Glossary

1st Order Kinetic Model k-C*

Model available in Source Catchments. The 1st Order Kinetic Model k-C* filter model describes the decay or reduction in inflow constituent concentration within a treatment facility such as a grass filter strip. The effectiveness of the treatment is a function of the inflow concentration, the 'background concentration' of the treatment facility (i.e. some measure of the ability of the treatment to reduce concentration), the inflow, and the treatment area. The k-C* model is the fundamental model used in the Universal Stormwater Treatment Model (USTM) of MUSIC (eWater 2009). The model is a conceptualisation of the reduction in constituent concentration that can be provided by a range of different treatment facilities. The basic equation is a decay function.

Source: (eWater CRC 2010a)

A

absolute cap

A cap beyond which there is no intention that the level of entitlements could be increased.

Source: (NWC 2007)

Source: Australian Water Resources 2005

absolute transfer (Tas)

Involves the outright sale of all or part of a licence or water allocation. The seller reduces their water allocation and the purchaser will require a new water licence or a variation to an existing licence before the transfer can proceed.

Source: (NWC 2007)

absorb

To physically or chemically assimilate a substance and include it in another; to take up gases, water, nutrients or other substances, eg by soils or plants.

Source: (toolkit 20091023)

absorption trench

The disposal field of a conventional domestic on-site effluent disposal system; an excavated area, filled with gravel with a light cover of soil from which water from a perforated pipe from a septic tank can evaporate and percolate into the surrounding soil.

Source: (toolkit 20091023)

account

Entity to keep track of the status of a water user's water usage. Note that a given water user can have more than one account, and these do not necessarily have to be of the same account type.

account balance (Qld)

The remaining volume or share of water available to an account holder. The sum of all the credits to an account minus the sum of all of the debits.
account sharing method

Demand is distributed between resource assessment system accounts. When the account sharing method is used, water supplied to the water user is limited by the balance of the accounts and accounts are updated for orders placed or water used.

accuracy

Closeness of a measured or computed value to its 'true' value, where the 'true' value is obtained with perfect information. Due to the natural heterogeneity and stochasticity of many environmental systems, this 'true' value exists as a distribution rather than a discrete value. In these cases, the 'true' value will be a function of spatial and temporal aggregation.

Source: (USEPA-CREM)

activated carbon

High porosity, high surface area carbon obtained by burning organic matter in the absence of air, which possess a high capacity to remove trace and soluble components from solution; used to remove impurities causing odour and undesirable taste from drinking water by absorbing gases and various organic and inorganic molecules. Also used for removing cyanobacterial toxins from drinking water.

Source: (toolkit 20091023)

activated sludge

A rich mixture of bacteria and mineral substances that has been through a reactor tank and which is to be reintroduced, aerated and mixed with the incoming sewage; a type of sewage treatment plant in which the above process is used to break down organic matter and nitrogen compounds.

Source: (toolkit 20091023)

active volume

The volume of water currently stored that may be released through outlet structures and is equal to the current volume less the inactive volume.

Source: (NWC 2007)

Source: Water Resources Observation Network

acute poison

A toxin that quickly causes a crisis situation to be reached; not chronic

Source: (toolkit 20091023)

Adopted Middle Thread Distance

The distance in kilometres, measured along the middle of a watercourse, from the mouth or junction.

Source: (Stanley, K. 2007)

adsorb

Attach a substance to the surface of a liquid or solid, eg cations to a negatively charged clay or other colloidal material; retain water, ions or exchangeable bases on a colloidal surface.
AEP
Annual Exceedance Probability
Use: exceedance probability
Source: (Welsh, Podger 2008)

aeration
Exposure of a material to air so that dissolved gases may be removed; the process by which air is added to a substance or exchanged with an existing atmosphere.
Source: (toolkit 20091023)

aerobic
Adapted to the presence of oxygen; growing or occurring only in the presence of molecular oxygen; having molecular oxygen as part of the environment; bacteria that require oxygen in order to survive and multiply.
Source: (toolkit 20091023)

aerobic digestion
Breakdown of organic matter in a liquid medium in the presence of oxygen or air.
Source: (toolkit 20091023)

aerosol
A colloidal system of solid or liquid particles dispersed in a gas; very fine particles in the atmosphere, eg smoke, fog, smog.
Source: (toolkit 20091023)

aging
The progressive breakdown of organic materials through the cumulative effects of irreversible physiochemical processes over a period of time; nutrient and sediment build up in water storages over time.
Source: (toolkit 20091023)

algal bloom
A rapid increase in the mass of one or more algae or cyanobacteria (blue-green algae) in a water body, usually in response to a change in its flow, light, temperature or nutrient status.
Source: (toolkit 20091023)

algorithm
A precise rule (or set of rules) for solving some problem.
Source: (USEPA-CREM)

allocation
The percentage of the entitlement volume that is available for diversion by irrigators in the current water year in regulated rivers that use an annual accounting system. This is supplied from guaranteed resources (ie from headwater storage or minimum flows from unregulated tributaries downstream of the storage), also adjusted for carryover and overdraft. Does not include any supplementary water that may become available. allocations are announced publicly by the system operator at various times during the year.

Source: (Welsh, Podger 2008)

**allotment**

A unit representing a building or small group of buildings and their surrounds, up to approximately 1000 square metres.

Source: (Hardy 2009)

**alluvial**

Deposits of clay, silt, sand, gravel, or other particulate material that has been deposited by a stream or other body of running water in a streambed, on a flood plain, on a delta, or at the base of a mountain.

Source: (Stanley, K. 2007)

**alum**

Hydrated double salt of aluminium and potassium sulphates; a general term used for aluminium sulphate, used as a coagulant in water treatment; the reaction product of sulphuric acid and alumina or bauxite.

Source: (toolkit 20091023)

**amalgamated (WA)**

When a Water Access Entitlement is merged with another and the result is the inclusion of that Water Access Entitlement in the original.

Source: (NWC 2007)

**amalgamation of water allocations (Qld)**

The joining of two or more water allocations into one.

Source: (NWC 2007)

**AMD**

Acid Mine Drainage

Source: (NWC 2007)

**anabranchn**

An arm of a river which separates from and later rejoins the main stream.

Source: (Moore 2004)

**anaerobic**

Lacking air or molecular oxygen; living or functioning in the absence of air or free oxygen; capable of survival only in the absence of oxygen; bacteria living in such conditions

Source: (toolkit 20091023)
**anaerobic digestion**

Decomposition of oxygenic materials under conditions of low air or oxygen supply.

*Source:* (toolkit 20091023)

**analytical models**

Models that can be solved mathematically in terms of analytical functions. For example, some models that are based on relatively simple differential equations can be solved analytically by combinations of polynomials, exponential, trigonometric, or other familiar functions.

*Source:* (USEPA-CREM)

**announced allocation (Qld)**

For a water allocation for supplemented supply, the announced allocation is the percentage of the nominal volume which can be taken during a water year. The announced allocation is declared from time to time by the holder of a resource operations licence (ROL) in accordance with the rules in the licence.

*Source:* (NWC 2007)

**announced allocation percentage (Qld)**

The percentage of the water allocation’s nominal volume which can be taken during a water year. Applies only to supplemented systems.

*Source:* (NWC 2007)

**annual accounting**

The accounting and sharing out of water resources in either a regulated or an unregulated river system on an annual cycle. Some carryover of users accounts from one year to the next, and overdraw of users accounts within a year, may be allowed with time limits on using the carryover or paying back the overdraw in the following year. There may also be annual and multi-year use limits. In a regulated river system the operator manages the water and makes regular announcements on volume that is available for use, and the storage, transmission and operation losses are funded from a communal account.

*Source:* (Welsh, Podger 2008)

*Source:* River Systems specification

**Annual series**

A means of analysing flood frequency that involves selecting the largest values in each year of the record often for the purposes of fitting a frequency distribution. Often the annual maxima are selected on the basis of water years rather than calendar years.

**anoxic**

Lacking dissolved oxygen; a condition in which oxygen is deficient or absent or exists only in a combined form

*Source:* (toolkit 20091023)

**antecedent storage condition**

The level of water within a wetland prior to the onset of the next inflow event

*Source:* (toolkit 20091023)
anthropogenic

Produced or caused by humans

Source: (toolkit 20091023)

applicability and utility

One of EPA’s five Assessment Factors (see definition) that describes the extent to which the information is relevant for the Agency’s intended use.

Source: (USEPA-CREM)

application niche

The set of conditions under which the use of a model is scientifically defensible. The identification of application niche is a key step during model development. Peer review should include an evaluation of application niche. An explicit statement of application niche helps decision makers to understand the limitations of the scientific basis of the model.

Source: (USEPA-CREM)

application niche uncertainty

Uncertainty as to the appropriateness of a model for use under a specific set of conditions (see application niche).

Source: (USEPA-CREM)

aquifer

Rock or sediment in a formation, group of formations, or part of a formation which is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Source: (ANCID 2001)
Source: (NWC 2007)

aquifer recharge

Build up of the water level in a natural underground storage

Source: (toolkit 20091023)

aquifer storage and recovery

The storage of water through wells installed into aquifers, with subsequent retrieval from the same wells during demand for the stored water

Source: (toolkit 20091023)

area

The extent or measurement of a surface (eg a piece of land or a body of water).

areal actual evapotranspiration

The ET that actually takes place, under the condition of existing water supply, from an area so large that the effects of any upwind boundary transitions are negligible and local variations are integrated to an areal average. For example, this represents the evapotranspiration which would occur over a large area of land under existing (mean) rainfall conditions.

Source: (Chiew 2002)
areal potential evapotranspiration

The ET that would take place, under the condition of unlimited water supply, from an area so large that the effects of any upwind boundary transitions are negligible and local variations are integrated to an areal average. For example, this represents the evapotranspiration which would occur over a very large wetland or large irrigated area, with a never-ending water inflow. A "large" area is defined as an area greater than one square kilometre.

Source: (Chiew 2002)

ARI

Average Recurrence Interval

Source: (NWC 2007)

artesian basin

A geological structural feature or combination of such features in which water is confined under pressure.

Source: Macquarie Dictionary

Source: (NWC 2007)

artesian bore

A bore whose shaft penetrates an aquifer and in which the water level rises above ground by hydrostatic pressure.

Source: Macquarie Dictionary

Source: (NWC 2007)

artificial channel storage

Volume of water in artificial channels. Includes the instantaneous volume of moving water, and any water in structures which are not classed as off river storages, on-river reservoirs or farm dams.

Source: (Sinclair, Knight, Merz 2006)

Source: (NWC 2007)

artificial wetland

A constructed habitat with either static or running water and aquatic or terrestrial vegetation, with the objective of directly reducing contaminants in the water or creating conditions for this to occur.

Source: (toolkit 20091023)

AsciiGrid Pre-processor

A software plugin. A mechanism for rapidly and easily importing daily rainfall or potential evapotranspiration data. It is particularly suitable for large and very large catchments (e.g. 50,000 to a million km2).

Source: (eWater CRC 2010a)

asphalt

A hard surface lining formed by the spreading of asphalt on the subgrade of the channel to form a hard surface and seal the channel.
assessment factors

Considerations recommended by EPA for evaluating the quality and relevance of scientific and technical information. These include: (1) soundness, (2) applicability and utility, (3) clarity and completeness, (4) uncertainty and variability, (5) evaluation and review.

Source: (USEPA-CREM)

assign share component (NSW)

Reduction in share of one licence and corresponding increase in share of another (effectively changes the location and ownership of the moved share in one transaction).

Source: (NWC 2007)

assign water allocation (NSW)

The reduction in water allocations in the account of one licence and corresponding increase in water allocations in the account of another licence. (Still commonly referred to as a temporary trade)

Source: (NWC 2007)

assignment of water allocation (Vic)

The holder of a water allocation may trade the whole or a part of that water allocation to a person who is the owner or occupier of land specified in a water-use licence or water-use registration. Assignment of water trades can only be for the period of the water allocation.

Source: (NWC 2007)

associated and non-associated water shares (Vic)

Water shares are either associated with water use licenses or water use registration or classified as being "non-associated". No more than ten percent of a water system can be non-associated.

Source: (NWC 2007)

attenuation

The gradual change in shape of a hydrograph as it passes downstream along a stream channel, with a reduction in the peak flow and the hydrograph shape becoming flatter.

Source: (Shaw 1994)

AUSRIVAS

Australian River Assessment System

Source: (NWC 2007)

Australian Water Balance Model

Australian Water Balance Model. Model available in Source Catchments. A conceptual rainfall runoff model that relates runoff to rainfall with daily data, and calculates losses from rainfall for flood hydrograph modelling. The model contains five stores; three surface stores to simulate partial areas of runoff, a base flow store and a surface runoff routing store.
automated calibration

Process of calibration using an optimisation procedure with model parameter values constrained to physically defensible ranges to find a set of parameter values that minimises a pre-defined objective function. The set of parameter values found may or may not be unique (see âequifinalityâ), may represent the global optimum or merely a local optimum on the response surface of model parameter values, and may or may not be robust and fit for purpose (this is also termed âinverse modellingâ in some domains, e.g. groundwater).

Source: (Madsen et al, 2002)

automatic control

Self-regulating flow control system with sensing and operation initiated via electronic, mechanical or hydraulic means without operator intervention.

Source: (ANCID 2001)
Source: (NWC 2007)

available water

Water potentially available for both extractive and non extractive use.

Source: Australian Water Resources 2005
Source: (NWC 2007)

available water determination (NSW)

The water made available from time to time to water access licence holders. Expressed as ML /unit share (but still publicised to users as percentage allocations)

Source: (NWC 2007)

average dry weather flow

The amount of water moving downstream in a catchment during the dry season; the average daily volume of wastewater entering a sewage treatment plant in dry weather.

Source: (toolkit 20091023)

back-flow

Movement of a liquid in a contra-direction to that intended, due to a reversal of pressures.

Source: (toolkit 20091023)

back-washing and flushing

By reversing the flow, to remove accumulated sediment particles from the sand filter in a water treatment plant.

Source: (toolkit 20091023)

bank

The slope immediately bordering the course of a river or channel along which the water normally runs.

Source: Macquarie Dictionary
Barmah-Millewa forest

is the collective name given to approximately 70 000 ha of wetland habitats located on the floodplain of the River Murray between Echuca, Deniliquin and Tocumwal.

_barrage_  
An artificial weir or barrier.

_baseflow_  
The component of streamflow that originates from groundwater, and supports streamflows during long periods of no rainfall.

_Baseflow index_  
The ratio of mean annual baseflow to mean annual flow.

_Baseflow separation_  
The process of dividing a hydrograph into baseflow and quick flow (or surface flow) components. Often this is achieved using a recursive digital filter algorithm.

_basin area_  
The total area of the basin including the evaporative area and the area required for associated infrastructure (such as banks, interception works and buffer zones).

_basin area percentage_  
The percentage of the drained area that is allocated to a saline disposal basin.

_bathymetry_  
The topography or the shape of the land below the water surface.

_bed_  
The ground under a body of water.
Is the ratio of total discounted benefits to total discounted costs. If discounted benefits exceed discounted costs, the ratio exceeds 1.0. All systems with ratio greater than one are financially desirable and the system with highest value is the most financially desirable

Source: (toolkit 20091023)

benthos

The sum total of organisms living in, or on, the sediment of aquatic habitats.

Source: (toolkit 20091023)

bentonite

Bentonite is a natural clay-like substance formed from the deposition of volcanic ash in seawater.

Source: (ANCID 2001)
Source: (NWC 2007)

bentonite buried membrane

A liner constructed by uniformly spreading powdered bentonite, 20 to 50mm thick, over a smooth, firm and dry channel subgrade. This layer is covered by at least 300mm of stable earth and compacted.

Source: (ANCID 2001)
Source: (NWC 2007)

bentonite sediment sealant

Dry, high swell bentonite in granular form is spread over the channel water surface. This material sinks to form a seal at the base of the channel.

Source: (ANCID 2001)
Source: (NWC 2007)

bentonite soil blanket

A liner constructed by uniformly spreading powdered bentonite over the surface area of a dry channel. The powder is then mixed into the top layer of soil using a rotary type mixer and to 100 mm thick blanket over the channel section.

Source: (ANCID 2001)
Source: (NWC 2007)

best management practice

Structural and non-structural measures used to reduce the impact of development on the urban water cycle.

Source: (toolkit 20091023)

best planning practice

Actions undertaken as part of developing a concept design plan that defines and matches site characteristics to the layout and final design of infrastructure to reduce the impact of development on the urban water cycle.

Source: (toolkit 20091023)
**Best Practice Modelling**

eWater defines Best Practice Modelling as a series of quality assurance principles and actions to ensure that model development, implementation and application are the best achievable, commensurate with the intended purpose. In particular, the principles and actions ensure that: Models are developed according to a best practice framework, including stakeholder governance, formal capture of user requirements, technical specification and review, testing procedures as well as software quality assurance procedures and usability testing. Also, this is all undertaken through an industry standard project management framework. Models are based on the best appropriate science, and considering data and scale constraints. Model assumptions and science are transparent and defensible; articulated in clear user documentation and supporting reference material. Model set-up, calibration and application are robust, transparent, repeatable and defensible within the constraints of data availability, and based on a consistent approach that is the best available. Model implementation is assisted by clear, unambiguous guidelines. Modelling and predictive uncertainties are clearly articulated in the context of a risk framework that stakeholders and decision-makers can understand and confidently make use of: all are based on sound decision science. A mechanism exists that allows for continuous improvement in best practice modelling as the state of knowledge and technology improves.

*Source:* (eWater CRC 2010c)

**BFI**

The ratio of mean annual baseflow to mean annual flow.

*Use:* Baseflow index

**bias**

Systematic deviation between a measured (i.e., observed) or computed value and its *true* value. Bias is affected by faulty instrument calibration and other measurement errors, systematic errors during data collection, and sampling errors such as incomplete spatial randomisation during the design of sampling programs.

*Source:* (USEPA-CREM)

**bioaccumulation**

A process whereby chemical substances are accumulated by aquatic organisms from water, directly or through the consumption of food containing the chemicals.

*Source:* (toolkit 20091023)

**biochemical oxygen demand**

A measure of the amount of oxygen needed by microorganisms to decompose organic matter in an effluent sample determined during a 5-day period in a reaction vessel at 20°C

*Source:* (toolkit 20091023)

**biodegradable**

Capable of conversion by chemical or biological processes to simple chemical substances

*Source:* (toolkit 20091023)

**biofilm**

Microbial populations that grow on the inside of pipes and other surfaces. A growth of microscopic organisms (i.e bacteria and algae) living on any available surfaces (e.g. plant, rock, sediment) in the water body

*Source:* (toolkit 20091023)
bio-filtration (bioretention) system

A grassed or landscaped swale or basin promoting infiltration into the underlying medium. A perforated pipe collects the infiltrated water and conveys it downstream.

Source: (toolkit 20091023)

biological nutrient reduction

An advanced form of the activated sludge process wherein some types of bacteria utilise the oxygen from phosphates in sewage as their energy source, reducing the phosphorus (P) content of the effluent from 10 â 15 mg/L to 1 â 5 mg/L.

Source: (toolkit 20091023)

biological treatment

Biological treatment involves the addition of biological agents to either the channel water or soil layer, which assist in reducing the seepage from the channel. There is also the potential for additional ecological benefits in using biological treatments.

Source: (ANCID 2001)
Source: (NWC 2007)

biologically activated carbon

A form of carbon with high porosity and surface area used in water treatment to adsorb pollutants, to allow their biological degradation.

Source: (toolkit 20091023)

bioreactor

A vessel or tank in which bacteria are used to decompose the organic matter content of wastewater.

Source: (toolkit 20091023)

biosolids

The stabilised organic solids derived from sewage treatment processes.

Source: (National Performance Framework 2006)
Source: (NWC 2007)

biosolids reuse

Reuse involves managing biosolids safely and sustainably to beneficially utilise their nutrient, energy, or other values. This may include biosolids beneficially used for agriculture (eg fertiliser), soil conditioning, mine rehabilitation, and other applications recognised as reuse.

Source: (NWC 2007)
Source: (National Performance Framework 2006)

Bird guard

A device often fitted to evaporation pans to prevent birds from using the pan to drink from. Comparative studies have shown that fitting of bird guards typically reduce recorded pan evaporation from Class A pans by 8%.

blackwater
Influent to or effluent from a septic tank or sewage system; water containing human excrement.

**Source:** (toolkit 20091023)

**BMP**

Best Management Practice best management practices

**Use:** best management practice

**Source:** (NWC 2007)

**Source:** (toolkit 20091023)

**BOD**

Biological Oxygen Demand

**Source:** (NWC 2007)

**bore**

A deep hole of small diameter bored to the aquifer of an artesian basin, through which water rises under hydrostatic pressure.

**Source:** Macquarie Dictionary

**Source:** (NWC 2007)

**boundaries**

The spatial and temporal conditions and practical constraints under which environmental data are collected. Boundaries specify the area or volume (spatial boundary) and the time period (temporal boundary) to which a model application will apply.

**Source:** (USEPA-CREM)

**boundary conditions**

Sets of values for state variables and their rates along problem domain boundaries, sufficient to determine the state of the system within the problem domain.

**Source:** (USEPA-CREM)

**BPEM**

Best Practice Environmental Management

**Source:** (NWC 2007)

**break even time**

Is the period in years for a systemâs cumulative cash flow to become positive. This represents the time period required for a system to pay for all itsâ debts and after this period net positive gains start accruing.

**Source:** (toolkit 20091023)

**broad crested weir**

A type of fixed crest weir.

**Source:** (ANCID 2001)
buffer zone
The area between the basin and its interception works and the surrounding land. Often contains trees or other vegetation to improve the aesthetics of the basin.
Source: (toolkit 20091023)

buffering
Resisting a change in pH when acids or bases are added to a solution
Source: (toolkit 20091023)

bulk entitlement (Vic)
An entitlement to take water held by an authority for water supply to an urban area.
Source: (NWC 2007)

bulk water
Water supplied by a water provider to another water provider.
Source: (NWC 2007)
Source: Australian Water Resources 2005

bulk water charge
A charge payable for the storage of water for, and the delivery of water to, any of the following: (a) infrastructure operators; (b) other operators of reticulated water systems; (c) other persons prescribed by the regulations for the purposes of this paragraph.
Source: (NWC 2007)
Source: Water Act 2007

C

CAEDYM
Computational Aquatic Ecosystem Dynamics Model
Source: (toolkit 20091023)

calculated
An value or number determined mathematically or via measurement.

Calendar year
Year starting on 1 January and ending on 31 December.

calibration
Process of adjusting the values of model parameters within physically defensible ranges until the model performance adequately matches observed historical data from one or more locations represented by the model (i.e. a match is obtained that is robust and fit for purpose).
calibration model

A calibration model involves the modelling of flows, extractions, operational rules, and infrastructure that occurred historically to produce a model that can be used to simulate ‘what if’ scenarios based on historical flow, rainfall and evaporation patterns and catchment conditions.

Source: (Stanley, K. 2007)

canal

The expression ‘Canal’ is also used for some main channels and usually forms part of the proper name in these cases, e.g. Cattanach Canal, Mulwala Canal.

Use: channel

Source: (ANCID 2001)
Source: (NWC 2007)

cap

An upper limit for the volume of water available for use from a waterway, catchment, basin or aquifer.

Source: (NWC 2007)
Source: Australian Water Resources 2005

cap development conditions

This is a scenario that represents water resource development infrastructure and management practices that existed in the 1993/94 water year (as defined in the MDBMC Cap). This term is relevant to hydrologic modelling for water management purposes, Water Sharing Plans and Cap accountability.

Source: (Welsh, Podger 2008)

capillary fringe

The zone immediately above the watertable, where water is drawn upwards by capillary tension.

Source: (ANCID 2001)
Source: (NWC 2007)

capillary tension

The forces acting on soil moisture in the unsaturated zone, attributable to surface tension effects and pore geometry.

Source: (ANCID 2001)
Source: (NWC 2007)

capital works grants

Capital works grants are funds received and receivable from governments for specific capital works.

Source: (NWC 2007)
**carryover**

A portion of allocated water in regulated river systems that can be carried over from one water year to the next by water users.

*Source:* (Welsh, Podger 2008)

**carryover reserve**

Water in storage in a regulated river system in a given year that is kept in reserve to meet high security requirements in the subsequent year (sometimes referred to simply as a reserve to avoid confusion with carryover).

*Source:* (Welsh, Podger 2008)

**cash flow budget**

A cash flow budget is a technique used to show future costs and returns associated with a project over a period of time. These are the basis for deciding whether or not to undertake a project, for obtaining finance and for monitoring its performance once it commences. These are used primarily to evaluate an investment.

*Source:* (toolkit 20091023)

**catchment**

The area of land drained by a water course that could range from a small runnel to a creek or a river. In hydrologic terms every point in the landscape is the outlet of a catchment of some description. As the term has a wide range of applicability it gets used very broadly (and loosely). The equivalent term in the US is watershed.

*Source:* (Welsh, Podger 2008)

**catchment area**

A drainage area in a river system to a defined location.

*Source:* Macquarie Dictionary

*Source:* (NWC 2007)

**Catchment Yield Estimation Tools**

Computer software, formulas or heuristics that can be used to estimate the water yield from a catchment with a specified reliability

**caveat (WA)**

(Buyer beware) - A warning to a person searching the original Water Access Entitlement that there is a claim lodged on that Water Access Entitlement, which may prohibit the Registrar of Titles from registering a dealing upon that Water Access Entitlement.

*Source:* (NWC 2007)

**cease to pump indicator**

The indicator measurement at which irrigators must stop pumping.

*Source:* (Welsh, Podger 2008)
ceding

Ceding occurs when there are multiple water owners with fixed storage shares and one water owner gives up water to another water owner using predefined percent distribution rules.

Source: (Gilmore et al 2008)

channel

Open channel or flume designed to convey water from an upstream water source to farms.

Source: (ANCID 2001)
Source: (NWC 2007)

channel bed conductance

The conductance (conductivity divided by thickness) of the naturally forming channel lining (largely due to the depositing of suspended sediment in the water) or, in the event of the removal of this lining, the surface layer resistance.

Source: (ANCID 2001)
Source: (NWC 2007)

channel leakage

Loss of water through the banks and base of a channel via macropores.

Source: (ANCID 2001)
Source: (NWC 2007)

channel lining

Low permeability membrane of concrete, compacted clay, bituminous, plastic or other material placed on the inner face of earthen channel, or within the bank, to reduce water loss by seepage. Earth or other materials may be used as cover to protect linings.

Source: (ANCID 2001)
Source: (NWC 2007)

channel regulator

A permanent structure constructed across a channel and fitted with a means of adjusting the waterway area so as to control the rate of water flow along the channel and/or the upstream water level. Most regulators are one of two general types which utilise different hydraulic characteristics for specific applications: - Overfall weir where water flows over a weir crest which can be varied in level for changing flow rates, - Undershot gate having an adjustable sliding gate allowing flows to pass beneath the gate, the rate of flow being controlled by the size of the opening.

Source: (ANCID 2001)
Source: (NWC 2007)

Channel roughness (Manning’s n)

Manning’s n is an estimate of channel roughness, used in the calculation of flow velocity and discharge. The value of n is typically between 0.01 and 0.1 and varies with channel slope, bed material composition (sand, gravel, cobble etc), in-stream vegetation and sinuosity.

Source: (Ward and Trimble 2004)
channel seepage
Loss of water from a channel via infiltration through micro-pores and soil processes (ie not via preferential flow through macropores). Seepage as measured in pondage tests includes a leakage component. Generally the term channel seepage refers to both seeped and leaked water, as the two are not easily separated.

Source: (ANCID 2001)
Source: (NWC 2007)

Channelisation
Process that occurs when defined streams start to form to capture water that had previously flowed from an upstream hillslope along undefined flow pathways.

check regulator
Channel regulator for overfall flow where flow adjustment is performed by adding or removing timber drop bars (âdrop boardsâ or âstop logsâ) to provide a moveable weir crest. Where the regulator includes a step in the channel bed it is referred to as a âcheck and dropâ regulator. Small check regulators on-farm channels are also referred to as âchannel stopsâ.

Source: (ANCID 2001)
Source: (NWC 2007)

checks
Specific tests in a quality assurance plan that are used to evaluate whether the specifications (performance criteria) for the project developed at its onset have been met.

Source: (USEPA-CREM)

chemical coagulation
Formation of a floc using chemical additives to treat water-containing colloids in suspension.

Source: (toolkit 20091023)

chemical nutrient reduction
The use of a chemical eg. aluminium sulphate, ferrous chloride, to reduce the phosphorus content of effluent by chemical precipitation of phosphates and filtration.

Source: (toolkit 20091023)

chemical oxygen demand/COD
The amount (mg/L) of oxygen required to react with chemicals present in effluents to convert them to their oxidised state.

Source: (toolkit 20091023)

chlorine disinfection
Treatment of waste or contaminated water with various forms of chlorine to reduce bacterial hazards or to prevent septicity. The amount required varies with pH, organic matter content, he level of contamination and unoxidised iron and manganese contents.

Source: (toolkit 20091023)

chronic poisons
Toxic substances whose effects take a long time to appear but continue for a long period.

Source: (toolkit 20091023)

clarifier

A structure at a sewage treatment plant designed to separate sludge from clearer effluent; a chemical or the system in which it is used, to remove impurities from a polluted stream or chemical process.

Source: (toolkit 20091023)

clarity and completeness

One of EPA’s five Assessment Factors (see definition) that describes the degree of clarity and completeness with which the data, assumptions, methods, quality assurance, sponsoring organisations and analyses employed to generate the information are documented.

Source: (USEPA-CREM)

class

A set of objects that share a common structure and behaviour. The structure of a class is determined by the class variables, which represent the state of an object of that class and the behaviour is given by the set of methods associated with the class.

Source: (USEPA-CREM)

Class A pan

Because evapotranspiration is difficult to measure directly, atmospheric evaporative demand is often estimated by observing the evaporation rate in an open water container. The Class A pan evaporimeter is the standard instrument used for such observations in Australia. This is a circular pan made of galvanized iron, 4 ft (121 cm) in diameter and 10 in (25 cm) deep, mounted on an open wooden platform. In Australia, the pans are protected with a wire ‘bird-guard’ to stop animals affecting the measurements.

