

# **Sydney Water Corporation OperaticbU Audit 2011/12**

Report to the Minister

**Water — Compliance Report**  
December 2012



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## Executive Summary

The Independent Pricing and Regulatory Tribunal of New South Wales (IPART) has audited Sydney Water Corporation's (Sydney Water) compliance with the requirements of its 2010 – 2015 operating licence (the licence).

The audit reviewed performance in the period from 1 July 2011 to 30 June 2012. The audit was carried out according to our Audit Guideline.<sup>1</sup> IPART engaged GHD Pty Ltd (GHD) to assist with the audit.

Using our risk-based scope, all requirements under the licence will be audited at least once over the licence period, 2010 to 2015. The areas audited in 2012 were water quality, infrastructure performance and water conservation.

We endorse the findings of the auditor for the 2012 audit. A copy of the auditor's report is in Appendix A.

Because we have undertaken a risk-based audit, Sydney Water's compliance with some clauses of the licence has not been audited this year. Sydney Water has certified that they complied during 2011/12 with the clauses that have not been audited in 2012.

### Overview of audit findings

Sydney Water has demonstrated that it continues to manage its resources and operations to an excellent standard. The auditor, GHD, awarded full compliance for all clauses audited this year.

In summary, this 2011/12 audit found that Sydney Water achieved:

- ▼ full compliance with requirements relating to water quality
- ▼ full compliance with requirements relating to infrastructure performance (including managing assets consistently with the asset management framework)
- ▼ full compliance with requirements relating to water conservation including meeting all of the water leakage standards.

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<sup>1</sup> IPART, *Audit Guideline – Public Water Utilities*, May 2012. This Audit Guideline is on our website ([www.ipart.nsw.gov.au](http://www.ipart.nsw.gov.au)).

Sydney Water's compliance is illustrated in the following table.

**Table 1 Sydney Water's compliance in 2011/12, the second year of its 2010-2015 operating licence**

Licence Clause	Number of auditable requirements <sup>a</sup>	Compliance grade awarded		
		Full	High	Adequate
Part 2 – Water Quality	10	10		
Part 3 – Infrastructure Performance	1	1		
Part 7 – Water Conservation	3	3		
<b>Total</b>	<b>14</b>	<b>14</b>		

<sup>a</sup> The 14 licence requirements audited this year were determined by IPART and advised to Sydney Water in letter of 21 May 2012. Clause 2.1(c) of the licence is not required to be audited until 2014.

**Source:** IPART, letter of 21 May 2012 to Sydney Water re 2011/12 AUDIT SCOPES.

**Source:** GHD, *Independent Pricing and Regulatory Tribunal Operational Audit of Sydney Water Corporation*, November 2012.

Further, Sydney Water has fully addressed all of the auditor's recommendations from the previous 2010/11 audit.

## IPART's Recommendations

Since full compliance has been awarded, we agree with the auditor that there are no audit recommendations to be made this year.<sup>2</sup>

However, the auditor has identified 20 opportunities for improvement<sup>3</sup> where Sydney Water could consider changing its processes and procedures to further enhance its operations. The opportunities are discussed in detail in the auditor's report (see Appendix A).

We will request Sydney Water to consider the prudence and efficiency of implementing such opportunities.

<sup>2</sup> Where full compliance is awarded, our Audit Guidelines state that an auditor should not make recommendations.

<sup>3</sup> These are suggestions by the auditors that may further improve procedures and practices. The utility can decide whether to implement such opportunities, based on their own assessment. We expect the pricing implications of continued improvement and value for money to the customer should be considered in determining whether to implement such opportunities.



# 1 Introduction and scope

Sydney Water is a State Owned Corporation (SOC) wholly owned by the NSW Government. Its primary role is to manage potable water supply and wastewater systems to protect public health and the environment in Sydney, Illawarra and the Blue Mountains. These roles and responsibilities, as well as Sydney Water's objectives, are prescribed by the *State Owned Corporations Act 1989*, the *Sydney Water Act 1994* (the Act) and the operating licence issued to Sydney Water under Part 5 of the Act.

We conduct annual audits to monitor Sydney Water's compliance with its licence requirements. We use a risk-based approach for auditing. We assess the risk associated with non-compliance with a licence requirement to determine the audit frequency necessary for that requirement. We audit those clauses that we consider to be a 'high risk' more frequently. Higher risk clauses include those dealing with water quality, infrastructure and water conservation. We consider other clauses, such as those dealing with customer contracts, to be low risk. Therefore these clauses are audited less frequently.

Adopting the risk-based approach has improved the effectiveness and efficiency of the auditing process without increasing risks to the community. The approach allows audit resources to be targeted to areas of higher risk. It also reduces the overall burden of compliance for the utility.

We audit all requirements of the operating licence at least once during the 5-year term of the licence. The 2011/12 audit is the second audit of compliance with the 2010-2015 licence. Not all of the licence requirements were required to be audited this year.

## 1.1 Purpose and structure of this report

The purpose of this report is to inform the Minister for Finance and Services of Sydney Water's performance against its audited licence requirements in 2011/12. The report also discusses suggestions for Sydney Water to improve its performance:

- ▼ Chapter 1 explains the scope of the audit review, and the process followed in undertaking the audit.
- ▼ Chapter 2 presents a summary of the audit findings and recommendations.

- ▼ Chapter 3 summarises the progress by Sydney Water to address and implement recommendations from the previous 2010/11 audit.

## 1.2 Audit scope

This audit covered the period from 1 July 2011 to 30 June 2012. The 2011/12 audit scope required the auditor to review the following parts of Sydney Water's operating licence:

- ▼ Water Quality (Part 2) – requirements relating to planning, monitoring, reporting, incident management, and wastewater and water recycling operations.
- ▼ Infrastructure Performance (Part 3) – asset management requirements, and compliance with Sydney Water's asset management framework.
- ▼ Water Conservation (Part 7) – requirements relating to the calculation and management of water leakage from Sydney Water's drinking water system.<sup>4</sup>

## 1.3 The audit process

We engaged GHD Pty Ltd to assist with the 2011/12 audit of Sydney Water. The auditor was required to undertake the following tasks, in accordance with our *Audit Guideline for Public Water Utilities*.

1. Prepare an information request (questionnaire) for Sydney Water setting out all information requirements prior to the audit interviews.
2. Assess the level of compliance achieved by Sydney Water against each of the requirements of the licence set out in IPART's risk-based audit scope, providing supporting evidence for this assessment and reporting compliance according to IPART's established compliance scoring methodology.
3. Assess and report on progress by Sydney Water in addressing any comments made by the relevant Minister and/or recommendations endorsed by IPART pertaining to previous audits, providing supporting evidence for these assessments.
4. Provide drafts of the audit report to IPART and seek and address comments from Sydney Water and IPART regarding the draft audit findings.
5. Prepare a final report on the findings of the audit.<sup>5</sup>

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<sup>4</sup> IPART set the Audit Scope and advised Sydney Water in letter of 21 May 2012 (IPART, letter of 21 May 2012 to Sydney Water re 2011/12 AUDIT SCOPES). We have distributed the audit requirements over the 5-year licence period (ie, 2010-2015). All of the licence requirements will be addressed at least once during the licence period.

<sup>5</sup> IPART, *Audit Guideline – Public Water Utilities, Water*, May 2012. This Audit Guideline is on our website ([www.ipart.nsw.gov.au](http://www.ipart.nsw.gov.au)).

Under our Audit Guideline, auditors can either make recommendations or suggest opportunities for improvement. Where we support an auditor's recommendation we follow-up the matter to ensure that it is addressed. Where auditors have suggested opportunities for improvement we take a different approach, particularly if it relates to an area where full compliance of the licence requirement has been awarded.

The utility can decide whether to implement an opportunity, based on their own assessment of whether the improvement is a prudent and efficient way to achieve its outcomes. We take this approach to balance performance and the investment required to improve it. That is, we want to consider the pricing implications of continued improvement and value to money to the customer before recommending that the utility implement further improvement.

We held an inception meeting for the audit on 8 October 2012, with GHD and Sydney Water, at Sydney Water's head office at Parramatta. At this meeting, we established the following:

- ▼ a mutual understanding and expectation of the audit requirements
- ▼ the protocols and timescale for the audit.

All parties adhered to the agreed protocols throughout the audit.

The audit commenced at the conclusion of the inception meeting. Further, on 9 October 2012, we audited Sydney Water's operations at 2 of its treatment plants, including the Wollongong Water Recycling Plant and Woronora Water Filtration Plant.

Throughout the course of the interviews, the auditors adopted a methodology consistent with our Audit Guideline. The Audit Guideline requires auditors to use a systematic approach to define the requirements of the audit. Further, the audit must be conducted to an established and recognised standard.<sup>6</sup>

The auditor has assessed Sydney Water's compliance with its operating licence according to the compliance grades outlined in our Audit Guideline, and in chapter 1 of the auditor's report (see Appendix A).

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<sup>6</sup> GHD adopted an audit methodology consistent with ISO 14011. The Audit Guideline does not prescribe a standard for the auditor to adopt. The Auditor must decide on a suitable approach to adequately plan the audits, interpret licence conditions, collect audit evidence, objectively assess the evidence, and report in a clear and accurate manner.

## 2 Overview of audit findings and recommendations

This section is a summary of the auditor's findings and recommendations for each of the audited clauses and sub-clauses of the operating licence.

For each of the clauses we have included a table comparing Sydney Water's performance in audits since the commencement of its current licence in 2010 (currently 2010/11 only).

Sydney Water has provided us with a statement of compliance for 2011/12, signed by the Managing Director and the Chairman (see Appendix B). This states that "there are no exceptions to report by Sydney Water for the 2010-2015 Operating Licence in 2011-12".

### 2.1 Water quality

Sydney Water has achieved full compliance with all of the audited sub-clauses for water quality.

Part 2 of Sydney Water's operating licence outlines the requirements for managing water quality. It includes requirements for planning, monitoring, reporting, and incident management, in line with the Australian Drinking Water Guidelines (ADWG). Part 2 also includes requirements for water recycling.

Under our risk-based auditing framework, we consider this part of the licence to be one that poses a high risk in terms of the likelihood and consequence of non-compliance with licence requirements.

The auditor found that Sydney Water has continued to deliver drinking water of an excellent standard to its customers. Sydney Water has complied with the health requirements of the current Australian Drinking Water Guidelines (ADWG 2004 and 2011). It has also complied with the aesthetic requirements specified by NSW Health and the Minister.<sup>7</sup>

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<sup>7</sup> For further details on the ADWG's, NSW Health's and Minister's requirements, and the actions taken by Sydney Water to address them, see Appendix A (GHD, *Independent Pricing and Regulatory Tribunal Operational Audit of Sydney Water Corporation*, November 2012, pp 28-43).

The auditor also found that Sydney Water has complied with the requirements for the supply of recycled water that were agreed with NSW Health. Sydney Water has met the requirements of the Australian Guidelines for Water Recycling (AGWR): Managing Health and Environmental Risks (Phase 1) 2006 (NRMMC, EPHC, AHMC).<sup>8</sup>

Sydney Water has addressed matters raised in the previous audit concerning the integrity of drinking water storages. The 2010/11 audit noted deficiencies in physical barriers against vermin ingress in the drinking water storage reservoirs. Sydney Water has developed a priority remediation program for inspecting and assessing reservoirs. The program also includes any actions necessary to maintain the quality of the stored drinking water.

Further, Sydney Water has addressed matters associated with completion and endorsement of its recycled water quality management plans (RWQMPs). The RWQMPs have been submitted to NSW Health, which has indicated that endorsement of the RWQMPs is imminent.

**Table 2.1 Water Quality compliance grades awarded for Sydney Water's Operating Licence 2010-2015**

Clause	Requirement	Compliance Grading				
		2010/11 <sup>a</sup>	2011/12 <sup>b</sup>	2012/13	2013/14	2014/15
2	Water quality					
2.1	Drinking water	High-Full	Full			
2.2	Recycled water (including stormwater)	Full	Full			
2.3	Changes to management of water quality	Full	Full			

<sup>a</sup> 2010/11 compliance grades awarded to Sydney Water.

<sup>b</sup> 2011/12 compliance grades awarded to Sydney Water.

**Source:** IPART, *Sydney Water Corporation Operational Audit 2010/11, Report to the Minister*, November 2011.

**Source:** GHD, *Independent Pricing and Regulatory Tribunal Operational Audit of Sydney Water Corporation*, November 2012.

The auditor has not made any recommendations for this part of the licence, as Sydney Water has achieved full compliance. We agree with this finding. To help Sydney Water maintain its full compliance, the auditor has noted 9 opportunities where it may be able to further improve its operations. For full details on these opportunities for improvement, see the auditor's report in Appendix A.

We will request Sydney Water to consider the prudence and efficiency of implementing such opportunities.

<sup>8</sup> For further details on the AGWR's and NSW Health's requirements, and the actions taken by Sydney Water to address them, see Appendix A (GHD, *Independent Pricing and Regulatory Tribunal Operational Audit of Sydney Water Corporation*, November 2012, pp 57-62).

## 2.2 Infrastructure Performance

Sydney Water has achieved full compliance with the audited sub-clause for Infrastructure Performance.

Part 3 of the licence outlines the asset management framework, as well as system performance standards (for water continuity, water pressure and sewage overflows) and the Priority Sewage Program. Under the risk-based auditing framework, we consider this part of the licence to be one that poses a high risk in terms of the likelihood and consequence of non-compliance.

The auditor found that Sydney Water has demonstrated high standards of asset management, which has enabled Sydney Water to provide services of an excellent standard to its customers.

Sydney Water has managed its assets under the asset management framework described in clause 3.1.2 of its operating licence. As evidence of this, Sydney Water has presented a comprehensive suite of plans, strategies and controlled documents covering all classes of assets.

**Table 2.2 Infrastructure Performance compliance grades awarded for Sydney Water's Operating Licence 2010-2015**

Clause	Requirement	Compliance Grading				
		2010/11 <sup>a</sup>	2011/12 <sup>b</sup>	2012/13	2013/14	2014/15
<b>3</b>	<b>Infrastructure performance</b>					
3.1.1	Asset management requirement – Managing assets	Full	Full			

<sup>a</sup> 2010/11 compliance grades awarded to Sydney Water.

<sup>b</sup> 2011/12 compliance grades awarded to Sydney Water.

**Source:** IPART, *Sydney Water Corporation Operational Audit 2010/11, Report to the Minister*, November 2011.

**Source:** GHD, *Independent Pricing and Regulatory Tribunal Operational Audit of Sydney Water Corporation*, November 2012.

We agree with the auditor that there are no recommendations to be made for this part of the licence. The auditor has noted 6 opportunities where it may be able to improve its operations. The auditor's suggestions relate to improving Sydney Water's asset management and internal processes (for further details, see the auditor's report in Appendix A).

We will request Sydney Water to consider the prudence and efficiency of implementing such opportunities.

## 2.3 Water conservation

Sydney Water has achieved full compliance with the audited sub-clauses for water conservation.

Part 7 of the licence details a specified water usage level and outlines Sydney Water's requirements for reporting on initiatives to promote water conservation activities. We consider non-compliance with elements of this part of the licence would constitute a moderate risk in terms of meeting the water needs of Sydney Water's customers.

The auditor found that Sydney Water has shown an ongoing commitment to water conservation and providing value for money to its customers. As part of its Leakage Management Strategy, Sydney Water has implemented a number of water loss management and renewals programs. These programs have been successful in limiting the water leakage reported to within the acceptable limits.<sup>9</sup>

**Table 2.3 Water Conservation compliance grades awarded for Sydney Water's Operating Licence 2010-2015**

Clause	Requirement	Compliance Grading				
		2010/11 <sup>a</sup>	2011/12 <sup>b</sup>	2012/13	2013/14	2014/15
7	Water conservation					
7.2	Water leakage	Full	Full			

<sup>a</sup> 2010/11 compliance grades awarded to Sydney Water.

<sup>b</sup> 2011/12 compliance grades awarded to Sydney Water.

**Source:** IPART, *Sydney Water Corporation Operational Audit 2010/11, Report to the Minister*, November 2011.

**Source:** GHD, *Independent Pricing and Regulatory Tribunal Operational Audit of Sydney Water Corporation*, November 2012.

We agree with the auditor that there are no recommendations to be made for this part of the licence. The auditor has noted 5 opportunities where it may be able to improve its operations. The auditor's suggestions relate to improving Sydney Water's asset management and internal processes (for further details, see the auditor's report in Appendix A).

We will request Sydney Water to consider the prudence and efficiency of implementing such opportunities.

<sup>9</sup> Clause 7.2(a) of Sydney Water's operating licence indicates that the level of water leakage from Sydney Water's drinking water supply must not exceed 105 ML/d with an agreed band of uncertainty of +/- 16 ML/d. In 2011/12, Sydney Water's reported water leakage was 115.4 ML/d, which is within the agreed band.

### 3 Progress on 2010/11 audit recommendations

The previous audit in 2011 identified licence areas where Sydney Water's performance was assessed as being less than fully compliant. It also noted areas where performance could be improved, though high grades of compliance were awarded. We made recommendations to address these issues. The following table outlines Sydney Water's progress in implementing these recommended actions.

**Table 3.1 Sydney Water's progress in 2011/12 to address IPART's recommendations from the 2010/11 audit**

	Recommendation <sup>a</sup>	Progress <sup>b</sup>
1	<p>Review the criteria used to define adequate integrity of storage tanks and reservoirs.</p> <p>This should be undertaken to ensure that there is no entry of vermin or birds and no unacceptable water ingress into these tanks. Sydney Water should then validate the inspection regimes and amend maintenance procedures to inspect and maintain tanks in the future to ensure the tanks meet the revised criteria.</p>	This recommendation has been fully addressed.
2	<p>Conduct an audit of the water reservoir tanks.</p> <p>This should be undertaken to identify tanks which do not have sufficient preventative measures.</p> <p>By 30 June 2012, establish a remediation timetable to rectify any faults found.</p>	This recommendation has been fully addressed.

<sup>a</sup> Recommendations to Sydney Water from 2010/11 operational audit.

<sup>b</sup> Sydney Water's progress in addressing recommendations from 2010/11 operational audit.

**Source:** IPART, *Sydney Water Corporation Operational Audit 2010/11, Report to the Minister*, November 2011.

**Source:** GHD, *Independent Pricing and Regulatory Tribunal Operational Audit of Sydney Water Corporation*, November 2012.





## Appendices



## A Operational Audit Report 2011/12 – Sydney Water Corporation





# **Independent Pricing and Regulatory Tribunal**

## Operational Audit of Sydney Water Corporation

November 2012



# Executive summary

## Introduction

GHD conducted a detailed audit of Sydney Water's compliance against nominated clauses of its Operating Licence for the 2011/12 year (ending 30 June 2012) on behalf of the Independent Pricing and Regulatory Tribunal of NSW (IPART).

IPART provided instructions on the nominated sections of Sydney Water's licence for audit (complete listing of the audit scope is at Appendix H – Audit Scope). IPART selected the clauses to be audited using its risk-based audit scope methodology (details of the risk-based methodology are in Audit Scope section of Chapter 1 – Introduction). The Mandatory Requirements of the previous Audit (R2.1 and R2.2 of 2010/11) were examined to determine if satisfactory progress had been made to address them. Secondary recommendations of the previous audit were also considered in focussing the audit scope for 2011/12.

A glossary and dictionary of terms used in this report is provided at Appendix A.

## Overall Performance

Sydney Water has managed its resources in 2011/12 to achieve Full Compliance with the Operating Licence, as shown below in Table ES - 1.

**Table ES - 1 Summary of Compliance**

Part	Compliance - Overall
2. Water Quality	Full compliance
3. Infrastructure Performance	Full compliance
7. Water Conservation	Full compliance

## Key Findings and Recommendations by Licence Part

There were no Key Recommendations identified against each Licence part audited. A number of Opportunities for Improvement have been developed. Sydney Water is encouraged to give due consideration to those recommendations and facilitate improved performance for subsequent audit periods.

### Water Quality – Part 2

Under the risk-based audit scope, all clauses in this part of the Operating Licence were subject to audit. Sydney Water achieved Full Compliance in meeting its licence requirements for the quality of water supplied during the audit period.

The drinking water supplied is of an excellent standard and complies with the requirements of NSW Health and the Australian Drinking Water Guidelines (ADWG) (2004) with work progressing to implement any changes required to meet the 2011 version of the ADWG. This has occurred across Sydney Water's area of operations including Build Own Operate (BOO) schemes. It is also being conducted in consultation with relevant stakeholders such as NSW Health and the Sydney Catchment Authority.

The recycled water supplied is of an excellent standard and complies with the requirements of the Australian Guidelines for Water Recycling (AGWR) (2006). Although not all Recycled Water Quality Management Plans have been fully signed off by NSW Health within the audit period, all Plans have been sufficiently developed and submitted for signing, which is likely to occur according to correspondence with NSW Health.

The Key Recommendations from the previous audit (R2.1 and R2.2 2010/11) have been adequately addressed and have demonstrated a strong process to ensure future completion, assuming the corporate risk method for assigning finances is not an impediment. We note that Sydney Water:

- 2.1.1 Reviewed the Water Quality Level of Service obligations for asset and maintenance management, and defined maximum tolerable hole sizes for water tanks that provided for vermin proofing, and a tolerance for the extent of direct runoff that may enter tanks through holes in roofs or other entry points.
  - 2.1.2 Established rules to minimise the presence of holes below the roofs of existing tanks thereby mitigating entry points for vermin and ingress of runoff, and in consideration of the anticipated design life and associated renewal of components.
  - 2.1.3 Conducted an audit of tanks, prior to 30 June 2012, and reported according to a risk-based framework any failures.
  - 2.1.4 Established a remediation timetable, prior to 30 June 2012, to rectify faults.
  - 2.1.5 Prior to 30 June 2012, amended maintenance strategies, procedures and associated work instructions, the asset management renewal/replacement strategy, training and competency for staff for inspection, maintenance and testing and operation and renewal/replacement for tanks to meet criteria.
- Recycled water                      Developed an agreed timetable with NSW Health, prior to 31 March 2012, for all recycled water schemes to be endorsed.

#### Water Quality Key Recommendations

There are no key recommendations relating to this Clause.

### ***Infrastructure Performance – Part 3***

Sydney Water has been assessed as having demonstrated Full Compliance with the requirements of this Part of the Licence. Sydney Water has demonstrated that its assets are managed consistently with the asset management framework described in clause 3.1.2.

#### Infrastructure Performance Key Recommendations

There are no key recommendations relating to this Clause.

### ***Water Conservation – Part 7***

Sydney Water has been assessed as having demonstrated Full Compliance with the requirements of this Part of the Licence. Sydney Water reported that leakage for 2011/12 was recorded as 115.4 ML/d. This was within the agreed band of uncertainty of 105 ML/d +/- 16 ML/day. Documentation provided confirmed this to be the outcome and that reporting to IPART had been carried out satisfactorily.

Up until the most recent two years leakage has maintained a downward and then steady trend, however it is noted from the past two years quarterly reporting that the leakage trend is rising from its low of 97 ML/d in 2009/10.

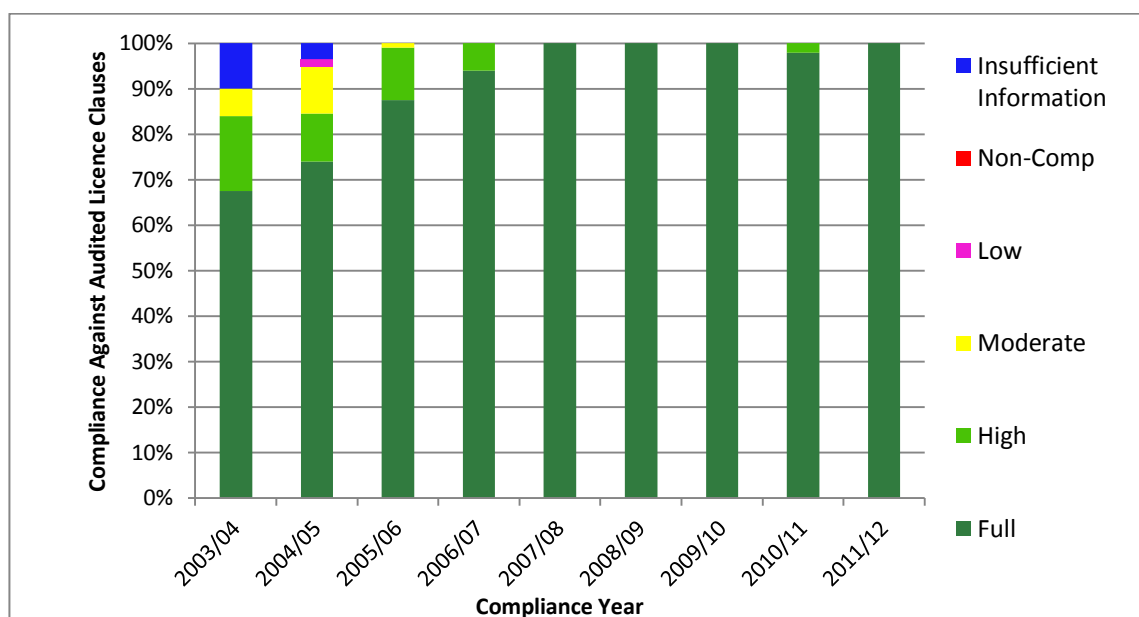
#### Water Conservation Key Recommendations

There are no key recommendations relating to this Clause.



## Comparison with Previous Year's Performance

Sydney Water's overall performance shows an improvement from the previous audit period, with Full Compliance achieved this audit period, as shown in Figure ES - 1.



**Figure ES - 1: Summary of Compliance**

Under IPART's risk-based audit scope methodology, the scope in a given year may be different to the scope in another year. Some clauses are audited every year, while others are audited less frequently. For this reason, care needs to be used to strictly compare performance over time. For years when relatively fewer clauses were audited (such as this current audit period 2011/12), the percentages of a particular audit compliance grade shown in Figure ES-1 will be higher than for years when more Licence clauses are included in the audit scope (such as the previous audit period 2010/11).

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*This report has been prepared by GHD for Independent Pricing and Regulatory Tribunal and may only be used and relied on by Independent Pricing and Regulatory Tribunal for the purpose agreed between GHD and the Independent Pricing and Regulatory Tribunal as set out in section 1 of this report.*

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*GHD has prepared this report on the basis of information provided by Sydney Water Corporation and others who provided information to GHD, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.*



## 1.2 Regulatory Structure

Sydney Water's water supply and wastewater service operations are regulated by various State Government agencies as outlined below:

- The NSW Government, which grants Sydney Water's Operating Licence under the *Sydney Water Act 1994*;
- The Independent Pricing and Regulatory Tribunal (IPART), which recommends the conditions of Sydney Water's Operating Licence to the NSW Government, conducts periodic audits of performance against the Operating Licence and establishes Sydney Water's prices for providing services;
- NSW Health, which regulates water quality in NSW via the Public Health Act. Sydney Water has entered into a Memorandum of Understanding with NSW Health to facilitate effective interaction on water quality management issues.
- The NSW Office of Water (NOW), which regulates water use in NSW.
- The Office of the Environment and Heritage (OEH), which regulates environmental matters in NSW.

## 1.3 Operating Licence

Sydney Water's first Operating Licence was issued in 1992 for a period of five years. The current licence was issued in 2010 and applies until 30 June 2015. The Operating Licence specifies the minimum standards of service or performance that must be met by Sydney Water in relation to its operations.

A copy of the licence is available from Sydney Water's website:

<http://www.sydneywater.com.au/Publications/LegislationActs/OperatingLicence.pdf>

Part 8 of the Licence provides that IPART (or its appointee) may undertake an Operational audit of Sydney Water's performance against the requirements of the Licence each year.

The performance of Sydney Water for 2011/12 was audited against the specific requirements of the Licence identified by IPART in its audit scope.

## 1.4 Audit Scope

IPART operates a risk-based approach to licence auditing. This approach matches the frequency of audit of each clause in the Licence to the level of risk (likelihood and consequence) of a potential breach of that clause. This report details Sydney Water's compliance with those clauses nominated by IPART as requiring independent auditing in 2011/12, as shown at Appendix H. The clauses subject to this audit are summarised in the table below.

**Table 1 Auditable clauses for the 2011/12 Operational Audit of Sydney Water Corporation**

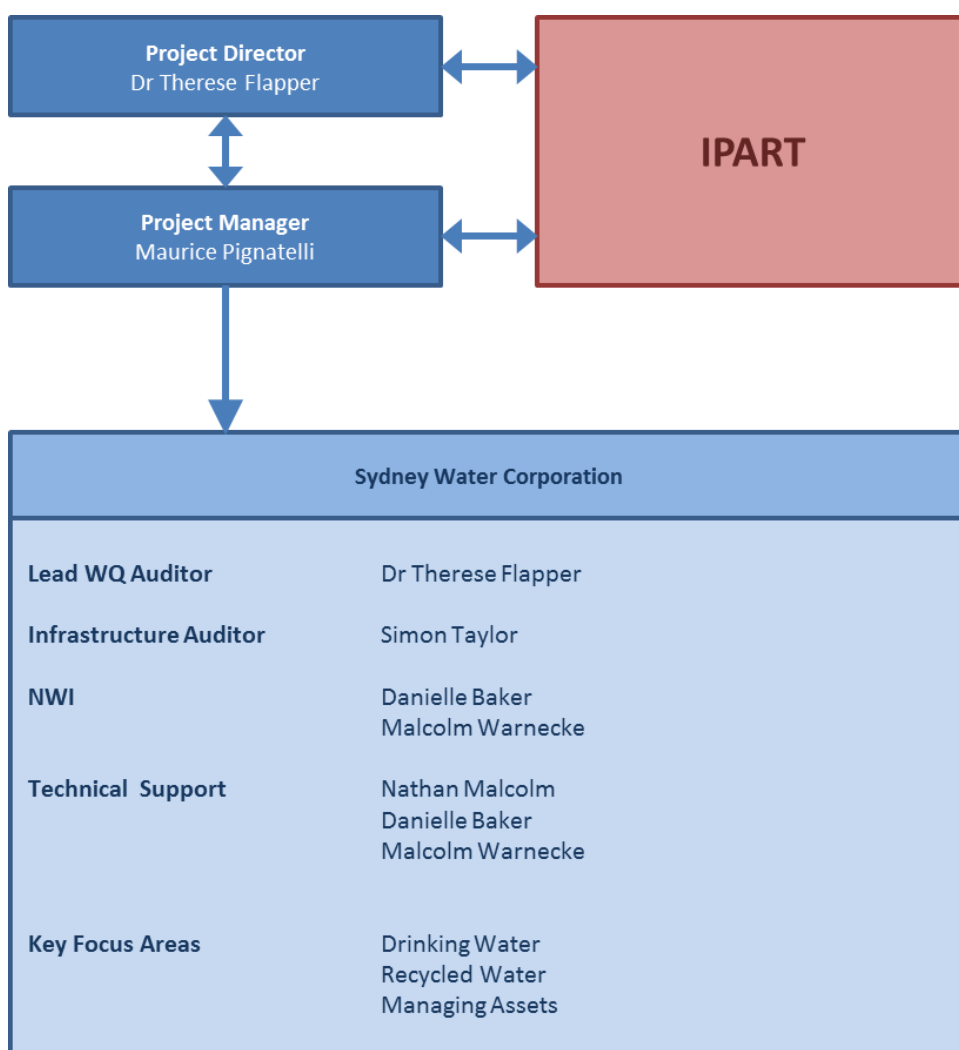
Licence Part	Description	Section / Clauses
2	Water Quality	2.1, 2.2, 2.3
3	Infrastructure Performance	3.1.1
7	Water Conservation	7.2 a, b, c

## 1.5 Audit Methodology

The operational audit adopted a methodology consistent with ISO 14011 'Guidelines for Environmental Auditing'. This guideline provides a systematic approach to defining the requirements of the audit, planning, interpreting Licence Conditions, collecting audit evidence, objectively assessing the evidence, and reporting in a clear and accurate manner. It also ensures that the audit has been conducted in accordance with an established and recognised audit protocol. The audit methodology applied is discussed further at Appendix G.

## 1.6 Audit Team

The audit team consisted of IPART accredited auditors as shown in Figure 2.



**Figure 2 Structure and Responsibility of the Audit Team**

## 1.7 Compliance Assessment Grades

The table below describes the ratings used to assess compliance in this audit. These terms are consistent with compliance grades provided by IPART and range from 'Full Compliance' to 'Non Compliance'.



Term	Meaning
Full Compliance	All requirements of the condition have been met.
High Compliance	Most requirements of the condition have been met with some minor technical failures or breaches.
Moderate compliance	The major requirements of the condition have been met.
Low compliance	Key requirements of the condition have not been met but minor compliance achievements have been demonstrated.
Non compliance	The requirements of the condition have not been met.
Insufficient information	Relevant, suitable or adequate information to make an objective determination of compliance was not available.
No requirement	The requirement of this condition falls out of the audit period or there is no auditable requirement.
Statement of Compliance (S of C)	Compliance with the requirements of the condition has been certified by Sydney Water. Clauses marked S of C are not subject to independent audit this year.

## 1.8 Structure of this Report

This chapter provides some background and information on Sydney Water, the scope of this audit and a discussion of audit methodology. Chapters 2 to 4 discuss compliance for each of the Licence parts assessed.

In the appendices, we have provided:

- A Glossary of abbreviations, terms used and definitions;
- Detailed audit findings for each of sections of the Licence that were audited;
- Our audit methodology;
- Audit scope;
- Attendees at audit interviews; and
- A register of documents and evidence provided.

## 2. Water Quality – Part 2

### 2.1 Summary of Licence Part Requirements

Part 2 of the Operating Licence requires Sydney Water to adhere to national water standards to the satisfaction of NSW Health, namely the Australian Drinking Water Guidelines (ADWG 2004 / 2011) and the Australian Guidelines for Water Recycling (AGWR 2006). The current audit was required to assess Sydney Water compliance to Sections 2.1, 2.2 and 2.3.

#### 2.1.1 Section 2.1 – Drinking Water

Section 2.1 of the Operating Licence refers to the obligations Sydney Water have regarding drinking water.

- (a) Sydney Water must manage Drinking Water quality to the satisfaction of NSW Health in accordance with the Australian Drinking Water Guidelines (unless NSW Health specifies otherwise).
- (b) Sydney Water must prepare, to the satisfaction of NSW Health, a Five Year Drinking Water Quality Management Plan covering the entire five year term of the Licence. The Five Year Drinking Water Quality Management Plan must be in operation by 31 December 2010 and include strategies for the comprehensive management of the quality of Drinking Water in Sydney Water's water supply system in accordance with the Australian Drinking Water Guidelines (unless NSW Health specifies otherwise).
- (c) The Five Year Drinking Water Quality Management Plan is to be revised for the period 1 July 2015 to 30 June 2020. Sydney Water must provide a draft revised Five Year Drinking Water Quality Management Plan to NSW Health by 31 December 2014.
- (d) Sydney Water is to implement procedures and processes for the appropriate management of the Drinking Water supply system under its control in light of its knowledge of the entire Drinking Water supply system (from the source to the consumer). Sydney Water must have adequate systems and processes in place to manage Drinking Water quality taking into account planning and risk management and their implementation across the entire Drinking Water supply system.
- (e) Sydney Water must comply with the fluoridation plant operating targets set out in the Fluoridation Code.
- (f) Sydney Water must report on Drinking Water quality monitoring in the manner and form outlined in the Reporting Manual.

#### 2.1.2 Section 2.2 – Recycled Water (including Stormwater)

Section 2.2 of the Operating Licence refers to the obligations Sydney Water have regarding recycled water (including stormwater). Sydney Water are required to manage recycled water in accordance with:

- (a) the Australian Guidelines for Water Recycling (unless NSW Health specifies otherwise) to the satisfaction of NSW Health; and/or
- (b) any other guidelines specified by NSW Health to the satisfaction of IPART.
- (c) Sydney Water must report on Recycled Water quality monitoring in the manner and form outlined in the Reporting Manual.

### **2.1.3 Section 2.3 – Changes to management of Water Quality**

Section 2.3 of the Operating Licence refers to the obligations Sydney Water have regarding changes to the management of water quality.

(a) Sydney Water must notify NSW Health of any proposed changes to its processes for:

- (i) managing; or
- (ii) reporting to NSW Health in relation to;

Drinking Water quality under clause 2.1 or Recycled Water quality under clause 2.2 where such changes may have a material impact on public health.

(b) Sydney Water must obtain NSW Health's approval for any changes notified under clause 2.3(a) before implementing them.

## **2.2 Factors Affecting Compliance**

It is the opinion of the auditor that there were no known external issues that may have substantially impacted on Sydney Water's performance with respect to this Licence Part. This was confirmed at interview with Sydney Water.

Substantial rainfall events did impact compliance to some water quality performance standards, but these did not have a material impact on public health or compliance to the Operating Licence.

## **2.3 Water Quality – Compliance**

Sydney Water has been assessed as having demonstrated 'Full Compliance' with the requirements of this Part of the Licence. Supporting commentary for specific Clauses is provided in Appendix B (Clause 2.1), Appendix C (Clause 2.2) and Appendix D (Clause 2.3).

Sydney Water addressed matters associated with the previous audit, which previously awarded only a 'High' Compliance for one Clause, as concern was raised associated with the integrity of drinking water storages.

Sydney Water addressed matters associated with endorsement of recycled water quality management plans, which have all been submitted to NSW Health. NSW Health indicated that endorsement of these was imminent.

## **2.4 Discussion**

The audit considered a risk-based approach to assessing drinking water and recycled water compliance, with a focus on those matters identified in the previous audit report, noted as both Key Recommendations and Secondary Recommendations.

The audit included a thorough audit questionnaire and desk top review of information provided by Sydney Water; a detailed but targeted site interview plan; and a detailed but focussed site inspection program including a drinking water treatment plant (operated by a Build Own Operate (BOO) – being Woronora), a recycled water treatment plant (Wollongong Stage 1 and Stage 2), and a reservoir site (Heathcote).

### **2.4.1 Drinking Water**

The quality of drinking water supplied to customers is of an excellent standard and complies with the health related requirements of the *Australian Drinking Water Guidelines* (ADWG 2004 and 2011), the aesthetic related requirements specified by NSW Health and the Minister, and the operating targets set out in the Fluoridation code.

Information provided by Sydney Water in its report *Implementation of the Five-year Drinking Water Quality Management Plan 2010 - 2015* provides a summary of the situation with respect to customer satisfaction during 2011/12. The information supports the conclusion that the water is of an excellent quality. A review of customer complaints shows that there is a reducing trend in the number of complaints and that the number of complaints is low.

Sydney Water prepares and maintains a plan (*Drinking Water Quality Operational Monitoring Plan 2011 – 2012*) that details the operational monitoring that is carried out to provide assurance that the operation of the water treatment and supply system accords with the requirements for supply of water of appropriate quality. This is consistent with the ADWG which places an emphasis on operational control being the primary means of assuring water quality complies with requirements. This was supported with verification that monitoring of the distribution system is undertaken.

Sydney Water has a good relationship with its BOO plant operators. Substantial evidence was noted to demonstrate this solid relationship, particularly associated with incident and event management protocols and communication. This provides some assurance as to the risk-based management of the catchment to protect human health and the environment.

Sydney Water has established a good working relationship with NSW Health and the Sydney Catchment Authority. These relationships provide confidence that issues requiring joint consideration by these organisations will be properly dealt with. A review of the minutes of the Joint Operational Group indicated that a wide range of water quality issues were discussed during 2011/12. Of particular focus in these and other relevant meetings and correspondence, was the transition to the ADWG 2011 requirements, particularly associated with individual filter turbidity limits and notifications, as well as cyanotoxins.

Sydney Water reported on drinking water quality monitoring in accordance with the Reporting Manual.

#### **2.4.2 Recycled Water**

Sydney Water complies with the current requirements that have been agreed with NSW Health for the supply of other grades of water. Sydney Water is in the process of obtaining endorsements for recycled water schemes and has submitted all Recycled Water Quality Management Plans (RWQMPs) for signing. Some have been signed and some are pending. NSW Health indicated that signing was imminent and there was no concern noted, that would impede full sign-off.

Sydney Water meets the requirements of the *Australian Guidelines for Water Recycling (AGWR): Managing Health and Environmental Risks (Phase 1) 2006 (NRMMC, EPHC, AHMC)*. Sydney Water is carrying out considerable work to continue to enhance its meeting of these requirements mostly associated with processes and management and control of chlorine associated contact time (Ct) to ensure appropriate disinfection is achieved. Sydney Water is currently entering these schemes into their KnowRisk (Risk register and ranking tool) platform which will strengthen risk management.

#### **2.4.3 Changes to Management of Water Quality**

Sydney Water has met the requirements with regard to changes to the management of water quality and has appropriately engaged with and notified NSW Health as was required during the audit period. No proposed changes were required to be notified to NSW Health during the audit period.

#### **2.4.4 Previous Audit Recommendations**

Sydney Water demonstrated an active program to address the Key Recommendations of the previous audit period. This included risk-based methods for inspecting and assessing reservoirs, and any mitigation/improvement actions required. A financial year based priority program has been developed to address either as 'fix now', in 2012\_13, and in 2013\_14. Staff are trained in the inspection process and this is also subject to internal audit by Sydney Water. It is the finding of this audit that water quality is protected at the reservoir site, and that where measures are required to improve performance, this is being undertaken according to a risk-based approach.

The roll-out of this program requires financial support at a corporate level and business case assurance is required to comply with the ADWG and to mitigate any impacts to water quality noted in the previous audit findings.

The Key Recommendations from the previous audit (R2.1 and R2.2 2010/11) have been adequately addressed and have demonstrated a strong process to ensure future completion, assuming the corporate risk method for assigning finances is not an impediment. We note that Sydney Water:

- 2.1.1 Reviewed the Water Quality Level of Service obligations for asset and maintenance management, and defined maximum tolerable hole sizes for water tanks that provided for vermin proofing, and a tolerance for the extent of direct runoff that may enter tanks through holes in roofs or other entry points.
  - 2.1.2 Established rules to minimise the presence of holes below the roofs of existing tanks thereby mitigating entry points for vermin and ingress of runoff, and in consideration of the anticipated design life and associated renewal of components.
  - 2.1.3 Conducted an audit of tanks, prior to 30 June 2012, and reported according to a risk-based framework any failures.
  - 2.1.4 Established a remediation timetable, prior to 30 June 2012, to rectify faults.
  - 2.1.5 Prior to 30 June 2012, amended maintenance strategies, procedures and associated work instructions, the asset management renewal/replacement strategy, training and competency for staff for inspection, maintenance and testing and operation and renewal/replacement for tanks to meet criteria.
- Recycled water                      Developed an agreed timetable with NSW Health, prior to 31 March 2012, for all recycled water schemes to be endorsed.

### **2.5 Discussion with Field Staff**

#### **2.5.1 Wollongong**

The site visit to Wollongong allowed a review of the RWQMP associated with both Stages 1 and 2 of the recycled water scheme. The review of Supervisory Control and Data Acquisition (SCADA) and onsite interview of staff demonstrated that the process flow diagram, sources and uses, CCPs and associated critical limits are in accordance with the endorsed RWQMP. The required monitoring plans are followed and reported. Staff were aware of their obligations and satisfactory records are held to document compliance with the RWQMP, and hence the AGWR. Training records provided evidence of all staff being trained in the RWQMP.

The review of incident and event notification showed that the protocols are followed. Some incidents and events did occur during the audit period all of which were recorded, communicated and reported appropriately.

In particular, routine verification sampling found detections of *Cryptosporidium* and *Giardia* in the supply of recycled water to the reservoir associated with Stage 2. Follow-up actions focussed on demonstrating that the barriers of chlorine and UV disinfection were operating within their validated CCP limits. However chlorine is not a recognised barrier for protozoa. The UV was operating within and indeed above its required  $\text{mJ}/\text{cm}^2$  and both Sydney Water and NSW Health deemed that the supply would have been safe, as the protozoa would likely have been inactivated.

There is a concern over the monitoring and calibration of the UV system, particularly when pathogens have been noted in reservoirs. The UV is the single barrier for protozoa removal in Stage 2, and attention needs to be paid to its importance including associated its records and calibration. A second barrier to disinfection may be warranted, and Sydney Water should consider this in a financial and risk-based manner.

The chlorine contact time (Ct) has been determined for this site and has been used to setup the operating protocols, SCADA and control limits. Chlorine analysers are routinely calibrated and maintained.

### **2.5.2 Woronora**

It was observed during the site visit that Veolia, the operators at Woronora, maintain an effective and ongoing relationship with Sydney Water. Water quality meetings and briefings are routinely conducted and any improvements discussed. A review of notification protocols and incident and event notification demonstrated a high awareness and a commitment to following requirements (as per documents WPIMS5274 Triggers, Notification and Actions for Adverse WQ results; WPIMS5228 V8 Drinking Water Quality Event Management Plan). Some events and incidents were noted during the audit period, and were found to follow these requirements. The transition to reporting of individual filter turbidity in accordance with the agreement between Sydney Water and NSW Health is also done by Veolia. However it was noted that only one Veolia Water operator of those on duty seemed to be across the process, with other operators not demonstrating clarity.

It was found that appropriate CCPs and critical limits were followed by Veolia. However it was observed that any operator can change the 'alarm' limits in the SCADA system. It may be more appropriate for a pass code of a senior operator be deployed for changes to CCP associated limits and alarms.

### **2.5.3 Reservoir - Heathcote**

A reservoir site that was subject to inspection and mitigation measure implementation was visited. All records associated with this program were reviewed. It was noted to follow the program developed out of the previous audit recommendations. Staff were aware of the obligations associated with reservoirs and the required implementation of mitigation measures identified during the site inspections. The reservoir and associated sampling tap were in good order.

## **2.6 Recommendations**

### **2.6.1 Key Recommendations**

There are no identified Key Recommendations.

### **2.6.2 Opportunities for Improvement**

The following Opportunities for Improvement have been identified:

## **Drinking Water**

- OFI 2.1 Individual filter turbidity instruments and reading. Ensure calibration records are of sufficient calibre to be fit for ADWG 2011 compliance given the heightened compliance and notification requirements, as compared to previous approach which suited a more 'operational' status.
- OFI 2.2 WPIMS5274 Triggers, Notification and Actions for Adverse WQ results, May 2010: References ADWG 2004 rather than ADWG 2011. Table 1 requires a review to ensure consistency.
- OFI 2.3 Reservoir Inspection Reports and Risk-Based Register (roof inspection data analysis): Ensure a feedback loop from the maintenance program to the Water Quality team to ensure the reservoir program meets water quality needs.
- OFI 2.4 Consider the inclusion of reservoir turnover time in the Risk Assessment of Reservoirs (roof inspection data analysis). Consider developing a Work Instruction to document the reservoir risk ranking process including inputs from the reservoir inspections and water quality data.
- OFI 2.5 Consider that 'reservoirs' could be identified as a separated asset class within the asset hierarchy, to ensure appropriate commitment as a key barrier in the catchment to tap protection of drinking water.

## **Recycled Water**

- OFI 2.6 Ensure all Recycled Water schemes are entered into KnowRisk.
- OFI 2.7 Ensure West Camden RWQMP reflects recent upgrades and any other changes in the scheme. Ensure the HIDRA (Sydney Water's risk register and ranking tool) is current and the review is documented.
- OFI 2.8 Consider further engaging with NSW EPA to ensure Environmental Protection License limits for recycled water scheme align with RWQMPs.
- OFI 2.9 Ensure that the UV system at Wollongong Stage 2 is appropriately calibrated and records maintained to better document reliance on the UV dose and UVT. Reliance was made on protozoa inactivation due to UV operation within its control limits.

## 3. Infrastructure Performance – Part 3

### 3.1 Summary of Licence Part Requirements

Part 3 of the Operating Licence requires Sydney Water to establish an asset management framework and requires Sydney Water to adhere to specific standards of service delivery to customers. The current Audit was required to assess Sydney Water compliance to Section 3.1.1.

#### 3.1.1 Section 3.1.1 – Managing Assets

Section 3.1.1 of Sydney Water's Operating Licence outlines that Sydney Water must ensure that its assets are managed consistently with the asset management framework described in clause 3.1.2. This framework states that Sydney Water's asset management framework must demonstrate:

- (a) robust and transparent methodologies for determining and prioritising licensing and other regulatory requirements and current and future service levels as well as identifying the infrastructure needed to achieve those service levels and requirements;
- (b) robust, transparent and consistent processes, practices and programs to ensure sustainable delivery of service levels and regulatory requirements, based on sound risk management, including:
  - (i) asset inventory;
  - (ii) asset planning incorporating both business and technical risk assessments;
  - (iii) maintenance of adequate records and robust and reliable data;
  - (iv) asset replacement, rehabilitation, augmentation, creation/acquisition and/or substitution (asset and non asset substitutions);
  - (v) management of service provision, including contracts;
  - (vi) monitoring and condition assessment;
  - (vii) proactive and reactive maintenance;
  - (viii) operations;
  - (ix) training and resourcing;
  - (x) contingency planning covering both emergency management and business continuity; and
  - (xi) asset rationalisation and disposal;
- (c) robust and transparent decision making processes that balance acceptable risk with cost and service provision to achieve prudent, efficient and effective operating and capital investment;
- (d) an approach that achieves the lowest cost of service delivery through the effective life cycle management of the asset base; and
- (e) robust and transparent processes of review and continuous improvement in asset management.



## 3.2 Factors Affecting Compliance

There were no known external issues that may have substantially impacted on Sydney Water's performance with respect to this Licence Part.

## 3.3 Infrastructure – Compliance

Sydney Water has been assessed as having demonstrated Full Compliance with the requirements of this Part of the Licence. Sydney Water has demonstrated that its assets are managed consistently with the asset management framework described in clause 3.1.2.

Supporting commentary for specific Clauses is provided in Appendix E (Clauses 3.1.1 and 3.1.2).

## 3.4 Discussion

### 3.4.1 Asset Management Framework

Sydney Water has a long history of high standards of asset management recognised by external parties. Sydney Water presented as evidence a comprehensive suite of plans, strategies, and controlled documents covering all classes of assets. Sydney Water did comment that they will change the format of the “*State of the Assets*” report, replacing it with a series of shorter, more forward, looking documents. Nothing in the Framework had been altered that required notification to IPART.

### 3.4.2 Reservoirs

As a result of the previous year's Audit, the Auditor was required to review water quality issues related to storage tank integrity and the implementation of the associated condition framework. A detailed response to the previous Audit findings was presented by Sydney Water. The records of the reservoir roof and site inspections (both hand written forms *W5* and associated photographs) were demonstrated to have been successfully entered into Maximo.

It was noted that reservoirs have their own asset management plans that set out a proposed program of investment. Sydney Water stated that some roofs are known to be coming to the end of their economic lives. Sydney Water also stated that during the development of business cases for the replacement of reservoir roofs, alternatives to replacement are explored, especially as those works will require the site to be out of operation for an extended period. The consideration of these temporary works as a permanent solution is a quite proper and correct approach. Any temporary network configuration that would cope with this extended down time should be considered as a permanent option.

It was noted that internal inspections of reservoir condition are held in a separate, tailored database provided under licence by the retained contractor. The database was identified as ASAM (acronym unknown). It is probably efficient for the contractor to supply updates to the information in their standard database format, however Sydney Water stated that they do not store that internal asset condition information in Maximo. This means that Maximo is not the single point of all asset information; data held separately for internal condition could be lost should the ASAM database not be maintained or the licence not paid. This also raises the possibility that business cases for works on a reservoir will not capture the overall condition of the structure. This could result in:

- Inaccurate prudence and efficiency arguments in any business case;
- Poor scoping of work requirements;
- Inadequate budgetary requirements; and,

- Unexpected claims for additional works by contractors.

It was noted that both the roof and the wall structures have been recorded in Maximo as a single asset. The implication is that both parts of the structure are afforded the same asset life and replacement value, when it is clear that the walls can be expected to have a much longer life than the roof. This raises a number of challenges for Sydney Water for the relationship between the asset management system (Maximo) and the separate, financial asset register, namely:

- Separating the reservoir asset into sufficient detail to account for differing lives and values (e.g. foundation, structure, roof, associated infrastructure such as pipework, valves, SCADA). The demonstration of Maximo suggested that more work is required to adequately separate the assets into this form of hierarchy and to comprehensively populate the fields.
- Separating the financial records of the asset to reflect a number of different lives, replacement values, associated depreciation, and disposal.
- Whether adequate allowance was made when the reservoirs were originally capitalised to allow for disposal of the roof only, through a renewal/replacement capital expenditure (Capex) project. If this was not the case the disposal may require the use of operational expenditure (Opex).

It is noted that some parts of the program of work identified as a result of the 2011 Audit, would be sitting outside of the normal capital works process. As a result the works will compete with all other Sydney Water capital projects, each with a business case, to allow corporate assessment. It was noted that the corporate risk assessment process, which is used to determine allocation of such funds, may hinder the progress to achieving greater investment for reservoirs as the associated assessment scores appear to sit within the Moderate or Minor category (see Table 2). This investment tool is used to enable the Executive to make decisions between business cases between programs with differing needs (e.g. between ICT and water/sewerage networks). This tool is a decision support tool under Licence Clause 3.1.2 and is acknowledged as both necessary and good practice.

That said the consequences identified that can arise from contaminated potable water resident in reservoirs are not explicitly included within the Customers category and may only be captured under the Public Health - Minor Assessment, after an event. This suggests that maintenance requirements such as those generated by the recent roof surveys may struggle to gain capital investment when considered against all business cases.

Greater consideration should be given to the potential for contamination, as opposed to reportable events, by considering the risk factors identified in the project resulting from 2011 Audit, with the inclusion of factors associated with residency time or turnover at each site.

**Table 2 Extract from Sydney Water's Corporate Risk Assessment**

Assessment	Public Health	Customers
<b>Catastrophic</b> Very High impact with very significant consequences	Widespread illness / fatalities.	Complete disruption to services > 1 week. Affects > 30% of SWC customers.
<b>Severe</b> High impact with major consequences	Serious illness requiring hospitalisation.	Partial disruption > 2 days. Affects 10% to 30% of customers. Widespread complaints.
<b>Moderate</b> Noticeable impact with clearly visible consequences	Deterioration in water quality parameters. Reportable event. Increase in illness.	Unreliable services. Increase in number of complaints. Multiple and repeat customer complaints. 5% to 10% of customers affected.

Assessment	Public Health	Customers
<b>Minor</b> Minor impact with some consequences	Deterioration in water quality parameters. Reportable event. No increase in illness.	Some customer complaints.
<b>Insignificant</b> Very minor impact with unimportant consequences	Non-reportable event	Isolated customer complaints.

### 3.4.3 Asset Disposal

Three categories are maintained for assets across the whole of the Sydney Water asset base, namely:

- Operational;
- Decommissioned; and,
- Disposed.

The Decommissioned assets are further divided into:

- Non maintained; and,
- Partially maintained.

This classification system can result in a Decommissioned asset still attracting a Maximo led planned maintenance program with associated investment. An example was given of a pipeline and pumps which can run in reverse if required. The assets associated with this intermittent reverse flow operation are classified as Decommissioned, Partially Maintained and regular work is carried out to ensure that the assets will operate when required.

No breakdown or magnitude of Opex investment on Decommissioned Non or Partially Maintained assets was requested. It may be of interest to follow up on these classes of assets to:

- Determine the value and performance of these Decommissioned Non or Partially Maintained assets relative to the other Operational assets.
- Determine how a prudence and efficiency based investment business case is made for these Decommissioned assets.

These assets do have an operational purpose as a contingency (albeit an irregular operation) and are required to be available for service, in the same manner that other duty – standby configurations are required to be available. This suggests that the assets should not be described as Decommissioned and Partially Maintained but Operational as Contingency Measure. Further investigation would reveal whether this is a material issue.

Once an asset is disposed of Maximo keeps a record; the financial asset register shows a removal of the asset for valuation purposes, but with a flag record for 7 years (to satisfy tax purposes). An annual write down of the financial asset register is carried out.

## 3.5 Discussion with Field Staff

### 3.5.1 Wollongong

The site visit to Wollongong afforded the opportunity to understand the practical use of Maximo at an operational plant. The asset management system is available to all Operators on site; any fault, failure or suspected issue can be reported through the system and an unplanned

maintenance request developed. This listing is reviewed by the site manager and appropriate work orders generated and passed to the most appropriate party for implementation.

The open access of the system to all operators is a positive way of ensuring everyone is empowered to report concerns.

With the impending outsourcing of maintenance activities Sydney Water will need to develop a process that enables the Operators to continue to report concerns, associated with a robust, internal prioritisation process for unplanned maintenance requests.

The plant is fed by two long rising mains. The residence time means that the sewage can be very septic when it is discharged at the plant inlet works. Sydney Water reported that there has been a history of damage from hydrogen sulphide and remedial works have been required to the concrete structures in the past. In an attempt to mitigate the septicity the network is dosed with ferric, which is said to have had some success. It was noted that adjacent catchments are dosed with magnesium; experience related during the site visit indicated that the latter is more successful in controlling septicity, especially when chlorides from seawater ingress may be a contributing factor. No empirical evidence was provided during the site visit however the verbal advice of the difference in outcomes from the dosing suggests that there may be benefit in revisiting the business case for magnesium over ferric dosing.

### **3.5.2 Woronora**

It was observed during the site visit that Veolia, the operators at Woronora, maintain a completely separate asset database on a different platform to Sydney Water, which has no copy of this asset record, or the planned maintenance. A superficial explanation of the contract between the two parties was given (the printed content remains unsighted) and the relationship between Sydney Water and Veolia appeared to be satisfactory. The risks to Sydney Water associated with asset management are probably minimised due to a contract condition which gives Sydney Water the option to purchase the plant at the end of the agreement, at a fair price.

A number of other BOO contracts are in place and can be expected to have different agreements to those discussed at Woronora. No details of the negotiations/extensions of other BOO contracts were provided.

With reference to specific elements of the asset management framework, namely 3.1.2 (b) *“consistent processes, practices and programs to ensure...regulatory requirements”*, (v) *“management of service provision, including contracts”* and; (viii) *“operations”*, a potential difference in philosophy between an owner and a BOO was observed; that of the policy for signage and entry to confined spaces. During the site visit to Wollongong it was noted that no signage for confined spaces was visible. The policy at the plant was quoted to be that only external contractors with specific training may carry out work in such locations. No Sydney Water staff are allowed to enter any such spaces, unless they are under the control of the external contractor (and are qualified to do so). Alternatively Veolia at Woronora did have confined spaces sign posted and staff on-site are expected to carry out duties in such spaces.

(It should be noted that Sydney Water reservoir site 151 that was visited also displayed confined space signage, with an understanding that Sydney Water staff and contractors would enter, using the correct procedures).

Of themselves these variations in policy positions are not in direct conflict. The fact that three different facilities are involved (water treatment, sewage treatment, potable water storage) is immaterial. This example demonstrates a very practical difference in approach to determining a safe system of work, which may be exacerbated and result in safety concerns when planned maintenance is further outsourced by Sydney Water, for example:

- Possible confusion in approaches between Sydney Water and , BOO sites, and those externally maintained;
- Maintaining appropriate registers of qualified Sydney Water staff and those qualified to set and enforce safety standards for a contractor;
- Clear accountabilities where a difference in approach may occur where operations and maintenance at one location are shared by different parties for different asset classes.

### **3.5.3 Reservoirs**

A site visit was conducted to one of the reservoirs identified to require maintenance to the roof during the previous audit. The completed site assessment sheet W5 was provided detailing the inspection, and recommended actions for WS 047 and 151 Heathcote (dated 7/8/12). The sole action for WS 151 related to two holes recorded on the roof on the west side. The general site and roof top was accessed. In accordance with the categories listed on the inspection sheet the following was noted:

- Access to the site had already been facilitated upon arrival.
- No rubbish was seen on the site.
- Those signs that could be seen upon pedestrian entry appeared adequate.
- The access ladder was padlocked upon arrival and no access was allowed until a safety briefing had been given by Sydney Water staff.

Once the roof was accessed by the side stairway a simple, escorted walkover was completed. The following were noted:

- Minor debris was noted on the gutters – certainly well under the minimum noted on the inspection sheet.
- Central vents contained mesh protection from vermin.
- All roof accesses were either riveted shut or padlocked.
- All plating was intact and no holes were observed.
- Foam seals were intact.
- Ridge capping was intact and in some locations appeared to have been strengthened.

In conclusion the inspected reservoir roof appeared to be in good condition and the fields on the sheet W5 had captured successfully the condition and hazards that could be expected from a visual inspection only. An internal Sydney Water email dated 27 September 2012 was provided, which communicated that the works orders raised following the inspection had been completed.

No other reservoir sites were visited due to time constraints. The successful implementation of an entire maintenance program cannot be guaranteed from one sample visit and it was noted during the presentations that not all identified actions for every reservoir had been completed at the time of this Audit. However if the Sydney Water inspection process, risk assessment, business case and resulting budget and actions have been and will be implemented consistently, there should be little further cause for concern and no further action required of later audits.

## **3.6 Recommendations**

### **3.6.1 Key Recommendations**

There are no identified Key Recommendations.

### **3.6.2 Opportunities for Improvement**

The following Opportunities for Improvement have been identified:

- OFI 3.1 It is recommended that reservoir condition information (both internal and external) be captured in one database, Maximo, as the standard used throughout Sydney Water.
- OFI 3.2 It is recommended that progress with the separation and recording of the elements/hierarchy that make up reservoir assets in Maximo are reviewed in later Audits.
- OFI 3.3 It is recommended that greater consideration should be given to the potential for contamination, as opposed to reportable events, by considering the risk factors identified in the reservoir risk assessment process, with the inclusion of factors associated with residency time or turnover at each site.
- OFI 3.4 With the impending outsourcing of maintenance activities it is recommended that Sydney Water develop a process that enables those on site at treatment plants to report concerns, and that these be associated with a robust, internal prioritisation process.
- OFI 3.5 It is recommended that the value and performance of Decommissioned Non and Partially Maintained assets is determined to understand the extent and materiality of the asset in terms of its criticality, value and budget. Should that investigation reveal a significant number and value of assets classified as decommissioned a more accurate description term should be determined for those Operational assets on standby as a contingency.
- OFI 3.6 That Sydney Water considers the implications and risks arising from differences in WH&S policies between it and its contractors, especially as contractor interactions/involvement in maintenance on sites are proposed to increase.
- OFI 3.7 It is recommended that the business case for magnesium over ferric dosing is revisited in those catchments draining to Wollongong, to determine whether the previous cost benefit analysis remains in favour of the ferric dosing.

## 4. Water Conservation – Part 7

### 4.1 Summary of Licence Part Requirements

Part 7 of the Operating Licence required Sydney Water to report on various initiatives to promote and practice water conservation. This involved the development, maintenance and publishing of a water conservation strategy that provides a transparent basis for Sydney Water's water conservation activities. The current audit was required to assess Sydney Water compliance to Section 7.2.

#### 4.1.1 Section 7.2 – Water Leakage

Section 7.2 of the Operating Licence states that:

- (a) Sydney Water must ensure that the level of water leakage from its Drinking Water supply system (the Water Leakage Level) does not exceed 105 megalitres per day;
- (b) When calculating the Water Leakage Level each year, Sydney Water must use the assumptions and methodology approved by IPART;
- (c) Sydney Water must complete a review by 31 December 2011 to determine the economic Water Leakage Level and submit a report on this review to IPART. The review must be conducted in a manner acceptable to IPART;
- (d) Following submission of the report from Sydney Water under clause 7.2(c), IPART must provide a recommendation to the Minister as to the economic Water Leakage Level; and
- (e) Following review of the report submitted to IPART under clause 7.2(c) and consideration of IPART's recommendation under clause 7.2(d), the Minister may adjust the Water Leakage Level.

### 4.2 Factors Affecting Compliance

There were no known external issues that may have substantially impacted on Sydney Water's performance with respect to this Licence Part.

### 4.3 Water Conservation – Compliance

Sydney Water has been assessed as having demonstrated Full Compliance with the requirements of this Part of the Licence. Sydney Water reported that leakage for 2011/12 was recorded as 115.4 ML/d. This was within the agreed band of uncertainty of 105 ML/d +/- 16 ML/day. Documentation provided confirmed this to be the outcome and that reporting to IPART had been carried out satisfactorily.

Up until the most recent two years leakage has maintained a downward and then steady trend, however it is noted that during past two years' quarterly reporting indicates that leakage is rising again from its low of 97 ML/d in 2009/10.

Supporting commentary for the specific Clause is provided in Appendix F (Clause 7.2).

### 4.4 Discussion

#### 4.4.1 Leakage

All the supplied evidence indicates that over the longer term water loss management and renewals programs have had the desired impact upon leakage volumes, first reducing to, and then maintaining the leakage within, the target range set by the Licence. The supplied figure of real losses from the network supports this conclusion.

Up until the two most recent years, leakage has maintained a downward and then steady trend, however the trend for the past two years suggests that leakage is rising again from its low of 97 ML/d +/- 20 ML/d in 2009/10. Four possible reasons were cited for the increase in leakage and during discussion it appeared that Sydney Water favoured the reason for increasing real losses as a reduced level of burst/leakage reporting by the public due to wet weather in 2011-12. This appeared to have resulted in a somewhat passive response from Sydney Water, as opposed to the continuation or enhancement of the proactive strategy demonstrated during the drought.

Based on the information supplied for the Operating Licence conditions 7.2 a, b, and c, Sydney Water has demonstrated full compliance with the Licence.

But at the heart of this discussion is the tension between the observed outcomes and the behaviours driven by the requirement for Sydney Water to:

- (i) Comply with the Operating Licence of 105 ML/d (+/- 16 ML/d); and,
- (ii) Achieve the Economic Level of Leakage (ELL) which is identified to be 97 ML/d (+/- 20 ML/d) in 2014-15.

With the upper confidence interval for 2014-15 ELL overlapping with that of current Operational Licence compliance there appears to be no incentive for Sydney Water to strive to meet an ELL. Both objectives would need to be the same to justify investment. It is noted that IPART has not recommended a change to the leakage level in the Operational Licence at the time of this Audit.

Furthermore the combination of the non-drought Short Run Marginal Cost (SRMC) of \$0.43c/kL (as opposed to either that which includes desalination or the Long Run Marginal Cost (LRMC)) and an impact of a "CPI minus x" price control have the impact of reducing both the economic value of the potential losses and the interventionist strategies that Sydney Water might employ. With inclusion of desalination costs the SRMC is reported to increase to \$0.62c/kL however the impact of using that value on active leakage management appeared marginal. Under drought conditions the LRMC of \$2.10/kL is expected to be used and this would impact positively upon active leakage management, thus the effort in active leakage detection increase or decrease with the drought cycle. This may run the risk of allowing leakage to increase during the early stages of a drought delivering a slower response. Sydney Water is proposing that active leak detection will be reduced from 21,000 to between 9,000 to 12,000 kilometres per year in response to the outcome from the ELL calculation.

The logic of incentivising Sydney Water appears to be short term: it suggests that the Sydney Water investment in leakage management operations should be maintained at a level where losses are compliant with the Operating Licence but above that of the 2014-15 ELL. This outcome needs to be set against the apparent trend of increasing losses in the past 24 months that may be difficult to arrest and reverse through the implementation of the program of pressure management alone (which was acknowledged as taking longer than originally anticipated, see 4.4.2).

#### **4.4.2 Pressure Reduction**

One key water loss management process is that of pressure reduction. Sydney Water has a program to implement 181 zones by June 2013. Of those 179 are built but only gradual progress was reported with implementing actual pressure reduction. The primary reason given for incomplete pressure reduction was associated with difficulties of maintaining fire flows and private fire system integrity. Historically many Sydney Water customers have relied upon the pressure supplied by Sydney Water for their fire system compliance and operation – reducing pressure below those previously experienced places a challenge upon the customer.



Customer standards of service do not include provision of water pressure for complex sprinkler systems; however knowing that many customers do have an implicit reliance has, and will continue to, slow down the implementation of pressure reduced zones.

This is a common experience in other utilities around the world when implementing these actions and should have been built into the risk analysis for the project, with an appropriate time allowance. The date of June 2013 is that projected for the contractor to complete work on the zones, however the implementation by Sydney Water Operations may extend beyond this date.

#### **4.4.3 Components of Losses**

Sydney Water has examined the components of water loss and suggest that the proportions are 59% service connections, 9% trunk mains and 32% distribution losses. The experience of many other utilities that have undertaken such studies shows these proportions can/do change as active leak detection strategies are implemented. The pattern is generally one of redistributing the proportions of losses away from trunk infrastructure to the customer services, reflecting the degree of uncertainty in understanding where losses can be attributed. Sydney Water may benefit from continuing to study other utilities' outcomes and seeking guidance from peak bodies/acknowledge topic experts to influence their investment decisions on leakage management. The customer supply pipe losses are the hardest to address and must be done so at the District Meter level using nightlines.

#### **4.4.4 Leakage Calculation Process**

Sydney Water reported that the leakage calculation process is to be moved from MSExcel to a new system within Sydney Water's computer program suite. This would be an excellent opportunity to provide appropriate version control to the regular rounds of leakage calculation at no extra cost. It would also be advisable to ensure that the data capture and calculation steps are thoroughly reviewed, checked and verified post implementation, to ensure that the assumptions, sources and embedded calculations in the current MSExcel work book are transferred correctly. These processes must be documented and recorded in operating manuals for the new system.

### **4.5 Recommendations**

#### **4.5.1 Key Recommendations**

There are no identified Key Recommendations.

#### **4.5.2 Opportunities for Improvement**

The following Opportunities for Improvement have been identified:

- OFI 7.1 Sydney Water communications with customers in a post drought condition must still maintain an adequate focus on water conservation and provide incentives for the reporting of potential leaks.
- OFI 7.2 IPART should consider whether the current Operating Licence leakage target of 105 ML/d originally devised for the 2005 -10 period and recently reviewed is, and remains consistent with, the use of a lower economic target, in order that appropriate water conservation behaviour is generated.
- OFI 7.3 To improve the understanding of where losses are occurring in the trunk, local reticulation and customer services networks, Sydney Water should further investigate the minimum night flows recorded to generate a better understanding of leak run time. This may in turn influence the priority placed upon leakage responses.

