WATER TREATMENT ASSET MANAGEMENT PLAN

December 2015

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Water Treatment
Asset Management Plan

December 2015

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LIST OF APPENDICES

Note: Appendices appear as separate documents and are not contained within the Water Treatment Asset Management Plan.

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Abbreviation	Description
ACH	Aluminium chlorohydrate
ADWG	Australian Drinking Water Guidelines
CEO	Chief Executive Officer
CCP	Critical Control Point
CSS	Client Service Standards
DEWS	Department of Energy and Water Supply (Queensland Government)
DWQMP	Drinking Water Quality Management Plan
ECI	Engineering and Commercial Infrastructure
EHP	Department of Environment and Heritage Protection (Queensland Government)
GIS	Geographic Information System
JAG	Department of Justice and Attorney-General (Queensland Government)
$KMnO_4$	Potassium permanganate
MDMM	Mean Day Max Month
MDPE	Medium Density Polyethylene
MRC	Mackay Regional Council
MWS	Mackay Water Services
NaF	Sodium Fluoride
NRM	Department of Natural Resources and Mines (Queensland Government)
PAC	Powdered activated charcoal
QLD	Queensland
QMS	Quality Management System
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedures
the Act	Water Supply (Safety and Reliability) Act 2008
the plan	Water Treatment Asset Management Plan
VSD	Variable Speed Drive
WHS	Work Place Health and Safety
WTP	Water Treatment Plant

1. INTRODUCTION

1.1 Purpose

This document is the Water Treatment Asset Management Plan (the plan) for Mackay Water Services (MWS). MWS is a business unit of the Mackay Regional Council (MRC).

The purpose of the plan is to outline the management framework employed by MWS to manage their water treatment assets to deliver the service outcomes for the community.

This document:

- is a documented risk based system for managing the water treatment assets held by MWS.
- sets out the strategies to ensure that the performance and maintenance of assets meets regulatory requirements, organisational and client needs, and that systems and processes are in place to address any emerging issues that may arise.
- communicates funding requirements to provide the required levels of service.
- is a living document which is actioned through MWS day to day activities.

1.2 Framework

This plan is prepared under the direction of MRC's and MWS's vision, mission, goals and objectives as captured in the organisation's Operational Plan (Appendix 3), Corporate Plan (Appendix 4) and Water Services Business Plan (Appendix 5).

MRC, as an organisation, is committed to the effective and efficient management of the community's assets for present and future generations. MRC understands that the assets form the basis for the majority of Council's service delivery and recognises the importance of the assets to communities and the significance of the assets to financial and strategic planning. This commitment is communicated through MRC's Asset Management Policy (Appendix 2). The policy is freely accessible on the MRC website.

This plan forms a component of MWS Quality Management System (QMS) and sits within business functions and is associated with the Drinking Water Quality Management Plan (DWQMP) (Appendix 6) as depicted in Figure 1.

