



Water Quality Program Policy

Chapter 2:

WQP Policy 1-11

Established: September 2006

Ensuring Credible Data for Water Quality Management

Purpose: This policy describes the Quality Assurance (QA) measures, guidance, regulations, and existing policies that help ensure the credibility of data and other information used in agency actions based on the quality of state surface waters. Agency actions include (1) determinations of whether a surface water is supporting its designated use, such as the 303(d) and 305(b) assessment processes, (2) establishment of a Total Maximum Daily Load (TMDL) and the associated load allocations and wasteload allocations, and (3) revisions to water quality standards. This policy is required by the *Water Quality Data Act* (WQDA) codified in RCW 90.48.570 through 90.48.590.

Application: This policy applies when evaluating data and information for use in agency decisions when the quality of a surface water of the state is at issue. It is also intended as guidance for all parties interested in submitting data for consideration in decisions related to water quality. The quality of surface water is assessed through comparison of measured parameters to water quality criteria and standards, to sediment quality criteria and standards, and to fish tissue criteria and standards. The quality of surface water is also assessed under the water quality standards through stream biological monitoring and physical habitat evaluation.

The WQDA states that:

- “Ecology shall use credible information and literature for developing and reviewing a surface water quality standard or technical model used to establish a TMDL for any surface water of the state.”
- “Ecology shall use credible data for the following actions:
 - Determining whether any water of the state is to be placed on or removed from any section 303(d) list;
 - Establishing a TMDL for any surface water of the state; or
 - Determining whether any surface water of the state is supporting its designated use or other classification.”

The WQDA does not restrict use of data for other department actions. Data generated to meet the requirements of wastewater effluent permits may not meet the requirements specified in the credible data policy but may still be used in compliance actions. Data submitted by some organizations and individuals will be compiled in Ecology information systems whether the data meets or does not meet the requirements of the credible data policy. The data needs to meet the credible data requirements in order to be used as the basis for the specific water quality actions listed above, according to the WQDA.

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1. Introduction and Background

The Department of Ecology (Ecology) is required to develop policy regarding the generation and use of credible data in certain water quality-related actions. This policy is required by the *Water Quality Data Act* (WQDA) codified in RCW 90.48.570 through 90.48.590.

Data are considered credible data if:

- Appropriate quality assurance and quality control procedures were followed and documented in collecting and analyzing water quality samples;
- The samples or measurements are representative of water quality conditions at the time the data were collected;
- The data consist of an adequate number of samples based on the objectives of the sampling, the nature of the water in question, and the parameters being analyzed; and
- Sampling and laboratory analysis conform to methods and protocols generally acceptable in the scientific community as appropriate for use in assessing the condition of the water.

This policy includes:

- An explanation of how Ecology uses scientific research and literature to develop and review any water quality standard or technical model used to establish a Total Maximum Daily Load (TMDL) for any water of the state,
- A description of the specific criteria that are used to judge whether data are of adequate credibility to use when (1) determining whether any water of the state is to be placed on or removed from any section 303(d) list, (2) establishing TMDLs, and (3) determining whether any surface water of the state is supporting its designated use, and
- Recommendations for appropriate training and experience needed for collection of credible data.

Policies, guidelines, and protocols that address some of these statutory requirements were established prior to adoption of the WQDA due to agency efforts to document and promote quality assurance principles in data collection and use. These include the following:

Agency-wide Policy

- Ecology Executive Policy 1-21
Establishing Quality Assurance established a program for ensuring the consistent application of quality assurance principles to the planning and execution of all activities that acquire and use environmental measurement data.
- Ecology Executive Policy 1-22
Requiring Use of Accredited Environmental Laboratories ensures that laboratories performing environmental analyses are capable of providing accurate and defensible data for Ecology's use in making decisions concerning the environment.

- Ecology Publication 05-03-031.
Quality Management Plan: Agency Plan to Implement, Document, and Assess the Effectiveness of the Quality System Supporting Environmental Data Operations is the Ecology blueprint for applying quality assurance and quality control to environmental programs. It defines the quality system for planning, implementing, and assessing the effectiveness of activities supporting environmental data decisions. It requires the preparation of a status report for Ecology management every two years.