Source: (Rayner 2005)

cluster

A small grouping of allotments, businesses and/or commercial premises of between approximately 2 and 20 in number. For example, a cluster could represent the number of houses in a small suburban street, or a block of apartments. It is a particularly useful scale for exploring decentralised options as it affords potential for some economies of scale in infrastructure delivery and ameliorates some of the need for expensive centralised distribution and collection infrastructure.

Source: (Hardy 2009)

coagulant

A chemical used to convert liquids or suspensions into solids; a material such as alum, gypsum, ferric sulphate etc. used to clarify water by clumping the negatively-charged suspended particles, which then settle as larger particles.

Source: (toolkit 20091023)

Coarse sediment

Sediment that is trapped principally by settling.

Source: (eWater CRC 2008)
**commence to pump indicator**
The indicator measurement, at which irrigators can start pumping.

*Source: (Welsh, Podger 2008)*

**community basins**
Local-scale basins that are shared by a small group of properties and are either privately or authority owned.

*Source: (toolkit 20091023)*

**compacted clay**
Compacted clay or a compacted earth lining consists of importing (and compacting) soils which have better soil characteristics than the in-situ soils (ie low permeability and high resistance to erosion).

*Source: (ANCID 2001)*
*Source: (NWC 2007)*

**compaction of soils in-situ**
This involves the enhancement of in-situ soil characteristics such as stability and permeability using standard compaction techniques.

*Source: (ANCID 2001)*
*Source: (NWC 2007)*

**component**
A collective term for nodes, links, rainfall runoff models, filters and constituent generation models.

**component model**
A model associated with a particular component e.g. node models are associated with nodes; link models with links etc.

**conceptual basis**
This is the underlying scientific foundation of model algorithms or governing equations. The conceptual basis for a model is either empirical (based on statistical relationships between observations) or mechanistic (process-based) or a combination. See definitions for: empirical model and mechanistic model.

*Source: (USEPA-CREM)*

**conceptual model**
A hypothesis regarding the important factors that govern the behaviour of an object or process of interest. This can be an interpretation or working description of the characteristics and dynamics of a physical system.

*Source: (USEPA-CREM)*

**conceptual rainfall runoff model**
A model that represents the hydrological response as a series of mathematical relationships, often attempting to represent the storage and transport of water through conceptual soil water and groundwater storage buckets.
confidence interval

The interval which includes the true value [of a data item, whether observed or estimated] with a prescribed probability and is estimated as a function of the statistics of the sample.

Source: (WMO 2008)

confidence level

The probability that the confidence interval includes the true value.

Source: (WMO 2008)

confined aquifer

An aquifer that is overlain by a confining bed. The confining bed has a significantly lower hydraulic conductivity than the aquifer.

Source: (ANCID 2001)
Source: (NWC 2007)

confluence

The point at which two watercourses join.

Source: (Stanley, K. 2007)

confluence node

A node available in Source. The Confluence node represents the location where two streams are joined to become one. Flows from the two streams are added together. Orders must be passed upward at a confluence so rules must be specified that allow the determination of the proportion of orders to be supplied by each stream flowing into the confluence.

Source: (eWater CRC 2010a)

confounding errors

Errors induced by unrecognised effects from variables that are not included in the model. The unrecognised, uncharacterised nature of these errors makes them more difficult to describe and account for in statistical analysis of uncertainty.

Source: (USEPA-CREM)

connected water/sewerage property

A connected water/sewerage property is: - connected to the licenseeâs water/sewerage system - the subject of billing for water supply/sewerage collectionâfixed and/or consumption - any property which, at the end of the reporting period, is connected to the water/sewerage system and is separately billed for water/sewerage servicesâfixed and/or consumption including a connected non-rateable property, and a connected but non-metered property, but does not include a body corporate, a rated but unconnected property, or a non-real property or strata garages, ie a master meter for a block of separately metered strata title flats.

Source: (NWC 2007)
Source: (National Performance Framework 2006)

conservative constituent

Conservative constituents are those constituents whose concentration is altered by advection and diffusion only
**constant head permeameter**

A device for measuring the saturated hydraulic conductivity of soils. A constant head of water is maintained in a shallow auger hole and the rate of leakage from the apparatus to maintain this constant head (once saturated conditions have been reached) is proportional to the saturated hydraulic conductivity (or permeability) of the soil.

*Source:* (ANCID 2001)  
*Source:* (NWC 2007)

**constants**

Quantities with have fixed values (e.g., the speed of light and the gravitational force) representing known physical, biological, or ecological activities.

*Source:* (USEPA-CREM)

**constituent**

A material that is generated, transported and/or transformed within a catchment. Constituents commonly include sediments, nutrients, contaminants (eg pesticides, heavy metals), pathogens and other water quality properties.

**Constituent concentration**

Ratio of the load of a constituent to the flow rate at a particular location at a particular point in time.

**constituent generation model**

A model for deriving the load of constituents produced from a given functional unit at a model time step.

*Source:* (Merritt, Letcher, Jakeman 2003)

**Constituent load**

Mass of a particular constituent passing a particular point over a defined period of time.

**constituent phase**

The ninth phase of execution within a time-step. In this phase the transport and transformation of water quality constituents is undertaken.

*Source:* (Podger 2011)

**constraint phase**

The second phase of execution within a time-step. In this phase relevant constraints are identified.

*Source:* (Podger 2011)

**constructed (artificial) wetlands**

A built series of aerobic, usually vegetated ponds through which effluent passes to improve its chemical and biological purity, before the liquid content is discharged to the lower catchment.

*Source:* (toolkit 20091023)
constructed wetland

An artificially created system containing pond, marsh and swamp features. The dominant element of the system is the vegetation of the marsh and swamp zones which either requires or can withstand wetting and drying. An artificially-created system often consisting of an inlet zone and vegetated zone that promotes physical, biological and chemical treatment mechanisms for water quality improvement.

Source: (toolkit 20091023)

consumptive pool

The amount of water resources that can be made available for consumptive use in a particular water resource plan area under the rules of the water resource plan for that water resource plan area.

Source: (NWC 2007)
Source: Water Act 2007

contaminant

Biological or chemical substance or entity, not normally present in a system, capable of producing an adverse effect in a biological system, injuring structure or function.

Source: (toolkit 20091023)

Continuity equation

An equation that expresses equilibrium between the various flow components (e.g. inflow, outflow, and storage). Derived initially by Leonardo da Vinci as a statement of the law of conservation of mass.

Source: (Ward and Robinson 1990)

continuous accounting

1. The sub-division of water resources in a dam (within a regulated river system) into user shares. The shares are updated on a frequent basis: eg currently monthly in the Gwydir and Namoi systems. Users manage their usage from their own account. 2. A resource assessment and allocation system with carryover only limited by available storage, user's balances limited to an upper bound, and the storage, transmission and operation losses funded from a communal account. 3. The accounting and sharing out of water resources in either a regulated or an unregulated river system based on an annual cycle, as for annual accounting, but with broader carryover provisions than under annual accounting. This provides water users with greater flexibility in managing their own accounts than under annual accounting, although account balances may not be permitted to become negative (ie no overdraft permitted: if a user needs more water they can enter into a temporary or permanent trade to buy the water needed). Carryover may be limited by annual and multi-year use limits. In a regulated river system the storage, transmission and operation losses are funded from a communal account.

Source: (Welsh, Podger 2008)
Source: River Systems specification
Source: (Ribbons, C 2011)

continuous sharing method

A resource assessment and allocation system with unlimited carryover, user's balances limited to an upper bound, storage losses funded by the water users in proportion to their storage volumes, transmission and operation losses funded by users based on their storage factors. Variation in operation from the fixed storage factors is funded by a joint accounting reconciliation.

Source: River Systems specification
Contributor
A software plugin. A tool to determine the amounts of a constituent that travels to a point in a network.
Source: (eWater CRC 2010b)

conversion (SA)
Conversion of a water allocation from taking to holding or vice versa.
Source: (NWC 2007)

core trenching
A mechanism for reducing the seepage from channels by excavating a trench either side of the channel and filling the trench with an impervious substance.
Source: (ANCID 2001)
Source: (NWC 2007)

corroboration
In some disciplines validation the term âcorroborationâ is preferred because it implies a claim of usefulness and not truth.
Use: validation

covenant
In the context of water entitlements, a covenant is a condition placed on an entitlement that prevents its use under certain conditions.
Source: (Productivity Commission 2006)
Source: (NWC 2007)

covenants (WA)
The indication of a matter which affects the Water Access Entitlement, this could include issues such as the vicinity of wetlands to the consumptive pool which could affect the use permits and extraction rates related to that that consumptive pool
Source: (NWC 2007)

covenants, positive or restrictive (WA)
Covenants requiring that the Water Access Entitlement to be used or not used in specified ways.
Source: (NWC 2007)

covered flexible membrane
The construction of a lined channel using a geomembrane to reduce seepage where the geomembrane is covered with a nonerosivematerial that protects the geomembrane.
Source: (ANCID 2001)
Source: (NWC 2007)
critical drought
The duration in time that resulted in the either the lowest dam levels, aquifer levels or pressures, or longest duration of restricted water access.
Source: (Welsh, Podger 2008)

crop efficiency factor
The dimensionless coefficient, crop factor, assumes 100% efficiency of evapotranspiration from the crop. In reality, there is not 100% efficiency so the crop efficiency factor adjusts for this. Sometimes, this is used as a calibration factor when calibrating a crop model to recorded water use.

crop factor
Dimensionless coefficient used to calculate evapotranspiration requirement for a particular crop from the potential evapotranspiration for a reference crop (ETo). Crop factors are determined experimentally and take into account leaf area development of the crop and the crop canopy physiology.
Source: (ANCID 2001)
Source: (NWC 2007)

Crop Water Economic Index
Gross Production ($) À· Evapotranspiration (mm)
Source: (NWC 2007)
Source: (ANCID 2001)

Crop Water Production Index
Total Product (kg) À· Evapotranspiration (mm)
Source: (NWC 2007)
Source: (ANCID 2001)

crop water requirement
The total volume of water required to meet the plants requirements for evapotranspiration for a given planting area and period (excluding leaching fraction).
Source: (ANCID 2001)
Source: (NWC 2007)

cropping farming
Farm type for which main crops are winter and/or summer grain (wheat, barley, oat etc.).
Source: (toolkit 20091023)

cross banks
mounds of soil created by scraping of snig tracks
Source: (toolkit 20091023)

culvert
An underground structure or pipe carrying water beneath a road, carriageway etc.

Source: (ANCID 2001)
Source: (NWC 2007)

**current balance of committed water**

Volume of water committed (set aside) in storages for environmental water rules at a point in time.

Source: (NWC 2007)
Source: (Sinclair, Knight, Merz 2006)

**current development conditions**

This is a scenario that represents water resource development infrastructure and management practices at the current point in time; this scenario requires regular updating. This term is in common use but can be misleading without a specific reference date. This term is relevant to hydrologic modelling for water management purposes and Water Sharing Plans.

Source: (Welsh, Podger 2008)

**current volume**

The volume of water currently stored.

Source: (NWC 2007)
Source: Water Resources Observation Network

**customer (rural)**

Any individual person or entity entitled to receive a rural water service from a rural water delivery agency.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

**D**

**dam**

A barrier to obstruct the flow of water, especially one of earth, masonry, etc., built across a stream.

Use: water storage

Source: Macquarie Dictionary
Source: (NWC 2007)

**data assimilation**

The combining of diverse data, possibly sampled at different times and intervals and different locations, into a unified and consistent description of a physical system, such as the state of the atmosphere.

Source: (AMS Glossary, 2010)
data fusion

The use of techniques that combine data from multiple sources and gather that information in order to achieve inferences, which will be more efficient and potentially more accurate than if they were achieved by means of a single source. (Source: Wikipedia, [http://en.wikipedia.org/wiki/Data_fusion](http://en.wikipedia.org/wiki/Data_fusion), accessed on 2 Nov. 2010.)

data uncertainty

Uncertainty (see definition) that is caused by measurement errors, analytical imprecision and limited sample sizes during the collection and treatment of data. Data uncertainty, in contrast to variability (see definition) is the component of total uncertainty that is reducible through further study.

Source: (USEPA-CREM)

dead storage

Capacity of a storage that is below the minimum operating level and cannot under normal circumstances be supplied to customers. Dead storage can be accessed for emergency supply (ie in times of drought) by installing temporary pumps to get the water out from below the minimum operating level. The minimum operating level can also be determined by water quality constraints.

Source: (NWC 2007)
Source: Australian Water Resources 2005

Decay (nutrient)

Reduction in the concentration of a constituent with time.

Decay model

An in-stream processing link model available in Source Catchments. Constituent Decay is a simple exponential decay model which acts on the selected constituent load within each link to which the model has been applied. The model is primarily based on physical principles.

Source: (eWater CRC 2010a)

deep drainage

The volume of water that moves below the root zone (ie a component of infiltration water), which cannot be transpired by plants, and which may or may not enter the saturated zone and become recharge to the groundwater system. Estimated as part of the Water 2010 model (BRS, 2006).

Source: Australian Water Resources 2005
Source: (NWC 2007)
Source: (Welsh, Podger 2008)

DEM

Digital Elevation Model

Use: digital elevation model

Source: (NWC 2007)
Source: (toolkit 20091023)

demand
A requirement for water to be met from the sources in the river system. Demands may be consumptive or non-consumptive and may, for example, include town water supplies, irrigation, hydro, industrial, minimum flows, environmental and recreational requirements, and interbasin transfers, but need not be limited to these.

**demand management**
Use of methods aimed at reducing the quantity of water required for irrigation and direct consumption

*Source: (toolkit 20091023)*

**demand model**
A set pattern of demand included in a model. For example, an annual volume distributed between months based on historical demand information that then may be spread over days as a constant (there are many variations).

*Source: (anonymous 2009)*

**demand node**
A type of node model available in Source which allows water users to specify the amount of water they would ideally like to take from the system. Demands can be generated using a number of different demand models.

*Source: eWater CRC*

**denitrification**
The biochemical reduction of nitrate to nitrite or of nitrite to gaseous nitrogen Refers to the conversion of nitrate (NO₃⁻) or nitrite (NO₂⁻) into dinitrogen (N₂) and/or gaseous oxides of nitrogen by means of bacterial respiration.

*Source: (toolkit 20091023)*
*Source: (Stolp 1996)*

**desalination**
The process of removing excess salt and other minerals from water in order to obtain freshwater suitable for human consumption and other purposes. Removal of salts from seawater or other saline solutions by distillation, chemical reactions or use of membranes; leaching of salt from the surface horizon of saline soils.

*Source: (NWC 2007)*
*Source: (toolkit 20091023)*

**design disposal capacity**
The amount of drainage water that a disposal basin can dispose of if the recycled water intercepted by the drainage system is equal to that leaked from the basin. May be given in volumetric units (m³/day or ML/yr) or per unit area (mm/day or ML/ha/yr).

*Source: (toolkit 20091023)*

**destratification**
Reduction of layer formation in water storages by producing turbulence with aerators or mechanised mixers.

*Source: (toolkit 20091023)*
**detention time**

The time it takes for a parcel of water to flow from the inlet of a wetland system to the outlet. Depending on the flow path taken by individual parcels of water, the time may vary significantly within the one system.

*Source:* (toolkit 20091023)

**deterministic model**

Deterministic models contain no random component, and provide no measure of error or uncertainty. They are commonly used for descriptive, analytical and predictive purposes, for example comparison of discharge in paired catchments. Contrast with stochastic models. A model that provides a solution for the state variables rather than a set of probabilistic outcomes. Because this type of model does not explicitly simulate the effects of data uncertainty or variability, changes in model outputs are solely due to changes in model components or in the boundary conditions or initial conditions.

*Source:* (Black 1996)
*Source:* (USEPA-CREM)

**dethridge meter outlet**

Positive displacement flow measurement device used to determine water volumes supplied from the authority supply channel to an individual farm. The meter consists of a metal wheel fitted with 8 vanes around the circumference and mounted on a horizontal axis in a concrete flume emplacement. Water flowing along the flume causes the wheel to rotate and a counting device records the number of revolutions which provides a direct measure of the volume of water supplied over a given time. The counting mechanism records the volume in ML passing through the meter over a given time from which flow rate in ML/d may be derived. In field use the rate of rotation of the wheel in Revolutions per minute, (usually abbreviated to Revs) is used to determine the approximate flow rate by application of a conversion factor determined by the size and geometry of the particular meter.

*Source:* (ANCID 2001)
*Source:* (NWC 2007)

**dethridge-long meter**

The Dethridge-Long (DL) Meter is an improved high capacity meter with 6 vanes and accurately measures flows up to 20 ML/d. The Dethridge Meter is intended primarily for measurement in open channel systems but can also be adapted for use in low pressure pipe systems, channel outfalls and drainage systems.

*Source:* (ANCID 2001)
*Source:* (NWC 2007)

**developed area**

The maximum land area that a farmer has the infrastructure in place to irrigate.

*Source:* (Welsh, Podger 2008)

**developed yield**

Developed yield should be reported as the total volume of water that could be diverted for use, on average, at existing infrastructure levels over the critical period of interest and at a set level of reliability. The developed yield does not include volumes released for the environment, that is, it is the yield capable of being supplied under current infrastructure development after provisions for environmental flows have been made. For some surface water management areas the developed yield may exceed the sustainable yield.

*Source:* (NWC 2007)
*Source:* Australian Water Resources 2005
dewatering
Removal of water from sludge, usually following addition of a polyelectrolyte, using a filter press.
Source: (toolkit 20091023)

DHG
Discharge hillslope gradient
Source: (toolkit 20091023)

Differential attachment
Differential attachment of solutes, especially cations, onto the finer soil particles (silt and clay) occurs due to the larger surface area and surface charge that finer particles have. This results in increased mass of attached solute per unit mass of the soil particle as the size range of the particles decreases and results in enrichment of the solute concentration as the particle size decreases.

diffuse source
Originating from many sites or derived from many processes; a source that cannot be pinpointed because the problem occurs over a wide area.
Source: (toolkit 20091023)

digester
A vessel or tank in which organic or chemical reaction processes take place within controlled conditions.
Source: (toolkit 20091023)

digital elevation model
A digital representation of surface terrain commonly used in geographic information systems. Usually constructed from survey maps and/or remote sensing data.
Source: (toolkit 20091023)

direct potable reuse
Water that has been highly treated to drinking water standards, and is transferred directly from the wastewater treatment plant to the water supply system.
Source: (toolkit 20091023)

direct recycling/reuse
The return of treated wastewater to a service reservoir for reticulation to the reuse site.
Source: (toolkit 20091023)

discharge
The rate at which a volume of water passes through a cross-section per unit of time; measured in cubic metres per second or in megalitres per day
Source: (Stanley, K. 2007)
**discount function**

Refers to water that is discounted from (taken off) the available water calculated after the resource assessment is done because a rule has come into play, for example based on the water level in a water storage.

*Source:* (Welsh, Podger 2008)

**disinfection**

Any process that destroys, inactivates or removes pathogenic micro-organisms; treatment of polluted or contaminated water to kill disease-causing organisms such as viruses, bacteria or protozoa; the destruction of infectious disease-causing organisms at their sources.

*Source:* ( toolkit 20091023)

**disinfection byproduct**

Products of reactions between disinfectants, particularly chlorine, and naturally occurring organic material.

*Source:* ( toolkit 20091023)

**dissolved air flotation**

A stage in sewage treatment whereby air is bubbled through alum and polyelectrolyte-treated water to collect the floc so that it forms a scum on the surface which overflows into a trough for removal.

*Source:* ( toolkit 20091023)

**Dissolved oxygen**

Oxygen that is dissolved in solution in water.

**distillation**

Conversion of a substance to vapour by heating, then condensing the volatile material by cooling in a retort or still; recovery and/or removal of volatile substances by heating and condensation.

*Source:* ( toolkit 20091023)

**distributed water**

Water supplied by water authorities (metropolitan and non-metropolitan) via a distribution network.

*Source:* (NWC 2007)

*Source:* Australian Water Resources 2005

**distribution channel**

A channel whose primary purpose is to deliver water from main channels to individual users.

*Source:* (ANCID 2001)

*Source:* (NWC 2007)

**distribution efficiency**
The efficiency of the system in delivering water from the dams to the users. This is determined by dividing deliveries by releases. (Note: this often excludes hydropower releases and deliveries).

**Source:** (Stanley, K. 2007)

**distribution pipeline**

A supply pipeline whose primary purpose is to deliver water from main channels or pipelines to individual users.

**Source:** (ANCID 2001)
**Source:** (NWC 2007)

**distribution system**

A network of pipes leading from a treatment plant to customers’ plumbing systems

**Source:** (toolkit 20091023)

**diversion**

Water extracted for use from waterways (including storages) by means of pumping or gravity channels.

**Source:** Australian Water Resources 2005
**Source:** (NWC 2007)

**diversion licence**

A right under the relevant water act to divert water from streams and storages in the study area

**Source:** (toolkit 20091023)

**divertable**

The ability to extract water from a surface water or groundwater resource, in a given area.

**Source:** Australian Water Resources 2005
**Source:** (NWC 2007)

**DO**

Dissolved Oxygen. Oxygen that is dissolved in solution in water.

**Use:** Dissolved oxygen

**domain (spatial and temporal)**

The spatial and temporal domain of a model cover the extent and resolution with respect to time and space for which the model has been developed and over which it should be evaluated.

**Source:** (USEPA-CREM)

**domain boundaries (spatial and temporal)**

The limits of space and time that bound a model’s domain and are specified within the boundary conditions (see boundary conditions).
**downstream regulation**

A method of channel regulation where the water level is controlled or maintained on the downstream side of the control structure. This control mode often operates automatically as demand signals are passed up the system.

Source: (NWC 2007)

Source: (ANCID 2001)

**dozer licence**

Licences, which have been issued but are underused.

Source: (toolkit 20091023)

**drainage channel**

An open channel or a modified natural waterway designed to remove excess water from rural lands.

Source: (ANCID 2001)

Source: (NWC 2007)

**drainage diversion**

A drainage surface diversion service that enables customers to pump or divert from a surface drain operated by a rural water delivery agency. In some circumstances, drainage diversion is included in the surface drainage service and the reporting agency should report against the primary service with explanatory comment provided.

Source: (NWC 2007)

Source: (National Performance Framework 2006-07)

**drainage network**

A collection network of carriers which is used to convey irrigation induced excess surface water or excess groundwater.

Source: (National Performance Framework 2006-07)

Source: (NWC 2007)

**drainage network carriers**

Network carriers are typically unlined channels (ie open drains), natural waterways, or buried perforated pipes.

Source: (National Performance Framework 2006-07)

Source: (NWC 2007)

**drainage overpass**

Pipe or flume conduit to convey natural drainage flows across supply channel. Used in steep topography where a drainage subway is not practicable.

Source: (ANCID 2001)

Source: (NWC 2007)
**drainage service**
A rural water service which provides for the collection and removal of water at a specified level of service targeted at increasing sustainability through a reduction in waterlogging and land salinisation and which confers common obligations on customers.

*Source: (NWC 2007)*
*Source: (National Performance Framework 2006-07)*

**drainage subway**
Conduit laid transversely under supply channel to convey natural drainage flows across the channel.

*Source: (ANCID 2001)*
*Source: (NWC 2007)*

**drainage surface diversion service**
A rural water service that provides for the diversion of raw water by customers from a surface water source at a specified level of service and which confers common obligations on customers. Typically, service provision involves water access, works or site licence administration, metering or measurement and monitoring of diversions on a regular basis. Aspects of water planning and water resource management may also be involved.

*Source: (NWC 2007)*
*Source: (National Performance Framework 2006-07)*

**drainage system**
An engineered network of horizontal pipe drains (also referred to as tile drains), horizontal open drains, or groundwater pumping from bores (also called tubewells, spearpoints or wells) used to manage water tables and thereby control waterlogging and the build up of salt in the plant root zone.

*Source: (toolkit 20091023)*

**drainage water**
Water that passes beyond the root zone as a result of rainfall and irrigation.

*Source: (toolkit 20091023)*

**drawdown**
The lowering of a storage resulting from the loss of water from the storage.

*Source: (Stanley, K. 2007)*

**drop structure**
Concrete, timber or steel weir structure placed in supply channel or drain to dissipate energy (to minimise erosion) at a point of desired reduction in water level.

*Source: (ANCID 2001)*
*Source: (NWC 2007)*

**Dry weather concentration (mg/L)**
Concentration of a given constituent during periods of baseflow only.
dS
decisieimens
Source: (NWC 2007)

dual reticulation
A system of piped water reticulation in which treated effluent is provided for industrial, household or garden use, via a separate delivery system to that for potable use.
Source: (toolkit 20091023)

DWC
Dry Weather Concentration
Source: (toolkit 20091023)

DWC (mg/L)
Concentration of a given constituent during periods of Baseflow only.
Use: Dry weather concentration (mg/L)

dynamic model
A model providing the time-varying behaviour of the state variables.
Source: (USEPA-CREM)

DYRESM
Dynamic Reservoir Simulation Model
Source: (toolkit 20091023)

E

E2
Whole-of-catchment model-building and running application that can simulate the effects of scenarios (eg land use or climatic change) on the flow and load of constituents (eg sediments, nutrients, salt) at defined points in a river network over time. A forerunner of Source IMS that could be used to simulate catchment processes to investigate management issues. Now considered obsolete.
Source: (anonymous 2009)

easement (WA)
Gives a person or a company "rights of use or engagement" over land owned by another. This may be in relation to the ability to access land to utilise water.
Source: (NWC 2007)

ecological response model
A model to simulate the ecological response to physical (eg river flow) and biological factors. A model relating the behaviour of one or more organisms (e.g. Macroinvertebrates or Golden Perch) to environmental factors (such as water temperature, flow at a given point or concentration of dissolved Oxygen).

Source: (anonymous 2009)

**ecological values (WA)**

The natural ecological processes occurring within water dependent ecosystems and the biodiversity of these systems.

Source: (NWC 2007)

**ecological water requirements (WA)**

The water regimes needed to maintain ecological values of water dependent ecosystems at a low level of risk.

Source: (NWC 2007)

**ecologically sustainable development (WA)**

Using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. (ESD Strategy, 1992)

Source: (NWC 2007)

**ecologically sustainable use**

Ecologically sustainable use of natural resources means use of the natural resources within their capacity to sustain natural processes while maintaining the life support systems of nature and ensuring that the benefit of the use to the present generation does not diminish the potential to meet the needs and aspirations of future generations.

Source: (NWC 2007)

Source: (EPA 1999)

**economic real rate of return**

Revenue from water and sewerage business operations less operating expenses (OMA + current cost depreciation) for the water and sewerage business divided by written down replacement operational assets for the water and sewerage business.

Source: (NWC 2007)

Source: (National Performance Framework 2006)

**economic water-use efficiency**

An activity is economically efficient if there is no other use where the resources would yield a higher value or net benefit.

Source: (Productivity Commission 2006)

Source: (NWC 2007)

**ecosystem**

A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. A regime involving the interactions between living organisms and their environment; a biotic community of organisms and their relationships with the physical, chemical and biological components of their environment.
ecosystem (WA)
A term used for a specific environment, e.g. wetland, or part thereof, to include all the biological, chemical and physical resources and the interrelationships and dependencies that occur between those resources.
Source: (NWC 2007)

EDC
Endocrine disrupting chemicals
Source: (NWC 2007)

effective rainfall
That portion of total precipitation that is available for uptake by plants.
Source: (ANCID 2001)
Source: (NWC 2007)

effluent
The term ‘effluent’ is used in a number of different ways. Effluent is commonly thought of as being the wastewater discharged from sewage treatment plants or industries into receiving waters, but it could be any discharge (e.g. from a dam to a river downstream). The term ‘effluent’ is used to denote a stream which conveys water away from the main river (i.e. a distributary stream or anabranch). An effluent stream or waterway is one which loses water to groundwater (also known as a ‘losing stream’).
Source: (Welsh, Podger 2008)

effluent irrigation
Application of reclaimed treated water from a sewage or wastewater treatment plant to water and fertilise crops, pastures or recreation areas.
Source: (toolkit 20091023)

EFOs
Environmental Flow Objectives
Source: (NWC 2007)

EIR
Environmental Impact Report
Source: (NWC 2007)

EIS
Environmental Impact Statement
Source: (NWC 2007)
electro-dialysis reversal
A process for removing salt from seawater, using a voltage gradient to remove sodium and chloride ions.
Source: (toolkit 20091023)

electromagnetic survey
Measurement of the apparent resistivity of the sub-surface by recording the response of a secondary electrical field induced by the pulsing of a current through a fixed or mobile loop.
Source: (ANCID 2001)
Source: (NWC 2007)

EMC
Event Mean Concentration
Source: (toolkit 20091023)

EMC (mg/L)
Mean concentration of a particular constituent over the quick flow component of an event hydrograph. EMC = Total constituent load during the event / Total quick flow during the event.
Use: Event mean concentration (mg/L)

EMC/DWC
Model available in Source Catchments. The Event Mean Concentration (EMC) / Dry Weather Concentration (DWC) model applies two fixed constituent concentrations (EMC & DWC) to a functional unit (FU) to calculate total constituent load. This model is based on physical principles.
Use: Event Mean Concentration/Dry Weather Concentration
Source: (eWater CRC 2010a)

empirical model
An empirical model is one where the structure is determined by the observed relationship among experimental data. These models can be used to develop relationships that are useful for forecasting and describing trends in behaviour but they are not necessarily mechanistically relevant.
Source: (USEPA-CREM)

EMS
Environmental Management System
Source: (NWC 2007)

EMSS
Environmental Management Support System
Source: (toolkit 20091023)

EMSS Pre-Processing Tools
(software plugin) Offers a range of tools that were available with the EMSS modelling framework, the fore-runner of Source Catchments. Tools include Hazard Map Scaling, EMSS Sediment Export Coverage Tool and Bulk Clip Time Series.

