LOWER HUNTER WATER PLAN

Monitoring, Evaluation, Reporting and Improvement 2019 Annual Evaluation

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More information

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Executive Summary

The first Lower Hunter Water Plan (LHWP), released in 2014, presented a portfolio of water supply and demand measures for the Lower Hunter. The plan set the following objectives:

- provide water security during drought
- ensure reliable water supplies to meet growing demand due to a growing population and increased business and industry activity
- help protect aquatic ecosystems
- maximise net benefits to the community.

Since the commencement of the plan in 2014 a range of implementation actions have been underway to deliver these objectives. The Monitoring, Evaluation, Reporting and Improvement (MERI) Plan guides assessment of the implementation actions and plan objectives.

As the next iteration of the LHWP is currently in development, the Department of Planning, Industry and Environment – Water has revised the 2018-19 approach to reporting of the MERI. This shorter, more succinct report focuses on those actions where progression was expected throughout the 2018-19 period rather than more broad review that assesses the need for a review of the plan.

During the 2018-19 period, climate was drier and warmer than average, resulting in higher overall demand and a decrease in water storage levels toward the end of the period. Composition of water supply from water sources did not change significantly, although accessibility constraints of the Tomago aquifer meant a reduction in its catchment and storage volume.

Implementation actions progressed throughout the period, although timelines were lengthened for drought response desalination readiness and pipeline infrastructure between the Hunter and Central Coast systems. Water savings from water efficiency programs primarily aimed at non-residential and Hunter Water operations have increased compared to the previous year.

A change in Government structure has seen responsibility for delivery of the Greater Sydney Water Strategy fall into the same department as the Lower Hunter Water Plan. This is likely to allow for improved knowledge sharing in future plan development and better internal capacity in areas of modelling and policy. This shift in Cabinet responsibilities means that Hunter Water and the Department of Planning, Industry, and Environment each report to the Minister for Water, Property and Housing.

A number of recommendations have been proposed for the implementation of the 2014 LHWP, and for consideration during the development of the next LHWP.

Contents

Glossary

Abbreviation	Description
CCC	Central Coast Council
DPI	Department of Primary Industries
DRISOG	Drought Response Senior Officers' Group
EIS	Environmental Impact Statement
ELWC	Economic Level of Water Conservation
EQ	Evaluation Question
Hunter Water	Hunter Water Corporation
IPART	Independent Pricing and Regulatory Tribunal
IWAP	Independent Water Advisory Panel
KEQ	Key Evaluation Question
KIWS	Kooragang Industrial Water Scheme
LHWCEOs	Lower Hunter Water Chief Executive Officers' Committee
LHWP	Lower Hunter Water Plan
LHWSOG	Lower Hunter Water Senior Officers' Group
MERI	Monitoring, Evaluation, Reporting and Improvement
ML	Megalitre – one million litres
NRAR	Natural Resources Access Regulator
NSW	New South Wales
PFAS	Poly-fluoroalkyl substances
WELS	Water Efficiency Labelling Scheme

Introduction

The first Lower Hunter Water Plan (LHWP), released in 2014, focussed on responding to drought because supply-demand modelling indicated that Hunter Water's supply system could meet demand for around 20 years. This LHWP comprises a portfolio of supply and demand measures in the categories of surface water, groundwater, water efficiency, demand management, recycling, stormwater and desalination. A key feature of the LHWP is that it is flexible to adapt to challenges, such as our highly variable climate patterns, new information and experience gained over time, as well as changes in behaviour, technology or the regulatory environment that may impact the portfolio.

The LHWP is aligned with the following objectives:

- provide water security during drought
- ensure reliable water supplies to meet growing demand due to a growing population and increased business and industry activity
- help protect aquatic ecosystems
- maximise net benefits to the community.

As part of the implementation of the LHWP, a Monitoring, Evaluation, Reporting and Improvement (MERI) Plan sets out a framework to assess performance against the LHWP's objectives and to ensure that it can adapt to incorporate the latest knowledge, experience and technology. Key elements to be monitored include:

- achievement of LHWP objectives
- the validity of the assumptions that underpin the LHWP
- the timely implementation of actions identified in the plan
- relevant developments in research and technology.

The Water Group within the Department of Planning, Industry and Environment is the lead agency in implementing the MERI Plan and developing future iterations of the LHWP, working in partnership with Hunter Water Corporation (Hunter Water) and Central Coast Council (CCC).

Annual evaluations were undertaken under the MERI framework in 2014, 2015, 2017 and 2018. A major evaluation was undertaken in 2016. This report outlines the findings from the 2019 annual evaluation of the performance and implementation of the LHWP and covers the timeframe from 1 July 2018 to 30 June 2019.

The next iteration of the LHWP is currently being developed. Ongoing revision of the LHWP ensures it reflects the changing community values and priorities in the region, while being both robust and adaptable in the long term. This process includes integration of the recommendations from previous MERI evaluations.

Planning for the next iteration of the LHWP began in 2017-18 and a new plan is estimated for delivery in 2021. This original date for delivery of a new plan was expected to be in 2020, however the Department of Planning, Industry and Environment – Water, Hunter Water and CCC have agreed that a longer planning period would result in a robust and adaptive plan that can respond to both drought and long term uncertainties and change.

The Lower Hunter experienced drought conditions in 2018-19 year, triggering the prioritisation of drought response measures. The short-term response to the drought is being assessed as part of the next LHWP, to ensure alignment with longer-term planning. This may impact the timing of delivery for the next LHWP beyond the proposed 2021 date, however this supports the adaptable nature of the LHWP.

Annual evaluation process

The MERI evaluation process is structured around four key evaluation questions (KEQ). Under each KEQ, there are a number of broad evaluation questions with their own set of specific assessment questions, as follows:

- Key Evaluation Question
    - Broad evaluation questions
        - Specific evaluation questions

This structure provides a level of detail that allows the Department of Planning, Industry and Environment – Water to adequately address the MERI Plan objectives and adapt the LHWP if needed. Table 1 summarises the four KEQs and the broad evaluation questions.

As shown in Table 1, only some of the evaluation questions are addressed in the annual evaluation. This is because:

- some implementation actions in the LHWP only occur in the event of a drought
- questions relating to the extent that the LHWP objectives are only considered as part of the major evaluation process.

In the former approach, evaluation questions are designed to monitor aspects of the LHWP that can meaningfully be measured and provide time series data to evaluate the effectiveness and efficiency of the plan when there is a major evaluation.

Drought evaluation

Total water storage levels in the lower Hunter dropped below 70% in March 2019 and then again in April 2019. This is the trigger level to convene the Drought Response Implementation Senior Officers' Group (DRISOG). The group has a role in reviewing the implementation of the drought response, including the restrictions policy.

Given that the onset of the drought was only slightly prior to the end of the 2018-19 MERI reporting period, discussion of the drought is limited in this report. A full report on the drought will be prepared as per the questions set out in the drought MERI and prepared at the end of the drought.

Table 1 Summary of MERI evaluation questions and timeframes

Key evaluation questions	Evaluation questions	Annual	Intermittent	
			Drought event	Major review
KEQ 1. How effective has the plan been in achieving its objectives?	EQ 1.1 To what extent are the LHWP's objectives being met?			
	EQ 1.2 Have the objectives been achieved as a result of the LHWP implementation?			
	EQ 1.3 The underlying premise of the plan is the supply and demand balance - is the forecast supply and demand balance still consistent with the LHWP's forecast?			
	EQ 1.4 Have there been any unintended outcomes (positive or negative) and how have these impacted on the LHWP's objectives?			
KEQ 2. How effective are the measures within the plan?	EQ 2.1 Do the measures perform as expected under drought conditions? Can any reasons for significant variation be explained?			
	EQ 2.2 Have the non-drought measures (i.e., continuing measures) been effective in the supply, saving and substitution of water? Can any reasons for significant variation be explained?			
KEQ 3. How efficiently has the plan been delivered?	EQ 3.1 Have the identified implementation actions been delivered within agreed timeframes or consistent with identified triggers? What are the reasons for any significant variation and how can this understanding improve delivery of the LHWP?			
	EQ 3.2 Are the implementation actions consistent with the LHWP's expectation for deliverables and costs? What are the reasons for any significant variation and how can this understanding improve delivery of the LHWP?			
KEQ 4. Do the measures within the plan remain appropriate?	EQ 4.1 Are the assumptions underpinning the LHWP still appropriate? Do any changes influence the measures and implementation actions in the LHWP?			
	EQ 4.2 Is the regulatory and operating environment still consistent with the LHWP? Do any changes influence the measures and implementation actions in the LHWP?			
	EQ 4.3 Has new technology, information or methods emerged that will influence the measures and their implementation? Do any changes influence the measures and implementation actions in the LHWP?			

