



Australian Government
Bureau of Meteorology

WATER MONITORING
STANDARDISATION
TECHNICAL COMMITTEE

National Industry Guidelines for hydrometric monitoring

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PART 0: GLOSSARY

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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 (*this guideline*)

Part 1: Primary Measured Data

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 0: Glossary

1 Scope and general

1.1 Application

The definitions in this Glossary are applicable to the National Industry Guidelines for hydrometric monitoring, Parts 1 to 10. This Glossary is included in the Australian Water Information Dictionary, which can be found on the Bureau of Meteorology web site at <http://www.bom.gov.au/water/awid/>.

1.2 Bibliography

Cognisance of the following was taken in the preparation of these definitions:

1. Bureau International des Poids et Mesures, *VIM3: International Vocabulary of Metrology*, <<https://www.bipm.org/en/publications/guides/vim.html>>.
2. International Organization for Standardization, *Quality management systems – Fundamentals and vocabulary*, ISO 9000:2015.
3. Standards Australia, *Measurement of water flow in open channels – Part 1: Hydrometric determinations—Vocabulary and symbols* (same as ISO 772:1996), AS 3778.1—2009.
4. Standards Australia, *Measurement of water flow in open channels – Part 2.2: General—Establishment and operation of a gauging station*, AS 3778.2.2—2001.
5. Standards Australia, *Measurement of water flow in open channels, Velocity-area methods*, AS 3778.3 series.
6. Standards Australia, *Standardisation Guide 006: Rules for the Structure and Drafting of Australian Standards*, viewed 2 October 2018 <http://www.standards.org.au/StandardsDevelopment/Developing_Standards/Pages/Standardisation-Guides.aspx>.
7. Standards Australia/Standards New Zealand, *Geographic Information – Metadata Fundamentals*, AS/NZS ISO 19115.1:2015.
8. USGS, *Water Science Glossary of Terms*, viewed 2 October 2018 <<https://water.usgs.gov/edu/dictionary.html>>.

2 Definitions

2.1 acoustic Doppler current meter

A point velocity meter that uses two acoustic transducers, each acting as transmitters and receivers for the purpose of water velocity measurement, when undertaking a discrete discharge measurement (gauging).

2.2 acoustic Doppler current profiler

A family of acoustic based instrumentation used to measure water velocities and water depths during a discrete discharge measurement (gauging).

2.3 acoustic Doppler velocimeter

A point velocity meter that uses a single acoustic transducer as a transmitter and separate dedicated transducers as receivers for the purpose of water velocity measurement, when undertaking a discrete discharge measurement (gauging).

2.4 acoustic Doppler velocity meter

A family of acoustic based instrumentation used for continuous in-situ measurement of water velocities.

2.5 ADC

acoustic Doppler current meter

A point velocity meter that uses two acoustic transducers, each acting as transmitters and receivers for the purpose of water velocity measurement, when undertaking a discrete discharge measurement (gauging).

2.6 ADCP

acoustic Doppler current profiler

A family of acoustic based instrumentation used to measure water velocities and water depths during a discrete discharge measurement (gauging).

2.7 ADV

acoustic Doppler velocimeter

A point velocity meter that uses a single acoustic transducer as a transmitter and separate dedicated transducers as receivers for the purpose of water velocity measurement, when undertaking a discrete discharge measurement (gauging).

2.8 ADVM

acoustic Doppler velocity meter

A family of acoustic based instrumentation used for continuous in-situ measurement of water velocities.

2.9 AHD

Australian Height Datum

The datum that sets mean sea level as zero elevation. Mean sea level was determined from observations recorded by 30 tide gauges around the coast of the Australian continent for the period 1966–1968.

NOTE: See Geoscience Australia for further information

<http://www.ga.gov.au/earth-monitoring/geodesy/geodetic-datums/australian-height-datum-ahd.html>

2.10 aquifer

A geological formation, group of formations or part of a formation; able to receive, store and transmit significant quantities of water.

2.11 artificial control

A hydraulic structure (e.g. weir, flume or gate) installed in an open channel where in most cases the discharge can be derived from the measured upstream water level.

NOTE: The structure is an artificial reduction of the cross-sectional area in the channel, where part of the upstream total head is converted into kinetic energy used to obtain critical streamflow.

2.12 Australian Height Datum

The datum that sets mean sea level as zero elevation. Mean sea level was determined from observations recorded by 30 tide gauges around the coast of the Australian continent for the period 1966–1968.

