

AWA Catchment Management Specialist Network

Source Water Protection Statement (Water Quality)

Acknowledgement of Country

The Australian Water Association acknowledges the Traditional Custodians across Australia, where we live, work and play, for their deep connection to our precious waters and land.

First Nations people have protected inland waters for thousands of generations, and we thank them for their custodianship.

We pay our respect to Elders past and present, and the ancestors who have cared protected and nurtured Country for many thousands of years.

We embrace the spirit of reconciliation, working towards the equality of outcomes and ensuring an equal voice.

Drinking water supply catchments and waterways, by their very nature, are complex and dynamic systems. Across Australia, we are seeing our catchments increasingly at risk from the intensification of development, increased recreational demand and extreme climatic events. The Australian Drinking Water Guidelines (ADWG) asserts that the most effective and efficient means of assuring drinking water quality and the protection of public health is through the adoption of a preventive management approach that encompasses all steps in the water supply chain, from catchment to consumer. Effective management of our water supplies, therefore, requires governments, water utilities, land management agencies, landholders and other custodians to work together to put in place a range of measures across multiple barriers.

Importantly, while the ADWG advocates that source waters should be protected to the maximum degree practicable, there appears to be a recent trend away from this and a greater reliance on water treatment solutions. As in countries such as the United Kingdom, we promote a “catchment first” approach. In doing so we challenge the trend of a ‘treatment-led approach’ for the supply of compliant potable water, preferring a ‘prevention-led approach’, based on pollution prevention at the source to reduce treatment costs and minimise the likelihood of drinking water contamination due to failure of treatment barriers.

The Statement provides eleven principles for source water protection and seeks to set a future direction for preventive risk management while providing resilience to the entire water supply system.

Principle 1: Drinking water source protection should not be compromised

The ADWG notes that:

“Water suppliers should... maintain the supply of water at the highest practicable quality. The guideline values should never be seen as a licence to degrade the quality of a drinking water supply to that level.”

This ADWG principle is an overarching statement for source water protection, and directly relates to the subsequent intent of the Guidelines - ‘protection to the maximum degree practicable’ and taking a ‘preventive management approach’ to source water quality management.

The buffer between the worst level of risk, or contamination, that would be considered acceptable, and the current level of protection afforded by water treatment, should not be seen as an opportunity for development, but a buffer for impacts of unforeseen circumstances, and cumulative event impacts, such as drought, fire and flood. Maintaining this safety margin ensures there is redundancy across the multiple barriers of the water supply system (Principle 2). The outcome of this approach is to minimise risks to the consumer, and maximise business as usual performance.

The importance of preventing degradation is also associated with the cumulative impact analogy, often termed ‘the thin end of the wedge’. Preventing incremental degradation of water quality over time is essential to avoid ultimately inevitable excessive degradation – that collectively results in either increased risks or the requirement to upgrade water treatment.

Measured impacts of catchment development aren’t always discernible against the background, or at levels that exceed guideline values within the ADWG. However, the ADWG promote a preventive risk-based approach, and it’s incumbent to not merely wait for contamination to arise and then mitigate it, but to put in place multiple barriers to mitigate potential contamination (risks).

Principle 2: Multiple barriers are recognised as a protection for source waters and should be maintained

Multiple barriers and the protection of source waters are promoted upfront within the ‘Guiding Principles’ section of the ADWG that includes the following points:

“The multiple barrier approach is universally recognised as the foundation for ensuring safe drinking water, and no single barrier is effective against all conceivable sources of contamination, is effective 100 per cent of the time or constantly functions at maximum efficiency”.

It is important to remember that water treatment plants can and do fail. Treatment plants are designed to operate within given specifications for source water quality, and source water quality outside of these specifications can reduce treatment efficacy. Moreover, treatment plants are susceptible to human error, extreme weather events (leading to flooding or power outages) (Principle 2), or other unforeseen events.

