

# Drinking Water Quality Management Plan (DWQMP) Annual report – NPA Water Supply System FY 2015 / 2016

## TRILITY Pty Ltd (Service Provider to DILGP)

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### Revision history

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02/05/2016	2.0	D. Ollerton	K. Braun	Revised to address queries raised by DEWS on 26/04/16
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Glossary of Terms

Term	Definition
<b>May</b>	Indicates a possible course of action.
<b>Shall</b>	Indicates a mandatory requirement.
<b>Should</b>	Indicates a preferred course of action.
<b>ADWG</b>	Australian Drinking Water Guidelines 6 (2011)
<b>ADWG Framework</b>	ADWG Framework for Management of Drinking Water Quality – the twelve elements
<b>CMF</b>	Continuous Micro Filtration
<b>CCP</b>	Critical Control Point
<b>DEWS</b>	Department for Energy and Water (QLD)
<b>DWQMP</b>	Drinking Water Quality Management Plan
<b>FY</b>	Financial Year
<b>NCR</b>	Non-Conformance Report
<b>O&amp;M</b>	Operations and Maintenance
<b>QCP</b>	Quality Control Point
<b>QMS</b>	Quality Management System
<b>R&amp;D</b>	Research and Development
<b>RMIP</b>	Risk management Improvement Plan (WQIP)
<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>SMT</b>	Senior Management Team
<b>TDS</b>	Total Dissolved Solids
<b>THM</b>	Trihalomethanes
<b>TOC</b>	Total Organic Carbons
<b>WTP</b>	Water Treatment Plant
<b>WQMS</b>	Water Quality Management System
<b>WQIP</b>	Water Quality Improvement Plan (RMIP)
<b>WQP</b>	Water Quality Plan

## 1. Introduction

This report documents the performance of TRILITY's drinking water service with respect to water quality and performance in implementing the actions detailed in the drinking water quality management plan (DWQMP) as required under the *Water Supply (Safety and Reliability) Act 2008* (the Act).

The report assists the Regulator to determine whether the approved DWQMP and any approval conditions have been complied with and provides a mechanism for providers to report publicly on their performance in managing drinking water quality.

This template has been prepared in accordance with the *Water Industry Regulatory Reform – drinking water quality management plan report factsheet* published by the Department of Energy and Water Supply, Queensland, accessible at [www.dews.qld.gov.au](http://www.dews.qld.gov.au).

The Water Supply (Safety and Reliability) Act 2008 commenced on 1 August 2008. Under the Act, the Department of Local Government, Infrastructure and Planning (DILGP) (Service Provider Identification Number 492) is defined as a service provider because it owns and operates the water services in the NPA. The DILGP – as the Registered Service Provider – is responsible for ensuring service delivery of the Northern Peninsula Area water supply and for ensuring that the associated infrastructure is managed efficiently and effectively. The DILGP has tasked TRILITY Pty Ltd to operate and maintain the scheme on their behalf.

## 2. Overview of Operations

The Northern Peninsula Area (NPA) is located near the tip of Cape York Peninsula. It consists of the communities of Bamaga, Injinoo, New Mapoon, Seisia, and Umagico. The NPA water supply system is integrated to serve all five communities. Bamaga WTP utilises a CMF process followed by liquid hypochlorite disinfection to produce up to 6.2ML/d of drinking water from the Jardine River raw water source. The process control system for the WTP runs to maintain set levels in the downstream reservoirs and clear water storage tanks from which the NPA townships supply their drinking water.

Bamaga WTP has a production capacity of 6.2ML/D however the WTP can operate at a range of flows depending on demand. The WTP can also be shut down for maintenance requirements. Raw water undergoes the following treatment steps to produce drinking water;

- CMF Membrane filtration
- pH correction
- Polyaluminium chloride (PACl) dosing
- Liquid chlorine disinfection using 10-12% w/w at pH < 8.5

The product water quality is measured against two specifications, contractual specifications outlined in the conditions of contract DILGP – 2411 - 14, and the DEWS Incident Notification Protocol form WSR503 – Drinking water quality: Incident reporting, adapted from the ADWG. The individual parameters of these specifications are documented in Appendix A.

The Clear Water Storage Tank level will depend on network demand and is a variable largely dependent on weather conditions and time of day. The production from Bamaga WTP is integrated into the water supply system for the area, and the WTP ensures a safe and reliable supply of drinking water to its customers. For the purpose of a 'catchment to tap' analysis as required under the ADWG, the catchment of the Bamaga WTP begins at the Jardine River raw water storage lagoon which is located within the WTP site grounds and has a capacity of 15ML. This storage is fed from the Jardine river pump station using water from the Jardine River and surrounding catchment.

From Catchment to tap the NPA water supply system overview comprises a raw water intake main and storage; a water treatment plant; individual storage reservoirs; trunk mains between the communities; and the reticulation network inside the communities either up to the service connection's stopcock / water meter (if present) or the boundary of the property supplied by the service.

The drinking water quality management plan (DWQMP) describes the functional requirements, processes and activities for the management of drinking water quality by TRILITY in delivering operations and maintenance (O&M) services for the Bamaga.

The WTP supplies drinking water to six service reservoirs at Bamaga, New Mapoon, Seisia, Umagico and Injinoo, ranging in size from 1.6ML to 2.0 ML. From there the water can be directed to the TRILITY operated water supply system. The configuration and operation of the distribution system is undertaken by TRILITY.

