



Source Water Strategy 2018–2030

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1 Executive summary

Background

Icon Water is committed to providing a safe, secure and sustainable water supply for the people of the ACT and region. From around 1997 to 2009 the ACT and region experienced an extended period of drought (known as the millennium drought). During this period, water restrictions were in place in the ACT for eight years.

In October 2007 the ACT Government announced a suite of measures aimed at providing water security for the ACT. These measures included a program of water security major projects to build the infrastructure and implement the arrangements necessary to secure our long term water supply. The enlargement of the Cotter Dam (completed in 2013), was the key infrastructure project and increased the ACT's total water storage capacity by 35%.

One of the ACT Government measures was a target reduction in per capita water consumption of 25%, relative to pre-drought consumption. Per capita water consumption has actually reduced by 40% and has not rebounded since the end of the millennium drought. This better than anticipated reduction has further enhanced our water security.

Water security analysis

Icon Water continually analyses the ability of the source water system to meet the needs of our current and future population under a variable and changing climate. Modelling using the most likely future supply and demand assumptions has identified the following.

Water security - Summary

- Our source water system is currently very secure. In the next 20 years, each year has an average probability of 0.9% (1 in 110) of experiencing water restrictions. This compares favourably with the target level of service of 5% (1 in 20).
- Our source water system has less than 0.01% chance of running out of water.
- Our source water system can withstand the worst drought on record without the need to implement water restrictions.
- Our source water system will meet the required level of service until 2061 (a demand growth of 50%).
- Per capita water consumption has declined by approximately 40% since 2000. Although earlier planning anticipated a reduction, this is a larger reduction than expected. As a result, current water security is higher than forecast in earlier planning.
- Icon Water must have rights to take water as well as the ability to access physical water. Icon Water has water entitlements (the right to draw water from the environment) sufficient for a demand growth of 100%. Given population estimates, this growth may not occur this century.

The Strategy

Key elements of the strategy are outlined below. Each element should be read in context of the broader Strategy to best understand our intention and approach.

<p>Our objectives</p>	<p>Objective 1: Ensure the ACT Government water security target is met, now and into the future.</p> <p>This means the source water system will satisfy the target to meet unrestricted demand for the ACT and Queanbeyan 95% of the time.</p> <p>Objective 2: Ensure that Icon Water’s storages will not run out of water.</p> <p>This means the source water system can withstand droughts more severe than experienced historically.</p> <p>Objective 3: Ensure Icon Water maintains adequate water rights to satisfy consumptive demand.</p> <p>This means that we will ensure there are enough water rights to abstract physical water from the Murray-Darling Basin to satisfy consumptive demand.</p>
<p>Our approach</p>	<p>Icon Water will:</p> <ul style="list-style-type: none"> • Maintain a functional water resource computer model of the source water system that can be used to assess performance against the objectives. • Review and update the key planning variables used in the model whenever new information becomes available or at least each financial year. • Optimise source water operations to balance water security and cost to provide best value to the community. • Execute planned initiatives when required in accordance with the strategy.

2 Introduction

Background

Icon Water is committed to providing services that sustain and enhance the quality of life in the nation's capital. Ensuring ongoing water security is fundamental to the achievement of this commitment.

The millennium drought from 1997–2009 was the most extreme drought in South-Eastern Australia's recorded history (CSIRO, 2012). In response, in 2004 Icon Water (then ACTEW Corporation) initiated the Future Water Options project to identify how best to provide a long-term reliable source of water for the ACT region. The project led to a program of water security major projects including:

- enlargement of the Cotter dam (from 4 GL to 76 GL)
- construction of a pump station and pipeline to transfer water from the Murrumbidgee river to Googong dam
- establishment of agreements to transfer water from Tantangara dam to the ACT source water system.

The water security major projects were successfully completed by 2013 and performance monitoring of our source water system has been performed continually thereafter. The completion of these projects, along with a reduction in per capita demand of about 40% since 2000, has delivered a significant improvement in our water security. The ACT and Queanbeyan region can now robustly withstand any historical drought without the need for permanent water restrictions. We will continue to benefit from these projects in the decades to come.

Purpose

This *Source Water Strategy 2018–2030* (Strategy) seeks to ensure Icon Water reliably satisfies the ACT Government's level of service requirement to meet unrestricted water demand for the ACT and region 95% of the time. The Strategy also confirms that Icon Water's source water system can withstand much more severe droughts than have been observed historically and verifies that our water entitlements are expected to be adequate for the foreseeable future.