Planning Guidelines and Examples

- Ecology Publication No. 04-03-030.
Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies presents detailed guidance on the preparation of QA Project Plans. It describes 14 elements to be addressed in the plan and provides supporting information and examples relevant to the content of each element.
- *Ecology Quality Assurance Project Plans* is a link to a list of some recent QA Project Plans prepared by Ecology.
- Environmental Assessment Program (EAP) Procedure 1-04
Preparation, Review, and Approval of Quality Assurance Project Plans establishes the review and approval process for QA Project Plans. Peer review is required of all QA Project Plans developed by staff within EAP.
- Sediment Sampling and Analysis.
www.ecy.wa.gov/biblio/0309043.html
This publication provides technical guidance for developing sampling and analysis plans for sediment investigations conducted under the Washington Sediment Management Standards (WAC Chapter 173-204). www.ecy.wa.gov/programs/tcp/smu/sediment.html

Monitoring Protocols

- Ecology Publication No. 01-03-036. www.ecy.wa.gov/biblio/0103036.html
Stream Sampling Protocols for the Environmental Monitoring and Trends Section describes the sample collection, shipment, and analysis procedures used by EAP's Environmental Monitoring and Trends Section staff to collect water quality information at long-term stream monitoring stations.
- Ecology Publication No. 93e04
Field Sampling and Measurement Protocols for the Watershed Assessments Section describes sampling and measurement protocols used by EAP's Watershed Assessment Section when conducting water quality assessment projects.
- Ecology Publication No. 03-03-052
Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends Section describes the protocols used by EAP's Environmental Monitoring and Trends Section to collect continuous water temperature data at stream monitoring stations.

- Puget Sound Protocols
www.psat.wa.gov/Publications/protocols/protocol.html
 This publication presents recommended protocols for measuring selected environmental variables in Puget Sound. The objective is to encourage most investigators conducting studies such as monitoring programs, baseline surveys, and intensive investigations to use equivalent methods whenever possible. If this objective is achieved, most data from future sampling programs should be comparable among studies.
- Sediment Sampling and Analysis
www.ecy.wa.gov/biblio/0309043.html
 This publication provides technical guidance for developing sampling and analysis plans for sediment investigations conducted under the Washington Sediment Management Standards (WAC Chapter 173-204).
www.ecy.wa.gov/programs/tcp/smu/sediment.html provides links to sediment related sites.
[www.ecy.wa.gov/programs/eap/mar_sed/NOAA-PSAMP%20QA Project Plan.pdf](http://www.ecy.wa.gov/programs/eap/mar_sed/NOAA-PSAMP%20QA%20Project%20Plan.pdf) is an example of a QA Project Plan for marine sediments.

Assessment Guidelines and Policy

- EAP Policy 4-01
Guidelines for Technical Document Review establishes the respective responsibilities of supervisors, authors, and reviewers in this quality assurance process. Appropriate review is an integral step to ensure high quality technical reports, and this set of guidelines lays out peer review procedures for EAP technical documents.
- Water Quality Program (WQP) Policy 1-11, Chapter 1
Assessment of Water Quality for the Section 303(d) List establishes the system for determining the status of state waters relative to the water quality standards and to help determine priorities for TMDL scheduling and development.
- WQP Policy 1-25
Dispute Resolution establishes the procedures that Ecology will follow in resolving a dispute on a TMDL issue when resolution cannot be reached through the normal TMDL process.
- Ecology Publication No. 91-78
Technical Guidance for Assessing the Quality of Aquatic Environments, A Handbook prepared for the Water Quality Financial Assistance Program (revised 1994) discusses developing water quality assessment programs and technical methods for conducting water quality studies.

The U.S. Environmental Protection Agency (EPA) also maintains policy, guidance and procedures that address some of the requirements. This link provides a directory to EPA QA documents: www.epa.gov/quality/qa_docs.html

2. Water Quality-Based Actions Subject to Water Quality Data Act Policy

The criteria in this policy have been developed to build on the policies that promote the generation and use of credible data in actions undertaken to assess and improve water quality. Typical actions that are intended to improve water quality subject to the provisions of the WQDA and this policy include:

- **Revisions of Water Quality Standards**

The state revises the water quality standards periodically as new information indicates that a change to water quality criteria, uses, and regulations is needed. The standards are in regulations compiled in the Washington Administrative Code (WAC). The surface water quality standards are in Chapter 173-201A WAC, *Water Quality Standards for Surface Waters of the State of Washington*. The WQDA requires Ecology to (1) use credible information and literature to develop and review a surface water quality standard and (2) explain in this policy how it uses scientific research and literature to develop and review any water quality standard.