MERI reporting approach

As planning for the next iteration of the LHWP is currently underway, Department of Planning, Industry and Environment – Water has reviewed the annual MERI reporting process and implemented a simplified approach for 2018-19 that covers the current stage of Plan development.

This annual MERI Report for 2018-19 provides an update on the actions undertaken in 2018-19. Implementation actions that have been determined through previous MERI evaluations to be complete or for consideration as part of the next plan are not discussed here. A more simple approach also addresses:

- Lengthy timing required for collating the report as a result of large amounts of agency information. The annual MERI Report felt outdated by the time it was presented to the Senior Officers Group and the Independent Water Advisory Panel.
- Repetition of information in MERI evaluation questions (35 in total).

This MERI Report uses the KEQ to assess the following:

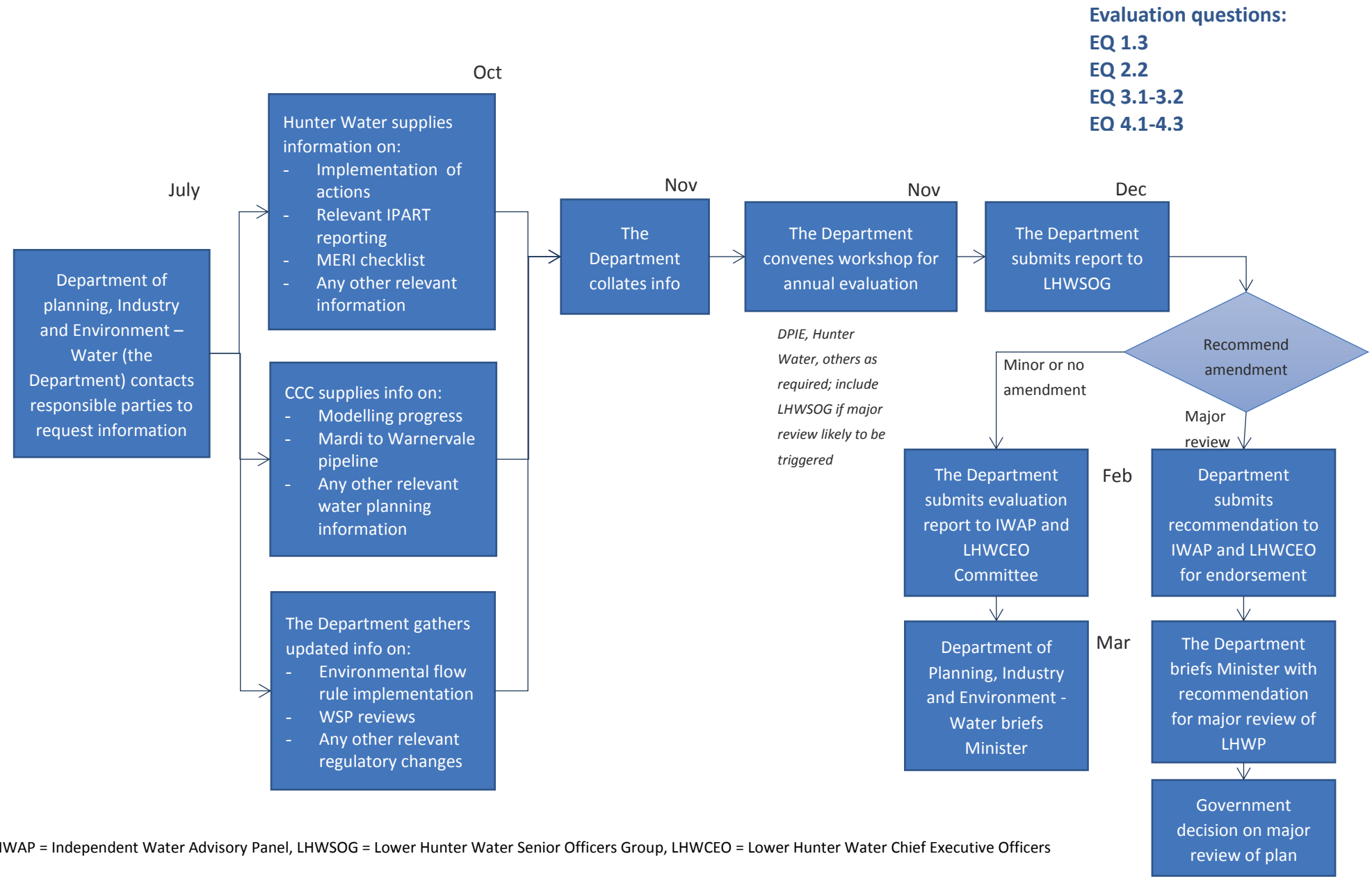
- How effective has the plan been in achieving its objectives? (KEQ 1)
- How effective are the measures within the plan? (KEQ 2)
- How efficiently has the plan been delivered? (KEQ 3)
- Do the measures within the plan remain appropriate? (KEQ 4)

The 2018-19 annual evaluation process began in May 2019 with discussion about the best approach for undertaking evaluation given the work already underway on the next plan. This was followed by a request for information from Hunter Water and CCC in September. Hunter Water and CCC submitted their responses to Department of Planning, Industry and Environment – Water in October 2019. The information was then collated and assessed for incorporation into this report. At completion of the report, results will be presented to the Lower Hunter Water Senior Officers Group (LHWSOG), Lower Hunter Water CEOs Committee (LHWCEOs) and Independent Water Advisory Panel (IWAP). Given the non-contentious nature of the 2018-19 review a brief to the Minister is not deemed to be required. The process is presented in Figure 1 and reflects 2019 dates.

Looking forward

Total water storage levels in the Lower Hunter dropped below 70% in March 2019 and again in April 2019. While there have been fluctuations since this time, storages levels have generally continued to have an overall decline, reaching a lowest point of 66% in late June 2019. As a result, Hunter Water established a drought response plan which comprised of implementations measures and costs which was endorsed by the DRISOG and LHWCEOs. Department of Planning, Industry and Environment – Water will undertake an evaluation of the drought measures as per the drought MERI and prepare a report.

Feedback from the previous MERI Reports identified the need for a more practical approach to MERI reporting. Department of Planning, Industry and Environment – Water will consider recommendations for improving the structure and implementation of the MERI process as part of the development of the next LHWP such that issues and lessons learnt are appropriately reflected. This may include consideration of a trigger-based approach rather than a time-based, annual approach, if it is considered to be more efficient to implement and more suited to the adaptive nature of the plan.



IWAP = Independent Water Advisory Panel, LHWSOG = Lower Hunter Water Senior Officers Group, LHWCEO = Lower Hunter Water Chief Executive Officers

Figure 1 Key steps in the annual evaluation process

Summary of major MERI recommendations for the next LHWP

The next LHWP will incorporate many of the actions and recommendations identified through previous MERI evaluations, most notably the 2016 major evaluation. These actions and their progress are listed in Table 2 below.