Scope

For the purposes of this Strategy, water security is defined as the capability of the source water system to satisfy the target level of service.

This Strategy provides context and direction in addressing three key questions:

- What is the current state of our water security?
- How is water security projected to change, accounting for climate change, population growth and consumption behaviour (among other parameters)?
- When should augmentation investments be considered to meet projected needs?

Icon Water's source water system

Icon Water can supply water from a number of different sources as shown in Figure 1. All of these sources have different catchment characteristics and costs of supply. The available sources, ordered by average volume of supply, are as follows:

- Bendora dam – the upper Cotter catchment, including Corin dam's catchment.
- Googong dam – the Queanbeyan river catchment.
- Cotter dam – the lower Cotter catchment.
- Murrumbidgee to Googong – a pump station and pipeline that can transfer Murrumbidgee river water into Googong dam.
- Murrumbidgee pump station – a pump station that can supply water directly to town via Stromlo Water Treatment Plant.

Bendora dam is our primary source of supply because the upper Cotter catchment has reliable runoff, excellent water quality and low costs of supply. The Murrumbidgee river is our least preferred source and will typically only be used during drought conditions.

Figure 1. Canberra's source water system and network

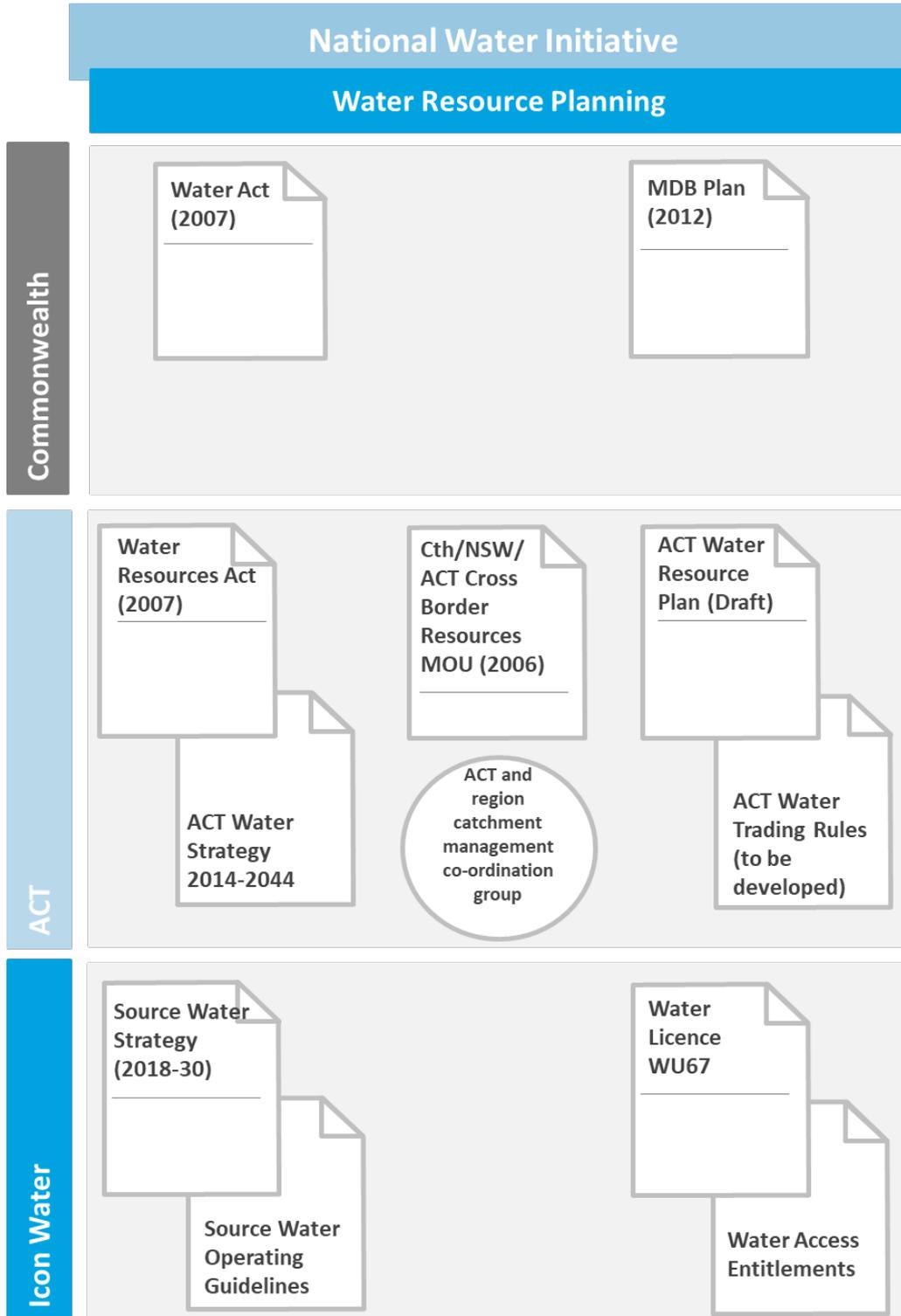


3 Water policy alignment

Policy context

Underpinning water management in Australia is a commitment to meeting the objectives of the National Water Initiative (NWI). The NWI aims to create a nationally-compatible, market, regulatory and planning based system of managing surface and groundwater resources that optimises economic, social and environmental outcomes. Figure 2 shows the water policy landscape.

Figure 2. Water Policy landscape



The Commonwealth *Water Act 2007* enables the Commonwealth, in conjunction with the Basin states, to manage the resources of the Murray-Darling Basin in the national interest. The *Murray-Darling Basin Plan 2012* further guides the sustainable management and use of waters within the Basin.

The ACT sits entirely within the Murray Darling Basin. As such, the ACT government must manage water resources in accordance with the Basin Plan. The *ACT Water Resources Act 2007* is the governing legislation for water resources in the ACT. The ACT and Region Catchment Management Coordination Group was established under this Act to provide a regional approach to water resource management, across jurisdictions. This is supported by the *Commonwealth-NSW-ACT Cross Border Resources Memorandum of Understanding 2006*.