NOTE: See Geoscience Australia for further information

<http://www.ga.gov.au/earth-monitoring/geodesy/geodetic-datums/australian-height-datum-ahd.html>

2.13 backscatter

The deflection of waves or particles through angles greater than 90 degrees by an obstacle.

[Source: © Macquarie Dictionary Fourth Edition, 2005, Macquarie Dictionary Publishers]

2.14 backwater

Water backed up or retarded in its course as compared with its normal or natural condition of flow.

[Source: USGS, viewed 2 October 2018, <<http://water.usgs.gov/wsc/glossary.html#B>>]

2.15 bias error

A measurement error that remains constant in magnitude for all observations; a kind of systematic error.

[Source: McGraw-Hill Dictionary of Scientific & Technical Terms sixth edition. Copyright © 2003, McGraw-Hill Education]

2.16 blanking distance

The distance from the transducers of an ADCP in which no measurement is taken. Also known as the “blank”.

2.17 bore

A hole drilled in the ground, a well or any other excavation used to access groundwater. May be used for observation of groundwater (including water level, pressure or quality).

2.18 bottom tracking

Acoustic method used to measure boat speed and direction by computing the Doppler shift of sound reflected from the stream bed relative to the ADCP.

2.19 BT

bottom tracking

Acoustic method used to measure boat speed and direction by computing the Doppler shift of sound reflected from the stream bed relative to the ADCP.

2.20 calibration

The process of comparing the response of a measuring device with a calibrator or a measuring standard, of known accuracy, over the measurement range.

NOTE: The comparison may result in no significant error being noted on the device under test, a significant error being noted but no adjustment made, or an adjustment made to correct the error to an acceptable level either by physical adjustment or by establishing a relationship for obtaining a result from the primary measured value.

[derived from AS 3778.1—2009]¹

2.21 casing

The construction component that lines a bore and provides the conduit from the water-producing zone to the surface.

2.22 cease to flow

The level or physical location at which a stream stops flowing. The lowest point in the low flow control.

2.23 continuous monitoring

Collecting repeated measurements of a parameter over time, typically using automatic sensing and recording instruments.

2.24 control

Physical properties of a cross-section or a reach of an open channel, either natural or artificial, that govern the relation between stage and discharge at a location in the open channel.

[Source: AS 3778.1—2009]²

¹ Source: AS 3778.1—2009 Clause 7.17. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

² Source: AS 3778.1—2009 Clause 1.91. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.25 cross-section

The cross-section of a stream is the section normal to the mean direction of flow bounded by the free surface and wetted perimeter of the stream.

[Source: AS 3778.1—2009]³

2.26 CTF

cease to flow

The level or physical location at which a stream stops flowing. The lowest point in the low flow control.

2.27 cumecs

Cubic metres per second (m³/s). International System of Units (SI Units) of measure for instantaneous discharge (rate unit).

2.28 current meter

Instrument for measuring water velocity.

[Source: AS 3778.1—2009]⁴

2.29 datum

A point, plane, or surface to which systems of measurement are referred or related to one another.

[Source: Geoscience Australia, viewed 2 October 2018,
<http://www.ga.gov.au/mapspeccs/topographic/v6/appendix_1.html>]

2.30 deploy

To prepare an instrument to retrieve data, then take measurements in contact with the water in its data retrieval mode.

2.31 depth

The vertical distance below the free surface of a stream to a point of reference, e.g. a measuring instrument, or the bottom of the stream at any point on a cross-section.

³ Source: AS 3778.1—2009 Clause 1.58. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

⁴ Source: AS 3778.1—2009 Clause 2.56. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.32 depth cell

A volume of water at a known distance and orientation from the transducer. Also known as a bin.

2.33 DGPS

Differential Global Positioning System

An enhancement to Global Positioning System (GPS) that uses a network of fixed ground based reference stations to broadcast the difference between the positions indicated by the satellite systems and the known fixed positions.

The underlying premise of differential GPS (DGPS) is that any two receivers that are relatively close together will experience similar atmospheric errors. DGPS requires that a GPS receiver be set up on a precisely known location. This GPS receiver is the base or reference station. The base station receiver calculates its position based on satellite signals and compares this location to the known location. The difference is applied to the GPS data recorded by the second GPS receiver, which is known as the roving receiver. The corrected information can be applied to data from the roving receiver in real-time in the field using radio signals or through post-processing after data capture using special processing software.

