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Water

LOWER HUNTER water PLAN

MERI Annual Evaluation 2015

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More information

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Cover image: Recycled water storage tank, Kooragang Recycled Water Scheme

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Executive summary

This report outlines the process and findings from the 2015 annual evaluation of the performance and implementation of the Lower Hunter Water Plan (LHWP) as part of the Monitoring, Evaluation, Reporting and Improvement (MERI) plan.

The MERI plan sets out a framework for assessing the LHWP's performance against its objectives and establishes triggers for review or amendment of the LHWP to incorporate new information as it becomes available. The MERI plan comprises a series of key evaluation questions linked to the LHWP objectives as well as implementation actions and timings to monitor delivery of the LHWP.

The 2015 annual MERI evaluation began in July 2015. The process included the then Metropolitan Water Directorate (now within DPI Water) collating reports from the relevant agencies (Hunter Water, Wyong Water (within Wyong Shire Council), DPI Water) and holding a workshop to discuss the findings of the evaluation. The outcomes of the evaluation and the draft report were endorsed by the Lower Hunter Water Senior Officers' Group (LHWSOG) on 9 November 2015 and by the Independent Water Advisory Panel (IWAP) on 26 November 2015. The Metropolitan Water Chief Executive Officers' Committee (MWCEOs) endorsed the report out-of-session in February 2016.

Implementing recommendations from the 2014 evaluation

The 2014 MERI evaluation recommended establishing a subgroup of the River Health Outcomes Group (RHOG) to consider the potential impact on the supply-demand balance of DPI Water's proposed amendments to access rules for the Tomago and Tomaree groundwater sources in the North Coast Coastal Sands Groundwater Sources Water Sharing Plan (WSP).

Hunter Water's modelling indicated that the proposed amendments would result in a yield loss of 3 GL/year from Tomago and 1.5 GL/year from Tomaree ground water sources, bringing forward a supply augmentation by around eight years and triggering a major review of the LHWP. Such a decision would have significant economic, social and environmental costs.

The groundwater group agreed that the issues associated with amended cease to pump rules would be best dealt with through the broader strategic planning process to develop the next iteration of the LHWP, due for release in 2019-20. As such, it recommended:

- a 'holding pattern' (ie, the current access conditions, as specified in the 2004 WSP, and in Hunter Water Corporation's works approval and licence should continue to apply) for the first five years of the WSP, pending the outcomes of scientific studies that had already been initiated. These aim to develop early warning indicators of water stress on groundwater dependent ecosystems and to provide a more robust basis for setting access conditions, particularly the level at which extraction must cease
- undertaking proposed research to close the gap on understanding the dependence on groundwater of high value ecosystems in the Tomaree source
- the broader environmental, economic, social and risk implications of significant changes to groundwater access, which would trigger a major supply augmentation, should be dealt with as part of the whole-of-government process to develop the next iteration of the LHWP. This will allow assessment of the costs and benefits of changing access rules in the context of the complex range of issues associated with a major supply augmentation and engagement with agencies, stakeholders and the community
- including a provision in the WSP to review the groundwater access conditions after the first five years, informed by the outcome of the points above.

DPI Water and the North Coast Interagency Regional Panel endorsed the recommendations from the Groundwater Group in June 2015 and amendments were included in the draft WSP for public exhibition in early 2016.

Key findings from the 2015 MERI evaluation

An update to Hunter Water's demand forecast showed a slight reduction in the demand forecast over the planning period compared with the forecast developed for the LHWP. There were no changes to the estimate of system yield and it remains at 75GL/year. The lower demand forecast causes the supply and demand curves to intersect in 2036-37, one year later than forecast in the LHWP.

Hunter Water reported that new information is available on the potential impacts of climate change from the NSW and ACT Regional Climate Model Project and the Eastern Seaboard Climate Change Initiative. Findings from this research indicate:

- temperatures are forecast to increase on all measures (maximum/minimum temperatures, number of hot and cold days, earlier and higher frequency and duration heatwaves)
- the impacts on rainfall from climate change are inconclusive at this stage and more work is needed on rainfall modelling.

DPI Water will maintain a watching brief on this issue and continue to liaise with Hunter Water to consider how outcomes of the modelling might be used for water planning in future.

The 2015 MERI evaluation found that implementation actions due within the MERI reporting period were delivered and that overall, implementation of the LHWP is progressing according to agreed timeframes.

Two implementation actions were due for completion and were delivered during the 2014-15 MERI reporting period:

- complete the Kooragang Recycled Water Scheme (KRWS)
- finalise a study into rainwater tank failure (carried over from the 2014 evaluation).

The MERI Evaluation also identified a number of projects not due for completion within the 2015 evaluation period, but on which work is underway to ensure timely delivery. These are discussed below. In some cases components of projects have experienced delays due to uncontrollable events or changes in scope and assumptions but it is anticipated that implementation actions will be delivered on time with some adjustments to the programs.

Increase transfers from the Central Coast and improve modelling of inter-regional transfers

Hunter Water and Wyong Water are on track with the design and construction of their respective pipelines and pump station modifications to increase the average water transfer rate north from the Central Coast under the existing agreement.

Hunter Water and Wyong Water are developing improved hydrologic models to better understand how the two systems interact and explore water transfer options as part of longer term planning. Hunter Water's model development has been delayed due to external factors, but both agencies anticipate that they will meet the October 2016 deadline for optimisation of transfer options.

Lower Hunter Alluvial Groundwater Source investigations

In September 2015, Hunter Water conducted initial test drilling to try and locate the potential Lower Hunter Alluvial Groundwater Source, identified for further investigation during LHWP development. The location for the drilling (near the junction of the Hunter and Paterson Rivers in the Morpeth-Bolwarra area) was based on a conceptual study and from existing Roads and Maritime Services bores.

The test drilling did not locate targeted aquifer in the paleochannel, requiring a change in the approach and timetable for these investigations. Hunter Water has developed a revised project timeline including engaging a consultant to undertake electrical resistivity imaging to identify potential sites for additional test bores. Hunter Water anticipates that the revised program will allow the overall project to be delivered on time, by June 2016.

New environmental flow rules for Chichester Dam and Seaham Weir

The River Health Outcomes Group (RHOG) developed enhanced environmental flow rules for Chichester Dam and Seaham Weir on the Williams River as part of the LHWP. DPI Water proposes to include the rules in the Hunter Unregulated and Alluvial Water Sources WSP.

Hunter Water has advised that the flow rules from Chichester Dam can be implemented by June 2016, once a new valve is installed to ensure sufficient flows can be released.

New infrastructure is required to release agreed flows and ensure fish passage at Seaham Weir. The Hunter Unregulated Environmental Flows Working Group was formed to oversee the implementation of the flow rules.

Investigations have identified a number of infrastructure options able to deliver the requirements. Hunter Water is now developing a decision framework to be used by the Working Group to identify the preferred option in early 2016.

Once the option is identified Hunter Water will submit a business case for internal funding approval by June 2016. Specific timing for the delivery of the new infrastructure is subject to the business case and will depend on design and construction requirements of the option identified. This is estimated for completion within Hunter Water's 2016-2020 price path, subject to funding approval. Precise timing of construction will be finalised as part of the 2015-16 MERI evaluation.

DPI Water anticipates that amendments to the Hunter Unregulated and Alluvial Water Sources WSP giving force to the environmental flow rules will be included in the new WSP, which must commence no later than 1 July 2019. Final timing however, will depend on further discussions between DPI Water and Hunter Water to agree on outcomes.

In the meantime, Hunter Water has proposed interim rules to approximate delivery of environmental flows until the infrastructure is built and advises that upgrades to the control system are now underway to implement the interim rules. DPI Water has drafted amendments to the Hunter Unregulated WSP and is considering the most appropriate implementation approach, including the potential to include the interim rules in Hunter Water's Water Access Licence, which can be amended at any time.

Mine water

The LHWP identified the option to treat and use groundwater pumped out of underground mines on the western side of Lake Macquarie as one that might warrant further exploration.

A water treatment plant has now been constructed at the mine to comply with Environment Protection Licence requirements for discharge of mine water to Lake Macquarie. This is likely to considerably reduce the cost and lead-time of this option.

DPI Water has obtained further information regarding water quality, availability and longer-term obligations relating to this option and will work with Hunter Water to investigate the feasibility of this option, taking into account costs, benefits and legal and commercial risks to Hunter Water.

Temporary desalination readiness

Drought 'readiness activities' for temporary desalination including site selection, technical and environmental investigations and review of procurement options were set out in the MERI plan for delivery by December 2015.

These investigations have identified that the costs associated with temporary desalination at each of the three sites under consideration are higher than initially assumed and are likely to trigger an environmental impact assessment, further increasing the cost and impacting the timing of delivery. Given this, Hunter Water now considers it will be more cost-effective to construct a single, larger plant at one of the shortlisted sites.

A change in plant size has implications for the assumptions about the temporary nature of this measure, which will need to be considered further – particularly in the context of community and stakeholder expectations.

Hunter Water re-modelled the portfolios to examine the impacts of changes to assumptions on cost-risk outcomes. The hydro-economic modelling indicated that the changes do not affect the ranking of portfolios and therefore do not trigger a major review of the LHWP (as provided for in the MERI plan).

Hunter Water is now progressing with readiness activities, with a consultant to be engaged by around April 2016 to undertake combined site selection, concept design & Environmental Impact Statement to compress timeframes so that desalination water can be delivered in time based on the extreme drought modelled for the LHWP.

1 Introduction

The LHWP sets out a mix of supply and demand measures to meet its objectives, which are to:

- 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.

At the time of the plan's release, the supply and demand estimates underpinning the LHWP indicated that augmentation of the lower Hunter's water supply to meet new growth would not be needed for around 20 years. Given this, the emphasis of the plan is on a portfolio of measures to respond to drought, if needed. The measures in the LHWP portfolio fall under the following categories: surface water, groundwater, water efficiency, demand management, recycling, stormwater, and temporary desalination.

A key feature of the plan is that it is flexible to adapt to challenges, such as our highly variable climate patterns and new information and experience gained over time, as well as to changes in the broader environment that impact the portfolio, such as population and business growth, regulatory context, technology and behaviour patterns. The plan will be reviewed every four to five years or as needed, so that the portfolio of measures can be adjusted over time to ensure that it continues to achieve its objectives.

As part of the implementation of the LHWP, the then Metropolitan Water Directorate, now DPI Water, engaged Evaluation and Sustainability Services Pty Ltd (ESS) to develop a MERI Plan (April 2014).

The 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:

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

DPI Water maintains its role as the LHWP lead agency in implementing the MERI plan. In particular, DPI WATER will lead the monitoring, evaluation and reporting processes as well as the development of future iterations of the LHWP.

The MERI framework also specifies timeframes for the evaluation of these key elements. Some elements of the evaluation will be undertaken annually, while other elements will be triggered by drought or during a major review of the LHWP.

The purpose of this paper is to report findings and implications of the 2015 annual evaluation against the MERI plan and to make recommendations to the LHWP governance groups. It also provides a progress report on the implementation of recommendations from last year's MERI evaluation.

2 The MERI Plan

2.1 Objectives of the MERI Plan

The overall aim of the MERI plan is to measure performance of the LHWP against its objectives. Another goal of the MERI framework is to report progress on implementation actions set out in the LHWP.

The MERI plan specifies monitoring, evaluation and reporting requirements to gather timely information to assess:

- the LHWP's effectiveness and efficiency in delivering on its objectives
- whether actions identified in the LHWP have been implemented in a timely manner
- key assumptions underpinning the LHWP, including costs of measures and factors considered in sensitivity analyses on demand forecasts and supply modelling
- the actual supply and demand balance compared with the plan's forecasts
- how the measures in the plan perform if a drought is experienced in the region, including whether the measures deliver the expected water savings and/or supply
- whether the measures in the plan continue to be appropriate and relevant in view of potential changes in the supply-demand balance or regulatory regime, advances in technology, and other developments.

Another critical objective of the MERI plan is to ensure early notice of any findings that would jeopardise delivery of the LHWP or achievement of its objectives, and trigger a major review of the LHWP. Triggers for a major review were developed by ESS, DPI WATER and Hunter Water as part of the MERI framework and include, but are not limited to:

- If demand is likely to exceed supply within 13 years based on the latest supply-demand balance estimate. This timeframe is based on the lead time for a major supply augmentation to be producing water before a supply-demand imbalance occurs. The rationale for this is to avoid constraining the options available for consideration in a revised LHWP.
- If the cost-risk analysis indicates that the ranking of options has significantly changed and the LHWP portfolio would no longer be preferred. The cost-risk analysis will require a re-run of the source model (SoMo) and Drought Portfolio Evaluation Model (DPEM) and will occur as soon as practicable after each of the following:
    - an improved inter-regional model for Central Coast transfers has been developed
    - readiness activities for temporary desalination are undertaken
    - investigations into the feasibility of the Lower Hunter Alluvial groundwater source for drought supply, if these indicate it is a viable alternative.
- the performance of drought measures is significantly below expectations, to the extent that the ability of the LHWP to maintain security of supply through an extreme drought is compromised.

2.2 Monitoring, Evaluation and Reporting

At least once each year, DPI WATER will undertake an evaluation in accordance with the MERI plan. A series of Key Evaluation Questions (KEQ) were devised for the MERI plan. These KEQ are based on the MERI plan objectives and set the direction and focus of the evaluation. The KEQ are:

- How effective has the plan been in achieving its objectives?
- How effective are the measures within the plan?
- How efficiently has the plan been delivered?
- Do the measures within the plan remain appropriate?

The KEQ are broken into two further layers of more specific evaluation questions, with processes for annual and intermittent monitoring, evaluation and reporting. Answers to lower level evaluation questions will contribute to answering the key evaluation questions and therefore address the MERI objectives for the LHWP. A comprehensive list of evaluation questions can be found in the MERI plan.

Some elements of the evaluation will be undertaken annually, while other elements will be intermittent. The intermittent elements comprise evaluation associated with a drought event and for a major review of the plan. For a major review, the evaluation will be integrated with the comprehensive planning process to develop the next LHWP. Evaluation questions to be answered annually primarily provide information about:

- the supply-demand balance compared with forecasts underpinning the LHWP
- performance of non-drought measures
- progress on implementation actions
- costs of delivering actions
- changes in assumptions or the regulatory environment.

In addition to the evaluation questions, the MERI plan lists the implementation actions identified in the LHWP, as well as the timing and responsibility for these actions. Most of the implementation actions have a specified due date, or are ongoing, with others triggered only if there is a drought. The MERI evaluations will report progress against these actions, as well as answering the evaluation questions.

There are a number of agencies involved in monitoring and reporting against the MERI Plan. Hunter Water is responsible for operational activities under the LHWP, and will be the primary provider of evidence to address the MERI evaluation questions. Other agencies will also be responsible for reporting progress against the MERI Plan where they are involved in delivering aspects of the LHWP. Under the current plan, DPI Water and Wyong Water (within Wyong Shire Council) are key agencies with a role to play in the MERI reporting.

To ensure that MERI remains a practical, achievable activity within the scope of all Hunter Water's monitoring and reporting activities, the MERI plan leverages existing reporting, such as requirements for Hunter Water to report to the Independent Pricing and Regulatory Tribunal (IPART) in accordance with its Operating Licence and associated Reporting Manual.

The annual MERI evaluation and report is submitted to the LHWSOG, the IWAP and the MWCEOs for endorsement in November of each year.

The roles of the various audiences for MERI plan reporting are summarised in Table 2, and the annual evaluation process is illustrated in Figure 1.

Table 1 summarises the MERI evaluation questions and the timing for review of each question. It should be noted that any evaluation can trigger a major review.

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Table 1: Summary of MERI evaluation questions and timeframes

Key Evaluation Question	Evaluation Question	Timeframe for monitoring, evaluation and reporting		
		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 (ie, 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?			

**The major review will be integrated with the comprehensive planning process for developing the next LHWP and will not necessarily require a standalone report*

Table 2: Audience for MERI Plan reporting

Category	Audience
Primary users Who will monitor, evaluate and adapt	Hunter Water, DPI Water, Wyong Water, other agencies
Secondary users Who need to be aware of the plan and evaluation outcomes	LHWSOG, MWCEOs, IWAP, Portfolio Minister

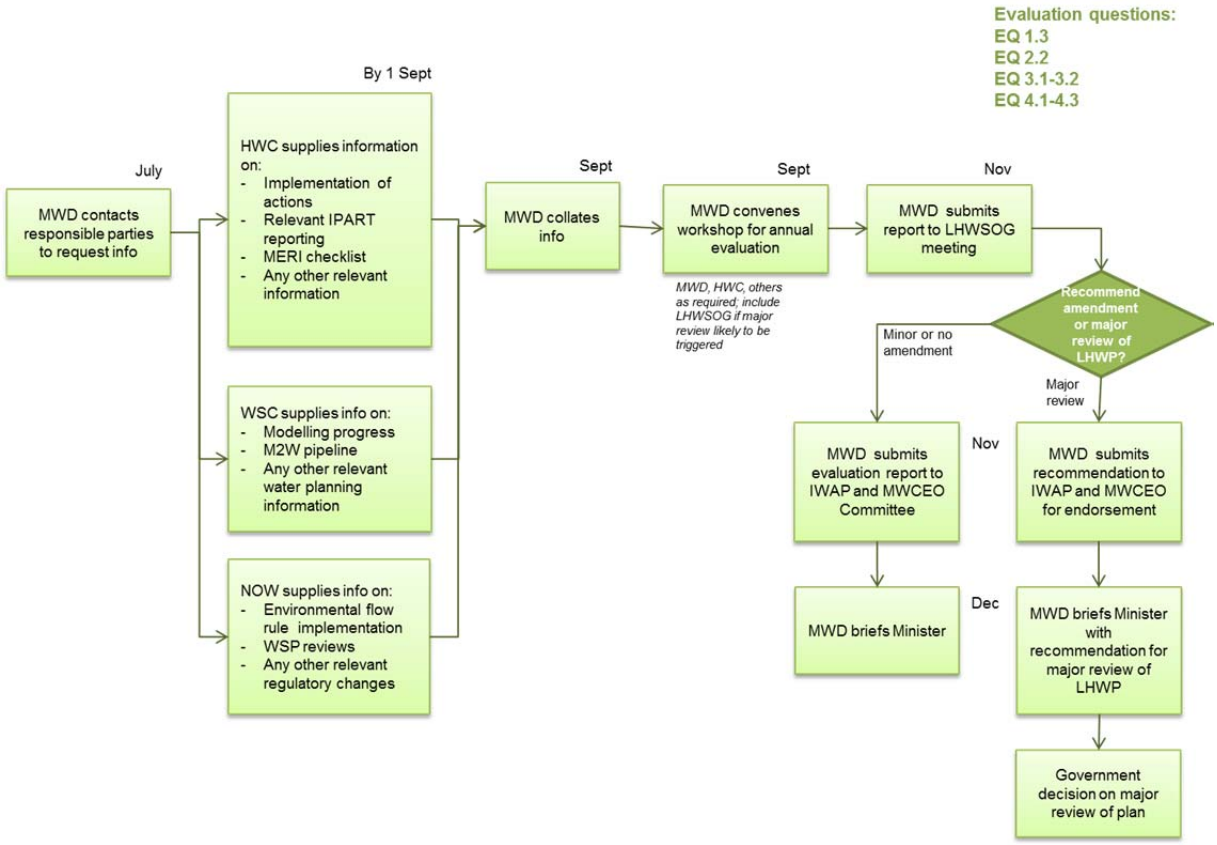

Figure 1: Annual MERI evaluation process

3 Implementing recommendations from the 2014 MERI evaluation

The key recommendation from the previous MERI evaluation in 2014 related to the potential impact on the supply-demand balance of proposed amendments by DPI Water (then NSW Office of Water) to cease to pump (CTP) rules for Tomago and Tomaree groundwater sources. The proposed changes were included in the draft WSP for the North Coast Coastal Sands Groundwater Sources.

