LOGAN CITY COUNCIL

DRINKING WATER QUALITY MANAGEMENT PLAN

ANNUAL REPORT 2016-2017

JANUARY 2018

LOGAN
CITY COUNCIL

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NOTATIONS AND ABBREVIATIONS

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

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TABLES

FIGURES

1 INTRODUCTION

This Drinking Water Quality Management Plan (DWQMP) Annual Report has been developed to meet the requirements of section 95 of the *Water Supply (Safety and Reliability) Act 2008 (the Act)*. The purpose of *the Act* is to provide safe and reliable drinking water supply throughout Queensland.

This DWQMP Annual Report documents the following for the 2016-17 Financial Year (FY)[1]:

- The water quality performance of Logan City Council's (Council) drinking water supply; and
- Actions taken to implement the Drinking Water Quality Management Plan.

This report assists the Queensland Water Supply Regulator (Department of Natural Resources, Mines and Energy (DNRM&E)) to determine compliance with the currently approved DWQMP and relevant approval conditions.

This report has been prepared in accordance with the Water Quality and Reporting Guideline for a Drinking Water Service September 2010 and the Drinking Water Quality Management Plan report template.

This report is available to the public via the Logan City Council's website, and copies may be provided to members of the public upon request.

[1] 1st July 2016 to 30th June 2017 relates to the 2016–17 FY.

2 OVERVIEW OF OPERATIONS

2.1 Council's Drinking Water Supply System

Logan City Council (Council) is a water service provider which distributes water that is sourced and treated by the bulk water supplier, Seqwater.[2]

Seqwater is the Queensland Government Authority responsible for ensuring safe, secure and reliable drinking water supply for South East Queensland (SEQ). They are also responsible for catchment management and providing recreational facilities to the community. Note that Council bears no responsibility for catchment management or primary treatment. Key responsibilities of Council and Seqwater are summarised in Table 1.

Table 1 - Seqwater and Council Responsibilities

Seqwater's Responsibilities	*Logan City Council's Responsibilities*
▪ Catchment management. ▪ Raw water treatment (including fluoridation). ▪ Clear water storage. ▪ Bulk water transport to defined transfer points. ▪ Monitoring of raw and treated water supply, including fluoridation.	▪ Receipt of bulk treated water from Seqwater at defined transfer points. ▪ Delivery to customers through Council's water distribution network. ▪ Operation and maintenance of the distribution network, reservoirs, pump stations and a number of secondary disinfection facilities. ▪ Monitoring of water supply throughout the distribution network.

2.2 SEQ Water Supply Network Grid

Logan City Council is supplied treated drinking water through the SEQ Water Supply Network Grid (Grid), managed and operated by Seqwater, as shown in Figure 1. Water may be sourced from various supplies throughout the Grid, dependent on operational supply requirements. For example; treated drinking water can flow south or north via the Southern Regional Water Pipeline (SRWP) to supply Logan City Council and the City of Gold Coast. The Eastern Pipeline Interconnector (EPI) can flow west to supply Logan City Council or east to supply Redlands City Council.

Both Seqwater and Council undertake extensive water quality monitoring to ensure safe drinking water is supplied to its customers.

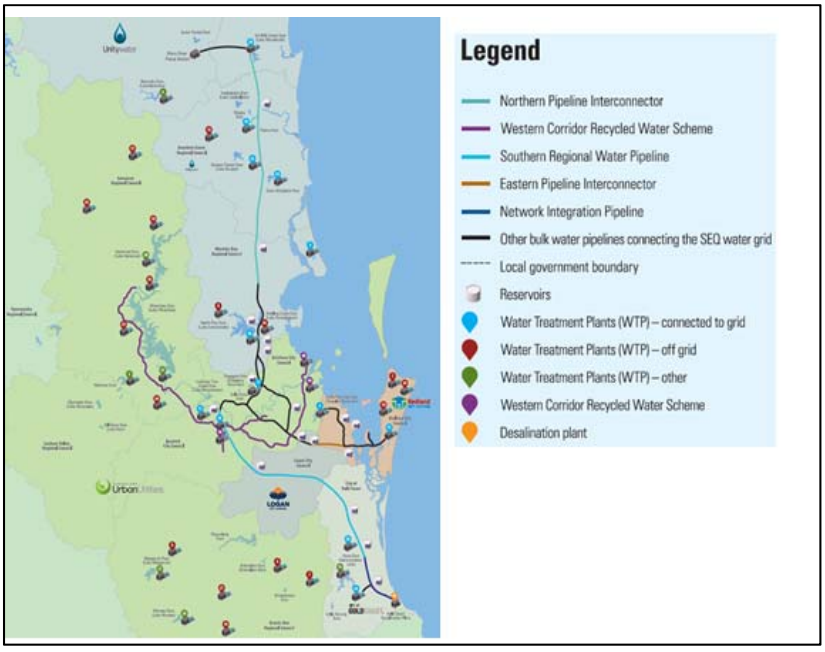

Figure 1 - South East Queensland Water Grid

[2] Further information on Seqwater can be accessed at http://www.seqwater.com.au/

2.3 Council's Drinking Water Supply Network

An overview of Council's drinking water supply network key features is provided in Table 2, including number of water supply connections and treated source water.

Table 2 – Overview of the Logan City Council's Drinking Water Supply

Overview	*Description*
City's Area	957 square kilometres
City's Population	318,492
Population connected to the drinking water supply network	302 909[3]
Seqwater's Primary Water Treatment Plants (WTP) & respective water catchments.	Mt Crosby (Wivenhoe Dam via Brisbane River), North Stradbroke Island (North Stradbroke Island Bores), Capalaba (Tingalpa Dam), Molendinar (Hinze Dam), Gold Coast desalination plant (seawater off Tugun, Gold Coast)[4]
Bulk Supply Points (transfer points)	**1.** Compton Road meter via Kuraby Reservoir inlet main; **2.** Trinder Park pump station via Kuraby Reservoir; **3.** Eastern Pipeline Interconnector (EPI) supply via Kimberly Park Reservoir; **4.** Southern Regional Water Pipeline (SRWP) supply via Teviot Road Offtake; **5.** SRWP supply via New Beith Offtake (Pub Lane offtake); and **6.** Gold Coast Supply via Stanmore Pump Station (contingency supply only).

2.4 Drinking Water Disinfection

The Australian Drinking Water Guidelines (ADWG) place a heavy emphasis on ensuring drinking water is microbiologically safe. A useful way to achieve this is by chemical disinfection such as chlorination. This is an effective way to kill or inactivate a wide range of harmful micro-organisms and has been used in the water industry worldwide for over 80 years.

The way Council manages effective disinfection within the drinking water network is described below:

- Drinking water distributed by Council contains either chloramine or chlorine as the disinfectant;
- Council strives to maintain effective disinfectant levels throughout its network at all times, aiming to maintain levels 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 in effective water quality maintenance of the water supply network;
- Council 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; and
- Council operates secondary disinfection facilities (i.e. boosters and breakpoint), to maintain effective residual disinfection and as part of the Council's network disinfection maintenance program. Customers in proximity of these sites may notice a stronger taste or smell on these occasions.

[3] Population and demand forecast information, based on current Desired Standards of Service (DSS) and adopted Infrastructure Demand Model (IDM), current as of 30/06/2017.

[4] Note this Seqwater water treatment plant (WTP) is currently in 'hot standby' mode. It is not in permanent use but is capable of being brought back online when needed.

2.5 Council's Drinking Water Quality Zones

During the 2016-17 FY, Council defined six Water Quality Zones (WQZ)[5]. Council's WQZ can be defined as an area of the water distribution network that takes into account the various bulk water supply sources and the two different disinfection types (i.e. chloramine or chlorine). WQZs are used when undertaking medium to long term water quality trend analysis and regulatory reporting.

A summary of Council's suburbs by WQZ is shown in Table 3, under general operating conditions.

Table 3 – Logan City Council's Water Quality Zones and Associated Suburbs

WQZ	*Main Suburbs*	*Partial Suburbs*
Greenbank	Browns Plains, Boronia Heights, Forestdale Greenbank, Heritage Park, Hillcrest, Park Ridge Regents Park	Berrinba, Chambers Flat, Crestmead, Logan Reserve, Munruben, Park Ridge South
Kimberley Park	Carbrook, Cornubia, Loganholme, Shailer Park, Tanah Merah	Slacks Creek
Marsden	Crestmead, Logan Reserve, Loganlea, Marsden, Meadowbrook, Waterford West	Berrinba, Heritage Park, Kingston, Park Ridge
Springwood	***Springwood High Level Zone*** Priestdale, Rochedale South, Underwood	
	Springwood Low Level Zone Berrinba, Daisy Hill, Eagleby, Kingston, Logan Central Slacks Creek, Springwood, Woodridge	Loganholme, Marsden, Shailer Park, Tanah Merah, Underwood
Logan East	Bannockburn, Bahrs Scrub, Beenleigh, Belivah, Bethania, Edens Landing, Holmview, Windaroo, Waterford, Wolffdene, Mount Warren Park	Eagleby
Logan South	Cedar Grove, Cedar Vale, Chambers Flat, Jimboomba Logan Village, Mundoolun, Munruben, New Beith North Maclean, Park Ridge South, Maclean, Stockleigh, Veresdale Scrub, Woodhill, Yarrabilba	Greenbank

[5] Please note that in Section 6.2 *Customer Complaints*, Springwood WQZ is separated into Springwood High Level Zone and Springwood Low Level Zone.

The SEQ water supply network grid, described in Section 2.2, means that Council may be supplied from any number of WTPs operated by Seqwater. In practice, the vast majority of treated water is supplied from the Mt Crosby WTP. An overview of the Council's supply sources, disinfection type and WQZs is provided in Table 4.

Table 4 - Logan City Council Water Source Summary

WSA	WQZ	WSZ	Disinfection Type	Blended	Approximate Water Supply from each Source			
					Mt Crosby (Kuraby)	Mt Crosby (SRWP)	Redland City (EPI)	City of Gold Coast (SRWP)
Logan North	Greenbank	Greenbank	Chloraminated[A]	Yes	85%	10%	-	5%
	Kimberly Park	Kimberly Park	Chloraminated[A]	Yes	90%	-	10%	-
	Marsden	Marsden	Chloraminated[A]	No	100%	-	-	-
	Springwood High	Springwood	Chloraminated	No	100%	-	-	-
	Springwood Low		Chloraminated	No	100%	-	-	-
Logan East	Logan East	Logan East	Chloraminated (winter) Chlorinated (summer)	No	100%	-	-	-
Logan South	Round Mountain	Logan South	Chloraminated (winter) Chlorinated (summer)	Yes	-	90%	-	10%
	Spring Mountain		Chloraminated (winter) Chlorinated (summer)					
	Travis Road		Chlorinated					
	Woodhill		Chlorinated					

^ Chlorinated during Network Maintenance Disinfection Program (occurs generally every 2 years).

3 ACTIONS TAKEN TO IMPLEMENT THE DWQMP

3.1 Progress in Implementing the Risk Management Improvement Plan

3.1.1 Risk Management Improvement Plan Process

Council's Risk Management Improvement Plan (RMIP) is the key document used to capture opportunities for improvements to reduce risks associated with drinking water and public health. It is also used to improve the quality of drinking water provided to Council's customers.

Opportunities for improvements are captured in the RMIP and are identified from the following:

- Risk Assessments – *high risks;*
- DWQMP Reviews and Audits – *non-conformances and general improvements;*
- Drinking Water Incidents; and
- 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 RMIP actions with details found in Appendix B.

Element 1 – Commitment to Drinking Water Quality Management

The Operating Protocol between Seqwater and Council has now been updated to include additional Trihalomethane (THM) notifications to Logan City Council.

Element 2 – Assessment of the Drinking Water Supply System

The updated risk assessment matrix has now been incorporated in the recently revised DWQMP Rev5.3. No new high risks were identified during the revision however any outstanding improvements have been included in the RMIP.

Online water quality monitoring and alarming via SCADA and validation will continue during the 2017-18 FY together with the potential identification of new monitoring sites.

Element 3 – Preventative Measures for Drinking Water Quality

The Network Maintenance Disinfection Programs (NMDP) are now well established, occurring annually, rotating between Kimberley Park WQZ (odd years) and Greenbank/Marsden WQZs (even years). The Greenbank NMDP occurred September 2016 with Kimberley Park planned for August 2017. Since implementation, this program has helped improve drinking water network cleanliness resulting in a 50% reduction in dirty water complaints and improved disinfection residuals. This has contributed to a significant improvement in drinking water quality and safety.

Round Mountain reservoir electro-chlorinator design was completed with construction and commissioning planned for the 2017-18 FY. Once commissioned, the changes at Round Mountain reservoir will help improve water quality by improving disinfection residuals in the Logan South water supply network.

Detailed design and installation of two new chlorine booster dosing systems for Logan East were completed late 2016, with commissioning commenced during 2017. Completion is expected early 2018, to help improve chlorine disinfection residuals. An additional chlorine booster dosing unit was also built and commissioned during 2016-17 FY. This will help improve chlorine residuals for the Logan North drinking water supply network, during the summer periods and reduce WH&S risks associated with manually dosing of liquid hypochlorite.

Review of the Critical Control Points (CCPs) commenced during 2017, with improvements to continue during 2018, as new dosing systems are commissioned, including the development of associated protocols.

Element 4 – Operational Procedures & Process Control

Disinfection of tools is now well established and operational procedures were updated to incorporate disinfection of parts and improved hygiene practises to reduce the risk of contamination during main repairs. Implementation was undertaken via tool box meetings during 2017 with hands-on training planned for 2018.

The potable water chlorine tablet trial undertaken during 2016-17 FY was successful for small reservoirs and will continue unless it is replaced with auto-dosing systems.

A CAPEX proposal to design and replace ageing sampling taps was successfully submitted during the 2016-17FY with implementation expected during the 2017-18 FY. Together with improved prompt reporting protocols this will help provide more effective monitoring of Council's drinking water quality for the community.

Element 5 – Verification of Drinking Water Quality

All online reservoirs have now been incorporated into Council's drinking water verification sampling program.

Council plans to integrate the numerous customer complaint systems into one Customer Relationship Management (CRM) system, likely post implementation of the Strategic Asset Maintenance Management System (SAMMS). Timeline is dependent on whole of Council implementation.

Element 6 – Management of Incidents & Emergencies

The incident response intranet has been updated to include additional tools such as an "*E. coli* Action Plan" flowchart together with key contacts to help improve incident management. A review of Council's Incident Management Plan (IMP) and associated training has been scheduled for the 2017-18 FY.

Element 7 – Employee Awareness & Training

Drinking water awareness training is now captured via the Water Operations certificate training. The DWQMP and *Water Supply (Safety & Reliability) Act* awareness training will continue to be delivered annually to senior staff and management, as part of internal audit review process.

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

Hygienic work practices training is to be developed and implemented during the 2017-18 FY.

Element 8 – Community Involvement & Awareness

New drinking water fact sheets and useful drinking water information, such as water hardness settings for dishwashers, were developed and uploaded on to Council's public website. Information regarding "upcoming" Network Maintenance Disinfection Programs has also been included on the website to inform customers when they occur.