**Source:** (eWater CRC 2010b)

**encumbrances (WA)**

A lodged or registered interest in water, by a person who is not the registered proprietor. Examples are mortgages, lease agreements, caveats and easements.

**Source:** (NWC 2007)

**end-of-system flow**

Streamflow at the end of a defined river system; eg Murrumbidgee River at Balranald.

**Source:** (Welsh, Podger 2008)

**Enrichment**

Enrichment of solute concentrations in runoff occurs due to differential attachment of solutes on to finer particles (silt and clay) and these finer particle being transported larger distances as they stay suspended for longer in the runoff.

**en-route storage**

A water storage (weir or lake) located either instream or off-stream in the middle or lower part of a river system (eg Hay Weir on the Murrumbidgee).

**Source:** (Welsh, Podger 2008)

**ENSO**

El Nino Southern Oscillation

**Source:** (NWC 2007)

**Entitlements and Trade Terminology**

(a logical grouping of terms in this glossary)

**Environment Protection Agency**

In Queensland, NSW & Victoria, a state regulatory, planning and research organisation responsible for development assessment, policy implementation and management of environmental issues.

**Source:** (toolkit 20091023)

**environmental and other public benefit outcomes**

Environmental and other public benefit outcomes are defined as part of the water planning process, are specified in water plans and may include a number of aspects, including:
- environmental outcomes: maintaining ecosystem function (eg. through periodic inundation of floodplain wetlands); biodiversity, water quality; river health targets; - other public benefits: mitigating pollution, public health (eg. limiting noxious algal blooms), indigenous and cultural values, recreation, fisheries, tourism, navigation and amenity values.

**Source:** (NWC 2007)

**Source:** National Water Initiative
environmental and other public benefit outcomes (WA)

Part of the water planning process, specified in statutory water management plans and may include a number of aspects, such as environmental outcomes: maintaining ecosystem function (eg through periodic inundation of floodplain wetlands); biodiversity, water quality; river health targets; other public benefits: mitigating pollution, public health (eg limiting noxious algal blooms), indigenous and cultural values, recreation, fisheries, tourism, navigation and amenity values.

Source: (NWC 2007)

environmental assets

include: (a) water-dependent ecosystems; and (b) ecosystem services; and (c) sites with ecological significance

Source: (NWC 2007)

Source: Water Act 2007

environmental data

Information collected directly from measurements, produced from models, and compiled from other sources such as databases and literature.

Source: (USEPA-CREM)

environmental demand

A specific instance of a water user node where the water demands of an environmental asset are estimated based on previously agreed rules to protect environmental values.

environmental flow

The provision of water within wetlands, rivers and groundwater systems to maintain aquatic ecosystems and their benefits where the ecosystem is subject to competing water uses, eg irrigation.

Source: (Welsh, Podger 2008)

environmental flow objective (Qld)

An environmental flow objective-as specified in a water resource plan (WRP)-is a flow objective relating to the health of natural ecosystems for the achievement of ecological outcomes. For example, the WRP could specify that the mean annual stream flow at a particular point must be maintained at or above 75% of the mean annual flow that would occur in the absence of all development.

Source: (NWC 2007)

environmental manager

An expertise based function with clearly identified responsibility for the management of environmental water so as to give effect to the environmental objectives of statutory water plans - the institutional form of the environmental manager will vary from place to place reflecting the scale at which the environmental objectives are set and the degree of active management of environmental water required - the environmental manager may be a separate body or an existing Basin, catchment or river manager provided that the function is assigned the necessary powers and resources, potential conflicts of interest are minimised, and lines of accountability are clear.

Source: (NWC 2007)

Source: National Water Initiative
environmental manager (WA)
An expertise-based function with clearly identified responsibility for the management of environmental water so as to give effect to the environmental objectives of statutory water management plans. The institutional form of the environmental manager will vary from place to place reflecting the scale at which the environmental objectives are set and the degree of active management of environmental water required. The environmental manager may be a separate body or an existing basin, catchment or river manager provided that the function is assigned the necessary powers and resources, potential conflicts of interest are minimised, and lines of accountability are clear.

Source: (NWC 2007)

Environmental Water Holdings Special Account
The account established by section 11 of the Water Act.

Source: (NWC 2007)
Source: Water Act 2007

environmental water provisions
Water allocated to support environmental outcomes and other public benefits. Environmental water provisions recognise the environmental water requirements and are based on environmental, social and economic considerations, including existing user rights.

Source: (NWC 2007)
Source: Australian Water Resources 2005

environmental water provisions (WA)
The water regimes that are provided as a result of the water allocation decision making process taking into account ecological, social and economic impacts. They may meet in part or in full the ecological water requirements.

Source: (NWC 2007)

environmental water requirements
Descriptions of flow regimes (e.g. volume, timing, seasonality, duration) that are needed to sustain the ecological values of aquatic ecosystems, including their processes and biological diversity, and that are designed to provide environmental outcomes.

Source: (NWC 2007)
Source: Australian Water Resources 2005

environmentally sustainable level of extraction
The level of water extraction from a particular system which, if exceeded would compromise key environmental assets, or ecosystem functions and the productive base of the resource.

Source: (NWC 2007)
Source: National Water Initiative

environmentally sustainable level of extraction (WA)
The level of water extraction from a particular system which, if exceeded would compromise key environmental assets, or ecosystem functions and the productive base of the resource.

Source: (NWC 2007)
EPBC
Environment Protection and Biodiversity Conservation Act 1999 (Cth)
Source: (NWC 2007)

EPHC
Environment Protection and Heritage Council
Source: (NWC 2007)

ephemeral
A short-lived, transitory event or occurrence often used to describe the life cycle of plants and animals. When used to describe wetlands, ephemeral refers to habitats that are either rarely inundated or only inundated for a very short period of time.
Source: (toolkit 20091023)

epistemic uncertainty
Uncertainty due to imperfect knowledge; this form of uncertainty can be reduced by further studies such as research and data collection.
Source: (Refsgaard et al, 2005b)

equifinality
The principle that in open systems a given end state can be reached by many potential means. In environmental modelling studies, and especially in hydrological modelling, two models are equifinal if they lead to an equally acceptable or behavioural representation of the observed natural processes. (Source: Wikipedia, http://en.wikipedia.org/wiki/Equifinality, accessed on 30 June 2010.)

equivalent persons
The total population computed in adult terms, making allowance for a different or lower demand for a resource or output of a waste product by younger persons.
Source: (toolkit 20091023)

ER
Enrichment Ratio
Source: (toolkit 20091023)

ESC
Essential Services Commission
Source: (NWC 2007)

ESD
Ecologically Sustainable Development
Source: (NWC 2007)

estuarine
Relating to that part of an inlet or river mouth where there is a tidal influence on the fresh or brackish current, affecting water height, salinity and nutrient levels, erosion and drainage channels on a daily basis.

Source: (toolkit 20091023)

estuary

The part of the mouth or lower course of a river in which its current meets the sea’s tides, and is subject to their effects.

Source: Macquarie Dictionary
Source: (NWC 2007)

ETO

Potential or actual evapotranspiration. Process of moisture loss to the atmosphere from plants by transpiration and evaporation.

Use: evapotranspiration

evaluation

The process used to generate information to determine whether a model and its results are of a quality sufficient to serve as the basis for a regulatory decision.

Source: (USEPA-CREM)

evaluation and review

One of EPA’s five Assessment Factors (see definition) that describes the extent of independent verification, validation and peer review of the information or of the procedures, measures, methods or models.

Source: (USEPA-CREM)

evapoconcentration

The increase in salinity of water in the basin as it evaporates. A non-linear decrease in evaporation rate is observed as the water salinity increases

Source: (toolkit 20091023)

evaporate

To turn to vapour; pass off in vapour, or to give off moisture.

Source: Macquarie Dictionary
Source: (NWC 2007)

evaporation

The process by which water changes its physical state from a liquid to a gas, so that vapour is lost from soil or water directly into the atmosphere, due to increased temperature.

Source: (toolkit 20091023)

evaporative area

The area of the basin usually covered by water and therefore the area over which evaporation takes place.
evapotranspiration

Evapotranspiration (ET) is a collective term for the transfer of water, as water vapour, to the atmosphere from both vegetated and un-vegetated land surfaces. It is affected by climate, availability of water and vegetation. Process of moisture loss to the atmosphere from plants by transpiration and evaporation. The combined loss of water from an area during a specified time by surface evaporation and transpiration by plants; water loss by these two processes as vapour from the water, soil, plant system. Potential or actual evapotranspiration. Process of moisture loss to the atmosphere from plants by transpiration and evaporation.

Source: Australian Water Resources 2005
Source: (NWC 2007)
Source: (toolkit 20091023)
Source: (Australian Bureau of Meteorology 2010)

EVC

Ecological Vegetation Communities

Source: (toolkit 20091023)

Event flow

Difference between the total flow and the baseflow for a flood event.

Event mean concentration (mg/L)

Mean concentration of a particular constituent over the quick flow component of an event hydrograph. EMC = Total constituent load during the event / Total quick flow during the event.

Event Mean Concentration/Dry Weather Concentration

Model available in Source Catchments. The Event Mean Concentration (EMC) / Dry Weather Concentration (DWC) model applies two fixed constituent concentrations (EMC & DWC) to flow generated from a functional unit (FU) to calculate total constituent load. EMC is applied to quick flow and DWC to baseflow.

Source: (eWater CRC 2010a)
Source: (Merritt, Letcher, Jakeman 2003)

EWR

Environmental Water Release

Source: (NWC 2007)

exceedance probability

Probability that an event of specified magnitude will be equalled or exceeded in any defined period of time, on average. In the context of natural resource management, examples of events include storms, floods, earthquakes, algal blooms and droughts. Exceedence probabilities are generally calculated and expressed as 1 in year AEP events (sometimes without the AEP); for example 1 in 100 year flood. With storms, the duration is also important; hence terms such as the 1 in 20 AEP 24 hour storm are used. Duration is important with droughts as well, and here the AEP concept becomes complicated because droughts can persist for more than one year. In such cases the exceedence probabilities may be expressed for a range of periods, e.g. 2 yrs, 5 yrs, and 10 yrs.

Source: (Welsh, Podger 2008)
exchange rate
The rate of conversion calculated and agreed to be applied to water to be traded from one trading zone and/or jurisdiction to another.

Source: National Water Initiative
Source: (NWC 2007)

exchange rate (WA)
The rate of conversion calculated and agreed to be applied to water to be traded from one trading zone and/or jurisdiction to another.

Source: (NWC 2007)

exit fee
A charge (often per megalitre) imposed on the trade of a water entitlement out of an irrigation district.

Source: (Productivity Commission 2006)
Source: (NWC 2007)

expansion limited
Describes basins where the rate of leakage is determined by the rate at which water can move laterally and vertically away from the basin. Leakage is therefore determined by the differences in depth between the water in the basin and the groundwater, and the hydraulic conductivity of soil, aquifers and aquitards around the basin.

Source: (toolkit 20091023)

expert elicitation
A systematic process for quantifying, typically in probabilistic terms, expert judgments about uncertain quantities. Expert elicitation may be used to characterise uncertainty and fill data gaps where traditional scientific research is not feasible or data are not yet available. Typically, the necessary quantities are obtained through structured interviews and/or questionnaires. Procedural steps can be used to minimise the effects of heuristics and bias in expert judgments.

Source: (USEPA-CREM)

Exponential decay
A model of the reduction in the load of a constituent with time where the rate of reduction is proportional to the load of the constituent at that point in time.

Export rate (kg/ha/a)
Average rate of generation and/or delivery to stream of a particular constituent per unit area and per unit time.

Export Rate model
Model available in Source Catchments. The Export Rate model applies a fixed constituent rate to a functional unit (FU) to calculate total constituent load. It requires only single parameter so is quick to use and therefore useful for exploring sensitivity. This model is based on physical principles.

Source: (eWater CRC 2010a)
exposed flexible membrane

An uncovered or exposed geomembrane lined channel is constructed by simply placing the material on the subgrade of the channel.

Source: (ANCID 2001)
Source: (NWC 2007)

extraction for environmental purposes

Extraction of water pursuant to an environmental water access entitlement.

Source: (NWC 2007)
Source: (Sinclair, Knight, Merz 2006)

extraction rate

The rate in terms of unit volume per unit time that water can be drawn from a surface or groundwater system. Used in the NWI in the context of a constraint that might exist due to the impact of exceeding a particular extraction rate at a particular point or within a specified system.

Source: (NWC 2007)
Source: National Water Initiative

extraction rate (WA)

The rate in terms of unit volume per unit time that water can be drawn from a surface or groundwater.

Source: (NWC 2007)

extrapolation

Extrapolation is a process that uses assumptions about fundamental causes underlying the observed phenomena in order to project beyond the range of the data. In general, extrapolation is not considered a reliable process for prediction; however, there are situations where it may be necessary and useful.

Source: (USEPA-CREM)

F

Falling limb

Part of a flood hydrograph where the stream level or flow is decreasing with time.

false negatives

Also known as false acceptance decision errors. False negatives occur when the null hypothesis or baseline condition cannot be rejected based on the available sample data. The decision is made assuming the baseline condition is true when in reality it is false.

Source: (USEPA-CREM)

false positives

Also known as false rejection decision errors. False positives occur when the null-hypothesis or baseline condition is incorrectly rejected based on the sample data. The decision is made assuming the alternate condition or hypothesis to be true when in reality it is false.
Farm Dam model

The Farm Dam model has been developed from the Tool for Estimating Dam Impacts (TEDI) which has been used effectively to estimate the impact of farm dams on stream flows in many catchments in Australia, particularly in Victoria and New South Wales. The Farm Dam model acts as a filter model by capturing a proportion of runoff within each functional unit (FU), according to the total storage density of dams. Overflow from dams in one FU will contribute to the total runoff of all FUs within a sub-catchment. This is a mass balance model based on conceptual relationships.

Source: (eWater CRC 2010a)

FARWH

Framework for Assessment of River and Wetland Health

Source: (NWC 2007)

FEBIGS

Floodplain Ecosystem Benefits of Interactions between Groundwater and Surfacewater.

Source: (Welsh, Podger 2008)

field capacity approximation

The equilibrium water content of an undisturbed soil core at a soil suction of 0.01MPa. If only loose, or disturbed soil is available, the equilibrium water content at 0.033MPa suction should be used. In both cases the method used to determine the field capacity value should be clearly stated (Loveday, 1974).

Source: (ANCID 2001)

Source: (NWC 2007)

field water requirement

Total volume of water required to meet the combined water requirements for evapotranspiration, leaching and distribution for a given planting area and period.

Source: (ANCID 2001)

Source: (NWC 2007)

filter

A filter model represents any transformation or storage of constituents that takes place between when they are generated and when they reach a sub-catchment node. Filtering allows representation of physical processes that may occur due to riparian buffers, small dams or detention ponds or denitrification processes.

filter model

A model that represents the reduction in concentration of a particular constituent between where it is generated in a catchment and delivery of that constituent to the node-link network in a Source Catchments model.

filter-strips

intact belts of forest adjacent to streams to control water quality
filtration

The separation of suspended material from a liquid by passing the liquid through a porous substance, a filter or other membrane which will retain insoluble matter or particles large in size than the pores in the membrane.

Source: (toolkit 20091023)

Financial year

Year that aligns with Government, company or tax reporting requirements. In Australia, taxation requirements and many companies and Governments use 1 July through 30 June as the financial year and this year is often adopted as the reporting year for water accounts.

Fine sediment

Sediment that is trapped principally by infiltration and adhesion.

Source: (eWater CRC 2008)

first flush

The initial flow of stormwater runoff that often contains high concentrations of contaminants that have built up during intervening dry periods; a mechanical device used to reject and discard the initial runoff from a roof catchment, so as to reduce contaminant loading to a storage tank.

Source: (toolkit 20091023)

fish ladder

A structure on a dam or weir designed to allow fish to move upstream to fresh water or downstream to the estuary or sea.

Source: (toolkit 20091023)

fixed charge

The fixed amount the business levies on a residential property per year. This is the component of each residential property’s bill that varies with the amount of water used or sewage produced.

Source: (NWC 2007)

Source: (National Performance Framework 2006)

Fixed Concentration

Node model available in Source Catchments. The fixed concentration node model allows the user to specify the concentration of a constituent at a particular node. This is a conceptual model.

Source: (eWater CRC 2010a)

fixed crest weir

Permanent weir structure across a channel waterway used to measure water flow and/or control upstream water level. This may include both sharp crested and broad crested weirs.

Source: (ANCID 2001)
flexible membrane
A geomembrane is a thin flexible impermeable liner, which combined with the strength of the base soil, can be used to reduce seepage. There are two distinct ways of constructing channels using geomembranes: Covered flexible membrane and exposed flexible membrane.

Source: (ANCID 2001)
Source: (NWC 2007)

flood flows
Excess water from an on-stream reservoir passing through a spillway to re-enter the waterway

Source: (toolkit 20091023)

Flood frequency curve
A curve that shows the mathematical relationship between flood peak flows, flood peak water levels or flood volumes at a particular location and the annual exceedance probability of that quantity.

Flood Harvesting Diversion
A node model available as a plugin to Source Catchments. The Flood Harvesting Diversion model replicates a licensing procedure to grant a landholder (such as a farmer or irrigator) permission to divert an amount of water from the river system if the water level exceeds a height threshold, such as during a major flood.

Source: (eWater CRC 2010a)

Flood hydrograph
The trace which describes the change in stream flow (or water level) over time at a given location in a stream during a flood event.

flood mitigation
Reduction of the severity of physical and economic losses caused by floodwater inundating land or damaging structures

Source: (toolkit 20091023)

flood mitigation volume
A volume of storage that is managed to minimise the risks of downstream flooding and may vary throughout the year.

Source: (NWC 2007)
Source: Water Resources Observation Network

Flood peak
The maximum value of flow or water level observed during a flood event.

flood retarding basin
A temporary flood storage system used to reduce flood peaks.
flood frequency
the percentage of days (during December-April) during which flooding occurred in the Barmah-Millewa Forest (also known as unseasonal flooding frequency).

floodplain
The low-lying land adjacent to the riparian zone.

floodplain harvesting
Includes water: Pumped from the floodplain to an on farm storage during large floods using secondary lift pumps. Entering an on farm storage from the floodplain because flood levels are high enough to allow it to flow in by gravity.

flow
definition of a flow hydrograph as it moves downstream, due to channel and floodplain storage and frictional effects. Also known as flow attenuation and translation.
flow routing model
A model for estimating the flow hydrograph at the downstream end of a model link (or stream reach) given the flow hydrograph at the upstream end of the model link or stream reach.

flume
Open conduit having concrete, metal or timber sides and floor used as a supply channel where topography is not suitable for a conventional earthen channel. Flumes are often raised above natural surface and supported by columns or piers.

Flux
Rate of water flow or flow of a constituent past a point per unit time.

FMA
Forest Management Area

forcing/driving variables
External or exogenous (from outside the model framework) factors that influence the state variables calculated within the model. These may include, for example, climatic or environmental conditions (temperature, wind flow, oceanic circulation, etc.).

forms
Models can be represented and solved in different forms, including: analytic, stochastic, and simulation.

freeboard
Vertical distance between a channel’s maximum design operating level and the top of the channel bank.

freehold land (WA)
The greatest estate that can be held by a person without being the absolute owner, which is the Crown.

FU
Functional Unit. Areas of a catchment (either contiguous or non-contiguous) that are assumed to have similar responses in terms of hydrology and/or generation and movement of constituents.

Use: functional unit

full supply level

The maximum normal operating level of a reservoir behind a dam. The water level can go above this, such as during floods when the spillway is operating (referred to as flood surcharge), but if the water level rises above the crest of the dam then the dam will be overtopped, and it may fail. For example, Burinjuck Dam was overtopped on one occasion, but did not fail. Sometimes the FSL may be set lower than the maximum capacity for dam safety reasons.

Source: (Welsh, Podger 2008)
Source: Australian Water Resources 2005
Source: (NWC 2007)

function

A mathematical relationship between variables.

Source: (USEPA-CREM)

functional unit

Areas of a catchment (either contiguous or non-contiguous) that are assumed to have similar responses in terms of hydrology and/or generation and movement of constituents. Functional units (FUs - “foos”) divide the sub-catchments into areas with a common response or behaviour based on various combinations of land use/cover (e.g., forest, crop, urban), management, position in landscape (flat, hillslope, and ridge) and/or hazard (however defined). Functional units are similar in definition to hydrological response units that are commonly used to delineate sub-catchments in other similar catchment modelling frameworks. However, the meaning is intended to be more general than just hydrology, which is why this term is preferred over “hydrological response unit”. Three basic “processes” are defined to operate within a functional unit: runoff generation (rainfall runoff) as constituent (contaminant) generation as filtering. Note that, unless it occurs at the start of a sentence, “functional unit” should generally be written in lower case.

G

Gauge

“Device for measuring the level of water in a stream with time, which can then be used to estimate the flow rate of water.”

Use: Streamflow gauge

gauge node

A node model available in Source. The Gauge node model provides a marker for a physical gauge location in a catchment, or a point of interest in a river network where you need to be able to record and view the modelled flow.

Source: (eWater CRC 2010a)

Gaussian distribution
Also known as the normal distribution, it has a characteristic bell shape that is centred around the mean. Scores occurring closer to the mean are more likely, with 68% occurring within 1 standard deviation of the mean. As values deviate more from the mean their occurrence decreases. 95% of scores occur within 2 standard deviations from the mean, and 99% occur within 3 standard deviations.

Source: (Ross 2005)

GDE
Groundwater Dependent Ecosystem
Source: (NWC 2007)

GHA
general harvest area
Source: (toolkit 20091023)

GHG
Greenhouse gases
Source: (NWC 2007)

gigalitre
1,000,000,000 litres.
Source: (NWC 2007)

GIS
Geographic Information System
Source: (NWC 2007)
Source: (toolkit 20091023)

GMA
Groundwater management area
Source: (NWC 2007)

GMP
Groundwater Management Plan
Source: (NWC 2007)

GMS
Groundwater Management System
Source: (NWC 2007)

Gnangara Mound (WA)
The Gnangara Mound is Perth's largest source of groundwater, stretching from Gingin in the north to the Swan River in the south. It is commonly referred to as the superficial shallow or unconfined aquifer overlaying deeper confined aquifers.

Source: (NWC 2007)

graded approach

The process of basing the level of application of managerial controls applied to an item or work according to the intended use of results and degree of confidence needed in the results.

Source: (USEPA-CREM)

groundwater

A raw water supply service from a supply network which is provided as an open gravity outfall to a customer's property or, if a piped supply network, where the design residual pressure head at more than 95% per cent of customer service points is less than 3 metres.

Source: (NWC 2007)

grazing farming

Farm enterprise for which cattle and sheep are the main products. Crops are annual and perennial pasture.

Source: (toolkit 20091023)

Great Anabranch

The Great Anabranch leaves the main channel of the Darling River below the Menindee Lakes and rejoins the main channel of the Murray River some 300 miles/480 km later below the Darling-Murray confluence. Refer 34° 5’ 54” S, 141° 46’ 20” E. Source: http://encyclopediaworldwide.com/anabranch.

grey water

Effluent from kitchen, bathroom and laundry used earlier for washing household utensils and clothes, in cooking, showering and bathing.

Source: (toolkit 20091023)

Grid Based Input Assignment

A method commonly used in Source Catchments input screens that shows a table with model components (FU, sub-catchments, links or nodes) listed down the left columns and table cells in the remaining columns where the user can select model options or provide model parameter values.

gross pollutant trap

A structure used to trap large pieces of debris (> 5 mm) transported through the stormwater system.

Source: (toolkit 20091023)

groundwater
(a) water occurring naturally below ground level (whether in an aquifer or otherwise); or (b) water occurring at a place below ground that has been pumped, diverted or released to that place for the purpose of being stored there; but does not include water held in underground tanks, pipes or other works.

Source: Water Act 2007
Source: (NWC 2007)

**Groundwater - Surface Water Interaction Tool**

Groundwater - Surface Water Interaction Tool developed by eWaterCRC.

Source: (anonymous 2009)

**groundwater dependent ecosystems**

Ecosystems that are dependent on groundwater for their existence and health.

Source: Australian Water Resources 2005
Source: (NWC 2007)

**groundwater discharge**

Flow of groundwater from the saturated zone to the earth surface.

Source: Australian Water Resources 2005
Source: (NWC 2007)

**groundwater diversion service**

A rural water service which enables customers to divert or pump water from a groundwater source at a specified level of service and which confers common obligations on customers. Typically, service provision involves water access, works or site licence administration, metering or measurement and monitoring of diversions on a regular basis. Aspects of water planning and water resource management may also be involved.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

**groundwater drawdown**

The lowering of the water table resulting from the loss of water from the aquifer.

Source: (Stanley, K. 2007)

**groundwater flux**

Water lost or gained from the interaction between the river and a groundwater aquifer. A loss is represented by a positive number, a gain by a negative number.

Source: River Systems specification

**groundwater management unit**

A hydraulically connected groundwater system that is defined and recognised by state and territory agencies. This definition allows for management of the groundwater resource at an appropriate scale at which resource issues and intensity of use can be incorporated into local groundwater management practices.

Source: (NWC 2007)
groundwater recharge
Inflow of water to a groundwater reservoir from the surface. Infiltration of precipitation and its movement to the water table is one form of natural recharge.
Source: Australian Water Resources 2005
Source: (NWC 2007)

GSWIT
Groundwater/SurfaceWater Interaction Tool.
Use: Groundwater - Surface Water Interaction Tool

GUI
Graphical User Interface.
Source: (Welsh, Podger 2008)

GWlag
GWlag is a Rainfall Runoff model and includes the companion models SimpleGWSaltModel, PumpingImpactModel, and FlowScaledNodeLossModel which are Constituent (salt) Generation, Catchment and Node models respectively.
Source: (Gilfedder et al, 2012)

H
HACCP
Hazard Analysis and Critical Control Point
Source: (NWC 2007)

hard water
Water which, due to the presence of calcium and magnesium salts in solution, reduces lathering after soap or detergent addition, reduces the efficiency of water-clarifying agents and flocculants, shortens the life of water heaters and pipes due to scale formation and then effectiveness of some pesticides. Hardness may be temporary (reduced by boiling) or permanent.
Source: (toolkit 20091023)

harmony operation
The operation of reservoirs in parallel with the aim of minimising the amount of spill from both reservoirs, while ensuring user needs within the branch are also met.

Hazard map
A spatial map or grid that defines the relative likelihood (or hazard) of sediment erosion from different parts of the catchment.

HCV
High Conservation Value
Source: (NWC 2007)

headwater
The source and upper reaches of a natural waterway.
Source: (Stanley, K. 2007)

headwater storage
A water storage reservoir created by a dam in the upper (usually higher rainfall) part of a river valley.
Source: (Welsh, Podger 2008)

hectare
An area equal to the area of an equilateral rectangle where each side is one hundred metres in length.
Source: eWater CRC

heritage value
The heritage value of a place includes the place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians.
Source: (EPA 1999)
Source: (NWC 2007)

high flow loss
Water loss from a reach during periods of high flow.
Source: River Systems specification

high level of development
Sum of water access entitlements is between 70 per cent and 100 per cent of sustainable yield.
Source: (NWC 2007)
Source: Australian Water Resources 2005

hindcasting
Modelling of scenarios representing the past, the present or possible future conditions using historical time series data as input. [This term is in common use in other fields such as coastal hydraulics modelling, where the context is exactly the same as here: e.g. modelling historical ocean wave patterns/regimes for different beach and/or coastal engineering scenarios].
Source: (Clement 2011)

HoA
Heads of Agreement
Source: (NWC 2007)
horticultural farming

Farm enterprise for which fruits and vegetables (grapevine, citrus, stone fruit etc.) are the main crops. Crops can be annual or perennial.

Source: (toolkit 20091023)

household sewage treatment plants

Four-stage treatment systems for household effluent disposal allowing the effluent to be used for garden or lawn irrigation.

Source: (toolkit 20091023)

Hydraulic Analysis Module

(software plugin) Allows users to construct a one-dimensional hydraulic model of a river reach and determine ecologically relevant flow thresholds based on hydraulic parameters such as water depth and velocity. Allows the creation of time series data.

Source: (eWater CRC 2010b)

Hydraulic conductivity

The flow rate of water through rock or soil under a unit hydraulic gradient. Commonly measured as metres per second or metres per day.

Source: (Huggett 2007)

hydraulic efficiency

Describes the extent to which uniform flow conditions occur at any wetland cross section

Source: (toolkit 20091023)

hydraulic head

The sum of the elevation head, the pressure head, and the velocity head at a given point in an aquifer.

Source: (ANCID 2001)

Source: (NWC 2007)

Hydraulic radius

Ratio of cross sectional area of flow at a given point in a stream channel to the wetted perimeter of the flow.

hydraulic roughness

Surface roughness of any medium that influences the velocity distribution of flow

Source: (toolkit 20091023)

hydraulics

The science that deals with the laws governing water or other liquids in motion and their applications in engineering. The science of the conveyance of water through a natural or artificial structure (eg wetland, pipe, channel).

Source: Macquarie Dictionary
hydrodynamics

The fluctuation or changes in flow behaviour (depth, direction, etc.) within a waterbody resulting from the interaction of hydrologic and hydraulic attributes of the system and surrounding environment.

Source: (toolkit 20091023)

hydro-electric

Relating to the generation and distribution of electric energy derived from the energy of falling water or other hydraulic source.

Source: Macquarie Dictionary
Source: (NWC 2007)

hydrograph

The trace which describes the change in stream flow (or water level) over time at a given location in a river system.

Source: (Welsh, Podger 2008)

hydrologic cycle

The circulation of water from the oceans through the atmosphere to the land and ultimately back to the ocean.

Source: (Welsh, Podger 2008)

hydrologic effectiveness

Describes the interaction between runoff capture, detention time and detention volume within a wetland system.