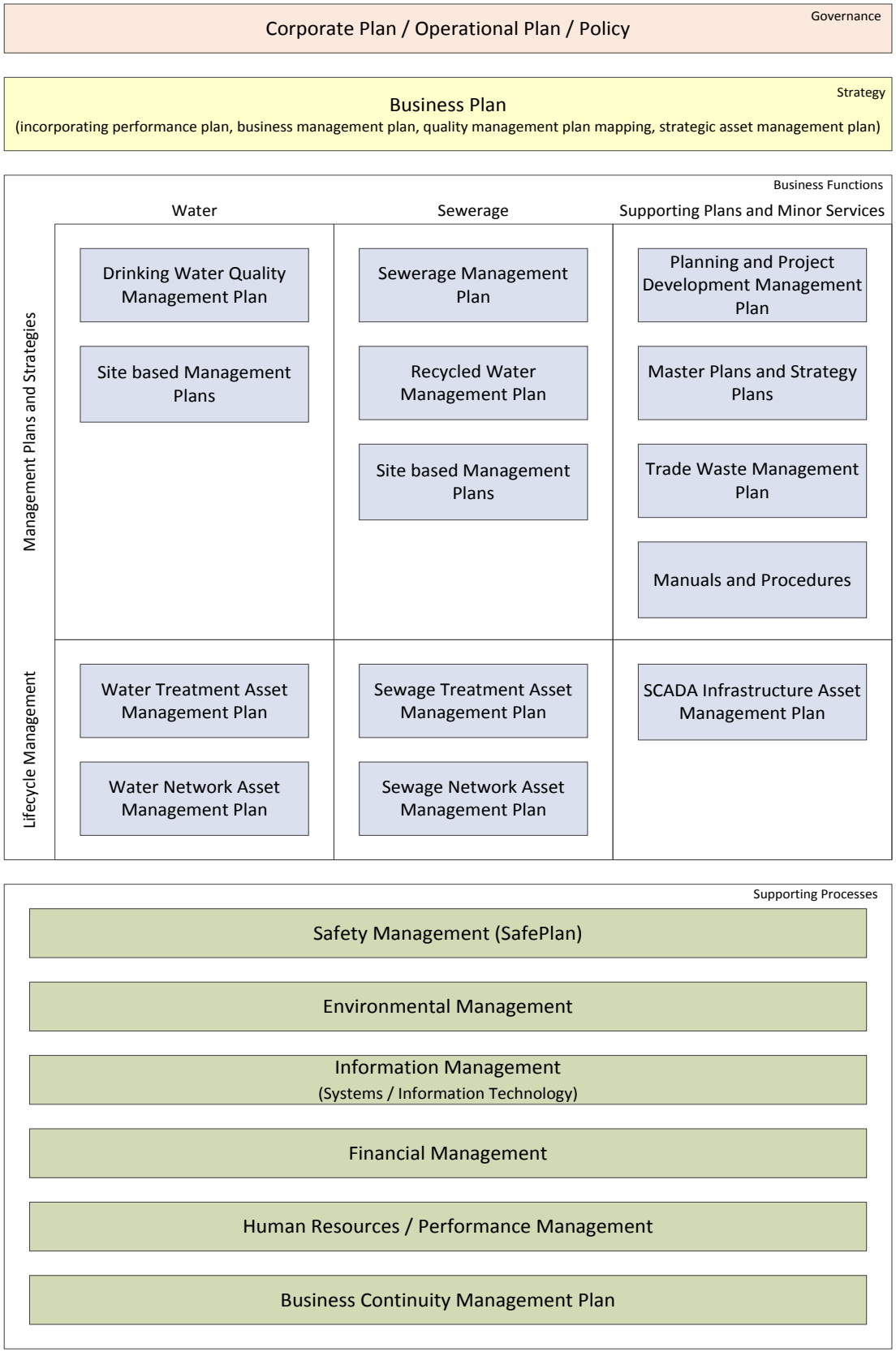

Figure 1 Mackay Water Services Quality Management System

1.3 Scope

This Water Treatment Asset Management Plan applies to management of all MWS water treatment assets. Table 1 summarises the infrastructure assets of MWS water treatment covered in this plan. Greater detail on the infrastructure listed in Table 1 can be found in the relevant sections of this plan.

Table 1 Existing MWS Water Treatment Assets Covered by this Plan

Asset Category	Quantity	Water Supply Scheme	Sites
Water Treatment Plant (WTP)	4	Mackay	Nebo Road WTP
		Sarina	Sarina (Mt Blarney) WTP
		Bloomsbury	Bloomsbury WTP
		Marian/Mirani	Marian WTP
Small Treatment Facility	12	Sarina	Bally Keel Alligator Creek Sarina Bores Marwood Bores
		Koumala	Koumala
		Eton	Eton
		Gargett	Gargett
		Finch Hatton	Finch Hatton
		Marian	Marian
		Mirani	Mirani
		Calen	Calen
		Midge Point	Kelsey Creek WTP

Note that this plan does not encompass water network assets, any wastewater assets and associated Supervisory Control and Data Acquisition (SCADA) software and hardware.

1.3.1 Critical Assets

Critical assets held by MWS are defined as having a criticality rating of 5. A register of assets and their criticality identified by MWS has been provided in Appendix 7 and includes those which form part of water treatment.

1.3.2 Non-Critical Assets

All assets which are not classed as critical according to the criteria described in section 1.3.1.

1.4 Document Ownership, Approval and Review

This plan is owned by the Manager Planning and Sustainability; and approved by the Chief Operating Officer Water and Waste Services.

The Manager Planning and Sustainability is responsible for ensuring that this plan is reviewed every two (2) years.

The implementation of this plan is undertaken through the roles and responsibilities of those in governance of water treatment assets as detailed in section 2.4.

Post the First Issue Revision 0 of this plan all amendments and changes to this plan and its associated appendices for the subsequent revisions will be recorded and captured in Appendix 1.

2. BUSINESS PRESSURES

2.1 Statutory Obligations

MRC is a registered Service Provider under the Water Supply (Safety and Reliability) Act 2008 (the Act). The Act details the powers, rights and obligations a Service Provider has under the Act. The main obligation in relation to water treatment is the protection of public health through the supply of safe drinking water. Safe drinking water is considered drinking water that is not likely to cause physical harm to a person who might consume it. The water quality criteria prescribed under the Act which a Service Provider is required to meet includes the standards covered under the Public Health Act 2005, the Australian Drinking Water Guidelines 2011 (ADWG) and the Water Fluoridation Act 2008.

