



## LOGAN CITY COUNCIL

### DRINKING WATER QUALITY MANAGEMENT PLAN ANNUAL REPORT – 2014/15 FINANCIAL YEAR

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## NOTATIONS AND ABBREVIATIONS

<b>ADWG</b>	Australian Drinking Water Guidelines, 2011. Published by the National Health and Medical Research Council of Australia
<b>AS</b>	Australian Standard
<b>BAU</b>	Business As Usual
<b>CCP</b>	Critical Control Point (as defined by HACCP)
<b>CRM</b>	Customer Relationship Management (system)
<b>DEWS</b>	Department of Energy and Water Supply
<b>DWQMP</b>	Drinking Water Quality Management Plan
<b><i>E. coli</i></b>	Escherichia coli, a bacterium which is considered to indicate the presence of faecal contamination and therefore potential health risk
<b>EPI</b>	Eastern Pipeline Interconnector
<b>ERP</b>	Emergency Response Plan
<b>FY</b>	Financial Year
<b>GCCC</b>	Gold Coast City Council
<b>HACCP</b>	Hazard Analysis Critical Control Point
<b>HLZ</b>	High Level Zone
<b>IMP</b>	Incident Management Plan
<b>KPI</b>	Key Performance Indicator
<b>LCC</b>	Logan City Council
<b>LIMS</b>	Laboratory Information Management System
<b>LLZ</b>	Low Level Zone
<b>LOD</b>	Limit of Detection
<b>LOR</b>	Limit of Reporting
<b>LWA</b>	Logan Water Alliance
<b>LWIA</b>	Logan Water Infrastructure Alliance
<b>mg/L</b>	Milligrams per litre
<b>MPN/100mL</b>	Most Probable Number per hundred millilitres
<b>NATA</b>	National Association of Testing Authorities
<b>RMIP</b>	Risk Management Improvement Plan
<b>SAMMS</b>	Strategic Asset Maintenance Management Systems
<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>SEQ</b>	South East Queensland
<b>SOP</b>	Standard Operating Procedure
<b>SRWP</b>	Southern Regional Water Pipeline
<b>THM</b>	Trihalomethane
<b>WGM</b>	Water Grid Manager
<b>WOP</b>	Work Operating Procedure
<b>WPR</b>	Water Planning and Regulation (formally QLD Office of the Water Supply Regulator)
<b>WQZ</b>	Water Quality Zone
<b>WSZ</b>	Water Supply Zone
<b>WTP</b>	Water Treatment Plant
<b>WWETT</b>	Water and Wastewater Event Tracking Tool

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# 1 INTRODUCTION

On the 1st July of 2008, the *Water Supply (Safety and Reliability) Act 2008* (the Act) came into effect. As detailed in Section 3 of the Act, the **purpose** is to provide safe and reliable water supply throughout Queensland.

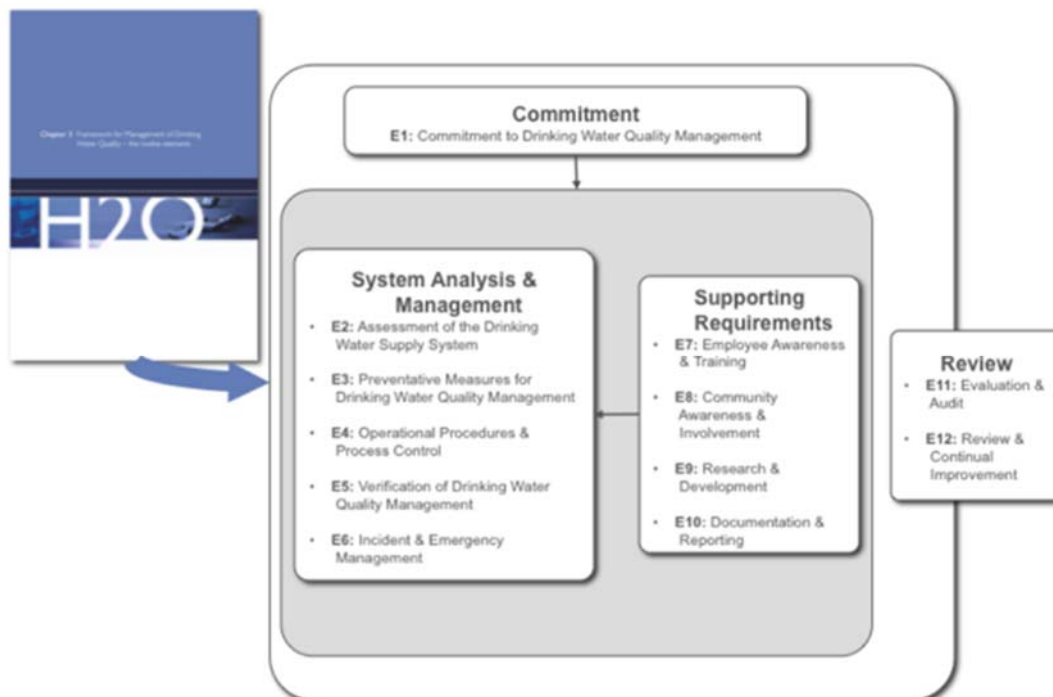
The **aim** is to protect public health through the management of drinking water quality achieved via a Regulatory Framework, thus under the Act, Service Providers are required to have an approved Drinking Water Quality Management Plan (DWQMP). Logan City Council (LCC) is governed by the Act and has had an approved DWQMP since December 2013.

This DWQMP Annual Report documents the performance of LCC's drinking water with respect to water quality and performance in implementing the actions detailed in the DWQMP Rev5.1 for the 2014/15 Financial Year (FY), as required under the Act.

This report assists the office of Water Planning and Regulation (formally the QLD Office of the Water Supply Regulator), Department of Energy and Water Supply (DEWS), to determine compliance with the approved DWQMP, and any approval conditions. It also provides a mechanism for water service providers to disclose information publicly on their performance in managing drinking water quality.

This report has been prepared in accordance with the Guidelines for Service Provider Annual Reports September 2010 and the Guidelines for Service Provider Annual Reports July 2013, published by DEWS.

The DWQMP Rev 5.1 uses the Framework for Management of Drinking Water Quality from the Australian Drinking Water Guidelines (ADWG), published by the National Health and Medical Research Council of Australia to help meet the Act requirements. The ADWG Framework consists of 12 Elements, 32 Components and 76 Actions, as shown in Figure 1.



**Figure 1 - ADWG Framework**

## 2 OVERVIEW OF OPERATIONS

### 2.1 Logan City Council Network Description Overview

LCC covers an area of approximately 957 square kilometres and has a population greater than 300,000 people, with approximately 285,000 connected to potable water supply.

LCC is bounded by Underwood in the North, Mundoolun in the South, the Albert River in the east and Greenbank in the west. There are significant areas of bushland, National Parks and waterways. LCC is the water service provider to Logan City's residential, non-residential, commercial and industrial users connected to the reticulated water supply.

LCC is a drinking water service provider which is responsible for receiving bulk treated water from Seqwater and delivering it to customers through its water distribution network. LCC manages, maintains and operates the reticulation network, including disinfection facilities located within Logan City. Extensive monitoring is also undertaken by our NATA accredited laboratory, to verify drinking water quality complies with internal targets and regulatory conditions.

### 2.2 SEQ Water – Bulk Water Supply Grid to Logan

LCC is part of the South East Queensland (SEQ) Water Supply Network, managed and operated by Seqwater. The SEQ Water Supply Network is an extensive drinking water distribution system that includes Noosa, Sunshine Coast, Moreton Bay, Brisbane, Ipswich, Lockyer Valley, Redlands, Logan, Gold Coast, Somerset and the Scenic Rim regions, as shown in Figure 2.

Seqwater is the Queensland Government Statutory Authority responsible for ensuring a safe, secure and reliable water supply for SEQ, as well as managing catchment health and providing recreational facilities to the community.

LCC does not treat any raw water for drinking purposes. It relies solely on the treated drinking water supplied by Seqwater. The treated drinking water supply for LCC is predominantly from the Mount Crosby Water Treatment Plant (WTP), which treats water from Wivenhoe Dam via the Brisbane River, and from the Molendinar WTP, that treats water from the Hinze Dam. Drinking water is also regularly sourced from the North Stradbroke Island WTP, and at times, the Gold Coast Desalination plant. However, due to the operation of the SEQ Water Supply Network, safe drinking water can be sourced from other WTPs at times.

Water supply from Seqwater to Logan can occur via a number of routes, including the Southern Regional Water Pipeline (SRWP) and Eastern Pipeline Interconnector (EPI), where water can flow in either direction, depending on demand.

Seqwater and LCC work together to manage the water supply system to ensure our customers receive safe drinking water that meets the health guideline values stated in the Australian Drinking Water Guidelines (ADWG).

### 2.3 Water Supply Disinfection

The ADWG place a heavy emphasis on ensuring drinking water is microbiologically safe. An effective way to achieve this is by chemical disinfection.

LCC can receive both chloraminated and chlorinated disinfected water from Seqwater. LCC can also convert chloraminated water to chlorinated water via its breakpoint chlorination systems located at various locations within Logan. Conversion generally occurs during the hotter months to ensure continued effective disinfection of water supply or during network maintenance.

Drinking water distributed by LCC contains either chloramine or chlorine as the disinfectant. These chemicals are a very effective way to kill or inactivate a wide range of harmful micro-organisms and have been used in the water industry worldwide for over 80 years.





Figure 2 – Seqwater Water Supply

LCC closely monitors the level of disinfectant within the water supply, and undertakes extensive monitoring of *Escherichia coli* (*E.coli*) to ensure that disinfection is effective.

Seqwater, who is responsible for treating raw water, and Logan City Council, who distributes treated water, normally maintain the level of disinfectants between 0.2 and 2 mg/L (parts per million). This is sufficient to protect customers against potential contamination of the drinking water supply, and assist in the maintenance of water quality in the water supply network.

LCC endeavours to ensure that there is a sufficient amount of disinfectant throughout our network to ensure that there is a continual barrier against potential contamination. This is consistent with world best practice.

LCC has a number of locations where re-chlorination of the drinking water can occur to maintain disinfection or as part of the network disinfection maintenance program. Customers who live close to these locations, at times, may notice a stronger taste or smell of chlorine.

## 2.4 Water Quality Zones

A Water Quality Zone (WQZ) can be defined as a section of the water distribution network that receives water with particular quality characteristics. *“Taking into account the various bulk water supply sources and two different disinfection types. During 2014/15 FY, LCC defined seven discrete WQZs. WQZs are used when undertaking medium to long term water quality trend analysis and regulatory annual reporting.”*

The WQZs supplied from each bulk water source, under general operating conditions, are shown in Table 1, indicating general water source and disinfection type, thus blending can occur within some of the zones.

**Table 1 - Logan City Council Water Source Summary (DWQMP Rev 5.2)**

MAJOR ZONE		DISINFECTION TYPE	BLENDED	APPROXIMATE WATER SUPPLY FROM EACH SOURCE			
				MT CROSBY (KURABY)	MT CROSBY (SRWP)	REDLAND CITY (EPI)	GOLD COAST (SRWP)
Logan North	Greenbank	Chloraminated	Yes	60%	30% (Summer)	-	10% (Winter)
	Kimberly Park	Chloraminated	Yes	70%	-	30%	-
	Marsden	Chloraminated	No	100%	-	-	-
	Springwood High	Chloraminated	No	100%	-	-	-
	Springwood Low	Chloraminated	No	100%	-	-	-
Logan East		Chloraminated (Winter) Chlorinated (Summer)	No	100%	-	-	-
Logan South		Chloraminated <sup>A</sup>	Yes	-	50%	-	50%

**Note:** (A) Some areas maybe chlorinated if incoming chlorine residual is low, generally during Summer.

## 3 ACTIONS TAKEN TO IMPLEMENT THE DWQMP

### 3.1 Progress in Implementating the Risk Management Improvement Plan

#### 3.1.1 Risk Management Improvement Plan Process

LCC's Risk Management Improvement Plan (RMIP) is the key document used to capture opportunities for improvement to reduce risks to drinking water and improve its quality. RMIP actions are identified to address the following:

- *Risk Assessments – high risks;*
- *Internal DWQMP Reviews and Audits – non-conformances and general improvements;*
- *Incidents; and*
- *Water Regulator feedback.*

To ensure the RMIP is communicated, implemented and monitored for effectiveness, RMIP reviews with key internal stakeholders are undertaken at least annually.

#### 3.1.2 Implementation of the RMIP

The following section summarises the progress of the key programs initiated in association with the RMIP, with details included in Appendix B.