Element 9 – Research & Development

Due to drinking water incidents occurring at reservoirs, a Reservoir Strategy and Function Specification was developed during the 2016-17 FY, to improve reservoir design. Reservoir condition audits were also undertaken, resulting in a Reservoir Renewals CAPEX program to repair and upgrade a number of reservoirs during the next 5 years. This will help reduce risks associated with drinking water quality.

To help address long term effective disinfection residual throughout SEQ, a SEQ Disinfection Optimisation Strategy team was established, including key stakeholders from a number of water service providers including Seqwater and Logan City Council. It identified two areas within Logan where priority chlorine dosing systems should be established, thus planning for these continues into the 2017-18 FY.

Appropriate maintenance scheduling of drinking water assets will be integrated with the new Strategic Asset Maintenance Management System (SAMMS), currently being developed Council wide, which will continue into the 2017-18 FY.

Element 10 – Documentation & Record Keeping

All of Council's DWQMP Annual Reports are now displayed on Council's public website. A document control system framework is still being investigated, which will continue during the 2017-18 FY.

Element 11 – Evaluation & Audit

The Process Improvement Team, established in 2014, continues to focus on reviewing long term trends and effectiveness of implemented improvements. Progress on long-term action status continues, to ensure Council continues to provide safe drinking water to the community.

An external audit was undertaken during June 2017 with key findings summarised in Section 7. Council will continue to undertake annual internal audits to help identify non-conformances and opportunities for improvement, which are captured in the RMIP (Appendix B).

The software for a Water Information Management System (WIMS), to help with effective medium/long term trend analysis, has been purchased with implementation to commence during the 2017-18 FY.

Element 12 – Review & Continual Improvement

Some aspects of the RMIP have now been integrated into the Business Planning process.

Investigations found that Intelex was deemed as the best tool to help better manage long term actions associated with incidents, non-conformances and high risks. Intellex development and implementation is planned during the 2017-18 FY.

Identification and management of any new high risks from the whole of system risk assessment and recent external audit findings will continue during the 2017-18 FY.

3.2 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 (Section 3.1 and Appendix B).

3.3 Amendments made to the DWQMP

During the 2016-17 FY, no amendments were made to the DWQMP Rev5.2 however a review of the DWQMP was undertaken during this period with key amendments summarised in Section 8. The amended DWQMP rev5.3 was submitted to the Water Supply Regulator during the 2017-18 FY.

4 COMPLIANCE WITH WATER QUALITY CRITERIA

4.1 Compliance Summary

To determine drinking water compliance, the verification monitoring program results are assessed against the:

- Water quality criteria specified by the Regulator in the Water Quality and Reporting Guideline for a Drinking Water Service;
- Health guideline values in the Australian Drinking Water Guidelines (ADWG); and
- Drinking water quality criteria from the *Public Health Regulation 2005.*

During the 2016-17 financial year (FY) there were three instances of non-compliance with the water quality criteria for Council's verification monitoring program. These are summarised briefly below in Table 5 and described in more detail in section 5.1.

Table 5 - Verification Monitoring Program Non-compliance Events Summary 2016-17 FY

#	Date	Location	Parameter	Result	ADWG (health) limit	Units
1	25/10/2016	Peacock Avenue, Beenleigh	Lead	0.019	<0.01	mg/L
2	23/01/2017	Mundoolun reservoir, Mundoolun	*E. coli*	1	<1	MPN/100mL
3	4/04/2017	Brosnahan reservoir, Belivah	*E. coli*	1	<1	MPN/100mL

4.2 Monitoring Program Overview

Monitoring of drinking water quality in Logan City is undertaken to:

- Verify drinking water quality meets regulatory requirements;
- Verify the safety of the drinking water along with the effectiveness of the network operation and system integrity;
- Facilitate review of water quality performance; and
- Identify potential emerging problems in a proactive manner.

Monitoring during the 2016-17 FY was carried out in accordance with Council's current Verification Monitoring Plan (DM#9486600).

4.3 Data Analysis Methodology

Table 6 summarises the methodology employed to analyse the data used in the Water Quality Performance Summary for 2016-17 FY. This methodology is consistent with the ADWG guidance provided on statistical principles (Information sheet 3.3).

Table 6 - Data Analysis Methodology

Data subject	*Methodology*	*Reference*
Outliers	All outliers are included in the analysis.	ADWG information sheet 3.3
Less than values (<)	Less than values (<) are substituted with a value equivalent to half the Limit of Reporting (LOR). For example a result of <1 is considered 0.5 for the purposes of data analysis.	ADWG information sheet 3.3
Data exclusions	Data from repeat samples, project, emergency or investigative sampling are not included in the data analysis.	DEWS Water Quality Reporting Guideline 2010

The summary of water quality data, found in Appendix A, is presented in six separate tables representing each of the six Water Quality Zones (WQZ).

Also included, is a summary of compliance results for *E. coli* undertaken during drinking water verification monitoring. *E. coli* results are displayed in this report for the whole of Logan City (i.e. all WQZs combined – refer to Appendix A (Table 19 and Table 20).

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

During the 2016-17 FY, there were six 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 was reason to believe public health was potentially at risk.

5.1 Non-Compliances with Water Quality Criteria

Three notifications were related to Council's routine Verification Monitoring program and three to the installation of new mains by contractors. Of the six notifications, five were related to the detection of *E. coli* of which one required Council to issue a precautionary boil water notice. The other notification related to the detection of lead from a sampling tap.

E. coli is an organism that may not directly represent a hazard to human health but may be indicative of recent faecal contamination and is often associated with the presence of other harmful pathogens from warm blooded organisms.

A summary of the notification findings with the corrective and preventative actions undertaken is summarised below.

5.1.1 Non-compliant Events - Verification Monitoring Program

5.1.1.1 Detection of Lead (Peacock Avenue, Beenleigh - Logan East WQZ)

Incident Description

Lead was detected in a sample collected on the 25th October 2016 from the Peacock Avenue sample tap. The lead result was 0.019mg/L, exceeding the ADWG health limit of 0.01mg/L.

Corrective and Preventative Actions

Flushing of the sample tap was carried out and resampling indicated no lead present nor in any of the other sample sites in the Logan East WQZ. The old sample tap and associated fittings were replaced and re-testing indicating no lead present.

As part of the 2017-18 FY CAPEX program, all verification sampling taps will be replaced with best practise design to eradicate aging assets and ongoing maintenance issues. Historically, plumbing in general, did use lead in fittings, which would have included tap fittings.

5.1.1.2 Detection of *E. coli* (Mundoolun Reservoir, Mundoolun - Logan East WQZ)

Incident Description

E. coli was detected in a sample collected on the 23rd January 2017 from the Mundoolun reservoir sample tap. The *E. coli* result was 5 MPN/100mL with a total chlorine residual of 0.11mg/L. Re-testing confirmed *E. coli* present however no *E. coli* was present in the surrounding area.

Corrective and Preventative Actions

Mundoolun reservoir supplying the area was isolated, inspected and dosed with liquid sodium hypochlorite and the surrounding network flushed. Repeat testing resulted in no *E. coli* present. Roof gaps found during the inspection were sealed to prevent ingress.

In consultation with Metro South Public Health Unit and DEWS, the reservoir was put back online and surrounding areas were flushed to draw chlorine residual throughout the network.

Long term preventative actions includes manually dosing the reservoir with liquid chlorine to maintain effective chlorine residual until an auto-dosing facility is designed via the 2017-18 FY CAPEX program with implementation to follow.

5.1.1.1 Detection of *E. coli* (Brosnahan Reservoir, Belivah - Logan East WQZ)

Incident Description

As part of Council's routine verification monitoring program, *E. coli* was detected in a sample collected on the 4th April 2017 from Brosnahan reservoir. The *E. coli* result was 1 MPN/100mL with a total chlorine residual of 0.07mg/L. Investigations found that the most likely cause of the *E. coli* was a result of contaminated flood water entering broken mains that fed this reservoir, during the flooding caused from ex-Tropical Cyclone Debbie.

Corrective and Preventative Actions

Brosnahan Reservoir supplying the area was isolated and manually dosed with liquid sodium hypochlorite with surrounding areas flushed. Additional sampling found no detection of *E. coli* in the other Logan East WQZ sampling sites.

In consultation with Metro South Public Health Unit and DEWS, a precautionary boil water notice was issued and then lifted with the reservoir put back online, once consecutive sample results indicated no *E. coli* present.

Preventative actions included maintaining chlorine residual in the reservoir until it is replaced with supply pumps during 2017-18 FY CAPEX program. Improved prompt reporting of health breaches and events that could cause public health concerns, such as submerged mains in contaminated flood water, has also been implemented.

5.1.1 Non-compliant events - New Mains Connections

5.1.1.1 Detection of *E. coli* (Johanna Street, Jimboomba - Logan South WQZ)

Incident Description

Council was informed by an external contractor on the 21st September 2016 of a positive *E. coli* result from a sample taken as part of a new main connection at Johanna Street, Jimboomba. The *E. coli* result was 1 MPN/100mL with total chlorine residual of 0.05mg/L with the sample taken via a hydrant standpipe. Council's verification monitoring results from a nearby sample tap on the same road indicated no *E. coli* present in Council's water supply network during the same period.

Corrective and Preventative Actions

Council conducted immediate flushing of the isolated mains together with localised flushing of the existing mains as a precautionary measure. Repeat sampling indicated no *E. coli* present. It is not unusual for samples taken from a standpipe to give a false positive bacterial test result.

The contractor was contacted to confirm that appropriate methods of disinfection and sampling were being undertaken in new mains installation and commissioning.

5.1.1.2 Detection of *E. coli* (Peppertree Drive, Jimboomba Woods - Logan South WQZ)

Incident Description

Council was informed by an external contractor on the 18th November 2016 of a positive *E. coli* result from a new main connection located at Peppertree Drive and Myrtle Street, Jimboomba. The *E. coli* result was 1 MPN/100mL (Myrtle Street existing supply) and 1 and 3 (both Peppertree Drive, new main connections) with the average total chlorine residual of 0.07mg/L. Council's verification monitoring results from the same water supply network indicated no *E. coli* present in the Council's water supply network during the same period.

Corrective and Preventative Actions

Council conducted immediate flushing of the isolated mains together with local flushing of the existing mains as a precautionary measure. Repeat sampling indicated no *E. coli* present. It is not unusual for samples taken from a standpipe to give a false positive bacterial test result.

The contractor was contacted to confirm appropriate methods of disinfection and sampling were being undertaken in new mains installation and commissioning.

5.1.1.3 Detection of *E. coli* (Koona Place, Hillcrest - Greenbank WQZ)

Incident Description

Council was informed by an external contractor on the 17th January 2017 of a positive *E. coli* result as part of a new main connection located at Koona Place, Hillcrest. The *E. coli* result was 73 MPN/100mL with a total chlorine residual of 0.08mg/L. Council's verification monitoring results from the same water supply network indicated no *E. coli* present in the Council's water network supply during the same period.

Corrective and Preventative Actions

Council conducted immediate flushing of the isolated main together with local flushing of the existing mains as a precautionary measure. Repeat sampling from the site and surrounding area indicated no *E. coli* present. It is not unusual for samples taken from a standpipe to give a false positive bacterial test result.

Council has informed all current contractors to review current disinfection and sampling methodologies to ensure appropriate methods are being used to minimise false positives, which may include duplicate sampling. Additionally, a reminder that immediate reporting to Council is required, once a positive *E. coli* result is known.

6 CUSTOMER COMPLAINTS RELATED TO DRINKING WATER QUALITY

6.1 Community Engagement

Consumer satisfaction is a critical aspect in the verification of drinking water quality. The monitoring and analysis of customer complaints is considered a key part of Logan City Council's (Council) drinking water quality verification program. At all times, Council 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

As discussed in section 3.1.2 (Element 3), a network maintenance disinfection program was implemented in the Greenbank WQZ during September 2016.

This program is undertaken to reduce nitrification in the Logan North network and help improve water quality. As part of community engagement, a letter drop was carried out in the area affected. Fact sheets and public notices were made available via Council's website and the local newspaper. Information was also posted on social media, informing the community of the proposed changes and timelines. Though the ultimate aim of such a program is to protect public health, Council received a number of customer complaints during this period, which is further discussed in proceeding sections.

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.

Council's aims are to:

- Respond directly to the customer making the complaint;
- Investigate the complaint;
- Rectify the condition; and
- Mitigate risks to public health effectively.

During this process data is collected which assists with future improvement activities. Establishment of this process is crucial in driving Council's process improvement activities.

Council classifies customer complaints according to the following categories:

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

Council received a total of 289 drinking water complaints for the 2016-17 FY, equating to 2.77 complaints per 1000 water connections.

Of the complaints Appearance (197) was the highest followed by Taste and Odour (67) and Suspected Health (25). A breakdown percent of customer complaints by category, is shown in Figure 2.

The number of customer complaints received by Council per category for each Water Quality Zone (WQZ) is shown in Figure 3 and Table 7 with complaints per connection shown in Table 8.

The calculation of complaints per 1000 connections allows for comparisons to be made between Water Quality Zones (WQZ). The number of connections is based on the number of properties currently connected to Council's drinking water network by WQZ.