A specific type of revision of the surface water quality standard is described in federal regulation, the Use Attainability Analysis (UAA). A UAA is a structured scientific assessment of the factors affecting the attainment of uses designated for protection in the water quality standards. It may include an assessment of physical, chemical, biologic, and economic factors as described in the federal regulations at 40 CFR 131.10(g). The WQDA requires Ecology to use credible data in a UAA because it is a determination of whether a surface water of the state is supporting its designated use or other classification.

- **Water Quality Assessment Updates**

The WQDA requires Ecology to use credible data to determine whether any water of the state is to be placed on or removed from any section 303(d) list and whether any surface water of the state is supporting its designated use or other classification.

The federal Clean Water Act established a process to identify and clean up polluted waters. Every two years, all states are required to prepare a list of waterbodies that do not meet water quality standards. This list is called the 303(d) list because the process is described in Section 303(d) of the Clean Water Act. All waterbodies identified on the list must attain water quality standards within a reasonable period, either through a water quality improvement plan (also known as a Total Maximum Daily Load or TMDL) or other pollution control mechanisms.

To develop the list, Ecology compiles its own water quality data and invites others to submit water quality data they have collected. All data submitted need to be collected and assessed using appropriate scientific methods as described in the agency's listing policy. Once the list is put together, the public has a chance to review it and give comments. The results of the assessment are submitted to EPA as an "*integrated report*" to satisfy federal Clean Water Act requirements of sections 303(d) and 305(b). The list helps Ecology to use state resources more efficiently by focusing on waterbodies that need the most work. The list of waterbodies in the assessment reflects local government, community, and citizen recognition of water quality problems in Washington, demonstrating citizen interest and commitment to clean water.

- **Total Maximum Daily Load studies, also known as Water Quality Improvement Reports**

TMDLs identify the maximum amount of pollutant that can be released into a waterbody without impairing specified uses of the water, and allocate that amount among various sources (both point and nonpoint sources). The technical studies prepared for TMDLs provide a complete and consolidated view of the condition of the water, as well as a framework to help develop, focus, and evaluate activities to improve water quality. The interactions between the public and Ecology during the TMDL process provide a forum to discuss issues, pursue solutions, and adjust activities over time to ensure that progress is made to meet water quality standards and improve water quality.

The WQDA requires Ecology to use credible data when establishing a TMDL for any surface water of the state.

3. Coordination with Tribes

This policy supports intergovernmental cooperation between the state and the tribes in Washington State in the various water quality-based actions. The WQDA specifically allows tribes to submit data in accordance with procedures arranged with EPA. Tribes also have the option to submit data in accordance with the procedures described in this state policy.

“Ecology shall consider water quality data that has been collected by Indian tribes under a quality assurance project plan that has been approved by the United States Environmental Protection Agency (EPA) if that data meets the objectives of the plan.” [90.48.580(4) RCW]
The Quality Assurance (QA) level assigned to data submitted by Indian tribes will be determined based on the QA documentation accompanying the data and any additional documentation requested by Ecology.

4. Water Quality Standards Revisions

The water quality standards are revised based on a review of available data, information, and technical literature obtained from the public, tribes, government agencies, and other sources (such as academia or library-facilitated literature searches). Quality assurance is maintained through evaluation of study or data collection methods, investigations into the technical

literature, and cross-checking assumptions and unusual findings with the authors and other experts in the field. Revisions of the standards are based on information from studies that are generally not waterbody specific and generated by individuals and organizations outside the state of Washington. The studies are not subject to the provisions of credible data in sections five through seven.

Ecology staff examine published, peer-reviewed studies, graduate dissertations, state and federal agency studies, and other information called “*gray literature*.” While not published as text books or journal articles, gray literature often contains the most complete information on the methods used to ensure the data and conclusions are sound and represent the environmental conditions described in the research. Academic theses and dissertations have been formally defended prior to completion. Published studies also undergo some level of peer review prior to being accepted for publication, but generally lack the details on methodology found in the gray literature due to constraints on copy size.

Staff critically examine the data, study designs, and findings in an attempt to ensure the measures and results are sound and represent the environmental conditions described in the research. Where study designs or monitoring conditions are in question, any concerns will be formally noted in the review and taken into consideration before choosing to use the results in any way. Questions commonly include:

- Were samples taken at sufficient intervals and representative locations?
- Were other environmental variables at no-effects levels?
- Was there too much variability between the initial test results and the tests for corroboration?

The data and statistical findings contained in the studies are used in the analysis independent of the conclusions and recommendations of the authors. Though in general there is connection between the study recommendations and the study data, this may not be true all of the time. Study recommendations can be reflective of the author’s assumptions on policy and risk management, and may fail to acknowledge weak statistical correlations. Where there are questions about a study or data, an attempt will be made to get answers from the original author.