Table 2 Summary of actions identified for the next LHWP

Recommendations	Lead	Status
Objectives		
Frame the objectives of the next LHWP to articulate the high-level goals that reflect strategic priorities to be achieved by the plan, together with more specific, measurable objectives under these goals. These objectives will also provide a basis for analysing options and portfolios, and will be linked to performance indicators for future evaluations of the performance of the LHWP.	All	Completed
Consider the capacity to adapt to the potential for significant climate variability in developing the objectives and evaluating measures for the next LHWP	Department of Planning, Industry and Environment – Water and Hunter Water	Ongoing
Demand and supply modelling		
Incorporate the 2016 population projections into the demand model, along with further analysis of underlying trends, as part of the more comprehensive review of the demand forecast in developing the next LHWP.	Hunter Water	Completed
Follow up any outstanding actions arising from the 2013 peer review of the demand forecast, such as those relating to outdoor water use, correction for weather conditions, demand characteristics of non-residential customer categories, and price elasticity. Incorporate findings into the process to develop the next LHWP.	Hunter Water	Completed
Follow up any outstanding actions arising from the 2013 peer review of the source model, such as those relating to periodic bathymetric surveys of Grahamstown and Chichester dams, optimisation processes, a proofing model, improved modelling of the Tomaree source, synthetic data generation, validation of the Grahamstown Dam model, updating SoMo to reflect any changes in operating strategies/contingency plans, and climate change assessment. Incorporate findings into the process to develop the next LHWP.	Hunter Water	Completed
Progress work with the University of Newcastle to generate paleo-informed synthetic data for use in hydrologic modelling and economic analysis for the next LHWP	Hunter Water	Ongoing
Review the levels of service criteria as part of developing the next LHWP	Hunter Water	Completed
Examine drivers of increasing residential demand and identify options for cost-effective demand management when developing the next LHWP	Hunter Water	Completed

Recommendations	Lead	Status
Continue to monitor the trend of increasing residential demand to better understand the drivers (climate change, behaviour bounce-back, etc.) and how this might inform the major review of the demand forecast for the next LHWP.	Hunter Water	Ongoing
Water Supply		
Address the environmental, economic, social and risk implications of changes to groundwater access (cease-to-pump) conditions for the Tomago and Tomaree groundwater sources in developing the next iteration of the LHWP.	Department of Planning, Industry and Environment – Water	Ongoing
Consider the impacts on water supply system yield from any risk mitigation measures for managing impact on Grahamstown Dam from the Campvale catchment in developing the next LHWP.	Hunter Water	Ongoing
Resolve whether or not the lower Hunter alluvial is likely to be a feasible source of supply in drought, so that it can be either included or excluded as an option for developing the next LHWP.	Department of Planning, Industry and Environment – Water	Completed in 2019
Explore opportunities for further water efficiency and recycled water schemes through strategies developed by Hunter Water and as options for the next LHWP	Hunter Water	Ongoing
Convene the Groundwater Working Group for an update on research into groundwater dependent ecosystems at Tomago and Tomaree, an update on the implications of groundwater contamination at Williamtown for water security and to agree a way forward for including impacts of groundwater extraction into analysis for the next LHWP	Department of Planning, Industry and Environment – Water	
Where appropriate, take findings from paleoclimate research into account in the hydrologic modelling and economic analysis for the next LHWP	Hunter Water	Ongoing
In developing the next LHWP, ensure that water efficiency and recycled water scheme options that rely on third parties appropriately account for uncertainties in expected water savings	Hunter Water	Ongoing
Planning process		
Incorporate the outcomes of the latest research into climate change and climate variability into the planning process to develop the next LHWP. The approach will be developed in response to the outcomes of ongoing research and industry best practice, and may include consideration of paleoclimate data, sensitivity analysis, scenario planning to test extremes, and/or recommendations for further work.	Department of Planning, Industry and Environment – Water	Ongoing
MERI Plan		
When developing the MERI Plan for the next LHWP, aim to avoid overlap between the evaluation questions and hence reduce duplication in reporting.	Department of Planning, Industry and Environment – Water	Ongoing

Key Evaluation Question 1 – How effective has the LHWP been in achieving the objectives of the plan?

KEQ 1: How effective has the LHWP been in achieving the objectives of the plan?

This section addresses if the supply-demand balance is still consistent with the 2014 LHWP forecast. The MERI framework requires that this is evaluated every year to ensure that:

- the demand forecast is tracking within the sensitivity bounds defined for the LHWP
- there have been no major changes to the levels of service or the system yield that would threaten water security
- there is enough time to plan for and implement new options before demand outstrips supply in the future.

Review of demand forecast

The methodology for forecasting demand used for the 2014 LHWP underwent a peer review in 2012 as part of the plan development process. A recommendation of this review was that climate correction capability be built in to the methodology. Hunter Water has now completed this work. Pending the outcomes of a peer review, due for completion in late 2019, the revised methodology will form a more robust forecast of demand for the development of the next iteration of the LHWP. The revised methodology will take into account revised population projections (released by the Department of Planning in 2016) and occupancy rates as well as new information on water efficiency, major customer demand and non-revenue water.

Given the work underway to develop this improved methodology, Hunter Water did not undertake a revised forecast using the original methodology as part of the 2018-19 MERI Report. Therefore, for the purposes of this report, comparisons can be made between the forecast from the 2014 LHWP and actual demand figures from 2018-19 but not for the longer term forecast demand as was done in previous MERI annual evaluations.

Demand in 2018-19

Overall demand in 2018-19 was higher than forecast under the 2014 LHWP. This is attributed to warm and dry weather conditions that drove demand well above average and the transfer of water to the Central Coast as part of the inter-regional transfer agreement. Demand in this period was above the sensitivity bounds presented in the LHWP, which are applied to average year demands. Demand breakdown is described in Table 3, and shown on Figure 2.

Table 3 Demand in 2018-19

Demand type	Demand (ML/annum)	Compared to 2014 LHWP forecast
Overall	73,102	This is approximately 4,300 ML/year above the high forecast predicted for the 2014 LHWP.
Residential	41,273	Approximately 2,800 ML/year above high forecast for the 2014 LHWP.
Non-residential	17,875	Approximately 1,300 ML/year lower than average forecast, although Orica has not been included in 2018-19 data. Orica use values are now included in bulk water export.
Non-revenue (leakage, firefighting, metering error, Hunter Water on site use)	10,291	Approximately 400 ML/year above the 2014 forecast.

Demand type	Demand (ML/annum)	Compared to 2014 LHWP forecast
Bulk water export (Orica, Central Coast transfers)	3,663	No 2014 LHWP forecast. Note Central Coast transfers comprise 2,294 ML of this value.