The *ACT Water Strategy: Striking the Balance 2014–2044* (ACT Government, 2014) sets out the ACT Government's vision for water resource management in the ACT and details the ACT Government's water related policies and priorities, including water restrictions and secondary water use.

Influence on this strategy

This strategy is informed by the Commonwealth and ACT Government. Specifically:

- The ACT Government manages, on behalf the Murray-Darling Basin Authority (MDBA), the amount of water used in the Canberra region. Icon Water abstractions are constrained not only by the physical availability of water, but also the legal right to take the water. This Strategy ensures that this constraint does not impact the ACT and region for urban water use.
- The ACT Government's water security target level of service is identified in the *ACT Water Strategy*. It is currently expressed as meeting unrestricted demand 95% of the time until at least 2030. Icon Water has interpreted the target level of service to mean that for any year, the probability of experiencing water restrictions is less than 5% (1 in 20).

4 Level of service and objectives

Level of service

The ACT Government sets our target level of service at ‘meet unrestricted demand for the ACT and Queanbeyan 95% of the time until at least 2030’ (ACT Government, 2014). Icon Water has interpreted this to mean that for every year there is less than 5% probability of temporary water restrictions. This interpretation of the target as a yearly probability is consistent with industry practice.

Objectives

Icon Water has established the following objectives to ensure a reliable source water system now and into the future:

1. Ensure the ACT Government water security target is met, now and into the future.
2. Ensure that Icon Water’s storages will not run out of water.
3. Ensure Icon Water maintains adequate water rights to satisfy consumptive demand.

Performance indicators

Table 1 identifies the key performance indicators (KPIs) and targets to assess achievement against the objectives.

Table 1. Water security key performance indicators (KPI) and targets

KPI #	KPI	Target	Initiatives if KPI target is not met
1a	Probability of water restrictions	For any year, modelling indicates there is a less than a 5% likelihood of experiencing restrictions. [Lead indicator]	Plan for network augmentation Manage demand
1b	Water storage levels	Actual water storage $\geq 50\%$. [Lag indicator]	Review our key planning variables. Drought contingency options analysis.
2	Probability of experiencing very low storage	For any year, modelling indicates there is less than a 0.01% (1 in 10,000 year) chance of water storage falling below 5%. [Lead indicator]	Plan for network augmentation Manage demand
3	Net abstraction forecast	Water use remains within Icon Water’s Licence capacity. [Lead indicator]	Trade water to increase abstraction limits.