#### **Element 1 – Commitment to Drinking Water Quality Management**

The DWQMP Policy was finalised & endorsed by the Senior Water Branch Managers & Deputy CEO November 2013. Development and implementation of formalised Policy training is planned for the 2016/17 Financial Year (FY).

Commercial high water volume users & critical customers register was developed and is now routinely updated to help with prompt communication about water quality changes.

The Operating Protocol between Seqwater and Logan was updated, with the future plan to include additional Trihalomethane (THM) notifications to Logan for the 2015/16 FY.

#### **Element 2 – Assessment of the Drinking Water Supply System**

As part of the regulatory review process, the DWQMP, including the Supply Network Schematic, was updated to reflect the future population growth, developments, key network assets and operational changes.

'Whole of system' Risk Assessment workshops are planned for the 2015/16 FY, to help identify and consolidate key risks associated with recent system changes and residual risks from Seqwater. The aim is to identify and distinguish between 'high' and 'low' risks so that attention and resources can be directed towards those hazards that are most threatening.

There was a delay in the implementation of the online water quality monitoring equipment due to the logistics of the sites chosen, being extensive, with completion expected during the 2015/16FY.

#### **Element 3 – Preventative Measures for Drinking Water Quality**

Pub Lane reservoir was decommissioned with Round Mountain reservoir commissioned to help improve water quality, by reducing water age in the Logan South water supply network.

Network Water Quality Maintenance and Operating Strategies were developed to help with the implementation of chlorine dosing systems, including newly commissioned systems at Travis Road Reservoir (Logan South), Greenbank Reservoir and Illaweena Reservoir.

Network disinfection maintenance programs were also undertaken for the first time in the Greenbank/Marsden water supply zones with Kimberley Park's second one to be completed August 2015. These programs help clean the network pipes and hence improve water quality.

Detailed planning has commenced for the installation of two new chlorine dosing systems for Logan East, with commissioning planned during the 2015/16 FY, to help improve chlorine disinfection residuals.

Review of the Critical Control Points (CCPs) continue into the 2015/16 FY, to incorporate newly commissioned chlorine dosing systems with associated procedures to be updated.

#### **Element 4 – Operational Procedures & Process Control**

The Water Quality Network & Operation Strategies will help improve operational processes such as procedures, optimal set-points, mains return to service, network flushing and cleaning of tools & equipment. Implementation will continue during the 2015/16 FY.

The Reservoir Reliability Assessment report was adopted, such that reservoir level management was formalised, to minimise detention times and help improve chlorine residuals.

Chemical supply and materials register was developed, incorporating products approved for use in drinking water supplies.

#### **Element 5 – Verification of Drinking Water Quality**

The Verification Monitoring program was revised during the 2014/15 FY to meet Legislation requirements as a results of changing population, Tap Audit findings and minor water supply zones changes as part of the DWQMP review.

Implementation of the Tap Audit findings continues during the 2015/16 FY, to ensure safety of staff and sample sites continue to be representative of Logan City.

In the future, LCC's plans to integrate the numerous customer complaint systems into one system (i.e. Customer Relationship Management (CRM)) system, post Strategic Asset Maintenance Management System (SAMMS) implementation, anticipated 2016/17 FY.

#### **Element 6 – Management of Incidents & Emergencies**

A consultant was engaged to help identify gaps and assisted with implementation and training roll-out of LCC's improved Incident Management Plan (IMP) during 2014/15 FY. IMP endorsement and continued training is planned for the 2015/16 FY.

#### **Element 7 – Employee Awareness & Training**

Formalised and OH&S safety training is well captured however a system to best capture and record 'on-the-job' training is still to be developed.

Drinking Water Policy awareness training still to be developed. The ADWG and Act awareness training will continue to be delivered annually to senior staff and management, as part of internal audit review process.

#### **Element 8 – Community Involvement & Awareness**

The development and implementation of new drinking water fact sheets for LCC's public website continues during the 2015/16FY.

#### **Element 9 – Research & Development**

A Reservoir Strategy is being developed, to help identify and improve reservoir inspections, cleans and asset replacement. This will also include appropriate escalations relating to drinking

water quality risks. Appropriate scheduling will be integrated with the new SAMMS, currently being developed.

Water Age modelling to be undertaken during the 2015/16 FY, following recent system changes, with outputs to be used during the whole of system risk assessment workshops and the potential re-establishment of the network flushing program.

#### **Element 10 – Documentation & Record Keeping**

Water Business reports were identified and consolidated, including more than 20 Water Business Plans that were developed as part of the NetServ plan.

A document control system framework is to be established during the 2015/16 FY.

#### **Element 11 – Evaluation & Audit**

The Process Improvement team was established during 2014 and continues to focus on reviewing and improving reservoir chlorine residuals.

The LCC internal audit program undertaken during the 2014/15 FY included key improvement findings in the RMIP.

#### **Element 12 – Review & Continual Improvement**

The RMIP process continues to be reviewed and refined with senior management during the 2015/16 FY.

### **3.1.3 Operational Monitoring Program Revisions to Maintain Water Quality Compliance**

No additional revisions were made to the Operating Monitoring Program to those already included in the improvements described in the current RMIP.

## 4 COMPLIANCE WITH WATER QUALITY CRITERIA FOR DRINKING WATER QUALITY

### 4.1 Compliance Summary

Results from the verification monitoring program have been compared against the water quality criteria specified by the Regulator in the water quality and Reporting Guideline for a Drinking Water Service. The water quality criteria mean the health guideline values in the most current Australian Drinking Water Guidelines (ADWG), as well as the standards in the Public Health Regulation 2005 and any other water quality criteria specified by the Regulator.

During the 2014/15 financial year (FY), all samples met health related compliance targets for fluoride. There were two non-conformances for the detection of *E.coli* during the Verification Monitoring of Logan City's drinking water and one detected during contractor testing, with details described in Section 5.

### 4.2 Monitoring Program Overview

Monitoring of drinking water quality in Logan is undertaken on a regular basis to assess whether water quality is meeting regulatory requirements. This practice verifies the safety of the water along with the effectiveness of the network operation and integrity of the system. Monitoring also allows for the review of results and an opportunity to assess overall performance and identify emerging problems in a proactive manner.

Verification monitoring during the the 2014/15 FY was carried out in accordance with that defined in LCC's DWQMP Rev5.1 Section 6.1.1 Sampling Plan.

LCC's current verification program remains appropriate for the following reasons;

- The minimum frequency for monitoring of *E.coli* is compliant with Schedule 3A of the Public Health Regulation (2005) and Table 9.4 of the ADWG (2011);
- The monitoring of *E.coli* under Schedule 3A is based upon projected populations of 2016 planning horizons, thus is conservative;
- The frequency of monitoring for non-microbial health and aesthetic parameters is as per the recommendations of Table 9.5 ADWG (2011);
- Monitoring is undertaken at both reservoirs and points within the reticulation network and spread across a range of locations to ensure a true understanding exists of the network and the water supplied to consumers;
- Sampling frequency in some water supply zones is well beyond the minimum frequency required. Zones identified as having particular traits that present challenges to water quality management are sampled in excess of regulatory requirements in some case by over 100% to ensure good coverage;
- Verification of drinking water undertaken by LCC also includes consumer satisfaction, the results of which are included in Section 6;
- Due to a number of customer complaints regarding high chlorine in their water changes were made to the source of their water to improve customer satisfaction. In the 2014/15 FY, this included changing Eagleby water supply from the Logan East WSZ to the Springwood Low WSZ. This improved the water quality and reduced complaints associated with a nearby disinfection facility; and
- Ongoing review of the program has resulted in the cessation of sampling at site/s where water was not representative of that supplied to customers. Alternate sites that were more representative were identified to maintain compliance where needed with the minimum sampling requirements.

### 4.3 Data Analysis Methodology

Statistical principles applied whilst undertaking analysis of water quality data are important to note, as management of the data must be appropriate, accurate and practical.

- **Outliers** – Data that appears to be extreme when contrasted against typical results can be classified as an outlier. Outliers are not excluded from data analysis unless it can be proven that they're a result of transcription error or malfunction of measuring equipment. Though outliers have the possibility to skew statistical results, it is not acceptable to censor them out of data as doing so could potentially affect public health.
- **'Less-than' values (<)** – 'Less than' values occur in a data set if a test is conducted and the measured result is less than the Limit of Reporting (LOR). There is no one correct or prescriptive method for the censoring and substitution of 'less-than' values however varying methods exist. It is important to note the methodology selected and the reason. The method adopted by LCC to rationalize 'less-than' values is to censor the result by substituting a value that is equivalent to half the LOR, known as L/2. This approach is consistent with the statistical principles recommended in Information Sheet 3.3 in the ADWG (2011). This approach, whilst not free of flaws, is more conservative than substituting for zero as trace levels could be present below the Limit of Detection (LOD).
- Due to censorship of data (use of L/2) minimum and mean values for some analytes may compute to less than the LOR. In this case, the minimum values are displayed as less than (<) the LOR.
- The reported water quality data do not include results derived from repeat samples, or from emergency or investigative samples undertaken in response to an elevated result.

The summary of water quality data is presented in seven separate tables representing each of the seven water supply zones found in Appendix A.

Also included is a summary of compliance results for *E.coli* undertaken during the drinking water verification monitoring. Whilst monitoring for *E.coli* is undertaken in each seven individual water supply zones, results are displayed in this report as one table for the whole of Logan City.

## 5 NOTIFICATIONS TO THE REGULATOR UNDER SECTIONS 102 AND 102A OF THE ACT

During the 2014/15 FY, there were three instances where the Regulator was notified under sections 102 and/or 102A of the Act.

Notifications include any limits exceeding the ADWG Health Limits and/or if there is reason to believe public health was at risk. Limits exceeding aesthetic limits are not reportable unless there is reason to believe that public health is at risk.

### 5.1 Non Compliances with the Water Quality Criteria

All of the three reportable notifications related to the detection of *E.coli*, an indicator organism for faecal contamination, often associated with the presence of other harmful pathogens from warm blooded organisms.

#### 5.1.1 Detection of *E.coli* (Hillcrest – new mains testing)

##### Incident Description

The first non-compliance was a detection of *E.coli* as part of a new mains connection at Peverell Street Hillcrest, reported on the 12<sup>th</sup> December 2014, with a detection of 14 MPN/100mL in the existing water main. This was reported to LCC by the installing Contractor.

##### Corrective and Preventative Actions

Peverell Street main was flushed. Test results downstream from the effected site and from LCC's routine verification monitoring of the surrounding area indicated no *E.coli* present with chlorine residual present. Followup re-testing at the site and surrounding area indicated no *E.coli*. Thus concluded that the original *E.coli* reported may have been due to a contaminated sample and no further actions were required, with outcomes reported to the Contractor.

#### 5.1.2 Detection of *E.coli* (Mundoolun – reticulation/reservoir)

##### Incident Description

The second non-compliance was a detection of *E.coli* from Friendship Court sample tap. This was part of LCC's routine verification monitoring, with the sample collected on the 27<sup>th</sup> January 2015, resulting in a detection of 5 MPN/100mL and disinfection residual of 0.12mg/L total chlorine.

##### Corrective and Preventative Actions

The reservoir supplying the area was isolated and surrounding area flushed. An inspection found that the reservoir overflow pipe was damaged and presence of frogs hence a boil water notice issued. The overflow pipe was repaired and the reservoir emptied, cleaned and disinfected. The boil water notice was lifted once duplicate testing results detected no *E.coli* in the surrounding network and reservoir, with a chlorine residual present.

#### 5.1.3 Detection of *E.coli* (Cornubia – reservoir sample tap)

##### Incident Description

The third non-compliance was a detection of *E.coli* from the Hideaway Mountain Reservoir sample tap Cornubia. This was part of LCC's routine verification monitoring, with the sample collected on the 23<sup>rd</sup> March 2015, resulting in a detection of 2 MPN/100mL and disinfection residual of 0.08mg/L total chlorine. No *E.coli* was detected in other surrounding sites or reservoirs.



**Corrective and Preventative Actions**

The Reservoir was isolated and chlorinated with inspection indicating no ingress potential. Surrounding area was flushed and re-testing, including via the reservoir hatch and sample tap, indicated the issue was with the reservoir sample tap. A new tap was installed and follow-up samples were free from *E.coli* and chlorine residual present.