- OFI 7.4 IPART should note that any published program for the implementation of the 181 pressure zones may be impacted upon by the need to determine a satisfactory fire capacity outcome for specific customers. It is recommended that actual implementation progress is requested at subsequent audits, together with any important lessons learned as the implementation proceeds.
- OFI 7.5 Sydney Water may benefit from studying other utilities' work and outcomes on system losses to influence their investment decisions on leakage management.
- OFI 7.6 The change in IT platform presents an opportunity to review the data capture and calculation steps that feed into the loss calculation process, to check and verify post implementation to ensure that the assumptions, sources and embedded calculations contained in the current MSExcels work book are transferred correctly.
- OFI 7.7 In common with all important calculation processes these leakage calculations must be documented and recorded in an appropriate operating manual for the new system, with appropriate quality assurance given to controlled documents.

# Appendices

## **Appendix A** – Glossary and Dictionary

Abbreviation/Acronym	Description
Act	Sydney Water Act, 1994 (NSW).
ADWG (2004) and (2011)	Australian Drinking Water Guidelines (2004) and (2011), National Health and Medical Research Council and Natural Resource Management Ministerial Council
AGWR	Australian Guidelines for Water Recycling (2006), The Environment Protection and Heritage Council, the Natural Resources Management Ministerial Council and the National Health and Medical Research Council.
AOMS	Assets and Operations Maintenance System
AS	Australian Standard
AWQC	Australian Water Quality Centre
BOO	Build own operate
Capex	Capital Expenditure
C/G	Cryptosporidium and Giardia
CCTV	Closed Circuit Television
CIS	Customer Information System
CMS	Complaints Management System
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CPI	Consumers Price Index
DA	Development Application
DAL	Department of Analytical Laboratories (Lidcombe)
DEC	Former Department of Environment and Conservation – now OEH
DECC	Former Department of Environment and Climate Change– now OEH
DECCW	Former Department of Environment, Climate Change and Water – now OEH
DEUS	Former Department of Energy, Utilities and Sustainability – covered part of the former DLWC
DLWC	Former Department of Land and Water Conservation (NSW) then changed to DWE
DIPNR	Former Department of Infrastructure, Planning and Natural Resources (NSW) – now covered by Department of Planning, OEH, NSW Office of Water (NOW) and Department of Industry and Investment NSW
DWE	Department of Water and Energy – now covered by NSW Office of Water (NOW)
DWT	Drinking Water
ELL	Economic Level of Leakage
EMP	Environmental Management Plan
EPA	Environment Protection Authority (NSW) – Now part of the Office of Environment and Heritage (OEH)
ESD	Ecologically Sustainable Development
EWON	Energy and Water Ombudsman NSW
FRC	Free residual chlorine
GEMP	Government Energy Management Plan
GIS	Geographical Information Systems
GL	Gigalitre
Sydney Water, SWC	Sydney Water Corporation
HPC	Heterotrophic plate count bacteria
IPART	Independent Pricing and Regulatory Tribunal (NSW)

Abbreviation/Acronym	Description
ISO	International Standards Organisation
IT	Information Technology
JOG	Joint Operational Group
kL	Kilolitre (1 thousand litres)
km	Kilometre
LRMC	Long Run Marginal Cost
ML	Megalitre (1 million litres)
MOU	Memorandum of Understanding
MNF	Minimum Night Flows
M&R	Monitoring and Reporting
NATA	National Analytical Testing Authority
NOM	Natural organic matter
NOW	NSW Office of Water.
NPR	National Performance Report (published by the National Water Commission and the parties to the National Water Initiative).
NSW Health	NSW Department of Health
OEH	Office of Environment and Heritage (formerly DECCW, the NSW Environmental Regulator)
Opex	Operational Expenditure
pa	Per annum
PAC	Powdered Activated Carbon
pH	A measure of the acidity of a solution related to the concentration of hydrogen ions.
QA	Quality Assurance
RFQ	Request for Scope of Work and Quote (sent by IPART on 5 July 2011)
RWT	Recycled water
SCA	Sydney Catchment Authority
SCADA	Supervisory Control and Data Acquisition
SEDA	Sustainable Energy Development Authority
SLC	Strategic Liaison Committee
SLG	Strategic Liaison Group
SRMC	Short Run Marginal Cost
STP	Sewage Treatment Plant
TC	Total chlorine
TOC	Total organic carbon
WML	Water Management Licence
WRAPP	Waste Reduction and Purchasing Policy
WSAA	Water Services Association of Australia
WTP	Water Treatment Plant
WQ	Water quality

## **Appendix B** – Water Quality Detailed Audit Findings (Part 2, Section 2.1)

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
a	<p>Sydney Water must manage Drinking Water quality to the satisfaction of NSW Health in accordance with the Australian Drinking Water Guidelines (unless NSW Health specifies otherwise).</p> <p><i>Audit is to consider the 2011 Audit recommendation in respect to the integrity of storage tanks and reservoirs. Including the review of the criteria used to define adequate integrity, inspection regimes and maintenance procedures. SWC is to have established a remediation timetable to rectify any faults found when Auditing water reservoirs and tanks by 30 June 2012.</i></p>	Full	<p>Has NSW Health specified any requirements?</p> <p>Is SWC applying the ADWG 2011 guidelines?</p> <p>What changes were required to meet 2011 as compared to 2004?</p> <p>How were these changes managed and documented where required?</p> <p>Were staff and contractors trained in changes?</p> <p>Were any exceptions required to be reported to NSW Health? If so, provide the documents.</p> <p>What chlorine residual is maintained in the distribution network? Does it vary across the network significantly?</p> <p>What chlorine booster infrastructure is maintained within the network? How is performance maintained and monitored? Is there a zone of concern in maintaining a residual? If so, what Plans or Policies are in place to address this zone?</p> <p>Was an Audit and Report of tanks and reservoirs conducted in accordance with the prior audit recommendations 2.1.1 to 2.1.5? Was this done for sites operated by contractors such as BOO schemes?</p> <p>Review the Water Quality Level of Service obligations for asset and maintenance management,</p>	<p>Drinking Water Quality Management Plan.</p> <p>Drinking Water exception reports.</p> <p>ADWG 2011 implementation documents.</p> <p>Training and awareness.</p> <p>Chlorine residual data for the reticulation network including reservoirs and pipes.</p> <p>Summary of Drinking Water Quality monitoring statistics, including how they are calculated.</p> <p>Monitoring Plan.</p> <p>Audit Report of Tanks and associated Remediation Timetable (associated with reservoirs and tanks findings of prior audit).</p> <p>Audit Recommendations Report. 31 March 2012.</p> <p>Site inspection of storage tank and reservoir.</p>	<p><b><u>Memorandum of Understanding between the NSW Ministry of Health and Sydney Water Corporation, May 2012, ISBN 978-1-74187-703-8</u></b></p> <p>Aims to form a co-operative relationship between NSW Health and SWC. Acknowledges NSW Health role as an advisor, particularly on standards in relation to drinking water and recycled water.</p> <p>The objective of this Memorandum is to formally set out the terms of a cooperative relationship between the parties, establish their respective roles, facilitate fulfilment of each party's function in relation to the protection of public health, and to fulfil the requirements of section 35 of the <i>Sydney Water Act</i> and Sydney Water's Operating Licence.</p> <p>IPART is also recognised for its role as the Operating Licence regulator.</p> <p>The ADWG 2011 version is recognised.</p> <p>The AGWR 2006 is recognised.</p> <p>A Strategic Liaison Group (SLG) has been formed, to discuss broad principles and policies.</p> <p>A Joint Operational Group is set to meet regularly to coordinate implementation, establish data and information sharing, programs of investigation, make recommendations to the SLG.</p> <p>Term is as per the current Operating Licence 2010-15.</p> <p>Roles and responsibilities defined. However seem repetitive of requirements elsewhere, and trust there is no conflict.</p> <p>The revised MOU of May 2012 Increased emphasis on RWT and provides a better differentiation of the roles and responsibilities between NSW Health and SWC role in RWT. It helps set the framework for the RWQMPs to be endorsed.</p> <p>SCA has its own MOU with NSW Health. All 3 participate are on the SLG and JOG.</p> <p>The entities are currently focussed on ADWG 2011 implementation. Also RWT aspects related to the POEO Immediate Notifications – currently means all 5 Authorities and this is not practical given the risk. Currently working with EPA to develop risk-based approach for environmental incidents. A draft Protocol has been developed.</p> <p><b><u>NSW Health Protocol for Reporting Sewage Overflows 20 December 2010</u></b></p> <p>Criteria for notifications is outlined for reticulation systems as well as STPs. Who to notify and how to follow up is outlined.</p>



Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
			<p>in particular: define a maximum tolerable hole size for water tanks that constitutes a 'vermin-proof' condition and a tolerance for the extent of direct runoff that may enter tanks through holes in roofs or other entry mechanisms.</p> <p>SOP Inspection Sheet provides guidance. Priority and sizing.</p> <p>2.1.2 Establish rules to minimise the presence of holes below the roofs of existing tanks that represent possible entry points for vermin and minimise the ingress of runoff from existing tank roofs into the tank including with respect to the anticipated design life and associated renewal/replacement of the relevant components.</p> <p>SOP Inspection Sheet gives process. Guidance provided. Design Specification.</p> <p>2.1.3 prior to 30 June 2012, conduct an audit of tanks that reports the number and location of tanks that fail to meet these requirements, and report the results of this audit to IPART. Done.</p> <p>2.1.4 prior to 30 June 2012, establish a remediation timetable to expeditiously rectify the faults identified in recommendation 2.1.3, that is to establish a program to fill/mesh any holes below the roofs of existing tanks which may permit the entry of vermin into tanks and address unacceptable water ingress to tanks;</p> <p>2.1.5 prior to 30 June 2012 amend maintenance strategy, procedures and associated work instructions and checklists, the</p>		<p><b>ADWG 2011 Implementation to staff:</b></p> <p>It was agreed with NSW Health to maintain the existing status as per ADWG 2004 in relation to <i>E. coli</i> where at least 98% of scheduled sampels contain no <i>E. coli</i></p> <p>For the Water Integration Meeting. Area level Manager attends. WQ update is provided. WQ ppt given at meetings. Area Managers can then disseminate info down to their groups.</p> <p>WTPs – Targeted at WTP Manager. Covers SWC and BOO plants. Delivered updates and re-issued protocols for 0.1 NTU to report against. As per WPIMS5228 Drinking Water Quality Event Management Plan.</p> <p>Meetings are held to discuss and manage roll out of triggers for turbidity absed targets. Minutes were noted for Friday 11 May 2012 whereby SWC and regulators met to discuss Risk based approach to manage turbidity trigger levels in the catchment and WFPs. System based risk ranking is proposed. Catchment based risk assessments are being conducted.</p> <p><b><u>Water Integration Meeting. Agenda. 20 June 2012.</u></b></p> <p>Covers OHS, Issues and Achievements, Water Quality and many other topics associated with operations.</p> <p><b><u>Annual Water Quality Review. 4 September 2012. Presented to Managers at SWC.</u></b></p> <p>Reviews and summarises performance over the audit period for water quality compliance.</p> <p>Noted the rain event impacts for Nepean for Colour and Turbidity, iron and manganese.</p> <p>Noted the positive crypto and giardia detections in raw water catchments over time – and how these have reduced since 2008/09 for most systems. Described WTP and delivery performance. Provided exception summaries. Noted changes due to ADWG 2011.</p> <p><b><u>Drinking Water Quality.pdf, Folio of Progress, 30 June 2012</u></b></p> <p>This folio reports on the drinking water quality requirements contained in Parts 2, 9 and 10 of the 2010-2015 Operating Licence, and clause 3.1.2 of the Customer Contract.</p> <p>Reports progress against Audit Findings. Summarises the response to the reservoir concerns raised in 2010-11 Audit Report.</p>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
			<p>asset management renewal/replacement strategy, training and competency needs for staff for inspection, maintenance, testing and operation and renewal/replacement/new specifications for tanks to meet these criteria.</p> <p><b>Site Inspection. 1 or 2 reservoirs.</b></p> <p>Did SWC prepare and issue to IPART by 31 March 2012 an Audit Recommendations Report that addressed the recent audit recommendations (2010-11) including address of opportunities for improvement?</p>		<p>A reservoir risk assessment workshop was held on 11 November 2011. The workshops identified various modes of contaminant ingress into the reservoir and discussions occurred on the most appropriate method to measure and prioritise the risk of ingress.</p> <p>Sydney Water inspected all existing reservoirs and finalised a remediation timetable by 30 June 2012. An inspection checklist and work instruction was prepared that included inspection criteria and critical limits that Sydney Water used to inspect each reservoir. The inspections commenced 1 February 2012 and were completed on 30 April 2012. Operational input and water quality data was used to prioritise the program of reservoir roof repairs identified from the inspections.</p> <p>For the period 1 July 2011 to 30 June 2012 Sydney Water managed drinking water quality in accordance with the Australian Drinking Water Guidelines and complied with this Operating Licence requirement.</p> <p>12 of the 13 water delivery systems fully complied with the 2004 ADWG health guideline values. The Nepean Delivery System did not comply against the THM health guideline value.</p> <p>A design Specification for a reservoir design was provided as an example of the standard needed.</p> <p>The aim of the Folio document is as internal document process to pull together whole story annually. Assigns accountability to Clauses. Tracks Progress specific to Clauses. Embedded with requirements and audit recommendations. Updated twice per year.</p> <p><b><u>Reservoir Roof Renewals Value Engineering Workshop, 24 May 2011</u></b></p> <p>Established a "functional requirement for the reservoir roof renewal" which would meet the stakeholders requirements, including optimised asset life, ease of construction, minimise construction costs and improvements in water quality performance.</p> <p>A concept design review was conducted on 3 November 2011. Initiatives included full roof span sheeting, minimising penetrations / hatches etc, ensuring roof extended over reservoir walls, vermin proofing and improving chlorine dosing ports.</p> <p>A Water Quality workshop was also held on 28 October 2011 to ensure a risk assessment process to protect water quality with reservoir design. Existing controls were reviewed.</p>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>A SOP for quarterly inspections was developed and has been delivered.</p> <p><b><u>Drinking Water Quality presentation to Managers. May 2012. Quarterly.</u></b>  Illustrates disinfection performance, customer complaints, main failures, other issues and achievements.</p> <p>Can clearly see impacts from significant rain events during the audit period.</p> <p><b>ADWG 2011 Technical Implementation:</b>  Some controversy when released. Worked with NSW Health via JOG and SLG on how to address. By 1 July 2012 – ‘fully implemented’ guidelines. Some elements – implemented base case requirements such as NTU exceedances. Exceptions reporting occurring a lot due to this .Via Working Group to develop catchment specific triggers. (Attachment 2 – SLG). States how approached and how embedding.</p> <p><u>Individual filters</u> still a work in progress – ripening times a concern, with valve shutdown delay – bit of increase – practicality aspect. Working with National Group to discuss. QMRA work may occur across NSW Health and SCA. Rated each catchment as Low, Med, High.</p> <p>By Dec 2012 Warragamba QMRA proposed – to then use as model for other catchments – using SCA models. Rain in catchment, activities undertaken, dairy farms, holding ponds, what are exposure paths and risk.</p> <p>Have currently agreed a trigger 0.5 NTU for more than 1 minute will be reported for any individual filters. Commenced first week April 2012. Some internal operational fixes have occurred to reduce exceptions.</p> <p>SWC have analysed Crypto and Giardia over last 8 years and are using this as input to current QMRA work. This is an intensive monitoring effort aiming to inform future risk-based monitoring programs.</p> <p>All individual filters have turbidity meters – SWC and BOO plants. Rigour over calibration and maintenance may not be up to scratch for NATA / regulatory records and is being enhanced on a risk-basis. This represents a shift from operational data to compliance data.</p> <p><b>OFI – ensure calibration and records shift to being for appropriate level of record, from in the past being operational.</b></p> <p>Exception reporting process is in place with BOO contracts – report done in</p>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>writing – then translated to NSW Health by SWC.</p> <p>Event Management done via WPIMS5228 – Drinking Water Quality Event Management Plan.</p> <p>Triggers managed via WPIMS5274 Triggers, Notification and Actions for Adverse WQ results – such as internal trending type changes. Not for BOOs. These are specified via contract. Do run this through from BOO to SWC. Internal triggers generally tighter for many instances.</p> <p>NTU spikes tend to be rain related – but at times perhaps filter ripening stage.</p> <p>SW are assessing for BOO partners for algorithms for reporting. Manual work required at the moment.</p> <p>Some long standing issues at Nepean. Low NTU but high colour came into the system. Treatment aspects arose that made operation difficult. R&amp;D was conducted to understand best coagulants – therefore now under control. 23 days of concern. ECC. Production aspect during prolonged event.</p> <p><b><u>SLG meeting minutes 6 Dec 2011 final and SLG meeting minutes 18 June 2012 final</u></b></p> <p>Senior members of agencies attending. Broad high level matters discussed. Agenda defined. Formal minutes recorded. Steering Committee updates provided. R&amp;D matters discussed. ADWG 2011 main points discussed. Actions listed. Participants change with topic being on agenda.</p> <p>Particularly addresses changes to ADWG 2011 and the relevant reviews and updates required internally.</p> <ul style="list-style-type: none"> <li><i>The ADWG 2011 state that the turbidity of water leaving individual filters should be less than 0.2 NTU, and should not exceed 0.5 NTU at any time where filtration alone is used as the water treatment process to address identified risks from chlorine-resistant pathogens. The emphasis has now changed from reporting turbidity exceptions from the combined filters to individual filters. For the majority of time Sydney Water is capable of meeting</i></li> </ul>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
					<p><i>the new targets. There are 90 individual filters throughout all WFPs within Sydney Water's control. Sydney Water has introduced new procedures for all plants where turbidity from individual filters exceeds 0.5 NTU. Sydney Water is working with BOO plant operators to upgrade SCADA alarms and reporting processes where necessary. Recent rainfall events and changes to raw water quality have proved challenging at some WFPs. After discussions between Sydney Water and NSW Health it was agreed that Sydney Water would report any turbidity exceptions from individual filters above 0.5 NTU for more than 1 minute. This is only an interim target until risk assessments have been completed for each catchment. The SCA, Sydney Water and NSW Health are working together to complete these risk assessments. (June 2012 minutes)</i></p> <p><b><u>ADWG 2011 main points of change (cited from P Byleveld, SLG meeting minutes 6 Dec 2011:</u></b></p> <p><i>The 98% E.coli target quoted in the 2004 ADWG has been removed from the 2011 edition of the ADWG. This has now been left to health authorities to determine in association with individual water authorities. NSW Health proposes that the original target of at least 98% of scheduled samples contain no E.coli continue for Sydney Water.</i></p> <p><i>The new cyanobacteria health alert levels and new turbidity levels were also discussed. These levels will be implemented by SCA &amp; Sydney Water. Relevant documentation of all agencies will need to be modified to reflect these changes. Paul Byleveld will contact the SCA and Sydney Water to identify contacts to follow up on this issue.</i></p> <p><i>The other major change in the guidelines is the addition of many new guideline values for pesticides in order to have the guidelines cover every pesticide legally available. Sydney Water is currently reviewing the risk associated with these new pesticides. Sydney Water will then liaise with SCA to decide whether any of these should be monitored based on the risk</i></p> <p><b><u>Attach 2 Implementation of ADWG 2011 final, June 2012</u></b></p> <p><i>The main issues outlined at the December 2011 SLG were:</i></p> <ol style="list-style-type: none"> <li><i>1. extensive expansion of pesticide information</i></li> <li><i>2. changes to notification procedures for cyanobacteria in raw water</i></li> <li><i>3. ensuring that the drinking water distribution system is free of E. coli and that the response to any detection is rigorous. The long-term E. coli compliance target in drinking water to be determined in consultation with NSW Health.</i></li> </ol>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>4. new guideline value of 100 nanograms per litre (hg/L) for N-Nitrosodimethylamine (NDMA)</p> <p>5. updated Cryptosporidium and Giardia fact sheets</p> <p>6. new turbidity targets for water treatment where filtration is a major barrier</p> <p>7. water suppliers' obligations to minimise plumbing risks in buildings</p> <p>8. total dissolved solids (TDS) limits for drinking water</p> <p>9. long-term microbial evaluations should include operational data.</p> <p>This memo provides adequate background and update of what needs to be done. Seems to be risk-based approach which is appropriate. Addresses each key area of change and promotes activity down to the WTP level and across monitoring programs.</p> <p>Sydney Water, NSW Health and the SCA met in early May to develop a qualitative risk ranking for each catchment/water filtration plant.</p> <p><b>WPIMS5228 V8 Drinking Water Quality Event Management Plan</b> Evidence of ADWG 2011 updates requirements being put into effect. In particular, algae and turbidity requirements noted to be consistent with ADWG 2011 changes.</p> <p><b><u>Water Treatment. Individual Filter Turbidity. Interim Notification Protocol.</u></b> From SWC to BOO plants. Effective date 2 April 2012. Notify if any individual filter is &gt; 0.5 NTU for longer than 1 minute. Describes communication protocol to follow.</p> <p><b><u>DWQ Compliance MP 2012-13 Final (a)</u></b> Consistent with previous versions and requirements. Provides for updates associated with changes due to ADWG 2011. Consistent with requirements of the Reporting Manual as a component of the Operating Licence with IPART. Sampling frequency and location is in accordance with ADWG 2011, and other requirements. ADWG 2011 required limits are appropriately referenced, including updates.</p> <p><b><u>WPIMS5274 Triggers, Notification and Actions for Adverse WQ results.</u></b></p>

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					<p><b><u>May 2010</u></b> References ADWG 2004 rather than 2011. Table 1 requires check for ADWG 2011 needs. Update required.</p> <p><b><u>Monthly Disinfection Report (selected Number of Months), June 2012 (ran 10/07/12)</u></b> Colour coded to clearly evidence any networks and samples of concern. Chlorine tends to exceed aesthetic guideline value as North Richmond, Orchard Hills, Nepean and Cascades. Chlorine targets for disinfection not passing disinfection target is coded red, with occurring &lt; 90% of the time at Prospect North, Ryde, Potts Hill, Macarthur and Woronora. Woronora performance in June 2012 was &lt; 78%. Generally associated with weekender facilities and end of run. Also impacted by colour and TOC with residual chlorine being consumed. Did trial and implement pre-chlorination at the Woronora WTP to assist when necessary.</p> <p><b><u>WPIMS5041 R4 Manual Disinfection of Service Reservoirs (a), Nov 2011</u></b> Objective is as per procedure name. Refers to primary and secondary disinfection roles and how and why reservoirs may require disinfection steps manually. <i>The SWC internal target requires that for 90 percentile of customers in a zone, the total chlorine residual should be greater than or equal to 0.2mg/L (or 0.6mg/L for monochloramine) at the customers tap</i> Calculations defined. Risk assessment conducted.</p> <p><b><u>NSYS13 JUL12, Control Chart example/s</u></b> Appears to show only actual data, not associated with a target of limit criteria. The SCADA however does link directly the control actual value to the control limit values.</p> <p><b><u>Copy of Prioritisation of mixers analysers chloro plants updated 8 Feb 2012 (2)</u></b> Indicates commitment to improved records and maintenance management of chlorine associated equipment.</p> <p><b><u>WOQ5171 Compliance Monitoring Plan 2011_12</u></b> Sets out the monitoring required for compliance. Compliant with Reporting Manual as per Operating Licence. Sample frequency and number adjusted due to population served, as</p>

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					<p>required.</p> <p><b><u>WOQ5013 2011-12 Annual Operational monitoring Plan final version 1</u></b>  <i>This plan sets out the proposed operational monitoring throughout the drinking water supply systems for the year 2011-12 and the associated reporting requirements. Operational parameters that are measured in this plan reflect the effectiveness of each process or activity and provide an immediate indication of performance. The results of this monitoring will not be used for water quality compliance assessment.</i>  Includes bulk water and project based monitoring.</p> <p>Well supports Element 4 of the ADWG.</p> <p><b><u>Quarterly Drinking water Quality Report Q3 2011-12 and Quarterly drinking Water Quality Report Q4 2011-12</u></b>  <i>Sydney Water produces this report each quarter to inform Sydney Water customers about water quality, available water stored in the dams, rainfall and water consumption. This report summarises a selection of health characteristics chosen in consultation with NSW Health and key aesthetic characteristics.</i></p> <p>Describes catchment to tap aspects and the associated multiple barriers. Includes data for each barrier zone – such as catchment, treatment and final water. Shows a good alignment with risk-based treatment of hazards and early warning capability.</p> <p>Table 19 – Woronora – Al. exceed on maximum value. Table 20 – 100% 'passed' noted. Table 51 and 52 reported full compliance.</p> <p>No Cryptosporidium or Giardia exceptions in treated water, except Crypto 1 for Outlet of Prospect WFP. Managed and responded to appropriately as noted below:</p> <p><i>For the year to 30 June, a single Giardia cyst was detected in a 100 litre treated water sample from Cascades WFP on 15 February and three Cryptosporidium oocysts were detected in a 100 litre treated water sample from on 4 June from Prospect WFP (Table 32). On each occasion Sydney Water notified NSW Health immediately and undertook re-sampling and an investigation of treatment performance. The re-sampling and subsequent routine monitoring did not detect any further Giardia cysts or Cryptosporidium oocysts. Based on an assessment of all relevant risk factors associated with these events, NSW Health advised that these events were unlikely to have affected public health.</i></p>



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					<p>Water quality noted to be impacted by flooding rains, such as those in March 2012.</p> <p><b><u>3rd Quarterly report 2011-12 year 1, for NSW Health</u></b>  Meets requirements of Reporting Manual.  Consistent with other reports and data / information.  Page 12 notes exceedances of pH at Woronora WTP on 14 occasions.  NSW Health notifications summarised appropriately.  <i>Woronora WTP had individual filter turbidity exceedances on 19-03-12 &amp; 23-03-12. This incident is related to the recent widespread rainfall event. The elevated raw water colour and turbidity caused operational problems at the plant.</i></p> <p>Noted that this was also evidenced and discussed during the site tour and the information and evidence was consistent. These exceedances were also consistent with implementation of a 'draft' reporting protocol for individual filters which as updated on 2 April 2012.</p> <p><b><u>4th Quarterly Drinking Water quality Report 2011-12, for NSW Health</u></b>  Meets requirements of Reporting Manual.  Consistent with other reports and data / information.</p> <p><b><u>Copy of Roof Inspection Data Analysis.xls (May 2012)</u></b>  Sufficient precision as to asset component specific risk review. Eg: hatch frame / hatch hinges / hatch locking mechanisms etc.  Notes site inspected, Who by, date, related then to HIDRA input and risk ranking.  Analysis provides for a priority ranking – major faults as red, Good as asset appropriate condition.  Many reservoirs noted to have Major Faults.  Some assets put in 12-13 program and some in 13-14 program. Some noted as 'fix now' such as Maianbar, Newport Heights, Newport, Terrey Hills, Berowra, Vaucluse and Panania.</p> <p>Scoring system applied.  Cross referenced 'risk ranking' of reservoir with WQ 'risk ranking'. Based on reservoir data over 5 years for FRC and microbiological – turnover was not incorporated. Improvement should be reflected over this date range. Used operational monitoring data not just exceptional data on known problem. Gave weighting according to strong weighting such as FRC and micro indicators. (as per Document Logic Behind the reservoir risk ranking tool).</p>

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					<p>Combined ranking was then developed. Then 'treatment' required was determined. 8 sites were deemed as 'FIX NOW' from of this process. = Major Faults and risk ranking WQ of 1.</p> <p>Status of Fix Now – handed to Maintenance Engineering. Currently doing repairs. Preparing Business Case for Fix Now. No Work Orders. Shall they do as package or separately etc.. Procurement method. WQ delivered a prioritised work program. They package into a specification. No physical works has commenced. Some repairs have occurred. Meeting held informally discussing progress. For one site WQ officer attended briefing of work at site. Confirm what said is repair can actually be done.</p> <p><b><u>Roof repair program 2012 13 &amp; 2013 14. Xls file.</u></b></p> <p>The fix now sites have been completed for 3 of 8. A further 3 were noted for completion due at end of October 2012. 2 were noted as deferred as they involve a major roof repair. A further 7 other sites were completed, and others are progressing based on the outcomes of the risk-based review.</p> <p><b><u>Roof Inspection Reports</u></b></p> <p>Viewed onsite and desk top for Heathcote (WS047 done 7/8/12) (WS151 done 7/8/12) and Lucas Heights (WS161 done 2/7/12) as examples of how done and how links to work order for work, and how closed out. Demonstrates successful transition from risk-based review, to inspection, to work, to closure.</p> <p>CONSIDER – close back and links between maintenance and WQ. How reported between eachother. By October – FIX NOW still not happening, how will meet 12/13 program as well. This is a compliance drop from Full to High and perhaps needs further risk-based .Structurally – org chart Maintenance took on and reports to GM. Doesn't go back to Operations. 1 July two divisions came back together. Another major org reform coming April 2013. Maintenance will then be back under Operations.</p> <p>Consider reservoir turnover as a component of the WQ risk associated with the Reservoir Ranking.</p> <p>Develop Work Instruction to explain conform and note any changes in future.</p> <p>Plan to revisit on annual basis to feed into capex and opex 5 year program.</p> <p>Photos are taken and copy of pdf put into Maximo.</p>

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					<p>QA control of xls. Team controlled. Shared drive can access. One –off document not to be QA at this stage. NOT FOR ONGOING.</p> <p><b><u>Copy of Process workshop WQ- potential contamination via reservoir roofing. HIDRA.</u></b></p> <p>Driver for HIDRA being noted <i>as compliance for water quality will be downgraded from full to high based on a finding from recent IPART audit relating to reservoir asset condition (specifically sealing of roof sheeting to reservoir walls and ponding on walkways) the risk of any cross contamination occurring and potential impacts on water quality</i></p> <p>Noted that <i>Multiple groups doing reservoir asset inspections with different criteria / focus / level of detail. Lack of centralised database / information storage</i></p> <p>Copy of Process Workshop WQ-potential contamination via reservoir roofing</p> <p>One std SOP now for reservoir inspections. Water area teams conducting inspections with sub-groups. Training has been provided and records were cited onsite (Heathcote Reservoir). Started July 2012 for implementation. Have recently conduct an internal review of how first quarter inspections occurred and this is still being finalised at time of audit.</p> <p>Data storage all now via Maximo data storage system. Forms and photos are stored in this location. Attaching to assets in Maximo. Then placed as a Work Log Order for any exceptions. Maximo BI to run exceptions report out of that.</p> <p>Maximo - storage, forms, assets attached, inspection report, exception reporting against work order. Check what work has been ordered previously so wont re-note that work.</p> <p>WS0211 – Newport Heights - REVIEWED ONSITE. 1011682 – Photos. Unique numbering per record entry. Filled out sheet logged. Copy sent to WQ team to add to risk register. In future quarterly will not go to WQ.</p> <p>Currently not considering how reservoirs are entered – recommend create its own asset class to give it clearer identity between roof and walls, and associated mechanical and electrical. This would assist in understanding asset replacement of roofs which need faster replacement than the walls for example.</p> <p><b><u>WN5340 Asset inspection water network facilities SOP, July 2012</u></b></p> <p><i>The purpose of this procedure is to ensure all reservoirs and water pumping</i></p>

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					<p><i>stations are effectively and regularly inspected. This inspection data is recorded and corrective actions are initiated and completed where needed to ensure that requirements for security, water quality and continuity are met.</i></p> <p>Under Section 3.5 Escalation. Role of Spotless and MED noted</p> <p>WN5340 Asset inspection water network facilities SOP – implemented 1 July 2012. First quarter just completed.</p> <p>Spotless and MED – contractors for repairs. Spotless facility manager – property maintenance – lawns / guttering / fences etc.</p> <p>MED (Mech Electrical Delivery) – mechanical / electrical maintenance. Some are internal SWC staff and some are contractors under the one entity. Tradesmen managed by Transfield. 30% asset stock managed by Transfield. Outsourcing opportunities being explored to be delivered 100% by contract.</p> <p>SWC does inspection. Give to Spotless as Report with Job No applied. Or recorded in Maximo as work order. Work Log references all.</p> <p>Work Order outlines priority and risk to MED.</p> <p>Up for Board to determine this risk priority compared to other risk for SWC.</p> <p><b><u>Copy of Reservoir risk ranking tool and Logic behind the reservoir risk ranking tool</u></b></p> <p>HIDRA based colour scheme. FRC and which microbe for risk. Every sample collected. Gave number for reservoir. Then compiled and ranked across all reservoirs. – 1 (bad) to 4 (good). Considered acute and chronic incidents. Met with internal stakeholders to review risk ranking approach and method.</p> <p>Disinfection optimisation meetings held routinely – Minutes Woronora Water Quality review. Internal stakeholders. Is post implementation impacting the data – discussed at meetings to observe changes.</p> <p><b><u>Woronora Water Quality Review Meeting Minutes (29/2/2012 and 2/10/12)</u></b></p> <p>Disinfection charts are reviewed as well as operational work and leak detection. Based in reticulation system predominantly except where WTP contributing.</p>

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					<p>Noted that modelling of Ct done for Sutherland PRV zones. Solar Bee updates also given.</p> <p>Woronora WFP aspects are outlined such as chlorine dosing set points.</p> <p>Reservoirs also reviewed for their chlorine levels.</p> <p>Looking to use ranking to adapt to asset funding requests such as mixers, etc..</p> <p><b><u>Training Record WN5340 - Jul 2012 Reservoirs and Tanks (a) and Training Record WN5340 for Reservoir and Tanks (a)</u></b>  Training record provided as evidence of training associated with asset inspection and revised forms WR4, WR5 and work instructions.</p> <p><b><u>7718 signed letter</u></b>  Evidence of report provided to IPART by 31 March 2012.</p> <p><b><u>Eval of 2010-11 OL Audit Recommendations External CR26032012 SS, 26 March 2012</u></b>  Evidence of report and program between SWC and IPART.  Noted that commitments on timing and breadth of work is being met.  Report provided to IPART prior to 31 March 2012, as was required.  Risk review conducted in October 2011 to respond immediately to reservoir concerns. Appropriate actions completed in a timely manner.  Inspection checklist and risk register completed. All reservoirs ranked and a priority program scoped with the financial years.</p> <p><b><u>Briefing note for Reservoir Roof inspection (and associated aspects):</u></b>  Draft checklist then field tested at some sites. Then went again and internally audited that data and inspections were as required.</p> <p><b><u>Instruments and Control Charts and CCPs:</u></b>  Chemical dosing team – look after 254 analysers. Work includes induction packages; SOPs for re-chlorination; ICATS SOP and training; Put out daily report.  ICATS viewed onsite. Flows, meters, levels. For example see Woronora.  Alarm levels gives ranges. Notified then investigated. Alarms are same as</p>

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					<p>CCPs – as per Aquality review assessed. Look at trends daily and notify any concerns. The instigate site review.</p> <p><b><u>Rechlorination Plant Monthly Report Aug 2012.</u></b>  Chlorine analyser – maintenance records. Internal maintenance of chlorine analysers. Some done by MED. All viewed onsite.  Rechlorination SOP.  Analysers database. V6 – 050612 QA unknown.  Maintenance via Maximo Work Orders. Current pdf of orders.  Meetings held Wednesday with Maintenance – Transfield. Go through them all for close out etc. Monthly meeting also held for higher level review.  Test Sheets. Pdf.</p> <p><b><u>Mainbar Reservoir – Any docs associated with mitigation of a concern zone:</u></b>  Example provided. Control charts and internal reporting targets. Chronic. National Park end of system. Weekenders etc. Issues with FRC up. Ranking tool applied. Applied a case to install a mixer. Chlorine tablet dosed. Solar bee mixer installed. Emails trail. Nitrifying system. Evaluated solar bee done. Control chart viewed during audit has seen an increase in FRC. From 0.2 to 0.6 and 1.6 mg/L. Dated 4 Oct 2012. Could now breakpoint chlorination if wanted. Held workshop to rank. WQ reviews done on regular basis. For Woronora do frequently. Six weekly. As per example before.</p> <p><b><u>Rechlorination plants process and equipment workflow. SOP. RE 5320. Issue 5. 1 April 2011.</u></b>  This is a workflow SOP, which shows the tasks to be completed on a routine site visit to each Rechlorination Plant be it Drinking Water or Recycled Water.</p> <p><b><u>Rechlorination Plants ICATS. SOP. WT 5201. Issue 5. Date 19 June 2012.</u></b>  This SOP assists in the allocation of resources to service drinking water and recycled water Rechlorination Plants on a day-to-day basis. Rechlorination plant failures are detrimental to the secondary disinfection within the water network. The performance of each Rechlorination plant is reported monthly</p> <p><b><u>ICATS Daily Rechlorination Plant Performance and Routine Plant Monitoring. XIs file. Dated October 2012.</u></b>  Lists each reservoir, date, chlorine range, chlorine residual, alarms, comments and PO notification.</p>

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					<p><b><u>Analysers database V6 050612. Xls file.</u></b> Lists delivery system, analyser assets, calibration requests, analyte and responsibility for calibration.</p> <p><b><u>Chlorine analyser – maintenance records – latest version. Xls file.</u></b> Shows online ph, turbidity analysers – maintenance activities. Such as probe changes, membrane / electrolyte changes.</p> <p><b><u>Chlorine analysers CPo2Aug1213.. Xls file.</u></b> Shows the chlorine analysers compliance performance summary.</p> <p><b><u>Field Form for calibration of W&amp;T membrane type chlorine analysers. RE 5031.01.</u></b> Viewed 16 and 17/8 noted records.</p>
b	Sydney Water must prepare, to the satisfaction of NSW Health, a Five Year Drinking Water Quality Management Plan covering the entire five year term of the Licence. The Five Year Drinking Water Quality Management Plan must be in operation by 31 December 2010 and include strategies for the comprehensive management of the quality of Drinking Water in Sydney Water's water supply system in accordance with the Australian Drinking Water Guidelines (unless NSW Health specifies otherwise).	Full	<p>As above, plus the following.</p> <p>Have any new reticulated areas been added or removed to the Plan since the previous audit period? If so, specify and describe how these were managed for incorporation and implementation.</p>	<p>Drinking Water Quality Management Plan.</p> <p>Associated significant policies, procedures and relevant registers and documents of the DWQMP for Elements 1, 2, 3 and 9.</p>	<p><b><u>Drinking Water Quality.pdf, Folio of Progress, 30 June 2012</u></b> NSW Health has endorsed the Five-year Drinking Water Quality Management Plan 2010 – 2015 (DWQMP). It includes Sydney Water's strategies for managing drinking water quality 2010 – 2015 and is prepared in accordance with the ADWG 2004.</p> <p>Sydney Water, in consultation with NSW Health, started adopting the new ADWG 2011 in the 2011-12 Financial Year with full implementation by 1 July 2012. Details of the changes have been documented in the 2011-12 Annual Report on the Implementation of the Five Year Drinking Water Quality Management Plan.</p> <p><b><u>WPIMS5152 Five Year Drinking Water Quality management Plan 2010-2015</u></b> Prepared and submitted in accordance with Reporting Manual and Operating Licence requirements.</p> <p><i>The primary objectives of this Five-year Drinking Water Quality Management Plan are:</i></p> <ul style="list-style-type: none"> <li>• to set the strategic direction for Sydney Water to manage drinking water quality in its drinking water systems</li> <li>• to document the strategies for managing drinking water quality under the 12-element structure of the Australian Drinking Water Guidelines (ADWG)</li> <li>• to fulfil the obligations of clause 2.1 of Sydney Water's Operating Licence.</li> </ul>

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					<p><i>These objectives are consistent with Sydney Water's Operating Licence and its Memorandum of Understanding with NSW Health.</i></p> <p>Does refer to ADWG 2004 which is appropriate for its writing time, but could possibly be updated to reflect ADWG 2011? Is 3.1.3 still relevant. Also notes AS4360 whereas ISO31000 may now be more appropriate.</p> <p>Don't update 5 year plan -except as via 1 year plan.</p> <p><b><u>KNOW RISK ONSITE DEMONSTRATION</u></b> Risk categories – corporate, process, asset etc.. Assets – water type: Eg – water Northern – 05 Prospect North Delivery System – 5.1.1 Baulkham Hills Supply Zone – A/ R/ Q/ C. Annual update of a register at Networks and Treatment Level. Done by teams, planner / lab / WQ / asset operator. Catchment to tap – system – contaminant – assessed. Eg – Nepean – THMs – occurs for extended period of time. Consequence and controls. Would consider incidents to verify future reviews.</p> <p>Specifically rated for a system and given parameter.</p> <p>If situation arises that is a whole new risk – as via HIDRA – or incident debrief / review – enter straight away.</p> <p>Further example – Asset – Woronora – Woronora – mainbar zone – risks noted. Solar mixers noted and will be reviewed when installed and changed.</p> <p>Good linkage between incidents and Know Risk.</p> <p>BOO and SDP included as catchment to tap – not plant. But attended joint RA with them at other times.</p> <p>RWT risks not in KnowRisk yet. Still in xls and templates to be transferred.</p> <p><b><u>Mid term review of catchment to tap risk assessment for water quality. Agenda, attendee list, minutes, Sept 2012.</u></b> Included SWC, NSW Health and SCA.</p>



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					<p>Included review of KnowRisk platform. Risk register reviews done for Water treatment systems. Considers ADWG 2011 updates and changes needed.</p> <p>Went to each area. Reviewed their risk assessments. Collated a review of issues of risks. Meeting with key staff. Any new risks / changes. Collated that input. Training session on KnowRisk given – records cited. Agenda for meeting. SCA requested to review their risks internally with their risks. Came together to optimise summary information. Signed attendance sheet cited. RD group, treatment, SCA, networks, NSW Health, BOO contractors. Comments underway for being received. Follow up actions noted. Eg – QMRA – c/g/NTU.</p> <p><i>Sydney Water intends to summarise its existing critical control point information into one document. This information is currently captured in the BWSA, DWQEMP, SCADA and control systems as well as SOPs</i></p> <p>North Richmond Plant done as example. Standard template developed. Deferred implementation due to resourcing. Only starting again shortly.</p> <p><i>Macarthur BOO/SCA to put appropriate safe guards in place to protect water quality in the event of a spill at Broughtons Pass.</i></p> <p>Hydrocarbon monitor to be installed. Action is with SCA.</p> <p><b><u>Aquality review – update – powerpoint presentation.</u></b> Summary of scores for review provided. SW achieved a high score of between 97 and 100% against all 12 Elements and an average score of 98%.</p> <p><b><u>Annual Report of 5 year Plan. Presentation.</u></b> Annual review of WQ performance. Trends and issues. Input to 5 year Plan. Any modifications / changes needed. Key Managers given a half day Workshop. Detailed WQ Management Review.</p>

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					<p>Level 3 Managers (not MD / GMs) as they get via SLG. Feeds into their Business Plans. Defined for capex / opex. Compiled into annual report against 5 year plan.</p> <p><b><u>4 September 2012, 2011-12 Annual WQ review – Water Product IMS Annual Review:</u></b></p> <ul style="list-style-type: none"> <li>• More formal</li> <li>• Catchment to tap, including SCA and SDP</li> <li>• All parameters – over 70</li> <li>• Nepean storms – colour and NTU, and some Fe and Mn, some toxic algae blooms also.</li> <li>• Raw c/g results</li> <li>• Upper Canal – c/g plans</li> <li>• Frequency concern for Upper Canal and Prospect for c/g detections</li> <li>• Giardia has increased moreso with storms than Cryptosporidium – not known why at this stage but appears to be environmental as has occurred across catchments.</li> <li>• Risk assessment for SDP confirmed with c/g monitoring</li> <li>• Nepean struggled with high FRC during period – extra demand due to colour.</li> <li>• Macarthur – NTU – 97.2%. Fast changing supply due to offtake location and setting. Rain event impacted. React promptly required. July 2011 declared an incident – Feb/March 2012 rains. SWIRL informed NSW Health. Increased FRC. No public health impact. Significant dollars would be needed to change the case. Such as capacity increases. Different coagulants and flocculation to be trialled.</li> <li>• THM one analyte in one system where THM above ADWG. NOM related.</li> <li>• Better understand customer complaints – such as ‘discoloured water’ what does that mean. Some also double up of entry into system</li> <li>• Noted ‘red’ areas of customer complaint.</li> <li>• Exceptions reported to Health – 55. Due to ind filter NTU aspect.</li> <li>• Two DWQ incidents decalred due to wet weather.</li> <li>• Aquality review – scope included BOO plants this time. Macarthur Plant was visited.</li> <li>• Shall repeat every 5 years.</li> <li>• Most exceptions due to samples taken when new mains commenced – seal around new mains. Now using ozone for new mains disinfection. More efficient – hours rather than days. Now moved from Pilot to real roll out progressively. More units now</li> </ul>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
					needed to be purchased.  Macarthur Plant – new operators given additional training. See Annual DWT Report. Document # 4. March 2012 – during rain event essentially. Coupled with reporting requirement change.
c	The Five Year Drinking Water Quality Management Plan is to be revised for the period 1 July 2015 to 30 June 2020. Sydney Water must provide a draft revised Five Year Drinking Water Quality Management Plan to NSW Health by 31 December 2014.		This clause does not apply until the 2014 audit and is excluded from the audit scope		Not audited as not applied in this audit period.
d	Sydney Water is to implement procedures and processes for the appropriate management of the Drinking Water supply system under its control in light of its knowledge of the entire Drinking Water supply system (from the source to the consumer). Sydney Water must have adequate systems and processes in place to manage Drinking Water quality taking into account planning and risk management and their implementation across the entire Drinking Water supply system.	Full	<p>Did the water supplied meet the ADWG for the compliance reporting period?</p> <p>If any non-conformances, were these appropriately managed, in accordance with the DWQMP, and reported to NSW Health?</p> <p>Does the Plan and associated Policies and Procedures appropriately incorporate ALL aspects of the Sydney Water system?</p> <p>Does planning inform the DWQMP and allow for update of the Risk Register?</p> <p>Does the Plan cover the full operating area of Sydney Water, including schemes that are operated by contractors</p>	<p>Drinking Water Quality Management Plan. Associated Risk Register, Risk Policy, Risk Procedure, Risk Matrix. Planning input to the Risk Register. CCPs and critical limits summary. Evidence of how incorporation of assets as they come on-line occurs.</p> <p>DWQMP associated documents for the Woronora WTP including relevant contract documents for how the contract is managed to protect Drinking Water quality (no commercial in confidence components required).</p>	<p><b>As noted under 2.1a</b> for relevant monitoring and compliance reports. Noted that compliance was almost always 100% and where not exceptions were reported and managed and responded to appropriately.</p> <p>Business Intelligence program.</p> <ul style="list-style-type: none"> <li>• Monthly Disinfection Report (selected Number of Months)</li> <li>• WOQ5171 Compliance Monitoring Plan 2011_12</li> <li>• Woq5013 2011-12 Annual Operational monitoring Plan final version 1</li> <li>• Quarterly drinking Water Quality Report Q4 2011-12</li> <li>• 3rd Quarterly report 2011-12 ver 1</li> <li>• 4th Quarterly Drinking Water quality Report 2011-12</li> <li>• Quarterly Drinking water Quality Report Q3 2011-12</li> </ul> <p><b><u>2011 12 Annual Report on Implementation of 5yr DWQMP Final</u></b>  <b><u>Key Issues for 2011-12:</u></b>  <i>In October 2011, the National Health and Medical Research Council (NHMRC) released the latest version of the Australian Drinking Water Guidelines 2011 (ADWG 2011). Sydney Water, in consultation with the NSW Ministry of Health (NSW Health), commenced adopting the new ADWG 2011 in the 2011-12 financial year with full implementation by 1 July 2012. NSW Health, the Sydney Catchment Authority (SCA) and Sydney Water found</i></p>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
			<p>and BOO approaches?</p> <p><b>Site inspection of Woronora Water Treatment Plant.</b></p> <ul style="list-style-type: none"> <li>• Gain understanding of how O&amp;M contract managed to protect Drinking Water Quality.</li> <li>• Understand monitoring – online and laboratory.</li> <li>• How reporting across the contract occurs.</li> <li>• How brought on-line and how moth-balled – considering water quality management.</li> <li>• CCPs and critical limits.</li> <li>• Focus on Elements 2, 3 and 9</li> </ul>		<p><i>nine main focus issues impacting Sydney Water's operations and reporting obligations from release of the ADWG 2011. There were no changes to the 12 elements in the ADWG 2004 Framework which is considered best practice in the management of drinking water quality.</i></p> <p><i>For the 2011-12 reporting period, 12 of the 13 Water Delivery Systems fully complied with the 2004 ADWG health guideline values. The Nepean Water Delivery System met all guideline values except trihalomethanes (THMs).</i></p> <p><i>Summary:</i></p> <ul style="list-style-type: none"> <li>• <i>A high percentage of samples continue to contain no E.coli. Only six samples returned positive results for E.coli in Financial Year 2011-12. These samples were thoroughly investigated for E.coli in accordance with NSW Health protocols and no direct evidence of faecal contamination has been found. On all occasions repeat samples have shown no E. coli.</i></li> <li>• <i>Sydney Water has been consistently meeting turbidity targets of &lt;0.1NTU at all water treatment plants (WTPs) and the turbidity levels at customers taps remains low at an average of 0.13 NTU in 2011-12.</i></li> <li>• <i>The levels of iron in drinking water measured at customers' taps have been stable and well within the guideline limits with an average concentration of 0.019 mg/L in 2011-12.</i></li> <li>• <i>The average pH measured at customers' taps has been very stable (7.9) for the last six years and well within the range required by the ADWG.</i></li> <li>• <i>Total trihalomethane levels have remained well below ADWG guideline levels. For the 2011-12 reporting period, a moderate increase in overall concentration of THMs has been noted. Wet weather events in the catchment led to an increase in true colour, turbidity and natural organic matter in the raw water supply. Sydney Water managed its water treatment processes as per the recommendations in the ADWG, where action is encouraged to reduce THM levels but must not compromise disinfection.</i></li> <li>• <i>The number of customer complaints related to drinking water quality in 2011-12 decreased to 0.50 from an annual rate of 0.63 complaints per 1,000 customers in 2010-11. Overall, customer complaints have decreased considerably over the past 10 years. Sydney Water is continuing to review its customer complaints and take action to further reduce customer complaints related to water quality.</i></li> <li>• <i>Sydney Water continues to rate highly in customer surveys. In the Customer Relationship Study conducted in May 2012, the average rating on a scale from 1 to 10 for drinking water quality was 8.4. These results show continual improvement in the ratings each year since the study began in 2007. The Sentiment Monitor Study also shows an increasing trend since 2005 in consumers' perception of the high quality of drinking water supplied by Sydney Water.</i></li> <li>• <i>For a number of years Sydney Water has achieved full compliance in the annual IPART Operating Licence Audit for drinking water quality. In the 2010-11 financial year, the auditor found that Sydney Water continued to</i></li> </ul>

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					<p><i>deliver drinking water to an excellent standard to its customers. Sydney Water achieved full compliance with 9 out of the 10 audited sub-classes with high compliance awarded to the remaining sub class.</i></p> <p><i>On-going action - Sydney Water developed models to calculate Ct values under various operating conditions for each WTP in 2003-04. These models are currently being reviewed and updated where necessary to deal with site changes.</i></p> <p><i>Real time variation of Ct and associated log inactivation of Giardia at each WTP is currently being reviewed. A trial involving trending an instantaneous Ct value on SCADA is being planned for one of the WTPs. A discussion paper to determine the use of Ct within Sydney Water is currently being drafted.</i></p> <p><i>This has been developed for a WTP and will be rolled out to others shortly.</i></p> <p><i>The risk management training strategy has been implemented and all operational users have been trained. The supplementary e-Learning tool has been developed with YouTube quick bites to refresh users. These will be rolled out over 2012-13.</i></p> <p><i>Ongoing action - By midway through the course of this Five-Year plan, Sydney Water intends to summarise its existing critical control point information into one document.</i></p> <p><i>This information is currently captured in the BWSA, DWQEMP, SCADA and control systems as well as SOPs. The current range of systems and documents contain water quality targets, operational limits and control actions. Work on summarising the critical control points started in 2011-12. North Richmond WTP was used as the trial plant.</i></p> <p><i>A template is currently being finalised and once completed will be used to capture the same information across all other WTPs.</i></p> <p><i>SWC and Woronora Ongoing action - Due to accelerated loss of disinfection residual in the Woronora Delivery System in 2011 a new operating protocol for disinfection at Woronora WTP was implemented to improve residual maintenance in the distribution network. Prechlorination of the raw water was trialled at first and then an increase in the final chlorine set point target at the WTP. These measures were found to prevent the loss of disinfectant residual in the distribution network.</i></p> <p><i>With the Desalination Plant shutting down the total blend of water supplied will change with increased water from Prospect WTP. A review of the operating regime will be completed in 2012-13 to further optimise levels of disinfectant throughout the distribution network, particularly in higher risk</i></p>

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					<p>periods.</p> <p>Pre-chlorination is not being done at the moment, but may be instructed to the BOO operators by SWC if needed.</p> <p>Appendix 1 provides a summary of notifications to NSW Health.</p> <p>Reporting and data / information is consistent with other Reports.</p> <p><b><u>Drinking Water Quality.pdf, Folio of Progress, 30 June 2012</u></b></p> <p><i>The DWQMP 2010 – 2015 outlines the Corporation's strategies to continue to maintain current drinking water quality performance, and at the same time to position Sydney Water to effectively deal with and manage any emerging water industry issues that may arise over the period of the Plan. The Five-year Plan is based on managing drinking water quality in accordance with the Framework For Management of Drinking Water Quality.</i></p> <p><i>Sydney Water's Corporate Risk Management Policy outlines the organisation's approach to assessing and addressing risks. It applies to all risk management activities carried out within Sydney Water and is consistent with the Australian/New Zealand Risk Management Standard AS/NZS 4360:2004. Risk assessment is now incorporated in Sydney Water's Integrated Management System, which is currently certified to the internationally recognised standard (ISO 9001).</i></p> <p><i>The Sydney Catchment Authority (SCA) and Sydney Water, together with Build Own Operate (BOO) contractors and NSW Health, undertook a comprehensive 'catchment to tap' risk assessment in 2009-2010 for water quality for each barrier.</i></p> <p><i>Major catchment-to-tap risk reviews are undertaken every five years. Outcomes from this risk assessment will be used to update the SCA's Raw Drinking Water Quality Management Framework and Sydney Water's Five-year Plan.</i></p> <p><i>Under Sydney Water's standard operating procedure for drinking water quality risk management, additional detailed risk assessments are also done regularly at Water Filtration Plants (WFPs) and in the water distribution networks. Operating and maintenance procedures, like the Drinking Water Quality Event Management Standard Operating Procedure, are controlled via the Integrated Management System.</i></p> <p><i>Sydney Water's training programs are developed both internally and externally to ensure that staff receive appropriate training. Personal training needs are identified annually through individual personal development plans. Compass (Sydney Water's web based performance and learning system) is used to schedule training and maintain records. Staff directly involved in</i></p>

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					<p>managing water quality are trained in relevant procedures contained in the Integrated Management System.</p> <p>In relation to Incident Management training, Sydney Water has a program of regular training and joint exercises with key stakeholders. These simulations place systems, processes and facilities into situations as close as possible to real events. The exercises provide opportunities to test communications, planning and management procedures, and include emergency management training.</p> <p><b><u>Know RISK</u></b> onsite review – recorded above</p> <p><b><u>AMQ0012 SAP Water Quality risk management processes, May 2011</u></b> The purpose of this SAP is to provide an overarching procedure for the implementation and integration of the various drinking water quality risk management processes that exist within Sydney Water</p> <p>Risk is managed at various levels in the organisation as reflected below: Sydney Water's Corporate Risk Management Policy (QMAF0003) provides a corporate wide approach for the assessment and treatment of risk. It applies to all risk management activities carried out within Sydney Water and is consistent with the Australian/New Zealand Standard AS/NZS 4360:2004, Risk Management.</p> <p>Further guidance on risk management is provided in the Water and Wastewater Risk Assessment SAP (BMIS0125), which describes the risk assessment process and provides instruction on how to establish, review and update risk registers.</p> <p>Catchment-to-tap risk assessments are undertaken and reviewed at a planning level to gain an understanding of the major risks to water quality from the catchments and dams, to the WFPs, right through to the ends of the distribution systems that supply Sydney Water's customers with drinking water. Catchment-to-tap risk assessments are used as an instrument to help steer the water quality planning process and develop strategies aimed at reducing water quality risk.</p> <p>On an annual basis the Network and Treatment risk assessments should be reviewed internally and evidence was presented to this effect as having been undertaken.</p> <p><b><u>Catchment-to-tap risk assessments</u></b> are broad in scope, capturing risks that fall under the jurisdiction of Sydney Water, the SCA, BOO WFPs and NSW Health. To ensure risks are appropriately assessed, these risk</p>

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					<p>assessments should involve senior representatives from Sydney Water's Water Networks, Water Treatment and Water Quality &amp; Assurance teams, the SCA, NSW Health and where appropriate, the BOO WFPs.</p> <p>Catchment-to-tap risk assessments should be undertaken every five years concomitant to the preparation of the Five-Year DWQMP. Any relevant issues identified in the risk assessment can then be addressed appropriately in the Five-Year DWQMP.</p> <p><b><u>SWIRL</u></b> onsite review done.</p> <p>Notifications to Health first via Phone. Then using this online notification system – Feb 2012 implemented. Sydney Water Incident Recording and Learning application. Workflow to capture actions and learnings. SCA have direct access to this also. ALL SWC incidents. Eg – Werriberri Ck detections entered by SCA. All incidents emailed to Health. Triggers for calling written in SOP. Entered responses are then emailed to all parties as entered by say Health or SWC. Aiming to open to BOO plants and contractors at some point.</p> <p>Eg: Macarthur NTU – exceed 0.5 for 19 mins. 15/6/12. Check with annual report. Checked and as per Annual Report. Good.</p> <p>Eg. Woronora WTP – Incident 22/5/12 – checked across SWIRL and Annual report. Good.</p> <p><b><u>ICATS</u></b> onsite review. All consistent with other documents.</p> <p><b><u>SCADA</u></b> onsite review. All consistent with other documents.</p> <p><b><u>WPIMS5274 Triggers, Notification and Actions for Adverse WQ results</u></b> As noted under 2.1a above.</p>



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					<p><b><u>Woronora Contracts – commercial in confidence</u></b> onsite review conducted.</p> <p>All BOO contracts noted to be similar. They are 'Old' contracts being signed in mid 1990s. Owned by Operator. Owner operator have own QMS. Interact with SWC. Responsibility sites with them. SWC has input to them for their requirements. Generally done via contract or via amendments.</p> <p>Contain monitoring plan. WQ spec set. Types and frequency set. Clauses general regarding reporting and incidents. Operators Procedures do their own and SWC input to check align with their needs. There is a standard template.</p> <p>Eg – Veolia for SWC. From Veolia procedure. Early warning report sent out including SOC. When SWC receive – protocols for notification followed. Into SWIRL. Then coordinate de-briefs.</p> <p>Viewed – Incident / Early Warning Report – 14.3.12. FM-WYU-9-1437-2. Woronora WFP. 22/5/12 7.42pm. Incident as high NTU due to ferric chloride dosing with NTU &gt; 0,1 for 2.33 hours. 0.5 exceeded for 14 mins.</p> <p>BOO plants prepare monthly NTU &gt; 0.5 report which includes new protocol.</p> <p>Woronora – dated 19.06.06. Fourth amending deed. (Wyuna). Progress Reports / Monthly Meeting / Copies of Reports.</p> <p>Monthly WFP performance report. Quantity and quality summary. Incidents noted. May 2012 report example showed 5 incidents – related to pH. And One NTU.</p> <p>Sometimes reported against contract criteria not ADWG but always same or tighter than ADWG.</p> <p>Fluoridation also addressed.</p> <p>Raw Water contracted via SWC, not SCA. Testing protocols covered by contract. SWC can audit water quality test data. Audit Rights held.</p> <p>SWC do Audit Wyuna. 1 to 3 per annum usually. Focussing on different aspects. Laboratory / WQ; Safety; Environment. Have audited their audits to</p>

Clause	Requirement	Grade Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>reduce re-work.</p> <p>Keeping up with legislation can be interesting – particularly for HSE.</p> <p>BOO – don't mothball. Bring on new plant. Not likely and not done in the audit period.</p> <p><b><u>THM exception reporting for Nepean. Monday 16 April 2012.</u></b> Evidence of timely response and notification cited.</p>
e	Sydney Water must comply with the fluoridation plant operating targets set out in the Fluoridation Code.	Full	<p>Has SWC complied with the code for the entire audit period?</p> <p>Has SWC complied for its entire area of operations including schemes that are operated by contractors and BOO approaches?</p> <p>Did the code change during the audit period?</p>	<p>Fluoridation Plan/s.</p> <p>Woronora Water Treatment Plant – specific fluoridation documents, policies, procedures, calibration records.</p> <p>Fluoridation monitoring data – summary. Entire area of operations.</p>	<p><b><u>May 2012 Fluoride report Combined new</u></b> <b><u>March 2012 Fluoride report Combined</u></b> <b><u>Feb 2012 Fluoride report Combined</u></b> <b><u>April 2012 Fluoride report Combined</u></b> <b><u>June 2012 Fluoride report Combined</u></b></p> <p>Few minor incidents of low Fluoride readings due to online monitoring calibration, and a manual override. Both promptly noted and rectified.</p> <p><b><u>Woronora WTP - Fluoride all in specification.</u></b></p> <p><b><u>Drinking Water Quality.pdf, Folio of Progress, 30 June 2012</u></b> Sydney Water complied fully with the fluoridation plant operating targets set out in the Fluoridation Code. A Fluoride report is sent to NSW Health every month containing data from Water Filtration Plants and customers' taps. 2011 –2012 (12 Months) – Full Compliance.</p>
f	Sydney Water must report on Drinking Water quality monitoring in the manner and form outlined in the Reporting Manual.	Full	<p>Did SWC report on drinking water quality in accordance with the Reporting Manual June 2012 update and earlier versions associated with the audit period?</p> <p>Were the quarterly public reports publicly available and</p>	<p>Drinking Water Quality Monitoring Reports.</p> <p>Two quarterly Public Reports. Evidence of publicly available free of charge.</p> <p>Five monthly NSW Health Reports. Fluoridation.</p> <p>Two Quarterly NSW Health reports. Drinking Water Quality.</p>	<p>As noted under 2.1a for relevant monitoring and compliance reports. Noted that compliance was almost always 100% and where not exceptions were reported and managed and responded to appropriately.</p> <ul style="list-style-type: none"> <li>• Monthly Disinfection Report (selected Number of Months)</li> <li>• WOQ5171 Compliance Monitoring Plan 2011_12</li> <li>• Woq5013 2011-12 Annual Operational monitoring Plan final version 1</li> <li>• Quarterly drinking Water Quality Report Q4 2011-12</li> <li>• 3rd Quarterly report 2011-12 ver 1</li> </ul>

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			<p>free of charge?</p> <p>Was this done in accordance with the required timelines?</p> <p>Was this done in accordance with the specified items for each type of report required?</p> <p>Were any incidents or emergency reports required?</p>	<p>Exception basis.</p> <p>Two Annual Reports. 1 October 2011. October 2012.</p> <p>Standard Operating Procedure.</p> <p>Drinking Water Quality Event Management.</p>	<ul style="list-style-type: none"> <li>• 4th Quarterly Drinking Water quality Report 2011-12</li> <li>• Quarterly Drinking water Quality Report Q3 2011-12</li> <li>• May 2012 Fluoride report_ Combined_new</li> <li>• March 2012 Fluoride report_ Combined</li> <li>• Feb 2012 Fluoride report_ Combined</li> <li>• April 2012 Fluoride report_ Combined</li> <li>• June 2012 Fluoride report_ Combined</li> </ul> <p><b><u>5YP Implementation report 2010 11 Final</u></b></p> <p>Prepared on time and in accordance with Reporting Manual.</p> <p><b><u>Drinking Water Quality.pdf, Folio of Progress, 30 June 2012</u></b></p> <p>Sydney Water produces detailed summary reports of drinking water quality monitoring and these reports are made available to the public on the Sydney Water website around 4 weeks of the end of each quarter. During the 2011-12 year, minor delays (1 business day) occurred in publishing the reports to the web due to the complexities in managing multiple data sources and the tight timeframes. Although Sydney Water treats its Operating Licence reporting obligations very seriously, it is not willing to compromise data integrity in order to meet these deadlines, however, has recognised that systems need to be improved to meet the deadlines.</p> <p>Sydney Water also produces an exception based Quarterly Drinking Water Quality Monitoring Report and delivers to NSW Health within 6 weeks of the end of the quarter.</p> <p>The 4th Quarterly Drinking Water Quality Monitoring Report to NSW Health is to be provided to IPART on 1 September each year. In 2010-11 this report was provided to IPART on 1 September 2011.</p> <p>An Annual report on the Implementation of the Five Year Drinking Water Quality Management Plan is to be provided to NSW Health and IPART on 1 October each year. The annual report for 2010-11 was produced by Sydney Water and delivered to stakeholders on 1 October 2011. The Annual Report for 2011-12 is being prepared and due to NSW Health and IPART on 1 October 2012.</p> <p><b><u>Compliance Certification 2011-12 MD Chairman.pdf, Dated August 2012</u></b></p> <p>Associated with annual reports submitted to IPART by 1 September 2012.</p> <p>Outlines compliance and any non-compliance matters, in associated schedules.</p> <ul style="list-style-type: none"> <li>• Schedule A – no non-compliances to report</li> <li>• Schedule B – System performance standards report</li> <li>• Schedule C – Performance Indicators Report</li> <li>• Schedule D – Water Efficiency Report</li> <li>• Schedule E – Priority Sewerage Program Annual Report</li> <li>• Schedule F – Fourth Quarter DWQ monitoring Report</li> <li>• Schedule G - Fourth Quarter DWQ monitoring Report</li> </ul>