Protection of source waters to the maximum degree ‘practicable’ needs to take account of historical and legacy circumstances and what is practicable in the local context. It may mean prohibiting development (entirely or within exclusion zones), limitations on activities, conditional access, and / or monitoring to identify activities or actions that are not generally suitable within source water protection areas.

Due to the effect of extreme events, when most sources will experience variable water quality, the source risk may exceed treatment capability levels. In this situation, the water utility has to either turn-off the source, or use real-time critical control point information to avoid high risk source water (through selective abstraction), or deploy additional treatment to deal with the increased challenge during these events. A part of source water protection is 'knowing your catchment' (Principle 7), and this includes understanding the likelihood of extreme events, how to predict them, and the capacity to estimate their likely impact on source water quality.

Principle 3: Human health protection requires priority

A water utility's investment in source water protection is likely to deliver multiple benefits, including improved waterway health, flood mitigation, security of supply, the protection of Indigenous values and improved landscape amenity. Nonetheless, the main objective of any initiative should be the delivery of a program that protects human health.

Ultimately, any risk to human health must be regarded as serious. Therefore, when water utilities are considering undertaking programs in drinking water supply catchments, managing hazardous events that could compromise human health should be prioritised, because of the serious outcomes associated with not doing so. This position is justifiable because, although unlikely, the contamination of drinking water supplies can lead to serious illness, or even death, even in developed countries, and is not likely to be considered acceptable by the community. Within a community, source water protection and other compatible landuses, can be prioritised in drinking water catchments, while other catchment activities can be promoted outside of these vulnerable areas.

Additionally, protecting source waters is essential to reduce the raw water treatment challenge to water treatment plants to meet microbial health-based targets, which is being advocated through the draft revisions to the ADWG, and which have already been adopted by the World Health Organization and Water Services Association of Australia.

Principle 4: Complacency needs to be avoided

A landmark publication investigating dozens of drinking water outbreaks in affluent nations, strongly highlighted complacency as a common underlying causal factor¹. A water supply system that, thanks to past foresight, has inherited protected source areas might not have been causally associated with detectable levels of waterborne disease for many decades. Complacency may then lead to the perception of a margin of safety that could be used to justify permitting increased development and other forms of access and reducing source protection. As a result, good historical performance should not be interpreted complacently as a justification for permitting increased catchment development. Closely aligning to this is the need to maintain and protect those areas of source water catchments that are currently under high levels of protection, not just focusing on addressing degraded areas of existing pollution sources.

Principle 5: The 'precautionary principle' should be applied

Due to the serious nature of the public health risk associated with drinking water contamination (Principle 3), the 'precautionary principle' should be applied to decision-making concerning changes in land use from new developments and activities proposed in source water catchments. The

¹ Hruday SE and Hruday EJ. 2004, Safe drinking water: lessons from recent outbreaks in affluent nations, International Water Association, ISBN 9781843390428.

precautionary principle tips the balance in favour of protecting water quality in the absence of certainty.

There is inevitably much uncertainty in assessing the impact that land use changes and developments have on source water catchments. Therefore, the precautionary principle becomes a significant consideration in deciding whether or not to support a proposal for which the extent of potential harm is uncertain, either in the current context or in the future. In this regard it is also important to note the temporal impacts of incremental or expansive development, precedence for additional development and the implications of future extreme events that could change the future source water risk or water treatment capacity. The threat to source water catchments from new and emerging contaminants, and the treatment challenges this presents, reaffirms the importance of this principle.

Principle 6: Appropriate investment and risk-based decision-making should be followed

Catchment lands and source waters should be considered as assets, either economically and/or financially. The full value of asset benefits should be clearly articulated, and investment and decision-making should maximise the benefits and minimise costs across the entire water supply system and asset lifecycle, while not compromising the water utility's objectives. Importantly, investing in source water protection also contributes to other catchment objectives, including ecological benefits, alignment with Indigenous values, agricultural production and rural aesthetics, social capital and the intrinsic value of the area in which we live.