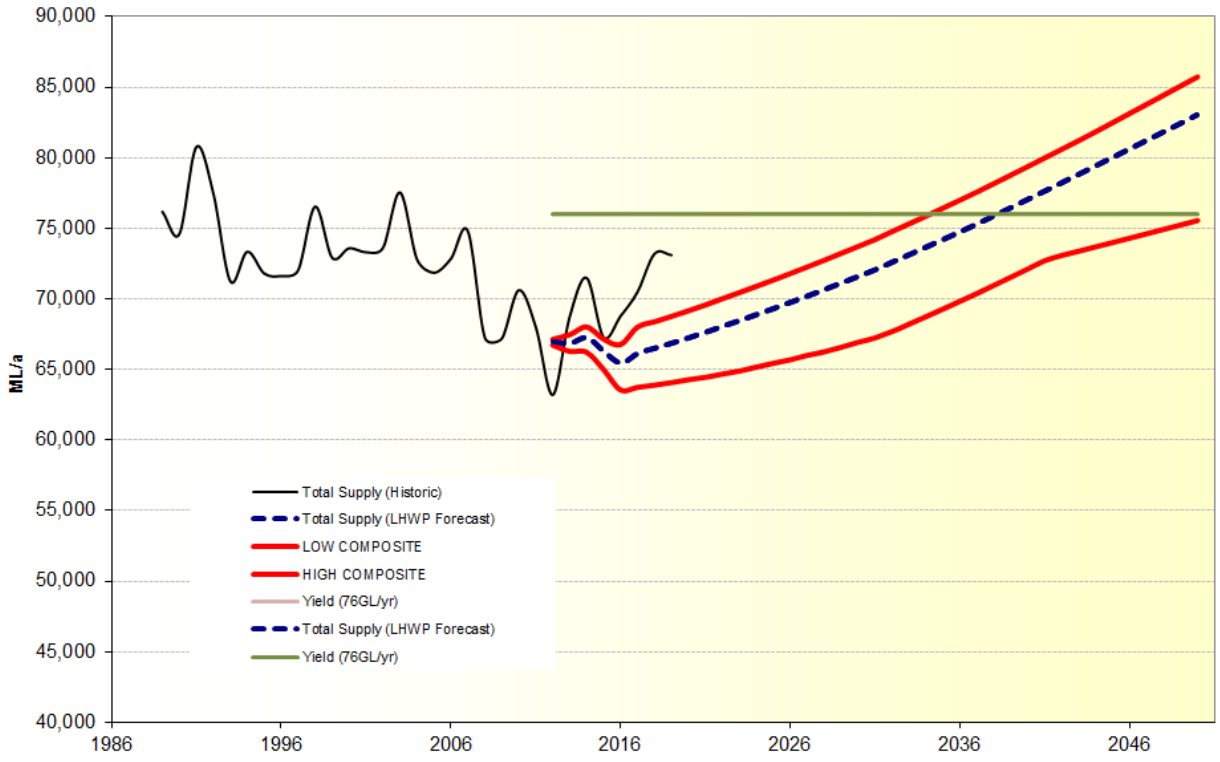


Figure 2 Overall supply and demand

Water supply 2018-19

Hunter Water supplied 75,945 ML of water in 2018-19, mainly comprised of surface water from Chichester Dam and Grahamstown Dam and groundwater from Tomaree and Tomago Sandbeds.

Other sources of water include:

- recycled water which substitutes potable water (for industry, agriculture and Hunter Water on-site use);
- some flows were sourced from Central Coast Council (277ML) due to water quality measures or operation reasons;
- Tomago borefields commenced operation on 4 June 2019 in response to falling storage levels. Around 1 GL of water was extracted from the sandbeds until the end of June.

Composition of water supply from the four major water sources did not change significantly in the year 2018-19 compared with 2017-18.

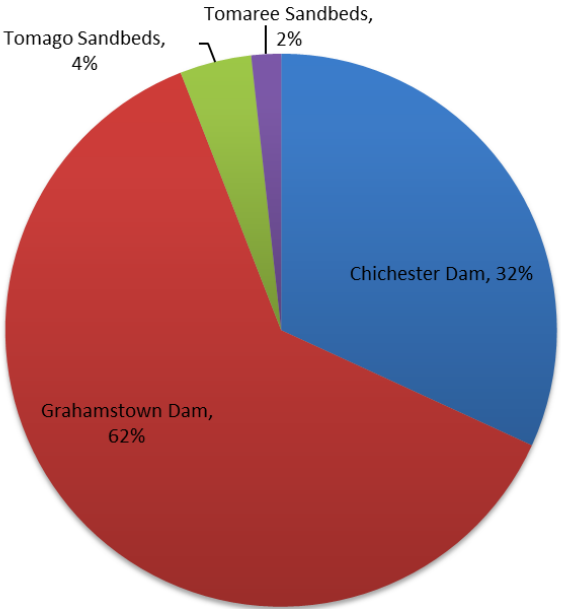


Figure 3 Percentage of water supplied from sources in 2018-19

Calculation of system yield

Hunter Water's system yield (the volume of water that can be reliably supplied each year over the long term) is currently calculated as 76,000 ML/year.

In 2018-19 the source strategy and operating rules for the Tomago Sandbeds groundwater source were modified to manage the risks of PFAS contamination. Following the changes, water extraction from two borelines was embargoed, which equates to an approximate 10% reduction to the catchment area and storage volume. This change has led to a reduction of around 0.5 GL/year in overall yield for the Hunter Water system.

The system yield of 76,000 ML/year is based on the current Central Coast transfer link capacity, which is approximately 15 ML/day for northward transfers and 33 ML/day for southward transfers, and the current water storage limit in Mangrove Creek Dam, which is 80% of its design capacity. The system yield will increase to around 77,000 ML/year when Central Coast Council completes planned works on the pipeline that will allow northward transfers of up to 30 ML/day. A yield benefit of a further 1,000 – 2,000 ML/year is also expected if Mangrove Creek Dam is restored to its full operating capacity.

A number of supply side risks exist which did not impact upon yield in 2018-19, although these could be an issue in the future. These issues will be monitored and considered in the calculation of yield for the next LHWP, including:

- reduced inflow to Grahamstown Dam due to water quality risks
- impacts due to asset life of current storages
- changes from the incorporation of climate variability from paleo-climate records into stochastic modelling
- changes to groundwater access conditions in the Water Sharing Plan for the North Coast Coastal Sands Groundwater Source following review of the broad impacts, specifically the interaction between bore operations and groundwater dependent ecosystems.

The University of Newcastle has been engaged to develop a paleo-informed synthetic data set for rainfall and streamflow for the Hunter and Central Coast. This data will create a climate informed calculation of system yield which will be applied in the Hunter-Central Coast WATHNET water supply system model for the development of the next LHWP.

Key Evaluation Questions 2 and 3 – Effectiveness of the non-drought measures of supply, substitution and efficiency of delivery of the plan

KEQ 2 and 3: Effectiveness of the non-drought measures of supply, substitution and saving and efficiency of delivery of the plan

- Timeframes of action delivery
- Consistency of timeframes with identified triggers
- Costs

As discussed earlier in this report, the 2018-19 MERI process has been undertaken with a view of streamlining reporting given the work already underway for the next iteration of the LHWP. For this reason, in contrast to previous MERI evaluations, KEQ 2 and KEQ 3 have been combined. The following section focuses on the ongoing implementation actions associated with the 2014 LHWP, and discusses the effectiveness and efficiency of these non-drought measures in the supply, saving and substitution of water. Timeframes for delivery, timeframes for triggers and costs are a focus of assessment.

Key implementations warranting discussion based on progress in 2018-19 comprise:

- Water supply implementation actions
  - inter-regional transfer pipeline between Hunter and Central Coast
  - Seaham Weir integrated gate and fish way construction
  - environmental flows at Chichester Dam
  - emergency desalination
- Water substitution
  - recycled water
- Water saving activities
  - water conservation programs.

Water supply implementation actions

Inter-regional transfer pipeline between Hunter and Central Coast

Key action: Transferring water between the Central Coast and the Lower Hunter. Water transfers are to be made as per the 2006 agreement for inter-regional transfers. Hunter Water and CCC are responsible for construction of infrastructure to enable transfers.

Action delivery: The full benefit of the 2006 agreement cannot be fully achieved until two outstanding issues are addressed. These are:

1. Completion of works to allow northward transfers at the rates specified in the 2006 agreement, and
2. Restoration of Mangrove Creek dam operating level to 100% of its original design capacity.

The infrastructure work in Hunter Water's area of operations to allow for northward transfers up to 30 ML/day was completed in late 2018. However, infrastructure work in the Central Coast area of operations has been delayed, which limits their ability to supply the water to around 15 ML/day. This work - comprised of the Mardi to Warnervale pipeline - was originally set to be delivered by the end of 2017 but is now forecasted for delivery in 2021. This work is essential to the delivery of the action, and would increase northbound transfer capacity to 30 ML/day.

Activities related to delivery of this action in the 2018-19 period included community engagement, a business case and an expression of interest callout for construction tendering. Contract of award for construction is planned for late 2019.

Timeframes for triggers: Under the 2006 agreement, northward transfers of 30 ML/day are triggered if lower Hunter storage falls below 70% while Central Coast storage is above 60%, and at 20 ML/day if lower Hunter storage falls below 60% while Central Coast storage is between 40% and 60%.

During the period while Mangrove Creek Dam storage was recovering after the Millennium Drought, the northward capacity of the Hunter Central Coast transfer pipeline and the capacity of Mangrove Creek Dam were not limiting constraints. Since mid 2015, when Mangrove Creek Dam recovered to around 70%, this situation changed, with the potential for northward transfers to be called that exceed pipeline capacity, and lost opportunities to store more water in Mangrove Creek Dam.