Source: (toolkit 20091023)

Hydrologic equation

"An equation that expresses equilibrium between the various flow components (e.g. inflow, outflow, and storage).Derived initially by Leonardo da Vinci as a statement of the law of conservation of mass."

Use: Continuity equation
Source: (Ward and Robinson 1990)

hydrologic model

A hydrologic model is a computer program that simulates stream flows, water losses, storages, releases, in-stream infrastructure, water diversion and water management rules within a river system.

Source: (Stanley, K. 2007)

hydrologic regime
Describes the long-term spatial variation in the water depths and period of inundation within a wetland system.

Source: (toolkit 20091023)

hydrological forecasting

WMO (2009) lists three categories:a) Short term: periods of up to two daysb) Medium range: periods ranging from 2 to 10 days c) Long range: periods exceeding 10 days

Source: (WMO 2009)

hydrological response unit

Similar to a functional unit, but can be a more specific term that only relates to hydrological response rather than generation and delivery of constituents.

Use: functional unit

hydrology

The science dealing with water on the land, or under the earth’s surface, its properties, laws, geographical distribution, etc. The science of the natural occurrence, distribution and movement of water. The study of water occurrence.

Source: Macquarie Dictionary

Source: (NWC 2007)

Source: (toolkit 20091023)

hydrotropic

Turning or tending towards moisture.

Source: Macquarie Dictionary

Source: (NWC 2007)

Hysteresis

Phenomenon whereby the water level at a particular point in a stream is not uniquely related to the flow rate. Due to changes in the slope of the water surface with time during a flow event, for a given water level the flow rate will be higher on the rising limb of the hydrograph than on the falling limb.

ICL

Integrated Closed Loop Design

Source: (NWC 2007)

ICM

Integrated Catchment Management

Source: (NWC 2007)

IDEA
Intermittently Decanted Extended Aeration

Source: (NWC 2007)

**IDMP**

Irrigation and Drainage Management Plans

Source: (NWC 2007)

**IFIM**

Instream Flow Incremental Methodology

Source: (NWC 2007)

**in situ field capacity**

The percentage of water remaining in a soil two or three days after having been saturated, with the soil surface covered to prevent evapotranspiration and after free drainage has practically ceased.

Source: (ANCID 2001)

Source: (NWC 2007)

**indigenous heritage value**

Indigenous heritage value of a place means a heritage value of the place that is of significance to indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history.

Source: (NWC 2007)

Source: (EPA 1999)

**infiltration**

The process by which water soaks into the soil from precipitation or irrigation. The movement of water through soil pores or other porous material

Source: (Welsh, Podger 2008)

Source: (toolkit 20091023)

**Infiltration capacity**

Maximum rate per unit time and area that water (usually from precipitation) can pass into an unsaturated soil. Usually this is the same as the hydraulic conductivity of the soil.

**Infiltration excess runoff**

Runoff that is generated due to the rate of water input (usually from precipitation) exceeding the infiltration capacity of the catchment.

**infiltration limited**

Describes basins where the rate of leakage is determined by factors that impact at the base of the basin. Leakage is therefore determined by the depth of water in the basin, and is moderated by the permeability of the basin floor.

Source: (toolkit 20091023)
inflow
The average flow rate into a link or river reach during a time-step.

Source: River Systems specification

inflow (stormwater)
Stormwater entering a sewage treatment plant, due to illegal connections. Movement of liquid into a storage.

Source: (toolkit 20091023)

inflow node
A node model available in Source. An Inflow node originates flows into a model. Inflows include runoff generated for defined headwater and residual catchment areas in the river system, point sources of water such as inter-basin transfers, and return flows from water users. Inflows are not used to account for rain falling directly on water bodies.

inflows
Surface water runoff and deep drainage to groundwater (groundwater recharge) and transfers into the water system (both surface and groundwater), for a defined area.

Source: Australian Water Resources 2005
Source: (NWC 2007)

influent stream
An influent stream is one which gains water from groundwater (also known as a gaining stream).

Source: (Welsh, Podger 2008)

INRM Groups
Integrated Natural Resource Management Groups

Source: (NWC 2007)

in-stream use
The use of freshwater in situ (for example, within a river or stream). Can include recreation, tourism, scientific and cultural uses, ecosystem maintenance, hydroelectricity and commercial activities, and dilution of waste. The volume of water required for most in-stream uses cannot be quantified, with the exception of hydro-electricity generation.

Source: (NWC 2007)
Source: Australian Water Resources 2005

instrument (WA)
A category of legal document which includes transfers, easements, leases, mortgages, etc., under any Act which affects the registration of Water Access Entitlement dealings.

Source: (NWC 2007)

Integrated Quantity and Quality Model
River system model that has been widely applied in Queensland and New South Wales over the 1990s and 2000s for the development of water sharing and water resources plans. River system model that has been widely applied in Queensland and New South Wales over the 1990s and 2000s for the development of water sharing and water resources plans.

Source: (Welsh, Podger 2008)

integrity

One of three main components of quality in EPA’s Information Quality Guidelines. Integrity refers to the protection of information from unauthorised access or revision to ensure that the information is not compromised through corruption or falsification.

Source: (USEPA-CREM)

Interception

Precipitation that is caught by vegetation in the catchment and later evaporated without contributing to infiltration or runoff.

interception activity

The interception of surface water or groundwater that would otherwise flow, directly or indirectly, into a watercourse, lake, wetland, aquifer, dam or reservoir that is a Basin water resource.

Source: (NWC 2007)

Source: Water Act 2007

interception works

Horizontal drains or open drains placed close to disposal basins to intercept leakage from the basin. They are usually sited within 2-20 m of the outer bank and at a depth close to the mean winter regional water table.

Source: (toolkit 20091023)

interflow

"Water that infiltrates the soil surface and then moves laterally through the upper soil horizons towards the stream channels, either as unsaturated flow, or more usually, as shallow perched saturated flow above the main groundwater level. Ward, R.C. and M. Robinson (1990) Principles of Hydrology (3rd Edition), McGraw-Hill, England."

Use: lateral throughflow

Source: (Ward and Robinson 1990)

internal spilling

A process that occurs in storages when there are multiple water owners with fixed storage shares. When one or more owners' shares in a storage are full but the overall storage is below full supply level, water belonging to those owners whose shares in the storage are full will be assigned to other water owners in the storage whose shares are not full, based on a set of predefined rules. The process continues until the storage full supply level is reached then any water remaining becomes external spill.

Source: (Gilmore et al 2008)

internal technical guidelines
Model application guidelines that usually focus on the technical aspects of modelling and are mainly intended for use by modellers. Examples are QA procedures in particular organisations, manuals for software packages which might include hints on how to best use the package, and some text books.

Source: (Refsgaard et al, 2005a)

interstate transfer (NSW)

The cancellation of a licence and subsequent grant of a corresponding interstate entitlement, or the grant of a licence after the cancellation of a corresponding interstate entitlement.

Source: (NWC 2007)

interstate water assignment (NSW)

The reduction or increase in the water allocations in the account of a water licence associated with corresponding changes in interstate entitlements.

Source: (NWC 2007)

intrinsic variation

The variability (see definition) or inherent randomness in the real-world processes.

Source: (USEPA-CREM)

inverted siphon

Structure or section of pipeline that conveys channel flow under a natural depression, river or drain.

Source: (ANCID 2001)
Source: (NWC 2007)

IPR

Indirect Potable Re-use

Source: (NWC 2007)

IQQM

Integrated Quantity and Quality Model (or Modelling). River system model that has been widely applied in Queensland and New South Wales over the 1990s and 2000s for the development of water sharing and water resources plans.

Use: Integrated Quantity and Quality Model

Source: (Welsh, Podger 2008)

IQQM crop model

A specific instance of a water user node where demands are estimated based on crop water requirements that take account of climatic factors.

irrigate

To supply land with water and thereby promote vegetation by means of canals, especially artificially made, passing through it.

Source: Macquarie Dictionary
irrigation area protected by drainage

The area of irrigated land serviced by either surface or sub-surface drainage.

Source: (NWC 2007)
Source: (ANCID 2001)

irrigation corporation contract/shareholding (NSW)

The right to have water delivered to a property by an Irrigation Corporation.

Source: (NWC 2007)

irrigation diversions

The volume of water extracted from waterways for irrigation purposes. The volume includes all losses incurred from when the water is diverted from the river or reservoir by individual users until it is delivered to the farm gate.

Source: Australian Water Resources 2005
Source: (NWC 2007)

irrigation network supply service

A raw water supply service from a supply network (either gravity or pressurised) where the majority of water is taken for the purpose of irrigation.

Source: (NWC 2007)
Source: (National Performance Framework 2006)

irrigation right (Tas)

A right under the Irrigation Clauses Act 1973 to be supplied with water for irrigation. Irrigation rights are issued by the Irrigation Entity and are granted from the Entity’s bulk Water allocation. Irrigation rights are linked to land, and held by the occupier of the corresponding land.

Source: (NWC 2007)

irrigation season (Vic)

The period of time that water allocations are made. Water allocations cannot be carried over to another irrigation season except where previously agreed, eg environmental allocations.

Source: (NWC 2007)

irrigation water application efficiency

The volume of water supplying the crop water requirement in a field as a percentage of water delivered to that field ie crop water use / water delivered to irrigation field.

Source: (NWC 2007)
Source: (ANCID 2001)

irrigation water delivery efficiency
The volume of water received at a field/farm inlet as a percentage of water entering the channel.

Source: (NWC 2007)
Source: (ANCID 2001)

**Irrigation Water Economic Index**

Gross Production ($) Å Irrigation Water Applied (ML)

Source: (NWC 2007)
Source: (ANCID 2001)

**Irrigation Water Production Index**

Total Product (kg) Å Irrigation Water Applied (ML)

Source: (NWC 2007)
Source: (ANCID 2001)

**irrigation water storage efficiency**

The volume of outflow from a storage (ie not as seepage and evaporation) as a percentage of water received into the storage.

Source: (NWC 2007)
Source: (ANCID 2001)

**ISC**

Index of Stream Condition

Source: (NWC 2007)

**Isohyetal map**

Map showing contour lines of equal rainfall depth recorded over a particular period of time.

**isotope**

A particular atom of an element that has the same number of electrons and protons as the other atoms of that element, but a different number of neutrons, ie the atomic numbers are the same but the atomic weights differ. Isotopes have essentially the same chemical properties as other atoms of the same element.

Source: (ANCID 2001)
Source: (NWC 2007)

**iteration**

The solution for a network linear program is reached by iteration. There may be one or more iterations per time-step.

**IUWM**

Integrated Urban Water Management

Source: (NWC 2007)
IWCM
Integrated Water Cycle Management
Source: (NWC 2007)

IWP
Irrigation Water Provider
Source: (NWC 2007)

IWRM
Integrated Water Resource Management
Source: (NWC 2007)

J
Jandakot Mound (WA)
The Jandakot Mound, to the south of Perth, holds about 2700 million cubic metres.
Source: (NWC 2007)

JRG
Jurisdictional Reference Group
Source: (NWC 2007)

K
kilolitre
1,000 litres.
Source: (NWC 2007)

Kinematic wave
Kinematic wave occurs where the inertial terms (local inertia, convective inertia, pressure
gradient and moment source terms) in the equation of motion are considered to be small. This
implies that discharge is a function of depth alone and that the friction slope is equal to the
bed slope.

KPI
Key Performance Indicators
Source: (NWC 2007)

Kriging
Kriging is a group of techniques used in the analysis of spatial data and involves the
interpolation of a spatially varying quantity based on the observations of that quantity at a set
of near-by locations.
**kT**

Kilotonnes

**Source:** (toolkit 20091023)

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**lag time**

The time delay between inflow and outflow of a river reach assuming that all flows have the same travel time.

**Source:** River Systems specification

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**Lagged flow**

A link model available in Source Catchments. A routing model that assumes flow at the upstream end of the reach is translated by a fixed lag to give the flow at the downstream end of the reach, with no attenuation of the flow. Lagged Flow routing is possibly the simplest routing model that actually influences the link flow. Lagged routing is a conceptual model.

**Source:** (eWater CRC 2010a)

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**lake**

A body of water (fresh or salt) of considerable size, surrounded by land.

**Source:** Macquarie Dictionary

**Source:** (NWC 2007)

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**LAM**

Lumped Alluvial Model.

**Source:** (Welsh, Podger 2008)

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**large dam**

The Australian National Committee of Large Dams (ANCOLD) has defined large dams as dams with a crest or wall height greater than 15 metres, or as dams with a dam wall height of greater than 10 metres but meeting other size criteria, including creating a reservoir capacity of no less than 1000 ML.

**Use:** major storage

**Source:** Australian Water Resources 2005

**Source:** (NWC 2007)

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**lateral flow**

Radial leakage away from a basin that occurs at shallow depth, top 4-5 m of soil.

**Source:** (toolkit 20091023)

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**lateral throughflow**
Relatively rapid subsurface flow through cracks, pipes, macropores in the soil. Also referred to as lateral subsurface flow and interflow. Water that infiltrates the soil surface and then moves laterally through the upper soil horizons towards the stream channels, either as unsaturated flow, or more usually, as shallow perched saturated flow above the main groundwater level.

**Source:** (Welsh, Podger 2008)

**Source:** (Ward and Robinson 1990)

**Laurenson Flow**

A link routing model available in Source Catchments. A routing model based upon Mein and Laurenson (1974) that assumes that the reach storage behaves as a non-linear store given by a power law relationship between reach storage and flow. The Laurenson Flow routing model is based on physical principles.

**Laurenson Lag Flow**

A link model available in Source Catchments. The Laurenson Lag Flow routing method is a composite of the Laurenson Flow method and a method of lagging the resulting outflows by a multiple of the routing time step. This is the routing procedure most used in the IQQM software (Podger 1997). This model is based primarily on physical principles.

**Source:** (eWater CRC 2010a)

**leaching**

The passage of water past the plant root zone causing the flushing of accumulated salts from the root zone. (Can be induced by application of more irrigation water than is needed to supply the plant evapotranspiration requirement).

**Source:** (ANCID 2001)

**Source:** (NWC 2007)

**leaching fraction**

The fraction of infiltrated irrigation water that percolates below the plant root zone. For this unit to be meaningful, it needs to specify the time over which the leaching fraction is measured and the depth interval over which it is calculated.

**Source:** (ANCID 2001)

**Source:** (NWC 2007)

**leakage**

The process by which water from the basin moves through the floor of the basin to the soil below

**Source:** (toolkit 20091023)

**leakage rate**

The amount of water that leaks from a basin in a given time. Leakage rate may be given in volumetric units (m³/day or ML/yr) or per unit area (mm/day or ML/ha/yr).

**Source:** (toolkit 20091023)

**lease of a water allocation (Qld)**

The passing of the benefits and responsibilities associated with ownership of the allocation to another person for a fixed period. The lease of a water allocation must be registered on the Water Allocations Register.
Source: (NWC 2007)

left bank
Left side bank of a channel or drain when looking in the direction of flow.
Source: (ANCID 2001)
Source: (NWC 2007)

LEP
Local Environment Plan (NSW)
Source: (NWC 2007)

level of development
Ranges of water access entitlements as a percentage of sustainable yield.
Source: (NWC 2007)

levels of evidence

life cycle cost
The total cost incurred to construct, operate, maintain and replace an asset over a given time frame.
Source: (toolkit 20091023)

limited period transfer (Tas)
Enables a licensee to transfer part or all of a licence or water allocation for a limited period of time (equivalent to a lease). The length of time for such a transfer is governed by the time remaining before the expiry of the seller’s water licence or the allocation. The purchaser will require a new water licence or a variation to an existing licence before the transfer can proceed. At the end of the "lease", the control of the licence and/or water allocation automatically reverts to the transferor.
Source: (NWC 2007)

limited term transfer (Vic)
The transfer of the whole of the right to future water allocations under a share for a period of not more than 20 years to the owner or occupier of land specified in a water-use licence or water-use registration.
Source: (NWC 2007)

link
Links represent river reaches but there are some important differences. A reach refers to a physical section of a river, while a link is is a logical connection within a Source model. A link will sometimes be defined as having zero length (to conveniently represent certain processes), which is not possible for a reach. Links act to store water and to route or process water and constituents passing between nodes and may represent sub-catchment processes.
Source: River Systems specification
link model

A model that operates on either flows or constituents within a link of a Source Catchments model. A routing model is a special case of a link model that operates on flows only.

linkage

degree to which sediment delivery pathways are linked to streams (eg, full channel linkage, partial linkage, direct linkage, and no linkage)

Source: (toolkit 20091023)

litre

The volume of water equal to 1,000 cubic centimetres.

Source: (Moore 2004)

LMRIA

Lower Murray Reclaimed Irrigation Area

Source: (NWC 2007)

Load-based Nutrient Delivery Ratio

Model available in Source Catchments. The Load-based Nutrient Delivery Ratio model reduces the amount of nutrient leaving a functional unit (FU) as a function of the amount of load generated in the FU, similar to the Load-based Sediment Delivery Ratio. This model is primarily based on physical principles.

Source: (eWater CRC 2010a)

Load-based Sediment Delivery Ratio

Model available in Source Catchments. The Load-based Sediment Delivery Ratio model reduces the amount of sediment leaving a functional unit (FU) as a function of the amount of load generated in the FU. Essentially, the ability of a filter (such as a riparian zone) is limited, and if considerable load is applied to a filter, then trapping efficiency will drop to the point where all incoming material is passed straight through. This model is based principally on physical principles.

Source: (eWater CRC 2010a)

loading

The rate of release of a constituent of interest to a particular receiving medium.

Source: (USEPA-CREM)

local-scale basins

Basins sited within the irrigation district where the drainage is generated.

Source: (toolkit 20091023)

log landings

sites where logs are dumped to be stripped of bark and loaded onto trucks

Source: (toolkit 20091023)
**Looped ratings**

A looped rating is an outcome of hysteresis that results in a non-unique relationship between water level and flow at a given stream location. When this relationship is plotted over time it has the shape of a loop.

**loss node**

A node model available in Source. The Loss node model describes the amount of water that is lost from a point in the stream network. Losses may include physical processes such as transmission losses due to evaporation and seepage, or may be used to represent losses associated with measurement error in the data used to develop the model, such as flow-measurement uncertainty. The Loss model is a conceptual model.

Source: (eWater CRC 2010a)

**low level of development**

Sum of water access entitlements is less than 30 per cent of sustainable yield.

Source: (NWC 2007)

Source: Australian Water Resources 2005

**lower bound pricing**

The level at which to be viable, a water business should recover, at least, the operational, maintenance and administrative costs, externalities, taxes or tax equivalent regimes (not including income tax), the interest cost on debt, dividends (if any) and make provision for future asset refurbishment/replacement. Dividends should be set at a level that reflects commercial realities and stimulates a competitive market outcome.

Source: National Water Initiative

Source: (NWC 2007)

**lower bound pricing (WA)**

The level at which to be viable, a water business should recover, at least, the operational, maintenance and administrative costs, externalities, taxes or TERs (not including income tax), the interest cost on debt, dividends (if any) and make provision for future asset refurbishment/replacement. Dividends should be set at a level that reflects commercial realities and stimulates a competitive market outcome.

Source: (NWC 2007)

**lumped routing**

Models the movement of constituents based upon the kinematic wave velocity in a link division. Lumped routing is less computationally intensive and more applicable for determining constituent loads at a larger temporal resolution.

**LWMP**

Land and Water Management Plan

Source: (NWC 2007)

**LWU**

Local Water Utility

Source: (NWC 2007)
M

main channel
A channel whose primary purpose is to convey bulk water from headworks storage or river diversion points into the distribution system.

Use: channel
Source: (ANCID 2001)
Source: (NWC 2007)

main pipelines
A supply pipeline whose primary purpose is to deliver water from storage or river into the distribution system.

Source: (ANCID 2001)
Source: (NWC 2007)

major extracted water storages
Major off-river storages that primarily store water extracted from rivers or aquifers, or from flood water emanating from rivers.

Source: Australian Water Resources 2005
Source: (NWC 2007)

major on-stream storages
Major storages on defined watercourses.

Source: Australian Water Resources 2005
Source: (NWC 2007)

major storage
Storages greater than 1000 megalitres in volume are considered to be major storages for the purposes of the water balance.

Source: Australian Water Resources 2005
Source: (NWC 2007)

manual calibration
The process of model calibration where parameter values are adjusted manually by trial and error within physically defensible ranges, based on the judgement of the modeller, to obtain a match between model results and observed data that is robust and fit for purpose. The resultant set of parameter values may or may not be unique (see âequifinalityâ) and may or may not represent a local or global optimum.

Source: (James & Burgess 1982)

MAR
Managed Aquifer Recharge
Source: (NWC 2007)
marginal cost
Marginal cost is defined as the change in total cost per unit increase in output. It is the cost of producing an additional unit of output.
Source: (toolkit 20091023)

Marginal Irrigation Water Economic Index
Marginal Return due to Irrigation ($) ÷ Irrigation Water Applied (ML)
Source: (NWC 2007)
Source: (ANCID 2001)

Marginal Irrigation Water Production Index
Marginal Production due to Irrigation (kg) ÷ Irrigation Water Applied (ML)
Source: (NWC 2007)
Source: (ANCID 2001)

marginal revenue
Marginal revenue is the change in total revenue per unit increase in output
Source: (toolkit 20091023)

marker routing
Models the movement of constituents based upon the average water velocity in a link division. Marker routing provides greater resolution in modelling constituent concentration as it captures constituent âspikesâ, and is useful for forecasting impacts of management decisions on constituent concentrations.

Markov chain
A stochastic process with a finite number of states in which the probability of occurrence of a future state is conditional only upon the current state; past states are inconsequential.
Source: (American Meteorology Society 2000)

mass balance
Equation based on the principle that water mass is preserved in the river system. Used to determine whether a model has been calibrated properly. In simple terms: Change in Storage = Inflows - Outflows
Source: (anonymous 2009)

matric potential
A variable describing how strongly the water within a soil matrix is bound to the soil by capillary and other forces.
Source: (ANCID 2001)
Source: (NWC 2007)

maximum allowable depletion
The maximum level of depletion to which the soil can dry without causing water deficit stress in a crop that has a fully expanded root zone. Notionally, the sum of the readily available water in each soil horizon within the plant root zone with an allowance made for the soil water extraction pattern of the crop. Also called A depletion.

Source: (ANCID 2001)
Source: (NWC 2007)

**maximum order constraint node**

A node model available in Source. Maximum order constraint nodes adjust orders to ensure that flows do not exceed a constraint in a river system.

**MDBA**

Murray Darling Basin Agreement

Source: (NWC 2007)

**Mean Annual Diversion**

The average volume of water taken by an allocation or group of allocations in a year. It is calculated by adding the total volume of water taken over a period of years and dividing by the number of years in that period. The calculation is performed on a water year basis.

Source: (Stanley, K. 2007)

**Mean Annual Flow**

The average volume of water in a year that would flow past a point and is calculated by adding the total volume of flow over a period of years and dividing by the number of years in that period. The calculation is performed on a water year basis.

Source: (Stanley, K. 2007)

**Meander**

One of a series of somewhat regular, sharp, freely developing and sinuous curves, bends, loops, turns or windings in the course of a stream. It is produced by a stream swinging from side to side as it flows across its flood plain or shifts its course laterally.

Source: (Eggleton 2001)

**Meander wavelength**

The distance of one meander along the down-valley axis.

**measurement**

A value in a time-series file, typically in megalitres per day.

**measurement errors**

Errors in the observed data that are a function of human or instrumental error during collection. Such errors may be independent or random. When a persistent bias or mis-calibration is present in the measurement device, measurement errors may be correlated among observations. In some disciplines, measurement error may be referred to as observation error.

Source: (USEPA-CREM)
measurement flume
A section of concrete channel flume with specially shaped sidewalls and/or floor that forms a constriction in the waterway. Measurement of the difference in water surface levels through the constriction allows calculation of water flow rate by referral to rating tables calibrated for the site. Particular types of measurement flume include the Parshall and Venturi flumes.

Source: (ANCID 2001)
Source: (NWC 2007)

mechanistic model
A model that has a structure that explicitly represents an understanding of physical, chemical, and/or biological processes. Mechanistic models quantitatively describe the relationship between some phenomenon and underlying first principles of cause. Hence, in theory, they are useful for inferring solutions outside of the domain that the initial data was collected and used to parameterise the mechanisms.

Source: (USEPA-CREM)

megalitre
1,000,000 litres.

Source: (NWC 2007)

memorial (WA)
Information recorded on a Water Access Entitlement prohibiting dealings on that Water Access Entitlement.

Source: (NWC 2007)

metropolitan
Refers to water and wastewater services provided in metropolitan urban areas having in excess of 50,000 connections.

Source: (NWC 2007)
Source: National Water Initiative

millilitre
0.001 litre

minimum flow requirement node
A node model available in Source. A minimum flow requirement ensures sufficient flow to meet demands (eg stock, domestic or environmental needs). A minimum flow requirement can also generate transfers between storages. The requirement imposes a constraint which must be met even if additional water must be released from storage.

minor catchment storages
Small storages (farm dams) that are not on defined waterways or watercourses, that are not filled from extracted water or flood flows out of rivers but from local catchment runoff.

Source: Australian Water Resources 2005
Source: (NWC 2007)

minor extracted water storages
Minor off-river storages (eg farm dams, turkeyâs nest dams) that primarily store water extracted from rivers or aquifers, or from flood water emanating from rivers.

**Source:** Australian Water Resources 2005

**Source:** (NWC 2007)

**minor on-stream storages**

Small storages (farm dams) on minor watercourses.

**Source:** Australian Water Resources 2005

**Source:** (NWC 2007)

**minor storages**

Storages less than 1000 megalitres in volume are considered to be minor storages for the purposes of the water balance.

**Source:** Australian Water Resources 2005

**Source:** (NWC 2007)

**mitigation water requirements (WA)**

Elements of the water regime that are identified to improve diminished water quality resulting from land use practices and developments in the catchment.

**Source:** (NWC 2007)

**model**

A simplification of reality that is constructed to gain insights into select attributes of a physical, biological, economic, or social system. A formal representation of the behaviour of system processes, often in mathematical or statistical terms. The basis can also be physical or conceptual.

**Source:** (USEPA-CREM)

**model application**

Application of a fit for purpose model to address a real world problem such as supporting natural resource management decision making.

**Source:** (CRCCH 2005)

**model code**

The mathematical representation of a conceptual model in the form of a functioning computer program.

**Source:** (Beven 2004)

**model coding**

The process of translating the mathematical equations that constitute the model framework into a functioning computer program.

**Source:** (USEPA-CREM)

**model development**
The conceptualisation, specification in mathematical terms, coding, testing and verification of a modelling tool, with the end product intended to be model code which is ready to be implemented and applied to addressing real world problems.

Source: (CRCCH 2005)

model execution phase


model framework

The model framework is the system of governing equations, parameterisation and data structures that make up the mathematical model. It is a formal mathematical specification of the concepts and procedures of the conceptual model consisting of generalised algorithms (computer code/software) for different site or problem-specific simulations.

Source: (USEPA-CREM)

model framework uncertainty

The uncertainty in the underlying science and algorithms of a model. Model framework uncertainty is the result of incomplete scientific data or lack of knowledge about the factors that control the behaviour of the system being modelled. Model framework uncertainty can also be the result of simplifications necessary to translate the conceptual model into mathematical terms.

Source: (USEPA-CREM)

model implementation

The setting up, calibration and validation of model code for a particular purpose, with the aim of producing a model that is fit for purpose.

Source: (CRCCH 2005)

model pedigree

A qualitative or quantitative determination of the rigour with which a model has been developed and evaluated. In some cases, a model's pedigree may be represented by a track record that reflects the quality of a model's development and evaluation. Model pedigree is concerned with the source of data used in model development, the origin of the model framework, and the extent of evaluation performed on the model.

Source: (USEPA-CREM)

model reliability

The confidence that (potential) users have in a model and in the information derived from the model such that they are willing to use the model and the derived information. Specifically, reliability is a function of the performance record of a model and its conformance to best available, practicable science.

Source: (USEPA-CREM)

model uncertainty

Uncertainty related to the hypotheses that underlie the model itself and the model structure.

Source: (Grayson and Bloschl, 2001)
Modelling Terms

(a logical grouping of terms in this glossary)

moderate level of development

Sum of water access entitlements is between 30 per cent and 70 per cent of sustainable yield.

Source: (NWC 2007)
Source: Australian Water Resources 2005

modes

Manner in which a model operates. Models can be designed to represent phenomena in different modes. Prognostic (or predictive) models are designed to forecast outcomes and future events, while diagnostic models work ‘backwards’ to assess causes and precursor conditions.

Source: (USEPA-CREM)

modified soil mix

To improve the slope stability, erosion resistance and permeability of the soil being used in the channel construction (in-situ or imported), soil may be treated or mixed with relatively small quantities of substances such as lime, cement, gypsum, and certain chemicals to overcome their natural deficiencies.

Source: (ANCID 2001)
Source: (NWC 2007)

module

An independent or self contained component of a model, which is used in combination with other components, and forms part of one or more larger programs.

Source: (USEPA-CREM)

monthly pattern

A specific instance of a water user node. The Monthly Demand node is used to represent demand for water on a monthly basis. This is a simple representation supporting the needs of demand and supply analysis. Monthly Demand is a conceptual model.

Source: (eWater CRC 2010a)

mortgage (WA)

Agreement to the repayment of a loan with interest, over a certain time, by the owner of the Water Access Entitlement to the mortgagee.

Source: (NWC 2007)

mortgagee (WA)

The lender of the money covered by the mortgage, for example a bank to the owner of the Water Access Entitlement.