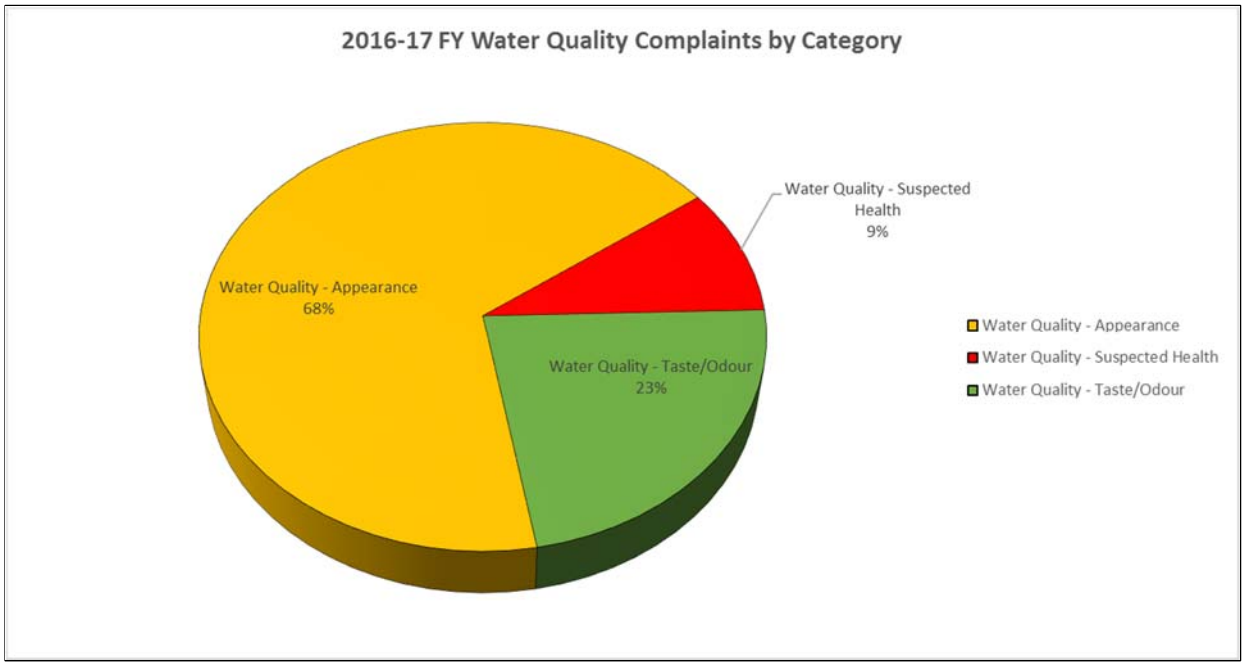

Figure 2 - Summary of Water Quality Complaints by Category

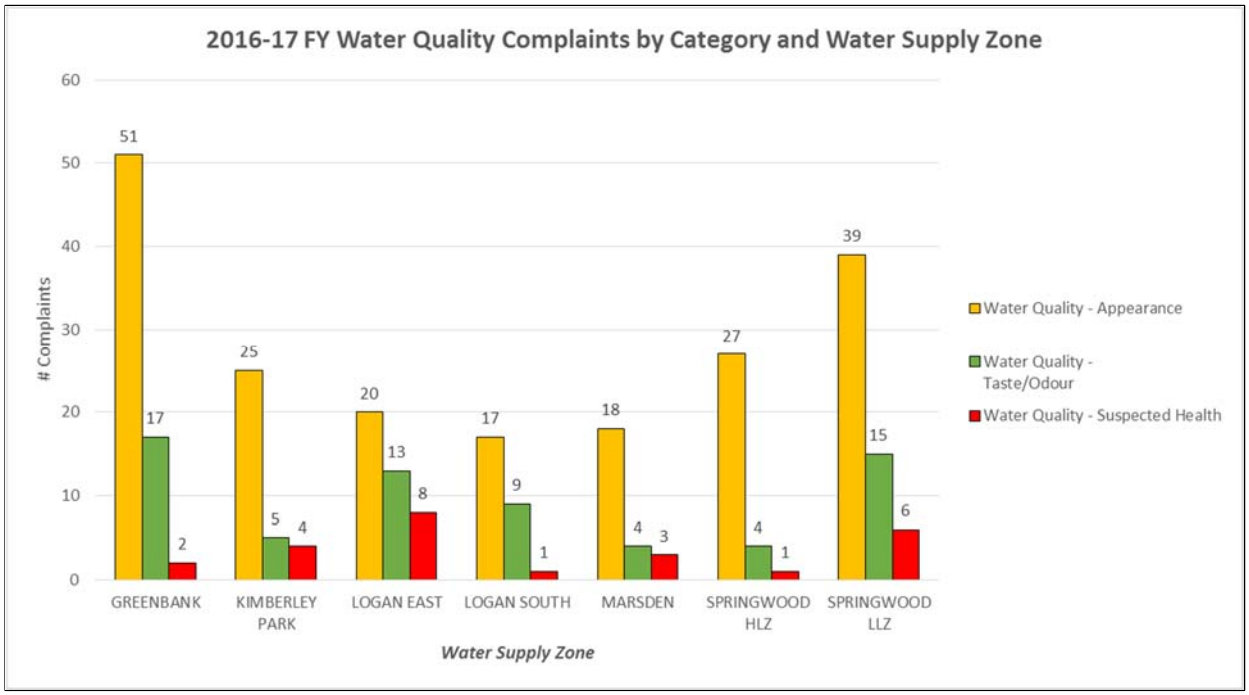

Figure 3 - Water Quality Customer Complaints by Category and Zone

Table 7 - Water Quality Complaints Summary 2016-17FY

2016-17 FY Total Water Quality Complaints				
Water Supply Zone	***Appearance***	***Taste/Odour***	***Suspected Health***	***Total***
Greenbank	51	17	2	70
Kimberley Park	25	5	4	34
Logan East	20	13	8	41
Logan South	17	9	1	27
Marsden	18	4	3	25
Springwood High Level Zone	27	4	1	32
Springwood Low Level Zone	39	15	6	60
Total	197	67	25	289
% of Total	68%	23%	9%	100%

Table 8 - Water Quality Customer Complaints per 1000 connections

2016-17 FY Customer complaints/1000 connections					
Water Supply Zone	***# Connections[6]***	***Appearance***	***Taste/Odour***	***Suspected Health***	***Total***
Greenbank	16,615	3.07	1.02	0.12	***4.21***
Kimberley Park	8,255	3.03	0.61	0.48	***4.12***
Logan East	16,221	1.23	0.80	0.49	***2.53***
Logan South	10,253	1.66	0.88	0.10	***2.63***
Marsden	15,294	1.18	0.26	0.20	***1.63***
Springwood High Level Zone	9,994	2.70	0.40	0.10	***3.20***
Springwood Low Level Zone	27,736	1.41	0.54	0.22	***2.16***
All Zones Total	104,368	1.89	0.64	0.24	***2.77***

[6] Number of connections based on population and demand forecast information, based on current Desired Standards of Service and Adopted Infrastructure Demand Model (IDM). Information current for 30/06/2017.

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.

During the 2016-17 FY, Council received a total of 25 suspected health complaints of which there were no confirmed cases after their water was tested against the ADWG.

Test results confirmed that the drinking water supply to their homes met the ADWG health related guidelines or regulated values.

All complaints were actioned and closed out following appropriate consultation with the customer. No operational changes have been implemented as a result of the suspected health complaints during the 2016-17 FY.

Fuel/chemical tasting complaints (i.e. hydrocarbon related) can be received either as a Suspected Health or Taste & Odour complaint. In this report they have been categorised in the Taste & Odour section (Section 6.2.3.3).

6.2.2 Appearance

Appearance of drinking water (*Appearance*) was the highest complaint type for the 2016-17 FY reporting period. Of the 289 total complaints 197 were related to the appearance of the water (68% of all water complaints received).

Greenbank WQZ returned the most *Appearance* complaints (51 complaints, 3.07 complaints per 1,000 connections) representing 26% of all appearance complaints received.

All water *Appearance* complaints received were investigated with the most common remedial action being flushing of water mains.

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

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

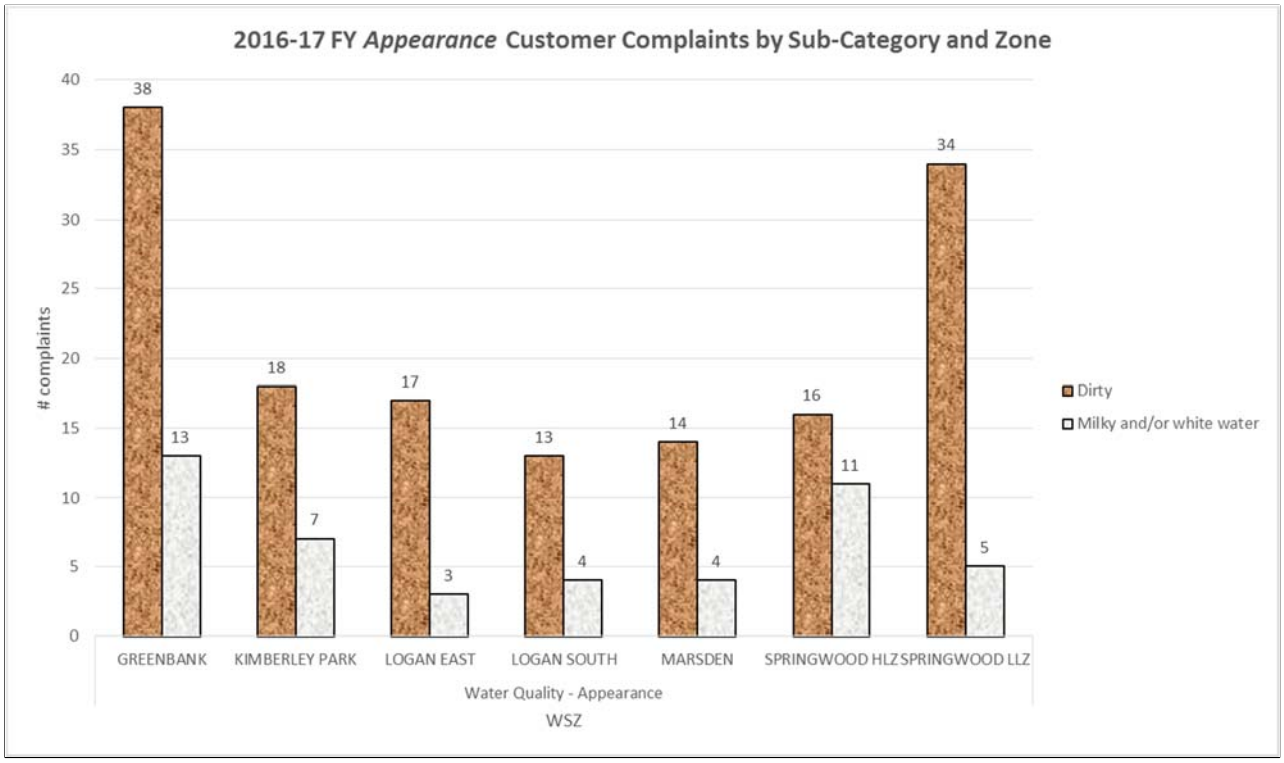

Figure 4 - *Appearance* Customer Complaints by Sub-Category and Zone

6.2.2.1 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 150 dirty water complaints, contributing to 76% of all water appearance complaints across the City.

As can be seen in Figure 4, Greenbank WQZ returned the highest number of dirty water complaints (38). About half of these dirty water complaints occurred during the Greenbank WQZ network maintenance disinfection project which was undertaken from September to early November 2016. Even though there were a number of dirty water complaints during this program, overall there has been a significant reduction in dirty water complaints since this program was introduced in 2014 (refer to Section 3.1.2 – Element 3).

The remaining complaints are generally related to unplanned broken mains or main repairs.

Implementation of the Hy5 hygienic work practices program will occur in the 2017-18 FY. This program includes training on adequate flushing techniques when working on mains (refer to Section 3.1.2 – Element 4).

6.2.2.2 Milky and/or White Water

The majority of *Milky and/or White Water* complaints were suspected to be associated with mains repairs, resulting in air in the line.

A total of 47 *Milky and/or White Water* complaints were received during the reporting period, 24% of the Appearance complaints.

Greenbank and Springwood High Level Zone WQZ returned the highest number (13 and 11 respectively), as shown in Figure 4.

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. This is done 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, had nearby mains flushed along with sampling and additional testing for further investigation.

No operational changes were implemented as a result of investigations into these complaints over the 2016-17 FY.

6.2.3 Taste and Odour

Taste and Odour complaints are characterised by an objectionable taste or odour noticed by customers. Typical descriptions from customers include earthy, metallic, chlorine or a chemical / petrol taste in the water. Thus Taste and Odour complaints are generally categorised into the following sub-sets:

- Chlorine;
- Musty / Earthy / Stale; and
- Hydrocarbons / Chemical / Petrol

The third category, *Hydrocarbons*, is included to account for water quality complaints where the water reportedly “smells or tastes like petrol”. 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.

During the 2016-17 FY reporting period, there were 67 *Taste and Odour* complaints received. Figure 5 shows the Taste and Odour subset complaints per WQZ, with Greenbank WQZ having the highest number of complaints.

All these complaints were attended to and flushed with customers on occasion being supplied bottled water, whilst investigation and remedial activities were undertaken.

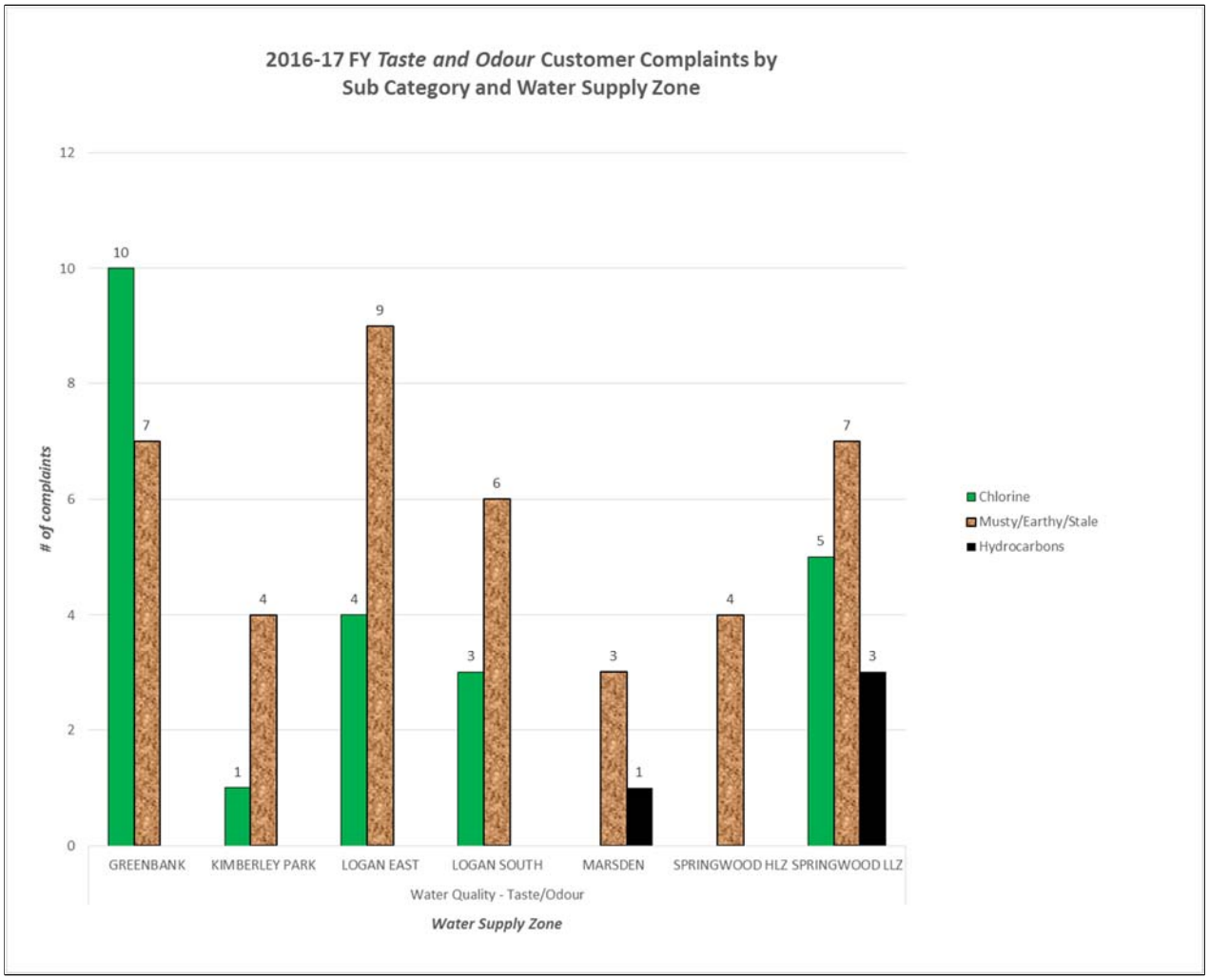

Figure 5 - *Taste and Odour* Complaints by Sub-Category and Zone

6.2.3.1 Chlorine

Whilst most of Logan City has chloramine as the residual disinfectant, some WQZs can at times have free chlorine in the water as the residual disinfectant.

When consuming water, customers typically detect chlorine more easily than chloramine. 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 for chlorine is 5 mg/L (as total chlorine) however Council aims to operate well below this limit. Council aims to manage network chlorine levels which provide customers with safe treated drinking water that is also pleasant to drink.