Notes

Objective 1

KPI 1a - Icon Water defines satisfaction of the ACT Government’s water security target as the modelled likelihood of experiencing water restrictions is no more than 5% in any calendar year. This approach is consistent with industry practice (SKM, 2011).

KPI 1b - Given the robustness of our current system, storage is only expected to drop below 50% infrequently and this will trigger several initiatives.

Objective 2

KPI 2 - Icon Water also examines the model output to ensure there is no reasonable prospect of our storages emptying. Currently, storage remains above 5% throughout 50,000 years of simulated climate. Water NSW has a similar target for the Sydney water supply catchments that 'storages should not approach emptiness (defined as 5% of water in the storage) more often than 0.001% of the time' (Water NSW, 2015).

Objective 3

KPI 3 - Icon Water must also operate within the net abstraction limits set by the ACT Government in line with the Murray-Darling Basin Plan (yet to be implemented). Icon Water's constraints have been proposed as net urban water use licence of 35 GL by the ACT Government.

5 Analysis and outcomes

Modelling requirements

It is not appropriate to use observed data to measure compliance with the indicators because:

- Recent years do not represent a large enough sample size to ensure compliance across the range of climate conditions that can be experienced.
- Long time periods typically contain conditions that are not representative of the current system. For example, the ACT has built major infrastructure and experienced significant reductions in demand for water during the past 20 years, making the data over this period difficult to use for future projections.

Instead, Icon Water uses a water resource computer model to determine how Canberra's source water system will perform across a range of possible climate conditions with current and projected water demand. The key planning variables can be material to the outcome of the assessment and are described in detail in Table 2.

Key planning variables

Water security is a function of the key planning variables. The variables can be estimated with confidence for the present day, but become more uncertain when projecting into the future. Climate change, population growth and changes in demand are all sources of future uncertainty. It is therefore necessary to regularly review the variables and update the water security strategy when variables change significantly.

The key planning variables and their impact on future water security are shown in Table 2.

Table 2. Key planning variables

Planning Variable	Impact on water security	Comments
Climate variability		Canberra's climate has always been variable and will remain variable in the future
Climate change		Climate change could reduce runoff and increase water demand
Growth		We need to provide for a growing population in Canberra and the region
Demand management		The amount of water used per person is expected to continue declining
Environmental flows		Environmental flow requirements are not expected to change significantly
Level of service target		The required level of service is not expected to change

Legend:  Increase water security
 Decrease water security
 No impact on water security

Current and future projections of our water security

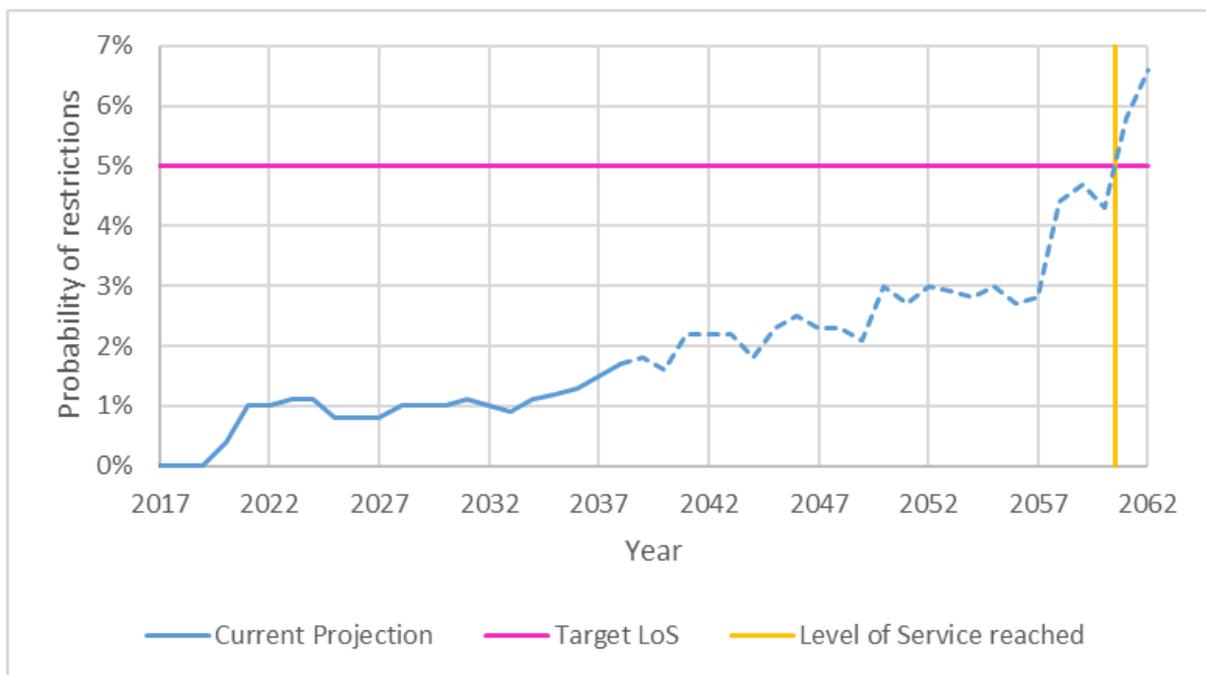
Icon Water’s projected level of water security is presented in Figure 3. The key findings are that:

- Our source water system is currently very secure. In the next 20 years, each year has an average probability of 0.9% (1 in 110) of experiencing water restrictions. This compares favourably with the target level of service of 5% (1 in 20).
- Our source water system will meet the required level of service until 2061 (a demand growth of 50%). This projection is sensitive to the key planning variables.

The performance is relatively linear until the probability of water restrictions reaches about 3%. At this point, the system becomes stressed and performance decreases much more rapidly with increasing demand.

It is difficult to predict changes in many of the key planning variables beyond 20 years, and as a result confidence in the model outputs decreases into the future. This decrease in accuracy is represented by changing the projection to a dotted line.

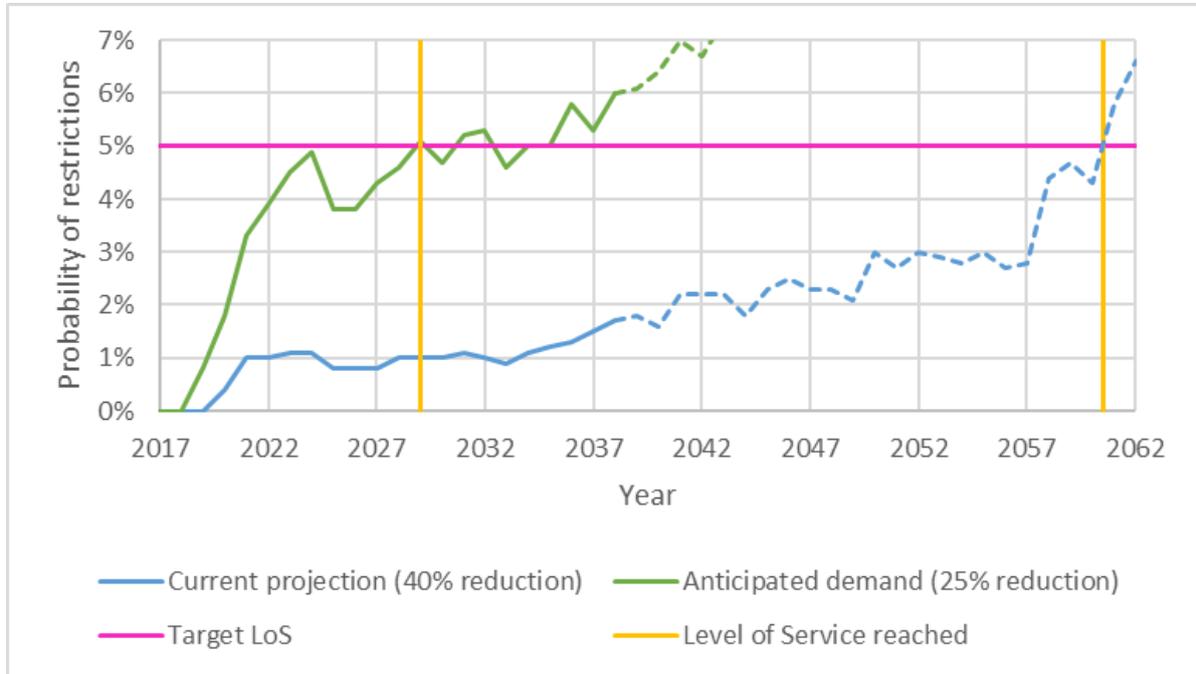
Figure 3. Current and future water security



Influence of demand savings on water security

Earlier modelling used as the basis for the water security major projects program assumed the ACT target of 25% per capita reduction in demand would be achieved (ACTEW Corporation, 2007). Instead, the community has reduced long-term demand by 40% per capita. Figure 4 illustrates the difference this has on projected water security.