Hunter Water's modelling for the MERI Evaluation indicated that the proposed rules would result in a yield loss of 3GL for Tomago and 1.5GL for Tomaree. This would bring forward the intersection of the supply and demand curves by around eight years, with significant social, environmental and economic impacts, and would trigger a major review of the LHWP. These implications were not fully recognised when the WSP was drafted.

To address this issue, the 2014 MERI evaluation recommended establishing a groundwater subgroup of the LHWP RHOG, chaired by DPI Water (LHWP team) and with representatives from other parts of DPI Water, the Office of Environment and Heritage and Hunter Water. The role of the group was to provide input to support the WSP process by:

- reviewing the available information
- developing potential options for access rules and timing
- considering the ecosystem and system yield impacts
- developing a path forward by April 2015.

The Groundwater group met three times between December 2014 and March 2015 and addressed all the tasks in its terms of reference. The final report was completed in April and endorsed by the LHWSOG in May 2015.

As part of its deliberations, the group reviewed the significant work that has been undertaken, and is ongoing, to improve understanding of the relationships between groundwater extraction and ecological impacts, and to develop early indicators of water stress to guide adaptive management of Hunter Water's extraction when groundwater levels decline.

The group recommended continuing this program to support evidence-based decisions on the groundwater extraction regime. It also recognised that science cannot answer every question – it needs to be coupled with value judgements on the trade-offs among environmental, economic and social issues, particularly where changes in access to one water source would have consequences for other existing or potential new sources.

These issues are significant, potentially involving cost impacts exceeding $100 million in present value terms by bringing forward substantial water supply infrastructure (along with associated environmental and social impacts). The group agreed that these issues would be best dealt with through the broader strategic planning process to develop the next iteration of the LHWP, which is anticipated to be finished in 2019-20. As such, it recommended:

- access conditions specified in the 2004 WSP, and in Hunter Water Corporation's works approval and licence should continue to apply for the first five years of the WSP, pending the outcomes of scientific studies that had already been initiated to develop early warning indicators of water stress on groundwater dependent ecosystems and to provide a more robust basis for setting access conditions, particularly the level at which extraction must cease
- the proposed research to close the gap on understanding the dependence on groundwater of high value ecosystems in the Tomaree source should proceed
- the broader environmental, economic, social and risk implications of significant changes to groundwater access, which would trigger a major supply augmentation, should not be dealt with in isolation. The whole-of-government process to develop the next iteration of

the LHWP is supported as the most appropriate vehicle through which to evaluate the complex range of issues for a major supply augmentation and to engage with agencies, stakeholders and the community

- the WSP should include a provision to review the groundwater access conditions after the first five years, informed by the outcome of the points above.

This approach is consistent with the water management principles in the *Water Management Act 2000*, particularly that *'the principles of adaptive management should be applied, which should be responsive to monitoring and improvements in understanding of ecological water requirements'.*

In parallel with the review by the Groundwater group, a number of strategic issues were identified for amendment in the WSP, including infiltration rates used to estimate the volume of recharge and planned environmental water.

DPI Water and the North Coast Interagency Regional Panel endorsed the recommendations from the Groundwater Group in June 2015 and amendments were included in the draft WSP. The new WSP must commence no later than 1 July 2016.

Implications for the LHWP of the changes to the draft WSP are that:

- the next iteration of the LHWP does not need to be brought forward from the current schedule (DPI WATER anticipates that the next LHWP will be finalised in 2019/20, subject to funding and Government approval)
- the next iteration of the plan must go beyond drought response measures to address the next major water supply augmentation.

4 Annual Evaluation 2015

The second evaluation of the LHWP against the MERI plan began in July 2015. DPI Water, Wyong Water and Hunter Water submitted their responses during September 2015. As the lower Hunter was not experiencing a drought at this time, agencies reported on the annual evaluation questions and the implementation actions under the broad categories of measures in the LHWP.

DPI Water has collated the information from agencies and assessed the results (refer Appendix A). The evaluation has highlighted a small number of key issues that require further discussion. These are addressed in the sections below.

4.1 Annual evaluation questions

As noted in section 0 above, the MERI plan includes a hierarchy of evaluation questions that set the direction and focus of the evaluation. These high-level questions are quite broad, so a series of lower level evaluation questions (EQ) were defined to provide more focus and narrow the attention on the required evidence sources.

Of 46 specific evaluation questions in the MERI plan, 33 are relevant to address in the annual evaluation. The sections below describe outcomes for the questions with greatest relevance to the 2015 MERI evaluation. Responses to all questions are in the tables in Appendix A.

4.1.1 Updated demand forecast

Evaluation question 1.3 asks whether the forecast supply and demand balance is still consistent with the LHWP's forecast with a specific evaluation question beneath it (SEQ 1.3.1) seeking to determine whether demand is trending within the LHWP forecast sensitivity analysis.

Hunter Water forecasts water demand for its area of operations using the Integrated Supply-Demand Planning (ISDP) model. The ISDP combines end-use modelling for residential forecasting with trend analysis for non-residential demand. Hunter Water's ISDP was peer reviewed by SKM during development of the LHWP and endorsed as appropriate and robust. The demand forecast from 2013 was a critical input to the supply-demand balance underpinning the LHWP.

Each year, as part of the annual MERI evaluation, Hunter Water is required to update its demand forecast to reflect actual growth in the previous year, incorporate significant changes to assumptions and compare it to the 2013 base year forecast. In particular, differences between the 2013 forecast and the latest forecast for the short-term (the next year) and the long-term (2035-36) are reported.

This ensures that the forecast is up to date and allows comparison of the latest forecast against the base year to identify any changes in underlying assumptions and trends. It will also identify any significant deviation from the base year forecast that could bring forward the need for a supply augmentation and trigger a major review of the LHWP. The 2015 review of the demand forecast reflects the changes in the forecast since the 2014 MERI evaluation that have an ongoing impact on demand with a small number of additional changes.

Due to these factors, which affect both residential and non-residential water use, demand is forecast to increase in some sectors and decrease in others over the planning period. The overall impact is a slight reduction in demand over the planning period, compared to the demand forecast used in developing the LHWP. The changes to underlying assumptions and their impacts are summarised in Table 3 and Figures 2 and 3 and discussed below.

Table 3: Changes in demand factors as compared to the 2013 forecast

Change	Description	Forecast demand Impact in 2016-17 GL/year	Forecast demand Impact in 2035-36 GL/year
Dwelling and population forecast	Forecast of dwelling connections reduced from 2933 to 2910 per year	- 0.1	- 0.2
	Higher population forecast due to higher occupancy rate forecast by the Department of Planning and Environment	+ 0.3 (res) + 0.2 (non-res)	+ 0.5 (res) +0.3 (non-res)
Residential outdoor water use	Water Wise Rules	- 1.0	- 1.0
	Garden water use	+ 0.5	+ 0.7
Water efficiency	New clothes washing machines more efficient than forecast (new data)	- 0.6	- 1.1
Major customer demands	Recycled water supply for KRWS	+ 1.1	+ 1.1
	Reduced demand forecast for large users resulting from water efficiency programs and updated historic consumption analysis	-1.8	-0.6
Inter-regional transfers	Potential supply to Singleton as a bulk water transfer no longer included in the forecast	- 0.2	- 0.2
Total	**Combined impact of all measures**	**-1.6**	**-0.5**

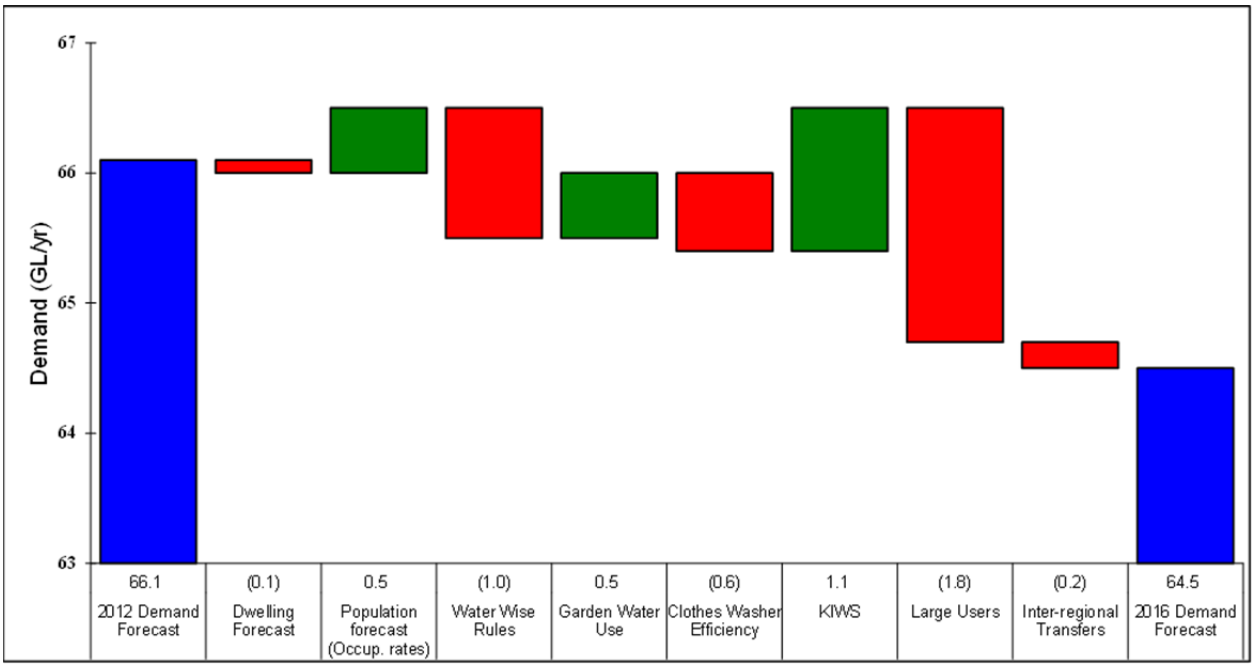

Figure 2: Forecasted changes in elements of demand 2015-16

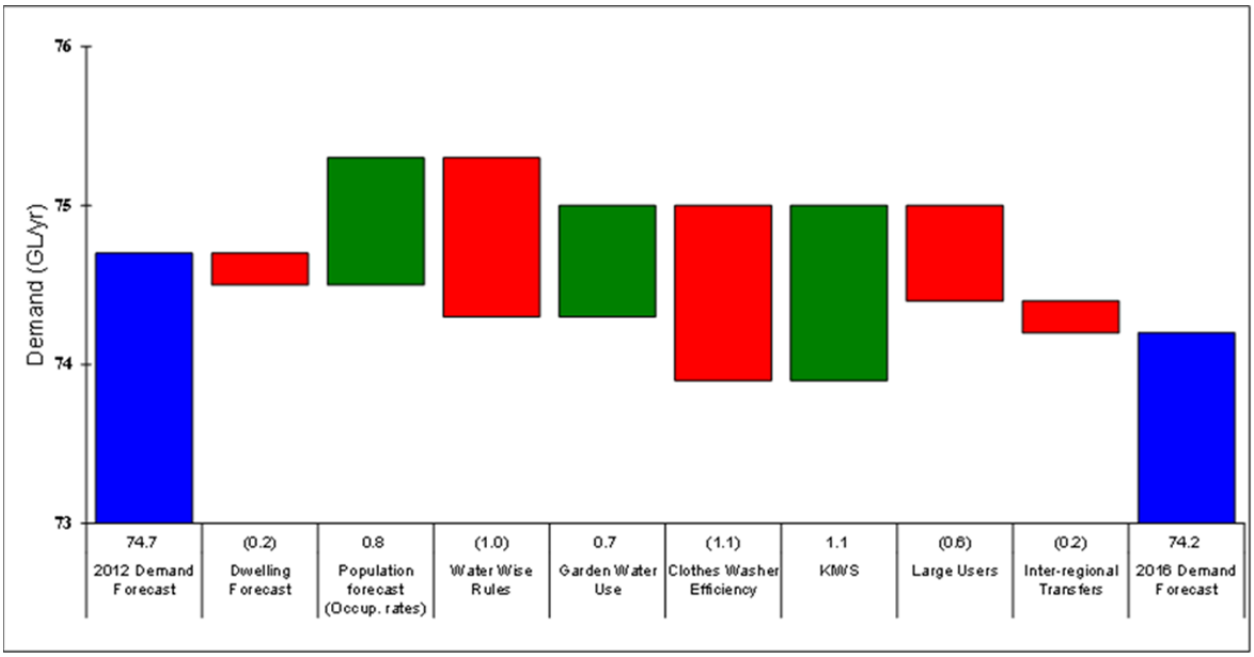

Figure 3: Forecasted changes in elements of demand 2035-36

Residential demand

The only change to the residential demand forecast for 2015 was an update to dwelling forecasts to reflect actual connections in 2014-15 compared with the forecast from the previous year.

In mid-2014, the NSW Department of Planning and Environment (DPE) released new population projections, which were higher than the previous projections. Although Hunter Water uses its own dwelling projections for its area of operations to forecast residential water demand, the population projections are an important input affecting the occupancy rate.

Hunter Water used the new population projections to update the occupancy rates within its 2014 demand forecast. This change resulted in a slight reduction in Hunter Water's dwelling forecast from 2,933 to 2,910 per year, with resulting reduction in residential water demand over the planning horizon.

For the 2015 MERI evaluation Hunter Water has reported that actual dwelling connections for 2014-15 were 2,889. This compares well to the forecast and did not significantly change the residential demand forecast when incorporated into the model.

Other amendments to the residential demand forecast in 2014 have resulted in ongoing demand changes, including:

- greater than expected efficiency from top-loading clothes washing machines and higher uptake of front loading machines
- reduced water savings from the BASIX scheme due to lower uptake of dual reticulation in new residential developments (ie rain tanks will be used instead)
- savings from the introduction of Water Wise Rules in July 2014 (discussed further in Section 4.2.8).

Taking these factors into account residential demand is forecast to decrease by 0.9GL/year in 2016-17 and by 1.1GL/year in 2035-36, compared with the 2013 forecast.[1]

Non-residential demand

Lower than expected use of recycled water from the KRWS is the key change to non-residential demand in 2014-15. The original LHWP demand forecast assumed that Orica would use up to 9ML/day, but actual use over the seven months of the plant's operation was 5.2ML/day. This increases the forecast demand to 1.1GL/year greater in 2016-17 compared with the 2013 forecast and 1.1GL/year in 2035-36. This is discussed further in Section 4.2.1.

Other changes to the non-residential demand forecast reflect ongoing savings from amendments to the forecast in 2014, including:

- updated population forecasts
- water efficiency programs for large users
- removal of bulk water supply to Singleton from the forecast.

Changes to the non-residential demand forecast are illustrated in Figure 4. The latest forecast is lower than the 2013 forecast because savings from water efficiency programs more than offset the lower than anticipated savings from the KRWS.

While non-residential demand is forecast to increase in the future, historic demand was characterised by a significant downward trend (see Figure 4). Hunter Water advised that this was primarily a result of the closure of, or the uptake of recycled water by, a number of large water using businesses. In the future, there is reduced scope for such substantial drops and non-residential demand is projected to increase steadily to service a growing population.

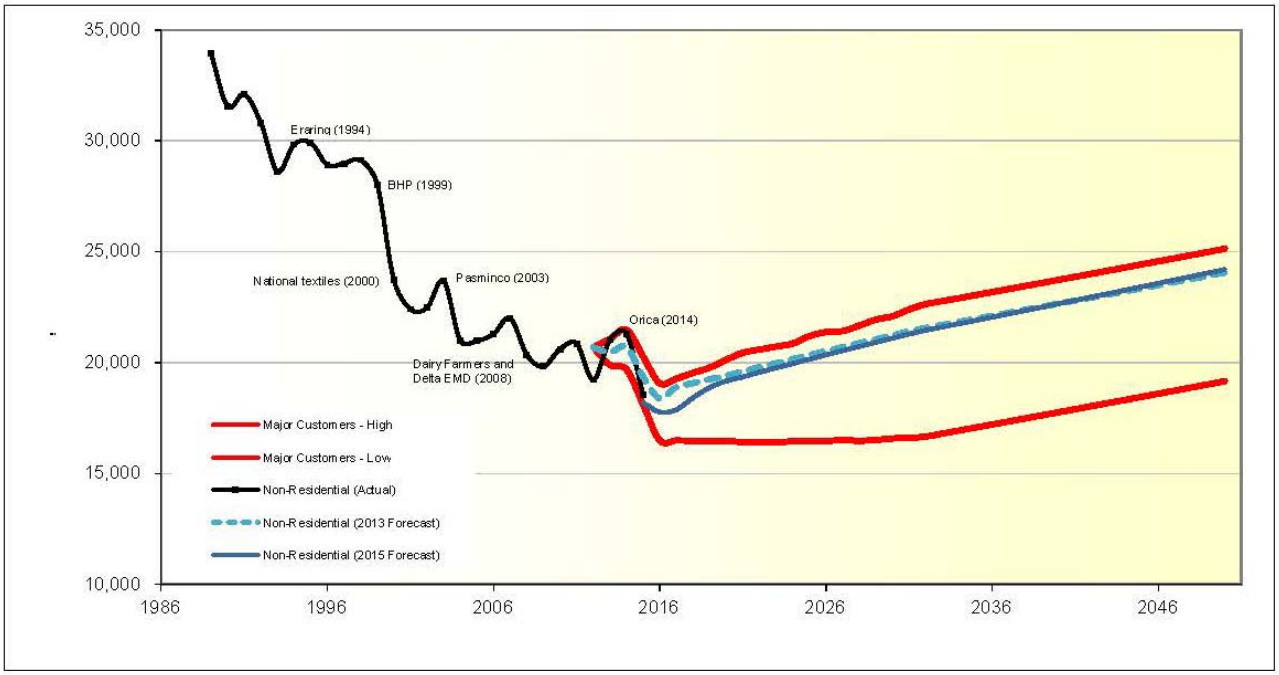

Figure 4: Non-residential water demand forecast 2015

[1] The demand forecast revision for the 2014 MERI plan resulted in demand reductions of 1.2GL/year in 2014-15 and 1.5GL/year in 2035-36.

Total demand

Taking account of changes to all factors affecting demand over the planning period, there is forecast to be a slight reduction in total demand for both 2016-17 and for 2035-36 when compared against the 2013 forecast.

Total demand in 2035-36 is forecast to be 74.2GL compared to the 2013 demand forecast of 74.7GL, a reduction of 0.5GL. The forecast demand is within the bounds of the sensitivity envelope for the LHWP as illustrated in Figure 5.

Figure 5 shows the most recent demand forecast, along with the 2013 baseline forecast and the sensitivity bands used for water planning. It also shows the actual volume of water supplied to Hunter Water's customers. The actual demand may be outside the sensitivity envelope in some years because it is not adjusted to take into account climatic variability, whereas the forecast can be considered a long term average and is not influenced by weather in any particular year.