During the reporting period, 23 of the Taste and Odour complaints were associated with a chlorine taste or odour (34%).

As can be seen in Figure 5, the majority of *Chlorine* complaints were from the Greenbank WQZ (10). All these complaints were reported during the Network Maintenance Disinfection Program (NMDP), described in section 6.1.1.

Marsden and Springwood WQZs did not record any *Chlorine* complaints, noting that these WQZs are chloraminated.

Review of the effectiveness of the NMDP, along with consumer satisfaction, is ongoing. As discussed in Section 3.1, NMDP fact sheets were developed and included on Council's website, as part of the program's comprehensive communication strategy.

No operational changes have been implemented by Council as a result of these complaints.

6.2.3.2 Musty / Earthy / Stale

Musty, Earthy or Stale tasting water can be due to a number of factors including:

- Odours from drains being mistaken for odour from taps;
- 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.

As shown in Figure 5, the majority of *Musty, Earthy or Stale* complaints were from the Logan East WQZ (9), followed by Greenbank and Springwood Low WQZs (both 7) with Marsden WQZ returning the lowest number (3).

All complaints were investigated and in cases where samples were collected and analysed, the customer was informed of the water quality results, of which all met the ADWG health guidelines. Generally flushing was also carried out by Water Operations.

No operational changes have been implemented by Council as a result of these complaints.

6.2.3.3 Hydrocarbons

Whilst not common, residents do occasionally spill petrol or oil on their property which seeps through the soil into their service line, contaminating their water supply.

During the 2016-17 FY, Council received four hydrocarbon Taste & Odour complaints[7]. Investigations were undertaken, including thorough sampling and testing from both Council's water supply to the property and directly from the effected property, and in some cases neighbouring properties. In each case the results concluded:

- That Council's water supply met ADWG health guideline requirements and there was no detection of hydrocarbons in the water supply to the property; and
- That contamination occurred within the owner's property, impacting their drinking water and exceeding the ADWG limits.

As a result, Council provided the water quality results together with advice on appropriate corrective and preventative actions that should be undertaken, including a fact sheet (*How to Avoid Chemical Contamination of Your Water Supply*) to all affected customers. This fact sheet can also be found on Council's website.

No operational changes have been implemented by Council as a result of these complaints.

[7] Please note that all hydrocarbon complaints have been classified 'Taste and Odour' for the purposes of this report (i.e. none are classified in the health complaints category).

7 FINDINGS AND RECOMMENDATIONS OF THE DRINKING WATER QUALITY MANAGEMENT PLAN AUDITOR

One of the conditions of having an approved DWQMP is to undertake an external DWQMP audit within 4 years of an approved DWQMP. Council's DWQMP was originally approved December 2013, with major amendments included in Rev 5.2 approved in December 2015.

Viridis Consultants Pty Ltd conducted an external audit of Logan City Council's approved DWQMP Rev 5.2 from the 20th – 22nd June 2017.The audit included site inspections of Council's laboratory, reservoirs and dosing facilities. The scope of the audit was in accordance with the *Drinking Water Management Plan Review and Audit Guidelines 2013.*

7.1 Summary of Audit Findings and Recommendations

The benefits of audits, besides meeting Regulatory requirements, is that they highlight what is being done well and what can be improved. An overall summary of compliance is shown in Table 9.

Table 9 - Audit Compliance Summary

Compliance Code		***Number of findings***
Compliant	**C**	6
Minor Non-compliant	**N**	4
Major Non-compliant	**M**	1

The major non-compliance was in relation to a failure in process, following a positive *E. coli* result. There was a 2-day delay in taking action after the test result was determined, which was considered to be a potential health risk. Following the incident, alerts for health-based limits were implemented in the Laboratory Information Management System (LIMS), which will assist to prevent delays in reporting in the future.

7.1.1 Summary of Audit Findings

The audit findings per area are summarised in Table 10 below.

Table 10 – Audit Findings Summary

Audit Area	*Finding*
Accuracy and Monitoring Performance Data	***Compliant***
Compliance with the Plan	**1.** Provision and conditions in the approval notice – ***Compliant*** **2.** Implementation of preventive measures – ***Minor Non-compliance*** **3.** Implementation of operational and maintenance procedures – ***Minor Non-compliance*** ***4.*** Implementation of process for managing incidents and emergencies – ***Compliant*** ***5.*** Implementation of operational and verification monitoring programs – ***Major Non-compliance*** ***6.*** Implementation of the risk management improvement program – ***Minor Non-compliance*** ***7.*** Maintaining records – ***Compliant*** **8.** Undertaking regular reviews – ***Compliant***
Relevance of the Plan	**1.** Service description and details of infrastructure – ***Minor non-compliance*** **2.** Catchment characteristics and water quality information – ***Compliant***

7.1.2 Summary of Audit Recommendations

Recommendations were provided for auditable elements which do not comply (either major or minor non-compliances). Recommendation 6 is in relation to the major non-compliance, which was addressed immediately.

Opportunities for improvements were also identified, however these are not discussed within this annual report.

The recommendations from the audit are as follows:

- ***Recommendation 1:*** Reconsider some of the generalizations in the risk assessment, in relation to preventive measures. An example is 'secure reservoir sites', not all of the sites are secure. This would be better managed through a Security Plan, which can consider exceptions.
- ***Recommendation 2:*** Operational control needs to have a more structured approach. There should be greater awareness/visibility of critical control points (CCPs). If an alert limit of a parameter at a CCP is triggered then action must be undertaken to bring the system under operational control. If a CCP critical limit is reached then appropriate actions must be taken. Action is required to prevent out of specification water reaching the consumer, where possible. Records must be kept of the actions taken in response to exceedance of a critical limit and records should be kept of other operational changes.

- ***Recommendation 3:*** Operational procedures must be followed and checklists completed, where they have been established. These are an excellent way of ensuring that preventive measures are implemented.
- ***Recommendation 4:*** Operational procedures must be reviewed as specified in the Drinking Water Quality Management Plan (DWQMP) and the current version implemented. Review must be of the procedure and then the practice, not the other way around (e.g. WOP 211 & WOP 401 don't reflect current practice).
- ***Recommendation 5:*** The monitoring program should be implemented in full. Haloacetic acid and phosphorus were not monitored as per the 2015/16 FY monitoring program.
- ***Recommendation 6:*** Immediate corrective action is required once a non-conformance of a health-related parameter is identified. Ideally this should be an automated process not reliant on staff to spot abnormal results.
- ***Recommendation 7:*** Actions in the Risk Management Improvement Plan (RMIP) should be realistic and all possible efforts taken to close out actions as prescribed.
- ***Recommendation 8:*** Ensure the risk assessment maintains its currency and accurately reflects the risks being managed. The risk assessment should be at the centre of the DWQMP driving the other elements.

7.1.3 Addressing the Audit Recommendations

Council intends to address the key audit findings and recommendations.

Recommendation 6 was immediately implemented, to address a major non-conformance. Health-based alert limits were implemented in the Laboratory Information Management System (LIMS) to automate exceedance notifications. This will help prevent delays in future health exceedance reporting such that corrective actions can be undertaken promptly.

It must also be noted that the audit was undertaken on the DWQMP Rev5.2, which was under review at the time and has since been updated (DWQMP Rev5.3), awaiting review approval from the Regulator. Thus some of the *Recommendations*, such as *Recommendation 5*, have already been addressed.

The remaining key audit findings and recommendations will be reviewed and addressed as part of the Risk Management Improvement Plan (RMIP) - Appendix B (Item 12.02).

8 OUTCOME OF THE REVIEW OF THE DRINKING WATER QUALITY MANAGEMENT PLAN

The purpose of DWQMP review is to ensure that the DWQMP remains relevant and current, with regards to the operation of the drinking water service.

In accordance with the requirement of Section 99 (2)(b) and 106 of *the Act*, Council undertook a review of the approved DWQMP Rev 5.2. This commenced in May 2017 and was completed by the regulatory deadline of the 30th June 2017.

The review of DWQMP Rev 5.2 was conducted internally by the key staff shown in Table 11. A final review approval of the updated and finalised DWQMP Rev5.3 document was conducted by the Water Branch Program Leaders and Managers.

Table 11 - DWQMP Review Team

Name	Position	Water Branch
Michael Armstrong	Regulatory & Performance Reporting Coordinator	Water Business
Nishendra Attygalla	Water Planning Engineer	Water Infrastructure (LWIA)
Cheryl Carr	Business Planning & Resilience Officer	Water Business
Nicola Currie	Customer Response & Communication Coordinator	Water Business
Padmini de Alwis	Laboratory Service Coordinator	Water Business
Murray Evans	Senior Water Operations Engineer	Water Operations
Natasha Georgius	Senior Water Quality Scientist (Engineer)	Water Business
Nicholas Heeney	Laboratory Systems Officer	Water Business
Troy Kasper	Senior Asset Management Engineer	Water Business (LWIA)
Carmen Roberts	Water Demand & Liaison Officer	Water Business
Daryl Ross	Water Business Manager	Water Business
Tammy Stevenson	Water Demand & Commercial Liaison Coordinator	Water Business
Jeremy Thomas	Project Manager	Logan Water Infrastructure Alliance
Darshan Udayaratna	Networks Operations Program Leader	Water Operations
Phil Wetherell	Water Quality Officer	Water Business
Rolly Wicks	Water Grid & Operations Support Coordinator	Water Operations
Lauren Williamson	Business Planning & Resilience Coordinator	Water Business

As a result of the DWQMP review, amendments were identified thus associated changes and updates were made to the DWQMP Rev 5.2, which are summarised in Table 12 below.

Table 12 - DWQMP Review Changes

Proposed Amendment	Change Details
Registered Service Details	No change.
Details of Infrastructure for providing the service	Updated schematics, stakeholders and disinfection descriptions including new dosing systems.
Identify Hazards & Hazardous Events	Updated to reflect more recent risk assessment information.
Information gathering – water quality and catchment characteristics	No significant change.
Assessment of Risks	Updated to reflect more recent risk assessment with whole of system undertaken 2016 and incorporate all individual dosing system risk assessments into one document.
Risk management measures	Updated to include current risk management information.
Operation and maintenance procedures	Updated to reflect current procedures.
Management of Incidents	Updated to reflect current incident management plan and associated documents.
Risk Management Improvement Program	Updated to reflect current RMIP.
Service wide support – information management	Minor cosmetic updates.
Operational Monitoring	No change.
Verification Monitoring	Updated to reflect current verification monitoring plan activities.
Other	Many cosmetic improvements have been made with information being presented more succinctly. These changes have not been highlighted in the attached DWQMP.

The updated DWQMP, now DWQMP Rev 5.3, together with a WSR506 DWQMP Amendment Application form, were submitted to the Office of Water Planning and Regulation November 2017. This DWQMP Rev 5.3 is currently being reviewed and assessed by the Regulator for approval.

Major amendments were either immediately updated in the DWQMP or included in the Risk Management Improvement Plan (RMIP).

The next internal review of the DWQMP is due by the 30th of June 2019.

There were no new hazards or hazardous events that affected the drinking water quality during the 2016-17FY, which were not already addressed in the DWQMP.

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. The reporting period was 1st July 2016 – 30th June 2017 (2016-17 FY). A summary of performance by Water Quality Zone is included on the proceeding pages.

Please refer to Section 4.3 for further descriptions of the monitoring program regime and statistical analysis principles adopted for the analysis.

Reticulation Verification Monitoring

Table 13 - Greenbank Water Quality Zone Performance Summary 2016-17 FY

Greenbank Water Quality Zone												
#	PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	95TH PERCENTILE	LOR	LABORATORY NAME
MICROBIAL												
1	*E. coli*	MPN/100mL	WEEKLY	186	0	0	<1	<1	<1	0	1	LCC
2	Heterotrophic Plate Count	cfu/mL	WEEKLY	83	32	***a***	<1	190	19	91	1	LCC
3	Total Coliforms	MPN/100mL	WEEKLY	186	0	***a***	<1	<1	<1	<1	1	LCC
CHEMICAL / PHYSICAL												
4	Alkalinity as $CaCO_3$	mg/L	EACH PERIOD	11	11	***a***	83	98	88	94	1	LCC
5	Aluminium, Total	mg/L	EACH PERIOD	47	47	***a***	0.03	0.11	0.06	0.09	0.01	LCC
6	Ammonia-N	mg/L	EACH PERIOD	83	44	***a***	<0.1	0.4	0.1	0.2	0.1	LCC
7	Arsenic, Total	mg/L	EACH PERIOD	47	28	0	<0.001	0.001	0.001	0.001	0.001	LCC
8	Barium, Total	mg/L	EACH PERIOD	47	47	0	0.023	0.031	0.026	0.030	0.001	LCC
9	Beryllium, Total	mg/L	EACH PERIOD	47	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
10	Bismuth	mg/L	EACH PERIOD	47	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
11	Boron, Total	mg/L	EACH PERIOD	47	47	0	0.03	0.03	0.03	0.03	0.01	LCC
12	Cadmium, Total	mg/L	EACH PERIOD	47	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
13	Calcium Hardness	mg/L	EACH PERIOD	47	47	***a***	52	79	67	75	1	LCC
14	Calcium, Total	mg/L	EACH PERIOD	47	47	***a***	21	31	26	30	1	LCC
15	Chloride	mg/L	EACH PERIOD	47	47	***a***	51	85.0	65.0	82.0	0.1	LCC
16	Chlorine, Free	mg/L	WEEKLY	212	127	***a***	<0.05	1.43	0.12	0.38	0.05	LCC
17	Chlorine, Total	mg/L	WEEKLY	212	207	0	<0.05	2.60	0.66	1.72	0.05	LCC
18	Chromium, Total	mg/L	EACH PERIOD	47	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
19	Cobalt, Total	mg/L	EACH PERIOD	47	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC

20	Colour, Apparent	Hazen	EACH PERIOD	47	47	***a***	1	5	3	5	1	LCC
21	Colour, True	Hazen	EACH PERIOD	47	2	***a***	<1	1	<1	<1	1	LCC
22	Conductivity	µS/cm	EACH PERIOD	83	83	***a***	417	634	466	526	1	LCC
23	Copper, Total	mg/L	EACH PERIOD	47	47	0	0.002	0.066	0.008	0.032	0.001	LCC
24	Fluoride	mg/L	EACH PERIOD	47	47	0	0.5	0.9	0.8	0.9	0.1	LCC
25	Iron, Total	mg/L	EACH PERIOD	47	47	***a***	0.005	0.059	0.012	0.020	0.003	LCC
26	Lead, Total	mg/L	EACH PERIOD	47	30	0	<0.001	0.002	0.001	0.001	0.001	LCC
27	Lithium, Total	mg/L	EACH PERIOD	47	2	***a***	<0.001	0.001	<0.001	<0.001	0.001	LCC
28	Magnesium, Total	mg/L	EACH PERIOD	47	47	***a***	11	16	14	16	1	LCC
29	Manganese, Total	mg/L	EACH PERIOD	47	47	0	<0.001	0.013	0.004	0.008	0.001	LCC
30	Molybdenum, Total	mg/L	EACH PERIOD	47	44	0	<0.001	0.001	0.001	0.001	0.001	LCC
31	Nickel, Total	mg/L	EACH PERIOD	47	7	0	<0.001	0.001	<0.001	0.001	0.001	LCC
32	Nitrate (NO_3-N)	mg/L	EACH PERIOD	47	44	0	<0.1	0.9	0.5	0.8	0.1	LCC
33	Nitrite (NO_2-N)	mg/L	EACH PERIOD	47	32	0	<0.1	0.9	0.2	0.5	0.1	LCC
34	pH	pH Units	EACH PERIOD	83	83	***a***	7.6	8.6	7.8	8.1	1	LCC
35	Potassium, Total	mg/L	EACH PERIOD	47	47	***a***	3	4	4	4	1	LCC
36	Selenium, Total	mg/L	EACH PERIOD	47	0	0	<0.01	<0.01	<0.01	<0.01	0.01	LCC
37	Sodium, Total	mg/L	EACH PERIOD	47	47	***a***	36	52	40	44	1	LCC
38	Sulphate	mg/L	EACH PERIOD	47	47	***a***	20	68	26	42	1	LCC
39	TDS, Calculated	mg/L	EACH PERIOD	50	50	***a***	265	385	288	337	1	LCC
	Temperature	°C	WEEKLY	186	186	***a***	18	33	25	32	***b***	LCC
41	Thallium, Total	mg/L	EACH PERIOD	47	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
42	THM Total	mg/L	EACH PERIOD	11	11	0	0.028	0.094	0.061	0.088	0.005	ALS/CGC
43	Total Hardness	mg/L	EACH PERIOD	47	47	***a***	97	145	124	136	1	LCC
44	Turbidity	NTU	EACH PERIOD	83	46	***a***	<0.1	1.5	0.2	0.6	0.5	LCC
45	Zinc, Total	mg/L	EACH PERIOD	47	2	***a***	<0.01	0.03	<0.01	<0.01	0.01	LCC

a **–** No ADWG prescribed guideline health limit for parameter

b – No Limit of Reporting (LOR) prescribed for Temperature

Table 14 - Kimberley Water Quality Zone Performance Summary 2016-17 FY

Kimberley Park Water Quality Zone												
#	PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	95TH PERCENTILE	LOR	LABORATORY NAME
MICROBIAL												
1	*E. coli*	MPN/100mL	WEEKLY	165	0	0	<1	<1	<1	<1	1	LCC
2	Heterotrophic Plate Count	cfu/mL	WEEKLY	117	53	***a***	<1	2700	75	242	1	LCC
3	Total Coliforms	MPN/100mL	WEEKLY	165	15	***a***	<1	34	<1	2	1	LCC
CHEMICAL / PHYSICAL												
4	Alkalinity as $CaCO_3$	mg/L	EACH PERIOD	26	26	***a***	76	93	86	91	1	LCC
5	Aluminium, Total	mg/L	EACH PERIOD	42	42	***a***	0.02	0.10	0.06	0.09	0.01	LCC
6	Ammonia-N	mg/L	EACH PERIOD	117	32	***a***	<0.1	0.2	0.0	0.2	0.1	LCC
7	Arsenic, Total	mg/L	EACH PERIOD	42	30	0	<0.001	0.001	0.001	0.001	0.001	LCC
8	Barium, Total	mg/L	EACH PERIOD	42	42	0	0.023	0.031	0.026	0.028	0.001	LCC
9	Beryllium, Total	mg/L	EACH PERIOD	42	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
10	Bismuth, Total	mg/L	EACH PERIOD	42	12	***a***	<0.001	0.004	<0.001	0.002	0.001	LCC
11	Boron, Total	mg/L	EACH PERIOD	42	42	0	0.03	0.03	0.03	0.03	0.01	LCC
12	Cadmium, Total	mg/L	EACH PERIOD	42	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
13	Calcium Hardness	mg/L	EACH PERIOD	42	42	***a***	57	78	66	76	1	LCC
14	Calcium, Total	mg/L	EACH PERIOD	42	42	***a***	23	31	26	30	1	LCC
15	Chloride	mg/L	EACH PERIOD	42	42	***a***	56	93	65	91	0.1	LCC
16	Chlorine, Free	mg/L	WEEKLY	165	63	***a***	<0.05	1.18	0.09	0.49	0.05	LCC
17	Chlorine, Total	mg/L	WEEKLY	165	165	0	0.05	2.15	0.47	1.59	0.05	LCC
18	Chromium, Total	mg/L	EACH PERIOD	42	2	0	<0.001	0.001	<0.001	<0.001	0.001	LCC
19	Cobalt, Total	mg/L	EACH PERIOD	42	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
20	Colour, Apparent	Hazen	EACH PERIOD	42	40	***a***	<1	5	3	5	1	LCC

21	Colour, True	Hazen	EACH PERIOD	42	4	***a***	<1	1	<1	1	1	LCC
22	Conductivity	µS/cm	EACH PERIOD	117	117	***a***	396	631	470	544	1	LCC
23	Copper, Total	mg/L	EACH PERIOD	42	42	0	0.002	0.046	0.013	0.031	0.001	LCC
24	Fluoride	mg/L	EACH PERIOD	42	42	0	0.5	0.9	0.8	0.9	0.1	LCC
25	Iron, Total	mg/L	EACH PERIOD	42	42	***a***	0.006	0.052	0.020	0.046	0.003	LCC
26	Lead, Total	mg/L	EACH PERIOD	42	34	0	<0.001	0.003	0.001	0.001	0.001	LCC
27	Lithium, Total	mg/L	EACH PERIOD	42	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
28	Magnesium, Total	mg/L	EACH PERIOD	42	42	***a***	12	17	14	16	1	LCC
29	Manganese, Total	mg/L	EACH PERIOD	42	42	0	0.001	0.014	0.005	0.009	0.001	LCC
30	Molybdenum, Total	mg/L	EACH PERIOD	42	42	0	0.001	0.004	0.001	0.002	0.001	LCC
31	Nickel, Total	mg/L	EACH PERIOD	42	10	0	<0.001	0.001	<0.001	0.001	0.001	LCC
32	Nitrate (NO_3-N)	mg/L	EACH PERIOD	42	42	0	0.3	0.9	0.6	0.8	0.1	LCC
33	Nitrite (NO_2-N)	mg/L	EACH PERIOD	42	26	0	<0.1	0.4	0.2	0.4	0.1	LCC
34	pH	pH Units	EACH PERIOD	117	117	***a***	7.4	8.0	7.7	7.8	1	LCC
35	Potassium, Total	mg/L	EACH PERIOD	42	42	***a***	3	4	4	4	1	LCC
36	Selenium, Total	mg/L	EACH PERIOD	42	42	0	<0.01	<0.01	<0.01	<0.01	0.01	LCC
37	Sodium, Total	mg/L	EACH PERIOD	42	42	***a***	36	51	40	48	1	LCC
38	Sulphate	mg/L	EACH PERIOD	42	42	***a***	20	49	24	34	1	LCC
39	TDS, Calculated	mg/L	EACH PERIOD	102	102	***a***	240	383	287	331	1	LCC
40	Temperature	°C	WEEKLY	165	165	***a***	18	32	25	31	***b***	LCC
41	Thallium, Total	mg/L	EACH PERIOD	42	42	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
42	THM Total	mg/L	EACH PERIOD	26	26	0	0.011	0.089	0.058	0.080	0.005	ALS/CGC
43	Total Hardness	mg/L	EACH PERIOD	42	42	***a***	110	145	124	138	1	LCC
44	Turbidity	NTU	EACH PERIOD	117	63	***a***	<0.1	1.0	0.2	0.4	0.5	LCC
45	Zinc, Total	mg/L	EACH PERIOD	42	18	***a***	<0.01	0.02	<0.01	0.01	0.01	LCC

a **–** No ADWG prescribed guideline health limit for parameter

b – No Limit of Reporting (LOR) prescribed for Temperature

Table 15 - Logan East Water Quality Zone Performance Summary 2016-17 FY

Logan East Water Quality Zone												
#	PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	95TH PERCENTILE	LOR	LABORATORY NAME
MICROBIAL												
1	*E.coli*	MPN/100mL	WEEKLY	269	1	***1***	<1	***1***	<1	<1	1	LCC
2	Heterotrophic Plate Count	cfu/mL	WEEKLY	109	55	***a***	<1	5700	81	212	1	LCC
3	Total Coliforms	MPN/100mL	WEEKLY	269	19	***a***	<1	<1	<1	<1	1	LCC
CHEMICAL / PHYSICAL												
4	Alkalinity as $CaCO_3$	mg/L	EACH PERIOD	13	13	***a***	67	92	85	91	1	LCC
5	Aluminium, Total	mg/L	EACH PERIOD	70	69	***a***	<0.01	0.09	0.05	0.08	0.01	LCC
6	Ammonia-N	mg/L	EACH PERIOD	109	29	***a***	<0.1	0.5	<0.1	0.2	0.1	LCC
7	Arsenic, Total	mg/L	EACH PERIOD	70	53	0	<0.001	0.001	0.001	0.001	0.001	LCC
8	Barium, Total	mg/L	EACH PERIOD	70	70	0	0.014	0.032	0.024	0.030	0.001	LCC
9	Beryllium, Total	mg/L	EACH PERIOD	70	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
10	Bismuth, Total	mg/L	EACH PERIOD	70	4	***a***	<0.001	0.003	<0.001	0.001	0.001	LCC
11	Boron, Total	mg/L	EACH PERIOD	70	70	4	0.03	0.33	0.04	0.04	0.01	LCC
12	Cadmium, Total	mg/L	EACH PERIOD	70	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
13	Calcium Hardness	mg/L	EACH PERIOD	70	70	***a***	46	86	68	79	1	LCC
14	Calcium, Total	mg/L	EACH PERIOD	70	70	***a***	18	34	27	31	1	LCC
15	Chloride	mg/L	EACH PERIOD	70	70	***a***	40	100	63	90	0.1	LCC
16	Chlorine, Free	mg/L	WEEKLY	269	126	***a***	<0.05	1.22	0.11	0.49	0.05	LCC
17	Chlorine, Total	mg/L	WEEKLY	269	266	0	<0.05	2.11	0.49	1.53	0.05	LCC
18	Chromium, Total	mg/L	EACH PERIOD	70	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
19	Cobalt, Total	mg/L	EACH PERIOD	70	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
20	Colour, Apparent	Hazen	EACH PERIOD	70	70	***a***	1	8	3	5	1	LCC

21	Colour, True	Hazen	EACH PERIOD	70	10	***a***	<1	2	<1	1	1	LCC
22	Conductivity	µS/cm	EACH PERIOD	109	109	***a***	310	646	454	542	1	LCC
23	Copper, Total	mg/L	EACH PERIOD	70	70	0	0.003	0.220	0.014	0.021	0.001	LCC
24	Fluoride	mg/L	EACH PERIOD	70	70	0	0.6	0.9	0.8	0.9	0.1	LCC
25	Iron, Total	mg/L	EACH PERIOD	70	70	***a***	0.003	0.041	0.014	0.0271	0.003	LCC
26	Lead, Total	mg/L	EACH PERIOD	70	61	***1***	<0.001	***0.019***	0.001	0.003	0.001	LCC
27	Lithium Total	mg/L	EACH PERIOD	70	1	***a***	<0.001	0.001	<0.001	<0.001	0.001	LCC
28	Magnesium, Total	mg/L	EACH PERIOD	70	70	***a***	7	16	13	15	1	LCC
29	Manganese, Total	mg/L	EACH PERIOD	70	69	0	<0.001	0.016	0.004	0.008	0.001	LCC
30	Molybdenum, Total	mg/L	EACH PERIOD	70	63	0	<0.001	0.004	0.001	0.001	0.001	LCC
31	Nickel, Total	mg/L	EACH PERIOD	70	10	0	<0.001	0.003	<0.001	0.001	0.001	LCC
32	Nitrate (NO_3-N)	mg/L	EACH PERIOD	70	67	0	<0.1	0.8	0.5	0.8	0.1	LCC
33	Nitrite (NO_2-N)	mg/L	EACH PERIOD	70	30	0	<0.1	0.4	0.1	0.4	0.1	LCC
34	pH	pH Units	EACH PERIOD	109	109	***a***	7.0	8.0	7.7	7.9	1	LCC
35	Potassium, Total	mg/L	EACH PERIOD	70	70	***a***	2	4	4	4	1	LCC
36	Selenium, Total	mg/L	EACH PERIOD	70	0	0	<0.01	<0.01	<0.01	<0.01	0.01	LCC
37	Sodium, Total	mg/L	EACH PERIOD	70	70	***a***	27	53	40	50	1	LCC
38	Sulphate	mg/L	EACH PERIOD	70	70	***a***	20	64	25	37	1	LCC
39	TDS, Calculated	mg/L	EACH PERIOD	52	52	***a***	188	392	280	326	1	LCC
40	Temperature	°C	WEEKLY	268	268	***a***	17	33	25	32	***b***	LCC
41	Thallium, Total	mg/L	EACH PERIOD	70	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
42	THM Total	mg/L	EACH PERIOD	79	79	0	0.006	0.150	0.077	0.122	0.005	ALS/CGC
43	Total Hardness	mg/L	EACH PERIOD	70	70	***a***	76	147	121	140	1	LCC
44	Turbidity	NTU	EACH PERIOD	109	51	***a***	<0.1	1.9	0.1	0.4	0.5	LCC
45	Zinc, Total	mg/L	EACH PERIOD	70	16	***a***	<0.01	0.20	0.01	0.02	0.01	LCC

***a* –** No ADWG prescribed guideline health limit for parameter

b – No Limit of Reporting (LOR) prescribed for Temperature

Table 16 - Logan South Water Quality Zone Performance Summary 2016-17 FY

Logan South Water Quality Zone												
#	**PARAMETER**	**UNITS**	**FREQUENCY**	**TOTAL NO. OF SAMPLES COLLECTED**	**NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED**	**NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)**	**MIN**	**MAX**	**MEAN**	**95TH PERCENTILE**	**LOR**	**LABORATORY NAME**
MICROBIAL												
1	*E.coli*	MPN/100mL	WEEKLY	393	***1***	***1***	<1	***5***	<1	<1	1	LCC
2	Heterotrophic Plate Count	cfu/mL	WEEKLY	193	126	***a***	<1	1100	69	294	1	LCC
3	Total Coliforms	MPN/100mL	WEEKLY	393	35	***a***	<1	280	2	<1	1	LCC
CHEMICAL / PHYSICAL												
4	Alkalinity as $CaCO_3$	mg/L	EACH PERIOD	32	32	***a***	83	97	91	96	1	LCC
5	Aluminium, Total	mg/L	EACH PERIOD	102	102	***a***	0.04	0.18	0.08	0.12	0.01	LCC
6	Ammonia-N	mg/L	EACH PERIOD	194	17	***a***	<0.1	0.3	<0.1	0.1	0.1	LCC
7	Arsenic, Total	mg/L	EACH PERIOD	101	77	0	<0.001	0.001	0.001	0.001	0.001	LCC
8	Barium, Total	mg/L	EACH PERIOD	102	102	0	0.023	0.037	0.027	0.032	0.001	LCC
9	Beryllium, Total	mg/L	EACH PERIOD	101	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
10	Bismuth, Total	mg/L	EACH PERIOD	101		0	<0.001	0.001	<0.001	<0.001	0.001	
11	Boron, Total	mg/L	EACH PERIOD	102	102	0	0.03	0.04	0.03	0.04	0.01	LCC
12	Cadmium, Total	mg/L	EACH PERIOD	102	102	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
13	Calcium Hardness	mg/L	EACH PERIOD	102	102	***a***	53	94	74	84	1	LCC
14	Calcium, Total	mg/L	EACH PERIOD	102	102	***a***	52	93	73	33	1	LCC
15	Chloride	mg/L	EACH PERIOD	102	102	***a***	57	107	67	96	0.1	LCC
16	Chlorine, Free	mg/L	WEEKLY	394	146	0	<0.05	1.62	0.15	0.84	0.05	LCC
17	Chlorine, Total	mg/L	WEEKLY	394	389	0	<0.05	1.93	0.37	1.20	0.05	LCC
18	Chromium, Total	mg/L	EACH PERIOD	102	102	0	<0.001	0.001	<0.001	<0.001	0.001	LCC
19	Cobalt, Total	mg/L	EACH PERIOD	102	102	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
20	Colour, Apparent	Hazen	EACH PERIOD	102	102	***a***	<1	13	3	6	1	LCC

