

Water Hub QA/QC and Grade Procedures

All data which is uploaded or linked to the Water Hub will undergo some form of QA/QC protocol, but the process will differ depending on the type of data. Five QA/QC Procedures have been developed which are detailed below:

[1. Procedure for numerical data, hosted and uploaded by the Water Hub](#)

[2. Procedure for numerical data collected using an existing protocol, hosted and uploaded by the Water Hub](#)

[3. Procedure for reports and other non-numerical forms of information](#)

[4. Procedure for data uploaded by users, QA/QC'd by the Water Hub](#)

[5. Procedure for data linked to other databases](#)

The [Water Hub Data Grades](#) are also detailed in this document.

1. Procedure for Numerical Data Hosted and Uploaded by the Water Hub that was not collected using an existing standard or protocol

Table 1. Procedure for Water Hub staff to complete for Numerical Data Hosted and Uploaded by the Water Hub (including Spatial files containing Numerical data)

Steps	Notes
Contributor submits data	
Backup original file	Contributors may opt out of this provided they have demonstrated their own backup procedures.
Complete metadata schema in template	Contact contributor to try to complete any missing information.
Verify map coordinates are correct for location	
Transfer data into template	
Generate a basic line chart for all parameters	Check whether there are any data anomalies or outliers, see if these can be explained or contact the contributor
For Water Quality, check for values outside of permissible range, flag these values where appropriate	The permissible ranges for field water quality parameters are based on Table E-2 of the Continuous Water-Quality Sampling Programs: Operating Procedures and reflect typical sensor ranges, not expected values for waterbodies.
Use Criteria to Distinguish Between Technical and Community Research Grade to determine the appropriate grade for the data.	

Assign a Grade of Community or Technical Research Grade to the data	Where grade is Community Research Grade, contact contributor to request any additional information which could allow the data to meet Technical Research Grade criteria.
Conduct five random spot checks	Compare values from the upload file and the raw data to ensure that rows and columns are properly aligned and that dates are entered properly.
Back up the file	
Upload the file (includes completing metadata schema in CKAN)	

1b. Criteria to Distinguish Between Technical and Community Research Grade

Table 2: Criteria to determine whether Numerical Data is Technical Research Grade. This table is from the [Water Hub Grade Criteria and QA/QC Reference Values](#) spreadsheet which contains the ranges of acceptable values and other parameters. Only Numerical data resources (which could include Spatial files containing Numerical data) which are not linked to an external database or collected in adherence with an existing standard will be assessed using this criteria. Such resources which do not meet these criteria will be assigned a grade of Community Research Grade.

Criteria	Rationale	Method/Notes
Site location is known, and coordinates are provided.	Site could be visited again for future monitoring - ensures comparable data.	If coordinates are provided, check that these coordinates represent an appropriate location. If only a site description is provided, estimate the coordinates and confirm with the monitoring group that the estimated coordinates represent the location.
Organization has completed both sections of a Data Management Plan, responses meet reasonable expectations.	This document provides insight about the group's data collection and management practices and allows Water Hub team to identify any opportunities for improvement	Verify that both sections of the data management plan are complete.
All fields in Dataset and Resource Metadata schema are complete. Measurement/observation specific metadata (instruments, accuracy, range) is available/included in upload file or in an appended file.	These fields contain information that is critical to understanding the methods and context of the data. The metadata is also used by CKAN to display the data on the site, and by DataCite to mint a DOI for the resource.	Verify that all fields in the Dataset and Resource Metadata schema are complete.
Site photos are included in the dataset.	Photos can provide context for a numerical resource, show changes over time or help to identify a monitoring site.	Refer to the Observations Metadata sheet of the upload template to see if photos will be included, or the organization's data management plan. Exceptions will be made where there are privacy or security concerns, for example if data is being collected on

		private land.
Instruments and methods being used are appropriate for the measurements taken. If unconventional methods or instruments are used, this is justified and explained within the metadata.	Using conventional, standard methods to collect data allows the data to be compared with other data collected in other locations or by different groups.	Using information provided by monitoring group, verify that instruments and methods being used are appropriate for measurements taken.
Where applicable, organization affirms that instruments are being calibrated according to manufacturer recommendations	Calibration ensures that instruments are performing and reading accurately, or can help to quantify inaccuracies.	Verify this using the organization's DMP or by contacting them directly if unsure.
Instrument accuracy is within the acceptable ranges for at least 95% of measurements (where applicable)	These accuracy ranges have been developed using RISC standards. This requirement was added in response to survey feedback.	Calculate the required accuracy for each measurement, using the values from the appropriate sheet in this workbook. Determine the number of measurements which are outside of this range and compare this to the total number of measurements.
For field water quality data , values are within the permissible ranges for water quality measurements for at least 95% of measurements.	Ensures that values are realistic for the parameter. The permissible ranges for field water quality parameters are based on Table E-2 of the Continuous Water-Quality Sampling Programs: Operating Procedures and reflect typical sensor ranges, not expected values for waterbodies.	Determine the number of measurements which fall outside of the permissible range and compare this to the total number of measurements.
For lab analysis , lab has the relevant accreditation to perform the analysis. For chemical analysis of water this is through CALA.	Ensures that the lab is qualified to perform the analysis.	Refer to the Provincial Directory of Qualified Laboratories or laboratory website.