Both issues are of similar importance to the benefit that Hunter Water receives from the 2006 agreement. The pipeline capacity constraint impacts how much water the lower Hunter can receive during a drought, and the Mangrove Creek Dam capacity constraint means that Central Coast storage cannot start a drought sequence full. The problem with never starting drought sequences full is that it significantly reduces the potential for maximum flow northward transfers to ever be triggered under the agreement.

Cost: Hunter Water has completed the infrastructure delivery for this project and therefore did not have costs associated with this project in the 2018-19 period. Costs paid by CCC in the 2018-19 period were $2.6 million. The 2014 LHWP did not specify a forecasted cost for CCC contribution to this implementation action, although it was initially estimated in 2017 at $24 million, and revised to $61 million in 2018.

Recommendation actions

Central Coast Council to deliver the following works:

- Required upgrades to Mangrove Creek Dam to restore it to its design capacity (by 2020)
- Complete planned works on the pipeline that will allow northward transfers to Lower Hunter of up to 30 ML/day (by 2021).

Seaham Weir integrated gate and fish way construction

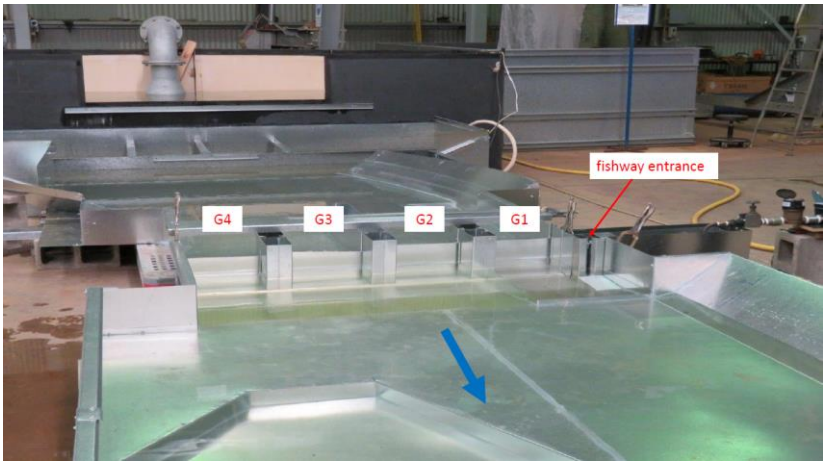
Key action: Hunter Water has completed the concept design and environmental impact assessment for the construction of an integrated gate and fishway structure at Seaham Weir. The Hunter Unregulated Environmental Flows Working Group including NSW DPI Fisheries, Department of Planning, Industry and Environment – Water and Natural Resources Access Regulator (NRAR) was formed in 2015 to oversee the implementation of the LHWP environmental flow rules and fish passage at Chichester Dam and Seaham Weir. The design is considered to be fit for purpose and has been reviewed by the Working Group. The structure has been designed with 4 m by 3 m wide gates and an associated seven baffle vertical slot fishway. The design process included physical scale modelling overseen by NSW Fisheries. Further details of this project were included in the 2018 MERI Annual Evaluation.

Cost: The cost estimate for the works has increased significantly as the design matured and more detail became available. The approved capital expenditure for this project was $5.6 million in July 2016. Based on the current information after undertaking the concept design, the estimated project value has increased to around $14.8 million. Due to the high costs proposed Hunter Water is conducting a constructability review to explore redesign options. A revised cost estimate will be determined through the constructability review.

Action delivery: The MERI Plan did not specify a timing for this project as it is dependent on the outcome of the regulatory processes for the *Hunter Unregulated and Alluvial Water Sharing Plan 2009*. A constructability review has extended the completion of this action by six months (endorsed by the Working Group members). This work is estimated to be completed by November 2019. Hunter Water is preparing internal approval and procurement documentation to explore re-design options, however a final decision is pending the outcomes of the constructability review. There is some risk that Hunter Water will not have sufficient time to undertake the re-design within the agreed six month timeframe.

Timeframes for triggers: This is not a trigger based action.

Figure 4 Seaham weir; prototype of recommended design option



Recommended actions

Department of Planning, Industry and Environment – Water to convene the Environmental Flows Working Group as needed to review outcomes of constructability review and delivery timeframes.

Environmental flows at Chichester Dam

Key Action: The River Health Outcomes Group developed enhanced environmental flow rules for Chichester Dam and Seaham Weir on the Williams River as part of the 2014 LHWP.

Action delivery: Hunter Water remains ready to implement the new releases at Chichester Dam as soon as the required changes are made to the *Hunter Unregulated and Alluvial Water Sharing Plan* by Department of Planning, Industry and Environment – Water. The water sharing plan is due to be remade by 1 July 2021, however it is likely that this will be extended for up to two years. While it was anticipated that Department of Planning, Industry and Environment – Water would undertake a community consultation process in 2018-19 to proceed with mid-term amendments of the water sharing plan, this has been delayed. As such, the Department will now assess if mid-term amendments are appropriate or if changes should be incorporated as part of the plan review process by 2023.

Timeframes for triggers: This is not a trigger based action.

Costs: Not applicable.

Recommended actions

Department of Planning, Industry and Environment – Water to determine the approach and timeline for amendment of the Hunter Unregulated and Alluvial water sharing plan.

Drought response desalination

Key action: Desalination as an emergency measure to supplement water supplies in an extreme drought. The key implementation action associated with desalination was the completion of readiness activities to expedite the delivery of water from desalination if it were to be required. Emergency desalination under the current proposed design is a water supply measure expected to contribute 15 ML/day once operational in a drought.

Action delivery: As per the major evaluation of the LHWP in 2016, review of the timeline recommended bringing forward the concept design, environmental impact statement (EIS) and planning approval to include these actions under ‘readiness activities’, with a revised completion time of December 2018.

Significant work for emergency desalination was carried out in 2018-19. In June 2018, GHD was engaged to complete the concept design and EIS for the preferred site at Belmont (Figure 5). This work included a range of environmental and cultural heritage studies, geotechnical and

groundwater investigations, modelling work on intake groundwater and brine water discharge, and community consultation.

Hunter Water is engaging with Department of Planning, Industry and Environment – Planning to ensure timely progress of the EIS. Completion of the concept design and EIS, and submission to Department of Planning, Industry and Environment – Planning is currently on track for late 2019.

There has been a delay of six months compared to the timeline from last year's MERI Report, predominantly due to work and approvals associated with groundwater investigations. In total, works have been delayed by approximately 30 months compared with the 2014 LHWP timeline (procurement to commence May 2017).

Timeframes for triggers: Recommendations as a result of the 2016 Major MERI Evaluation also included the trigger for procurement under a 'design and construct' contract package which is triggered at 65% water storage levels. Procurement activities for the detailed design phase of the project had commenced prior to storage levels reaching 65%.

Based on current advice it is assumed that construction of a desalination facility would take at least 12 months.

The LHWP sets a trigger for construction at 35% on the basis that this would allow the plant to be operational by the time storage levels reach 15%. These levels are based on a depletion rate from an extreme 'design drought" selected from stochastic modelling using Hunter Water's SoMo model.

In the scenario modelled in Figure 7, total restricted demand would be 155 ML/day. The Belmont drought response desalination plant is expected to contribute 15 ML/day, and Chichester Dam would continue to supply 30 ML/day.

Potential risks associated with desalination include: the ability for a plant to be constructed and operational within the LHWP timeline (based on 35% trigger), storage levels falling more quickly than expected, and less than expected inflows from Chichester Dam. These issues will be further explored and raised with the DRISOG and LHWCEOs if the drought persists. Detailed assessment of the drought response desalination project will be reported in the drought MERI.