2.2 Demand, Growth and Other Factors

The factors captured in Table 2 have been identified as elements that impact on water treatment infrastructure[1].

Table 2 Factors Affecting Water Treatment Infrastructure[1]

Factor	Impact
Mean Day Maximum Month (MDMM) water consumption	Water treatment infrastructure are designed to accommodate up to 20 hours operation per day under MDMM demand.
Growth rate	Construction or upgrade of new treatment infrastructure is programmed to align with expected growth rates. A detailed summary of population and demand changes for the MWS water supply schemes can be found in Section 2.2 of the DWQMP (Appendix 6).
Client behaviour	Overall demand is impacted by large changes in water use by clients.
Water quality requirements	The requirements for monitoring and testing and specification limits for new treatment infrastructure are influenced by legislative requirements on safe drinking water quality criteria.

2.3 Business Capability

There are many factors which influence the business capability of MWS; therefore the following is a snapshot of the factors that can have an effect on the MWS's business capability in relation to water treatment infrastructure operation and maintenance.

Table 3 Factors Affecting MWS's Business Capability for Water Treatment

Factor	Impact
Skills within the business	The availability, accessibility, recruitment and retention of the appropriately skilled workforce have been difficult in recent years. The main reason being competition with the mining sector and its service industries.

[1] Sourced from CAC No. 8 Sensitivity to Planning Parameters

Factor	Impact
Service providers within MWS	There are tasks in water treatment dependent on the assistance of service providers within MWS such as Planning & Sustainability and Infrastructure Delivery. Good planning and project management are integral to constructing fit-for-purpose assets.
Pathways, Customer Request Management System	Accurate and timely data capture provided by Pathways, the customer service database, is fundamental to reliable data output which is used to assess the business's functionality and capability.
Esri. Geographic Information System (GIS) Software	Planning of future works and repair or maintenance is dependent on accurate location of existing infrastructure captured in GIS.
Drawing index, Drawing Management Database	Planning of future works and repair or maintenance is dependent on the availability of 'as constructed' drawings contained within the drawing index.
Assetic, Asset Management Software	Under implementation. Each asset will be assigned a unique Assetic identifier as per Appendix 9 and recorded according to Appendix 13 and Appendix 14.
Technology 1, Maintenance management software	Under implementation. The software will assist with the coordination, structuring and recording of maintenance tasks.
SCADA [Clear SCADA, Citect SCADA, RadTel SCADA & Multitrode SCADA]	Clear SCADA is being rolled out and will replace the various SCADA currently in place except for at Nebo Road WTP where Citect SCADA will remain.
MonitorPro, operating information database	Is a data store which allows multiple users to input data and view data sets at any one time. Operational data from teams and summaries from SCADA will be manually and automatically imported into the database.
InControl, Safety and Incident Management System	Under implementation. System used to record and report workplace incidents and environmental incidents.
ECM, Document Management System	System designated by MRC as the document storage database for all external correspondence and documents of importance or key significance.
Bruce, intranet [SharePoint]	Document management system for all QMS documents. Allows MRC wide access to documents and controls document revisions. Is the single true 'point of source' for documents.

2.3.1 Key Principles, Risk and Drivers

The key principles and risks which drive the management of water treatment have been summarised in Table 4. Detailed risk assessments have been performed in relation to the individual asset categories and are provided in Appendix 6 and Appendix 8.

Table 4 Key Principles and Risks Driving Water Treatment Management[2]

Principle and Risk	Performance Indicator
Safety of employees, stakeholders and the public is protected	No incident or injury Operations performed in accordance with legislation
Water quality is safe for consumption	Drinking water is supplied in accordance with legislated and ADWG Health limits
Water quality meets the Aesthetic Client Service Standard Requirements[3]	Drinking water is supplied in accordance with Client Service Standards[3]
Continuity of water supply meets Client Service Standards[3]	Drinking water is supplied in accordance with Client Service Standards[3]
The environment is protected	Compliance with environmental legislation
Whole of life costs are minimised	Meet planned and adopted budgets

2.4 Governance

Governance of water treatment assets aligns with the MWS organisational structure as represented in Figure 2.

