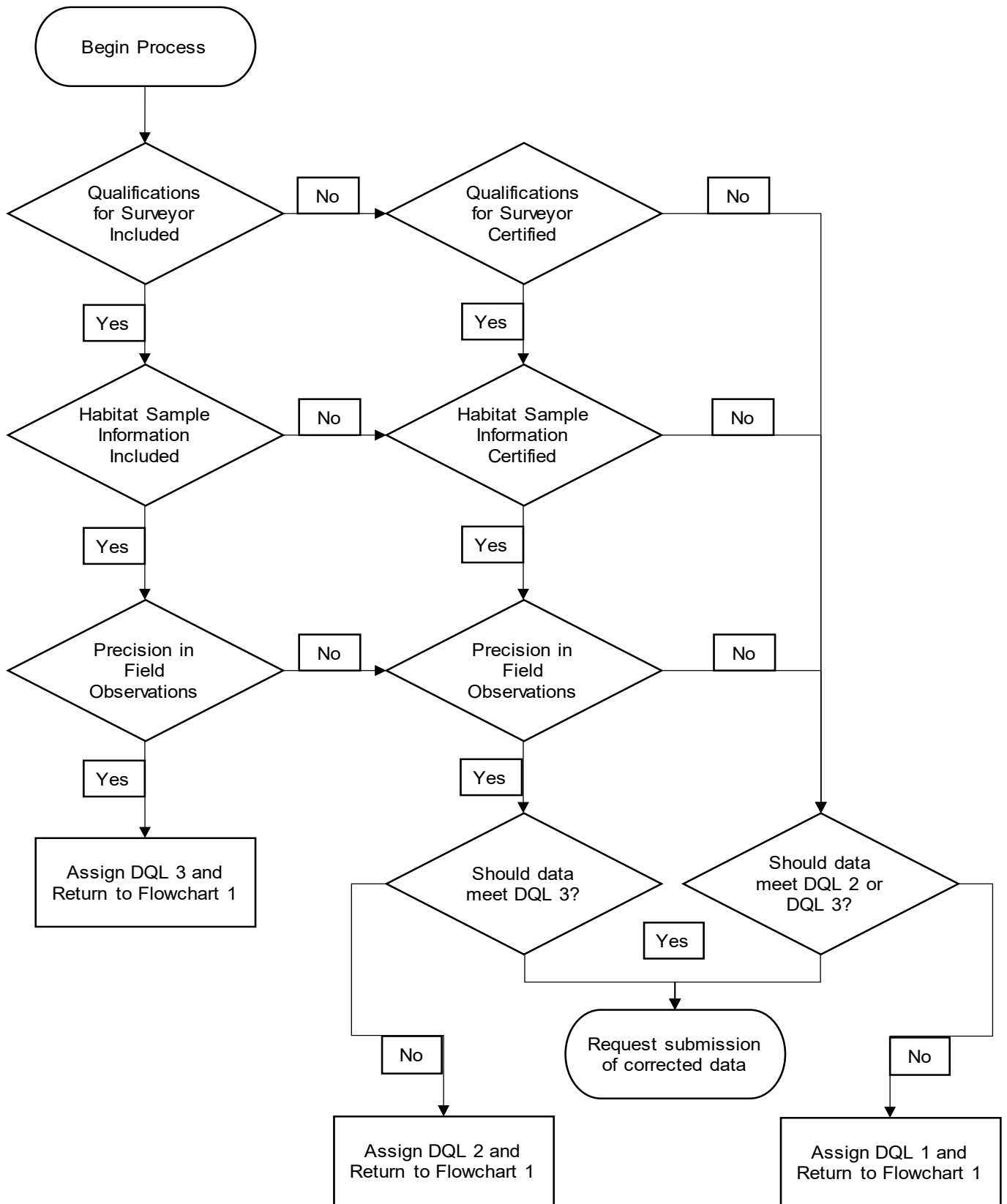
C. Determine if Evaluation of General Chemistry and Nutrient Data is Complete

The QAO will determine if the general chemistry and nutrient metadata provided in the data submission meets the minimum criteria for DQL assignment (Flowchart 3). More information on collecting the general chemistry and nutrient data can be found in IDEM, 2020. General chemistry and nutrient data packages generally require the following metadata to be included for the assignment of a DQL:

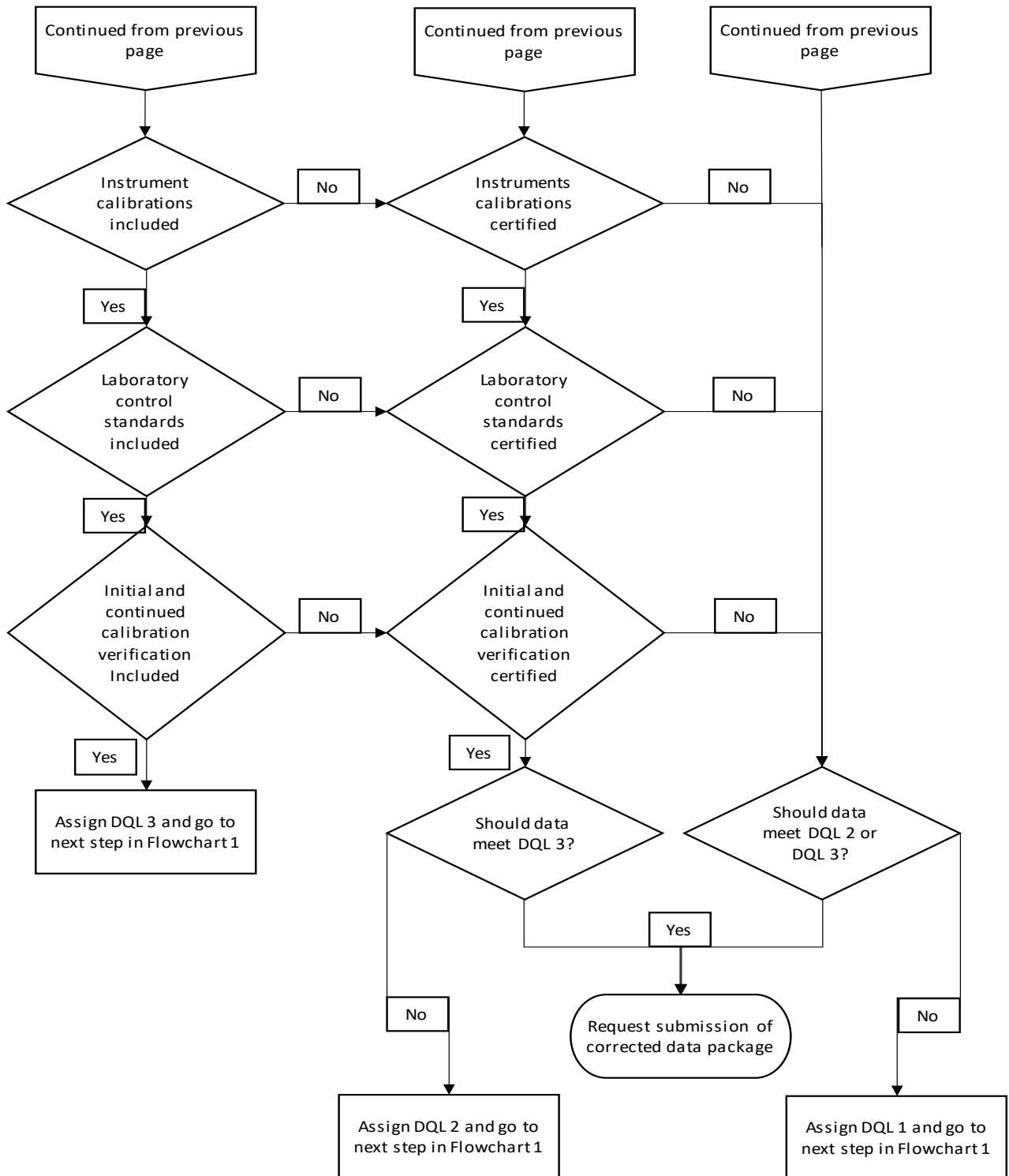
1. Sample preparation date
2. Date of the analysis for each result
3. Analytical method for each result
4. Quantitation (reporting) limits for each parameter
5. Detection limits for each parameter
6. Blank, field duplicate, and MS/MSD results
7. Instrument calibrations results
8. Laboratory control standards results
9. Initial and continuing calibration results

These elements must be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package may be assigned DQL 1 as determined by the QAO. Information may be provided in the work plan or project QAPP, in the data submission and/or in separate documentation provided by the data submitter.

Flowchart 4: Evaluation of General Chemistry and Nutrient Data



Flowchart 4b: Evaluation of General Chemistry and Nutrient Data



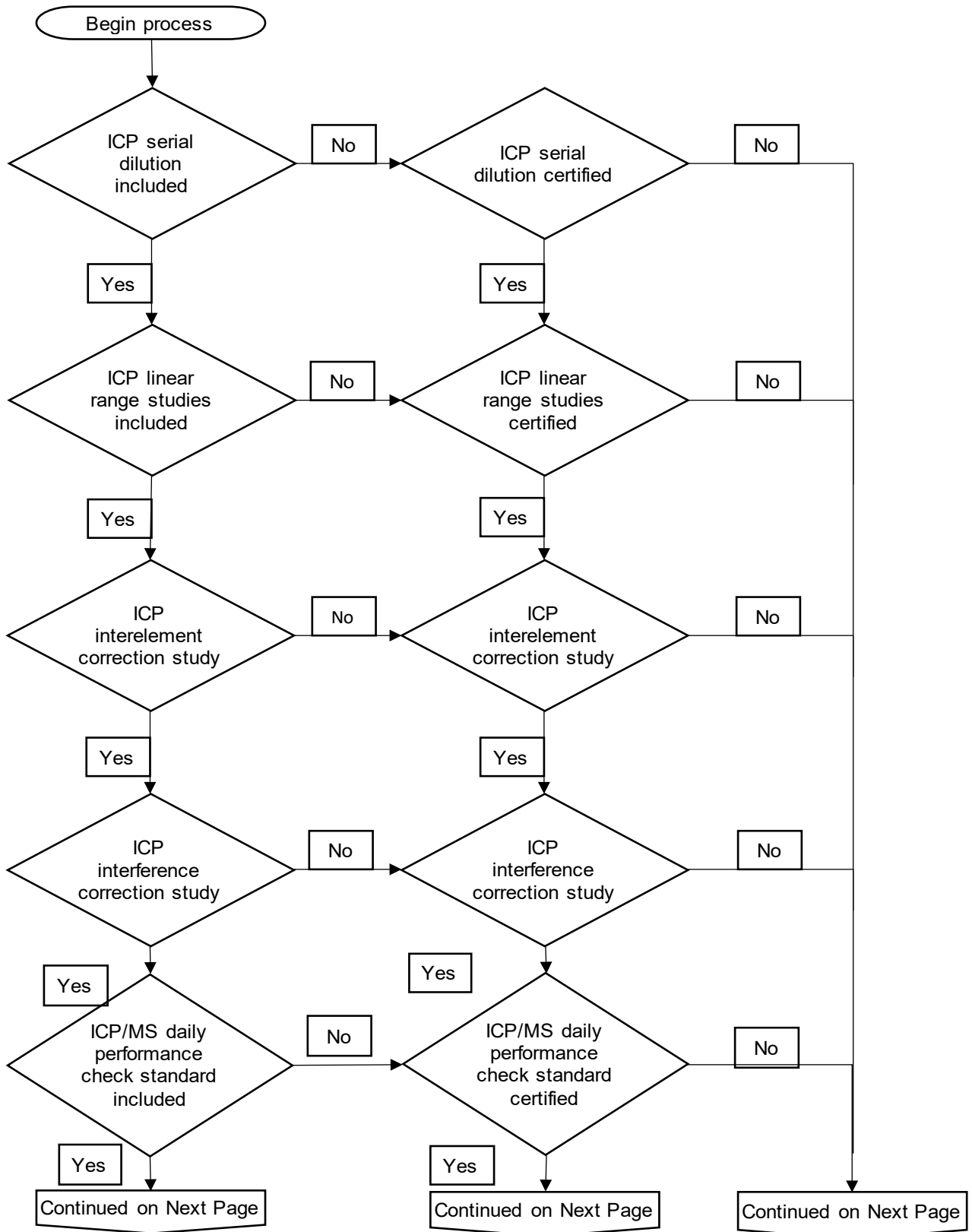
D. Determine if Evaluation of Metals Data is Complete

The QAO will determine if the metals metadata provided in the data submission meets the minimum criteria for DQL assignment (Flowchart 4). More information on collecting the metals data can be found in IDEM, 2020. Metals data packages require the following metadata for the assignment of a DQL:

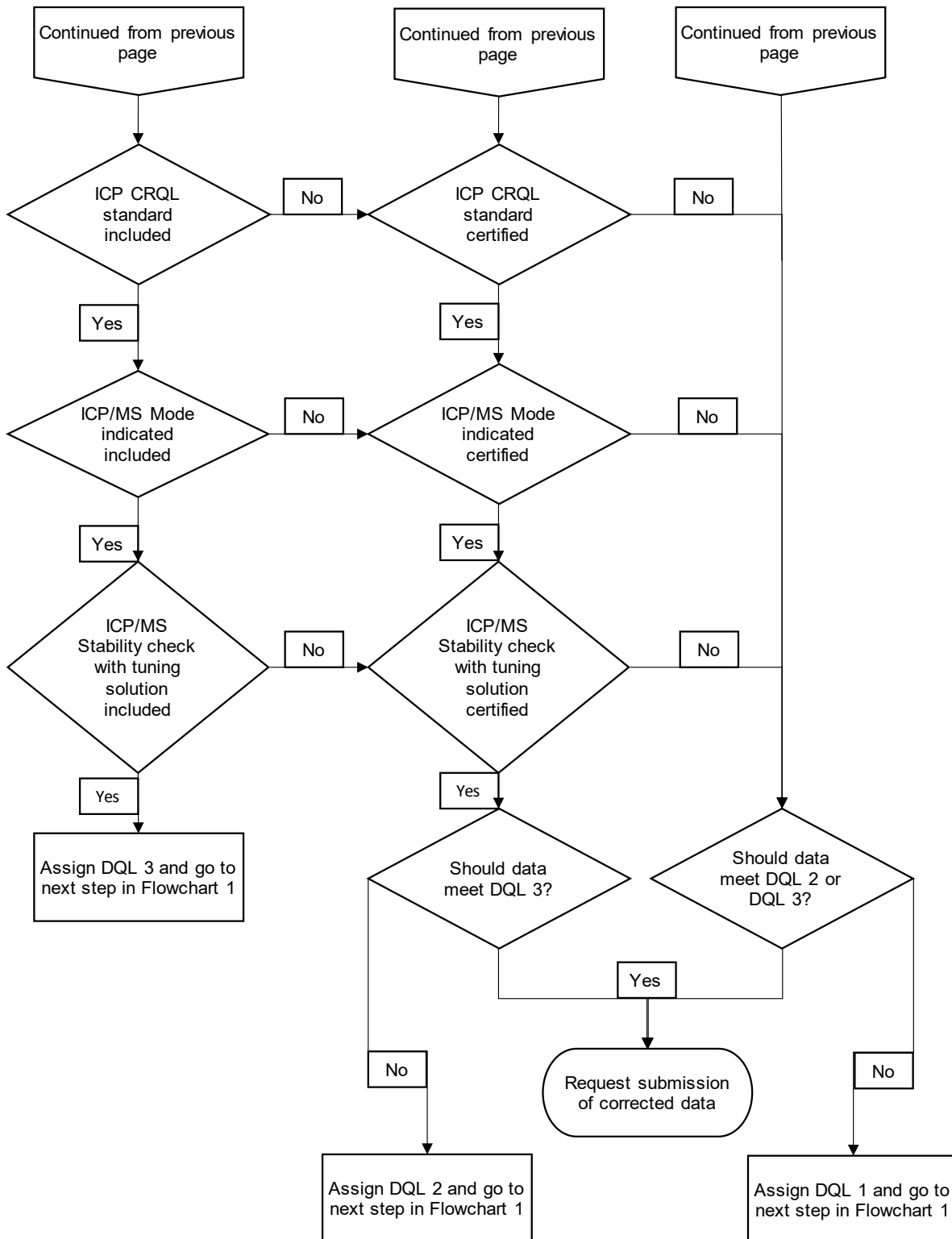
1. Inductively coupled plasma (ICP) serial dilution
2. ICP linear range studies metadata
3. ICP interelement correction study metadata
4. ICP interference check standard metadata
5. ICP/MS daily performance check standards
6. ICP CRQL standard metadata
7. ICP/MS mode indicated metadata
8. ICP/MS stability check with tuning solution metadata

These elements must be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package may be assigned DQL 1 as determined by the QAO. Information may be provided in the work plan or project QAPP, in the data submission and/or in separate documentation provided by the data submitter.

Flowchart 5: Evaluation of Metals Data



Flowchart 5b: Evaluation of Metals Data (Continued)



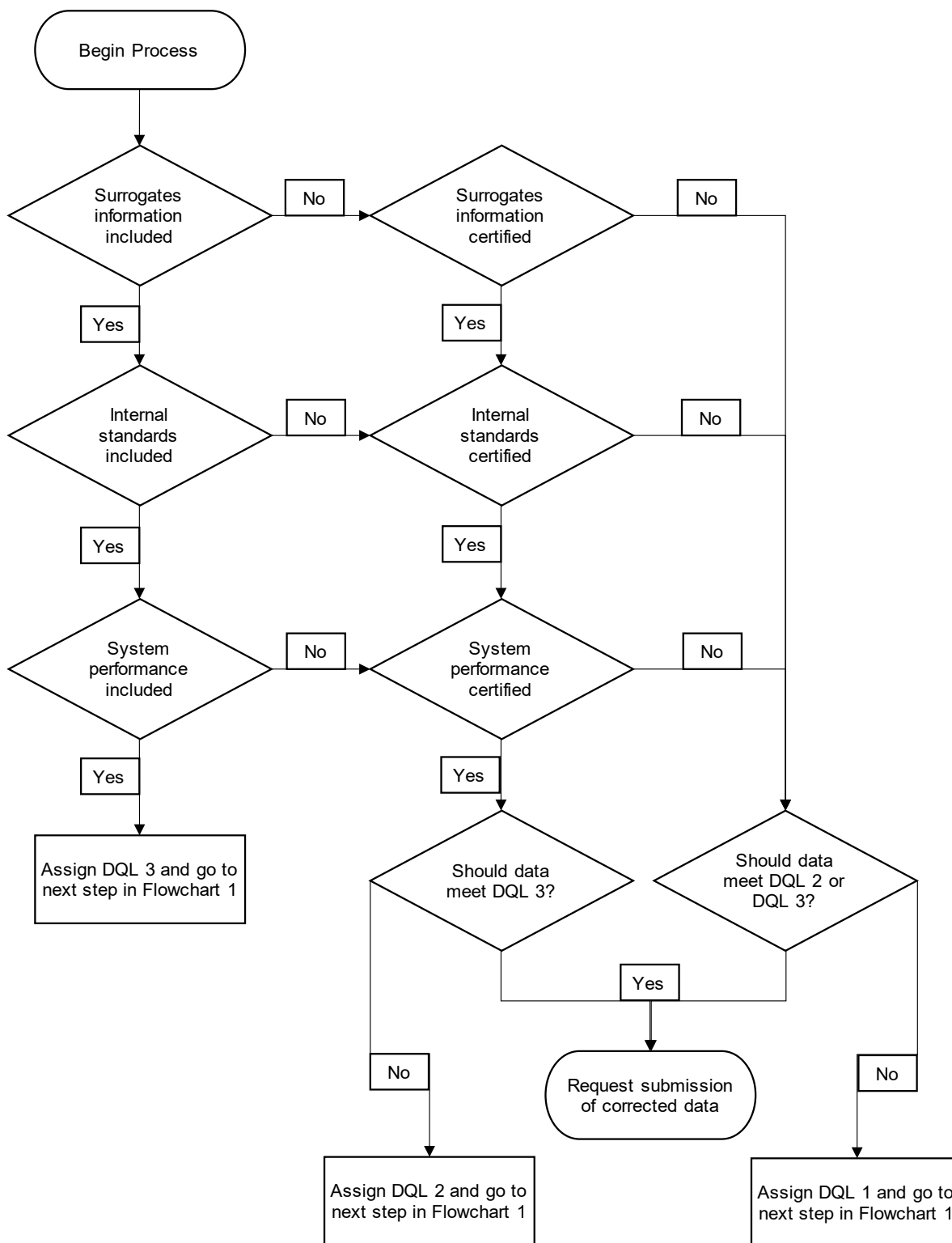
E. Determine if Evaluation of Organics Data is Complete

The QAO will determine if the organics metadata provided in the data submission meets the minimum criteria for DQL assignment (Flowchart 5). More information on collecting the organics data can be found in IDEM, 2020. Organics data packages require the following metadata for the assignment of a DQL:

1. Surrogates metadata
2. Internal standards metadata
3. System performance metadata

These elements must be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package will be assigned DQL 1. Information may be provided in the work plan or project QAPP, in the data submission and/or in separate documentation provided by the data submitter.

Flowchart 6: Evaluation of Organic Compounds Data



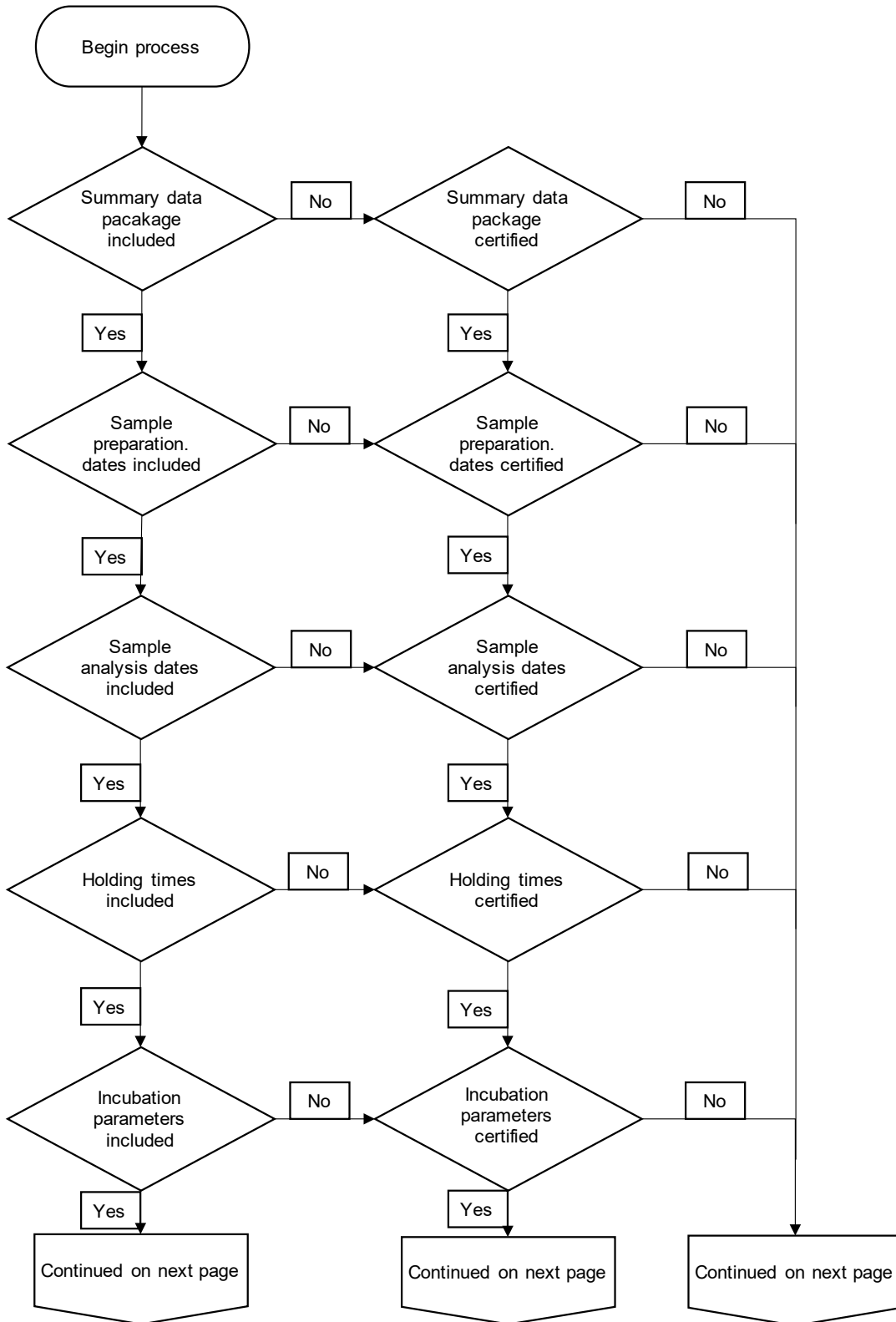
F. Determine if Evaluation of Bacteriological Data is Complete

The QAO will determine if the bacteriological metadata provided in the data submission meets the minimum criteria for DQL assignment (Flowchart 6). More information on collecting bacteriological samples can be found in IDEM, 2019a. Bacteriological data packages generally require the following metadata for the assignment of a DQL:

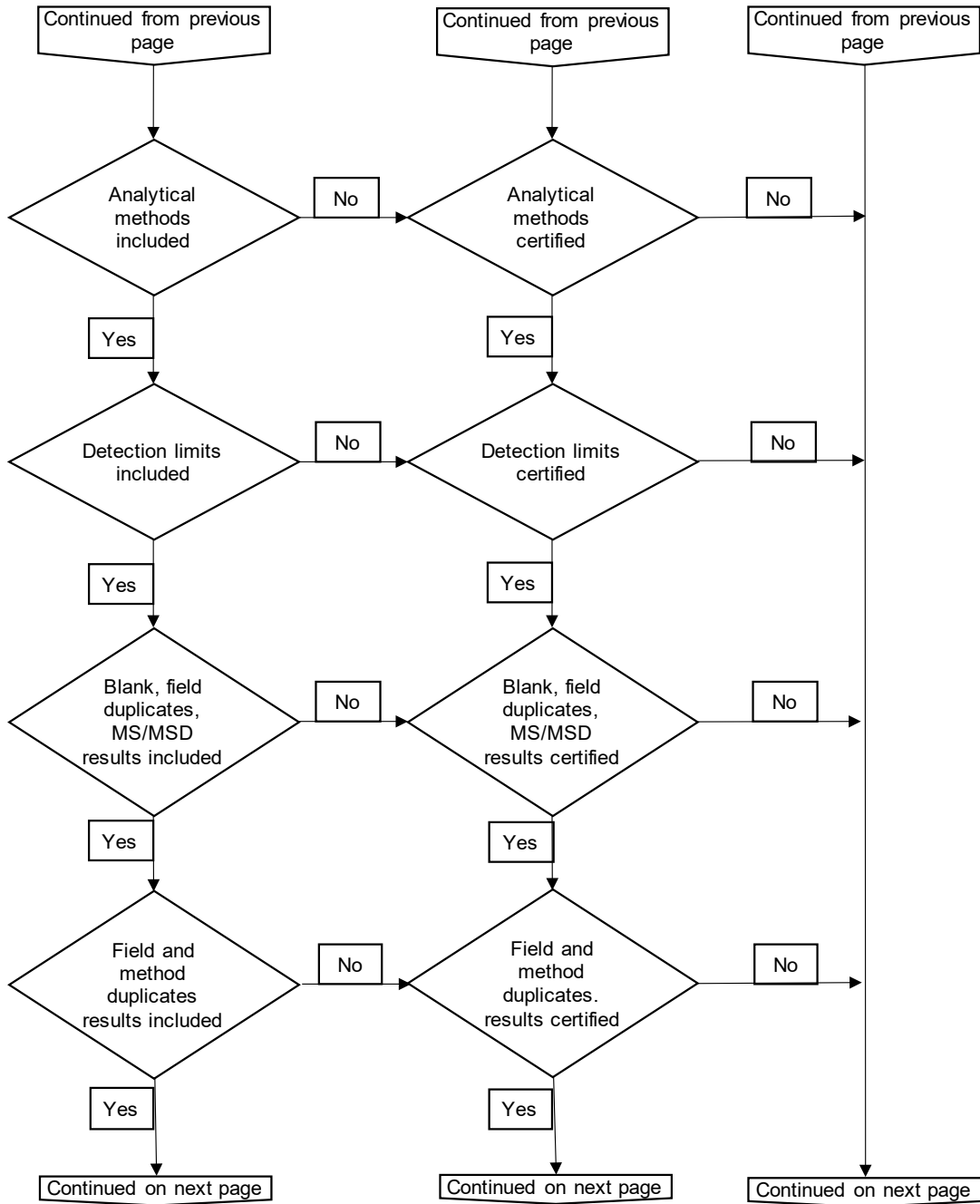
1. Summary data package
2. Sample preparation dates metadata
3. Sample analysis dates metadata
4. Holding times metadata
5. Incubation parameters and/or temperature evaluation metadata
6. Analytical methods metadata
7. Quantitation (reporting) limits metadata
8. Detection limits metadata
9. Blank, field duplicate, and MS/MSD results metadata
10. Field and method duplicates metadata
11. Colilert quality control report(s) metadata (assuming Colilert is used)
12. Positive control results metadata
13. Beginning and ending sterility control results metadata
14. KP, PA, EC, media control standards results metadata

These elements must be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package may be assigned DQL 1. Information may be provided in the work plan or project QAPP, in the data submission and/or in separate documentation provided by the data submitter.

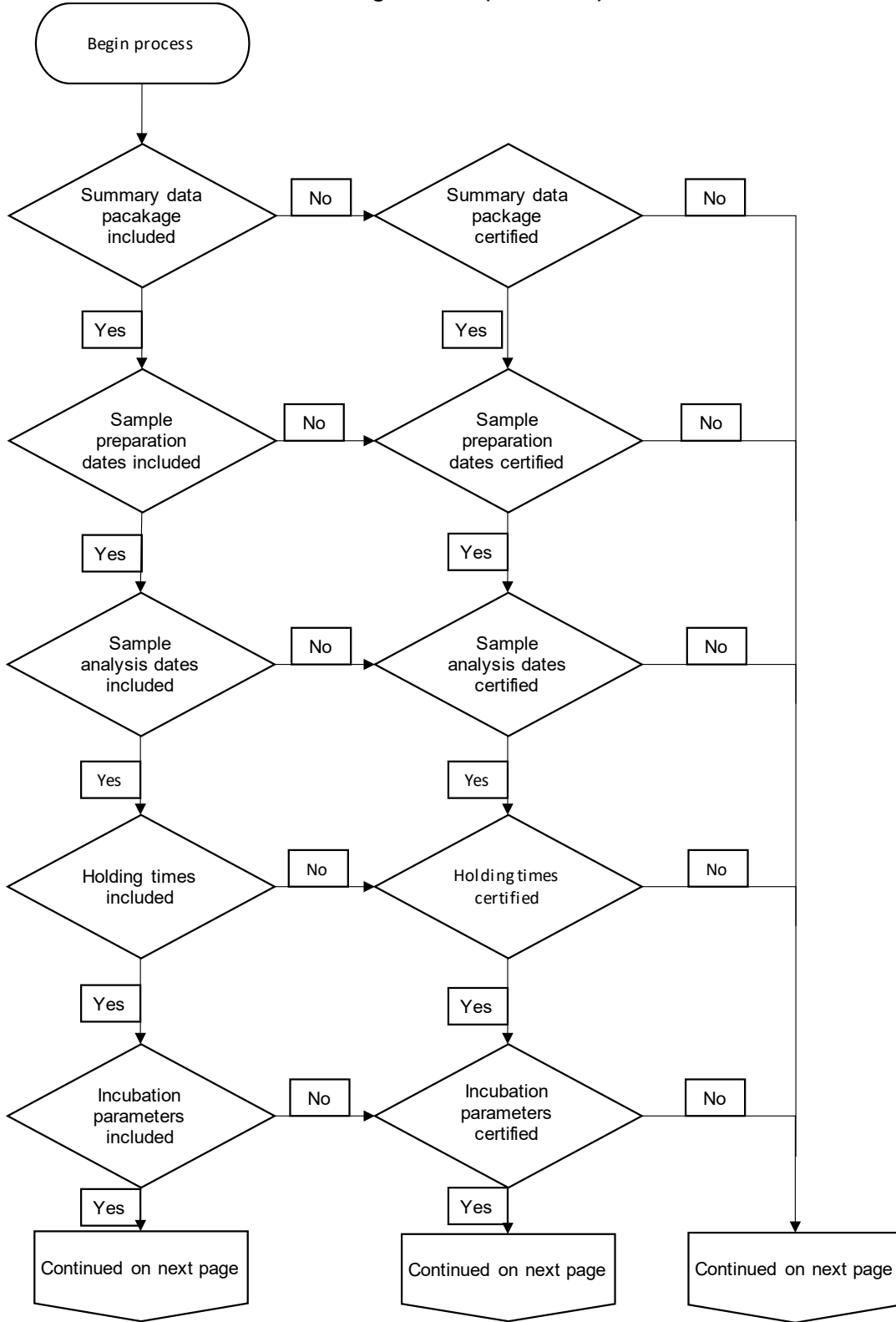
Flowchart 7: Evaluation of Bacteriological Data



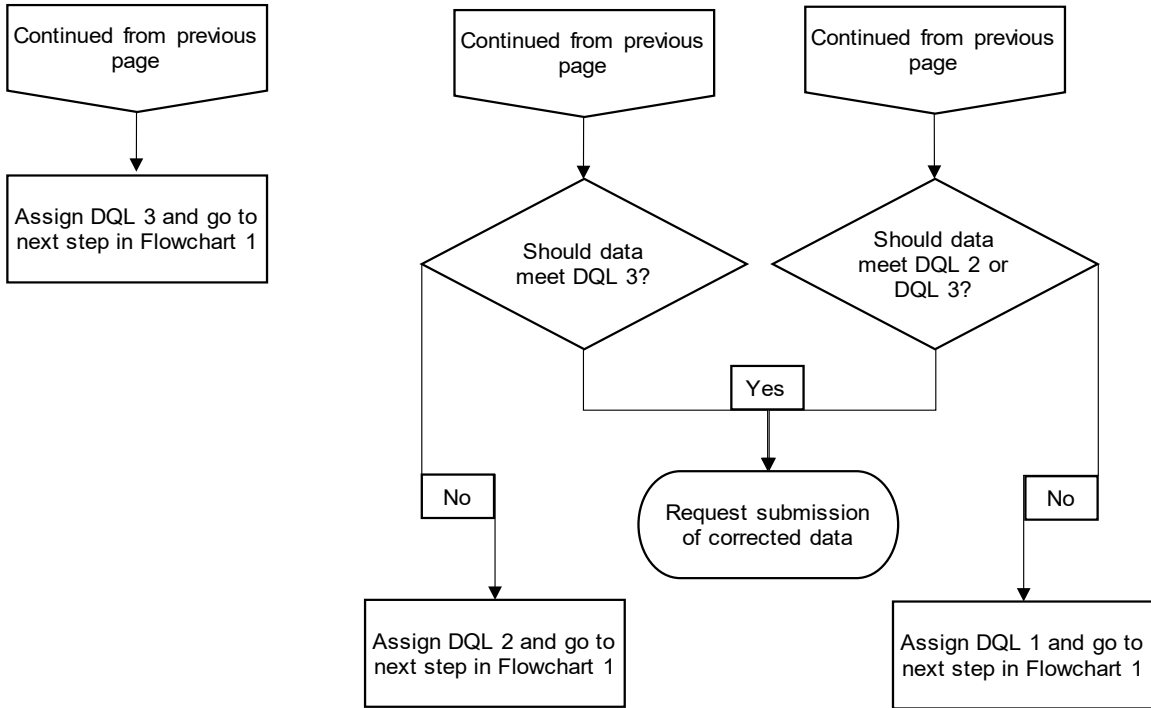
Flowchart 7b: Evaluation of Bacteriological Data (continued)



Flowchart 7: Evaluation of Bacteriological Data (continued)



Flowchart 7: Evaluation of Bacteriological Data (continued)



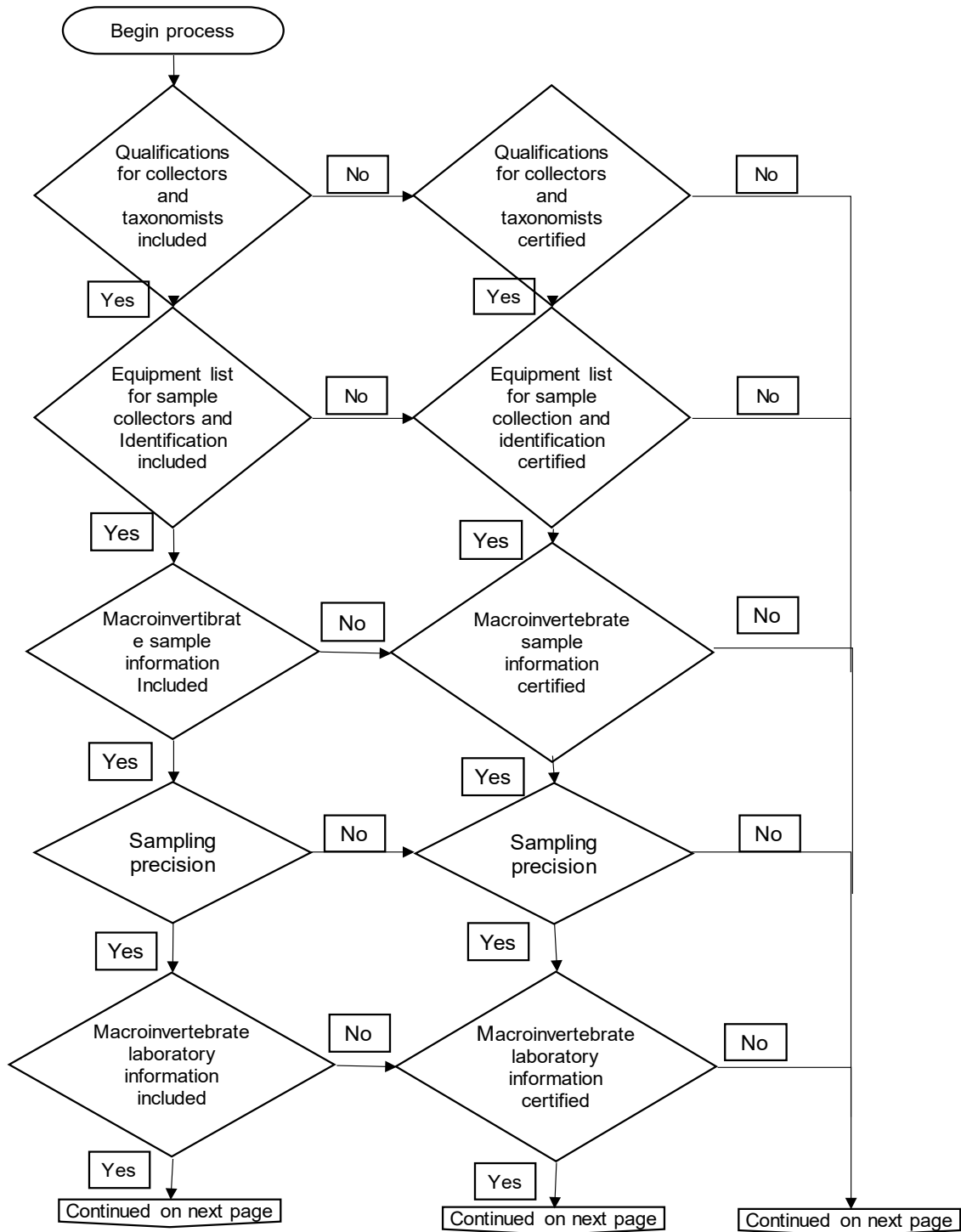
G. Determine if Evaluation of Macroinvertebrate Community Data is Complete

The QAO will determine if the macroinvertebrate community metadata provided in the data submission meets the minimum criteria for DQL assignment (Flowchart 7). More information on collecting macroinvertebrate community samples can be found in IDEM, 2023b and 2023c. Submitted data packages require the following metadata for the assignment of a DQL:

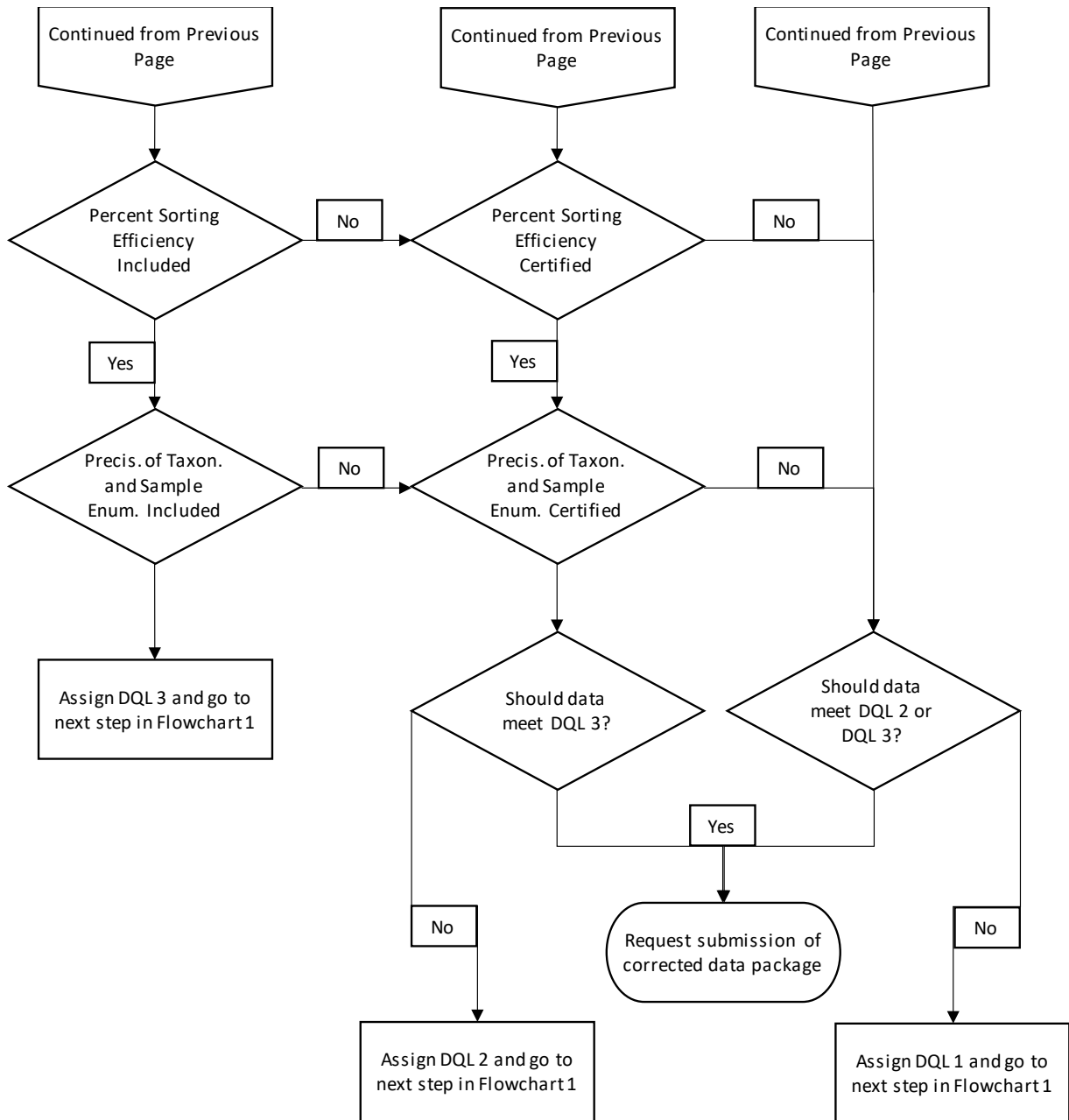
1. Qualifications for collectors and taxonomists
 - a. Education
 - b. Formal training
 - c. Experience (may include publications authored or co-authored)
 - d. Certifications (Society of Freshwater Science taxonomic certification with dates)
 - e. Taxonomic references used to identify specimen
2. Equipment list for sample collection and identification
 - a. Sampling equipment used (i.e., net mesh size and dimensions)
 - b. Sieve size
 - c. Clean sample containers (thoroughly rinsed between samples)
 - d. Preservative used in sample
 - e. Microscope specifications (dissecting and compound, magnification range, phase contrast capabilities for compound microscope)
3. Macroinvertebrate sample information complete
 - a. Sample number (unique event identifier to link all other information)
 - b. Macro sample type (MHAB, KICK, HD)
 - c. Macro count header (15-Minute, 100-Organism)
 - d. Macro sub sample (field, lab)
4. Sampling Precision
 - a. Percentage of sites with duplicate collections
 - b. Relative percent difference (RPD) in number of taxa
5. Macroinvertebrate laboratory information complete (Example Appendix 9.3)
 - a. Sample number (unique event identifier to link all other information)
 - b. Macro square count (if applicable, otherwise leave blank)
 - c. Initials of taxonomist and date finished
 - d. Taxa name (lowest taxonomic level following IDEM reference taxon list)
 - e. Number of individuals
 - f. Notes (if applicable, otherwise leave blank. May include the number of adults, pupae and/or larvae if different identification levels are expected or if specimens are immature or damaged)
6. Percent sorting efficiency (PSE)
 - a. Percent of samples re-sorted, and organism counts checked
7. Precision of taxonomy and sample enumeration
 - a. Percent of samples completed per taxonomist randomly selected for whole sample reidentification by a different taxonomist (include report of misidentified taxa and correct information).

These elements must be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package will be assigned DQL 1. Information needed may be provided in the work plan or project QAPP, in the data submission, and/or in separate documentation provided by the data submitter.

Flowchart 8: Macroinvertebrate Community Data Evaluation



Flowchart 8: Macroinvertebrate Community Data Evaluation (continued)



H. Determine if Evaluation of Fish Community Data is Complete

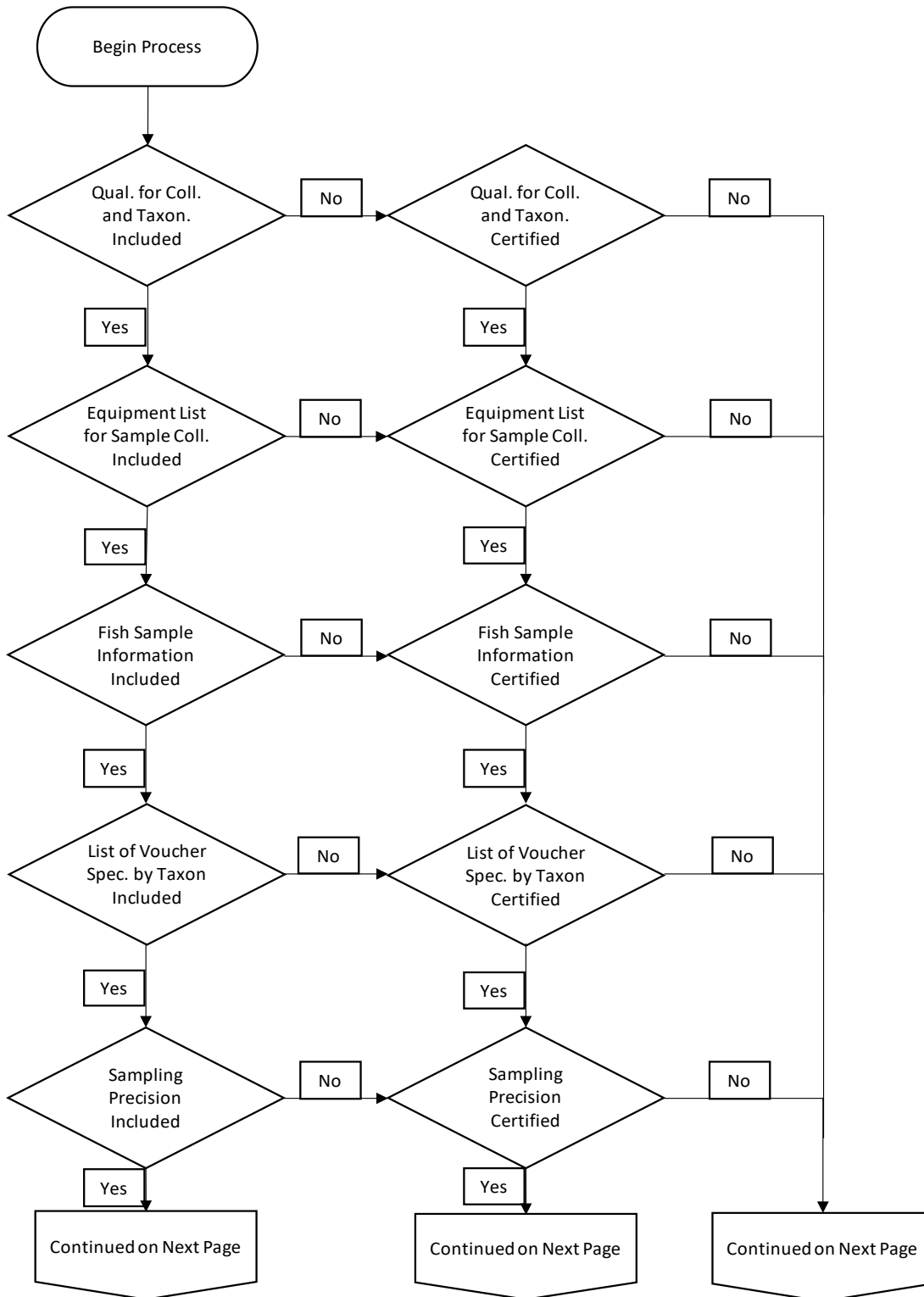
The QAO will determine if the fish community metadata provided in the data submission meets the minimum criteria for DQL assignment (Flowchart 9). More information on collecting fish community samples can be found in IDEM, 2023d. Submitted data packages require the following metadata for the assignment of a DQL:

1. Qualifications for collectors and taxonomists
 - a. Education
 - b. Formal training
 - c. Experience
 - d. Indiana scientific purposes license
 - e. Taxonomic references used to identify specimen
2. Equipment list and protocol for sample collection
 - a. Net mesh size, dimensions
 - b. Number of netters
 - c. Direction of sampling (upstream, downstream, combination of both)
 - d. Clean sample containers
 - e. Preservative used in sample
3. Fish sample information complete (Appendix 9.4)
 - a. Sample number (unique event identifier to link all other information)
 - b. Equipment (e.g., boat, tote barge, backpack, canoe, longline, etc.)
 - c. Voltage
 - d. Time fished in seconds
 - e. Sampling reach length in meters
 - f. Maximum depth in meters
 - g. Average depth in meters
 - h. Average stream width in meters
 - i. Comments (e.g., bridge in reach, possible equipment malfunctioning, etc.)
 - j. Taxa name (following IDEM Reference Taxon List)
 - k. Number of individuals
 - l. Minimum length (millimeters)
 - m. Maximum length (millimeters)
 - n. Total weight in grams
 - o. Number of individuals with deformities (D)
 - p. Number of individuals with eroded fins (E)
 - q. Number of individuals with lesions (L)
 - r. Number of individuals with tumors (T)
 - s. Number of individuals with multiple DELTs
 - t. Initials of fish field taxonomist and date finished (in the field or lab)
4. List of voucher specimens by fish field taxonomist
5. Sampling precision
 - a. Percentage of sites with revisits
 - b. RPD in number of taxa
6. Precision of taxonomy
 - a. Percent of samples completed per taxonomist randomly selected for voucher sample reidentification by a different taxonomist.

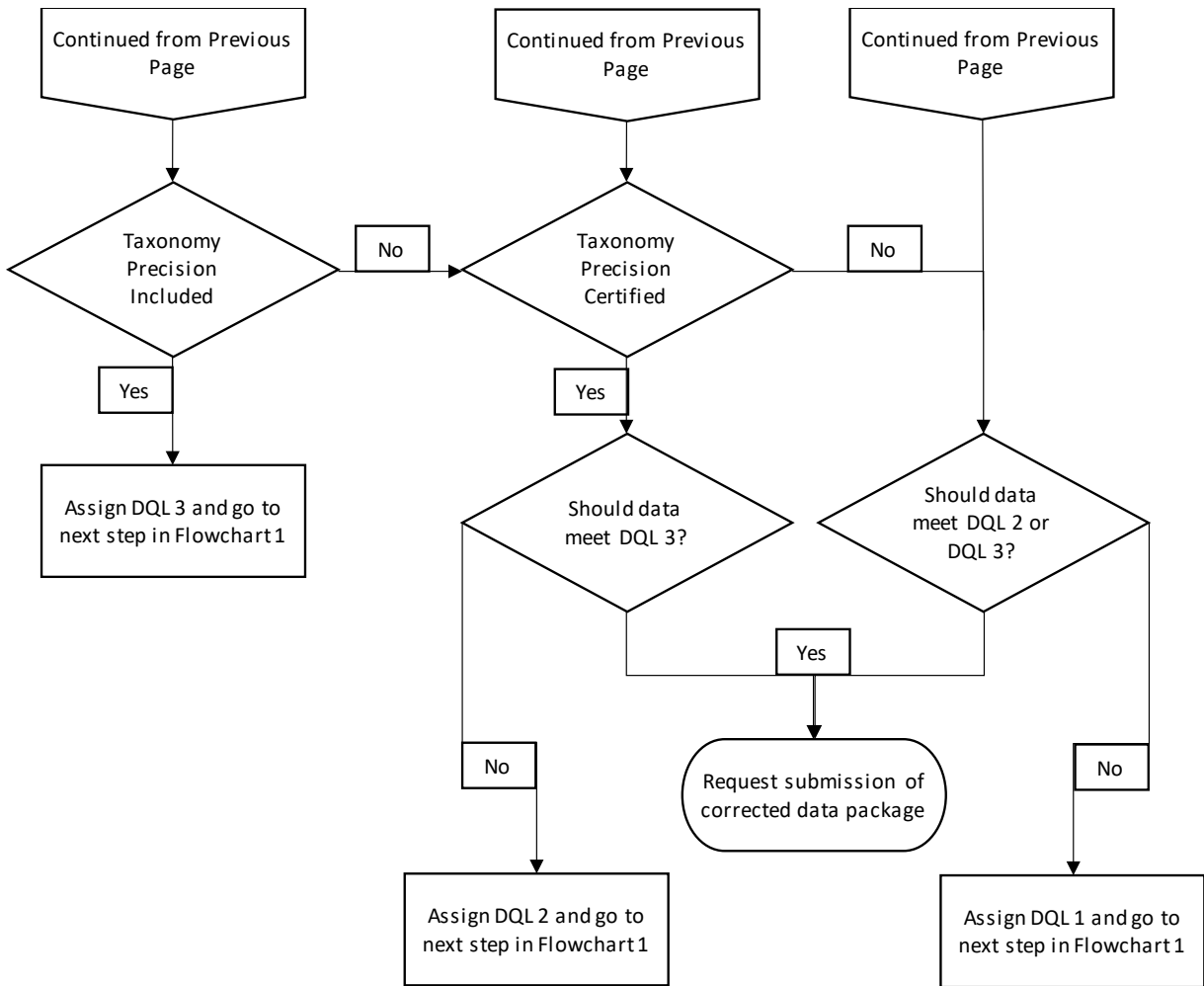
These elements must be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package will be assigned DQL 1. Information needed may be provided in the work plan or project QAPP, in the data

submission, and/or in separate documentation provided by the data submitter. Flowchart
9. Fish Community Data Evaluation