The information is categorized and summarized to create a weight-of-evidence-style analysis (e.g., field studies, laboratory studies, fluctuating exposure, constant exposure, cellular effects, behavioral effects, long-term effects, physiological effects, short-term effects, lethality, sublethal). Where defensible, data may be translated to a standard format to enable the findings of different studies to be compared against each other (e.g., studies that use average concentrations versus studies that use minimum daily concentrations). In some cases the raw data can be used to make these translations directly and in others it is necessary to create a translation equation (e.g., a daily maximum temperature is on average equivalent to a 7-day average daily maximum temperature that is 1.5°C cooler). Where data are of similar quality, Ecology will consider combining the results from multiple studies to increase confidence and reduce the influence of unusual and possibly outlier studies.

Recommendations are developed to ensure that criteria have duration of exposure components (e.g., daily maximums, weekly averages, seasonal averages) supported by the data and technical literature.

As part of the standards development process and as an aid in public review, Ecology provides formal written documentation of the information used to develop a revised water quality standard. Credible studies and data may be submitted by interested parties and incorporated in a revision of the analysis.

5. Components of an Approvable Quality Assurance (QA) Project Plan

All data used in water quality assessment updates and TMDLs are required to meet specific quality assurance requirements. Sampling and analysis must be conducted under a documented QA Project Plan or other plan that Ecology determines to be equivalent.

Guidance for preparing a QA Project Plan is available from several publications.

Ecology

- *Guidelines for Preparing Quality Assurance Plans for Environmental Studies (2004)*. Publication No. 04-03-040.
www.ecy.wa.gov/biblio/0403030.html.
- *Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards (2003)*. Publication No. 03-09-043.
www.ecy.wa.gov/programs/tcp/smu/sediment.html.
- QA Project Plan Template – A draft document has been prepared for use by Ecology grantees and others needing simplified guidelines.

Department of Natural Resources (DNR)

- TFW-AM9-99-005, DNR publication 107.

EPA

- *Requirements for Quality Assurance Project Plans*
www.epa.gov/quality/qs-docs/r5-final.pdf.
- *EPA Guidance for Quality Assurance Project Plans* www.epa.gov/quality/qs-docs/g5-final.pdf.
- *The Volunteer Monitor's Guide to Quality Assurance Project Plans*, EPA 841-B-96-003.
www.epa.gov/OWOW/monitoring/volunteer/qappcovr.htm.

For purposes of identification of impaired and unimpaired waters or development of TMDLs, any entity submitting monitoring data to Ecology must provide Ecology with documentation that the data collection planning, implementation, and assessment was consistent with the concurrent version of *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*. Documentation should address each of the 14 elements described in the guidelines or provide an explanation for omitted elements. Other pertinent factors that enhance data quality should also be addressed in the project plan document.

Ecology (EAP, WQP, TCP) may accept a QA Project Plan containing less than the required elements if Ecology determines that the reasons stated for omitting an element are valid and that its omission will not impact the quality of the results based upon the type of pollutants to be monitored, the type of surface water, and the purpose of the monitoring.

Ecology may consider that the following data are also credible and relevant to an impaired water identification or TMDL decision, if the sample analysis was performed by a laboratory meeting the criteria of Section 6 or according to applicable field procedures.

- The data were collected before August 31, 1993 with sufficient QA documentation commensurate with commonly accepted practices at the time.
- The data were collected before September 30, 2002 according to a QA Project Plan approvable according to the guidelines existing at the time.
- The data were collected as part of an ongoing monitoring effort by a governmental agency and the data collection yielded results of comparable quality to data collected according to this policy.
- The water quality data were or are collected under the terms of an NPDES permit, permit application, or a compliance order issued by Ecology or EPA, a consent decree signed by Ecology or EPA, or a sampling program approved by Ecology or EPA under MTCA or CERCLA, and the data collection yielded results of comparable quality to data collected according to this policy.
- Data may be excluded from data sets or be assigned a level of credibility different from associated data as determined by Ecology in accordance with the WQDA.

6. Monitoring Procedures

The monitoring entity providing water quality data for water quality assessment updates and TMDLs must collect, preserve, and analyze data using methods of sample collection, preservation, and analysis as prescribed in procedures, where available, published by Ecology, EPA, USGS, APHA, USACOE, ASTM, or in the Code of Federal Regulations. New and revised methods will be added as deemed appropriate according to the exemption policy under accreditation. Accreditation for the new methods will be acquired by the supporting laboratory as soon as practical thereafter.