TRILITY as a supplier of drinking water into the NPA Water supply system will ensure its DWQMP and by association its operational water quality plan (WQP) for Bamaga WTP and the reticulation network are maintained, ensuring a 'catchment to tap' philosophy aligned to the ADWG framework.

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### 3. Objective of the DWQMP

The objective of the DWQMP is to assure optimal drinking water quality and to protect public health through a preventive management approach covering all steps in the production of drinking water from catchment to tap. To meet this objective, the DWQMP will:

- Comply with the requirements of the Water Supply (Safety and Reliability) Act QLD 2008
- Comply with the TRILITY drinking water quality policy and all relevant corporate and HSEQ policies and procedures.
- Comply with the requirements of the 2011 Australian Drinking Water Guidelines (ADWG) including the Framework for Management of Drinking Water Quality – the twelve elements (ADWG Framework).
- Incorporate an incident reporting and management procedure consistent with the Department for Energy and Water Supply (DEWS) incident notification protocol.
- Incorporate TRILITY's internal CCP validation process, including but not limited to the implementation of the ADWG Framework.
- Incorporate DILGP requirements for reporting of information and performance in relation to water quality management.
- Incorporate the objective to supply safe drinking water at all times, over the full range of production flows from the WTP.
- Incorporate a preventive risk management approach covering all steps from source to the contractual interface point between TRILITY and DILGP and development of a risk management plan in accordance with the requirements of the ADWG.

### 4. Actions taken to implement the DWQMP

#### Operational Procedures and Training

TRILITY operators are required at all times to adhere to agreed protocols and monitor the Bamaga WTP effectively so that drinking water quality standards are continuously met. The operators are experienced, appropriately trained and understand their responsibilities in ensuring and maintaining drinking water quality. The Bamaga WTP operates intermittently and as such protocols and procedures have been developed to ensure that during start-up and shutdown the Bamaga WTP does not compromise water quality.

Operational procedures and Work Instructions (WIs) for the Bamaga WTP have been developed for all major operational activities. These procedures guide operators in providing safe drinking water of compliant quality. Control procedures and PLC (Programmable Logic Controller) logic is detailed in the control sequence manual for the Bamaga WTP micro filtration membranes.

All employees are familiar with the location of the WIs and trained in their implementation. A summary of all WIs can be found in the Bamaga operations Work Instructions index on site.

Training has been recently provided covering the revised corporate requirements for water quality management as part of the TRILITY QMS/WQMS

#### Continuous and Discrete Operational Monitoring

Critical Control Points (CCPs) have been set and are continuously monitored via the Plant's SCADA system. If any of the CCPs deviate outside of their Critical Limits, an alarm is signalled via a text

message to operators. This alarm identifies the CCP which has exceeded its Critical Limit, and at what location.

SCADA alarms relating to CCPs take precedence over all other SCADA alarms as the safety of consumers is at risk. Early warnings also form part of the control system in order to have enough time to rectify a situation in case a parameter gets close to its Critical Limit.

Guidelines to appropriate operational response to these alarms are detailed in Bamaga's Water Quality Plan. The WQP is intended as an operational water quality summary of the DWQMP with a focus on CCP adherence and water quality procedural management. The general operational monitoring of the Bamaga WTP including the daily operational measurements & Inspections and water quality sampling are also outlined therein. Please refer to this document for further information.

### **Corrective Action**

TRILITY ensure corrective action is taken in response to water quality non-conformances or DILGP feedback. All corrective actions relating to DILGP breaches is documented in the TRILITY Non-Conformance database on Lotus Notes, which also defines responsibilities and authorities, and ensures that staff are trained in appropriate procedures. Training records are stored in TRILITY's intranet-based HR Self Service database.

Corrective action can result from:

- Water quality exceedances, plant process/performance failures and the outcomes of their respective incident investigations
- Short-term evaluation of drinking water quality monitoring data
- Client and consumer feedback
- Workplace assessments
- Calibration, and;
- Training.

Failure to take immediate or effective action may lead to the escalation of a situation, such as a breach of DILGP protocols, which may require incident response protocols to be implemented.

Should corrective action necessitate amendments to the NPA DWQMP, TRILITY will implement and record such changes.

### **Maintenance**

Maintenance of plant and equipment is continually undertaken to ensure equipment performs reliably. TRILITY have developed a maintenance plan outlining preventative maintenance requirements for all plant and equipment. All preventative and corrective maintenance undertaken by TRILITY is documented and reported in the monthly operations reports.

TRILITY has also developed an Asset Management Plan (AMP) that describes the systems, processes and activities related to the maintenance and replacements of assets. This AMP is reviewed on an annual basis.

### **Materials and Chemicals**

Three different chemicals are used in the treatment process at the Bamaga WTP and are regularly checked for potential contamination, as this contamination could result in unsafe drinking water being distributed to the consumer. All chemicals utilised within the treatment process are listed in the ADWG as being approved for use by the NHMRC.

## Chemical Suppliers

Chemical suppliers are evaluated and selected on their ability to supply chemicals not only in accordance with the required specifications, but also in regards to their security of supply. TRILITY seek from chemical supplier's evidence of how the quality of the chemical against the specification can be assured, and evidence to demonstrate that security of supply can be maintained.

The control of chemicals and chemical delivery systems at the Bamaga WTP is crucial to ensuring drinking water quality. Maintenance of these systems are documented in the Asset Management Plan. Chemical stock management is managed by the Plant Manager, who is also responsible for the reordering of chemicals. Certificates of compliance are supplied at regular intervals by the supplier or upon request as appropriate. The most recent MSDS for each chemical is stored on site.