## 6 CUSTOMER COMPLAINTS RELATED TO DRINKING WATER QUALITY

### 6.1 Community Engagement

Consumer satisfaction is considered a critical aspect in the verification of drinking water quality. Due to this, the monitoring and analysis of customer complaints is considered a key part of LCC's drinking water quality verification program. At all times LCC encourages customers to lodge complaints about their water quality, if they feel their drinking water is unsatisfactory or if they believe their health is at risk.

Encouraging customers to lodge complaints establishes a link between the service provider and the customer and provides a real time indicator of water quality.

#### 6.1.1 Key Projects

An extensive network disinfection maintenance program commenced at the end of the 2013/14 FY and extended into the 2014/15 FY. This was to reduce nitrification in the network for Logan North and help improve water quality. The community was informed about this program via their local newspaper and LCC's website, which included regular updates.

Planning was also undertaken in the 2014/15 FY for a similar project in the Kimberley Park zone, which was undertaken July to August during the 2015/16 FY. As part of community engagement, fact sheets and public notices were made available to the public via LCC's website and local newspaper, informing the community of the proposed changes and timelines.

### 6.2 Customer Complaints

Customer complaints are closely linked to the performance of the water supply system and thus are an important link in forming preventative strategies and process improvement activities. In all cases, LCC's primary aim is to respond to the complaint to investigate and rectify the condition, ensuring public health is not compromised. With this, data is collected which assists with future improvement activities. Establishment of this process is crucial in driving LCC's process improvement activities.

Over the 2014/15 FY, LCC recorded customer complaints according to the following categories;

- Water Quality - Suspected Health
- Water Quality - Appearance
- Water Quality - Taste and Odour

A total of 663 complaints were received for the 2014/15 FY, equating to 7 complaints per 1000 connections for all types of complaints across the whole of the city.

Of the 663 complaints, the majority related to Appearance (63%), followed by Suspected Health (20%) and Taste and Odour (17%). The number of customer complaints received by LCC per category for each Water Supply Zone (WSZ) is shown in Table 2.

**Table 2 – Water Quality Customer Complaints by Water Supply Zone**

<b>TOTAL WATER QUALITY COMPLAINTS 2014/15 FY</b>				
<b>WATER SUPPLY ZONE</b>	<b>Suspected Health</b>	<b>Appearance</b>	<b>Taste/Odour</b>	<b>TOTAL</b>
LOGAN EAST	9	33	12	54
LOGAN SOUTH	4	28	3	35
GREENBANK	34	141	31	206
MARSDEN	72	136	57	265
SPRINGWOOD LOW	12	46	6	64
SPRINGWOOD HIGH	1	14	1	16
KIMBERLEY PARK	2	20	1	23
<b>TOTAL</b>	<b>134</b>	<b>418</b>	<b>111</b>	<b>663</b>
<b>% OF TOTAL</b>	<b>20 %</b>	<b>63 %</b>	<b>17 %</b>	

Customer complaints per 1000 connections is shown below in Table 3. Whilst the total number of total complaints is relevant, analysing complaints per 1000 connections helps understand the intensity distribution of complaints, as each zone has a different number of connections and thus people within it. Number of connections was based on rateable metered connections.

**Table 3 – Water Quality Customer Complaints per 1000 Connections**

<b>CUSTOMER COMPLAINTS / 1000 CONNECTIONS 2014/15 FY</b>					
<b>WATER SUPPLY ZONE</b>	<b>Suspected Health</b>	<b>Appearance</b>	<b>Taste/Odour</b>	<b>TOTAL</b>	<b>No. Connections</b>
LOGAN EAST	0.68	2.50	0.91	4.09	13,225
LOGAN SOUTH	0.61	4.26	0.45	5.32	6,574
GREENBANK	2.22	9.20	2.02	13.44	15,333
MARSDEN	4.87	9.21	3.86	17.94	14,772
SPRINGWOOD LOW	0.47	1.79	0.23	2.49	25,628
SPRINGWOOD HIGH	0.12	1.66	0.12	1.90	8,422
KIMBERLEY PARK	0.18	1.82	0.09	2.09	11,000
<b>ALL ZONES TOTAL</b>	<b>1.41</b>	<b>4.40</b>	<b>1.17</b>	<b>6.98</b>	<b>94,954</b>

### 6.2.1 Suspected Health

Complaints are occasionally received from customers concerned that their drinking water may be causing illness and these are thus categorised as Suspected Health complaints. At all times LCC encourages customers to lodge a complaint if they believe they are experiencing illness due to their drinking water.

During the 2014/15 FY, LCC received a total of 134 suspected health complaints of which there were no confirmed cases of the water supply system being non-compliant with the ADWG health related guidelines or regulated values. All 134 complaints were actioned and closed out following appropriate consultation with the customer.

Records indicate that around half of these complaints occurred during the Logan North network disinfection maintenance program. During this program, some customers responded to chlorine in their drinking water by calling Council with suspected health concerns. During major maintenance projects such as this, it is not unusual to have complaints of this nature. Consultation with the public and education during this process is essential and something LCC ensures it delivers.

No operational changes have been implemented as a result of any of these 134 complaints across the 2014/15 FY. This number of complaints is not typical for "business as usual" and as mentioned was largely attributed to the maintenance program in the Logan North zone. Post review of the effectiveness of the network disinfection maintenance program along with consumer satisfaction is ongoing.

### 6.2.2 Appearance

Appearance of water was the highest complaint type for the 2014/15 FY reporting period. Of the 663 total complaints, 418 were related to the appearance of the water and thus represented 63% of all water complaints received.

The zones with the most complaints for the appearance of water was Greenbank (141) and Marsden (136). All water appearance complaints received during the 2014/15 FY were investigated with the most common remedial action being flushing of water mains. In all cases the aim is to respond to the complaint to restore clean water to the property and ensure public health is maintained.

There are two sub-sets to Appearance being the following with further descriptions below:

- Dirty Water; and
- Milky and/or White Water

#### Dirty Water

Dirty Water is a sub-set of water appearance complaints and is typically associated with brown or turbid water. In total, there were 392 of these complaints received which shows that 94% of all water appearance complaints across the city were related to dirty water.

Of all seven zones in the city, Greenbank zone had the highest incidence of dirty water complaints at 139. This indicates that this zone alone is responsible for around 35% of all dirty water complaints received. Marsden zone had the second highest number at 136, thus accounts for 35% of all dirty water complaints. This data serves to show that both Marsden and Greenbank together account for 70% of the cities' dirty water complaints, whilst only representing 32% of total connections.

Analysis of complaints within the Marsden and Greenbank WSZ's shows that around 80% of the dirty water complaints occurred whilst work was being undertaken for the Logan North network disinfection maintenance program.

Both the Marsden and Greenbank zones have been identified as having high water age and in response to this, operational changes have been made to better manage the storage volume and improve water quality. These zones have been and will continue to be the focus for future water quality improvement projects.

### **Milky and or White Water**

Milky and or White Water is considered a sub-set of water appearance complaints. A total of 26 complaints of this nature were recorded and investigated across the entire Logan city for this reporting period. Of all complaints, around 40% were suspected to be associated with air in the line.

As part of the customer complaint management process, complaints lodged by customers for white or milky water are first investigated to see if air entrainment is the cause by requesting the customer to perform a settling test and observing if the water clears after a defined time period. All complaints that were not rectified by a settling test or mains flushing were investigated further along with sampling and additional testing to assess the root cause. None of these investigations resulted in detection of system faults.

No operational changes were implemented as a result of investigations into these complaints over the 2014/15 FY.

### **6.2.3 Taste and Odour**

Taste and Odour complaints are characterised by an objectionable odour or taste noticed by customers. Typical descriptions from customers include earthy, metallic, or a chemical taste in the water. A total of 111 of these complaints were received across the whole of Logan City this financial year.

Occasionally, a taste and odour complaint may accompany a claim of illness, thus these complaints are often treated in the same manner as suspected health related complaint types. All 111 complaints relating to Taste and odour were attended to and flushed with customers on occasion being supplied bottled water whilst investigation and remedial activities were undertaken. No operational changes have been implemented by LCC as a result of these complaints.

There are three main sub-sets to Taste and Odour being the following with further descriptions below:

- Hydrocarbon, Petrol, Chemical;
- Chlorine; and
- Musty / Earthy / Stale

#### **Hydrocarbon**

Whilst not common, residents do occasionally spill petrol or oil on their property and call LCC with water quality concerns. In all cases, LCC liaises with the concerned resident and ensures appropriate corrective and preventative actions are understood. Logan City Council received no complaints relating to hydrocarbons contamination this financial year.

In light of this, work is currently being undertaken to develop and publish fact sheets outlining how people can avoid mistakes around the home which can lead to contamination of their property's water service lines. These fact sheets will be available on LCC's website when completed.

#### **Chlorine**

Whilst most water supply zones of Logan have chloramine as the disinfectant, some zones can at times have free chlorine in the water as the disinfectant. Due to sensitivity in taste, people typically taste chlorine more easily than chloramine. Due to this, complaints received regarding chlorine smell or taste are usually in areas where free chlorine is used.

The ADWG advises that customers may notice the taste of chlorine at levels as low as 0.6 mg/L however this will vary between people. The ADWG health limit is 5mg/L however LCC aims to operate well below this limit to balance effective disinfection and aesthetic quality.

At all times it is important to maintain a sufficient amount of disinfectant within the drinking water to ensure the water remains safe for consumption. It is important to note that this raises the challenge of ensuring customers receive water that is safe but also pleasant to drink.

During the 2014/15 FY, 67 complaints were received associated with chlorine. Of these complaints 61% occurred in the Marsden zone whilst the network disinfection maintenance program was being undertaken. At this time, the Marsden zone, normally chloraminated, was converted to free chlorine disinfection and some customers responded to this with complaints. Chlorine levels during the program were monitored continually and at all times kept well below the ADWG health guideline limit. All complaints were investigated and sampled with the customer informed of the water quality results and educated on the system changes. On occasions, flushing of the service was undertaken.

No operational changes have been implemented by LCC as a result of these complaints. Review of the effectiveness of the network disinfection maintenance program, along with consumer satisfaction, is ongoing.

### **Musty / Earthy / Stale**

The remaining 44 taste and odour complaints (39%) were generally due to musty, earthy or stale tasting water. The unpleasant tastes can be due to a number of things including;

- stale water in the pipes in areas of low water usage or stale water in residence's pipes when they have been away for a long period; or
- high rainfall in the Seqwater catchment area which can increase the amount of organics and minerals in the raw water which can impact taste even after water treatment.

All complaints were investigated and sampled with the customer informed of the water quality results as well as flushing carried out by water operations.

No operational changes have been implemented by LCC as a result of these complaints however a review of the water flushing program maybe undertaken during the 2015/16 FY.

## **7 FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR**

No regulatory external audit of LCC's DWQMP was undertaken in the 2014/15 financial year. External audits are required within 4 years of an approved DWQMP and the LCC DWQMP Rev 5.1 was approved December 2013. Thus LCC's regulatory external audit is due prior to the 30<sup>th</sup> of June 2017.

## 8 OUTCOME OF THE REVIEW OF THE DWQMP AND HOW ISSUES RAISED HAVE BEEN ADDRESSED

In accordance with the requirement of Section 99 (2)(b) and 106 of the the Act, LCC undertook their first review of their approved DWQMP Rev 5.1. This commenced April 2015 and was completed by the regulatory deadline of the 30<sup>th</sup> June 2015.

The purpose of the review was to ensure that the DWQMP remains relevant, having regard to the operation of the drinking water service.

The review was conducted internally by the following key staff as shown in Table 4, with some advice from external stakeholders. A final review of the finalised DWQMP Rev5.2 document was also conducted by all Program Leaders and Managers from the three Water Branches.

**Table 4 - DWQMP Review Team**

<b>Name</b>	<b>Position</b>	<b>Water Branch</b>
Nishendra Attygalla	Water Planning Engineer	Water Infrastructure
Jamies Barnes	Water Quality Officer	Water Business
Josh Brennan	Regulatory & Performance Reporting Coordinator	Water Business
Lester Bridgham	Network Operations Supervisor	Water Operations
Padmini de Alwis	Laboratory Service Coordinator	Water Business
Natasha Georgius	Senior Water Quality Scientist (Engineer)	Water Business
Nick Heeney	Laboratory Systems Officer	Water Business
Yi-Cheng Huang	Operations Support Officer	Water Operations
Johanna Johnson	Chemist	Water Business
Carmen Roberts	Water Demand & Liason Officer	Water Business
Scott Smith	Mechanical Maintenance Supervisor	Water Operations
Ben Steel	Business Planning & Resilience Coordinator	Water Business
Tammy Stevenson	Water Demand & Liason Coordinator	Water Business
Jeremy Thomas	Project Manager	Logan Water Alliance
Rolly Wicks	Water Grid & Operations Support Coordinator	Water Operations



As a result of the review, the following key changes were made to the DWQMP, summarised in Table 5.