Flowchart 9: Fish Community Data Evaluation



Flowchart 9: Fish Community Data Evaluation (continued)



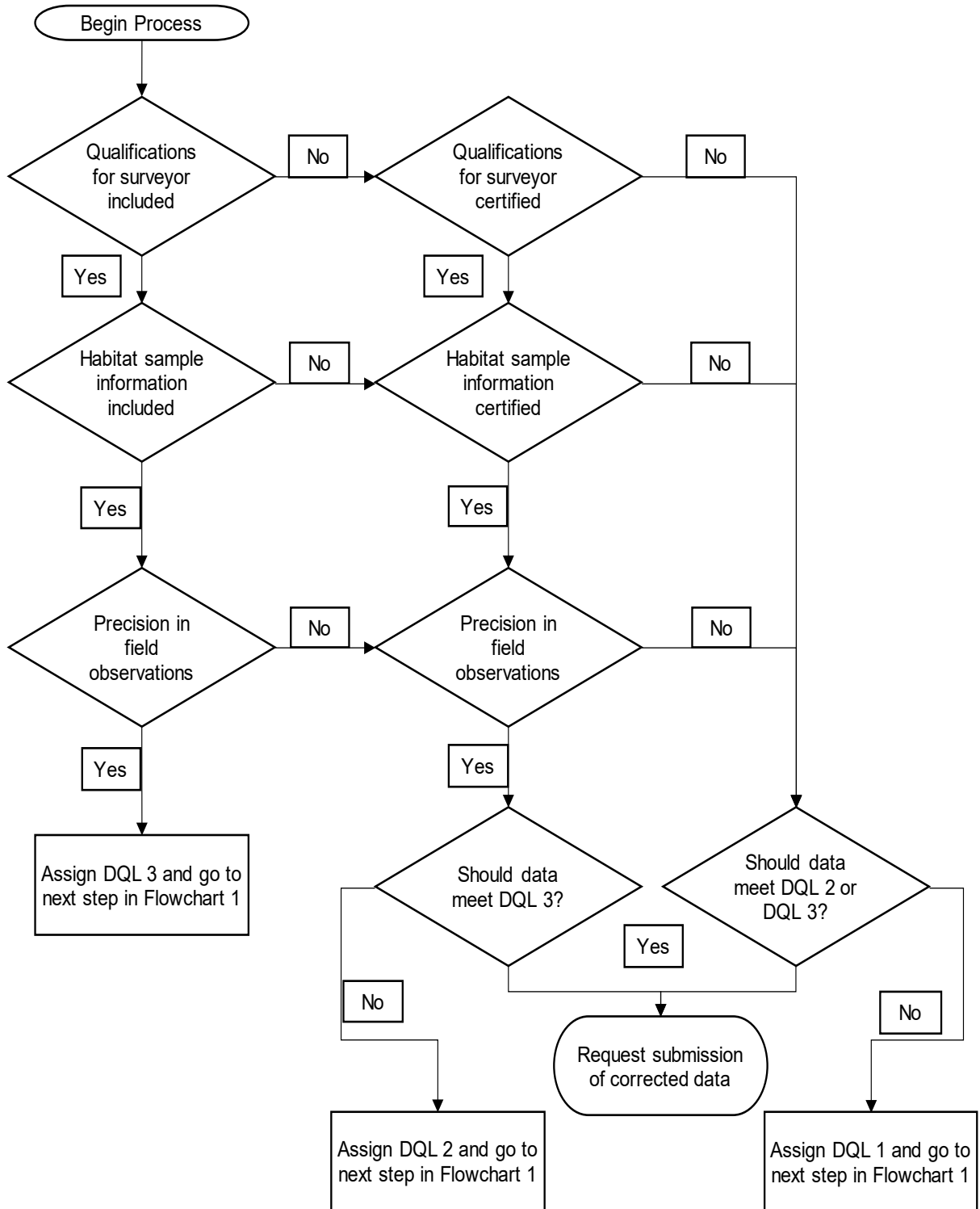
I. Determine if Evaluation of Habitat Data is Complete

The QAO will determine if the habitat metadata provided in the data submission meets the minimum criteria for DQL assignment (Flowchart 10). More information on completing the Qualitative Habitat Evaluation Index (QHEI) can be found in IDEM, 2023x. Submitted data packages require the following metadata for the assignment of a DQL:

1. Qualifications for surveyor
 - a. Education
 - b. Formal training
 - c. Experience
2. Habitat sample information complete (Appendix 9.5)
 - a. Sample number (unique event identifier to link all other information)
 - b. Stream name, location, county, latitude and longitude if not accompanied by stream sampling field information
 - c. Initials of surveyor
 - d. QHEI total score
 - e. Substrate score
 - f. Instream cover score
 - g. Channel score
 - h. Riparian bank score
 - i. Pool/current score
 - j. Riffle/run score
 - k. Gradient score
 - l. Densiometer (% canopy open; >10m, average readings from left, middle, and right stream bank; <=10m, 1 reading in middle of stream.)
 - m. Stream drawing
3. Precision in field observations
 - a. Percentage of sites with revisits
 - b. RPD in QHEI total score

These elements must be included with the data package for it to be assigned DQL 3. The data package may be assigned DQL 2 if these elements are not present but can be certified as “available from the data submitter”. If any elements listed above are unavailable for inspection by the QAO, the data package will be assigned DQL 1. Information needed may be provided in the work plan or project QAPP, in the data submission, and/or in separate documentation provided by the data submitter.

Flowchart 10: Habitat Data Evaluation



2.2 Data Quality Indicator Evaluation and Flag Assignment

Data results assigned a DQL 2 or 3 will undergo a DQI evaluation and flags will be assigned to individual results, as appropriate.

A. Chemical and Bacteriological Data

Quantitative Data Quality Indicators

1. A precision DQI is a quantitative indicator of the random errors or fluctuations in the measurement process. Precision is measured by calculating the RPD between the original sample (*S*) and a field duplicate sample (*D*) (IDEM, 2021).
 - a. Field duplicate samples are expected to be collected at a minimum rate of 5% of total samples collected for each monitoring event unless stated otherwise in the project QAPP.
 - b. The field duplicate site is randomly chosen.
 - c. The precision limit for each parameter is documented in the project QAPP.
 - d. The final RPD calculations for lab duplicates are completed on Sheet “3-Lab_QAQC_Data” of the AIMS Results Upload Template (ARUT) spreadsheet (the *ARUT2020-Rev2.0* spreadsheet).
 - e. The formula for calculating the RPD is:

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

Where:

S = the original sample value.

D = the revisit sample value.

2. A bias/accuracy DQI is a quantitative indicator of the magnitude of systematic error resulting from sampling and/or calibration errors. Bias is used as a measure of accuracy in addition to the specifications for the field instruments provided by the manufacturer (IDEM, 2021). Bias is determined through the collection of a field blank for each monitoring event or sample trip.
 - a. Field blanks are collected at a rate of approximately 5% of total samples collected for each monitoring event unless stated otherwise in the project QAPP.
 - b. The collection site for these blanks should be random in order to be representative of the monitoring event.
 - c. The “out of control” limits are defined in the flags table on sheet “DQI Tables” of the *ARUT2020-Rev2.0* spreadsheet.
 - d. The project manager adds flags that are appropriate for the sample results as described in the sheet “For Reference – Flags” of the *ARUT2020-Rev2.0* spreadsheet.
3. The sensitivity DQI describes the capability of the instrument to measure a constituent at low levels. Sensitivity is regarded as a detection limit without defining whether it is a minimum detection or quantitation. Project managers are required to list detection limits for each analytical method in the project QAPP.
 - a. Methods and instrument detection limits are used for these values. If Standard Methods (Lipps WC, Braun-Howland EB, Baxter TE, 2023) or other analytical methods are used, the laboratory will set the value OR the reporting limits identified in the AIMS database protocols will be used.
 - b. Some projects use a combination of instrument detection limits or ranges, volunteer methods limits or ranges, and analytical method reporting limits.

Whenever possible, the reporting limits stored in the AIMS database will be applied.

- c. Discrepancies or deviations will be reported in sheet “2-Results” in column Z (“Comments”) of the *ARUT2020-Rev2.0* spreadsheet.

Qualitative Data Quality Indicators

1. Representativeness DQIs are qualitative and quantitative statements regarding the degree to which data reflect the true characteristics of a well-defined population.
 - a. Representativeness is discussed in the project QAPP under site selection and monitoring design.
2. The comparability DQI is a qualitative indicator of the similarity of attributes of data sets.
 - a. Comparability is discussed in the project QAPP and includes analytical methods, frequency, time, and location. Secondary data or historical data are also discussed as it refers to the current project.
3. The DQI for completeness is often expressed as a percentage. Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that should have been collected.
 - a. Completeness is calculated from the number of valid samples collected, divided by the total number of samples that were projected to be collected in the project QAPP.
 - b. The project manager establishes a percent completeness value for each parameter collected, to meet monitoring goals.
 - c. The percent values are determined by the project manager and represent the minimum sample results needed to meet monitoring goals. Completeness determinations for biological sampling may require only one sample while requiring three (e.g., water chemistry) or five (e.g., bacteriological) samples for other parameters to obtain usable results.
 - d. Completeness does not include reasons a measurement was not collected.

QAO Verification of Data using Associated DQIs

QAO verification refers to the procedures needed to ensure that a set of data reflects all the processes and procedures used to generate the data. Verification entails the examination of objective evidence that the specified method, procedures, and contractual requirements were fulfilled. The individual DQIs are verified as follows:

1. The QAO evaluates precision and reporting limits filled out by the project manager on sheets “2-Results” and “3-Lab_QAQC_Data” of the *ARUT2020-Rev 2.0* spreadsheet.
 - a. Were the duplicate samples collected at a 5% minimum rate or the rate specified in the project QAPP?
 - b. Were the reporting limits set for each analysis test and listed in the sheets “2-Results” and “3-Lab_QAQC_Data” of the *ARUT2020-Rev 2.0* spreadsheet?
2. The QAO evaluates accuracy and or bias.
 - a. Were the blank samples collected at a 5% rate?
 - b. Were the instrument detection limits and calibration limits identified in sheet “DQI Tables” of the *ARUT2020-Rev2.0* spreadsheet?

3. The QAO compares percent completeness before and after monitoring events.
 - a. Was the percent completion that was set for the project successful, and did it meet the contractual agreement?
4. The QAO evaluates if representativeness was adequate for the purposes of the study.
 - a. Were the samples collected at each site per event?
 - b. Were the parameters measured at each site equally?
5. The QAO evaluates if comparability goals were met.
 - a. Were the samples from each site and during one sampling event at each site collected on the same day?
 - b. Were the analysis methods the same throughout the project?
 - c. Were the collection methods the same throughout the project?
6. The QAO evaluates if sensitivity limits were set and applied to data results.
 - a. Were the detection limits the same throughout the project?
 - b. Were the detection limits the same as in the project QAPP?
7. Data validation that is performed by the QAO is a specific process to determine the analytical quality of a specific data set. The validation checks were performed on at least 10% of data sets.
 - a. Did the results meet the project DQI limits?
 - b. Were qualifiers and flags assigned to results correctly?
 - c. Were adequate inspections or audits of the project performed through site visits or phone calls?
8. Integrity affects all aspects of data interpretation including data used for decision making. The QAO checks for a lack of integrity. Examples are listed below:
 - a. Was there a Chain of Custody form?
 - b. Were the correct results applied for the DQI calculation tables?
 - c. Were there any signs of falsification, manipulation, post analysis results alterations, or a failure to conduct the required analytical steps?

B. Biological and Habitat Data

Quantitative Data Quality Indicators

The project manager adds flags that are appropriate for the biological sample results as described in the sheet "For Reference – Flags" of the *ARUT2020-Rev2* spreadsheet.

1. Fish Assemblage

Sampling precision is measured by calculating the RPD between the original sample (*S*) and a field revisit sample (*D*) for number of species (IDEM, 2021).

