



Australian Government
Bureau of Meteorology

WATER MONITORING
STANDARDISATION
TECHNICAL COMMITTEE

National Industry Guidelines for hydrometric monitoring

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PART 1: PRIMARY MEASURED DATA

NI GL 100.01–2019

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In 2017 and 2018 the Water Monitoring Standardisation Technical Committee (WaMSTeC) led a periodic review of the National Industry Guidelines for hydrometric monitoring. WaMSTeC subcommittees conducted the review process and coordinated extensive industry consultation.

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Foreword

This guideline is part of a series of ten National Industry Guidelines for hydrometric monitoring. It has been developed in the context of the Bureau of Meteorology's role under the *Water Act 2007* (Cwlth) to enhance understanding of Australia's water resources.

The Bureau of Meteorology first published these guidelines in 2013 as part of a collaborative effort amongst hydrometric monitoring practitioners to establish standardised practice. They cover activities relating to surface water level, discharge and water quality monitoring, groundwater level and water quality monitoring and rainfall monitoring. They contain high level guidance and targets and present non-mandatory Australian industry recommended practice.

The initial versions of these guidelines were endorsed by the Water Information Standards Business Forum (the Forum), a nationally representative committee coordinating and fostering water information standardisation. In 2014, the functions and activities of the Forum transitioned to the Water Monitoring Standardisation Technical Committee (WaMSTeC).

In 2017, as part of the ongoing governance of the guidelines, WaMSTeC initiated a 5-yearly review process to ensure the guidelines remain fit-for-purpose.

These revised guidelines are the result of that review. They now include additional guidance for groundwater monitoring, and other updates which improve the guidelines' currency and relevance. WaMSTeC endorsed these revised guidelines in December 2018.

Industry consultation has been a strong theme throughout development and review of the ten guidelines. The process has been sponsored by industry leaders and has featured active involvement and support from the Australian Hydrographers Association, which is considered the peak industry representative body in hydrometric monitoring.

These guidelines should be used by all organisations involved in the collection, analysis and reporting of hydrometric information. The application of these guidelines to the development and maintenance of hydrometric programs should help organisations mitigate program under-performance and reduce their exposure to risk.

Organisations that implement these guidelines will need to maintain work practices and procedures that align with guideline requirements. Within the guidelines, the term “shall” indicates a requirement that must be met, and the term “should” indicates a recommendation.

The National Industry Guidelines can be considered living documents. They will continue to be subject to periodic WaMSTeC review at intervals of no greater than five years. In the review phase, WaMSTeC will consider any issues or requests for changes raised by the industry. Ongoing reviews will ensure the guidelines remain technically sound and up to date with technological advancements.

National Industry Guidelines for hydrometric monitoring

This document is one part of the National Industry Guidelines for hydrometric monitoring series, which can be found at

<http://www.bom.gov.au/water/standards/niGuidelinesHyd.shtml>.

The series contains the following parts:

Part 0: Glossary

Part 1: Primary Measured Data (*this guideline*)

Part 2: Site Establishment and Operations

Part 3: Instrument and Measurement Systems Management

Part 4: Gauging (stationary velocity-area method)

Part 5: Data Editing, Estimation and Management

Part 6: Stream Discharge Relationship Development and Maintenance

Part 7: Training

Part 8: Application of Acoustic Doppler Current Profilers to Measure Discharge in Open Channels

Part 9: Application of in-situ Point Acoustic Doppler Velocity Meters for Determining Velocity in Open Channels

Part 10: Application of Point Acoustic Doppler Velocity Meters for Determining Discharge in Open Channels

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National Industry Guidelines for hydrometric monitoring

Part 1: Primary Measured Data

1 Scope and general

1.1 Purpose

The purpose of this document is to provide guidelines for recommended practice for the collection of primary measured data. Compliance with this guideline is part of the basis of assigning Water Data Transfer Format (WDTF) quality codes.

1.2 Scope

This document provides guidelines for primary measured data and defines minimum metadata and quality coding requirements for all compliant hydrometric data collection and management.

1.3 Application

This guideline applies to primary measured data for the following hydrometric monitoring site categories:

1. surface water level, discharge, water quality
2. groundwater level, water quality
3. precipitation.