*[Source: ESRI, viewed 2 October 2018. Copyright © 1995-2019 Esri.
<<http://www.esri.com/news/arcuser/0103/differential1of2.html>>]*

2.34 Differential Global Positioning System

An enhancement to Global Positioning System (GPS) that uses a network of fixed ground based reference stations to broadcast the difference between the positions indicated by the satellite systems and the known fixed positions.

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*[Source: ESRI, viewed 2 October 2018. Copyright © 1995-2019 Esri.
<<http://www.esri.com/news/arcuser/0103/differential1of2.html>>]*

2.35 discharge

Volume of liquid flowing through a cross-section in a unit of time.

[Source: AS 3778.1—2009]⁵

2.36 discrete monitoring

Operating sensors or instruments by hand to collect measurements of a parameter. This can include regular or irregular measurements.

NOTE: A synonym of manual monitoring.

2.37 electric tape

A water level measurement device comprising a graduated measurement tape with a moisture detector on one end and a signal device on the other. The moisture detector is lowered into the bore and sends an electrical signal to the surface when it makes contact with the groundwater. This triggers the signal device, usually a light or sound, enabling the operator to measure the distance to water.

2.38 ensemble

A column of depth cells equivalent to a vertical in conventional current meter gauging. An ensemble or profile may refer to a single measurement of the water column or an average of pings or profile measurements.

2.39 feature

A part of the physical environment with properties that can be observed; these include natural features such as rivers, aquifers and the atmosphere, and human defined or constructed features such as channels, irrigation districts and urban supply areas.

2.40 FSD

full scale deflection

The full range of observations which can be recorded by an instrument.

2.41 full scale deflection

The full range of observations which can be recorded by an instrument.

⁵ Source: AS 3778.1—2009 Clause 1.37. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.42 gauge height

The water level, typically measured at a water monitoring site.

NOTE: A synonym of stage.

2.43 gauging

Physical measurement of instantaneous streamflow to develop the stage-discharge relationship.

2.44 GDA2020

Geocentric Datum of Australia 2020

A geocentric (earth-centred) coordinate reference system that is Australia's official national datum (since December 2017). It is a plate-fixed datum that is aligned with the 2014 realisation of the International Terrestrial Reference Frame 2014.

GDA2020 coordinates differ from GDA94 coordinates by approximately 1.5 to 1.8 metres.

For more information on GDA94 and GDA2020 see <http://www.icsm.gov.au/datum/gda-frequently-asked-questions>.

[Source: Intergovernmental Committee on Surveying and Mapping, viewed 2 October 2018, <<http://www.icsm.gov.au/datum/what-gda2020>>]

2.45 GDA94

Geocentric Datum of Australia 1994

A coordinate reference system whose origin coincides with a determination of the centre of mass of the earth, hence the term 'geocentric'. GDA94 is a plate-fixed or static coordinate datum based on the International Terrestrial Reference Frame 1992, held at the reference epoch of 1 January 1994.

GDA94 was the official geodetic datum before GDA2020.

For more information on GDA94 and GDA2020 see <http://www.icsm.gov.au/datum/gda-frequently-asked-questions>.

[Source: Intergovernmental Committee on Surveying and Mapping, viewed 2 October 2018, <<http://www.icsm.gov.au/datum/geocentric-datum-australia-1994-gda94>>]

2.46 GGA

Data string that provides geographic position information determined by the GPS.

2.47 Global Positioning System

A system of radio-emitting and -receiving satellites used for determining positions on the earth. The orbiting satellites transmit signals that allow a Global Positioning System receiver anywhere on earth to calculate its own location through trilateration. Developed and operated by the U.S. Department of Defense, the system is used in navigation, mapping, surveying, and other applications in which precise positioning is necessary.

[Source: ESRI GIS Dictionary, viewed 2 October 2018, Copyright © 1995-2019 Esri.
<<https://support.esri.com/en/other-resources/gis-dictionary/browse/g>>]

2.48 GPS

Global Positioning System

A system of radio-emitting and -receiving satellites used for determining positions on the earth. The orbiting satellites transmit signals that allow a Global Positioning System receiver anywhere on earth to calculate its own location through trilateration. Developed and operated by the U.S. Department of Defense, the system is used in navigation, mapping, surveying, and other applications in which precise positioning is necessary.

[Source: ESRI GIS Dictionary, viewed 2 October 2018, Copyright © 1995-2019 Esri.
<<https://support.esri.com/en/other-resources/gis-dictionary/browse/g>>]

2.49 HDOP

horizontal dilution of precision

A measure of the geometric quality of a GPS satellite configuration in the sky. Horizontal dilution of precision is a factor in determining the relative accuracy of a horizontal position. The smaller the dilution of precision number, the better the geometry.