Chemical delivery contractors, as with all contractors undertaking works on TRILITY sites, are required to complete a site induction that outlines general site OHS hazards and risks. A Job Safety and Environmental Analysis (JSEA) is also required. In addition to chemicals, lubricants and oils used on mechanical equipment could contaminate drinking water. Any contamination is likely to arise during maintenance activities. The management of contamination by lubricants is via approved maintenance procedures and work instructions.

## 5. Progress against the DWQMP Risk Management Improvement Program\* (RMIP)

The below RIMP/WQIP taken from the approved DWQMP originally submitted by SunWater has been updated to reflect current status against each action.

In addition, other areas for improvement identified in the NPA WQ Compliance Audit undertaken by TRILITY in March 2016 and October 2016 are summarised below along with a statement regarding status;

- Insert updated copy of TRILITY's DWQ Policy on site – **completed in March 2016**
- Development of a site specific Water Quality Plan – **Draft and Training complete – implementation scheduled for December 2016**
- Operations Manual out of date – **in the process of being updated as part of the Water Quality Plan requirements**
- Chlorine CCP monitoring and reporting improvements – **complete, see Section 6 for further details**
- Water Quality Issue Escalation procedure update – **Superseded in 2016 by emergency response action plan (ERAP) process which will be implemented nationally by TRILITY. All ERAP protocols will be compliant to the ADWG, DEWS and existing health protocols for water quality notifications. Staff training on protocol completed October 2016**
- Operator Training – **operators to be trained in site specific Water Quality Plan prior to implementation. Staff training completed October 2016**

For further details on the above refer to the risk management improvement plan (below) and the NPA Water Quality Compliance Report in Appendix B.

\*Also referred to as the water quality improvement plan (WQIP)



Scheme Component / Sub-component	Hazard/ Hazardous event	Priority	Action(s)			Target date/s	Estimated cost	Responsibility	Status
			Interim	short-term	long-term				
Raw water	Pollution in river - bacteria	Moderate (based on current mitigated risk)	<ul style="list-style-type: none"> <li>TRILITY Operations support laboratory trial for ACH dosing to membranes. <i>In progress</i></li> <li>Enhanced catchment monitoring for vulnerability assessment (Tier 1) in line with ADWG health based targets changes. <i>Max E. Coli included in WQP</i></li> <li>Catchment key WQ characteristic assessment - Revised Water Quality Plan (WQP) and DWQMP.</li> <li>CCP alarm and shutdown review / annual CCP compliance and validation testing (Complete).</li> <li>Membrane integrity testing (MIT) review as per WQP update.</li> </ul>			October 2016	OPEX only (NQ OPS/WQ & Process support)	Water Quality Manager  Regional Operations Manager  Scheme Manager - Bamaga	Scope of work planned for ACH trials
Raw water	Pollution in river - viruses	Moderate (based on current mitigated risk)							Raw water E.Coli monitoring implemented 2015. LRV to be assessed (complete)
Raw water	High rainfall in river catchment - Colour	High (based on current mitigated risk)							Key characteristic catchment summary drafted (WQP)
Chemical dosing	Disinfection by-products	Moderate (based on current mitigated risk)							ACH dosing trial for enhanced colour removal in progress
Reticulation	No Chlorine Residual	Moderate (based on current mitigated risk)		Lower reservoir operating levels to improve turn over		Dependent on next item	No cost	Scheme Manager - Bamaga	Completed
Reticulation	Water pressure low - insufficient water	Moderate (based on current mitigated risk)		Reduce excessive water demand via preparing a Demand Management Program. This program will include (but not be limited to) a public education program, including how it will be implemented and who will be responsible.		June 30 2016	Absorbed into operational budget	Regional Operations Manager	In progress, water restrictions comms provided to community.

## 6. Revisions to the Operational Monitoring Program

A detailed review of the CCP operational philosophy has recently been completed, resulting in a number of changes to the way the chlorine CCP is tested, monitored and reported. These changes have improved operational control significantly at the point of application. The operational philosophy of the plant was reviewed, including changes to instrumentation and process control that have increased the stringency of FRC compliance and highlighted this CCP as the key control point of the plant. Retrospective CCP compliance KPI's at the plant will be reviewed on a monthly basis with any non-conformance resulting in corrective action by the water quality and process engineering team. Automatic cessation of supply on critical alarm will be applied automatically on CCP failure and should not be confused with the WQ governance process described above. This has been commissioned, testing was carried out as part of the May and October audits.

Operational monitoring of trihalomethanes (THMs) has been initiated and undertaken by TRILITY on behalf of DILGP to assess the risk of disinfection by-product formation, in line with recommendations in the ADWG. Initial risk assessment has been carried out at site utilising a colorimetric method due to the proximity and preservation challenge of THM sampling and analysis at present.

## 7. Amendments to the DWQMP

TRILITY took over the operation of the NPA water supply system in September 2014 from the then incumbent SunWater. During 2015, TRILITY updated the DWQMP (Rev 2.) and a summary of the changes to October 2016 as applied are listed below;

### 2015 Revision

- Updated contact details
- Referenced TRILITY specific policies and procedures
- Added detailed schematic of the NPA treatment and distribution network
- Added TRILITY WQ performance standards (as per O&M Agreement KPIs as stipulated by DIGLP)
- Updated hazard identification and risk assessments

All amendments to the DWQMP were initiated internally as part of TRILITY's annual review and continuous improvement process.