This guideline does not apply to discrete water quality sampling.

1.4 Bibliography

Cognisance of the following was taken in the preparation of this guideline:

- Bureau of Meteorology 2012, Water Data Transfer Format, version 1.0.2, viewed 2 October 2018, <<http://www.bom.gov.au/water/standards/wdtf>>.
- Bureau of Meteorology 2016, National Industry Guideline for water quality metadata, NI GL 101.00–2016.
- Standards Australia/Standards New Zealand, *Geographic Information – Metadata Fundamentals*, AS/NZS ISO 19115.1:2015.
- World Meteorological Organization 2017, WMO-No. 1192 WIGOS Metadata Standard, viewed 2 October 2018, <https://library.wmo.int/opac/doc_num.php?explnum_id=3653>.

1.5 Definitions

For the purpose of this guideline, the definitions given in National Industry Guidelines for hydrometric monitoring, Part 0: *Glossary*, NI GL 100.00–2019 apply.

2 Metadata

Metadata is fundamental to compliance with this guideline.

The accuracy and recovery rate of all primary measured data shall be defined in the metadata that shall include as a minimum:

1. Description and units of all parameters measured including length of record and time series information (e.g. water level in metres at 15-minute intervals since 10:00 hrs 01/06/1981).
2. Purpose for which the data are being collected (this will underpin many other data attributes such as the accuracy and data recovery required to achieve the intended purpose).
3. Location and elevation of the site and/or the immediate area (if required) from which the data are collected, to a defined geo-code (e.g. Latitude, Longitude, MGA) and datum (e.g. AHD) of a stated accuracy (e.g. ± 5 metres horizontal) or defined method of determination of location (e.g. aerial photo or GPS).
4. Site identification and traceability (refer to NI GL 100.02–2019 sections 4.1.1 and 4.3.1.2).
5. Description of geographical environment or the immediate area within which the measurement is made. This includes metadata to interpret the measurement (e.g. watercourse name, contributing catchment area, topography or bathymetry, surface cover, bore construction details).
6. Description and history of:
 - i. methods of measurement;
 - ii. characteristics of the instruments associated with each parameter measured (e.g. water level from a pressure transducer model XX, range YY); and
 - iii. instrument calibration.
7. The applicable time zone (e.g. AEST for eastern Australian states).
8. Necessary reference data to be able to convert level data to a standard datum.
9. Specifications of who is responsible for, and who owns the data. Specifications of where additional information about the data can be obtained.

In addition to the above mandatory metadata requirements, the tolerance achieved for each parameter measured should be stated (e.g. water level to ± 0.01 metre or 1% of measurement range).

The National Industry Guideline for water quality metadata (NI GL 101.00–2016) identifies key operational, procedural and organisational metadata for water quality measurements.

For guidance on further metadata requirements associated with specific parameters, refer to AS/NZS ISO 19115.1:2015, *Geographic information – Metadata Fundamentals*.

3 Quality coding

Data quality codes are used to provide a high-level indication of the usefulness of a dataset.

They provide comparable measures between different datasets and allow benchmarking of performance.

The quality code assigned to a dataset is directly determined by the purpose for which the data were collected. That is, a dataset of a high quality code for one purpose may be considered an inferior quality for a different purpose and vice versa.

The minimum requirements specified in National Industry Guidelines for hydrometric monitoring, Part 2: *Site Establishment and Operations*, NI GL 100.02–2019, will enable all compliant data to be assigned a quality code in accordance with the Water Data Transfer Format Quality Code System.

Organisations should document the mapping of their quality classification standards to the Water Data Transfer Format quality codes (Table 1).