## **Appendix C** – Water Quality Detailed Audit Findings (Part 2, Section 2.2)

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
a	the Australian Guidelines for Water Recycling (unless NSW Health specifies otherwise) to the satisfaction of NSW Health; and/or	Full	<p>Did Sydney Water manage Recycled Water in accordance with the Australian Guidelines for Water Recycling? Please provide evidence of compliance through Sydney Water internal audit records and substantiated KPIs).</p> <p>Were any other requirements specified by NSW Health?</p> <p>Have all RWQMPs been endorsed by NSW Health? Was this done by 31 March 2012? Has an agreed timetable been deployed?</p> <p>Are operators, staff and contractors aware of their commitments under the RWQMP, and in particular critical control points and associated limits (CCPs)? How are Operator training records maintained and reported? How are Operator immunisation records maintained as current?</p> <p>Are SCADA and monitoring points aligned with the CCPs and limits? Are they consistent from RWQMP to online to records?</p> <p>Have CTs been developed for each RWQMP scheme? Does the minimum CT allow sufficient disinfection for the end use?</p> <p>In validating recycled water schemes, have you developed and documented verifiable evidence for all assumptions made in validation and moved away from any reliance being placed upon, or any reference being made to, the indicative estimated values in Table 3.4 of the AGWR?</p>	<p>Recycled Water Quality Management Plan (RWQMP)– corporate.</p> <p>NSW Health correspondence associated with an agreed timetable for endorsement of all RWQMPs.</p> <p>Rouse Hill RWQMP – including validation evidence. Monitoring data.</p> <p>Camden RWQMP – including validation evidence. Monitoring Data.</p> <p>Illawarra RWQMP - including validation evidence. Monitoring Data. Documents associated with contract that supports recycled water quality management.</p> <p>Training and awareness of operators, staff and contractors in the RWQMP, with a focus on CCPs and limits.</p> <p>Calculation of CT for all RWQMPs, where appropriate.</p>	<p><b><u>QMP RWS final Quality Management Plan RW Schemes , Version 1, July 2009</u></b></p> <p><i>This Quality Management Plan – Recycled Water Systems (QMP – RWS) sets out those risk management processes and procedures for recycled water quality that are common to all Sydney Water's recycled water schemes. As such, this plan is the base reference for all scheme specific recycled water quality management plans (RWQMPs). As with the scheme specific RWQMPs, this plan follows the 12 elements of the Australian Guidelines for Water Recycling: Managing Health and Environmental Risks, (Phase 1), 2006 (AGWR).</i></p> <p><i>This QMP – RWS does not address scheme specific matters nor does it specify the form of the scheme specific RWQMPs. In addition, this plan does not address strategic issues, rather the fundamental business activities that Sydney Water uses to assess and manage risk.</i></p> <p>Focus on RWT has changed – wont invest in future. RWT team resourcing issues therefore very difficult to conclude the sign-off. RWT transitioned to BAU. Only completed 1 July 2012. Health also had resourcing aspects.</p> <p>As part of the transfer – have had a quality documents review meeting - developed roles and responsibilities – will be reviewed and checked in future.</p> <p><b><u>VALIDATION:</u></b></p> <p>Some validation in plant. Not doing all schemes. Control points and management options approach. Don't supply in wet weather – have interlocks. During dry weather periods show consistency.</p> <p>Will have a prioritisation process – prepared draft SOP for how to do validation. Bombo ear-marked for this FY. Try to establish statistically how many runs need to do.</p> <p>Verify – re-validate schemes if significant chane made to a process. Was this done for West Camden.</p> <p>Post commissioning – verify and pathogen sampling – E coli targets.</p> <p><b><u>Recycled water treatment plant validation monitoring for pathogen reduction. Procedure – under development</u></b></p> <p>This Procedure concerns the development of monitoring plans for the</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
			<p>Does the Plan cover the full operating area of Sydney Water, including schemes that are operated by contractors and BOO approaches?</p> <p><b>Site inspection of Illawarra Wastewater Treatment Plant and Recycled Water Scheme.</b></p> <ul style="list-style-type: none"> <li>Gain understanding of how O&amp;M contract managed to protect Recycled Water Quality.</li> <li>Understand monitoring – online and laboratory.</li> <li>How reporting across the contract occurs.</li> <li>How brought on-line and how moth-balled – considering water quality management.</li> <li>CCPs and critical limits.</li> <li>Focus on Elements 2, 3 and 9</li> </ul> <p><b>Phone Interview.</b> Operator of Camden RW plant.</p>		<p>validation of recycled water treatment processes under dry weather flow conditions.</p> <p>This Procedure is primarily concerned with the management of public health (acute) risks involving microorganisms. It does not deal with environmental or chronic health risks that may be associated with the chemical nature or chemicals present in recycled water, respectively.</p> <p>The selection of plants for validation should be undertaken according to a prioritisation process. This will include:</p> <ol style="list-style-type: none"> <li>New schemes as part of commissioning</li> <li>Existing high risk schemes</li> <li>Existing schemes with appreciable changes to process or end uses.</li> </ol> <p>There is no need to re-validate unchanged schemes with existing Recycled Water Quality Management Plans.</p> <p><b><u>Recycled water quality event management. SOP. Rev 7. 23/7/12.</u></b></p> <p>The purpose of this SOP is to provide guidance for staff involved in the operation of Sydney Water recycled water supply systems in identifying and responding to water quality events, notifiable events, and incidents as defined in this SOP. This SOP sets out the procedures to be adopted to identify and respond to events that are outside those normally expected, and to escalate the event to an incident where necessary in accordance with <i>ERP</i> requirements.</p> <p>This SOP covers all recycled water supply systems operated by, on behalf of or in agreement with Sydney Water. It does <u>not</u> include schemes where Sydney Water is the retailer only, and/or where a third party has been granted a WICA licence to operate a recycled water scheme.</p> <p>It includes discussion of the MOU with NSW Health. And the MOU with Fire &amp; Rescue NSW regarding acceptance of recycled water for fire fighting purposes.</p> <p>Hoxton Park will undergo substantial validation during development as new site with household - next audit period.</p> <p>Ct – Rouse Hill, West Camden and Illawarra all done. Not for all, but risk-based.</p> <p>Some reliance still on AGWR Table 3.4 on risk-based approach.</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p><b><u>Recycled Water Quality.pdf, Folio of Progress, 13 September 2012.</u></b> Provides overview of Clause and other requirements under various instruments. Summarises requirement, performance for report period, action tracking and mitigation measures. Audit Findings are described.</p> <p><i>Sydney Water does not currently operate any recycled water schemes using stormwater as source water. Sydney Water currently complies with the minimum requirements outlined in relevant state or national guidelines for specific end uses of recycled water and any specific requirements determined by NSW Health and/or NSW OEH (previously known as DECCW) concerning the quality of recycled water and the management practices to be adopted for a new recycled water scheme. Sydney Water also considers any additional customer specific requirements relating to their use of recycled water and/or site conditions as specified in customer agreements.</i></p> <p><b><u>Minutes JOG 3 May 2012</u></b> Recycled water updated given at item 14. Update of implementation of AGWR for irrigation schemes. <i>Quakers Hill Recycled Water Quality Management Plan (RWQMP) was submitted to NSW Health for endorsement in early December 2011. Comments received from NSW Health in late January 2012. Revision resubmitted and an in principle agreement was received from NSW Health on 10 February 2012. At this stage there were another 8 RWQMPs that were required to be sent to NSW Health for review and endorsement.</i></p> <p><i>In April 2012, 4 final drafts of RWQMP's were sent to NSW Health. These were for <u>St Marys, Bombo, Castle Hill and Penrith</u>. Awaiting feedback from NSW Health. Another 3 RWQMP's will be sent in May 2012, (<u>Richmond, West Camden and Liverpool</u>) and in early June 2012 the final RWQMP (<u>Picton</u>) will be sent</i></p> <p><i>Sydney Water has issued new irrigation customer agreements to all irrigation customers for signature before the 1 July 2012. This will ensure that the irrigation agreements are all in line with the RWQMP's, latest guidelines and management framework. These new agreements include the previously agreed notifiable events from irrigation customers to local public health units and the environmental notifications to the relevant environmental regulator.</i></p> <p><i>All plans will be batched together so that they can be signed off at the same time. Focus should be on completing plans by the June 2012 time</i></p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>frame.</p> <p><b><u>Recycled Water Supply Agreement. Sydney Water and Camden Council. Feb 2012.</u></b>  Cited as example of current type of agreement. Legal document binding both parties. Covers the rules, responsibilities and associated articles between the entities. Conditions precedent exist associated with Approvals, plumbing controls and Land Suitability Assessment. Notifications and non-supply of out of spec recycled water is described.</p> <p><i>Recycled water supply to customers off the Rosehill scheme commenced on 18 October, 2011. SWC not responsible – only supply sewage. Under WICA license.</i></p> <p><b><u>RW0001 Rouse Hill RWQMP, Version 1, July 2009</u></b>  Endorsed by NSW Health on 29 October 2009. Represents the latest version.</p> <p>No process changes, no suspected need to change this document. Only increased capacity.</p> <p><b><u>RWQMP West Camden V1.6 final, Version 1.6, August 2012</u></b>  Unsigned.  Is Table ES1 Element 2 and Table ES4 up to date?  Appendix C – HIDRA dated Jul 2008 – does this need review / update?  Appendix E – dates are for which year? Is July 15 mean July 2015?  Appendix G – is this up to date?</p> <p>During process of new document did review HIDRA. Unclear answer.</p> <p>Reviewed Monitoring Plan at Appendix G is March 2012.</p> <p>Does this require re-validation post treatment upgrades? Scheduled for July 2015 in RWQMP.</p> <p><b><u>RW0002 Wollongong STP Stage 1 RWQMP, Versio 1, July 2009</u></b>  Endorsed by NSW Health on 29 October 2009.</p> <p>Still operate as per July 2009 – no significant changes. Volume will reduce</p>



Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>due to BlueScope downsizing.</p> <p>CCPs and control loops reviewed onsite at treatment plant and found to be consistent.</p> <p><b><u>Wollongong Stage 2 RWQMP v1 June 2008</u></b> Endorsed by NSW Health on 23 June 2008.</p> <p>Still operate as per June 2008. Low risk at this point of time.</p> <p>CCPs and control loops reviewed onsite at treatment plant and found to be consistent.</p> <p><b><u>General</u></b></p> <p>Have submitted all 9 plans to NSW Health – awaiting their sign-off. Correspondence file noted and reviewed onsite. All Plans signed by SWC management. Picton Plant change – grazing animals E. coli – needed to be changed. Email Thursday 4 October Katrina Wall. Amend figure 2.1. To be couriered to Health for final sign-off.</p> <p>Why does EPA not sign-off. At prior time – and correspondence, own guidelines as per irrigation – therefore wont sign-off. Raised at SLG at higher level etc..</p> <p><b><u>MOU between SWC and NSW Fire and Rescue. Version 2.1 Date 1 July 2011.</u></b> Parties include SWC, Fire and Rescue NSW and NSW Rural Fire Service. The purpose of this document is to establish an understanding between Fire &amp; Rescue NSW (FRNSW - formerly the NSW Fire Brigades), the NSW Rural Fire Service (RFS) and Sydney Water in respect of the use of recycled water from agreed schemes as listed in Schedule 1, during operational and training activities if appropriate, as conducted by FRNSW and the RFS.</p> <p>This memorandum of understanding is intended as a generic document that can be applied to all recycled water schemes where recycled water is supplied for fire fighting (listed in Schedule 1 as updated from time to time).</p> <p>This memorandum of understanding has been developed in accordance</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>with the National Water Quality Management Strategy – Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1 - 2006), (AGWR).</p> <p>FRNSW and the RFS have established a position that supports the use of recycled water that meets the AGWR as required by NSW Health for fire fighting, including training. The Recycled Water Quality Management Plan will demonstrate for each scheme that the recycled water is no less safe than drinking water when used according to FRNSW and RFS operational protocols.</p> <p>Roles and responsibilities are defined. Scheme covered include Wollongong Stage 1 and Stage 2 and Rouse Hill.</p> <p><b><u>MOU between SWC and NSW Fair Trading. 8 June 2012.</u></b></p> <p>Provides for a cooperative relationship. Defines roles and responsibilities. Recognises the linked roles between safe supply of potable, recycled, wastewater and stormwater for SWC and the plumbing work impacts of the Plumbing and Drainage Code Act 2011 (NSW).</p> <p>Fair Trading are to notify SWC of non-compliant or defective plumbing and drainage work.</p>
b	any other guidelines specified by NSW Health to the satisfaction of IPART.	Full	<p>Were any other requirements or guidelines specified by NSW Health?</p> <p>Were these notified and agreed with IPART?</p>	NSW Health correspondence associated with alternative guidelines or requirements.	None during audit period.
c	Sydney Water must report on Recycled Water quality monitoring in the manner and form outlined in the Reporting Manual.	Full	<p>Did SWC report on recycled water quality in accordance with the Reporting Manual June 2012 update and earlier versions associated with the audit period?</p> <p>Was this done in accordance with the required timelines?</p>	<p>Two Quarterly Reports to NSW Health. Exception basis.</p> <p>Annual Reports. October 2011. 1 October 2012.</p> <p>Any incident or emergency reports that may have been required for any RW scheme.</p>	<p><b><u>RWQ Report Health 2011-12 4th Quarter and RWQ Report Health 2011-12 3rd Quarter</u></b></p> <p><i>Endorsed by NSW Health for the following schemes:</i></p> <ul style="list-style-type: none"> <li>• Rouse Hill – dual reticulation, indoor and outdoor use</li> <li>• Wollongong Stage 1 – industrial water for BlueScope Steel</li> <li>• Wollongong Stage 2 – industrial water for Port Kembla Coal Terminal &amp; irrigation water for Wollongong golf course and municipal parks.</li> <li>• Western Sydney Recycled Water Initiative – environmental flows for</li> </ul>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
			<p>Was this done in accordance with the specified items for the type of report required?</p> <p>Were any incidents or emergency reports required?</p> <p>In the case of an incident were Sydney Water's response plans adhered to? What form of post incident review was carried out? Were the recommendations implemented and if so how?</p> <p>Are the response plans considered to be controlled documents?</p> <p>Were any significant changes to recycled water quality required? If so were these reported to NSW Health?</p>	<p>Any notifications to NSW health with regard to significant changes that may have a material impact on public health.</p>	<p><i>Hawkesbury-Nepean River</i></p> <p><i>The quarterly report to NSW Health contains the following requirements:</i></p> <ul style="list-style-type: none"> <li>• <i>Details of any exception from any guideline values as agreed with NSW Health over the previous 12 months.</i></li> <li>• <i>Test results and date or period of exception from these guidelines of the health and environmental parameters for which compliance is required.</i></li> <li>• <i>Explanation of the causes of the exception and any action taken to rectify the exception and prevent it re-occurring.</i></li> <li>• <i>Appraisal of the exception including discussion of the extent and nature of the exception and an analysis of the risks posed by the exception.</i></li> </ul> <p>Some exceptions were noted at Table 1.</p> <p>Wollongong Stage 2 noted 23 Crypto in a sample. – Investigation followed. <i>The plant was operating normally and within critical control point limits. NSW Health was notified of the result and advised the ultraviolet system was operating above the CCP limit so there should be at least 4 log removal of Cryptosporidium oocysts. As shown in the viability testing undertaken during the proving period prior to scheme start-up, it is likely that the oocysts recovered had been inactivated by the UV, and would not pose a health risk.</i></p> <p>Most exceedances were marginal with no serious operational issue. No further information was readily available. Plant required to investigate – no obvious cause noted.</p> <p><b><u>Recycled Water Exception Report Example. Crypto detected in RW supply to Port Kembla Coal Terminal. 11 August 2011.</u></b></p> <p>Routine verification sampling detection. Reported as required. Follow up showed that chlorine and UV were within the validated control loop so risk to human health was mitigated. NSW Health concurred this finding. NTU was also within specification. NSW Health noted that with UV at 55 mJ/cm<sup>2</sup> there should be at least 4 log reduction and therefore would be assumed to be inactivated.</p> <p><b><u>2010-11 Annual RWQM Report approved</u></b></p> <p><i>In the 2010-11 financial year all recycled water schemes achieved full compliance with health and environmental performance targets. Total iron and fluoride concentrations at Liverpool Water Recycling Plant exceeded the 100 year average long term trigger value (LTV) as recommended by the AGWR, but were below the 20 year short term trigger value (STV).</i></p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p><i>These parameters are monitored by Sydney Water to provide operational data to the irrigation customers for their on-site management and usage of recycled water.</i></p> <p><i>DONE Ongoing action - As the responsibility for plumbing regulation transfers from Sydney Water to the Office of Fair Trading, develop and agree on a Memorandum of Understanding between the two parties, which adequately manages the risks associated with RW plumbing.</i></p> <p><b><u>MOU between SWC and NSW Fair Trading. 8 June 2012.</u></b> Provides for a cooperative relationship. Defines roles and responsibilities. Recognises the linked roles between safe supply of potable, recycled, wastewater and stormwater for SWC and the plumbing work impacts of the Plumbing and Drainage Code Act 2011 (NSW).</p> <p><b><u>2011-12 Annual RWQM Report FINAL</u></b> <i>In the 2011-12 financial year, all recycled water schemes achieved full compliance with health and environmental performance targets. Total iron concentration at Liverpool Water Recycling Plant (WRP) marginally exceeded the 100 year average long term trigger value (LTV) as recommended by the AGWR, but was below the 20 year average short term trigger value (STV). The observed iron concentration is not considered to pose a significant health or environmental risk and is monitored by Sydney Water to provide operational data to the irrigation customers for their on-site management and usage of recycled water.</i> <i>A new scheme, Hoxton Park Recycled Water Scheme, is being commissioned. The scheme will supply recycled water for non-potable uses to residential and industrial customers in the Campbelltown and Liverpool Local Government Areas.</i> <i>The quality of residential recycled water, industrial recycled water, and environmental flows for the period 1 July 2011 to 30 June 2012 was monitored and assessed according to the respective RWQMPs. Irrigation schemes were assessed against relevant parameters from available guidelines for the particular recycled water use, and specific customer requirements as per the individual customer agreements in place.</i> <i>The long term trigger value (LTV, 100-year average), and the short term trigger value (STV, 20-year average) as recommended by the AGWR, are the same as the guidelines currently used for the irrigation schemes. So for some parameters, performance was actually compared against the AGWR requirements.</i> <i>All recycled water schemes achieved full compliance with health and environmental performance requirements. Total iron concentration at Liverpool WRP marginally exceeded the LTV recommended by the AGWR, but was below the STV. This parameter is monitored by Sydney</i></p>

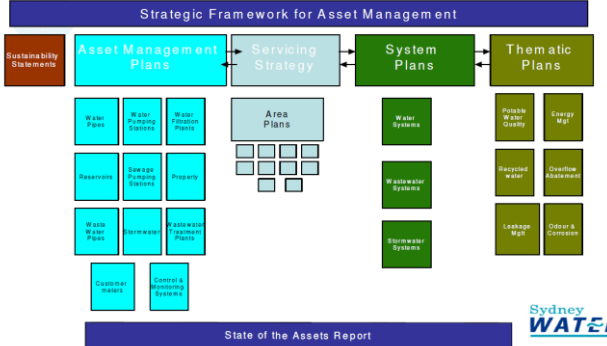
Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p><i>Water to provide operational data to the irrigation customers for their on-site management and usage of recycled water.</i></p> <p><i>DONE Completed action – Reviewed MoU with Fire &amp; Rescue NSW and NSW Rural Fire Service. Procedure adopted for prompt communication of recycled water quality exceedances.</i></p>

## **Appendix D** – Water Quality Detailed Audit Findings (Part 2, Section 2.3)

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
a	<p>Sydney Water must notify NSW Health of any proposed changes to its processes for:</p> <ul style="list-style-type: none"> <li>(1) managing; or</li> <li>(2) reporting to NSW Health in relation to;</li> </ul> <p>Drinking Water quality under clause 2.1 or Recycled Water quality under clause 2.2 where such changes may have a material impact on public health.</p>	Full	<p>Were any such notifications required during the audit period for:</p> <ul style="list-style-type: none"> <li>• drinking water quality</li> <li>• recycled water quality?</li> </ul> <p>If so, were these reported in accordance with the Reporting Manual June 2012 and previous versions (section 2.3.3)?</p> <p>What post notification processes are carried out inside Sydney Water and how are any accountabilities formalised and authorised?</p>	Any notifications as provided to NSW Health.	No changes noted by SWC.
b	<p>Sydney Water must obtain NSW Health's approval for any changes notified under clause 2.3(a) before implementing them.</p>	Full	<p>If so, was approval provided by NSW Health prior to implementation of the change?</p> <p>If so, provide evidence of subsequent appropriate and compliant internal change/action by Sydney Water.</p>	NSW Health documented evidence of approval.	No changes noted by SWC.

## **Appendix E** – Infrastructure Performance Detailed Audit Findings (Part 3, Section 3.1.1)



Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations
	<p>Sydney Water must ensure that its Assets are managed consistently with the asset management framework described in clause 3.1.2.</p> <p>As a result of the 2010/11 Audit, water quality issues relating to storage tank integrity, the Auditor should audit the implementation of the framework.</p>	Full	<p>1. Were assets managed in accordance with the Asset Management Framework (AMF)? Which asset classes are included in the AMF?</p> <p>2.If not, what were the exceptions and the reasons associated with exceptions?</p> <p>3.Was the AMF updated / changed during the audit period? If so, was this notified to IPART?</p> <p>4.How is the AMF linked with BOO contracts associated with the Woronora Water Treatment Plant?</p> <p>5.How have the audit findings and recommendations of the previous audit associated with storage tanks and reservoirs been addressed?</p> <p>6.How is asset management prioritised according to licensing and regulatory requirements, as well as levels of service needs current and future?</p> <p>7.How is the asset inventory maintained? Please demonstrate consistency of approach across all asset classes.</p> <p>8.Please demonstrate how asset rationalisation and disposal is managed in a consistent manner across all asset classes.</p> <p>9.How is asset replacement, rehabilitation, augmentation, creation/acquisition and or</p>	<p>Asset Management Framework (AMF).</p> <p>System Performance Standards Report. September 2012.</p> <p>State of the Assets Report. September 2011.</p> <p>Evidence of prioritising licensing and other regulatory requirements in the management of assets, including current and future service levels.</p> <p>Asset Inventory. Sample only.</p> <p>Asset Rehabilitation Records. Sample only.</p> <p>Asset rationalisation and disposal records. Sample only.</p> <p>Asset creation/acquisition records. Sample only.</p> <p>Failure mode reporting / understanding.</p> <p>Continuous improvement documents and records.</p> <p>Capex and Opex estimates and actuals for past 2 years. Sample only. Eg: 1 WTP. 1 Business Unit.</p>	<p>Sydney Water Corporation has a long history of high standards of asset management recognised by external parties There is a comprehensive suite of plans, strategies, and controlled documents covering all classes of assets. These were offered as evidence:</p> <ul style="list-style-type: none"> <li>• Strategic Asset Management Framework</li> <li>• Reticulation Watermain Asset Management Plan.</li> <li>• State of the Asset Report – 2011</li> </ul> <p>The range of documents is best illustrated by a figure from the Sydney Water Asset Management Framework (see Figure 3).</p>  <p>Figure 3 Sydney Water Asset Management Framework</p> <p>One possible suggestion to assist future readers would be to use that same figure in all documents introductions, highlighting the document in hand. This is a minor suggestion for clarity when an external party is presented with some or all of these documents.</p> <p>In the early part of the site discussions SWC identified changes that will or are about to occur to the way material concerning asset classes is to be presented for internal consumption. For example in response to a question concerning the “State of the Assets” report Sydney Water presented as evidence a comprehensive suite of plans, strategies, and controlled documents covering all classes of assets. Sydney Water did comment that they will change the format of the “<i>State of the Assets</i>” report, replacing it with a series of shorter, more forward, looking documents. Instead SWC demonstrated some draft single sheet reports that summarised the state and the future objectives for the class of asset concerned. It is suggested that these documents are reviewed in future years to determine the success of this change in approach.</p> <p>1. 2. 3. In response to the enquiry concerning whether the assets were all managed under the framework SWC responded that “<i>Yes all are managed under the framework</i>”. In addition no changes had been made to the framework in the past 12 months. As a result there were no recorded exceptions and SWC is compliant.</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations
			<p>substitution documented and managed? Focus on creation/acquisition.</p> <p>10.How is proactive and reactive maintenance scheduled and managed? How is this documented and linked with long term asset understanding (eg: failure modes)?</p> <p>11.How do you demonstrate prudent decision making in balancing acceptable risk with cost and service provision?</p> <p><b>Site inspection of Woronora WTP and Illawarra WWTP and RW scheme.</b></p> <ul style="list-style-type: none"> <li>Gain understanding of how O&amp;M contract managed to align with the AMF.</li> <li>Understand link with Asset Register, maintenance, replacement programs for assets</li> <li>How asset related reporting across the contract occurs.</li> <li>How brought on-line and how moth-balled – considering asset management.</li> </ul> <p><b>Site inspection of 1 to 2 reservoirs.</b></p>		<p>4. In response to the query concerning the relationship between the AM framework and the BOO contracts SWC responded <i>“BOO contracts are performance based on product. The risk for effective management of plant is with the BOO contractor.”</i></p> <p>5. A detailed response to the previous audit findings concerning the reservoir assets was given in the first session. The records of the site inspections (hand written and photographs) have been entered in to Maximo. The records were demonstrated to confirm this outcome.</p> <p>It was noted that reservoirs have their own asset management plans setting out the investment required. During detailed discussion concerning reservoirs SWC stated that some roofs are coming to the end of their lives. Alternatives to replacing the roof are explored during business cases, especially as to carry out the works the site would be out of operation for an extended period. Any option that would cope temporarily with this extended down time should be considered as a permanent option too.</p> <p>It was noted that internal inspections of reservoir condition are held in a separate bespoke database provided by the contractor who carries out the inspections, often using divers. The database was identified as ASAM (acronym unknown). It is probably efficient for the contractor to supply updates to the information in their standard database format however SWC are not storing that information in Maximo. This raises the possibility that business cases for external or internal works are not capturing the overall condition of the structure. Inclusion of both may change the prudence and efficiency arguments in a business case. It is recommended that reservoir condition information is captured in one database and that should be the standard Maximo used throughout SWC.</p> <p>6. Programs of investment are put forward as a business case requesting an allocation of funds. The business case depends on a standard decision making framework used within that program, based on risk, cost and payback period. This means that every request has to be financially viable.</p> <p>A corporate investment prioritisation is available to the Executive in order that investment choices between business cases of varying needs can be made (e.g. between ICT needs and network needs).</p> <p>The investment prioritisation tool is a decision support tool under Licence Clause 3.1.2. It is recommended that clarity be sought concerning the use of this corporate framework and its influence on asset investments.</p> <p>7. SWC maintains and manages a large number of assets. The records of these are managed through the Asset Management system and the Geographic Information System. SWC commented that <i>“Maximo is our asset &amp; works management system. We have procedures for the creation and update of asset data.”</i></p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations
					<p><i>Asset data entry procedure sample i.e.: Facilities in Maximo &amp;/or GIS data".</i></p> <p>SWC demonstrated both systems and specific attention was paid to the records in both systems for reservoirs, which had been discussed in the first session. This demonstrated satisfactorily that the on-site inspection records and photographs were in place on Maximo.</p> <p>During the demonstration and subsequent discussions additional questions were raised which included:</p> <ul style="list-style-type: none"> <li>Asbestos Cement (AC) mains make up a small component of the water mains (c102 or 105 klms depending on which table is reviewed). The challenges with managing the maintenance of this material are discussed within the pipeline asset management plan, but no strategy for positively managing the pipe out of the system is presented. In response SWC commented that there is no specific need to proactively remove the AC mains other than when failures occur. This is an appropriate strategy given the small quantity.</li> <li>Cathodic Protection (CP) can be expected to be in operation in locations within the SWC operating area; Cathodic protection is not discussed in the water pipeline plan as it is ineffective for pipes with joints. In response SWC stated that CP is classified as part of the electrical system and therefore not considered in the document supplied. Most effort is put into isolating reservoirs and pipelines / crossings close to high voltage such as rail electrification.</li> </ul> <p>8. Three categories for assets are maintained across the whole of the SWC asset base:</p> <ul style="list-style-type: none"> <li>Operational</li> <li>Decommissioned</li> <li>Disposed</li> </ul> <p>The decommissioned assets are further divided into:</p> <ul style="list-style-type: none"> <li>Non maintained</li> <li>Partially maintained</li> </ul> <p>This classification can result in a decommissioned asset still attracting a Maximo led planned work program and investment. An example was given of a pipeline and pumps which can run in reverse if required. These assets are classified as decommissioned, but maintenance is carried out to ensure that the assets will operate when required.</p> <p>Once an asset is disposed of Maximo keeps a record but the financial asset register shows a removal of the asset for valuation purposes, but with a flag record for 7 years (to satisfy tax purposes). An annual write down of the financial asset register is carried out.</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations
					<p>No breakdown or magnitude of investment on decommissioned non or partially maintained assets was requested. It may be of interest to follow up on these classes of assets to:</p> <ul style="list-style-type: none"> <li>(i) Determine the value and performance of these decommissioned non and partially maintained assets relative the other "active" assets.</li> <li>(ii) Determine how a prudence and efficiency based investment business case is made for these assets.</li> </ul> <p>These assets have an operational purpose (albeit an irregular operation) but are required to be available for service, in the same manner that other duty – standby configurations are required to be available. This suggests that the assets should not be described as decommissioned but Operational with a Contingency label.</p> <p>9. Entry of new asset information onto Maximo is handled in two ways.</p> <ul style="list-style-type: none"> <li>(i) Electrical and mechanical information is required through a standard contractual process from the supplying contractors. A maintenance plan is required which must determine FMECA. This has to be provided at commissioning and is entered into Maximo. SWC Operators are trained at commissioning.</li> <li>(ii) Civil assets are captured through the progression of the design and construction process. Again the commissioning process captures any areas missed.</li> </ul> <p>SWC have applied this contractual process having had experience of significant backlogs of asset data in the past.</p> <p>10. If any physical change is made to the asset the maintenance schedule is reviewed and principles of reliability centred maintenance are applied. If no changes to the maintenance record is made for 10 years the process is reviewed, again the determine applicability. This has proven to be beneficial.</p> <p>When asked SWC stated that no backlog existed for Maximo; however there was a manageable backlog in placing asset data onto the GIS. This is difficult to address using contracts in the way that construction has been set up.</p> <p>11. <i>"We have process and procedures in place for the planning and improvement of maintenance. This best further discussed at the interview. Maintenance strategy defines that FMECA be undertaken at each phase of the asset life. FMECA has been undertaken for a sample of each class of assets This provides the risk priority number (RPN) for each failure mode. Asset failure history is used to gauge the deterioration of the asset. Prioritisation is done using RPN".</i></p> <p>At the end of the review session two further detailed points were raised:</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations																																																																														
					<p>1. Reviewing Table 16 from the Water Main Asset Management Plan 2011/12 showed that previous years actual spend for Preventative Maintenance, but no budget figures for the years were given (an extract of Table 16 is given).</p> <table border="1"> <thead> <tr> <th colspan="6">Preventative Maintenance</th></tr> </thead> <tbody> <tr> <td>WP6B</td><td>Inspect / Verify Critical Fittings &amp; Valves</td><td>0.38</td><td>0.40</td><td>0.42</td><td>0.71</td></tr> <tr> <td>WP6J</td><td>Inspect Dividing Valves</td><td>0.33</td><td>0.34</td><td>0.36</td><td>0.01</td></tr> <tr> <td>WP6A</td><td>Inspect / Evaluate and exercise Trunk Main Fittings &amp; Valves</td><td>3.42</td><td>3.59</td><td>3.77</td><td>0.85</td></tr> <tr> <td>WP2C</td><td>Civil Inspection of Above Ground Mains (Aqueducts)/Pipes in Service Tunnels</td><td></td><td></td><td></td><td></td></tr> <tr> <td colspan="2">Preventative Maintenance Total</td><td>4.12</td><td>4.33</td><td>4.55</td><td>1.57</td></tr> </tbody> </table> <p>Figure 4 Extract of Table 16 Water Main Asset Management Plan</p> <p>For the previous years (2007/08, 2008/09, 2009/10) actual out turns are given, all of which have exceeded \$4m. For the forecast year of 2010/11 a budget is shown of \$1.57m. This represented a decrease in budget for that program from the previous years of the order of \$2.98m (approximately 65%) against the background of a 3 year rising trend. A question was raised concerning the 2010/11 actual out turn because of the previous program budgets were higher. The request for the out turn was to determine the forecast proved accurate:</p> <ul style="list-style-type: none"> <li>The previous 3 years overall out turns were all broadly equivalent (\$4.1 to \$4.4m). Did the 2010/11 actual out turn exceeded that budget of \$1.57m?</li> <li>Would the reduction in the specific activity WP6A need to return to the previous investment profile? If so would adequate budget be available?</li> </ul> <p>In response to request concerning the decrease and whether the budget had been adhered to SWC provided the out turn figures for that year (2010/11) and the following (2011/12). (See Table 3).</p> <p>Table 3 Actual Out Turn Figures for Preventative Maintenance 2010/11 and 2011/12 from Sydney Water</p> <table border="1"> <thead> <tr> <th colspan="3">2010/2011</th><th colspan="3">2011/2012</th></tr> <tr> <th>Task Code</th><th>No Units</th><th>Cost</th><th>Task Code</th><th>No Units</th><th>Cost</th></tr> </thead> <tbody> <tr> <td>WP6A</td><td>4,317</td><td>\$983,466</td><td>WP6A</td><td>5,563</td><td>\$1,202,812</td></tr> <tr> <td>WP6B</td><td>11,482</td><td>\$757,053</td><td>WP6B</td><td>13,001</td><td>\$857,215</td></tr> <tr> <td>WP6J</td><td>4</td><td>\$753</td><td>WP6J</td><td>4</td><td>\$753</td></tr> <tr> <td>WP2C</td><td></td><td>\$0</td><td>WP2C</td><td></td><td>\$7,700</td></tr> <tr> <td colspan="3">\$1,741,272</td><td colspan="3">\$2,068,480</td></tr> </tbody> </table> <p>This indicates that the 2010/11 budget figure of \$1.57m was exceeded by 10%, primarily in WP6A.</p> <p>2. The status of AWQ0049 (Water Main Asset Management Plan 2011-12) appeared to be out of date or at least out of</p>	Preventative Maintenance						WP6B	Inspect / Verify Critical Fittings & Valves	0.38	0.40	0.42	0.71	WP6J	Inspect Dividing Valves	0.33	0.34	0.36	0.01	WP6A	Inspect / Evaluate and exercise Trunk Main Fittings & Valves	3.42	3.59	3.77	0.85	WP2C	Civil Inspection of Above Ground Mains (Aqueducts)/Pipes in Service Tunnels					Preventative Maintenance Total		4.12	4.33	4.55	1.57	2010/2011			2011/2012			Task Code	No Units	Cost	Task Code	No Units	Cost	WP6A	4,317	\$983,466	WP6A	5,563	\$1,202,812	WP6B	11,482	\$757,053	WP6B	13,001	\$857,215	WP6J	4	\$753	WP6J	4	\$753	WP2C		\$0	WP2C		\$7,700	\$1,741,272			\$2,068,480		
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					<p>review date. Subsequent comment from Sydney water state <i>“It was noted that AWQ0049 has not been updated in 2012. A review of asset management plans is underway and after that review completes in 2013 then the decision will be made on the updating (of) the asset management plan – potentially to an electronic format”</i>. (Taken for the 1<sup>st</sup> draft comments from SWC).</p> <p><b>Site Visits and Subsequent Observations</b></p> <p><b>Wollongong</b></p> <p>The site visit to Wollongong afforded the opportunity to understand the practical use of Maximo on an operational plant. The AM system is available to all operators on site; any fault, failure or suspected issue can be reported through the system and an unplanned maintenance request developed. This listing is reviewed by the site manager and appropriate work orders generated and passed to the most appropriate party for implementation. The open access of the system to all operators is a positive way of ensuring everyone is empowered to report concerns.</p> <p>With the impending outsourcing of maintenance activities SWC will need to develop a process that enables the operators to continue to report concerns but with an internal review process for unplanned maintenance requests.</p> <p>The plant is fed by two long rising mains. The residence time means that the sewage can be very septic when it is discharged to the plant inlet works. There has been a history of gas damage from hydrogen sulphide and remedial works have been required to the concrete structures. In an attempt to mitigate the septicity the network is dosed with ferric which is said to have had some success. It is noted that adjacent catchments are dosed with magnesium; experience suggests that this is more successful especially when chlorides from seawater ingress may be a contributing factor. It was acknowledged that inflow and infiltration is a concern in the network that discharges at the plant. It is suggested that the business case for magnesium over ferric dosing is revisited to determine whether the cost benefit analysis still remains in favour of the ferric dosing.</p> <p><b>Woronora</b></p> <p>It was observed during the site visit that the operators at Woronora maintain a completely separate asset database. SWC has no copy of this asset record, or the planned or unplanned maintenance. A superficial explanation of the contract was given (although the printed content was unseen) and the relationship appeared to be satisfactory, probably minimising the risk to SWC which has the option to purchase the plant at the end of the agreement.</p> <p>A number of BOO contracts are in place and can be expected to have different contractual agreements to those discussed at Woronora. No details of the negotiations/extensions of other BOO</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations
					<p>contracts were provided.</p> <p>The potential difference in philosophy between an owner and a BOO was illustrated by the policy with regard to confined spaces. During the site visit to Wollongong it was noted that no signage for confined spaces was visible. The policy at the plant was quoted as that only contractors with specific training may carry out such works - no SWC staff are allowed enter any spaces unless they are under the control of the contractor. As an alternative Woronora did have confined spaces signed and staff on site are expected to carry out such works. In addition the reservoir visited also displayed confined space notices with an understanding that SWC staff and contractors would enter, using the correct procedures. (see photos if required)</p> <p>Of itself these two positions are not a challenge, however this does demonstrate a difference in approach that may be exacerbated when planned maintenance is further outsourced by SWC, for example:</p> <ul style="list-style-type: none"> <li>• confusion in approaches between SWC owned, owned and operated sites but externally maintained</li> <li>• Maintaining appropriate registers of qualified SWC staff and those qualified to set and enforce safety standards from a contractor</li> <li>• Clear accountabilities where a difference in approach may occur where operations and maintenance are shared by different parties.</li> </ul> <p><b>Reservoirs</b></p> <p>A site visit was conducted to one of the reservoirs identified to require maintenance to the roof during the previous audit. The completed site assessment sheet W5 was provided detailing the inspection, and recommended actions for WS 047 and 151 Heathcote (dated 7/8/12). The sole action for WS 151 related to two holes recorded on the roof on the west side. The general site and roof top was accessed. In accordance with the categories listed on the inspection sheet the following was noted:</p> <ul style="list-style-type: none"> <li>• Access to the site had already been facilitated upon arrival.</li> <li>• No rubbish was seen on the site</li> <li>• Those signs that could be seen upon pedestrian entry appeared adequate</li> <li>• The access ladder was padlocked upon arrival and no access was allowed until a safety briefing had been given by SWC staff.</li> </ul> <p>Once the roof was accessed by the side stairway a simple, escorted walkover was completed</p> <ul style="list-style-type: none"> <li>• Minor debris was noted on the gutters – certainly well under the minimum noted on the inspection sheet</li> <li>• Central vents contained mesh protection from vermin</li> <li>• All roof access were either riveted shut or padlocked</li> </ul>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations									
					<ul style="list-style-type: none"><li>All plating was intact and no holes were observed</li><li>Foam seals were intact</li><li>Ridge capping was intact in in some locations appeared to have been strengthened</li></ul> <p>In conclusion the inspected reservoir roof appeared to be in good condition and the fields on the sheet had successfully captured the condition and hazards that could be expected from a visual inspection only.</p> <p>An internal SWC email dated 27 September 2012 was provided, which communicated that the works orders raised following the inspection had been completed.</p> <p>No other reservoir sites were visited due to time constraints. Clearly the success of an entire program cannot be guaranteed from one sample visit and it is noted that not all identified actions for every reservoir had been completed at the time of the audit (from first session). However if the SWC inspection process, risk assessment, business case and resulting budget and actions have been or are to be implemented consistently, there should be little further cause for concern. Inspection form W5 was made available for WS161 Lucas Heights.</p> <p>It is noted that parts of the program of work identified for the reservoirs as a result of the previous year's audit would be sitting outside of the normal capital works process. As a result the program of works will need to compete with other projects, each with a business case to allow corporate assessment. It was noted that the corporate risk assessment process that allocated funds may hinder the progress to achieving greater investment. Reviewing the corporate framework (partial extract given below in Table 4 – our selection indicated by shading and italics) shows that the risks that might be the drivers for the reservoirs program may score lowly. This apparent low level of risk recognition might hinder the improvement projects in their quest for funding against other projects.</p> <p>Table 4 Extract from Corporate Risk Table</p> <table><tr><th>Assessment</th><th>Public Health</th><th>Customers</th></tr><tr><td><b>Catastrophic</b> Very High impact with very significant consequences</td><td>Widespread illness / fatalities.</td><td>Complete disruption to services &gt; 1 week. Affects &gt; 30% of SWC customers.</td></tr><tr><td><b>Severe</b> High impact with major consequences</td><td>Serious illness requiring hospitalisation.</td><td>Partial disruption &gt; 2 days. Affects 10% to 30% of customers. Widespread complaints.</td></tr></table>	Assessment	Public Health	Customers	<b>Catastrophic</b> Very High impact with very significant consequences	Widespread illness / fatalities.	Complete disruption to services > 1 week. Affects > 30% of SWC customers.	<b>Severe</b> High impact with major consequences	Serious illness requiring hospitalisation.	Partial disruption > 2 days. Affects 10% to 30% of customers. Widespread complaints.
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					<p>case the disposal may require the use of Opex. (3.1.2 (c).)</p> <p>These are points of principle that are required to be implemented in a transparent and consistent manner to demonstrate good asset management. It is recommended that progress with the separation of these elements of the assets is reviewed in later audits.</p>
					<p><b>Summary</b></p> <p>As a result of reviewing the Asset Management Obligations under 3.1.1 and 3.1.2 it is found that SWC has complied with the requirements set out in the clauses and sub clauses.</p> <p>A number of observations have been made and these are detailed below as Secondary Recommendations or Opportunities for Improvement to be followed up.</p> <p><b>Recommendations</b></p> <ol style="list-style-type: none"> <li>1. It is recommended that reservoir condition information is captured in one database and that should be Maximo as the standard used throughout SWC.</li> <li>2. It is recommended that progress with the separation of the elements that make up a reservoir assets are reviewed in later audits.</li> <li>3. It is recommended that greater consideration should be given to the potential for contamination, as opposed to reportable events, by considering the risk factors identified in the reservoir risk assessment process, with the inclusion of factors associated with residency time or turnover at each site.</li> <li>4. With the impending outsourcing of maintenance activities it is recommended that Sydney Water develop a process that enables those on site at treatment plants to report concerns, and that these be associated with a robust, internal prioritisation process.</li> <li>5. It is recommended that the value and performance of Decommissioned Non and Partially Maintained assets is determined to understand the extent and materiality of the asset criticality, value and budget. Should that investigation reveal a significant number and value of assets classified as decommissioned a more accurate description term should be determined for those Operational assets on standby, as a Contingency.</li> <li>6. That Sydney Water considers the implications and risks arising from differences in WH&amp;S policies between it and its contractors, especially as contractor interactions/involvement in maintenance on sites are proposed to increase.</li> <li>7. It is recommended that the business case for magnesium over ferric dosing is revisited in those catchments draining to Wollongong, to determine whether the previous cost benefit analysis remains in favour of the ferric dosing.</li> </ol>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Requirements	Audit Observations

## **Appendix F** – Water Conservation Detailed Audit Findings (Part 7, Section 7.2)

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
a	Sydney Water must ensure that the level of water leakage from its Drinking Water supply system (the Water Leakage Level) does not exceed 105 megalitres per day.	Full	<p>1. Did Sydney Water operate the system to have an Overall Water Leakage level of less than 105 ML/d?</p> <p>2. How was this verified?</p> <p>3. Were there any exception days? If so, what were the causative factors?</p> <p>4. If the Overall Water Leakage Level exceeded 105 ML/d please demonstrate why it should be considered "reasonable".</p> <p>5. What was the total amount of Water Leakage during the Audit Period?</p>	Water Leakage Level data. Daily. Annual Total. Summary statistics.	<p>1. SWC reported that leakage was "within the agreed band of uncertainty of +/- 16 ML/day (P 9 of Reporting Manual)". Documentation provided showed that leakage for 2011/12 is recorded as 115.4 ML/d. (SWC Corporate Compliance Program Annual Folio Update p15).</p> <p>Figure 5 was presented during discussions. The solid line shows the trend based on quarterly calculations of leakage The target of 105 ML/d is shown as a red square with the confidence limits indicated by the broken lines. The end of year figure for 2011/12 is given as 115 ML/d.</p> <div> </div> <p>Figure 5. Real Losses 1999/00 - 2011/12</p> <p>2. SWC reported that the leakage was "calculated using the agreed water balance method".</p> <p>3. As the leakage is required to be reported over a financial year no information was supplied about exception days: "Leakage calculated over a year as per the operating licence and reported &amp; measured on the 30 June each year".</p> <p>4. The overall leakage did not exceed the Operational Licence. SWC commented that "Though the leakage is numerically 115, the overall water leakage level is within the bounds of measurement of +/- 16 ML/day. The rise could simply be a natural variation due to the wide uncertainty range of the results."</p> <p>5. Leakage for the period was reported to be 115.4ML/d. Inspecting the graphical representation of historic data illustrates a rising trend when compared to the previous two years but the volumes reported are still within the +/- 16 ML/d tolerance. In documentation supplied and during discussion</p>

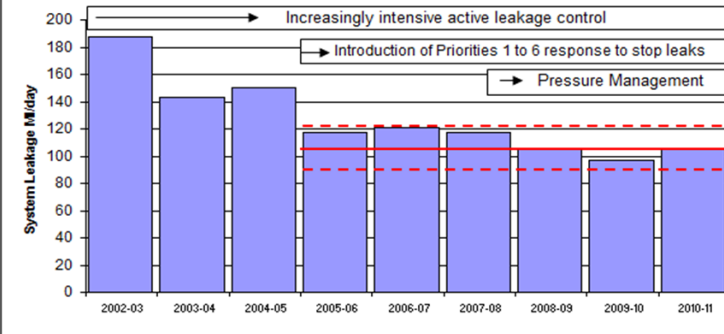
Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>four reasons are postulated for this observed trend, namely:  <i>"The 2011–12 leakage figure is higher than the previous two years. Possible reasons for this increase are:</i></p> <ul style="list-style-type: none"> <li><i>natural variation due to the uncertainty range in results</i></li> <li><i>the effects of pressure reduction take time to be realised in leakage results</i></li> <li><i>the wet weather in 2011–12 meant that some leaks may not have been detected or have been reported later than usual</i></li> <li><i>a minor increase in unreported or undetected leaks in some areas, due to a more targeted Active Leak Detection Program."</i></li> </ul> <p>(SWC Water Efficiency Report 2011-12 p14)</p> <p>A review of a number of relevant sources of information concerning water loss and management shows the following:</p> <ul style="list-style-type: none"> <li>It was reported that breaks have reduced over the review period. The reason cited during discussion was stabilisation of wet soils post drought. Figure 5 of AMQ01111 State of the Assets Report shows the decreasing trend line for water breaks and leaks per 100 kilometres up to 2010-2011 Financial Year.</li> <li>Figure 11 p26 AMQ0049 shows the projected mains growth which illustrates an increasing trend.</li> <li>Renewals of Reticulation Mains (figure 15) and Critical Water Mains (figure 16) are all projected to increase or stabilise.</li> <li>Table 1 ELL Method Final 221211 shows that response time to Priority Leaks (6, 5 and 4) have all been met or exceeded for the period 2010-2011.</li> <li>Falling demand/use of water (litres/person/day) Figure 12 Water Efficiency Report 2011-12.</li> </ul> <p>Set against this background of reported improvements to the network, response times and expansion of the network (increases in length and connections) the overall reported lag trend is one of increasing leakage (i.e. 97 ML/d 2009/10 to 106 ML/d 2011/12 or a 9% increase. SWC are encouraged to maintain their strict vigilance as reversing a rising trend in losses can be a challenging process.</p> <p><b>Conclusion</b></p> <p>All the supplied evidence indicates that over the longer term leakage, water loss management and renewals programs have had the desired impact, first reducing to and then maintaining the leakage within the target range set by the Licence. The supplied Figure of real losses from the network supports this conclusion. Up until the most recent two years leakage has maintained a downward and then steady trend, however the past two years suggests that leakage is rising again from its reported low of 97 or 98 ML/d in 2009/10 (depends on which source, namely</p> <p>(i) Averaging the four quarters reported in the Presentation Graph and shown in Figure 5.</p> <p>Q1 101.6 ML/d  Q2 97.8 ML/d  Q3 95.9 ML/d.</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>Q4 96.8 ML/d</p> <p>Average of these four figures = 98.025 ML/d</p> <p>Table 4 Schedule D Water Efficiency Report 2011-12 reporting 97 ML/d 2009/10</p> <p>(All figures +/- 16ML/d 95% confidence)</p> <p>In discussion with the SWC team no further detail was provided to determine whether any one of four reasons given was more likely than another to be a cause of the increase. It appears that the favoured reason – that of a reduced level of burst/leakage reporting by the public – has resulted in a somewhat passive response from SWC as opposed to the development and instigation of a positive strategy to further reduce losses within the on-going work plans.</p> <p>The Operating Licence has a +/- 20 ML/d confidence range. The past 24 months quarterly outcomes suggest a trend of rising losses. Though SWC has thought that there could be a possible rise in leakage, it does not think that an upward trend exists. It is acknowledged that the leakage remains in the agreed uncertainty band. SWC continues to monitor and proactively manage leakage in the long term on an ELL basis. It is acknowledged that ELL is dynamic and that will rise and fall as conditions change. SWC manages leakage following that trend with activities increasing or decreasing. SWC recognise the importance of maintaining losses within the targets set by the Operational Licence.</p> <p><b>Recommendation</b></p> <p>Whilst it is acknowledged that Operating Licence Compliance has been achieved the increasing trend in leakage that can be observed quarter on quarter for the past 24 months should be receiving proactive attention.</p>
b	When calculating the Water Leakage Level each year, Sydney Water must use the assumptions and methodology approved by IPART		<p>1. Was the Water Leakage Level calculated using the latest version of the “National Performance Framework: Urban performance reporting, indicators and definition handbook” (NWC)?</p> <p>2. If not, why not and what was used instead? Was this approved by IPART?</p> <p>3. What assumptions have had to be made and how were these recorded? What processes were/are in use to verify those assumptions?</p> <p>4. Was uncertainty addressed in</p>	<p>Water Leakage Level data. Daily. Annual Total. Summary statistics.</p> <p>Calculation including uncertainty bands.</p>	<p>1. SWC use the Standard Water Balance procedures in accordance with the National Performance Framework approved by IPART (Obtain Reference). The associated water losses are calculated quarterly and at the end of each year (financial year). The process is recorded in Standard Water Balance Procedure AMQ0059 (Issue 3 provided).</p> <p>3. It is noted that the unauthorized consumption and meter under registration values are taken from WSAA default values as a default percentage of total billed and metered consumption.</p> <p>Fire fighting water supply consumption estimates are obtained from NSW fire brigade although it is acknowledged that results can be supplied after the reporting deadlines. Consumption due to testing is estimated based on the number of known systems. It is noted that volumes are known to be small and do not vary much.</p> <p>4. Uncertainties are built in to the calculation spreadsheet with errors associated with them in a transparent manner. The confidence limits used are consistent with practices outlined by both IWA and WSAA. These are contained in the PIFast Calcs spreadsheet from WSAA. The version quoted</p>

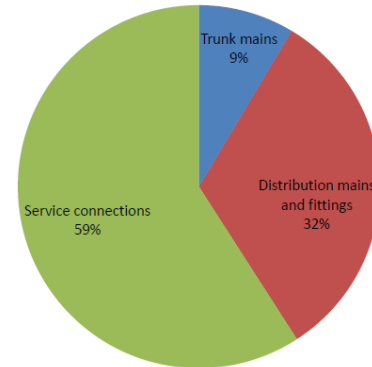
Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
			the calculation, in accordance with IPARTs specific uncertainty bands?		<p>in the form is 2c 12 Feb 2009.</p> <p><b>Conclusion</b></p> <p>The Master MSeExcel Workbook that calculates the quarterly leakage figures was seen. Some check sum quality assurance was demonstrated for internal integrity of the workbook. The workbook was reported to be password controlled to provide security, however no specific version control appeared to be maintained, with no record of updates or changes to the calculation methodology. This represents a minor risk to the organisation as the workbook contains a large number of sheets that captures data from many sources. Maintaining a version number and internal log would provide confidence should the workbook need to be recovered, for example post a systems failure or accidental deletion.</p> <p>It was reported that the calculation process is to be moved from MSeExcel to a new system within SWC computer program suite which would afford more protection. This would be an excellent opportunity to provide appropriate version control at no extra cost. It would also be advisable to ensure that the data capture and calculation steps are thoroughly reviewed, checked and verified to ensure that the sources and embedded calculations in the work book are transferred correctly to the new system. This would be expected to be part of the User Specification and Site Acceptance testing process.</p> <p><b>Recommendation</b></p> <p>IPART should be advised of an acceptable outcome from the platform transfer prior to or as part of the Operation Licence audit for 2012/13.</p>
c	Sydney Water must complete a review by 31 December 2011 to determine the economic Water Leakage Level and submit a report on this review to IPART. The review must be conducted in a manner acceptable to IPART		<p>1. Did Sydney Water submit a report to IPART by 31 December 2011?</p> <p>2. Was the review conducted in a manner acceptable to IPART? What exceptions were noted by IPART and how did Sydney Water respond to these?</p> <p>3. Did the Water Conservation Report include a discussion on water leakage and the major factors that influenced performance?</p> <p>4. How many pressure control zones are in place? How are these zones and the losses from them verified and maintained?</p> <p>5. What changes to operational procedures has Sydney Water considered and implemented to</p>	<p>Economic Water Leakage Level review. 31 December 2011.</p> <p>Water Conversation Report. 1 September 2012.</p> <p>Any relevant documents associated with causes and solutions to Water Leakage.</p>	<p>1. SWC has produced an ELL report for the relevant reporting period in a timely manner. This was submitted to IPART in an acceptable and timely manner. (Determination of ELL December 2011).The report does discuss the leakage and the major factors that influenced the performance.</p> <p>2. SWC commented that the report was submitted. <i>"By negotiation with IPART. We followed a project plan in agreement with IPART. We provided the methodology for ELL report to IPART and amended the methodology based on IPART's recommendations. We submitted the methodology and the final report in December 2011".</i></p> <p>That report "ELL Method Final 221211" was received by IPART by the due date and has been considered by the Tribunal. Email dated 15/10 from IPART advised that no further action is required of Sydney Water at this time.</p> <p>The review itself (reported under "Determination of ELL December 2011") was reported by SWC to have been submitted to IPART but SWC report that no comment or formal acceptance had been recorded. The IPART position should be clarified as soon as possible.</p>



Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
			<p>maintain/lift performance (i.e. reduce losses).</p> <p>6. Did the Report describe the number of bursts, breaks or leaks which occurred in the immediately preceding financial year, and the average time and costs taken to repair?</p> <p>7. Does the Report differentiate where losses are occurring (mains, reservoirs and customer services post customer meter)?</p> <p>8. Did this improve or not from prior year performance? If so, what were the driving factors for a change?</p> <p>9. Was there a particular zone of the system that was / is more subject to Leakage? If so, what strategies and programs are in place to mitigate this for the zone?</p>		<p>3. Leak management in 2011-12 was discussed within Section 3 of the Water Efficiency Report 2011-12 and this did cover the major factors.</p> <p>4. SWC reported that <i>"Out of the 181 pressure reduced zones, 179 pressure zones are built. But not all of the built zones are reduced to give maximum benefit. The implementation across those built zones is one of a gradual process of pressure reduction with the ongoing process proposed to be complete by June 2013.</i></p> <p><i>When pressure control zones are set up, flow meters are monitored for boundary closures. Progressive pressure reduction takes place and minimum night flows are measured from a base figure to calculate the savings in water loss. Once pressures are reduced to the required level and boundary checks made, the zones are maintained by monitoring the minimum night flows via the flow meters. Alarms in ILCATS will alert the SOC that the PRV or PRV zone is not operating as it should be."</i></p> <p>When discussed the primary reason for incomplete pressure reduction was primarily associated with difficulties of maintaining fire flows and private fire system integrity. The date of June 2013 is that projected for the contractor to complete work on the zones, however the implementation by SWC Operations may extend beyond this date.</p> <p>Historically many customers have relied upon the pressure supplied by SWC for their fire system compliance and operation – reducing pressure below system operational limits places a challenge upon the customer. Customer standards of service do not include provision of water pressure for complex sprinkler systems; however knowing that many customers do have an implicit reliance has, and will continue to, slow down the implementation of pressure reduced zones. IPART should note that any published program for the implementation of the pressure zones may be impacted upon by the need to determine a satisfactory outcome for specific customers.</p> <p>5. A graphic (see Figure 6) was presented during discussion that set out the SWC approach to managing losses. This showed the strategy and outcomes, culminating in the pressure reduction program. (The Operational Licence target of 105 ML/d is shown as the solid red line, with the broken lines representing the confidence limits around two standard deviations.)</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					 <p>Figure 6 Leakage Management Strategy and Outcomes</p> <p>The strategy was presented as increasing the active leakage control, introduction of priority responses and then pressure management. It is this final stage that has yet to be completed. It is of note that the effort put into active leakage control/detection is to reduce (see point 8 below).</p> <p>6. In response to the question SWC commented that <i>“The water efficiency report does not require the cost but does require the Number and Hours which are in the water efficiency report page 14”</i>.</p> <p>7. No specific discussion was provided within the report on ELL concerning where losses might be taking place. SWC reported that this breakdown was not required of them however during on site discussion a breakdown was shown graphically.</p> <p>8. SWC commented prior to the site meeting that <i>“We are operating within the economic level of leakage boundaries to meet the targets and provide value for money to the customers.”</i> It is noted that active leak detection is set to reduce from 21,000 to between 9,000 to 12,000 kilometres per year (Section 2.4 Determination of ELL December 2011). This set against a background of an increasing trend in leakage volumes</p> <p>9. In response to the question about a zone subject that is/was subject to more leakage SWC responded that <i>“Raby zone was more subject to leakage and it was surveyed twice in 2011/12. After each Active Leak detection survey in a quarter, the natural rate of rise is calculated and the zones are reprioritised for next survey. Based on the prioritised list, some zones will be surveyed more than once a year.”</i></p> <p>During discussion no specific cause for the current level of leakage levels in Raby zone were provided.</p> <p><b>Conclusions</b> Based on the information supplied the Operating Licence conditions 7.2 a, b, and c SWC are compliant. But at the heart of this discussion is the tension</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>between the observed outcomes and the behaviours driven by the requirement for SWC to:</p> <ul style="list-style-type: none"> <li>(i) Compliance with the Operating Licence of 105 ML/d (+/- 16 ML/d) and,</li> <li>(ii) Achieve the ELL which is identified to be 97 ML/d (+/- 20 ML/d) in 2014-15.</li> </ul> <p>With the upper confidence level of ELL overlapping that of Operational Licence compliance there appears to be no incentive for SWC to strive to meet an ELL. Furthermore the combination of the SRMC of \$0.43c/Kl (as opposed to either that which includes desalination or the LRMC) and an impact of a "CPI minus" price control has the impact of reducing the economic value of the potential losses and hence the strategy SWC might employ. With inclusion of desalination costs the SRMC rises to \$0.62c/Kl however the impact of using that value on leakage management was not provided. Under drought conditions the LRMC of \$2.10/Kl is expected to be used.</p> <p>That logic of incentivising SWC appears to be perverse and short term: it suggests that SWC investment in leakage management operations should be maintained at a level where losses are compliant with the Operating Licence (within two standard deviations) but above that of the ELL. That needs to be set in the context of a background of increasing losses. SWC are proposing that active detection will be reduced – perhaps until drought conditions pertain and a LRMC is used for ELL.</p> <p>It is noted that active leak detection is set to reduce from 21,000 to between 9,000 to 12,000 kilometres per year (Section 2.4 Determination of ELL December 2011) – all set against a backdrop of increasing losses over the past two years.</p> <p>In discussion with SWC a graph was shown that suggested that the proportion of losses are thought to be 59% service connections, 9% trunk mains and 32% distribution losses (see Figure 7).</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>Breakdown of water leakage by asset type</p>  <p>Figure 7 Breakdown of Leakage</p> <p>In common with experiences in many other utilities that study where losses may be occurring within the networks these proportions can change as active strategies for leak detection are implemented. The pattern generally is one of redistributing the proportions of losses away from trunk infrastructure to the customer services, reflecting the degree of uncertainty in understanding where losses can be attributed. Experience suggests that many losses occur at the physical connection of the service pipe and the reticulation main on the utility side of the customer meter. These losses can be harder to capture, measure and react to because they are small and often don't appear on the surface. However because there are so many customer service connections the actual volumes can be very large.</p> <p>Production meters at BOO plants are volumetrically calibrated once every 2 years. Double meters are installed in series in SWC ownwd treatment plants to provide higher degree of assurance in supply volumes.</p> <p>This will address potential bias error in meter readings. A 3 year rolling program of electrical signal calibration is carried out. This fails to address any random error in the meter curve. The assumption that the bulk meters are correct drives the uncertainty about where losses occur into the reticulation network. District meters need to be implemented to capture losses within the local reticulation. As SWC observe, not all leaks come to the surface and if they do during a prolonged wet period they may not be reported. To determine whether this is the case and to improve their understanding of where losses are occurring in the networks SWC should investigate the minimum night flows to generate a better understanding of the leak run time.</p> <p><b>Recommendations</b></p> <p>IPART may wish to consider whether SWC communications with customers in a post drought condition still maintain an adequate focus on water</p>

Clause	Requirement	Grade and Reason	Audit Questions	Evidence Cited	Audit Observations
					<p>conservation and the reporting of potential leaks.</p> <p>IPART should note that any published program for the implementation of the 181 pressure zones may be impacted upon by the need to determine a satisfactory fire capacity outcome for specific customers. It is suggested that actual implementation progress is requested at subsequent audits, together with any important lessons learned as the implementation proceeds.</p> <p>IPART should consider whether the current Operating Licence leakage target of 105 ML/d (+/- 16 ML/d) originally devised for the 2005-10 period and recently reviewed, is and remains consistent with, the use of a lower economic target for 2014-15 against an apparent rising trend of losses. It is acknowledged that SWC do manage leakage proactively but there is a concern that a rising trend can be difficult to arrest.</p> <p>To improve the understanding of where losses are occurring in the trunk, local reticulation and customer services networks SWC should further investigate the minimum night flows recorded to generate a better understanding of leak run time. This may in turn influence the priority placed upon leakage responses.</p>

## **Appendix G – Audit Methodology**

It was an IPART requirement that the conduct of the audit of the utility's compliance with the relevant Part, Section or Clause of its Licence, involved the following activities:

- a) conduct a **detailed examination** of those activities of the utility that are regulated by the Operating Licence, subject to IPART's risk-based audit scope, where applicable.
- b) assess the **level of compliance** achieved by the utility against each of the requirements of the Operating Licence, set out in IPART's risk-based audit scope, providing detailed supporting evidence for this assessment and reporting compliance according to IPART's established compliance scoring methodology.
- c) assess and report on progress by the utility in addressing any **comments made by the relevant portfolio Minister** pertaining to previous audits, providing supporting evidence for these assessments.
- d) for each section of the Operating Licence that is to be audited, **identify factors (if any) that have affected the utility's performance** for the audit period (1 July 2011 to 30 June 2012). This includes verifying the calculation of performance indicators associated with relevant requirements of the operating licences and undertaking an assessment of any underlying trends in performance arising from these indicators. Make recommendations to IPART on how the utility can improve its performance in the future, based on the audit assessment.
- e) provide a **formal briefing** to the Tribunal, if required, comprising an overview of the utility's overall performance against the requirements of the Operating Licence and the key findings of the audit.
- f) prepare a **full report** on the findings of the assignment, including a summary of the utility's overall performance against the audited obligations of the Operating Licence and detail of its compliance with each audited obligation of the Operating Licence.

The auditor is responsible for assessing and interpreting the audit requirements in the relevant Operating Licence and the Act and ensuring that the audit process satisfies all statutory requirements subject to the detailed audit scope.

IPART advertised the audit processes and sought submissions from the public. The auditor was required to take account of any public submissions received and the views of relevant regulators (NSW Health) and other stakeholders including environment, social welfare and public interest groups.

For efficiency purposes, IPART also included auditing of Sydney Water's National Water Initiative (NWI) reporting into the Request for Quote (RFQ) audit scope, as the indicators reported in that reporting framework overlap with (and are being progressively integrated with) Operating Licence compliance and performance reporting. The outcomes of the NWI audit are the subject of a separate report.

## **Audit Methodology**

The methodology adopted for this audit is described in the following paragraphs.

### ***Audit Preparation***

To meet the specific requirements of IPART, the operational audit was undertaken adopting a methodology consistent with ISO 14011 'Guidelines for Environmental Auditing'. This guideline provides a systematic approach to defining the requirements of the audit, planning, interpreting Licence Conditions, collecting audit evidence, objectively assessing the evidence, and reporting in a clear and accurate manner. It also ensures that the audit has been conducted in accordance with an established and recognised audit protocol.

### ***Audit Questionnaires***

Specific audit questionnaires were developed for all clauses to be audited within the scope of the risk-based approach adopted by IPART for 2011/12. These questionnaires sought to determine compliance with the Licence requirements, identify any factors that may have impacted on performance (and the likely magnitude of that impact) and the systems in place to deliver or pursue '*best appropriate practice*' performance.

Audit questionnaires were provided prior to the audit interviews, to allow Sydney Water the opportunity to prepare for the interview.

### ***Provision of Preliminary Information***

The audit questionnaires indicated the evidence required to enable a review of compliance. This allowed for more effective targeting of issues or factors during the interview process. Sydney Water was able to provide all of the information requested in sufficient time to allow for targeted questions and follow-up during the Conduct of the Audit. The documents provided are shown at Appendix J.

### ***Audit Interviews***

Nominated auditors (see Figure 2) led interviews over 8 and 9 October 2012. The interviews permitted the auditors to explore factors or issues not readily addressed in the written response to the auditors' questionnaires, or in the evidence previously provided by Sydney Water. The provision of the written responses and evidence prior to the interviews maximised the benefit of the interview process by allowing the auditors to better target key factors and issues not fully or readily addressed in the provided information. Staff interviewed included those at Appendix I.

### ***Site Audit***

Nominated Auditors (Figure 2) led site based inspections of facilities pertaining to the audit clauses at Woronora Water Treatment Plant, Wollongong Stage 1 and Stage 2 Recycled Water Treatment Plant and the Heathcote Reservoir. We met with Sydney Water staff as well as Veolia Water staff (for the BOO site of Woronora). Local desk top review of further evidence was sighted. Online platforms such as SCADA and calibration records were also sighted.

### ***Follow Up Information***

The Auditors developed a Table of Evidence Request during the audit interviews and site audit, and requested Sydney Water to respond.

Sydney Water provided all further information requested in a timely manner, allowing consideration of such evidence in this Audit Report (see Appendix J).