21	Colour, True	Hazen	EACH PERIOD	102	102	***a***	<1	2	<1	1	1	LCC
22	Conductivity	µS/cm	EACH PERIOD	194	194	***a***	231	624	473	555	1	LCC
23	Copper, Total	mg/L	EACH PERIOD	102	102	0	0.002	0.120	0.010	0.029	0.001	LCC
24	Fluoride	mg/L	EACH PERIOD	102	102	0	0.1	0.9	0.8	0.9	0.1	LCC
25	Iron, Total	mg/L	EACH PERIOD	102	102	***a***	0.003	0.130	0.022	0.083	0.003	LCC
26	Lithium, Total	mg/L	EACH PERIOD	102	23	***a***	<0.001	0.001	<0.001	0.003	0.001	LCC
27	Lead, Total	mg/L	EACH PERIOD	102	57	0	<0.001	0.005	0.001	0.001	0.001	LCC
28	Magnesium, Total	mg/L	EACH PERIOD	102	102	***a***	10	20	14	16	1	LCC
29	Manganese, Total	mg/L	EACH PERIOD	102	102	0	<0.001	0.040	0.004	0.009	0.001	LCC
30	Molybdenum, Total	mg/L	EACH PERIOD	102	102	0	<0.001	0.002	0.001	0.001	0.001	LCC
31	Nickel, Total	mg/L	EACH PERIOD	102	20	0	<0.001	0.001	<0.001	0.001	0.001	LCC
32	Nitrate (NO_3-N)	mg/L	EACH PERIOD	102	99	0	<0.1	0.9	0.7	0.9	0.1	LCC
33	Nitrite (NO_2-N)	mg/L	EACH PERIOD	102	26	0	<0.1	0.4	0.1	0.3	0.1	LCC
34	pH	pH Units	EACH PERIOD	194	194	***a***	7.6	8.5	8.0	8.2	1	LCC
35	Potassium, Total	mg/L	EACH PERIOD	102	102	***a***	3	5	4	4	1	LCC
36	Selenium, Total	mg/L	EACH PERIOD	102	102	0	<0.01	<0.01	<0.01	<0.01	0.01	LCC
37	Sodium, Total	mg/L	EACH PERIOD	102	102	***a***	37	64	41	51	1	LCC
38	Sulphate	mg/L	EACH PERIOD	102	102	***a***	20	38	24	36	1	LCC
39	TDS, Calculated	mg/L	EACH PERIOD	124	124	***a***	140	379	288	341	1	LCC
40	Temperature	°C	WEEKLY	391	391	***a***	17	33	24	31	***b***	LCC
41	Thallium, Total	mg/L	EACH PERIOD	102	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
42	THM Total	mg/L	EACH PERIOD	102	102	0	0.016	0.150	0.069	0.120	0.005	LCC
43	Total Hardness	mg/L	EACH PERIOD	102	102	***a***	95	165	132	151	1	ALS/CGC
44	Turbidity	NTU	EACH PERIOD	194	155	***a***	<0.1	1.1	0.1	0.5	0.5	LCC
45	Zinc, Total	mg/L	EACH PERIOD	102	23	***a***	<0.01	0.02	<0.01	0.02	0.01	LCC

***a* –** No ADWG prescribed guideline health limit for parameter

b – No Limit of Reporting (LOR) prescribed for Temperature

Table 17 - Marsden Water Quality Zone Performance Summary 2016-17 FY

Marsden Water Quality Zone												
#	**PARAMETER**	**UNITS**	**FREQUENCY**	**TOTAL NO. OF SAMPLES COLLECTED**	**NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED**	**NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)**	**MIN**	**MAX**	**MEAN**	**95TH PERCENTILE**	**LOR**	**LABORATORY NAME**
MICROBIAL												
1	*E.coli*	MPN/100mL	WEEKLY	242	0	0	<1	<1	<1	<1	1	LCC
2	Heterotrophic Plate Count	cfu/mL	WEEKLY	121	52	***a***	<1	1100	29	130	1	LCC
3	Total Coliforms	MPN/100mL	WEEKLY	242	0	***a***	<1	<1	<1	<1	1	LCC
CHEMICAL / PHYSICAL												
4	Alkalinity as $CaCO_3$	mg/L	EACH PERIOD	18	18	***a***	51	94	87	92	1	LCC
5	Aluminium, Total	mg/L	EACH PERIOD	61	61	***a***	0.03	0.10	0.06	0.09	0.01	LCC
6	Ammonia-N	mg/L	EACH PERIOD	121	95	***a***	<0.1	0.5	0.1	0.2	0.1	LCC
7	Arsenic, Total	mg/L	EACH PERIOD	61	43	0	<0.001	0.001	0.001	0.001	0.001	LCC
8	Barium, Total	mg/L	EACH PERIOD	61	61	0	0.002	0.029	0.025	0.028	0.001	LCC
9	Beryllium, Total	mg/L	EACH PERIOD	61	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
10	Bismuth	mg/L	EACH PERIOD	61	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
11	Boron, Total	mg/L	EACH PERIOD	61	61	0	0.03	0.04	0.03	0.03	0.01	LCC
12	Cadmium, Total	mg/L	EACH PERIOD	61	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
13	Calcium Hardness	mg/L	EACH PERIOD	61	61	***a***	47	73	65	72	1	LCC
14	Calcium, Total	mg/L	EACH PERIOD	61	61	***a***	18	29	26	29	1	LCC
15	Chloride	mg/L	EACH PERIOD	61	61	***a***	48	99	65	83	0.1	LCC
16	Chlorine, Free	mg/L	WEEKLY	216	151	***a***	<0.05	1.37	0.15	0.37	0.05	LCC
17	Chlorine, Total	mg/L	WEEKLY	216	216	0	0.07	2.30	1.06	2.08	0.05	LCC
18	Chromium, Total	mg/L	EACH PERIOD	61	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
19	Cobalt, Total	mg/L	EACH PERIOD	61	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
20	Colour, Apparent	Hazen	EACH PERIOD	61	61	***a***	1	7	3	5	1	LCC

21	Colour, True	Hazen	EACH PERIOD	61	5	***a***	<1	1	<1	1	1	LCC
22	Conductivity	µS/cm	EACH PERIOD	121	121	***a***	371	629	464	537	1	LCC
23	Copper, Total	mg/L	EACH PERIOD	61	61	0	0.002	0.700	0.029	0.043	0.001	LCC
24	Fluoride	mg/L	EACH PERIOD	61	61	0	0.6	0.9	0.8	0.9	0.1	LCC
25	Iron, Total	mg/L	EACH PERIOD	61	59	***a***	<0.003	0.073	0.013	0.033	0.003	LCC
26	Lithium	mg/L	EACH PERIOD	61	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
27	Lead, Total	mg/L	EACH PERIOD	61	61	***a***	<0.001	0.005	0.001	0.002	0.001	LCC
28	Magnesium, Total	mg/L	EACH PERIOD	61	61	***a***	10	17	14	16	1	LCC
29	Manganese, Total	mg/L	EACH PERIOD	61	61	0	0.001	0.017	0.005	0.011	0.001	LCC
30	Molybdenum, Total	mg/L	EACH PERIOD	61	57	0	<0.001	0.001	0.001	0.001	0.001	LCC
31	Nickel, Total	mg/L	EACH PERIOD	61	13	0	<0.001	0.001	<0.001	0.001	0.001	LCC
32	Nitrate (NO_3-N)	mg/L	EACH PERIOD	61	57	0	<0.1	0.9	0.5	0.8	0.1	LCC
33	Nitrite (NO_2-N)	mg/L	EACH PERIOD	61	33	0	<0.1	0.5	0.1	0.4	0.1	LCC
34	pH	pH Units	EACH PERIOD	121	121	***a***	7.5	8.7	7.8	7.9	1	LCC
35	Potassium, Total	mg/L	EACH PERIOD	61	61	***a***	3	5	4	4	1	LCC
36	Selenium, Total	mg/L	EACH PERIOD	61	61	0	<0.01	<0.01	<0.01	<0.01	0.01	LCC
37	Sodium, Total	mg/L	EACH PERIOD	61	61	***a***	36	61	41	50	1	LCC
38	Sulphate	mg/L	EACH PERIOD	61	61	***a***	20	111	28	61	1	LCC
39	TDS, Calculated	mg/L	EACH PERIOD	81	81	***a***	225	382	284	333	1	LCC
40	Temperature	°C	WEEKLY	242	242	***a***	17	32	26	31	***b***	LCC
41	Thallium, Total	mg/L	EACH PERIOD	61	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
42	THM Total	mg/L	EACH PERIOD	19	19	0	0.030	0.130	0.061	0.094	0.005	ALS/CGC
43	Total Hardness	mg/L	EACH PERIOD	61	61	***a***	87	136	122	135	1	LCC
44	Turbidity	NTU	EACH PERIOD	121	29	***a***	<0.1	0.8	0.2	0.5	0.5	LCC
45	Zinc, Total	mg/L	EACH PERIOD	61	16	***a***	<0.01	0.03	<0.01	0.02	0.01	LCC

a **–** No ADWG prescribed guideline health limit for parameter

b – No Limit of Reporting (LOR) prescribed for Temperature

Table 18 - Springwood Water Quality Zone Performance Summary 2016-17 FY

Springwood Water Quality Zone												
#	PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	95TH PERCENTILE	LOR	LABORATORY NAME
MICROBIAL												
1	*E.coli*	MPN/100mL	WEEKLY	367	0	0	<1	<1	<1	<1	1	LCC
2	Heterotrophic Plate Count	cfu/mL	WEEKLY	171	49	***a***	<1	230	5	20	1	LCC
3	Total Coliforms	MPN/100mL	WEEKLY	368	0	***a***	<1	<1	<1	<1	1	LCC
CHEMICAL / PHYSICAL												
4	Alkalinity as $CaCO_3$	mg/L	EACH PERIOD	25	25	***a***	57	93	85	91	1	LCC
5	Aluminium, Total	mg/L	EACH PERIOD	93	25	***a***	0.03	0.27	0.06	0.09	0.01	LCC
6	Ammonia-N	mg/L	EACH PERIOD	171	140	***a***	<0.1	0.4	0.1	0.2	0.1	LCC
7	Arsenic, Total	mg/L	EACH PERIOD	93	70	0	<0.001	0.001	0.001	0.001	0.001	LCC
8	Barium, Total	mg/L	EACH PERIOD	93	93	0	0.022	0.034	0.026	0.028	0.001	LCC
9	Beryllium, Total	mg/L	EACH PERIOD	93	93	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
10	Bismuth, Total	mg/L	EACH PERIOD	93	92	***a***	<0.001	0.001	<0.001	<0.001	0.001	LCC
11	Boron, Total	mg/L	EACH PERIOD	93	93	0	0.03	0.03	0.03	0.03	0.01	LCC
12	Cadmium, Total	mg/L	EACH PERIOD	93	93	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
13	Calcium Hardness	mg/L	EACH PERIOD	93	93	***a***	49	81	65	76	1	LCC
14	Calcium, Total	mg/L	EACH PERIOD	93	93	***a***	19	32	26	31	1	LCC
15	Chloride	mg/L	EACH PERIOD	93	93	***a***	38	102	66	87	0.1	LCC
16	Chlorine, Free	mg/L	WEEKLY	367	289	***a***	<0.05	1.49	0.18	0.53	0.05	LCC
17	Chlorine, Total	mg/L	WEEKLY	367	367	0	0.05	2.80	1.26	2.30	0.05	LCC
18	Chromium, Total	mg/L	EACH PERIOD	93	0	0	<0.001	<0.001	<0.001	<0.001	0.001	LCC
19	Cobalt, Total	mg/L	EACH PERIOD	93	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
20	Colour, Apparent	Hazen	EACH PERIOD	93	93	***a***	1	35	4	10	1	LCC

21	Colour, True	Hazen	EACH PERIOD	93	12	***a***	<1	2	<1	1	1	LCC
22	Conductivity	µS/cm	EACH PERIOD	171	171	***a***	370	630	465	538	1	LCC
23	Copper, Total	mg/L	EACH PERIOD	93	93	0	0.002	0.808	0.035	0.109	0.001	LCC
24	Fluoride	mg/L	EACH PERIOD	93	93	0	0.5	0.9	0.8	0.9	0.1	LCC
25	Iron, Total	mg/L	EACH PERIOD	93	93	***a***	<0.001	0.506	0.035	0.130	0.003	LCC
26	Lead, Total	mg/L	EACH PERIOD	93	51	0	<0.001	0.004	0.001	0.002	0.001	LCC
27	Lithium, Total	mg/L	EACH PERIOD	93	1	***a***	<0.001	0.001	<0.001	<0.001	0.001	LCC
28	Magnesium, Total	mg/L	EACH PERIOD	93	93	***a***	10	17	14	16	1	LCC
29	Manganese, Total	mg/L	EACH PERIOD	93	93	0	0.002	0.108	0.008	0.016	0.001	LCC
30	Molybdenum, Total	mg/L	EACH PERIOD	93	85	0	<0.001	0.002	0.001	0.001	0.001	LCC
31	Nickel, Total	mg/L	EACH PERIOD	93	24	0	<0.001	0.001	<0.001	0.001	0.001	LCC
32	Nitrate (NO_3-N)	mg/L	EACH PERIOD	93	86	0	<0.1	1.0	0.4	0.8	0.1	LCC
33	Nitrite (NO_2-N)	mg/L	EACH PERIOD	93	51	0	<0.1	1.4	0.1	0.4	0.1	LCC
34	pH	pH Units	EACH PERIOD	171	171	***a***	7.3	7.9	7.7	7.8	1	LCC
35	Potassium, Total	mg/L	EACH PERIOD	93	93	***a***	3	5	4	4	1	LCC
36	Selenium, Total	mg/L	EACH PERIOD	93	0	0	<0.01	<0.01	<0.01	<0.01	0.01	LCC
37	Sodium, Total	mg/L	EACH PERIOD	93	93	***a***	35	65	41	49	1	LCC
38	Sulphate	mg/L	EACH PERIOD	93	93	***a***	20	128	28	58	1	LCC
39	TDS, Calculated	mg/L	EACH PERIOD	106	106	***a***	225	382	285	350	1	LCC
40	Temperature	°C	WEEKLY	367	367	***a***	17	34	25	32	***b***	LCC
41	Thallium, Total	mg/L	EACH PERIOD	93	0	***a***	<0.001	<0.001	<0.001	<0.001	0.001	LCC
42	THM Total	mg/L	EACH PERIOD	51	51	0	0.011	0.130	0.058	0.092	0.005	ALS/CGC
43	Total Hardness	mg/L	EACH PERIOD	93	93	***a***	90	144	123	136	1	LCC
44	Turbidity	NTU	EACH PERIOD	171	147	***a***	<0.1	12.0	0.3	0.8	0.5	LCC
45	Zinc, Total	mg/L	EACH PERIOD	93	22	***a***	<0.01	0.05	<0.01	0.02	0.01	LCC

a – No ADWG prescribed guideline health limit for parameter

b – No Limit of Reporting (LOR) prescribed for Temperature

WATER QUALITY SUMMARY: *E. coli*

Council's verification monitoring performance for key microbial indicator *E. coli* is summarised in Table 1 below.