### 2016 Revision (to be included in next revision delivered to DILGP and DEWS)

- Revised WQP and DWQMP Schematic includes PDT measurement as a CCP
- Updated CCP's section and reviewed set points (OPS support site visit)
- Revised ERAP training and incident management protocol included in DWQMP/WQP

## 8. Compliance with Water Quality Criteria for Drinking Water

Table shows the treated water compliance data for FY 2015 / 2016 supplied from Bamaga WTP. All water quality results met the recommended values in the Australian Drinking Water Guidelines. See Appendix A for information outlining the sampling and testing regime implemented at Bamaga WTP and the NPA distribution system.

Compliance				
Parameter	Bamaga WTP Outlet	Min Level	Max Level	Number of Samples
pH	100%	6.8	8.21	55
Free Cl <sub>2</sub>	100%	0.5	4.2	55
E. coli	100%	0	0	54
THM (Operational)	100%	8	234	52
Treated Water Aluminium	100%	0	0.07	55
TOC	-	-	-	-
Treated Water Colour	100%	0	9	51

**Table 1 – Bamaga WTP Outlet Treated Water Compliance Data**

### Distribution System

Table shows compliance data for the communities serviced by the plant. All sample points were compliant with the exception of one sample result at Seisia (see Table 3), indicating that network chlorine residual management was effective. See Appendix A outlining the sampling and testing regime implemented for the distribution system.

Distribution System Compliance Summary						
Parameter	Primary School	Hospital	Injinoo	Umagico	Seisia	New Mapoon
pH	100%	100%	100%	100%	100%	100%
Free Cl <sub>2</sub>	100%	100%	98%	100%	98%	96%
E. coli	100%	100%	100%	100%	100%	100%
THM	98% (operational)	100%	100%	100%	100%	100%

**Table 2 – Distribution System Treated Water Compliance Data**

Table 3 provides further details of the sample results at each distribution system location and includes;

- Total samples taken for each parameter
- maximum and minimum results recorded for each parameter
- number of non-compliances recorded for each parameter
- Location of each sample point and applicable compliance range for each parameter

Sample point (QCP)	Range	pH (6.5 - 8.5)	Cl2 mg/L (0.2 - 5.0)	E.Coli (<1cfu/100ml)	THM (0 - 250µg/L)	Number of Samples	No. non-compliant
Primary School	Min	6.80	0.22	<1	0	pH -54 Free Cl2-56 E.Coli-54 THM-52	0
	Max	8.34	1.90	<1	174		1 (Operational)
Hospital	Min	6.80	0.40	<1	0	pH -56 Free Cl2-54 E.Coli-54 THM-52	0
	Max	8.10	2.30	<1	8		0
Injinoo	Min	6.70	0.45	<1	0	pH -54 Free Cl2-54 E.Coli-54 THM-52	1
	Max	7.74	2.10	<1	144		0
Umagico	Min	6.80	0.40	<1	0	pH -54 Free Cl2-54 E.Coli-54 THM-52	0
	Max	8.10	2.30	<1	8		0
Seisia	Min	6.80	0.07	<1	17	pH -54 Free Cl2-54 E.Coli-55 THM-52	2
	Max	7.81	1.80	<1	126		0
New Mapoon	Min	6.80	0.30	<1	12	pH -53 Free Cl2-55 E.Coli-55 THM-51	2
	Max	7.97	1.50	<1	92		0

**Table 3 – Distribution System Treated Water Compliance Data (detailed)**

### Description of non-compliant results

**Primary School:** THM result of 253µg/L recorded 1/4/16.

Operational THM monitoring has been undertaken at site utilising HACH THM plus method (10132). Whilst accurate for screening and formation potential testing, this method is not suitable for regulatory reporting. The field THM method has been undertaken as part of an initial risk assessment for disinfection by-products as this had previously been uncharacterised as part of a system assessment. It is recommended operational testing be transferred to a NATA accredited laboratory compliant to ISO17025. Regulatory reporting to DEWS should be considered for approved APHA procedures outlined in section 6232 A, B, C and D of the standard methods manual. Although a result >250µg/L has been noted a non-standard method has been applied in this case outside of contractual monitoring requirements with DILGP. Trend control analysis of the FY 2015 / 16 results indicate

monthly monitoring of THMs performed by a NATA accredited contract laboratory should be programmed for FY 2016 /17.

**Injinoo:** Free chlorine result of 0.16mg/L – Distribution QCP

Low turnover and demand in the Injinoo reservoir and distribution system formed the root cause of loss of disinfectant residual. The following free Cl<sub>2</sub> result was in range for this QCP. Improved reservoir level controls have been implemented to increase turnover and improve chlorine residual levels is the network/reticulation system. Mains flushing were undertaken.

**Seisia:** Free chlorine of 0.07mg/L and 0.02mg/L – Distribution QCP.

Low turnover and demand in the Seisia reservoir and distribution system formed the root cause of loss of disinfectant residual. The following free Cl<sub>2</sub> results for both measurements were in range for this QCP. Improved reservoir level controls have been implemented to increase turnover and improve chlorine residual levels is the network/reticulation system. Mains flushing were undertaken.

**New Mapoon:** Free chlorine of 0.02mg/L and 0.04mg/L – Distribution QCP.

Low turnover and demand in the New Mapoon reservoir and distribution system formed the root cause of loss of disinfectant residual. The results were consecutive for this QCP. Improved reservoir level controls have been implemented to increase turnover and improve chlorine residual levels is the network/reticulation system. Mains flushing were undertaken. Mains flushing on residual <0.2mg/L immediately following results have been reiterated to operations staff.