**Table 5 – DWQMP Review Changes**

<b>Proposed Amendment</b>	<b>Change Details</b>
Registered service Details	No change
Details of Infrastructure for providing the service	Changes and updates to the water supply system including bulk water supply source changes, system schematic changes, updates to network assets, inclusion of DMAs, inclusion of water zone definitions, water quality zone changes and inclusion of new disinfection systems commissioned at Illaweena, Greenbank and Travis Road reservoirs.  Regulatory & formal requirements and internal & external stakeholder register updated. Inclusion of Water NetServ Plans strategic Framework and SEQ Integrated Water Network descriptions.
Identify Hazards & Hazardous Events	No change.
Information gathering – water quality and catchment characteristics	No significant change.
Assessment of Risks	No change – refer to RMIP
Risk management measures	Minor clarifications added.
Operation and maintenance procedures	Review updates to operational procedures and associated review dates. Inclusion of chemical and materials register.
Management of Incidents	Revised LCC's Incident Management Plan and association with the Seqwater's Emergency Response Plan (LCC's bulk water supplier).
Risk Management Improvement Program	Updated to reflect current state.
Service wide support – information management	Changes to work order system and associated capture of customer complaints system (i.e. Water and Wastewater Events Tracking Tool (WWETT)).
Operational Monitoring	Very minor clarifications.
Verification Monitoring	Replaced previously approved version with 2015/16 monitoring plan to reflect population changes, new developments, water source and system changes. Inclusion of Trihalomethane (THM) monitoring due to introduction of new disinfection systems. Also included description of annual update process.
Other	Format changes to include a summary reference of all key documents at the end of each Element chapter.

Major amendments were identified hence an updated DWQMP Rev5.2 together with a WSR506 DWQMP Amendment Application form was submitted to the office of Water Planning and Regulation August 2015 for review. LCC is currently awaiting outcomes from the review which is anticipated by the end of 2015.

Review updates to the DWQMP sections which have yet to be completed, have been included in the RMIP. A key update will be undertaking a whole of system drinking water risk assessment, which may identify additional hazards, hazardous events or control measures. The next internal review of the DWQMP is due by the 30<sup>th</sup> of June 2017.

## APPENDIX A - SUMMARY OF COMPLIANCE WITH WATER QUALITY CRITERIA

The results from the verification monitoring program have been assessed against the water quality criteria specified by the Regulator in the water quality and Reporting Guideline for a Drinking Water Service. Each water supply zone assessed is tabulated below.

Please refer to Section 4.2 - Monitoring Program Overview and Section 4.3 - Data Analysis Methodology for further descriptions on the sampling program regime and statistical analysis principles used.

The Limit of Reporting (LOR) is quoted within the tables below as is the Laboratory name. LCC Laboratory was responsible for conducting all verification monitoring analytical testing except for Trihalomethanes, (THM's) which was conducted by either ALS or the Gold Coast Water Laboratory, depending on availability.

Where less-than (<) values are seen, the value will be in reference to the LOR as per bullet point 3 of Section 4.3 - Data Analysis Methodology.

## Reticulation Verification Monitoring

Table 6 - Logan East WSZ

LOGAN EAST										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA	MIN	MAX	MEAN	LOR	LABORATORY NAME
Chlorine, Free	mg/L	WEEKLY	188	76	0	<0.05	1.04	0.1	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	188	76	0	<0.05	2.06	0.5	0.05	LCC
E.coli by Colilert	MPN/100mL	WEEKLY	188	0	0	<1	<1	<1	1	LCC
Temperature	°C	WEEKLY	188	188	0	16	31	24	1	LCC
Total Coliforms	MPN/100mL	WEEKLY	188	16	0	<1	130	3	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	49	49	0	0.02	0.10	0.00	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	86	19	0	<0.1	0.3	<0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	49	21	0	<0.01	<0.01	<0.01	0.01	LCC
Barium, Total	mg/L	EACH PERIOD	49	49	0	0.010	0.030	0.000	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	49	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	49	49	0	0.030	0.050	0.000	0.001	LCC
Cadmium, Total	mg/L	EACH PERIOD	49	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	54	49	0	<0.1	94.7	62.1	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	49	49	0	15.8	37.9	27.4	0.1	LCC
Chloride	mg/L	EACH PERIOD	49	49	0	32	113	65	1	LCC
Chromium, Total	mg/L	EACH PERIOD	49	1	0	<0.001	0.000	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	49	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	49	49	0	1	5	3	1	LCC
Colour, True	Hazen	EACH PERIOD	49	17	0	<1	2	<1	1	LCC

Conductivity	µS/cm	EACH PERIOD	86	86	0	206	737	445	1	LCC
Copper, Total	mg/L	EACH PERIOD	49	49	0	0.000	0.040	0.000	0.001	LCC
Fluoride	mg/L	EACH PERIOD	49	49	0	0.7	0.9	0.8	0.1	LCC
HPC	cfu/mL	EACH PERIOD	86	34	0	<1	120	10	1	LCC
Iron, Total	mg/L	EACH PERIOD	49	49	0	0.010	0.090	0.000	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	49	33	0	<0.001	0.000	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	49	49	0	6.1	18.0	12.4	0.1	LCC
Manganese, Total	mg/L	EACH PERIOD	49	49	0	0.000	0.010	0.000	0.001	LCC
Molybdenum, Total	mg/L	EACH PERIOD	49	42	0	<0.001	0.000	<0.001	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	49	22	0	<0.001	0.000	<0.001	0.001	LCC
Nitrate-N	mg/L	EACH PERIOD	49	39	0	<0.1	0.7	0.3	0.1	LCC
Nitrite-N	mg/L	EACH PERIOD	49	11	0	<0.1	0.3	<0.1	0.1	LCC
pH	pH Units	EACH PERIOD	86	86	0	7.3	8.0	7.6	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	49	49	0	2	4	3	1	LCC
Sodium, Total	mg/L	EACH PERIOD	49	49	0	21	61	39	1	LCC
Selenium, Total	mg/L	EACH PERIOD	49	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sulphate	mg/L	EACH PERIOD	49	49	0	15.5	51.8	28.2	0.1	LCC
Total Hardness	mg/L	EACH PERIOD	54	49	0	<1	161	109	1	LCC
Thallium, Total	mg/L	EACH PERIOD	49	0	0	<0.001	<0.001	<0.001	0.001	LCC
Turbidity	NTU	EACH PERIOD	86	86	0	0.1	0.6	0.3	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	49	9	0	<0.01	0.01	<0.01	0.01	LCC
TDS, Calculated	mg/L	EACH PERIOD	52	49	0	<1	447	260	1	LCC
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	12	12	0	54	87	78	1	LCC
THM Total	mg/L	EACH PERIOD	49	49	0	0.040	0.180	0.100	0.001	ALS/GC

Table 7 - Logan South WSZ

LOGAN SOUTH										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA	MIN	MAX	MEAN	LOR	LABORATORY NAME
Chlorine, Free	mg/L	WEEKLY	330	60	0	<0.05	1.32	0.10	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	330	314	0	<0.05	2.90	0.30	0.05	LCC
E.coli by Colilert	MPN/100mL	WEEKLY	330	1	1	<1	5	<1	1	LCC
Temperature	°C	WEEKLY	330	330	0	16	31	24	1	LCC
Total Coliforms	MPN/100mL	WEEKLY	330	70	0	<1	580	8	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	82	82	0	0.02	0.12	0.10	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	127	8	0	<0.1	0.4	<0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	82	48	0	<0.01	<0.01	<0.01	0.01	LCC
Barium, Total	mg/L	EACH PERIOD	82	82	0	0.012	0.036	0.000	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	82	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	82	82	0	0.026	0.046	0.000	0.001	LCC
Arsenic, Total	mg/L	EACH PERIOD	82	48	0	<0.01	<0.01	<0.01	0.01	LCC
Cadmium, Total	mg/L	EACH PERIOD	82	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	83	82	0	<0.1	103.3	73.6	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	82	82	0	23.4	41.4	29.8	0.1	LCC
Chloride	mg/L	EACH PERIOD	82	82	0	41	120	64	1	LCC
Chromium, Total	mg/L	EACH PERIOD	82	1	0	<0.001	0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	82	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	82	82	0	1	13	4	1	LCC
Colour, True	Hazen	EACH PERIOD	82	33	0	<1	2	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	127	127	0	209	819	453	1	LCC

Copper, Total	mg/L	EACH PERIOD	82	82	0	0.001	0.014	0.000	0.001	LCC
Fluoride	mg/L	EACH PERIOD	82	82	0	0.5	0.9	0.8	0.1	LCC
HPC	cfu/mL	EACH PERIOD	127	83	0	<1	905	56	1	LCC
Iron, Total	mg/L	EACH PERIOD	82	81	0	<0.003	0.125	0.000	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	82	29	0	<0.001	0.002	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	82	82	0	6.8	19.0	13.1	0.1	LCC
Molybdenum, Total	mg/L	EACH PERIOD	82	69		<0.001	0.002	<0.001	0.001	LCC
Manganese, Total	mg/L	EACH PERIOD	82	79	0	<0.001	0.019	0.000	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	82	48	0	<0.001	0.001	<0.001	0.001	LCC
Nitrate-N	mg/L	EACH PERIOD	82	79	0	<0.1	0.9	0.5	0.1	LCC
Nitrite-N	mg/L	EACH PERIOD	82	23	0	<0.1	0.4	0.1	0.1	LCC
pH	pH Units	EACH PERIOD	127	127	0	7.4	8.6	8.0	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	82	82	0	2	4	3	1	LCC
Sodium, Total	mg/L	EACH PERIOD	82	82	0	28	66	38	1	LCC
Selenium, Total	mg/L	EACH PERIOD	82	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sulphate	mg/L	EACH PERIOD	82	82	0	19.5	48.8	28.0	0.1	LCC
Total Hardness	mg/L	EACH PERIOD	83	82	0	<1	181	127	1	LCC
Thallium, Total	mg/L	EACH PERIOD	82	0	0	<0.001	<0.001	<0.001	0.001	LCC
Turbidity	NTU	EACH PERIOD	127	126	0	<0.1	1.7	0.4	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	82	0	0	<0.01	<0.01	<0.01	0.01	LCC
TDS, Calculated	mg/L	EACH PERIOD	61	60	0	<1	497	281	1	LCC
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	15	15	0	54.61	93	84	1	LCC
THM Total	mg/L	EACH PERIOD	82	82	0	0.026	0.150	0.100	0.001	ALS/GC

Table 8 – Marsden WSZ

MARSDEN										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA	MIN	MAX	MEAN	LOR	LABORATORY NAME
Chlorine, Free	mg/L	WEEKLY	217	139	0	<0.05	1.33	0.20	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	217	217	0	0.05	2.15	1.00	0.05	LCC
E.coli by Colilert	MPN/100mL	WEEKLY	217	0	0	<1	<1	<1	1	LCC
Temperature	°C	WEEKLY	217	217	0	15	31	24	1	LCC
Total Coliforms	MPN/100mL	WEEKLY	217	39	0	<1	110	5	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	54	54	0	0.03	0.07	0.00	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	91	62	0	<0.1	0.4	0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	54	28	0	<0.01	<0.01	<0.01	0.01	LCC
Barium, Total	mg/L	EACH PERIOD	54	54	0	0.018	0.038	0.000	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	54	1	0	<0.001	0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	54	54	0	0.026	0.041	0.000	0.001	LCC
Cadmium, Total	mg/L	EACH PERIOD	54	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	55	54	0	<0.1	96	65.2	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	54	54	0	21.6	38.4	26.6	0.1	LCC
Chloride	mg/L	EACH PERIOD	54	54	0	49	162	69	1	LCC
Chromium, Total	mg/L	EACH PERIOD	54	0	0	<0.001	<0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	54	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	54	54	0	<1	7	3	1	LCC
Colour, True	Hazen	EACH PERIOD	54	3	0	<1	2	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	91	91	0	393	835	456	1	LCC
Copper, Total	mg/L	EACH PERIOD	54	54	0	0.001	0.010	0.000	0.001	LCC