- a. 10% of the sampling sites for the project are revisited and sampled at least two weeks following the initial sampling event unless stated otherwise in the project QAPP.
- b. The revisit sites are randomly chosen, and the same sampling reach and equipment type (e.g., backpack shocker, longline) is used; however, the equipment and anode operator electrofishing the reach is different (e.g., a different set of longline equipment is used from what was originally used to

sample the site; the intent is to measure reproducibility of the sampling methodology).

- c. The precision limit for number of species is documented in the project QAPP.
- d. The final RPD calculations are completed on sheet “DQI Tables” of the *ARUT2020-Rev2.0* spreadsheet.
- e. The formula for calculating the RPD is:

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

Where:

S = the original sample value.

D = the revisit sample value.

Taxonomic precision for fish assemblages is calculated as average Percent Taxonomic Disagreement (PTD) by comparing taxonomic results from voucher specimens (or photographs for larger specimens) re-identified by a different fisheries biologist external to the organization (IDEM, 2021).

- a. For sites that are revisited, voucher specimens are re-identified by a fisheries biologist external to the organization and disagreements are counted.
- b. The precision limit for PTD is documented in the project QAPP.
- c. The PTD calculations are completed on sheet “DQI Tables” of the *ARUT2020-Rev 2.0* spreadsheet.
- d. The formula for calculating the PTD is:

$$PTD = \left[1 - \left(\frac{a}{N} \right) \right] \times 100$$

Where:

a = the number of agreements.

N = the total number of individuals in the larger of two counts.

2. **Macroinvertebrate Assemblage**

Sampling precision is measured by calculating the RPD between the original sample (S) and a field duplicate sample (D) for number of taxa (IDEM, 2021).

- a. 10% of the sampling sites for the project will have duplicate samples.
- b. Duplicate samples will be collected on the same day using the same collector and equipment. However, the duplicate sample will be collected from a different area of the waterbody that closely resembles the original sample area (the intent is to measure reproducibility of the sampling methodology).
- c. The precision limit for number of taxa is documented in the project QAPP.
- d. The final RPD calculations are completed on sheet “DQI Tables” of the *ARUT2020-Rev 2.0* spreadsheet.
- e. The formula for calculating the RPD is:

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

Where:

S = the original sample value.

D = the duplicate sample value.

PSE of laboratory samples will be determined by having a second analyst examine sample residuals to check for additional organisms missed by the first analyst (IDEM, 2021).

- a. Once the primary sorter's PSE is >90% for five consecutive samples, only 10% of the primary sorter's future samples will be examined for residuals (one out of every 10 samples processed) to keep track of PSE for individuals and the macroinvertebrate program overall.
- b. The PSE is documented in the project QAPP.
- c. The PSE calculations are completed on sheet "DQI Tables" of the *ARUT2020-Rev 2.0* spreadsheet.
- d. The formula for calculating the PSE is:

$$PSE = \left(\frac{A}{A + B} \right) \times 100$$

Where:

A = the number of organisms found by the primary sorter.

B = the number of recoveries (organisms missed by the primary sort and found during the QC check).

Taxonomic precision for macroinvertebrate assemblages is calculated as average PTD by comparing taxonomic results from the duplicate samples with the results of whole sample re-identifications by a macroinvertebrate taxonomist external to the organization (IDEM, 2021).

- a. For duplicate samples, the whole sample is re-identified by a macroinvertebrate taxonomist external to the organization.
- b. The precision limit for PTD is documented in the project QAPP.
- c. The PTD calculations are completed on sheet "DQI Tables" of the *ARUT2020-Rev 2.0* spreadsheet.
- d. The formula for calculating the PTD is:

$$PTD = \left[1 - \left(\frac{a}{N} \right) \right] \times 100$$

Where:

a = the total number of agreements (matches between both taxonomists) summed across all individuals and taxa.

N = the total number of individuals in the larger of the two counts for a sample.

Percent Difference in Enumeration (PDE) will also be performed on the 10% of macroinvertebrate samples used for PTD to compare counts between internal and external taxonomists (IDEM, 2021).

- a. For duplicate samples, the whole sample is counted again by a macroinvertebrate taxonomist external to the organization.
- b. The Difference in Enumeration (DE) is documented in the project QAPP.
- c. The PDE calculations are completed on sheet "DQI Tables" of the *ARUT2020-Rev 2.0* spreadsheet.
- d. The formula for calculating the PDE is:

$$PDE = \left(\frac{|n1 - n2|}{n1 + n2} \right) \times 100$$

Where:

n1 = number of individuals counted in sample by internal taxonomist.

n_2 = number of individuals counted in sample by external taxonomist.

3. **Habitat Evaluation**

Sampling precision is measured by calculating the average (RPD) between the original sample value (S) and the duplicate sample value (D) for the total (QHEI) score at the same site (IDEM, 2021).

- a. 10% of the sampling sites are evaluated by a different surveyor on the same sampling reach.
- b. The surveyor must be different since the intent is to measure reproducibility of the sampling methodology to produce a similar QHEI.
- c. The precision limit for QHEI score is documented in the project QAPP.
- d. The final RPD calculations are completed on sheet "DQI Tables" of the *ARUT2020-Rev 2.0* spreadsheet.
- e. The formula for calculating the RPD is:

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

Where:

S = the original sample value.

D = the duplicate sample value.

Qualitative Data Quality Indicators

1. To collect a representative fish or macroinvertebrate assemblage for the stream, strict adherence to established field methods must be followed which include training and calibration of staff, laying out the proper sampling reach, using the proper equipment, and consistent use of methodology to collect the specimens.
 - a. Representativeness is discussed in the project QAPP under site selection and monitoring design.
2. Taxonomic accuracy is evaluated based on the experience and technical expertise of the individual(s) performing the identifications; consistent use of accepted scientific nomenclature in all identifications; and use of appropriate taxonomic references.
 - a. Individuals performing identifications should have at least one year of experience in taxonomy of fish/macroinvertebrates in the region (verified through resume, reference check, and Scientific Purposes License if necessary).
 - b. For fish, scientific nomenclature will follow the American Fisheries Society (AFS) (Page et al. 2013). For macroinvertebrates, scientific nomenclature will follow the Integrated Taxonomic Information System (ITIS), which is available online at <http://www.itis.gov/>.
 - c. Following importation into AIMS, taxonomic reasonableness checks will take place on secondary data to verify species or taxa known to occur in a given 12-digit hydrologic unit code (HUC).
3. Completeness can be calculated to summarize the number of samples collected as a proportion of those that were originally planned.
 - a. Completeness is calculated from the number of valid samples collected divided by the total number of samples that were projected to be collected in the project QAPP.
 - b. The project manager establishes a percent completeness value for each parameter collected to meet their monitoring goals.
 - c. The percent values are determined by the project manager and represent the minimum sample results needed to meet their monitoring goals.

QAO Verification of Biological and Habitat Data using Associated DQIs

1. The QAO evaluates sampling and taxonomic precision as well as PSE and PDE filled out by project manager on sheet “DQI Tables” of the ARUT spreadsheet.
 - a. Were the revisit/duplicate samples collected at 10% minimum rate or the rate specified in the project QAPP?
 - b. Were precision limits set for number of species/taxon and QHEI score listed in the sheet “DQI Tables” of the *ARUT2020-Rev 2.0* spreadsheet?
 - c. Were percent taxonomic disagreement limits listed in the sheet “DQI Tables” of the *ARUT2020-Rev 2.0* spreadsheet?
 - d. Were PSE and PDE limits for macroinvertebrate samples listed in the sheet “DQI Tables” of the *ARUT2020-Rev 2.0* spreadsheet?
2. The QAO evaluates taxonomic accuracy.
 - a. Did the individual(s) performing the identifications have at least one year of experience in the region?
 - b. Was the proper scientific nomenclature used and referenced in the sheets “6-FishData” and “7-MacroData” of the *ARUT2020-Rev 2.0* spreadsheet?
 - c. Did any species or taxa show up as new for a 12-digit HUC upon import to AIMS? Biologists will need to verify prior to final approval in AIMS.
3. The QAO evaluates percent completeness for monitoring events.
 - a. Was the percent completion that was set for the project successful?
4. The QAO evaluates if representativeness was adequate for the purposes of the study.
 - a. Were staff properly trained and calibrated prior to sampling events?
 - b. Were established field methods followed at each site during each event?
 - c. Were the parameters measured at each site equally?
5. Integrity affects all aspects of data interpretation including data used for decision making. The QAO checks for a lack of integrity. Examples are listed below:
 - a. Did the results meet the project DQI limits?
 - b. Were qualifiers and flags assigned to results correctly?
 - c. Were adequate inspections or audits of the project performed through site visits or phone calls?
 - d. Was there a Chain of Custody?
 - e. Were the correct results (taxonomic agreements, total habitat score, etc.) applied for the DQI calculation tables?
 - f. Were there any signs of falsification, manipulation, post analysis results alterations, or a failure to conduct the required steps?

3.0 Roles

3.1. Responsibilities

- A. Secondary data coordinator
 1. Serves as a contact with secondary data generators.
 2. Responsible for spatial validation and site identification for projects.

3. Responsible for the creation of project sites and their entry in the secondary data upload template.
 4. Responsible for providing a prepared secondary data upload template for customers.
 5. Responsible for initial evaluation of secondary data assessment level in determining the QAO best suited to assist and review.
 6. Responsible for uploading data into AIMS (update and append or replace if necessary)
 7. Responsible for maintaining workflow and compiling a final QA report.
- B. Secondary data outreach
1. Responsible for maintaining secondary data public website.
 2. Responsible for periodic solicitation for secondary data submissions.
- C. Secondary data QAO
1. Responsible for reviewing data packages submitted to the WAPB.
 2. Responsible for reviewing project work plans or QAPPs.
 3. Responsible for assigning DQLs to data results.
 4. Responsible for contacting secondary data submitter to reconcile issues with data (must copy the secondary data coordinator).
 5. Responsible for providing the secondary data coordinator with QA report.
- D. Secondary data submitter
1. Responsible for managing preparation of secondary data upload template, the compilation of any supporting documentation and completion of the Certification Form.
 2. Responsible for making updates and corrections to data included in the secondary data upload template and resubmitting it in collaboration with the QAO.
 3. Responsible for project accountability under contract for completing the QAPP and data reporting task.
- E. Technical and logistical services section chief (QA manager).
1. Responsible for updating this SOP.
- 3.2. Training requirements
- A. EPA QAPP Elements
1. QAO
 2. Secondary data coordinator
 3. Secondary data submitter
- B. ESRI Arc GIS training
1. Secondary data coordinator
- C. Experience with the AIMS database
1. QAO
 2. Secondary data coordinator

4.0 Required Forms, Equipment, or Software List

- 4.1 Forms
- A. "AIMS Results Upload Template (ARUT)" pre-formatted MS Excel spreadsheet

B. Certification Form for Submission of External Data Sets including checklist. (See Appendix 9.6)

5.0 Records Management

- 5.1. Completed secondary data upload templates are stored electronically in SharePoint and shared drive project folders. The location of the folders is detailed in the SharePoint site [NPS Project Tracking](#).
- 5.2. Final quality assurance reports are stored electronically in SharePoint and shared drive project folders. The location of the folders is detailed in the SharePoint site [NPS Project Tracking](#).

6.0 Definitions

- 6.1. “205(j) Grant” – The federal Clean Water Act Section 205(j) provides funding for water quality management planning. Funds are to be used to determine the nature, extent and causes of point and nonpoint source pollution problems and to develop plans to resolve these problems. Organizations eligible for funding include municipal governments, county governments, regional planning commissions, and other public organizations. For-profit entities, nonprofit organizations, private associations, and individuals are not eligible to receive this assistance. The Section 205(j) program provides for projects that gather and map information on nonpoint and point source water pollution, develop recommendations for increasing the involvement of environmental and civic organizations in watershed planning and implementation activities, and develop and implement watershed management plans. The Watershed Planning and Restoration Section administers the Section 205(j) Program for Indiana.
- 6.2. “319 Grant” – The federal Clean Water Act Section 319(h) provides funding for various types of projects that endeavor to reduce nonpoint source water pollution. Funds may be used to conduct assessments, develop and implement total maximum daily loads (TMDLs) and watershed management plans, provide technical assistance, demonstrate new technology, and provide education and outreach. Organizations eligible for funding include nonprofit organizations, universities and local, state or federal government agencies. A 40% (non-federal) in-kind or cash match of the total project cost must be provided. The Watershed Planning and Restoration Section administers the Section 319(h) Program for Indiana.
- 6.3. “Assessment information management system database (AIMS II database)” – IDEM OWQ data base containing information related to water chemistry, aquatic habitat, macroinvertebrate and fish communities, fish tissue analyses, sediments, algae, and *E. coli* bacteria data generated through WAPB, External Data Framework, and NPS sampling events.
- 6.4. “Certified results (certification)” – IDEM WAPB must certify data sets, which adds a layer of confidence that the IDEM WAPB has received or can easily obtain all the information needed to support the DQA level assigned to the data set. All secondary data generators who submit data through the EDF must include a completed certification form and accompanying checklist related to their data submittal. The certification form, description of requirements of each DQA level, and the checklist can be found in Appendix 9.7.
- 6.5. “Chain of custody (COC)” – The records documenting the possession of the samples from the time they are obtained until they are disposed of or shipped off site.

Chronological documentation or paper trail, showing the collection, transfer, receipt, analysis, storage, and disposal of a sample.