[Source: ESRI GIS Dictionary, viewed 2 October 2018, Copyright © 1995-2019 Esri.
<<https://support.esri.com/en/other-resources/gis-dictionary/browse/h>>]

See also PDOP

2.50 horizontal dilution of precision

A measure of the geometric quality of a GPS satellite configuration in the sky. Horizontal dilution of precision is a factor in determining the relative accuracy of a horizontal position. The smaller the dilution of precision number, the better the geometry.

[Source: ESRI GIS Dictionary, viewed 2 October 2018, Copyright © 1995-2019 Esri.
<<https://support.esri.com/en/other-resources/gis-dictionary/browse/h>>]

See also PDOP

2.51 hydrometric project

An individual or collaborative work to monitor components of the hydrological cycle including rainfall, surface water and groundwater characteristics, as well as water quality.

2.52 index velocity rating

The computation of discharge using measured water velocities that are an index or predictor of the mean channel velocity.

NOTE: More than one variable may be used in the creation of a rating if this would improve the accuracy of the overall rating.

2.53 ISO

International Organization for Standardization

An international standard-setting body composed of representatives from various national standards organisations.

2.54 IVR

index velocity rating

The computation of discharge using measured water velocities that are an index or predictor of the mean channel velocity.

NOTE: More than one variable may be used in the creation of a rating if this would improve the accuracy of the overall rating.

2.55 mAHD

The abbreviation for elevation in metres with respect to the Australian Height Datum.

2.56 manual monitoring

Operating sensors or instruments by hand to collect measurements of a parameter. This can include regular or irregular measurements.

NOTE: A synonym of discrete monitoring.

2.57 may

Indicates an allowable option.

2.58 measurement uncertainty

A parameter, associated with the result of a measurement, that characterises the dispersion of values that could reasonably be attributed to the measurand.

[Source: ISO/IEC Guide 98-3:2008, Uncertainty of Measurement-Part 3: Guide to the Expression of Uncertainty in Measurement (GUM:1995)]⁶

It describes a range of possible values of the quantity being measured (the measurand) that fall around the true value, and indicates a level of confidence that the true value lies within a defined uncertainty range. The 'true value' is the result that would be obtained if a 'perfect' measurement were made. However, all measurements have a degree of uncertainty regardless of precision and accuracy. Factors that may contribute to uncertainty include limitations of measuring systems, measurement techniques and behaviours of the natural system being measured that cannot be controlled during the measurement.

2.59 measuring point

A place where a particular parameter is measured within a site. Typically, this is where a sensor is located or where the observation is made.

2.60 metadata

Information about a resource.

[Source: AS/NZS ISO 19115.1:2015]⁷

2.61 metrological confirmation

A set of operations required to ensure that measuring equipment conforms to the requirements for its intended use.

[Source: ISO 9000:2015]⁸

⁶ Source: ISO/IEC Guide 98-3:2008. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

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⁸ Source: ISO 9000:2015. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.62 metrology

The science of measurement, embracing both experimental and theoretical determinations at any level of uncertainty in any field of science and technology

[Source: *Bureau International des Poids et Mesures*, viewed 2 October 2018, <https://www.bipm.org/en/worldwide-metrology/>>]

2.63 MGA2020

Map Grid of Australia 2020

The standard map projection associated with GDA2020. It is a transverse Mercator projection that conforms to the internationally accepted Universal Transverse Mercator Grid system.

[Source: *Intergovernmental Committee on Surveying and Mapping*, viewed 2 October 2018, <<http://www.icsm.gov.au/datum/what-gda2020>>]

2.64 MGA94

Map Grid of Australia 1994

The standard map projection associated with GDA94. It is a transverse Mercator projection that conforms to the internationally accepted Universal Transverse Mercator Grid system.

[Source: *Intergovernmental Committee on Surveying and Mapping*, viewed 2 October 2018, <<http://www.icsm.gov.au/datum/geocentric-datum-australia-1994-gda94>>]

2.65 ML/d

The abbreviation for megalitres per day. A unit of measure for instantaneous discharge (rate unit).

2.66 monitoring site

A place where observations of the environment are made; typically a physical location where sensors are used to measure the properties of one or more features of the environment (e.g. depth of a river and temperature of the atmosphere).

NOTE: A synonym of site.

2.67 nested bore

A bore with more than one casing or pipe or a group of nearby bores, open at different levels in aquifers/aquitards, used to evaluate the vertical variation in groundwater pressure head or chemistry.

