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Primary drafting by original project team (2011):

Rob De Hayr, Manager, Chemistry Centre, Department of Environment and Resource Management, QLD

Gabrielle van Willigen, Natural Resource Officer, Science Coordination and Information, Department of Environment and Resource Management, QLD

Jennifer Ryan, Senior Project Officer, Chemistry Centre, Department of Environment and Resource Management, QLD

Garry Dawson, Principal Information Systems Officer, Spatial Information Group, Department of Environment and Resource Management, QLD

Katrina Rodrigues, Senior Project Officer, Spatial Information Group, Department of Environment and Resource Management, QLD

Original project steering committee (2011):

Rob De Hayr, Manager, Chemistry Centre, Department of Environment and Resource Management, QLD (Chairperson)

Ian White, Principal Policy Officer, Water Monitoring and Information, Department of Environment and Resource Management, QLD

Paul Webb, Regional Water and Wetlands Coordinator, Qld Murray-Darling Committee Inc

Grant Robinson, Information Quality Coordinator, NSW Office of Water, NSW

Brendan Moran, Manager A/g, Water Standards and Regulation, Bureau of Meteorology

Linton Johnston, Senior Hydrologist, Water Standards and Regulation, Bureau of Meteorology

Technical reference group for water quality metadata

National Industry Guideline members (October 2015):

Jacqui Bellhouse, Senior Water Resources Advisor, Water Corporation, WA

Dr Ulrike Bende-Michl, Senior Hydrologist, Water Resources Assessment, Bureau of Meteorology

Rob De Hayr (Chairperson), Science Leader, Chemistry Centre, Department of Science, Information Technology, Innovation and the Arts, QLD

John Hayes, Manager, Water Information Systems, DPI Water, NSW

Daniel Harris, Data & Procedures Officer, DPI Water, NSW

Chris Hepplewhite, Water Quality Policy Section, Australian Government Department of the Environment

Marty Jack, Data Administrator, Dept. of Primary Industries, Parks, Water and Environment, Tas

Linton Johnston, Manager, Regulations and Policy, Bureau of Meteorology

Dr Carolyn Maxwell, Senior Environmental Scientist, Hydro Tasmania, Tas

David Malone, DPI Water, NSW

Monika Muschal, Team Leader Water Quality, DPI Water, NSW and NWQMS

Dr Kemachandra Ranatunga, Senior Hydrologist, Regulations and Policy, Bureau of Meteorology

Ataur Rahman, Associate Professor, Water and Environment, UWS, Nominated from AWA

Grant Robinson, Secretary, Australian Hydrographers Association

Katrina Rodrigues, Senior Project Officer, Department of Natural Resources and Mines, Qld

Sabine Schreiber, Manager, Policy and Projects, Department of Environment, Land, Water and Planning, VIC

Shaun Thomas, Senior Scientific Officer, Environmental Protection Authority, SA

Laura Torrible, DPI Water, NSW

Damien Venema, Business Project Leader, SA Water, Australian Water Quality Centre, SA

Daniel Wagenaar, Manager, Water Monitoring Systems, Department of Land Resource Management, NT

Nicholas Car, CSIRO Land and Water Flagship, QLD.

(Note that at the time of contribution, individuals may have been employed with different organisations and some organisations were known by other names)

FOREWORD

Under the Commonwealth *Water Act 2007* the Bureau of Meteorology (the Bureau) has key functions to enhance understanding of Australia's water resources. These include responsibilities to "collect, hold, manage, interpret and disseminate Australia's water information" and to "issue National Water Information Standards". The Water Monitoring Standardisation Technical Committee (WaMSTeC, previously the Water Information Standards Business Forum) is a national representative committee that coordinates and fosters the development and endorsement of water resource monitoring guidelines and standards. In this capacity, WaMSTeC supports the Bureau to fulfil its functions as outlined in the Act.

This National Industry Guideline has been endorsed by WaMSTeC and presents non-mandatory industry recommended practice. It was developed through extensive industry consultation, and aligns with policies and procedures associated with collection and storage of water quality metadata in Australia. The content of this guideline is based on a report written in 2011 (Ryan et al, 2011) by the then Queensland Department

of Environment and Resource Management (relevant functions and personnel responsible for the report are now part of the Queensland Department of Science, Information Technology and Innovation). The initial project was funded under the Bureau-administered Modernisation and Extension of Hydrologic Monitoring Systems program to identify water quality information being captured by the various agencies, government bodies, councils and water authorities across Australia and develop a nationally standardised approach to water quality metadata.