As noted in the previous section, in the past, decreases in total demand have been partly driven by reduction in non-residential water use due to the closure of large water using businesses. As a result, residential demand now makes up a larger proportion of total demand and population growth serves as the primary driver for projected increases in total future demand.

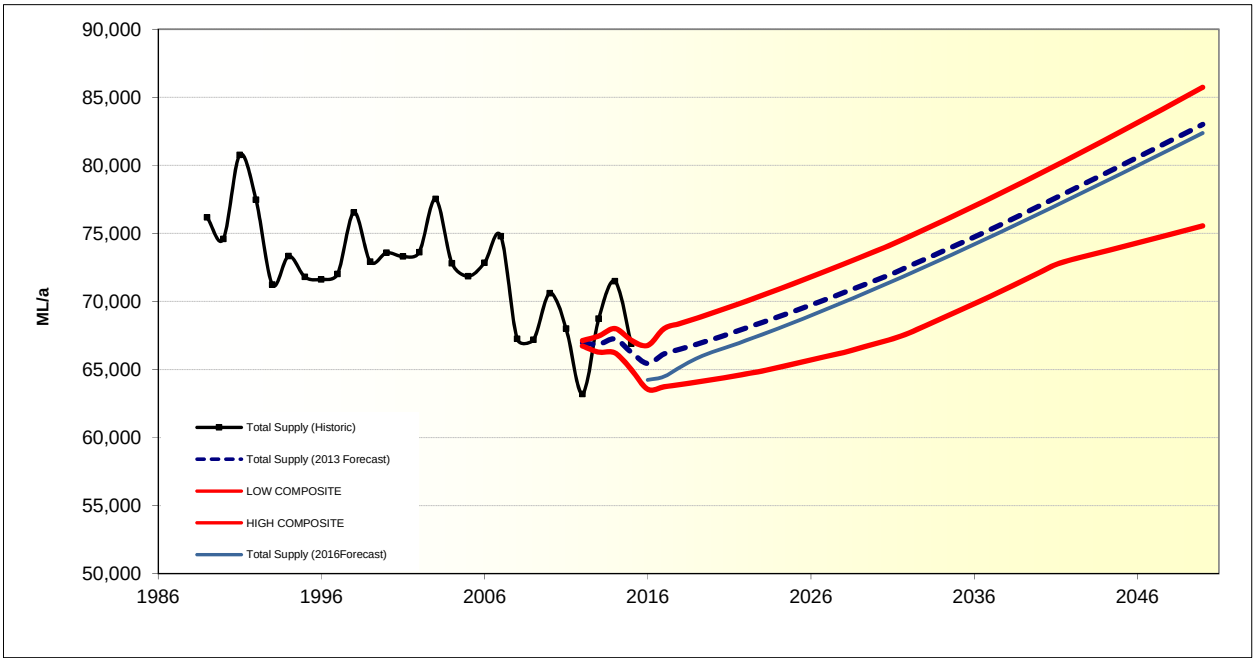

Figure 5: Total water demand based on 2015 forecast

4.1.2 Supply-demand balance

Water supply system yield is defined as the maximum average volume of water that can be supplied each year over the long term, meeting service level requirements[2]. During development of the LHWP, the water supply system yield was calculated as 75GL/year for the existing system, including drought restrictions[3].

The supply-demand balance combines the system yield with the forecast demand to determine when a new supply augmentation will be needed. The MERI plan specifies that a major review of the LHWP will begin 13 years before the intersection of the water supply and demand curves. This allows sufficient lead-time for any of the supply augmentation options to be delivered and therefore does not rule out options with longer lead times.

Hunter Water has reported (under specific evaluation question 1.3.3) that there are no changes to the calculation of system yield with respect to the level of service criteria that were developed as part of the LHWP.

Based on the current yield estimate of 75GL/year and the demand forecast discussed in section 4.1.1 the intersection of the supply and demand curves will occur in 2036-37, one year later than originally forecast in the LHWP (see Figure 6). This means that planning to address the next major supply augmentation will be needed no later than 2023-24 based on current conditions.

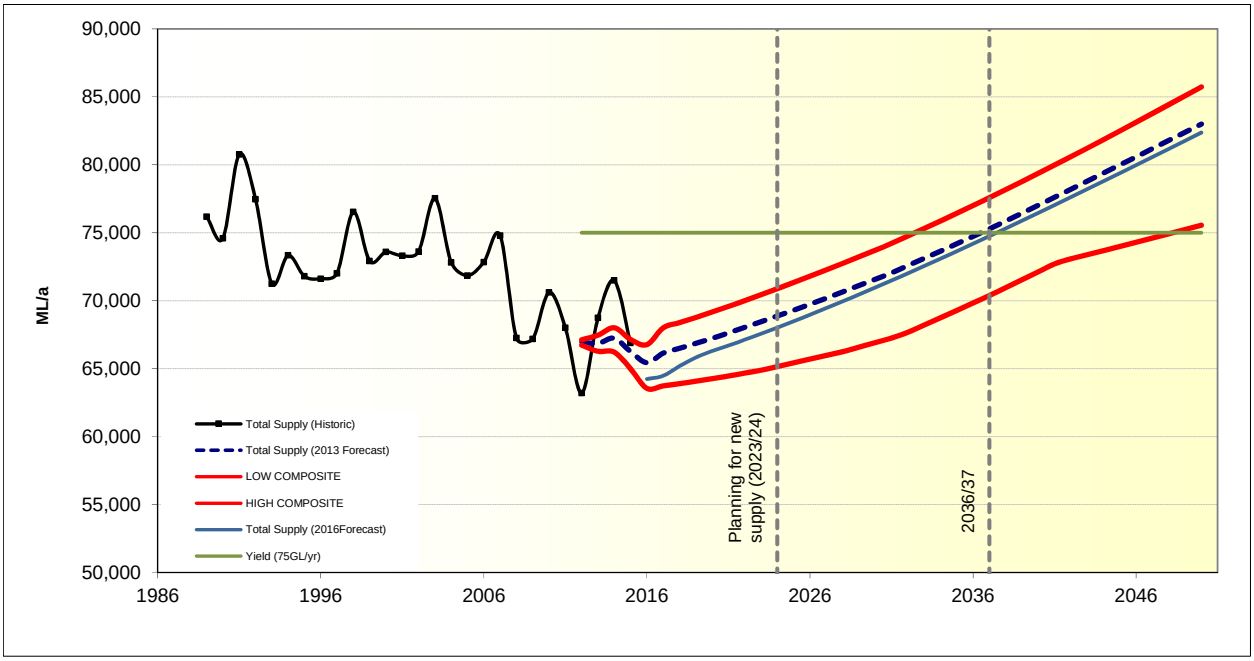

Figure 6: Supply demand balance based on 2015 demand forecast

Hunter Water noted, however, that there are several risks to the yield that must be kept in mind to ensure the potential cumulative impacts on water security are appropriately managed into the future.

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[2] The level of service criteria that were adopted for the LHWP are:

- *Frequency*: the average frequency of imposing drought restrictions shall not exceed once per 10 years on average
- *Duration*: the average duration of drought restrictions shall not exceed five per cent of the time
- *Security*: the chance of water storages approaching empty (defined as 10 per cent total storage level) shall not exceed once per 10,000 years on average.

[3] Key assumptions in the yield calculation included: Tomago storage 60,000ML, Chichester 18,350ML, Grahamstown 182,400ML, Anna Bay supplies constant 7ML/day, adopted environmental flow releases at Chichester and Seaham. Restrictions reduce demand by 5%, 8%, 16% and 21% applied at 60%, 50%, 40% and 30% respectively. Water Wise Rules are taken into account on the demand side, so they are effectively included.

Firstly, the amendment clause in the North Coast Coastal Sands Groundwater Sources WSP means that the extraction rules for Tomago and Tomaree will be reviewed after the first five years of the WSP to allow findings of ecological research to be incorporated into the decision. Depending on the outcomes of the research, this could result in a loss of 3GL in yield for the Tomago source, and a loss of 1.5GL in yield for the Tomaree source. Together, these impacts would bring forward the intersection of the supply and demand curves by around eight years. As discussed in Section 3, it was agreed that the broader environmental, social, economic and risk implications of significant changes to groundwater access should be addressed as part of the process to develop the next iteration of the LHWP.

Secondly, contamination of groundwater within the Tomago Sandbeds originating from RAAF Base Williamtown has resulted in the precautionary isolation of two bore stations. The bores will continue to be isolated until they can be verified as safe for use. Further work is being carried out in consultation with Defence and NSW government agencies to better understand the issue, including extent, impact and mitigation options. While the impact has not been modelled, preliminary estimates from Hunter Water indicate that the impact could be in the order of a 1.5GL reduction in yield.

Thirdly, Hunter Water is required under its water management licence to operate Campvale Pumping Station in order to minimise local flooding. Campvale Pumping Station pumps stormwater from the Campvale Canal catchment, which includes rural, industrial and agricultural land uses as well as the Medowie urban settlement area, into Grahamstown Dam. The Campvale catchment presents a significant water quality risk to the dam. Hunter Water is conducting a 15 month investigation to further understand the water quality risks and consider mitigation options. One potential option is diverting stormwater runoff from the Campvale catchment away from Grahamstown Dam, which could result in a 1.5 – 2GL yield reduction.

Finally, the impacts of climate change may also impact the supply demand balance, both on the supply and demand side.

Hunter Water's 2014-15 Compliance and Performance Report notes that it is involved in a number of research projects related to the potential impact of climate change on rainfall and runoff and how that may affect future water security for the metropolitan regions of NSW.

The NSW Government, through the Office of Environment and Heritage (OEH), has recently completed the NSW and ACT Regional Climate Model Project. This project involved development of a regional climate model for NSW and produced fine scale (10km x 10km) climate projections for use in planning and adapting for climate change impacts at a local scale.

In addition, the Eastern Seaboard Climate Change Initiative – Influence of East Coast Lows on the security of coastal NSW (East Coast Lows project) aiming to improve the understanding of the behaviour of ECL weather patterns as well as how climate change may change their behaviour in future years, is now largely complete. The key finding of this work is that ECL activity has varied considerably over the past 2000 years and that this variability is significantly greater than any changes that are predicted due to climate change. Indeed, predictions based on the regional climate model project (discussed above) indicate that ECL frequency is generally not expected to change significantly due to climate change. The notable exception is that the frequency of large ECL events is predicted to increase in summer.

Hunter Water and researchers at the University of Newcastle are currently investigating how the output of this research may be used in future water planning work for the lower Hunter.

4.2 Progress towards implementation actions

Actions required to implement the measures in the LHWP are set out in Appendix 8 of the MERI plan. These are additional to the MERI evaluation questions and progress towards their attainment is reviewed as part of the MERI framework. The following implementation actions were due for completion (and were completed by Hunter Water) within the MERI review period:

- complete the KRWS and assess future expansion opportunities
- finalise a trial with Lake Macquarie City Council to better understand rainwater tank failures and educate participants.

There are a number of key actions not requiring completion during the 2015 MERI plan review period, but for which work is underway so that they can be delivered on time, including:

- develop an improved model for the inter-regional transfers with the Central Coast
- new environmental flow rules for Chichester Dam and Seaham Weir
- investigations into the Lower Hunter Alluvial groundwater source
- watching brief on mine water opportunities
- temporary desalination readiness.

Each of these actions is further discussed below.

4.2.1 Recycled water and the Kooragang Recycled Water Scheme

The $71 million KRWS was officially opened in November 2014. This was a month earlier than the completion date specified in the MERI plan.

The plant can currently produce up to 9ML/day of recycled water using microfiltration and reverse osmosis and can be expanded to 12ML/day if required. The recycled water is pumped to Orica's Kooragang Island site via an eight-kilometre pipeline that crosses under the Hunter River.

Hunter Water is currently supplying an average of around 5.2ML/day of recycled water, which equated to a total saving of 1.12GL of potable water in 7 months of operation. This is lower than the 3GL/year of potable substitution volume assumed in modelling for the LHWP and has implications for Hunter Water's demand forecast, as discussed in Section 4.1.1. Hunter Water advises that Orica is entitled to take less than the maximum 9ML/day under its long-term contract for purchasing the recycled water.

The MERI plan implementation action also requires that Hunter Water "assess future expansion opportunities" for the KRWS. Hunter Water advises that aside from its initial investigations into potential customers for the recycled water, no progress has been made on this component of the action, partly because it is in the process of selling the KRWS.

In September 2015, Hunter Water announced that it is exploring the sale of the KRWS, which includes the existing long-term contract with Orica. Hunter Water has indicated that it does not expect the sale to affect the long-term water savings from the plant.

Implications of the sale of the KRWS on delivery of LHWP and MERI plan outcomes will need to be considered, including consideration of incentives for the new owner to increase sales of recycled water and to explore opportunities to expand the plant.

Total recycled water use of 4,166ML was achieved in 2014-15, compared with LHWP forecast of 6,300ML. This was due, in part, to the lower than expected industrial recycling by KRWS, as well as reduced reuse for agricultural irrigation due to wet weather. The forecast and actual recycled water use is shown in Figure 7.

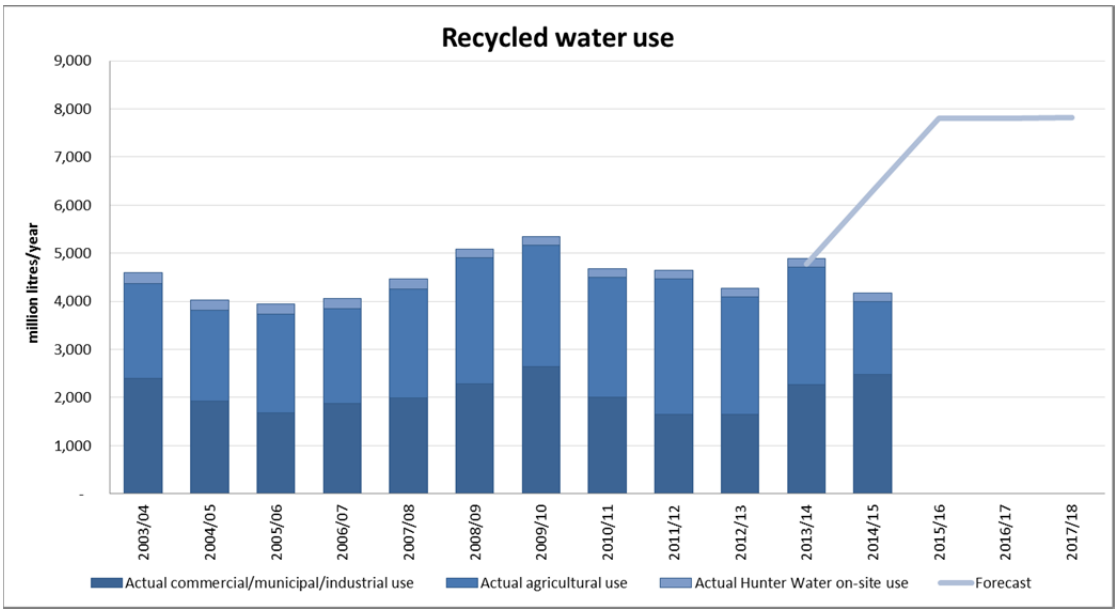


Figure 7: Forecast and actual savings from recycled water

4.2.2 Rainwater tank study

The MERI plan includes an action for Hunter Water to conduct a trial with Lake Macquarie City Council to better understand rainwater tank failures and educate participants. This action was due for completion in June 2014, but was slightly delayed so that it was completed during the current MERI evaluation period. Hunter Water provided the report on the study to DPI Water in July 2015.

In June-July 2014 Hunter Water and Hunter Research Foundation carried out a study of rainwater tank functionality in 191 properties in Cameron Park and Fletcher. The purpose of the study was to gather information about current and potential future failure rates of rainwater tanks. Qualified plumbers provided a free rainwater tank check at each property and participating households gave a brief interview, followed by completing a post audit online survey.

The data indicated an overall failure rate of 18% of tanks, based on the following conditions:

- tank not watertight
- gutter to tank plumbing not operational
- switching device not operating
- pump not operational (whether switched on or off).

The failure rate increased to 34% when the definition was broadened to include systems in which the switching device and/or pump had been replaced, indicating a previous failure. The most common source of failure was the pump, followed by the switching device. Half of households with a failed system thought it was working. Almost one-quarter (23%) of tanks were found to be under-performing, with the majority of these having only one defect. Age of the tank was significantly associated with under-performance, particularly for tanks installed prior to 2011.

The great majority of householders (91%) indicated that the sole reason for installing the tank was to meet BASIX requirements, with environmental considerations a secondary reason for about one in 20 consumers. Most householders had a positive attitude to the rainwater tank, because of its benefits to the environment.

The data overall indicated a low level of consumer knowledge and awareness of the operation and maintenance requirements of their rainwater tank system. This, and associated failures, are likely to become an issue as the stock of rainwater tanks increases to meet BASIX requirements.

These results highlight a risk to the water savings achievable into the future from rainwater tanks unless steps are taken to ensure that tanks are maintained.

The NSW DPE has advised that there is currently no mechanism for requiring homeowners to maintain tanks. DPE also advised that the Office of Environment and Heritage is advocating voluntary disclosure of water and energy efficiency at point of property sale. This may encourage people to repair and maintain water and energy saving devices.

It will be necessary to consider rainwater tank failure in demand forecasts and in the absence of action to ensure ongoing compliance with BASIX requirements, erosion of water savings will need to be modelled for water planning purposes.

4.2.3 Central Coast inter-regional transfers

Infrastructure to transfer more water from the Central Coast under existing agreement

The LHWP specifies that infrastructure to transfer more water from the Central Coast to the lower Hunter will be completed in 2017.

Hunter Water and Wyong Water are on track with the design and construction of their respective pipelines and pump station modifications to increase the average water transfer rate north from the Central Coast from 13 to 3ML/day, as required under the existing transfer agreement.

Wyong Water advises that the route for the pipeline has been selected, and work is underway to address easement issues. The pipeline will begin near the Mardi Water Treatment Plant in the south and link into the existing 750 mm diameter pipe in Sparks Road, Warnervale (see Appendix B). The pipe will connect with the Hunter link pipeline, built to transfer water between the two systems during the Millennium drought, and will join Hunter Water's existing system at Morisset. Construction of the new pipeline is due for completion by the end of 2017.[4]

Hunter Water has also identified the preferred option for increasing the capacity of its water supply network to increase transfers (see Appendix B).

Hunter Water advises that the 30ML/day transfer volume specified in the transfer agreement is achievable but the preferred option will result in the water supply network receiving pressures that are marginally higher than it currently receives. There is a risk that this may result in more frequent water main breaks during continuous operation of the scheme. In this event, it will be possible to run the scheme at a lower transfer rate (closer to 25ML/day) for a period of time whilst mitigation measures to protect problematic water mains (eg pressure reducing valves) are implemented.

A pump station trial is scheduled for late 2015 to confirm the system performance of trunk water mains between Morisset and Wangi with Morisset 3 water pumping station operating under the expected northerly transfer pressure regime. Hunter Water's work on this project is also on track to be completed by the end of 2017.

Improved inter-regional water supply modelling

Hunter Water and Wyong Water are working to develop improved hydrologic models to better understand how the two systems interact and explore optimisation of potential 'water transfer' options as part of longer term planning for the Central Coast and the next iteration of the LHWP.