2.68 observation well

A well drilled in a selected location for the purposes of observing parameters such as water levels or pressure changes. Also called a bore, monitoring bore, monitoring well or piezometer.

2.69 PDOP

positional dilution of precision

A measure of the geometric quality of a GPS satellite configuration in the sky. A PDOP value measures the possible error in both the horizontal and vertical plane (altitude).

See also HDOP

2.70 piezometer

A small pipe open at the bottom inserted into an aquifer to observe water table changes.

2.71 ping

A series of acoustic pulses, of a given frequency, transmitted by an acoustic Doppler current profiler.

[Source: AS 3778.1—2009]⁹

2.72 point velocity meter

A family of hand held acoustic based instrumentation used to measure water velocities and water depths during a discrete discharge measurement (gauging).

2.73 positional dilution of precision

A measure of the geometric quality of a GPS satellite configuration in the sky. A PDOP value measures the possible error in both the horizontal and vertical plane (altitude).

See also HDOP

2.74 primary gauge

The gauge plate which shows gauge zero elevation as described in AS 3778.2.2—2001 section 5.2.2.3.

⁹ Source: AS 3778.1—2009 Clause 5.84. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.75 primary measured data

Data recorded on-site, or observed or collected first hand. Also known as raw, unedited or original data.

2.76 profile

The velocity distribution of a stream cross-section.

NOTES:

1. Ensembles are measured representations of the profile.
2. When used as a verb, it refers to an instrument measuring stream velocity at defined positions in the cross-section.

2.77 PVM

point velocity meter

A family of hand held acoustic based instrumentation used to measure water velocities and water depths during a discrete discharge measurement (gauging).

2.78 rating

A relationship between variables.

See also stage-discharge relationship

2.79 reduced level

The surveyed level of a location relative to a datum (after survey calculations have been completed).

2.80 reference point

A point from which a water level measurement is recorded.

2.81 RL

reduced level

The surveyed level of a location relative to a datum (after survey calculations have been completed).

2.82 section

A portion of a cross-section for which velocity is measured or unmeasured.

2.83 seiche

Oscillation of the surface of a liquid caused mainly by winds and variations in atmospheric pressure.

[Source: AS 3778.1—2009]¹⁰

2.84 shall

Indicates a mandatory requirement.

2.85 ship track

The displayed route undertaken by an ADCP during a measured transect.

2.86 should

Indicates a recommendation.

2.87 signal to noise ratio

A measure used in science and engineering that compares the level of a desired signal to the level of background noise. It is defined as the ratio of signal power to the noise power. A ratio higher than 1:1 indicates more signal than noise.

2.88 site

A place where observations of the environment are made; typically a physical location where sensors are used to measure the properties of one or more features of the environment (e.g. depth of a river and temperature of the atmosphere).

NOTE: A synonym of monitoring site.

2.89 SNR

signal to noise ratio

A measure used in science and engineering that compares the level of a desired signal to the level of background noise. It is defined as the ratio of signal power to the noise power. A ratio higher than 1:1 indicates more signal than noise.

2.90 space time image velocimetry

A method to calculate surface velocities from an orthorectified video image. The velocities are used to calculate discharge using the midsection method.

¹⁰ Source: AS 3778.1—2009 Clause 2.53 . © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.91 spot check

A single value check of a measuring instrument or system to confirm that it is within expected tolerance. A series of spot checks may provide sufficient evidence for verification of a measuring instrument or system.

2.92 stage

The water level, typically measured at a water monitoring site.

NOTE: A synonym of gauge height.

2.93 stage-area relationship

The relationship between the gauge height and the cross-sectional area of the stream.

2.94 stage-discharge relationship

Curve, equation or table that expresses the relation between the stage and the discharge in an open channel at a given cross-section, for a given condition of steady, rising or falling stage.

[Source: AS 3778.1—2009]¹¹

See also rating

2.95 standard test instrument

An instrument used to perform calibration tests of monitoring equipment.

2.96 stream characteristics

Physical characteristics of a specific stream location that determine the stage-discharge relationship.

2.97 streamflow

The flow of water in streams, rivers and other channels.

¹¹ Source: AS 3778.1—2009, Clause 1.83. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.98 tolerance

Root sum squared combination of instrument error and reference error. Tolerance is calculated as $Tolerance = \pm\sqrt{A^2 + B^2}$ where:

- A = instrument error from manufacturer's specifications confirmed by calibration (e.g. ± 3 mm for this range); and
- B = ability to read reference reading (e.g. gauge plate can be read to ± 4 mm).