This guideline is a living document. WaMSTeC is responsible for ongoing governance of this guideline, which will be subject to review at intervals of no more than five years. In the review phase, consideration will be given to any issues or requests for changes raised by the industry. The review process will ensure the guideline remains technically sound and up-to-date with technological advancements.

1 SCOPE AND GENERAL

1.1 PURPOSE

This document identifies the essential metadata requirements for water quality data to provide the necessary information to allow users to identify if data is fit for their purposes.

1.2 SCOPE

This National Industry Guideline applies to water quality data collected and being supplied to the Bureau of Meteorology (the Bureau) under the *Water Regulations 2008* by persons named in the regulations. It pertains solely to water quality data parameters being collected from surface water and groundwater as identified in the Water Regulations. It provides guidance about mandatory and optional metadata elements, and describes data entities (or groupings) that are meaningful and pragmatic for hydrographical, laboratory and hydrologic practitioners at a national level.

The guideline is applicable to automated continuous water quality monitoring (e.g. using in-situ sensors or probes), tests performed in the field and grab samples sent for laboratory testing.

While adherence is voluntary, implementation of the guideline will facilitate consistent collection of water quality metadata, and will improve the interoperability, quality and future usefulness of water quality data.

1.3 REFERENCES

1.3.1 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this guideline:

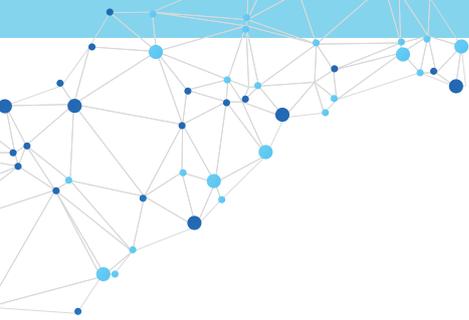
- ANZLIC the Spatial information Council 2011, *ANZLIC Metadata Profile Guidelines*, Version 1.2. ISBN: 978-0-646-46940-9, viewed 1 October 2015, <<http://www.anzlic.gov.au/resources/anzlic-metadata-profile>>
- Ministry of Health 2008, *Drinking-water Standards for New Zealand 2005 (Revised 2008)*, Wellington: Ministry of Health, <<http://www.health.govt.nz/system/files/documents/publications/drinking-water-standards-2008-jun14.pdf>>

- Open Geospatial Consortium (OGC)
 - 2010, OGC Implementation Standard – Corrigendum, 10-126r4, *OGC WaterML 2.0: Part 1 – Timeseries*, viewed 13 April 2016, <<http://www.opengis.net/doc/IS/waterml/2.0.1>>
 - 2014, OGC Best Practice Paper 14-003, 2014, *WaterMLWQ – an O&M and WaterML 2.0 profile for water quality data*, viewed 13 April 2016, <<http://docs.opengeospatial.org/bp/14-003/14-003.html>>
- Ryan, J., Rodrigues, K., De Hayr, R., 2011, *National information management protocols for water quality monitoring: Report A, Water quality metadata guidelines*, Department of Environment and Resource Management, State Government of Queensland, Brisbane, viewed 13 April 2016, <<http://www.bom.gov.au/water/standards/projects/waterqity.shtml>>
- Standards Australia/Standards New Zealand
 - *Geographic information – Metadata – Fundamentals*, AS/NZS ISO 19115.1:2015.
 - *Geographic information – Observations and measurement*, AS/NZS 19156:2012.