The aim is for Hunter Water and Wyong Water to develop separate models that simulate the combined system behaviour of the two systems. Both models will use historic streamflow and rainfall data for both regions as input data. The Hunter Water model will contain a detailed simulation of Hunter Water assets and superficial simulation of Central Coast assets. The

[4] While the MERI plan specifies that construction will be completed by June 2017, the LHWP specifies that the project will be completed in 2017 but does not specify a month, so this completion date does not breach the LHWP requirement.

Central Coast model will have the opposite focus. The purpose of each model will be to accurately simulate the local system, but at the same time carry enough information to be able to estimate the storage situation in the neighbouring region, and thereby optimise inter-regional transfer arrangements and operation of the connecting pipeline.

The MERI plan specifies that the improved model for inter-regional transfers between the lower Hunter and the Central Coast would be completed in October 2015, with optimisation of water transfers using the new model(s) due by October 2016.

Wyong Water is currently on track with its modelling and has developed a preliminary model. Initial results indicate that the model is able to replicate Hunter Water's system behaviour reasonably well. Further work will continue to calibrate the model and make adjustments (if necessary) based on:

- a review of demand estimates
- dam evaporation
- time step differences
- mass balance modelling.

Wyong Water is also investigating development of a second water resource model using more commercial software to simplify verification of the model and to allow it to be more readily used. Hunter water has been involved in some of these investigations as there would be benefit for joint modelling if both regions used a common modelling platform.

Wyong Water had previously advised that Mangrove Creek Dam will require an increase in its capacity to pass floods. Until the flood capacity is increased the dam is required to operate with an interim top operating level of 80% of total capacity. Whilst there is a reasonably low cost option available to rectify the flood capacity constraint there are also dam raising options which in addition to solving the flood issue could provide an opportunity for enhanced water sharing between the Hunter and Central Coast regions. Unfortunately in the event that the dam is raised following the implementation of the low cost option much of the low cost option would require demolition. As such, it is highly desirable that an appropriate assessment of the benefits of various inter regional water management options are undertaken prior to a decision being made on rectifying the flood capacity constraints.

Recent system yield modelling for the Central Coast indicates that the flood capacity rectification is not required for a number of years and therefore there is time to understand the inter-regional modelling before a decision is made.

Hunter Water has begun to develop its combined water supply model, but has advised that work was delayed as a result of the impact of operational issues (including the April 2015 East Coast Low storm and groundwater contamination from RAAF Base Williamtown) that diverted the key resource from this work and it will not be able to deliver the model by the agreed date of October 2015.

Next steps for Hunter Water include:

- setting up a source utilisation routine (how much water comes from each source)
- creating water balance modules for all dams and weirs
- collecting relevant statistics from model runs
- confirming that the Hunter Water model appropriately replicates the behaviour of Central Coast dams.

Hunter Water anticipates that the model development will be complete by February 2016 and that meeting the deadline in the MERI Plan of October 2016 for optimisation of transfer options is still possible.

In the meantime, Wyong Water will continue development and verification of its model and begin modelling and preliminary optimisation of potential water sharing rules between the two regions. Once its model is sufficiently developed (estimated December 2015), Wyong Water will request that DPI Water convene a meeting of the Central Coast Working Group to agree on potential water sharing rules between the two regions to be simulated and assessed.

4.2.4 Environmental flow rules

Enhanced environmental flow rules for Chichester Dam and Seaham Weir on the Williams River (where Hunter Water harvests water to pump into Grahamstown Dam) were developed by the interagency RHOG as an integral part of the LHWP planning process, due to the potential impact on the yield of the water supply system. DPI Water is seeking to include the rules in the Hunter Unregulated and Alluvial Water Sources WSP.

Hunter Water advises that the flow rules from Chichester Dam can be implemented once a new valve is installed to ensure sufficient flows can be released as required. Hunter Water estimates that this will be completed by June 2016.

New infrastructure is needed to give effect to the agreed rules for Seaham Weir, which are consistent with the RHOG's agreed 'Scenario 10' and comprise:

- release of a 500ML fresh from Seaham Weir approximately once per year
- translucent releases[5] from Seaham Weir of:
  - 30 per cent when storage levels are above the levels where restrictions apply
  - 20 per cent when moderate restrictions apply (ie, overall storage less than 60 per cent but above 40 per cent)
  - 10 per cent when severe restrictions apply (ie, overall storage less than 40 per cent)
- 20ML per day transparent release at Seaham Weir
- replacing the existing fishway with a more effective design to meet fish passage objectives.

The Hunter Unregulated Environmental Flows Working Group, chaired by DPI Water and made up of representatives from DPI Fisheries, DPI Water and Hunter Water Corporation was formed to oversee the implementation of the LHWP environmental flow rules and fish passage at Seaham Weir. A range of flow release control strategies have been investigated to give effect to the new flow release requirements. This included investigation of new control strategies for the existing infrastructure as well as investigation of new infrastructure options to provide better control of release rates and improved fish passage across Seaham Weir. A suite of options was developed and information on their relative performance against a range of flow release and fish passage objectives was gathered.

Hunter Water engaged a consultant (SMEC) to develop high-level concept designs for delivering the environmental flow release and fish passage objectives for Seaham Weir. SMEC investigated the preferred location for constructing a new control structure at the weir, including options for the type and number of gates. A vertical slot fishway was recommended as the most suitable for this application, taking into consideration the complexity of tidal operation, the need to minimise saltwater ingress into the weir pool during reverse flow, and the objective of passing juvenile fish (20-50 mm long) and adult fish (100-700 mm long).

The MERI plan did not specify timing for delivery of these actions, as they are dependent on outcomes of regulatory processes for amending the WSP. Work has now progressed enough

[5] Transparent flows are flows up to a defined threshold below which all inflows are released downstream. Translucent flows are a percentage of inflows greater than the transparency threshold that are allowed to pass downstream.

that potential delivery times can be better estimated. DPI Water has met with Hunter Water and DPI Water and proposed next steps and timing for delivering the agreed environmental flows and fish passage at Seaham Weir are discussed below and summarised in Table 4.

Hunter Water is currently developing a decision-making framework, anticipated to be completed in early 2016, for selecting the preferred option to achieve the objectives agreed by the Working Group.

Once the framework is developed the Working Group will be convened to assess options and arrive at an agreed position. By June 2016, Hunter Water will submit a business case for internal approval of the preferred option. After business case approval, concept design and environmental impact assessment will commence followed by detailed design and construction. It is anticipated that the construction of infrastructure at Seaham Weir will be completed during the 2016-20 price path, subject to funding approval.[6] Hunter Water will advise of more detailed delivery dates following the identification of the preferred option. Precise timing of construction will be finalised as part of the 2015-16 MERI evaluation.

DPI Water anticipates that WSP amendments to give effect to the flow release requirements using the new flow release infrastructure will be included in a re-make of the Hunter Unregulated and Alluvial Water Sources WSP, which must commence by 1 July 2019, following the 10-year review of the WSP.

Final timing for delivery of infrastructure and WSP amendments will need to be agreed through further consultation between DPI Water and Hunter Water and will be informed by a decision on the preferred infrastructure option.

Table 4: Actions for delivering new environmental flow rules at Seaham Weir

Action	Anticipated delivery date
Hunter Water to develop a decision framework to be used by the working group to agree a preferred option	January 2016
Hunter Water to submit a business case for preferred option for internal funding approval	June 2016
Construction of the preferred infrastructure option during Hunter Water's next price path	2016-2020 (TBD subject to selected option and funding)
Aim to include final flow rules in the Hunter Unregulated and Alluvial Water Sources WSP when it is extended/replaced	1 July 2019 (TBD)

In the meantime, a set of interim access rules has been developed by Hunter Water and DPI Water, to approximate the Scenario 10 releases until the new infrastructure is built. Hunter Water proposed the new rules in a paper to DPI Water in March 2014 and these were endorsed by the Working Group. Hunter Water advises that upgrades to the control system are now underway to implement the interim rules.

DPI Water has drafted amendments to the Hunter Unregulated and Alluvial Water Sources WSP and is considering the most appropriate implementation approach, including the potential to include the interim rules in Hunter Water's Water Access Licence.

[6] Hunter Water has included an estimated cost of $5-$6 million for the new infrastructure in its pricing submission to the Independent Pricing and Regulatory Tribunal (IPART) for the next price path from July 2016.

If the interim rules are to be included in the WSP, DPI Water anticipates that WSP amendments to give force to the rules will commence by the end of 2017, whereas the Water Access Licence can be amended at any time.

4.2.5 Lower Hunter Alluvial groundwater source investigations

A preliminary desktop assessment of potential new groundwater sources was initiated during development of the LHWP. The Lower Hunter Alluvial groundwater source, near the junction of the Hunter and Paterson Rivers in the Morpeth-Bolwarra area, was identified as warranting further investigation. There are thought to be three separate aquifers in the Lower Hunter Alluvial groundwater source, ranging in depth from six metres to over 20 metres. The two deeper aquifers are the focus of investigations. The investigation site covers an area of 8.5km^2 and sits beneath an existing underground water source currently used by farmers in the Morpeth / Largs area.

The inferred location of the paleochannel is north of Morpeth Bridge. This was identified as a possible location based on a conceptual cross section developed by Roy and Boyd[7] and from existing Roads and Maritime Services bores adjacent to Morpeth Bridge. Based on this information Hunter Water drilled a test bore in this location in early September 2015; however the targeted aquifer in the paleochannel was not located. This has required a change to the approach and timetable for the Lower Hunter Alluvial investigations.

The next step is for Hunter Water to engage a consultant to better characterise the paleochannel using Electrical Resistivity Imaging and, if results indicate further investigations are warranted, help locate the best site for an additional water quality test bore. The location is shown in Figure 8 below. A staged approach has been adopted for these investigations and a flow chart illustrating this is included at Appendix C.

Figure 8: Location identified for Electrical Resistivity Imaging

[7] Roy and Boyd (1996) International Geological Correlation Program Project #367. *Quaternary Geology of Southeast Australia : A Tectonically Stable, Wave Dominated, Sediment – Deficient Margin*. Field Guide to the New South Wales Coast November 2006. New South Wales Geological Survey, Sydney. Published by the Geological Survey of New South Wales, Department of Mineral resources PO BOX 536, Sydney 2065, Australia.

4.2.6 Mine water

The LHWP identified the option to treat and use groundwater pumped out of underground mines on the western side of Lake Macquarie as one that might warrant further exploration.

Since the release of the 2014 LHWP, Centennial Coal has constructed a new water treatment plant at its Newstan Mine (Fassifern). The project received a 'highly commended' award at the latest Newcastle Engineering Excellence and can treat up to 14ML/day of water for reuse or discharge to the environment, of which the mine currently uses around 3ML/day. The plant was constructed in 12 months at a cost of $14.5 million. The plant design provides for the future addition of reverse osmosis if needed.

DPI Water, Hunter Water and Wyong Water attended a site inspection and meeting with Centennial Coal in June 2015. At DPI Water's request, Centennial Coal has provided further information regarding:

- water quality
- reliability under different climate scenarios
- variation in quantity under pre and post mining scenarios
- longer term obligations.

The report will inform consideration of the viability of mine water from the Newstan mine as a potential drought supply for the lower Hunter. Further investigations will need to continue to determine the viability of this option and the issues around cost, timing and planning approval; environmental and health issues; and legal and commercial risks and mine site legacy issues.

The next steps in the mine water investigations will be:

- DPI Water and Hunter Water to meet with Centennial Coal and its consultant for further information on the report and its interpretation
- DPI Water and Hunter Water will review the information provided by Centennial Coal to better understand the legal and commercial risks of this option, along with costs and benefits associated with mine water so that it can be compared with other measures, such as temporary desalination, which can provide similar volumes
- Depending on the outcome of this review and the feasibility of the option, further cost-risk modelling may be needed to test portfolio ranking.

One approach suggested by DPI Water would be to include mine water in the analysis of temporary desalination options (see Section 3.1.8). Hunter Water has indicated that this may be possible if sufficient information on this option is available in time for the assessment and selection of a preferred site for temporary desalination, allowing it to be evaluated in the options analysis at that time.

4.2.7 Temporary desalination 'readiness'

The LHWP identified small-scale, temporary desalination units as a contingency measure for a severe drought. The first steps to progress in the short term were identified as:

- further investigations to develop a short-list of suitable sites and assess their feasibility from an operational, environmental and planning approval perspective
- proceeding with environmental and other technical investigations
- undertaking a more detailed assessment of procurement options, including evaluation of potential suppliers and comparing opportunities for purchase or hire of desalination units
- developing and implementing a water quality monitoring program for the preferred sites.

The modelling was premised on undertaking 'readiness activities' now to ensure that investment in construction could be deferred as long as possible, while still delivering water 'just in time' if

needed in a very severe drought. The LHWP recognised that the key trigger levels would need to be flexible as part of an adaptive management approach.

Hunter Water has short-listed three potential sites in consultation with DPI Water, and progressed with network modelling. The three sites comprise two Hunter Water sites on the coast at Stockton and Belmont, and co-location at Eraring Power Station on the western side of Lake Macquarie.

The LHWP originally proposed constructing small (3ML/day) temporary desalination plants on three separate sites, as it was assumed that plants could be delivered under Part 5 of the NSW EP&A Act and that each site would not exceed $10 million threshold to trigger an EIS.[8]

Hunter Water's recent investigations have revealed that it is likely that the cost associated with temporary desalination at each of the three sites will be above the $10M threshold and will be declared to be State Significant Infrastructure, thereby requiring approval from the Minister for Planning and requiring the preparation of an Environmental Impact Statement.

Given these changes to cost and timing assumptions, Hunter Water considers it is likely to be more cost-effective and reduce project complexity to construct a single, larger plant on one site. Hunter Water has estimated costs for a range of plant capacities (variants of 9ML/day, 15ML/day and 30ML/day) on the three shortlisted sites to support the site selection process. These are compared in Table 5.

Table 5: Comparison of cost estimates for desalination plants at three sites

Supply capacity	Location	Cost	Cost breakdown and comments
9ML/d	Belmont	$40	• plant $9M; raw water intake $6M; brine disposal <$1M • $2M for distribution network to increase capacity from 8ML/day
	Stockton	$42	• plant $9M; raw water intake $6M; brine disposal $3M • < $1M for distribution network
	Eraring	$37	• plant $12M; raw water intake <$1M; brine disposal <$1M • $1M for distribution network • Origin Energy have been consulted for this option and have provided in-principle support for investigations to continue provided proposed plant does not impact on their operations.
15ML/d	Belmont	$66	• plant $15M; raw water intake $10M; brine disposal <$1M • $4M for distribution network (new 6km pipeline)
	Stockton	$66	• plant $15M; raw water intake $10M; brine disposal $4M • < $1M for distribution network • Increased impacts due to brine disposal and subsurface intake at greater scale.
	Eraring	$55	• plant $20M; raw water <$1M; brine disposal <$1M • $1M for distribution network • Plant of 15 ML/d scale has not been discussed with Origin Energy. Small increase in discharge salinity concentration.
30ML/d	Belmont	$126	• plant $30m; rainwater intake $20M; brine disposal <$1M • $8M for distribution network (new 13km pipeline) • Subsurface intake unlikely to be suitable at this scale. Outfall more saline than ambient seawater.
	Stockton	-	• Demand limited to 15ML/d. Not feasible to augment network beyond this flowrate.

[8] See Lower Hunter Water Plan, Hydro-economic modelling assumptions for options and portfolios, September 2013.

Eraring	$98	• plant $40M; raw water $1M; brine disposal $1M • $1M for distribution network • Plant of 30ML/d scale has not been discussed with Origin Energy. Small reduction in inlet flows for cooling water.

To understand whether the changes to assumptions would trigger a major LHWP review, Hunter Water re-ran the cost-risk analysis of portfolios to test whether the ranking of options had significantly changed and the LHWP portfolio would no longer be preferred.[9]

The modelling indicated a $2 million increase in mean present value cost in comparison to the temporary desalination portfolio modelled for the 2014 LHWP. Figure 9 shows each of the mean, max, and 5th and 95th percentiles for plant capacities of 9ML/day, 15ML/day and 30ML/day. While the timeframe required to obtain the EIS and begin construction will require earlier investment in readiness activities, there are considered to be no significant changes to the elements of the portfolio from those outlined in the 2014 LHWP.

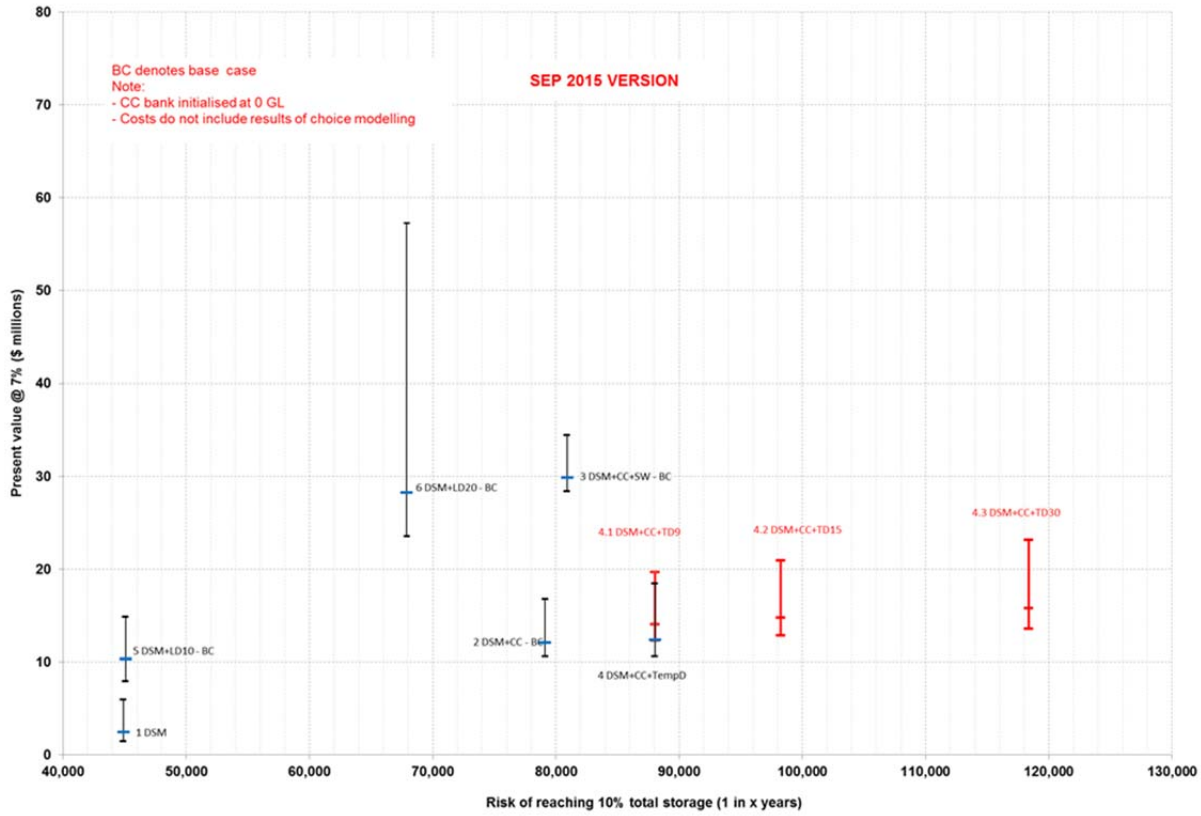


Figure 9: Updated cost risk modelling of portfolios with various desalination capacities

The 2014 LHWP was designed to be flexible and adaptable so that it could take into consideration new information from investigations into readiness activities as a result of further evaluation. While the LHWP assumed that temporary desalination could deliver 9ML/day for the purposes of modelling, it stated that the facility could be scaled up or down depending on the needs at the time. The 2014 LHWP also carried out sensitivity analysis to explore the impact of triggering temporary desalination at higher storage levels.