In many circumstances investing in source water protection can make economic sense when compared with additional water treatment – and these Catchment First options should be considered. Additional levels of water treatment can require large capital investment and incur additional operational costs. Importantly, there is a lack of assurance that water treatment systems will work 100% of the time and when those barriers are breached, the potential consequences for communities can be severe, both financially and socially.

It is in the interests of the broader community from a health and cost perspective to keep source water risk down to benchmark levels associated with water treatment capability, and where those levels are exceeded to reduce the source water quality risks as far as practicable. Therefore, investment should occur as a matter of priority to address unacceptable risks to source waters, and to reduce other risks to as low as reasonably practicable, to maintain a multiple barrier approach or achieve legislative compliance.

Monitoring and evaluation processes should be in place to consider the efficacy of mitigation actions to inform the decision-making process and build a strong evidence base to validate the use of catchment interventions. This information then feeds into the adaptive management framework (Principle 9).

Principle 7: Knowing your catchment

An important part of effectively protecting a water source is 'knowing your catchment'. This includes:

- assessing source water vulnerability to determine the susceptibility to contamination. For example, a reservoir located in the upper reaches has lower vulnerability compared with a reservoir located in the downstream reaches of a large catchment;

- identifying and quantifying sources of contamination. Factors to consider include, pollutant sources, drainage pathways to waterways or aquifers, and attenuation or dilution – before extraction at the water treatment plant;
- understanding the source water quality variation and influence on water treatment performance. These may be attributed to natural in-source processes including events caused by the weather or pollution incidents, or changes to scheme operation;
- identifying trends in water quality. Forecasting plays an important role in supporting decision making and identifying catchment intervention options; and
- reviewing the improvement in water quality attributed to the management and investment in a catchment (as described in Principle 6).

Critical to understanding the dynamic source water risk is knowledge on catchment land use and activities and hydrological or hydrogeological processes. Without ‘knowledge of your catchment’ it is not possible to implement proactive and effective management of a drinking water source. However, due to the complexity of water sources, there is often a limit to our understanding of these factors. As such, the precautionary principle should be applied when making decisions relating to catchment management and water treatment (see Principle 3).

Principle 8: Communication with the community is vital

It is incumbent on the water utility to not only protect drinking water sources but to also communicate, educate and engage the community on the importance of source water protection within the context of the water supply system, and this, in turn, will help positively influence behaviours.

The ADWG states:

“Discussions should include the establishment of levels of service, costs, existing water quality problems, and the options for protection and improvement of drinking water quality, including constraints on land use and changes in treatment or infrastructure”.

Without initial awareness-raising to build community understanding, and then having informed two-way deliberations, water utilities cannot hope to bring catchment residents, consumers and the broader community into the discussion on catchment use, protection programs and water treatment options.

Given that decisions on drinking water quality should be aligned with the needs and expectations of the consumer, there is a need to first present information to the community and consumers in a form that is accessible and understandable².

Water utilities tend to assume a level of drinking water literacy which might not exist within many communities and may limit community engagement to the desirable forms of development, rather than a full discussion on various developments and their consequences to water treatment and community costs and benefits. Through water utility led education and sustained engagement, consumers and the community (that resides in, uses and receives water from a catchment) can best contribute to decisions, participate in programs and deliver outcomes for that catchment.

² WA Parliament, 2010. Recreation activities within public drinking water source areas. Legislative Council Standing Committee on Public Administration, Report Number 11.

Principle 9: The transdisciplinary and adaptive nature of source water protection should be acknowledged and practised

Source water protection requires input from a range of disciplines and an understanding of the social, cultural, political and economic setting. These inputs and understandings should not be overlooked. They include the wide variations in the preferences and values of decision-makers and stakeholders, resulting in the need to facilitate outcomes and apply different approaches to management.