Table 19 – Whole of Logan region *E. coli* water quality summary

MICROBIAL PARAMETER	Units	Number of Samples Collected	Number of Detections	% Samples which met Compliance	ADWG Guideline (Health)	ADWG Compliance (Health)
E.coli	MPN/100mL	1622	2	99.8%	98.0%	✓[8]

[8] *The Public Health Regulation 2005* requires that at least 98% of samples contain no *E. coli* over a 12 month period

E. coli Verification Monitoring

Table 20 – Logan City Council *E. coli* Verification Monitoring

WHOLE OF LOGAN CITY - ALL ZONES	2016-17 FY											
Month Sampled	**July 16**	**Aug 16**	**Sept 16**	**Oct 16**	**Nov 16**	**Dec 16**	**Jan 17**	**Feb 17**	**Mar 17**	**Apr 17**	**May 17**	**June 17**
No. of samples collected	125	160	126	135	145	104	147	128	125	132	163	132
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	1	0	0	1	0	0
No. of samples collected in previous 12 month period	1528	1556	1538	1552	1567	1571	1598	1592	1613	1645	1633	1622
No. of failures for previous 12 month period	1	1	1	0	0	0	0	1	1	2	2	2
% of samples that comply	99.2	99.7	99.8	100	100	100	100	99.9	99.9	99.8	99.8	99.8
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

APPENDIX B - IMPLEMENTATION OF THE RISK MANAGEMENT IMPROVEMENT PROGRAM

The Risk Management Improvement Plan (RMIP) summarises the progress of the proposed actions undertaken as part of the current RMIP.

Item No.	Priority (1, 2 or 3)	G-General Improvement (Review or Audit OFI) R-Risk Assessment NC-Non-conformance(*health exceedance or Audit finding*) / DWQMP SECTION	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2017)	LEAD POSITION (Branch)	LEAD Program Leader	ORIGINAL TARGET DATE	TARGET DATE	% COMPLETE (JUN'17)	STATUS Jun-17
		E1 : Commitment to Drinking Water Quality Management									
1.01	2	**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 SEQ Operating Protocol hence update required.	**Long Term**: Incorporate THM Notification alert limits for events which may affect LCC with next Operating Protocol update.	**Short Term:** Seqwater will notify LCC of increase changes in THMs as per current GC limits in Operating Protocol - **completed**✓ **Long Term:** LCC has incorporated new THM alerts into updated Operating Protocol accepted by Seqwater **- completed** ✓	Nework Operations Program Leader	Darshan U	Jun-17	Jun-17	100%	COMPLETE
		E2: Assessment of Drinking Water Supply Systems									
2.00	1	**Res 1.10 Res 1.11 Dis 8.1 Dis 9.1 & 9.2 Net 4.1**	Backup online chlorine monitoring system required if Seqwater disinfection systems failed (i.e. dosing and monitoring).	Undertake "Online W ater Quality Monitoring Strategy" - online instrumentation with SCADA alarms as backup to Seqwater system.	Online Water Quality Monitoring prioritisation - Preliminary Planning & Design and Installation - **completed** ✓ SCADA alarming & validation to be completed 2017/18FY.	Product Quality Program Leader (Water Business)	Chris PM	Jun-17	Jun-18	95%	**MONITOR**
		Element 3: Preventive Measures for Drinking Water Quality									
3.00	3	**4.1 (G) Net 1.1 & 1.2**	Poor disinfection residual, particularly during Summer periods.	**Strategy & Planning Investigation outcome** to help with implementation of routine network chlorination and chlorine dosing systems as required. Install two chlorine booster stations in Logan East.	CAPEX approved for two booster stations in Logan East 2015/16FY- **completed** ✓ Delivery & construction (end 2016) **completed** ✓ Commissioning commenced with completion expected post summer **2017/18**	Product Quality Program Leader (Water Business)	Chris PM	Dec-16	May-18	80%	**MONITOR**
3.01	3	**Net 1.1 & 1.2**	Poor disinfection residual, particularly during Summer periods.	**Strategy & Planning Investigation outcome** 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.	CAPEX approved and planning completed for electro-chlorinator system at Round Mt Reservoir 2015/16FY- **completed** ✓ Construction & commissioning expected by **Dec'17.**	Product Quality Program Leader (Water Business)	Chris PM	Dec-17	Dec-17	80%	ON TRACK
3.02	1	**Dis 16.2 Net 1.1 & 1.2**	Poor disinfection residual, particularly during Summer periods.	**Implement** 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.	Kimberley Park WSZ network disinfection clean - **completed Aug'15** ✓ **(& re-scheduled Aug'17).** Greenbank WSZ network disinfection clean **completed Sep'16** ✓ Network disinfection cleans scheduled every 2 years alternate for Kimberley Park & Logan North - **completed Jun'17** ✓	Product Quality Program Leader & Senior Water Quality Scientist (Water Business)	Chris PM & Natasha G	Jun-17	Jun-17	100%	COMPLETE
3.03	1	**DIS 3.1 DIS 5.5**	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.** Associated WOPs to be updated & training undertaken, to ensure effective implementation.	a). CCP & Operational workshops commenced with Logan River breakpoint dosing systems CCP charts & associated SCADA updated - **completed** ✓ b). Remaining dosing CCPs identified & charts developed - **completed** ✓	Senior Water Quality Scientist (Water Business) & Mech & Elec Operations Program Leader (Water Operations)	Natasha G & Darshan U	Jun-17	Jun-17	100%	COMPLETE
3.04	2	**NC DIS 3.1 DIS 5.5**	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. **Associated CCP WOPs to be updated & training undertaken, to ensure effective record keeping & implementation.**	a). Dosing site procedure gap analysis tool developed with audit review to commence, including importance of record keeping. b). Procedures to be updated & associated training implemented, post audit review. c). Undertaken another audit review of CCP vs SCADA .	Senior Water Quality Scientist (Water Business) & Mech & Elec Operations Program Leader (Water Operations)	Natasha G & Darshan U	Jun-18	Jun-18	20%	NEW
		Element 4: Operational Procedures and Process Control									
4.00	1	**5.2 (G)**	Poor residual disinfection in Marsden and Greenbank water supply zones during Summer periods.	Breakpoint chlorination systems to be instigated at Illaweena & Greenbank Reservoirs - Marsden/Greenbank Water Supply Zone (WSZ) Disinfection Maintenance Program. LWA 90-12-97 Network Water Quality Maintenance Strategy. Once implemented, review effectiveness.	Initial review indicated that routine Network Disinfection Program provided a 50-75% reduction in dirty water customer complaints indicating, generally, greater effectiveness than routine flushing.	Product Quality Program Leader & Senior Water Quality Scientist (Water Business)	Chris PM & Natasha G	Dec-17	Jun-17	100%	COMPLETE
4.02	2	**NC Net 4.1**	Risk Assessment: No formal potable water hygiene practises WOP exists.	Review & potentially develop formal Potable Water Hygiene Practises WOP and incorporate into future inductions and sign off (Staff & Contractors).	Hygiene practises incorporated into WOP as part of document review process to align with 5xC's philosophy **- completed** ✓	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	Jun-17	Jun-17	100%	COMPLETE

Item No.	Priority (1, 2 or 3)	G-General Improvement (Review or Audit OFI) R-Risk Assessment NC-Non -conformance(*health exceedance or Audit finding*)	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2017)	LEAD POSITION (Branch)		ORIGINAL TARGET DATE	TARGET DATE	% COMPLETE (JUN'17)	STATUS
4.02b	2	**NC Net 4.1**	Risk Assessment: No formal potable water hygiene practises WOP exists.	Review & potentially develop formal Potable Water Hygiene Practises WOP and incorporate into future inductions and sign off (Staff & Contractors).	Develop awareness training material and implement hygiene practises training to align with 5xC's philosophy. **Implement with the mains break "hands-on" training Ref. 4.03b.**	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	Dec-18	Dec-18	10%	NEW
4.03a	1	**NC Net 4.1**	Risk Assessment: Need to confirm what flushing system is used when main has been not used for some time and can result in *E.coli* incident if not effectively implemented.	Undertake further **WOP review** in light of incident & internal audit findings: a). Flushing & Scouring of mains; b). Mains Repairs; and c). Minor Works (incl. Sampling Taps).	Further review included "key improvements" to WOPs such as improved valve isolation identification processes, hygiene practises and equipment disinfection, incorporating 5xCs philosophy. Changes communicated via toolbox meetings.	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	Mar-17	Mar-17	100%	COMPLETE
4.03b	2	**NC Net 4.1**	Risk Assessment & Audit: Need to confirm what flushing system is used when main has been not used for some time, or not effectively disinfected during mains repairs or reporting of significant events, and can result in *E.coli* incident if not effectively implemented.	Develop and **implement "on-the-job" training** for the following WOPs to ensure effective implementation: a). Flushing & Scouring of mains that have been offline for sometime; b). Mains Repairs; and c). Minor Works (incl. Sampling Taps). d). Reporting of 'Events' that could impact customers health.	WOPs updated & tool box meetings undertaken regarding revised WOPs - **completed** ✓ **NEW** Effective implementation via "on-the-job" training being investigated & developed.	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	Dec-18	Dec-18	10%	NEW
4.04	1	**NC Net 4.3**	Risk Assessment: Need to confirm what flushing system is used when mains has been not used for some time and can result in *E.coli* incident if not effectively implemented.	Undertake further WOP review in light of incident: a). Recommissioning assets such as mains that have been out of service for a period (> 4 weeks), including both planned and 'hot standby' due to emergency re-instatement. b). Recommissioning reservoirs that have been out of service for a period (> 4 weeks), including both planned and 'hot standby' due to emergency re-instatement.	Under final review including both mains and reservoirs.	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	Jun-17	Aug-17	70%	**MONITOR**
4.05b	2	**NC Net 4.3**	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.	Finalise analysis to help develop an appropriate flushing program for hot spots.	Initial analysis, post network disinfection cleans, identified hot spots which continued to experience dirty water complaints, noting a 50-75% reduction in dirty water complaints post network cleans. **NEW** Implementation plan to be developed.	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	2018/19FY	2018/19FY	0%	NEW
4.06a	1	**NC**	There have been a number of non-conformances relating to re-instatement of sampling taps which have either been newly installed or been out of service for some time. **Also refer to Items 4.03, 4.04 & 4.08 which are related.**	Review Verification Sampling Tap installation & repair WOP to ensure disinfection of all parts and best practise Tap design, to minimise contamination risks.	Tap installation process including disinfection of parts, incorporated into Minor Works WOP, to ensure no accidental contamination of parts **Ref 4.03. completed** ✓	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	Jun-17	Jun-17	100%	COMPLETE
4.06b	1	**NC**			Investigated best practise Verification Sampling Tap design which is to be incorporated into 2017/18FY CAPEX **completed** ✓	Network Maintenance Program Leader & Senior Water Operations Engineer (Water Operations)	Angus H & Murray E	Jun-17	Jun-17	100%	COMPLETE
4.07	3	**NC**		Submit CAPEX 2017/18FY Plan for new sampling tap and ensure design to fabricate and install for 2017/18FY.	CAPEX submitted with installation planned for 2017/18FY.	Water Asset Management Program Leader (Water Business) & Water Business/Water Operations	Darren M, Natasha G & Murray E	2017/18FY	Jun'18	20%	ON TRACK
4.08a	2	**NC**	Internal audit identified slow response to alert Water Operations &/or WPQ of unusually high turbidity &/or metals, delaying prompt response to address unexpected events. External audit found inadequate timely reporting of *E.coli* health exceedance to key internal stakeholders. **Ref Item 4.08b - linked.**	a). Review & update procedures to ensure prompt reporting of health exceedance to key internal stakeholders. b). Improve response time from Verification Monitoring to promptly inform Water Operations &/or WPQ of "unusual results" for "lead indicators" such as high turbidity, colour, pH or key metals.	a). Lab systems & procedures updated to ensure prompt reporting of 'health' exceedances and unusual sampling observations - **completed** ✓ **b).** Key aesthetics parameters to follow. **Pending WIMS implementation (Ref. 11.00).**	Product Quality Program Leader (Water Business)	Chris PM	Dec-17	Jun'18	60%	**MONITOR**
4.08b	1	**NC**	There have been two non-conformances relating to re-instatement of sampling taps which have either been newly installed or been out of service for some time. **Also refer to Items 4.03, 4.04, 4.06, 4.07 & 4.08a which are related.**	Investigate formalised drinking water sampling NATA accredication, currently undertaken by NATA accredited laboratory to ensure consistencey & key observations reported.	Sampling proposal submitted to NATAapproved.	Product Quality Program Leader (Water Business)	Chris PM	Dec-17	Dec-17	100%	COMPLETE
4.09	2	**Net 4.4**	**2012RMIP (G6)** To reduce the risk of contamination from properties without backflow prevention devices.	**2012RMIP (G6)** Residual project from Allconnex period where exisiting properties were mainly located in Gold Coast areas. Investigate if project still required. Undertake project to identify the unmetered properties & install a meter with backflow prevention (ongoing project).	All new propeties require backflow prevention and there is a regulatory requirement for commercial operations. Council undertakens own Review outcomes from Risk Assessment undertaken 2016.	Network Maintenance Program Leader (Water Operations)	Angus H	Jun-14	TBC	0%	NOT STARTED