## **Appendix H – Audit Scope**

Licence Clause	Operating Licence Obligations	2011/12	Comments
<b>2.1</b>	<b>Drinking Water</b>		
	<p>(a) Sydney Water must manage Drinking Water quality to the satisfaction of NSW Health in accordance with the Australian Drinking Water Guidelines (unless NSW Health specifies otherwise).</p> <p>(b) Sydney Water must prepare, to the satisfaction of NSW Health, a Five Year Drinking Water Quality Management Plan covering the entire five year term of the Licence. The Five Year Drinking Water Quality Management Plan must be in operation by 31 December 2010 and include strategies for the comprehensive management of the quality of Drinking Water in Sydney Water's water supply system in accordance with the Australian Drinking Water Guidelines (unless NSW Health specifies otherwise).</p> <p>(c) The Five Year Drinking Water Quality Management Plan is to be revised for the period 1 July 2015 to 30 June 2020. Sydney Water must provide a draft revised Five Year Drinking Water Quality Management Plan to NSW Health by 31 December 2014.</p> <p>(d) Sydney Water is to implement procedures and processes for the appropriate management of the Drinking Water supply system under its control in light of its knowledge of the entire Drinking Water supply system (from the source to the consumer). Sydney Water must have adequate systems and processes in place to manage Drinking Water quality taking into account planning and risk management and their implementation across the entire Drinking Water supply system.</p> <p>(e) Sydney Water must comply with the fluoridation plant operating targets set out in the Fluoridation Code.</p> <p>(f) Sydney Water must report on Drinking Water quality monitoring in the manner and form outlined in the Reporting Manual.</p>	Audit/ SC	<p>Audit is to consider the 2011 Audit recommendation in respect to the integrity of storage tanks and reservoirs. Including the review of the criteria used to define adequate integrity, inspection regimes and maintenance procedures. SWC is to have established a remediation timetable to rectify any faults found when Auditing water reservoirs and tanks by 30 June 2012.</p> <p>See recommendations 2010/11 1&amp;2 below</p> <p>Please note that the Australian Drinking Water Guidelines were amended in October 2011.</p>
<b>2.2</b>	<b>Recycled Water (including stormwater)</b>		
	<p>Sydney Water must manage Recycled Water quality in accordance with:</p> <p>(a) the Australian Guidelines for Water Recycling (unless NSW Health specifies otherwise) to the satisfaction of NSW Health; and/or</p> <p>(b) any other guidelines specified by NSW Health to the satisfaction of IPART.</p> <p>(c) Sydney Water must report on Recycled Water quality monitoring in the manner and form outlined in the Reporting Manual.</p>	Audit/ SC	
<b>2.3</b>	<b>Changes to management of water quality</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) Sydney Water must notify NSW Health of any proposed changes to its processes for:</p> <p>(3) managing; or</p> <p>(4) reporting to NSW Health in relation to;</p> <p>Drinking Water quality under clause 2.1 or Recycled Water quality under clause 2.2 where such changes may have a material impact on public health.</p> <p>(b) Sydney Water must obtain NSW Health's approval for any changes notified under clause 2.3(a) before implementing them.</p>	Audit/ SC	

Licence Clause	Operating Licence Obligations	2011/12	Comments
3.1.1	Managing Assets		
	Sydney Water must ensure that its Assets are managed consistently with the asset management framework described in clause 3.1.2.	Audit/ SC	<p>As a result of the 2010/11 Audit water quality issues relating to storage tank integrity the Auditor should audit the implementation of the framework.</p> <p>See 2010/11 Audit recommendation 1 below</p>
3.1.2	Asset management framework		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>Sydney Water's asset management framework must demonstrate:</p> <ul style="list-style-type: none"> <li>(a) robust and transparent methodologies for determining and prioritising licensing and other regulatory requirements and current and future service levels as well as identifying the infrastructure needed to achieve those service levels and requirements;</li> <li>(b) robust, transparent and consistent processes, practices and programs to ensure sustainable delivery of service levels and regulatory requirements, based on sound risk management, including: <ul style="list-style-type: none"> <li>(1) asset inventory;</li> <li>(2) asset planning incorporating both business and technical risk assessments;</li> <li>(3) maintenance of adequate records and robust and reliable data;</li> <li>(4) asset replacement, rehabilitation, augmentation, creation/acquisition and/or substitution (asset and non asset substitutions);</li> <li>(5) management of service provision, including contracts;</li> <li>(6) monitoring and condition assessment;</li> <li>(7) proactive and reactive maintenance;</li> <li>(8) operations;</li> <li>(9) training and resourcing;</li> <li>(10) contingency planning covering both emergency management and business continuity; and</li> <li>(11) asset rationalisation and disposal;</li> </ul> </li> <li>(c) robust and transparent decision making processes that balance acceptable risk with cost and service provision to achieve prudent, efficient and effective operating and capital investment;</li> <li>(d) an approach that achieves the lowest cost of service delivery through the effective life cycle management of the asset base; and</li> <li>(e) robust and transparent processes of review and continuous improvement in asset management.</li> </ul>	SC/ Audit only if changes to AM framework	Adequacy of the framework is only audited if there is a significant change or in conjunction with a pricing review
<b>3.2</b>			
	Sydney Water must advise IPART of any significant changes to processes and methodologies established in accordance with clause 3.1.2 which may have a material impact on the asset management framework.	SC/ Audit 3.1.2 if changes to AM framework	<p><b>SWC to provide prior notice of any change to the asset management framework</b></p> <p>Audit of clause 3.1.2 if there are changes to the asset management system or processes.</p> <p>Noted as Audit each year to provide means to check if any changes have occurred.</p>

Licence Clause	Operating Licence Obligations	2011/12	Comments
<b>3.3</b>	<b>System performance standards</b>		
	<p>(a) For the purposes of this clause 3.3 (except in relation to Uncontrolled Sewerage Overflows under clause 3.3.3), each separately billed or separately occupied part of multiple occupancy Property is considered to be a separate Property.</p> <p>(b) For the purposes of Uncontrolled Sewerage Overflows under clause 3.3.3, each multiple occupancy Property is counted as a single Property.</p> <p>(c) In the case of any ambiguity in the definition or application of any system performance standards, IPART's interpretation or assessment of the system performance standards will prevail.</p>	NR	Definition clause.
<b>3.3.1</b>	<b>Water Pressure Standard</b>		
	<p>(a) Water Pressure Standard Sydney Water must ensure that no more than 6,000 Properties experience a Water Pressure Failure in a financial year in its Drinking Water supply system.</p> <p>(b) Water Pressure Failure</p> <p>(1) A Property is taken to have experienced a Water Pressure Failure at each of the following times:</p> <p>(A) when a person notifies Sydney Water that the Property has experienced a Water Pressure Failure and that Water Pressure Failure is confirmed by Sydney Water; or</p> <p>(B) when Sydney Water's systems identify that the Property has experienced a Water Pressure Failure.</p> <p>(2) A Property will not be taken to have experienced a Water Pressure Failure only because of a short term operational problem (such as a main break) which is remedied within 4 days of its occurrence or from abnormal demand (such as demand during fire fighting).</p> <p>(3) Clause 3.3.1(b)(1) does not limit the circumstances in which a Property will have experienced a Water Pressure Failure.</p>	SC	

Licence Clause	Operating Licence Obligations	2011/12	Comments
<b>3.3.2</b>	<b>Water Continuity Standard</b>		
	<p>(a) Water Continuity Standard Sydney Water must ensure that:</p> <p>(1) no more than 40,000 Properties experience an Unplanned Water Interruption exceeding 5 hours in a financial year; and</p> <p>(2) no more than 14,000 Properties experience 3 or more Unplanned Water Interruptions of more than 1 hour duration in a financial year, in its Drinking Water supply system.</p> <p>(b) Unplanned Water Interruption</p> <p>(1) In determining whether a Property experiences an Unplanned Water Interruption a best estimate is to be applied from the best available data, taking account of water pressure data where that data is available.</p> <p>(2) A Property is taken to have experienced a separate Unplanned Water Interruption for each period of 5 hours or more that the Unplanned Water Interruption exists.</p> <p>(3) Clause 3.3.2(b)(2) does not limit the circumstances in which a Property will have experienced an Unplanned Water Interruption under clause 3.3.2(b)(1).</p>	SC	
<b>3.3.3</b>	<b>Sewage Overflow Standard</b>		
	<p>Sydney Water must ensure that:</p> <p>(a) no more than 14,000 Properties (other than Public Properties) experience an Uncontrolled Sewage Overflow in dry weather in a financial year; and</p> <p>(b) no more than 175 Properties (other than Public Properties) experience 3 or more Uncontrolled Sewage Overflows in dry weather in a financial year.</p>	SC	
<b>3.4</b>	<b>Service quality and system performance indicators</b>		
	<p>(a) Sydney Water must maintain record systems that are sufficient to enable it to measure accurately its performance against the Service Quality and System Performance Indicators.</p> <p>(b) In the case of any ambiguity in the definition or application of any indicators, IPART's interpretation or assessment of the indicators will prevail.</p>	SC	
<b>3.5</b>	<b>Response time for water main breaks</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) Sydney Water's response to water main breaks and leaks (in the trunk and reticulation components of Sydney Water's Drinking Water supply system between water treatment plants and a Property), as measured from the time Sydney Water receives notification of a break or leak to the time Sydney Water stops the loss of water, will be as follows:</p> <p>(1) Priority 6 breaks/leaks      90% of jobs within 3 hours</p> <p>(2) Priority 5 breaks/leaks      90% of jobs within 6 hours</p> <p>(3) Priority 4 breaks/leaks      90% of jobs within 5 days</p> <p>(b) Categorisation of Priorities 4, 5 and 6 is set out in Schedule 3.</p>	SC	



Licence Clause	Operating Licence Obligations	2011/12	Comments
3.6	<b>Priority Sewerage Program</b>		
	<p>(a) Sydney Water must continue with the planning and delivery of the Priority Sewerage Program such that Wastewater services are provided to the requisite number of lots in the following areas by the dates specified below:</p> <ol style="list-style-type: none"> <li>(1) Agnes Banks and Londonderry by 31 December 2012;</li> <li>(2) Glossodia, Freeman's Reach and Wilberforce by 31 December 2012;</li> <li>(3) Yellow Rock and Hawkesbury Heights by 31 December 2012; and</li> <li>(4) Appin by 30 June 2015.</li> </ol> <p>(b) If either Sydney Water or a licensee under the Water Industry Competition Act 2006 provides Wastewater services to a significant development (as determined by the Minister) in an adjoining area to one of the following areas in the Priority Sewerage Program:</p> <ol style="list-style-type: none"> <li>(1) Austral and West Hoxton;</li> <li>(2) Wilton; or</li> <li>(3) Menangle and Menangle Park,</li> </ol> <p>then Sydney Water must deliver the Priority Sewerage Program in that area such that Wastewater services are made available to Customers within 24 months of Wastewater services being available to service the significant development.</p> <p>(c) Clause 3.6(b) does not apply where a licensee under the Water Industry Competition Act 2006 provides Wastewater services to the relevant area of the Priority Sewerage Program.</p> <p>(d) Sydney Water must complete planning for, and begin construction on, the provision of Wastewater services to the requisite number of lots in the Cowan and Bargo areas of the Priority Sewerage Program by the end of the term of the Licence. The construction work to be commenced by the end of the term of the Licence must include the augmentation of the sewage treatment plant at Picton required to facilitate the implementation of the Priority Sewerage Program in the Bargo area.</p> <p>(e) Should delays caused by consent authorities impair Sydney Water's ability to meet the timeframes set out in this clause 3.6, Sydney Water must write to the Minister to advise of the reasons for the delay.</p> <p>(f) Sydney Water must provide an annual report on its progress in implementing the Priority Sewerage Program to IPART in accordance with the Reporting Manual.</p>	SC	

Licence Clause	Operating Licence Obligations	2011/12	Comments
<b>4.1</b>	<b>Customer Contract</b>		
	<p>(a) Section 54 of the Act requires that the terms and conditions of a customer contract are set out in Sydney Water's operating licence. Sydney Water's customer contract is set out in Schedule 2 (Customer Contract).</p> <p>(b) The Customer Contract sets out the rights and obligations of Customers and Sydney Water in relation to the Services provided through systems required under the Licence. These rights and obligations are in addition to the rights and obligations conferred by the Act and any other law.</p> <p>(c) A copy of the Customer Contract, and any variations to it must be posted on Sydney Water's website for downloading by any person free of charge and provided to Customers free of charge upon request.</p>	SC	
<b>4.2.1</b>	<b>Explaining the Customer Contract</b>		
	<p>Sydney Water must prepare a pamphlet that:</p> <p>(a) provides a brief explanation of the Customer Contract;</p> <p>(b) summarises the key rights and obligations of Customers under the Customer Contract;</p> <p>(c) refers to the types of account relief available for Customers experiencing financial hardship; and</p> <p>(d) contains a list of Sydney Water's contact numbers in its Area of Operations.</p>	SC	
<b>4.2.2</b>	<b>Explaining variation to Customer Contract</b>		
	<p>The pamphlet prepared under clause 4.2.1 must be updated when changes are made to the Customer Contract and must be disseminated by Sydney Water free of charge to:</p> <p>(a) Customers, at least once annually with their quarterly or other bills; and</p> <p>(b) any other person on request.</p>	SC	
<b>4.3</b>	<b>Consumers</b>		
	<p>Sydney Water's obligations under the Customer Contract relating to complaint handling and complaint resolution procedures are extended to Consumers as if the Consumers were a party to the relevant Customer Contract.</p>	SC	

Licence Clause	Operating Licence Obligations	2011/12	Comments
<b>4.4</b>			
	<p>(a) Sydney Water must have in place and comply with procedures relating to customer hardship, debt, water flow restriction and disconnection. These procedures must include:</p> <ol style="list-style-type: none"> <li>(1) a customer hardship policy for residential Customers, that helps residential Customers in financial difficulty better manage their current and future bills;</li> <li>(2) a payment plan for residential Customers who are responsible for paying their bill and who are, in Sydney Water's opinion, experiencing financial difficulty;</li> <li>(3) conditions for disconnection of supply or water flow restriction in accordance with the disconnection procedure set out in the Customer Contract; and</li> <li>(4) provisions for self-identification, identification by community welfare organisations and identification by Sydney Water of residential Customers experiencing financial difficulty.</li> </ol> <p>(b) Sydney Water must set out the procedures relating to customer hardship, debt, water flow restriction and disconnection referred to in clause 4.4(a) in the Customer Contract.</p> <p>(c) Sydney Water must provide information on its procedures relating to customer hardship, debt, water flow restriction and disconnection free of charge to:</p> <ol style="list-style-type: none"> <li>(1) residential Customers, at least once annually with their quarterly or other bills;</li> <li>(2) residential Customers who are identified as experiencing financial difficulty; and</li> <li>(3) any other person who requests it.</li> </ol> <p>(d) Sydney Water must publish its procedures relating to customer hardship, debt, water flow restriction and disconnection on its website.</p> <p>(e) Sydney Water must advise residential Customers of their rights, including any rights to have a complaint or dispute referred to the Energy and Water Ombudsman NSW for resolution.</p>	SC	
<b>4.5.1</b>	<b>Customer Councils</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) In accordance with the Act, Sydney Water must have in place and regularly consult with a Customer Council to enable community involvement in issues relevant to the performance of Sydney Water's obligations under the Licence. Sydney Water may have one or more Customer Councils.</p> <p>(b) Sydney Water must consult with the Customer Council, in accordance with the terms of the relevant Customer Council Charter, on:</p> <ol style="list-style-type: none"> <li>(1) the interests of Customers and Consumers of Sydney Water;</li> <li>(2) the Customer Contract; and</li> <li>(3) such other key issues related to Sydney Water's planning and operations as Sydney Water may determine.</li> </ol> <p>(c) Sydney Water must appoint the members of a Customer Council, consistent with the Licence.</p> <p>(d) At all times, the membership of a Customer Council must include a representative for the interests of at least each of the following:</p> <ol style="list-style-type: none"> <li>(1) business and consumer groups;</li> <li>(2) low income households;</li> <li>(3) people living in rural and urban fringe areas;</li> <li>(4) residential consumers;</li> <li>(5) environmental groups;</li> <li>(6) local government; and</li> <li>(7) people from culturally and linguistically diverse backgrounds.</li> </ol> <p>(e) Sydney Water must provide a Customer Council with information within its possession or under its control (other than information or documents over which Sydney Water or another person claims confidentiality or privilege) necessary to enable that Customer Council to discharge the tasks assigned to it.</p>	SC	
4.5.2	Customer Council Charter		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) In consultation with members of each Customer Council, Sydney Water must maintain a customer council charter (Customer Council Charter) that addresses:</p> <ol style="list-style-type: none"> <li>(1) the role of the Customer Council;</li> <li>(2) selection criteria on how members will be drawn from the community;</li> <li>(3) how the Customer Council will operate;</li> <li>(4) induction processes for new members;</li> <li>(5) a description of the type of matters that will be referred to the Customer Council;</li> <li>(6) procedures for the conduct of Customer Council meetings, including the appointment of a chairperson and the requirement to invite on an annual basis a co-chair of the Customer Council from Customer representatives;</li> <li>(7) communicating the outcome of the Customer Council's work to the public, including the publication of meeting agenda and minutes on Sydney Water's website;</li> <li>(8) procedures for tracking issues raised and ensuring appropriate follow-up of those issues; and</li> <li>(9) funding and resourcing of the Customer Council by Sydney Water including sitting fees and expenses for members.</li> </ol> <p>(b) Either Sydney Water or the Customer Council may propose any amendments to the Customer Council Charter. However, such amendments will not be effective until they have been approved by both Sydney Water and the Customer Council.</p>	SC	
5.1	<b>Internal Dispute Resolution Process</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<ul style="list-style-type: none"> <li>(a) Sydney Water must establish and maintain internal complaint handling procedures for receiving, responding to and resolving Complaints by Customers and Consumers against Sydney Water.</li> <li>(b) The internal complaints handling procedures of Sydney Water must be based on the Australian Standard AS/ISO 10002: 2004 MOD Customer Satisfaction – Guidelines for Complaint Handling, as amended or replaced from time to time.</li> <li>(c) Sydney Water must make available to Customers and Consumers information concerning its internal complaints handling procedures which explains how to make a Complaint and how the complaint handling procedure works.</li> <li>(d) Sydney Water must provide information of the nature described in clause 5.1(c) to Customers through their quarterly, or other, bills at least once annually.</li> </ul>	SC	
<b>5.2</b>	<b>External Dispute Resolution Scheme</b>		
	<ul style="list-style-type: none"> <li>(a) Sydney Water must establish or be a member of an industry based dispute resolution scheme for the resolution by a dispute resolution body of disputes between Sydney Water and its Customers and between Sydney Water and Consumers.</li> <li>(b) Any industry based dispute resolution scheme so established by Sydney Water is subject to the Minister's approval.</li> <li>(c) Sydney Water must: <ul style="list-style-type: none"> <li>(1) prepare a pamphlet that explains how the dispute resolution scheme operates and how it can be accessed; and</li> <li>(2) provide that pamphlet to Customers through their quarterly or other bills, at least once annually.</li> </ul> </li> </ul>	SC	
<b>6.1</b>	<b>Environment management</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) Sydney Water must maintain an environmental management system certified to AS/NZS ISO 14001:2004 (as updated from time to time) to manage environmental risk of its business and service delivery.</p> <p>(b) Sydney Water must prepare a Five Year Environment Plan in accordance with the environmental management system in clause 6.1(a) by 30 September 2010. The Five Year Environment Plan must:</p> <ol style="list-style-type: none"> <li>(1) include Sydney Water's environmental objectives;</li> <li>(2) contain details of Sydney Water's program to meet the environmental objectives including targets and timetables;</li> <li>(3) endorse the principles of ecologically sustainable development;</li> <li>(4) be integrated into Sydney Water's business plans; and</li> <li>(5) be posted on Sydney Water's website for downloading by any person free of charge. A copy of the plan must be provided to any member of the public free of charge upon request.</li> </ol> <p>(c) Sydney Water must complete an annual progress report in accordance with the Reporting Manual, outlining details of Sydney Water's progress with the environmental objectives, targets and timetable.</p> <p>(d) Each year Sydney Water must review the Five Year Environment Plan by consulting with DECCW and peak environmental non-governmental organisations to determine whether any changes to the Five Year Environment Plan are required in the subsequent year and the nature of those amendments.</p>	SC	
<b>6.2</b>	<b>Environment indicators</b>		
	<p>Sydney Water must:</p> <ol style="list-style-type: none"> <li>(a) monitor, record and compile data on the Environmental Performance Indicators; and</li> <li>(b) report on the Environmental Performance Indicators,</li> </ol> <p>in accordance with its obligations under the Reporting Manual.</p>	SC	
<b>7.1</b>	<b>Water Usage Level</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) Sydney Water must reduce the quantity of Drinking Water it draws from all sources to a level of water usage equal to, or less than, 329 litres per person per day (the Water Usage Level) by 30 June 2011.</p> <p>(b) Thereafter, Sydney Water must continue to maintain the Water Usage Level for the remainder of the term of the Licence, to be measured at 30 June each year.</p> <p>(c) In calculating water usage for the purposes of the Water Usage Level, Sydney Water may make reasonable adjustments to account for the effects of weather on water usage using a methodology approved by IPART.</p> <p>(d) If Sydney Water fails to meet the Water Usage Level in a particular year, Sydney Water must demonstrate, to the satisfaction of IPART, that it would not have been reasonable to meet the Water Usage Level in that year.</p> <p>(e) Sydney Water must undertake a review of the water usage level as part of the end of term review of this Licence.</p>	SC	
<b>7.2</b>	<b>Water Leakage</b>		
	<p>(a) Sydney Water must ensure that the level of water leakage from its Drinking Water supply system (the Water Leakage Level) does not exceed 105 megalitres per day.</p> <p>(b) When calculating the Water Leakage Level each year, Sydney Water must use the assumptions and methodology approved by IPART.</p> <p>(c) Sydney Water must complete a review by 31 December 2011 to determine the economic Water Leakage Level and submit a report on this review to IPART. The review must be conducted in a manner acceptable to IPART.</p> <p>(d) Following submission of the report from Sydney Water under clause 7.2(c), IPART must provide a recommendation to the Minister as to the economic Water Leakage Level.</p> <p>(e) Following review of the report submitted to IPART under clause 7.2(c) and consideration of IPART's recommendation under clause 7.2(d), the Minister may adjust the Water Leakage Level.</p>	SC/ Audit a,b &c	Water Leakage Level review completed in the 2011/12 Audit period.
<b>7.3</b>	<b>Water efficiency programs</b>		
	<p>(a) Sydney Water must undertake and promote water efficiency programs.</p> <p>(b) Sydney Water must give due consideration to water efficiency and other water conservation measures as part of planning the future provision of its Services, including addressing water leakage.</p>	SC	



Licence Clause	Operating Licence Obligations	2011/12	Comments
7.4	<b>Water recycling program (including stormwater)</b>		
	<p>(a) Sydney Water must promote, foster and encourage the production and use of Recycled Water in the Area of Operations.</p> <p>(b) Sydney Water must:</p> <ol style="list-style-type: none"> <li>(1) meet any target relating to the production and/or use of Recycled Water set by the Minister from time to time consistent with the objectives of the Metropolitan Water Plan; and</li> <li>(2) implement any particular Recycled Water schemes indicated by the Minister so as to meet any target in clause 7.4(b)(1) above.</li> </ol> <p>(c) Sydney Water is not required to undertake any Recycled Water scheme where it is not financially viable to do so.</p>	SC	
7.5	<b>Water Conservation Strategy Document and annual report</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) Sydney Water must prepare and submit to IPART and the Minister by 31 December 2010 a Five Year Water Conservation Strategy Document covering the term of the Licence. The Five Year Water Conservation Strategy Document must include details of:</p> <ol style="list-style-type: none"> <li>(1) strategies relating to water leakage;</li> <li>(2) strategies relating to Recycled Water;</li> <li>(3) strategies relating to water efficiency;</li> <li>(4) how the water conservation strategies outlined in paragraphs (a)(1) – (a)(3) above contribute to the objectives and targets outlined in the Metropolitan Water Plan.</li> </ol> <p>(b) The Five Year Water Conservation Strategy Document must provide an analysis of current and future programs and projects being undertaken, and expected to be undertaken, by Sydney Water. In particular, the Five Year Water Conservation Strategy Document must outline Sydney Water's water conservation objectives, targets and timetable for the entire term of the Licence.</p> <p>(c) Sydney Water must provide an annual report on its progress in implementing its water conservation strategies in accordance with the Reporting Manual. The annual report must include an explanation of how work done for the purpose of implementing the water conservation strategies undertaken during the year contribute to the objectives and targets outlined in the Metropolitan Water Plan.</p> <p>(d) The following documents must be placed on Sydney Water's website:</p> <ol style="list-style-type: none"> <li>(1) the annual report on Sydney Water's progress in implementing its water conservation strategies required under clause 7.2(c); and</li> <li>(2) the Five Year Water Conservation Strategy Document.</li> </ol>	SC	
<b>9</b>	<b>Reporting and maintaining records</b>		
	<p>(a) Sydney Water must comply with its reporting obligations set out in the Reporting Manual and must report to IPART in accordance with the Reporting Manual.</p> <p>(b) Sydney Water must provide to NSW Health a copy of any report referred to in the Reporting Manual relating to water quality monitoring.</p> <p>(c) Sydney Water must maintain record systems that are sufficient to enable it to accurately report in accordance with clause 9(a).</p>	SC	
<b>10.1</b>	<b>Request for information and access – IPART</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) Sydney Water must comply with any reasonable request by IPART for information relating to the performance by Sydney Water of its obligations under clause 9.</p> <p>(b) As part of its obligations under clause 10.1(a), Sydney Water must provide IPART with physical and electronic access to the records kept by Sydney Water that enable it to comply with clause 9.</p> <p>(c) Sydney Water must provide IPART with such information as IPART reasonably requires to enable it to conduct any reviews of the Licence or obligations under the Licence as may be required by the Minister.</p>	SC	Auditor should seek confirmation from IPART on Sydney Water's compliance with this clause. Should IPART identify any concerns this clause should be included in that years audit
<b>10.2</b>	<b>Request for information and access – NSW Health</b>		
	Sydney Water must comply with any request by NSW Health for information relating to water quality. The information provided under this clause must be in the manner and form specified by NSW Health.	SC	Auditor should seek confirmation from the Department of Health on Sydney Water's compliance with this clause. Should NSW Health identify any concerns this clause should be included in that years audit.
<b>11</b>	<b>Memoranda of Understanding</b>		

Licence Clause	Operating Licence Obligations	2011/12	Comments
	<p>(a) In accordance with the Act, Sydney Water must maintain a memorandum of understanding with each of the following:</p> <ul style="list-style-type: none"> <li>(1) the Water Administration Ministerial Corporation (WAMC);</li> <li>(2) NSW Health; and</li> <li>(3) DECCW,</li> </ul> <p>for the term of the Licence.</p> <p>(b) The purpose of a memorandum of understanding is to form the basis for co-operative relationships between the parties to the memorandum. In particular:</p> <ul style="list-style-type: none"> <li>(1) the memorandum of understanding with NSW Health is to recognise the role of NSW Health in providing advice to the Government of NSW in relation to: <ul style="list-style-type: none"> <li>(A) the management of the supply of Drinking Water to ensure it is safe to drink; and</li> <li>(B) the management of the supply of Recycled Water in respect of its fitness for purpose and effects on health;</li> </ul> </li> <li>(2) the memorandum of understanding with DECCW is to recognise DECCW as the environmental regulator of the State and to commit Sydney Water to environmental obligations; and</li> <li>(3) the memorandum of understanding with the WAMC, is to recognise the role of WAMC in regulating water access, use and management and Sydney Water's right to use water vested in the WAMC.</li> </ul> <p>(c) Clause 11(a) does not limit the persons or regulatory agencies with whom Sydney Water may have a memorandum of understanding.</p>	SC	
<b>12</b>	<b>End of term review of Licence</b>		
	<p>(b) Sydney Water must, on the direction of the Minister, make available to the public on request and for downloading from its website, and free of charge, the report prepared by the Licence Reviewer at the conclusion of the review.</p>	SC	

## **Appendix I** – Attendance at Audit Interviews

### Drinking Water Quality Interview

Personnel	Role
Emma Cooper	Water Quality & Assurance Manager
Peter Cresta	Water Quality Manager
Gordon Aiken	Network Integration Manager Water
Andrew Phillips	System Operations Officer 5 To 6
Ross Lindsay	System Operations Officer 5 To 6
Anita Bidkar	System Operations Officer 1 To 4
Howard Hilton	Plant Manager Level 1
Darren Lavender	Production Officer Level B
Tony Venturino	System Operations Officer 1 To 4
Greg Rossington	Technical Specialist Level 3
Rebecca Gonzalez	Risk Manager
Clive Copelin	System Operations Officer 5 To 6
Lachlan Joyner	Operations & Maintenance Cont Specialist Level F
Scribe: Sandra Spargo	A/Corporate Compliance manager

### Recycled Water Quality Interview

Personnel	Role
Emma Cooper	Water Quality & Assurance Manager
Peter Cresta	Water Quality Manager
Kimson Lam	System Operations Officer 5 To 6
Joseph Chandy	Technical Specialist Level 5
Mark Angles	R&D Program Manager
Scribe: Sandra Spargo	A/Corporate Compliance manager

### Managing Assets Interview

Personnel	Role
Craig Crawley	Strategy Manager
Barry Thomas	Business Systems Specialist
Raelene Young	Business Systems Specialist
Danny Azavedo	Strategist
Scribe: Catherine Rolston	Project Manager OLP

### Water Leakage Interview

Personnel	Role
Aravinda Stanley	Senior Analyst
Craig Crawley	Strategy Manager
Gordon Aiken	Network Intergration Manager Water
Scribe: Rebecca Reid	Senior Comp Analyst

### Wollongong Interview

Personnel	Role
Stewart Ramsay	Plant Manager
Marco Onofir	Production Officer Level C
Martin Brewster	Production Officer Level D
Kimson Lam	System Operations Officer 5 to 6

### West Camden Phone Interview

Personnel	Role
Adnan Firat	Plant Manager
Andy Lam	Production Officer Level C

### Reservoir Visit Interview

Personnel	Role
Lal Wickramarachchi	System Operations Officer 5 to 6
Peter Vidovich	System Operations Officer 5 to 6
Emma Cooper	Water Quality and Assurance Manager
Peter Cresta	Water Quality Manager
Lisa Howell	System Operations officer 1 to 4
Bernie Sheridan	Manager product and Asset Management

### Woronora WFP Visit Interview

Personnel	Role
Ben Blayney	Treatment Manager Water
Lachlan Joyner	Operations and Maintenance Cont. Specialist Level F
Colin Storey	Principal Chemist
Slim Somerville	Process Maintenance Technician
Michael Woodward	Process Maintenance Technician
Les Hart	Process Maintenance Technician

### NWI Audit Interview

Personnel	Role
Lionel Harris	Licence Compliance Manager
Shaohua Ye	Technical Specialist Level 3
Vincent Young	Technical Specialist Level 4
Ian Watts	Information & Reporting Manager Civil Delivery
Neil Hart	Manager Business Planning & Reporting
Stuart McDonald	Principal Engineer
Mylissa Kilian	Reporting & Relationship Manager
Joe Virgona	Network Integration Manager WW
Glenice Ault	Manager Planning & Reporting
Aravinda Stanley	Senior Analyst
Sunietha Katupitiya	Assurance Manager

## **Appendix J** – SWC Document Received by GHD



Document Reference Number	Document file	Document name/Description
1	5YP Implementation report 2010_11_Final	Implementation of the Five Year Drinking Water Quality Management Plan 2010-11 Annual Report
2	Attach 2 Implementation of ADWG 2011 final	Attachment 2 from June 2012 SLG Meeting
3	Health MOU	Memorandum of Understanding between NSW Health and Sydney Water Corporation
4	2011_12 Draft_v15 2011_12 Annual Report on Implementation of 5yr DWQMP	Implementation of the Five Year Drinking Water Quality Management Plan 2011-12 Annual Report
5	WPIMS5152 Five Year Drinking Water Quality management Plan 2010-2015	Five Year Drinking Water Quality management Plan 2010-2015
6	WPIMS5228 V8 Drinking Water Quality Event Management Plan	Drinking Water Quality Event Management Plan
7	Copy of Roof Inspection Data Analysis	Summary of findings from reservoir roof inspections
8	Logic behind the reservoir risk ranking tool	Logic used to rank water quality results in terms of risk from reservoir roof issues
9	WN5340 Asset inspection water network facilities SOP	Asset inspection water network facilities SOP
10	Briefing Note for Reservoir Roof Inspections	Briefing note summarising reservoir roof work
11	Copy of Process workshop WQ- potential contamination via reservoir roofing.	Initial HIDRA workshop to define scope of reservoir roof issue
12	Copy of Reservoir risk ranking tool	Copy of reservoir output using water quality ranking tool
13	Monthly Disinfection Report (selected Number of Months)	Monthly disinfection report using internal chlorine targets
14	WOQ5171 Compliance Monitoring Plan 2011_12	2011-12 Compliance monitoring plan
15	Woq5013 2011-12 Annual Operational monitoring Plan final version 1	2011-12 Operational monitoring plan
16	Quarterly drinking Water Quality Report Q4 2011-12	Fourth Quarterly Drinking Water Quality Report 2011-12 (SW Website)

Document Reference Number	Document file	Document name/Description
17	3rd Quarterly report 2011-12 ver 1	Third Quarterly Drinking Water Quality Report 2011-12 (For NSW Health)
18	4th Quarterly Drinking Water quality Report 2011-12	Fourth Quarterly Drinking Water Quality Report 2011-12 (For NSW Health)
19	Quarterly Drinking water Quality Report Q3 2011-12	Third Quarterly Drinking Water Quality Report 2011-12 (SW Website)
20	WPIMS5274 Triggers, Notification and Actions for Adverse WQ results	SOP used to set trigger levels for WQ exception reporting
21	AMQ0012 SAP Water Quality risk management processes.	SAP for water quality related risk assessments
22	NSYS13_JUL12	Control charts looking at key characteristics – used at disinfection workshops
23	RWQ Report Health 2011-12 4th Quarter	Quarterly Recycled Water Quality Monitoring Report for NSW Health Fourth Quarter 2011-12
24	RWQ Report Health 2011-12 3rd Quarter	Quarterly Recycled Water Quality Monitoring Report for NSW Health Third Quarter 2011-12
25	2010-11 Annual RWQM Report approved	Annual Report on Recycled Water Quality Management 2010-11
26	Draft Annual RWQM Report 2011-12	Annual Report on Recycled Water Quality Management 2010-11 DRAFT
27	QMP RWS final Quality Management Plan RW Schemes	Quality Management Plan Recycled Water Schemes (generic document)
28	Minutes JOG 3 May 2012	Minutes of May JOG meeting indicating June 2012 timeframe for providing Health with 9 draft Recycled Water Management Plans
29	RW0001 Rouse Hill RWQMP	Recycled Water Quality Management Plan for Rouse Hill Recycled Water Scheme
30	RWQMP West Camden V1.6 final	Recycled Water Quality Management Plan for West Camden Recycled Water Irrigation Scheme
31	RW0002 Wollongong STP Stage 1 RWQMP	Recycled Water Quality Management Plan for Wollongong Stage 1 Recycled Water Scheme

Document Reference Number	Document file	Document name/Description
32	Wollongong Stage 2 RWQMP v1 June 2008	Recycled Water Quality Management Plan for Wollongong Stage 2 Recycled Water Scheme
33	7718_signed letter	Covering letter for March report to IPART
34	Eval of 2010-11 OL Audit Recommendations_External_CR26032012_SS	Update on 2010-11 Operating Licence Audit
		Ministerial requirements arising from IPART recommendations (sent with covering letter)
35	Training Record WN5340 - Jul 2012 Reservoirs and Tanks (a)	Reservoir roof inspection training records
36	Training Record WN5340 for Reservoir and Tanks (a)	Reservoir roof inspection training records
37	SLG meeting minutes 6 Dec 2011_ final draft	December 2011 SLG Minutes
38	SLG meeting minutes 18 June 2012_ final draft	June 2012 SLG Minutes
39	DWQ Compliance MP 2012-13 Final (a)	2012-13 Compliance Monitoring Plan
40	WPIMS5041 R4 Manual Disinfection of Service Reservoirs (a)	Manual Disinfection of Service Reservoir Dosing SOP WPIMS 5041
41	Copy of Prioritisation of mixers analysers chloro plants updated 8 Feb 2012 (2)	Prioritisation tool for reservoir mixers, rechlorination plants & analysers
42	May 2012 Fluoride report_ Combined_new	5 Monthly fluoride reports
	March 2012 Fluoride report_ Combined	
	Feb 2012 Fluoride report_ Combined	
	April 2012 Fluoride report_ Combined	
	June 2012 Fluoride report_ Combined	
43	P.Broad_Crypto_%26_Giardia_Report(11May)_SCA.XLS	8 years of Crypto / Giardia results
44A	Heathcote WS047 (Roof inspection).pdf	Completed reservoir inspection sheets for the two reservoirs being inspected as part of audit site visits

Document Reference Number	Document file	Document name/Description
44B	Heathcote WS151 (roof inspection).pdf	
44C	Lucas Heights WS161 (roof inspection).pdf	
45	2012-05-11 Meeting minutes of WFP turbidity triggers final.docx	2012-05-11 Meeting minutes of WFP turbidity triggers QMRA work
46A	WS0262-51_A.pdf	Design specifications / rules for reservoir roofs
46B	Reservoir Roof Renewals value engineering workshop.docx	
47	Roof Repair Program 2012_13 & 2013_14.xlsx	Evidence of what work has been done to date for the 'Fix Now' reservoir program/Roof repair program status information
48A	Woronora Disinfection Review Minutes for Sep 12.doc	Minutes of Woronora Water Quality Review
48B	Woronora Disinfection Review Minutes for Feb 12.doc	
49A	2Rechloro SOP.DOC	
49B	3WT5201 - Rechlorination Plant IICATs SOP.DOC	Online instrument/calibration component
49C	4Rechlorination Plants -Daily IICATS Report October 2012 xlsx	
49D	Analysers Database-V6 050612.xls	
49E	Chlorine Analyser - Maintenance Records Latest Version.xlsx	
49F	Chlorine Analyser Schedule.doc	
49G	Chlorine Analysers - CP02Aug1213.xls	
49H	Chlorine Analysers -Run Sheets.xls	
49I	Maximo WOs.pdf	
49J	Rechlorination Plants - PM Schedule_v1 August 2011.xls	
49K	Test sheets.pdf	
50A	1206 WI Meeting.pdf	Water Quality Integration meeting – monthly meeting minutes (sample)

Document Reference Number	Document file	Document name/Description
50B	WQ update May 2012.ppt	
51	Aquality introduction presentation 11_Sept_2012 rev2.pptx	Aquality Review presentation to management
52	2012-04-02 Individual filter turbidity interim response protocol.pdf	Change of Turbidity Reporting Levels (from Phil Broad)
53A	Attendance sheet for mid term review.pdf	Documents relating catchment to tap mid-year risk review – agenda, minutes, actions etc (Clive Copelin)
53B	Agenda for mid term review.pdf	
53C	Draft comments document attached to Email to SCA requesting review of draft comments on mid term review.pdf	
53D	Email to SCA requesting review of draft comments on mid term review.pdf	
53E	Summary of Networks issues.pdf	
53F	Summary of Treatment issues.pdf	
53G	Training on KnowRisk.pdf	Documents relating catchment to tap mid-year risk review – agenda, minutes, actions etc (Clive Copelin)
54	DOH and SWC Sewage overflow Protocol December 2010 final.pdf	Notification Protocol for wastewater incidents
55A	SLG meeting minutes 6 Dec 2011_ final.docx	Final meeting minutes of SLG meetings on 16/12/11
55B	SLG meeting minutes 18 June 2012_ final.docx	Final meeting minutes of SLG meetings on 18/6/12
56	101482_AS-NZS ISO 9001-2008- Quality Management Requirements.pdf	ISO 9001 certificate of approval
57A	document2012-10-10-090052.pdf	Wollongong recycling plant UV information
57B	10-10-12 Email regarding UV at Wollongong recycled water plant.pdf	

Document Reference Number	Document file	Document name/Description
58A	Engadine Reservoir WSO258 completed roof repairs.docx	Additional information relating to reservoir roof repairs sighted on day 2 at Heathcote Reservoir
58B	Heathcote WS0047.pdf	
58C	Helensburgh Reservoir WSO048 completed roof works.docx	
58D	Helensburgh Reservoir WSO348 completed work.docx	
58E	Lucas Heights WS0161.pdf	
58F	Menai Reservoir WSO268 completed roof repairs.docx	
58G	Roof Inspection Data Analysis - Report to Auditor.xlsx	
58H	Spotles WO 5735535.docx	
58I	Spotles WO 5735558.docx	
58J	WO 70581547.pdf	
58K	WO 70581859.pdf	
58L	WS0047-WR5.pdf	
58M	WS151-WR5.pdf	
58N	WS161-WR5.pdf	
59	2012 Annual Drinking Water Quality Review (Final).ppt	2012 Annual Drinking Water Quality Review
70	THM exception reporting for Nepean.pdf	THM exception reporting for Nepean
71	Filter exceedence at Woronora WFP 27-07-12.pdf	Filter exceedence at Woronora WFP 27-07-12
72	RWTP verification monitoring 120316 DRAFT.docx	RWTP verification monitoring 120316 DRAFT
73	SWC_MoU_FINAL_SIGNED.pdf	Sydney Water Corporation Memorandum of Understanding FINAL SIGNED
74A	letter-exception report.docx	Exception report
74B	MOU Minutes and actions.docx	Memorandum of Understanding Minutes and Actions
74C	MOU_FB_SWC_v2 1 (FINAL).DOC	Memorandum of Understanding _FB_SWC_v2 1 (FINAL)

Document Reference Number	Document file	Document name/Description
75	WR5271 RW Quality EMP v4 300712 DRAFT.doc	WR5271 RW Quality EMP v4 300712 DRAFT
76	Example of Crypto exception reports recycled water.pdf	Example of Crypto exception reports recycled water
77	Camden Council Recycled Water Agreement (Irrigation).pdf	Camden Council Recycled Water Agreement (Irrigation)





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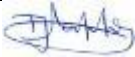
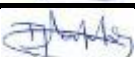
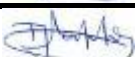
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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
First	T. Flapper	S. Taylor		T. Flapper		29.10.12
Second	S. Taylor T. Flapper	T. Flapper S. Taylor		T. Flapper		20.11.12
Final	S. Taylor T. Flapper	T. Flapper S. Taylor		T. Flapper		29.11.12

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## B | Sydney Water's Statement of Compliance

Annual Compliance and Performance Report 2012  
For 2011-12  
Submitted by Sydney Water Corporation  
ABN: 49 776 225 038

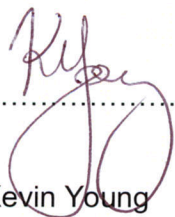
To: The Chief Executive Officer  
Independent Pricing and Regulatory Tribunal of NSW  
PO Box Q290  
QVB Post Office NSW 1230

Sydney Water reports as follows:

1. This report documents compliance during 2011-12 with all obligations to which Sydney Water is subject by virtue of its Operating Licence, excluding obligations under clause 1.8 of the Operating Licence.
2. This report has been prepared by Sydney Water with all due care and skill in full knowledge of conditions to which it is subject and in compliance with IPART's current Sydney Water Reporting Manual.
3. Schedule A provides information on all obligations with which Sydney Water did not fully comply during 2011-12.
4. Other than the information provided in Schedule A, Sydney Water has complied with all conditions to which it is subject.
5. Sydney Water's performance against the System Performance Standards in Appendix D is reported at Schedule B.
6. Performance Indicators reporting Sydney Water's operations (excluding environmental indicators in Table E5 and Table E6) are provided in Schedule C.
7. Sydney Water's Water Conservation Annual Report (*Water Efficiency Report*) is provided at Schedule D.
8. Sydney Water's *Priority Sewerage Program Annual Report* is provided at Schedule E.
9. Sydney Water's *Quarterly Drinking Water Quality Monitoring Report for period ending 30 June* is provided at Schedule F.
10. Sydney Water's *Quarterly Recycled Water Quality Report for period ending 30 June* is provided at Schedule G.
11. The compliance and performance indicator reports have been approved by the Managing Director and the Chairman of the Board of Sydney Water or a duly authorised Board member other than the Managing Director.

DATE:

Signed:

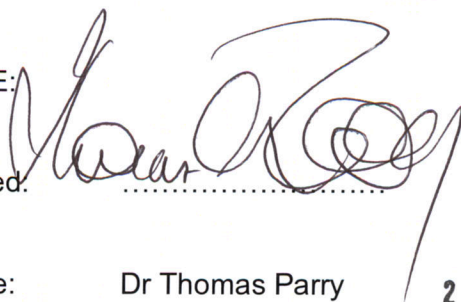


Name: Kevin Young  
Designation: Managing Director

3 0 AUG 2012

DATE:

Signed:



Name: Dr Thomas Parry  
Designation: Chairman

2 7 AUG 2012

## **Schedule A      Non Compliances**

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There are no exceptions to report by Sydney Water for the 2010-2015 Operating Licence in 2011-12.

# **Operating Licence 2010-2015 Compliance Report**

## **System Performance Standards Report 2011-12**

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# 1 Introduction

This report has been prepared for the Independent Pricing and Regulatory Tribunal of NSW (IPART). It addresses the requirements for compliance and performance reporting for 2011-12 prescribed by the 2010-2015 Operating Licence and Table D.1 of the associated Reporting Manual for:

- System Performance Standards for Water Pressure, Water Continuity, and Sewerage Overflows (SPS 1-5)
- Response times to Priority 6, 5 and 4 main breaks and leaks (RT 1-3)
- Water conservation requirements relating to the quantity of potable water drawn from all sources and the amount of water leakage from the drinking water supply system (WC 1-2).



## 2 System performance standards

### 2.1 Water Pressure Standard (SPS 1)

Standard #	Standard	Outcome
SPS 1	Number of properties that experience a water pressure failure, as defined in clause 3.3.1 of the Operating Licence, in the preceding financial year.	572

#### Operating Licence 3.3.1

##### (a) Water pressure standard

*Sydney Water must ensure that no more than 6,000 properties experience a water pressure failure in a financial year in its water supply system.*

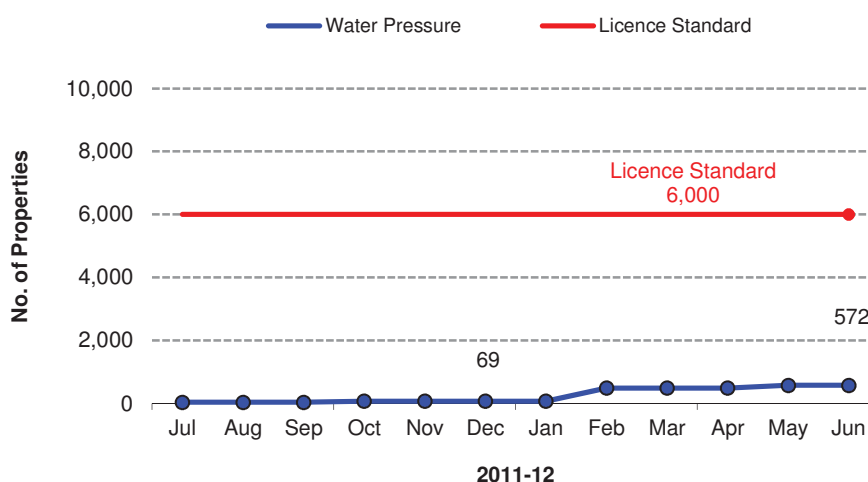
##### (b) Water pressure failure

- 1) *A property is taken to have experienced a water pressure failure at each of the following times:*
  - (A) *When a person notifies Sydney Water that the property has experienced a water pressure failure and that water pressure failure is confirmed by Sydney Water or*
  - (B) *When Sydney Water's systems identify that the property has experienced a water pressure failure.*
- 2) *A property will not be taken to have experienced a water pressure failure only because of a short term operational problem (such as a main break) which is remedied within four days of its occurrence or from abnormal demand (such as during fire fighting).*
- 3) *Clause 3.3.1(b)(1) does not limit the circumstances in which a Property will have experienced a Water Pressure Failure.*

Interpretation: Water Pressure Failure means a situation in which a Property experiences a pressure of less than 15 metres for a continuous period of 15 minutes or more measured at the point of connection of the property to Sydney Water's water supply system, usually at the point of connection known as the "main tap".

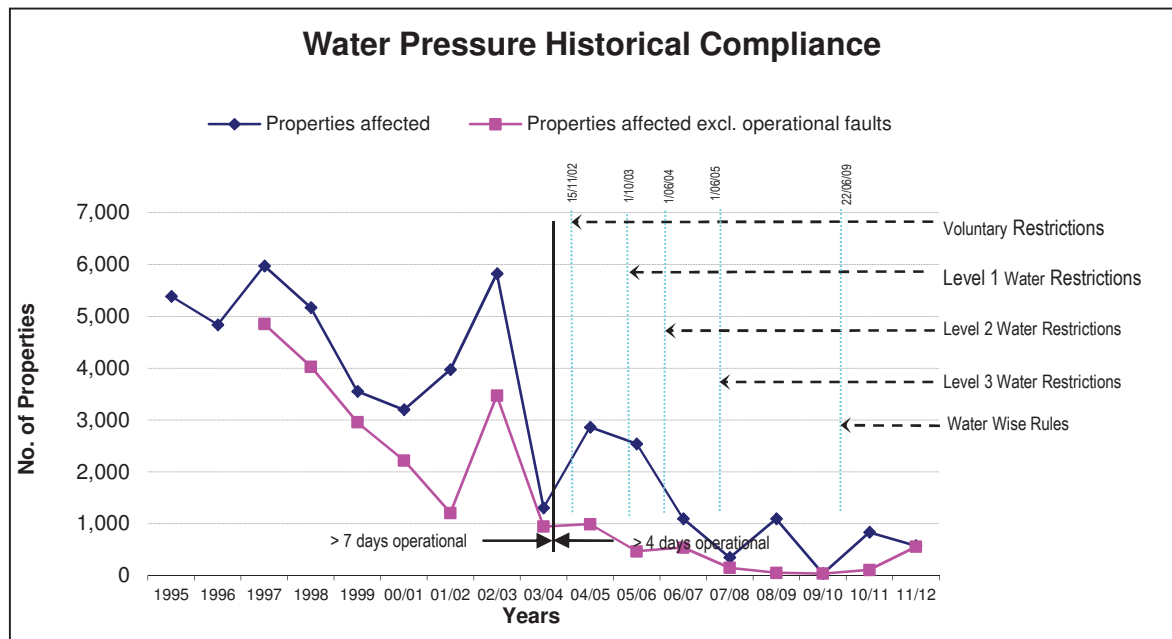
#### Compliance Summary

Compliance achieved



In 2011-12, 572 properties experienced water pressure less than 15 metres head, compared to 832 properties in 2010-11. There were 554 properties affected due to capacity issues and 18 properties affected due to abnormal operations. There was an increase in the number of properties affected due to capacity issues compared to 2010-11. This rise was mainly due to a customer drawing a large amount of water from the Macarthur System, which affected pressure for 376 properties. Discussions have been held with the customer to try and prevent a recurrence and investigations are underway to enable sustained pressure within the system.

### 2.1.1 Water pressure historical performance comparison



#### Notes:

The System Performance Standards for pressure were changed from 1 July 2001. Prior to that time the number of reportable properties for operational problems was based on operational faults causing pressure below the prescribed limit not being remedied within 7 consecutive days, compared with the current requirement of 4 days. From 1 July 2010, the maximum number of properties allowed under the water pressure standard changed from 15,000 to 6,000.

The number of properties affected by low water pressure has been consistently well below the Licence standard of 6,000 properties and has trended downwards since 2004-05. This is mainly due to the implementation of the Pressure Improvement Program to address the more intractable system problems affecting properties with low pressure and the implementation of water restrictions in previous years.

## 2.2 Water Continuity Standard (SPS 2, SPS 3)

Standard #	Standard	Outcome
SPS 2	Number of properties that experience an unplanned water interruption exceeding 5 hours, as defined in the Operating Licence, in the preceding financial year	28,386
SPS 3	Number of properties that experience 3 or more unplanned water interruption exceeding 1 hour, as defined in the Operating Licence, in the preceding financial year	4,171

### Operating Licence 3.3.2

#### (a) *Water continuity standard*

*Sydney Water must ensure that:*

- 1) no more than 40,000 properties experience an unplanned water interruption exceeding five hours in a financial year and*
- 2) no more than 14,000 properties experience three or more unplanned water interruptions of more than one hour duration in a financial year, in its drinking water supply system.*

#### (b) *Unplanned water interruption*

- 1) In determining whether a Property experiences an Unplanned Water Interruption a best estimate is to be applied from the best available data, taking account of water pressure data where that data is available.*
- 2) A Property is taken to have experienced a separate Unplanned Water Interruption for each period of 5 hours or more that the Unplanned Water Interruption exists.*
- 3) Clause 3.3.2(b)(2) does not limit the circumstances in which a Property will have experienced an Unplanned Water Interruption under clause 3.3.2(b)(1).*

Interpretation: Unplanned Water Interruption is an event which:

- (a) commences when the supply of Drinking Water at the first cold water tap of a Property is interrupted without the Customer or Consumer having received prior notice of that interruption from Sydney Water (and includes an interruption resulting from damage caused by a person, other than Sydney Water, or from a power failure); and
- (b) ceases when a normal supply of Drinking Water is restored to the Property referred to in paragraph (a).

## 2.2.1 Water continuity: unplanned interruptions (SPS 2)

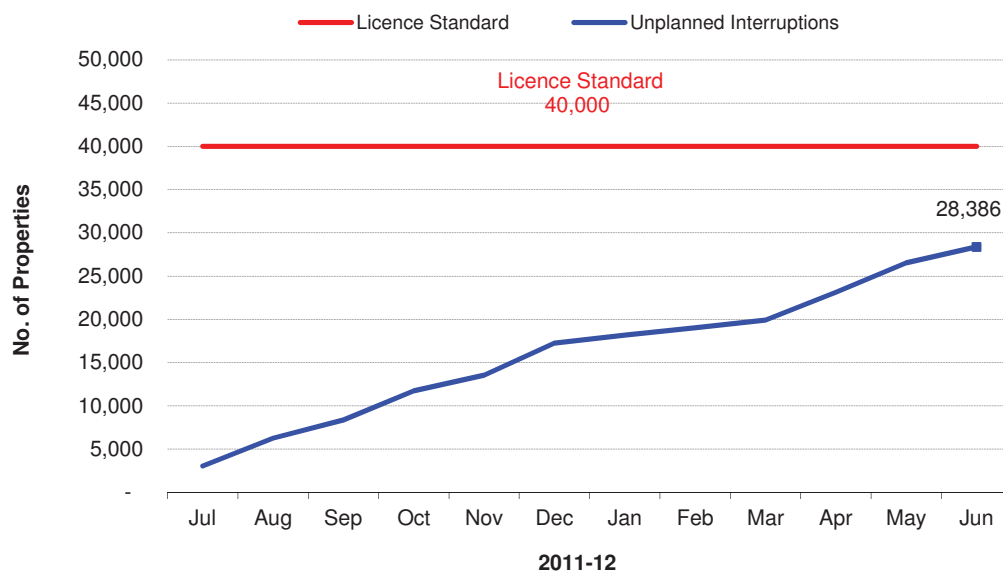
### Operating Licence 3.3.2(a)(1)

*Sydney Water must ensure that:*

*No more than 40,000 properties experience an Unplanned Water Interruption exceeding 5 hours in a financial year.*

#### Compliance Summary

Compliance achieved



In 2011-12, there were 537 unplanned shutdown events exceeding 5 hours. The number of properties affected by unplanned shutdown events in 2011-12 was 28,386 (compared with 26,205 properties in 2010-11). The number of properties affected by unplanned water interruptions greater than 5 hours is influenced by:

- the number and severity of the instances of faults on the water network that require the supply of water to be isolated
- the requirement within the Operating Licence to respond to and stop the loss of water from any fault within prescribed timeframes.

## 2.2.2 Water continuity: repeat unplanned interruptions (SPS 3)

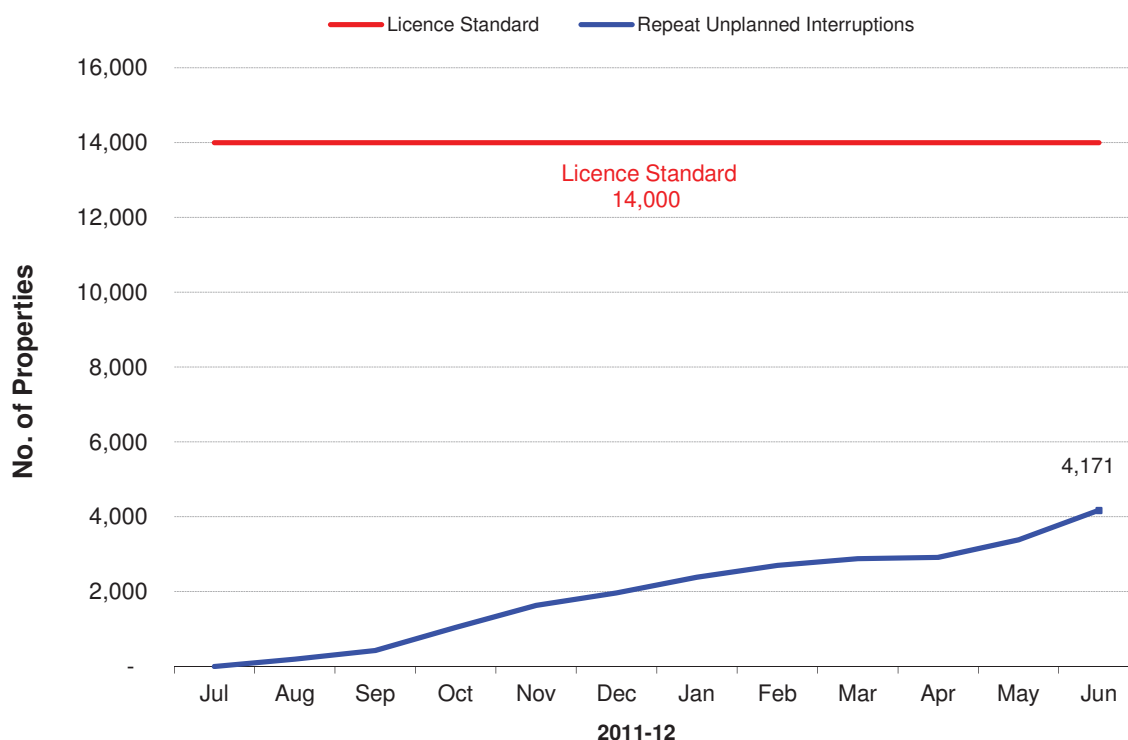
### Operating Licence 3.3.2(a)(2)

*Sydney Water must ensure that:*

*No more than 14,000 properties experience 3 or more Unplanned Water Interruptions of more than 1 hour duration in a financial year.*

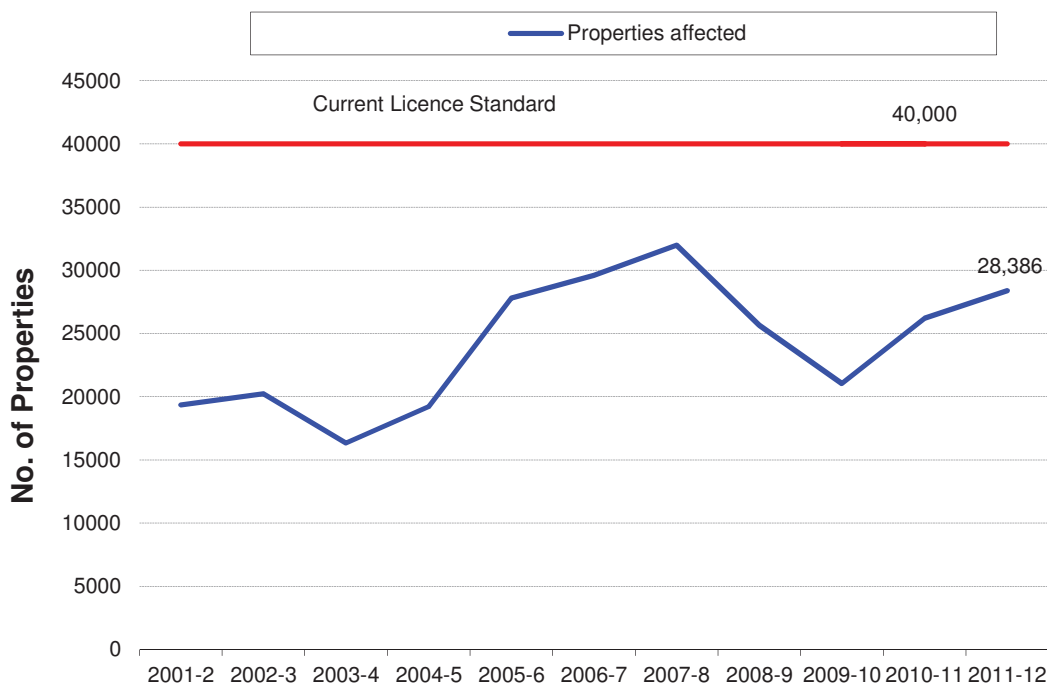
#### Compliance Summary

Compliance achieved



In 2011-12, 4,171 properties experienced three or more unplanned water interruptions of more than one hour. This is a reduction from the 5,305 properties affected in 2010-11.

### 2.2.3 Water continuity: historical performance comparison



Whilst there has been an increase in unplanned interruptions for 2011-12, Sydney Water is still well within the Licence standard.

Work practices have been developed and implemented to minimise both the likelihood of a discontinuity event occurring, and the inconvenience caused to our customers in the event of a discontinuity.

#### Reactive Response (Unplanned Interruptions)

Discontinuity events resulting from a breakdown within the networks are given Sydney Water's highest response priority. Repairs are undertaken after carefully planning the network isolation to minimise the inconvenience to customers. Alternative supply measures are put in place wherever practicable, particularly for customers with a critical need to maintain supply.

#### Planned Interruptions (and Warned)

When it is determined that a shutdown is required for maintenance or adjustments to the networks, customers are notified in advance in accordance with the requirements of the Customer Contract. Work practices are tailored to the particular site conditions in order that the duration of any discontinuity event is kept to a minimum. For customers where the continuation of water supply is critical, all practical measures including the provision of a temporary supply or the undertaking of the task at a more mutually acceptable time, are implemented.

#### Active Leakage Detection

Sydney Water is undertaking intensive investigations of its networks to identify areas of potentially high leakage. In many instances this leakage would progress to become an unplanned discontinuity event if remedial actions were not completed. Repairs can be carried out in a controlled manner greatly reducing the inconvenience to customers. The entire reticulation network has been scanned since the program inception with some supply zones being inspected up to 12 occasions.

### Operational Improvements

As well as our response to network breakdowns and the periodic need to isolate the networks to undertake planned works, Sydney Water conducts investigations to identify areas of potential operational improvements. The operation of key components of the networks is monitored and forms the basis of future improvement strategies.

### Network Monitoring

The network continues to be monitored utilising the Integrated Instrumentation, Control and Telemetry System (IICATS). (IICATS is an on-line remote monitoring, control and reporting (by exception) system). IICATS is used 24hrs a day to monitor the operation of critical components of the networks to optimise system performance and maintain system capability during planned and unplanned network shutdowns.

### Renewals

In order to continue to improve unplanned discontinuity performance, capital programs are underway to replace water mains that are not performing at the required standard.

## 2.3 Sewage Overflow Standard (SPS 4, SPS 5)

Standard #	Standard	Outcome
SPS 4	Number of properties (other than public properties) that experience an uncontrolled sewage overflow in dry weather, as defined in the Operating Licence, in the preceding financial year	7,708
SPS 5	Number of properties (other than public properties) that experience 3 or more uncontrolled sewage overflows in dry weather, as defined in the Operating Licence, in the preceding financial year	43

### Operating Licence 3.3.3

*Sydney Water must ensure that:*

- (a) *no more than 14,000 Properties (other than Public Properties) experience an Uncontrolled Sewage Overflow in dry weather in a financial year; and*
- (b) *no more than 175 Properties (other than Public Properties) experience 3 or more Uncontrolled Sewage Overflows in dry weather in a financial year.*

**Interpretation:** Uncontrolled Sewage Overflow is a Sewage Overflow that is not a Controlled Sewage Overflow and will be taken to have commenced on the earlier of the following:

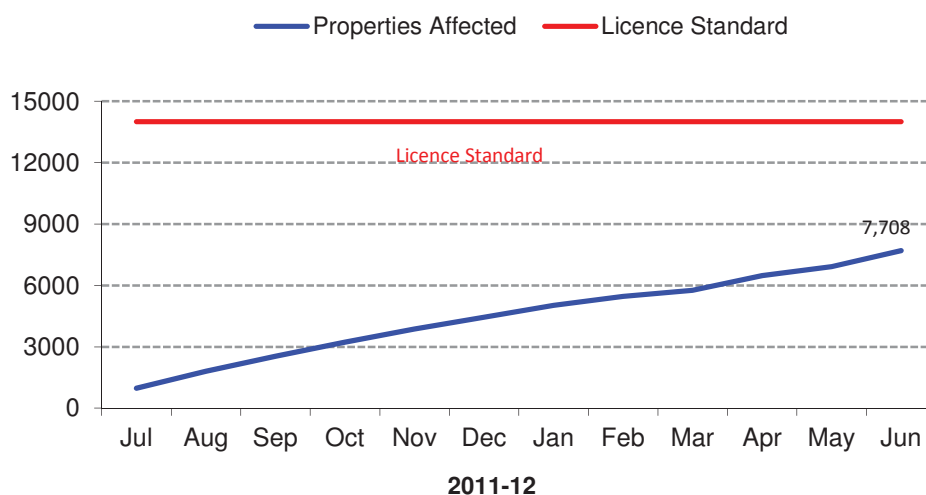
- (a) when a person notifies Sydney Water that a property has experienced a Sewage Overflow which Sydney Water confirms is an Uncontrolled Sewage Overflow; and
- (b) when Sydney Water's systems (which may include modelling undertaken by Sydney Water) identify that a property has experienced an Uncontrolled Sewage Overflow.

Only dry weather uncontrolled sewage overflows are included. Private property means all property privately owned or used for private purposes, including unoccupied private property. Where a private property is affected more than once in a reporting year, the property is counted each time it is affected. Each multiple occupancy property is counted as a single property.

### 2.3.1 Sewage overflows: properties affected (SPS 4)

#### Compliance Summary

Compliance achieved





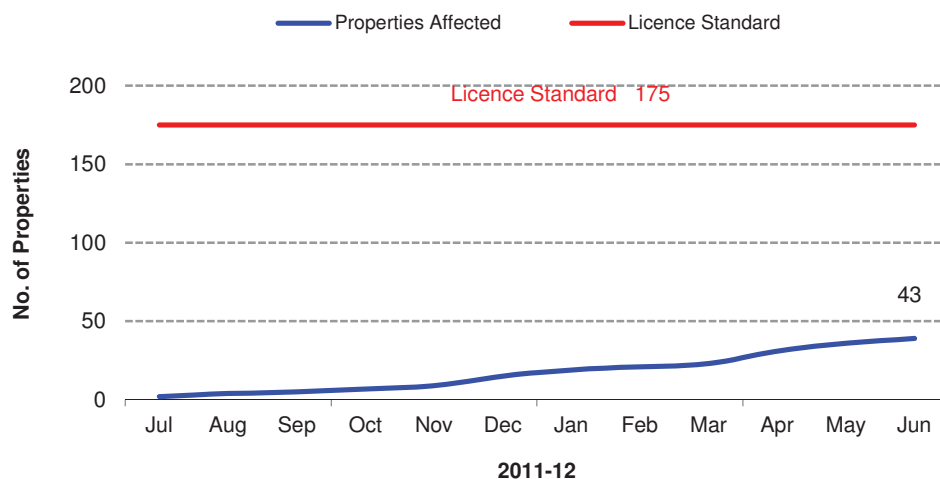
In 2011-12, 7,708 private properties were affected by dry weather uncontrolled sewage overflows compared to 9,158 in 2010-11.

The number of private properties affected by sewage overflows is closely linked to the number of sewer chokes or blockages that occur in the wastewater system. Both of these fault types have been reduced by Sydney Water's current preventative maintenance programs.

### 2.3.2 Sewage overflows: repeat (SPS 5)

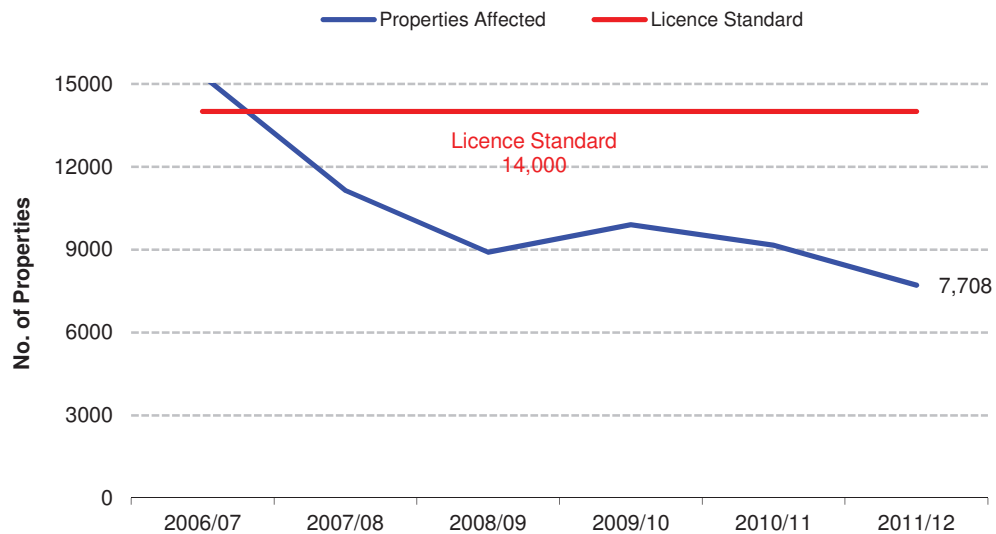
#### Compliance Summary

Compliance achieved



In 2011-12, 43 private properties were affected by three or more dry weather uncontrolled sewage overflows. The slight increase from the 30 properties affected in 2010-11 can be attributed to natural variation. The number of properties affected remains well below the current licence standard.

### 2.3.3 Sewage overflows: historical performance comparison



The above chart compares performance in 2011-12 against prior year's results using the current licence definition for properties affected. The choke management strategy is continuing to ensure a downward long-term system performance trend. The choke management strategy for Sydney Water was revised in 2005 and a consolidated program developed to ensure the required performance was achieved. Key components of the strategy implementation include:

The inspection and repair of sewers that have:

- not blocked but have a high consequence if they do
- blocked three or more times in five years
- discharged to a waterway or inside a home.

#### **Voluntary repair of private sewers**

Tree root intrusion from the approximately 23,000 kilometres of private sewer that connects to the public sewer is the cause of approximately 30 per cent of all sewer chokes. Sydney Water requests property owners to clean or repair their sewers when Sydney Water has identified a private sewer fault while undertaking inspections of the public sewer.

Tree roots cause the majority of blockages and the resultant discharges occur mainly to private property. Because tree roots are a major factor, the number of blockages has a strong seasonal component and variability across years.

### 3 Response time for water main breaks

Standard #	Standard	Outcome
RT 1	Percentage of Priority 6 breaks/leaks in drinking water mains (as defined in the Operating Licence) that Sydney Water attended within 3 hours	92
RT 2	Percentage of Priority 5 breaks/leaks in drinking water mains (as defined in the Operating Licence) that Sydney Water attended within 6 hours	93
RT 3	Percentage of Priority 4 breaks/leaks in drinking water mains (as defined in the Operating Licence) that Sydney Water attended within 5 days.	92

#### Operating Licence 3.5

(a) *Sydney Water's response to water main breaks and leaks (in the trunk and reticulation components of Sydney Water's Drinking Water supply system between water treatment plants and a Property), as measured from the time Sydney Water receives notification of a break or leak to the time Sydney Water stops the loss of water, will be as follows:*

- 1) *Priority 6 breaks/leaks 90% of jobs within 3 hours*
- 2) *Priority 5 breaks/leaks 90% of jobs within 6 hours*
- 3) *Priority 4 breaks/leaks 90% of jobs within 5 days*

**Table 1 Leak categories (Operating Licence Schedule 3)**

Response Level	Nature of leak	Leakage descriptor
<b>Priority 6</b>	A leak that: a) is to result or results in a major loss of water; b) is to cause or causes damage to property; or c) is to pose or poses immediate danger to the environment or people.	A high flow of water causing an immediate danger to people, property or the environment.  An example of a Priority 6 leak is water gushing or spurting from the ground and resulting in a major loss of water.
<b>Priority 5</b>	A leak that: a) is to result or results in the moderate loss of water; b) is to cause or causes service disruption to a customer or customers; c) is to threaten or may threaten damage to property; or d) is to pose or poses a potential risk to the environment or people	A moderate flow of water representing a risk to people, property or the environment.  An example of a Priority 5 leak is a leak which results in a moderate loss of water. A leak classified as a Priority 5 would be running at a rate greater than the full flow of a garden tap.
<b>Priority 4</b>	A leak that: a) is to result or results in a minor loss of water; b) is to cause or causes a limited service disruption to customers (ie, lower pressure than normal or a reported minor leak on a roadway); and c) is not a danger to the environment or people.	A low flow of water that does not represent a risk to people, property or the environment.  An example of a Priority 4 leak is a leak which results in a minor loss of water. A leak classified as a Priority 4 would be running at a rate less than the full flow of a garden tap.

### 3.1 Response times for Priorities 6, 5 and 4 (RT 1, RT 2, RT 3)

#### Compliance Summary

Compliance achieved

**Table 2** Performance against response time targets

Priority	Work Orders 2011-12	Response Times	Target	Compliance 2011-12
6	194	<=3hrs	90%	92%
5	3,396	<=6hrs	90%	93%
4	3,796	<=5 days	90%	92%
Total	7,386			

In 2011-12, compliance was achieved for all response time targets. There was a slight decrease (2 per cent) in meeting Priority 4 response times due to delays in obtaining data from the Dial Before You Dig Program. The issue of delays and the impact on Sydney Water meeting its response time targets, has been flagged with the Program. Due to ongoing preventative maintenance strategies the number of Priority 6 events has reduced since 2010-11.

## 4 Water Conservation

### 4.1 Potable water drawn - expressed on a per capita basis (WC 1)

Standard #	Standard	Outcome
WC 1	The quantity of potable water that Sydney Water has drawn from all sources in the preceding financial year (L/person/day)	286 litres per person per day

#### Operating Licence 7.1

- (a) *Sydney Water must reduce the quantity of Drinking Water it draws from all sources to a level of water usage equal to, or less than, 329 litres per person per day (the Water Usage Level) by 30 June 2011.*
- (b) *Thereafter, Sydney Water must continue to maintain the Water Usage Level for the remainder of the term of the Licence, to be measured at 30 June each year.*
- (c) *In calculating water usage for the purposes of the Water Usage Level, Sydney Water may make reasonable adjustments to account for the effects of weather on water usage using a methodology approved by IPART.*

#### Compliance Summary

Compliance achieved

Total water use in 2011–12 was 286 litres per person per day (481,930 million litres). This is about the same total water use as in 2007–08, when Level 3 drought restrictions and an extensive water efficiency program were in place. Between 2007–08 and 2011–12 there has been about a seven per cent increase in population. Weather conditions in both these years were wetter than average. If the weather conditions in 2011–12 had been average, it is estimated that every person would have used on average about 10 litres more water a day.