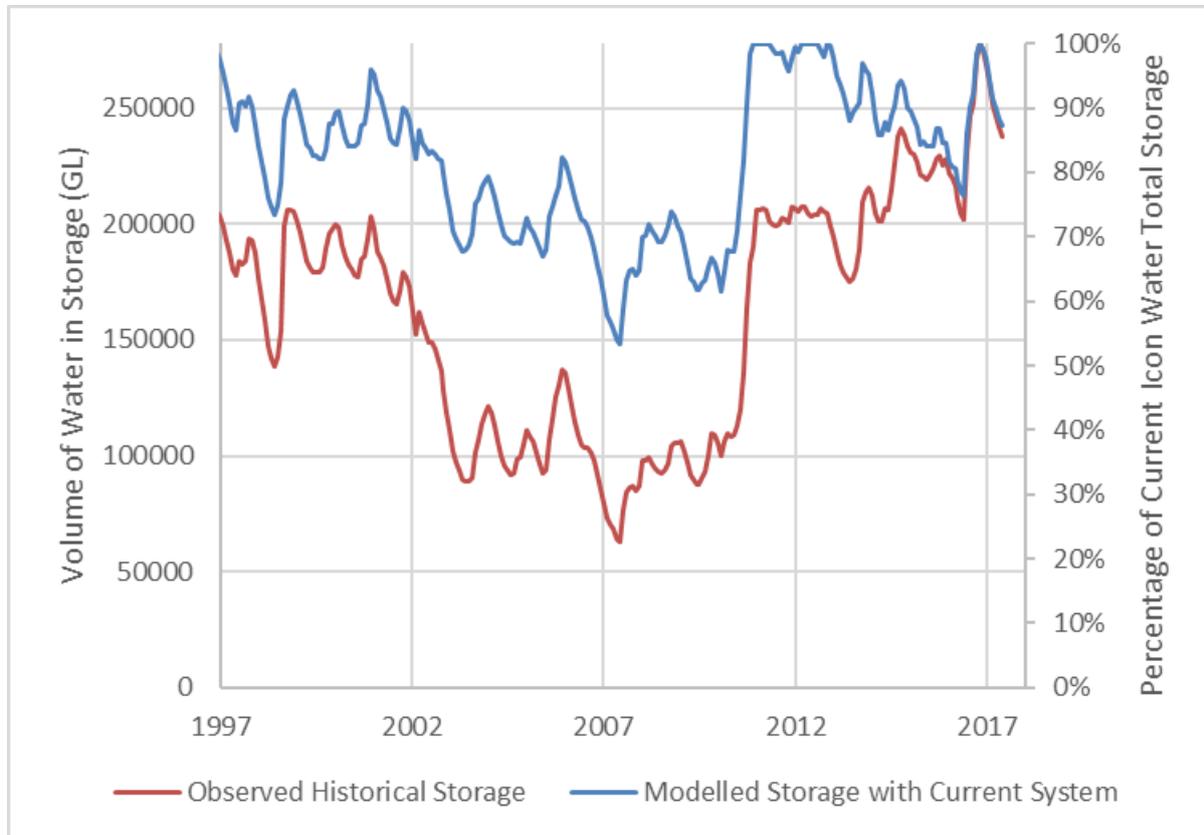
Figure 4. Projection using anticipated 25% per capita demand reduction rather than 40%



Repeat of millennium drought

The 1997–2009 millennium drought is the most severe drought on record for our source water system. Figure 5 shows how our current source water system would perform with a repeat of the weather conditions experienced historically. The key finding is that our source water system can withstand the worst drought on record without the need to implement water restrictions.