Fluoride	mg/L	EACH PERIOD	54	54	0	0.7	0.9	0.8	0.1	LCC
HPC	cfu/mL	EACH PERIOD	91	31	0	<1	129	4	1	LCC
Iron, Total	mg/L	EACH PERIOD	54	54	0	0.003	0.033	0.000	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	54	20	0	<0.001	0.001	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	54	54	0	8.2	24.6	13.4	0.1	LCC
Molybdenum, Total	mg/L	EACH PERIOD	54	47		<0.001	0.003	<0.001	0.001	LCC
Manganese, Total	mg/L	EACH PERIOD	54	54	0	0.001	0.012	0.000	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	54	39	0	<0.001	0.001	<0.001	0.001	LCC
Nitrate-N	mg/L	EACH PERIOD	54	31	0	<0.1	0.7	0.2	0.1	LCC
Nitrite-N	mg/L	EACH PERIOD	54	18	0	<0.1	0.3	<0.1	0.1	LCC
pH	pH Units	EACH PERIOD	91	91	0	7.2	8.0	7.6	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	54	54	0	2	4	3	1	LCC
Sodium, Total	mg/L	EACH PERIOD	54	54	0	32	86	40	1	LCC
Selenium, Total	mg/L	EACH PERIOD	54	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sulphate	mg/L	EACH PERIOD	54	54	0	22.3	55.9	29.3	0.1	LCC
Total Hardness	mg/L	EACH PERIOD	55	54	0	<1	192	119	1	LCC
Thallium, Total	mg/L	EACH PERIOD	82	0	0	<0.001	<0.001	<0.001	0.001	LCC
Turbidity	NTU	EACH PERIOD	91	91	0	0.2	0.9	0.3	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	54	0	0	<0.01	<0.01	<0.01	0.01	LCC
TDS, Calculated	mg/L	EACH PERIOD	49	49	0	238	469	274	1	LCC
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	12	12	0	53	90	79	1	LCC
THM Total	mg/L	EACH PERIOD	12	12	0	0.059	0.120	0.100	0.001	ALS/GC

Table 9 – Kimberley Park WSZ

KIMBERLEY PARK										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA	MIN	MAX	MEAN	LOR	LABORATORY NAME
Chlorine, Free	mg/L	WEEKLY	155	25	0	<0.05	1.00	<0.05	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	155	155	0	<0.05	1.96	0.40	0.05	LCC
E.coli by Colilert	MPN/100mL	WEEKLY	155	1	1	<1	2	<1	1	LCC
Temperature	°C	WEEKLY	155	155	0	17	31	24	1	LCC
Total Coliforms	MPN/100mL	WEEKLY	155	60	0	<1	870	23	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	39	39	0	0.02	0.07	0.00	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	116	33	0	<0.1	0.3	<0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	39	20	0	<0.01	<0.01	<0.01	0.01	LCC
Barium, Total	mg/L	EACH PERIOD	39	39	0	0.018	0.033	0.000	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	39	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	39	39	0	0.026	0.039	0.000	0.001	LCC
Cadmium, Total	mg/L	EACH PERIOD	39	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	39	39	0	55.3	103.8	67.0	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	39	39	0	22.2	41.6	26.8	0.1	LCC
Chloride	mg/L	EACH PERIOD	39	39	0	47	116	66	1	LCC
Chromium, Total	mg/L	EACH PERIOD	39	0	0	<0.001	<0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	39	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	39	39	0	2	6	3	1	LCC
Colour, True	Hazen	EACH PERIOD	39	9	0	<1	1	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	116	116	0	212	745	446	1	LCC

Copper, Total	mg/L	EACH PERIOD	39	39	0	0.001	0.044	0.000	0.001	LCC
Fluoride	mg/L	EACH PERIOD	39	39	0	0.7	0.9	0.8	0.1	LCC
HPC	cfu/mL	EACH PERIOD	116	80	0	<1	2015	79	1	LCC
Iron, Total	mg/L	EACH PERIOD	39	39	0	0.004	0.026	0.000	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	39	12	0	<0.001	0.002	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	39	39	0	9.0	17.9	13.0	0.1	LCC
Molybdenum, Total	mg/L	EACH PERIOD	39	30		<0.001	0.002	<0.001	0.001	LCC
Manganese, Total	mg/L	EACH PERIOD	39	39	0	0.001	0.009	0.000	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	39	23	0	<0.001	0.001	<0.001	0.001	LCC
Nitrate-N	mg/L	EACH PERIOD	39	36	0	<0.1	0.7	0.4	0.1	LCC
Nitrite-N	mg/L	EACH PERIOD	39	19	0	<0.1	0.3	0.1	0.1	LCC
pH	pH Units	EACH PERIOD	116	116	0	7.4	7.9	7.6	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	39	39	0	2	4	3	1	LCC
Sodium, Total	mg/L	EACH PERIOD	39	39	0	30	60	38	1	LCC
Selenium, Total	mg/L	EACH PERIOD	39	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sulphate	mg/L	EACH PERIOD	39	39	0	22.5	54.3	28.6	0.1	LCC
Total Hardness	mg/L	EACH PERIOD	39	39	0	96	175	121	1	LCC
Thallium, Total	mg/L	EACH PERIOD	39	0	0	<0.001	<0.001	<0.001	0.001	LCC
Turbidity	NTU	EACH PERIOD	116	116	0	0.2	0.7	0.3	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	39	3	0	<0.01	0.01	<0.01	0.01	LCC
TDS, Calculated	mg/L	EACH PERIOD	103	103	0	129	452	269	1	LCC
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	26	26	0	53	90	78	1	LCC
THM Total	mg/L	EACH PERIOD	26	26	0	0.050	0.120	0.100	0.001	ALS/GC

Table 10 – Greenbank WSZ

GREENBANK										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA	MIN	MAX	MEAN	LOR	LABORATORY NAME
Chlorine, Free	mg/L	WEEKLY	162	54	0	<0.05	1.28	0.10	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	162	159	0	<0.05	2.14	0.60	0.05	LCC
E.coli by Colilert	MPN/100mL	WEEKLY	162	0	0	<1	<1	<1	1	LCC
Temperature	°C	WEEKLY	162	162	0	16	31	25	1	LCC
Total Coliforms	MPN/100mL	WEEKLY	162	54	0	<1	230	11	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	42	42	0	0.03	0.55	0.10	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	87	47	0	<0.1	0.3	0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	42	23	0	<0.01	<0.01	<0.01	0.01	LCC
Barium, Total	mg/L	EACH PERIOD	42	42	0	0.004	0.030	0.000	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	42	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	42	42	0	0.025	0.040	0.000	0.001	LCC
Cadmium, Total	mg/L	EACH PERIOD	42	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	44	42	0	<0.1	82.5	62.9	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	42	42	0	12.2	33.0	26.4	0.1	LCC
Chloride	mg/L	EACH PERIOD	42	42	0	20	93	64	1	LCC
Chromium, Total	mg/L	EACH PERIOD	42	2	0	<0.001	0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	42	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	42	42	0	<1	5	3	1	LCC
Colour, True	Hazen	EACH PERIOD	42	5	0	<1	3	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	87	87	0	181	715	438	1	LCC

<b>Copper, Total</b>	mg/L	EACH PERIOD	42	42	0	0.002	0.045	0.000	0.001	LCC
<b>Fluoride</b>	mg/L	EACH PERIOD	42	42	0	0.6	0.9	0.8	0.1	LCC
<b>HPC</b>	cfu/mL	EACH PERIOD	87	29	0	<1	300	11	1	LCC
<b>Iron, Total</b>	mg/L	EACH PERIOD	42	42	0	0.005	0.034	0.000	0.003	LCC
<b>Lead, Total</b>	mg/L	EACH PERIOD	42	17	0	<0.001	0.001	<0.001	0.001	LCC
<b>Magnesium, Total</b>	mg/L	EACH PERIOD	42	42	0	1.3	18.0	12.9	0.1	LCC
<b>Molybdenum, Total</b>	mg/L	EACH PERIOD	42	27		<0.001	0.001	<0.001	0.001	LCC
<b>Manganese, Total</b>	mg/L	EACH PERIOD	42	42	0	0.001	0.010	0.000	0.001	LCC
<b>Nickel, Total</b>	mg/L	EACH PERIOD	42	23	0	<0.001	0.001	<0.001	0.001	LCC
<b>Nitrate-N</b>	mg/L	EACH PERIOD	42	29	0	<0.1	0.9	0.3	0.1	LCC
<b>Nitrite-N</b>	mg/L	EACH PERIOD	42	13	0	<0.1	0.3	<0.1	0.1	LCC
<b>pH</b>	pH Units	EACH PERIOD	87	87	0	7.2	9.7	7.7	0.1	LCC
<b>Potassium, Total</b>	mg/L	EACH PERIOD	42	42	0	1	4	3	1	LCC
<b>Sodium, Total</b>	mg/L	EACH PERIOD	42	42	0	19	51	38	1	LCC
<b>Selenium, Total</b>	mg/L	EACH PERIOD	42	0	0	<0.01	<0.01	<0.01	0.01	LCC
<b>Sulphate</b>	mg/L	EACH PERIOD	42	42	0	15.3	53.3	28.9	0.1	LCC
<b>Total Hardness</b>	mg/L	EACH PERIOD	44	42	0	<1	147	113	1	LCC
<b>Thallium, Total</b>	mg/L	EACH PERIOD	42	0	0	<0.001	<0.001	<0.001	0.001	LCC
<b>Turbidity</b>	NTU	EACH PERIOD	87	87	0	0.2	0.7	0.3	0.1	LCC
<b>Zinc, Total</b>	mg/L	EACH PERIOD	42	0	0	<0.01	<0.01	<0.01	0.01	LCC
<b>TDS, Calculated</b>	mg/L	EACH PERIOD	62	61	0	<1	434	257	1	LCC
<b>Alkalinity as CaCO<sub>3</sub></b>	mg/L	EACH PERIOD	16	16	0	34	93	77	1	LCC
<b>THM Total</b>	mg/L	EACH PERIOD	16	16	0	0.048	0.160	0.100	0.001	ALS/GC

**Table 11 – Springwood Low WSZ**

<b>SPRINGWOOD LOW LEVEL</b>										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA	MIN	MAX	MEAN	LOR	LABORATORY NAME
Chlorine, Free	mg/L	WEEKLY	243	187	0	<0.05	1.22	0.10	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	243	243	0	<0.05	2.70	1.60	0.05	LCC
E.coli by Colilert	MPN/100mL	WEEKLY	243	0	0	<1	<1	<1	1	LCC
Temperature	°C	WEEKLY	243	243	0	15	31	25	1	LCC
Total Coliforms	MPN/100mL	WEEKLY	243	6	0	<1	99	1	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	59	59	0	0.03	0.18	0.10	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	98	89	0	<0.1	0.4	0.2	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	59	28	0	<0.01	<0.01	<0.01	0.01	LCC
Barium, Total	mg/L	EACH PERIOD	59	59	0	0.019	0.042	0.000	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	59	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	59	59	0	0.026	0.044	0.000	0.001	LCC
Cadmium, Total	mg/L	EACH PERIOD	59	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	59	59	0	53.2	99.9	68.0	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	59	59	0	21.3	40.0	27.2	0.1	LCC
Chloride	mg/L	EACH PERIOD	59	59	0	57	185	76	1	LCC
Chromium, Total	mg/L	EACH PERIOD	59	0	0	<0.001	<0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	59	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	59	59	0	2	37	4	1	LCC
Colour, True	Hazen	EACH PERIOD	59	15	0	<1	2	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	98	98	0	211	940	465	1	LCC