The monitoring entity must ensure that chemical, microbiological, physical, radiological, and toxicological samples (excluding data generated by field methods) are analyzed in a laboratory accredited by Ecology or obtain a waiver to this requirement in accordance with Ecology Executive Policy 1-22. Use of laboratories not accredited by Ecology must be approved prior to initiating monitoring by seeking and obtaining a waiver to the Executive Policy 1-22 requirement. Laboratories must use approved methods when required by federal programs or Ecology. A list of laboratories and the methods for which they are accredited can be found at www.ecy.wa.gov/programs/eap/labs/labs_main.html. Policy 1-22 does not apply to data obtained in the field or to benthic analyses.

7. Minimum Documentation for Data Submission and Recordkeeping

Documentation must be provided with all water quality data submitted for consideration in water quality assessment updates and TMDLs indicating that the objectives of the QA Project Plan or equivalent quality assurance procedures were met. Documentation must also be provided that indicates whether the data are suitable for water quality-based actions. Data suitable for use in water quality-based actions must include an adequate number of measurements in the total data set for a waterbody. The assessment of the data must consider whether the data, in total, fairly characterize the quality of the waterbody at that location at time of sampling. The QA Project Plan must address the adequacy of the number of samples and explain procedures to assure that the sample set yields data that are representative of the waterbody.

Data collectors submitting information to Ecology for an impaired water identification or TMDL decision must document the planning, implementation, and assessment strategies used to collect the information. The document, or QA Project Plan, is expected to clearly state the original intended use of the information gathered (e.g. chemical/physical data for TMDL analyses) and any limitations on use of the data (e.g. these measurements only represent storm-event conditions). Data sets must be complete, that is, not censored to include only part of the data results from the project.

Data and information submitted by a third party that were initially collected by other entities must document that the required quality assurance objectives were met. If this documentation of data verification and data usability/validation is not provided, the data will not be used in the characterization of the waterbody.

The data submitter should provide Ecology with the following information accompanying data submission.

- A. An electronic copy of the QA Project Plan (or the equivalent document), revisions to a previously submitted QA Project Plan, and any other information necessary for Ecology to evaluate the data according to the guidance for exceptions
- B. The applicable dates of the QA Project Plan, including any revisions.
- C. Written assurance that the methods and procedures specified in the QA Project Plan were followed.
- D. The name of the laboratory(s) used for sample analyses and its Laboratory ID number, along with a report of results and a data verification report provided by the laboratory. Field data must be accompanied by a data verification report which includes the name of the organization that performed the measurements.
- E. Any field notes, laboratory comments, or laboratory notations concerning a deviation from standard procedures, quality control, or quality assurance that affects data reliability, data interpretation, or data validity.
- F. The quality assurance/quality control documentation, including the analytical methods used by the laboratory, method number, detection limits, quantitation or minimum levels, if available, and the types of quality control samples and standards necessary to properly interpret the data, if different from those specified in the QA Project Plan.

- G. The QA/QC documentation requirement includes a summary of data assessment documentation including report(s) of data verification, data validation if available, and assessment of data for usability in meeting the objectives expressed in the QAPP.
- H. Field instruments, such as multi-parameter devices (Hydrolabs™), must be operated and calibrated according to the manufacturer's recommendations or other acceptable demonstrated method. Calibration information and any other appropriate documentation of accuracy must be submitted if requested by Ecology.
- I. The following information must be retained for at least five years (ten years for records associated with data from grant and loan projects) and provided to Ecology if requested:
 - i. Other information, such as complete field notes, photographs, weather, or other information related to flow, field conditions, or documented sources of pollutants in the watershed for interpreting or validating data.
 - ii. All records associated with the generation and interpretation of sample results including documentation related to adherence to the QA Project Plan, or coordinate with Ecology to ensure that adequate records are maintained.

This documentation requirement does not apply to data previously submitted during 303(d) water quality assessment cycles before 2006.