Per person demand has trended down since the early 2000s. The first downward trends (between 2002–03 and 2007–08) were primarily due to water restrictions. In addition, savings from water efficiency initiatives, increased rainfall and lower temperatures helped reduce per person water demand even further especially in 2006–07 and 2007–08. An increase in drinking water drawn in 2008–09 resulted from a return to average weather conditions after a relatively wet, cool year in 2007–08. This was followed by an unusually hot and dry summer in 2009–10. Wetter than average weather conditions in 2011–12 has again helped to keep demand low.

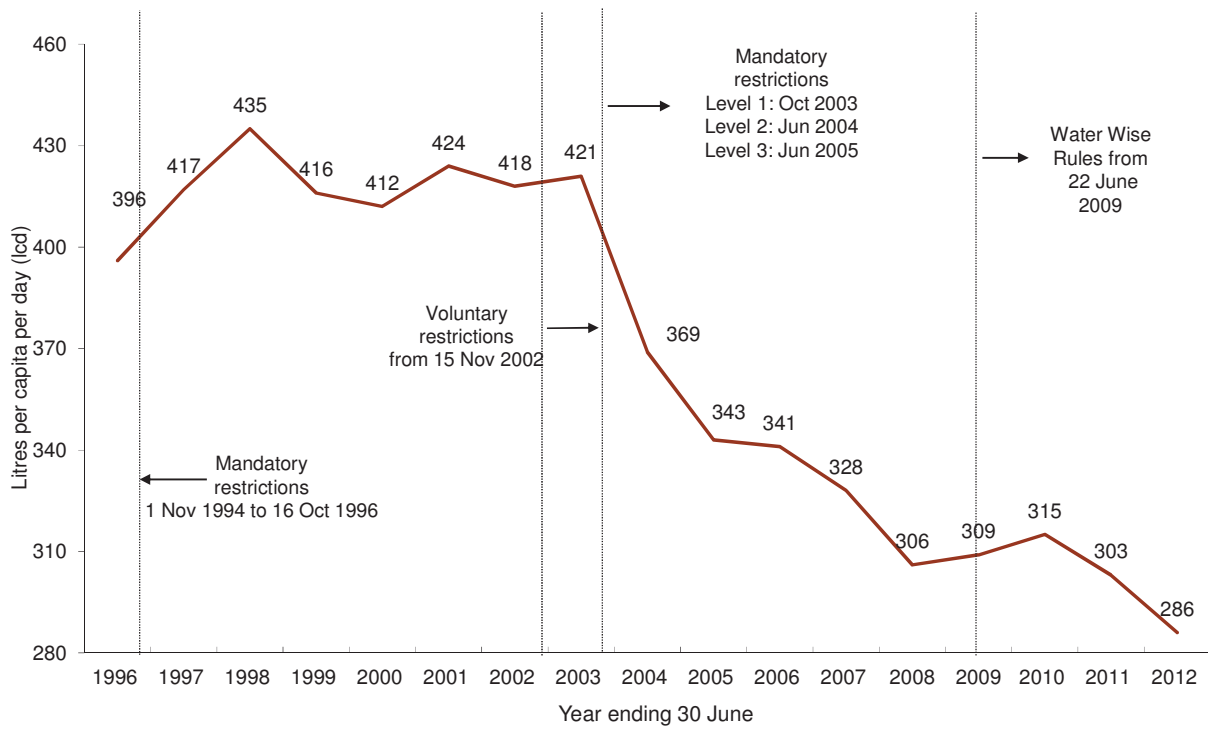
Sydney Water's Operating Licence requires us to reduce the quantity of drinking water that we draw from all sources to a level of water use equal to or less than 329 litres per person a day (LPD) by 30 June 2011, and maintain water use at or below this level for the remainder of the Operating Licence term (weather corrected).

Sydney Water exceeded this target, reducing average water use to 304 LPD by 30 June 2011.

Sydney Water continues to maintain water use at equal to or less than 329 LPD. In 2011–12, water use was 297 LPD (weather corrected). This figure includes water used by the residential sector, businesses, industry and for irrigation and is 11 LPD less than in 2010–11.

It is expected that Sydney Water will maintain drinking water demand (under average weather conditions) to less than 329 LPD to 2015 as required by the Operating Licence.

## Water use per capita per day



## 4.2 Water leakage from the drinking water supply system (WC 2)

Standard #	Standard	Outcome
WC 2	The amount of water leakage from the Drinking Water Supply System, averaged for the preceding financial year (ML per day)	115

### Operating Licence 7.2

- (a) *Sydney Water must ensure that the level of water leakage from its Drinking Water supply system (the Water Leakage Level) does not exceed 105 megalitres per day.*

#### Compliance Summary

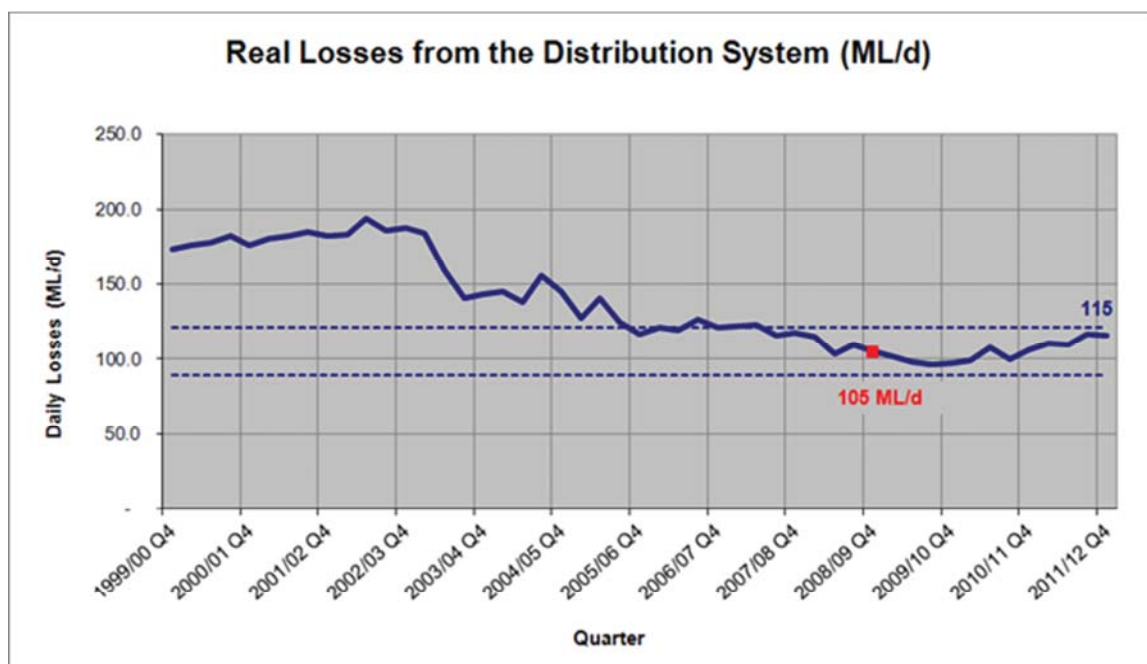
Compliance achieved

The level of leakage is determined quarterly and is based on the water balance method over a rolling 12-month period. Water leakage for the twelve months ending 30 June 2012 was estimated to be 115 ML a day, within the range of  $105 \pm 16$  ML/d required by the Operating Licence.

The 2011–12 leakage figure is higher than previous years. Possible reasons for this increase are:

- natural variation due to the uncertainty range of results
- the effects of pressure reduction take time to be realised in leakage results
- wet weather in 2011-12 meant that some leaks may not have been detected or have been reported later than usual
- a minor increase in unreported or undetected leaks in some areas due to a more targeted active leak detection program.

Sydney Water will continue to closely monitor leakage performance to ensure that it remains within the limits defined within the Operating Licence.



#### 4.1.1 Calculating water leakage

The water balance method is used to estimate the average losses (leakage) from the water distribution systems over the preceding year. Essentially the water balance is a reconciliation of the volume of water produced by Sydney Water's water filtration plants with all known and estimated end uses subtracted, with the remainder deemed to be leakage. Sydney Water follows the methods, definitions and terminology recommended by the International Water Association (IWA). The Water Services Association of Australia (WSAA) also supports this approach.



# Operating Licence 2010-2015 Performance Indicators Report

2011-12

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# Introduction

This report has been prepared for the Independent Pricing and Regulatory Tribunal of NSW (IPART) to meet the requirements of the 2010-2015 Operating Licence and associated Reporting Manual.

Section 2.4 of the Reporting Manual requires Sydney Water to submit to IPART by 1 September each year the majority of its performance indicators as part of the annual compliance and performance report. Performance against environmental indicators is reported separately and must be submitted by 1 October each year.

The majority of indicators have been developed by the National Water Commission (NWC) as part of the 'National Benchmarking Framework for Rural and Urban Water Utilities'. These indicators are notated as 'NWI Indicators'. The remaining indicators are specific to Sydney Water's operations and are notated as 'IPART Indicators'.

Indicator definitions are found in the *NWI Urban Definitions Handbook* (for NWI indicators) and the Operating Licence *Reporting Manual* (for IPART indicators).

Commentary has only been provided for selected indicators where necessary to explain a yes/no response or where there has been a distinct change in trend.

## Table E.1 – NWI Water Resources and Asset Indicators

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>NWI Water Resources Indicators</b>						
<b>Sources of Water – Volume of water sourced</b>						
NWI W1	- Surface Water (ML)	5,486	5,885	6,065	5,589	5,141
NWI W2	- Groundwater (ML)	N/A	N/A	N/A	N/A	N/A
NWI W3	- Desalination (ML)	0	0	19,952	77,102	61,290
NWI W3.1*	- Volume of water sourced from desalination of marine water (ML)				77,102	61,290
NWI W3.2*	- Volume of water sourced from desalination of groundwater				N/A	N/A
NWI W3.3*	- Volume of water sourced from desalination of surface water such as dams, rivers or irrigation channels (ML)				N/A	N/A
NWI W4	- Recycling (ML)	10,101	8,264	10,253	10,606	13,191
NWI W5	- Bulk Supplier (ML)	475,156	491,727	479,633	414,004	415,498
NWI W5.1*	- Volume of potable water received from bulk supplier (ML)				N/A	N/A
NWI W5.2*	- Volume of non-potable water received from bulk supplier (ML)				414,004	415,498
NWI W6	- Volume of bulk recycled water purchased (ML)	N/A	N/A	N/A	N/A	N/A
NWI W7	Total volume of water sourced (ML)	490,743	505,876	515,903	507,301	495,120

Notes: \* New indicator reported from 1 July 2011.

### NWI W3 Volume of desalinated water sourced

Sydney Water recognised the need to lower production of desalinated water in December 2011 after dam storage levels in Sydney reached 80 per cent. A decision was made to wind back production at the desalination plant from 250ML/per day to 90ML/per day, apart from a period in which final proving trials were conducted.

The NSW Government's 2010 Metropolitan Water Plan outlines the operating rules for the Desalination Plant. It states that if dam levels reach 80 per cent after the two year proving period (1 July 2012), the desalination plant will be turned off and switched on again if the levels fall below 70 per cent.

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Volume of water supplied (uses of supplied water)</b>						
NWI W8	- Residential (ML)	292,782	320,861	334,488	325,769	321,656
NWI W8.1*	- Volume of potable water supplied - residential				324,003	319,783
NWI W8.2*	- Volume of non-potable water supplied - residential (ML)				0	0
NWI W9	- Commercial, municipal and industrial (ML)	136,064	126,712	130,640	126,036	122,671
NWI W9.1*	- Volume of potable water supplied - commercial, municipal and industrial (ML)				113,759	110,479
NWI W9.2*	- Volume of non-potable water supplied - commercial, municipal and industrial (ML)				4,579	2,509
NWI W10	- Other (ML)	52,855	44,395	40,522	92,411	83,531

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
NWI W10.1*	- Volume of potable water supplied - other (ML)				N/A	N/A
NWI W10.2*	- Volume of non-potable water supplied - other (ML)				N/A	N/A
NWI W10.3*	- Volume of water supplied - managed aquifer recharge (ML)				N/A	N/A
NWI W10.4*	- Volume of water supplied - agricultural irrigation (ML)				N/A	N/A
NWI W11	Total urban water supplied (ML)	481,701	491,968	505,650	544,216	527,858
NWI W11.1*	Total urban potable water supplied (ML)				437,762	430,262
NWI W11.2*	Total urban non-potable water supplied (ML)				4,579	2,509
NWI W11.3*	Total volume of potable water produced (ML)				492,167	480,773
NWI W12	Average annual residential water supplied (kL/property)	182	197.7	204.58	197	192.96
NWI W13	- Environmental flows (ML)	0	0	0	0	0
NWI W14	- Bulk water exports (ML)	0	0	0	0	0
NWI W14.1*	- Volume of potable bulk water exports (ML)				N/A	N/A
NWI W14.2*	- Volume of non-potable bulk water exports (ML)				N/A	N/A
NWI W15	- Bulk recycled water exports (ML)	0	0	0	0	0

Notes: \* New indicator reported from 1 July 2011.

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Sewage collected</b>						
NWI W16	Volume of sewage collected – residential sewage, non-residential sewage and non-trade waste (ML)	520,845	451,075	440,251	485,268	563,484
NWI W17	Volume of sewage collected – Trade waste (ML)	25,536	24,617	23,986	24,167	24,613
NWI W18	Total sewage collected (ML)	546,381	475,692	464,237	509,435	588,097#
NWI W18.1*	Volume of sewage supplied to other infrastructure operators (ML)				908	803
NWI W18.2*	Volume of sewage taken from other infrastructure operators (ML)				0	0
NWI W18.3*	Volume of sewage taken from sewer mining (ML)				0	0
NWI W18.4*	Volume of sewage measured at inlet to treatment works (ML)				508,527	561,000
NWI W18.5*	Volume of sewage treated effluent (ML)				472,129	576,520
NWI W19	Sewage collected per property (kL per property)	324	279	269	292^	334#

Notes: \* New indicator reported from 1 July 2011. ^This figure was amended following publication of the 2010-11 report and has been updated for accuracy. #The figure includes network overflows, total collected at waste water treatment plants and recycled water produced at Camellia Water Recycling Plant.

### NWI W18 Total sewage collected

The increase in the volume of sewage collected in 2011-12 was due to the higher than normal wet weather conditions.

### NWI W18.5 Volume of sewage treated effluent

The volume of sewage treated effluent has increased from 472,129 ML in 2010-11 to 576,520 ML in 2011-12. This is due to higher than normal wet weather conditions.

In 2011-12 the amount of treated effluent (W18.5) reported is higher than the amount of effluent measured at inlet (W18.4) due to recycling of effluent onsite.

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Uses of recycled water</b>						
NWI W20	- Residential (ML)	1,402	1,704	2,209	2,250	1,873
NWI W21	- Commercial, municipal and industrial (ML)	7,212	5,155	7,537	7,687	9,683
NWI W22	- Agricultural (ML)	632	3,034	5,643	5,199	5,187
NWI W23	- Environmental (ML)	0	0	1,980	15,989	13,362
NWI W24	- On-site (ML)	14,917	15,549	16,314	16,396	15,823
NWI W25	- Other ML)	0	0	0	0	0
NWI W25.1*	Volume of recycled water supplied - managed aquifer recharge (ML)				N/A	N/A
NWI W26	Total of recycled water supplied (ML)	24,163	25,442	33,683	47,521	45,929
NWI W27	Recycled water (per cent of effluent recycled)	4	5.3	7.26	10	7.97
NWI W28*	Total volume of urban stormwater discharges from a stormwater discharge point (ML)				N/A	N/A
NWI W28.1*	Volume of urban stormwater supplied to other infrastructure operators (ML)				N/A	N/A
NWI W28.2*	Volume of urban stormwater received from other infrastructure operators (ML)				N/A	N/A
NWI W28.3*	Volume of urban stormwater supplied for managed aquifer recharge (ML)				N/A	N/A
NWI W28.4*	Volume of urban stormwater used (ML)				N/A	N/A
NWI W29*	Total volume of treated and untreated sewage discharges from a sewage discharge point (ML)				472,112	548,619

Notes: \* New indicator reported from 1 July 2011.

### NWI W20 Residential recycled water use

In 2011-12 the recycled water demand by residential customers has reduced possibly due to the higher than normal wet weather conditions.

### NWI W21 Commercial, municipal and industrial recycled water use

In 2011-12 the volume of recycled water supplied to commercial, municipal and industrial areas increased due to the commencement of Camellia Water Recycling Scheme.

### NWI W26 Amount of recycled water supplied

In 2011-12 the total recycled water supplied has reduced due to less demand for residential and onsite reuse.

### NWI W27 Per cent of effluent recycled

The recycled water (per cent of effluent recycled) has reduced due the increase in inflow to treatment plants plant and the reduced recycled water usage. Both changes were due to the increased wet weather conditions in 2011-12.

### NWI W29 Volume of sewage discharges

The increase in the volume of sewage discharges was due to the higher than normal wet weather conditions. The reported figure includes the recycled water releases from the Advanced Water Treatment Plant at St Marys.

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>NWI Asset Indicators</b>						
<b>Water and Sewerage Assets</b>						
NWI A1	Number of Water Treatment Plants providing full treatment	9	9	10	10	10
NWI A2	Length of water mains (km)	20,896	20,936	21,015	21,069	21,680*
NWI A3	Properties served per km of water main	83	84	84	85	84
NWI A4	Number of sewage treatment plants	31	29	29	29	25
NWI A5	Length of sewage mains and channels (km)	23,708	23,817	24,022	24,193	24,768**
NWI A6	Properties served per km of sewer main	71	72	72	72	71
NWI A7	Number of recycled water treatment plants	2	2	2	6	5

Notes: \* Due to a change in the interpretation of NWI requirements the 2011-12 figure includes recycled water mains (539 km) \*\* Due to a change in the interpretation of NWI requirements the 2011-12 figure includes stormwater channels (442 km)

### NWI A4 and NWI A7 Sewage and recycled water treatment plants

The number of Recycled Water Treatment Plants reported in 2011-12 has changed from the previous year. This is due to the change in the predominant use of recycled water at one of the dual purpose plants (sewage treatment and recycled water treatment).

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Water and Sewer breaks and leakage</b>						
NWI A8	Number of water main breaks (per 100km water main)	30	34	28	28	22
NWI A9	Infrastructure leakage index (ILI)	1.5	1.4	1.3	1.3	1.5
NWI A10	Real losses (L/service connection/d)	91	81	73	79	85
NWI A11	Real losses (kL/km water main/d)	5.6	5.0	4.6	5.0	5.5
NWI A14 <sup>#</sup>	Sewerage mains breaks and chokes (No, per 100 km sewer main)	64	51	56	57	48
NWI A15 <sup>*</sup>	Property connection sewer breaks and chokes (No, per 1000 properties)	0.12	0.08	0.13	0.15	0.12

Notes: # The Reporting Manual incorrectly shows this indicator as NWI A 12

♦ The Reporting Manual incorrectly shows this indicator as NWI A 13 with an incorrect parameter of 'Number per 100 km of sewer main').

### NWI A 10 Real losses

Although the leakage figure is higher than the previous three years, it remains within the Economic Level of Leakage limits. Sydney Water continues to closely monitor the effectiveness of its leakage reduction programs and to make the necessary adjustments to ensure leakage is efficiently managed.

## Table E.2 - IPART Service Quality and System Performance Indicators

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Sewer Overflows, Stormwater and Water Quality</b>						
IPART A1.1	Number of sewage overflow events affecting public properties occurring in dry weather	5,958	4,536	5,474	6,169	5,855
IPART A1.2	Number of sewage overflow events affecting other than public properties occurring in dry weather	9,253	7,627	8,249	7,629	6,271
IPART A2.1	Number of sewage overflow events affecting public properties occurring in wet weather	227	44	154	139	479
IPART A2.2	Number of sewage overflow events affecting other than public properties occurring in wet weather	105	29	74	46	216
IPART A3.1	Number of Priority 6 sewage overflow events where response time was less than one hour	3,812	3,331	3,954	3,624	2,431
IPART A3.2	Number of Priority 6 sewage overflow events where response time was more than one hour	1,419	794	760	993	518
IPART A4.1	Number of Priority 5 sewage overflow events where response time was less than three hours	17,098	14,193	15,746	15,410	9,467
IPART A4.2	Number of Priority 5 sewage overflow events where response time was more than three hours	3,861	1,358	1,341	1,642	1,418
IPART A5*	Length of stormwater drains and channels maintained (km)				447	442
IPART H1*	Number of drinking water quality incidents for which Sydney Water was required to notify NSW Health.				25	55

Notes: \* New indicator reported from 1 July 2010.

### IPART A1.1 and IPART A1.2 Sewage Overflow events – dry weather

The choke management strategy is continuing to ensure a downward system performance trend. The choke management strategy for Sydney Water was revised in 2005 and a consolidated program developed to ensure the required performance was achieved. Key components of the strategy implementation include:

The inspection and repair of sewers that have:

- not blocked but have a high consequence if they do
- blocked three or more times in five years
- discharged to a waterway or inside a home.

### IPART A2.1, IPART A2.2 Sewage Overflow events – wet weather

These indicators have both increased in 2011-12 due to higher than normal wet weather conditions.

### NWI H1 Drinking water quality incidents

The number of water quality incidents that require notification to NSW Health increased from 25 in 2010-11 to 55 in 2011-12. This was a result of the increase in wet weather events which affected the treatment processes and the changes to the turbidity targets in the new ADWG 2011 guidelines.



Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Service Interruption</b>						
IPART C1*	The total number of properties affected by Planned Interruptions				89,560	79,972
IPART C2.1	The number of properties affected by unplanned Interruption duration less than or equal to 1 hour.	117,959	101,348	103,773	102,729	83,635
IPART C2.2	The number of properties affected by unplanned Interruption duration more than 1 hour and less than or equal to 5 hours.	234,091	223,313	210,497	185,204	154,660
IPART C3	The number of Properties which experience 2 Unplanned Water Interruptions	47,506	43,562	42,683	39,695	33,708
IPART C4	Average time taken to respond to water main breaks (minutes)	390	390	309	324	325
IPART C5* <sup>◇</sup>	Average frequency of unplanned interruption – sewerage	0.005	0.004	0.005	0.005	0.004
IPART C6.1	The number of Properties experiencing a water pressure failure which is: occasional or recurrent, but not permanent	322	1,070	14	805	543
IPART C6.2	The number of Properties experiencing a water pressure failure which is: permanent	23	23	22	27	29
IPART C7.1	The number of Properties experiencing more than one water pressure failure	98	39	22	593	171
IPART C7.2	The number of Properties experiencing more than one water pressure failure as % of all properties supplied with water.	0.01	<0.01	<0.01	0.05	0.01
IPART C8*	Average number of private properties experiencing sewage overflow				0.005	0.004
IPART C9*	Number of private properties experiencing 2 sewer overflows in dry weather in the year				438	376

Notes: \* New indicator reported from 1 July 2010.

◇ There is a discrepancy in the Reporting Manual for indicator IPART C5. The definitions table details IPART C5 as 'The average number of private properties experiencing an uncontrolled sewage overflow in dry weather', however this description relates to IPART C8.

## Table E.3 - NWI Customer Indicators

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Connected properties and population</b>						
NWI C1	Population receiving water supply services (000s)	4,322	4,344	4,435	4,581	4,626
NWI C2	Connected residential properties - water supply (000s)	1,608	1,623	1,635	1,651	1,667
NWI C3	Connected non-residential properties - water supply (000s)	129	132	137	142	145
NWI C4	Total connected properties - water supply (000s)	1,737	1,755	1,772	1,793	1,812
NWI C5	Population receiving sewerage services (000s)	4,195	4,240	4,333	4,477	4,491
NWI C6	Connected residential properties - sewerage (000s)	1,570	1,586	1,598	1,615	1,631
NWI C7	Connected non-residential properties - sewerage (000s)	118	121	126	130	132
NWI C8	Total connected properties - sewerage (000s)	1,688	1,707	1,724	1,745	1,763

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Complaints</b>						
NWI C9	Water quality complaints (per 1000 properties)	0.9	0.6	0.7	0.6	0.5
NWI C10	Water service complaints (per 1000 properties)	0.5	0.4	0.3	0.3	0.2
NWI C11♦	Sewerage service complaints (per 1000 properties)	0.5	0.38	0.41	0.4	0.5
NWI C12	Billing and account complaints – water and sewerage (per 1000 properties)	5.30	4.18	2.24	1.8	2.0
NWI C13♦	Total water and sewerage complaints (per 1000 properties)	7.7	6.02	4.06	3.4	3.5
NWI C14	Per cent of calls answered by an operator within 30 seconds (%)	88.50	84.70	88.90	79.3	86.2

Notes: ♦ All contacts regarding odours are now included as sewerage service complaints as per the NWI definition. For comparative purposes, results reported from 2007-08 to 2010-11 have been adjusted using the same definition.

### NWI C9 Water quality complaints

There were 839 water quality complaints in 2011-12, a 23 per cent reduction from 2010-11.

Sydney Water has implemented several initiatives over the past few years that have assisted in the reduction of water quality complaints.

These include:

- The introduction of the 'dirty water alert system'. There were several small events throughout the year which triggered the dirty water alert system. Although the events were caused by operational issues such as rezoning of the supply and broken mains, the 'alert system' worked effectively to quickly identify the problem. This allowed maintenance crews to react swiftly and contain the number of complaints.
- Targeted planning and monitoring of projects. Several projects were undertaken throughout the year including the commissioning of the Prospect buffering plant and the Warragamba pipeline outage work. Part of this work required pumping of water from Prospect Lake, potentially increasing taste and odour complaints. Planning, monitoring and ensuring that existing protocols were followed led to minimal increases in complaint numbers.

During 2012-13, dirty water complaints will be captured with additional detail to help Sydney Water identify the root cause of the complaints. Work practices and processes will then be reviewed to further minimise complaints.

### **NWI C10 Water service complaints**

There were 314 water service complaints in 2011-12, 32 per cent lower than last year.

Failing assets that have caused repeat water continuity complaints are investigated for possible inclusion in the water main renewals program. Water pressure complaints are largely resolved through operational activities that improve system performance. Other water complaints relate to water interruptions where notice was not given to customers or general water asset issues.

The following key strategies have been deployed to address systemic water continuity issues, thereby lessening the impact on customers:

- The water main renewals program optimises the performance of water assets resulting in a reduction of water main breaks.
- The active leakage detection program, where over 12,000 kilometres of pipes were inspected during the year for hidden water leaks. This minimises minor asset failures and potentially reduces major failures.
- An ongoing program to ensure valves operate effectively. This program will minimise the number of customers impacted by water main breaks.
- The water pressure reduction program that has led to fewer failures within the pressure reduced areas.

### **NWI C11 Sewerage service complaints**

There were 815 sewerage service complaints in 2011-12, a 5 per cent increase from last year. Of these, 330 were odour complaints attributed to the wastewater system, compared to 327 in 2010-11.

A dry weather choke management strategy continued during 2011-12. Key components of the choke management strategy are the:

- waterways program to optimise the performance of wastewater assets resulting in a reduction of wastewater overflows to waterways
- repeat overflow program to reduce the impact on customers of repeat wastewater overflow events
- internal overflow program to reduce the impact on customers of wastewater overflows inside their homes.

The 2011-12 maintenance and renewal program was delivered, covering the inspection, cleaning, repairing and relining of damaged pipes.

Odour complaints from wastewater treatment plants (WWTPs) and water recycling plants (WRPs) have decreased by around 20 per cent over the last three years. This can be attributed to an odour management strategy that Sydney Water developed in 2008 to target and manage odour issues at high-risk plants. The strategy is still in place and in late 2010, Sydney Water formed an 'Odour Alliance' to carry out a program of odour mitigation works for high-risk plants. As part of the odour management strategy, mitigation works have now been completed at the North Head WWTP, Warriewood WWTP, Wollongong WRP and the Bondi WWTP. Further work is underway at Cronulla and Malabar WWTPs.

Sydney Water continued its corrosion and odour strategy for the wastewater distribution system by installing additional chemical dosing and odour control units at key locations on pipelines and at major wastewater pumping stations. In addition, odour and corrosion management plans are being developed for each of the 24 wastewater systems, which will provide effective strategies for both the treatment plants and the network.

Sydney Water continues to undertake significant research and development to reduce odours and is working with the Australian Research Council, which includes other Australian water authorities and universities on a five-year project investigating how to better manage corrosion and odour issues in wastewater systems.

#### **NWI C12 Billing and account complaints – water and sewerage**

There were 3,701 billing and account complaints in 2011-12, a 14 per cent increase from 2010-11.

Around 80 per cent of account related complaints are due to meter reading errors. The increase in the number of these instances is more a reflection of improved recording of these occurrences rather than a reflection on the meter reading performance. The number of account adjustments due to incorrect reads represents less than 0.06 per cent of the 5.2 million reads made each year.

A renewed meter reading contract contains more robust performance criteria including penalties and incentives. The contractor has appointed three quality assurance officers to monitor and train staff. Sydney Water has appointed a new contracts manager to focus specifically on the effectiveness of the contractor.

#### **NWI C13 Total water and sewerage complaints**

There were 6,272 water and sewerage complaints in 2011-12, a 2 per cent decrease from 2010-11.

The results of our annual customer relationship study for 2012 shows that customer ratings of our water services have improved steadily over the last few years. Customers are highly satisfied with the reliability of the water supply, rating this aspect 8.8 out of 10 (the same as 2010-11) and the quality of drinking water is rated 8.4 compared to 8.2 last year.

Similarly, satisfaction with the provision of an efficient and effective wastewater system has shown a significant rating improvement of 8.0, up from 7.7 in 2010-11. Satisfaction with Sydney Water's overall service delivery is steady at 7.5.

The number of customers rating Sydney Water 0-4 on a 0-10 scale has decreased over the last year.

#### **NWI C14 Per cent of calls answered by an operator within 30 seconds**

Of the total 752,026 calls received by Sydney Water during 2011-12, 86.15 per cent were answered within 30 seconds. Customers experienced a good standard of service with the average speed of answer being 17 seconds.

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Service Interruption</b>						
NWI C15	Average duration of unplanned interruption - water (minutes)	166.80	140.60	140.20	147.31	154.78
NWI C16	Average sewerage interruption (minutes)	246.00	240.00	238.00	239.74	261.23
NWI C17	Average frequency of unplanned interruption - water	221.09	199.61	189.23	175.28	147.20
NWI C18	Number of restrictions applied for non-payment of water bill (per 1000 properties)	2.00	2.4	2.9	3.4	3.3
NWI C19	Number of legal actions applied for non-payment of water bill (per 1000 properties)	0.0	0.0	0.0	0.5	0.4

#### **NWI C18 Number of restrictions applied for non-payment of water bill**

The number of restrictions has decreased by 4 per cent from last year. Restrictions are imposed when customers fail to pay their bill despite receiving reminder notices or fail to meet their agreed

payment arrangements. The reminder notice informs customers to contact Sydney Water if they are experiencing financial difficulties so alternative payment arrangements can be made.

In the past year Sydney Water continued to restrict non-paying customers in order to facilitate a resolution and stop a growing debt.

Legal action has been taken where customers have had two or more occasions of their water supply being restricted and do not qualify for financial assistance.

**NWI C19 Number of legal actions applied for non-payment of water bill**

Sydney Water has a legal contract to address the increasing number of customers who ignore requests for payment and fail to make contact with Sydney Water. There were 777 legal actions taken during 2011-12, resulting in 62 per cent of the outstanding debt being recovered.

## Table E.4 – IPART Customer Service Indicators

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Complaints and Rebates</b>						
IPART C10♦	Total number of customer complaints (all categories)	15,318	12,498	8,986	7,398	7,527
IPART C11.1	Number of pressure complaints	69	117	89	61	49
IPART C11.2	Number per 1000 properties of pressure complaints	0.04	0.07	0.05	0.03	0.03
IPART C12.1	Total number of complaints received by Sydney Water relating to stormwater and drainage services.	22	16	23	19	65
IPART C12.2	Number per 1000 properties of complaints received by Sydney Water relating to stormwater and drainage services.	0.05	0.03	0.05	0.04	0.12
IPART C13♦	Number per 1000 properties of sewage odour complaints.	0.20	0.14	0.13	0.19	0.19
IPART C14	Number per 1000 properties of noise complaints generated from Sydney Water's construction or operational activities.	0.06	0.20	0.12	0.05	0.04
IPART C15.1	The percentage of complaints received by Sydney Water that are resolved within 2 business days	20.45	22.04	30.02	26.7	19.9
IPART C15.2	The percentage of complaints received by Sydney Water that are resolved within 10 business days	89.86	91.02	86.29	85.6	86.3
IPART C16.1	The number of rebates paid pursuant to a Customer Contract in the categories in clause 7.2 of the Customer Contract.	294,598	271,220	258,437	73,865	91,527
IPART C16.2	The value of rebates paid pursuant to a Customer Contract in the categories in clause 7.2 of the Customer Contract. (\$)	4,372,026	5,123,259	4,710,595	3,441,105	5,041,489
IPART C17*	Total number of complaints relating to recycled water				4	1

Notes: \* New indicator reported from 1 July 2010. ♦ All contacts regarding odours are now included as sewerage service complaints as per the NWI definition. For comparative purposes, results reported from 2007-08 to 2010-11 have been adjusted using the same definition.

### IPART C10 Total number of customer complaints (all categories)

In addition to the complaints included in 'NWI C13 - Total water and sewerage complaints' there were another 553 complaints received regarding categories such as stormwater, noise and restoration.

The Energy and Water Ombudsman of NSW (EWON) received a further 702 complaints about Sydney Water during 2011-12. This compares with the 593 complaints received by EWON in 2010-11.

### IPART C12.1 Total stormwater and drainage complaints

There were 65 stormwater complaints in 2011-12 a significant increase from 2010-11.

During 2011-12 the Sydney region experienced above average rainfall, hampering the ability of our mowing contractors to access Sydney Water's trunk drainage land in Rouse Hill. This led to an increase in customer complaints regarding long grass and maintenance.

In the short term, we will increase the mowing frequencies in high contact areas. The option of partnering with local councils to integrate mowing schedules will be explored as will a review of available equipment and methods to access water logged areas.

#### **IPART C16.1 - C16.2 The number and value of rebates paid pursuant to a Customer Contract**

Rebate changes were made to the Customer Contract for 2010-15 and now align more closely to the system performance standards. There is more emphasis on repeat disruptions and the rebate value is a better reflection of the inconvenience caused to customers.

The average rebate in 2011-12 was \$55.08 compared to \$46.59 in 2010-11.

As repeat disruptions accumulate over a twelve-month period and the associated rebates are paid over a twelve-month period, the full impact of the rebate changes were not realised until the end of June 2012. As a consequence, the number and value of rebates rose in 2011-12 compared to 2010-11. The number and value of rebates are expected to stabilise over the next year.

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Metering</b>						
IPART C18.1	Percentage of metered accounts of Customers that receive a bill not based on an actual meter read during the year	0.5	0.5	0.6	0.6	0.6
IPART C18.2	Percentage of metered accounts of Customers that receive a bill not based on a business meter read for two consecutive years	0.3	0.4	0.4	0.4	0.4

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
<b>Financial Hardship Assistance, Restrictions and Disconnections</b>						
IPART C19.1	Total number of requests for instalment or deferred payment plans.	111,138	139,312	158,804	158,812	156,502
IPART C19.2	Number per 1000 properties of requests for instalment or deferred payment plans.	64.00	79.39	89.60	88.6	86.4
IPART C19.3	The total number of residential customers with continuing instalment or deferred plans with durations greater than 3 months.				376	528
IPART C19.4	The total number of non-residential customers with continuing instalment or deferred plans with durations greater than 3 months.				18	31
IPART C20.1 <sup>Δ</sup>	Number of payment assistance vouchers utilised.	15,173	17,551	24,258	27,700	See note below
IPART C20.2 <sup>Δ</sup>	Value of payment assistance vouchers utilised. (\$)	379,343	438,777	596,710	692,487	See note below
IPART C21.1	The total number of residential customers disconnected for non payment of amounts owed to Sydney Water.	0	0	0	0	0



Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
IPART C21.2	The total number of non-residential customers disconnected for non payment of amounts owed to Sydney Water.	0	0	2	0	0
IPART C22.1*	Average number of days for which water flow restrictions are applied to customers where restrictions have been removed				53	33.9
IPART C22.2*	Average number of days for which water flow restrictions are applied to customers where restrictions are still in place				385	504
IPART C23.1	Total number of residential customers on whom water flow restrictions have been imposed	3,493	3,881	4,720	5,792	5,241
IPART C23.2	Total number of non-residential customers on whom water flow restrictions have been imposed	216	286	363	284	262

Notes: \* New indicator reported from 1 July 2010.

Δ Indicator cannot be reported. Whilst Sydney Water continues to provide assistance to customers under its hardship program, a 'voucher' system is no longer used.

### **IPART C19.3 Total number of residential customers with continuing instalment or deferred plans with durations greater than 3 months**

The number of payment arrangements in place for extended periods is influenced by the promotion of regular payment arrangements for customers having payment difficulties. This includes customers paying regularly through 'Centrepay'. Centrepay allows customers who are receiving income support from Centrelink to pay bills via regular deductions from their Centrelink payment. Customers can register for Centrepay over the phone when they call Sydney Water.

In November 2011, a specialised customer assistance (hardship) program called 'BillAssist' commenced. Qualified community service case coordinators provide tailored assistance to customers experiencing hardship. BillAssist also provides proactive assistance to customers by identifying and contacting customers experiencing hardship who had sudden large bill increases and/or high water use.

A plumbing service for residential customers in hardship called 'PlumbAssist' commenced in 2011. It helps customers in hardship by making emergency or essential plumbing repairs. PlumbAssist completed 174 jobs to the value of \$151,587 during 2011-12.

An outreach and education program commenced in 2012 with regular briefings conducted to community welfare and service agencies. A customer outreach program will also commence later in 2012.

Sydney Water provides a multilingual brochure in English and seven other community languages on assistance options for customers having payment difficulties.

### **IPART C20.1 - C20.2 Number and value of payment assistance vouchers utilised**

Sydney Water provides support to residential customers who are willing, but unable to pay their water bills due to a financial crisis or other difficulties.

Our Payment Assistance Scheme (PAS) was reviewed and enhanced in 2012. Following a hardship assessment by a community agency or BillAssist staff, a PAS credit can now be made directly to the customer's account. The system of providing credits commenced in December 2012. Vouchers are no longer used.

During 2011-12, \$720,748 was provided on 4,415 occasions to 3,184 distinct households under the PAS.



We currently have more than 200 PAS providers. This includes 16 agencies targeting culturally and linguistically diverse communities and Aboriginal and Torres Strait Islanders. Quarterly training is held for new agencies and assessors.

**IPART C22.1 The average number of days for which water flow restrictions are applied to customers where restrictions have been removed**

The average number of days water supply restrictions were in place is high due to some long-term debt and continued data purification corrections to properties that had been reconnected for some time but had not been updated in our system.

During 2011-12 there were 5,258 restrictions that were restored with an average restriction period of 34 days. Of these, 4,443 were restored within 2 days

**IPART C22.2 The average number of days for which water flow restrictions are applied to customers where restrictions are still in place**

The high number of vacant, derelict or abandoned properties influences the average number of days. There were 465 properties where restrictions were in place for longer than 12 months at the end of June 2012. A sample of these properties were inspected and most were vacant, derelict or abandoned.

**IPART C23.1 Total number of residential customers on whom water flow restrictions have been imposed**

The number of restrictions has decreased by 4 per cent from last year. Restrictions are imposed when customers fail to pay their bill despite receiving reminder notices or fail to meet their agreed payment arrangements. The reminder notice informs customers to contact Sydney Water if they are experiencing financial difficulties so alternative payment arrangements can be made.

In the past year Sydney Water continued to restrict non-paying customers in order to facilitate a resolution and stop a growing debt.

Legal action has been taken where customers have had two or more occasions of their water supply being restricted and do not qualify for financial assistance.

## Table E.7 - NWI Pricing Indicators

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
NWI P1	Water Tariff Structure (description)	N/A	N/A	N/A	N/A	N/A
NWI P1.1	Free Water Allowance (kL/property)	N/A	N/A	N/A	N/A	N/A
NWI P1.2	Fixed Water Charge (\$/property)	56.71	75.7	101.54	125.23	144.79
NWI P1.3	Usage Water Charge (\$/kL)	1.34	1.61	1.87	2.01	2.10
NWI P1.4	Usage Water Charge (\$/kL)	1.83	1.83	1.87	2.01	2.10
NWI P1.12	Special Water Levies (\$)	N/A	N/A	N/A	N/A	N/A
NWI P1.13	Income from Special Water Levies Retained by Utility? (Yes/No)	No	No	No	No	No
NWI P2	Annual water bill based on 200kL/a	324.51	397.70	475.54	527.63	565.39
NWI P2.1	Average Annual Residential Water Supplied	186	198	205	197	193
NWI P3	Typical Residential Water Bill	305.76	394.48	484.10	522.23	550.57
NWI P3.1	Number of Water Meter Readings per annum	4	4	4	4	4
NWI P3.2	Number of Water Bills per annum	4	4	4	4	4
NWI P4	Sewerage Tariff Structure	N/A	N/A	N/A	N/A	N/A
NWI P4.1	Sewerage Fixed Charge	407.81	480.31	501.10	517.19	539.53
NWI P4.2	Sewerage Usage Charge	N/A	N/A	N/A	N/A	N/A
NWI P4.3	Special Sewerage Levies (\$)	N/A	N/A	N/A	N/A	N/A
NWI P4.4	Income from Special Sewerage Levies Retained by Utility? (Yes/No)	No	No	No	No	No
NWI P5	Annual sewerage bill based on 200kL/a	407.81	480.31	501.10	517.19	539.53
NWI P6	Typical Residential Sewerage Bill	407.81	480.31	501.10	517.19	539.53
NWI P6.1	Number of Sewerage Bills per annum	4	4	4	4	4
NWI P7	Annual water and sewerage bill based on 200kL/a	732.32	878.01	976.64	1,044.82	1,104.92
NWI P8	Typical Residential water and sewerage bill	713.57	874.79	985.20	1,039.42	1,090.10

## Table E.8 - NWI Finance Indicators

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
NWI F1	Total Revenue – water (\$000)	737,929	907,503	1,072,499	1,163,681	1,190,781
NWI F2	Total Revenue – sewerage (\$000)	908,622	995,675	1,074,687	1,096,437	1,148,084
NWI F3	Total Income for utility (\$000)	1,688,465	1,870,884	2,132,334	2,251,577	2,613,517
NWI F4	Residential revenue from usage charges – water (%)	84	83	82	80	78
NWI F5	Revenue per property for water supply services (\$/property)	425	517	605	649	657
NWI F6	Revenue per property for sewerage services (\$/property)	538	583	623	628	651
NWI F7	Income per property for utility (\$/property)	972	1,066	1,203	1,256	1,442
NWI F8	Revenue from Community Service Obligations (%)	5	6	6	7	6
NWI F9	Written down replacement cost of fixed water supply assets (\$000s).	8,889,412	10,433,975	11,592,458	12,013,525	11,731,991
NWI F10	Written down replacement cost of fixed sewerage assets (\$000s).	20,069,452	21,549,095	22,278,233	22,898,198	22,994,649
NWI F11	Operating cost – water (\$/property)	336	299	311	323	341
NWI F12	Operating cost – sewerage (\$/property)	261	240	245	256	274
NWI F13	Combined operating cost water and sewerage (\$/property)	589	539	556	579	616
NWI F14	Total water supply capital expenditure (\$000s)	910,061	1,453,164	800,845	292,167	278,496
NWI F15	Total sewerage capital expenditure (\$000s)	443,610	394,703	455,005	417,392	442,642
NWI F16	Total capital expenditure for water and sewerage (\$000s)	1,353,671	1,847,867	1,255,850	709,559	721,138
NWI F17	Economic real rate of return - water	-0.5	1.7	2.3	2.6	2.4
NWI F18	Economic real rate of return – sewerage	1.2	0.9	1.7	1.6	1.6
NWI F19	Economic real rate of return – water and sewerage	0.7	1.2	1.9	2.0	1.9
NWI F20	Dividend (\$000s)	190,000	205,000	232,000	230,000	242,000
NWI F21	Dividend payout ratio (%)	105	115	52	84	66
NWI F22	Net Debt to equity %	62	103	120	123	94
NWI F23	Interest coverage ratio	0.9	1.5	3.2	1.9	1.3
NWI F24	Net profit after tax (NPAT) (\$000's)	180,500	177,501	445,854	273,768	367,075
NWI F25	Community Service Obligations (\$000s)	91,295	112,736	130,607	146,902	149,557
NWI F26	Capital works grants – water (\$000s)	0	0	0	0	0

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
NWI F27	Capital works grants – sewerage (\$000s)	0	0	0	0	2,054
NWI F28	Water supply capital expenditure (\$/property)		828	452	163	154
NWI F29	Sewerage capital expenditure (\$/property)		231	264	239	251
NWI F30	NPAT Ratio (%)		9.5	20.9	12.2	14.0

### **NWI F9 Replacement cost of fixed water supply assets**

The written down replacement cost of fixed water supply assets decreased in 2011-12 to 11,731,991 (from 12,013,525 in 2010-11). This is because as of 30 June 2012, assets relating to the desalination plant were not included.

### **NWI F27 Capital works grants**

In 2011-12 Sydney Water received grants as Community Service Obligation payments from NSW Treasury for the Priority Sewerage Program.

## Table E.9 - NWI Health Indicators

Ref.	Indicator	2007-08	2008-09	2009-10	2010-11	2011-12
NWI H1	Water quality guidelines	ADWG 2004	ADWG 2004	ADWG 2004	ADWG 2004	ADWG 2004*
NWI H2	Number of zones where microbiological compliance was achieved (eg, 23/24)	13/13	13/13	13/13	13/13	13/13
NWI H3	Percent (%) of population where microbiological compliance was achieved	100	100	100	100	100
NWI H4	Number of zones where chemical compliance was achieved (eg, 23/24)	13/13	13/13	13/13	13/13	12/13**
NWI H5	Risk-based drinking water quality management plan externally assessed	Yes	Yes	Yes	Yes	Yes
NWI H6	Risk-based drinking water quality management plan (specify plan in place ISO9001, HACCP, ADWG Aquality assessment)	ISO 9001	ISO9001	ISO9001	ISO9001	ISO9001 ***
NWI H7	Public disclosure of drinking water quality performance (yes/no)	Yes	Yes	Yes	Yes	Yes

Notes: \* Sydney Water commenced implementing the ADWG 2011 after its release in October 2011. Full implementation occurred by 1 July 2012.

\*\* There were four THM exceptions in Nepean Delivery System during 2011-12.

\*\*\* Sydney Water's quality system is accredited to ISO9001. Sydney Water has committed to undertake an Aquality review within the 2010-15 period. Results will become available in 2012-13.

### NWI H4 Chemical compliance

One of the thirteen (13) delivery systems (Nepean) failed to meet the health guideline value for trihalomethanes (THM – disinfection by-product). This is the first time in many years that a delivery system has not met a guideline value. This exceedance was due to wet weather events increasing natural organic matter levels in raw water. Chlorine levels were increased in order to maintain adequate disinfection. As per the recommendation in the ADWG, action is encouraged to reduce THM levels but must not compromise disinfection. This has been reported to NSW Health and no further action was required. All other delivery systems met the guideline values. The short term high level exceedences were unlikely to pose a significant health risk, as acknowledged by the Australian Drinking Water Guidelines.

# Water Efficiency Report

2011–12



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## At a glance – 2011–12

Sydney Water is planning for the future. Our vision is to provide valued water solutions. To do this, we will put our customers front of mind, focus on business excellence and be forward thinking.

We are applying these three themes to how we meet our *Operating Licence* requirements for water conservation.

Water use in Sydney continues to remain at historically low levels. At 30 June 2012, total water use was 297 litres per person per day (LPD)<sup>1</sup>, well below our *Operating Licence* water use target of 329 LPD.

This includes water used by the residential sector, businesses, industry and for irrigation. This is an excellent achievement by the community, and reflects ongoing efforts to maintain water saving behaviours adopted during drought restrictions. It also reflects a general decline in the use of drinking water by the non-residential sector. Sydney Water expects that water use will remain about this level until at least 2015.

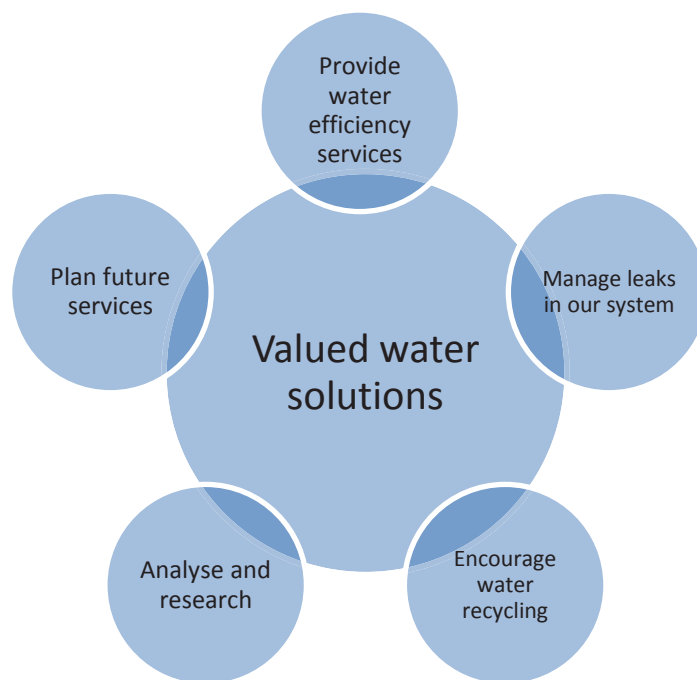


Figure 1 Links to Sydney Water's vision

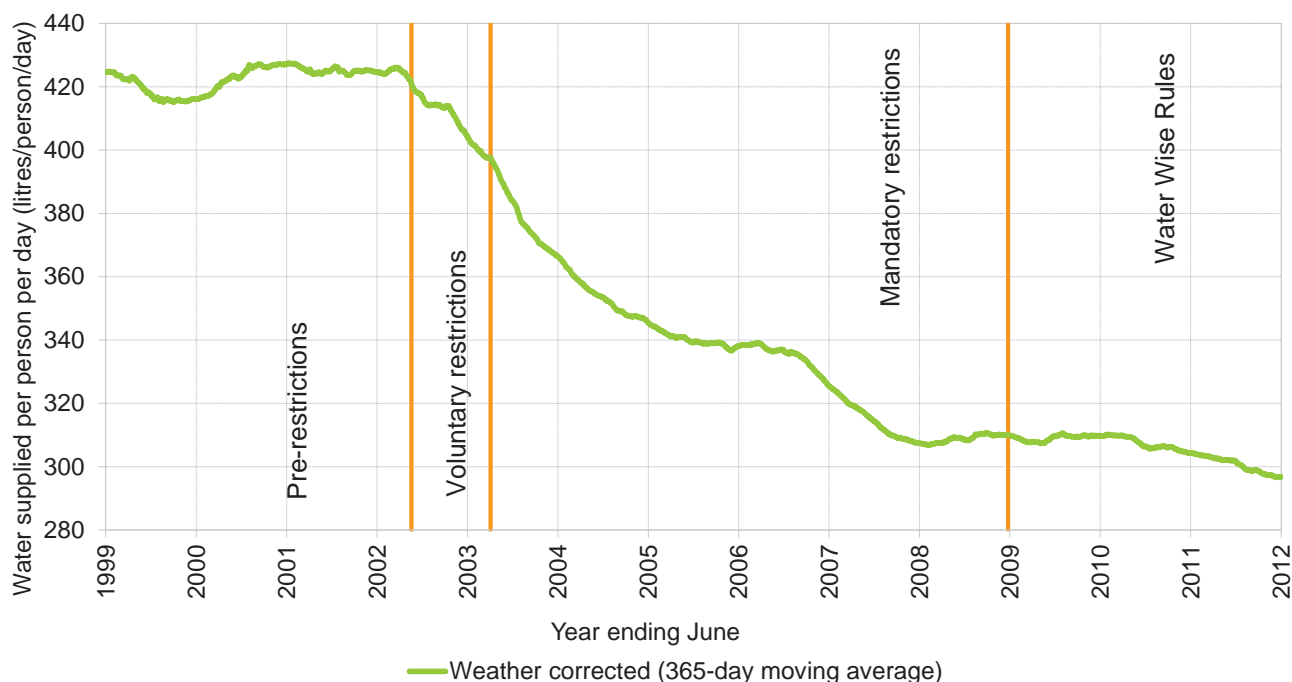


Figure 2 Daily water use in greater Sydney was 297 litres per person per day in 2011–12

<sup>1</sup> All LPD numbers are weather corrected unless noted otherwise. Appendix 2 lists LPD in 2011–12 both corrected and uncorrected for weather.

As noted in last year's Water Efficiency Report, Sydney Water's approach to water efficiency is changing. After more than a decade of sustained effort, the biggest gains in water savings are already made. Our overall focus for water efficiency now is to deliver services that customers value, in a way that limits increases to bills.

Customer research (2010) shows that 39% of our customers want their basic needs met at an affordable price, while 61% want more than basic services. To meet these customer expectations, we are developing new products and services we can tailor to customers' circumstances and deliver cost-effectively.

We are currently in a phase of research, analysis and program development, similar to when Sydney Water first developed a *Water Conservation Strategy* in the late 1990s. During this period, Sydney Water developed what were then new and untested water efficiency programs, such as WaterFix and the Every Drop Counts Business Program. These programs went on to be highly successful, playing an important role in reducing water use during the last drought. Ongoing savings from these programs will continue over time and help maintain low water use.

In 2011–12, we have invested significant effort in program development and staff training. Our new services will continue to be developed in 2012–13.

We also remain committed to investing in research and data analysis, and to providing the community with expert advice, information and education. Our experience in developing and delivering water efficiency programs has made Sydney Water a world leader in water conservation research.

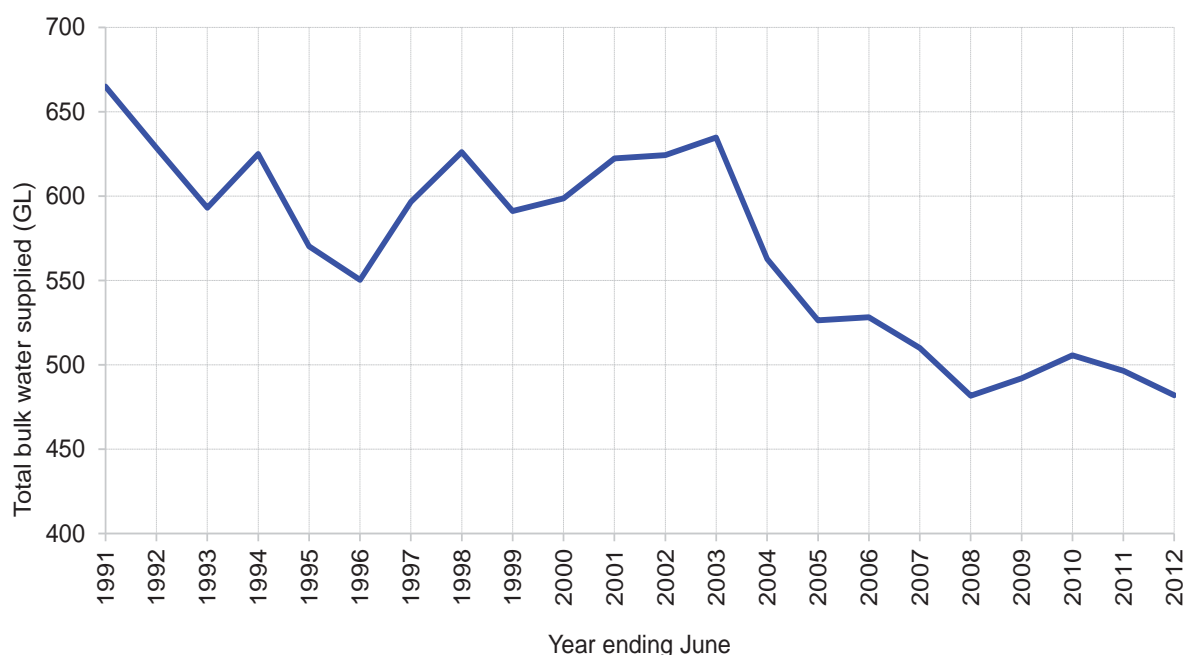
Through our strong internal capability and research partnerships we will continue to research, assess and evaluate new opportunities to provide valued water solutions for water efficiency, leak management and recycling.

## Water use in Sydney

Total water use for 2011–12 was 481,930 million litres compared to 496,695 million litres in 2010–11. This is about the same level as in 2007–08, when Level 3 drought restrictions and an extensive water efficiency program were in place.

Weather conditions in both 2007–08 and 2011–12 were wetter than average; however, since 2007–08, there has been about a seven per cent increase in population. The continued low level of total water use reflects a major shift in how the community now uses water.

Currently, residential demand accounts for almost 75% of total water use. Non-residential properties use about 25%. This includes industrial properties (8%), commercial (10%) and government and other (7%).



**Figure 3 Total water use in Sydney was 482 billion litres a year in 2011–12. This is about the same volume used in 2007–08.**

## Water conservation

In 2011–12, Sydney Water continued to implement a range of initiatives to meet our *Operating Licence* water conservation requirements. These included:

- providing water efficiency initiatives
- reducing leaks from Sydney Water's and customers' pipes
- providing recycled water to households and businesses
- promoting water efficiency and water recycling projects.

We also did substantial analysis and research to support and continue to develop these initiatives.

## Water saved in people's homes

In 2011–12, Sydney Water expanded the former WaterFix Program to provide customers with a choice of services to suit their individual needs. This new WaterFix service includes replacing showerheads, toilets and taps, and repairing leaks. We offer the new service to residential customers at cost recovery rates. We will continue to develop WaterFix as we learn from implementing the new service.

Recognising the increasing cost of living, Sydney Water is committed to supporting customers in hardship.

We introduced PlumbAssist in 2011–12, to help customers experiencing financial hardship to reduce their debt by identifying and addressing high water use and its causes. The service provides essential plumbing services and emergency plumbing work, if required, for customers who cannot afford it.

Estimates of water savings from PlumbAssist services provided in 2011–12 are not yet able to be calculated. Sydney Water will analyse savings from this service in 2012–13.

Sydney Water's new programs are delivered differently from the more general programs of the past. Our new approach is to offer cost-recovery programs tailored to individual customer's needs, rather than implementing large-scale programs that result in across the board price increases.

## Water saved by businesses

This year we have also refocused the way that we work with business customers. Sydney Water's new Business Customer Services area aims to provide a holistic service to business customers. By bringing together customer connections, trade waste, backflow prevention compliance and water efficiency assistance into one service area we can look at a business's water use in its entirety.

In 2011–12, Sydney Water helped businesses save water by identifying opportunities to reduce water use through improved management and processes, leak detection, reuse, water efficient devices and industry specific advice such as best practice guidelines.

These initiatives have achieved about 588 million litres of water savings this year.

Sydney Water also continued to work with Councils to help small to medium business. This program saves about 166 million litres of water a year.

## Water saved in schools

The Every Drop Counts in Schools Program finished at the end of 2011. However, most participating schools elected to retain the smart meter installed as part of this program. We funded upgrades for technologically out-dated smart meters and training for schools on how to use their meters.

The Every Drop Counts in Schools Program saved about 218 million litres a year. We expect these savings can be retained if schools and the NSW Department of Education and Communities continue to monitor schools' water use, identify leaks and other unexplained water use, and fix these issues within reasonable timeframes.

## Water saved by reducing leaks

Sydney Water has continued to cost-effectively manage leaks by proactively finding concealed leaks, maintaining fast response times to reported leaks and breaks, reducing pressure and renewing water mains.

In total, this program saves over 30 billion litres a year.

## Recycled water

In 2011–12, Sydney Water continued to operate recycled water schemes. We also encourage water recycling by other businesses, where it is cost effective. Recycled water is used for irrigation, industrial/business processes, residential outdoor use, toilet flushing and for the environment.

Schemes run by Sydney Water saved about 13 billion litres of drinking water in 2011–12.

## The year ahead

In 2012–13, Sydney Water will continue to develop and refine this new approach to water efficiency.

We will look into new options and services we can provide to customers. We will also continue to inform customers how to be water wise through the Sydney Water website and our communication and education initiatives.

Water efficiency will continue to be incorporated into broader education initiatives such as educational tours at operational sites, the Water Recycling Education Centre and educational resources.

We will keep reducing leaks in the water supply system and implementing recycled water schemes, where it is cost-effective.

We will also continue investigating and researching future water use, customer wants and needs, and potential future water efficiency, leak management and recycled water projects, to enable best practice long-term planning.

# 1 Introduction and regulatory context

## Meeting Operating Licence requirements

Sydney Water's *Operating Licence* includes water conservation requirements that cover water efficiency, leak management, water recycling and a water use target of 329 litres per person per day (LPD).

In 2011–12, water use was 297 LPD. This is well below the target and slightly lower than last year.

We continue to meet our *Operating Licence* requirements for water efficiency, leak management and recycling. Our progress in these areas this year is detailed in Section 2, Section 3 and Section 4.

This report is a yearly report on how Sydney Water meets its water conservation requirements under Section 7.5(c) of our *Operating Licence 2010–15*.

Appendix 1 outlines how this report meets specific requirements in the *Operating Licence* reporting manual.

## 1.1 Water Conservation Strategy 2010–15

Sydney Water's *Operating Licence* requires us to:

- reduce the quantity of drinking water that we draw from all sources to a level of water use equal to or less than 329 litres per person a day (LPD) by 30 June 2011, and maintain water use at or below this level for the remainder of the *Operating Licence* term<sup>2</sup>
- ensure that the level of leaks from our drinking water supply system is not over 105 million litres a day
- promote, foster and encourage the production and use of recycled water in our area of operations
- consider water efficiency and other water conservation measures when planning for future services, including reducing leaks
- undertake and promote water efficiency programs.

The licence also required us to develop a *Water Conservation Strategy 2010–15* in 2010. We provided this strategy to the

Independent Pricing and Regulatory Tribunal (IPART) in December 2010. The strategy describes how we will meet our licence requirements for water conservation and how Sydney Water contributes to the water efficiency (including leak management) and recycling targets in the *2010 Metropolitan Water Plan*.

The areas covered by the strategy are:

- water efficiency for residential customers
- water efficiency for business customers
- water efficiency for schools and councils
- leak management
- water recycling projects.

The *Water Conservation Strategy* says that Sydney Water will review and amend how we achieve *Operating Licence* requirements over time. We continually adapt water efficiency, leak management and recycling initiatives to take into account forecast demand, our progress against *Operating Licence* targets and the cost-effectiveness of individual initiatives.

The 2011–12 Water Efficiency Report notes Sydney Water's change in focus for water efficiency initiatives for residential customers, business customers and schools.

Appendix 6 describes the success of our water conservation strategies between 1999 and 30 June 2011.

## 1.2 Water use target

Sydney Water continues to maintain water use at equal to or less than 329 litres per

<sup>2</sup> This target includes total water used by residents, businesses and government.



person per day (LPD). In 2011–12, water use was 297 LPD<sup>3</sup>. This figure includes water used by the residential sector, businesses, industry and for irrigation and is 11 LPD less than in 2010–11.

This lower demand reflects a decline in the use of drinking water by some non-residential customers. For example, the partial closure of BlueScope Steel at Port Kembla and the start of the new recycled water scheme at Rosehill led to a reduction in drinking water use at these sites. It also reflects the ongoing efforts by customers to maintain water saving behaviours that were established while drought restrictions were in place.

Sydney Water estimates that water use will continue to be well under the *Operating Licence* water usage target for the rest of the licence period.

### 1.3 2010 Metropolitan Water Plan

The *2010 Metropolitan Water Plan* sets out measures approved by the NSW Government to secure Sydney, the Illawarra and the Blue Mountains' water supply now and in the future.

The 2010 plan builds on the success of past plans by continuing to concentrate efforts on four major areas – dams, recycling, desalination and water efficiency.



Figure 4 The NSW Government's *Metropolitan Water Plan* is based on the four key elements of the Water for Life equation.

Sydney Water contributes to two targets in the *2010 Metropolitan Water Plan*:

- to recycle 70 billion litres of water each year by 2015
- to save 145 billion litres of water each year by 2015 through water efficiency measures (including leak management).

Other agencies, such as the Office of Environment & Heritage (OEH), are also responsible for implementing initiatives that contribute to these targets.

Estimated water savings from Sydney Water initiatives in 2011–12 that will contribute to *Metropolitan Water Plan* targets are reported in Appendix 5

### 1.4 Reporting savings from non-Sydney Water programs

In past versions of this report, Sydney Water reported on water savings from programs run by other agencies, recycled water schemes operated by private operators and regulatory measures, such as the Building Sustainability Index (BASIX) and the Water Efficiency Labelling Scheme (WELS).

From 2011–12, water savings from non-Sydney Water initiatives will not be included in this report. The Metropolitan Water Directorate in the Department of Finance & Services now collates water savings from non-Sydney Water programs.

<sup>3</sup> All LPD numbers are weather corrected unless noted otherwise.



## 2 Water efficiency in 2011–12

### Tailoring our water efficiency initiatives

Sydney Water is changing from having a broad-scale water efficiency program to delivering cost-recovery water efficiency services and assisting customers experiencing financial hardship. Tailoring these services to individual customers' needs gives customers more flexibility and limits impacts on bills.

Our residential water efficiency services in 2011–12 included PlumbAssist and the new WaterFix (combining the old WaterFix and Toilet Replacement Programs).

We now provide a 'one stop shop' for business customers through Business Customer Services (BCS). BCS connects new business customers to Sydney Water services and works with businesses to prevent backflow, improve wastewater quality, become more water efficient and help develop a water contingency plan.

We also worked with schools to wrap up the Every Drop Counts in Schools Program and supported water efficiency programs led by other agencies. Water efficiency will continue to be incorporated into broader education initiatives on the urban water cycle.

### 2.1 Residential water efficiency

Appendix 5 includes water savings and costs of Sydney Water residential water efficiency services in 2011–12, where possible to calculate.

#### 2.1.1 PlumbAssist

The key focus of Sydney Water's residential programs in 2011–12 was to provide a tailored water conservation program for customers experiencing financial hardship.

Financial hardship has many causes, such as illness, a death in the family, relationship breakdown, loss of employment or disability. Customers experiencing hardship often have several difficulties, which compound their payment difficulties.

Customers in financial distress can receive help to manage their payment difficulties through Sydney Water's BillAssist service. Customers are referred to BillAssist by the Sydney Water Contact Centre or external community service agencies. Other customers identified with high and/or long-term debt are proactively offered assistance by BillAssist.

BillAssist staff offer customers case management and a range of assistance options. They check for high water use or a sudden increase in use. As part of the assistance package, BillAssist also does an initial plumbing assessment. Eligible customers with high water use or who cannot

afford to fix urgent or essential plumbing services are then referred to PlumbAssist.

PlumbAssist aims to provide customers with essential plumbing services, for example, a working wastewater system, hot water and functioning bathroom fixtures. Plumbers also fix leaks and replace inefficient toilets where required. PlumbAssist reduces water waste, the cost of future water bills and alleviates financial stress for financially vulnerable customer groups. A case study of a PlumbAssist service is included in Box A.

In 2011–12, 228 properties were referred to the PlumbAssist service. Of these, 174 properties had a plumbing issue resolved. Properties received repairs to fix plumbing issues that could affect health, public amenity, safety or water costs.

PlumbAssist is a new service that is still in the early stages of development. Water savings associated with PlumbAssist are difficult to calculate. Savings will vary significantly from house to house due to the variety of plumbing issues fixed through the program.

Currently, there is insufficient water use data available to estimate savings for 2011–12, or potential future water savings, from the PlumbAssist service. As we develop the service and more customers participate, we will be better able to estimate water savings.

### Box A: Case study Working with customers in financial hardship

Sydney Water began working with Mr Jones (not his real name) in April 2012. Mr Jones is a pensioner on a low income. His family circumstances have recently changed and he also has a disability.

When first referred to the BillAssist program, Mr Jones owed a significant amount of money to Sydney Water and had several plumbing issues in his home that required work.

Through BillAssist, Mr Jones received financial assistance with his outstanding water bill and was referred to Sydney Water's PlumbAssist service.

PlumbAssist fixed the plumbing issues in Mr Jones' home that were contributing to his high water use. This included repairing leaks in the kitchen and bathroom, and replacing a faulty toilet.

Mr Jones is still participating in the BillAssist Program and is now on a payment plan to reduce his debt. In three months he has reduced his water bill debt by a third.

We will analyse participants' water use in more detail in 2012–13. This will assist Sydney Water to understand the potential volume of water savings that may be achieved through this program.

Sydney Water spent \$207,996 in 2011–12 to develop and deliver PlumbAssist.

#### 2.1.2 WaterFix

We changed the WaterFix service from 1 July 2011, offering it to customers on a cost-recovery basis. The new service merged the previous WaterFix Program and Toilet Replacement Program (which both ended on 30 June 2011).

Under the new WaterFix service, customers have more flexibility to choose the type of service they need. Costs for the customer

vary, depending on the type of service they select.

In 2011–12, the new WaterFix service offered:

- tap and toilet leak repairs
- installation of WELS (Water Efficiency Labelling Scheme) 3-star showerheads
- installation of WELS 4-star, dual flush toilets
- installation of WELS 3-star flow regulating aerators or WELS 4-star in-body flow regulators.

In 2011–12, there was a base charge of \$100 for all WaterFix appointments. The rest of the charge to the customer varied, depending on the number of services we provided. For example, tap and/or toilet leak repairs cost \$14 for each leak, installing a WELS 3 star-rated showerhead (standard range) cost \$30 and installing a WELS 4 star-rated dual flush toilet (standard range) \$315. Mid-range and premium range products were also available, at a higher cost. A surcharge applied for Saturday appointments.

The number of shower, toilet and leak-related services provided to customers in 2011–12 is listed in Table 1.