Figure 5. System Performance with Repeat of millennium drought

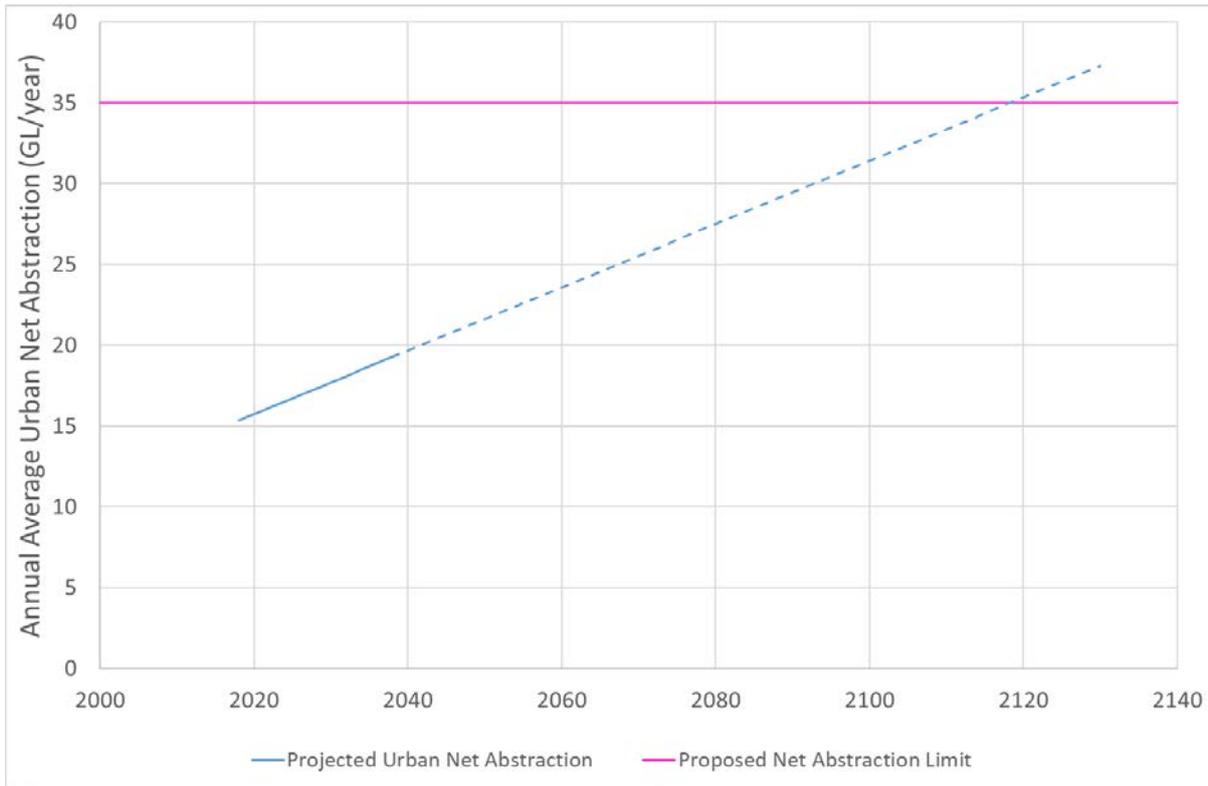


Icon Water’s abstraction rights

It has been proposed that Icon Water will receive 35 GL of water rights when the Murray-Darling Basin Plan is implemented in 2019. This is a net abstraction (that is, abstraction minus returns¹ must be less than 35 GL). Figure 6 presents Icon Water’s projection of the net take and the key finding is that Icon Water has water entitlements sufficient for a demand growth of 100%. Given population estimates, the demand growth may not take place this century and Icon Water will have no need to increase capacity until 2118.

¹ Abstraction is water taken from a river system for consumptive purposes. Transfer of water from one river to another (for example from the Murrumbidgee River to Googong Dam) does not constitute abstraction. Returns are discharges to a river system from ACT and Queanbeyan sewage treatment plants.

Figure 6. Projection of Icon Water’s net take against the proposed water rights limit



6 Approach and implementation

Icon Water's approach to achieving the objectives comprises of:

- maintaining a functional water resource computer model of the source water system that can be used to assess performance against the objectives.
- reviewing and updating the key planning variables used in the model whenever new information becomes available or at least each financial year.
- optimising source water operations to balance water security and cost to provide best value to the community.
- executing planned initiatives when required in accordance with the strategy.

Maintain and updating the water resources computer model

The Asset Strategy and Analytics (ASA) Branch within Business Services Group is responsible for maintaining and updating the model that monitors KPIs 1a, 2 and 3.