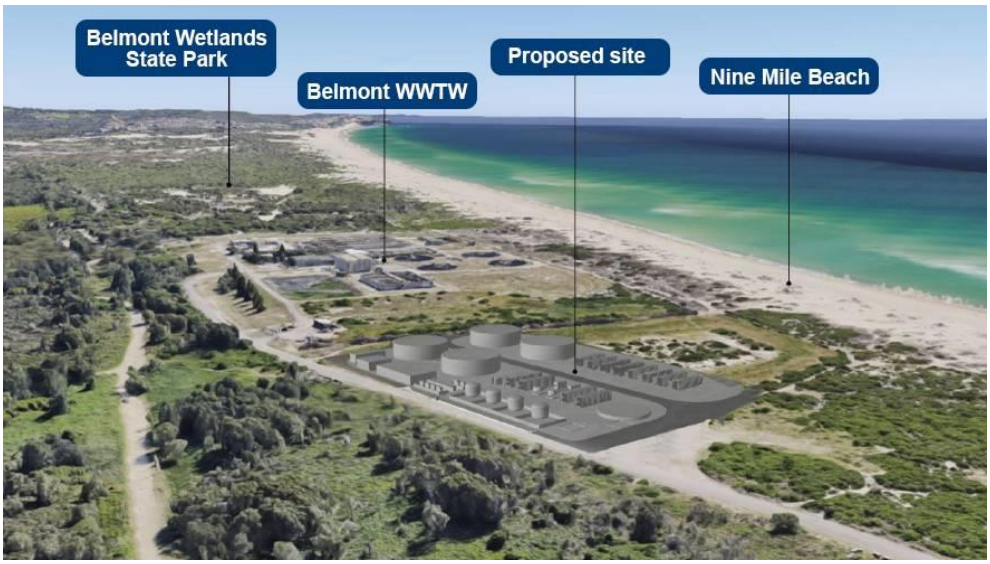


Figure 5 Location of the proposed site at Belmont

Cost: Cost estimates changed considerably from the 2014 LHWP. Due to changes in size of the plant, and unforeseen constraints associated with construction, the cost of the plant has increased to approximately $98.7 million from the 2014 LHWP estimate of $25.5 million (Table 4). Detailed justification for incremental changes in costs have been detailed in previous MERI evaluations.

Table 4 Emergency desalination and readiness activities costs in 2018-19 year

Stage	2014 LHWP assumed cost for 9ML/d plant	Estimated cost for 15ML/d plant (2016)	Revised cost for 15ML/d plant (2017)	Revised cost for 15ML/d plant (2018)	Revised cost for 15ML/d plant (2019)
Readiness	n/a	$2,000,000	$1,700,000	$1,940,000	$1,690,000
Trigger 1[1]	$23,000	$3,000,000	$4,900,000	$4,900,000	$5,041,000
Trigger 2 [2]	$23,000,000	$59,400,000	$84,100,000	$84,100,000	$91,936,000
Total	**$25,500,000**	**$64,400,000**	**$90,700,000**	**$90,940,000**	**$98,667,000**

1 LHWP trigger states trigger 1 is when total storage levels reaches 65%: procurement for design and construct package, with optional exit points

2 LHWP states trigger 2 is when total storage levels reaches 35%: start operation, if construction completed (must produce water no later than 15%)

Water substitution - Recycled water

Key action: Recycled water schemes providing a substitution for potable water use. A major component of recycled water actions outlined in the 2014 LHWP included the Kooragang Industrial Water Scheme (KIWS), now operated by Water Utilities Australia, and recycling of water by private operators to supply new residential developments.

Action delivery: The KIWS was delivered by Hunter Water in 2015. Now owned by a private operator, it continues to deliver potable water substitution for industrial users on Kooragang Island. Under the 2014 LHWP, the KIWS had a target annual volume of potable substitution of 3,000 ML. In 2018-19, KIWS offset 2,160 ML of potable water use, or 72% of the target. This was slightly less than 2017-18 when 2,495 ML was offset.

During the 2018-19 period, a total volume of 4,500 ML of recycled water was supplied for end uses offsetting potable water. Figure 6 shows the amount of water substituted with recycled water in different sectors.

Dual reticulation schemes at Chisholm and Gillieston Heights have not proceeded as forecast by the 2014 LHWP. In 2018-19 commissioning and verification was completed for both schemes however the scale of the schemes has been reduced since 2013 due to the lack of support from developers. Hunter Water will be finalising regulatory approvals to commence supplying recycled water from both schemes in the next financial year (by December 2019).

Timeframes for triggers: This is not a trigger based action.

Cost: For KWIS, this action is already completed and the scheme is now owned and operated by a private utility.

Recommended actions:

Hunter Water to finalise regulatory approvals for residential dual reticulation schemes.

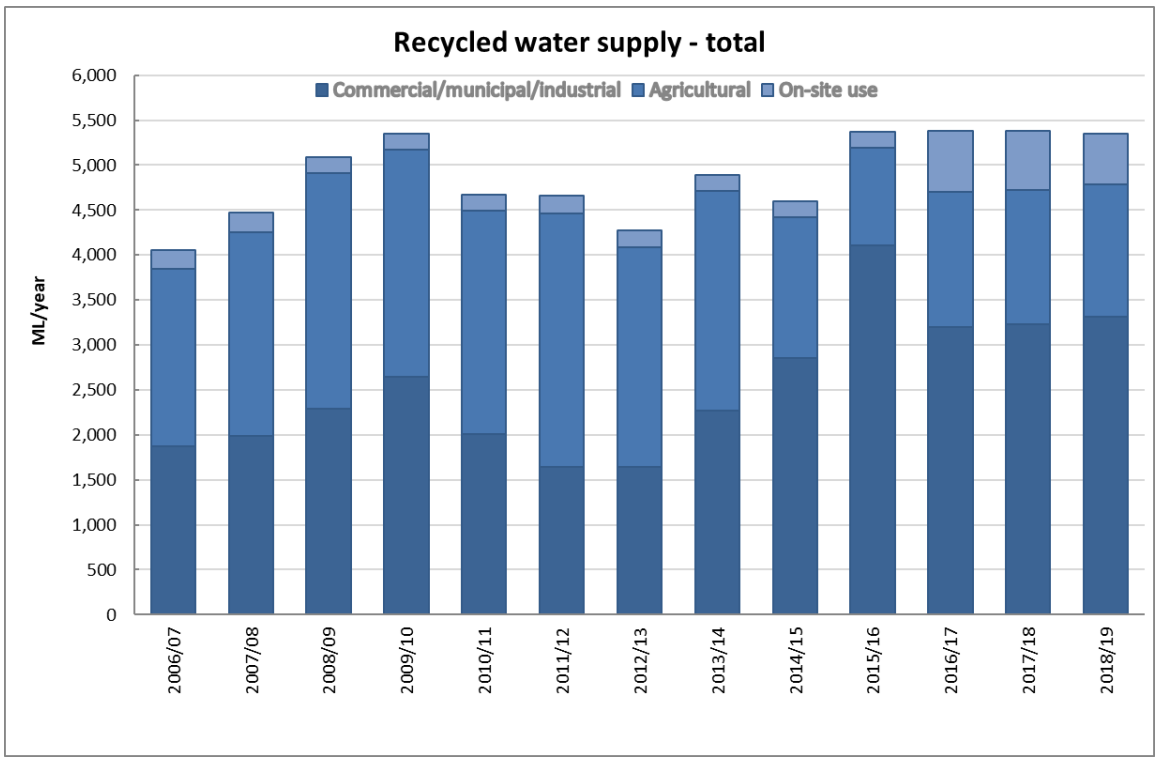


Figure 6 Total recycled water supplied

Water Conservation Programs

Overall water savings

Estimated cumulative savings from all of Hunter Water's water efficiency programs in 2018/19 are shown in Figure 7.