Table 1 – Water Data Transfer Format version 1.0.2 quality codes

Quality	Description	Description to be used by the Data Provider for transferring data to the Bureau of Meteorology	Description for Ratings
quality-A	The record set is the best available given the technologies, techniques and monitoring objectives at the time of classification.	The data provider releases the recorded measurements for use, declaring that it is the best available given the technologies, techniques and monitoring objectives at the time of classification.	The data provider releases the measurements for use, declaring that it is the best available given the technologies, techniques and monitoring objectives at the time of classification.
quality-B	The record set is compromised in its ability to truly represent the parameter.	The data provider releases the recorded measurement for use with the provision that the data is compromised in its ability to represent the monitored parameter.	The data provider releases the measurement for use with the provision that the data is compromised in its ability to represent the monitored parameter.
quality-C	The record set is an estimate.	The data provider releases the record set for use, declaring that the data is an estimate.	The data provider releases the record set for use, declaring that the data is an estimate.
(quality-D)	This code has been withdrawn.		
quality-E	The record set's ability to truly represent the monitored parameter is not known.	The data provider releases the record set declaring that the data's ability to represent the monitored parameter is not known.	The data provider releases the record set declaring that the data's ability to represent the monitored parameter is not known.
quality-F	The record set is not of release quality or contains missing data.	The data provider releases the record set declaring that the data is missing, void or known to be incorrect.	The data provider releases the record set declaring that the data is missing, void or known to be incorrect.

(Source: Bureau of Meteorology, accessed 2 October 2018, <http://www.bom.gov.au/water/wdtf/documentation/schema-control-lists/quality-code.htm>).

Appendix A Training

A.1 Training session outline

LEARNING ELEMENTS	RESOURCES	DESCRIPTION	
Identify and understand the 1.1 Purpose, 1.2 Scope and 1.3 Application of this guideline	Copies of all guideline documents. Access to all reference material.	Discussion with reference to the guideline document	Face to face delivery
2 Metadata	Copies of all guideline documents. Access to all reference material.	Address: <ul style="list-style-type: none"> • Description and units of all parameters measured • Purpose for which the data are being collected • Location and elevation to a defined geo-code • Site Identification and traceability • Description of geographic environment • Description and history of methods of measurement, characteristics of instruments associated with each parameter measured and instrument calibration • Description of the applicable time zone • Description of reference data for converting to a standard datum • Specification of who is responsible for, and who owns the data. In addition to the above mandatory metadata requirements: <ul style="list-style-type: none"> • Discuss data tolerance 	Face to face delivery
3 Quality coding	Copies of all guideline documents. Access to all reference material.	Address site documentation: <ul style="list-style-type: none"> • Discuss the purpose and intended use of data quality codes • Explain the minimum metadata requirements • Explain the (BoM) Water Data Transfer Format Quality Code System. Address needs for documenting the mapping of their quality classification standards to the Water Data Transfer Format quality codes.	Face to face delivery
References	Copies of all guideline documents. Access to all reference material.	Trainers to ensure the learner's ability to source and use reference material.	Face to face delivery

A.2 Training learning resources

A.2.1 Introduction

Welcome to the learner resource for National Industry Guidelines for hydrometric monitoring, Part 1: *Primary Measured Data*, NI GL 100.01–2019. The purpose of this resource is to develop your knowledge and skills and improve your competency in this guideline.

A.2.2 Section references

The table below shows elements of the guideline that are covered in this learner resource. This may help the learner to map their progress as they work their way through this resource.

Section	Unit element
1 Scope and General	1.1 Purpose 1.2 Scope 1.3 Application
2 Metadata	Metadata is fundamental to compliance with this standard.
3 Quality coding	Data quality codes are used to provide a high-level indication of the usefulness of a dataset.

A.2.3 Who needs this competency?

This learning material covers the skills and knowledge required for a person to use and understand National Industry Guidelines for hydrometric monitoring, Part 1: *Primary Measured Data*, NI GL 100.01–2019.

A.2.4 Learning outcomes

At the completion of this learner resource you will be competent in the following:

- use the guideline document for reference
- use the guideline in day to day operations
- access the material referenced in the guideline document
- use and understand related internal procedures and work instructions.

A.2.5 Health and safety considerations

Health and safety legislation shall always be considered when implementing National Industry Guidelines, workplace procedures and work instructions.

Employees carrying out work related to the National Industry Guidelines should be adequately trained in all relevant health and safety matters.

A.2.6 What resources will I need?

- Workplace policies and procedures
- Manufacturer manuals, requirements and specifications
- Codes of practice
- Workplace equipment, tools and instruments
- Workplace reports
- Workplace maps, plans and instructions
- Permits and access to locations and worksites

Other useful resources

- Relevant Health and Safety Act
- Safe Work Australia Model Codes of Practice
- Organisation's procedures and work instructions
- Australian Standards