2. Procedure for Numerical Data Hosted and Uploaded by the Water Hub that was collected using an existing standard or protocol

Table 3. Procedure for Water Hub staff to complete for Numerical Data Hosted and Uploaded by the Water Hub which was collected using an existing standard or protocol (including Spatial files containing Numerical data)

Steps	Notes
Contributor submits data	
Backup original file	Submitting organizations may opt out of this provided they have demonstrated their own backup procedures.
Complete metadata schema in template	

Verify map coordinates are correct for location	
Transfer data into template if applicable	Some methods may have their own required formats, discuss how best to display the data with data contributor
Generate a basic line chart for all parameters	Check whether there are any data anomalies or outliers, see if these can be explained or contact the contributor
For Water Quality, check for values outside of permissible range, flag these values where appropriate	The permissible ranges for field water quality parameters are based on Table E-2 of the Continuous Water-Quality Sampling Programs: Operating Procedures and reflect typical sensor ranges, not expected values for waterbodies.
Verify that the protocol is being followed	For RISC, data must be graded by a professional hydrologist For CABIN, request certificate
Assign a Grade of CABIN, ISO, RISC or WSC to the resource	
Conduct five random spot checks	Compare values from the upload file and the raw data to ensure that rows and columns are properly aligned and that dates are entered properly.

3. Procedure for Reports and Other Forms of Information Hosted and Uploaded by the Water Hub

Table 4: QA/QC Procedures for reports and other non-numerical forms of information (including Spatial files that do not contain numerical data).

Steps	Notes
Confirm that person/organization submitting the resource is authorized to share it	
Confirm that the resource is relevant to water stewardship in the Basin	
Backup original file	Submitting organizations may opt out of this provided they have demonstrated their own backup procedures.
Complete metadata schema in CKAN	Some fields may not be applicable for this type of resource, but all relevant fields should be completed.
Assign a Grade of People and Perspectives	
Mint a DOI	



4. Procedure for data uploaded by users, QA/QC'd by the Water Hub

Table 5: QA/QC Procedures for data that was uploaded to the database by a user, and is subsequently QA/QC'd and graded by the Water Hub team

Steps	Notes
Organization uploads data, selecting Not Reviewed as a grade	
Water Hub team (or someone certified to conduct the QA/QC process) downloads resource and assesses using Criteria to Distinguish Between Technical and Community Research Grade for numerical data, or criteria for other types of data.	Only complete the QA/QC steps that are applicable for data that has already been uploaded
Contact the contributor if there are any issues or opportunities to improve the data	
Assign the appropriate grade	

5. Procedure for data linked to other databases

Table 6: QA/QC Procedure for data linked to other databases or websites.

Process	Notes
Confirm that resource is relevant to water stewardship in the Basin	
Complete Metadata schema in CKAN with as much detail as is available.	Disclaimer reminds user to check any disclaimers or metadata available on the third-party site
Assign a grade of Links	
Link is checked annually	This process may be automated, in which case it could be conducted more frequently

Water Hub Data Grades

All resources shared on the Water Hub will be assigned a grade according to the Water Hub Data Grading System. Figure 1 is a flowchart illustrating the decision making process used to assign a grade to a resource. Table 1 contains the criteria required for resources to achieve a grade of Technical Research Grade. Definitions of the grades and the type of data that they may be applied to are as follows:

Grade	Data Type
<p>CABIN/ISO/RISC/WSC: Data which has been collected and processed according to an existing standard method will simply display the applicable standard.</p>	<p>For numerical resources, and spatial resources (geodatabases, shapefiles, etc) which contain numerical data (points, lines, polygons with accompanying water data)</p>
<p>Technical Research Grade: These resources may be generated from data collected by regional or municipal governments, First Nations, community-based monitoring groups or other sources. Resources which receive this classification meet the standards for Technical Research Grade that have been developed by the Water Hub using community survey feedback, RISC guidelines and expert input. Although these resources have been determined to meet a certain standard of quality, they will still include a disclaimer as the Water Hub cannot guarantee the quality of any resource.</p>	
<p>Community Research Grade: These resources are generated from data collected by Citizen Science groups and community-based monitoring groups which may rely on volunteers and the public to provide the measurements collected in the dataset, and do not meet the criteria for Technical Research Grade. These datasets are still valuable, and may be very appropriate for use in some situations. An example of this data grade may include datasets collected by Selkirk College and College of the Rockies environmental programs, as well as other citizen science based projects such as Water Rangers. These resources will still undergo the QA/QC protocol for spatial and tabular, numerical data. These resources will include a disclaimer ensuring that any issues with the dataset are highlighted for the user.</p>	
<p>People and Perspectives: This could include written reports, images, descriptions of cultural values or other formats. Non-numerical resources will not be graded using the same standards as the spatial and numerical data discussed above, as they are assessed in a more qualitative manner. The intent is not to devalue or dismiss these resources, but to recognize that they cannot be consistently or fairly assessed using the same standards as numerical data. The following flowchart depicts the process used to determine the grade of a resource.</p>	<p>For non-numerical resources, including spatial resources which do not contain numerical data</p>
<p>Links: Data obtained through links to external databases or sources</p>	<p>Any type of data which is provided in the form of a link</p>

Water Hub Data Grading Flow

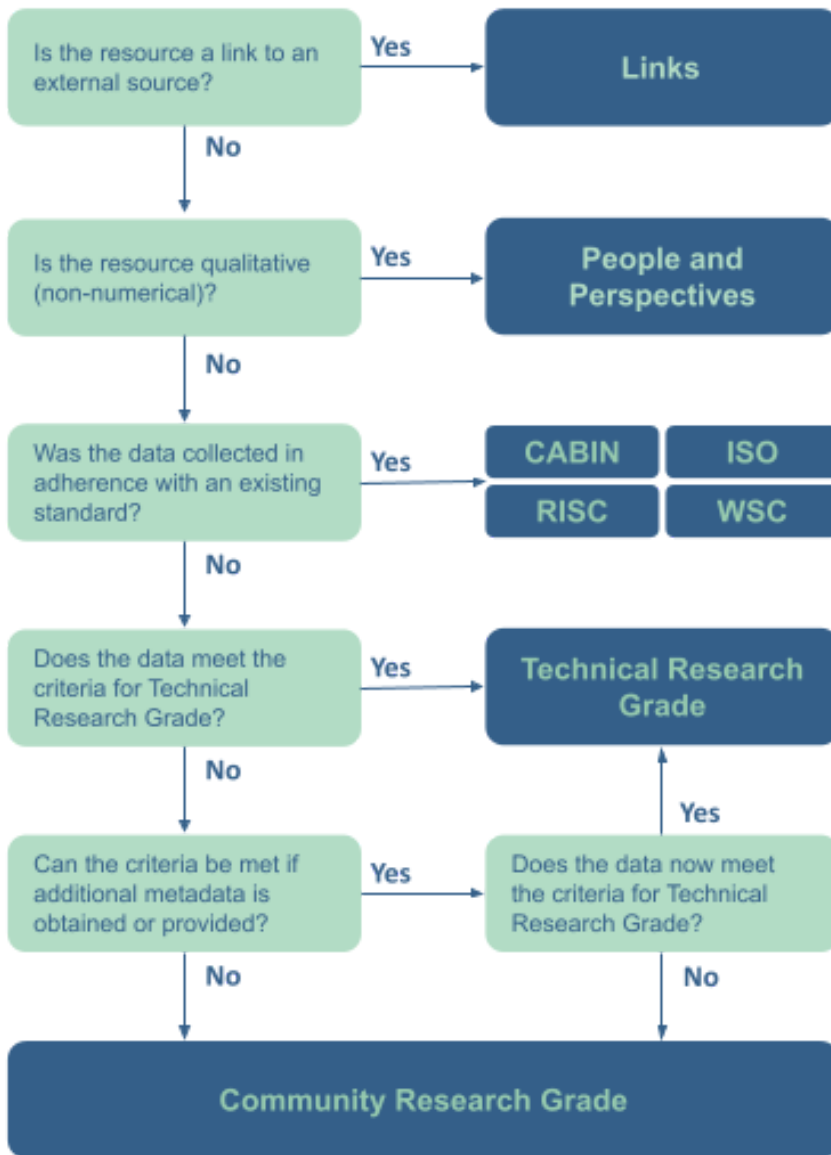


Figure 1: Flowchart illustrating the decision making process used to assign a Water Hub Data Grade to a resource.