2.99 transect

Single pass across a river, lake or estuary.

NOTES:

1. a transect may be described as a collection of ensembles.
2. one transect may constitute a single measurement of discharge.

[Source: AS 3778.1—2009]¹²

2.100 United States Geological Survey

The sole American science agency for the Department of the Interior that provides science about the natural hazards that threaten lives and livelihoods, the water, energy, minerals, and other natural resources the U.S. relies on, the health of U.S. ecosystems and environment, and the impacts of climate and land-use change.

[Modified from source: USGS, viewed 2 October 2018, <<http://www.usgs.gov/aboutusgs/>>]

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[Modified from source: USGS, viewed 2 October 2018, <<http://www.usgs.gov/aboutusgs/>>]

¹² Source: AS 3778.1—2009, Clause 5.86. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.102 validation

The process of confirming, through provision of objective evidence (including verification and/or spot checks), that data fulfil the requirements for a specific use or application as agreed with the customer.

NOTE: Validation will include elements of verification and focuses on the suitability of the end result for the customer. For example, a hydrographer may verify a gauging as part of the validation of a rating for a streamflow site.

2.103 velocity extrapolation method

A method of correcting a measured ADVN velocity to a theoretical mean velocity for each ADVN velocity bin (depth cell).

The method involves taking the depth position of the velocity bin and using a velocity profile (e.g. 1/6th power law), the water level, and the bed level to calculate a velocity correction which is applied to each raw ADVN bin velocity. The corrected ADVN velocity bins are then used to calculate a discharge using the mid-section method.

2.104 VEM

velocity extrapolation method

A method of correcting a measured ADVN velocity to a theoretical mean velocity for each ADVN velocity bin (depth cell).

The method involves taking the depth position of the velocity bin and using a velocity profile (e.g. 1/6th power law), the water level, and the bed level to calculate a velocity correction which is applied to each raw ADVN bin velocity. The corrected ADVN velocity bins are then used to calculate a discharge using the mid-section method.

2.105 verification

The process of confirming, through provision of objective evidence (e.g. a series of spot checks), that a given measuring instrument or system fulfils specific requirements.

For example, a hydrographer may verify that a measuring instrument is within expected tolerance over the measurement range.

2.106 vertical

Line on which velocity measurements or depth measurements are made.

[Source: AS 3778.1—2009]¹³

¹³ Source: AS 3778.1—2009 Clause 2.4. © Standards Australia Limited. Copied by the Australian Government Bureau of Meteorology with the permission of Standards Australia and Standards New Zealand under Licence 1901-c052.

2.107 VTG

GPS data string that provides the velocity relative to the ground, including direction and speed.

2.108 Water Data Transfer Format

An XML data transfer format designed to support the water industry to share and deliver water data to the Bureau of Meteorology as required under the *Water Regulations 2008*.

[Modified from source: Bureau of Meteorology, viewed 2 October 2018, <<http://www.bom.gov.au/water/standards/wdtf/aboutWDTF.shtml>>]

2.109 water elevation

The elevation of the water surface at a particular time and date, relative to a specified vertical datum.

2.110 water level

The measured distance to the water surface at a particular time and date, relative to a reference point.

NOTE: In groundwater monitoring practice, this is also known as 'depth to groundwater'.

2.111 watercourse

A river, creek or other natural watercourse (whether modified or not) in which water is contained or flows (whether permanently or from time to time); and includes:

- (i) a dam or reservoir that collects water flowing in a watercourse;
- (ii) a lake or wetland through which water flows;
- (iii) a channel into which the water of a watercourse has been diverted;
- (iv) part of a watercourse; and
- (v) an estuary through which water flows.

[Modified from source: *Water Act 2007 Part 1 Section 4*] ¹⁴

¹⁴ Based on content from the [Federal Register of Legislation](https://www.legislation.gov.au/Details/C2018C00505) (<https://www.legislation.gov.au/Details/C2018C00505>), at 2 October 2018. For the latest information on Australian Government law please go to <https://www.legislation.gov.au>

2.112 WDTF

Water Data Transfer Format

An XML data transfer format designed to support the water industry to share and deliver water data to the Bureau of Meteorology as required under the *Water Regulations 2008*.

*[Modified from source: Bureau of Meteorology, viewed 2 October 2018,
<<http://www.bom.gov.au/water/standards/wdtf/aboutWDTF.shtml>>]*