In the development of the LHWP the temporary desalination option was assumed to consist of small scale, portable units that would only have short-term visual and noise impacts and would

[9] See page 35 of the MERI plan 'Triggers for a major review'

be removed following the drought. There was some concern that, if constructed, a larger scale plant might be perceived as 'permanent' rather than 'temporary'. In this event, a communication strategy would have to be developed by DPI Water and Hunter Water to mitigate community concerns. This may also be a consideration in the process of identifying a preferred site and the Environmental Impact Assessment process.

Hunter Water advised that a larger desalination plant is still intended to only be used as a drought mitigation measure with operation triggered at the same water storage level as originally proposed (around 15%) and ceasing when the drought breaks and the water storage level increases as originally proposed. Hunter Water noted that it envisages that key components such as the filtration and membrane units would be temporary and able to be removed after use. Some elements of the infrastructure would remain and be ready for use if ever needed again in another drought, but this would probably also be the case (to a lesser degree) for smaller units.

Hunter Water has reported that the next step in readiness for temporary desalination involves engaging a consultant to undertake site selection, concept design and the EIS. Hunter Water intends to use a single consultancy for these three bodies of work to expedite the process to ensure readiness activities including EIS approval can be completed in time to facilitate project delivery within the nominated timeframe if required. A timeline for this work is shown in Figure 10 below.

The timeline shows that under the accelerated program, site selection, concept design and the EIS will be completed by April 2018. If an extreme drought were to start now, this will still allow the temporary desalination plant to be constructed and deliver water according to LHWP trigger levels (see Figure D1 in Appendix D). There is a hold point in the project once planning approval is obtained. At that point, procurement of design and construction would only progress once dam storage levels fall below 65%. Construction is triggered at 35% storage levels.

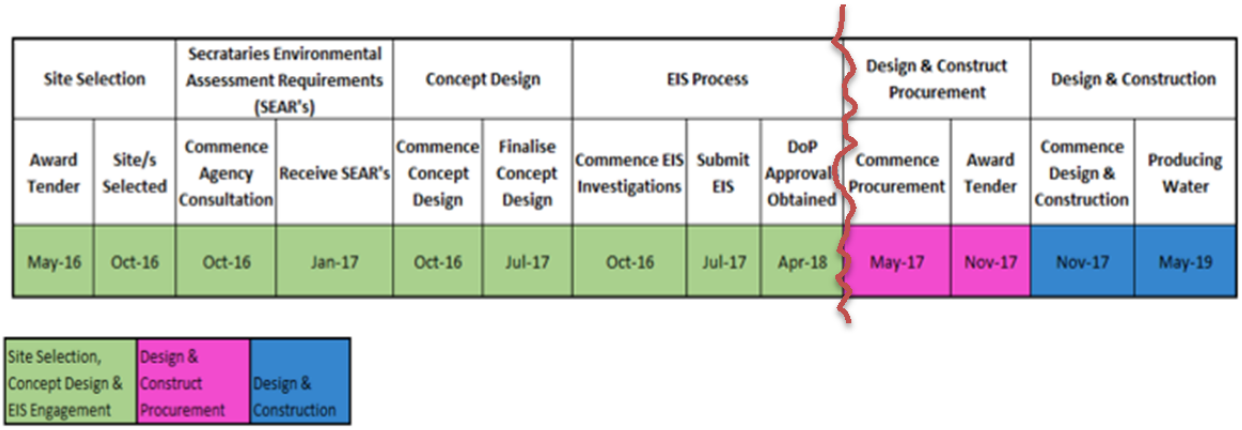


Figure 10: Updated timeframe for delivery of temporary desalination

4.2.8 Ongoing implementation actions

Water Wise Rules

The LHWP assumed potable water savings of 2.5% of residential water use from the introduction of Water Wise Rules, implemented from 1 July 2014.

Residential water consumption for 2014-15 was 37.7GL, a reduction of 2.4GL (6%) compared to the previous year (ie prior to the introduction of Water Wise Rules). However, Hunter Water reported that it cannot isolate the water savings resulting from the implementation of Water Wise Rules because it is not able to correct for variations in weather from year to year.

Hunter Water noted that climatic variation can result in demand fluctuation of 13 per cent in any year and there are many factors impacting demand, so in the absence of a climate correction model the actual savings from Water Wise Rules cannot be isolated.

The MERI plan recognised that it may be difficult to determine a causal link between demand reductions and Water Wise Rules and noted that this may be best achieved with specific qualitative surveys.

DPI Water will continue to liaise with Hunter Water to determine the most appropriate method of estimating savings from Water Wise Rules over time.

Stormwater Harvesting

In 2014, a letter and copy of the LHWP were included in a combined package of information sent to local councils by Hunter Water. In July 2015, Newcastle City Council sought Hunter Water's support for a stormwater harvesting proposal in Newcastle's Civic Park. The proposal comprises underground stormwater storage and reuse for park irrigation. Hunter Water provided a letter of support for the project which, if successful, will result in potable substitution.

At the request of Merewether Golf Club, Hunter Water put together a scope and tender package for a stormwater harvesting feasibility study. The study will be completed in two stages, starting with the identification of stormwater reuse opportunities, and then assessing the feasibility of reuse options. Merewether Golf Club is awaiting funding to complete the study.

As part of the large customer water audit completed at Hunter Stadium, a stormwater harvesting feasibility study was undertaken. The study identified capture of stormwater from the field profile and roof areas on the site for reuse with minor treatment through the existing irrigation system. Modelling of water yield and quality indicates that natural dilution of the system would be sufficient to maintain appropriate water quality for irrigation, with some regular dilution with potable water to provide for a factor of safety. This project will be completed for 2015-16.

Water Efficiency

Water efficiency programs exceeded expectations in 2014-15, with savings of 289ML compared with the forecast of 147ML. This resulted in cumulative savings of 1,606ML per year as shown in Figure 11.

Hunter Water advised that this is largely due to changes in the water efficiency of washing machines. Sales data for the average water use for front loading and top loading washing machines showed that top loading washing machines manufactured in the last couple of years are more efficient than was previously forecast.

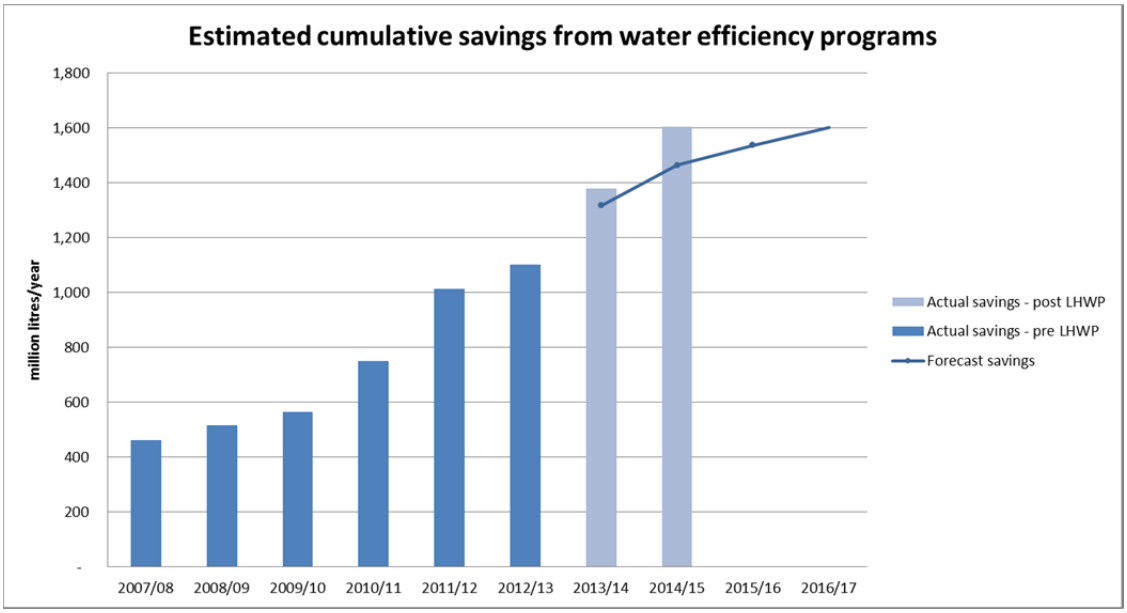


Figure 11: Estimated cumulative savings from water efficiency programs

Loss minimisation

Under the water main/water service replacement, pressure management and active leak detection programs approximately 55ML of water loss abatement was achieved in 2014-15. This is significantly less than the forecast value of 506ML due to a delay in the implementation of the active leak detection program for 2014-15, meaning no leakage reduction from these areas was achieved.

Active leak detection programs were also delayed in both 2012-13 and 2013-14, resulting in lower than expected savings from loss minimisation programs in each of those years.

Hunter Water advises that the current active leak detection contract will restore the schedule by surveying an additional 20% of the network in 2015-16 to resolve a backlog of inspections from previous periods.

Active leak detection generally accounts for the majority of water loss reduction achieved and this is the main factor in the reduced water loss reduction figure compared to the 2013-14 saving of 259ML.

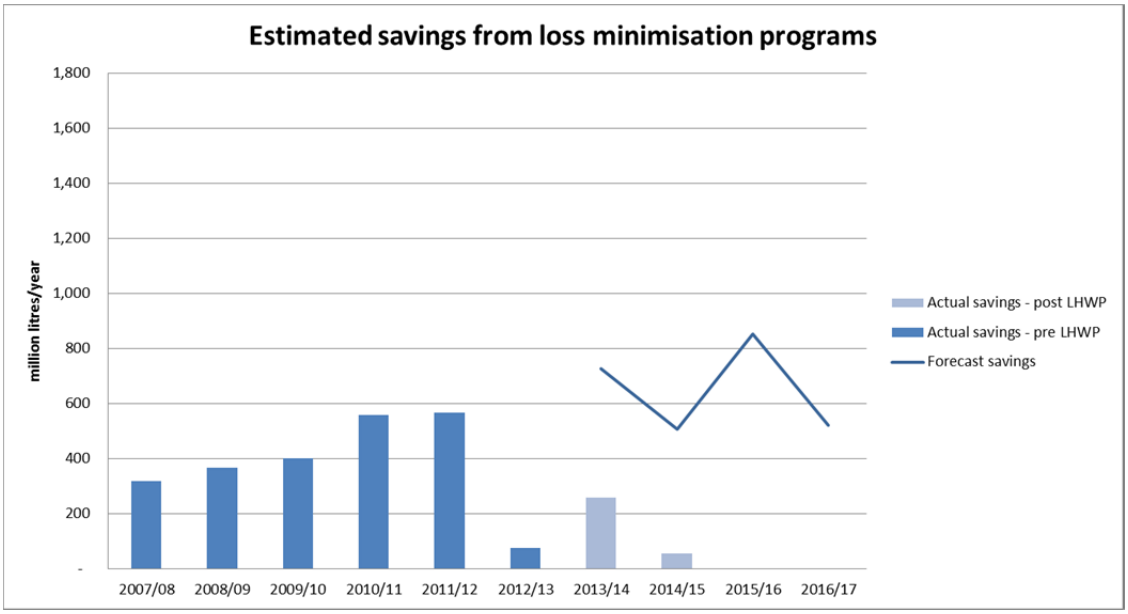


Figure 12: Estimated savings from loss minimisation programs

4.2.9 Costs of implementation actions

The MERI framework requires reporting of annual costs of progress towards the implementation actions. This will provide useful information about whether cost estimates used in developing the 2014 LHWP were realistic and will inform the economic analysis for future LHWPs.

Table 6 shows the costs borne by Hunter Water to implement the MERI actions. These include costs to engage external parties to carry out work as well as internal costs for work undertaken by Hunter Water. Hunter Water advises that it is difficult to accurately determine the internal staff costs for individual projects as work is spread across several divisions and budgets, however, estimates (not actual costs) have been provided for the purposes of the MERI evaluation. The estimated costs are based on estimated proportions of allocated resources and average internal charge out rates.

Table 6: Costs of implementation actions in 2014-15

	Internal costs (estimated $)	External costs ($)
Kooragang Recycled Water Scheme	-	71,000,000
Rainwater tank study	-	34,250
Central Coast water transfer upgrade	43,000	-
Hunter-Central Coast combined model	25,000	-
E-flows at Seaham Weir	103,000	94,400
Lower Hunter Alluvial groundwater source investigations	71,000	-
Temporary desalination readiness	165,000	14,000
Water Wise Rules	21,000	152,000
Water efficiency	387,000	2,313,000*
Water loss management	86,000	
TOTAL	901,000	73,452,650

*Total external expenditure on major customer water audits and Hunter Business Water Savers Program were $39,044 and $79,166, respectively. Other water efficiency programs included in the figure for this external expenditure item are: education programs, showerhead replacement program and water loss management.

4.3 Evaluation workshop

A workshop was held on 21 September 2015 with participants from DPI Water, Hunter Water and Wyong Water. The workshop was held to discuss the draft findings from the evaluation, review the draft evaluation report, and develop recommendations to put forward to the governance groups for endorsement at their meetings in November and December 2015, ie:

- Lower Hunter Water Senior Officers' Group
- Metropolitan Water Chief Executive Officers' Committee
- Independent Water Advisory Panel.

The workshop provided an opportunity for Hunter Water to present on changes to the demand forecast and the rationale for the yield calculation and implications of potential changes to groundwater access rules. It also provided a forum for the agencies involved in implementing the LHWP to contribute to developing strategies for working together to address issues emerging through the MERI process.

A number of actions were agreed during the workshop to progress work on implementation actions evaluated as part of the MERI process.

5 Findings and recommendations / actions for 2016 MERI

5.1 Implementation of recommendations from 2014 MERI evaluation

The 2014 MERI evaluation recommended establishing a subgroup of the RHOG to consider the potential impact on the supply-demand balance of proposed amendments by DPI Water to access rules for the Tomago and Tomaree groundwater sources in the North Coast Coastal Sands WSP.

Hunter Water's modelling indicated that the proposed rules would result in a yield loss of 3GL for Tomago and 1.5GL for Tomaree and bring forward the need for a supply augmentation, with significant social, environmental and economic impacts, and would trigger a major review of the LHWP. The role of the group was to provide input to support the water sharing plan process by:

- reviewing the available information
- developing potential options for access rules and timing
- considering the ecosystem and system yield impacts
- developing a path forward by April 2015.

The groundwater group came to an agreed position on proposed changes to the WSP rules, including:

- a 'holding pattern' will apply for the first five years of the WSP, retaining the existing rules while research is undertaken to better understand groundwater dependence of ecosystems, develop early warning indicators of water stress, and provide a more robust basis for setting access conditions (especially the cease to pump conditions)
- the groundwater extraction regime will be reviewed after the first five years of the WSP, informed by the outcome of the research and the next iteration of the LHWP.

This approach will ensure the environmental, economic, social and risk implications of significant changes to groundwater access, which would trigger a major supply augmentation, will not be dealt with in isolation. Rather, the costs and benefits will be assessed as part of the whole-of-government process to develop the next iteration of the LHWP.

5.2 Deliverables for 2015

Overall, the 2015 MERI evaluation shows that implementation of the LHWP is largely on track.

The supply-demand balance shows that a new supply augmentation will not need to be operational until around 2036-37, with demand over the planning period forecast to be slightly lower than in 2013.

Hunter Water noted that there are a number of risks to water security that must be monitored between now and the next major review of the LHWP, including diversion of stormwater flows into Grahamstown Dam to manage water quality; contamination of groundwater within the Tomago Sandbeds originating from the Williamtown RAAF Base; and potential climate change impacts. It will be important to mitigate the risk that these potential impacts on yield occur simultaneously.

Hunter Water delivered the two key implementation actions that were due in the 2015 MERI reporting period, the KRWS and the study into rainwater tank failure (carried over from the 2014 MERI evaluation).

Hunter Water reported however, that it has not undertaken any new activities to assess future expansion opportunities for the KRWS, partly because it plans on selling the recycled water plant.

Further work is needed to better understand the implications of rainwater tank failure and consider options for ensuring that systems are maintained to retain water security benefits of rain tanks installed to meet BASIX requirements.

5.3 Other key actions and issues

The MERI evaluation examined key implementation actions, due for delivery beyond 2015 to ensure that actions are progressing according to established timeframes. The evaluation found that work on infrastructure to deliver increased Central Coast transfers by Hunter Water and Wyong Water is on track to be delivered by the end of 2017. Wyong Water's contribution to development of an improved inter-regional water supply model is also progressing according to the specified timeframe.

The evaluation also found that while components of some projects have experienced delays or changes in scope and assumptions, work is progressing and it is still anticipated that implementation actions will be delivered on time with some adjustments to the programs.

DPI Water has worked with agencies through the MERI evaluation to map out how programs and/or timings for these actions will be modified to ensure they can be delivered according to the LHWP.

Progress on key implementation actions not yet due for completion is discussed below.

1. *Development of an inter-regional water system model by Hunter Water*

   Hunter Water's contribution to the improved inter-regional modelling has been delayed as a result of the impact of operational issues that diverted the key resource from this work. Hunter Water reports that model development will be completed by February 2016 and that optimisation of water transfers can still be delivered on time by October 2016.

2. *Implementation of new environmental flow rules for Chichester Dam and Seaham Weir*

   The Hunter Unregulated Environmental Flows Working Group was formed to oversee the implementation of the LHWP environmental flow rules and fish passage at Chichester Dam and Seaham Weir.

   The MERI plan did not specify timing for delivery of environmental flows, as they are dependent on outcomes of regulatory processes for amending the Hunter Unregulated and Alluvial Sources WSP. Work has now progressed, allowing potential delivery times to be better estimated.

   Hunter Water advised that works to install a valve so that the changes to environmental releases from Chichester Dam can be made by June 2016.

   A range of flow release control strategies have been investigated to give effect to the new flow release requirements at Seaham Weir. Hunter Water engaged SMEC to investigate and assess infrastructure options for delivering the flows. SMEC delivered its final report in August 2015.

   Next steps are for Hunter Water to develop a decision framework to be used by the working group to agree a preferred option, by January 2016. A business case for the preferred option will then go through Hunter Water's internal governance process for funding approval by June 2016, with timing of construction of infrastructure to be agreed between Hunter Water and DPI Water following selection of the preferred option and development of a project delivery timeline (noting that Hunter Water has sought funding for this project as part of its 2016-20 price path). DPI Water anticipates that the flow release rules will be formalised in the remake of the Hunter Unregulated and Alluvial Source WSP, which must commence no later than 1 July 2019.

   In the meantime, Hunter Water has proposed interim rules to approximate delivery of environmental flows until the infrastructure is built. DPI Water has drafted amendments to the

Hunter Unregulated WSP and is considering the most appropriate implementation approach, including via Hunter Water's Water Access Licence, which can be amended at any time.