Source water protection involves both science and the art of discovering bridges between different areas of knowledge and alternative preferences and values associated with uses, risks and management solutions.

Solutions go beyond technical competence to being socially and culturally acceptable, sustainable and resilient (with a need to include the social and cultural sciences alongside natural sciences).

Scientific knowledge should be contextualised with linkages created between people of various disciplines and stakeholders within the community –to achieve a common understanding, if not a common goal or desired‘ levels of service’. Rational knowledge comes out of not only “what we know” but “how we communicate” it³. Our understanding of consumers and stakeholders, and our ability to negotiate outcomes across spatial and temporal scales, utilising the available evidence-base will be a measure of success (Principle 8 and 10).

The need for an adaptive management approach is paramount in source water protection. Adaptive management is a procedure for implementing management while learning about which management actions are most effective at achieving specified objectives. Adaptive management is often referred to as structured ‘learning by doing’, that emphasises the importance of involving stakeholders (those that control or enable management) including encouraging active partnerships between managers, scientists and other stakeholders (Principle 10).

Principle 10: Achieving source water protection through leading the way and partnerships

In an open drinking water supply catchment, landholders within the catchment look to the water utility to provide guidance and set the standard for source water protection. If it is perceived that the water utility does not do best practice management, then source water protection initiatives involving landholders are likely to be harder to achieve. The importance of water utilities ‘leading the way’ in source water protection cannot be overstated. Leadership is especially true, given water utilities often own and manage lands in the immediate proximity to water supply storages and offtakes.

Enduring partnerships within and across government agencies and councils, and with community and industry groups, Indigenous stakeholders (Principle 11) and catchment landholders are required to achieve source water protection. While water utilities should ‘lead the way’, sustainable catchment management requires effective and efficient relationships between stakeholders. Only by understanding who has a stake in a decision, and through understanding the nature of their position

³ Klein, J. T. (2004). Prospects for transdisciplinarity. *Futures*, 36(4), 515-526

and inter-relationships with each other, can the appropriate stakeholders be effectively involved in decision-making⁴.

Partnerships should focus on shared knowledge regarding stakeholder water values, and consider the state and condition of water resources, processes influencing water quality, and alternative management strategies. When aiming to find a balanced policy outcome, the decision-making process should be completed transparently and equitably, ensuring the source water is protected.

Principle 11: Indigenous Australian participation in source protection is vital

Access to water and drinking water security is essential for the viability, self-determination, and sustainability of Indigenous communities throughout Australia. Provision of safe drinking water is key to Indigenous communities' health and wellbeing. Maintaining and enhancing water quality and availability enables communities to practice culture and supports social, and environmental outcomes. Water catchment lands and waters are extremely important to Indigenous communities and often include special and sacred places. Compromise and pollution of those catchments and waterways conflicts with the Indigenous heritage values.

Indigenous communities should always be afforded genuine opportunity to lead and collaborate in decisions that materially affect them, and this includes the development and implementation of catchment and source water protection programs. Source water protection, and protection of Country, are complementary, and water and land management are inseparable in indigenous culture. Utilities should lead collaborative programs incorporating advice and techniques from Traditional Owners and Aboriginal and Torres Strait Islander people in catchment and land management programs. Building the capacity of these often remote communities to co-manage their catchments will improve water and interconnected social and environmental outcomes.

Water insecurity is exacerbated in numerous remote Indigenous communities where raw water sources are scarce and vulnerable, and treatment solutions are often cost-prohibitive or impracticable. Security of catchments and source waters is critical to meeting this challenge, and these should be afforded the highest protection to improve outcomes for Indigenous communities. Economic and other risks are high when these vulnerable water sources are not protected.

More broadly, source water protection measures are compatible with many cultural water objectives, and this alignment should be invested in, through meaningful partnerships that acknowledge the cultural, social and environmental values of water.

⁴ Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C. H., & Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of environmental management*, 90(5), 1933-1949