<b>Copper, Total</b>	mg/L	EACH PERIOD	59	59	0	0.001	0.088	0.000	0.001	LCC
<b>Fluoride</b>	mg/L	EACH PERIOD	59	59	0	0.7	0.9	0.8	0.1	LCC
<b>HPC</b>	cfu/mL	EACH PERIOD	98	21	0	<1	19	1	1	LCC
<b>Iron, Total</b>	mg/L	EACH PERIOD	59	59	0	0.004	0.300	0.000	0.003	LCC
<b>Lead, Total</b>	mg/L	EACH PERIOD	59	8	0	<0.001	0.001	<0.001	0.001	LCC
<b>Magnesium, Total</b>	mg/L	EACH PERIOD	59	59	0	11.8	28.3	14.3	0.1	LCC
<b>Molybdenum, Total</b>	mg/L	EACH PERIOD	59	48	0	<0.001	0.002	<0.001	0.001	LCC
<b>Manganese, Total</b>	mg/L	EACH PERIOD	59	59	0	0.001	0.082	0.000	0.001	LCC
<b>Nickel, Total</b>	mg/L	EACH PERIOD	59	44	0	<0.001	0.001	<0.001	0.001	LCC
<b>Nitrate-N</b>	mg/L	EACH PERIOD	59	40	0	<0.1	0.8	0.2	0.1	LCC
<b>Nitrite-N</b>	mg/L	EACH PERIOD	59	14	0	<0.1	0.3	<0.1	0.1	LCC
<b>pH</b>	pH Units	EACH PERIOD	98	98	0	7.4	7.9	7.6	0.1	LCC
<b>Potassium, Total</b>	mg/L	EACH PERIOD	59	59	0	2	4	3	1	LCC
<b>Sodium, Total</b>	mg/L	EACH PERIOD	59	59	0	32	105	44	1	LCC
<b>Selenium, Total</b>	mg/L	EACH PERIOD	59	0	0	<0.01	<0.01	<0.01	0.01	LCC
<b>Sulphate</b>	mg/L	EACH PERIOD	59	59	0	22.3	55.1	29.9	0.1	LCC
<b>Total Hardness</b>	mg/L	EACH PERIOD	59	59	0	104.6	213.5	126.9	1	LCC
<b>Thallium, Total</b>	mg/L	EACH PERIOD	59	0	0	<0.001	<0.001	<0.001	0.001	LCC
<b>Turbidity</b>	NTU	EACH PERIOD	98	98	0	0.2	3.2	0.4	0.1	LCC
<b>Zinc, Total</b>	mg/L	EACH PERIOD	59	13	0	<0.01	0.02	<0.01	0.01	LCC
<b>TDS, Calculated</b>	mg/L	EACH PERIOD	52	52	0	130	447	270	1	LCC
<b>Alkalinity as CaCO3</b>	mg/L	EACH PERIOD	13	13	0	56	89	80	1	LCC
<b>THM Total</b>	mg/L	EACH PERIOD	28	28	0	0.009	0.140	0.100	0.001	ALS/GC

Table 12 – Springwood High WSZ

SPRINGWOOD HIGH LEVEL										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA	MIN	MAX	MEAN	LOR	LABORATORY NAME
Chlorine, Free	mg/L	WEEKLY	165	86	0	<0.05	0.22	<0.05	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	165	165	0	<0.05	2.60	0.80	0.05	LCC
E.coli by Colilert	MPN/100mL	WEEKLY	165	0	0	<1	<1	<1	1	LCC
Temperature	°C	WEEKLY	165	165	0	15	32	25	1	LCC
Total Coliforms	MPN/100mL	WEEKLY	165	2	0	<1	36	<1	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	41	41	0	0.03	0.08	0.00	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	80	53	0	<0.1	0.4	0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	41	28	0	<0.01	<0.01	<0.01	0.01	LCC
Barium, Total	mg/L	EACH PERIOD	41	41	0	0.019	0.042	0.000	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	41	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	41	41	0	0.026	0.044	0.000	0.001	LCC
Cadmium, Total	mg/L	EACH PERIOD	41	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	41	41	0	54.7	110.5	69.0	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	41	41	0	21.9	44.3	27.6	0.1	LCC
Chloride	mg/L	EACH PERIOD	41	41	0	50	181	73	1	LCC
Chromium, Total	mg/L	EACH PERIOD	41	0	0	<0.001	<0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	41	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	41	41	0	2	16	3	1	LCC
Colour, True	Hazen	EACH PERIOD	41	7	0	<1	1	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	80	80	0	392	932	463	1	LCC
Copper, Total	mg/L	EACH PERIOD	41	41	0	0.001	0.251	0.000	0.001	LCC



Fluoride	mg/L	EACH PERIOD	41	41	0	0.7	0.9	0.8	0.1	LCC
HPC	cfu/mL	EACH PERIOD	80	13	0	<1	57	2	1	LCC
Iron, Total	mg/L	EACH PERIOD	41	41	0	0.005	0.152	0.000	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	41	9	0	<0.001	0.002	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	41	41	0	10.3	26.0	14.0	0.1	LCC
Molybdenum, Total	mg/L	EACH PERIOD	41	31	0	<0.001	0.004	<0.001	0.001	LCC
Manganese, Total	mg/L	EACH PERIOD	41	41	0	0.001	0.044	0.000	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	41	32	0	<0.001	0.001	<0.001	0.001	LCC
Nitrate-N	mg/L	EACH PERIOD	41	34	0	<0.1	0.7	0.3	0.1	LCC
Nitrite-N	mg/L	EACH PERIOD	41	15	0	<0.1	0.3	<0.1	0.1	LCC
pH	pH Units	EACH PERIOD	80	80	0	7.4	7.7	7.5	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	41	41	0	2	4	3	1	LCC
Sodium, Total	mg/L	EACH PERIOD	41	41	0	32	98	43	1	LCC
Selenium, Total	mg/L	EACH PERIOD	41	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sulphate	mg/L	EACH PERIOD	41	41	0	22.5	54.2	29.1	0.1	LCC
Total Hardness	mg/L	EACH PERIOD	41	41	0	107	218	127	1	LCC
Thallium, Total	mg/L	EACH PERIOD	41	0	0	<0.001	<0.001	<0.001	0.001	LCC
Turbidity	NTU	EACH PERIOD	80	80	0	0.2	1.6	0.4	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	41	5	0	<0.01	0.03	<0.01	0.01	LCC
TDS, Calculated	mg/L	EACH PERIOD	52	52	0	238	463	273	1	LCC
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	13	13	0	53	90	79	1	LCC
THM Total	mg/L	EACH PERIOD	13	13	0	0.049	0.100	0.100	0.001	ALS/GC

### E.Coli Verification Monitoring

Table 13 – LCC E.coli Verification Monitoring

WHOLE OF LOGAN CITY - ALL ZONES		2014/15 FY										
Month Sampled	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
No. of samples collected	132	105	126	117	112	120	118	118	137	127	118	130
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	1	0	1	0	0	0
No. of samples collected in previous 12 month period	1375	1374	1385	1376	1373	1404	1418	1426	1440	1437	1443	1460
No. of failures for previous 12 month period	0	0	0	0	0	0	1	1	2	2	2	2
% of samples that comply	100%	100%	100%	100%	100%	100%	99.93%	99.93%	99.86%	99.86%	99.86%	99.79%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

## **APPENDIX B - IMPLEMENTATION OF THE DWQMP RISK MANAGEMENT IMPROVEMENT PROGRAM**

The following table summarises the progress of the proposed actions undertaken as part of the current Risk Management Improvement Plan.

Item No.	DWQMP Section (G-General Improvement (Audit/Review) R-Risk Assessment or Audit)	ISSUES / RISKS	KEY ACTIONS	CURRENT ACTION STATUS (Jun'15)	LEAD POSITION	TARGET DATE	% Complete (Jun'15)
<b>E1 : Commitment to Drinking Water Quality Management</b>							
1.00	2.1 (G)	Need to ensure senior management & staff understand regulatory responsibilities re-Water Act requirements & implementation of approved DWQMP and consequences of in-actions.	Develop & deliver ADWG & Water Act responsibility awareness training for executive management & senior staff once Policy endorsed.	Policy has been endorsed & displayed (internal & public) 2013.  ADWG & Water Act awareness training material developed & now delivered annually to management and senior staff post internal audit findings presentation.	Senior Water Quality Scientist	Apr-15	100%
1.01	2.1 (G)	Internal audit review highlighted that some staff were still unsure of the DWQMP & clarity of Drinking Water Policy.	Develop & deliver DWQMP & Policy awareness/toolbox training to all Water Branch staff and possibly include in future Induction Program.	<i>Refer to Element 7 Item 7.01.</i>			
1.02	2.2 (G)	List of relevant regulatory & formal requirements is out of date and requires review. A number of disjointed databases exist.	Annual review required to ensure latest regulations have been included.	Review & update completed Jun'15.	Business & Customer Mgt Program Leader	Jun-15	100%
1.03	2.3 (G)	Key stakeholders, who have been actively involved in the management of drinking water quality, and their relevance, must be identified for each scheme and detailed in the plan.	Annual review required or when system changes occur.	Review & update completed Jun'15.	Business & Customer Mgt Program Leader	Jun-15	100%
1.04	2.3 (G)	Formal communication tool/form required to inform key stakeholders of changes to water quality from bulk water supply (aesthetics) which may effect them, particularly industrial users. Not necessarily health related.	Develop tool/form to communicate potential water quality changes that may effect key stakeholders (i.e. high conductivity - effect cooling tower blowdown & potential increase in RO systems maintenance/set-ups).	Medical Remissions Register (incl. most recent dialysis patients, hospitals & notification process) implemented.  Commercial High Volume Users register developed. Reviewed & updated annually.  "Notification" systems developed: via phone, email, SMS, website.	Business & Customer Mgt Program Leader	Jun-15	100%
1.05	2.3 (R)	LCC not formally notified by Seqwater of high THM experienced in bulk water supply to Gold Coast early 2015. This notification not in current & recently updated SEQ Operating protocol hence update required.	<b>Short Term:</b> Seqwater to notify LCC of increase changes in THMs as per current GCCC limits in Operating Protocol.	<b>Short Term:</b> Seqwater to notify LCC of increase changes in THMs as per current GCCC limits in Operating Protocol - <b>commenced.</b>	Senior Water Quality Scientist	Sep-15	70% (NEW)
1.06	2.3 (R)	LCC not formally notified by Seqwater of high THM experienced in bulk water supply to Gold Coast early 2015. This notification not in current & recently updated SEQ Operating protocol hence update required.	<b>Long Term:</b> Incorporate THM Notification alert limits for events which may affect LCC with next Operating Protocol - Schedule 8 update.	<b>Long Term:</b> Incorporate THM Notification alert limits for events which may affect LCC with next Operating Protocol - Schedule 8 update - confirm date for next update.	Water Grid & Operations Support Coordinator	2015/16 FY	10% (NEW)
<b>E2: Assessment of Drinking Water Supply Systems</b>							
2.00	3.1 (G)	Population, No. connections and water demands require review to reflect new IDM.	Annual review required or when system changes occur. Update to include changes since 2013.	Review & update completed Jun'15.	Water Infrastructure Program Leader	Jun-15	100%
2.01	3.1 (G)	Internal audit found schematic outdated hence requires updating to reflect operational changes since 2013.	Annual review required or when system changes occur. Update to include changes since 2013.	Review & update completed Jun'15.	Water Infrastructure Program Leader	Jun-15	100%
2.02	3.3 (R) DOS 1.0 DIS 1.0 SEQ 1.0	Backup online chlorine monitoring system required if Seqwater disinfection systems failed (i.e. dosing and monitoring).	Undertake "Online Water Quality Monitoring Strategy" - online instrumentation with SCADA alarms as backup to Seqwater system.	Undertake "Online Water Quality Monitoring Strategy" with SCADA alarms as backup to Seqwater system. Installation commenced with SCADA alarming & validation being completed 2015/16FY.  Logistics of sites chosen was extensive hence finish date revised.	Product Quality Program Leader	Oct-15	90%
2.03	3.3 (G)	Regular reviews not undertaken, taking into account system changes and various risk assessments exist for newly installed dosing systems. Need to review & consolidate risk assessments, taking into account any system changes from Seqwater which may impact LCC.	Arrange workshop to undertake entire system risk assessment, taking into account water source changes, standpipes and any new Seqwater residual risks entering LCC network and consolidate numerous risk assessment undertaken since commissioning new dosing systems.  Ensure current processes & systems captured.	Undertake individual risk assessments for newly installed chlorine dosing systems (Greenbank, Illaweena & Travis Rd reservoirs) - <b>completed.</b>  Undertake whole of system Risk Assessment workshops - planned for 2015/16FY. Incorporate Seqwater residual risks.	Senior Water Quality Scientist	Jun-16	40%