1.3.2 Bibliography

The following were considered in preparing this guideline:

- Australia New Zealand Land Information Council 2007a, *ANZLIC metadata profile (version 1.1): an Australian/New Zealand profile of AS/NZS ISO 19115:2005, geographic information – metadata (implemented using ISO/TS 19139:2007, geographic information – metadata – XML schema implementation)*, Commonwealth of Australia, Canberra.
- Australia New Zealand Land Information Council 2007b, *ANZLIC metadata profile guidelines (version 1.0)*, Commonwealth of Australia, Canberra.
- Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000a, *Australian and New Zealand guidelines for fresh and marine water quality*, Canberra, retrieved 13 April 2016, <<https://www.environment.gov.au/water/quality/publications/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1>>



- Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000b, *Australian guidelines for water quality monitoring and reporting*, Canberra, retrieved 13 April 2016, <<https://www.environment.gov.au/water/quality/publications/nwqms-australian-guidelines-water-quality-monitoring-reporting>>
- American Public Health Association 2005, *Standard methods for the examination of water and wastewater, 21st edition*, Washington DC.
- American Society for Testing and Materials 2010, *Annual book of ASTM standards: section 11, water and environmental technology*, West Conshohocken, PA.
- Bureau of Meteorology 2011, *Definitions – sub-categories of water information*, Australian Government, Canberra, retrieved 14 June 2011, <<http://www.bom.gov.au/water/regulations/subCategoriesWaterAuxNav.shtml>>
- De Hayr, R., Ryan, J., 2010, *Scoping information management protocols for water quality monitoring in Queensland*, Department of Environment and Resource Management, State Government of Queensland, Brisbane.
- Geoscience Australia 2010, *Gazetteer of Australia 2008*, Committee for Geographical Names of Australasia (CGNA), Australian Government, Canberra, retrieved 14 June 2011, <<http://www.ga.gov.au/map/names/>>
- Gutteridge Haskins and Davey Pty Ltd 2010, *National water information standards development – an industry needs analysis*, final report for the Bureau of Meteorology by GHD Pty Ltd, Sydney, retrieved 14 June 2011, <http://www.bom.gov.au/water/standards/documents/nwis-final_report.pdf>
- International Organization for Standardization 2006, *Water Quality – Vocabulary – Part 2*, ISO 6107-2:2006.
- International Organization for Standardization, *ISO 19100 series International geographic information standards*.
- International Organization for Standardization/ International Electrotechnical Commission 2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM)*, ISO/IEC Guide 98-3:2008.
- International Organization for Standardization/ International Electrotechnical Commission 1999, *Information technology – Vocabulary – Part 17: Databases*, ISO/IEC 2382-17:1999.
- International Organization for Standardization/ International Electrotechnical Commission 2005, *Information technology – Guidelines for the organization and representation of data elements for data interchange – Coding methods and principles*, ISO/IEC TR 9789:1994.
- National Association of Testing Authorities 2013, *Technical Note 17: Guidelines for the validation and verification of quantitative and qualitative test methods*, Australia, retrieved 21 April 2016, <http://www.nata.com.au/nata/phocadownload/publications/Guidance_information/tech-notes-information-papers/technical_note_17.pdf>
- National Association of Testing Authorities 2016, *Technical Note 33: Guidelines for estimating and reporting measurement uncertainty of chemical test results*, Australia, retrieved 21 April 2016, <http://www.nata.com.au/nata/phocadownload/publications/Guidance_information/tech-notes-information-papers/technical_note_33.pdf>
- National Water Commission 2006, *Australian water resources 2005: a baseline assessment of water resources for the national water initiative: level 1 assessment key findings*, Australian Government, Canberra.
- Robinson, G., 1997, *Water quality – Triton reference tables*, document no: 32013, issue 1, NSW Department of Land and Water Conservation Centre for Natural Resources, Sydney, retrieved 13 April 2016, <https://www.seegrid.csiro.au/wiki/pub/NRInfo/WQDP_Server/32013.doc>
- Simons, B.A., Cox, S.J.D., 2013. *Water Quality exchange standard for Bioregional Assessments*, Water for a Healthy Country Flagship Report series, ISSN: 1835-095X. Commonwealth Scientific and Industrial Research Organisation.
- Simons, B.A., Yu, J., Cox, S.J.D., 2013, 'Defining a water quality vocabulary using QUDT and ChEBI', In: *Piantadosi, J., Anderssen, R.S., J., B. (Eds.), MODSIM2013, 20th International Congress on Modelling and Simulation*. Modelling and Simulation Society of Australia and New Zealand, Adelaide, SA, pp. 2548– 2554.