## 9. Notifications to the Regulator under Sections 102 and 102A of the Act

This financial year there were **no** instances where the Regulator was required to be notified under sections 102 or 102A of the Act.

## 10. Customer Complaints related to Water Quality

TRILITY is required to report on the number of complaints, general details of complaints, and the responses undertaken.

### Water Quality

During 2016, there were **no** complaints relating to water quality.

### Suspected Illness

During 2016, there were **no** confirmed cases of illness arising from the water supply system.

### Discoloured Water

During 2016, there were **no** discoloured water complaints.

### Taste and Odour

During 2016, there were **no** taste and odour complaints.

## 11. Findings and Recommendations of the DWQMP Auditor

A copy of the 2015 / 2016 FY compliance report, titled 'NPA Water Quality Compliance Report' is appended to this report. Improvements to CCP alarm reporting have been recommended and are in progress. Review of operational monitoring including raw water E.Coli have been implemented.

## 12. Outcome of the review of the DWQMP

An internal CCP validation audit was completed in October 2016. The results from this audit were used in identifying ongoing improvements to be included in the WQIP and the timeframe to address them.

In addition, a Water Quality Plan summarising the DWQMP requirements for Bamaga operational staff has been drafted and is scheduled for implementation in November. This document is being developed to target 100% compliance to CCP and PCP's identified in water quality management plans across TRILITY's national operations. A draft of this document can be provided on request. The document relies on internal training to be completed prior to delivery. This training was completed in October 2016.

WQP's provide an operational summary of;

- Catchment risk and raw water quality characteristics
- Treatment and system schematic and overview
- Description of CCP/PCP
- SCADA critical alarm summary
- Contractual sample description and data management nomenclature
- ADWG or contractual WQ parameter limits
- Emergency response plan protocol linked for microbial or chemical detections
- Annual review and audit applied to the WTP and supply system

The next internal review of the DWQMP is due before March 2018.

## Appendix A – Sampling and Testing Regime for the Bamaga WTP

Raw Water QCP			Treated Water - Plant Outlet QCP			Treated Water – NPA distribution QCP's		
Parameter	Sample Frequency	Target	Parameter	Sample Frequency	Target	Parameter	Sample Frequency	Target
<i>E. coli</i>	Weekly		<i>E. coli</i>	Monthly	<1	<i>E. coli</i>	Monthly	<1
<b>Total coliforms</b>	Monthly		Total coliforms	Monthly	<1	Total coliforms	Monthly	
<b>Heterotrophic plate count</b>	Monthly		Heterotrophic plate count	Monthly		Heterotrophic plate count	Monthly	
<b>Sodium</b>	Quarterly	≤180	Sodium	Quarterly	≤180	Sodium	Quarterly	≤180
<b>Potassium</b>	Quarterly		Potassium	Quarterly		Potassium	Quarterly	
<b>Calcium</b>	Quarterly		Calcium	Quarterly		Calcium	Quarterly	
<b>Magnesium</b>	Quarterly		Magnesium	Quarterly		Magnesium	Quarterly	
<b>Total Hardness</b>	Quarterly	60<TH≤200	Total Hardness	Quarterly	60<TH≤200	Total Hardness	Quarterly	60<TH≤200
<b>Iron</b>	Quarterly	≤0.3	Iron	Quarterly	≤0.3	Iron	Quarterly	≤0.3
<b>Manganese</b>	Quarterly	≤0.1	Manganese	Quarterly	≤0.1	Manganese	Quarterly	≤0.1
<b>Aluminium (Dissolved)</b>	Quarterly	<0.2	Aluminium (Dissolved)	Quarterly	<0.2	Aluminium (Dissolved)	Quarterly	<0.2
<b>Conductivity</b>	Quarterly		Conductivity	Quarterly		Conductivity	Quarterly	
<b>pH</b>	Quarterly	6.5-8.5	pH	Quarterly	6.5-8.5	pH	Quarterly	6.5-8.5
<b>Total Alkalinity</b>	Quarterly		Total Alkalinity	Quarterly		Total Alkalinity	Quarterly	
<b>Colour (Apparent)</b>	Quarterly	≤15	Colour (Apparent)	Quarterly	≤15	Colour (Apparent)	Quarterly	≤15
<b>Turbidity</b>	Quarterly	≤5	Turbidity	Quarterly	≤5	Turbidity	Quarterly	≤5
<b>Sulphate</b>	Quarterly	≤250	Sulphate	Quarterly	≤250	Sulphate	Quarterly	≤250
<b>Chloride</b>	Quarterly	≤250	Chloride	Quarterly	≤250	Chloride	Quarterly	≤250
<b>Fluoride</b>	Quarterly	≤1.5	Fluoride	Quarterly	≤1.5	Fluoride	Quarterly	≤1.5
<b>THM (Operational only)</b>	Weekly	<.25	THM (Operational only)	Weekly	<.25	THM (Operational only)	Weekly	<.25

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## Appendix B – NPA Water Quality Compliance Report

# NPA WATER QUALITY COMPLIANCE REPORT

### Operations and Maintenance

## Northern Peninsula Area (Bamaga WTP)

### Revision history

Date	Rev.	Author	Approved by	Description
16/03/2016	1.0	J. Livingston	K. Braun	WQ Compliance summary
25/10/2016	2.0	K. Braun	D. Ollerton	2015 / 2016 FY update