Item No.	DWQMP Section G-General Improvement (Audit/Review) R-Risk Assessment or Audit	ISSUES / RISKS	KEY ACTIONS	CURRENT ACTION STATUS (Jun'15)	LEAD POSITION	TARGET DATE	% Complete (Jun'15)
<b>Element 3: Preventive Measures for Drinking Water Quality</b>							
3.00	4.1 (G) 2012RMIP (G3)	Water age is high in the Spring Mt & Pub Lane areas.	It is proposed to reduce the detention times in the system by decommissioning the Pub Lane Reservoir (the reservoir is not needed hydraulically).	Decommission Pub Lane reservoir post commissioning of Round Mountain reservoir - completed May'14. Delays due to resolution of New Beith Water allowance from Seqwater.	Product Quality Program Leader	Dec-14	100%
3.01	4.1 (G) & R	Poor disinfection residual, particularly during Summer periods.	Summarise risk assessment outcomes for "additional preventative measures" and assess implementation.  <b>Develop</b> strategy to help with implementation of routine network chlorination and chlorine dosing systems as required.	Develop strategy to help with implementation of routine network chlorination and chlorine dosing systems as required: 1. LWA 90-12-97 Network Water Quality Maintenance Strategy (2014-2015). 2. LWA 90-12-98 Network Water Quality Operating Strategy (2014-2015).  Individual risk assessment undertaken for new chlorine dosing systems as they were implemented: Illaweena & Greenbank reservoirs commissioned Jun'14; Travis Rd reservoir commissioned Aug'14.	Product Quality Program Leader	Jun-15	100%
3.02	4.1 (G) & R	Poor disinfection residual, particularly during Summer periods.	<b>Strategy &amp; Planning Investigation outcome</b> to help with implementation of routine network chlorination and chlorine dosing systems as required.  Install two chlorine booster stations in Logan East.	<b>Strategy &amp; Planning Investigation outcome</b> to help with implementation of routine network chlorination and chlorine dosing systems as required.  CAPEX approved for two chlorine booster stations in Logan East 2015/16FY.	Product Quality Program Leader	Jun-16	5% (NEW)
3.03	4.1 (G) & R	Poor disinfection residual, particularly during Summer periods.	<b>Strategy &amp; Planning Investigation outcome</b> to help with implementation of routine network chlorination and chlorine dosing systems as required.  Install chlorination system at Round Mt Reservoir. Requires construction of additional outlet main.	Develop <b>Strategy &amp; Planning Investigation</b> to help with implementation of routine network chlorination and chlorine dosing systems as required.  CAPEX approved chlorination system at Round Mt Reservoir 2015/16FY.	Product Quality Program Leader	Jun-16	5% (NEW)
3.04	4.1 (G) & R	Poor disinfection residual, particularly during Summer periods.	<b>Implement</b> LWA 90-12-98 & LWA 90-12-98 Network Water Quality Maintenance & Operating Strategies to help improve network chlorine residual in the network systems. Develop associated Plans (i.e. valving, monitoring, communication, etc) & SOPs. Need to ensure business Plans capture associated costs as now part of BAU.	<b>Implement</b> LWA 90-12-98 & LWA 90-12-98 to help improve network chlorine residuals & develop associated plans & SOPs. Need to ensure costs captured in Business Plans. Re-schedule Marsden & Greenbank network disinfection project after being undertaken Jul-Aug 2014. Kimberley Park network disinfection project - commenced Jun'15.	Product Quality Program Leader	Jun-16	10% (NEW)
3.05	4.2 (G) & R	Internal audit identified that not all CCPs are easily visible on SCADA system to confirm limits. CCP limits are hard coded.  Inconsistency of CCP SCADA limits vs CCP chart limits.	Undertake workshop to ensure CCP limits are relevant, SCADA updated to reflect this and ensure visibility of CCP limits on SCADA.  Once completed SOPs updated & associated training as required to ensure effective implementation.	Undertake workshop to ensure CCP limits are relevant & reflected in SCADA. Ensure visibility of CCP limits on SCADA.  Once completed, SOPs updated & deliver associated training as required to ensure effective implementation.	Senior Water Quality Scientist & Mech & Elec Operations Program Leader	Jun-16	5% (NEW)
<b>Element 4: Operational Procedures and Process Control</b>							
4.00	5.1 (G)	Need to ensure newly commissioned chlorine dosing systems have relevant SOP developed.	Greenbank & Illaweena reservoir dosing systems commissioned Jun'14 & Travis Rd reservoir dosing system commissioned Dec 2014	SOPs developed for recently commissioned Greenbank, Illaweena & Travis Reservoir chlorine dosing systems.	Network Operations Program Leader	May-15	100%
4.01	5.1 (G)	Poor residual disinfection in Marsden and Greenbank water supply zones during Summer periods.	Breakpoint chlorination systems to be instigated (Illaweena & Greenbank Reservoirs) - The Logan North (Marsden/Greenbank Water Supply Zone (WSZ)) Disinfection Maintenance Program. Review effectiveness.	Review effectiveness of Disinfection Maintenance Project: LWA 90-12-97 Network Water Quality Maintenance Strategy (ref 3.04).	Product Quality Program Leader	Jun-16	30% (NEW)
4.02	5.1 (R) WOS 2.0	Risk Assessment: Private Works - Same staff work on wastewater and water systems and potentially same tools and equipment used. Need to confirm and develop disinfection of tools & equipment SOP.	Private Works - review develop disinfection of tools and equipment SOP.  Need to confirm what Contractors do.	Develop disinfection of tools & equipment SOP. SOP developed and currently being implemented.  Contractors follow SEQ Code.  Date revised due to new appointment of Network Maintenance PL.	Network Maintenance Program Leader	Dec-15	75%
4.03	5.1 (R) WOS 2.0	Risk Assessment: No formal potable water hygiene practises SOP exists.	Review & potentially develop formal Potable Water Hygiene Practises SOP and incorporate into future inductions and sign off (Staff & Contractors).	Review & potentially develop formal Potable Water Hygiene Practises SOP and incorporate into future inductions and sign off (Staff & Contractors). Ensure alignment with endorsed Drinking Water Quality Policy Statement. (Ref 1.01).	Network Maintenance Program Leader & Senior Water Quality Scientist	2016/17 FY	0%
4.04	5.1 (R) DIS 4.0 WOS 2.0 2012RMIP (G7)	Risk Assessment: Need to confirm what flushing system is used when mains has been not used for some time.	Review SOP - (1) & (2) Flushing & Disinfection of Mains post repairs and (3) testing/recommissioning assets (i.e. mains) that have been out of service for a period (> 4 weeks).	Development of appropriate SOPs: 1. WOP 408 Flushing & Scouring of Water Mains SOP updated - <b>complete</b> . 2. WOP 404 Water Mains Breaks: Reticulation - <b>complete</b> . 3. Recommissioning mains out of service WOP - <b>commenced</b> .	Network Maintenance Program Leader	Feb-16	80%

Item No.	DWQMP Section G-General Improvement (Audit/Review) R-Risk Assessment or Audit	ISSUES / RISKS	KEY ACTIONS	CURRENT ACTION STATUS (Jun'15)	LEAD POSITION	TARGET DATE	% Complete (Jun'15)
4.05	5.1 (R) DIS 4.0 WOS 2.0	Internal audit identified that routine flushing ceased 2014 post Marsden/Greenbank Disinfection project. This was a preventative measure in the previous Risk Assessment hence needs review. Additionally, with network changes since 2012 a review is warranted to identify changed/new hot spots.	Re-establish flushing program by reviewing customer complaints & water quality verification trends to identify hot spots. Additionally Water Age modelling would also assist, noting network change (ref 9.00).	Re-establish flushing program by reviewing customer complaints & water quality verification trends to identify hot spots. Additionally Water Age modelling would also assist, noting network change (ref 9.00).	Network Maintenance Program Leader & Senior Water Quality Scientist	Jun-16	5% (NEW)
4.06	2012RMIP (G6)	To reduce the risk of contamination from properties without backflow prevention devices.	2012RMIP (G6) Undertake project to identify the unmetered properties & install a meter with backflow prevention (ongoing project).	New properties require backflow prevention. Residual project from Allconnex period where existing properties were mainly located in Gold Coast areas. Investigate if project still required during whole of system Risk Assessment (ref. 2.03)	Network Maintenance Program Leader	Jun-16	0%
4.07	5.1 (R) DIS 1.0	Risk Assessment: Reservoir levels managed to minimise detention time and maintain chlorine residual	Formalise Reservoir level management SOP/Protocol using LWA reservoir modelling results.	Formalise Reservoir level management SOP/Protocol using LWA reservoir modelling results. LWA Task # 90-12-12 Logan North Water Supply - Reservoir Reliability Assessment report recommendations adopted.	Network Operations Program Leader	May-15	100%
4.08	5.1 (R) DOS 1.0 SEQ 1.0	Risk Assessment: The need for disinfection would only apply if received water was not adequately disinfected. Online monitoring exists at entry points with alarms. Kimberly Park (Seqwater) LCC requires read access to online monitoring.	1. Arrange online read access to Seqwater online water quality SCADA monitoring via Seqwater Protocol (Kimberley Park, Kuraby & Chambers Flat). 2. Determine when Seqwater's Kuraby Reservoir chlorination dosing system will be installed.	Arrange online read access to Seqwater online water quality SCADA monitoring via Seqwater Protocol (Kimberley Park, Kuraby & Chambers Flat). Interfaces between Seqwater's PLCs and LCC RTUs have been completed with mimics to be finalised. Await access to Seqwater site. Ensure incorporation into Operating Protocol.	Water Asset Management Program Leader & Telemetry Coordinator	Dec-15	95%
4.09	5.2 (G)	No clear operational monitoring program currently in place. Develop and show how to link to corrective actions by operations. Also relate to SCADA. Some Operational monitoring occurs as part of the Lab's Verification Monitoring program (i.e. HPC, etc).	Commence: 1. Identify operational monitoring parameters & processes. 2. Determine if related SOPs exist or need to be developed; incorporate related SCADA (trends/events/alarms) and management of excursions, including reporting responsibilities. 3. Implement.	Informal processes exist including review of weekly lab reports, flushing program and SCADA trend reviews. Formalisation will commence post LWA project findings and recommendations. <b>LWA 90-12-97 Network Water Quality Maintenance Strategy.</b> <b>LWA 90-12-98 Network Water Quality Operating Strategy.</b>	Senior Water Quality Scientist	2015/16 FY	40%
4.10	5.2 (G)	No formal corrective action system currently exists. Documented SOPs for corrective action to control excursions in operational parameters required. Needs to align with updated LCC IMP.	<b>Establish Corrective Action system.</b> 1. Develop and establish centralised corrective action process across LCC Water Branches. Must be documented and allow for trail (i.e. tracking & prioritisation). Responsibilities need to be developed and understood. 2. Develop appropriate SOP.	<b>Establish Corrective Action system.</b> 1. Develop and establish centralised corrective action process across LCC Water Branches. Must be documented and allow for trail (i.e. tracking & prioritisation). Responsibilities need to be developed and understood. 2. Develop appropriate SOPs.	Senior Water Quality Scientist	2016/17 FY	30%
4.11	5.1 (R) DIS 1.0	Internal Audit (2013) - large gaps and dirt close to vent holes found at reservoir.	<b>Short Term</b> - maintenance undertaken to promptly address gaps and vent holes. Reservoir inspection form updated and review conditions of other reservoirs (WOP 202). <b>Long Term:</b> Develop and implement Reservoir Inspection training to operational staff.	Reservoir inspection form to be reviewed and updated. Development of reservoir training material commenced. Finalise & implement 2015/16 FY. Water Quality Distribution training workshop, by QLD Water Directorate, which covers reservoirs - <b>delivery Jul'15.</b>	Senior Water Quality Scientist	Jun'16	50%
4.12	5.4 (G) & R	Recent internal audit found reservoir inspections and cleans were overdue (i.e. 2 yearly cleans up to one year overdue).	<b>RESERVOIRS</b> Undertake audit review to ensure schedules are followed and not significantly overdue (eg reservoir inspections & cleans).	<b>RESERVOIRS</b> Undertake audit review to ensure schedules are followed and not significantly overdue (eg reservoir inspections & cleans).	Network Operations Program Leader	Jun-16	0% (NEW)
4.13	5.4 (G)	Recent internal audit found reservoir inspections and cleans were overdue (i.e. 2 yearly cleans up to one year overdue).	<b>RESERVOIRS</b> Schedules will be "locked" in new SAMMS with associated escalations.	<b>RESERVOIRS</b> Schedules will be "locked" in new SAMMS with associated escalations.	Water Asset Management Program Leader	2016/17 FY	0% (NEW)
4.14	5.5 (R) DOS 2.0 WOS 2.0	Recent internal audit found no formal approved materials & chemicals register exists.	Develop Chemical Supply and Materials procurement register, incorporating AS4020 requirements.	Develop Chemical Supply and Materials procurement register, incorporating AS4020 requirements.	Network Operations Program Leader	Jun-15	100%
4.15	5.5 (R) DOS 2.0 WOS 2.0	No formal agreed supplier agreement exists.	Formalise chemical supply agreement (i.e. quality & delivery schedule).	Due to small volumes of hypo delivered, informal agreement currently exists with reference to associated SOP. <b>Formalise chemical supply agreement (i.e. quality &amp; delivery schedule).</b>	Network Operations Program Leader	Jun-15	100%