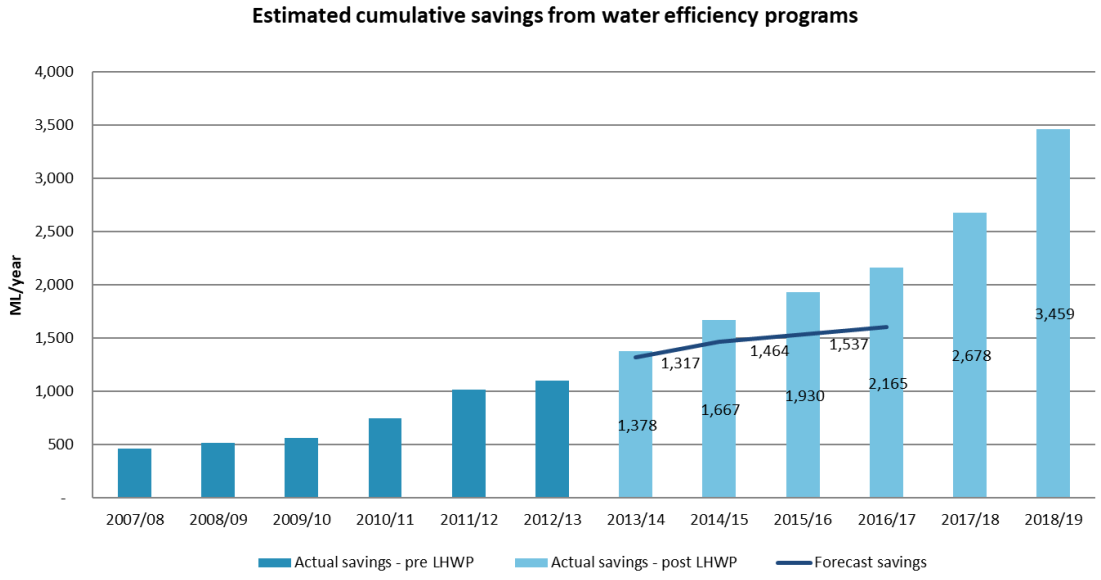


Figure 7 Estimated cumulative water savings from water efficiency programs

Hunter Water has applied the Economic Level of Water Conservation (ELWC) methodology to help determine whether programs are economically efficient. The methodology considers social and environmental costs and benefits in addition to the cost of the program and the water saved. The ELWC methodology is based on a cost-benefit analysis framework where the costs and benefits are assessed in marginal terms from a societal perspective. A water conservation measure is

considered to be economically viable if the benefits are at least equal to the costs. The benefits are assessed in terms of the value of water conserved and the costs are assessed in terms of the levelised cost of implementing the water conservation measure, both of which are expressed as a present value of dollars per kilolitre of water. The ELWC is calculated by adding the volume of water conserved from all new water conservation measures that are assessed as being economically viable.

Hunter Water submitted a final ELWC methodology to IPART for approval in January 2019. IPART has approved this methodology and Hunter Water has since been applying the ELWC to the program of works.

Residential customer efficiency programs

Key action: Water loss and water efficiency programs for residential customers.

Action delivery: The 2014 LHWP included programs aimed at residential savings (i.e. Showerhead Exchange Program and the Hunter Region No Interest Loans Scheme).

Throughout 2018-19, Hunter Water focused on creating a connection to water and driving behavioural change throughout the community through the Love Water Campaign. This has seen a significant increase in community engagement regarding on water conservation.

Programs carried out in 2018-19 targeted residential water use, and included:

- Schools Education Program
    - Learning Together to Change Our World
    - Bubbles & Squirt Water Saving Show
- Hunter Water Website which includes a dedicated 'Save Water' section
- community events
- media awareness raising like television commercials
- 36 separate community programs to raise awareness on water conservation,

In addition, Hunter Water also:

- continued support of the Water Efficiency Labelling Scheme (WELS) for household appliances;
- participated in the Smart Approved WaterMark program;
- implemented the Rainwater Tank Tune Ups initiative; and
- implemented the Plumbing Assist Program which targeted high household users.

These programs were supported by an independent review by the Institute of Sustainable Futures in 2018.

Non-Residential customer efficiency programs

Key action: Water loss and water efficiency programs for non-residential customers.

In 2018-19 Hunter Water focussed on water efficiency programs for non-residential customers. These non-residential water loss and water efficiency programs saved 351 ML in 2018-19, and included:

- 183 ML of savings through leak detection programs and operational improvements for non-residential customers
- 168 ML was saved through conducting audits of nine large industrial/commercial customers and recommending improved operational processes, leak repairs, fittings upgrades, cooling tower and irrigation system improvements and the use of alternative water sources.

Voluntary Water Audits described in the 2014 LHWP are available for large business customers and have been extended to customers who use at least 10 ML/year where appropriate. The Hunter Water Business Savers Program has been redesigned to target specific industries and end uses,

for example audits for pools, irrigation and shopping centres. Councils have been identified as a key consumer to support to achieve significant water savings.

Timeframes for triggers: This action is not trigger-based.

A number of the activities which were initially captured in the 2014 LHWP have been altered, or discontinued. Programs have also been added. This change aligns with the adaptive nature of the LHWP, particularly the increase in education programs during the 2018-19 period given decreasing water storage levels and the potential to enter drought conditions.

Hunter Water operations efficiency programs

Key action: Water loss and water efficiency programs for Hunter Water operations. These programs comprise active leak detection, pressure management and asset replacement throughout the Hunter Water network.

Action delivery:

There was approximately 430 ML of savings over the 2018-19 period as a result of the ongoing network water loss programs, including pressure management and active leak detection.

In relation to the active leak detection program, the 2014 LHWP established a target of surveying 20% of Hunter Water's water mains for leaks each year. Hunter Water undertook leak detection throughout their entire 5000 km network in 2018-19, prior to the drought response trigger of 70% storage levels.

Hunter Water has proposed to continue active leak detection for the whole system over 2019-20. After two years the program will be reviewed to assess its efficiency including outcomes and impacts on the system during the drought period. More details about the impact of the water conservation activities will be discussed in the drought MERI report.

Infrastructure Leakage Index (ILI) is a performance indicator for comparison of leakage management in a water supply system. The ILI is derived from a ratio of real water losses and unavoidable water losses from a supply system. Figure 10 shows the trend of ILI before and after the 2014 LHWP until now. For understanding, industry benchmarks supplied by the Water Services Association of Australia (WSAA) have been added to the graph to show what is considered as good or excellent practice from the utility. The Hunter Water ILI decreased from 1.23 to 1.15, nearing the excellent benchmark. Real losses decreased from 3.9 to 3.6 kilolitres per day per kilometre of water main per day (see Figure 9).