WaterFix services	
Shower related	285
Toilet related	643
Leak repairs	799

**Table 1 Types of services completed for WaterFix participants in 2011–12**

Initial estimates of potential water savings from the new WaterFix service are included in Section 5. These estimates are only preliminary because:

- participants in the new WaterFix service may be significantly different from those who participated in the former WaterFix Program. Water savings from the former program cannot be compared to this new service
- we provided around 25% of WaterFix services in 2011–12 to property types that are generally not individually metered (for example, apartments)
- about 30% of WaterFix services in 2011–12 were in tenanted properties.

This is a higher proportion than for the former WaterFix program and is likely to be in response to changes in tenancies legislation

- not enough time has passed since participants joined the program. At least one full year of water use data after participation in the service is needed to reliably estimate water savings
- 846 customers received a new WaterFix service to the end of June 2012. More customers are needed to improve the accuracy of water saving estimates.

Sydney Water spent about \$458,000 in 2011–12 in developing and delivering the new WaterFix service.

We will review the WaterFix service in 2012–13. This is discussed in Section 7.

### 2.1.3 NSW Government Home Saver and rainwater tank rebates

In 2010–11, under the Climate Change Fund, the NSW Government offered rebates to households that installed hot water circulators and dual flush toilets. In 2010–11, Sydney Water also offered rebates for households that installed rainwater tanks. These programs ended on 30 June 2011.

We continued to accept rebate applications until the end of September 2011, for purchases made before the end of June 2011.

The total number of rebates paid and an estimate of water savings achieved over the life of these programs is listed in Table 2.

Program	Rebates paid	Water savings (ML/yr)
Dual flush toilet <sup>4</sup>	9,213	235
Hot water circulator	11	<1
Rainwater tank <sup>5</sup>	58,490	2,154

**Table 2 Rebates paid by program**

Appendix 6 details water savings and costs of each of these programs.

<sup>4</sup> Rebates for dual flush toilets and hot water circulators were paid between January 2010 and the end of September 2011.

<sup>5</sup> Rebates for rainwater tanks were paid between October 2002 and the end of September 2011.

## 2.2 Business water efficiency

Businesses account for nearly one third of Sydney's daily water use. Businesses that reduce water use often find they also save money in reduced wastewater, energy and chemical treatment costs.

Appendix 5 includes estimated costs and savings from business water efficiency services in 2011–12.

### 2.2.1 Business Customer Services

Sydney Water works with business customers through Business Customer Services (BCS). BCS provides a holistic water management service to business customers, helping them achieve best practice water and wastewater management. Water efficiency is part of this broad service.

As well as assisting businesses with water efficiency, BCS works with them to connect new customers to Sydney Water services, prevent backflow, improve wastewater quality and develop water contingency plans.

We provide information and help businesses to:

- benchmark water use
- conduct water use monitoring
- do water audits for different business sectors
- identify water saving opportunities
- implement water saving measures.

Business customers may be able to achieve water savings by improving processes to achieve efficient water and energy use, installing water efficient equipment for business processes and cleaning, monitoring and repairing leaks, using alternative water sources to drinking water and detecting inefficient water use through online monitoring.

Examples of initiatives implemented by business customers in 2011–12 include:

- consolidating production lines
- altering wash-down schedules
- increasing the use of backwash water
- detecting and quickly fixing leaks
- increasing staff awareness of leak prevention.

A case study of a customer working with Business Customer Services is provided in Box B.

#### **Box B: Benefits of online monitoring**

Business Customer Services encourages business customers to monitor their water meters regularly and, where feasible, to install online monitoring equipment. This helps customers quickly identify and repair leaks and faulty equipment, reducing excessive and unnecessary water use.

In 2011–12, a business customer in western Sydney detected unusual water use patterns from their cooling tower through online monitoring.

An inspection of the cooling tower identified a faulty float, which was quickly repaired.

Installing the online monitoring system has been a great investment for this business, resulting in water savings of 17,000 litres a day of drinking water. This has saved the business more than \$10,000 a year.

We estimate water savings from businesses working with Sydney Water in 2011–12 to be around 588 million litres a year, at a cost of about \$565,000.

A number of publications and resources to help business customers be water efficient are available on the Sydney Water website. These include fact sheets on trade waste, best practice guidelines to achieve water efficiency, case studies, water efficiency benchmarks for different types of businesses and a do-it-yourself tool to save water in your business.

#### **2.2.2 Council Partnerships Program**

Through the Council Partnerships Program, Sydney Water works with local councils to help small and medium water-using businesses achieve sustainable water savings. For the past three years, Sydney Water has co-funded the employment of 15

sustainability project officers who work with 20 councils. In 2011–12, two new councils joined the program.

The project officers engage with small and medium businesses to conduct water audits, recommend how they can improve their water efficiency and help them implement water efficiency projects.

At the end of 2011–12, around 500 small to medium water using businesses were participating in the program, with total savings to date of around 789 million litres per year.

In 2011–12, Sydney Water spent about \$249,000 implementing the Council Partnerships Program.

#### **2.2.3 Irrigation and Landscape Efficiency Project**

The Australian Government, through its Water for the Future program, funded a Hawkesbury-Nepean River Recovery Program (HNRRP) to improve the health of the river. Sydney Water worked with the HNRRP to implement the Irrigation and Landscape Efficiency Project (ILEP). The project aimed to improve water efficiency and turf and soil management for Greater Sydney's open spaces (parks and sporting facilities). Savings were made by using improved technology and a range of land and site management practices over 33 sites. These sites were owned by the 23 partner organisations (including councils, golf courses and sporting fields) who participated in the project.

ILEP officially concluded in September 2011. Our involvement in 2011–12 was to provide in-kind support to the project by monitoring water savings achieved.

The project is now estimated to save 1,090 million litres in drinking water per year (exceeding its target of 1,060 million litres a year). These water savings are used for environmental benefits in the Hawkesbury-Nepean River system. As this is not a Sydney Water initiative, water savings from this project are not included in Appendix 5 .

Using our ILEP experience, we developed the '*Best practice guidelines for holistic open space turf management in Sydney*'. These are available on the Sydney Water website.

Some projects that received assistance from Sydney Water as part of ILEP are still being implemented by councils. We will continue to monitor water savings from these projects.



## 2.3 Education initiatives

Sydney Water no longer provides specific water efficiency programs to schools. Instead, water efficiency is integrated into broader education initiatives that focus on the urban water cycle.

We have developed a new education plan that aligns with our *Corporate Strategic Plan 2012–16* and our Communication Strategy. Under this plan, educational initiatives will include:

- curriculum-linked excursion programs for secondary schools delivered at the Water Recycling Education Centre
- educational tours of water filtration, water recycling and wastewater treatment plants
- online virtual tours with curriculum linked resources
- professional development for educators to deliver effective and engaging water education
- direct engagement with students through guest lectures at universities and TAFE colleges
- education resources on the Sydney Water website
- sponsorship of other organisations to deliver water education.

### 2.3.1 Every Drop Counts in Schools Program

Sydney Water ran the Every Drop Counts in Schools Program for four years. The program provided schools with tools and resources to monitor their water use and identify potential leaks.

In 2011, Sydney Water contacted the 121 participating schools to inform them that the program was finishing. We offered schools the option of continuing to use the smart meter installed as part of the program to monitor their water use, with the school maintaining and repairing it. Alternatively, schools could choose to have their smart meter removed free of charge.

We provided all participating schools with a final report card on their water use covering the period from July to December 2011.

We also offered training sessions with Watersave Australia on how to use the smart meter. Watersave provided this training to 66 schools between November 2011 and April 2012.

After the program, 113 schools continued to have a smart meter on their premises<sup>6</sup>, with 20 of these schools upgrading technologically out-dated smart meters. Schools that identify leaks will continue to manage them independently.

Information on responsible water use and how to be a water efficient school is still available on the Sydney Water website.

Total program investment in the Every Drop Counts in Schools Program in 2011–12 was \$154,000. We estimate water savings from the program will remain at about 218 million litres a year, if schools and the NSW Department of Education and Communities continue to monitor schools' water use, identify leaks and other unexplained water use, and fix these issues within reasonable timeframes.

### 2.3.2 Top 100 Schools Program

The Top 100 Schools Program is run by the NSW Department of Education & Communities (DEC, formerly the Department of Education & Training). The program targets the 100 schools in NSW with the highest water use. Schools are provided with water efficient fixtures and fittings to replace older, inefficient items.

In 2011–12, Sydney Water's involvement with this program was limited to providing a small amount of school water use data to DEC. We do not anticipate that DEC will require any further support from Sydney Water for this program.

Water savings from the Top 100 Schools Program are estimated to remain at about 296 million litres a year.

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<sup>6</sup> As at April 2012, when Sydney Water concluded funding the removal of smart meters.

### 2.3.3 Educational tours

Sydney Water conducts educational tours at 11 operational sites including water filtration, water recycling and wastewater treatment plants. We provide tours for secondary schools, TAFE colleges, universities and technical and international delegations. Information on water efficiency is included in these tours.

In 2011–12, about 135 tours and presentations were provided to more than 4,300 participants.

Sydney Water opened its Water Recycling Education Centre in February 2011. The centre has displays and interactive resources that explain the four key elements of the NSW Government's *Metropolitan Water Plan* – dams, recycling, desalination and water efficiency. Water efficiency is also discussed in educational tours of the water recycling plant at the centre. In 2011–12, more than 1,400 people visited the Water Efficiency Recycling Centre and participated in a tour of the site.

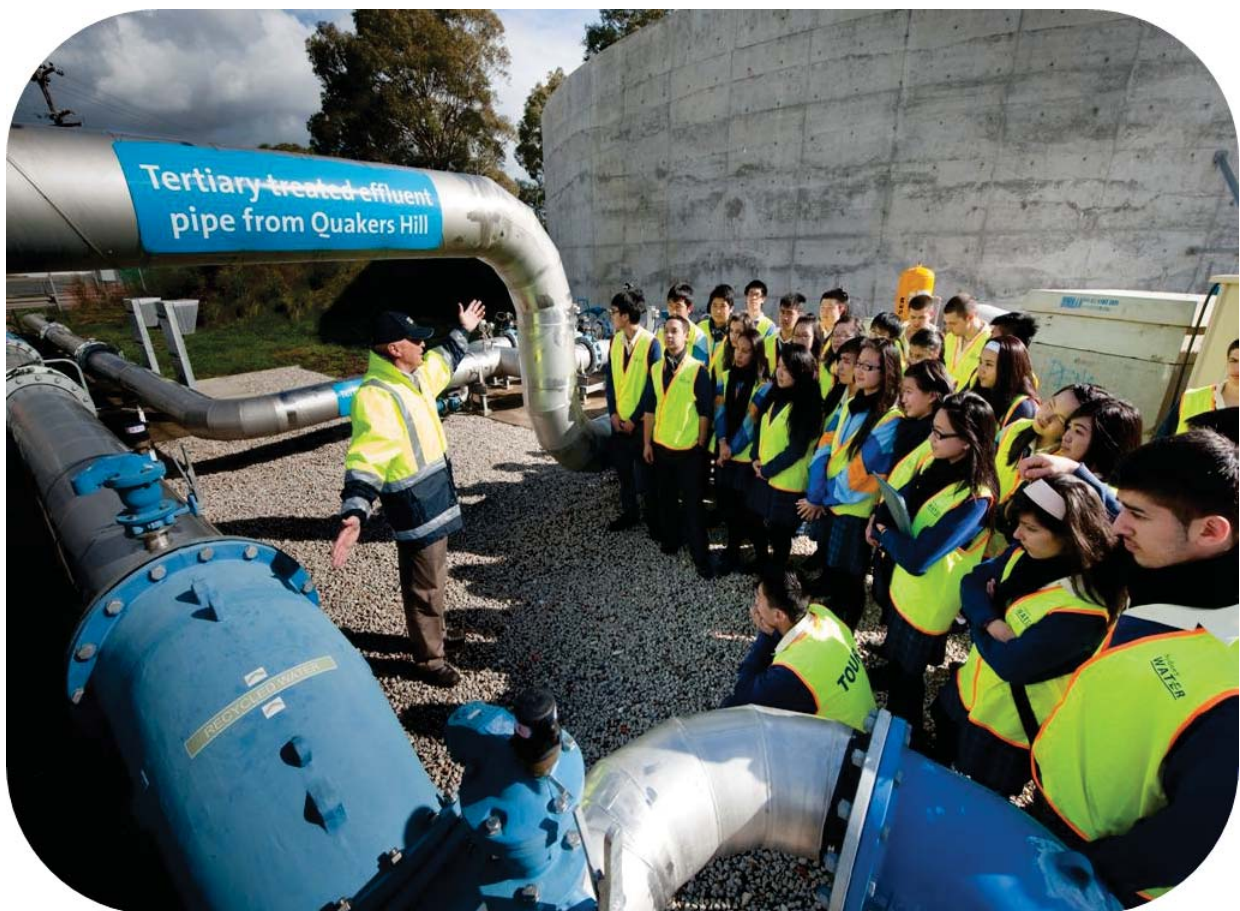


Figure 5 Water efficiency is incorporated into tours and educational resources.

## 2.4 Regulatory measures

As they are not Sydney Water initiatives, water savings from regulatory measures are not included in water efficiency savings reported in Appendix 5 .

### 2.4.1 BASIX and WELS

Sydney Water's *Water Conservation Strategy 2010–15* noted that most of the available water efficiency savings from 2010 to 2015, particularly in the area of residential indoor water savings, would be generated by regulatory measures.

The NSW Government's Building Sustainability Index (BASIX) and the national Water Efficiency and Labelling Scheme (WELS) now play key roles in achieving water savings and will play greater roles in the future. Information on these regulatory measures is available at [www.waterforlife.nsw.gov.au](http://www.waterforlife.nsw.gov.au).

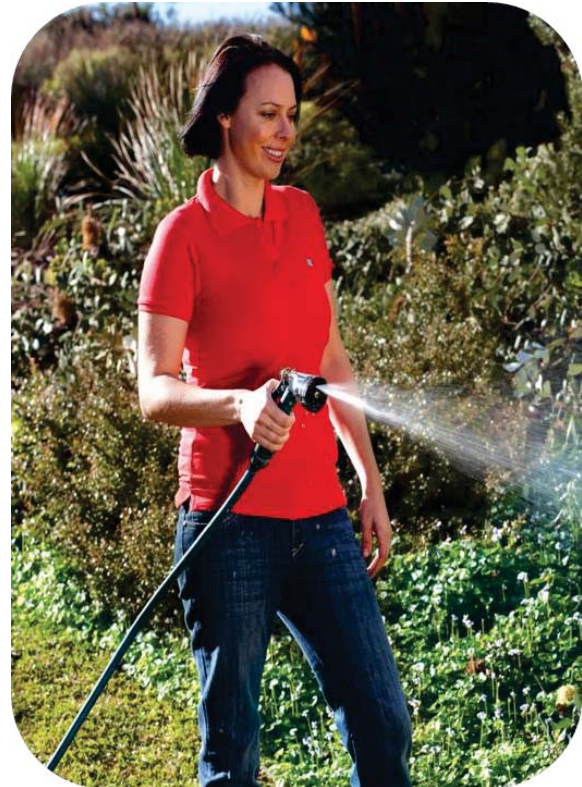
### 2.4.2 Water Wise Rules

Water Wise Rules replaced drought restrictions in June 2009. They remain the baseline initiative for outdoor water efficiency.

The rules focus on simple, common-sense behaviours:

- watering, including sprinklers and watering systems, is allowed any day before 10 am and after 4 pm. This avoids the heat of the day. Children are allowed to play under sprinklers on hot days
- hand held hoses must be fitted with a trigger nozzle, including for washing vehicles. Hoses must not be left running unattended
- hard surfaces, such as paths or driveways, cannot be hosed, except for health and safety, emergency or construction activity purposes. If hosing is required, only trigger nozzle hoses or high-pressure cleaning devices can be used
- fire hoses may be used for fire fighting activities only.

Sydney Water implements Water Wise Rules on behalf of the NSW Government, in the same way we implemented drought restrictions. Sydney Water's analysis estimates that Water Wise Rules save about 19 billion litres of water a year.



**Figure 6 Under Water Wise Rules, hand held hoses must be fitted with a trigger nozzle.**



## 3 Leak management in 2011–12

### Best practice leak management

We estimate average water leakage for the twelve months ending 30 June 2012 to be 115 million litres a day. This meets our *Operating Licence* requirements and reflects international best practice.

In 2011–12 we managed leaks cost-effectively by proactively finding concealed leaks, maintaining fast response times to reported leaks and breaks, reducing pressure and renewing water mains.

In total, our leak management activities save over 30 billion litres of water a year.

### 3.1 Key leak management statistics

Sydney Water owns and maintains about 21,000 km of pipes that distribute water to customers. We also maintain the 1.3 million connections to customers' properties.

We continue to meet *Operating Licence* leakage requirements of  $105 \pm 16$  million litres a day (the accepted range of uncertainty set in the licence). Average water leakage for the twelve months ending 30 June 2012 is estimated to be 115 million litres a day.

The key aspects of leak management that can be quantified include the:

- leakage rate
- number of bursts, breaks and leaks
- average time to repair bursts, breaks and leaks
- length of mains inspected
- economic level of leakage.

Appendix 3 includes an explanation of how we calculate the economic level of leakage.

Statistic	Value
Leakage	115 ML/day
Number of bursts, breaks and leaks	13,041
Average time to repair water main break	36 hours
Length of mains inspected	12,045 km
Economic level of leakage	117 ML/day
Infrastructure Leakage Index	1.5

**Table 3** Key leak management statistics

Costs and savings from leak management programs in 2011–12 are included in Appendix 5

### 3.2 Infrastructure Leakage Index

The Infrastructure Leakage Index (ILI) measures how effectively infrastructure management can reduce leaks. According to leakage experts, it is the best performance indicator for real loss management.

The ILP includes bands from A (reflecting best practice) to D, with recommendations for both developed and developing countries. Sydney Water's ILI of 1.5 is in the top band (Band A) and compares well against other developed countries.

### 3.3 Factors affecting leak performance

Like all water pipe networks around the world, leaks and breaks can occur in our supply system. Many things can cause leaks, such as deteriorating joints and fittings, ground movement cracking pipes and changes in water pressure.

Sydney Water implements a number of programs to reduce the likelihood of leaks and the amount of water lost when they do occur. These programs include:

- active leak detection and repair
- pressure management
- improved response times to repair leaks and breaks
- improved flow metering.

In addition, Sydney Water has an ongoing Pipe Renewal Program. By replacing pipes



that have reached the end of their life, this program aims to prevent pipes from breaking and leaking.

Table 4 lists the reported volume of water leakage between 2009–10 and 2011–12.

Year	Water leakage (ML/d)
2009–10	97
2010–11	106
2011–12	115
Average	106

**Table 4 Water leakage**

The 2011–12 leakage figure is higher than the previous two years. Possible reasons for this increase are:

- natural variation due to the uncertainty range in results
- the effects of pressure reduction take time to be realised in leakage results
- the wet weather in 2011–12 meant that some leaks may not have been detected or have been reported later than usual
- a minor increase in unreported or undetected leaks in some areas, due to a more targeted Active Leak Detection Program.

Sydney Water will continue to monitor leaks and, if necessary, will review programs to ensure licence compliance. Appendix 4 explains how we estimate leakage.

### 3.4 Active leak detection and repair

Active leak detection and repair involves acoustically scanning for concealed leaks in buried pipes and repairing pipes identified. Leaks are generally found in water mains, connections to the mains and in fittings such as hydrants and valves. Active leak detection and repair is a continuous process. Without it, leaks from pipes would increase each year.

All 180 of Sydney Water's supply zones and the new pressure managed zones are prioritised for active leak detection and targeted accordingly. Sydney Water has worked with the broader water industry to improve leak detection techniques.

We inspected 12,045 km of pipes in 2011–12 (covering 90 reservoir zones and 7 pressures zones). Since the Active Leak Detection Program began almost 152,000 kilometres of pipes have been inspected. It is estimated that this program achieves about 2.3 billion litres of water savings a year.

Sydney Water spent almost \$2.5 million on active leak detection and repair in 2011–12.



**Figure 7 Acoustic equipment is used to actively detect leaks, so they can be repaired.**

### 3.5 Improving flow metering

Flow metering helps us identify leaks and monitor leak reduction programs. Improved flow metering has improved our monitoring of the effectiveness of the Active Leak Detection Program.

To the end of June 2012, Sydney Water has installed 242 bulk water flow meters.

### 3.6 Improved leak/break response times

Leaks from buried pipes that reach the surface are reported by customers and Sydney Water staff. Improving Sydney Water's response time to repair these leaks reduces water loss. We prioritise all reported leaks by the size and risk of the leak.

### 3.7 Pressure management

Sydney Water aims to supply water in a pressure range suitable for households and businesses, while reducing leaks and breaks. However, in some areas water pressure remains unnecessarily high. High pressure in pipes can cause them to break and can cause problems with household appliances such as hot water systems.

The Pressure Management Program involves installing pressure-reducing valves in high-pressure areas. This reduces water pressure in the system and also reduces main breaks and leaks. Sydney Water has implemented about 181 pressure reduction schemes between 2005 and 2012.

To the end of June 2012, we estimate water savings from the program to be 5 billion litres a year. In addition, each customer that has their pressure reduced saves an extra 3,900 litres a year, on average.

In 2011–12, Sydney Water spent about \$7 million to deliver the Pressure Management Program.

### 3.8 Additional leak management services

Leak detection services have become a standard practice service included in Sydney Water's water efficiency services. Participants in PlumbAssist and WaterFix and businesses working with Business Customer Services are offered leak detection, repair and assistance to self-detect leaks as part of these services.

The Sydney Water website also contains information to help customers identify leaks

## 4 Water recycling in 2011–12

### Promoting and encouraging water recycling

Water recycling in Sydney has more than quadrupled over the past twelve years from about 11 billion litres in 2000 to 46 billion litres in 2012.

Sydney Water has now implemented all financially viable recycled water servicing opportunities from our wastewater and water recycling plants. This includes very large projects such as the Rosehill Recycled Water Scheme and the St Marys Water Recycling Project.

Future water recycling schemes are likely to be small, localised sewer mining or stormwater harvesting projects. Sydney Water enables others to develop water recycling schemes by accessing water resources from our wastewater and stormwater systems.

### 4.1 Promoting and encouraging water recycling

Water recycling is a key component in securing the water supply for greater Sydney and the environment.

The NSW Government's *2010 Metropolitan Water Plan* retained the commitment identified in the 2006 Plan to use 70 billion litres of recycled water a year for industry, environmental and residential use. Sydney Water works with relevant government agencies to deliver water recycling schemes that are economically, technically and environmentally feasible.

We particularly encourage water recycling where it can replace drinking water, such as green space irrigation, industrial/business processes and residential outdoor use and toilet flushing.

Sydney Water's approach includes:

- efficiently operating and maintaining existing schemes
- developing financially viable schemes to switch existing drinking water users to recycling
- considering water recycling as an option to service growth, where it is financially viable
- making access to Sydney Water's wastewater and stormwater systems easier, so external parties can obtain source water and develop their own water recycling schemes

- engaging stakeholders and the community about future water recycling opportunities
- initiating and participating in research projects to quantify the real and perceived costs and benefits of recycling
- developing guidelines and documents for local government about developing recycled water sources.

### 4.2 Industrial customers

There are challenges in supplying recycled water to industrial customers, as their demand can fluctuate subject to business needs. For example, in 2011–12:

- a foundation customer of the Rosehill Recycled Water Scheme, Shell (Refining) Australia, announced that it will pull out of the scheme in 2014 after concluding refining operations at Camellia
- VISYPET announced that it will build a facility for washing plastic bottles at its Smithfield site. We expect this facility will also use the Rosehill scheme's recycled water in its operations.

## 4.3 Water recycling projects

Sydney Water operates 18 plants from which we provide 23 recycled water schemes. We also provide recycled water for use at our own wastewater treatment plants. Table 5 provides details of our recycled water schemes, including the volume of recycled water and how much drinking water this saves each year.

Other significant achievements over the past year include:

- commencing operation of the Rosehill Recycled Water Scheme
- continuing construction work on Hoxton Park Recycled Water Scheme
- signing two new sewer mining agreements with third parties
- consulting with stakeholders on six potential recycled water schemes
- running a workshop at OzWater 2012, based on research examining the costs and benefits of water recycling and building industry capacity to make water recycling investment decisions.

Volumes of water recycled by Sydney Water in 2011–12 are listed in Table 5 and Appendix 5 .

### 4.3.1 Rosehill Recycled Water Scheme

The Rosehill Recycled Water Scheme began operating in October 2011. The scheme supplies high quality recycled water to Sydney Water's six foundation customers at Rosehill and Smithfield, and three other customers.

The scheme can supply up to 7.3 billion litres of recycled water a year. In 2011–12, more than two billion litres of drinking water was saved by this scheme.

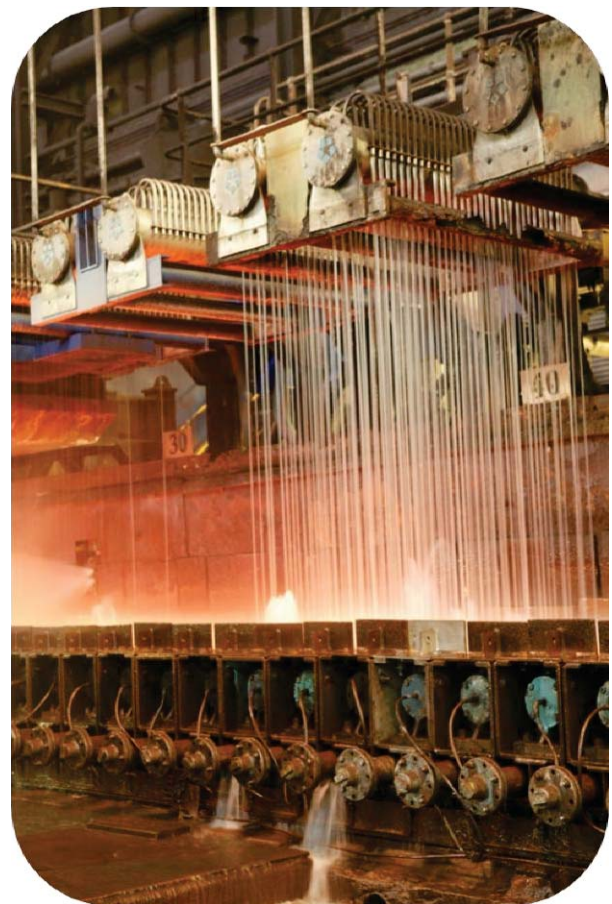
This project is delivered through a public private partnership.

### 4.3.2 Hoxton Park Recycled Water Scheme

In 2011–12, work continued on the Hoxton Park Recycled Water Scheme. Construction of the scheme is almost complete. Testing of the recycled water plant will occur from mid-2012. By the end of 2013, about 400 households and several light industrial properties will be supplied with recycled water from the scheme.

By 2015, we expect the scheme to supply recycled water to about 2,300 dwellings.

To date, the cost of developing the Hoxton Park Recycled Water Scheme is about \$83 million. Expected Sydney Water expenditure in 2012–13 is \$5 million.



**Figure 8** Since 2006, Sydney Water has provided high quality recycled water to BlueScope Steel.



Recycled water scheme	Source of recycled water	Volume of water recycled (ML/year)	Water savings (ML/year)	Type of use
Kiama Golf Course	Bombo	53	-	Irrigation, golf course
BlueScope Steel	Wollongong	6,838	6,838	Industrial
Port Kembla Coal Terminal	Wollongong	353	353	Industrial
Wollongong Golf Club	Wollongong	19	19	Irrigation, golf course
Wollongong City Council	Wollongong	3	3	Irrigation, parks, sports fields
Warwick Farm Racecourse	Liverpool	59	-	Irrigation, race course
Liverpool Golf Club	Liverpool	19	14	Irrigation, golf course
Industrial Foundation <sup>7</sup> and Rosehill Racecourse	Rosehill	2,156	2,156	Industrial, race course
Hickeys Lane	Penrith	2	-	Irrigation, parks, sports fields
Penrith Council parks	Penrith	4	4	Irrigation, parks, sports fields
Ashlar Golf Course	Quakers Hill	24	-	Irrigation, golf course
Agricultural release	Quakers Hill	366	-	Agricultural release
Rouse Hill residential	Rouse Hill	1,873	1,873 <sup>8</sup>	Residential, commercial
Castle Hill Golf Course	Castle Hill	22	-	Irrigation, golf course
Dunheved Golf Course	St Marys	46	2	Irrigation, golf course
Agricultural release	St Marys	2,436	-	Agricultural release
Hawkesbury-Nepean replacement flows <sup>9</sup>	St Marys WRP <sup>10</sup>	13,362	-	Environmental flows
Elizabeth Macarthur Agricultural Institute	West Camden	170	-	Irrigation, farm
Agricultural release	West Camden	1,830	-	Agricultural release
Richmond Golf Course	Richmond	25	-	Irrigation, golf course
University of Western Sydney, Hawkesbury	Richmond	62	-	Irrigation, farms, parks, sports fields
Picton Farm	Picton	362	-	Irrigation, farm
Aorangi Farm	Gerroa	23	-	Irrigation, farm
Sydney Water reuse at wastewater recycling and treatment plants		15,823	1,929	Industrial
<b>Total for recycled water projects<sup>11</sup></b>		<b>45,929</b>	<b>13,191</b>	

**Table 5 Summary of total recycled water supplied and volume of drinking water replaced by recycled water initiatives in 2011–12**

<sup>7</sup> This refers to customers provided with recycled water from the Rosehill Recycled Water Scheme.

<sup>8</sup> This includes recycled water used in BASIX properties in Rouse Hill.

<sup>9</sup> The St Marys Water Recycling Project (Replacement Flows) means that there is up to 18 billion litres more drinking water supply in Warragamba dam. However, the project does not reduce the demand for drinking water so the number is not included in the total for drinking water saved.

<sup>10</sup> Water Recycling Plant (WRP)

<sup>11</sup> Totals listed may not balance exactly with numbers in the table due to rounding.

# 5 Research, analysis and support in 2011–12

## Leading edge research, modelling and analysis

Sydney Water continues to invest in research and data analysis to identify new opportunities to provide valued water solutions for water efficiency, leak management and recycling.

Our experience in developing and delivering water efficiency and reuse projects has resulted in Sydney Water becoming a leader in water conservation research.

We have strong internal analytical capability to assess the feasibility and likely success of potential initiatives. We also have joint research agreements with a number of industry partners and centres of excellence. This gives us access to important national and international research developments.

## 5.1 Communicating with customers on water efficiency

In 2011–12, Sydney Water maintained information for customers on the Sydney Water website on:

- how to be water efficient in the home, in the garden and in business
- Water Wise Rules and general tips on how to use water wisely
- educational resources on the water cycle for both teachers and students
- helping customers prevent leaks
- water recycling projects, including recycling in residential areas, industry, the environment, irrigation, recycled water quality and pricing.

Sydney Water customers can also register for the new expanded WaterFix service online or by calling a toll-free phone number. The new WaterFix service was also promoted in 2011–12 in our customer newsletter, Waterwrap. The newsletter is sent to customers with their bills and provides information to help customers compare their water use to that of an efficient household with the same number of people. There is also a tool to do this on the Sydney Water website.

## 5.2 Water use trends and forecasting

Understanding water use trends is vital to better understanding customers, planning future services and forecasting possible future water use. In 2011–12, Sydney Water

completed a number of projects to help inform future decisions on the feasibility and success of potential services and initiatives.

### 5.2.1 Peer review of new short-term demand forecast model

Sydney Water has a new approach to forecasting water use. In 2010–11, we created two models to forecast short-term residential and non-residential water demand separately. Splitting water use in this way provides greater transparency and reliability in the demand forecast. Sydney Water uses these models to consider possible influences on water use at a household level and non-residential property level to predict whether demand is likely to change in the future.

In 2011–12, Sapere Research Group peer reviewed Sydney Water's new short-term demand forecasting model. The review concluded that our approach is robust, transparent, likely to produce more accurate results than alternatives and that assumptions made when developing the model were justified.

There has been a high level of interest from industry and other water utilities in our new approach to forecasting. The short-term demand forecast was an important element of Sydney Water's pricing submission to the Independent Pricing & Regulatory Tribunal in 2011.

In 2012–13, Sydney Water will extend this new approach to long-term demand forecasting. This is discussed in Section 7.

### 5.2.2 Residential behavioural change

Sydney Water continually considers the influences on demand for water and how they are changing. In 2011–12, we did preliminary analysis on the apparent shift in residential water use since the last drought began in the late 1990s.

After past droughts, water use returned to pre-restricted levels quickly (within a year) once restrictions were lifted. The ‘bounce back’ in demand that occurred after the most recent drought was much smaller than expected. Sydney Water’s initial assessment of residential water use since Water Wise Rules were introduced indicates that the community has continued water efficient behaviours they adopted during drought restrictions in place from November 2002 to June 2009.

We estimate that, currently, total residential demand has reduced by about 30 billion litres each year due to sustained behavioural change. This is a conservative estimate, correcting for factors such as price increases and Water Wise Rules.

### 5.2.3 End use panel data analysis

In previous years, Sydney Water has collected data on key end uses of water within the home (such as toilet flushing, clothes washing and showering). Work on analysing this data began in 2011–12 and is continuing in 2012–13.

This information will help us better understand the way customers use water and the water efficiency of home appliances and fittings.

Depending on the results of this analysis, Sydney Water may gather follow up data from the same households to further understand how and why customers’ water use changes over time.

## 5.3 Analysis for new water efficiency services

### 5.3.1 WaterFix

Sydney Water has done preliminary analysis of the water use of initial participants in WaterFix in 2011–12, to gain an idea of possible water savings from this new service. This analysis is preliminary and restricted, due to the small number of properties with sufficient water use data available after the service has been completed.

Estimates made this early in the delivery of a project may be biased. Water saving estimates are significantly influenced by the type of fitting that was replaced as part of the service. Initial estimates may reflect the most common fittings and the most popular services of the current participants, rather than accurately reflect long-term average water savings that could be expected from the new WaterFix service.

While noting these potential biases, our preliminary analysis of around 480 initial participants in the new WaterFix service indicates that, on average, each property is likely to save around 27,000 litres a year.

This is higher than the average water savings from Sydney Water’s former WaterFix Program and Toilet Replacement Program, which saved about 21,000 and 24,000 litres a year per property, respectively.

### 5.3.2 Hardship analysis

To help Sydney Water deliver the PlumbAssist service and other hardship programs for customers in financial hardship, we analysed billing and water use records. This helps us identify customers that are in debt and have high water use.

The analysis provided us with information on the length of time a customer has been in debt and if this is likely to have been related to plumbing problems. We then contacted potential customers who could benefit and assessed them for eligibility for PlumbAssist or other services that may be able to help them manage their payment difficulties.

Analysis done in 2011–12 also highlighted particular suburbs that may benefit most from different types of targeted assistance, such as information stalls at community centres, working with charity organisations or mail-outs.

We will continue analysis in 2012–13 to help us deliver these types of services in the future.

## 5.4 Water Conservation Program Implementation Review

In 2011–12, Sydney Water reviewed its *Water Conservation Strategy* from 1995 to 2010 to capture information on how we had developed and implemented water efficiency programs. The review focused on practicalities, such as engaging suppliers and contractors, developing partnerships with business customers, managing databases and IT support, but did not consider program water savings and costs.

The review also captured lessons staff had learnt by implementing programs over the last 15 years. This will preserve corporate knowledge that may benefit the development of future Sydney Water programs, and assist other water utilities. Results of the review will be published in 2012–13.

## 5.5 Pipe condition assessment

Sydney Water is the leading industry partner in a \$16 million five-year international research project to examine when and why critical water mains burst. This research will develop advanced condition assessment and failure prediction techniques that can help us better evaluate remaining pipe life. The research outcomes will be used to better target critical mains renewals and reduce pipe bursts. As part of this project, current and emerging condition assessment tools will be evaluated in the world's first large diameter test bed pipe.

The Sydney Water test bed pipe is now established in Sydney. We began researching condition assessment technologies in January 2012. We have already tested various technologies, providing valuable baseline data for research. The research program will continue over the next four years.

## 5.6 Leak detection

Work continued in 2011–12 to trial different technologies to identify accurate and cost-effective ways to detect leaks, where conventional techniques used for smaller diameter mains are unsuitable.

We successfully carried out leak detection surveys on two trunk mains over a distance of 14 km, using 'SmartBall' technology. In 80 km of trunk mains we also assessed four other devices that both detect and locate leaks.

We are still validating results of the leaks found during these assessments and evaluating the technology trials. The project is due to finish in December 2012.

## 5.7 Smart Grid Smart City

Smart Grid Smart City is a federally funded project that Sydney Water is participating in with Ausgrid. The project aims to determine the benefits of integrating advanced metering infrastructure for water and energy. It will show how receiving real time water and energy use information affects customer behaviour, and will provide high quality information on household leaks.

The project includes trials at five locations in Sydney and Newcastle. Metering equipment is likely to be installed later in 2012. The project is due to finish in December 2013.

## 5.8 Smart Home

The Smart Home project aims to showcase current best practice in efficient household products and appliances.

The home provides a real life laboratory for testing products and appliances that will help reduce energy use and greenhouse gas emissions and reduce water use in the home. We believe this is the first home in Australia to use recycled water for clothes washing.

In 2010, the first family moved into the Smart Home in Newington. They used about 17% less water over their 18 month stay than a water efficient household of the same size in Sydney.

In April 2012, a new family moved into the home to trial these technologies and provide feedback to the community via a blog.



Figure 9 A water efficient garden in the Smart Home at Newington



## 5.9 Smart metering residential project

As noted in the 2010–11 Water Efficiency Report, Sydney Water trialled a Smart Metering Residential Project with over 600 properties and almost 2,000 customers in Westleigh in Sydney's north-west, to assess the costs and benefits of smart metering technology. We installed automatic meter reading devices on residential water meters to enable remote meter readings. Some customers also trialled a digital in-home display that provided real time water-use information. The project was completed in June 2011.

Further results from the trial show an overall 7–10% reduction in water use in households fitted with a digital in-home display. About 80% of the properties in the study had a leak at some time during the project and between 10–17% of properties had leaks on any given day.

The overall findings from this project suggest that smart metering is costly and there are limitations to the technology currently available. However, it is an effective tool to detect leaks and influence customers' water use through in-home displays.

## 5.10 BASIX multi-dwelling monitoring study

The aim of this study is to determine if multi-unit dwellings built under the NSW Government's BASIX policy are achieving the 40% water savings target. The field data collected as part of this study will also help Sydney Water determine whether to revise its infrastructure design criteria for multi-dwelling developments.

The Department of Planning and Infrastructure is helping Sydney Water with this project, which began in May 2011. To date, six properties have agreed to participate in the study and their water use is currently being monitored.



**Figure 10** An apartment building taking part in the BASIX multi-dwelling monitoring study

## 5.11 Recycling research projects

In 2011–12, Sydney Water took part in a number of projects with research partners on water recycling. These included:

- participating in a National Water Commission project to evaluate biological assays as a screening tool for recycled water quality
- working with the University of NSW via an Australian Research Council grant to develop tools to detect failures in recycled water treatment and distribution, and detect cross connections
- contributing to a Water Quality Research Australia project to develop an online sensor to detect recycled water contamination of drinking water.

Ongoing research projects we contributed to in 2011–12 and will continue to be involved with in 2012–13 include:

- participating in a Water Quality Research Australia project to develop suitable and safe testing methods for membrane integrity, specifically in relation to viruses
- participating in an Australian Water Recycling Centre of Excellence project to develop a national engagement and demonstration program to support recycled water as a supply option for drinking water
- providing advice to the Australian Water Recycling Centre of Excellence on developing a consistent validation framework for recycled water treatment processes across Australia
- participating in a research project through the Australian Water Recycling Centre of Excellence to build industry capability to make recycled water investment decisions. Sydney Water has contributed both funding and in-kind support to this project
- funding a PhD project through the University of Technology Sydney to understand the full costs and benefits of small-scale recycled water schemes.

## 5.12 Recycling database

In 2011–12, Sydney Water developed the Knowledge Bank database to capture information and outcomes from investigations into proposed recycled water schemes over the last 13 years. The database provides a quick reference resource to address general customer enquiries and will help us to streamline the provision of advice on potential schemes.

We plan to continue to add to the database as other recycled water proposals are investigated.

## 6 Planning future water and wastewater services

### Planning for a liveable city

Sydney Water's *Operating Licence* requires us to consider water efficiency and other water conservation measures when planning for the delivery of future services.

Our design guidelines and approach to planning take into account water efficiency, leak management and recycling, as well as the impact of regulatory measures.

### 6.1 Servicing and asset strategies

Sydney Water's servicing and asset strategies provide direction when we develop future products and services. They enable us to continue to provide water and wastewater services that meet customer and community needs.

The strategies include current customer requirements and the changing commercial, social, regulatory and physical environment in which Sydney Water operates. They also guide Sydney Water staff and management on how to maintain existing assets and services while planning for future challenges like population growth, climate change impacts and policies, and changes to legislation, including those that promote competition in the water industry.

Overall, the strategies help ensure that Sydney Water's products and services are aligned with community expectations and are delivered efficiently.

Water efficiency is specifically considered when planning future water related services through the options assessment process used for Area Plans and System Plans. We have adjusted design guidelines to reflect changes in water use due to the success of past demand management programs. We also take into account BASIX, other legislative drivers that improve water efficiency, water efficient fittings and non-drinking water options when developing Area Plans.

### 6.2 Sustainability Planning Manual

Sydney Water's Sustainability Planning Manual was developed in line with the Water Services Association of Australia (WSAA) *Sustainability Framework*. The manual helps us make decisions about infrastructure.

The Sustainability Planning Manual highlights the need to:

- set objectives
- assign appropriate measures to assess options
- engage stakeholders
- identify multiple potential options
- identify the importance of individual criteria (by assigning weights to environment, social, technical and financial impacts) and evaluate options appropriately
- identify how sensitive assessments are to change and further compare options.

The Sustainability Planning Manual works within Sydney Water's Strategic Asset Management Framework. It has been applied to the decision making process for Sydney Water projects such as growth planning, the biosolids strategy, the cost of carbon abatement and for managing wet weather sewer overflows.

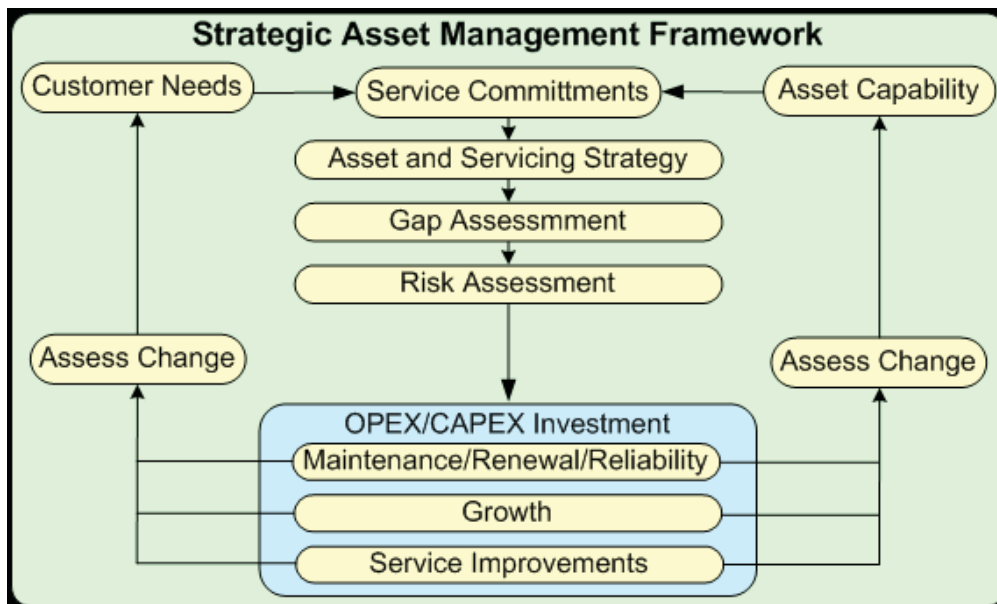


Figure 11 Sydney Water's Strategic Asset Management Framework

### 6.3 Options library

The options library is a centralised source of up-to-date information on major aspects of water-related servicing options, especially for urban growth areas. Examples of resource documents in the library include rainwater tanks, recycled water reticulation, sewer mining and decentralised wastewater systems. The library also contains tools to help planners estimate relative drinking water savings and energy requirements for different servicing options, based on Sydney Water's current understanding of expected water use.

The options library allows us to more easily and consistently compare options. It forms a strong base of information to help us compare different servicing approaches and develop servicing strategies. This follows the multi-criteria analysis set out in the Sustainability Planning Manual.

### 6.4 Strategic Infrastructure and Resource Review

During 2011–12, Sydney Water finalised a strategic review of its products and services. This involved analysing future threats, risks and opportunities to providing services from an infrastructure perspective.

The review considered potential impacts of population and demographic changes, as well as water efficiency. Scenario analysis supporting the review considered risks and opportunities around different infrastructure approaches for recycling water and other resources such as nutrients and energy.

Information and outcomes from this review are now being used by Sydney Water planning staff.

### 6.5 Capital Investment Prioritisation Framework

In 2012, Sydney Water revised its capital investment framework to align with Sydney Water's *Corporate Strategic Plan 2012–16*. The strategic plan establishes a view of valued water solutions and a mission of putting customers front of mind and contributing to liveable cities.

The aim of the renewed framework is to help Sydney Water identify the best mix of projects that balance managing risk with achieving value for the customer. We determine customer value by considering the potential cost efficiency of a project (for example, the economic level of leakage), the long-term benefits the project will provide (for example, meeting the long-term demand for water) and customer demand for the project.

The new framework will be used for capital investment planning from 2013–14 onwards.



## 7 Projects planned for 2012–13

### Looking to the year ahead

In 2012–13, Sydney Water will continue to undertake and promote water efficiency, water recycling and leak management projects.

We will continue to refine our new approach to residential water efficiency, focusing on customers who are experiencing financial hardship, and work with businesses and councils through a partnership approach.

We will keep working on ongoing and new analysis and research projects, to work out how to deliver initiatives more cost-effectively, understand water use patterns and trends, and investigate potential future water efficiency, leak management and recycling projects.

### 7.1 Water efficiency services

#### 7.1.1 PlumbAssist

In 2012–13, Sydney Water's key focus for residential water efficiency will be to continue to provide a proactive, tailored water efficiency service for customers in financial hardship who are high water users.

As we gain more experience in delivering PlumbAssist, we will consider ways to deliver the service more efficiently. Changes will focus on administrative and operational efficiencies within Sydney Water. We do not expect changes to affect our PlumbAssist customers. The service will remain free of charge.

We will also continue to refine estimates of water savings from the PlumbAssist program.

Sydney Water's estimated expenditure for PlumbAssist in 2012–13 is about \$450,000.

#### 7.1.2 WaterFix service

In 2012–13, Sydney Water will review the financial viability of the new WaterFix service to ensure that it can be delivered on a cost-recovery basis, as part of our continual review of water efficiency initiatives. We will consider customer demand for the service as part of this review.

Depending on customer demand, we estimate that costs and savings will be similar to those achieved through the new WaterFix service in 2011–12, as listed in Appendix 5

#### 7.1.3 Business Customer Services

In 2012–13, Business Customer Services (BCS) will continue working with businesses to achieve sustainable water management.

BCS initiatives planned for 2012–13 include:

- benchmarking water use for significant business customers (customers using more than 150,000 litres a day)
- monitoring water use and working with businesses to investigate any large increases in use.

Sydney Water is also playing a key role in developing the National Business Water Efficiency Benchmark tool (NBweb). This tool is being developed in collaboration with other Australian water utilities and the Water Services Association of Australia (WSAA).

The Council Partnerships Program is scheduled to run until 30 June 2013. We have contracted BMT WBM to run the program in 2012–13. BMT WBM will engage additional councils to achieve further water savings with small to medium water use businesses.

The 2012–13 budget for BCS is about \$957,000 (including the Council Partnerships Program). BCS expects to achieve water savings of around 1.5 million litres a day in 2012–13.

#### 7.1.4 Education initiatives

From 2012–13, Sydney Water will focus its education initiatives on increasing customers' understanding of the urban water cycle, the value of water, and water services for sustainable and liveable cities. Water efficiency information will be integrated into education initiatives and resources provided on the Sydney Water website.

In 2012–13, Sydney Water will research customer needs to inform planning and development of a professional development program for educators, including teachers,

lecturers, and local and state government educators. We aim to increase educators' capability and confidence to explore issues, complexities and innovations in sustainable water services.

Sydney Water will also continue to conduct educational tours of operational sites and at the Water Recycling Education Centre. These tours include information on the role of water efficiency in Sydney Water's operations and as part of broader sustainable water management.

### 7.1.5 Communicating with customers

In 2012–13, Sydney Water will continue to inform customers on how to use water efficiently in the home, in the garden, in business and in schools through the Sydney Water website.

We will also promote our water efficiency services through the website and customer newsletter, *Waterwrap*.

We will continue to refer customers who may benefit from PlumbAssist through the Sydney Water Contact Centre, the BillAssist program or by direct contact.

## 7.2 Water Conservation Support

### 7.2.1 Research & Development projects

In 2012–13, Sydney Water will continue to be involved with the following research projects:

- Smart Grid, Smart City
- Smart Home
- BASIX multi-unit monitoring study.

Project details are included in Section 5.

### 7.2.2 Review of peaking factors

Water use in Sydney has changed significantly in recent years and demand per person is at historically low levels. To ensure we provide infrastructure efficiently and deliver maximum value for customers, we are planning to review how water use is changing, including possible changes in peak demands and how that may influence future network design.

This project will be completed in 2012–13.

### 7.2.3 Monitor water use trends and understand customers

Sydney Water continually monitors water use to identify potential trends and patterns that may influence future demand. This includes understanding the impact of long-term water efficiency initiatives.

In 2012–13, Sydney Water plans to:

- review savings from Water Wise Rules
- further review reductions in demand due to long-term behavioural change
- investigate likely savings from future drought restrictions.

In previous years, Sydney Water has collected data on key end uses of water within the home (such as toilet flushing, clothes washing and showering). We will analyse this data in 2012–13.

We will also investigate broader changes in water uses and assess how they may impact on future water demand. This knowledge will help us plan future services and products that will better meet customer needs.

Outcomes from this work will be also used as inputs to metropolitan water supply-demand planning, which is led by the Department of Finance & Services.

### 7.2.4 Long-term demand forecast

Sydney Water will be developing a long-term (50+ years) demand forecast in 2012–13. This model will be used for Sydney Water's system and financial planning and used by the Sydney Catchment Authority to plan for Sydney's future water supply needs. The long-term demand forecast will be a key input to the review of metropolitan water planning being led by the Department of Finance & Services.

The new long-term forecasting approach will be similar to our new approach to forecast short-term demand. The new model will forecast long-term residential and non-residential demand separately. It will include a number of inputs to enable consideration of the impacts from weather, water prices, recycling, water efficiency, drought restrictions and population changes.

The project will involve consulting with water supply and management agencies. We will complete the first version of the model in 2012–13.

### 7.2.5 Hardship investigation

To help Sydney Water deliver the PlumbAssist and other hardship programs to customers that need them most, we will continue to analyse bills and water use records in 2012–13.

More information, such as demographic data, will be incorporated into this analysis to help us understand how we can better target our assistance.

## 7.3 Leak management

Sydney Water will continue to reduce leaks in its water supply system, where it is cost-effective.

It is estimated Sydney Water will spend about \$6 million on its leak management program in 2012–13.

In 2012–13, we will also continue our involvement with the SmartBall leak detection trial and pipe condition assessment research project. Project details are included in Section 5.

## 7.4 Water recycling

Sydney Water seeks to develop water recycling services that are financially viable.

In 2012–13, we will continue to participate in projects that contribute to our understanding of the viability and support for recycled water schemes. A number of these projects will be done in collaboration with the Australian Recycled Water Centre of Excellence.

Projects details for continuing research projects in 2012–13 are outlined in Section 5.

## 8 Water use forecast

Our current demand forecast predicts a decline in per person water use to about 286 litres per person per day (LPD) in 2014–15.

We expect to keep meeting or exceeding our *Operating Licence* water use target to end of the current licence.

### 8.1 2010–15 Operating Licence water use target

In 2011–12, water use was 297<sup>12</sup> litres per person per day (LPD). Our current demand forecast (see Figure 12) of 286 LPD in 2014–15 assumes average weather conditions.

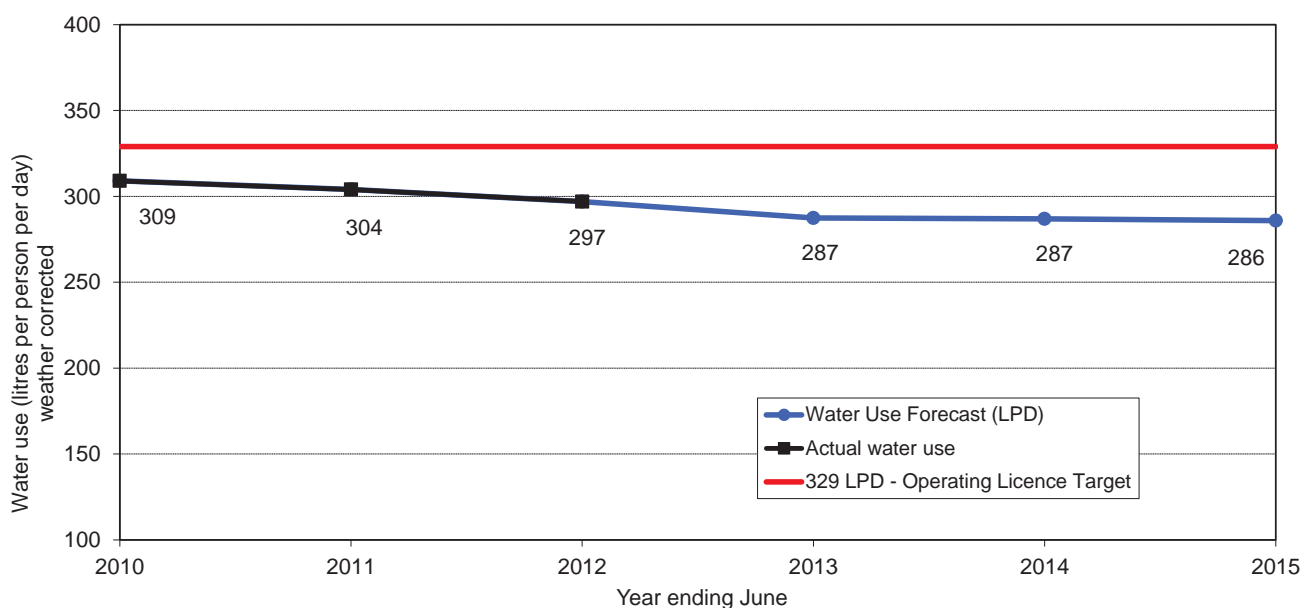
### 8.2 Key factors in forecast

Sydney Water expects total water use to remain below 493 billion litres until the end of Sydney Water's current *Operating Licence*. Key factors influencing this forecast include:

- Rosehill Recycled Water Scheme began operating in October 2011. We expect this scheme will reduce drinking water demand by about 4 billion litres a year from 2012–13.
- A partial shutdown at BlueScope Steel in late 2011–12 reduced its demand for unfiltered water.
- A privately owned and operated recycled

water project at Kurnell planned to begin operating in early 2012–13 will reduce total demand for drinking water.

- A slight decrease in demand resulting from price increases in July 2011 set by IPART. (There is a time lag between when price increases occur and their effect on demand.)
- A continued downward trend in average water use for non-residential properties reflects property growth in industrial and commercial units, which have small per property water use.
- We expect residential customers to continue using water at the low levels of recent years. The most significant factor increasing future demand from this sector is population growth.
- The BASIX program will continue to ensure new residential properties, and significantly altered existing properties, are water efficient.



**Figure 12 Total demand will continue to remain below the *Operating Licence* target until 30 June 2015**

<sup>12</sup> All LPD numbers are weather corrected unless noted otherwise.



## Appendix 1 Reporting requirements

Reporting Manual requirement	Subject	Location in report
Clause 4.1.1	Reduce the quantity of water drawn to 329 LPD by 30 June 2011	Section 1.2, Section 8
	Continue to maintain the water use level for the rest of the licence term (measured at 30 June each year)	Section 1.2, Section 8
	Quantity of potable water drawn in LPD, both uncorrected and corrected for weather	Section 1.2, Appendix 2
	List of current financial year projects, including description, estimate of costs and savings	Section 7
	Update on projects in previous financial year, including description, costs and savings	Section 2, 3, 5 Appendix 5
Clause 4.1.2	Leakage rate including uncertainty band	Section 3, Appendix 4
	Reasons for variation in performance in the preceding financial year and prior years	Section 3
	Discuss major factors that have influenced the water leakage performance: <ul style="list-style-type: none"> <li>• flow measurement (optional)</li> <li>• system water pressure management (optional)</li> <li>• the effectiveness of maintenance (optional)</li> <li>• any research into leakage (optional)</li> <li>• number of bursts, breaks or leaks and average time taken to repair them (mandatory)</li> <li>• length of mains inspected for leakage (mandatory)</li> <li>• program for inspecting and rehabilitating reservoir zones to prevent or correct leakage (mandatory).</li> </ul>	Section 3
	Contribution of leak management activities to objectives and targets outlined in the <i>Metropolitan Water Plan</i>	Section 1
	Economic level of leakage for the preceding financial year (including calculation)	Appendix 3
Clause 4.1.3	Efforts to promote and encourage water recycling	Section 4
	Recycling projects, water end use, annual use of recycled water in each scheme	Section 4
	Contribution of recycling projects to objectives and targets outlined in the <i>Metropolitan Water Plan</i>	Section 1
Clause 4.1.3	Details of planned water efficiency projects including estimate of costs and savings	Section 7
	Details of water efficiency projects in the previous financial year including costs and savings	Section 2 Appendix 5
	Contribution of water efficiency projects to objectives and targets outlined in the <i>Metropolitan Water Plan</i>	Section 1

Table 6 Reporting guide for auditors

## Appendix 2 Correcting for weather

### Weather correction

Climatic conditions have a strong influence on the levels of customer water use, mainly because they affect residential outdoor use. Water use by residential customers is seasonal, with higher use over summer months and lower use during colder winter months. However, the difference in water use between summer and winter has weakened since drought restrictions were implemented. Day-to-day and week-to-week changes in the weather can also cause short term fluctuations in water use, significantly above or below the seasonal trend.

The purpose of weather correction (or 'climate' correction) is to remove, as much as we can, the impact of climatic variations. This helps us determine how much water would have been used under 'average weather conditions'. This is important, as year-to-year total demand figures may show significant variation. Weather correction is necessary to monitor and identify underlying demand trends.

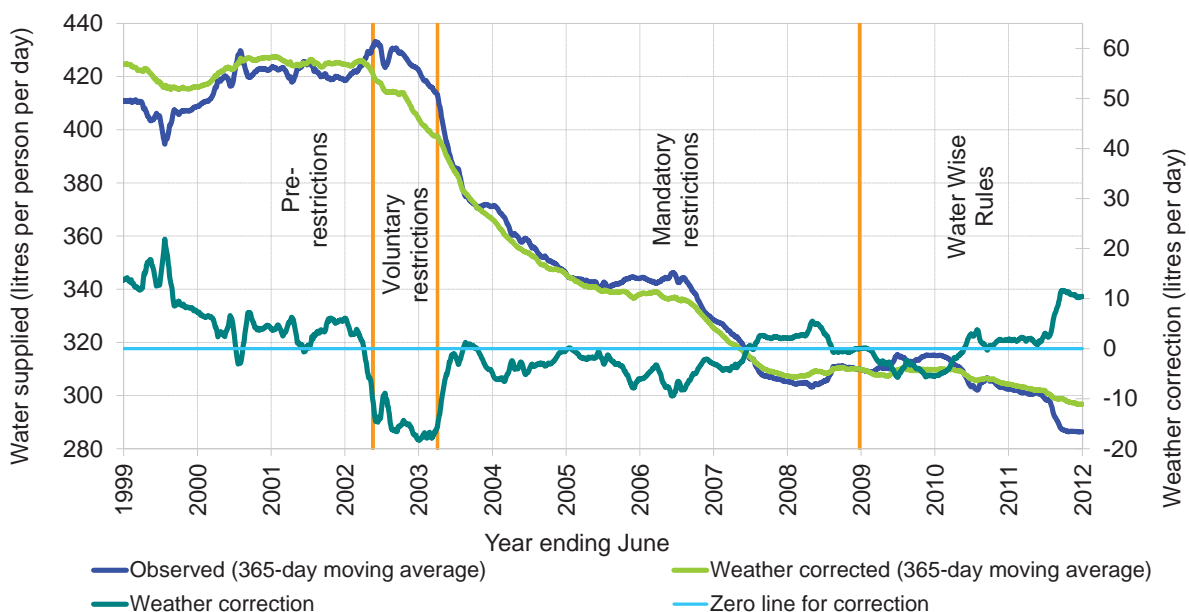
The weather correction model used by Sydney Water does not remove seasonal variations in demand. However, corrections are made for weather conditions (temperature, rainfall and an evaporation index) that are significantly above or below average for that period of the year.

Sydney Water reviewed its weather correction model in 2009–10. As part of the review, we modified the model calibration method and period, to improve the predictive ability of the model. We also updated documentation of the model as part of this process.

### Measuring against an 'average year'

Sydney Water uses a model that reports 'average year' demand as a 365 day rolling average of water use in litres per person per day.

Results from the weather correction model at 30 June 2012 estimate an upward correction to demand (that is, under normal weather conditions we would have used more water than we actually did). The 365-day moving average of demand at 30 June 2012 was 286 LPD with a weather correction of +10.4 LPD<sup>13</sup>. This gives a weather corrected demand of 297 LPD at 30 June 2012. Weather corrected per person demand has been decreasing since early 2002, with the decline steepening after mandatory restrictions were introduced in October 2003.



**Figure 13 The much wetter and cooler weather in 2011–12 meant that each person used over 10 litres less water than they would have in a year with average weather conditions.**

<sup>13</sup> Numbers listed may not balance exactly due to rounding.

## Appendix 3 Calculating the economic level of leakage

The economic level of leakage (ELL) is the point where the cost of reducing leaks equals the value of the water saved. It is based on a least-cost model to determine the best rate of expenditure to manage leaks.

In 2011–12 the ELL was estimated to be 117 million litres a day, being the combined effect of the economically justified programs. The leakage result for 2011–12 was 115 million litres a day, which is within an acceptable range of the ELL.

Initially, Sydney Water determined the economic level of leakage based on the *Best Practice Principles in the Economic Level of Leakage Calculation*, a report published by the United Kingdom water industry regulator, the Office of Water Services, in 2002. The methods in the report are limited to evaluating leak management programs such as Active Leak Detection and Repair.

Over time, we have improved our method for determining the economic level of leakage to include the effects of pressure management. This approach is based on International Water Association best practice customised for Australian National Performance Reporting.

The chart below is a simplified presentation of an economic level of leakage analysis. Higher rates of expenditure result in lower levels of leakage and lower rates of expenditure result in higher levels of leakage. Sydney Water aims to implement a mix of leak management and pressure management programs to achieve the economic level of expenditure, in order to provide value for customers.

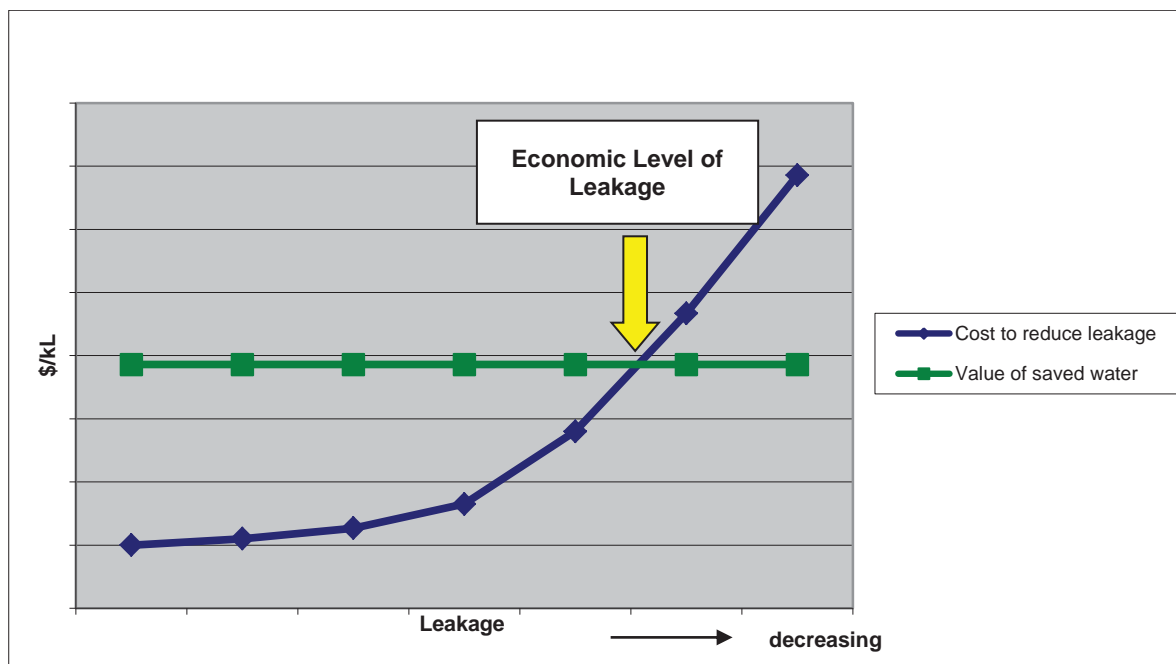


Figure 14 The economic level of leakage

## Appendix 4 Estimating leakage

Sydney Water uses the water balance method to estimate average losses (leakage) from our water supply systems. The water balance is a reconciliation of the volume of water produced by Sydney Water's water filtration plants with all known and estimated end uses subtracted. The remaining volume is deemed to be leakage.

Sydney Water follows the methods, definitions and terminology recommended by the International Water Association (IWA). The Water Services Association of Australia (WSAA) also supports this approach.

Water supplied 481,213	Authorised water use 429,868	Billed authorised use 424,863	Revenue water 424,863	Billed metered use 422,550	
				Billed unmetered use 2,314	
		Unbilled authorised use 5,004	Non-revenue water 56,350	Unbilled metered use 331	
	Water losses 51,346	Apparent losses 9,105		Unbilled unmetered use 4,673	
				Unauthorised use 481	
		Real losses 42,241		Customer meter under- registration 8,623	
	Real losses from distribution system 42,241 - 8%* (115 ML/day)				

\* Percentage in relation to base year of 2005–06

**Table 7 Water Balance table for 2011–12**

Residential	Billed metered water use	Single residence	210,301
		Multi-unit	102,305
		Other	35
Non-residential	Billed metered water use	Industrial	35,060
		Commercial	43,438
		Government	19,129
		Primary producers	1,710
		Other	10,328
Residential and non- residential	Billed unmetered		2,314
	Unbilled metered and unmetered use		5,004

**Table 8 Sectoral water use 2011–12 (ML)**

## Appendix 5 Water savings and program investment in 2011–12

Table 9 lists the water savings achieved by Sydney Water's water efficiency and recycling programs and services in 2011–12. Residential program figures are correct as of 12 July 2012.

Savings from new initiatives that commenced in 2011–12 will build on savings achieved from programs that ran until the date of our *Operating Licence* water use target, 30 June 2011.

Appendix 6 includes an overview of savings achieved by initiatives included in Sydney Water's *Water Conservation Strategies* up to 30 June 2011.

Program/service	2011–12	
	Water savings (ML/yr)	Investment (\$'000, gross)
<b>Water efficiency</b>		
PlumbAssist	Not available <sup>14</sup>	208
WaterFix	Not available <sup>14</sup>	458
Business Customer Service	39 <sup>15</sup>	565
Council Partnerships	789	249
<b>Leak management</b>		
Active Leak Detection	22,780	2,474
Pressure management	7,636	7,040
<b>Water recycling</b>		
BlueScope Steel	6,838	2,302
Port Kembla Coal Terminal	353	
Wollongong Golf Club	19	
Wollongong City Council	3	
Industrial Foundation <sup>16</sup> and Rosehill Racecourse	2,156	11,219
Rouse Hill residential	1,873	1,483
Other minor schemes	1,949	319
Hoxton Park Recycled Water Scheme (under construction)	-	35,614
<b>Total</b>	<b>44,435<sup>17 18</sup></b>	<b>61,930</b>

**Table 9 Water savings and program investment in 2011–12**

<sup>14</sup> It is not possible to estimate water savings from these programs at this time. Refer to Section 2 and Section 7 for a more detailed explanation.

<sup>15</sup> Water savings achieved above the *Water Conservation Strategy 2010–15* commitment to maintain non-residential water savings. Total savings achieved by Business Customer Services in 2011–12 was 588 million litres a year.

<sup>16</sup> This refers to customers provided with recycled water from the Rosehill Recycled Water Scheme.

<sup>17</sup> This total does not include water savings achieved from the PlumbAssist or WaterFix services. It is not possible to estimate water savings from these programs at this time. Refer to Section 2 and 7 for a more detailed explanation.

<sup>18</sup> The total water savings does not include water savings achieved from programs that are no longer running. Water savings and investment for these past programs are listed in Appendix 6

## Appendix 6      Savings achieved between June 1999 to June 2011

Sydney Water first developed a five-year *Water Conservation Strategy* in 1995, in accordance with our *Operating Licence*. Each *Operating Licence* since then has included this requirement and we have developed a strategy to cover each licence period.

In 1995, there was little information to help customers save water and no regulation to promote water efficiency. Sydney Water provided information and education, and developed an extensive range of programs, rebates and incentives to help customers reduce water use.

Our water efficiency programs began in earnest in 1999. Water efficiency programs implemented by Sydney Water have been extremely successful in reducing water use, seeing water savings grow to 121 billion litres a year by the end of June 2011 (Table 10). Savings from these initiatives should continue in the future, despite the completion of the programs, as water efficient fixtures installed and behaviours established under these programs continue to affect water use.