Item No.	DWQMP Section G-General Improvement (Audit/Review) R-Risk Assessment or Audit	ISSUES / RISKS	KEY ACTIONS	CURRENT ACTION STATUS (Jun'15)	LEAD POSITION	TARGET DATE	% Complete (Jun'15)
<b>E5: Verification of Drinking Water Quality</b>							
5.00	6.1 (G)	Verification Monitoring program requires review to incorporate water supply system changes, tap audit findings & meet regulatory requirements.	Revise 2013/2014 Monitoring program for 2015-2108 predicated population, water supply and system changes per Water Quality Zone (WQZ).	Revised 2013/2014 Monitoring program for 2015-2108 predicated population, water supply and system changes per Water Quality Zone (WQZ) to be implemented 2015/16 FY.	Water Quality Officer	Jun-15	100%
5.01	6.1 (G)	A number of sampling tap sites were identified as either not representative of water supplied to customers or had OH&S issues associated with location and tap design or difficult to find.	Tap audit developed, undertaken and completed which included OH&S, LIMS, GIS & appropriate WQZ sampling spread. Finalise implementation of all key findings. Need to ensure LIMS & Sampling Plan (lab) updated as required.	Tap audit developed, undertaken and completed which included OH&S, LIMS, GIS & appropriate WQZ sampling spread. Finalise implementation of all key findings. Need to ensure LIMS & Sampling Plan (lab) updated as required.	Water Quality Officer	Dec-15	0% (NEW)
5.02	6.2 (G)	Various "disjointed" customer complaint systems exist (i.e. pathways, WWETT, various CM database (emails/letters), etc).	<b>Short term:</b> WWETT system developed. <b>Long term:</b> investigation is taking place to look at "one" Customer RM system, integrated with other systems (i.e. asset mgt, etc). Consultant engaged to scope works.	WWETT system developed to replace UMD to manage current phoned in customer complaints however various systems still exists for written complaints & enquiries. Customer Service audit commenced by external provider. Anticipate a CRM system will follow once Strategic Asset Maintenance Mgt System (SAMMS) implemented. Limited by Corporate initiatives.	Business & Customer Mgt Program Leader	2016/17 FY	40%
5.03	6.3 (G)	Informal review of weekly/monthly lab and SCADA data currently undertaken.	Formalise water quality monitoring data review SOPs, including customer satisfaction. Water Information Management System (WIMS) required for more efficient capture and trending of water quality information.	Continue informal weekly review of water quality until formalised Water Information Management System (WIMS) is implemented (ref.11.01).	Senior Water Quality Scientist	Jun-15	100%
5.04	6.3 (G)	Informal review of weekly/monthly lab and SCADA data currently undertaken.	Water Information Management System (WIMS) required for more efficient capture and trending of water quality information.	Scoping for WIMS commenced with key internal stakeholders (ref. 11.01).	Product Quality Program Leader	Jun-16	0% (NEW)
5.05	6.4 (G)	Recent internal audit found incorrect Priority assignment to health related customer complaints in WWETT.	<b>NEW: Short Term</b> - meet with staff to discuss the importance of Priority rating for health related water quality complaints.	<b>Short Term</b> - meet with staff to discuss the importance of Priority rating for health related water quality complaints.	Water Grid & Operations Support Coordinator	Aug-15	0% (NEW)
5.06	6.4 (G)	Recent internal audit found incorrect Priority assignment to health related customer complaints in WWETT.	<b>NEW: Long Term</b> - investigate if health related complaints can be automatically rated a Priority 1. Note: WWETT improvements captured in Water Operations Business Plan 2015/16. <b>Also refer to Item 5.02.</b>	<b>Long Term</b> - investigate if health related complaints can be automatically rated a Priority 1. Note: WWETT improvements captured in Water Operations Business Plan 2015/16. <b>(ref. 5.02 SAMMS &amp; CRM)</b>	Business & Customer Mgt Program Leader	Jun-16	0% (NEW)
<b>Element 6: Management of Incidents and Emergencies</b>							
6.00	7.2 (G)	No previous internal Emergency Response Plan (ERP) training undertaken only via Seqwater Grid.	External exercise involving Seqwater and Distribution entities.	Exercise Hydra planned Oct'14 (Seqwater Grid).	Business & Customer Mgt Program Leader	Oct-14	100%
6.01	7.2 (G)	LCC's Incident Management Plan (IMP) requires updating to reflect improved processes.	Update LCC IMP to reflect recent workshop and training sessions.	LCC IMP has been updated to reflect recent workshop and training sessions and awaits final endorsement.	Business & Customer Mgt Program Leader	Mar-16	80% (NEW)
6.02	7.2 (G)	Internal exercises required to test new IMP,	Trial exercise completed July 2015 Full internal exercise planned Sept 2015 Seqwater exercise planned Sept 2015	Trial exercise to be completed July 2015 Full internal exercise planned Sept 2015 Seqwater exercise planned Sept 2015	Business & Customer Mgt Program Leader	Oct-16	20% (NEW)
<b>Element 7: Employee Awareness and Training</b>							
7.00	8.1 (G)	Recent audit identified external & OH&S training well documented however internal "on-the-job" training is not.	Develop and implement appropriately tool to document "on-the-job" training.	Develop and implement appropriate tool to document "on-the-job" training.	Water Branch Managers	Jun-16	0%
7.01	8.1 (G)	Internal audit review highlighted that some staff were still unsure of the DWQMP & clarity of Drinking Water Policy.	Develop & deliver DWQMP & Policy awareness/toolbox training to all Water Branch staff and possibly include in future Induction Program.	DWQMP & Policy awareness training material to be developed & implemented to all Water Branch staff, eventually via inductions.	Senior Water Quality Scientist	Jun-17	0%
<b>Element 8: Community Involvement &amp; Awareness</b>							
8.00	9.2 (G) 2012RMIP (G11 & G12)	No water quality reports currently exist on LCC's website, like some of the other water service providers do.	Place a public equivalent LCC Annual Water Quality Report on LCC website and other helpful information about water quality and management.	Place a public equivalent LCC Annual Water Quality Report on LCC website and other helpful information about water quality and management.	Senior Water Quality Scientist	Dec'15	80%
<b>Element 9: Research &amp; Development</b>							
9.00	10.2 (G)	Water age modelling is required as inputs to review of flushing program and assist with identifying any other low residual hot spots.	Undertake updated Water Age Modelling for Logan to incorporate more recent network changes. Outputs will be used for various other projects such as re-establishing flushing program, future chlorine booster dosing systems and drinking water risk assessment workshops (ref 4.05).	Undertake updated Water Age Modelling for Logan to incorporate more recent network changes. Outputs will be used for various other projects such as re-establishing flushing program, future chlorine booster dosing systems and drinking water risk assessment workshops (ref 4.05).	Product Quality Program Leader	Dec-15	0% (NEW)
9.01	10.2 (G)	Document the design approaches used to ensure appropriate equipment deployed.	Document the design approaches used to ensure appropriate equipment deployed.	Documents exists with previous LWA however needs to be reviewed in set-up of new Alliance (LWIA).	Product Quality Program Leader	Dec-15	10% (NEW)
9.02	10.2 (G)	Document the design approaches used to ensure appropriate equipment deployed and maintained, particularly risks to drinking water - fit for purpose.	<b>Reservoir Strategy</b> to be developed to review asset's fitness for purpose and determine future requirements. Also review notification process to escalate asset priorities due to potential drinking water risks.	<b>Reservoir Strategy</b> to be developed to review asset's fitness for purpose and determine future requirements. Also review notification process to escalate asset priorities due to potential drinking water risks (LWIA).	Water Asset Management Program Leader	2015/16 FY	0% (NEW)

Item No.	DWQMP Section G-General Improvement (Audit/Review) R-Risk Assessment or Audit	ISSUES / RISKS	KEY ACTIONS	CURRENT ACTION STATUS (Jun'15)	LEAD POSITION	TARGET DATE	% Complete (Jun'15)
<b>Element 10: Documentation &amp; Reporting</b>							
10.00	11.1 (G)	Recent audit identified changed or out dated document DM# hence various doc mgt approaches exist across the various Water Branches since Allconnex dissolution.  DWQMP has documented SOPs known to date.	Establish Document Control Framework Principles.  Water Ops & Lab have an established but different system.	Establish Document Control Framework Principles: Investigate current management tool to meet requirement needs.	Product Quality Program Leader	Dec-15	30%
10.01	11.2 (G)	Various internal/external WQ reports are generated with no formal procedures.	Ensure register of reports is maintained and associated procedures developed.	Ensure register of reports is maintained and associated procedures developed. Regular Water Branch monthly reports undertaken which include water quality KPIs - <b>action complete</b> .  Formal SOP to be developed, keeping in mind WIMS development ( <b>Item 11.01</b> )	Water Quality Officer	Jun-16	90%
10.02	11.2 (G)	Public display of annual report will be a DEWS requirement for 2014/15FY report.	Place LCC DWQMP annual report on LCC website.	Internal & external resources used to help finalise Annual Water Quality Report with support information (i.e. suburb maps vs water quality zones) to be included in LCC's website ( <b>ref 8.00</b> ).	Senior Water Quality Scientist	Jan'16	90%
<b>Element 11: Evaluation of Audit</b>							
11.00	12.1 (G)	Long term data is not evaluated or documented.	<b>Process</b> - Undertake "long-term" trend analysis, evaluate performance and identify opportunities for improvements.	Process Improvement team implemented Feb'14 to focus on evaluating Medium/Long term trends and associated improvements (i.e. reservoir chlorine residuals)- <b>complete</b> .	Senior Water Quality Scientist	Feb-14	100%
11.01	12.1 (G)	Long term data is not evaluated or documented.	<b>Long Term - Tool:</b> Investigate an integrated Water Information Management System (WIMS) (i.e. link with LIMS, SCADA, field data, etc) being investigated to allow effective long term trending of water quality parameters.	<b>Long Term</b> - Investigate an integrated Water Information Management System (WIMS) (i.e. link with LIMS, SCADA, field data, etc) being investigated to allow effective long term trending of water quality parameters. Specifications commenced. Previous systems investigated however an integrated system is preferred ( <b>ref 5.04</b> ).	Product Quality Program Leader	Jun-16	5%(NEW)
11.02	12.2 (G)	Internal audit undertaken & presented 2013, however processes for annual audit not yet established.	Establish Internal Annual audit review process. Investigate use of Intellex system and <b>WSA-AQuality</b> audit tool (i.e. get feedback from other service providers effectiveness of tools).	Annual internal audit over next 4 years established using external provider - <b>complete</b> .  Establish internal audit plan to be implemented by LCC staff by 2018 with WSA-AQuality as potential tool.	Senior Water Quality Scientist	Jun-18	50%
11.03	12.2 (G)	Lack of appropriate internal auditor skills.	Develop internal auditor skills and aim to gain RABQSA auditor qualifications.	Lead auditor training undertaken Jun'14 and ISO22000 HACCP training Aug'14. Applied skills by undertaking internal audits Apr'15 including cross training additional staff via external provider.	Senior Water Quality Scientist	Jun-15	100%
11.04	12.2 (G)	External audit to be undertaken as per Regulator's "condition" of an approved DWQMP.	Arrange external audit as per Regulator's requirements before June 2017 (Feb'17) and ensure captured in 2016/17 Business Plan.	Arrange external audit as per Regulator's requirements before June 2017 (Feb'17) and ensure captured in 2016/17 Business Plan.	Senior Water Quality Scientist	Jun-17	0%(NEW)
<b>Element 12: Review &amp; Continual Improvement</b>							
12.01	12.2 (G)	Annual review of audit findings and identification of "none actions" trends which could impact business.	Annual review of audit findings, identifying trends.	1. Key audit finding actions incorporated into RMIP, which is reviewed at least annually - <b>complete</b> . 2. Development of internal Audit required & ensure findings captured & communicated to senior mgt - <b>complete</b> . 3. Engaged external provider to undertake annual non-regulatory audit & present findings over next 4 years with actions included in RMIP - <b>complete</b> .	Senior Water Quality Scientist	May-15	100%
12.02	12.2 (G)	Annual review of audit findings and identification of "none actions" trends which could impact business.	RMIP actions to be incorporated into appropriate Water Branch NetServPlans and Business Plan strategies and action.  DWQMP (ADWG Component) facilitators assigned to help facilitate actions.	RMIP actions to be incorporated into appropriate Water Branch Business Plan strategies and action.  DWQMP (ADWG Component) facilitators assigned to help facilitate actions however additional training maybe required.	Water Branch Managers	Jun-16	5%(NEW)