8. Data Audit

Contingent on available resources, Ecology may take one or more of the following actions to determine whether data collected by internal or external parties meet the requirements of this policy:

- Review of quality documentation submitted for completeness (presence/absence checklist)
- Review of QA Project Plans and monitoring reports for adequacy of quality assurance evaluation
- Detailed audit of quality assurance documentation provided by data submitters
- Independent validation of submitted data for quality/credibility

9. Statistical and Modeling Methods for Total Maximum Daily Load Studies

As required by Ecology policy, a QA Project Plan is written prior to collecting data for Total Maximum Daily Load (TMDL) studies. Lombard and Kirchner (2004) identified 14 required elements for Ecology QA Project Plans, including the following that are relevant to this section:

- Project Description (including Study Goals and Objectives)
- Sampling Process Design (Experimental Design)
- Quality Objectives
- Quality Control
- Data Quality Assessment

The QA Project Plan will include a description of the data Ecology will collect through field monitoring, expected needs for water quality data from external sources, and a summary of how that data will be used in the TMDL analysis, including any anticipated modeling analysis. The methods for determining credibility of external data will be explained in the plan. The QA Project Plan will include criteria for selection of a framework for modeling and for assessment of the quality of modeling results.

The final TMDL report will include a summary of how information was analyzed for determining allocations, including the use of a model, if applicable. If a model was used, the report will include a description of how the model framework was selected and applied to the TMDL study, including the calibration process. An assessment of the credibility of ancillary data from other sources that were used in modeling will be documented in the final report.

The draft TMDL report will be sent to interested and affected parties for their review and comment; all comments received by Ecology will be considered. The TMDL report will also be peer reviewed according to Ecology's TMDL peer review policy. The final Water Quality Improvement Report will undergo public review prior to being submitted to EPA for approval.

The Ecology webpage *Models-for-TMDLs* (www.ecy.wa.gov/programs/eap/models/index.html) contains descriptions of models and tools supported by Ecology for TMDL development. It also includes links to other models and resources used by Ecology.

10. Appropriate Knowledge, Training, and Experience for Collection of Credible Data

Ecology may inquire on the qualifications of individuals responsible for the collection and submittal of data in accordance with this policy and to assign the appropriate level of quality assurance to project data entered into the Ecology database.

Data collectors are those individuals with oversight responsibilities for the planning, implementation, and assessment strategies used to collect information.

Data collectors should have knowledge and practical experience commensurate with the nature of the information collection activity. Data collectors are responsible for ensuring that field, laboratory, quality assurance, and other project personnel are supervised or properly trained in the use of equipment and procedures required to implement and assess the elements defined in the QA Project Plan.

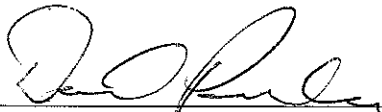
- The recommended qualifications for individuals submitting chemical/physical water quality data (data collectors) include the following:
 - Practical experience or successful completion of college-level training in limnology, aquatic biology, chemistry, environmental sciences, or a related discipline.
 - Knowledge of water quality sampling techniques and practical experience in using water quality sampling equipment.
 - Knowledge of general stream or marine hydrology, morphology, and fluvial processes.

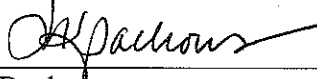
- Knowledge and sufficient practical experience with systematic planning and development of sampling and analysis plans and/or QA Project Plans.
- The recommended qualifications for individuals submitting macroinvertebrate data include the following:
 - Practical experience or successful completion of training involving limnology, aquatic biology, environmental sciences, or a related discipline.
 - College-level course credit in aquatic invertebrate zoology or equivalent practical experience in the identification of aquatic macroinvertebrates.
 - Familiarity with commonly used macroinvertebrate taxonomic references and dichotomous keys based on at least family level taxonomy.
 - Knowledge of general stream or marine hydrology, geomorphology, and fluvial processes.
 - Knowledge of local aquatic macroinvertebrates at the family level.
- The recommended qualifications for individuals submitting physical habitat data include the following:
 - Knowledge of the general principles of stream hydrology, geomorphology, and fluvial process.
 - Successful completion of the DNR habitat evaluation certification.
 - Successful completion of training in assessing Proper Functioning Condition.

11. Abbreviations and Acronyms

CFR –	Code of Federal Regulations
DNR –	Washington State Department of Natural Resources
EAP –	Environmental Assessment Program (of the Department of Ecology)
Ecology –	Washington State Department of Ecology
EPA –	U.S. Environmental Protection Agency
QA/QC –	Quality Assurance/Quality Control
RCW –	Revised Code of Washington
TCP –	Toxics Cleanup Program (of the Department of Ecology)
TMDL –	Total Maximum Daily Load
WAC –	Washington Administrative Code
WQDA –	Water Quality Data Act
WQP –	Water Quality Program (of the Department of Ecology)

12. Approvals

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