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## ACRONYMS AND DEFINITIONS

Term	Definition
<b>May</b>	Indicates a possible course of action.
<b>Shall</b>	Indicates a mandatory requirement.
<b>Should</b>	Indicates a preferred course of action.
<b>ADWG</b>	Australian Drinking Water Guidelines 6 (2011)
<b>ADWG Framework</b>	ADWG Framework for Management of Drinking Water Quality – the twelve elements
<b>CCP</b>	Critical Control Point
<b>CFU</b>	Colony Forming Unit
<b>DEWS</b>	Department for Energy and Water (QLD)
<b>DWQMP</b>	Drinking Water Quality Management Plan
<b>QCP</b>	Quality Control Point
<b>QMS</b>	Quality Management System
<b>R&amp;D</b>	Research and Development
<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>SMT</b>	Senior Management Team
<b>TDS</b>	Total Dissolved Solids
<b>THM</b>	Trihalomethanes
<b>TOC</b>	Total Organic Carbons
<b>WQMS</b>	Water Quality Management System
<b>WQP</b>	Water quality plan

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## SCOPE

This review of the Bamaga DWQMP is provided as a continuous improvement report. To enable transparent information to be provided internal audit of TRILITY DWQMP's and WQP's has been provided by operation support staff based in South Australia. 'Operations Support' is required to attend site and conduct this audit on an annual basis.

The audit framework applied to drinking water quality management by TRILITY to Bamaga WTP utilises an in house system risk assessment and CCP validation audit compliant to the TRILITY WQMS. Summary reporting in this report will be limited to general compliance to the ADWG framework for drinking water quality management "The Framework".

The Water supply (Safety and Reliability) Act 2008 requires performance reports to be required as part of an annual DWQMP review process. Further information required supplementary to this report can be obtained through the Regional Operations Manager QLD or the Water Quality Manager.

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# FRAMEWORK FOR DRINKING WATER QUALITY MANAGEMENT

This section will summarise plant compliance with the DWQMP with respect to each element of the ADWG “The Framework”

## Element 1 – Commitment to Drinking Water Quality Management

TRILITY have developed a drinking water quality policy (GOV-POL-031) that has been endorsed by the managing director of TRILITY. This policy is displayed on site near both computer work stations. This Policy is reviewed bi-annually by the SMT and water quality manager.

The ADWG is referred to for guidance on plant compliance and best practice issues and is available on site through the plant manager.

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

The water quality sampling plan outlined in Appendix A of the DWQMP is currently in place at the Bamaga WTP. Records of the sampling results are kept on the internal TRILITY servers and can be provided on request.

Short term water quality results are used to drive plant operation. SCADA trends and on site laboratory results provide rapid results allowing the plant operator to identify water quality performance problems as they arise. This data is summarised by operations staff and uploaded to internal TRILITY servers as part of respective QMS and KIMS databases.

Development of a water quality plan summarising the DWQMP’s for Bamaga operational staff has been drafted and is currently out for comment with stakeholders. Completion is planned for May 2016. This document is being developed to provide an operational focus on 100% compliance to CCP and PCP’s identified in DWQMP’s across national operations. A draft of this document can be provided on request.

WQP’s will provide an operational summary of

- Catchment risk and raw water quality characteristics
- Treatment and system schematic and overview
- Description of CCP/PCP
- SCADA critical alarm summary
- Contractual sample description and data management nomenclature
- ADWG or contractual WQ parameter limits
- Emergency response plan protocol linked for microbial or chemical detections

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- Annual review and audit applied to the WTP and supply system

## Element 3 – Preventive Measure for Drinking Water Quality Management

CCPs and PCPs are clearly defined within the DWQMP. These are maintained by operations staff in line with asset management principles and an operational CCP philosophy requiring 100% compliance to critical alarms. CCP identification, operation and risk assessment has been carried out in line with the ADWG guidelines and is described in detail in Figure1.

## Element 4 – Operational Procedures and Process Control

Informal water quality management procedures are currently in place at the Bamaga WTP. In the case that the plant operator is unable to correct an issue at the plant or unsure what the best course of action is the Water Quality Issue Escalation procedure (BAA-WQ-002) is used. An operations manual is available on site that can also be used as a diagnostic tool. This is of limited utility as it requires updating. This will be actioned as part of audit findings related to process documentation. In the interim the critical procedure for management of WQ compliance will be the draft WQP. A schematic with critical alarms is attached in Figure 1.


Operators have been trained and instructed to use this plan for operational management of water quality during actioning of non-conformance items identified as part of the AQUALITY audit.

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**Risk Profile**




**Rainfall Punsand Bay 14.7km away from Bamaga (BOM 1996 - 2010)**  
 Peak rainfall from Nov – Apr  
 Significant impact to WQ  
 10 Year Annual AVG, 1935 mm  
**20 Year Max. monthly AVG, Feb – 431 mm**



**Key raw water quality Characteristics 2015**  
 Drinking water catchment only  
 Crypto and Giardia detected < 5years? No (n=5)  
 Total Coliform MAX = N/A  
 Turbidity 0.3NTU – 9.1NTU  
 True Colour 0HU – 59HU