- 6.6. “Data quality indicators (DQI)” – The quantitative statistics and qualitative descriptors used to interpret the degree of acceptability or utility of data to the user. The principal data quality indicators are measures of principal quality attributes (bias, precision, accuracy (bias is preferred) comparability, completeness, representativeness, and sensitivity).
- 6.7. “Data qualifier flags” – The abbreviated form, such as letters or symbols, defined by the program, that describe analytical processes/methods that do not meet the predetermined limits of the data quality indicators (DQI). The data results associated with the analytical method that was “out of control” based on the DQI limits are identified through the data quality flag to help data users make decisions.
- 6.8. “Data package” – Analytical results and quality assurance/quality control documentation provided by the analytical laboratory and supporting information and documentation submitted for consideration to the WAPB QAO for qualification and inclusion in the AIMS data base.
- 6.9. “Data qualification” – A definition of elements that must accompany the data results such as the analytical methods used, the metadata elements required for data storage; the data submission tool; the data management system with data quality indicators and limits; the QAPP; the SOPs; and the training requirements for staff.
- 6.10. “Data quality level (DQL)” – Each dataset or parameter therein, is assigned a DQL ranging from 1 to 3. The QAO assigns a DQL based on the quantity and quality of QA elements submitted with the data package, as well as the amount of documentation of Quality Control QC procedures performed during laboratory and/or field analysis.
- 6.11. “Data verification” – Part of the quality assessment process that provides verification of those sampling and analytical processes operated within analytical or operational limits, and confirming sufficient data were collected to permit reasonable interpretation.
- 6.12. “Indiana Clean Lakes program (ICLP)” – The Indiana Clean Lakes program was created in 1989 as a program within the IDEM Office of Water Management (now Office of Water Quality). The program is administered through a grant to Indiana University's School of Public and Environmental Affairs (SPEA) in Bloomington. The Indiana Clean Lakes Program is a comprehensive, statewide public lake management program.
- 6.13. “External customers” – Any entity outside the IDEM Watershed Assessment and Planning Branch (WAPB) requesting or reviewing data within the AIMS database, or any data generator outside the WAPB submitting secondary data through the External Data Framework (EDF).
- 6.14. “External data” – See Secondary Data.
- 6.15. “External data framework (EDF)” – Developed by the Indiana Department of Environmental Management (IDEM) Office of Water Quality (OWQ) to provide a systematic, transparent, and voluntary process for external organizations to submit their water quality data for consideration in various OWQ programs.
- 6.16. “Hoosier Riverwatch Program (HRW)” – A program developed in 1994, to engage Indiana citizens in becoming active stewards of Indiana’s valuable water resources through its hands-on water quality education and volunteer stream monitoring program.

- 6.17. "Internal data" – Data that is obtained through the IDEM WAPB which includes adhering to branch QAPPs and SOPs; using trained staff; using IDEM contracted laboratories; using IDEM approved methods; and storing the data in AIMS.
- 6.18. "Nonpoint source (NPS)" – Pollution that originates from diffuse sources over a relatively large area. Nonpoint sources can be divided into source activities related to either land or water use including failing septic tanks, improper animal-keeping practices, forest practices, and urban and rural run-off.
- 6.19. NPS projects – Watershed projects funded from EPA CWA 319 and 205j grants and managed by Watershed Planning and Restoration Section project managers.
- 6.20. Project manager (PM) – Agency staff designated as responsible to coordinate/implement activities associated with a site or project specific Quality Assurance Project Plan, especially with respect to collecting, using, and reporting environmental data.
- 6.21. Quality assessment process – A data management system for determining the scientific and statistical quality of data to ensure data is limited in error by examining data for errors that are identified through the development of a data management system.
- 6.22. Quality assurance (QA) – An integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item or service is of the type and quality needed and expected by the client and the overall system of technical activities that measures the attributes and performance of a process, item, or service is of the type and quality needed and expected by the client.
- 6.23. Quality assurance officer (QAO) – An agency staff member in the program areas responsible for ensuring that quality assurance criteria are met.
- 6.24. Quality assurance project plan (QAPP) – A document describing in comprehensive detail the necessary quality assurance, quality control, and other technical activities to ensure that the results of the work performed will satisfy the stated performance criteria. Quality Assurance Project Plans (QAPPs) apply to data gathering activities associated with projects and lab procedures. QAPPs are commonly needed for laboratory operations, remediation projects and mitigation projects. QAPPs may contain one or more standard operating procedures. A QAPP is valid for a period up to five years from the official publication date (approval date).
- 6.25. Quality control (QC) – The overall system of technical activities that measure the attributes and performance of a process, item or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality.
- 6.26. Quality control samples – An uncontaminated sample matrix spiked with known amounts of analytes from a source independent of the calibration standards. Generally used to establish intra- laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system.
- 6.27. Secondary data (also known as acquired data, external data) – Data or information used for project implementation or decision-making, which meets one of the following criteria:
 - 1) Are compiled from other sources;
 - 2) Were originally collected for some other purposes;
 - 3) Are obtained from non-measurement sources such as computer databases, programs, scientific literature and historical databases.

- 6.28. Secondary data QAPP – A quality assurance project plan including all the elements defined by EPA from non-internal data sources or also referred to as secondary data.
- 6.29. Secondary data upload template – This term is used to describe the preformatted Excel Workbook provided to the customer for collecting their environmental data into a format that will upload information into AIMS.
- 6.30. SharePoint – A Web-based collaboration and document management platform from Microsoft.
- 6.31. Technical and Logistical Services Section (TLSS) – A section within the Watershed Planning and Assessment Branch of the Office of Water Quality principally involved with providing technical and quality assurance support to various programs within the branch.
- 6.32. Watershed Assessment and Planning Branch (WAPB) – A branch within the IDEM Office of Water Quality responsible for surface water monitoring..
- 6.33. Water Quality Portal (WQP) - [Water Quality Data Home](#) The premiere source of discrete water quality data in the US and beyond. IDEM uploads AIMS II data via the Water Quality Exchange (WQX) framework to the WQP. Public can make retrieval requests from the WQP.

7.0 Quality Assurance and Quality Control

- 7.1. The QAO reviews associated project data and documentation, including the QAPP and ARUT data, and makes comments on the Certification Form (Appendix 9.6) which is completed by the data submitter. The QAO will then make a DQL assignment on the Certification Form. The QA Manager will have the final approval for DQL assignments based upon the QAO recommendations on the Certification Form.

8.0 References


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- 8.5. IDEM 2021. [Technical Guidance for the Office of Water Quality External Data Framework](#). Indiana Department of Environmental Management, Office of Water Quality, Watershed and Assessment and Planning Branch. 93 pg.
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- 8.7. IDEM. 2023a. [Fish Community Field Collection Procedures. B-009-OWQ-WAP-XXX-23-T-R1](#). Indiana Department of Environmental Management, Office of Water Quality, Indianapolis, Indiana.
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- 8.14. Page, L.M., H. Espinoza-Perez, L.T. Findley, C.R. Gilbert, R.N. Lea, N.E. Mandrak, R.L. Mayden and J.S. Nelson. 2013. Common and Scientific Names of Fishes from the United States, Canada, and Mexico, 7th edition. American Fisheries Society Special Publication 34. 243 pg.

9.0 Appendices

- 9.1 Stream Sampling Field Information
- 9.2 Chain of Custody Form
- 9.3 Macroinvertebrate Laboratory Information
- 9.4 Fish Sample Information
- 9.5 Habitat Sample Information
- 9.6 Certification Form for Submission of External Data Sets including checklist

9.1 Stream Sampling Field Information

										Stream Sampling Field Data Sheet										Analysis Set #		EPA Site ID		Rank	
Sample #		Site #		Sample Medium				Sample Type				Duplicate Sample #													
Stream Name:										River Mile:		County:													
Site Description:																									
Survey Crew Chief	Sample Collectors				Sample Collected		HydroLab #	Water Depth/Gage Ht (ft)	Water Flow (cf/sec)	Flow Estimated?	Algae?	Aquatic Life?													
	1	2	3	4	Date	Time																			
Sample Taken?		Aliquots				Water Flow Type			Water Appearance			Canopy Closed %													
◊ Yes ◊ No; Frozen		◊ 1 ◊ 2		◊ 3 ◊ 4		◊ Riffle	◊ Dry	◊ Stagnant	◊ Clear	◊ Green	◊ Sheen	◊ 0-20%	◊ 60-80%												
◊ No; Stream Dry ◊ No; Other		◊ 6 ◊ 8		◊ 12 ◊ 24		◊ Pool	◊ Run	◊ Flood	◊ Murky	◊ Black	◊ Other	◊ 20-40%	◊ 80-100%												
◊ No; Owner refused Access		◊ 48 ◊ 72		◊ AS-Flow		◊ Glide	◊ Eddy	◊ Other	◊ Brown	◊ Gray (Septic/Sewage)	◊ 40-60%														
Special Notes:																									

Field Data:

Date (m/d/yy)	24-hr Time (hh:mm)	D.O. (mg/l)	pH	Water Temp (°C)	Spec Cond (µmhos/cm)	Turbidity (NTU)	% Sat.	Chlorine (mg/l)	Chloride (mg/l)	Chlorophyll (mg/l)	Weather Codes							
											SC	WD	WS	AT				
Comments																		
Comments																		
Comments																		
Comments																		
Comments																		
Comments																		

Measurement Flags < Min. Meter Measurement > Max. Meter Measurement E Estimated (See Comments) R Rejected (See Comments)	Weather Code Definitions			
	SC Sky Conditions	WD Wind Direction	WS Wind Strength	AT Air Temp

Field Calibrations:

Date (m/d/yy)	Time (hh:mm)	Calibrator Initials	Calibrations			
			Type	Meter #	Value	Units

Calibration Type	pH DO Turbidity
------------------	-----------------------

Preservatives/Bottle Lots:

Group: Preservative	Preservative Lot #	Bottle Type	Bottle Lot #	Groups: Preservatives	Bottle Types
GC				General Chemistry: Ice	2000P 2000mL Plastic, Narrow Mouth
Nx				Nutrients: H2SO4	1000P 1000mL Plastic, Narrow Mouth
Metals				Metals: HNO3	500P 500mL Plastic, Narrow Mouth
CN				Cyanide: NaOH	250P 250mL Plastic, Narrow Mouth
O&G				Oil & Grease: H2SO4	1000G 1000mL Glass, Narrow Mouth
Toxics				Toxics: Ice	500G 500mL Glass, Wide Mouth
Ecol				Bacteriology: Ice	250G 250mL Glass, Wide Mouth
VOA				Volatile Organics: HCl & Thiosulfate	125G 125mL Glass, Wide Mouth
Pest				Pesticides: Ice	40GV 40mL Glass Vial
Phen				Phenols: H2SO4	120PB 120mL Plastic (Bacteria Only)
Sed				Sediment: Ice	1000PF 1000mL Plastic, Coming Filter
Gly				Glyphosate: Thiosulfate	500PF 500mL Plastic, Coming Filter
Hg				Mercury(1631): HCl	60P 60mL Plastic
Cr6				Chromium(VI)(1636): NaOH	250T 250mL Teflon
MeHg				Methyl Mercury(1630): HCl	500T 500mL Teflon
					125T 125mL Teflon

Data Entered By: _____ QC1: _____
 QC2: _____

9.2 Chain of Custody Form



Indiana Department of Environmental Management
OWQ Chain of Custody Form

Project:
OWQ Sample Set or Trip #:

I certify that the sample(s) listed below was/were collected by me, or in my presence. Date: _____

Signature: _____ Section: _____

Sample Media (Water, Algae, Fish, Macro, Cyanobacteria/Microcystin, Sediment)

Lab Assigned Number / Event ID	IDEM Control Number	Sample Type	ID	1000 ml P.N.M.	1000 ml G.N.M.	40 ml Vial	120 ml P (Bact)	2000 ml Nalgene	250 ml Nalgene	125 ml Glass	Date and Time Collected		One check per bottle present
											Date	Time	
P = Plastic M = MS/MSD		G = Glass B = Blank		N.M. = Narrow Mouth D = Duplicate		Bact = Bacteriological Only R = Revisit		Should samples be iced?		Y	N		

Carriers

I certify that I have received the above sample(s).

Signature	Date	Time	Seals Intact		Comments
Relinquished By:			Y	N	
Received By:					
Relinquished By:			Y	N	
Received By:					
Relinquished By:			Y	N	
Received By:					
IDEM Storage Room #					

Lab Custodian

I certify that I have received the above sample(s), which has/have been recorded in the official record book. The same sample(s) will be in the custody of competent laboratory personnel at all times, or locked in a secured area.