While total water savings from water efficiency programs continued to increase each year, annual growth in savings from residential water efficiency programs peaked in 2006–07, then began to decline. A similar pattern occurred in the non-residential sector from 2007–08. This downward trend in savings growth occurs because of a natural decline in the ability of programs to generate new savings as time passes. Interested customers are most likely to participate in the early stages of a program. As the program continues, cumulative savings continue to increase but the rate of new savings achieved each year slows down. Some programs, such as rebates, are intentionally designed to be in place for a limited period of time. For example, rebates may be used to shift market preference or to provide just enough financial incentive to encourage customers to take up initiatives they had been deferring because of cost. When the desired effect is achieved, the rebate is removed.

The key objective of our *Water Conservation Strategy* when it was first developed was to meet our *Operating Licence* water use target of 329 litres per person per day (LPD) by 30 June 2011. This objective has been retained in subsequent strategies developed by Sydney Water to comply with *Operating Licence* requirements. At 30 June 2011, water use was well under the target and remains so. We expect to continue to exceed the water use target until the end of the current licence period.

We have always reviewed and adapted our water efficiency programs to ensure they are cost effective and targeting the largest uses of water. As we approached the date of the water use target, our analysis showed that many of our water efficiency programs were approaching maturity and that future water efficiency gains would largely be achieved through regulatory measures that Sydney Water does not implement.

After more than a decade of sustained effort, there is now little scope for the broad-scale water efficiency programs implemented by Sydney Water in the past to continue to produce additional water savings cost-effectively. From July 2011, Sydney Water's water efficiency focus has been to develop new cost-recovery services and provide services to help customers experiencing financial hardship.

**Table 10 Yearly water savings (ML/year) achieved through Sydney Water's Water Conservation Strategy between the end of June 1999 and end of June 2011**

Program	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11 <sup>19</sup>
<b>Residential</b>												
WaterFix	765	2,525	3,559	4,285	4,889	5,901	7,270	9,002	9,747	9,918	10,030	10,144
DIY Water Saving Kits						40	180	618	911	776	799	785
Washing Machine Rebate				10	118	118	260	1,172	2,430	3,056	3,551	3558
Toilet Replacement Service								7	14	224	423	558
Dual-Flush Toilet Rebate											29	235
Hot Water Circulator Rebate											0	<1
Rainwater Tank Rebate				31	155	481	928	1,394	1,868	1,765	2,066	2,154
Love Your Garden					5	157	198	524	1,150	2,015	174	174
Education, water saving measures and pricing												
<b>Business</b>												
Business programs			680	2,298	4,307	5,767	8,116	12,250	20,058	23,181	22,576	22,577
Top 100 Online Monitoring										0	247	296
Smart Rinse								1	260	767	1,074	1,189
BizFix								12	12	0	349	373
Hospitals Sustainability Initiative											0	0
Council Partnerships											91	624
<b>School</b>												
Every Drop Counts in Schools								102	102	219	194	218
School Amenities Replacement											0	237
Rainwater Tanks in Schools						3	21	38	43	46	47	47

<sup>19</sup> 2010-11 water savings estimates for WaterFix, Dual flush toilet and hot water circulator rebate programs are different from what was reported in the *Water Efficiency Report 2010-11* as program participation data was finalised after the report was published due to time lags with data entry and the extension for rebate program applications until the end of September 2011.

Program	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11 <sup>19</sup>
<b>Leak reduction</b>												
Active Leak Detection	949	5,439	9,089	12,374	15,148	16,790	18,506	20,915	21,974	22,959	24,018	24,098
Pressure Management							102	161	840	3,431	4,803	6,081
Improved leak/break response times								730	730	730	730	730
<b>Recycled water</b>												
Existing WWTP reuse and minor recycling	5	5	5	5	626	671	1,838	2,101	2,047	2,160	2,083	1,970
Rouse Hill Recycled Water Scheme (Stage 1 & 2)				313	1,337	1,370	1,698	1,652	1,402	1,704	1,513	1,548
Wollongong Recycled Water Scheme Stage 1 (BlueScope Steel) & Stage 2								4,335	6,652	4,398	6,657	7,088
Botany - Orica (non-Sydney Water scheme)								200	529	927	1,278	1,643
SOPA (non-Sydney Water scheme)				850	778	588	599	723	767	823	886	787
<b>Regulatory measures</b>												
WELS							431	1,139	1,774	3,220	7,779	9,664
BASIX								949	2,854	3,381	6,032	5,192
Water Wise Rules											19,000	19,000
<b>Pilots</b>												
HiRise											85	189
WaterSmart											10	10
Residential Concealed Leak Detection											181	4
<b>Total</b>	<b>1,719</b>	<b>7,969</b>	<b>13,333</b>	<b>20,166</b>	<b>27,364</b>	<b>31,885</b>	<b>40,147</b>	<b>58,026</b>	<b>76,163</b>	<b>85,848</b>	<b>116,703</b>	<b>121,173</b>



## Appendix 7      Glossary

<b>Building and Sustainability Index (BASIX)</b>	State-wide planning policy that ensures new residential dwellings are designed to use less drinking water and be responsible for fewer greenhouse gas emissions by setting energy and water reduction targets. BASIX also applies to extensions and alterations of existing residential properties.
<b>Economic level of leakage</b>	The point where the cost of leak reduction activities equals the savings from reduced demand.
<b>Recycled water</b>	Recycled water is water that has been used before and is then cleaned again to remove impurities. Recycled water (sometimes called reclaimed water) comes from wastewater, which includes greywater and stormwater. Sydney Water treats recycled water to <i>Australian Recycled Water Guidelines</i> and NSW Health standards so that it is suitable and safe for its intended use.
<b>Sewer mining</b>	The extraction of wastewater upstream and/or downstream of a wastewater treatment plant for treatment and reuse as recycled water.
<b>Stormwater harvesting</b>	The collection, treatment, storage and use of stormwater runoff.
<b>Water Conservation Strategy</b>	In 2010, Sydney Water prepared a five year water conservation strategy document that includes: <ul style="list-style-type: none"> <li>• strategies relating to water leakage, recycled water, water efficiency</li> <li>• how these strategies contribute to the objectives and targets outlined in the <i>Metropolitan Water Plan</i></li> <li>• analysis of current and future programs and projects</li> <li>• an outline of water conservation objectives, targets and timetable for the entire term of the licence.</li> </ul>
<b>Water Efficiency Labelling Scheme (WELS)</b>	National scheme that involves mandatory water efficiency rating and labelling for a range of appliances and fittings.
<b>Water Wise Rules</b>	Long-term water saving rules introduced by the NSW Government in June 2009. The rules focus on simple, common-sense behaviours, such as watering in the cool parts of the day, no hosing of hard surfaces and fitting hand-held hoses with trigger nozzles.
<b>Weather Correction</b>	The removal of year-to-year variation in water use relating to changes in weather conditions.

## Appendix 8 List of acronyms and units

<b>BASIX</b>	Building Sustainability Index
<b>ILEP</b>	Irrigation and Landscape Efficiency Project
<b>IPART</b>	Independent Pricing and Regulatory Tribunal
<b>IWA</b>	International Water Association
<b>LPD</b>	Litres per person per day
<b>OEH</b>	Office of Environment and Heritage
<b>NSW</b>	New South Wales
<b>SOPA</b>	Sydney Olympic Park Authority
<b>WELS</b>	Water Efficiency Labelling and Standards
<b>WSAA</b>	Water Services Association of Australia
<b>m</b>	metres
<b>L</b>	litres
<b>kL</b>	kilolitres
<b>km</b>	kilometres
<b>ML</b>	megalitres

# **Operating Licence 2010-2015 Compliance Report**

**Priority Sewerage Program Annual Report 2011-12**

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# 1 Introduction

## 1.1 Purpose of this report

This report has been prepared to comply with the 2010-2015 Operating Licence requirement (clause 3.6 (f)) to provide an annual report on progress in implementing the Priority Sewerage Program (PSP) to IPART in accordance with the Reporting Manual. The Reporting Manual requires the report to be submitted by 1 September each year.

## 1.2 Background

The environment can be negatively impacted in areas where there are a high proportion of unsewered properties. Around 97 per cent of the 1.8 million properties in Sydney Water's area of operations are sewerage. Where existing properties are unsewered, improved sewerage services may be required to meet environmental standards determined by environmental regulators.

In February 1997, the NSW Government announced the Priority Sewerage Program (Stage One), which identified 16 suburbs, towns and villages with high environmental sensitivity for improved sewerage services. In December 2001, the Government announced the extension of the Program (Stage Two) to an additional 20 unsewered urban village areas within Sydney Water's area of operations.

The 2005-2010 Operating Licence required completion of the Stage 1 PSP schemes by 30 June 2009 (with the exception of Menangle and Menangle Park, which have been carried over from Stage 1). The Licence also required that Sydney Water commence work, which when completed, will allow connection of at least 30 per cent of lots eligible under Stage 2 of the program by 30 June 2009. These targets were met.

The 2010-2015 Operating Licence sets further targets for completion of the PSP schemes and was amended on 28 October 2011 to include targets for the delivery of an additional eight areas in Stage 3.

## 1.3 Obligations under the Operating Licence 2010-2015

Clause 3.6 of the Operating Licence 2010-2015 sets out the following requirements for the Priority Sewerage Program:

(a) *Sydney Water must continue with the planning and delivery of the Priority Sewerage Program such that wastewater services are provided to the number of lots detailed in Schedule 4 in the following areas by the dates specified below:*

- (1) *Agnes Banks and Londonderry by 31 December 2012*
- (2) *Glossodia, Freeman's Reach and Wilberforce by 31 December 2012*
- (3) *Yellow Rock and Hawkesbury Heights by 31 December 2012*
- (4) *Appin by 30 June 2015*
- (5) *Wilton and Douglas Park by 30 June 2014*
- (6) *West Hoxton by 30 June 2014*
- (7) *Bargo and Buxton by 30 June 2014*
- (8) *Cowan by 30 June 2014*
- (9) *Galston and Glenorie by 30 June 2015*

(b) *Sydney Water will commence planning for Yanderra by 30 June 2015*

*(c) If either Sydney Water or a licensee under the Water Industry Competition Act 2006 provides wastewater services to a significant development (as determined by the Minister) in an adjoining area to one of the following areas in the Priority Sewerage Program:*

*(1) Austral*

*(2) Menangle and Menangle Park*

*Then Sydney Water must deliver the Priority Sewerage Program in that area such that wastewater services are made available to customers within 24 months of wastewater services being available to service the significant development.*

*(d) Clause 3.6 (b) does not apply where a licensee under the Water Industry Competition Act 2006 provides wastewater services to the relevant area of the Priority Sewerage Program.*

*(e) Should delays caused by consent authorities impair Sydney Water's ability to meet the timeframes set out in the clause 3.6, Sydney Water must write to the Minister to advise of the reasons for the delay.*

*(f) Sydney Water must provide an annual report on its progress in implementing the Priority Sewerage Program to IPART in accordance with the Reporting Manual.*

## 2 Planning and delivery of the Priority Sewerage Program

### 2.1 Progress against PSP schemes in 2011-12

Sydney Water is on track to meet the Operating Licence targets for delivery of sewerage services to PSP schemes. Progress against individual schemes is outlined below.

#### [Agnes Banks and Londonderry Sewerage Scheme \(31 December 2012\)](#)

Construction of the Agnes Banks and Londonderry scheme started in April 2009. Wastewater services were available to Agnes Banks in March 2010 and Londonderry in December 2010.

#### [Glossodia, Freemans Reach and Wilberforce Sewerage Scheme \(31 December 2012\)](#)

Construction of the Glossodia, Freemans Reach and Wilberforce Sewerage Scheme commenced March 2009. Wastewater services were available to Freemans Reach in March 2010, Glossodia in July 2010 and part of Wilberforce in October 2010. Wastewater services were available to the remaining part of Wilberforce in January 2011.

#### [Yellow Rock and Hawkesbury Heights Sewerage Scheme \(31 December 2012\)](#)

Wastewater services became available to Hawkesbury Heights in March 2010 and Yellow Rock in June 2010.

#### [Appin Sewerage Scheme \(30 June 2015\)](#)

Environmental and funding approval for the scheme was received in October 2010. Construction of the Scheme commenced in December 2010 and wastewater services were available at the end of June 2012.

#### [Wilton and Douglas Park Sewerage Schemes \(30 June 2014\)](#)

Detailed planning for both schemes is complete. Construction of both schemes is expected to commence in early 2013. Wastewater services are expected to become available in June 2014.

#### [West Hoxton Sewerage Scheme \(30 June 2014\)](#)

Detailed planning for the West Hoxton Sewerage Scheme is complete. Construction is expected to commence in early 2013. Wastewater services are expected to become available in June 2014.

#### [Bargo and Buxton Sewerage Schemes \(30 June 2014\)](#)

Detailed planning for both schemes is complete. Construction of both schemes is expected to commence in early 2013. Wastewater services are expected to become available in June 2014.

#### [Cowan Sewerage Scheme \(30 June 2014\)](#)

Detailed planning for the Cowan Sewerage Scheme is complete. Construction of both schemes is expected to commence in early 2013. Wastewater services are expected to become available in June 2014.

#### [Galston and Glenorie Sewerage Schemes \(30 June 2015\)](#)

Detailed planning for both schemes is scheduled to commence in December 2012. Construction of both schemes is expected to commence in early 2014. Wastewater services are expected to become available in June 2015.

#### [Planning for Yanderra \(30 June 2015\)](#)

Planning for Yanderra will commence by 2015.

### 2.2 Significant developments adjoining PSP areas

There are no significant developments (as determined by the Minister) near the villages detailed in clause 3.6(c).

## 2.3 Delays by consent authorities

No delays of the nature described in Operating Licence clause 3.6(e) occurred during 2011-12.

## 2.4 Advice from the Office of Environment and Heritage

The Office of Environment and Heritage (OEH) has not provided advice on any schemes required to address significant detrimental environmental impact outside of those already nominated in the recent change to Sydney Water's Operating Licence.

## 2.5 Ministerial directives

The 2010-2015 Operating Licence was amended on 28 October 2011 to include additional projects for completion under the Priority Sewerage Program. Clause 3.6 was amended to include schemes for Wilton, Douglas Park, West Hoxton, Bargo, Buxton, and Cowan for completion by 30 June 2014. Also, Galston and Glenorie by 30 June 2015. Planning for provision of wastewater services for Yanderra is to commence by 30 June 2015.

Section 2.1 of this report provides an update on Sydney Water's progress against these requirements.



# Quarterly Drinking Water Quality Monitoring Report for NSW Health

**Fourth Quarter 2011-12**

1 April 2012 to 30 June 2012

## Distribution list

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### Commercial-in-Confidence

This Drinking Water quality report and the information, ideas, concepts, methodologies, technologies and other material it contains remain the intellectual property of Sydney Water Corporation, unless otherwise agreed.

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This document should be read in conjunction with the Annual Drinking Water Quality Monitoring Plan 2011-12.

## DOCUMENT STATUS

This quarterly report was prepared by the Planning and Reporting Group to comply with the Memorandum of Understanding (MoU) requirement between NSW Health and Sydney Water.

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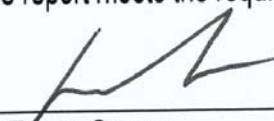


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Endorsement that the report meets the requirements of the MoU



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Date

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# 1. Introduction

It is a condition of Sydney Water's Operating Licence that it must comply with reporting obligations set out in the Reporting Manual for Sydney Water issued by Independent Pricing and Regulatory Tribunal of New South Wales (IPART). Sydney Water must provide to NSW Health within 6 weeks of the end of the quarter an exceptions based drinking water quality report for that quarter. Each quarterly report must include the following information for the exception reporting:

- Details of any exception from the health guideline values and aesthetic guideline values that have been agreed with NSW Health and have been outlined in Appendix G in the Reporting Manual over the previous 12 months. Details should include test results and date or period of non-conformance with these guideline values.
- Appraisal of the exception including discussion of the extent and nature of the exception and an analysis of the risk to public health posed by the exception.
- Explanation of the causes of the exception and any action taken to rectify the exception and prevent it re-occurring.

This Quarterly Drinking Water Quality Monitoring Report covers the **fourth quarterly period of 2011-2012: 1 April 2012 to 30 June 2012**. This report focuses on the compliance monitoring and an evaluation of this data on an exception basis for both health and aesthetic characteristics. The report is to be read in conjunction with the Annual Drinking Water Quality Monitoring Plan 2011-12.

In order to fulfil requirements under Clause 3.1.2 of the Reporting Manual the report is in the following sections:

## Water quality - monitoring results:

- Summary tables of exceptions to health and aesthetic guidelines for all Sydney Water Delivery Systems, for Quarter 4 and rolling 12 months.
- Summary of the percentage compliance to health and aesthetic guidelines for all Sydney Water Delivery Systems, for Quarter 4 and rolling 12 months.
- Summary of the performance of key characteristics (agreed between Sydney Water and NSW Health) using average as the performance measure on year to date data and comments.

## Water quality – compliance characteristics:

- Covers the key drinking water quality compliance characteristics as set out in the Annual Drinking Water Quality Monitoring Plan 2011-12. Results are examined in detail on an exception basis for all delivery systems. This summary will include comments on the extent and cause of the exception and any action taken to prevent reoccurrence.

## Water quality – characteristics not for compliance assessment:

- Covers other drinking water quality characteristics which must be monitored but for which compliance is not required as set out in the Annual Drinking Water Quality Monitoring Plan 2011-12. Results are examined in detail on an exception basis for all delivery systems.

## Water quality – summary of NSW Health notifications:

- This summary table will include both compliance and operational incidents/events that are notifiable to NSW Health as per the Drinking Water Quality Incident Management SOP (WPIMS5228). It will also include any actions and investigations undertaken by Sydney Water to resolve incidents/events.

## 2. Water quality monitoring results

### 2.1 Summary of exceptions in the fourth quarter 2011-12.

Table 1 summarises the exceptions that occurred in each system against the Australian Drinking Water Guidelines 2004. The ADWG 2011 was not formally adopted by Sydney Water during this reporting period. Sydney Water is currently in the process of moving towards adopting the new ADWG 2011 in consultation with NSW Health. The new guidelines for cyanobacteria and turbidity targets for individual filters at the water filtration plants were used for reporting exceptions this quarter.

Fluoride is measured against the requirements of the Fluoridation of Public Water Supplies Act 1957. The table includes samples that are collected at customers' taps for all health guidelines and aesthetic guidelines for which compliance is required.

Free chlorine and monochloramine aesthetic guideline value exceptions have been excluded. Sydney Water has deliberately targeted higher disinfection concentrations in order to improve health related microbiological performance at customers' taps. Sydney Water undertakes two main methods of chlorine disinfection in its water supplies – chloramination (Prospect systems, Macarthur and Woronora) and chlorination (Cascades, North Richmond, Orchard Hills, Warragamba, Nepean and Illawarra). In order to maintain an adequately disinfected supply system, the majority of sample points will have a chlorine residual greater than the aesthetic guideline value. As this is the case we will not discuss each individual chlorine exception, unless it exceeds the health guideline.

Since the 28 January 2010, the Sydney Desalination Plant at Kurnell has been supplying water to parts of Potts Hill Delivery System. The operators of the plant Veolia Water, as part of their contract with Sydney Water have implemented an extensive water quality monitoring program. A summary of the water quality data at the desalination plant can be found on the Sydney Water Website. (<http://www.sydneywater.com.au/WaterQuality/QuarterlyDrinkingWaterQualityReport/>). Any exceptions that occur in the Potts Hill Delivery System, that is sampled as part of the routine compliance monitoring at the customers' tap, will be recorded in this report.

**Table 1: Exception summary for water quality monitoring. – Quarter 4, 2011-12 and rolling 12 months**

An evaluation of results on an exception basis is provided in Table 1. These exceptions do not necessarily indicate an actual or potential failure to meet annual drinking water quality performance requirements. The summary of the health guideline exceptions is taken from Table 11 and 12. The summary for aesthetic guideline exceptions is taken from Table 13 and 14 (excluding free chlorine and monochloramine).

Delivery System	Health guidelines – compliance Quarter 4 (1-04-12 to 30-06-12)	Health guidelines – compliance Rolling 12 months (1-07-11 to 30-06-12)	*Aesthetic guidelines – compliance Quarter 4 (1-04-12 to 30-06-12)	*Aesthetic guidelines – compliance Rolling 12 months (1-07-11 to 30-06-12)
North Richmond	Nil	Nil	10 pH	45 pH
Orchard Hills	Nil	1 <i>E. coli</i>	6 pH	19 pH, 1 turbidity , 1 taste & 1 odour
Prospect South	Nil	Nil	Nil	1 dissolved oxygen
Prospect North	Nil	1 <i>E. coli</i>	7 pH	23 pH, 1 iron, 1 turbidity
Prospect East	Nil	Nil	Nil	Nil
Ryde	1 <i>E. coli</i>	3 <i>E. coli</i>	Nil	2 dissolved oxygen
Potts Hill	Nil	Nil	Nil	3 pH
Warragamba	Nil	Nil	Nil	Nil
Nepean	<sup>^</sup> 4 THMs	<sup>^</sup> 4 THMs	1 pH	3 pH, 1 dissolved oxygen
Macarthur	Nil	Nil	6 pH	24 pH
Illawarra	Nil	Nil	5 pH	10 pH, 2 turbidity
Woronora	Nil	1 <i>E. coli</i>	5 pH	25 pH
Cascades	Nil	Nil	Nil	6 pH, 1 dissolved oxygen

*\*Note: Does not include temperature or aesthetic targets for chlorine, which are reported against health guideline*

*<sup>^</sup>Includes 2 exceptions at Nepean WFP*



## 2.2 Summary of overall performance

The Australian Drinking Water Guidelines (ADWG) 2004 and 2011 recommend that performance be assessed over 12 months and provides guidelines for assessing performance for the various types of characteristics over that period. For the rolling 12 months period covered by this report, Sydney Water's combined delivery systems achieved full compliance against all the characteristics required under the Operating Licence. On an individual delivery system basis the Nepean Delivery System did not comply against the THM health guideline value (see Section 5 for details).

For all of Sydney Water in this quarter 99.93% of the analyses for compliance characteristics met the health guideline values and 98.27% met the aesthetic guideline values. For the rolling 12 months *E. coli* was detected on 6 occasions. However all delivery systems still achieved full compliance for *E. coli* as at least 98% of scheduled samples contain no *E. coli* for the preceding 12 months.

**Table 2: Percentage compliance for water quality monitoring – Quarter 4 2011-12 and rolling 12 months**

%Compliance – All of delivery systems combined						
	Health guidelines – compliance Quarter 4	Health guidelines – compliance Rolling 12 months	*Aesthetic guidelines – compliance Quarter 4	*Aesthetic guidelines – compliance Rolling 12 months	Health & aesthetic guidelines – compliance Quarter 4	Health & aesthetic guidelines – compliance Rolling 12 Months
<b>No. of exceptions</b>	5	10	40	170	45	180
<b>Total no. of samples</b>	7596	30438	5511	22070	13107	52508
<b>Percentage analyses meeting guidelines</b>	99.93%	99.97%	98.27%	99.23%	99.66%	99.66%

*\*Note: Does not include temperature or aesthetic targets for chlorine, which are reported against health guideline*

## 2.3 Performance for key characteristics

The purpose of the table below is to show how key water quality characteristics at customers' taps are performing over time by using average as a performance measure and comparing the results year to date 2011-12 to the same period for 2010-11.

**Table 3: Summary of average results of key characteristics - all delivery systems**

Water Quality Characteristics	YTD 2011-12 01/07/2011 to 30/06/2012	YTD 2010-11 01/07/2010 to 30/06/2011	Comments
<b>Average free chlorine mg/L</b> (chlorinated systems)	0.70	0.51	Chlorine residuals have been levelled to maintain customer satisfaction with taste & odour. Average free chlorine has increased slightly as compared to previous 12 months Sydney Water increased chlorine levels in response to high colour and turbidity in raw water supply to the treatment plants caused by heavy rain in catchment during April.
<b>Average monochloramine mg/L</b> (chloraminated system)	0.97	0.88	Chlorine residuals have been maintained to minimise risk of nitrification.
<b>% of samples containing no <i>E. coli</i></b>	99.93	99.95	Continued very good performance for <i>E. coli</i> .
<b>Average THM's mg/L</b> <ul style="list-style-type: none"> <li>Chlorinated system</li> <li>Chloraminated system</li> </ul>	0.085 <ul style="list-style-type: none"> <li>0.103</li> <li>0.073</li> </ul>	0.059 <ul style="list-style-type: none"> <li>0.087</li> <li>0.043</li> </ul>	Average THM levels have increased slightly as compared to previous 12 months. This was caused by changes to the raw water quality from recent wet weather events.
<b>Average turbidity -NTU</b>	0.13	0.13	Water Filtration Plants have continued to perform well even during wet weather events.
<b>Average pH - pH Units</b>	7.9	7.9	pH levels have remained stable due to a reduction of pH at the outlets of several water filtration plants.
<b>Average nitrite - mg/L</b>	0.046	0.053	Good water quality has helped maintain nitrite levels well within the guideline value.
<b>Customer complaints (average per month)</b> <ul style="list-style-type: none"> <li>Health</li> <li>Taste &amp; odour</li> <li>Discoloured water</li> <li>Other</li> <li>Total</li> </ul>	<ul style="list-style-type: none"> <li>6</li> <li>28</li> <li>146</li> <li>6</li> <li>186</li> </ul>	<ul style="list-style-type: none"> <li>9</li> <li>35</li> <li>185</li> <li>5</li> <li>234</li> </ul>	Total customer complaints have decreased compared to the previous 12 months period. This is due to fewer dirty water complaints, which could be attributed to the introduction of the early warning dirty water alert system by Sydney Water and a reduction in white water complaints.

### 3. Water quality: compliance characteristics

The compliance monitoring is done at customer taps but also includes monitoring of raw and treated water at North Richmond Water Filtration Plant. Sydney Catchment Authority carries out similar monitoring of raw water for the other Water Filtration Plants and Veolia Water carries out monitoring of raw and treated water at the Sydney Desalination Plant.

#### 3.1 Evaluation of results on an exception basis

For compliance characteristics an exception is considered to have occurred in a sample where:

- *Escherichia coli* (*E. coli*) – greater than zero organisms (orgs) per 100 mL.
- Fluoride – result is outside range of 0.9 mg/L to 1.5 mg/L (fluoride is measured against the requirements of the Fluoridation of Public Water Supplies Act 1957).
- For other parameters – the result exceeded the relevant health or aesthetic values in the ADWG 2004.

The data reported in Table 4 are for the quarterly period 1 April 2012 to 30 June 2012.

### 3.1.1 Evaluation of results on an exception basis for all compliance characteristics

**Table 4: Summary of exceptions for compliance characteristics for Quarter 4 2011-12**

Delivery System	No. of exceptions/total no. of samples	Characteristics	Agreed guideline values	Actual Value	Sample date	Address	Comment
North Richmond	10/51	pH	6.50 – 8.50	8.8 8.6 8.6 9.0 8.9 9.0 8.9 9.0 9.0 8.6	29-05-12 15-06-12 16-04-12 14-05-12 20-06-12 2-04-12 22-05-12 5-06-12 26-04-12 15-06-12	88-90 Mitchell Dr, Glossodia " 20 Grono Farm Rd, Wilberforce " " 54 Bathurst St, Pitt Town " " 174 Spinks Rd, Glossodia "	Quarterly system average was 8.0.
Orchard Hills	6/111	pH	6.50 – 8.50	9.1 9.0 8.7 8.7 8.6 8.6	12-04-12 10-05-12 26-06-12 12-04-12 10-05-12 18-04-12	56 Terrymont Rd, Warrimoo " " 114 Richard Rd, Warrimoo " 22 Aldinga Pl, Claremont Meadows	Quarterly system average was 7.9.
Prospect South	Nil exceptions this quarter						
Prospect North	7/261	pH	6.50 – 8.50	8.7 8.9	11-04-12 3-05-12	64 Commercial Rd, Vineyard "	Quarterly system average was 8.0.

Delivery System	No. of exceptions/total no. of samples	Characteristics	Agreed guideline values	Actual Value	Sample date	Address	Comment
				9.0 8.6 8.6 8.6 8.7	14-06-12 23-04-12 25-05-12 3-05-12 14-06-12	" 7 Constitution Rd, Wentworthville " 636 Old Pitt Town Rd, Oakville "	
<b>Prospect East</b>	Nil exceptions this quarter						
<b>Ryde</b>	1/264	<i>E. coli</i>	0 Orgs/100mL	1	15-06-12	5 Cassino Cl, Allambie Heights	NSW Health was notified and repeat samples did not detect <i>E. coli</i> . For full details of investigation see section 5.
<b>Potts Hill</b>	Nil exceptions this quarter						
<b>Warragamba</b>	Nil exceptions this quarter						

Delivery System	No. of exceptions/total no. of samples	Characteristics	Agreed guideline values	Actual Value	Sample date	Address	Comment
Nepean	1/39	pH	6.50 – 8.50	8.6	24-05-12	27 Devitt Cres, The Oaks	Quarterly system average was 7.9.
	2/6 (customer taps)	Total trihalomethanes	0.25 mg/L	0.254	24-04-12	14 Station St, Thirlmere	The THM exceptions were caused by changes to the raw water quality from recent wet weather events. Sydney Water responded by initially increasing chlorine levels to maintain adequate disinfection as recommended in the ADWG 2011. Sydney Water has reviewed changes to the raw water quality versus the level of chlorination at the treatment plant and subsequent THM results have been below the guideline level. NSW Health was notified. For full details of investigation see section 5.
	2/3 (WFP)			0.255	7-05-12	5 Weeta St, Picton	
				0.293	9-04-12	Nepean WFP	
				0.261	1-05-12	"	
Macarthur	6/123	pH	6.50 – 8.50	8.7	7-05-12	9 Gowan Pl, Denham Court	Quarterly system average was 7.9.
				8.8	1-06-12	"	
				8.9	2-04-12	55 Cubitt Drive, Denham Court	
				8.6	28-05-12	"	
				8.8	14-06-12	"	
				8.7	1-05-12	143 Camden Rd, Douglas Park	
Illawarra	5/192	pH	6.50 – 8.50	8.8	4-04-12	38 Osbourne St, Gerringong	Quarterly system average was 7.8.
				8.6	21-06-12	"	
				8.6	16-04-12	14 Haig St, Wombarra	
				8.6	04-04-12	45 Stafford St, Gerroa	
				8.6	04-04-12	39 Wollonyuh Cres, Horsley	

Delivery System	No. of exceptions/total no. of samples	Characteristics	Agreed guideline values	Actual Value	Sample date	Address	Comment
<b>Woronora</b>	5/66	pH	6.50 – 8.50	8.6 8.7 8.6 8.6 8.7	24-05-12 6-06-12 29-05-12 16-05-12 16-05-12	3 McAuley Cl, Heathcote " 41 Dandarborg Ave, Bangor 14 Tamarind Pl, Alfords Point 5 Bundarra St, Waterfall	Quarterly system average was 8.0.
<b>Cascades</b>	Nil exceptions this quarter						

## 4. Water quality: other characteristics not for compliance assessment

Water quality characteristics that are monitored but do not have a guideline value by the ADWG 2004 and 2011, such as *Cryptosporidium*, *Giardia*, and Cyanobacteria (North Richmond only) are reported in this section. These characteristics are not included for compliance assessment and have been agreed between Sydney Water and NSW Health. These characteristics are documented in the Annual Drinking Water Quality Monitoring Plan 2011-12. A summary of any exceptions for these characteristics can be seen in Tables 5, 6, 7, 8 and 9.

### 4.1 Evaluation of results on exception basis

A summary of any exceptions for these characteristics is based on the following definition of an exception for non-compliance characteristics.

An exception is considered to have occurred in a sample where:

- *Cryptosporidium* – greater than zero oocysts in any sample volume. The exceptions for *Cryptosporidium* are reported for both IFA positive and DAPI confirmed positive results.
- *Giardia* – greater than zero cysts in any sample volume. The exceptions for *Giardia* are reported for both IFA positive and DAPI confirmed positive results.
- Cyanobacteria – The notification procedure is a two tiered framework, which includes an initial notification to NSW Health and an alert level for cell counts and biovolumes based on toxin produced by specific cyanobacteria. (see Table 9).

The data reported in Tables 5, 6, 7, 8 and 9 are for the quarterly period from 1 April 2012 to 30 June 2012.

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Table 5: Summary of exceptions for *Cryptosporidium* IFA positive

Quarter 4 (01-04-2012 to 30-06-2012)				
CRYPTOSPORIDIUM (IFA POSITIVE)				
Site	No. exceptions /total no. samples	Guideline value	Notable exception data	Comment
<u>Raw Water</u>				
Warragamba Pipeline 1 & 2 and Inlet to Prospect WFP Composite	6/78	No guideline value set. Tested as a precautionary measure.	1 oocyst/20L – 12-04-12, 17-04-12 1 oocyst/15L – 26-05-12, 13-06-12, 21-06-12 2 oocysts/20L – 19-04-12	The SCA continue to investigate potential sources of <i>Cryptosporidium</i> in the Upper Canal. Also the results of the routine raw and treated water samples are being reviewed in consultation with Sydney Water and NSW Health.
Upper Canal Prospect (HPR1 & HPR3)	3/15		1 oocyst/10L – 19-04-12, 15-06-12 2 oocysts/10L – 13-06-12	The Upper Canal at Prospect is analysed separately in response to either <i>Cryptosporidium</i> and/or <i>Giardia</i> detections in the Prospect raw water composite sample of the same date.
Inlet to Macarthur WFP	1/13		1 oocyst/10L – 9-05-12	
Inlet to North Richmond WFP	5/13		1 oocyst/10L – 24-04-12, 2-05-12, 16-05-12, 30-05-12, 13-06-12	
<u>Finished Water</u>				
Outlet Prospect WFP (HPR44)	1/80		3 oocysts/100L – 4-06-12	See section 5.

Table 6: Summary of exceptions for *Cryptosporidium* DAPI confirmed

Quarter 4 (01-04-2012 to 30-06-2012)				
CRYPTOSPORIDIUM (DAPI CONFIRMED)				
Site	No. exceptions /total no. samples	Guideline value	Notable exception data	Comment
<u>Raw Water</u>				
Warragamba Pipeline 1 & 2 and Inlet to Prospect WFP Composite	3/78	No guideline value set. Tested as a precautionary measure	1 oocyst/15L – 26-05-12, 13-06-12, 21-06-12	
Upper Canal Prospect (HPR1 & HPR3)	3/15		1 oocyst/10L – 19-04-12, 13-06-12, 15-06-12	
Inlet to Macarthur WFP	1/13		1 oocyst/10L – 9-05-12	
Inlet to North Richmond WFP	4/13		1 oocyst/20L – 24-04-12, 16-05-12, 30-05-12, 13-06-12	
<u>Finished Water</u>				
Outlet Prospect WFP (HPR44)	1/80		3 oocysts/100L – 4-06-12	See section 5.

Table 7: Summary of exceptions for *Giardia* IFA positive

Quarter 4 (01-04-2012 to 30-06-2012)				
GIARDIA (IFA POSITIVE)				
Site	No. exception s/total no. samples	Guideline value	Notable exception data	Comment
<u>Raw Water</u>				
Warragamba Pipeline 1 & 2 and Inlet to Prospect WFP Composite	8/78	No guideline value set. Tested as a precautionary measure.	1 cyst/20L – 6 occurrences 1 cyst/15L – 24-04-12 2 cysts/15L – 6-06-12	The SCA continue to investigate potential sources of <i>Cryptosporidium</i> in the Upper Canal. Also the results of the routine raw and treated water samples are being reviewed in consultation with Sydney Water and NSW Health.
Warragamba Pipeline 1 & 2	1/17		1 cyst/10L – 14-06-12	
Upper Canal Prospect (HPR1 & HPR3)	3/15		1 cyst/10L – 12-04-12, 13-06-12 2 cysts/10L – 21-06-12	The Upper Canal at Prospect and Inlet to Prospect WFP are analysed separately in response to either <i>Cryptosporidium</i> and/or <i>Giardia</i> IFA positive detections in the Prospect raw water composite sample of the same date.
Inlet to Prospect WFP	1/13		1 cyst/10L – 12-04-12	
Inlet to Macarthur WFP	3/13		1 cyst/10L – 11-04-12, 23-05-12, 13-06-12	
Inlet to North Richmond WFP	6/13		1 cyst/10L – 16-05-12, 06-06-12 2 cysts/10L – 2-05-12, 20-06-12, 27-06-12 4 cysts/10L – 13-06-12	
Composite of Inlets to Cascades, Nepean, Illawarra & Woronora WFPs	2/13		1 cyst/20L – 16-05-12, 13-06-12	
<u>Finished Water</u>				
Outlet Prospect WFP (HPR44)	1/80		1 cyst/100L – 14-06-12	See section 5.

Table 8: Summary of exceptions for *Giardia* DAPI Confirmed

Quarter 4 (01-04-2012 to 30-06-2012)				
<i>GIARDIA</i> (DAPI CONFIRMED)				
Site	No. exceptions /total no. samples	Guideline value	Notable exception data	Comment
<u>Raw Water</u>				
Warragamba Pipeline 1 & 2 and Inlet to Prospect WFP Composite	3/78	No guideline value set. Tested as a precautionary measure.	1 cyst/20L – 2-04-12, 20-04-12 1 cyst/15L – 18-06-12	
Upper Canal Prospect	1/15		1 cyst/10L – 13-06-12	
Inlet to Macarthur WFP	1/13		1 cyst/10L – 13-06-12	
Inlet to North Richmond WFP	3/13		1 cyst/10L – 16-05-12 2 cysts/10L – 13-06-12, 20-06-12	
Composite of Inlets to Cascades, Nepean, Illawarra & Woronora WFPs	1/13		1 cyst/20L – 13-06-12	
<u>Finished Water</u>				
			No Exceptions	

**Table 9: Summary of exceptions for Cyanobacteria at North Richmond raw water**

Quarter 4 (01-04-2012 to 30-06-2012)						
Cyanobacteria	Toxin(s) produced	Notification level cell count (cells/mL)	Notification level biovolume (mm <sup>3</sup> /L)	Alert level toxin (µg/L)	No. exceptions/total no. samples	Comment
<i>Microcystis aeruginosa</i>	Microcystins	2,000	0.2	1.3	0/10	Nil Exceptions
<i>Microcystis, Anabaena, Planktothrix (Oscillatoria), Nostoc, Anabaenopsis and Radiocystis.</i>		N/A			0/10	Nil Exceptions
<i>Cylindrospermopsis raciborskii</i>	Cylindrospermopsin	4,500	0.2	1	2/10	See section 5
<i>Aphanizomenon ovalisporum, Aphanizomenon flos-aquae, Raphidiosis curvata and Umezakia natans.</i>		N/A			0/10	Nil Exceptions
<i>Anabaena circinalis</i>	Saxitoxins, anatoxin-a and anatoxin-a(s)	6,000	1.5	3	0/10	Nil Exceptions
<i>Anabaena, Lyngbya, Oscillatoria, Cylindrospermopsis, Cylindrospermum, and Aphanizomenon.</i>		N/A			0/10	Nil Exceptions
<i>Nodularia spumigena</i>	Nodularin	12,000	2.7	1.3	0/10	Nil Exceptions

## 5. Water Quality: Summary of NSW Health notifications

All water quality events or incidents that are considered a potential threat to public health are put on the Water Quality On-line Incident Notification System. The table below is a summary of notifications that were forwarded to NSW Health by Sydney Water during the 4<sup>th</sup> quarter of 2011-12, and include compliance and operational monitoring results.

Sydney Water is currently in the process of moving towards adopting the new ADWG 2011 in consultation with NSW Health. Interim turbidity targets for individual filters at the water filtration plants and the new cyanobacteria criteria have been adopted. Exceedances against these targets have been reported in Table.10.

**Table 10: Summary of notifiable events and incidents**

Date of notification	Event/incident closed (Yes/No)	System	Event/Incident
<b>April</b>			
<b>2-04-2012</b>	Yes	<b>North Richmond</b>	A cyanobacteria count of 2734 cells/mL ( <i>Cylindrospermopsis raciborskii</i> ) and biovolume of 0.273 mm <sup>3</sup> /L was reported for a raw water sample collected on 28 03-12 from the Hawkesbury / Nepean River at the North Richmond WFP. A sample collected on the same day was submitted for toxin testing (Cylindrospermopsin) and the level was <0.1 µg/L. Sydney Water returned to routine monitoring.
<b>5-04-2012</b>	Yes	<b>Illawarra</b>	<p><i>E. coli</i> (1 Org/100mL) and total coliforms (12 Org/100mL) was detected in a sample collected in <b>a section of renewed main (not compliance sample)</b> at Forster St, Port Kembla on 4-04-12, total chlorine was 0.19 mg/L. Repeat samples were collected from the front tap of customer's properties on Forster St, and from Cowper St, Port Kembla which supplies the new main. The repeat samples did not detect the presence of <i>E. coli</i> (&lt;1 Orgs/100mL) and/or total coliforms (&lt;1 Orgs/100mL) with total chlorine ranging from 0.07 mg/L to 0.11 mg/L in the system.</p> <p>Due to the low chlorine residuals systematic flushing of the area was arranged, including the flushing of Forster St.</p> <p>The new main sample was collected from a hydrant off the new section of water main and the <i>E. coli</i> exceptions may have resulted from contamination due to poor sampling technique, inadequate flushing or hydrant fittings.</p>
<b>10-04-12</b>	Yes	<b>North Richmond</b>	<p>A cyanobacteria count of 4905 cells/mL (<i>Cylindrospermopsis raciborskii</i>) and biovolume of 0.490 mm<sup>3</sup>/L was reported for a raw water sample collected on 4-04-12 from the Hawkesbury / Nepean River at the North Richmond WFP. A sample collected on the same day was submitted for toxin testing (Cylindrospermopsin) and the level was &lt;0.1 µg/L. Plant operation was normal at the time and Sydney Water returned to routine monitoring.</p> <p>A cyanobacteria count of 3458 cells/mL (<i>Cylindrospermopsis raciborskii</i>) and biovolume of 0.345 mm<sup>3</sup>/L was reported for a raw water sample collected on 18 04-12 from the Hawkesbury / Nepean River at the North Richmond WFP. A sample collected on the same</p>

Date of notification	Event/incident closed (Yes/No)	System	Event/Incident
			day was submitted for toxin testing (Cylindrospermopsin) and the level was <0.1 µg/L. Plant operation was normal at the time and Sydney Water returned to routine monitoring
12-04-2012	Yes	Macarthur	Macarthur WFP had individual filter turbidity exceedances on 11-04-12 and 12-04-12. This incident is related to a widespread rainfall event. The elevated raw water colour and turbidity caused operational problems at the plant. Dosing adjustments and filter backwash was performed at plant and a reduction in the maximum filter run times to help prevent recurrence. The plant went back on line and returned to normal operations.
13-04-2012	Yes	Macarthur	Macarthur WFP had individual filter turbidity exceedances on 13-04-12. This incident is related to a widespread rainfall event. The elevated raw water colour and turbidity caused operational problems at the plant. Dosing adjustments and filter backwash were performed at plant and a reduction in the maximum filter run times to help prevent recurrence. The plant went back on line and returned to normal operations.
16-04-2012	Yes	Nepean	<p>Due to high colour and turbidity in the raw water supply to the Nepean WFP caused by heavy rain in the catchment, the plant experienced difficulties in maintaining effective filtration processes. Pre-chlorination commenced in early March to oxidise organics in the raw water and reduce colour. This was effective in improving filtration performance but resulted in elevated total trihalomethane (THM) levels. Two compliance samples collected from Nepean Reservoir (WS252) on 9-04-12 and 1 05-12 contained THM levels above the Australian Drinking Water Guidelines (ADWG) health guideline value of 0.25 mg/L (0.293 mg/L and 0.261mg/L respectively). Two compliance sites collected on the 24-04-12 and 7-05-12 also contained THM levels above the ADWG health guideline value (0.254 mg/L and 0.255mg/L respectively).</p> <p>As per the recommendations in the ADWG, action is encouraged to reduce THM levels but must not compromise disinfection. Sydney water responded by increasing operational monitoring for THMs, requested a screen change in Nepean Dam to source better raw water quality, reduced post chlorine dosing by 0.2 mg/L and incrementally reduced pre-chlorination while assessing the impact on filter performance versus THM levels. A scheduled upgrade of the SCADA system at Nepean WFP was also in progress at the time. Sydney Water worked in conjunction with the service provider to ensure that the upgrade was prioritised which helped to manage the stability of the pre-chlorination process. THM levels were eventually reduced below the ADWG level of 0.25mg/L.</p>
27-04-2012	Yes	Potts Hill	Several customers complained about a strong chlorine taste and odour in the water supply starting on 25-04-12. The complaints followed the chlorination of the 500mm water main at Rookwood Road, Yagoona. Samples collected from a customer's tap at 118 Rookwood Rd, Yagoona confirmed a free chlorine concentration of 64mg/L. A temporary supply was connected to all 26 properties, the owners were notified and provided with bottled water. The main was dewatered and flushed until normal water supply was restored. After flushing chlorine in the main located at 118 Rookwood Rd Yagoona

Date of notification	Event/incident closed (Yes/No)	System	Event/Incident
			<p>was 1.35 mg/L.</p> <p>The suspected cause was a leakage from the valve on the 100mm main connected to the 500mm chlorinated main. The water main was then returned to service and customer complaints monitored as a precautionary measure. No further customer complaints were received from the Yagoona area, and the incident declared closed.</p>
27-04-2012	Yes	North Richmond	<p>The raw water sample collected at North Richmond WFP (HRN1-2) on 24-04-12 had 1 <i>Cryptosporidium</i> oocyst (DAPI positive) in 10L. The finished water sample from North Richmond WFP (NRWFPF) collected on 24-04-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.</p>
<b>May</b>			
4-05-2012	Yes	North Richmond	<p>The raw water sample collected at North Richmond WFP (HRN1-2) on 2-05-12 had 2 <i>Giardia</i> cysts (DAPI negative) and 1 <i>Cryptosporidium</i> oocyst (DAPI negative) in 10L. The finished water sample from North Richmond WFP (NRWFPF) collected on 2-05-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.</p>
14-05-2012	Yes	Macarthur	<p>Macarthur WFP had individual filter turbidity exceedances on 11-05-12. This incident is related to the recent widespread rainfall event. The elevated raw water colour and turbidity caused operational problems at the plant. Dosing adjustments and filter backwash were performed at plant and a reduction in the maximum filter run times to help prevent recurrence. The plant went back on line and returned to normal operations.</p>
15-06-2012	Yes	Prospect South	<p><i>E. coli</i> (78 Org/100mL) and total coliforms (&gt;200 Org/100mL) was detected in a repeat sample collected in <b>a section of renewed main (not compliance sample)</b> at Siemens Crescent, Emerton on 11-05-12, total chlorine was 1.38 mg/L. Main was isolated on 12-05-12 and properties connected up to temporary service. Samples were collected at four of these properties connected to the temporary service. The repeat samples did not detect the presence of <i>E. coli</i> (&lt;1 Orgs/100mL) and/or total coliforms (&lt;1 Orgs/100mL) with total chlorine ranging from 1.33 to 1.36 mg/L in the system. The new main sample was collected from a hydrant off the new section of water main and the <i>E. coli</i> exceptions may have resulted from contamination due to poor sampling technique, inadequate flushing, hydrant fittings or from sediment in the water main. This main was chlorinated on 4-06-12 and water quality samples were taken on 5-06-12. All water quality results were clear and the main was put back to service on 7-06-12.</p>
18-05-2012	Yes	North Richmond	<p>The raw water sample collected at North Richmond WFP (HRN1-2) on 16-05-12 had 1 <i>Giardia</i> cysts (DAPI positive) and 1 <i>Cryptosporidium</i> oocyst (DAPI positive) in 10L. The finished water sample from North Richmond WFP (NRWFPF) collected on 16-05-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the</p>



Date of notification	Event/incident closed (Yes/No)	System	Event/Incident
			plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.
23-05-2012	Yes	Woronora	Woronora WFP had individual filter turbidity exceedances on 22-05-12 due to ferric chloride dosing operational failure, following the shutdown plant. The plant operators corrected the ferric dosing system, then managed the filter flow to minimise impact of clear water quality. Sydney Water returned to routine monitoring.
01-06-2012	Yes	North Richmond	The raw water sample collected at North Richmond WFP (HRN1-2) on 30-05-12 had 1 <i>Cryptosporidium</i> oocyst (DAPI positive) in 10L. The finished water sample from North Richmond WFP (NRWFPF) collected on 30-05-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.
June			
5-06-2012	Yes	Prospect	<p>The <b>finished</b> water sample collected at Prospect WFP (HPR44) on 4-06-12 had 3 <i>Cryptosporidium</i> oocysts (3 DAPI positive) in 100L. A repeat sample collected at Prospect WFP on 4-06-12 was analysed and no <i>Cryptosporidium</i> were detected, the raw water samples were also clear.</p> <p>The <b>finished</b> water sample collected at Prospect WFP (HPR44) on 14-06-12 had 1 <i>Giardia</i> cyst (DAPI negative) in 100L, the plant was being supplied from a mix of Upper Canal and Prospect. Localised heavy rainfall was recorded across the Upper Nepean, Prospect and Upper Canal catchments on the days preceding. The rainfall resulted in a slight increase in flow in the canal, partly due to increase in weir pool level at Broughton's Pass and partly due to localised runoff. The rainfall also caused a small rise in level of Prospect Reservoir. A repeat sample collected at Prospect WFP on 14-06-12 was analysed and no <i>Giardia</i> or <i>Cryptosporidium</i> were detected, the raw water samples were also clear. There was a detection of 1 <i>Cryptosporidium</i> in Prospect raw water composite on 13-06-12. The component results were clear. Sydney Water returned to routine monitoring.</p>
8-06-12	Yes	North Richmond	The raw water sample collected at North Richmond WFP (HRN1-2) on 06-06-12 had 1 <i>Giardia</i> cyst (DAPI negative) in 10L. The finished water sample from North Richmond WFP (NRWFPF) collected on 06-06-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.
15-06-12	Yes	North Richmond	The raw water sample collected at North Richmond WFP (HRN1-2) on 13-06-12 had 1 <i>Cryptosporidium</i> oocyst (DAPI positive) and 4 <i>Giardia</i> cysts (2 DAPI positive) in 10L. The finished water sample from North Richmond WFP (NRWFPF) collected on 13-06-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.
18-06-2012	Yes	Ryde	<i>E. coli</i> (1 Orgs/100mL) detected in a <b>compliance</b> sample collected from 5 Cassino CI in Allambie Heights on 15-06-12, total chlorine

Date of notification	Event/incident closed (Yes/No)	System	Event/Incident
			residual was 1.16 mg/L. The repeat sample collected on 16-06-12 did not detect the presence of <i>E. coli</i> (<1 orgs/100mL), total chlorine residual was 1.18 mg/L. Repeat samples collected at four supplying reservoirs in Pymble on 16-06-12 were also clear for <i>E. coli</i> (<1 orgs/100mL), total chlorine residual were between 0.36 mg/L and 1.38 mg/L. The roofs of all four Pymble reservoirs were inspected for any anomalies or ingress. The roofs were clean and in good condition. Small gaps on the underside of the corrugated roof at Pymble reservoir (R099) were noted during its inspection. Sydney Water returned to routine monitoring.
20-06-12	Yes	Potts Hill	<i>E. coli</i> (3 Orgs/100mL) detected in a routine <b>operational sample</b> collected from Caringbah reservoir on 19-06-12, total chlorine residual was <0.03 mg/L. The reservoir is hydraulically isolated from the delivery system and is not currently supplying the zone. The reservoir was recently emptied on 23-05-12, cleaned and refilled 29-05-12. The two sites in that zone sampled on the same day were clear for <i>E. coli</i> . The total chlorine level at these sites was 0.18 mg/L and 1.38 mg/L. A repeat sample collected at Caringbah reservoir on 20-06-12 had <i>E. coli</i> of 4 Orgs/100mL, total chlorine was 0.05 mg/L. The reservoir was dewatered and remains offline.
22-06-12	Yes	North Richmond	The raw water sample collected at North Richmond WFP (HRN1-2) on 20-06-12 had 2 <i>Giardia</i> cysts (2 DAPI positive) in 10L. The finished water sample from North Richmond WFP (NRWFPP) collected on 20-06-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.
29-06-12	Yes	North Richmond	The raw water sample collected at North Richmond WFP (HRN1-2) on 27-06-12 had 2 <i>Giardia</i> cysts (DAPI negative) in 10L. The finished water sample from North Richmond WFP (NRWFPP) collected on 27-06-12 was analysed and no <i>Cryptosporidium</i> or <i>Giardia</i> were detected. A review of North Richmond WFP performance confirmed that the plant met filtration and disinfection target specifications. Sydney Water returned to routine monitoring.

# Tables for compliance assessment

Table 11: Health guideline values for compliance assessment - all systems

## North Richmond

Characteristic	Analyte Name	2004 Guideline Health Value  Units in mg/L unless otherwise stated	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	51	51	0	<1	<1	<1	<1	100	204	204	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	51	51	0	1.14	0.24	0.78	1.06	100	204	204	0	1.14	0.14	0.67	1
	Monochloramine	3	100	51	51	0	0.1	0	0.06	0.1	100	204	204	0	0.1	0	0.04	0.08
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.088	0.002	0.0296	^	100	28	28	0	0.088	0.002	0.0243	0.083
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	1	1	1.1	100	120	120	0	1.1	0.9	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.001	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.003	<0.001	<0.001	0.002	100	120	120	0	0.008	<0.001	0.0013	0.006
	Nitrate as NO3	50	100	7	7	0	1.37	0.84	1.0686	^	100	28	28	0	1.41	0.53	1.0268	1.37
	Nitrite as NO2	3	100	7	7	0	0.003	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	0.001	0.003
	Total Nickel	0.02	100	2	2	0	0.001	<0.001	<0.001	^	100	8	8	0	0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.7	8.7	9	^	100	4	4	0	8.7	4.8	7	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	6	6	0	0.1	0.072	0.0872	^	100	24	24	0	0.1	0.046	0.0763	0.1
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.068	0.053	0.0583	^	100	12	12	0	0.083	0.024	0.0493	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Orchard Hills

Characteristic	Analyte Name	2004 Guideline Health Value  Units in mg/L unless otherwise stated	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	E.coli	0 Orgs/100mL	100	111	111	0	<1	<1	<1	<1	99.78	458	458	1	1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	111	111	0	1.26	0.16	0.8	1.18	100	458	458	0	1.3	0.08	0.65	1.14
	Monochloramine	3	100	111	111	0	0.24	0	0.1	0.17	100	458	458	0	0.24	0	0.08	0.14
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.028	0.004	0.0134	^	100	28	28	0	0.042	0.004	0.0142	0.028
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	1	1	1.1	100	120	120	0	1.1	0.9	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.002	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.003	<0.001	<0.001	0.003	100	120	120	0	0.01	<0.001	0.001	0.003
	Nitrate as NO3	50	100	7	7	0	0.93	0.13	0.7971	^	100	28	28	0	0.93	0.13	0.75	0.93
	Nitrite as NO2	3	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	0.001	0.003
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.4	8.4	8	^	100	4	4	0	8.4	8.1	8	^
	Total Chromium	0.05	100	2	2	0	0.0006	<0.0004	0.0004	^	100	8	8	0	0.0006	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	9	9	0	0.181	0.097	0.1513	^	100	36	36	0	0.208	0.088	0.1454	0.194
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.134	0.102	0.1213	^	100	12	12	0	0.139	0.081	0.1028	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Prospect South

Characteristic	Analyte Name	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value
Microbiological	E.coli	0 Orgs/100mL	100	165	165	0	<1	<1	<1	<1	100	660	660	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	165	165	0	1.48	0	0.06	0.28	100	660	660	0	1.56	0	0.04	0.28
	Monochloramine	3	100	165	165	0	1.58	0.04	1.17	1.54	100	660	660	0	1.6	0.04	1.14	1.49
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.037	0.003	0.0151	^	100	28	28	0	0.104	0.003	0.0227	0.091
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	1	1	1.1	100	120	120	0	1.1	1	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.004	<0.001	0.0015	0.003	100	120	120	0	0.004	<0.001	<0.001	0.002
	Nitrate as NO3	50	100	7	7	0	1.07	0.17	0.7286	^	100	28	28	0	1.07	0.17	0.7104	1
	Nitrite as NO2	3	100	7	7	0	0.141	0.003	0.0453	^	100	28	28	0	0.2	0.003	0.0482	0.168
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.4	8.4	8	^	100	4	4	0	8.4	7.5	8	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	12	12	0	0.122	0.064	0.0976	^	100	48	48	0	0.122	0.042	0.0735	0.121
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.136	0.089	0.118	^	100	12	12	0	0.136	0.035	0.0778	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Prospect North

Characteristic	Analyte Name	2004 Guideline Health Value  Units in mg/L unless otherwise stated	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	261	261	0	<1	<1	<1	<1	99.9	1,044	1,044	1	3	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	261	261	0	1.3	0	0.1	0.74	100	1,044	1,044	0	1.3	0	0.09	0.66
	Monochloramine	3	100	261	261	0	1.58	0	0.89	1.44	100	1,044	1,044	0	1.58	0	0.84	1.42
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.039	0.01	0.0229	^	100	28	28	0	0.065	0.004	0.0245	0.044
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	1	1.1	1.1	100	120	120	0	1.1	0.9	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.002	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.003	<0.001	0.0014	0.003	100	120	120	0	0.01	<0.001	<0.001	0.002
	Nitrate as NO3	50	100	7	7	0	1.14	0.44	0.8443	^	100	28	28	0	1.14	0.44	0.8071	1.1
	Nitrite as NO2	3	100	7	7	0	0.43	<0.001	0.1052	^	100	28	28	0	0.43	<0.001	0.1012	0.286
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.4	8.4	8	^	100	4	4	0	8.4	7.5	8	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	0.0009	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	12	12	0	0.164	0.045	0.0997	^	100	48	48	0	0.164	0.037	0.0737	0.117
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.136	0.089	0.118	^	100	12	12	0	0.136	0.035	0.0778	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Prospect East

Characteristic	Analyte Name	2004 Guideline Health Value  Units in mg/L unless otherwise stated	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	114	114	0	<1	<1	<1	<1	100	456	456	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	114	114	0	0	0	0	0	100	456	456	0	0	0	0	0
	Monochloramine	3	100	114	114	0	1.6	0.8	1.29	1.54	100	456	456	0	1.8	0.22	1.21	1.51
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.031	0.01	0.0204	^	100	28	28	0	0.055	0.009	0.0196	0.031
	Fluoride	0.9 - 1.5	100	30	30	0	1.2	1	1.1	1.2	100	120	120	0	1.2	1	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.004	<0.001	0.0018	0.004	100	120	120	0	0.004	<0.001	<0.001	0.002
	Nitrate as NO3	50	100	7	7	0	1.12	0.21	0.7286	^	100	28	28	0	1.12	0.21	0.7457	0.99
	Nitrite as NO2	3	100	7	7	0	0.122	0.003	0.046	^	100	28	28	0	0.269	0.003	0.0741	0.21
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.4	8.4	8	^	100	4	4	0	8.4	7.5	8	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	9	9	0	0.115	0.06	0.0914	^	100	36	36	0	0.115	0.04	0.0738	0.115
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.136	0.089	0.118	^	100	12	12	0	0.136	0.035	0.0778	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Ryde

Characteristic	Analyte Name	2004 Guideline Health Value  Units in mg/L unless otherwise stated	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	99.62	264	264	1	1	<1	<1	<1	99.72	1,056	1,056	3	1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	264	264	0	0.84	0	0.02	0	100	1,056	1,056	0	0.88	0	0.02	0
	Monochloramine	3	100	264	264	0	1.78	0.04	0.95	1.42	100	1,056	1,056	0	1.78	0	0.88	1.36
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.039	0.007	0.0163	^	100	28	28	0	0.04	0.007	0.0164	0.039
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	1	1	1.1	100	120	120	0	1.1	1	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.024	<0.001	0.0021	0.003	100	120	120	0	0.024	<0.001	0.0013	0.003
	Nitrate as NO3	50	100	7	7	0	1.21	0.52	0.8914	^	100	28	28	0	1.45	0.52	0.9146	1.4
	Nitrite as NO2	3	100	7	7	0	0.384	0.007	0.1216	^	100	28	28	0	0.588	0.007	0.1741	0.384
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.4	8.4	8	^	100	4	4	0	8.4	7.5	8	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	12	12	0	0.147	0.056	0.1008	^	100	48	48	0	0.147	0.032	0.0747	0.136
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.136	0.089	0.118	^	100	12	12	0	0.136	0.035	0.0778	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile



## Potts Hill

Characteristic	Analyte Name	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	543	543	0	<1	<1	<1	<1	100	2,164	2,164	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	543	543	0	0.28	0	0	0	100	2,164	2,164	0	0.28	0	0	0
	Monochloramine	3	100	543	543	0	1.64	0.04	1.07	1.5	100	2,164	2,164	0	1.64	0.04	1.01	1.44
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.042	0.005	0.0216	^	100	28	28	0	0.048	0.005	0.0247	0.042
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	0.9	1	1.1	100	120	120	0	1.1	0.9	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.006	<0.001	0.0015	0.003	100	120	120	0	0.006	<0.001	<0.001	0.002
	Nitrate as NO3	50	100	7	7	0	1.01	0.25	0.6743	^	100	28	28	0	1.01	<0.01	0.56	1.01
	Nitrite as NO2	3	100	7	7	0	0.217	0.003	0.0534	^	100	28	28	0	0.217	0.003	0.0508	0.187
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.4	8.4	8	^	100	4	4	0	8.4	7.5	8	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	18	18	0	0.15	0.016	0.0884	^	100	72	72	0	0.15	0.003	0.058	0.11
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.136	0.089	0.118	^	100	12	12	0	0.136	0.035	0.0778	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Warragamba

Characteristic	Analyte Name	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	27	27	0	<1	<1	<1	<1	100	108	108	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	27	27	0	1.22	0.2	0.82	1.17	100	108	108	0	1.22	0.06	0.54	1.1
	Monochloramine	3	100	27	27	0	0.14	0.04	0.09	0.14	100	108	108	0	0.16	0.04	0.08	0.12
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.024	0.011	0.016	^	100	28	28	0	0.024	0.005	0.013	0.022
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	0.9	1	1.1	100	120	120	0	1.1	0.9	1	1.1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.001	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.001	<0.001	<0.001	<0.001	100	120	120	0	0.003	<0.001	<0.001	<0.001
	Nitrate as NO3	50	100	7	7	0	0.97	0.84	0.9343	^	100	28	28	0	0.97	0.62	0.7832	0.97
	Nitrite as NO2	3	100	7	7	0	0.003	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	0.001	0.003
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	8.4	8.4	8	^	100	4	4	0	8.4	8.2	8	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	6	6	0	0.163	0.096	0.1222	^	100	24	24	0	0.163	0.089	0.1126	0.135
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.127	0.09	0.1047	^	100	12	12	0	0.127	0.079	0.0946	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Nepean

Characteristic	Analyte Name	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	48	48	0	<1	<1	<1	<1	100	192	192	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	39	39	0	0.92	0.18	0.46	0.92	100	156	156	0	2.32	0.18	0.66	1.12
	Monochloramine	3	100	39	39	0	0.12	0.04	0.07	0.12	100	156	156	0	0.22	0	0.07	0.13
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.021	0.005	0.0107	^	100	28	28	0	0.036	0.003	0.0118	0.031
	Fluoride	0.9 - 1.5	100	30	30	0	1.2	0.9	1	1.1	100	120	120	0	1.2	0.9	1	1.1
	Total Lead	0.01	100	7	7	0	0.002	<0.001	<0.001	^	100	28	28	0	0.002	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.015	<0.001	0.0023	0.008	100	120	120	0	0.015	<0.001	0.0022	0.007
	Nitrate as NO3	50	100	7	7	0	1.15	0.89	1.0057	^	100	28	28	0	1.15	0.62	0.9139	1.11
	Nitrite as NO2	3	100	7	7	0	0.003	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	<0.001	0.003
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	2.4	2.4	2	^	100	4	4	0	2.7	2.2	2	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	0.0005	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	66.7	6	6	2	0.255	0.166	0.2185	^	91.7	24	24	2	0.255	0.068	0.1261	0.254
	Trihalomethanes (total)-Water Filtration Plants	0.25	33.3	3	3	2	0.293	0.171	0.2417	^	83.3	12	12	2	0.293	0.046	0.1054	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Macarthur

Characteristic	Analyte Name	2004 Guideline Health Value  Units in mg/L unless otherwise stated	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	123	123	0	<1	<1	<1	<1	100	492	492	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	123	123	0	1.44	0	0.1	0.92	100	492	492	0	1.44	0	0.1	0.87
	Monochloramine	3	100	123	123	0	1.48	0.04	0.86	1.42	100	492	492	0	1.74	0	0.98	1.55
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.177	0.005	0.0356	^	100	28	28	0	0.177	0.004	0.0198	0.059
	Fluoride	0.9 - 1.5	100	30	30	0	1.3	1	1.1	1.2	100	120	120	0	1.3	0.9	1.1	1.2
	Total Lead	0.01	100	7	7	0	0.002	<0.001	<0.001	^	100	28	28	0	0.002	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.012	<0.001	0.0019	0.003	100	120	120	0	0.012	<0.001	0.0011	0.002
	Nitrate as NO3	50	100	7	7	0	0.92	0.24	0.4629	^	100	28	28	0	0.92	0.22	0.4793	0.84
	Nitrite as NO2	3	100	7	7	0	0.174	<0.001	0.0416	^	100	28	28	0	0.427	<0.001	0.0583	0.411
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	3.5	3.5	4	^	100	4	4	0	4	3.2	4	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	12	12	0	0.166	0.066	0.0951	^	100	48	48	0	0.212	0.041	0.0835	0.148
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.104	0.095	0.0993	^	100	12	12	0	0.105	0.034	0.0733	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Illawarra

Characteristic	Analyte Name	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	210	210	0	<1	<1	<1	<1	100	840	840	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	192	192	0	1.18	0.12	0.48	0.91	100	768	768	0	1.22	0.09	0.56	0.9
	Monochloramine	3	100	192	192	0	0.12	0	0.05	0.09	100	768	768	0	0.23	0	0.06	0.1
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.024	0.006	0.0146	^	100	28	28	0	0.061	<0.001	0.0161	0.042
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	0.9	1	1.1	100	120	120	0	1.1	0.9	1	1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.003	<0.001	<0.001	<0.001	100	120	120	0	0.012	<0.001	<0.001	0.002
	Nitrate as NO3	50	100	7	7	0	0.09	0.09	0.09	^	100	28	28	0	0.18	<0.01	0.1027	0.18
	Nitrite as NO2	3	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	<0.001	<0.001
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	3.6	3.6	4	^	100	4	4	0	3.6	3.3	3	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	12	12	0	0.1	0.061	0.0756	^	100	48	48	0	0.103	0.036	0.0678	0.1
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.096	0.083	0.0907	^	100	12	12	0	0.096	0.032	0.0647	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Woronora

Characteristic	Analyte Name	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	66	66	0	<1	<1	<1	<1	99.63	272	272	1	1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	66	66	0	0	0	0	0	100	272	272	0	0	0	0	0
	Monochloramine	3	100	66	66	0	1.38	0.21	0.87	1.31	100	272	272	0	1.62	0.2	0.99	1.46
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.021	0.002	0.0086	^	100	28	28	0	0.022	0.002	0.0085	0.021
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	1	1.1	1.1	100	120	120	0	1.1	0.9	1	1.1
	Total Lead	0.01	100	7	7	0	0.001	<0.001	<0.001	^	100	28	28	0	0.001	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.004	<0.001	0.0012	0.003	100	120	120	0	0.004	<0.001	<0.001	0.002
	Nitrate as NO3	50	100	7	7	0	0.52	0.21	0.3286	^	100	28	28	0	0.59	0.21	0.3618	0.52
	Nitrite as NO2	3	100	7	7	0	0.236	0.007	0.123	^	100	28	28	0	0.338	0.007	0.0794	0.286
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	4.8	4.8	5	^	100	4	4	0	5.9	4.8	6	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	9	9	0	0.132	0.068	0.1007	^	100	36	36	0	0.142	0.068	0.1009	0.132
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.147	0.096	0.1273	^	100	12	12	0	0.147	0.067	0.112	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## Cascades

Characteristic	Analyte Name	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	<i>E.coli</i>	0 Orgs/100mL	100	72	72	0	<1	<1	<1	<1	100	274	274	0	<1	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	72	72	0	1.06	0.2	0.67	1	100	274	274	0	1.42	0.16	0.7	1.02
	Monochloramine	3	100	72	72	0	0.1	0	0.04	0.07	100	274	274	0	0.1	0	0.03	0.06
Other Inorganic Chemicals	Total Antimony	0.003	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total Cadmium	0.002	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Total cyanide	0.08	#	#	#	#					100	2	2	0	<0.005	<0.005	<0.005	^
	Total Copper	2	100	7	7	0	0.029	<0.001	0.0109	^	100	28	28	0	0.13	<0.001	0.0257	0.096
	Fluoride	0.9 - 1.5	100	30	30	0	1.1	0.9	1	1	100	120	120	0	1.1	0.9	1	1
	Total Lead	0.01	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.001	<0.001	<0.001	<0.001
	Manganese	0.5	100	30	30	0	0.008	<0.001	0.0014	0.005	100	120	120	0	0.022	<0.001	0.002	0.007
	Nitrate as NO3	50	100	7	7	0	0.04	0.04	0.04	^	100	28	28	0	0.13	<0.01	0.0677	0.13
	Nitrite as NO2	3	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	0.003	<0.001	<0.001	0.003
	Total Nickel	0.02	100	2	2	0	<0.001	<0.001	<0.001	^	100	8	8	0	<0.001	<0.001	<0.001	^
	Sulphate	500	100	1	1	0	0.9	0.9	1	^	100	4	4	0	1.4	0.8	1	^
	Total Chromium	0.05	100	2	2	0	<0.0004	<0.0004	<0.0004	^	100	8	8	0	<0.0004	<0.0004	<0.0004	^
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	100	9	9	0	0.151	0.091	0.1156	^	100	36	36	0	0.151	0.067	0.0967	0.133
	Trihalomethanes (total)-Water Filtration Plants	0.25	100	3	3	0	0.112	0.097	0.1053	^	100	12	12	0	0.112	0.057	0.0852	^
Organic Compounds	benzo(a)pyrene	0.00001	#	#	#	#					100	2	2	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^