3. *Investigations into the Lower Hunter Alluvial groundwater source as a potential future drought response measure*

Hunter Water has conducted investigations into a potential groundwater source for drought response near the confluence of the Hunter and Paterson Rivers in the Morpeth-Bolwarra area.

Initial test drilling did not locate the targeted aquifer in the paleochannel within the original timeframe. This has required a change to the approach and timetable for the Lower Hunter Alluvial groundwater source investigations. This is illustrated in Appendix C. Hunter Water anticipates that the overall project will be delivered on time.

4. *Investigations into mine water opportunities*

DPI Water is keeping a watching brief on opportunities to treat and use groundwater pumped out of underground mines on the western side of Lake Macquarie as a potential drought supply.

A water treatment plant has now been constructed at the mine, which is likely to considerably reduce the cost and lead-time of this option.

DPI Water has obtained further information regarding water quality, availability and longer-term obligations relating to this option and will work with Hunter Water to investigate the feasibility of this option. Depending on outcomes, further cost-risk modelling may be needed to test the portfolio ranking with new assumptions for this option.

5. Temporary desalination readiness

Hunter Water began work on readiness activities for temporary desalination during the 2014 MERI evaluation period. Further investigations during the current period have led to changes in costs, scope and timing of this measure. Key changes include:

- the cost associated with temporary desalination at each of the three sites is likely to be greater than $10 million (the LHWP estimated $8.29 million for each 3ML/day facility)
- temporary desalination is likely to be declared to be State Significant Infrastructure, requiring approval from the Minister for Planning and requiring the preparation of an Environmental Impact Statement (which will further increase costs and increase the delivery time)
- Given these factors, Hunter Water considers it is likely to be more cost-effective to construct a single, larger plant on one of the shortlisted sites.

Hunter Water undertook hydro-economic modelling using the new assumptions to test whether it changed portfolio ranking. This was not the case, so Hunter Water is progressing with readiness activities under a compressed timeframe to ensure the project can be delivered in an extreme drought if needed.

Table 7 summarises the activities discussed above and proposes timing for their delivery to ensure that the implementation actions due in the coming years can meet the MERI plan targets. DPI Water recommends that the governance committees endorse these actions for implementation.

Table 7: Tasks and timing for progressing LHWP implementation actions

Issue	Action	Anticipated date
Inter-regional transfers with the Central Coast	Hunter Water to develop an improved model for the inter-regional transfers with the Central Coast	February 2016
Hunter Alluvial groundwater source	Hunter Water to engage a consultant to undertake Electrical Resistivity Imaging to identify suitable sites for a second drilling.	November 2015
E-flow Rules for Chichester Dam	Hunter Water to install new valve to ensure sufficient flows at Chichester Dam to meet new e-flow rule requirements and begin releasing agreed flows.	June 2016
E-flow Rules for Seaham Weir	Hunter Water to develop decision framework for selecting a preferred infrastructure option to achieve flow release and fish passage objectives	January 2016
	Environmental Flows Working Group to evaluate options within the agreed decision-making framework to identify a preferred infrastructure option at Seaham Weir. Hunter Water to develop and submit a business case for internal approval of the preferred option	By June 2016
	Hunter Water to construct new infrastructure at Seaham Weir	2016-20 (TBA subject to selected option and funding)
	DPI Water to review flow rules in WSP to achieve ensure implementation of Scenario 10 outcomes as part of the formal review of the Hunter Unregulated WSP	By June 2019
Mine water	DPI Water to review report from GHD and to convene meeting with Centennial Coal, Hunter Water, and GHD to discuss findings and agree next steps.	January 2016
Temporary desalination readiness	Hunter Water to progress readiness activities to achieve LHWP triggers, including: • engage a consultant for site selection, concept design and EIS • complete site selection, concept design and EIS	 April 2016 February 2018

APPENDICES

Appendix A MERI reporting tables

LOWER HUNTER WATER PLAN

MONITORING, EVALUATION, REPORTING AND IMPROVEMENT

Annual Evaluation Questions

			Enter Yes, No or NA from drop-down box			*Enter Yes, No or NA from drop-down box*		
		Evaluation question	**2013/14**	**If changed, enter new number where relevant**	**Comments**	**2014/15**	**If changed, enter new number where relevant**	**Comments**
EQ 1.3	1.3.1	Is demand trending within the LHWP forecast sensitivity limits? What is the cause of movement outside of the sensitivity range?	Yes		HWC has updated the demand forecast for the 2015 pricing submission, incorporating actual customer connection data for 2013-14. Demand is trending within the LHWP forecast sensitivity limits. (HWC file HW2006-3431/5/3) Refer 2014 MERI Report, section 3.2.1 for updated demand forecast graph.	Yes		The 2015 demand forecast developed in August 2014 remains the basis for comparison of future impacts, but has been updated to incorporate actual customer connection data for 2014-15 and lower than expected sales of recycled water at KRWS. Demand is trending within the LHWP forecast sensitivity limits (HWC file HW2006-3431/5/3). Refer 2015 MERI Report, section 3.2.2 for updated demand forecast.
	1.3.2	Have the Level of Service criteria changed and what has been the impact (if any) on the supply-demand balance? *[Note this question has a slightly different focus to LoS success statement under question 1.1.2.]*	No		There has been no change to the Level of Service criteria outlined in the LHWP. Refer to HWC Compliance and Performance Report 2013-14, Section 3 Water Quantity.	No		There has been no change to the Level of Service criteria outlined in the LHWP. Refer to HWC Compliance and Performance Report 2014-15, Section 3 Water Quantity.
	1.3.3	Is the yield still as expected (75 GL pa)?	Yes		There was no change in 2013/14 to the expected yield of 75 GL pa calculated for the LHWP. Refer to HWC Compliance and Performance Report 2013-14, Section 3 Water Quantity. Refer EQ 4.1.3, 4.1.8 and 4.2 regarding potential changes arising from review of Tomago Tomaree Water Sharing Plan. HWC estimates the impact on yield from the changes recommended by NOW would be -3GL for Tomago and -1.5 GL for Tomaree, bringing forward the supply-demand intersection by 8 years. Refer 2014 MERI Report, section 3.2.3 for updated supply-demand balance graph and discussion on sensitivity.	Yes		There was no change in 2014-15 to the expected yield of 75 GL pa calculated for the LHWP. Refer to HWC Compliance and Performance Report 2014-15, Section 3 Water Quantity. Potential changes to groundwater access arising from review of Tomago Tomaree Water Sharing Plan (that would have reduced yield and brought forward a supply augmentation) have been placed on hold for up to 5 years, pending further research into GDEs and consideration of the broader implications within the next iteration of the LHWP. PFOS/PFOA contamination of groundwater within the Tomago Sandbeds originating from RAAF Base Williamtown has resulted in the precautionary isolation of bore stations 7 and 9 until they can be verified as safer for use. Further work is required to better understand the issue, including further investigations into the extent, impact and mitigation options for the contamination. If stations 7 and 9 need to be abandoned, it has the potential to reduce Tomago borefield catchment area by around 10%. While this impact has not been modelled, preliminary estimates indicate the impact on yield could be in the order of a 1.5 GL/year, or around 2%, reduction in yield. Hunter Water continues to liaise with the Department of Defence and NSW Government on this issue.
	1.3.4	Is there new information from EQ 4.3 findings that would affect the supply-demand balance?	No		New population projections released by NSW Department of Planning & Environment in 2014 were used to update the occupancy rates within the HWC demand forecast. Hunter Water continues to use its own dwelling projection for connected cutomers. The updated demand forecast has not significantly affected the supply-demand balance. Refer to HWC file HW2006-3431/5/3. Refer 2014 MERI Report, section 3.2.3 for updated supply-demand balance graphs.	Yes		Refer to EQ 4.3 - The NSW and ACT Regional Climate Model project is complete. Modelling indicates that in future, temperatures will increase on all measures but rainfall impacts are more uncertain. Hunter Water and Uni of Newcastle are currently investigating how output may be used in future water planning for the lower Hunter. The East Coast Lows project found that that ECL frequency is predicted to increase in summer. Refer to HWC Compliance and Performance Report 2014-15, Section 3.6.2 Climatic data, trends and projections for more information.
EQ 2.2		Have the non-drought measures (i.e. continuing measures) been effective in the supply, saving and substitution of water?	Yes		<u>Supply</u>: Refer to HWC Compliance and Performance Report 2013-14, Figure 6.2. <u>Savings</u>: Water efficiency programs - Forecast cumulative savings of 1,317 ML/year resulting from water efficiency programs were exceeded in 2013-14 (forecast additional water efficiency savings in 2013-14 of 216 ML/year, compared with actual water efficiency savings in 2013-14 of 277 ML/year). Refer to HWC Compliance and Performance Report 2013-14, Section 6.6 Conserve water supplies by ensuring efficient water use. Water loss minimisation programs - Under the water main/water service replacement and active leak detection programs approximately 259 ML of water loss abatement was achieved. This is less than the forecasted value of 728 ML due to delays in implementing the 2013/14 active leak detection survey. The current contract has been prepared to include 2013/14 survey areas as well as 2014/15 survey areas to ensure the forecast savings are delivered with this period. The Operating Licence required Hunter Water to develop an Economic Level of Leakage. This assessment forecasted a leakage rate of 16.4 +/- 3.9 ML/day for the 2013-14 water balance period. Actual performance complied with this value with 17.9 ML/day observed. Refer to HWC Compliance and Performance Report 2013-14, Section 6.6 Conserve water supplies by ensuring efficient water use. <u>Substitution</u>: Total recycled water use of 4,895 ML was achieved in 2013-14, compared with LHWP forecast of 4,775 ML. Refer to HWC Compliance and Performance Report 2013-14, Figure 6.5.	Yes		Supply: Refer to HWC Compliance and Performance Report 2014-15, Figure 6.1. Savings: Water efficiency programs - Forecast cumulative savings of 1,464 ML/year resulting from water efficiency programs were exceeded in 2014-15 (forecast additional water efficiency savings in 2014-15 of 147 ML/year, compared with actual water efficiency savings in 2014-15 of 289 ML/year). The efficiency of washing machines is better than forecasted and has contributed significantly to actual water savings. Water loss minimisation programs - Under the water main/water service replacement, pressure management and active leak detection programs approximately 55 ML of water loss abatement was achieved. This is less than the forecasted value of 506 ML due to a delay in the implementation of the active leak detection program for 2014-15, meaning no leakage reduction from these areas was achieved. All outstanding loss reduction porgrams will be implemneted in 2015-16. Active leak detection generally accounts for the majority of water loss reduction achieved and this is the main factor in the reduced water loss reduction figure compared to the 2013-14 saving of 259ML. Refer to HWC Compliance and Performance Report 2014-15, Section 6.6 Conserve water supplies by ensuring efficient water use. Substitution: Total recycled water use of 4,166 ML was achieved in 2014-15, compared with LHWP forecast of 6,300 ML. Although there was a 200 ML increase in industrial recycling in 2014-15 brought about by the commissioning of KRWS, there was an almost 1,000 ML decrease in agricultural reuse during the 2014-15 reporting period. This decrease in volume was due to wet weather leading to reduced irrigation requirements. Refer to HWC Compliance and Performance Report 2014-15, Figure 6.2.
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 plan?			See Implemention Actions table for detail.			See Implemention Actions table for detail.
EQ 3.2		Are the implementation actions consistent with the LHWP's expectation for deliverables and costs?			See Implemention Actions table for detail.			See Implemention Actions table for detail.

		What are the reasons for any significant variation and how can this understanding improve delivery of the plan?						
EQ 4.1	4.1.1	Does the accessible storage at Chichester Dam remain at least 18,357 ML?	Yes			Yes		The existing rock anchor system at Chichester Dam has a finite life which could affect the storage capacity at some point in its future. It is not clear whether rehabilitation of this system would be cost effective when compared to alternative options for maintaining, replacing or augmenting this source. It is therefore recommended that long term maintenance options for Chichester Dam be considered in future iterations of the LHWP.
	4.1.2	Does the accessible storage at Grahamstown Dam remain at least 182,400 ML?	Yes			Yes		Consider long term maintenance in next iteration of LHWP.
	4.1.3	Does the accessible storage level of Tomago Sandbeds remain at least 60,000ML?	No		NSW Office of Water identified that 60,000ML is the maximum available from Tomago Sandbeds due to licence conditions that require specific approvals to continue pumping when water levels are low. Refer EQ 1.3.3 and 4.2 - review of Tomago Tomaree WSP may reduce the accessible volume.	Yes		Potential changes to groundwater access arising from review of Tomago Tomaree Water Sharing Plan (that would have reduced yield and brought forward a supply augmentation) have been placed on hold for up to 5 years, pending further research into GDEs and consideration of the broader implications within the next iteration of the LHWP. PFOS/PFOA contamination of groundwater within the Tomago Sandbeds originating from RAAF Base Williamtown has resulted in the precautionary isolation of bore stations 7 and 9 until they can be verified as safer for use. Further work is required to better understand the issue, including further investigations into the extent, impact and mitigation options for the contamination. If stations 7 and 9 need to be abandoned, it has the potential to reduce Tomago borefield catchment area by around 10%. While this impact has not been modelled, preliminary estimates indicate the impact on yield could be in the order of a 1.5 GL/year, or around 2%, reduction in yield. Hunter Water continues to liaise with the Department of Defence and NSW Government on this issue.
	4.1.4	Is the surrogate method of modelling transfers representative of Central Coast transfers under the existing agreement? OR If new inter-regional modelling capacity is developed, do the inter-regional models accurately represent transfers under the existing agreement?	Yes		The surrogate method of modelling transfers is representative of Central Coast transfers under the existing agreement, but will be improved on when the new inter-regional model with the Central Coast is developed in 2015.	Yes		The surrogate method of modelling transfers is representative of Central Coast transfers under the existing agreement, but will be improved on when the new inter-regional model with the Central Coast is developed later in 2015.
	4.1.5	Can 90% of pumpable water from Williams River be transferred?	Yes		No changes have been made to the Balickera Pump Station Operating Methodology, which outlines the range of factors HWC considers when deciding whether to operate Balickera Pump Station to transfer flows into Grahamstown Dam. The current water quality selectivity rules remain the same as was assumed during development of the LHWP.	Yes		No changes have been made to the Balickera Pump Station Operating Methodology, which outlines the range of factors HWC considers when deciding whether to operate Balickera Pump Station to transfer flows into Grahamstown Dam. The current water quality selectivity rules remain the same as was assumed during development of the LHWP. These rules have been formalised in operating procedures which are controlled documents within Hunter Water's accredited Quality Management System.
	4.1.6	Does the current source strategy for Tomago continue to apply / operate? *When the storage in Tomago Sandbeds (in % terms) exceeds the storage in Grahamstown Dam by more than 5%, Tomago is operated at 45ML/day.* *When overall system storage is between 40% and 70%, Tomago Sandbeds is operated at 75ML/day unless it runs out of water.* *When overall system storage is below 40%, Tomago Sandbeds is operated at 45ML/day whenever water is available in Tomago Sandbeds.*	Yes		The current source strategy for Tomago Sandbeds continues to apply. However maintenance activities, including a major upgrade to the high voltage network in Tomago, have meant that the borefields haven't always been able to operate in accordance with the strategy.	Yes		The current source strategy for Tomago Sandbeds continues to apply. However maintenance activities, including a major upgrade to the high voltage network in Tomago, and PFOS/PFOA groundwater contamination resulting from RAAF Base Williamtown, have meant that the borefields haven't always been able to operate in accordance with the strategy. These activities however did not impact on storage levels, which remained high due to good rainfall. These rules have been formalised in operating procedures which are controlled documents within Hunter Water's accredited Quality Management System.
	4.1.7	Is future climate represented by historical climate records as of 2012? How do any changes impact on supply (yield) modelling?	Yes NA		There are known deficiencies in this approach, however current projects on which Hunter Water is a funding partner will assist in improving understanding of these issues. Such projects include the NSW and ACT Regional Climate Model (NARCliM) Project and the Eastern Seaboard Climate Change Initiative (ESCCI) – East Coast Lows (ECL) Project. Refer to HWC Compliance and Performance Report 2013-14, Section 3 Water Quantity.	Yes NA		There are known deficiencies in this approach, however current projects on which Hunter Water was a funding partner will assist in improving understanding of these issues. Such projects include the NSW and ACT Regional Climate Model (NARCliM) Project and the Eastern Seaboard Climate Change Initiative (ESCCI) – East Coast Lows (ECL) Project. Refer to HWC Compliance and Performance Report 2014-15, Section 3 Water Quantity. The University of Newcastle is experimenting with analysing the performance of the Hunter Water bulk supply system using preliminary results from the NARCLiM project.
	4.1.8	Is the assumption that Tomaree aquifer can deliver a constant sustainable supply of 7ML/d still valid?	Yes		No change in 2013/14. Refer EQ 1.3.3 and 4.2 - review of Tomago Tomaree WSP may reduce the accessible volume.	Yes		No change in 2014/15. Refer EQ 1.3.3 and 4.2 - review of Tomago Tomaree WSP may reduce the accessible volume. Hunter Water is co-funding an Australian Research Council linkage grant awarded to UTS which seeks to close the gap on understanding the dependence on groundwater of high value ecosystems in the Tomaree source.
	4.1.9	Is 10% total storage representative of nearly empty?	Yes			Yes		
	4.1.10	Is the actual non-residential use trending close to the base case forecast?	Yes		Non-residential use in 2013-14 (actual 21.3GL) was higher than forecast (20.7GL) but is within forecast sensitivity limits and in line with expected demand for the hot and dry conditions experienced in the previous two years.	Yes		Non-residential use in 2014-15 was 18.6 GL. This is lower than the LHWP demand forecast of 19.4 GL, but higher than the most recent forecast of 18.2 GL. The difference between the forecasts and the actual demand are generally a result of lower than estimated water savings resulting from KRWS. The non-residential actual demand is within the sensitivity bounds for large water users.
	4.1.11	Has Kooragang Industrial Water Scheme offset 3GL pa of potable water use from Dec 2014?	NA		KIWS is not yet operational. Scheduled to supply recycled water from Dec 2014.	No		KIWS offset 1,115 ML of potable water use in the 7 months since commissioning in November 2014. Current usage by Orica is 5.2 ML/day on average, trending below the LHWP potable substitution forecast for KIWS of 9ML/day.