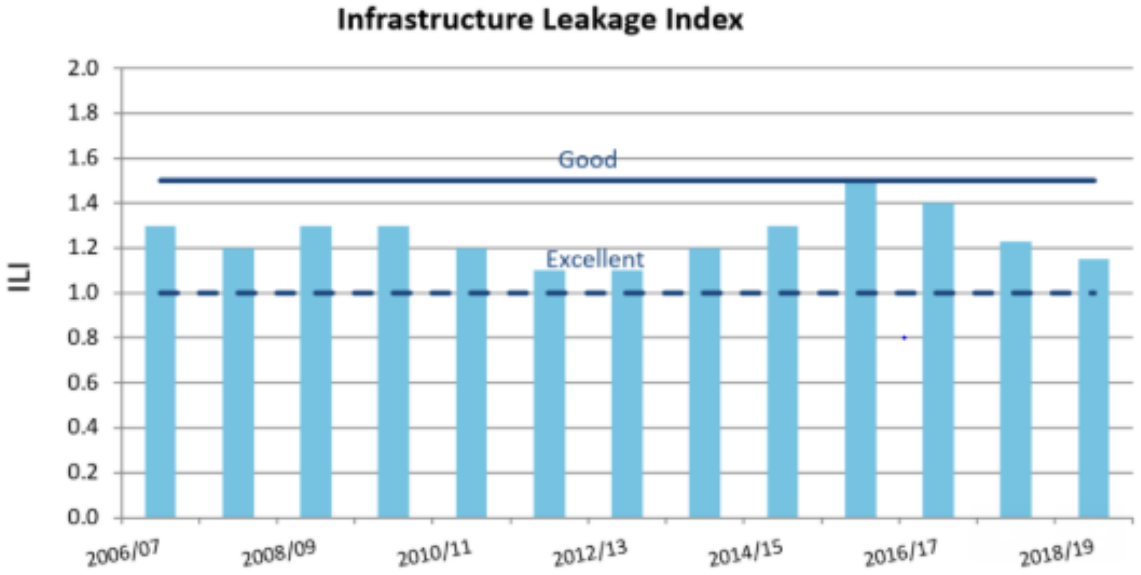


Figure 8 Hunter Water Infrastructure Leakage Index

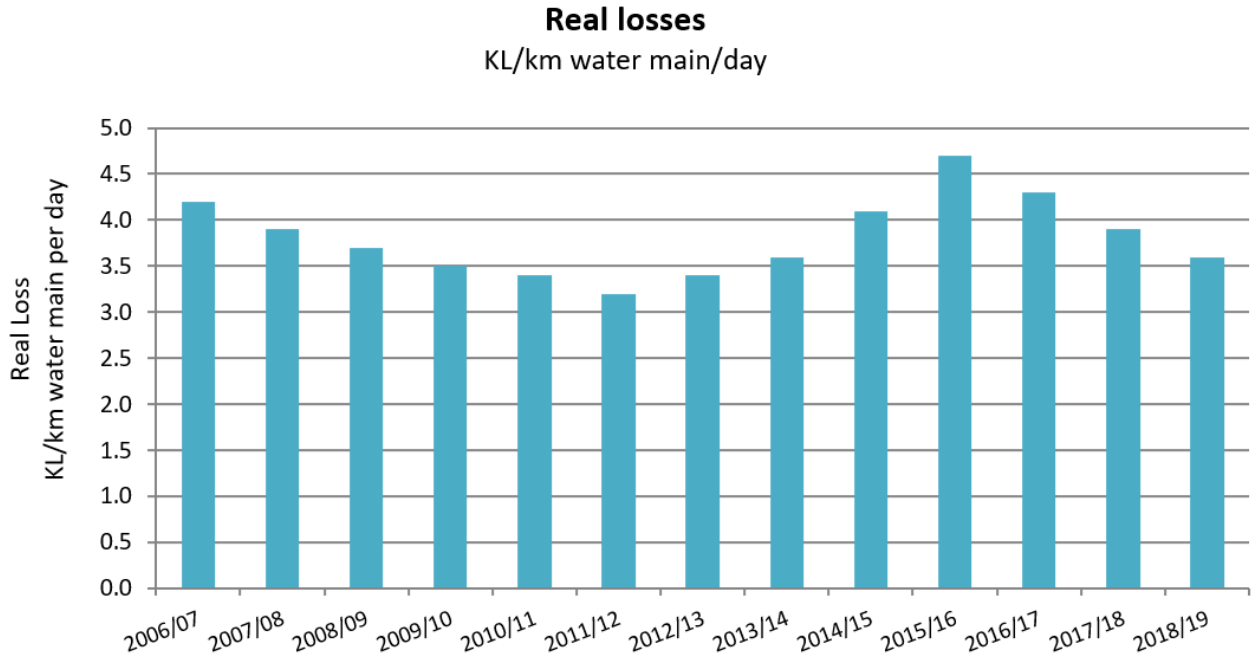


Figure 9 Real system losses

Cost: Hunter Water has applied the Economic Level of Water Conservation (ELWC) methodology to help determine whether all water conservation programs are economically efficient. This includes the leak detection, pressure management and asset replacement programs.

Recommended actions

Hunter Water undertake a review to determine an appropriate frequency and duration of non-revenue water savings (Hunter Water operations).

This will be considered in the next iteration of the LHWP and MERI Plan.

Key Evaluation Question 4 – Evaluation measures of the plan

KEQ 4: Evaluation measures of the Plan

- Appropriateness of the assumptions
- Consistency of regulatory and operating environment of the plan
- Influence of new technology, information or methods

Appropriateness of assumptions

Assumptions made as part of the 2014 LHWP are now being reassessed as part of the development of the next LHWP. A number of recommendations made under previous MERI Reports have been taken into consideration and will be incorporated into the next iteration of the LHWP. As such, assumptions made under the 2014 LHWP are not discussed in this report.

Regulatory and operating environment

After the NSW Government state election in March 2019, the LHWP and Greater Sydney Water Strategy are both managed under the Department of Planning, Industry and Environment. Previously, the LHWP was overseen by former Department of Industry and Sydney Metropolitan Water Plan was managed by Department of Planning and Environment. This has not impacted the governance of the LHWP and the plan has been operating in the same regulatory environment. It is anticipated however that in the future this will allow better collaboration across the regions and more consistency in the planning processes.

As part of this government change, Hunter Water and the Department of Planning, Industry and Environment both report to the Minister for Water, Property and Housing. This is likely to be beneficial to the development of the next iteration of the LHWP as it will streamline Ministerial reporting.

New technology and information

Hunter Water is working on an initiative with the University of Newcastle to examine consumers' water consumption behaviour to better understand the barriers and motivations. The first phase of this research project commenced in 2018-19 with a series of focus groups made up of representatives from four key customer segments. The outcomes of the project, which is to be completed in late 2019, will allow better tailoring and targeting of water conservation messaging and support for Hunter Water customers. Outcomes of this work can be applied to the development of the next LHWP.

Evaporation management is another area where further collaborative research is proposed. In the future this could provide opportunities for reducing water losses from Grahamstown Dam. Work in this area will be considered in the development of options for the next LHWP.

The Independent Pricing and Regulatory Tribunal (IPART) completed a review of pricing arrangements for recycled water, sewer mining and stormwater harvesting services provided by Hunter Water in July 2019. Based on this review, the price regulation needs to support efficient and effective water services that have considered a range of options for water supply.

This refined regulatory approach enables efficient investment in recycled water where it provides broader benefits to the customers in development of the next LHWP.

Conclusion and recommended actions

Implementation of the 2014 LHWP during the 2018-19 year has progressed in several areas while work is now well underway on the next iteration of the LHWP. It is acknowledged that a number of actions prescribed under the 2014 LHWP will be included for further development in the next plan.

The year of 2018-19 saw a warmer and drier climate which drove demand higher, and put particular importance on readiness activities for drought response desalination. While readiness work is progressing as per the proposed LHWP schedule, a number of risks have been identified and ongoing reporting to the DRISOG and LHWCEOs will continue if the drought persists.

Weather conditions also resulted in the use of expedited water conservation actions to make savings, with Hunter Water decreasing water loss throughout their operational network, and increasing the number of community conservation initiatives for residential savings. Research on consumptive behaviour to better understand customer behaviour will also continue to assist in conservation program development and results, which will be incorporated into the next LHWP.

A summary of the recommended actions as a result of the 2018-19 MERI Report is provided in Table 5 below.

Table 5 Summary of recommended actions

LHWP element	Recommended action
Inter-regional transfer pipeline between Hunter and Central Coast	Central Coast Council to deliver the following works: • Required upgrades to Mangrove Creek Dam to restore it to its design capacity (by 2020) • Complete planned works on the pipeline that will allow northward transfers to Lower Hunter of up to 30 ML/day (by 2021).
Seaham Weir integrated gate and fish way construction	Department of Planning, Industry and Environment – Water to convene the Environmental Flows Working Group as needed to review outcomes of constructability review and delivery timeframes.
Environmental flows at Chichester Dam	Department of Planning, Industry and Environment – Water to determine the approach and timeline for amendment of the Hunter Unregulated and Alluvial water sharing plan.
Water substitution - Recycled water	Hunter Water to finalise regulatory approvals for residential dual reticulation schemes.
Water conservation programs	Hunter Water undertake a review to determine an appropriate frequency and duration of non-revenue water savings (Hunter Water operations). This will be considered in the next iteration of the LHWP and MERI Plan.
Regulatory and operating environment	LHWP team at Department of Planning, Industry and Environment – Water to collaborate with the Sydney Metro Water Plan team where possible, exchange knowledge and experience in the area of urban water planning
New technology and information	Hunter Water to consider the outcome from the consumption behaviour research in the water conservation measures for the next LHWP