Optimise source water operations

ASA Branch is responsible for creation and maintenance of the *Source Water Guidelines*. The Guidelines balance performance (likelihood of experiencing water restrictions) and operation cost (from pumping and treatment) by using the water resources model to optimise triggers for turning the water sources on and off (Icon Water, 2018). The Guidelines assist Operations Services Branch to make optimal water sourcing decisions. Operations Services Branch is responsible for operating the system in alignment with Guidelines while also considering day to day operational factors such as weather forecasts, water quality and availability of staff and infrastructure.

Execute initiatives

The KPIs from Table 1 have response initiatives if the targets are not met.

KPI 1a – probability of water restrictions

For KPI 1a, an options analysis for the next augmentation will be run about 20 years before the augmentation is required. It is not necessary to investigate future augmentation options in detail now as technology will provide new options that might be more appropriate closer to the augmentation time. Infrastructure options will have long lead times for planning and commissioning which drives the early options assessment.

An Options Assessment should consider supply augmentation and demand management initiatives that will improve Icon Water's water security. The General Manager Business Services is responsible for initiating an Options Assessment when required.

KPI 1b – water storage levels

Failure of KPI 1b will require response initiatives in the unlikely event of a water shortage. Icon Water may need to develop an immediate response plan. If storages fall below 50%, the General Manager Business Services is responsible for:

- Initiating a complete review of key planning variables and assumptions used to analyse water security to ensure that they remain the most appropriate.
- Preparing for the potential implementation of temporary water restrictions, for example by reviewing water restrictions constraints and targets, preparing communications plans, consulting with ACT Government and other community stakeholders and identifying resources and measures required to enforce restrictions.
- Identifying options available for reducing demand, including educating the community of the benefits of demand reduction.

- Identifying opportunities for minor supply augmentation, including through non-potable water or new technologies.
- Reporting on these actions to the Icon Water Board, Executive and staff.

KPI 2 – probability of experiencing very low storage

The response initiatives for a projected failure in KPI 2 is the same as for KPI 1a.

KPI 3 – net abstraction forecast

The response initiatives for a projected KPI 3 failure is to increase Icon Water's rights to take water by purchasing rights from other users either internally or externally to the ACT. There is currently no trading mechanism to support this initiative but Icon Water is confident it will exist before required. An alternative solution to purchasing water rights is to reduce consumption through demand management initiatives, but this is a less preferred solution.

7 Governance

Performance monitoring and reporting

The General Manager Business Services is responsible for facilitating the implementation of the Strategy and ensuring adequate performance monitoring and reporting.

Performance against objectives will be reported to the Icon Water Executive and Board annually. The annual report will include identification of any significant changes to key planning variables or infrastructure that lead to a significant change in the performance of the source water system against the KPIs.

Review

The ACT and Queanbeyan communities have a high level of water security and augmentation will not be required in the short to medium term, despite significant population growth and increased service throughout the region. However, due to the sensitivity of the key planning variables used in the projection, this Strategy will be reviewed not less than every three years, to ensure the appropriateness of these conclusions.

Otherwise, review of the Strategy will be performed by ASA Branch when:

- there is a significant change in Icon Water's infrastructure or catchments (the source water system)
- there is a significant regional expansion in services for Icon Water's source water system
- there is a significant change in any of the key planning variables
- the water storage level drops below 50%.

Annual reporting to the Board and Executive will consider the need to update the Strategy. Major amendments will be approved by the Icon Water Board; minor amendments by the Executive Committee; and administrative amendments by General Manager Business Services².

² Procedure *PR11.03 Creating and maintaining IMS documents* provides definitions of amendment types.

8 References

ACT Government. (2014). *ACT Water Strategy 2014–44: Striking the Balance*. Retrieved from https://www.environment.act.gov.au/__data/assets/pdf_file/0019/621424/ACT-Water-Strategy-ACCESS.pdf

ACTEW Corporation. (2007). *Water Security for the ACT and Region: Recommendations to ACT Government*.

CSIRO. (2012). *Climate and water availability in south-eastern Australia: A synthesis of findings from Phase 2 of the South Eastern Australian Climate Initiative (SEACI)*.

Icon Water. (2018). *Source Water Guidelines (Draft)*.

SKM. (2011). *Water Supply System Model and Yield Review: Prepared By SKM for Sydney Catchment Authority*.

Water NSW. (2015). *Greater Sydney's Water Supply System Yield*.