Signature: _____ Date: _____ Time: _____

Lab: _____ Address: _____

9.4 Fish Sample Information

IDEM
 OWQ-WATERSHED ASSESSMENT AND PLANNING BRANCH

Event ID _____ Voucher jars _____ Unknown jars _____ Equipment _____ Page _____ of _____
 Voltage _____ Time fished (sec) _____ Distance fished (m) _____ Max. depth (m) _____ Avg. depth (m) _____
 Avg. width (m) _____ Bridge in reach _____ Is reach representative _____ If no, why _____
 Elapsed time at site (hh:mm) _____: _____ Comments _____

Museum data: Initials _____ ID date _____ Jar count _____ Fish Total _____


Coding for Anomalies: D – deformities E – eroded fins L – lesions T – tumor M – multiple DELT anomalies O – other (A – anchor worm C – leeches
 W – swirled scales Y – popeye S – emaciated F – fungus P – parasites) H – heavy L – light (these codes may be combined with above codes)

TOTAL # OF FISH				WEIGHT (s)				ANOMALIES						
				(mass g)				(length mm)						
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												

KRW: Rev/09.26.18 Calculation: _____ QC1 + Entry _____ QC 1 _____ QC 2 _____

9.5 Habitat Sample Information

OWQ Biological QHEI (Qualitative Habitat Evaluation Index)

	Sample # _____	bioSample # _____	Stream Name _____	Location _____
Surveyor _____	Sample Date _____	County _____	Macro Sample Type _____	<input type="checkbox"/> Habitat Complete
				QHEI Score:

1] SUBSTRATE Check ONLY Two predominant substrate TYPE BOXES and check every type present

<p>BEST TYPES</p> <p>PREDOMINANT</p> <input type="checkbox"/> BLDR/SLABS [10] <input type="checkbox"/> BOULDER [9] <input type="checkbox"/> COBBLE [8] <input type="checkbox"/> GRAVEL [7] <input type="checkbox"/> SAND [6] <input type="checkbox"/> BEDROCK [5] <p>PRESENT P/G R/R</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>OTHER TYPES</p> <p>PREDOMINANT</p> <input type="checkbox"/> HARDPAN [4] <input type="checkbox"/> DETRITUS [3] <input type="checkbox"/> MUCK [2] <input type="checkbox"/> SILT [2] <input type="checkbox"/> ARTIFICIAL [0] <p>PRESENT P/G R/R</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <p>(Score natural substrates; ignore sludge from point-sources)</p>	<p>ORIGIN</p> <input type="checkbox"/> LIMESTONE [1] <input type="checkbox"/> TILLS [1] <input type="checkbox"/> WETLANDS [0] <input type="checkbox"/> HARDPAN [0] <input type="checkbox"/> SANDSTONE [0] <input type="checkbox"/> RIP/RAP [0] <input type="checkbox"/> LACUSTRINE [0] <input type="checkbox"/> SHALE [-1] <input type="checkbox"/> COAL FINES [-2]	<p>QUALITY</p> <p>HEAVY [-2] MODERATE [-1] NORMAL [0] FREE [1]</p> <p>Substrate</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>EXTENSIVE [-2] MODERATE [-1] NORMAL [0] NONE [1]</p> <p>Maximum 20</p>
---	---	--	--

NUMBER OF BEST TYPES: 4 or more [2] 3 or less [0]

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed root wad in deep/fast water, or deep, well-defined, functional pools.)

<input type="checkbox"/> UNDERCUT BANKS [1] <input type="checkbox"/> OVERHANGING VEGETATION [1] <input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1] <input type="checkbox"/> ROOTMATS [1]	<input type="checkbox"/> POOLS > 70cm [2] <input type="checkbox"/> ROOTWADS [1] <input type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> OXBOWS, BACKWATERS [1] <input type="checkbox"/> AQUATIC MACROPHYTES [1] <input type="checkbox"/> LOGS OR WOODY DEBRIS [1]
--	---	--

AMOUNT Check ONE (Or 2 & average)

EXTENSIVE > 75% [11]
 MODERATE 25 - 75% [7]
 SPARSE 5 - < 25% [3]
 NEARLY ABSENT < 5% [1]

Cover

Maximum 20

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

<p>SINUOSITY</p> <input type="checkbox"/> HIGH [4] <input type="checkbox"/> MODERATE [3] <input type="checkbox"/> LOW [2] <input type="checkbox"/> NONE [1]	<p>DEVELOPMENT</p> <input type="checkbox"/> EXCELLENT [7] <input type="checkbox"/> GOOD [5] <input type="checkbox"/> FAIR [3] <input type="checkbox"/> POOR [1]	<p>CHANNELIZATION</p> <input type="checkbox"/> NONE [6] <input type="checkbox"/> RECOVERED [4] <input type="checkbox"/> RECOVERING [3] <input type="checkbox"/> RECENT OR NO RECOVERY [1]	<p>STABILITY</p> <input type="checkbox"/> HIGH [3] <input type="checkbox"/> MODERATE [2] <input type="checkbox"/> LOW [1]
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Channel

Maximum 20

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

<p>River right looking downstream</p> <p>EROSION</p> <p>L R</p> <input type="checkbox"/> NONE/LITTLE [3] <input type="checkbox"/> MODERATE [2] <input type="checkbox"/> HEAVY/SEVERE [1]	<p>RIPARIAN WIDTH</p> <p>L R</p> <input type="checkbox"/> WIDE > 50m [4] <input type="checkbox"/> MODERATE 10-50m [3] <input type="checkbox"/> NARROW 5-10m [2] <input type="checkbox"/> VERY NARROW [1] <input type="checkbox"/> NONE [0]	<p>FLOOD PLAIN QUALITY</p> <p>L R</p> <input type="checkbox"/> FOREST, SWAMP [3] <input type="checkbox"/> SHRUB OR OLD FIELD [2] <input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1] <input type="checkbox"/> FENCED PASTURE [1] <input type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<p>CONSERVATION TILLAGE [1] URBAN OR INDUSTRIAL [0] MINING /CONSTRUCTION [0]</p> <p>Indicate predominant land use(s) past 100m riparian.</p> <p>Riparian</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Maximum 10</p>
---	---	--	---

5] POOL/GLIDE AND RIFFLE/RUN QUALITY

<p>MAXIMUM DEPTH</p> <p>Check ONE (ONLY!)</p> <input type="checkbox"/> > 1m [6] <input type="checkbox"/> 0.7 - < 1m [4] <input type="checkbox"/> 0.4 - < 0.7m [2] <input type="checkbox"/> 0.2 - < 0.4m [1] <input type="checkbox"/> < 0.2m [0] [metric = 0]	<p>CHANNEL WIDTH</p> <p>Check ONE (Or 2 & average)</p> <input type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2] <input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1] <input type="checkbox"/> POOL WIDTH < RIFFLE WIDTH [0]	<p>CURRENT VELOCITY</p> <p>Check ALL that apply</p> <input type="checkbox"/> TORRENTIAL [-1] <input type="checkbox"/> SLOW [1] <input type="checkbox"/> VERY FAST [1] <input type="checkbox"/> INTERSTITIAL [-1] <input type="checkbox"/> FAST [1] <input type="checkbox"/> INTERMITTENT [-2] <input type="checkbox"/> MODERATE [1] <input type="checkbox"/> EDDIES [1] <p>Indicate for reach - pools and riffles.</p>	<p>Recreation Potential</p> <p>(Check one and comment on back)</p> <input type="checkbox"/> Primary Contact <input type="checkbox"/> Secondary Contact <p>Pool/ Current</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Maximum 12</p>
---	--	--	---

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

<p>RIFFLE DEPTH</p> <input type="checkbox"/> BEST AREAS > 10cm [2] <input type="checkbox"/> BEST AREAS 5 - 10cm [1] <input type="checkbox"/> BEST AREAS < 5 cm [metric = 0]	<p>RUN DEPTH</p> <input type="checkbox"/> MAXIMUM > 50cm [2] <input type="checkbox"/> MAXIMUM < 50cm [1]	<p>RIFFLE/RUN SUBSTRATE</p> <input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2] <input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1] <input type="checkbox"/> UNSTABLE (e.g., Fine Gravel, Sand) [0]	<p>RIFFLE/RUN EMBEDDEDNESS</p> <input type="checkbox"/> NONE [2] <input type="checkbox"/> LOW [1] <input type="checkbox"/> MODERATE [0] <input type="checkbox"/> EXTENSIVE [-1] <p>Riffle/ Run</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <p>Maximum 8</p>
--	--	--	---

6] GRADIENT (ft/mi) VERY LOW - LOW [2-4] MODERATE [6-10] HIGH - VERY HIGH [10-6] %POOL: %GLIDE:

DRAINAGE AREA (mi²) VERY LOW - LOW [2-4] MODERATE [6-10] HIGH - VERY HIGH [10-6] %RUN: %RIFFLE:

Gradient

Maximum 10

9.6 Certification Form for Submission of External Data Sets including checklist.



Certification Form for the Submission of External Data Sets to the Office of Water Quality, Watershed Assessment and Planning Branch (WAPB)

Submitting Authority: _____

Project Name: _____

I certify that the information included on this form is complete and accurate to the best of my knowledge. I understand that incorrect or incomplete information may result in the rejection of any data submitted with this form.

Signature of Secondary Data Submitter: _____ Date: _____

(For IDEM Use Only Beyond This Line) _____

Signature of Secondary Data Quality Assurance Officer (QAO): _____ Date: _____

Assignment to Data Quality Assessment (DQA) Level 3 - The information listed on this form must be submitted with the data package for data to be assigned to DQA Level 3.

Assignment to DQA Level 2 - The information on this form must be certified as available for review upon request from the Quality Assurance Officer or other appropriate staff of the WAPB for data to be assigned to DQA Level 2.

Assignment to DQA Level 1 - Failure to record and store for review any element of the information listed on this form may result in all data being assigned to DQA Level 1.

Rejection of Data Submittal - Failure to provide at least the date, time and location of sample collection will result in those results being rejected for any use by the WAPB.

Secondary Data QAO Comments: _____

Instructions:

Please complete this form and the checklist on the following pages to include with each data submittal. Note that this form has some informational elements that apply to all submittals and others that are specific to the type(s) of data included with the submittal. Depending on the type(s) of data you are submitting, some of the quality assurance information listed on this form may not be applicable and should be marked as such in the "NA" column.

Quality Assurance Information Required for DQA Level 2 and DQA Level 3 Data Submission for OWQ Uses					
Item	Included with Data Submittal	Available to OWQ upon request	Not Available	N/A	Comments
	DQA Level 3	DQA Level 2	DQA Level 1		
Sample Information					
Sampling and Analysis Work Plan or Quality Assurance Project Plan was submitted as part of the Data Package.					
General Sample Information and Field Parameters					
Dates of sample collection were recorded.					
Times of sample collection were recorded.					
Stream Names of sample collection were recorded.					
Site Descriptions of sample collection were recorded.					
Latitude and longitude of sample collection were recorded.					
Drainage area and gradient of sites were recorded.					
Unique event identifier (sample number) was linked to all other information recorded.					
Sample Type (Normal, Duplicate, Blank, Revisit) recorded.					
Field parameters were recorded (temperature, dissolved oxygen, pH, specific conductance, and turbidity).					
Analytical methods used with this data set were recorded.					
Approved detection limits were recorded.					
Field calibration checks were recorded.					
Field duplicates were collected as appropriate.					
Data Package included detailed listing of the preservatives used in the samples, per each individual container.					
General Chemistry and Nutrients Data					
Sample Prep Dates were recorded.					
Date of analysis was recorded for each result.					
Analytical method was recorded for each result.					
Detection limits were recorded for each parameter.					
Quantitation (Reporting) Limits were recorded.					
Blank, Field Duplicate and MS/MSD results were recorded.					
Instrument calibrations were recorded.					
Laboratory control standards results were recorded.					
Initial and continuing calibration results were recorded.					

Quality Assurance Information Required for DQA Level 2 and DQA Level 3 Data Submission for OWQ Uses					
Item	Included with Data Submittal	Available to OWQ upon request	Not Available	N/A	Comments
	DQA Level 3	DQA Level 2	DQA Level 1		
Metals Data					
ICP Serial Dilution information was recorded.					
ICP Linear Range Studies information was recorded.					
ICP Interement Correction Study information was recorded.					
ICP Interference Check Standard information was recorded.					
ICP CRQL Standard information was recorded.					
ICP/MS Mode used in the analysis was recorded.					
ICP/MS Stability Check with Tuning Solution information was recorded.					
Organics Data					
Surrogates information was recorded.					
Internal Standards information was recorded.					
System Performance information was recorded.					
Bacteriological Data					
Summary Data Package was compiled.					
Sample Prep Dates and Times were recorded.					
Sample Analysis Dates and Times were recorded.					
Holding Times were recorded.					
Incubation Parameters were recorded.					
Temperature Evaluation was conducted.					
Analytical Methods were recorded.					
Detection Limits were recorded.					
Quantitation (Reporting) Limits were recorded.					
Blank, Field Duplicate and MS/MSD results recorded.					
Field and Method Duplicates were collected.					
Colilert Quality Control Report(s) were collated.					
Positive Control results were recorded.					
Beginning and Ending Sterility Control results recorded.					
KP, PA, EC, Media Control Standards results recorded.					
Macroinvertebrate Community Data					
Qualifications for Collectors and Taxonomists included.					
Equipment for Sample Collection/Identification included.					
Complete macroinvertebrate sample information provided.					
Sampling precision (relative percent difference in number of taxa) provided.					
Complete macroinvertebrate laboratory information provided.					
Percent Sorting Efficiency was provided.					
Precision of taxonomy and sample enumeration was provided.					

Quality Assurance Information Required for DQA Level 2 and DQA Level 3 Data Submission for OWQ Uses					
Item	Included with Data Submittal	Available to OWQ upon request	Not Available	N/A	Comments
	DQA Level 3	DQA Level 2	DQA Level 1		
Fish Community Data					
Qualifications for Collectors and Taxonomists were included.					
Equipment List and Protocol for Sample Collection was included.					
Complete fish sample information was provided.					
List of voucher specimens by fish field taxonomist was provided.					
Sampling precision (relative percent difference in number of taxa) was provided.					
Precision of taxonomy was provided.					
Habitat Data					
Qualifications for Surveyor were provided.					
Complete habitat sample information was provided.					
Precision in Field Observations was provided.					
Chain of Custody					
Chain of Custody form was used.					
Chain of Custody Form included the date that the samples were collected.					
Chain of Custody Form included the time that the samples were collected.					
Chain of Custody Form included the type and number of containers that were used for each sample number.					
Chain of Custody Form included the signature of the person who collected the samples.					
Chain of Custody Form included the signature of the person accepting custody of the samples.					
Chain of Custody Form included the date and time that the samples were received by the Laboratory.					
Chain of Custody Form included date and time samples were placed in storage.					
Laboratory					
Name and address of the Laboratory was recorded.					
Telephone number and e-mail of the Contact Person at the Laboratory was recorded.					
Sample delivery date and time was recorded by the laboratory.					
Laboratory Job Number was recorded.					
Date that the Lab Report was prepared was recorded.					
Date that the Lab Report was received from the laboratory was recorded.					