Source: (NWC 2007)

Morton equation

Equation for estimating the evaporation rate from shallow lakes.
MSM
Murray Simulation Model.
Use: MSM-BigMod
Source: (Welsh, Podger 2008)

MSM-BigMod
The Murray-Darling Basin Authority's existing river simulation model. Murray Simulation Model - Big Model, a custom designed water resources planning model of the main stem of the Murray River system.
Source: MDBA

MSWQS
Major Storages Water Quality Study
Source: (toolkit 20091023)

multiple lines of evidence
The use of several independent evaluation strategies to address the same evaluation issue, relying on different data sources, on different analytical methods, or on both.
Source: (Centers for Disease Control and Prevention, 2006)

multiple supply path modelling
A modelling approach used when there are multiple paths from storage to demand. This includes the situations where an order can be supplied from two or more water storages, or can be routed via alternate paths such as anabranches or channels. Rules for river operation also need to be satisfied when deciding which storage(s) an order should be met from and which path to utilise for delivery. A network linear program is used to select the optimal combination of storages and paths while meeting operations constraints.

multistage flash
A series of distillation processes used to remove salt from seawater to produce water of drinking quality.
Source: (toolkit 20091023)

Murray-Darling Water Basin
Murray-Darling Basin means the area falling within the boundary described in the dataset that: (a) is titled Murray-Darling Basin BoundaryâWater Act 2007; and (b) has a dataset scale of 1:250,000; and (c) specifies the boundary of the Murray-Darling drainage division derived from the dataset that is titled âAustraliaâs River Basins 1997â and is dated 30 June 1997; and (d) is held by the Commonwealth.
Source: Water Act 2007

MUSIC
The acronym used for the Model for Urban Stormwater Improvement Conceptualisation software developed by the CRC for Catchment Hydrology to model urban stormwater management schemes
Source: (toolkit 20091023)
Muskingum Flow
A link model available in Source Catchments. The Muskingum Flow routing model makes use of the storage-outflow relationship, based on the inflow, storage dimensions, discharge, the travel time through the reach, and a dimensionless value expressing the relative effect of inflow and outflow on the storage of the reach. This model is based on physical principles.

Source: (eWater CRC 2010a)

natural channel storage
Volume of water in river channels. Includes the instantaneous volume of moving water, and any water in weirs which are not classed as major on-river storages or minor on-stream dams.

Source: (Sinclair, Knight, Merz 2006)

Source: (NWC 2007)

natural development conditions
This term denotes a scenario that comprises conditions in a river system without any water resources development (dams, water supply infrastructure, irrigation development). Catchment land use changes that have occurred over the years, such as land clearing, are ignored in this definition. This term is relevant to hydrologic modelling for water management purposes and Water Sharing Plans.

Source: (Welsh, Podger 2008)

natural flow
Water movement in accordance with gravitational forces, without artificial intervention.

Source: (toolkit 20091023)

NDSP
National Dryland Salinity Programme

Source: (NWC 2007)

NEPM
National Environment Protection Measure

Source: (NWC 2007)

NES
National Environmental Significance

Source: (NWC 2007)

net cash flow
This is the net of total annual income after paying for total annual costs before overhead costs, taxes and discounting. Annual net cash flows over the life of an enterprise are used to see when the investment begins to earn a positive cash flow. This measure also allows cash flow trends to be seen, i.e. whether cash flows are increasing, decreasing or remaining steady over time.

Source: (toolkit 20091023)
net evaporation
Open water surface evaporation less rainfall.
Source: River Systems specification

net leakage
The amount of leakage that passes beyond the interception drain (= leakage − interception).
Source: (toolkit 20091023)

net present value
Is the net gain or difference obtained after subtracting the total discounted cost of an enterprise from the total discounted benefit over the expected life of an enterprise. A scenario with a positive NPV provides a net gain and so is desirable, that with the highest NPV is most desirable. A negative value shows the system is financially unattractive.
Source: (toolkit 20091023)

network linear program
A type of solver/optimiser program that is used to find the minimum cost solution to network flow problems. Examples include RELAX IV and PPRN. NETLP is used in Source to find the best supply path to meet orders efficiently.
Source: (anonymous 2009)
Source: (Bertsekas, Tseng, 1994)
Source: (Bertsekas 1991)

network phase
The fifth phase of execution within a time-step. During the network phase, the order of execution through the node-link network is determined. The user can view and change this information if required.
Source: (Holz, 2010)

network supply service
An individual rural water supply service that is dependent on a supply network and is provided to customers' properties at an agreed and specified level of service and common price, which may allow for differentiated service standards or prices, but which is commonly available to customers and which confers common obligations on customers with properties served by the supply network. In some circumstances, drainage (typically surface drainage) may be included as part of the supply service rather than being defined as a separate service.
Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

NLWRA
National Land and Water Resources Audit.
Source: (NWC 2007)
Source: (toolkit 20091023)

NMU
Non-Major Urban

Source: (NWC 2007)

node

Nodes represent a class of model within Source that modifies flows and/or constituent loads at a point on a river system where certain processes occur. For example water can be added, extracted, stored, recorded, or have a change in ownership. The node type identifies the rules and parameters that are used by the model to simulate the relevant processes at a given location.

Source: (Stanley, K. 2007)

node-link network

A node-link network is a simplified representation of a river system for use in computer simulation modelling.

noise

Inherent variability that the model does not characterise.

Source: (USEPA-CREM)

nominal volume (Qld)

An attribute of a water allocation. It is the share of water available for consumptive use (in megalitres per year), that is available to be taken by the holder of the water allocation.

Source: (NWC 2007)

non-irrigation network supply service

A raw water supply service from a supply network (either gravity or pressurised) where the majority of water is taken for purposes other than irrigation, such as environmental applications or consumptive uses such as, urban water supply, commercial, industrial or stock and domestic use.

Source: (NWC 2007)

Source: (National Performance Framework 2006)

non-renewable groundwater

Groundwater extracted from an aquifer that receives limited or no recharge (ie &miningâ of the resource or use of long term aquifer storage).

Source: Australian Water Resources 2005

Source: (NWC 2007)

non-saline groundwater

Groundwater with a salinity concentration less than 3500 milligrams per litre.

Source: Australian Water Resources 2005

Source: (NWC 2007)

non-uniqueness

Groundwater modelling term synonymous with &equifinalityâ.
Normal distribution

"Also known as a Gaussian distribution, it has a characteristic bell shape that is centred around the mean. Scores occurring closer to the mean are more likely, with 68% occurring within 1 standard deviation of the mean. As values deviate more from the mean their occurrence decreases. 95% of scores occur within 2 standard deviations from the mean, and 99% occur within 3 standard deviations."

Source: (Grayson and Bloschl, 2001)

Use: Gaussian distribution

Source: (Ross 2005)

notice of existence of supply contract (Qld)

A form used to notify the registrar of water allocations of a supply contract between the water allocation holder and water supply infrastructure operator. This notice is required by the Registrar for all transfers and changes of water allocations for supplemented supply.

Source: (NWC 2007)

notice of proposed un-supplemented transfer (Qld)

A form used to notify the Department of Natural Resources, Mines and Water of a proposed transfer of a water allocation for un-supplemented supply. A certificate is issued by the Department in response to the form which is then required by the Registrar for all transfers of water allocations for un-supplemented supply.

Source: (NWC 2007)

notice of seasonal water assignment approval (Qld)

A notice given by the Department of Natural Resources, Mines and Water to approve an application for a seasonal assignment of un-supplemented water.

Source: (NWC 2007)

notifications (WA)

Notifications are not to be deemed as encumbrances under the Water Legislation and are not intended to prevent the registration of any other instrument but merely to provide information in relation to matter.

Source: (NWC 2007)

NPSI

National Programme for Sustainable Irrigation

Source: (NWC 2007)

NRHP

Natural River Health Program

Source: (NWC 2007)

NRM

Natural Resource Management

Source: (NWC 2007)
NRMIS
Natural Resource Management Information System
Source: (NWC 2007)

number of service connections
The number of metered accounts, minus the total of any sub-meters (after master meters, eg to shops and flats), plus the estimated number of unmetered service connections (including fire connections).
Source: (NWC 2007)
Source: (National Performance Framework 2006)

Nutrient storage
Process for nutrients to accumulate within one or more reaches of the model for a period of time, possibly to be released later. Nutrient storage would most commonly occur in large reservoirs.

Nutrient transformation
Changes in the observed forms of nutrients (for example between nitrate and ammonium) due to chemical or biological interactions within the water.

NWI
National Water Initiative
Source: (NWC 2007)

NWQMS
National Water Quality Management Strategy
Source: (NWC 2007)

o

oasis effect
This refers to the increase in evaporation rates when water bodies are surrounded by dry regions. This effect results in larger basins having lower rates of evaporation (evaporation factor 0.7 - 0.8) than smaller basins (evaporation factor close to unity).
Source: (toolkit 20091023)

objectivity
One of three main components of quality in EPA’s Information Quality Guidelines. Objectivity includes whether disseminated information is being presented in an accurate, clear, complete and unbiased manner. In addition, objectivity involves a focus on ascertaining accurate, reliable and unbiased information.
Source: (USEPA-CREM)

object-oriented platforms
Type of user interface that models systems using a collection of cooperating objects. These objects are treated as instances of a class within a class hierarchy, where a class is a set of objects that share a common structure and behaviour. The structure of a class is determined by the class variables, which represent the state of an object of that class and the behaviour is given by the set of methods associated with the class.

Source: (USEPA-CREM)

**observation**
A time-stamp plus at least one associated measurement.

**Observed Runoff**
Model available in Source Catchments. Observed runoff allows the inclusion of an observed time series for rainfall runoff and uses a digital filter to separate the quick flow (surface flow) and slow flow (baseflow). Model type is a mathematical filtering algorithm.

Source: (eWater CRC 2010a)

**Observed Surface Runoff**
Rainfall runoff model available in Source Catchments. The Observed Surface Runoff model is used to input an observed runoff sequence of quick flow (surface flow) in place of runoff generated by a model (i.e., there is no slow flow (baseflow) component). The model can be used in situations where there is only surface flow affecting the sub-catchment (e.g., surface flow from a sewage treatment plant), or where only part of a catchment is being modelled, and observed runoff is used to represent inflows from areas that are not being explicitly modelled. This is a mass balance model based on conceptual relationships.

Source: (eWater CRC 2010a)

**ocean outfall**
An ocean site for discharge of a piped liquid; a (usually) deep offshore disposal area for effluent from a sewage treatment plant.

Source: (toolkit 20091023)

**off-allocation**
Access to rain-rejection, flood and other excess flows in the river that is granted to users in excess of their allocated water entitlement.

Source: (toolkit 20091023)

**off-allocation flow sharing node**
A node model available in Source.

**off-river storage**
A water storage (weir or lake) in the middle or lower part of a river system which is off the main stream (e.g., Lake Brewster in the Lachlan).

Source: (Welsh, Podger 2008)

**on-farm basins**
Local-scale basins that occupy parts of individual properties and are privately owned.

Source: (toolkit 20091023)
on-farm storage
A large private water storage off the mainstream, eg on an irrigation property, such as a cotton farm. Some are formed by modifying billabongs but usually they are constructed at any convenient location on the property.

Source: (Welsh, Podger 2008)

on-site system
Sewage treatment equipment for converting household effluent to materials suitable for local disposal, eg septic systems, grease traps, composting toilets and household sewage treatment plants.

Source: (toolkit 20091023)

operation loss
The volume of water released from a dam to meet irrigator water orders that is subsequently not diverted by the irrigators. This occurs when irrigators reject their ordered water because local rainfall has met their water needs since a water order was placed. This loss also includes an allowance for operator uncertainty in predicting how the river system as a whole will behave during the time the release water takes to travel from the dam to the users.

Source: (Welsh, Podger 2008)

options contract
A contract that gives the right, but not the obligation, to purchase or sell a good at a specified price within a specified period of time.

Source: (Productivity Commission 2006)
Source: (NWC 2007)

order time
The number of days in advance that an order has to be made to ensure that the ordered water arrives on time.

Source: (Stanley, K. 2007)

ordering phase
The fourth phase of execution within a time-step. In a regulated system, during the ordering phase Source begins at the most downstream end of the system and accumulates any orders as it passes back up the system. It takes into account any losses and forecast inflows, as well as making adjustments to orders if necessary at any minimum or maximum flow nodes. Orders are directed to specific storages where subsequent releases are made. Various ordering methods can be specified including: 1. Optimised multiple supply (NetLP); 2. Algorithm; 3. Network costs; and 4. Rules-based. In unregulated rivers, orders are compared with forecast inflows. If there is insufficient inflow to meet the orders then the available water is distributed between used according to specified rules.

Source: eWater CRC
Source: (Podger 2011)
Source: (Holz, 2010)

other supply
A type of network supply or regulated surface diversion service where customers are supplied on the basis of a roster determined by the rural water delivery agency, or the right to access water at any time subject to availability and threshold conditions. Roster periods may be varied according to different supply and demand circumstances or may be one off in nature, such as for an annual dam filling schedule for a gravity non-irrigation network supply service. Restrictions or rostering may apply in stages and in the most severe circumstances be a total ban on the taking of water.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

**outfall structure**

Regulating structure located at the downstream end, or intermediate points, of a supply channel to allow safe discharge of surplus flows arising in the system due to the effects of rainfall inflow, planned channel shutdown or operational error. An outfall can also be used to drain water from the channel at the end of the irrigation season. Water released through the outfall is usually discharged to a drainage channel, natural waterway or regulating storage.

Source: (ANCID 2001)
Source: (NWC 2007)

**outflow**

The average flow rate out of a link or river reach during a time-step.

Source: River Systems specification

**over order factor**

The factor by which water orders in an IQQM model need to be increased to account for operational inefficiencies in a water supply scheme. This factor does not account for transmission losses.

Source: (Stanley, K. 2007)

**overallocation**

There is an overallocation for a water resource plan area if, with full development of water access right in relation to the water resources of the area, the total volume of water able to be extracted by the holders of water access rights at a given time exceeds the environmentally sustainable level of take for those water resources.

Source: (NWC 2007)
Source: Water Act 2007

**overallocation (WA)**

Refers to situations where with full development of water access entitlements in a particular system, the total volume of water able to be extracted by entitlement holders at a given time exceeds the environmentally sustainable level of extraction for that system.

Source: (NWC 2007)

**overbank flow**

Water which flows out of a river channel onto floodplains or into billabongs and wetlands during high flows. Some of this water will not return to the river when water levels subside as it goes into storage.

Source: (Welsh, Podger 2008)
overdraw
A portion of next water year's reserved water in a regulated system that can be used in the present water year.
Source: (Welsh, Podger 2008)

overfall weir
A channel regulator where water flows over a weir crest which can be varied in level for changing flow rates.
Source: (ANCID 2001)
Source: (NWC 2007)

over-fitting
Calibrating a model to the point where goodness of fit statistics for the calibration period are maximised/optimised but the calibrated model is not robust when used with input data for other periods.
Source: (Good & Hardin 2006)
Source: (CRCCH 2005)

overland flow
Surface runoff, which is caused when either, the ground surface is impervious, the underlying soil is saturated and cannot accommodate any more water, or because the intensity of rainfall is greater than the soil's capacity to infiltrate it.
Source: (Welsh, Podger 2008)

overturn
An inversion process in water-bodies, where the cooler, deeper layers rise towards the surface.
Source: (toolkit 20091023)

overuse
There is an overuse for a water resource plan area if the total volume of water actually taken for consumptive use from the water resources of the area at a given time exceeds the environmentally sustainable level of take for those water resources. Note: An overuse may arise for a water resource plan area if the area is overallocated, or if the planned allocation for the area is exceeded due to inadequate monitoring or accounting.
Source: (NWC 2007)
Source: Water Act 2007

overused (WA)
Refers to situations where the total volume of water actually extracted for consumptive use in a particular system at a given time exceeds the environmentally sustainable level of extraction for that system. Overuse may arise in systems that are overallocated, or it may arise in systems where the planned allocation is exceeded due to inadequate monitoring and accounting.
Source: (NWC 2007)

owner
1. An entity that owns a share of water in a river system. 2. An entity (a state) that owns a parcel of water and has the location of that water tracked as it moves through a river system. An owner is associated with a resource assessment system.

Source: (anonymous 2009)
Source: River Systems specification

ownership phase

The seventh phase of execution within a time-step. In this phase any distribution between owners is calculated and owners’ accounts are updated.

Source: (Podger 2011)

parameter uncertainty

Uncertainties related to parameter values.

Source: (USEPA-CREM)

parameters

Terms in the model that are fixed during a model run or simulation but can be changed in different runs as a method for conducting sensitivity analysis or to achieve calibration goals.

Source: (USEPA-CREM)

parametric variation

When the value of a parameter itself is not a constant and includes natural variability. Consequently, the parameter should be described as a distribution.

Source: (USEPA-CREM)

parsimony

The principle of parsimony calls for keeping the model as simple as possible while accounting for the system processes and characteristics that are evident in the observations and are important to the predictions, and while respecting all system information.

Source: (Hill and Tiedeman, 2007)

Partial series

A means of analysing flood frequency that involves selecting all values above a particular threshold value. Normally the threshold value is chosen so that the number of peaks chosen is between two and three times the number of years of record.

Pass Through

Filter model available in Source Catchments. The Pass Through or null filter preserves the amount of constituent generated in a functional unit (FU) and passes this to the downstream sub-catchment node. This is a conceptual model.

Source: (eWater CRC 2010a)

pay for use charge
The charge per unit of consumption levied upon a residential customer for their use, expressed as dollars per kilolitre.

Source: (NWC 2007)

Source: (National Performance Framework 2006)

**peak wet weather flows**

The maximum volumes of water flowing into a sewage treatment plant, down a waterway or through a catchment, during or soon after a period of heavy rainfall.

Source: (toolkit 20091023)

**Penman Equation**

Uses wind, net solar radiation, humidity and temperature data to estimate evaporation (E) from an open water surface.

Source: (Borrelli 2003)

**Penman-Monteith Equation**

The Penman-Monteith equation (FAO-56) estimates reference crop evapotranspiration in mm/day, with inputs including relative humidity and wind speed.

Source: (Allen et al 1998)

**percentage full**

The percentage ratio of current volume to full supply volume. Note this may be greater than 100% in some cases.

Source: (NWC 2007)

Source: Water Resources Observation Network

**percentage removal**

A filter model available in Source Catchments. The Percentage Removal model is a constant removal coefficient applied to the constituent load passing with baseflow (slow flow) and surface (quick flow). This is a simple linear multiplier model.

Source: (eWater CRC 2010a)

**perched aquifer**

A region in the unsaturated zone where the soil or rock may be locally saturated because it overlies a low-permeability unit.

Source: (ANCID 2001)

Source: (NWC 2007)

**perched watertable**

The surface in a perched aquifer at which the pore pressure is atmospheric.

Source: (ANCID 2001)

Source: (NWC 2007)

**perfect information**
The state of information where there is no uncertainty. The current and future values for all parameters are known with certainty. The state of perfect information includes knowledge about the values of parameters with natural variability.

Source: (USEPA-CREM)

permanent pool

The level of water retained within a basin below the invert of the lowest outlet structure

Source: (toolkit 20091023)

permanent transfer

Permanent transfer of a water entitlement (licence to take water) from one licensed user to another.

Source: (Welsh, Podger 2008)

permanent wilting point

The soil matric potential below which plants wilt and fail to recover, even when placed in a humid chamber. This soil matric potential is usually estimated to be -1.5 MPa.

Source: (ANCID 2001)
Source: (NWC 2007)

permeability

The measure of the ability of a rock, soil or sediment to transmit a fluid. The magnitude of the permeability depends largely on the porosity and the connectedness of pores spaces.

Source: (ANCID 2001)
Source: (NWC 2007)

PI

Performance Indicator

Source: (NWC 2007)

piezometer

A non-pumping well, generally of small diameter, that is used to measure the elevation of the watertable or potentiometric surface. A piezometer generally has a short well screen through which water can enter.

Source: (ANCID 2001)
Source: (NWC 2007)

pipe

A closed conveyance or carrier regardless of material, size or shape which conveys water typically for supply service. It is also a buried perforated carrier to collect subsurface drainage water.

Source: (National Performance Framework 2006-07)
Source: (NWC 2007)
**piped sub-surface drainage service**
A drainage service which collects and removes excess groundwater through a series of collector pipes.

*Source:* (NWC 2007)

*Source:* (National Performance Framework 2006-07)

**piston-flow**
The process by which leakage from the basin displaces all soil water and groundwater from areas into which it flows. No mixing or diffusion with existing water is considered to take place.

*Source:* (toolkit 20091023)

**planted area**
The area that an irrigation farmer plants in a season. The planted area may be reduced during the season if there is not enough water available to service the whole of the initially planted area.

*Source:* (Welsh, Podger 2008)

**plug flow**
Flow conditions where all parcels of inflow have the same detention time. In this document this term is also used to describe flow conditions where a constant detention time is achieved, but is less than maximum (Q/V) because of ineffective flow volume, ie apparent plug flow.

*Source:* (toolkit 20091023)

**plugin**
A component model or tool that can be incorporated into Source Catchments. Usually in the form of .dll or .exe files.

**PMIS**
Programme Management Information System

*Source:* (NWC 2007)

**POAMA**
Predictive Ocean Atmosphere Model for Australia

*Source:* (NWC 2007)

**point potential evapotranspiration**
The ET that would take place, under the condition of unlimited water supply, from an area so small that the local ET effects do not alter local air mass properties. It is assumed that latent and sensible heat transfers within the height of measurement are through convection only. For example, this represents the evapotranspiration which would occur from small irrigated fields with a never-ending water inflow, surrounded by unirrigated land. Point potential ET may be taken as a rough preliminary estimate of evaporation from small water bodies such as farm dams and shallow water storages.

*Source:* (Chiew 2002)

**pollute**
To make foul or unclean; dirty.
**pond**

A small artificial body of open water (ie dam or small lake).

*Source:* ([toolkit 20091023](#))

**pondage test**

A water balance approach to measuring channel seepage within an isolated reach of channel. A section of channel is blocked off with embankments and the section filled with water. The seepage rate is calculated from the rate of water drop after corrections are made for evaporation and rainfall.

*Source:* ([ANCID 2001](#))

*Source:* ([NWC 2007](#))

**post-resource assessment phase**

The eighth phase of execution within a time-step. In this phase account balances are adjusted to recognise any difference between water that was ordered and the amount of water actually delivered (ie this phase takes account of shortfalls).

*Source:* ([Podger 2011](#))

**potable**

Suitable for human consumption, whether used as drinking water or in the preparation of food.

*Source:* ([toolkit 20091023](#))

**potable recycling**

The recycling of water that has been treated to a standard suitable for human consumption.

*Source:* ([toolkit 20091023](#))

**potential disposal capacity**

The total amount of drainage water that a disposal basin can dispose of per unit of time. May be given in volumetric units (m³/day or ML/yr) or per unit area (mm/day or ML/ha/yr) and includes the effects of evaporation, rainfall, leakage and interception. It does not consider recycling of shallow lateral or vertical flow.

*Source:* ([toolkit 20091023](#))

**potentiometric surface**

A surface that represents the level to which water will rise in tightly cased wells. The watertable is a particular potentiometric surface for an unconfined aquifer.

*Source:* ([ANCID 2001](#))

*Source:* ([NWC 2007](#))

**Power Function**
The Power Function is a constituent generation model that fits a rating curve describing the relationship between constituent concentration or load and discharge in linear space. This model is an empirically derived statistical function.

Source: (eWater CRC 2010a)

PPET

Point Potential Evapotranspiration “The evapotranspiration (ET) that would take place, under the condition of unlimited water supply, from an area so small that the local ET effects do not alter local air mass properties. It is assumed that latent and sensible heat transfers within the height of measurement are through convection only. For example, this represents the evapotranspiration which would occur from small irrigated fields with a never-ending water inflow, surrounded by unirrigated land. Point potential ET may be taken as a rough preliminary estimate of evaporation from small water bodies such as farm dams and shallow water storages.”

Use: point potential evapotranspiration

Source: (Chiew 2002)

precast concrete

Concrete that is cast into its final shape before positioning.

Source: (Moore 2004)

precautionary principle

The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.

Source: (NWC 2007)
Source: (EPA 1999)

precipitation

Rain, snow, hail, sleet, dew.

Source: (Welsh, Podger 2008)

precision

The quality of being reproducible in amount or performance. With models and other forms of quantitative information, precision refers specifically to the number of decimal places to which a number is computed as a measure of the ‘preciseness’ or ‘exactness’ with which a number is computed.

Source: (USEPA-CREM)

predictive modelling

Applying a model to analyse scenarios representing the past, the present or possible future options.

Source: (CRCCH 2005)

predictive uncertainty

Uncertainty in prediction of hydrological responses associated with: uncertainty in the input data due to sampling or interpolation error; uncertainty in simulated responses due to errors in model parameter values; and uncertainty related to the hypotheses that underlie the model itself and the model structure.
preferential flow
The process by which leakage from the basin does not pass through the entire soil matrix. Sometimes referred to as bypass flow.
Source: (toolkit 20091023)

preliminary treatment
The first processes used in a sewage treatment plant, involving screening to remove gross solids, rags and plastic and the settling of sand and grit particles.
Source: (toolkit 20091023)

pre-resource assessment phase
The third phase of execution within a time-step. In this phase account balances are adjusted prior to ordering to take account of any resource allocation rules, or accounting requirements.
Source: (Podger 2011)

pressurised network supply service
Any raw water supply service from a supply network where the minimum design residual pressure head at more than 95% of customer service points is greater than or equal to 3 metres.
Source: (NWC 2007)
Source: (National Performance Framework 2006)

Pride
A specific instance of a water user node where demands are estimated based on crop water requirements that take account of climatic factors.

Priestly Taylor Equation
The Priestley-Taylor method (Priestley and Taylor, 1972) for the calculation of daily potential evapotranspiration replaces the aerodynamic term of Penman-Monteith equation by a dimensionless empirical multiplier.

primary treatment
The first major treatment process in a sewage treatment facility, principally designed to remove a substantial amount of suspended matter, but little or no colloidal or dissolved matter. Typical primary sewage treatment processes may include clarification (with or without chemical treatment, to accomplish solid-liquid separation), grease removal and screens.
Source: (National Performance Framework 2006)
Source: (NWC 2007)

priority group (Qld)
An attribute of a group of water allocations for supplemented supply. A common water allocation security objective applies to all water allocations in the group.
Source: (NWC 2007)
private irrigation district water allocation (NSW)
The right to have water delivered to a property within a private irrigation district.

Source: (NWC 2007)

probability density function
Mathematical, graphical, or tabular expression of the relative likelihoods with which an unknown or variable quantity may take various values. The sum (or integral) of all likelihoods equals one for discrete (continuous) random variables. These distributions arise from the fundamental properties of the quantities we are attempting to represent. For example, quantities formed from adding many uncertain parameters tend to be normally distributed, and quantities formed from multiplying uncertain quantities tend to be lognormal.

Source: (USEPA-CREM)

Probable Maximum Flood
The flood resulting from Probable Maximum Precipitation (PMP), and where applicable snow melt, coupled with the worst flood-producing catchment conditions that can be realistically expected in the prevailing meteorological conditions.

Source: (Welsh, Podger 2008)

Probable Maximum Precipitation
The theoretical greatest depth of precipitation for a given duration that is physically possible over a particular catchment area, based on generalised methods.

Source: (Welsh, Podger 2008)

production function
A production function describes the rate at which resources are transformed into products or it specifies quantities and qualities of resources needed to produce a particular product.

Source: (toolkit 20091023)

programs
Instructions, written in the syntax of a computer language, that provide the computer with a step-by-step logical process. Computer programs are also referred to as code.

Use: code

Source: (USEPA-CREM)

project management
Planning, monitoring and control of all aspects of a project and the motivation of all those involved in, the aim being to achieve the project objectives on time and to the specified cost, quality and performance.

Source: (PMI 2008)

property connection sewer
A short sewer, owned and operated by the sewerage agency, which connects the main sewer and the customer sanitary drain. It includes a junction on the main sewer, a property connection fitting, a vertical riser (in some cases) and sufficient straight pipes to ensure the property connection fitting is within the lot to be serviced.

Source: (National Performance Framework 2006)
property service

 includes any water infrastructure between the water main and the internal plumbing of the property. It may be owned by the water business, and is often referred to as the mains to meter service or connection. All waterplumbing downstream of the meter is usually the property owner's asset.

Source: (National Performance Framework 2006)
Source: (NWC 2007)

protected catchment

An area upstream of a water storage in which human activity is not permitted or is restricted so as to protect water quality values.

Source: (toolkit 20091023)

provisional cap

A cap that recognises that the level of entitlement may be raised in the future.

Source: (NWC 2007)
Source: Australian Water Resources 2005

public interaction guidelines

Guidelines established through a public consultative and consensus building process that provide guidance on the interaction between the modeller and the water manager, who often have the roles of consultant and client, respectively.

Source: (Refsgaard et al, 2005a)

public technical guidelines

Modelling guidelines often containing the same substance as internal technical guidelines (see definition) but differing in the sense that they have been prepared through a consultative and consensus building process involving many persons and organisations.

Source: (Refsgaard et al, 2005a)

pump storage dams

Reservoirs built above and adjacent to larger dams, with hydroelectric power production during peak demand periods when water flows from the higher dam. Water is pumped back up to the storage during off peak periods.

Source: (toolkit 20091023)

pumped sub-surface drainage service

A drainage service which collects and removes excess groundwater through one or more pumps. In some circumstances, pumped sub-surface drainage and piped sub-surface drainage are combined and the reporting agency should report against the primary service with explanatory comment provided.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)
qualitative assessments

Some of the uncertainty in model predictions may arise from sources whose uncertainty cannot be quantified. Examples are uncertainties about the theory underlying the model, the manner in which that theory is mathematically expressed to represent the environmental components, and theory being modelled. The subjective evaluations of experts may be needed to determine appropriate values for model parameters and inputs that cannot be directly observed or measured (e.g., air emissions estimates). Qualitative, validation activities may involve the elicitation of expert judgment on the true behaviour of the system and agreement with model-forecasted behaviour.

quantitative assessments

The uncertainty in some sources such as some model parameters and some input data can be estimated through quantitative assessments involving statistical uncertainty and sensitivity analyses. In addition, comparisons can be made for the special purpose of quantitatively describing the differences to be expected between model estimates of current conditions and comparable field observations.

quick flow

The component of streamflow that has travelled through the catchment as interflow or across the surface as overland flow.

