

Groundwater-level records.

Process of Analyzing, Approving and Auditing of Groundwater-Level Records

Analyzing and Approving Discrete Quality-Control Groundwater-Level Records

The discrete quality-control (QC) measurement collected during the site visit at a continuous-record site must be analyzed and approved following established guidelines before it is used in the analysis of continuous records. This measurement determines if a correction should be applied to the time series and the amount of the correction; therefore, the hydrographer should be confident in the quality of the discrete measurement record.

Analyzing Continuous Groundwater-Level Records – After each field trip

This data processing stage is the responsibility of the person most familiar with the field visit and factors that may affect the data. This data processing stage should begin as soon as practical after the field visit, ideally within one week of returning to the office. The discrete QC water-level measurement collected during the site visit should be analyzed and approved following established guidelines before it is used to correct continuous-record data. A station analysis must be written for the period of analysis using the established [Station Analysis Template](#) and stored in the Record Management System (RMS).

- Document instrument replacement or installation during the site visit in the **Instrumentation** section of the Station Analysis.
- Decode and upload Electronic Data Logger (EDL) data for continuous-record sites or to fill in periods of missing Data Communication Platform (DCP) data. For real-time continuous sites that have a Fill-Data Gaps processor set up in AQUARIUS, the EDL data will automatically fill in DCP missing data. Describe the backup data quality in the **Backup Data** section of the Station Analysis. Describe periods of missing data in the **Missing Data** section of the Station Analysis. Archive the EDL data in the Center electronic archive.
- Describe the equation and rating number of the conversion of input used for the period in the **Rating/Conversion of Input** section of the Station Analysis, if used.
- Examine the instantaneous values record and edit, as needed. The initial instantaneous values cleanup should include checking thresholds set in the database and removing poor values (spikes, for example) that were not automatically removed by thresholds. Note: Do not estimate missing instantaneous or daily values.
- Describe discrete water-level measurements made during the period in the **Measurements** section of the Station Analysis.
- Verify instantaneous value data against discrete measured values.
- Apply data corrections to the dataset and describe in the **Water-Level Corrections** section

of the Station Analysis. Do not over-correct the data; there should be a threshold established by each Water Science Center (WSC) for applying corrections that takes into account the QC measurement accuracy, equipment limitations, and site conditions (i.e. shallow vs deep water depths).

- Review daily value statistics according to guidelines ([Partial Day Computations for Groundwater](#))
- Use [NWIS Data Portal and Reports](#) as needed for analysis
 - o Corrections At a Glance
 - o 5-Year Daily Value Hydrograph
 - o Daily-Value and Unit Value Hydrograph for analysis period
 - o Extremes Report
 - o Sensor Reading Summary
- Document hydrographic comparison of nearby or similar sites, if applicable, in the **Hydrographic Comparison** section of the Station Analysis. Discuss how the comparison was done and where the sites compared favorably/poorly.
- Add any pertinent remarks or comments for the period of analysis that are not contained in other sections in the **Comments** section of the Station Analysis.
- Update Manuscript and Station Description in SIMS, if needed.

After completing the above described tasks for continuous records, the analyst should set the analysis period to the analyzed state in AQUARIUS and in the records tracking system.

Approving Continuous Groundwater-Level Records

This data processing stage must be done by someone other than the data collector/analyst. The record approver performs a quality-control check of the methods and procedures used to collect and process the record and verifies the accuracy and interpretations of the analyzed period. The record approver documents this examination in RMS using the established [Approval Guidelines](#). Analysis periods that are determined to have errors are documented and returned to the record analyst for corrections.

- Verify that discrete QC data are approved for the period of analysis.
- Review field visit notes and station analysis from the analyst. Notes from the site inspection should substantiate the record relative to site status, site conditions, and the site history.
- Verify that all ratings/conversion of inputs active during the analysis period were documented and approved in accordance with WSC procedures.
- Check instantaneous values and examine missing periods of record.
- Evaluate [NWIS Data Portal and Reports](#)
 - o Corrections At a Glance
 - o 5-Year Daily Value Hydrograph
 - o Daily-Value and Unit Value Hydrograph for analysis period
 - o Extremes Report
 - o Sensor Reading Summary
- Evaluate corrections applied to the discrete QC measurement as well as the continuous record. Document if the corrections appear to be reasonable considering site conditions and measurement method limitations. Ensure that corrections are not over-applied (less than twice the accuracy of the method) and are fully explained.
- Evaluate hydrologic trend by comparing data to a reference site, if applicable, and reviewing **Hydrographic Comparison** notes in the Station Analysis.
- Verify Station Analysis has been properly completed. Provide a brief written final assessment of the period of analysis; this may include answers to questions or explanations contained in the [Approval Guidelines](#).

- Ensure the Station Description is current and relevant and has been properly updated to reflect any changes made or observed during the analysis period.
- If analysis period closes out a water year, review and approve Manuscript for the Water Year Summary publication.

After completing the above described tasks for continuous records and all issues are resolved, the approver should set the analysis period to the approved state in AQUARIUS and in the records management system.

Auditing Groundwater-Level Records

Routine Auditing of Groundwater-Level Records

Routine audits are not required for groundwater-level records, but WSCs may elect to perform audits at regular intervals to verify the effectiveness of the approval process.

Non-routine Auditing of Groundwater-Level Records

Non-routine audits occur anytime an aspect of an approved record is re-examined. For example, an end user may question a published period of unusually low water levels or a series of spikes in the historic water-level record. Errors found during non-routine audits are subject to defined error threshold criteria for revisions. Non-routine audits do not have any required tasks aside from documentation of the audit to include; the date of the audit, the auditor, what was examined, why it was examined, and the outcome of the audit to include a discussion of potential revisions, if any. Another example of a non-routine audit would be a record that is examined during a triennial discipline review. In this case, most aspects of a designated analysis period are examined (superficially or in detail) and the documentation should include the notes or forms that were filled out by the reviewer. Non-routine audits are to be documented by filling out the Audit Template in RMS.