4.1.12	Have the revised environmental flow rules for Chichester Dam and Seaham Weir been implemented? Do the revised environmental flow rules better reflect natural flow variability?	NA NA		Preparatory work has started toward implementing the revised environmental flow rules for Chichester Dam and Seaham Weir. Hunter Water, with input from all relevant agencies under the auspices of the River Health Outcomes Group during development of the Lower Hunter Water Plan, has met the requirements of Condition 30e of the Water Supply Work and Water Use Approval of the Seaham Weir Management Zone of the Williams River Source. Formal recognition that this requirement has been met is contained in a letter from the A/Deputy Commissioner, Water Reform and Evaluation at the Office of Water to the Chief Operating Officer at Hunter Water dated 27 November 2013. With the water sharing arrangements now agreed, the Office of Water and Hunter Water are moving forward with developing control logic and infrastructure options to give effect to the agreed water releases at Seaham Weir.	NA NA		Preparatory work has started toward implementing the revised environmental flow rules for Chichester Dam and Seaham Weir. Hunter Water, with input from all relevant agencies under the auspices of the River Health Outcomes Group during development of the Lower Hunter Water Plan, has met the requirements of Condition 30e of the Water Supply Work and Water Use Approval of the Seaham Weir Management Zone of the Williams River Source. Formal recognition that this requirement has been met is contained in a letter from the A/Deputy Commissioner, Water Reform and Evaluation at the Office of Water to the Chief Operating Officer at Hunter Water dated 27 November 2013. With the water sharing arrangements now agreed, the Office of Water and Hunter Water are moving forward with developing control logic and infrastructure options to give effect to the agreed water releases at Seaham Weir. Next steps are: HWC to develop a decision framework to identify a preferred infrastructure option (January 2016); Working group to use fwk to agree a preferred infrastructure option and HWC to seek internal approval of business case for preferred option (June 2016); HWC to construct infrastructure (anticipated between 2016-2020 as per price submission); DPI Water to include e-flow rules in Hunter Unreg WSP once infrastructure underway (anticipated in new WSP 1 July 2019).
4.1.21	Are the triggers for commencing temporary desalination still appropriate for minimum lead time? *(ie, it is assumed that commencing design and approval no later than 65% total storage level and construction no later than 35% will enable operation to commence no later than 15%)*	Yes		No new information available in 2013/14. Drought readiness activities for temporary desalination have started and are due for completion in December 2015. The appropriateness of the triggers for commencing temporary desalination will be reassessed with the latest information.	No		The likely requirement for an EIS under statutory environmental assessment and approvals process means concept design and planning approval is required upfront as part of drought 'readiness activities' (to ensure that water can be delivered in time during an extreme drought), rather than at the 65% total storage level trigger. If severe drought does not occur, detailed design will commence at 65% storage level. See Implemention Actions table for detail.
4.1.22	Can temporary desalination units supply a minimum of 9ML/d? (ie, capability)	NA		Drought readiness activities for temporary desalination are underway but not yet complete.	Yes		Based on initial site investigations, the 3 shortlisted sites for temporary desalination all have capability to supply a minimum of 9 ML/day. Further work is underway to identify a preferred site.
4.1.23	Can Central Coast transfers supply an average of 30ML/d northbound by 2017?	NA		Infrastructure planning is on track as reported in the Implemention Actions table (surface water section).	Yes		Infrastructure planning is on track for the end of 2017 as reported in the Implemention Actions table (surface water section).
4.1.24	Does the application of Water Wise Rules result in a demand reduction of 2.5% of residential demand?	NA		Water Wise Rules were not in place in 2013/14. Commenced 1 July 2014.	TBC		Water Wise Rules were introduced on 1 July 2014. Hunter Water does not use analysis tools that allow corrections for variations in weather from year to year, so cannot adequately isolate the water savings resulting from the implementation of Water Wise Rules. Water consumption for residential customers in 2013-14 was 40.1 GL. The water consumption for residential customers in 2014-15 was 37.7 GL, a reduction of 2.4 GL (6%) compared to the previous year (ie prior to the introduction of WWR). The water demand from residential customers dropped considerably from 2013/14 to 2014/15. Some of this was expected from continuing improvement to water efficiency. The average residential house is forecast to reduce demand by approx.. 2KL/yr from 184 to 182 in this time. The main factor driving the reduction is the weather. Long spells of dry and warm weather contributed to significant blocks of high water consumption during 2013/14 (graph below). These periods were not as obvious in 2014/15. Historically, variations to total demand because of the weather have been about +7% to -6% from the average. To normalise variations in demand caused by the weather a 'climate correction' model would be required. Hunter Water do not utilise this for any planning tasks.
4.1.25	Are the Water Wise Rules cost assumptions still valid?	NA	$262,940	Water Wise Rules were not in place in 2013/14. Commenced 1 July 2014. LHWP assumed initial cost $318,000	Yes	$152,000	Water wise rules cost $152,000 in 2014/15. This is slightly higher than the assumption in the LHWP of $120,000 per year.
EQ 4.2	Is the regulatory and operating environment still consistent with the LHWP? Do any changes influence the measures and implementation actions? Issues include but are not limited to: Institutional arrangements HWC regulatory environment BASIX Environmental regulation changes which may impact on the viability of measures in the plan (eg, EEC, threatened species)	No NA		Groundwater sources at Tomago and Tomaree are covered by the 2003 Water Sharing Plan for the Tomago Tomaree Stockton Groundwater Sources, which will be replaced by the Water Sharing Plan for North Coast Sands Groundwater in 2015. Changes from the current water access rules in the new WSP have the potential to reduce yield and affect the supply-demand balance. Refer EQ 1.3.3, 4.1.3 and 4.1.8.	Yes NA		Potential changes to groundwater access have now been deferred for up to 5 years.
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? Key issues include but are not limited to: Population forecasts or forecasting methods Climate modelling Desalination technology Technology or measures that didn't make plan Results of testing demand forecast assumptions Relevant changes in other water authority practices to improve best practice Relevant media for emerging issues Potential to use contingency measures not included in the LHWP	Yes No		The NSW Department of Planning & Environment has released new 2014 population forecasts. Refer EQ 1.3.4.	No Yes		See EQ1.3.4 and also Refer to HWC Compliance and Performance Report 2014-15, Section 3.6.2 Climatic data, trends and projections. Changes to cost and timing and information on minewater from the Centennial Coal warrants further investigation The plant capacity, costs, timing and approvals process have changed from the LHWP assumptions for temporary desalination. Cost-risk analysis showed that the LHWP portfolio is still preferred and so readiness activities are continuing

LOWER HUNTER WATER PLAN
IMPLEMENTATION ACTIONS SUMMARY

					2013-14			2014-15		
					Enter Complete, On track or Delayed from drop-down box			*Enter Complete, On track or Delayed from drop-down box*		
Category	**Action**	**Lead**	**Timing**	**LHWP page**	**Progress**	**Costs** (where relevant)	**Comment**	**Progress**	**Costs** (where relevant)	**Comment**
Surface water	Construct infrastructure to transfer more water from the Central Coast to the lower Hunter as per existing agreement	HWC	Jun-17	20	On track		HWC has identified the works required to increase the capacity of its water supply network to receive up to 30 ML/day of water transferred from the Central Coast. Design is scheduled to commence in 2014/15.	Delayed	$43,000 (HWC internal)	Slightly delayed but on track for delivery by end of 2017 (consistent with LHWP). June 2017 may be possible under an accelerated program, subject to finalisation of design. Information from Wyong Council indicates peak flow requirement is less than initially indicated (now expected to be around 30ML/day), meaning higher flowrates do not need to be catered for. Preferred option has been identified. The preferred option will result in the water supply network receiving pressures that are marginally higher than it currently receives. There is a risk that this will be problematic during continuous operation of the scheme. If watermain breaks were to occur too frequently, the scheme can be run at a transfer rate closer to 25ML/d for a period of time whilst mitigation measures to protect problematic watermains, (eg. pressure reducing valves) are implemented. A pump station trial is scheduled for late 2015 to confirm the system performance of trunk watermains between Morisset and Wangi with Morisset 3 WPS operating under the expected northerly transfer pressure regime.
		WSC	Jun-17	20	On track		WSC has selected the broad route for the Mardi to Warnervale pipeline	Delayed		Likely to be completed late 2017. Route selected. Currently addressing outstanding easement issues.
	Develop an improved model for the inter-regional transfers with the Central Coast	HWC	Oct-15	21	On track		HWC elements are scheduled to commence in early 2015.	Delayed	$25,000 (HWC internal)	Work has commenced however completion of the Hunter Water model is expected to be delayed until February 2016
		WSC	Oct-15	21	On track		WSC is progressing with preparing a Model Manual. Current model has some capability for modelling inter-regional transfers.	On track		Model ready to be tested with Hunter Water agreed scenario - Central Coast Working Group to be convened to agree on rules and scenarios to be simulated and assessed
	Investigate options to optimise water transfers with a view to enhancing existing transfer agreement if required/ appropriate	HWC, WSC, MWD	Oct-16	21	On track		Pending development of improved model	On track		Pending development of improved model. Once this is done, the following tasks will be undertaken: • Decide which permutations of water sharing rules need to be simulated (collaborative HWC, WSC and MWD) • Undertake model runs to assess the agreed water sharing rule permutations
	Implement new environmental flow rules for Chichester Dam and Seaham Weir	DPI Water	Subject to DPI Water	18, 21	On track		NOW has notified HWC of its intention to amend the Hunter Unreg WSP to apply the environmental flow rules as modelled in developing the LHWP and called 'Scenario 10'. NOW has established a Working Group with HWC and MWD to negotiate details and timing, recognising the need to consider investigation, design, and construction of infrastructure modifications and the timing for IPART's price determinations for HWC. The Working Group supported interim rules being incorporated into an amendment to the plan, proposed for May 2015.	On track		The Working Group continued to oversee implementation. See details below regarding the progress of investigations by Hunter Water into gate and fishway options at Seaham Weir (new infrastructure required), and implementation of changes for Chichester Dam (no major infrastructure required). Package of amendments to Hunter Unreg WSP drafted to implement interim flow rules as a proxy for final. DPI Water considering most appropriate mechanism for implementing interim rules, including Water Access Licence. Final rules anticipated to be included in remake of Hunter Unreg WSP commencing 1 July 2019 (TBC)
		HWC	Subject to DPI Water	18, 21			See above	On track	Seaham Weir options: $94,400 (external) $103,000 (HWC internal)	Seaham Weir - Investigations to identify infrastructure options for releasing agreed flow rules and ensure fish passage are complete. Next steps are: 1. HWC to develop decision fwk to identify preferred infrastructure option by January 2016. 2. Working Group to meet and agree preferred option and HWC to seek internal approval of business case by June 2016. 3. HWC to construct approved infrastructure, anticipated 2016-2020 (TBC). 4. DPI Water to amend WSP if necessary to deliver e-flows, anticipated in re-make of Hunter unreg WSP 1 July 2019 (TBC). Hunter Water is waiting on DPI Water to confirm interim arrangements proposed by HWC to approximate agreed environmental flow rules until infrastructure is agreed. DPI Water are reviewing the proposal and developing draft clauses for the Water Sharing Plan. Chichester Dam - Releases are made through the hydroelectric generator, or a bypass pipe when the hydro unit fails. The hydro unit is capabable of delivering the required flows, however agreement with DPI Water is needed regarding the release pattern. The bypass requires a new valve and control scheme to release the required flowrate. This capability is programmed to be installed in 2015-16.
	Activate transfers to or from the Central Coast under existing agreement	HWC, WSC	If triggered	20-21			Not triggered.			Not triggered.

Groundwater	Consider any implications for the LHWP arising from review of the Water Sharing Plan for the Tomago Tomaree Stockton groundwater sources	MWD	After July 2014	25	Delayed		The existing WSP was extended to apply until its date of replacement (1 July 2015 or sooner). NOW is proceeding with proposed WSP rules for Tomago and Tomaree groundwater sources as recommended by the Interagency Regional Panel (IRP) in March 2014. NOW advised that public exhibition of the new draft WSP is planned for late 2014, aiming for commencement in early 2015 (subsequent advice indicated this may be delayed). The amended Tomago cease to pump (CTP) rule was proposed to apply from year 1 of the WSP, and the amended Tomaree CTP rule from year 6. HWC will need to address the impact on yield in reporting on the supply-demand balance, for further discussion.	On track		The 2014 annual evaluation identified significant impacts for water supply system yield, and hence for the timings for supply augmentation and major review of the LHWP, due to the proposed amendments to introduce new cease-to-pump conditions. An interagency group with representatives from MWD, NOW, Hunter Water and OEH undertook a comprehensive review and recommended an alternate path forward. This was a holding pattern for five years to allow a decision to consider outcomes of ecological research and so that the broader costs and benefits could be evaluated in the analysis for the next LHWP. The recommendations were supported by NOW and the North Coast Interagency Regional Panel in June 2015. Revisions to the draft WSP are being finalised by NOW (now DPI Water), and public exhibition is planned for later in 2015.
	Investigate feasibility of Lower Hunter Alluvial for drought supply	HWC	Jun-16	25	On track		A project delivery timeline was developed in consultation with MWD and NOW, and initial investigations commenced. The project has since been placed on hold in order to focus resources on drought readiness activities for temporary desalination due to low water storage levels. The feasibility investigations may still be completed on time, subject to adequate water storage levels over the remaining period.	On track	$40,000 (Estimated cost of initial field investigations) $71,000 (HWC internal)	Initial field investigations are underway. The purpose of the initial investigations is to characterise groundwater quality in the paleochannel thought to exist north of Morpeth Bridge. The inferred paleochannel path is based on a conceptual cross section from Roy & Boyd (1996) and RMS bores adjacent to Morpeth bridge. The preferred location for an intial test bore was identified based on this existing information. A test bore was constructed in September 2015, however the paleochannel was not encountered. Hunter Water has modified the program and will now engage a consultant to undertake Electrical Resistivity Imaging to identify a suitable location for a second test bore. An updated project flowchart is provided in Appendix C. of the MERI evaluation report.
	Watching brief on use of water from underground mines	MWD	Plan review	25	On track		Ongoing	On track		The new water treatment plant at Newstan Mine can treat up to 14ML/day for reuse or discharge into the environment, with the mine currently using ~3ML/day onsite). The plant design provides for future addition of RO if needed. Centennial Coal and GHD have provided MWD with a report with further information on: Water quality data for the raw and treated water; Information on the mine's operating future and longer-term obligations regarding water pumping, treatment and discharge; GHD's hydrology (water balance) modelling and any related information. MWD and HWC will review the report and meet with Centennial Coal to seek further information. HWC will consider the feasibility of this option based on the new information.
Water efficiency	Continue existing water efficiency programs	HWC	Ongoing	28-32	On track	2013-14 actual expenditure: $2,650,140	Refer to HWC Compliance and Performance Report 2013-14, Section 6.6 Conserve water supplies by ensuring efficient water use.	On track	$2,313,000 (actual external expenditure) $387,000 (HWC internal cost for water efficiency) $86,000 (HWC internal cost for loss management)	Refer to HWC Compliance and Performance Report 2014-15, Section 6.6 Conserve water supplies by ensuring efficient water use.
	Expand programs for household and business water efficiency and water loss minimisation in drought	HWC	If triggered	34-35			Not triggered.			Not triggered.
Demand management	Introduce Water Wise Rules	HWC	1-Jul-14	37	Complete	2013-14 actual expenditure: $262,940	Water Wise Rules were introduced on 1 July 2014. LHWP modelling assumed $318,000 initial cost	Complete	$152,000 $21,000 (HWC internal)	Water Wise Rules were introduced on 1 July 2014. The marketing campaign promoting Water Wise Rules continued throughout 2014-15 following the commencement of the rules. LHWP assumed $120,000 per year cost to implement
	Watching brief on pricing issues	MWD	Ongoing	43	On track		Ongoing			IPART is currently conducting its periodic review of Hunter Water's prices. Key issues for consideration include: wholesale water pricing, which may impact the recycled water market; cost passthrough mechanisms for drought response; incentive mechanisms such as a weighted average price cap, which may lead to differential pricing of water services; and whether usage prices should continue to be based on LRMC.
	Apply water restrictions in drought	HWC	If triggered	40			Not triggered.			Not triggered.

Recycled water	Proceed with dual reticulation schemes at Chisholm and Gillieston Heights as development proceeds.	HWC	2018/19	48	On track		Recycled water servicing options assessments for each scheme are scheduled to be completed in 2014/15, with concept designs to be completed in 2015/16.	On track		Recycled water servicing options assessments are nearing completion, with concept designs to commence in 2015-16. Following preparation of the water demand forecast in 2012 that was used to develop the Lower Hunter Water Plan, the number of customers in the two proposed dual reticulation schemes at Chisholm and Gillieston Heights was reduced in 2013 due to a lack of support from developers. The number of customers to be supplied with recycled water is limited to residential lots that already have dual reticulation pipes installed. There is no provision to supply additional customers with recycled water. This will reduce the number of recycled water customers within these schemes from 7,600 to approximate 1,100 residential homes. Customers not supplied with recycled water are still required to meet the minimum BASIX water saving targets. They would typically achieve this by installing a rainwater tank for internal and external water uses. It is estimated that the water savings provided from a dual reticlation scheme are about 50 KL/annum compared to 40 KL/annum from rainwater tanks. The overall impact on water demand from the reduced number of recycled water customers is expected to be small, at between 0.05 and 0.1 GL/annum. The revised dual reticulation schemes were incorporated into the 2013 water demand forecast, and incorporated into the Lower Hunter Water Plan released in April 2014.
	Complete the Kooragang Recycled Water Scheme and assess future expansion opportunities.	HWC	Dec 2014 / ongoing	48	On track	Total expenditure to date: $67M	Commissioning phase of KRWS is underway and on track for completion in December 2014.	Complete	$71.2M	The Kooragang Recycled Water Scheme was commissioned in November 2014. The plant has an installed capacity of 9 ML/day, and is currently supplying an average of 5.2 ML/day to Orica. The plant can also be upgraded to 12 ML/day to supply other industrial customers if required. HWC has not identified other customers for recycled water and advised that no further work has progressed on this part of the action. Hunter Water resolved in September 2015 to explore the sale of KRWS, which includes the existing long term contract with Orica for the supply of up to 9 ML/day. The sale of KRWS is not expected to affect the long term water savings locked in by the Orica contract.
	Watching brief on private sector involvement in providing water supply and/or wastewater services	MWD	Ongoing	49	On track		Network operator's licence 14/026 granted under the WIC Act for Wyee on 18 June 2014. Applications for Catherine Hill Bay and Huntlee developments pending decision.	On track		Network operator's licence 15/030 granted under the WIC Act for Huntlee on 3 March 2015. Applications for Catherine Hill Bay and Cooranbong developments pending decision. IPART Issues Paper for its price determination is examining wholesale water pricing, which may impact private sector investment. IPART has also flagged that it may consider a review of developer charges, which may also have implications for investment.
Rainwater and stormwater use	Trial with Lake Macquarie City Council to better understand rainwater tank failures and educate participants	HWC	Jun-14	52	Delayed	2013-14 actual expenditure: $20,400	191 properties in Cameron Park and Fletcher were recruited. Audits on all properties have been completed. Preliminary findings from online survey include: • 75% of rainwater tanks functioning correctly. • All of those who have a problem stated that they are planning to or have already done something about the problem. • 80% of participants think the program was worthwhile or very beneficial. Overall comments on the program have been positive. Full analysis of the audit results is expected by the end of 2014.	Complete	$34,250	191 properties in Cameron Park and Fletcher were recruited as part of the study, which is now complete. Key findings include: - data indicated an overall failure rate of 34% (including current and previous failures) - half of households with a failed system thought it was working - age of tank, pump and switching device were all significantly associated with failure - 23% of tanks were found to be underperforming - BASIX requirements was the sole reason for installation for the great majority of householders - overall low level of consumer knowledge and awareness about system O&M requirements.
	Liaise with councils to encourage potential stormwater harvesting schemes.	HWC	Ongoing	55	On track		Letter from MWD and copy of LHWP included as part of combined package of information sent to Councils by HWC in May 2014. The package included relevant extracts from the stormwater harvesting opportunities report prepared by SKM as part of the LHWP for their consideration.	On track		Newcastle City Council sought Hunter Water's support in July 2015 for a stormwater harvesting proposal at Civic Park in Newcastle. The proposal comprises underground stormwater storage and reuse for park irrigation, and if successful, would result in potable substitution. A letter of support was provided to Council.
		MWD	Ongoing	55	On track		See above			