R

rain rejection
This occurs when in a regulated river system ordered water is not extracted because local rainfall has met the water needs since a water order was placed.

**Source:** (Welsh, Podger 2008)

**rain rejection flows**

are released from the Hume Dam during the irrigation season but not diverted into the irrigation areas from Mulwala Lake.

**Source:** (toolkit 20091023)

**Rainfall exceedance curve**

A graphical representation of a ranking of all the rainfall values over a fixed duration in a given period, from the lowest to the highest, where the rank is the percentage of time the rainfall value is equalled or exceeded.

**rainfall on storage**

The average depth of rainfall over a period of time on the storage water surface

**Source:** Water Resources Observation Network

**Source:** (NWC 2007)

**rainfall runoff**

Flow of surface water from a given area resulting from the effects of rainwater and/or applied irrigation water in excess of crop water requirement and leaching.

**Source:** (ANCID 2001)

**Source:** (NWC 2007)

**rainfall runoff harvesting**

Water from a rainfall event that is harvested on irrigation farms via a water recirculation system.

**Source:** (Welsh, Podger 2008)

**rainfall runoff model**

A model that generates runoff from rainfall and other climatic inputs (often potential evaporation and sometimes temperature). In Source rainfall runoff models operate at the scale of the FU or sub-catchment.

**Rainfall surface**

Grid showing the spatial variation in rainfall depths for a given duration over an area.

**rainfall volume on storage**

The volume of rainfall over a period of time on the storage water surface.

**Source:** Water Resources Observation Network

**Source:** (NWC 2007)

**RAP**
Contains a suite of tools for analysing the hydrology and hydraulics of a river and their relationship to ecology.

Use: River Analysis Package

Source: (Stewardson and Marsh 2004)

Raster
A map image formed by a matrix of pixels arranged in rows columns, which can be displayed on a computer screen.

Rating curve
relationship between water level at a given location and flow rate.

raw sewage
Untreated liquid waste entering a sewage treatment plant through a system of pipes, collected from domestic and industrial sources.

Source: (toolkit 20091023)
aw water
Untreated water from a storage, stream or aquifer destined for treatment for domestic and industrial uses.

Source: (toolkit 20091023)

reach
A length of channel between two points.

Source: (ANCID 2001)

Source: (NWC 2007)

reach dead storage
The storage in a river reach that does not contribute to outflow from that reach.

Source: River Systems specification

reach length
The distance along the river reach.

Source: River Systems specification

reach storage
The volume of water stored in a river reach, which is a function of reach dead storage and flow in the reach.

Source: River Systems specification

reach width
The average river reach surface width at a specific flow or storage volume. This information is used to calculate the surface area of the reach by multiplying by the reach length.
reactor tank
A vessel of steel or concrete in which chemical and biological processes occur to remove biodegradable organic material by bacterial digestion and to reduce nutrient levels, during sewage treatment.

Source: (toolkit 20091023)

readily available water
Water that can be removed from a soil horizon by a crop without resulting in water deficit stress. This is often estimated to be half the total available water.

Source: (ANCID 2001)
Source: (NWC 2007)

REALM
"Resource Allocation Model. A tool that has been routinely used for water resources planning in Victoria, South Australia and Western Australia since the 1980's."

Use: Resource Allocation Model

Source: (Welsh, Podger 2008)

receiving water
A river, estuary or ocean site into whose waters treated effluent is discharged

Source: (toolkit 20091023)

recession
The falling limb of a hydrograph.

Source: (Stanley, K. 2007)

reclaimed water
Wastewater that has been recently treated to a standard sufficient to enable it to be recycled for some specific use

Source: (toolkit 20091023)

Recursive digital filter
A mathematical algorithm for separating baseflow from the total runoff signal.

recycled water
Treated effluent that is used by either the water utility itself, a business supplied by the water utility, or supplied through a third pipe system or urban reuse. Recycled water can be provided for onsite reuse, agriculture, irrigation, industry, potable or other use external to the treatment process.

Source: (National Performance Framework 2006)
Source: (NWC 2007)
reduced water level
Groundwater levels given with respect to height above sea-level (ie a given metres above Australian Height Datum, mAHD).
Source: Australian Water Resources 2005
Source: (NWC 2007)

reducible uncertainty
Uncertainty in models that can be minimised or even eliminated with further study and additional data. See data uncertainty.
Source: (USEPA-CREM)

reference crop evapotranspiration
The evapotranspiration rate from a reference surface, not short of water, is called the reference crop evapotranspiration or reference evapotranspiration and is denoted as ETo. The reference surface is a hypothetical grass reference crop with specific characteristics.
Source: (Allen et al 1998)

regional natural resource management plans
Plans that cover specific regions like those developed under the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality.
Source: (NWC 2007)
Source: National Water Initiative

regional natural resource management plans (WA)
Plans that cover specific regions like those developed under the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality.
Source: (NWC 2007)

regional-scale basins
Basins that accept drainage water from multiple farms and irrigation districts and/or sited outside the districts themselves.
Source: (toolkit 20091023)

regulated flow
Water that is released from storage to meet downstream requirements.
Source: (Welsh, Podger 2008)

regulated resource assessment system
A way of characterising a resource assessment system based on its resource type.

regulated river
The section of river that is downstream of a major storage from which supply of water to irrigators or other users can be regulated or controlled. In NSW these storages and rivers are operated by State Water and the regulated rivers are designated by legislation.
Source: (Welsh, Podger 2008)
regulated river network

A water supply network which at its simplest may comprise a single structure such as a dam, which provides storage and the ability to regulate or control river flows, but which may comprise many structures and multiple connected regulated rivers or streams. A regulated river network would typically provide a regulated river's commercial or urban supply customers.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

regulated river section

A section of river that is operated to manage regulated water using a set of storages and expected inflows. Regulated users in a regulated system can order water from different storages. The water available to each regulated user is determined by rules on their licences and rules used to operate the system. There can be unregulated water and unregulated users in a regulated river section.

Source: eWater CRC

regulated river supply service

A rural raw water supply service that is dependent on assets such as dams, weirs and bulk carriers and is provided at customer service points at an agreed and specified level of service and common price, which may allow for differentiated service standards or prices, but which is commonly available to customers and confers common obligations on customers. This service excludes issuing and administration of licences and may or may not include activities related to water ordering, metering and measurement. This service does not apply to any agency in South Australia in relation to the River Murray in South Australia, where the storage releases occur in the upper states in accordance with the provisions of the Murray Darling Basin Agreement.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

regulated surface diversion service

A drainage surface diversion service that enables customers to pump or divert from a surface water source, typically a river that is regulated or controlled by a structure or structures operated by a rural water delivery agency.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

regulated system

River system where the flow of the river is regulated through the operation of large dams or weirs.

Source: Australian Water Resources 2005
Source: (NWC 2007)

regulated water

Water, both stored and release that can be used to supply regulated demands in a regulated river section according to the licence and operational rules in place.

Source: eWater CRC

regulating storage
Water storage located within, or close to, the channel system and used to regulate fluctuations in channel flows. Excess channel flows are directed from an Outfall Structure to the Regulating Storage and returned for use in the channel system at a time when demand increases. A Regulating Storage can reduce system water losses and improve water efficiency and service standards particularly at the downstream end of a large system.

Source: (NWC 2007)
Source: (ANCID 2001)

**reinforced concrete**
Concrete with metal bars or wire etc embedded to increase its tensile strength.

Source: (Moore 2004)

**RELAX-IV**
A computer program for optimising integer network linear programming problems. This is one of the methods available in Source for determining flow and storage distribution in a river system model.

Source: (Bertsekas and Tseng 1994)

**reliability (model)**

Source: (USEPA-CREM)

**reliability (water access entitlement)**
The frequency with which water allocated under a water access entitlement is able to be supplied in full. Referred to in some jurisdictions as high security and general security.

Source: National Water Initiative
Source: (NWC 2007)

**remote control**
Remote control of channel flow regulators initiated by a signal from a distant location.

Source: (NWC 2007)
Source: (ANCID 2001)

**remote sensing**
Any kind of data recording by a sensor which measures energy emitted or reflected by objects located at some distance from the sensor (ie no direct ground contact).

Source: (ANCID 2001)
Source: (NWC 2007)

**remote surveillance**
Remote sensing of water levels, flow and/or system using electronic data collection and transmission systems.
renewable groundwater

Groundwater extracted from an aquifer that receives recharge from rivers, rainfall, or from other aquifers.

Source: Australian Water Resources 2005
Source: (NWC 2007)

reporting agency

A rural water delivery agency which has an obligation to participate in rural performance reporting because it provides at least one rural water service in excess of the agreed threshold for participation in rural performance reporting, and for which the additional recurrent costs incurred in relation to collecting, auditing and reporting data is less than 1% of total revenue associated with rural water service provision.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

reporting entity

A rural water delivery agency or if applicable, an individual geographical or service-based business unit of a rural water delivery agency, which may be the level of aggregation for some aspects of rural water performance reporting, such as for customer complaints. If and where required, such an entity is likely to have responsibility for a cluster of rural water services, such as water supply for irrigation and associated drainage services.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

reporting period

The time over which data for determination of characteristics and performance indicators is to be collected, likely to be a 12 month period from 1 July to 30 June.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

residential water consumption

Total metered and estimated non-metered, potable and non-potable consumption by residential properties.

Source: (NWC 2007)
Source: (National Performance Framework 2006)

resistivity survey

A geophysical technique used to measure the apparent resistivity of the sub-surface by applying a direct current to the ground and measuring the resultant ground potential and current in the vicinity of the applied current.

Source: (ANCID 2001)
Source: (NWC 2007)

resource allocation
The process by which the volume of water assessed as being available is shared amongst
the water users in a resource allocation system.

Source: River Systems specification

Resource Allocation Model (REALM)

REsource ALlocation Model (Perera et al. 2005). A river system simulation model used mainly
for Water Resource Planning developed in Victoria. A tool that has been routinely used for
water resources planning in many Australian states since the 1989’s.

Source: (Welsh, Podger 2008)

resource allocation system

Describes the resource assessment, resource allocation and water users that make up a
water sharing arrangement.

Source: River Systems specification

resource assessment system

Describes the resource assessment, resource allocation, water use accounting and water
users that make up a water sharing arrangement.

Source: (Welsh, Podger 2008)

resource operations licence (Qld)

A licence relating to the operating rules for infrastructure and management of water. The
licence is granted under an approved resource operations plan to the operator of water
storage infrastructure.

Source: (NWC 2007)

resource operations plan (Qld)

A resource operations plan (ROP) provides rules and processes to implement a water
resource plan. A ROP may contain specific detail about: infrastructure operating rules, trading rules, water sharing rules, converting entitlements tied to land to tradeable water allocations, processes for granting of any additional water allocations, monitoring and reporting on water and ecosystems.

Source: (NWC 2007)

reticulated supply

Treated water supplied through a system of pipes, mains, control valves etc. for household or
industrial use.

Source: (toolkit 20091023)

return flow

Return flows refer to water that has been diverted by industry or an irrigator and then returned
to the river after use (eg non-consumptive uses such as hydropower, cooling water for
industry or water for aquaculture). This water is included as an inflow to the basin because
the water is available to be diverted downstream or will pass the basin outlet.

Source: Australian Water Resources 2005
Source: (NWC 2007)
reuse water

Re-using water that would otherwise be wasted instead of using fresh water. Reuse water includes wastewater, stormwater, rainwater, and greywater.

Source: (National Performance Framework 2006)
Source: (NWC 2007)

reverse osmosis

A membrane filtration process that allows only the passage of water; can be used for desalination or where water of high purity is required.

Source: (toolkit 20091023)

RFA

Regional Forest Agreement

Source: (NWC 2007)

rhizomateous

The pattern of plant growth originating from an underground stem-like root system

Source: (toolkit 20091023)

Richards’ equation

Formulated by Lorenzo A. Richards in 1931, the equation represents the movement of water through saturated or unsaturated soils. Richards’ equation is the foundation of all mechanistic models used to simulate the dynamics of water (or other liquid) in permeable materials, including rocks, soil and aquifers.

Source: (Buchan 2003)

riffle

A fast flowing, turbulent portion of a stream or river, where the water is shallow, well-aerated and the surface broken by rocks, stones or gravel.

Source: (toolkit 20091023)

right bank

Right side bank of a channel or drain when looking in the direction of flow.

Source: (ANCID 2001)
Source: (NWC 2007)

ring tank

An off-stream storage, filled by pumping during periods of high flow in the stream.

Source: (toolkit 20091023)

Riparian Particulate Model

Filter model available in Source Catchments. Conceptual model of particulate trapping in riparian buffers through the processes of settling, infiltration and adhesion. The model is primarily based on physical principles.
Riparian zone
The zone adjacent to streams and rivers; usually there is some exchange of water and nutrients between this zone and the stream. An area or zone within or along the banks of a stream or adjacent to a watercourse or wetland; relating to a riverbank and its environment, particularly to the vegetation.

Source: (Welsh, Podger 2008)

Rising limb
Part of a flood hydrograph where the stream level or flow is increasing with time.

Rising mains
A particular form of main pipeline that conveys water directly from a pump to a higher elevation (often a storage).

Source: (ANCID 2001)
Source: (NWC 2007)

Risk assessment
A process for the qualitative or quantitative analysis and evaluation of the hazards associated with any particular action or inaction.

Source: (toolkit 20091023)

River
A considerable natural stream of water flowing in a definite course or channel or series of diverging and converging channels.

Source: Macquarie Dictionary
Source: (NWC 2007)

River abstractions
Supplies to off-river storages, including tanks, reservoirs or dams.

Source: (NWC 2007)
Source: (National Performance Framework 2006)

River Analysis Package
Contains a suite of tools for analysing the hydrology and hydraulics of a river and their relationship to ecology.

Source: (Stewardson and Marsh 2004)

River basin
The total area from which water drains to a river system, or a grouping of adjacent river systems. In geological terms, a basin is defined as either a broad tract of land in which the rock strata are tilted toward a common centre, or a large, bowl-shaped depression in the surface of the land or ocean floor.

Source: (Stanley, K. 2007)
river diversion
Water diverted (by pump or gravity) from a river
Source: (Welsh, Podger 2008)

river freshes
are small excess flows (which are generated by local rainfall) in the unregulated tributaries of the Murray upstream of the forest.
Source: (toolkit 20091023)

River Manager
River Manager is a personal-computer-based application for describing and modelling the behaviour of river systems. It is part of a family of eWaterCRC products including River Operator and Source Catchments. River Manager is designed to support the construction and operation of river models that mimic river behaviour over arbitrarily-long periods (weeks, months, years, centuries). This contrasts with River Operator which is intended to support day-to-day applications.
Use: Source IMS
Source: eWater CRC

River Operator
A tool for assisting water authorities to operate regulated and unregulated river systems on a daily or seasonal basis.
Use: Source IMS
Source: (Podger 2009)

River Systems Pre-processing Tools
(software plugin) Inserts extra methods for importing input time series data into Source Catchments.
Source: (eWater CRC 2010b)

RO
Reverse osmosis
Source: (NWC 2007)

robustness
The capacity of a model to perform well across the full range of environmental conditions for which it was designed.
Source: (USEPA-CREM)

ROL
Resource Operation Licence (Qld)
Use: resource operations licence (Qld)
Source: (NWC 2007)
rolling cap
Some water entitlements are based on a rolling average of use (eg entitlements that are averaged over a three-year period), rather than a fixed annual entitlement.

Source: (NWC 2007)
Source: Australian Water Resources 2005

ROP
Regional Operations Plan (Qld)
Use: resource operations plan (Qld)
Source: (NWC 2007)

RPM
“Filter model available in Source Catchments. Conceptual model of particulate trapping in riparian buffers through the processes of settling, infiltration and adhesion. The model is primarily based on physical principles.”

Use: Riparian Particulate Model
Source: (eWater CRC 2010a)

RSMT
River System Management Tool.
Source: (Welsh, Podger 2008)

run-off
Surface overland flow of water resulting from rainfall or irrigation exceeding the infiltration capacity of the soil.

Use: rainfall runoff
Source: (toolkit 20091023)

rural and regional services
Refers to water and wastewater services provided for rural irrigation and industrial users and in regional urban areas with less than 50,000 connections.

Source: (NWC 2007)
Source: National Water Initiative

rural water delivery agency
An organisation which provides a rural water service or services in one or more of the five rural water service categories.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

rural water service category
The five rural water service categories are regulated river supply, network supply, drainage, surface water diversion and groundwater diversion.
RWTP
Recycled Water Treatment Plant
Source: (NWC 2007)

Sacramento
Model available in Source Catchments. The Sacramento model is a catchment water balance model that relates runoff to rainfall with daily data. The model contains five stores; and has 16 parameters. This is a mass balance model that is based on conceptual relationships.
Source: (eWater CRC 2010a)

SAG
Scientific Advisory Group
Source: (NWC 2007)

sales water (Vic)
Lower-reliability water offered to irrigators on a seasonal basis, in proportion to their base rights, after provision has been made to meet the base rights in the following year.
Source: (Victorian Water Accounts 2008-2009)

saline disposal basins
Man-made or natural shallow depressions used for the disposal of saline water. Often referred to as evaporation basins.
Source: (toolkit 20091023)

saline groundwater
Groundwater that exceeds a salinity concentration of 3500 milligrams per litre.
Source: Australian Water Resources 2005
Source: (NWC 2007)

salinity
The concentration of soluble salts in a solution, soil or other medium
Source: (toolkit 20091023)

salt export
The process in which saline water is transported outside the irrigation area in which it originated
Source: (toolkit 20091023)
SAT
Soil Aquifer Treatment
Source: (NWC 2007)

saturated zone
The zone in which the voids in the rocks or soil are filled with water at a pressure greater than atmospheric. The watertable is the top of the saturated zone in an unconfined aquifer.
Source: (ANCID 2001)
Source: (NWC 2007)

Saturation excess runoff
Runoff that is generated due to soils at the surface having all of their pore space full with water.

SAWM
Smart Approved Water Mark scheme
Source: (NWC 2007)

scenario (model creation, editing and calibration)
One of the possible implementations of a model. A particular set of parameters and settings for a river or catchment model.
Source: (anonymous 2009)

scenario (model execution and analysis)
If scenarios are to be used to manage the uncertainties that can accumulate in models, the type of scenario chosen will depend on the purpose of the exercise. A typology modified from Börjeson et al. (2005) is proposed to classify three different approaches to scenarios of the future: âprojections; âexploratory scenarios; ânormative scenarios. Baseline projections can be used to estimate the future state of a system subject to âbusiness as usualâ assumptions with no major policy changes. Projections can also be used to pose the question of how a system reacts if a certain set of âwhat-ifâ assumptions are made. Such scenarios, which quantify outcomes, are challenged by uncertainty in the long term, and may not explore adequately variations in drivers, or transformation in the system. The narratives of exploratory scenarios are predominantly qualitative but usually with a quantitative underpinning provided by model simulation outputs. They can either focus on drivers of change that are exogenous to the system and out-with the control of the actors for whom the scenarios are being developed, external scenarios, or they can include policy, in which case they are described as strategic. Exploratory scenarios are useful if the uncertainties in the system cannot be sufficiently managed using a model, or modelling framework alone. Methodological and epistemological uncertainty may be explored using qualitative narratives.
Source: (Börjeson et al, 2005)

screening model
A type of model designed to provide a âconservativeâ or risk-averse answer. Screening models can be used with limited information and are conservative, and in some cases they can be used in lieu of refined models, even when time or resources are not limited.
Source: (USEPA-CREM)

seasonal determination (Vic)
The assessment of the volume of water made that is assessed that could be made available for a water allocation for a specified irrigation season.

Source: (NWC 2007)

seasonal water assignment (Qld)

The assigning of some or all of the water available under a water allocation for all or part of a water year to another person or another place of extraction. This is often referred to as a temporary trade.

Source: (NWC 2007)

seasonal water assignment rules (Qld)

The rules stated in a regulation or a resource operations plan that regulate the approval of seasonal water assignments.

Source: (NWC 2007)

seasonality of flows

The pattern of variation, during the year, of the volume of water flowing through an unimpeded catchment.

Source: (toolkit 20091023)

secondary treatment

Typically, a biological treatment process that is designed to remove approximately 85 per cent of the Biological Oxygen Demand (BOD) and influent suspended solids. Some nutrients may incidentally be removed, and ammonia may be converted to nitrate. Typical secondary sewage treatment processes may include sand filtration, disinfection, a polishing step (to lower suspended solids and bacterial levels), activated-sludge processes, anaerobic plus aerobic processes, biological filters and lagoons (aerated, facultative, maturation or polishing).

Source: (NWC 2007)
Source: (National Performance Framework 2006)

sediment

Transported and deposited particles or aggregates derived from rocks, soil or biological material.

Source: (Soil Science Society of America 2008)

sediment delivery ratio

sediment delivery ratio - proportion of eroded sediment actually delivered to streams from sediment source

Source: (toolkit 20091023)

sediment load rate at sill

Parameter of the load based sediment delivery ratio filter model that defines the rate of sediment input at which all of the sediment is then delivered to the stream (with no removal).

sediment loading rate threshold
Parameter of the load based sediment delivery ratio filter model that defines the rate of sediment input at which all of the sediment is removed by the filter (with no delivery to the stream).

**sediment storage**

Process for sediment to accumulate within one or more reaches of the model for a period of time, possibly to be released later. Sediment storage would most commonly occur in large reservoirs or in flatter lower lying reaches of large rivers.

**sedimentation**

The process whereby suspended particles settle from a water column; the disposition of soil materials as the end-process of erosion.

*Source:* [toolkit 20091023]

**seepage**

The movement of water downwards or laterally through soils or permeable rock. This water can originate from a very wide range of sources, including all water bodies and most land surfaces. Seepage water may percolate far enough to reach groundwater.

*Source:* [Welsh, Podger 2008]

**seepage meter**

Covered cylindrical infiltrometers modified for use under water. Seepage meters are used for spot measurements of seepage in channels without artificial lining. The most well known seepage meter is the âIdaho Meterâ.

*Source:* [ANCID 2001]
*Source:* [NWC 2007]

**seepage plume**

The horizontal and vertical extent of groundwater which has been mixed with channel seepage water.

*Source:* [ANCID 2001]
*Source:* [NWC 2007]

**SEIS**

South East Irrigation Scheme (Tasmania)

*Source:* [NWC 2007]

**self-extracted water**

Water that is extracted by the user (generally in-situ) from either surface waters (streams or dams) or groundwater bores.

*Source:* [Australian Water Resources 2005]
*Source:* [NWC 2007]

**semi-permeable membrane**

An osmotic filter that separates a solvent (water) from a dissolved substance; the cell wall of plants and animals.
sensitivity
The degree to which the model outputs are affected by changes in selected input parameters.
Source: (USEPA-CREM)

sensitivity analysis
1. Analysis of the variability of one or more outputs of a model (e.g. flow or constituent loads) with variations in the assumptions of the model. Most commonly this is achieved by varying the value of one or more model parameters in a systematic way and then reporting the change in the selected key model outputs. 2. The computation of the effect of changes in input values or assumptions (including boundaries and model functional form) on the outputs. The study of how uncertainty in a model output can be systematically apportioned to different sources of uncertainty in the model input. By investigating the relative sensitivity of model parameters, a user can become knowledgeable of the relative importance of parameters in the model.
Source: (USEPA-CREM)

sensitivity surface
A theoretical multi-dimensional surface that describes the response of a model to changes in its parameter values. A sensitivity surface is also known as a response surface.
Source: (USEPA-CREM)

septic tank
A tank in which solid organic sewage is decomposed and purified by anaerobic bacteria. A system used to treat domestic organic wastes (blackwater) using bacteria in a concrete chamber in which the sludge settles and the nutrient-rich liquid flows on through a series of absorption trenches.
Source: Macquarie Dictionary
Source: (NWC 2007)
Source: (toolkit 20091023)

sequestration
The process of removing carbon from the atmosphere. Generally, sequestration is achieved through establishing tree plantations; however it can also be accomplished by other means, including chemical treatment and deep ocean air injection.
Source: (National Performance Framework 2006)
Source: (NWC 2007)

settling
Process by which particles suspended in water fall out of the water column over time and come to rest on the bottom.

settling tank
A container of water or wastewater in which solid matter in suspension forms a sediment or sludge for later removal, while the liquid flows on to the next step of the treatment process.
Source: (toolkit 20091023)
settling velocity
Rate at which particles suspended in water fall out of the water column over time and come to rest on the bottom.

sewer reticulation main
Sewer reticulation mains include all gravity sewer mains, all pressure mains (including common effluent pipelines, rising mains etc) and all vacuum system mains of any diameter. This excludes property connection sewers and pipelines carrying treated effluent.

Source: (National Performance Framework 2006)
Source: (NWC 2007)

sewerage
The system of pipes and pumps used to collect and transport sewage to, and the equipment used to treat and discharge effluent from, a sewage treatment plant.

Source: (toolkit 20091023)

sharing delivery capacity
An approach to sharing of an irrigation supply channel capacity (supplemented systems) or a water course capacity (unsupplemented) held by an entitlement holder and specified as a percentage share or volumetric supply rate at a particular time.

Source: (NWC 2007)
Source: National Water Initiative

sharing delivery capacity (WA)
An approach to sharing of an irrigation supply channel capacity (supplemented systems) or a water course capacity (un-supplemented) held by an entitlement holder and specified as a percentage share or volumetric supply rate at a particular time.

Source: (NWC 2007)

sharp crested weir
A type of fixed crest weir.

Source: (ANCID 2001)
Source: (NWC 2007)

shotcrete
A hard surface lining formed by the spraying of a concrete that dries in place onto the surface of the channel subgrade to form a hard surface and seal the channel.

Source: (ANCID 2001)
Source: (NWC 2007)

SILO
Comprehensive national rainfall dataset managed by the Queensland Department of Natural Resources and Mines

Source: (toolkit 20091023)
**SIMHYD**

SIMHYD is a conceptual rainfall runoff model that estimates daily stream flow from daily rainfall and areal potential evapotranspiration data. The model contains three stores for interception loss, soil moisture and groundwater. The model has seven parameters. This is a mass balance model that is based on conceptual relationships.

*Source: (eWater CRC 2010a)*

**Simple Urban Runoff Model**

Model available in Source Catchments. Simple Urban Runoff Model is a conceptual rainfall runoff model that estimates daily stream flow from daily rainfall and areal potential evapotranspiration data. It is a simplified version of SIMHYD. The model contains three stores for interception loss, soil moisture and groundwater and model has seven parameters. This is a mass balance model based on conceptual relationships.

*Source: (eWater CRC 2010a)*

**Simulation models**

Represent the development of a solution by incremental steps through the model domain. Simulations are often used to obtain solutions for models that are too complex to be solved analytically. For most situations, where a differential equation is being approximated, the simulation model will use finite time step (or spatial step) to simulate changes in state variables over time (or space).

*Source: (USEPA-CREM)*

**Siphon tube**

Small flexible pipe used to discharge water from a farm channel on to land using siphonic action.

*Source: (ANCID 2001)*

*Source: (NWC 2007)*

**Sirofloc**

A water and wastewater treatment process, licensed by CSIRO, which uses magnetite to remove some of the impurities.

*Source: (toolkit 20091023)*

**SLA**

Statistical Local Area

*Source: (NWC 2007)*

**Sleeper licence**

Licences, which have been issued but do not have history of water usage.

*Source: (toolkit 20091023)*

**SLRS**

Parameter of the load based sediment delivery ratio filter model that defines the rate of sediment input at which all of the sediment is then delivered to the stream (with no removal).

*Use: Sediment load rate at sill*
SLRT
Parameter of the load based sediment delivery ratio filter model that defines the rate of sediment input at which all of the sediment is removed by the filter (with no delivery to the stream).
Use: Sediment loading rate threshold

sludge
Settled solid matter in a liquid medium; the solid alum-rich material which settles in a sedimentation tank in a water treatment plant, recovered from the back-washing recovery tank; the watery solid material which settles during the primary and secondary treatment of wastewater.
Source: (toolkit 20091023)

sludge thickening
Use of a chemical, eg a polyelectrolyte, to de-water sludge to enable it to be more easily managed.
Source: (toolkit 20091023)

SMAR
Soil Moisture Accounting Runoff.
Source: (Welsh, Podger 2008)

snig track
Pathways created by bulldozers to carry logs to log landings.
Source: (toolkit 20091023)

snowpack
Volume of water held as snow.
Source: (Sinclair, Knight, Merz 2006)
Source: (NWC 2007)

SOC
State Owned Corporation.
Source: (NWC 2007)

social water requirements (WA)
Elements of the water regime that are identified to meet social (including cultural) values.
Source: (NWC 2007)

soft water
Water that contains less than 200 mg/L CaCO3, lathers readily with soap or detergents.
Source: (toolkit 20091023)

SOI
Southern Oscillation Index

Source: (NWC 2007)

soil sealants

Soil sealants are either natural or artificially processed materials that can be either injected into water, mixed into the soil, sprayed onto the soil or injected into the subsoil to reduce the channel seepage losses and increase soil stability.

Source: (ANCID 2001)
Source: (NWC 2007)

soil water

Water in the unsaturated zone in the soil profile

Source: (Sinclair, Knight, Merz 2006)
Source: (NWC 2007)

soil water stores

Mathematical components of a conceptual water balance model that represent the ability of the soils of the catchment to store water.

soundness

One of EPA's five Assessment Factors (see definition) that describes the extent to which the scientific and technical procedures, measures, methods or models employed to generate the information are reasonable for and consistent with, the intended application.

Source: (USEPA-CREM)

Source Catchments

Catchment modelling tool developed from E2. Used for modelling, forecasting and managing the amounts of water and materials flowing across a catchment and into receiving waters.

Use: Source IMS
Source: (anonymous 2009)

Source IMS

Umbrella application environment, based on E2, which supports river management, operations and and catchments scenario types. Incorporates antecedent products such as WaterCAST, Source Catchments, River Manager, River Operator and Source Rivers. See http://www.ewater.com.au/products/ewater-source/

Source Rivers

Umbrella application environment supporting River Manager and River Operator scenarios.