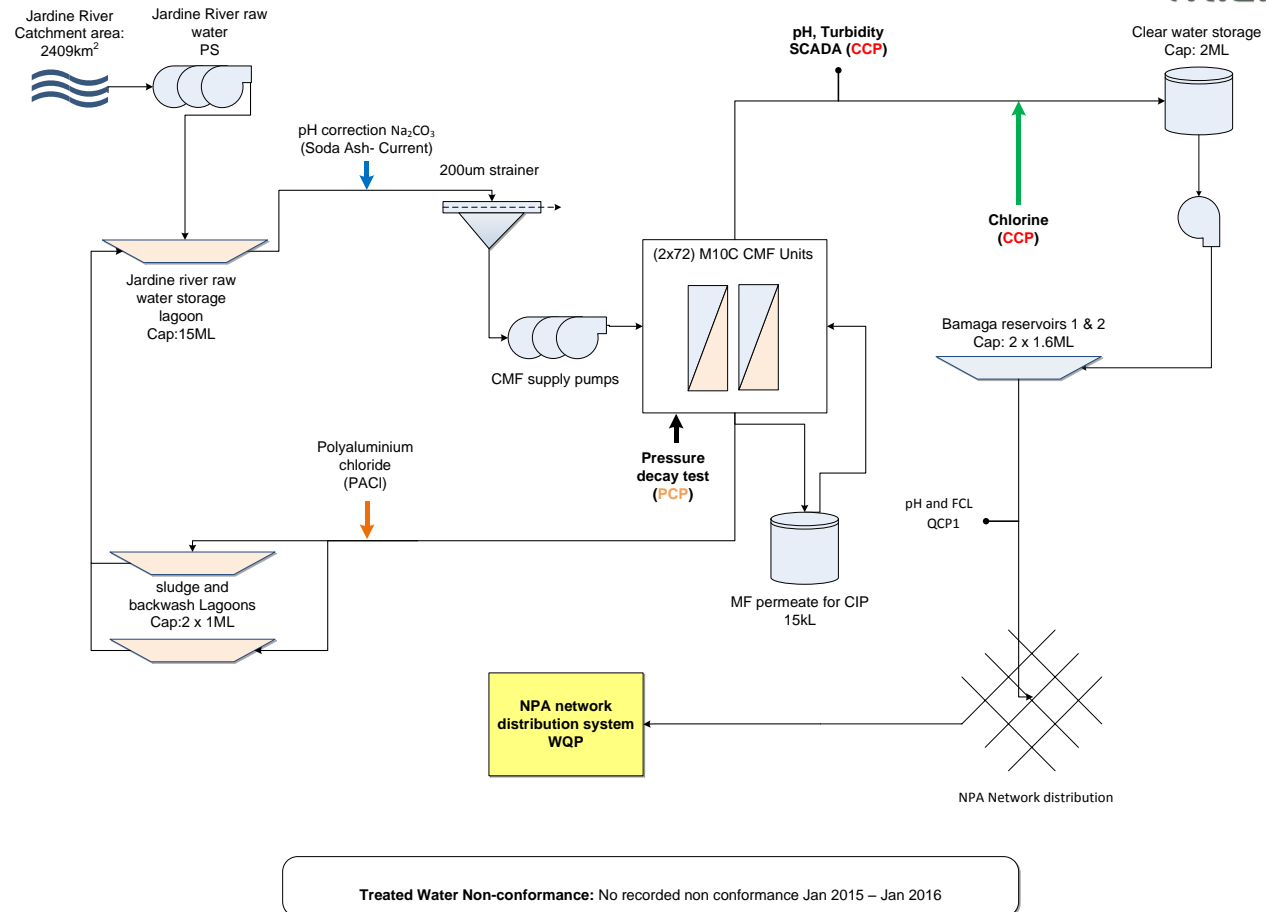
**Faecal Coliform MAX= 30CFU LEVEL 2 Source**



**Critical and process control points (CCP/PCP)**  
 Continuous SCADA  
**Critical:** Primary chlorination  
 Monitoring: Continuous SCADA  
 Range: 1.5mg/L – 3.5mg/L [Lo/Lo] = 1.0 mg/L]  
 Standby Cl pump: [Lo/Lo] <1 min  
 Autoshtutdown: Standby [Lo/Lo] >10min  
**Critical:** CMF filtrate turbidity  
 Monitoring: Continuous SCADA  
 Range: 0.0NTU – 0.3NTU [Hi/Hi]  
 Autoshtutdown >10min  
**Process:** Membrane integrity (Pressure decay) test  
 Monitoring: Weekly  
 [Lo] = 7.0kPa/min  
 [Lo/Lo] – 12.0kPa/min

**Autoshtutdown: Yes, Lo/Lo 12.0kPa/min**

## Bamaga WTP Water Quality Plan – January 2016



**Figure 1: Bamaga WTP Water Quality Plan**

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Water quality and sampling work instructions are available from the plant operations database. These work instructions cover water sampling, operation and maintenance of laboratory equipment.

The TRILITY notifications database is currently used to document and track corrective actions.

Quality assurance documentation for chemicals used on site is provided on request from our chemical supplier.

## Element 5 – Verification of Drinking Water Quality

Table 1 shows the CCP and PCP compliance levels for the 2015 calendar year.

**Table 1 - CCP and PCP Compliance for FY 2015 / 2016**

CCP/PCP	Compliance
Treated Water Free Chlorine	85%
Combined CMF Outlet Turbidity	99%
Raw Water True Colour	96%
Membrane Differential Pressure Decay Rate	N/A*

\*CCP reporting for PDT is currently being implemented and should be available by December 2016

The operational control philosophy of the plant was reviewed, including reviewing the changes to instrumentation and process control that have increased the stringency of FRC compliance. No major issues were found on this review. A fault with alarm validation testing of the CCP was identified and is being rectified when a SCADA integration specialist can attend site. Retrospective CCP compliance KPI's at the plant will continue to be reviewed on a monthly basis with any non-conformance resulting in corrective action by the water quality and process engineering team. Automatic cessation of supply on critical alarm will be applied automatically on CCP failure and should not be confused with the WQ governance process described above. This has been commissioned. Testing was carried out as part of a previous audit.