Rainwater and stormwater use	Consider stormwater harvesting as part of large customer water efficiency initiatives	HWC	Ongoing	55	On track	2013-14 actual expenditure on major customer water audits: $122,900	Large customer water audits continue to be undertaken by HWC. Investigation of alternative water sources are included in the audits. HWC is currently investigating a stormwater harvesting opportunity for Merewether Golf Club.	On track	2014-15 actual expenditure on major customer water audits: $79,166 2014-15 actual expenditure on Hunter Business Water Savers Program: $39,044	Merewether Golf Club At the request of Merewether Golf Club, Hunter Water put together a scope and tender package for a stormwater harvesting feasibility study for the Club. The scope adopted for the project includes identification of harvesting opportunities through to treatment requirements and usage. The study will be undertaken in two stages, starting with identification of stormwater reuse opportunities, and then assessing the feasibility of reuse options. Tenders were received and assessed, and the tender awarded. Merewether Golf Club are awaiting funding to complete the study. Hunter Stadium As part of the large customer audit completed at Hunter Stadium, a stormwater harvesting feasibility study was undertaken. The study identified capture of stormwater from the field profile and roof areas on the site for reuse with minor treatment through the existing irrigation system. Modelling of water yield and quality indicates that natural dilution of the system would be sufficient to maintain appropriate water quality for irrigation, with some minor regular dilution with potable water to provide a factor of safety. This project will be completed in 2015/16.
Temporary desalination	Drought 'readiness activities' (including site selection, technical and environmental investigations, review of procurement options)	HWC	Dec-15	60-61	On track		Drought readiness activities are in progress. Water distribution system modelling has been undertaken for shortlisted sites and site selection is scheduled to be finalised in November 2014. Technical information on desalination has been obtained from Central Coast which will assist in delivering HWC's readiness activities.	Delayed	$14,000 $165,000 (HWC internal)	Investigations have revealed that it is likely that temporary desalination will be declared to be State Significant Infrastructure, making the Minister for Planning the approval authority and requiring the preparation of an Environmental Impact Statement. This requirement differs significantly from the project assumptions made as part of the LHWP, increasing cost and timing. Given this, HWC suggests it is likely to be more cost-effective for the desalination plant to be constructed (if needed) on a single site. Planning advice sought by Hunter Water recommends reducing the shortlisted sites to a single preferred site before commencing the statutory environmental assessment and approvals process. Hunter Water is currently developing a revised project plan based on the required approvals process. This includes: - an assessment of costs and benefits associated with increasing plant scale - updated source water and economic modelling to compare original LHWP modelling with updated costs and plant scale options - site selection methodology - a review of statutory planning requirements - a review of delivery options It is anticipated that planning approval will need to be sought as part of the drought 'readiness activities' in order to meet the LHWP storage level triggers for design and delivery of temporary desalination. This significantly changes the scope and timing of the readiness activities.
	Water quality monitoring program for preferred sites	HWC	TBD[1]	60	On track		The scope and timing of the water quality monitoring program will be determined after finalising the site selection.	Delayed		See above.
	Activate temporary desalination as a contingency measure in drought	HWC	If triggered	60			Not triggered.			Not triggered.
	Watching brief on improvements in desalination technology	HWC	Ongoing	61	On track		HWC will be liaising with suppliers and reviewing desalination technology options as part of the readiness activities currently underway.	On track		Hunter Water will be reviewing desalination technology options as part of the concept design and approvals process for temporary desalination.
	Liaison with Central Coast regarding desalination as a contingency drought measure	MWD	Ongoing	61	On track		Ongoing	On track		Liaison with the Central Coast is continuing, sharing information and experience.

1. *Subject to the outcome of site selection studies (NB: Refer to HW2010-2060/26/27.001 for action details)*

Appendix B Preferred pipeline routes for inter-regional transfers

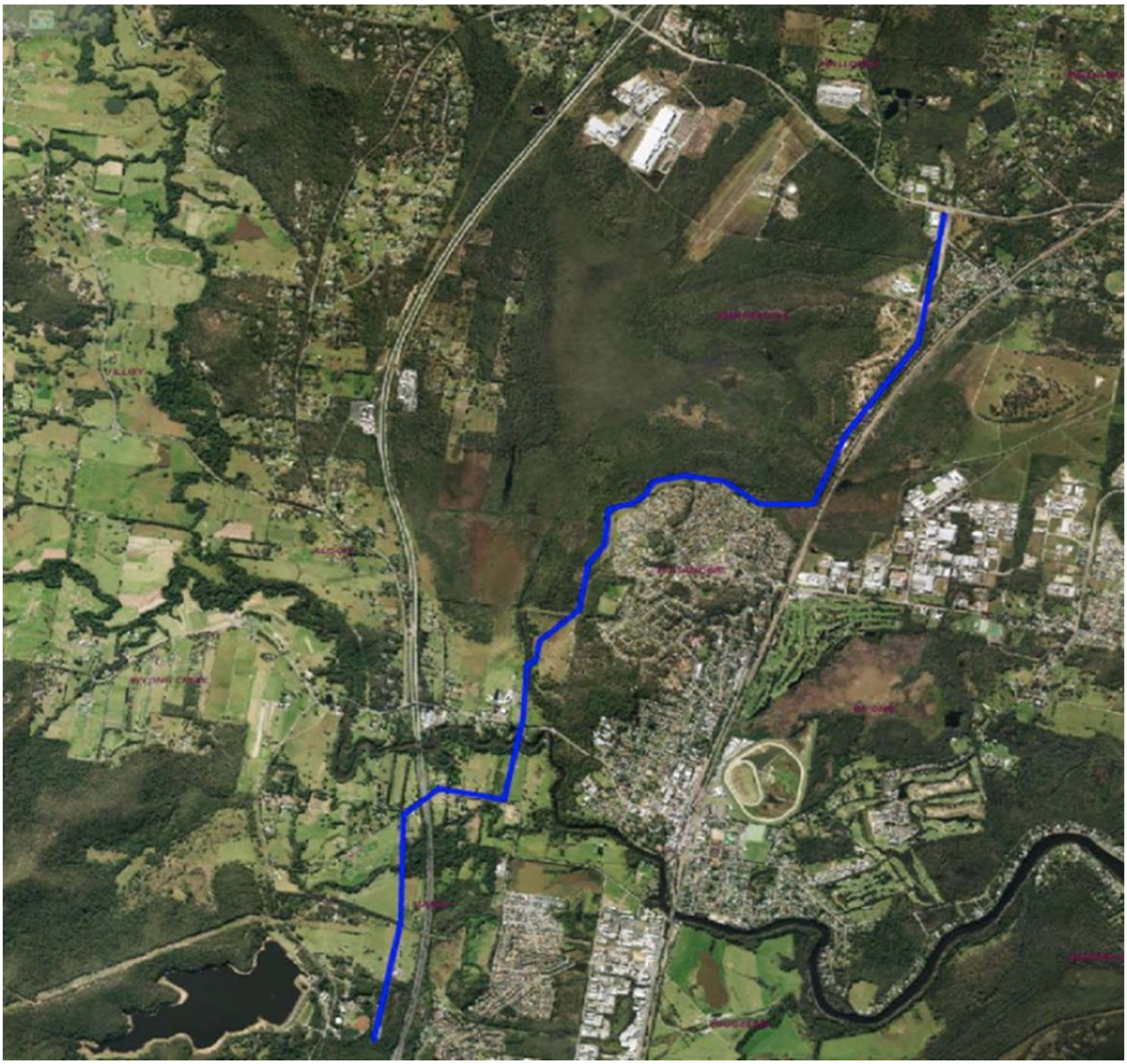


Figure B1: Wyong Water's pipeline route for increasing transfers between the two regions

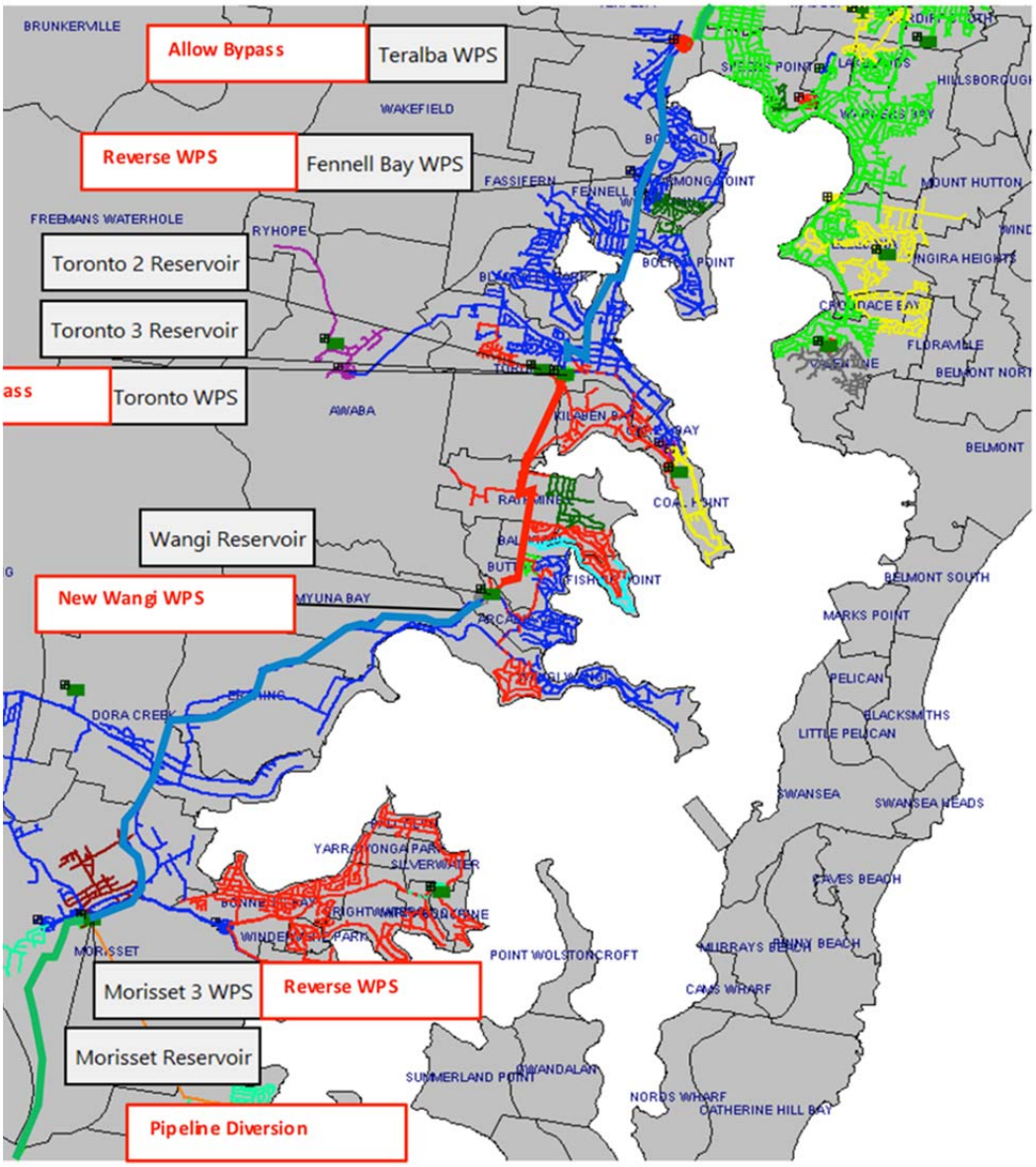
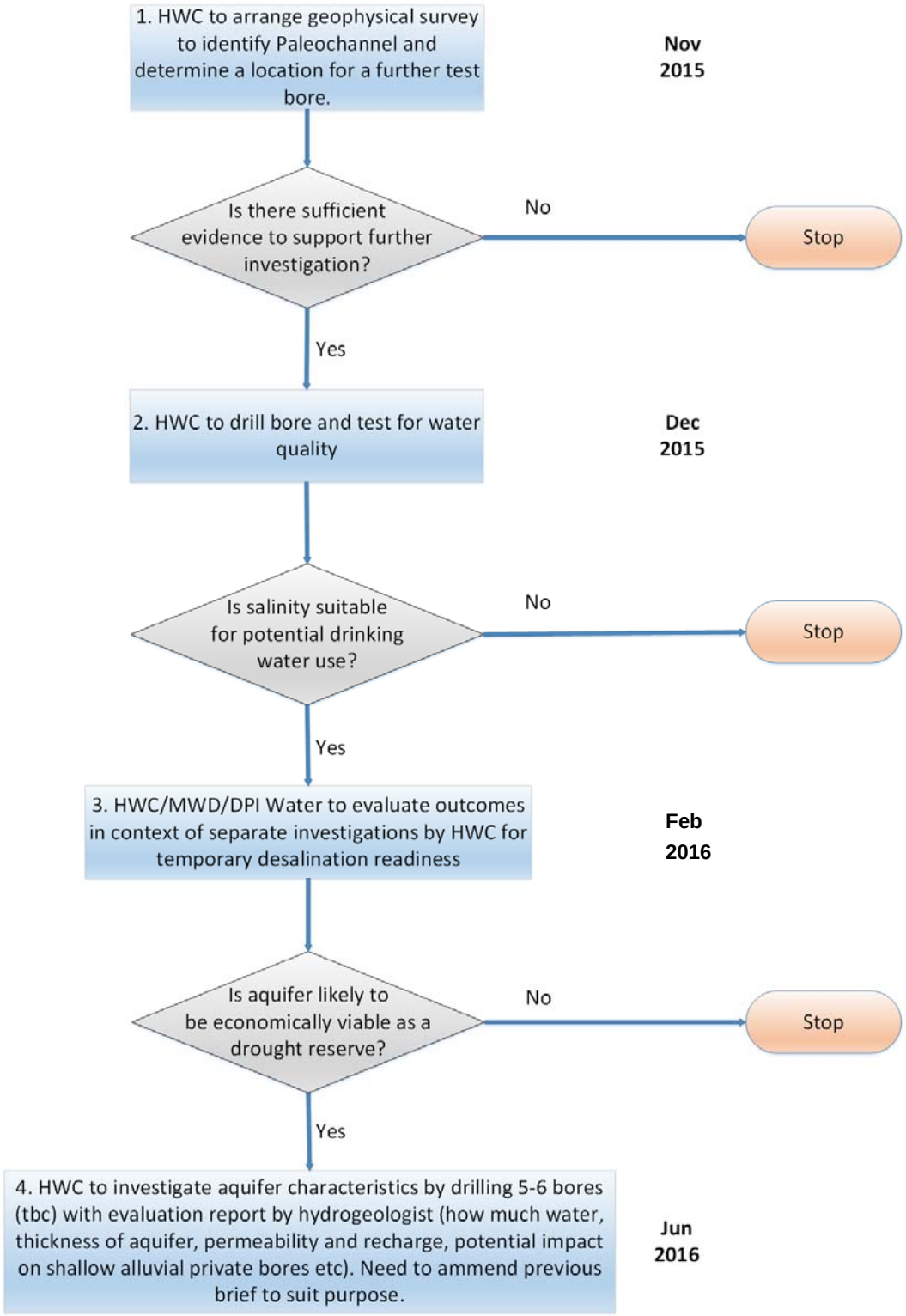


Figure B2: Hunter Water's preferred pipeline route for increasing interregional transfers

Appendix C Flowchart for Lower Hunter Alluvial groundwater source investigations



Appendix D Supplementary information for temporary desalination readiness

Table D1: Cost Risk modelling results of new assumptions for temporary desalination

		LHWP COST	UPDATED COST		
		9ML/d	9ML/d	15ML/d	30ML/d
Present value cost to implement portfolio	Maximum	$86m	$96m	$115m	$157m
	Mean	$12m	$14m	$15m	$16m
Risk of storage reaching 10% (1 in x years)		88,000	88,000	98,000	118,000

1 PORTFOLIO INCLUDES DEMAND MANAGEMENT, CENTRAL COAST TRANSFERS AND TEMPORARY DESALINATION

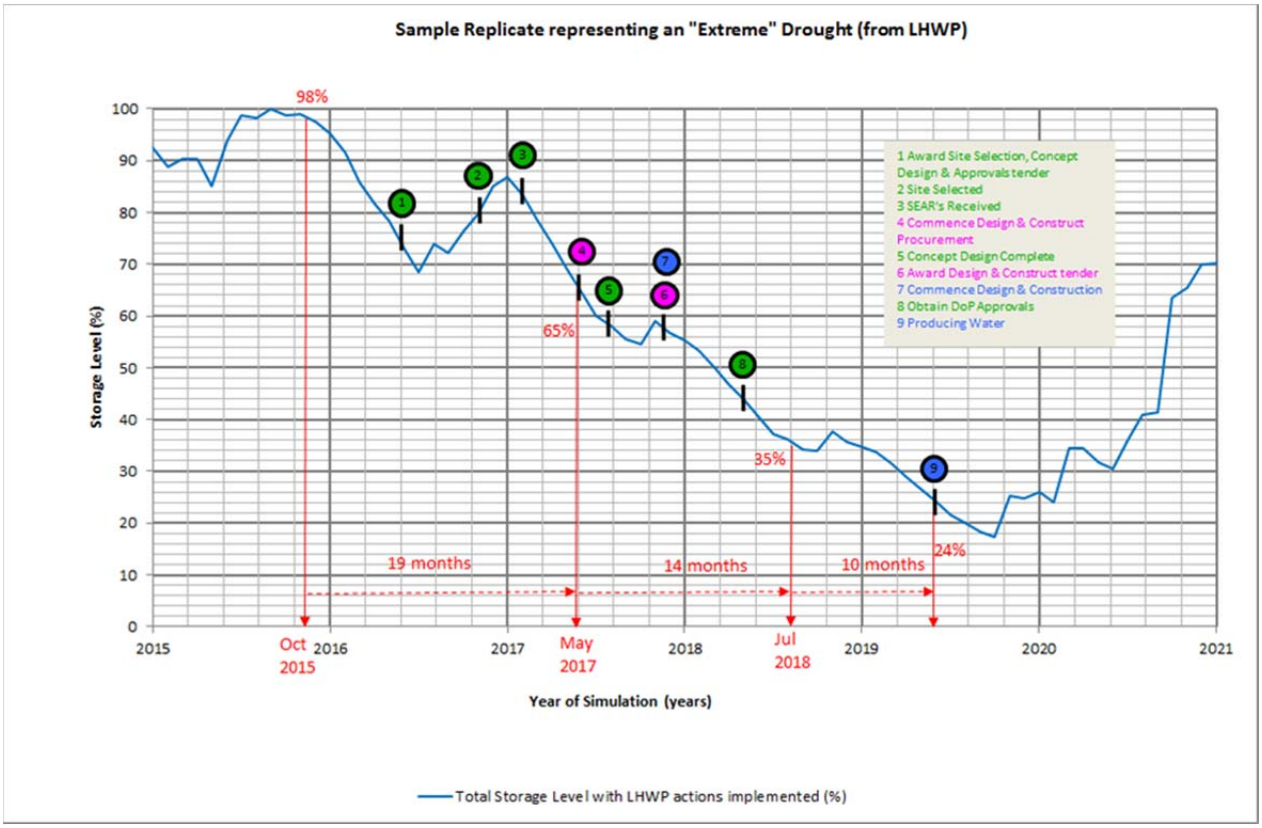


Figure D1: Updated timeline for temporary desalination readiness for design drought scenario