Use: Source IMS

spatial interpolation

Process of estimating values of a particular quantity at spatial locations where data has not been observed from point observations of that quantity. This is commonly undertaken with rainfall, where rainfall depths are required across a catchment but observations are only available at point rainfall gauges.
special levies

Special levies are any charges that are directly levied upon properties, and are neither a fixed or pay for use charge for water or sewage (eg environmental improvement levy).

Source: (NWC 2007)
Source: (National Performance Framework 2006)

specifications

Acceptance criteria set at the onset of a quality assurance plan that help to determine if the intended objectives of the project have been met. Specifications are evaluated using a series of associated checks (see definition for checks).

Source: (USEPA-CREM)

spillway

The construction beside or in the wall of a dam to allow overflow during periods when intake exceeds storage capacity.

Source: (toolkit 20091023)

spillway volume

Volume at the spillway crest level.

Source: Water Resources Observation Network
Source: (NWC 2007)

spline interpolation

A form of interpolation where the interpolant is a special type of piecewise polynomial called a spline.

Source: (Rivlin 2003)

split-sample test

(Also differential split-sample test). Common approach of separating the available data into a set used for model calibration and an independent set for validation of the performance of the model. A common approach used in hydrology is to use part of the record (say the first 2/3 of the available years of data) for calibration and the remaining part of the record to validate the performance of the model using the parameter values that had previously been calibrated on the first part of the record.

splitter node

A node model available in Source. A splitter divides water travelling down a single branch into two different branches. Splitters can be used to represent distributaries (a system with multiple end-points), effluents (a split in the river into the main channel and a smaller channel), anabranches (where a smaller section of river branches away from the main channel and then rejoins the main channel further downstream), or losses (where water is leaving the system). There are two kinds of splitter: &a splitter node models the behaviour of a natural system;&a controlled splitter node models the behaviour of a system where the flow down the effluent can be controlled by some kind of regulating structure.

spring

An issue of water from the earth, flowing away as a small stream or standing as a pool or small lake, or the place of such an issue.
square kilometre
An area equal to the area of an equilateral rectangle where each side is one kilometre in length.
Source: eWater CRC

SRA
Sustainable Rivers Audit (MDBC)
Source: (NWC 2007)

SS
suspended solids. Solid particles or sediment that are supported within the water flow without regularly being in contact with the bed or sides of the stream channel.
Use: Suspended solids

SSD
Sub-surface Drip (Irrigation)
Source: (NWC 2007)

staff gauge
Streamflow gauge that records water level heights using visual observations of water levels on vertical graduated measuring sticks known as staff boards. Before the installation of automated level recording equipment, water levels were often only recorded manually from the staff gauge once per day.

stage height
Recorded water level at a streamflow gauge expressed in a distance above the defined datum for that gauge. It is common for the datum to be defined as the bed level of the stream channel at the gauge location and in that case the stage height is the depth of water in the channel. There are other situations where a different datum is used, such as Australian Height Datum or other local survey datums.

stakeholder
An individual or organisation with a vested interest in the long-term success of a project.
Source: (toolkit 20091023)

standing water level
Depth to groundwater (m) below a datum point or reference point, usually from the top of casing or natural surface.
Source: Australian Water Resources 2005
Source: (NWC 2007)

State of the Environment
state variables
The dependent variables calculated within the model, which are also often the performance indicators of the models that change over the simulation.

Source: (USEPA-CREM)

statistical models
Models built using observations within a probabilistic framework. Include simple linear or multivariate regression models obtained by fitting observational data to a mathematical function.

Source: (USEPA-CREM)

statutory water management plans (WA)
Plans for surface and/or groundwater systems, developed in consultation with all relevant stakeholders on the basis of best scientific and socio-economic assessment, to provide secure ecological outcomes and resource security for users.

Source: (NWC 2007)

stay orders (WA)
An application to the Registrar from a person wishing to deal on a WAE which subject to certain conditions prevents any other dealing on a property for 48 hours.

Source: (NWC 2007)

steady state model
A model providing the long-term or time-averaged behaviour of the state variables.

Source: (USEPA-CREM)

STEDS
Septic Tank Effluent Disposal Scheme

Source: (NWC 2007)

STEG
Septic Tank Effluent Gravity

Source: (NWC 2007)

STEP
Septic Tank Effluent Pump

Source: (NWC 2007)

steps
There may be steps in the pay for use charge as usage increases past certain levels, meaning the same charge may not apply to each unit used by the customer. The steps of the pricing structure, usually in kilolitres, are the points where the usage charge applied to each customer changes.

Source: (NWC 2007)
Source: (National Performance Framework 2006)

**stochastic**

The random variability in the occurrence and magnitude of a parameter (eg, rainfall, streamflow, etc.)

Source: (toolkit 20091023)

**Stochastic Analysis Tool**

The Stochastic Analysis Tool is an abridged version of the Stochastic Climate Library (SCL) software available via the eWater Toolkit web site www.toolkit.net.au/scl. SCL is a stand alone program containing several different stochastic models for climate data generation at various spatial and temporal scales. The Stochastic Analysis Tool in Source Catchments currently contains a model for the generation of daily rainfall data for a multi-site using the transition probability matrix (with Boughtonâs correction). The resulting flow and constituent loadreplicates for each rainfall time series produced is the output visible to users for analysis and support. The Stochastic Analysis Tool is provided with the Source Catchments Installer.

Source: (eWater CRC 2010a)

**stochastic model**

A model that includes variability (see definition) in model parameters. This variability is a function of: 1) changing environmental conditions, 2) spatial and temporal aggregation within the model framework, 3) random variability. The solutions obtained by the model or output is therefore a function of model components and random variability.

Source: (USEPA-CREM)

**stochastic uncertainty**

The random variability in the occurrence and magnitude of an environmental variable (eg, rainfall, streamflow, etc.). This variability may cause stochastic uncertainty.

Source: (Refsgaard et al, 2005b)

**stochasticity**

Fluctuations in ecological processes that are due to natural variability and inherent randomness.

Source: (USEPA-CREM)

**storage behaviour**

The time varying change in a water storage status, influenced by rainfall, inflows, outflows and evaporation.

Source: (Welsh, Podger 2008)

**storage catchment runoff**

The volume of water flowing into storage over a period of time from the catchment between the headwater tributaries and the dam wall and upstream of the storage water surface.

Source: Water Resources Observation Network
storage demand
The volume of water that has been requested to be released from the storage. Note this may be more than the storage release.
Source: Water Resources Observation Network
Source: (NWC 2007)

storage inflow
The volume of water flowing into storage over a period of time that includes upstream tributaries, storage catchment runoff and rainfall on the storage.
Source: Water Resources Observation Network
Source: (NWC 2007)

Storage link model
A link model available in Source. Storages in Source Catchments are represented as links. Thus, storages are just another specific routing scheme at an abstract level, and appear in the list of routing models. The Storage model is based upon Mandrill (EMSS) and IQQM. The Storage model works by maintaining a mass balance.
Source: (eWater CRC 2010a)

storage node
A node model available in Source. A storage represents a point in a river system where water is retained until released. A release may be controlled (eg through a valve) or uncontrolled (eg during a spill). Storages operate by maintaining water mass balance.

Storage Nutrient Deposition
An in-stream processing link model available in Source Catchments. Storage Nutrient Deposition uses the approach that in-channel storages often act as a nutrient processing system and so have an effect that can be represented by a nutrient delivery ratio. The model is primarily based on physical principles.
Source: (eWater CRC 2010a)

storage release
The volume of water released to meet downstream demands. Note this may be less than storage demand due to release or operational constraints.
Source: Water Resources Observation Network
Source: (NWC 2007)

Storage Sediment Deposition
An in-stream processing link model available in Source Catchments. Storage Sediment Deposition uses the approach that in-channel storages often act as a sediment processing system and so have an effect that can be represented by a sediment delivery ratio. The model is primarily based on physical principles.
Source: (eWater CRC 2010a)

storage spill
The volume of water discharged from the storage in excess of the storage demand.
Source: Water Resources Observation Network
Source: (NWC 2007)

stormwater
A sudden, excessive run-off of water following a storm. Surface runoff resulting from excess rainfall, usually passing quickly through a drainage area.
Source: Macquarie Dictionary
Source: (NWC 2007)
Source: (toolkit 20091023)

stormwater management scheme
A holistic approach to managing urban stormwater that incorporates some or all of the following considerations; stormwater drainage, water quality improvements, aquatic habitat protection, stormwater harvesting and use, and landscape amenity
Source: (toolkit 20091023)

STP
Sewage Treatment Plant
Source: (NWC 2007)

Straight-through model
A link model available in Source Catchments. Straight-through routing is used in the trivial case of no routing, water enters a reach and immediately exits the reach in the same time step. The calculated outflow rate out of the reach is the same as the one into the reach in that time step. Straight-through routing is a conceptual model, and is the default link routing model.
Source: (eWater CRC 2010a)

stratification
The formation of layers in a water body, showing differences in temperature, turbidity, pH, nutrients, salinity and light penetration at various depths; lack of mixing within a water storage.
Source: (toolkit 20091023)

Streamflow
The net flow of water through a stream channel that integrates all contributing components, e.g., overland flow, interflow, and groundwater discharge.
Source: (Soil Science Society of America 2008)

Streamflow gauge
Device for measuring the level of water in a stream with time, which can then be used to estimate the flow rate of water.

subartesian water
A confined aquifer containing groundwater that will, if tapped by a bore, not flow naturally to the surface.
sub-catchment
Area of land within a catchment; used in specific contexts to distinguish components of a larger catchment.
Source: (Welsh, Podger 2008)

subdivide (Qld)
The subdivision of a water allocation into two or more water allocations.
Source: (NWC 2007)

subdivided (WA)
A Water Access Entitlement which has been divided into smaller lots than that of the parent Water Access Entitlement and new Water Access Entitlements have been allocated.
Source: (NWC 2007)

subdivision (allotment cluster)
Use the hyphenated form.
Use: sub-division (allotment cluster)

sub-division (allotment cluster)
A grouping of allotment clusters. For example, a sub-division could represent a new residential housing development consisting of 5 streets, with approximately 20 houses in each cluster ñ roughly 100 allotments in total.
Source: (Hardy 2009)

subdivision (NSW)
Cancellation of a licence and issue of multiple licences with the same total share.
Source: (NWC 2007)

sub-division (Vic)
A water share may be divided by cancelling (or reducing) the share and issuing new water shares.
Source: (NWC 2007)

submerged aquatic macrophyte
large plant that predominately grows below the surface of the water.
Source: (toolkit 20091023)

sub-reach
A sub-division of a reach for routing purposes.
Source: River Systems specification
sub-surface drainage system
System of drainage collector pipes, wells, ditches and/or pumps designed to intercept and remove excess groundwater so as to control the watertable level to be below the plant root zone. Often designed to exclude or restrict entry of surface drainage and rainfall.
Source: (ANCID 2001)
Source: (NWC 2007)

suburb
A grouping of sub-divisions. For example, a suburb could represent 10 subdivisions, with approximately 100 houses in each—roughly 1000 allotments in total.
Source: (Hardy 2009)

sunken pan
Used in the estimation of evaporation from lakes. It is a 920mm square and 460mm deep container made of unpainted galvanised iron that is buried and level with the ground surface. The sunken pan can have similar radiation and aerodynamic characteristics to a lake. On an annual basis, lake evaporation is approximately 80% of sunken pan evaporation (using a 0.80 pan coefficient conversion constant).
Source: (Subramanya 2008)

Supervisory Control And Data Acquisition
Supervisory, Control And Data Acquisition process using dedicated computer equipment and purpose written software. SCADA differs from automatic control in that it provides the facility for remote surveillance and control of supply works.
Source: (NWC 2007)

supplementary water
Water in a regulated river that is generally uncontrolled and in excess of any flow replenishment or environmental needs and ordered water. Also called off allocation water.
Source: (Welsh, Podger 2008)

supplemented water (Qld)
A water supply where the reliability is enhanced by releases of stored water from infrastructure.
Source: (NWC 2007)

supply contract (Qld)
A mandatory contract between the infrastructure operator and the holder of a water allocation for supplemented supply.
Source: (NWC 2007)

supply network
A distribution supply network of carriers which is used to convey water either under gravity or pressurised, from a source, typically a regulated river network, through customer service points to customer properties. A supply network may also be described as being an irrigation or non-irrigation (domestic and stock) network depending on the predominant purpose for which customers use the water supplied through the network.
supply network carriers

Network carriers are typically lined channels, unlined channels, pipes or natural waterways.

Source: (National Performance Framework 2006-07)
Source: (NWC 2007)

supply pipeline

Closed conduit designed to convey water under pressure from upstream source to farms. Pipeline systems can be classified as: High Pressure Systems where the delivery pressure is sufficient to operate pressurised on-farm irrigation systems, (pipeline with minimum residual pressure greater than 10 m); or Low Pressure Systems where the delivery pressure is usually sufficient to allow flood or furrow irrigation and additional pumping is required on farm to operate pressurised irrigation, (pipeline with minimum residual pressure greater than 1 m but less than 10 m).

Source: (ANCID 2001)
Source: (NWC 2007)

supply point

Point of delivery from an irrigation authority supply system to an individual farm. A supply point from a channel system usually consists of a small gated regulator or pipe outlet which may incorporate a measurement device such as a Dethridge meter outlet or in-line flow meter.

Source: (NWC 2007)
Source: (ANCID 2001)

supply point node

A node model available in Source. A supply point node represents a point in a river system where water can be diverted to meet demands.

surety (Tas)

Actual or relative probability with which a water allocation is expected to be available in any year having regard to the natural variability of the supply of water.

Source: (NWC 2007)

surface drainage service

A drainage service which collects and removes irrigation induced excess surface water, generally through surface drains.

Source: (NWC 2007)
Source: (National Performance Framework 2006)
Source: (National Performance Framework 2006-07)

surface drainage system

System of open drainage channels, modified natural waterways and/or storages designed to collect drainage from rainfall and irrigation runoff on rural lands and convey it to disposal. A system may include private, community and public works.
**Surface flow**

The component of streamflow that has travelled through the catchment as interflow or across the surface as overland flow. Also sometimes referred to as “surface runoff” or “overland flow”.

**Surface inflow**

Water flowing on the surface into an entity from adjoining entities. Includes river flows and overbank flows.

*Source: (Sinclair, Knight, Merz 2006)*

*Source: (NWC 2007)*

**Surface outflow**

Water flowing on the surface out of an entity from adjoining entities. Includes river flows and overbank flows.

*Source: (Sinclair, Knight, Merz 2006)*

*Source: (NWC 2007)*

**Surface runoff**

The component of streamflow that has travelled through the catchment as interflow or across the surface as overland flow. Also sometimes referred to as “surface flow” or “overland flow”.

**Surface water**

Includes: (a) water in a watercourse, lake or wetland; and (b) any water flowing over or lying on land: (i) after having precipitated naturally; or (ii) after having risen to the surface naturally from underground.

*Source: Water Act 2007*

*Source: (NWC 2007)*

**Surface water (WA)**

Water flowing or held in streams, rivers and other wetlands on the surface of the landscape. Water courses or artificial channels that is able to be captured and stored and supplemented from dams and reservoirs.

*Source: (NWC 2007)*

**SURM**

"Model available in Source Catchments. Simple Urban Runoff Model is a conceptual rainfall runoff model that estimates daily stream flow from daily rainfall and areal potential evapotranspiration data. It is a simplified version of SIMHYD. The model contains three stores for interception loss, soil moisture and groundwater and model has seven parameters. This is a mass balance model based on conceptual relationships."

*Use: Simple Urban Runoff Model*

*Source: (eWater CRC 2010a)*

**suspended solids**
(SS) Solid particles or sediment that are supported within the water flow without regularly being in contact with the bed or sides of the stream channel.

sustainable yield (WA)
The amount of water that can be taken from a water resource system (expressed as an extraction regime) without causing unacceptable impacts.

Source: (NWC 2007)

SWMA
Surface Water Management Area

Source: (NWC 2007)

SY
Sustainable Yield

Source: (NWC 2007)

system flexibility
the degree to which the regulated system can accommodate unseasonal surplus flows, either through airspace at Yarrawonga or flow of the River Murray below bankfull capacity.

Source: (toolkit 20091023)

T

take
To remove water from, or to reduce the flow of water in or into, the water resource including by any of the following means: (a) pumping or siphoning water from the water resource; (b) stopping, impeding or diverting the flow of water in or into the water resource; (c) releasing water from the water resource if the water resource is a wetland or lake; (d) permitting water to flow from the water resource if the water resource is a well or watercourse; and includes storing water as part of, or in a way that is ancillary to, any of the processes or activities referred to in paragraphs (a) to (d).

Source: Water Act 2007

Source: (NWC 2007)

TCC
Total Channel Control

Source: (NWC 2007)

TDS
Total Dissolved Salts

Source: (NWC 2007)

temporary trade
Trade in seasonal water allocations that involves transferring some or all of the water allocated to the entitlement for the current irrigation season or for an agreed number of seasons.

Source: (Productivity Commission 2006)

Source: (NWC 2007)

temporary transfer

Transfer of a volume of water, during a water year, from one licensed user to another.

Source: (Welsh, Podger 2008)

temporary transfer (Tas)

The short term movement (max 21 days) of the right to take water from an allocation to a person who does not hold a licence. In this lease arrangement the water entitlement is retained by the seller and a temporary transfer to a person (who does not require a licence) is permitted to overcome a significant water shortage.

Source: (NWC 2007)

term transfer (NSW)

Fixed term transfer of rights under a licence to another person.

Source: (NWC 2007)

terminal seepage rate

The constant rate of seepage attained once the groundwater mound caused by channel seepage rises to the elevation of the water surface in the channel.

Source: (ANCID 2001)

Source: (NWC 2007)

Terrain Analysis Library

(within TIME) Series of routines for analysing and modifying DEM.

tertiary treatment

Principally designed to remove nutrients, such as phosphorus (typically <2 mg/L) and/or nitrogen (typically <15 mg/L). A high percentage of effluent suspended solids (typically >95 per cent) are also removed. Tertiary treatment may additionally target other contaminants of concern, eg toxicants and salt. Typical tertiary sewage treatment processes may include biological nutrient removal plants, chemical dosing of secondary plants for nutrient removal (including lagoons), enhanced pond treatment systems for nutrient removal, reverse osmosis and advanced filtration systems, membrane bioreactors and secondary treatment plus grass plots or wetlands for nutrient removal. The further processing of wastewater, which has already had secondary or advanced secondary treatment. Treatment may involve further reduction in nutrient levels, filtration, use of constructed wetlands and higher levels of disinfection, using UV radiation, ozone etc., to inactivate pathogens.

Source: (NWC 2007)

Source: (National Performance Framework 2006)

Source: (toolkit 20091023)

Thalweg

Path of the deepest thread of water in a stream or river channel.
The Choke
Refers to the reach of the River Murray, between the junction of the Edward River and the Barmah township, with the lowest channel capacity (10600 ML/day) between Lake Hume and South Australia. Refer 35°56'S 144°57'E.
Source: (toolkit 20091023)

The Invisible Modelling Environment
Software development architecture specifically written for developing eco-hydrological models based upon the Microsoft .NET framework.
Source: (Welsh, Podger 2008)

Thiessen interpolation
A method of spatially interpolating point rainfall to a surface that assumes that the rainfall depth for the period at any location is the same as that recorded at the nearest rainfall gauge. For this reason it is sometimes known as "nearest neighbour" interpolation.

Thiessen weightings
Thiessen weightings are derived from the proportion of a catchment that is nearest to a particular rainfall gauge.

Thin plate splines
A method of spline interpolation that fits a surface to point observations using a polynomial function.

Threshold
A value of an algorithm or mathematical function at which there is a defined change in the behaviour of the function.

tile drain
A kind of tube drain system with linings constructed from joined slotted plastic pipes or terracotta pipes laid end to end.
Source: (ANCID 2001)
Source: (NWC 2007)

TIME
The Invisible Modelling Environment. Software development architecture specifically written for developing eco-hydrological models based upon the Microsoft .NET framework.
Use: The Invisible Modelling Environment

time series
A set of observations arranged in monotonically increasing order of time-stamp. The expression "time series" refers to the abstract concept. In an adjectival situation, use "time-series".
Source: (anonymous 2009)
Time Series Analysis
A graphical user interface that allows users to interactively investigate time series data. Designed as an interpretive tool.
Source: (eWater CRC 2010b)

time series demand
A specific instance of a water user node.

Time Series Manager
(software plugin) A tool for manipulating, infilling, cleaning and transforming time series. It can also apply any rating curve to a time series to create new time series.
Source: (eWater CRC 2010b)

time-series
When using "time series" in an adjectival situation, use a hyphen and write "time-series". For example, "time-series file". This makes it clear that "time series" is the relevant concept, as opposed to "series file".

time-stamp
A date and optional time on that date. A time-stamp represents a moment in time.

time-step
The resolution of the executing model. A time-step is a multiple of whole seconds and represents a duration of time, as distinct from a time-stamp which represents a moment in time. A daily model has a time step of 1 day. Other common time steps are 6 minutes, 1 month, 1 year.

time-step initialisation phase
The first phase of execution within a time-step. In this phase, time-series data are updated, expressions are evaluated, inflows are forecast, and demands are calculated.
Source: (Podger 2011)
Source: (Holz, 2010)

TN
Total Nitrogen
Source: (toolkit 20091023)

total available water
The volume of water in a soil that can be utilised by plant roots. It is the amount of water released between in situ field capacity and the permanent wilting point.
Source: (ANCID 2001)
Source: (NWC 2007)

total net flows
Total surface water runoff and deep drainage to groundwater (groundwater recharge) and transfers into the water system (both surface and groundwater), for a defined area.

Source: Australian Water Resources 2005
Source: (NWC 2007)

**total urban water supplied**

The total metered volume of water (potable, non-potable and recycled water) supplied to customers over a reporting period plus estimated non-metered consumption. This comprises the sum of bulk water exports, residential water consumption, commercial/municipal and industrial water consumption and other water supplied (includes estimated non-metered consumption).

Source: (NWC 2007)
Source: (National Performance Framework 2006)

**total water application efficiency**

The volume of water used by a crop as a percentage of total water applied (irrigation plus effective rainfall)

Source: (NWC 2007)
Source: (ANCID 2001)

**Total Water Economic Index**

Gross Production ($) ÷ Total Water Applied (ML)

Source: (NWC 2007)
Source: (ANCID 2001)

**Total Water Production Index**

Total Product (kg) ÷ Total Water Applied (ML)

Source: (NWC 2007)
Source: (ANCID 2001)

**total water resource**

Total inflows to surface and groundwater in a given year, for a defined area, plus the nett volume of water in store at the start of the year.

Source: Australian Water Resources 2005
Source: (NWC 2007)

**total water use**

Total water use is equal to distributed water use plus self-extracted water use plus reuse water use.

Source: (NWC 2007)
Source: Australian Water Resources 2005

**TP**

Total Phosphorous
trade (NT)
The change of ownership and location of a licence, absolutely or for a fixed period.

Source: (NWC 2007)

trade waste
Liquid waste generated by industry, business or manufacturing processes but excluding domestic wastewater.

Source: (toolkit 20091023)

tradeable water rights
(a) water access rights; or (b) water delivery rights; or (c) irrigation rights.

Source: Water Act 2007
Source: (NWC 2007)

trading zone (Vic)
Are specific area based zones which define where water can be traded to and from. They are based on the physical irrigation water delivery systems.

Source: (NWC 2007)

trading zones
Zones established to simplify administration of a trade by setting out the known supply source or management arrangements and the physical realities of relevant supply systems within the zone. Trade can occur within and between zones without first having to investigate and establish the details and rules of the system in each zone.

Source: National Water Initiative
Source: (NWC 2007)

transfer (ACT)
Both water allocations and licences can be transferred.

Source: (NWC 2007)

transfer (NSW)
Change in the ownership of the licence.

Source: (NWC 2007)

transfer (NT)
The automatic change of ownership of a licence when the land to which the licence relates changes ownership.

Source: (NWC 2007)

transfer (Qld)
For a water allocation, this means the passing of the legal or beneficial interest in the water allocation to another person. For a water licence, this means either the transfer of the legal or beneficial interest to the new owner of the land to which the licence is attached, or the transfer of the licence to a different piece of land (where this is allowed under regulations).

Source: (NWC 2007)

**transfer (SA, trust water allocation)**

The water allocation attached to a property within a district can be transferred to another property within the district, or to the authority responsible for the district. Note: To transfer a licence to another location, must lodge transfer and variation at same time. If fixed term transfer, the ownership automatically reverts but the variation does not.

Source: (NWC 2007)

**transfer (Vic)**

In relation to a water share, transfers the rights in the share held by a person to another person. (Note that the water allocations already granted do not transfer, and the transfer is absolute). The transfer of a water share is a permanent change in ownership of the water share (until such time the new owner decides to transfer it).

Source: (NWC 2007)

**transfer (WA)**

The outright sale of all of a Water Access Entitlement. Does not provide for the extraction or use of water, these are separate instruments.

Source: (NWC 2007)

**transfer of irrigation right (Tas)**

A change in ownership of a right to be supplied water in an Irrigation Scheme. May be absolute or for a limited period. May include the transfer of the irrigation right from one property in the Scheme to another. Approval is undertaken in accordance with section 23A of the Irrigation Clauses Act 1973.

Source: (NWC 2007)

**transfer of licence (SA)**

The transfer of the legal or beneficial interest in the licence to another. Can be absolute or for a defined period. (Does not in itself change where water can be taken or used)

Source: (NWC 2007)

**transfer of licence (Tas)**

A change in the ownership of the licence. May be absolute or may be for a limited period. May include a change in the physical location of extraction. Where the donor licence relates to a dam, it includes an obligation to release water from that dam. Approval is undertaken in accordance with Division 4, Part 6 of the Water Management Act 1999.

Source: (NWC 2007)

**transfer of water allocation (SA, licence)**

Reduction in a water allocation on one licence and corresponding increase in water allocation on another licence. Can be absolute or for a fixed period.

Source: (NWC 2007)
transfer of water allocation (Tas)
The movement of water allocation from one licence to another. May be absolute or may be for a limited period. Where the donor licence relates to a dam, it includes an obligation to release water from that dam.
Source: (NWC 2007)

translucency
An operational practice that involves releasing a portion of dam inflow to meet downstream targeted needs (eg environmental flows).
Source: (Welsh, Podger 2008)

transmission loss
The flow volume that is lost from a river or stream as water travels downstream. It includes seepage to groundwater, overbank flow that goes into floodplain depressions, wetlands and billabongs and never returns to the river, evapotranspiration from vegetation along the river fringe that access water directly from the river and evaporation from the water surface.
Source: (Welsh, Podger 2008)

transparency (clarity and completeness)
The clarity and completeness with which data, assumptions and methods of analysis are documented. Experimental replication is possible when information about modelling processes is properly and adequately communicated.
Source: (USEPA-CREM)

transparency (inflows)
An operational practice that passes dam inflows straight through the storage.
Source: (Welsh, Podger 2008)

transpiration
Evaporation loss of water from the leaves of plants through the stomata; the flow of water through plants from soil to atmosphere.
Source: (toolkit 20091023)

transpire
To emit or give off water vapour through the surface, as of the body, of leaves etc.
Source: Macquarie Dictionary
Source: (NWC 2007)

travel time
Time required for a representative flow to travel along a reach.
Source: River Systems specification

treated effluent discharge
Where wastewater treatment plant effluent is not reused, the treated effluent may be disposed to land, evaporative ponds, rivers and other streams or the ocean. For the purposes of the water balance, we are interested only in treated effluent discharged back to rivers and other streams.

Source: Australian Water Resources 2005
Source: (NWC 2007)

treatment train
The sequencing of structural Best Management Practices to achieve optimal flow management and pollutant removal from urban stormwater

Source: (toolkit 20091023)

tributary
A stream that joins another stream or body of water.

Source: (Stanley, K. 2007)

tributary inflow
The volume of water flowing from a tributary river over a period of time.

Source: Water Resources Observation Network
Source: (NWC 2007)

trickling filters
Concrete containers of rocks, over and through which primary-treated effluent passes.

Source: (toolkit 20091023)

TSS
Total Suspended Solids

Source: (toolkit 20091023)

tube drain
Buried horizontal pipeline containing openings (or slots) to allow gravity entry of excess groundwater which is then led to a suitable point of discharge or pit.

Source: (ANCID 2001)
Source: (NWC 2007)

TWE
Tradeable Water Entitlement

Source: (NWC 2007)

TWG
Technical Working Group

Source: (NWC 2007)
Unincorporated area (for groundwater management)

Source: (NWC 2007)

unaccounted difference node

A node model available in Source. A variant of the gauge node, the unaccounted difference node is used to forecast unaccounted differences. Unaccounted differences functionality can also be used to override modelled data with observed data. This is useful for calibration.

unaccounted for water

The difference between the volume of water entering a reticulated system and the recorded use, due to system leaks and un-metered uses.

Source: (toolkit 20091023)

unbundling

The separating of historic water entitlements which bundled water, land, water use, delivery and works approvals, into separate entitlements or licences.

Source: (Productivity Commission 2006)
Source: (NWC 2007)

uncertainty

The term used in this document to describe lack of knowledge about models, parameters, constants, data, and beliefs. There are many sources of uncertainty, including: the science underlying a model, uncertainty in model parameters and input data, observation error, and code uncertainty. Additional study and collecting more information allows error that stems from uncertainty to be minimised/reduced (or eliminated). In contrast, variability (see definition) is irreducible but can be better characterised or represented with further study. A person lacking confidence about the specific outcomes of an event or action is said to be uncertain. Reasons for this lack of confidence might include a judgement of the information as incomplete, blurred, inaccurate or potentially false or might reflect intrinsic limits to the deterministic predictability of complex systems or of stochastic processes.