Membrane differential pressure decay rate (MDPDR) compliance data was not quantified as compliance time. Confirmation was given that every 500 filtration hours a PDT is triggered. Manual maintenance of the membranes is performed if the decay rate exceeds 7kPa/min. Automatic shutdown has been tested as part of the March audit and is compliant to the critical alarm values of 12kPa/min stated in the DWQMP/WQP. Incomplete data logging and records of PDT performance has been raised as a non-conformance item. These records will be summarised and provided in future compliance reports.



## Distribution

Table shows the clear water compliance data for FY 2015 / 2016. 100% compliance was recorded for all parameters excluding free chlorine residual. Where residuals in network reticulation were below 0.2mg/L flushing was carried out to restore residual to compliance.

**Table 2 - Treated Water Compliance Data**

Compliance				
Parameter	Bamaga WTP Outlet	Min Level	Max Level	Number of Samples
pH	100%	6.80	8.21	55
Free Cl <sub>2</sub>	100%	0.50	4.22	55
E. coli	100%	0	0	54
THM	100%	8	234	20
Treated Water Aluminium	100%	0	0.070	55
TOC	-	-	-	-
Treated Water Colour	100%	0	20	51

Table shows compliance data for the communities serviced by the plant. All sample points showed very high levels of compliance indicating that network management was excellent given the CCP maintenance issues present through the year.

**Table 3 – Distribution System Treated Water Compliance Data**

Compliance						
Parameter	Primary School	Hospital	Injinoo	Umagico	Seisia	New Mapoon
pH	100%	100%	100%	100%	100%	100%
Free Cl <sub>2</sub>	100%	100%	98%	100%	98%	96%
E. coli	100%	100%	100%	100%	100%	100%
THM	98% (operational)	100%	100%	100%	100%	100%

Source data for tables in this section can be provided on request.

Customer complaints are recorded and stored on TRILITY internal servers with corrective actions tracked within the TRILITY notifications database.

**Table 4 – Distribution System Treated Water Compliance Data (detailed)**

Sample point (QCP)	Range	pH (6.5 - 8.5)	Cl2 mg/L (0.2 - 5.0)	E.Coli (<1cfu/100ml)	THM (0 - 250µg/L)	No. non-compliant
Primary School	Min	6.69	0.22	<1	<10	0
	Max	8.34	3.03	<1	253	1
Hospital	Min	6.67	0.27	<1	<10	0
	Max	8.10	2.44	<1	240	0
Injinoo	Min	6.67	0.16	<1	<10	1
	Max	7.74	2.61	<1	211	0
Umagico	Min	6.70	0.22	<1	<10	0
	Max	7.86	2.11	<1	187	0
Seisia	Min	6.80	0.02	<1	<10	2
	Max	7.81	2.58	<1	231	0
New Mapoon	Min	6.90	0.02	<1	12	2
	Max	7.97	2.34	<1	92	0

## Element 6 – Management of Incidents and Emergencies

Incidents are managed using the Water Quality Issue Escalation procedure (BAA-WQ-002). This document describes who should be engaged in the case of incidents and emergencies and each relevant party is adequately trained in their incident response responsibilities. This process will be superseded in 2016 by the emergency response action plan (ERAP) process which will be implemented nationally. All ERAP protocols will be compliant to the ADWG, DEWS and existing health protocols for water quality notifications. Corporate incident response procedures are available through the TRILITY document management system IBM Notes.

Incidents and emergencies are tracked through the TRILITY notifications database using non-conformance reports (NCR).

## Element 7 – Employee Awareness and Training

Employee mandatory training is provided to cover all work required in the operation of the plant. A summary of the current training completion is provided in Table 2.

**Table 2 - Training completion for plant operators**

Role	Training Completion
Plant Manager	87.5%
Process Controllers	90.0%

## Element 8 – Community Involvement and Awareness

Community engagement activities can be provided by TRILITY communications on request. Water quality complaints and grievances are dealt with on a case by case basis.

## Element 9 – Research and Development

TRILITY participates in national R&D linkages with WSAA, SA Water, Sydney Water Corporation and a number of local suppliers nationwide. Microfiltration membrane optimisation trials are planned for Bamaga WTP in 2017. These trials will be based on Research and Development findings from Northern WTP (QLD) utilising a scaled CMF process for comparison.

## Element 10 – Documentation and Reporting

Plant performance logs and WQ data along with water quality monitoring results and client reports are kept on the TRILITY QMS and KIMS servers. Copies of these documents can be referenced on request.

## Element 11 – Evaluation and Audit

An internal CCP/PCP validation audit was completed in October 2016. The results from this audit were used in identifying compliance issues that have been included in this report. An extended summary of the audit findings can be provided on request.

TRILITY has a governance review process for water quality which will undertake quarterly review of all CCP/PCP compliance issues in line with the ADWG as part of "The Framework".

## Element 12 – Review and Continual Improvement

Recent rapid development of process documentation and systemic review of plant control philosophies have allowed increased plant performance against CCP and ADWG KPI's. This has also identified the need to focus on development of documentation specifically related to water quality (for example the WQP).

Ongoing review of the DWQMP combined will require regular audits and full compliance with the ADWG, QLD health regulatory requirements, QLD legislative acts and provisions.