#) No samples ^) Insufficient data to calculate 95th percentile

## SWC Summary

Characteristic	Analyte Nm	2004 Guideline Health Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Microbiological	E.coli	0 Orgs/100mL	99.95	2,055	2,055	1	1	<1	<1	<1	99.93	8,220	8,220	6	3	<1	<1	<1
Inorg. disinfection Product/byprod	Free Chlorine	5	100	2,028	2,028	0	1.48	0	0.18	0.92	100	8,112	8,112	0	2.32	0	0.17	0.84
	Monochloramine	3	100	2,028	2,028	0	1.78	0	0.79	1.48	100	8,112	8,112	0	1.8	0	0.76	1.44
Other Inorganic Chemicals	Total Antimony	0.003	100	26	26	0	<0.001	<0.001	<0.001	<0.001	100	104	104	0	<0.001	<0.001	<0.001	<0.001
	Total Cadmium	0.002	100	26	26	0	<0.001	<0.001	<0.001	<0.001	100	104	104	0	<0.001	<0.001	<0.001	<0.001
	Total cyanide	0.08	#	#	#	#					100	26	26	0	<0.005	<0.005	<0.005	<0.005
	Total Copper	2	100	91	91	0	0.177	<0.001	0.0181	0.039	100	364	364	0	0.177	<0.001	0.0186	0.046
	Fluoride	0.9 - 1.5	100	390	390	0	1.3	0.9	1	1.1	100	1,560	1,560	0	1.3	0.9	1	1.1
	Total Lead	0.01	100	91	91	0	0.002	<0.001	<0.001	<0.001	100	364	364	0	0.003	<0.001	<0.001	<0.001
	Manganese	0.5	100	390	390	0	0.024	<0.001	0.0014	0.003	100	1,560	1,560	0	0.024	<0.001	0.0011	0.003
	Nitrate as NO3	50	100	91	91	0	1.37	0.04	0.6611	1.14	100	364	364	0	1.45	<0.01	0.6326	1.11
	Nitrite as NO2	3	100	91	91	0	0.43	<0.001	0.0416	0.217	100	364	364	0	0.588	<0.001	0.0455	0.243
	Total Nickel	0.02	100	26	26	0	0.001	<0.001	<0.001	<0.001	100	104	104	0	0.001	<0.001	<0.001	<0.001
	Sulphate	500	100	9	9	0	8.7	0.9	5	^	100	36	36	0	8.7	0.8	5	8.4
	Total Chromium	0.05	100	26	26	0	0.0006	<0.0004	<0.0004	<0.0004	100	104	104	0	0.0009	<0.0004	<0.0004	<0.0004
Organic Disinfection Byproducts	Trihalomethanes (total)-Customer Taps	0.25	98.5	132	132	2	0.255	0.016	0.1054	0.175	99.6	528	528	2	0.255	0.003	0.0846	0.153
	Trihalomethanes (total)-Water Filtration Plants	0.25	92.6	27	27	2	0.293	0.053	0.1185	0.261	98.1	108	108	2	0.293	0.024	0.085	0.139
Organic Compounds	benzo(a)pyrene	<0.00001	#	#	#	#					100	26	26	0	<0.00001	<0.00001	<0.00001	^
	carbon tetrachloride	0.003	100	9	9	0	<0.001	<0.001	<0.001	^	100	36	36	0	<0.001	<0.001	<0.001	<0.001

#) No samples ^) Insufficient data to calculate 95th percentile



Table 12: Health guideline values for compliance assessment – North Richmond WFP only

## North Richmond

Characteristic	Analyte Name	2004 Guideline Health Value  Units in mg/L unless otherwise stated	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Inorganic Chemicals	Arsenic	0.007	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^
	Barium	0.7	100	1	1	0	0.028	0.028	0.028	^	100	4	4	0	0.032	0.019	0.028	^
	Boron	0.3	100	1	1	0	0.023	0.023	0.023	^	100	4	4	0	0.023	0.015	0.019	^
	Iodide	0.1	#	#	#	#					100	1	1	0	<0.05	<0.05	<0.05	^
	Mercury	0.001	100	1	1	0	<0	<0	0	^	100	4	4	0	<0	<0	0	^
	Molybdenum	0.05	100	1	1	0	<0.001	<0.001	<0.001	^	100	4	4	0	<0.001	<0.001	<0.001	^
	Selenium	0.01	100	1	1	0	<0.003	<0.003	<0.003	^	100	4	4	0	<0.003	<0.003	<0.003	^
	Silver	0.1	#	#	#	#					100	1	1	0	<0.001	<0.001	<0.001	^
Pesticides	Aldrin	0.0003	100	3	3	0	<0.00001	<0.00001	<0.00001	^	100	12	12	0	<0.00001	<0.00001	<0.00001	^
	Atrazine	0.02	100	3	3	0	<0.0005	<0.0005	<0.0005	^	100	12	12	0	<0.0005	<0.0005	<0.0005	^
	Chlordane	0.001	100	3	3	0	<0.00001	<0.00001	<0.00001	^	100	12	12	0	<0.00001	<0.00001	<0.00001	^
	2,4-D	0.03	100	3	3	0	<0.0001	<0.0001	<0.0001	^	100	12	12	0	<0.0001	<0.0001	<0.0001	^
	Diazinon	0.003	100	3	3	0	<0.0001	<0.0001	<0.0001	^	100	12	12	0	<0.0001	<0.0001	<0.0001	^
	Dicamba	0.1	100	3	3	0	<0.005	<0.005	<0.005	^	100	12	12	0	<0.005	<0.005	<0.005	^
	DDT	0.02	100	3	3	0	<0.00001	<0.00001	<0.00001	^	100	12	12	0	<0.00001	<0.00001	<0.00001	^
	Dieldrin	0.0003	100	3	3	0	<0.00001	<0.00001	<0.00001	^	100	12	12	0	<0.00001	<0.00001	<0.00001	^
	Dimethoate	0.05	100	3	3	0	<0.0001	<0.0001	<0.0001	^	100	12	12	0	<0.0001	<0.0001	<0.0001	^
	Diquat	0.005	100	3	3	0	<0.0005	<0.0005	<0.0005	^	100	12	12	0	<0.0005	<0.0005	<0.0005	^
	Endosulfan	0.03	100	3	3	0	<0.00001	<0.00001	<0.00001	^	100	12	12	0	<0.00001	<0.00001	<0.00001	^
	Glyphosate	0.01	100	3	3	0	<0.01	<0.01	<0.01	^	100	12	12	0	<0.01	<0.01	<0.01	^
	Lindane	0.02	100	3	3	0	<0.00001	<0.00001	<0.00001	^	100	12	12	0	<0.00001	<0.00001	<0.00001	^
	Heptachlor	0.0003	100	3	3	0	<0.00001	<0.00001	<0.00001	^	100	12	12	0	<0.00001	<0.00001	<0.00001	^
	Metsulfuron-Methyl	0.03	100	3	3	0	<0.005	<0.005	<0.005	^	100	12	12	0	<0.005	<0.005	<0.005	^
	Molinate	0.005	100	3	3	0	<0.0001	<0.0001	<0.0001	^	100	12	12	0	<0.0001	<0.0001	<0.0001	^
	Paraquat	0.03	100	3	3	0	<0.0005	<0.0005	<0.0005	^	100	12	12	0	<0.0005	<0.0005	<0.0005	^
	Triclopyr	0.01	100	3	3	0	<0.0001	<0.0001	<0.0001	^	100	12	12	0	<0.0001	<0.0001	<0.0001	^

#) No samples ^) Insufficient data to calculate 95th percentile

Table 13: Aesthetic guideline values for compliance assessment of key characteristics - all systems

## Delivery System : North Richmond

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.012	<0.01	<0.01	^	100	28	28	0	0.03	<0.01	0.01	0.022
	Iron	0.3	100	30	30	0	0.063	<0.01	0.026	0.051	100	120	120	0	0.063	<0.01	0.023	0.04
	Zinc	3	100	7	7	0	0.007	<0.005	<0.005	^	100	28	28	0	0.011	<0.005	<0.005	0.007
Physical Characteristics	Turbidity	5 NTU	100	51	51	0	0.52	0.06	0.12	0.26	100	204	204	0	0.58	<0.05	0.12	0.22
	pH	6.5 - 8.5 pH Units	80.4	51	51	10	9	7.3	8	9	77.9	204	204	45	9.5	7.3	8.1	9
	True Colour (400nm)	15 CU	100	7	7	0	<2	<2	<2	^	100	28	28	0	<2	<2	<2	<2

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Orchard Hills

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.049	<0.01	0.011	^	100	28	28	0	0.049	<0.01	<0.01	0.016
	Iron	0.3	100	30	30	0	0.033	<0.01	0.013	0.032	100	120	120	0	0.035	<0.01	0.011	0.03
	Zinc	3	100	7	7	0	0.022	<0.005	0.007	^	100	28	28	0	0.022	<0.005	<0.005	0.008
Physical Characteristics	Turbidity	5 NTU	100	111	111	0	0.4	0.06	0.1	0.14	99.8	458	458	1	8.23	0.06	0.13	0.21
	pH	6.5 - 8.5 pH Units	94.6	111	111	6	9.1	7.5	7.9	8.6	95.9	458	458	19	9.1	7.4	7.8	8.4
	True Colour (400nm)	15 CU	100	7	7	0	<2	<2	<2	^	100	28	28	0	<2	<2	<2	<2

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Prospect South

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.027	<0.01	0.016	^	100	28	28	0	0.027	<0.01	0.011	0.027
	Iron	0.3	100	30	30	0	0.024	<0.01	0.014	0.022	100	120	120	0	0.036	<0.01	0.014	0.02
	Zinc	3	100	7	7	0	<0.005	<0.005	<0.005	^	100	28	28	0	<0.005	<0.005	<0.005	<0.005
Physical Characteristics	Turbidity	5 NTU	100	165	165	0	0.22	0.08	0.11	0.13	100	660	660	0	1.35	0.07	0.11	0.14
	pH	6.5 - 8.5 pH Units	100	165	165	0	8.4	7.8	8	8.3	100	660	660	0	8.5	7.7	8.1	8.3
	True Colour (400nm)	15 CU	100	7	7	0	3	<2	3	^	100	28	28	0	3	<2	2	3

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Prospect North

Delivery System : Prospector Net																		
Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)									Rolling 12 Months						
			From 1/04/2012 To 30/06/2012									From 1/07/2011 To 30/06/2012						
			Performance									Performance						
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.029	<0.01	0.017	^	100	28	28	0	0.047	<0.01	0.013	0.029
	Iron	0.3	100	30	30	0	0.028	<0.01	0.014	0.026	99.2	120	120	1	0.416	<0.01	0.019	0.028
	Zinc	3	100	7	7	0	<0.005	<0.005	<0.005	^	100	28	28	0	0.006	<0.005	<0.005	<0.005
Physical Characteristics	Turbidity	5 NTU	100	261	261	0	0.65	0.07	0.11	0.14	99.9	1,044	1,044	1	6.86	0.07	0.13	0.17
	pH	6.5 - 8.5 pH Units	97.3	261	261	7	9	7.7	8	8.4	97.8	1,044	1,044	23	9	7.7	8	8.4
	True Colour (400nm)	15 CU	100	7	7	0	3	<2	2	^	100	28	28	0	3	<2	2	3

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Prospect East

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.03	<0.01	0.017	^	100	28	28	0	0.03	<0.01	0.011	0.027
	Iron	0.3	100	30	30	0	0.052	<0.01	0.016	0.031	100	120	120	0	0.052	<0.01	0.016	0.027
	Zinc	3	100	7	7	0	<0.005	<0.005	<0.005	^	100	28	28	0	<0.005	<0.005	<0.005	<0.005
Physical Characteristics	Turbidity	5 NTU	100	114	114	0	0.8	0.08	0.12	0.18	100	456	456	0	0.8	0.07	0.12	0.15
	pH	6.5 - 8.5 pH Units	100	114	114	0	8.2	7.8	8	8.1	100	456	456	0	8.3	7.8	8	8.1
	True Colour (400nm)	15 CU	100	7	7	0	3	<2	3	^	100	28	28	0	4	<2	2	3

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Ryde

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.022	<0.01	0.015	^	100	28	28	0	0.022	<0.01	0.013	0.019
	Iron	0.3	100	30	30	0	0.187	0.011	0.024	0.051	100	120	120	0	0.187	<0.01	0.021	0.039
	Zinc	3	100	7	7	0	<0.005	<0.005	<0.005	^	100	28	28	0	0.009	<0.005	<0.005	<0.005
Physical Characteristics	Turbidity	5 NTU	100	264	264	0	0.54	0.07	0.12	0.18	100	1,056	1,056	0	1.83	0.07	0.13	0.2
	pH	6.5 - 8.5 pH Units	100	264	264	0	8.4	7.7	7.9	8	100	1,056	1,056	0	8.5	7.5	7.9	8.1
	True Colour (400nm)	15 CU	100	7	7	0	3	2	3	^	100	28	28	0	3	<2	2	3

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Potts Hill

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.031	<0.01	0.017	^	100	28	28	0	0.031	<0.01	0.013	0.027
	Iron	0.3	100	30	30	0	0.15	<0.01	0.016	0.023	100	120	120	0	0.15	<0.01	0.014	0.023
	Zinc	3	100	7	7	0	<0.005	<0.005	<0.005	^	100	28	28	0	0.005	<0.005	<0.005	<0.005
Physical Characteristics	Turbidity	5 NTU	100	543	543	0	1.22	0.06	0.12	0.21	100	2,164	2,164	0	1.54	0.06	0.12	0.2
	pH	6.5 - 8.5 pH Units	100	543	543	0	8.5	7.5	7.9	8	99.9	2,164	2,164	3	8.8	5.7	7.9	8
	True Colour (400nm)	15 CU	100	7	7	0	3	<2	2	^	100	28	28	0	6	<2	2	3

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Warragamba

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise stated	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.012	<0.01	<0.01	^	100	28	28	0	0.02	<0.01	<0.01	0.018
	Iron	0.3	100	30	30	0	0.041	0.013	0.021	0.037	100	120	120	0	0.061	0.01	0.018	0.033
	Zinc	3	100	7	7	0	0.006	<0.005	<0.005	^	100	28	28	0	0.006	<0.005	<0.005	0.006
Physical Characteristics	Turbidity	5 NTU	100	27	27	0	0.18	0.08	0.11	0.16	100	108	108	0	0.37	0.07	0.11	0.21
	pH	6.5 - 8.5 pH Units	100	27	27	0	8.2	7.7	7.9	8.2	100	108	108	0	8.3	7.6	7.9	8.2
	True Colour (400nm)	15 CU	100	7	7	0	<2	<2	<2	^	100	28	28	0	<2	<2	<2	<2

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Nepean

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.107	0.029	0.049	^	100	28	28	0	0.107	0.018	0.04	0.064
	Iron	0.3	100	30	30	0	0.101	0.013	0.029	0.056	100	120	120	0	0.101	<0.01	0.023	0.055
	Zinc	3	100	7	7	0	0.018	<0.005	<0.005	^	100	28	28	0	0.018	<0.005	<0.005	0.006
Physical Characteristics	Turbidity	5 NTU	100	39	39	0	0.83	0.07	0.14	0.57	100	156	156	0	0.83	0.06	0.13	0.25
	pH	6.5 - 8.5 pH Units	97.4	39	39	1	8.6	7.4	7.9	8.4	98.1	156	156	3	8.8	7.2	7.8	8.3
	True Colour (400nm)	15 CU	100	7	7	0	3	<2	<2	^	100	28	28	0	3	<2	<2	3

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Macarthur

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.082	0.038	0.055	^	100	28	28	0	0.082	0.03	0.044	0.079
	Iron	0.3	100	30	30	0	0.233	0.017	0.038	0.059	100	120	120	0	0.233	0.011	0.033	0.059
	Zinc	3	100	7	7	0	<0.005	<0.005	<0.005	^	100	28	28	0	0.006	<0.005	<0.005	<0.005
Physical Characteristics	Turbidity	5 NTU	100	123	123	0	0.37	0.08	0.14	0.26	100	492	492	0	1.1	0.08	0.15	0.28
	pH	6.5 - 8.5 pH Units	95.1	123	123	6	8.9	7.5	7.9	8.5	95.1	492	492	24	9.3	7.5	7.9	8.5
	True Colour (400nm)	15 CU	100	7	7	0	3	<2	<2	^	100	28	28	0	3	<2	<2	<2

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Illawarra

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.035	0.019	0.027	^	100	28	28	0	0.047	0.019	0.027	0.036
	Iron	0.3	100	30	30	0	0.055	<0.01	0.016	0.03	100	120	120	0	0.148	<0.01	0.015	0.031
	Zinc	3	100	7	7	0	<0.005	<0.005	<0.005	^	100	28	28	0	0.006	<0.005	<0.005	0.006
Physical Characteristics	Turbidity	5 NTU	100	192	192	0	1.5	0.07	0.15	0.3	99.7	768	768	2	5.64	0.07	0.16	0.29
	pH	6.5 - 8.5 pH Units	97.4	192	192	5	8.8	7.3	7.8	8.4	98.7	768	768	10	8.8	7.3	7.8	8.2
	True Colour (400nm)	15 CU	100	7	7	0	<2	<2	<2	^	100	28	28	0	<2	<2	<2	<2

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Woronora

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.076	0.04	0.064	^	100	28	28	0	0.083	0.04	0.07	0.082
	Iron	0.3	100	30	30	0	0.082	<0.01	0.022	0.034	100	120	120	0	0.086	<0.01	0.02	0.034
	Zinc	3	100	7	7	0	0.009	<0.005	<0.005	^	100	28	28	0	0.014	<0.005	<0.005	0.009
Physical Characteristics	Turbidity	5 NTU	100	66	66	0	0.37	0.08	0.12	0.22	100	272	272	0	0.74	0.07	0.11	0.18
	pH	6.5 - 8.5 pH Units	92.4	66	66	5	8.7	7.6	8	8.6	90.8	272	272	25	8.9	7.2	8	8.7
	True Colour (400nm)	15 CU	100	7	7	0	3	<2	2	^	100	28	28	0	3	<2	<2	3

#) No samples ^) Insufficient data to calculate 95th percentile

## Delivery System : Cascades

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	7	7	0	0.029	0.019	0.025	^	100	28	28	0	0.055	0.011	0.025	0.041
	Iron	0.3	100	30	30	0	0.073	<0.01	0.02	0.045	100	120	120	0	0.224	<0.01	0.025	0.045
	Zinc	3	100	7	7	0	0.007	<0.005	<0.005	^	100	28	28	0	0.012	<0.005	<0.005	0.01
Physical Characteristics	Turbidity	5 NTU	100	72	72	0	0.71	0.06	0.12	0.26	100	274	274	0	1.42	0.06	0.14	0.31
	pH	6.5 - 8.5 pH Units	100	72	72	0	8.4	7.4	7.8	8.3	97.8	274	274	6	9	7.4	7.9	8.4
	True Colour (400nm)	15 CU	100	7	7	0	<2	<2	<2	^	100	28	28	0	<2	<2	<2	<2

#) No samples ^) Insufficient data to calculate 95th percentile

## SWC Summary

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 Months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Other Inorganic Chemicals	Aluminium	0.2	100	91	91	0	0.107	<0.01	0.025	0.073	100	364	364	0	0.107	<0.01	0.022	0.07
	Iron	0.3	100	390	390	0	0.233	<0.01	0.021	0.042	99.9	1,560	1,560	1	0.416	<0.01	0.019	0.039
	Zinc	3	100	91	91	0	0.022	<0.005	<0.005	0.007	100	364	364	0	0.022	<0.005	<0.005	0.006
Physical Characteristics	Turbidity	5 NTU	100	2,028	2,028	0	1.5	0.06	0.12	0.2	100	8,112	8,112	4	8.23	<0.05	0.13	0.21
	pH	6.5 - 8.5 pH Units	98	2,028	2,028	40	9.1	7.3	7.9	8.3	98.1	8,112	8,112	158	9.5	5.7	7.9	8.3
	True Colour (400nm)	15 CU	100	91	91	0	3	<2	<2	3	100	364	364	0	6	<2	<2	3

#) No samples ^) Insufficient data to calculate 95th percentile



Table 14: Aesthetic guideline values for physical and other non key characteristics – all systems

## North Richmond

	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	109.9	87.9	98.4	^	100	28	28	0	156	87.9	103.4	122.9
	Hardness (Total)	200	100	7	7	0	50.1	35.5	42.6	^	100	28	28	0	50.1	23	34.9	47.9
	Flavour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Total Dissolved Solids	500	100	1	1	0	66	66	66	^	100	4	4	0	155	66	122	^
Other Inorganic Chemicals	Ammonia as NH <sub>3</sub>	0.50 mg/L	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	29.4	51	51	36	1.14	0.24	0.78	1.06	45.6	204	204	111	1.14	0.14	0.67	1
	Monochloramine	0.5	100	51	51	0	0.1	0	0.06	0.1	100	204	204	0	0.1	0	0.04	0.08
	Total Copper	1	100	7	7	0	0.088	0.002	0.03	^	100	28	28	0	0.088	0.002	0.024	0.083
	Sulphate	250	100	1	1	0	8.7	8.7	8.7	^	100	4	4	0	8.7	4.8	6.675	^
	Manganese	0.1	100	30	30	0	0.003	<0.001	<0.001	0.002	100	120	120	0	0.008	<0.001	0.001	0.006
Other Inorganic Chemicals	Sodium	180	100	1	1	0	32.9	32.9	32.9	^	100	4	4	0	32.9	31	31.85	^
	Chloride	250	100	1	1	0	34	34	34	^	100	4	4	0	56.9	34	48.95	^

## Orchard Hills

	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	109.1	96.8	103.8	^	100	28	28	0	120.3	96.8	108.2	119.2
	Hardness (Total)	200	100	7	7	0	71.9	59.5	66.9	^	100	28	28	0	71.9	58.9	64.6	68.6
	Flavour	Acceptable	100	1	1	0	3	3	3	^	80	5	5	1	4	2	3	^
	Odour	Acceptable	100	1	1	0	3	3	3	^	80	5	5	1	4	3	3	^
	Total Dissolved Solids	500	100	1	1	0	143	143	143	^	100	4	4	0	156	127	145.3	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	30.3	111	111	76	1.26	0.16	0.8	1.18	52.6	458	458	216	1.3	0.08	0.65	1.14
	Monochloramine	0.5	100	111	111	0	0.24	0	0.1	0.17	100	458	458	0	0.24	0	0.08	0.14
	Total Copper	1	100	7	7	0	0.028	0.004	0.013	^	100	28	28	0	0.042	0.004	0.014	0.028
	Sulphate	250	100	1	1	0	8.4	8.4	8.4	^	100	4	4	0	8.4	8.1	8.25	^
	Manganese	0.1	100	30	30	0	0.003	<0.001	<0.001	0.003	100	120	120	0	0.01	<0.001	0.001	0.003
Other Inorganic Chemicals	Sodium	180	100	1	1	0	11.9	11.9	11.9	^	100	4	4	0	12.9	11.9	12.275	^
	Chloride	250	100	1	1	0	29.5	29.5	29.5	^	100	4	4	0	31.3	29.1	30.225	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Prospect South

	Analyte Name	2004 Guideline Aesthetic Value  Units in mg/L unless otherwise specified	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	127.6	103.5	113.6	^	96.4	28	28	1	127.6	84.5	105.4	120.3
	Hardness (Total)	200	100	7	7	0	65.4	57.3	61.8	^	100	28	28	0	65.4	46.9	55.7	65.4
	Flavour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Total Dissolved Solids	500	100	1	1	0	120	120	120	^	100	4	4	0	126	110	120.3	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	0.43	0.33	0.3757	^	100	28	28	0	0.43	0.28	0.3618	0.41
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	96.4	165	165	6	1.48	0	0.06	0.28	97.7	660	660	15	1.56	0	0.04	0.28
	Monochloramine	0.5	18.1	165	165	136	1.58	0.04	1.17	1.54	11	660	660	588	1.6	0.04	1.14	1.49
	Total Copper	1	100	7	7	0	0.037	0.003	0.015	^	100	28	28	0	0.104	0.003	0.023	0.091
	Sulphate	250	100	1	1	0	8.4	8.4	8.4	^	100	4	4	0	8.4	7.5	7.775	^
	Manganese	0.1	100	30	30	0	0.004	<0.001	0.001	0.003	100	120	120	0	0.004	<0.001	<0.001	0.002
Other Inorganic Chemicals	Sodium	180	100	1	1	0	13.9	13.9	13.9	^	100	4	4	0	14	13.1	13.7	^
	Chloride	250	100	1	1	0	26	26	26	^	100	4	4	0	27.5	25	26.375	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Prospect North

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Ex pected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Ex pected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	129.8	97.9	111.1	^	100	28	28	0	129.8	85.3	107.6	127
	Hardness (Total)	200	100	7	7	0	65	57.4	61.1	^	100	28	28	0	65	46.3	56.2	64.3
	Flavour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Total Dissolved Solids	500	100	1	1	0	120	120	120	^	100	4	4	0	126	110	120.3	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	0.43	<0.001	0.2644	^	100	28	28	0	0.43	<0.001	0.2594	0.4
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	93.9	261	261	16	1.3	0	0.1	0.74	94.7	1,044	1,044	55	1.3	0	0.09	0.66
	Monochloramine	0.5	24.1	261	261	198	1.58	0	0.89	1.44	27.3	1,044	1,044	759	1.58	0	0.84	1.42
	Total Copper	1	100	7	7	0	0.039	0.01	0.023	^	100	28	28	0	0.065	0.004	0.025	0.044
	Sulphate	250	100	1	1	0	8.4	8.4	8.4	^	100	4	4	0	8.4	7.5	7.775	^
	Manganese	0.1	100	30	30	0	0.003	<0.001	0.001	0.003	100	120	120	0	0.01	<0.001	<0.001	0.002
Other Inorganic Chemicals	Sodium	180	100	1	1	0	13.9	13.9	13.9	^	100	4	4	0	14	13.1	13.7	^
	Chloride	250	100	1	1	0	26	26	26	^	100	4	4	0	27.5	25	26.375	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Prospect East

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	121.3	109.1	115.1	^	100	28	28	0	126.4	87.6	108.7	124.5
	Hardness (Total)	200	100	7	7	0	63.7	55.7	60	^	100	28	28	0	63.7	39.2	55.1	62.4
	Flavour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Total Dissolved Solids	500	100	1	1	0	120	120	120	^	100	4	4	0	126	110	120.3	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	0.41	0.32	0.3743	^	100	28	28	0	0.41	0.18	0.3407	0.41
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	100	114	114	0	0	0	0	0	100	456	456	0	0	0	0	0
	Monochloramine	0.5	0	114	114	114	1.6	0.8	1.29	1.54	2.2	456	456	446	1.8	0.22	1.21	1.51
	Total Copper	1	100	7	7	0	0.031	0.01	0.02	^	100	28	28	0	0.055	0.009	0.02	0.031
	Sulphate	250	100	1	1	0	8.4	8.4	8.4	^	100	4	4	0	8.4	7.5	7.775	^
	Manganese	0.1	100	30	30	0	0.004	<0.001	0.002	0.004	100	120	120	0	0.004	<0.001	<0.001	0.002
Other Inorganic Chemicals	Sodium	180	100	1	1	0	13.9	13.9	13.9	^	100	4	4	0	14	13.1	13.7	^
	Chloride	250	100	1	1	0	26	26	26	^	100	4	4	0	27.5	25	26.375	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Ryde

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	114.1	101.8	108.2	^	92.9	28	28	2	115.9	80.2	102.5	115.5
	Hardness (Total)	200	100	7	7	0	64.8	55.7	61	^	100	28	28	0	64.8	46.2	55.4	63.4
	Flavour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Total Dissolved Solids	500	100	1	1	0	120	120	120	^	100	4	4	0	126	110	120.3	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	0.39	0.15	0.2886	^	100	28	28	0	0.39	0.02	0.2375	0.36
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	98.9	264	264	3	0.84	0	0.02	0	98.9	1,056	1,056	12	0.88	0	0.02	0
	Monochloramine	0.5	21.1	264	264	209	1.78	0.04	0.95	1.42	21.1	1,056	1,056	834	1.78	0	0.88	1.36
	Total Copper	1	100	7	7	0	0.039	0.007	0.016	^	100	28	28	0	0.04	0.007	0.016	0.039
	Sulphate	250	100	1	1	0	8.4	8.4	8.4	^	100	4	4	0	8.4	7.5	7.775	^
	Manganese	0.1	100	30	30	0	0.024	<0.001	0.002	0.003	100	120	120	0	0.024	<0.001	0.001	0.003
Other Inorganic Chemicals	Sodium	180	100	1	1	0	13.9	13.9	13.9	^	100	4	4	0	14	13.1	13.7	^
	Chloride	250	100	1	1	0	26	26	26	^	100	4	4	0	27.5	25	26.375	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Potts Hill

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	118.2	103.6	111.3	^	100	28	28	0	129.4	86.5	111.4	126.7
	Hardness (Total)	200	100	7	7	0	60.5	45.5	55.6	^	100	28	28	0	60.5	44.5	52.4	60.3
	Flavour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Total Dissolved Solids	500	100	1	1	0	120	120	120	^	100	4	4	0	126	110	120.3	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	0.39	0.13	0.2971	^	100	28	28	0	0.4	0.13	0.3186	0.39
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	100	543	543	0	0.28	0	0	0	100	2,164	2,164	0	0.28	0	0	0
	Monochloramine	0.5	11.2	543	543	482	1.64	0.04	1.07	1.5	12.7	2,164	2,164	1,889	1.64	0.04	1.01	1.44
	Total Copper	1	100	7	7	0	0.042	0.005	0.022	^	100	28	28	0	0.048	0.005	0.025	0.042
	Sulphate	250	100	1	1	0	8.4	8.4	8.4	^	100	4	4	0	8.4	7.5	7.775	^
	Manganese	0.1	100	30	30	0	0.006	<0.001	0.002	0.003	100	120	120	0	0.006	<0.001	<0.001	0.002
Other Inorganic Chemicals	Sodium	180	100	1	1	0	13.9	13.9	13.9	^	100	4	4	0	14	13.1	13.7	^
	Chloride	250	100	1	1	0	26	26	26	^	100	4	4	0	27.5	25	26.375	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Warragamba

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	123.3	96.7	105.7	^	100	28	28	0	123.3	96.7	108.8	123.3
	Hardness (Total)	200	100	7	7	0	55.4	47.5	51.5	^	100	28	28	0	55.4	47.1	51.2	55
	Flavour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Total Dissolved Solids	500	100	1	1	0	130	130	130	^	100	4	4	0	143	120	130.5	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	37	27	27	17	1.22	0.2	0.82	1.17	69.4	108	108	33	1.22	0.06	0.54	1.1
	Monochloramine	0.5	100	27	27	0	0.14	0.04	0.09	0.14	100	108	108	0	0.16	0.04	0.08	0.12
	Total Copper	1	100	7	7	0	0.024	0.011	0.016	^	100	28	28	0	0.024	0.005	0.013	0.022
	Sulphate	250	100	1	1	0	8.4	8.4	8.4	^	100	4	4	0	8.4	8.2	8.275	^
	Manganese	0.1	100	30	30	0	0.001	<0.001	<0.001	<0.001	100	120	120	0	0.003	<0.001	<0.001	<0.001
Other Inorganic Chemicals	Sodium	180	100	1	1	0	20.8	20.8	20.8	^	100	4	4	0	21.2	18.1	19.675	^
	Chloride	250	100	1	1	0	32	32	32	^	100	4	4	0	32.5	28.7	31.3	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level



## Nepean

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	144	95.2	108.3	^	96.4	28	28	1	144	80.9	105.1	118.3
	Hardness (Total)	200	100	7	7	0	74.4	67.6	71.7	^	100	28	28	0	79.3	46.8	58.8	74.4
	Flavour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Total Dissolved Solids	500	100	1	1	0	184	184	184	^	100	4	4	0	184	109	134	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	82.1	39	39	7	0.92	0.18	0.46	0.92	51.9	156	156	75	2.32	0.18	0.66	1.12
	Monochloramine	0.5	100	39	39	0	0.12	0.04	0.07	0.12	100	156	156	0	0.22	0	0.07	0.13
	Total Copper	1	100	7	7	0	0.021	0.005	0.011	^	100	28	28	0	0.036	0.003	0.012	0.031
	Sulphate	250	100	1	1	0	2.4	2.4	2.4	^	100	4	4	0	2.7	2.2	2.425	^
	Manganese	0.1	100	30	30	0	0.015	<0.001	0.002	0.008	100	120	120	0	0.015	<0.001	0.002	0.007
Other Inorganic Chemicals	Sodium	180	100	1	1	0	9.99	9.99	9.99	^	100	4	4	0	10.7	9.99	10.2475	^
	Chloride	250	100	1	1	0	40	40	40	^	100	4	4	0	40	27	30.25	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Macarthur

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	117.2	95	103.6	^	100	28	28	0	131.5	95	107.1	122.4
	Hardness (Total)	200	100	7	7	0	58.7	51.6	54	^	100	28	28	0	67.7	40.5	48.2	61.2
	Flavour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Total Dissolved Solids	500	100	1	1	0	149	149	149	^	100	4	4	0	172	110	143.3	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	0.4	<0.001	0.1888	^	100	28	28	0	0.46	<0.001	0.2241	0.46
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	92.7	123	123	9	1.44	0	0.1	0.92	93.1	492	492	34	1.44	0	0.1	0.87
	Monochloramine	0.5	30.1	123	123	86	1.48	0.04	0.86	1.42	27.2	492	492	358	1.74	0	0.98	1.55
	Total Copper	1	100	7	7	0	0.177	0.005	0.036	^	100	28	28	0	0.177	0.004	0.02	0.059
	Sulphate	250	100	1	1	0	3.5	3.5	3.5	^	100	4	4	0	4	3.2	3.6	^
	Manganese	0.1	100	30	30	0	0.012	<0.001	0.002	0.003	100	120	120	0	0.012	<0.001	0.001	0.002
Other Inorganic Chemicals	Sodium	180	100	1	1	0	10.8	10.8	10.8	^	100	4	4	0	12.4	10.8	11.65	^
	Chloride	250	100	1	1	0	39	39	39	^	100	4	4	0	40	29	35.625	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Illawarra

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	106.7	100.5	103.3	^	100	28	28	0	123.8	94.4	106.7	119.9
	Hardness (Total)	200	100	7	7	0	43.7	38.5	40.4	^	100	28	28	0	52.5	38.1	42.4	47
	Flavour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Total Dissolved Solids	500	100	1	1	0	93	93	93	^	100	4	4	0	101	80	91.5	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	83.3	192	192	32	1.18	0.12	0.48	0.91	64.3	768	768	274	1.22	0.09	0.56	0.9
	Monochloramine	0.5	100	192	192	0	0.12	0	0.05	0.09	100	768	768	0	0.23	0	0.06	0.1
	Total Copper	1	100	7	7	0	0.024	0.006	0.015	^	100	28	28	0	0.061	<0.001	0.016	0.042
	Sulphate	250	100	1	1	0	3.6	3.6	3.6	^	100	4	4	0	3.6	3.3	3.45	^
	Manganese	0.1	100	30	30	0	0.003	<0.001	<0.001	<0.001	100	120	120	0	0.012	<0.001	<0.001	0.002
Other Inorganic Chemicals	Sodium	180	100	1	1	0	9.79	9.79	9.79	^	100	4	4	0	10.2	9.37	9.7775	^
	Chloride	250	100	1	1	0	22	22	22	^	100	4	4	0	22.5	20	21.375	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Woronora

Characteristic	Analyte Name	2004 Guideline Aesthetic Value  Units in mg/L unless otherwise specified	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	112.6	99.4	104.4	^	100	28	28	0	123.4	94.5	107.4	118.5
	Hardness (Total)	200	100	7	7	0	49.4	44.3	46.4	^	100	28	28	0	52.8	44	48.1	52.7
	Flavour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Total Dissolved Solids	500	100	1	1	0	126	126	126	^	100	4	4	0	142	126	132.5	^
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	7	7	0	0.44	0.18	0.3186	^	100	28	28	0	0.46	0.13	0.34	0.44
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	100	66	66	0	0	0	0	0	100	272	272	0	0	0	0	0
	Monochloramine	0.5	22.7	66	66	51	1.38	0.21	0.87	1.31	15.8	272	272	229	1.62	0.2	0.99	1.46
	Total Copper	1	100	7	7	0	0.021	0.002	0.009	^	100	28	28	0	0.022	0.002	0.009	0.021
	Sulphate	250	100	1	1	0	4.8	4.8	4.8	^	100	4	4	0	5.9	4.8	5.5	^
	Manganese	0.1	100	30	30	0	0.004	<0.001	0.001	0.003	100	120	120	0	0.004	<0.001	<0.001	0.002
Other Inorganic Chemicals	Sodium	180	100	1	1	0	13.3	13.3	13.3	^	100	4	4	0	14.1	13.3	13.8	^
	Chloride	250	100	1	1	0	32	32	32	^	100	4	4	0	34.5	32	33.75	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## Cascades

Characteristic	Analyte Name	2004 Guideline Aesthetic Value	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
		Units in mg/L unless otherwise specified	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	7	7	0	102	87.1	92.4	^	96.4	28	28	1	114.5	84	94.6	110.5
	Hardness (Total)	200	100	7	7	0	59.8	49.3	55	^	100	28	28	0	65.9	49.3	57.3	63.7
	Flavour	Acceptable	#	#	#	#					100	1	1	0	2	2	2	^
	Odour	Acceptable	#	#	#	#					100	1	1	0	3	3	3	^
	Total Dissolved Solids	500	100	1	1	0	107	107	107	^	100	4	4	0	107	94	101.3	^
Other Inorganic Chemicals	Ammonia as NH <sub>3</sub>	0.50 mg/L	100	7	7	0	<0.001	<0.001	<0.001	^	100	28	28	0	<0.001	<0.001	<0.001	<0.001
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	45.8	72	72	39	1.06	0.2	0.67	1	39.4	274	274	166	1.42	0.16	0.7	1.02
	Monochloramine	0.5	100	72	72	0	0.1	0	0.04	0.07	100	274	274	0	0.1	0	0.03	0.06
	Total Copper	1	100	7	7	0	0.029	<0.001	0.011	^	100	28	28	0	0.13	<0.001	0.026	0.096
	Sulphate	250	100	1	1	0	0.9	0.9	0.9	^	100	4	4	0	1.4	0.8	1	^
	Manganese	0.1	100	30	30	0	0.008	<0.001	0.001	0.005	100	120	120	0	0.022	<0.001	0.002	0.007
Other Inorganic Chemicals	Sodium	180	100	1	1	0	3.41	3.41	3.41	^	100	4	4	0	4.23	3.41	3.8325	^
	Chloride	250	100	1	1	0	16.5	16.5	16.5	^	100	4	4	0	16.5	15.9	16.1	^

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

## SWC Summary

Characteristic	Analyte Name	2004 Guideline Aesthetic Value  Units in mg/L unless otherwise specified	Quarter 4 (April to June 2012)								Rolling 12 months							
			From 1/04/2012 To 30/06/2012								From 1/07/2011 To 30/06/2012							
			Performance								Performance							
			% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile	% Passed	Expected No. of Samples	Actual No. of Samples	No. of Exceptions	Max Value	Min Value	Mean Value	95th Percentile
Physical Characteristics	Dissolved Oxygen (% Saturation)	> 85% Sat	100	91	91	0	144	87.1	106.1	121.3	98.6	364	364	5	156	80.2	105.9	122.4
	Hardness (Total)	200	100	91	91	0	74.4	35.5	56	71.9	100	364	364	0	79.3	23	52.3	66.4
	Flavour	Acceptable	100	1	1	0	3	3	3	^	94.1	17	17	1	4	2	3	^
	Odour	Acceptable	100	1	1	0	3	3	3	^	94.1	17	17	1	4	2	3	^
	Total Dissolved Solids	500	100	9	9	0	184	66	124.2	^	100	36	36	0	184	66	124.5	172
Other Inorganic Chemicals	Ammonia as NH3	0.50 mg/L	100	91	91	0	0.44	<0.001	0.1623	0.41	100	364	364	0	0.46	<0.001	0.1604	0.4
Characteristics with Health and Aesthetic Guidelines	Free Chlorine	0.6	88.1	2,028	2,028	241	1.48	0	0.18	0.92	87.8	8,112	8,112	991	2.32	0	0.17	0.84
	Monochloramine	0.5	37.1	2,028	2,028	1,276	1.78	0	0.79	1.48	37.1	8,112	8,112	5,103	1.8	0	0.76	1.44
	Total Copper	1	100	91	91	0	0.177	<0.001	0.018	0.039	100	364	364	0	0.177	<0.001	0.019	0.046
	Sulphate	250	100	9	9	0	8.7	0.9	5.4556	^	100	36	36	0	8.7	0.8	5.2167	8.4
	Manganese	0.1	100	390	390	0	0.024	<0.001	0.001	0.003	100	1,560	1,560	0	0.024	<0.001	0.001	0.003
Other Inorganic Chemicals	Sodium	180	100	9	9	0	32.9	3.41	14.0878	^	100	36	36	0	32.9	3.41	14.0897	32.4
	Chloride	250	100	9	9	0	40	16.5	30.1111	^	100	36	36	0	56.9	15.9	30.4389	53.9

#) No samples ^) Insufficient data to calculate 95th percentile -) No Trigger Level

# Tables for characteristics not for compliance

Table 15: *Cryptosporidium* and *Giardia* monitoring – not for compliance assessment***Cryptosporidium* - (IFA POSITIVE)**

	Cryptosporidium [oocysts/Volume]	Quarter 4 (April to June 2012)					Rolling 12 months				
		From 1/04/2012 To 30/06/2012					From 1/07/2011 To 30/06/2012				
		Performance					Performance				
		Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value	Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value
Raw Water	Prospect WFP Raw Water Composite	15	78	6	2	0	15	314	39	33	0
	Warragamba Pipeline 1 & 2 Composite	10	17	0	1	0	10	17	1	1	0
	Warragamba Pipeline 1	10	12	0	0	0	10	52	2	1	0
	Warragamba Pipeline 2	10	9	0	0	0	10	49	2	1	0
	Upper Canal Prospect	10	15	3	2	0	10	55	29	4	0
	Inlet to Prospect WFP	10	13	0	0	0	10	53	3	2	0
	Inlet to Macarthur(Broughtons Pass)	10	13	1	1	0	10	52	3	1	0
	Inlet North Richmond WFP	10	13	5	1	0	10	52	9	2	0
	Composite of Inlets to Cascades, Nepean, Illawarra & Woronora WFPs	20	13	0	0	0	20	52	4	2	0
	Inlet Cascades WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Nepean WFP	10	2	0	0	0	10	9	2	1	0
	Inlet Illawarra WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Woronora WFP	10	2	0	0	0	10	8	1	1	0
Treated Water	Outlet Prospect WFP HPR44	100	80	1	3	0	100	316	1	3	0
	Outlet Warragamba WFP R129	100	78	0	0	0	100	314	0	0	0
	Outlet Orchard Hills WFP MOH2	100	78	0	0	0	100	315	1	1	0
	Outlet Macarthur WFP MACSP4	100	4	0	0	0	100	7	0	0	0
	Outlet North Richmond WFP NRWFPF	100	8	0	0	0	100	21	0	0	0
	Outlet Cascades WFP R394	100	2	0	0	0	100	10	0	0	0
	Outlet Nepean WFP R252	100	2	0	0	0	100	10	0	0	0
	Outlet Illawarra WFP IWFPF	100	2	0	0	0	100	9	0	0	0
	Outlet Woronora WFP HWO2	100	2	0	0	0	100	9	0	0	0

NOTE: This table shows all positive results observed with IFA prior to DAPI confirmation

**Cryptosporidium - (DAPI CONFIRMED)**

	Cryptosporidium [oocysts/Volume]	Quarter 4 (April to June 2012)					Rolling 12 months				
		From 1/04/2012 To 30/06/2012					From 1/07/2011 To 30/06/2012				
		Performance					Performance				
		Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value	Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value
Raw Water	Prospect WFP Raw Water Composite	15	78	3	1	0	15	314	20	33	0
	Warragamba Pipeline 1 & 2 Composite	10	17	0	0	0	10	17	0	0	0
	Warragamba Pipeline 1	10	12	0	0	0	10	52	0	0	0
	Warragamba Pipeline 2	10	9	0	0	0	10	49	0	0	0
	Upper Canal Prospect	10	15	3	1	0	10	55	16	4	0
	Inlet to Prospect WFP	10	13	0	0	0	10	53	2	2	0
	Inlet to Macarthur(Broughtons Pass)	10	13	1	1	0	10	52	3	1	0
	Inlet North Richmond WFP	10	13	4	1	0	10	52	7	2	0
	Composite of Inlets to Cascades, Nepean, Illawarra & Woronora WFPs	20	13	0	0	0	20	52	3	2	0
	Inlet Cascades WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Nepean WFP	10	2	0	0	0	10	9	2	1	0
	Inlet Illawarra WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Woronora WFP	10	2	0	0	0	10	8	0	0	0
Treated Water	Outlet Prospect WFP HPR44	100	80	1	3	0	100	316	1	3	0
	Outlet Warragamba WFP R129	100	78	0	0	0	100	314	0	0	0
	Outlet Orchard Hills WFP MOH2	100	78	0	0	0	100	315	0	0	0
	Outlet Macarthur WFP MACSP4	100	4	0	0	0	100	7	0	0	0
	Outlet North Richmond WFP NRWFPF	100	8	0	0	0	100	21	0	0	0
	Outlet Cascades WFP R394	100	2	0	0	0	100	10	0	0	0
	Outlet Nepean WFP R252	100	2	0	0	0	100	10	0	0	0
	Outlet Illawarra WFP IWFPF	100	2	0	0	0	100	9	0	0	0
	Outlet Woronora WFP HWO2	100	2	0	0	0	100	9	0	0	0

NOTE: This table shows only positive results which have been confirmed with DAPI



**Giardia** - (IFA POSITIVE)

Water Type	Giardia [cysts/Volume]	Quarter 4 (April to June 2012)					Rolling 12 months				
		From 1/04/2012 To 30/06/2012					From 1/07/2011 To 30/06/2012				
		Performance					Performance				
		Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value	Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value
Raw Water	Prospect WFP Raw Water Composite	15	78	8	2	0	15	314	21	2	0
	Warragamba Pipeline 1 & 2 Composite	10	17	1	1	0	10	17	2	1	0
	Warragamba Pipeline 1	10	12	0	0	0	10	52	0	0	0
	Warragamba Pipeline 2	10	9	0	0	0	10	49	0	0	0
	Upper Canal Prospect	10	15	3	2	0	10	55	17	5	0
	Inlet to Prospect WFP	10	13	1	1	0	10	53	8	3	0
	Inlet to Macarthur(Broughtons Pass)	10	13	3	1	0	10	52	4	1	0
	Inlet North Richmond WFP	10	13	6	4	0	10	52	18	4	0
	Composite of Inlets to Cascades Nepean Illawarra & Woronora WFPs	20	13	2	1	0	20	52	5	1	0
	Inlet Cascades WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Nepean WFP	10	2	0	0	0	10	9	2	2	0
	Inlet Illawarra WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Woronora WFP	10	2	0	0	0	10	8	1	1	0
Treated Water	Outlet Prospect WFP HPR44	100	80	1	1	0	100	315	1	1	0
	Outlet Warragamba WFP R129	100	78	0	0	0	100	314	0	0	0
	Outlet Orchard Hills WFP MOH2	100	78	0	0	0	100	315	0	0	0
	Outlet Macarthur WFP MACSP4	100	4	0	0	0	100	7	0	0	0
	Outlet North Richmond WFP NRWFPF	100	8	0	0	0	100	21	0	0	0
	Outlet Cascades WFP R394	100	2	0	0	0	100	10	1	1	0
	Outlet Nepean WFP R252	100	2	0	0	0	100	10	0	0	0
	Outlet Illawarra WFP IWFPF	100	2	0	0	0	100	9	0	0	0
	Outlet Woronora WFP HWO2	100	2	0	0	0	100	9	0	0	0

NOTE: This table shows all positive results observed with IFA prior to DAPI confirmation

**Giardia - (DAPI CONFIRMED)**

Water Type	Giardia [cysts/Volume]	Quarter 4 (April to June 2012)					Rolling 12 months				
		From 1/04/2012 To 30/06/2012					From 1/07/2011 To 30/06/2012				
		Performance					Performance				
		Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value	Typical Volume (L)	No of Samples	No. of Exceptions	Max. Value	Min. Value
Raw Water	Prospect WFP Raw Water Composite	15	78	3	1	0	15	314	8	2	0
	Warragamba Pipeline 1 & 2 Composite	10	17	0	0	0	10	17	0	0	0
	Warragamba Pipeline 1	10	12	0	0	0	10	52	0	0	0
	Warragamba Pipeline 2	10	9	0	0	0	10	49	0	0	0
	Upper Canal Prospect	10	15	1	1	0	10	55	8	5	0
	Inlet to Prospect WFP	10	13	0	0	0	10	53	4	2	0
	Inlet to Macarthur(Broughtons Pass)	10	13	1	1	0	10	52	1	1	0
	Inlet North Richmond WFP	10	13	3	2	0	10	52	10	2	0
	Composite of Inlets to Cascades Nepean Illawarra & Woronora WFPs	20	13	1	1	0	20	52	2	1	0
	Inlet Cascades WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Nepean WFP	10	2	0	0	0	10	9	1	1	0
	Inlet Illawarra WFP	10	2	0	0	0	10	8	0	0	0
	Inlet Woronora WFP	10	2	0	0	0	10	8	0	0	0
Treated Water	Outlet Prospect WFP HPR44	100	80	0	0	0	100	315	0	0	0
	Outlet Warragamba WFP R129	100	78	0	0	0	100	314	0	0	0
	Outlet Orchard Hills WFP MOH2	100	78	0	0	0	100	315	0	0	0
	Outlet Macarthur WFP MACSP4	100	4	0	0	0	100	7	0	0	0
	Outlet North Richmond WFP NRWPF	100	8	0	0	0	100	21	0	0	0
	Outlet Cascades WFP R394	100	2	0	0	0	100	10	1	1	0
	Outlet Nepean WFP R252	100	2	0	0	0	100	10	0	0	0
	Outlet Illawarra WFP IWFPF	100	2	0	0	0	100	9	0	0	0
	Outlet Woronora WFP HWO2	100	2	0	0	0	100	9	0	0	0

NOTE: This table shows only positive results which have been confirmed with DAPI

# Annual summary

The following tables are summary data for the rolling 12 months (July 2011 to June 2012)

- *Summary of exceptions for 2010-11 and 2011-12*

During 2011-12 there were ten exceptions for the health related characteristics, four exceptions occurred during 2010-11. There were six *E. coli* exceptions as compared to four last year. As seen in Table 16 and 17 there has been an increase in the number of exceptions for the characteristics that have an aesthetic guideline value. This is mainly due to an increase in pH levels pH exceptions in the current financial year have increased from 113 to 158. This year Sydney Water's catchments have observed unusually very high wet weather conditions resulting in the deterioration of raw water quality to be treated by various water treatment plants. The wet weather also resulted in low water demand and hence a higher water age. It is a well know phenomenon that the pH increases in the distribution system with higher water retention time due to dissolution or leaching through cement lining of pipelines. Sydney Water has initiated an action in order to address the increase in pH exceptions in the distribution systems.

- *Summary of Chlorine disinfection performance for 2004-05 to 2011-12*

Table 18 represents chlorine performance against Sydney Water's internal disinfection targets. Sydney Water uses a combination of either free chlorine or monochloramine to achieve disinfection within Sydney Water operated delivery systems. The criteria used to calculate performance is based on the total chlorine level being greater than 0.6 mg/L, or if the total chlorine is less than or equal to 0.6 mg/L, then the free chlorine must be greater than 0.2 mg/L. Performance is based on samples meeting this criteria 90% of the time. In 2011-12 the Prospect North, Ryde, Potts Hill, Macarthur and Woronora Delivery Systems were below the internal target of 90%. In all cases compliance against microbial indicators was achieved.

- *Summary of Customer Complaints for 2010-11 to 2011-12*

As seen in Table 19 there was a decrease in the number of customer complaints in 2011-12, as compared to 2010-11.

In 2010 Sydney Water implemented an early warning dirty water alert system. This system has contributed greatly to the large reduction in the number of dirty water complaints.

Table 16: Number of exceptions for 2011-12 as compared to 2010-11

Water Quality Characteristics	No of exception 2010-11	No of exception 2011-12	Change in number of exceptions
<i>E.coli</i> (Thermotolerant Coliforms)	4	6	UP 2
Turbidity	9	4	DOWN 5
Iron	1	1	SAME
pH	113	158	UP 45
Dissolved Oxygen	12	5	DOWN 7
THMs	0	4	UP 4
Manganese	1	0	DOWN 1
Odour	1	1	SAME
Taste	0	1	UP 1
<b>Total</b>	<b>141</b>	<b>180</b>	

Table 17: Summary of exceptions for 2010-11 and 2011-12

Summary of Exceptions for 2010-11 compared with 2011-12																															
Characteristic	E.coli		THM		Turbidity		Iron		pH		Taste		Odour		Dissolved Oxygen		Manganese		Total Number of:						Percent of:						
																			Health		Aesthetic		All		Health		Aesthetic		All		
Delivery System	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012	2010/ 2011	2011 / 2012			
North Richmond	0	0	0	0	0	0	0	0	28	45	0	0	0	0	2	0	0	0	0	0	30	45	30	45	0.0	0.0	21.9	26.5	21.3	25.0	
Orchard Hills	0	1	0	0	0	1	0	0	17	19	0	1	1	1	0	0	0	0	0	0	18	22	18	23	0.0	10.0	13.1	12.9	12.8	12.8	
Prospect South	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	2	1	2	1	0.0	0.0	1.5	0.6	1.4	0.6	
Prospect North	0	1	0	0	1	1	0	1	10	23	0	0	0	0	2	0	0	0	0	0	1	13	25	13	26	0.0	10.0	9.5	14.7	9.2	14.4
Prospect East	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0.0	0.0	0.7	0.0	0.7	0.0	
Ryde	0	3	0	0	1	0	0	0	1	0	0	0	0	0	2	2	0	0	0	0	3	4	2	4	5	0.0	30.0	2.9	1.2	2.8	2.8
Potts Hill	1	0	0	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0	1	0	4	3	5	3	25.0	0.0	2.9	1.8	3.5	1.7	
Warragamba	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0.0	0.0	2.2	0.0	2.1	0.0	
Nepean	1	0	0	4	0	0	0	0	2	3	0	0	0	0	0	1	1	0	1	4	3	4	4	8	25.0	40.0	2.2	2.4	2.8	4.4	
Macarthur	1	0	0	0	1	0	0	0	22	24	0	0	0	0	0	0	0	0	1	0	23	24	24	24	25.0	0.0	16.8	14.1	17.0	13.3	
Illawarra	1	0	0	0	3	2	0	0	4	10	0	0	0	0	0	0	0	0	1	0	7	12	8	12	25.0	0.0	5.1	7.1	5.7	6.7	
Woronora	0	1	0	0	0	0	0	0	4	25	0	0	0	0	1	0	0	0	0	1	5	25	5	26	0.0	10.0	3.6	14.7	3.5	14.4	
Cascades	0	0	0	0	1	0	1	0	20	6	0	0	0	0	2	1	0	0	0	0	24	7	24	7	0.0	0.0	17.5	4.1	17.0	3.9	
No. of Exceptions	4	6	0	4	9	4	1	1	113	158	0	1	1	1	12	5	1	0	4	10	137	170	141	180							
No. of Samples	8124	8220	636	636	8052	8112	1560	1560	8052	8112	17	17	13	17	365	364	1560	1560	8760	8856	19619	19742	28379	28598							
% Health	100.0	60.0	0.0	40.0																											
% Aesthetic					6.6	2.4	0.7	0.6	82.5	92.9	0.0	NA	0.7	0.6	8.8	2.9	0.7	0.0													
% all Exceptions	2.8	3.3	0.0	2.2	6.4	2.2	0.7	0.6	80.1	87.8	0.0	NA	0.7	0.6	8.5	2.8	0.7	0.0	2.8	5.6	97.2	94.4									

Table 18: Chlorine performance by distribution system for 2004-05 to 2011-12

Delivery System	% of Test Results at Customers Taps meeting Chlorine Residual Targets (Internal Target = 90 %)							
	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Greaves Creek	96.30%							
North Richmond	93.14%	92.16%	97.06%	95.10%	99.51%	97.55%	97.06%	98.53%
Orchard Hill	93.13%	92.44%	90.83%	<b>87.59%</b>	95.56%	98.50%	98.38%	91.27%
Prospect South	93.79%	99.20%	98.08%	98.43%	98.11%	97.80%	95.30%	96.67%
Prospect North	<b>88.02%</b>	90.43%	<b>88.31%</b>	<b>85.35%</b>	<b>86.38%</b>	<b>82.43%</b>	<b>80.46%</b>	<b>89.94%</b>
Prospect East	98.68%	99.36%	98.50%	98.90%	99.56%	98.46%	99.78%	99.34%
Ryde	<b>89.05%</b>	<b>87.98%</b>	<b>81.59%</b>	<b>84.67%</b>	<b>86.02%</b>	<b>79.98%</b>	<b>74.43%</b>	<b>85.31%</b>
Potts Hill	96.53%	95.45%	91.62%	91.91%	95.75%	90.53%	<b>87.03%</b>	<b>87.94%</b>
Warragamba	<b>87.96%</b>	96.30%	100%	95.37%	97.22%	98.15%	98.15%	91.67%
Nepean	91.03%	98.72%	<b>88.46%</b>	<b>87.74%</b>	96.79%	98.72%	98.08%	97.44%
Macarthur	<b>80.21%</b>	<b>84.17%</b>	<b>89.63%</b>	<b>83.13%</b>	91.67%	90.83%	<b>86.25%</b>	<b>85.77%</b>
Illawarra	95.71%	97.98%	91.54%	95.83%	99.12%	96.72%	94.95%	95.57%
Woronora	<b>81.36%</b>	<b>79.94%</b>	<b>66.67%</b>	<b>58.33%</b>	<b>74.47%</b>	<b>72.22%</b>	<b>66.35%</b>	<b>85.29%</b>
Cascades	92.11%	90.23%	92.63%	93.88%	99.55%	98.94%	97.92%	99.64%
Total	<b>91.78%</b>	<b>92.90%</b>	<b>89.95%</b>	<b>89.58%</b>	<b>92.89%</b>	<b>89.91%</b>	<b>87.25%</b>	<b>90.79%</b>

Note: Results in blue and bold are those less than the 90% target.

**Table 19: Customer complaints for 2010-11 compared to 2011-12**

Delivery System	2010-11		2011-12	
	Received	Resolved as Sydney Water's responsibility*	Received	Resolved as Sydney Water's responsibility*
North Richmond	41	N/A	43	N/A
Orchard Hill	296	N/A	213	N/A
Prospect South	138	N/A	74	N/A
Prospect North	306	N/A	228	N/A
Prospect East	48	N/A	46	N/A
Ryde	241	N/A	306	N/A
Potts Hill	959	N/A	597	N/A
Warragamba	6	N/A	3	N/A
Nepean	43	N/A	36	N/A
Macarthur	252	N/A	240	N/A
Illawarra	339	N/A	241	N/A
Woronora	39	N/A	69	N/A
Cascades	102	N/A	136	N/A
<b>Total</b>	<b>2810</b>	<b>1005</b>	<b>2232</b>	<b>839</b>
Discoloured Water	2223	912	1750	718
Taste & Odour	421	71	335	100
WQ others	59	2	74	15
Health	107	20	73	6

*\*Note: In 2005-2006 SWC Customer and Community Relations Division began reporting customer complaints as those that had been resolved to be Sydney Water's responsibility. These numbers are not available by Delivery System.*

# Quarterly Recycled Water Quality Monitoring Report for NSW Health 2011-12

**Fourth Quarter 2011-12**

**1 April 2012 to 30 June 2012**





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This Recycled Water quality report and the information, ideas, concepts, methodologies, technologies and other material it contains remain the intellectual property of Sydney Water Corporation, unless otherwise agreed.

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This document should be read in conjunction with the Annual Recycled Water Quality Monitoring Plan 2011-12.

## DOCUMENT STATUS

This quarterly report was prepared by Monitoring Services to comply with the Recycled Water quality management requirement specified under clause 2.2 of Sydney Water's Operating Licence.

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Endorsement that the report meets the requirements of the Operating Licence



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# 1. Introduction

In Sydney Water's Operating Licence for 2010-2015, Clause 2.2 specifies that:

'Sydney Water must manage recycled water quality in accordance with

- (a) the *Australian Guidelines for Water Recycling* (unless NSW Health specifies otherwise) to the satisfaction of NSW Health
- (b) any other guidelines specified by NSW Health to the satisfaction of IPART.'

Currently Sydney Water has transitioned to meet the requirements of the *Australian Guidelines for Water Recycling* (AGWR), *Managing Health and Environmental Risks, Phase 1, 2006*, with Recycled Water Quality Management Plans (RWQMPs) endorsed by NSW Health for the following schemes:

- Rouse Hill – dual reticulation, indoor and outdoor use
- Wollongong Stage 1 – industrial water for BlueScope Steel
- Wollongong Stage 2 – industrial water for Port Kembla Coal Terminal & irrigation water for Wollongong golf course and municipal parks.
- Western Sydney Recycled Water Initiative – environmental flows for Hawkesbury-Nepean River.

Recycled water quality performance for these four schemes is assessed against the compliance monitoring plan listed in the 'Monitoring Summary' contained within the respective RWQMP.

Sydney Water's remaining schemes, where recycled water is supplied solely for municipal or agricultural irrigation, are in the process of transitioning to meet the requirements of the AGWR. For these schemes, NSW Health has agreed that Sydney Water continue to assess water quality performance based on relevant parameters from available guidelines for the particular recycled water use, and specific customer requirements as per the individual customer agreements in place.

The customer agreements for these irrigation schemes typically require the recycled water to meet water quality specifications that relate to:

- 1) Grades as classified by the National Water Quality Management Strategy Guidelines for Sewerage Systems – Use of Reclaimed Water (NWQMS 2000).
- 2) Additional environmental specifications that are scheme specific requirements typically included in the management plans that form part of the customer agreement. These may be derived from site-specific environmental studies or taken from the Department of Environment and Climate Change NSW Environmental Guidelines – Use of Effluent by Irrigation (DECC 2004).

In addition, Sydney Water's water recycling plants (WRPs) that supply recycled water may have additional requirements specified by NSW Environment Protection Agency (EPA) in their Environment Protection Licences. Compliance with these requirements is assessed in Sydney Water's annual licence returns and other reports to EPA.

A quarterly recycled water quality report is submitted each quarter to NSW Health to comply with clause 2.2 of Sydney Water's Operating Licence. The quarterly report to NSW Health contains the following requirements:

- Details of any exception from any guideline values as agreed with NSW Health over the previous 12 months.
- Test results and date or period of exception from these guidelines of the health and environmental parameters for which compliance is required.
- Explanation of the causes of the exception and any action taken to rectify the exception and prevent it re-occurring.
- Appraisal of the exception including discussion of the extent and nature of the exception and an analysis of the risks posed by the exception.

This *Quarterly Monitoring Report on Recycled Water Quality* covers the fourth quarterly period of 2011-2012: **1 April 2012 to 30 June 2012** and focuses on the compliance monitoring and an evaluation of this data on an exception basis for both health and environmental characteristics.

## 2. Recycled water quality monitoring results & commentary

### 2.1 Performance summary

For the 12-month period covered by this report, Sydney Water has achieved full compliance with the health and environmental performance requirements. *Cryptosporidium* oocysts were found in a sample collected from Wollongong Stage 2 in August 2011 and February 2012. NSW Health was notified of both results. The plant was performing optimally on both occasions and the level of disinfection was adequate to inactivate oocysts. As demonstrated in the viability testing of oocysts detected in the proving period prior to scheme start-up, it is likely that the oocysts recovered had been inactivated by the UV, and would not pose a risk to public health.

### 2.2 Summary of exceptions

An exception is considered to have occurred in a sample where the measured recycled water parameter has exceeded the specific performance target.

Table 1 summarises the exceptions that occurred in each recycled water scheme assessed against performance requirements as outlined in the introduction to this report. Exceptions for the quarter and rolling 12 months are reported. The exceptions however, do not necessarily indicate an actual, or potential, failure to meet annual recycled water quality performance requirements.

### 2.3 Evaluation of results on exception basis

Table 2 provides further sampling details and commentary on the exceptions for the fourth quarter of 2011-12.

Table 1: Exception summary for recycled water quality monitoring: 4<sup>th</sup> quarter 2011-12 and 12 month rolling period

Recycled water scheme	Scheme category	Number of exceptions				Volume supplied (ML) 2011-12 4 <sup>th</sup> Q
		Health parameters		Environmental / Customer parameters		
		2011-12 4 <sup>th</sup> Q	12 month period	2011-12 4 <sup>th</sup> Q	12 month period	
Rouse Hill	Residential (including fire fighting)	Nil	Nil	Nil	Nil	408.219
Wollongong Stage 1	Industrial (including fire fighting)	Nil	Nil	Nil	Nil	17,02.676
Wollongong Stage 2	Industrial (including fire fighting)	Nil	2 <i>Crypto</i>	1 TP	1 TP	102.654
Western Sydney Recycled Water Initiative	Environmental flows	Nil	Nil	1 TRC	1 TRC	1,829.811
Castle Hill WRP	Irrigation – Municipal, uncontrolled public access*	Nil	1 FC	Nil	Nil	0.000
Quakers Hill WRP	Irrigation – Municipal, uncontrolled public access*	Nil	Nil	Nil	Nil	0.002
Richmond WRP	Irrigation – Municipal, uncontrolled public access*	Nil	Nil	Nil	Nil	2.938
St Marys WRP	Irrigation – Municipal, uncontrolled public access*	1 FC	3 FC	Nil	Nil	5.402
Penrith WRP	Irrigation – Municipal, uncontrolled public access*	Nil	2 FC	Nil	1 pH	0.257
Picton WRP	Agricultural – with no withholding period*	Nil	1 FC	Nil	2 pH	54.936
Liverpool WRP	Irrigation – Municipal, controlled public access*	Nil	Nil	Nil	Nil	1.602
West Camden WRP	Agricultural – Pasture & fodder for dairy animals (without withholding period)* Irrigation – Municipal use, with restricted access and application (as per AGWR)	Nil	Nil	Nil	3 TP	3.745
Bombo WRP	Irrigation – Municipal, controlled public access*	Nil	1 FC	Nil	Nil	12.185

Recycled water scheme	Scheme category	Number of exceptions				Volume supplied (ML) 2011-12 4 <sup>th</sup> Q
		Health parameters		Environmental / Customer parameters		
		2011-12 4 <sup>th</sup> Q	12 month period	2011-12 4 <sup>th</sup> Q	12 month period	
Gerringong/Gerroa WRP	Irrigation – Municipal, uncontrolled public access*	Nil	1 FC	Nil	1TP, 1CBOD <sub>5</sub>	5.380
All RW schemes–total		1 FC	9 FC, 2 <i>Crypto</i>	1 TRC,1TP	1TRC, 5TP, 3pH, 1CBOD <sub>5</sub>	4,129.807

\* categorised according to NWQMS Guidelines for Sewerage Systems - Use of Reclaimed Water, November 2000

FC = faecal coliforms; *Crypto* = *Cryptosporidium* oocyst; TP = total phosphorus; CBOD<sub>5</sub> = carbonaceous biochemical oxygen demand; TRC = total residual chlorine

Table 2: Evaluation of results on exception basis for compliance parameters for 4<sup>th</sup> quarter 2011-12

RW scheme	No of exceptions / total no of samples	Characteristics	Agreed performance values	Actual Value	Sample date	Sample location	Comment
<b>Residential recycled water</b>							
Rouse Hill	Nil exceptions						
<b>Industrial recycled water</b>							
Wollongong Stage 1	Nil exceptions						
Wollongong Stage 2	1/3	TP	<2.0 mg/L (50%ile)	2.01 mg/L	05/06/12	Sampling tap at WRP on the main supply to Port Kembla Coal Terminal	Minor exceedance. Complying with agreed performance value. Continue to monitor.
<b>Environmental flows</b>							
Western Sydney Recycled Water Initiative	1/13	TRC	<0.1 mg/L (50%ile)	0.30 mg/L	08/06/12	Discharge channel at Penrith WRP	Environmental parameter. EPA was notified of the result and reported in the EPL quarterly report to EPA.
<b>Irrigation recycled water</b>							
Castle Hill WRP	Nil exceptions						
Quakers Hill WRP	Nil exceptions						
Richmond WRP	Nil exceptions						
St Marys WRP	1/15	FC	<10 CFU/100 mL (50%ile)	15 CFU/100 mL	12/05/12	Outlet of the chlorine contact tank	Minor exceedance. Complying with agreed performance value. Continue to monitor.
Penrith WRP	Nil exceptions						
Picton WRP	Nil exceptions						
Liverpool WRP	Nil exceptions						
West Camden WRP	Nil exceptions						
Bombo WRP	Nil exceptions						
Gerringong/Gerroa WRP	Nil exceptions						