Source: (USEPA-CREM)
Source: (Refsgaard et al, 2005b)

uncertainty analysis

Investigates the effects of lack of knowledge or potential errors on the model (e.g, the & uncertainty associated with parameter values) and when conducted in combination with sensitivity analysis (see definition) allows a model user to be more informed about the confidence that can be placed in model results.

Source: (USEPA-CREM)

uncertainty and variability

One of EPA's five Assessment Factors (see definition) that describes the extent to which the variability and uncertainty (quantitative and qualitative) in the information or in the procedures, measures, methods or models are evaluated and characterised.

Source: (USEPA-CREM)
unconfined aquifer
An aquifer in which there are no confining beds between the saturated zone and the surface. There will be a watertable in an unconfined aquifer.
Source: (ANCID 2001)
Source: (NWC 2007)

undershot gate
A channel regulator where an adjustable sliding gate allowing flows to pass beneath the gate, the rate of flow being controlled by the size of the opening.
Source: (ANCID 2001)
Source: (NWC 2007)

unincorporated areas
Unincorporated areas include any groundwater resources located outside of the groundwater management units for that jurisdiction. Unincorporated areas may be defined on the basis of hydrogeological basin or aquifer type.
Source: (NWC 2007)
Source: Australian Water Resources 2005

Units of Measurement
Quantities chosen as a standard in terms of which other quantities may be expressed.

Universal Stormwater Treatment Model
The 1st Order Kinetic Model k-C* model describes the decay or reduction in inflow concentration within a treatment facility such as a grass filter strip.

unplanned water supply interruption
Occurs when the customer has not received at least 24 hours notification of the interruption. It also includes situations where the duration of a planned interruption exceeds that which was originally notified. In this circumstance the length of the entire interruption is counted. All un-notified interruptions caused by third parties should be included. This differs from the asset performance definition, which excludes interruptions caused by third parties as this is not necessarily a result of asset failure, as the end result is a loss of service to the customer.
Source: (NWC 2007)
Source: (National Performance Framework 2006)

unprotected catchment
The area upstream of a water storage where many types of land uses are allowed, without concern for potential harmful effects on water quality.
Source: (toolkit 20091023)

unregulated resource assessment system
A way of characterising a resource assessment system based on its resource type.

unregulated river section
refers to a section of a river system which is not operated for the purpose of satisfying water requirements. Users in the unregulated river section may or may not be able to extract water depending on licence restrictions, but there is no concept of ordering water. Licence types are usually stock and domestic, small scale irrigation licences or water-harvesting. Unregulated river sections, but not always, sit above regulated river sections in headwater catchments.

Source: eWater CRC

unregulated rivers

All rivers that are not regulated, including rivers where the flow is controlled by dams or weirs constructed by urban water suppliers or private users.

Source: (Welsh, Podger 2008)

unregulated surface diversion service

A drainage surface diversion service that enables customers to pump or divert under specified conditions from a surface water source, typically a stream, that is not regulated or controlled by a structure or structures operated by a rural water delivery agency.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

unregulated system

River system where flows are not regulated by the operation of structures such as major dams or weirs.

Source: Australian Water Resources 2005
Source: (NWC 2007)

unregulated water

is either all the water in an unregulated river section, or water in a regulated river section that does not come from a regulated source or does not form part of the regulated supply. For example, if a regulated storage spills and there is water in excess of demand requirements downstream then this excess water is considered to be unregulated water.

Source: eWater CRC

unreinforced concrete

Concrete that is not reinforced.

unsaturated zone

The zone between the land surface and the watertable. The pore spaces contained water at less than atmospheric pressure, as well other gases. Also called âZone of Aerationâ and âVadose Zoneâ.

Source: (ANCID 2001)
Source: (NWC 2007)

unseasonal surplus flows

are generated from river freshes and rain rejection flows. Also referred to as âexcess flowsâ.

Source: (toolkit 20091023)
un-supplemented water (Qld)

A water supply where reliability is not enhanced by the operation of water storage infrastructure.

Source: (NWC 2007)

upper bound pricing

The level at which, to avoid monopoly rents, a water business should not recover more than the operational, maintenance and administrative costs, externalities, taxes or tax equivalent regimes, provision for the cost of asset consumption and cost of capital, the latter being calculated using a weighted average cost of capital.

Source: National Water Initiative

Source: (NWC 2007)

upper bound pricing (WA)

The level at which, to avoid monopoly rents, a water business should not recover more than the operational, maintenance and administrative costs, externalities, taxes or tax equivalent regimes (TERs), provision for the cost of asset consumption and cost of capital, the latter being calculated using a weighted average cost of capital (WACC).

Source: (NWC 2007)

upstream regulation

A method of channel regulation where the water level being controlled or maintained is upstream of the control point. Most manually controlled systems in Australia are designed on this basis. Drop bars are removed / placed or gates opened/closed to maintain a steady level upstream of a regulating point.

Source: (ANCID 2001)

Source: (NWC 2007)

urban diversions

The volume of water extracted from waterways to supply towns and does not include water for stock and domestic use. The volume of urban diversions is the total volume of water diverted and includes any losses in the distribution system.

Source: Australian Water Resources 2005

Source: (NWC 2007)

USLE

Universal Soil Loss Equation

Source: (toolkt 20091023)

USTM

The 1st Order Kinetic Model k-C\(^*\) model describes the decay or reduction in inflow concentration within a treatment facility such as a grass filter strip.

Use: Universal Stormwater Treatment Model

utility

One of three main components of quality in EPAâs Information Quality Guidelines. Utility refers to the usefulness of the information to the intended users.
UV disinfection

The use of ultraviolet light to irradiate drinking water to kill pathogens such as bacteria and viruses, and to inactivate cysts and oocysts of harmful protozoa.

Source: (toolkit 20091023)

Variability

Variability refers to observed differences attributable to true heterogeneity or diversity. Variability is the result of natural random processes and is usually not reducible by further measurement or study (although it can be better characterised).

Source: (USEPA-CREM)

Variable

A measured or estimated quantity which describes an object or can be observed in a system and which is subject to change.

Source: (USEPA-CREM)

Verification

Strict tests, such as of model code where analytical and numerical simulations are compared. Should not be used in relation to model testing against real data. Examination of the algorithms and numerical technique in the computer code to ascertain that they truly represent the conceptual model and that there are no inherent numerical problems with obtaining a solution.

Source: (eWater CRC 2008)

Source: (USEPA-CREM)
**vertical flow**

Leakage away from a basin that occurs vertically through the underlying groundwater.

_Source: (toolkit 20091023)_

**volume**

The amount of space that a substance or object occupies, or the amount of space within a container.

**volumetric limit (Qld)**

The maximum amount of water that may be taken under a water allocation for unsupplemented supply in a water year.

_Source: (NWC 2007)_

**VWQMN**

Victorian Water Quality Monitoring Network

_Source: (toolkit 20091023)_

**W**

**WAC**

Water Abstraction Charge

_Source: (NWC 2007)_

**WAP**

Water Allocation Plan

_Source: (NWC 2007)_

**WAS**

Water Activated Sludge

_Source: (NWC 2007)_

**wastewater**

Water which has been used at least once and hence regarded as unsuitable for immediate reuse for that purpose without treatment; water collected from domestic and industrial sources to be treated prior to discharge to the environment or for recycling for other uses.

_Source: (toolkit 20091023)_

**water access entitlement**

A perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan. A perpetual or ongoing entitlement, by or under law of a State, to exclusive access to a share of the water resources of a water resource plan area.

_Source: National Water Initiative_
**water access entitlement (ACT)**
An entitlement to the amount of surface water or groundwater stated in the entitlement.

**Source:** (NWC 2007)

**water access entitlement (WA)**
A perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan.

**Source:** (NWC 2007)

**water access licence (NSW)**
Entitles holder to share in available water in specified water

**Source:** (NWC 2007)

**water access right**
(a) means any right conferred by or under a law of a State to do either or both of the following: (i) to hold water from a water resource; (ii) to take water from a water resource; and (b) without limiting paragraph (a), includes the following rights of the kind referred to in that paragraph: (i) stock and domestic rights; (ii) riparian rights; (iii) a water access entitlement; (iv) a water allocation; and (c) includes any other right in relation to the taking or use of water that is prescribed by the regulations for the purposes of the paragraph.

**Source:** Water Act 2007

**water account (Qld)**
This is the volume of water in megalitres that is available to the allocation holder in a water year. This volume results from the application of the water sharing rules and the approval of seasonal water assignments.

**Source:** (NWC 2007)

**water allocation**
The specific volume of water allocated to water access entitlements in a given season, given accounting period, defined according to rules established in the relevant water plan.

**Source:** National Water Initiative

**Source:** (NWC 2007)

**water allocation (ACT)**
An access entitlement for surface or groundwater in relation to water, means an allocation granted under Part 6.

**Source:** (NWC 2007)

**water allocation (NSW)**
The quantity of water available to be taken under a water access licence, as shown in the licence's water allocation account.

Source: (NWC 2007)

water allocation (Qld)

A water allocation is an authority to take water established under a resource operations plan. Water allocations are separate from land, tradeable and registered on the Water Allocations Register. A water allocation is specified in terms of the following registered attributes: For supplemented water: â¢ the nominal volume of water for the allocation; â¢ the location from which the water may be taken under the allocation; â¢ the purpose for which water may be taken under the allocation; and â¢ a priority group to which the allocation belongs. For un-supplemented water: â¢ the nominal volume of water for the allocation; â¢ the volumetric limit; â¢ the location from which the water may be taken under the allocation; â¢ the purpose for which water may be taken under the allocation; â¢ the water allocation group to which the allocation belongs; â¢ the maximum rate for taking water; and â¢ the flow conditions under which water may be taken.

Source: (NWC 2007)

water allocation (SA, holding)

The quantity of water that the licensee is entitled to request that the Minister convert to a water (taking) allocation.

Source: (NWC 2007)

water allocation (SA, taking)

The quantity of water that the licensee is entitled to take and use pursuant to a licence. May include a purpose constraint.

Source: (NWC 2007)

water allocation (SA, water licences)

The water (taking) allocation or the water (holding) allocation endorsed on a water licence.

Source: (NWC 2007)

water allocation (SA, within irrigation districts)

The quantity of water that a property occupier is entitled to receive within an irrigation district. The right is attached to the property. (NB the Trust holds a licence to take the water which it uses to supply the water allocations within the district)

Source: (NWC 2007)

water allocation (Tas)

A quantity of water that a licensee is entitled to take and use under a Water Licence.

Source: (NWC 2007)

water allocation (Vic)

Water allocations are formally made against water shares for use during the specified irrigation. This includes use in accordance with the water use licence, and traded in accordance with trading rules. Water allocations are made subject to an assessment of the availability of water for the up-coming irrigation season.

Source: (NWC 2007)
**water allocation (WA)**

The specific volume of water allocated to water access entitlements in a given season, defined according to rules established in the relevant water plan.

*Source:* (NWC 2007)

**water allocation change rules (Qld)**

The rules that define the extent to which the attributes of water allocations may be changed without causing third-party impacts. The rules for an area are specified in the resource operations plan.

*Source:* (NWC 2007)

**water allocation group (Qld)**

An attribute of a group of water allocations for un-supplemented supply. A common water allocation security objective applies for all water allocations in the group.

*Source:* (NWC 2007)

**water allocation holder (Qld)**

The registered holder(s) of a water allocation as recorded on the Water Allocations Register.

*Source:* (NWC 2007)

**water allocation security objective (Qld)**

A measure of performance of a water allocation stated in a water resource plan. It is a measure, for a group of water allocations, of the probability of being able to take water under the water allocations. For example, a WASO may be expressed as the percentage of months in a period for which 100% of the water user's monthly water requirements can be delivered.

*Source:* (NWC 2007)

**water allocations register (Qld)**

The Water Allocations Register is a Torrens based register that centrally records details of water allocations and other interests and dealings in water allocations. It provides the same integrity and functionality as the land registry and is a public register.

*Source:* (NWC 2007)

**water application rate**

Quantity of water used per unit area of land measured in mega litre per hectare.

*Source:* (toolkit 20091023)

**water customer supply point**

A legitimate water service location that may or may not have a measurement device at which a customer is provided with a rural water service from a rural water delivery agency. This could be either a water supply or a drainage collection point.

*Source:* (NWC 2007)

*Source:* (National Performance Framework 2006-07)

**water delivered or protected under rules**
Reduction in volumes of water committed (set aside) in storages for environmental water rules by release or delivery in accordance with the rules.

**Source:** (NWC 2007)

**Source:** (Sinclair, Knight, Merz 2006)

**water delivery right**

A right to have water delivered by an infrastructure operator.

**Source:** Water Act 2007

**Source:** (NWC 2007)

**water dependent ecosystems (WA)**

Those parts of the environment, the species composition and natural ecological processes of which are determined by the permanent or temporary presence of water resources, including flowing or standing water and water within groundwater aquifers.

**Source:** (NWC 2007)

**water entitlement**

A legal right to access water. An entitlement can be specified as a share of water from a consumptive pool of water as defined in the relevant water plan, or a fixed annual volume which may be restricted according to the resource assessment. Note that the licensing system in many jurisdictions has two parts to it: 1. A water access licence (i.e. the entitlement, as defined here), which is a permanent property right in the same way as land ownership title but is not associated with land title, and is tradeable. It can be expressed in terms of unit shares or some other measure, as described above. In the context of Source, each entitlement also has an account type and an account associated with it. 2. A water use licence, which is associated with a specific location and usage, and is not tradeable. In the context of Source these come into consideration when defining the properties of water users for modelling - location, demand characteristics, etc à but otherwise they do not need to be modelled.

**Source:** (toolkit 20091023)

**water harvesting (Qld)**

The taking of un-supplemented water during specified high flow events. It generally involves the pumping of water into on-farm storage for later use.

**Source:** (NWC 2007)

**water irrigation area**

The area under control of an individual water service provider (eg. an irrigation corporation, cooperative or trust, or water authority).

**Source:** (NWC 2007)

**Source:** National Water Initiative

**water irrigation area (WA)**

The area under control of an individual water service provider (eg an irrigation corporation, cooperative or trust, or water authority).

**Source:** (NWC 2007)

**water licence (ACT)**
The right to take a water allocation from a specified waterway or location.

Source: (NWC 2007)

**water licence (NT)**

Authority to take water. Held by a person.

Source: (NWC 2007)

**water licence (Qld)**

An authority to take water and use it on specified land. Attached to the specified land. (Not placed on register.) It may be transferred to another piece of land where Regional Operations Plan allows.

Source: (NWC 2007)

**water licence (SA)**

Authorises the holder to take (or to hold) water. Specifies: the prescribed water resource from which water may be taken; one or more water allocations; for taking allocations, the part of the water resource from which water may be taken; conditions, which may specify the land where the water is to be used and use conditions.

Source: (NWC 2007)

**water licence (Tas)**

An authority under Part 6 of the Water Management Act 1999 to take water from a watercourse, lake or well. The licence is held by a person as personal property.

Source: (NWC 2007)

**Water Management and Operation Terms**

(a logical grouping of terms in this glossary)

**water management areas**

In general the water management areas for surface water will be the surface water management areas and groundwater management units reported in the National Land and Water Resources Audit 2000, subject to the adjustments to those boundaries made subsequently by the jurisdictions. In Tasmania the boundaries used will be those developed for the Conservation of Freshwater Ecosystems Values Project.

Source: (NWC 2007)

Source: Australian Water Resources 2005

**water orders**

Water ordered by a user in a regulated river system to be supplied by the system operator. Normally the water must be ordered in advance.

Source: (Welsh, Podger 2008)

**water ownership**

Water ownership is concerned with assigning and tracking the ownership of parcels of water as they enter, are stored in, transit through, and exit systems. Water can be traded, both within storages as well as in transit.
water permit (Qld)
A right to take water from a specified location for a specified purpose and time frame. Applies to purposes such as road construction or mineral exploration. Also granted to a person who is the assignee of seasonal water from a water allocation.

Source: (NWC 2007)

water plan
Statutory plans for surface and/or groundwater systems, consistent with the Regional Natural Resource Management Plans, developed in consultation with all relevant stakeholders on the basis of best scientific and socio-economic assessment, to provide secure ecological outcomes and resource security for users.

Source: (NWC 2007)
Source: National Water Initiative

water provider
A business or organisation that provides a reticulated water supply, irrigation water, reused or recycled water, or a bulk water supply service. Water providers may be government or private and often operate water storage, purification and supply services. They may also provide sewerage or drainage services.

Source: (NWC 2007)
Source: Australian Water Resources 2005

water quality guidelines
The water quality guidelines (standard) specified in the licence (or franchise agreement) or required by the health regulatory agency or government against which the water utility measures verification of water quality. In the absence of a formal requirement on the water utility, the requirements of the Australian Drinking Water Guidelines (2004) should be used.

Source: (NWC 2007)
Source: (National Performance Framework 2006)

water regime (WA)
A description of the variation of flow rate or water level over time; it may also include a description of water quality.

Source: (NWC 2007)

water resource
(a) surface water or groundwater; or (b) a watercourse, lake, wetland or aquifer (whether or not currently has water in it); and includes all aspects of the water resource (including water, organisms and other components and ecosystems that contribute to the physical state and environmental value of the water resource).

Source: Water Act 2007
Source: (NWC 2007)

water resource (Tas)
The waters from which water may be taken under a licence. May be a specific watercourse (eg lake, dam etc) or a variety of watercourses.
water resource plan (Qld)

Water resource plans are plans for a catchment that establish the consumptive share and environmental share of a water resource. These plans also identify any additional water available for allocation.

Source: (NWC 2007)

Water Resource Terms

(a logical grouping of terms in this glossary)

water resources (WA)

Water in the landscape (above and below ground), with current or potential value to ecosystems and the community.

Source: (NWC 2007)

water season

Time during the reporting period in which customers are generally provided with service at their customer service point. The water season may be the entire reporting period, or a defined shorter period, such as a declared irrigation season.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

water sensitive urban design

The integration of urban planning with the management, protection and conservation of the urban water cycle, that ensures urban water management is sensitive to natural hydrological and ecological processes.

Source: (NWC 2007)
Source: National Water Initiative

water sensitive urban design (WA)

The integration of urban planning, with the management, protection and conservation of the urban water cycle, that ensures urban water management is sensitive to natural hydrological and ecological processes.

Source: (NWC 2007)

water share (Vic)

Is an on-going share of a consumptive pool of water in a particular water system. Specifies: â¢ The declared water system that the water share is tagged against. â¢ The use and source trading zones that the water share is associated with. â¢ The water system which the water share is associated. â¢ Share, expressed as the volume of the water system. â¢ Water use licence/registration with which the water share is associated (optional) â¢ The reliability class, ie whether the water share is a higher or lower reliability water share.

Source: (NWC 2007)

water sharing rules (Qld)
The water sharing rules for a water allocation specify how available water will be shared or apportioned between water allocation holders. The water sharing rules may include: rules for making announced allocations; critical water supply rules for sharing water during periods of low water availability; carry over rules about the extent to which an allocation holder can store announced allocation in water storage infrastructure for use in a subsequent year; seasonal water assignment rules; and rules for when water may/may not be taken.

Source: (NWC 2007)

**water stock**

Surface and groundwater resources available in Australia for economic and environmental use.

Source: Australian Water Resources 2005

Source: (NWC 2007)

**water storage**

Includes barrages, dams, reservoirs, turkey nests, tanks, weirs, constructed for or provided to contain water, regulate flows, mitigate floods, for irrigation use, power generation or for domestic and industrial consumption.

Source: (toolkit 20091023)

**water supply**

The system of dams, pipes, etc., by which water is supplied to a community or region.

Source: Macquarie Dictionary

Source: (NWC 2007)

**water supply interruption**

A water supply interruption is any event causing a total loss of water supply due to any cause. Interruptions include those caused by bursts or leaks in the property service (mains to meter connection). This differs from the asset performance definition for water supply interruptions, which excludes property service interruptions as, whilst the property service is managed differently from an asset performance perspective, the end result is a loss of service to the customer.

Source: (NWC 2007)

Source: (National Performance Framework 2006)

**water supply works approval (NSW)**

Authority to construct and use water supply works (pumps, bores, dams etc) on specified land.

Source: (NWC 2007)

**water supply zones**

A water supply zone will generally be defined by each water business using criteria such as: a discrete area of similar water quality, eg served by one water treatment plant; an area able to be described by its boundaries; the nature and design of the water supply system (including the location of service reservoirs, pump stations, tanks, and trunk systems etc); the source and nature of the source of the drinking supply; the treatment components of the supply system.

Source: (NWC 2007)

Source: (National Performance Framework 2006)
**water system**

A system that is hydrologically connected and described at the level desired for management purposes (e.g., sub-catchment, catchment, basin or drainage division and/or groundwater management unit, sub-aquifer, aquifer, groundwater basin).

Source: (NWC 2007)

**Source:** National Water Initiative

**water system (Vic)**

Water shares are tagged against their source water system and this attribute continues regardless of the trading of water shares. A water system is the description of a water source and system type, and is generally based on river basins for "unbundled" entitlements. An example is "Goulburn regulated water system". For unbundled water it refers to a specific groundwater system or a specific stretch of river.

Source: (NWC 2007)

**water system (WA)**

A system that is hydrologically connected and described at the level desired for management purposes (e.g., sub-catchment, catchment, basin or drainage division and/or groundwater management unit, sub-aquifer, aquifer, groundwater basin).

Source: (NWC 2007)

**water table**

The water table, at atmospheric pressure, marks the variable upper limit of the unconfined aquifer. Locally, a lens of clay, or other impermeable layer, can hold up the groundwater to form a perched water table.

Source: (Shaw 1994)

**water tagging**

An accounting approach that allows a traded water access entitlement to retain its original characteristics when traded to a new jurisdiction and/or trading zone, rather than being converted into a form issued in the new jurisdiction and/or trading zone.

Source: National Water Initiative

Source: (NWC 2007)

**water tagging (WA)**

An accounting approach that allows a traded water access entitlement to retain its original characteristics when traded to a new jurisdiction and/or trading zone, rather than being converted into a form issued in the new jurisdiction and/or trading zone.

Source: (NWC 2007)

**Water Terms**

(a logical grouping of terms in this glossary)

**water tower**

A tower holding a tank into which water is pumped to obtain the required pressure.

Source: Macquarie Dictionary
water trade

Describes the practice of water transfers (both permanent and temporary)

Source: (Welsh, Podger 2008)

water transfers on substitution

In water transfers on substitution, to allow transfer of a particular volume of water entitlements from Zone A to Zone B, requires the same volume to be transferred from Zone B to Zone A.

Source: (toolkit 20091023)

water treatment plant

An individual location receiving raw or partially treated water for treatment and ultimate delivery to customers.

Source: (National Performance Framework 2006)
Source: (NWC 2007)

water use

The volume of water diverted from a stream or extracted from groundwater or transferred to another area for use. It is not representative of the “on farm” or “town” use. It is representative of the volume “taken” from the environment.

Source: (NWC 2007)
Source: Australian Water Resources 2005

water use approval (NSW)

Authority to use water on specified land.

Source: (NWC 2007)

water use efficiency

The following framework is suggested when describing water use efficiency: First word: Irrigation or Total Second word: Water Third word: Application, Delivery, Storage Fourth word: Efficiency. By definition all efficiency units are % Substitution of “Total” for “Irrigation” refers to irrigation plus effective rainfall.

Source: (NWC 2007)
Source: (ANCID 2001)

water use indices

Indices that can be used to indicate water efficiency performance.

Source: (NWC 2007)
Source: (ANCID 2001)

water use licence (Vic)

Authorises the use of water on land for irrigation.
water use licence (WA)
Authorises the use of water on land.
Source: (NWC 2007)

water use limits
Compliance with Bulk Water Entitlements or Annual Water Allocation.
Source: (NWC 2007)
Source: (ANCID 2001)

water use registration (Vic)
Authorises the use of water on land for purposes other than irrigation
Source: (NWC 2007)

water user and supply point
A modelled entity in Source that can order and/or use water.
Source: River Systems specification

water user node
A node model available in Source. A water user node provides a mechanism for defining demand. It can be used to generate orders, manage water extractions, and provide drainage return flows.

water user storage
An off-river storage associated with a particular water user. This encompasses both on-farm storages (OFSs) used for irrigation and off-river storages used to meet urban or environmental demands.
Source: Source Scientific Reference Guide

water vapour
Gaseous water, especially when diffused and below the boiling point, distinguished from steam.
Source: Macquarie Dictionary
Source: (NWC 2007)

water year
A continuous twelve-month period starting from a specified month for water accounting purposes. The water year varies between systems. Two common Water year periods are 1 July to 30 June, and 1 October to 30 September. A means of defining the start and end of a year with the intention of analysing a particular water resources or hydrological phenomenon. Often the water year is not the same as a calendar or financial year. For analysis of floods, water years are often chosen to start and end in the dry season for that catchment to avoid floods crossing the water year boundary. For water resources analysis (particularly in irrigation areas) water years are often chosen to start and end in the wet season so that the entire irrigation season is within one water year.
Source: (Welsh, Podger 2008)

water year (Qld)
A continuous 12 month period starting from July or any other month as prescribed under the Water Regulation or a resource operations plan.
Source: (NWC 2007)

WaterCAST
WaterCAST is the original name given to Source Catchments.
Use: Source IMS

watercourse
(a) means a river, creek or other natural watercourse (whether modified or not) in which water normally flows; (b) includes: (i) a dam or reservoir that collects water flowing in a watercourse; and (ii) a lake or wetland through which water flows; and (iii) a channel into which the water of a watercourse has been diverted; and (iv) part of a watercourse; and (v) an estuary through which water flows.
Source: Water Act 2007
Source: (NWC 2007)

Watercress
Water resources planning model commonly used in South Australia.

water-harvesters
Water users who can access unregulated water in unregulated and regulated river sections. Their licences apply rules that control their access to water, usually some trigger event such as a flow at a certain location being met or a weir over flowing. In regulated river sections users may have separate licences permitting access to both regulated and unregulated waters. Also known as out-of-allocation or floodplain harvesters.
Source: eWater CRC

waterlogging
Process of soil becoming saturated with water, generally for an extended period.
Source: (ANCID 2001)
Source: (NWC 2007)

water-on-demand
A type of network supply or regulated surface diversion service where customers are permitted and able to take water from a supply service at any time without ordering during the normal operating period. This service supply mode may be subject to occasional restrictions or rostering as a result of shortages in supply availability.
Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

water-on-order
A type of network supply or regulated surface diversion service where customers are generally required to submit an order as part of normal operating procedure before they are permitted to take or receive water during the water season. Some water-on-order supply services may on occasion, particularly during times of peak demand, revert to another supply arrangement such as rostering.

Source: (NWC 2007)
Source: (National Performance Framework 2006-07)

**watershed**

The ridge or crest line dividing two drainage areas; divide.

Source: Macquarie Dictionary
Source: (NWC 2007)

**watertable**

The surface in an unconfined aquifer or confining bed at which the pore pressure is atmospheric. It can be measured by installing shallow wells extending a few metres into the saturated zone and then measuring the water level in those wells.

Source: (ANCID 2001)
Source: (NWC 2007)

**waterway**

A river, canal, or other body of water as a route or way of travel or transport.

Source: Macquarie Dictionary
Source: (NWC 2007)

**waterworks**

An aggregate of apparatus and structures by which water is collected, preserved, and distributed for domestic and other purposes, as for a town.

Source: Macquarie Dictionary
Source: (NWC 2007)

**wave**

A movement of the surface of a liquid body, such as the sea or alake, in the form of a ridge or a swell.

Source: Macquarie Dictionary
Source: (NWC 2007)

**Wave celerity**

The velocity of a very small wave along a body of water.

Use: Celerity

**WDRC**

Written down replacement cost - the current cost of replacing the service potential of fixed water and sewerage business assets based on current technology.
weir

A structure on a river to facilitate regulation of flow or diversion to storages or supply networks. A structure usually of concrete, across a stream to impound water, with any surplus flowing over the crest; in a water treatment plant, a concrete wall of a settling pond, over which clarified water flows into the next stage of the process.

Source: (National Performance Framework 2006-07)
Source: (NWC 2007)
Source: (toolkit 20091023)

well

A hole drilled into the earth, generally by boring, to obtain water.

Source: Macquarie Dictionary
Source: (NWC 2007)

wetland

An area transitional between land and water systems, which is either permanently or periodically inundated with shallow water, and either permanently or periodically supports the growth of aquatic macrophytes (eg marsh, swamp, fen, bog).

Source: (toolkit 20091023)

wetlands

Areas of marsh, fern, parkland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 metres. Areas of low-lying land covered with either fresh or salt water, whether irregularly or permanently; water habitats either natural eg billabongs, lagoons, lakes, creeks, weirs, estuaries, salt marshes, swamps, mound springs or constructed eg dams, canals, bore, drains, channels, rice fields.

Source: Ramsar Convention
Source: (NWC 2007)
Source: (toolkit 20091023)

wetted perimeter

The part of the cross section of an open channel flow that is in contact with the bed and sides of the stream channel.

WFP

Water Filtration Plant
Source: (NWC 2007)

WIMS

Water Information Management System
Source: (NWC 2007)
WMA
Water Management Areas. Can be based on either surface water management areas (see SWMA) or groundwater management areas (see GMU).
Source: (NWC 2007)

works license (Vic)
Authorises the owner to implement works to take water from a water system; ie to install a groundwater pump, or a pump to take water from a river, etc.
Source: (NWC 2007)

works permit (ACT)
To construct or alter a dam, water storage or other water control structure in a waterway.
Source: (NWC 2007)

WPP
Water Purification Plant
Source: (NWC 2007)

WRM
Water Resources Management
Source: (NWC 2007)

WRON
Water Resources Observation Network
Source: (NWC 2007)

WRP
Water Resources Plan (Qld)
Source: (NWC 2007)

WSP
Water Sharing Plan
Source: (NWC 2007)

WSPA
Water supply protection areas
Source: (NWC 2007)

Z
zone (Qld)
A geographic location, eg a reach of a watercourse. Zones are for defining the location from which water may be taken under a water allocation.

Source: (NWC 2007)