Item No.	Priority (1, 2 or 3)	G-General Improvement (Review or Audit OFI) R-Risk Assesssment NC-Non-conformance(*health exceedance or Audit finding*)	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2017)	LEAD POSITION (Branch)		ORIGINAL TARGET DATE	TARGET DATE	% COMPLETE (JUN'17)	STATUS
4.11	2	**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. Informal operational monitoring occurs as part of the Lab's routine Verification Monitoring program (i.e. HPC, etc) and ad hoc SCADA trend reviews.	Formalise operational monitoring with training and use of Water Imformation Management System (WIMS).	**a).Refer to Item 3.03 & 3.04:** CCP & OCP reviewed with associated WOP to be developed and implemented. b). Implementation will be assisted with the development of Water Information Management System (WIMS) which requires development and implementation. **Pending WIMS implementation (Ref. 11.00).**	Product Quality Program Leader (Water Business) & Network Operations Program Leader (Water Operations)	Chris PM & Darshan U	2017/18 FY	Jun'18	50%	ON TRACK
4.12	3	**5.2 (G)**	No formal **corrective action** system currently exists. Documented WOPs for corrective action to control excursions in operational parameters required. Needs to align with updated LCC IMP.	Establish effective drinking water Corrective Action system with associated responsibilties and WOP to be developed. Consider implementation process across all 3 Water Branches required.	Drinking water health incidents currently managed via IMP, with reporting to Regulator and long term actions captured via RMIP ✔ Intelex recently implemented for WH&S incidents ✔ **Intelex system** investigated as best tool for Corrective Actions, including drinking water near miss incidents, to allow for communication trail & status reporting. **Ref. Item 12.00b.**	Product Quality Program Leader & Senior Water Quality Scientist (Water Business)	Chris PM & Natasha G	Dec-17	Jun-18	30%	**MONITOR**
4.15	2	**Res 1.5, 1.6 & 1.7**	Internal Audit (2013) - large gaps and dirt close to vent holes found at reservoir. Gaps were repaired.	**Long Term:** Develop and implement Reservoir Inspection training to operational staff. Investigate on-going refresher training.	Water Quality Distribution training workshop delivered by QLD Water Directorate, including reservoir inspections **- Jul'15** ✔ "on-the-job" reservoir inspection training undertaken - **Nov'16** ✔ Investigate Reservoir Inspection "refresher" training.	Senior Water Quality Scientist & Product Quality Program Leader (Water Business)	Chris PM & Natasha G	Dec-17	Jun-18	60%	**MONITOR**
4.17	1	**NC** **Res 1.5, 1.6 & 1.7** **Res 4.4**	*E.coli* incidents were a result of poor reservoir condition & design with **low chlorine residual.**	**RESERVOIRS** Trial chlorine tablets as safer alternative to liquid hypochlorite dosing to maintain chlorine residual for smaller reservoirs (short term). Also investigate other alternatives **(see Item 4.24).**	Chlorine tablet trial completed with findings indicating effective for smaller reservoirs, though increased monitoring required if no online system exists.	Product Quality Program Leader & Nework Operations Program Leader (Water Operations)	Darshan U & Chris PM	Dec-16	Mar-17	100%	COMPLETE
4.21	1	**NC** **Dis 4.1, 4.2 & 4.3**	Internal audit review highlighted improvements required in the process to evaluate the quality of chemicals & products supplied (i.e. hypochlorite) to ensure AS4020 compliance, suitable for use in drinking water.	**NEW** Develop new hypochlorite WOP for procurement, which includes quality criteria.	**NEW**	Nework Operations Program Leader	Darshan U	Jun-18	Jun-18	0% (NEW)	NEW
4.22	2	**NC** **Dis 4.1, 4.2 & 4.3**	Internal audit review highlighted improvements required in the process to evaluate the quality of chemicals & products supplied (i.e. hypochlorite) to ensure AS4020 compliance, suitable for use in drinking water.	**NEW** Implement new hypochlorite WOP for procurement, which includes quality criteria.	**NEW**	Nework Operations Program Leader	Darshan U	Jun-18	Jun-18	0% (NEW)	NEW
4.23	3	**NC** **Res 1.5 & 1.6**	*E.coli* incident was a result of **poor reservoir condition & design** with low chlorine residual.	**NEW** LWIA Reservoir renewals program (roof, hatches, overflow pipe ingress preventation).	Commenced	LWIA & Water Asset Management Program Leader (Water Business)	Rajindar S & Darren M	2017-2019FY	Jun-19	0% (NEW)	NEW
4.24	2	**NC** **Res 1.6** **Res 4.4** **Dis 12.1 & 12.2**	*E.coli* incident was a result of poor reservoir condition & design with **low chlorine residual.**	**NEW** Chlorine tablets were trialled however deemed only effective for small reservoirs. Audto dosing system required.	**NEW** Designed, built and installed new dosing system at Hideaway Mt reservoir. **Completed**	Nework Operations Program Leader	Darshan U	Jun-17	Jun-17	100%	
		E5: Verification of Drinking Water Quality									
5.01	3	**6.2 (G)** **6.4 (G)**	Various "disjointed" customer complaint systems exist (i.e. pathways, WWETT, various CM database (emails/letters), etc). Internal audit found incorrect Priority assignment to health related customer complaints in WWETT.	**Short term:** WWETT system developed to replace UMD. **Long term:** investigation is taking place to look at "one" Customer Relationship Management System (CRM) integrated with other systems such as SAMMS.	WWETT system implemented ✓ Water Branch CRM system now to be **investigated & developed** as **interim** solution, until SAMMS implemented (limited by Corporate initiatives) - **SAMMS Ref Item 9.02.** Anticipate Water Branch CRM **implementation 2018/19FY.**	Business & Customer Mgt Program Leader (Water Business)	Ben S	Dec-17	2018/19 FY	40%	**MONITOR**
5.01	1	**Res 1.5** **Res 1.6**	Not all reservoirs are included in the Verification Monitoring Program hence no visibility of chlorine residual nor other parameters.	Incorporate all on-line reservoirs into the Verification Monitoring Program.	**Completed**	Senior Water Quality Scientist (Water Business)	Natasaha G	Jun-17	Jun-17	100%	COMPLETE
		Element 6: Management of Incidents and Emergencies									
6.03	2	**NC**	Audit highlighted requirement for regular review of IMP & associated training requirements.	Update incident response tools website to include *E.coli* incident flow chart and key stakeholder contacts. Ensure IMP review and updates undertaken including training requirements implemented.	Incident response website updated to include additional tools & contact details - **completed** ✔ IMP reivew and associated training to be undertaken **2017/18FY.**	Business & Customer Mgt Program Leader (Water Business)	Ben S	Jun-18	Jun-18	10%	NEW
		Element 7: Employee Awareness and Training									

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7.00	3	**8.1 (G)**	Internal audit review highlighted that some staff were still unsure of the DW QMP & clarity of Drinking Water Policy.	Develop & deliver DW QMP & Policy awareness/toolbox training to all Water Branch staff and possibly include in future Induction Program.	a). Policy endorsed & displayed.✓ b). Annually awareness training delivered to senior management .✓ c). Investigate DWQMP & Policy awareness training material to be developed & implemented to all Water Branch staff, eventually via inductions.	Business & Customer Mgt Program Leader & Senior Water Quality Scientist (Water Business)	Ben S & Natasha G	TBC	2018/19 FY	20%	ON TRACK
7.01	3	**8.1 (G)**	Recent audit identified external & OH&S training well documented however internal "on-the-job" training is not, to incorporiate employee awareness of drinking water quality management.	Investigate capture of drinking water quality awareness via formalised training, which will be captured via current training systems.	Water Operations certificate training now includes a drinking water quality component.	Network Maintenance Program Leader (Water Operations)	Angus H	TBC	Mar-17	100%	COMPLETE
7.02	3	**8.1 (G)**	Recent audit identified external & OH&S training well documented however internal "on-the-job" training is not.	Develop and implement appropriate tool to document "on-the-job" training.		Water Branch Managers	All Managers	TBC	TBC	0%	NOT STARTED
		Element 8: Community Involvement & Awareness									
8.00	2	**9.2 (G)**	Limited drinking water quality information currently exists on LCC website, like what some of the other water service providers have. On rare occasions, customers have contaminated their own water supply such as tipping old fuel/chemicals onto their lawn.	Develop and upload on LCC's public website helpful information about drinking water quality such as disinfection type, rainwater tanks, water hardness for dishwashers, avoiding contamination of own water supply.	Useful drinking water quality information for customers has been developed and uploaded onto LCC's website, including Fact Sheets and Frequently Asked Quesiont (FAQ).	Business & Customer Mgt Program Leader & Senior Water Quality Scientist (Water Business)	Ben S & Natasha G	Feb-17	May-17	100%	COMPLETE
		Element 9: Research & Development									
9.01	3	**10.3 (G)**	Document the design approaches used to ensure appropriate equipment deployed.	Document the design approaches used to ensure appropriate equipment deployed.	Dosing system design standardisation specification commenced.	Product Quality Program Leader (Water Business)	Chris PM	Jun-17	Jun-18	15%	**MONITOR**
9.02	3	**5.4 (G)**	Recent internal audit found reservoir inspections and cleans were overdue (i.e. 2 yearly cleans up to one year overdue).	Strategic Maintenance Management System (SAMMS) to have effective schedule systems to ensure associated escalations if due dates not met.	The Water Branch as part of the whole of Council's approach to implement **SAMMS** hence timeline dependant on Cooperate progress. Works order management in development.	Water Asset Management Program Leader (Water Business)	Darren M	Jun-18	Jun-18	15%	ON TRACK
9.03	2	**NC Res 1.12 & 1.13**	*E.coli* incidents were a result of **poor reservoir condition & design** with low chlorine residual.	**RESERVOIRS** Development of Reservoir Strategy & Functional Specification by LWIA to address appropriate design, asset condition audits, functional specifications and optimal use.	Reservoir Strategy and Function Specification documents developed and adopted.	Water Asset Management Program Leader (Water Business)	Darren M	Mar-17	Jun-17	100%	COMPLETE
9.04a	2	**NC Res 1.7 & 1.8**	*E.coli* incidents were a result of **poor reservoir condition & design** with low chlorine residual.	**RESERVOIRS** LWIA to investigate replacement of Brosnahan reservoir.	Investigation completed with implementation expected 2017/18FY.	Water Asset Management Program Leader (Water Business)	Darren M	Jun-17	May-17	100%	COMPLETE
9.04b	3	**NC Res 1.7 & 1.8**	*E.coli* incidents were a result of **poor reservoir condition & design** with low chlorine residual.	**RESERVOIR** Brosnahan reservoir to be decommissioned and replaced with suitable pumps.	Design for replacement completed with implementation expected 2017/18FY.	LWIA & Water Asset Management Program Leader (Water Business)	Rajindar S & Darren M	Jun-17	Jun-18	50%	**MONITOR**
9.05a	2	**BUL 1.2 & 1.3 Res 1.14 Res 4.1, 4.2 & 4.3 Dis 2.1, 2.2 & 2.3**	*E.coli* incidents were a result of poor reservoir condition & design with **low chlorine residual.**	Develop SEQ Disinfection Strategy to investiate long term solution to improve network residuals for Logan.	SEQ Disinfection Strategy developed to investiate long term solution to improve network residuals for Logan. Breakpoint dosing identified for Greenbank reservoir site.	Product Quality Program Leader (Water Business)	Chris PM	Dec-16	May-17	100%	COMPLETE
9.05b	3	**BUL 1.2 & 1.3 Res 1.14 Res 4.1, 4.2 & 4.3 Dis 2.1, 2.2 & 2.3**	*E.coli* incidents were a result of poor reservoir condition & design with **low chlorine residual.**	Implement SEQ Disinfection Strategy long term solution to improve network residuals for Logan.	Seqwater engaged consultant to develop delivery package to improve Logan's network residuals. Complete. Greenbank breakpoint dosing to designed and be delivered	Product Quality Program Leader (Water Business)	Chris PM	Jun-18	Dec-18	50%	NEW
		Element 10: Documentation & Reporting									
10.00	3	**11.1 (G) NC**	Internal audit identified changed or out dated document DM# used. Various doc mgt approaches exist across the various Water Branches since Allconnex dissolution. DWQMP has documented WOPs known to date.	Establish Document Control Framework Principles. Water Ops & Lab have an established but different system.	Current Document Control system reviewed with recommendations to be presented to management. Document Control to be developed as part of HSEQ functions.	Product Quality Program Leader (Water Business)	Chris PM	Dec-17	2018/19 FY	40%	**MONITOR**
10.02	1	**11.2 (G)**	Public display of DWQMP annual report will be a Regulatory requirement for 2014/15FY onwards.	Upload LCC's DWQMP annual report onto LCC website.	DWQMP Annual Report uploaded to LCC's website.	Business & Customer Mgt Program Leader & Senior Water Quality Scientist (Water Business)	Ben S & Natasha G	Feb-17	May-17	100%	COMPLETE
		Element 11: Evaluation of Audit									
11.00	2	**12.1 (G)**	Long term data is not fully evaluated or documented.	Establish Process Improvement team to commence review of medium/long term trends & identify opportunities for improvements. Investigate an integrated Water Information Management System (WIMS) with links to other systems (i.e. LIMS, SCADA, field data, etc) to enable effective long term trends.	a). Process Improvement team established reviewing trends, improvement opportunities & action effectiveness ✓ b). WIMS tender awarded. Development and implementation required to broaden trend analysis capability. c). Software purchased.Server requirements finalised.	Senior Water Quality Scientist & Product Quality Program Leader (Water Business)	Natasha G & Chris PM	Dec-17	Jun-18	65%	**MONITOR**
11.01	3	**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 **WSA-AQuality** audit tool.	Established annual internal audits over next 4 years using external provider ✓ Investigate capacity & capability to undertake internal audits by LCC staff by 2018.	Senior Water Quality Scientist (Water Business)	Natasha G	Jun-18	Jun-18	50%	ON TRACK

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11.03	2	**12.2 (G)**	External audit to be undertaken as per Regulator's "condition" of an approved DWQMP.	Arrange external audit & report findings as per Regulator's conditions.	Regulatory external audit was conducted **June 2017**.	Senior Water Quality Scientist (Water Business)	Natasha G	Jun-17	Jun-17	100%	COMPLETE
		Element 12: Review & Continual Improvement									
12.00a	2	**13.1 (G)**	Identify RMIP "none actions" which could impact the Business by RMIP annual review, which includes high risks, internal audit non-conformances and long term actions to address drinking water health incidents.	Program Leaders responsible to ensure RMIP actions implemented such as incorporation into appropriate Water Branch Plans.	Evidence of some RMIP actions incorporated into Water Branch Plans - **completed** ✓ DWQMP (ADWG Component) facilitators assigned to help Program Leaders facilitate actions **- completed** ✓ Intelex investigated as the most appropriate tool to assist with RMIP action implementation and status reporting - **completed** ✓	Water Branch Managers	Natasha G	Jun-17	Jun-17	100%	COMPLETE
12.00b	3	**13.1 (G)**	Identify RMIP "none actions" which could impact the Business by RMIP annual review, which includes high risks, internal audit non-conformances and long term actions to address drinking water health incidents.	Program Leaders responsible to ensure RMIP actions implemented such as incorporation into appropriate Water Branch Plans. Intelex tool to be developed to assist with RMIP status reporting.	Intelex modules to be developed and implemented as tool to assist with RMIP action implementation and status reporting.	Water Branch Managers	Natasha G	Dec-18	Dec-18	0%	NEW
12.01	2	**13.2 (G)**	Ensure RMIP is kept up to date by incorporating any new actions to address risks identified via risk assessments, incidents or internal audit findings. Communicate and implement improvements, monitoring effectiveness.	Incorporate any newly identified high risks from whole of system Risk Assessment undertaken 2016 into RMIP. Communicate changes with key stakeholders to ensure effective implementation.	**Completed**	Senior Water Quality Scientist (Water Business)	Natasha G	Jun-17	Jun-17	100%	COMPLETE
12.02	2	**13.2 (A)**	Ensure RMIP is kept up to date by incorporating any new actions to addrss risks or non-conformances identified via external Regulagory Audit.	Update RMIP to include actions to address non-conformances from Regulatory Audit and address any outstanding items from Risk Assessment.	**NEW**	Senior Water Quality Scientist (Water Business)	Natasha G	Jun'18	Jun'18	0%	NEW