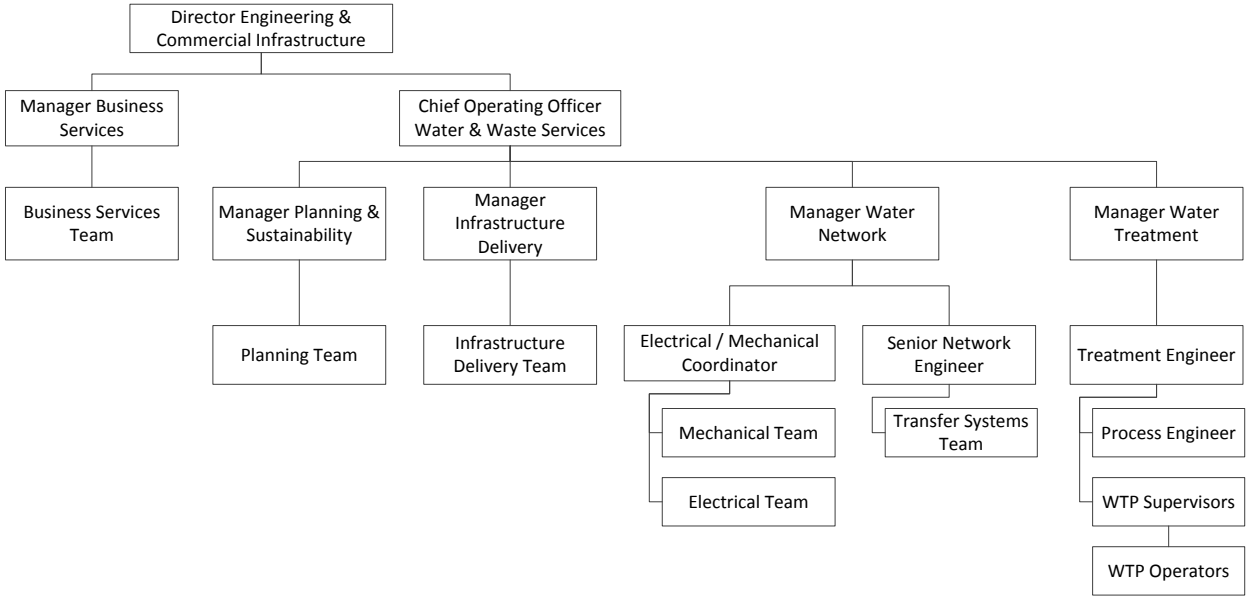

Figure 2 Mackay Water Services Water Treatment Governance Structure

2.4.1 Roles and Responsibilities

Table 5 provides a summary of the roles and responsibilities in the governance of water treatment from the lead roles in key activities to handover activities and support services.

[2] Sourced from CAC No. 9 Information Management
[3] Captured in the Water and Waste Services Performance Plan (Appendix 5)

Table 5 Roles and Responsibilities in the Governance of Water Treatment

Role	Responsibility
Director Engineering & Commercial Infrastructure (ECI)	Oversees the ECI program and communicates for the program to the Chief Executive Officer (CEO) and Council and vice versa.
Manager Business Services	Manages and coordinates the support services for MWS and the interface with clients.
Business Services Team	Provide budgeting administrative support to water treatment.
Chief Operating Officer Water and Waste Services	Oversees the coordination of planning, infrastructure delivery and water treatment operations ensuring budget and statutory requirements are met.
Manager Planning & Sustainability	Oversees the planning of infrastructure projects, the strategic direction of MWS and allocation of capital budget in consultation with infrastructure delivery and water treatment.
Planning Team	Carry out the ground work for the investigation into and costing of options for infrastructure projects. Develop the MWS strategic plans.
Manager Infrastructure Delivery	Oversees the delivery of infrastructure projects identified by the Planning Team and the handover of completed infrastructure to water treatment.
Infrastructure Delivery Team	Project manage the delivery of infrastructure projects.
Manager Water Network	Coordinates the maintenance of water treatment assets with water treatment.
Electrical / Mechanical Coordinator	Coordinates and supervises the programmed and reactive work required on water treatment electrical and mechanical assets.
Mechanical Team	Undertake the mechanical works required on water treatment assets.
Electrical Team	Undertake the electrical works required on water treatment assets.
Senior Network Engineer	Plans and coordinates the programmed and reactive maintenance on assets and oversees the monitoring of performance.
Transfer Systems Team	Monitor and attend two small treatment facilities to ensure optimal and efficient performance.
Manager Water Treatment	Oversees and coordinates the operation and maintenance of water treatment assets.
Treatment Engineer	Plans and coordinates the programmed and reactive maintenance on water treatment assets and oversees the monitoring of water treatment assets' performance.
Process Engineer	Monitors water treatment assets' performance and implements improvement strategies to increase efficiency and optimisation.
WTP Supervisors	Oversee the day-to-day operation and maintenance of water treatment plants and facilities.
WTP Operators	Undertake the day-to-day operation and maintenance of water treatment plants and facilities.

In addition to the governance roles and responsibilities there are supporting departments within MRC which participate in delivering the asset management outcomes for water treatment. The supporting departments and their roles and responsibilities are summarised in Table 6.

Table 6 Roles and Responsibilities of Supporting Departments to Water Treatment

Role	Responsibility
Plant and Procurement	Provide assistance with contracts, orders and purchasing of goods and ensure purchasing is undertaken in compliance with MRC policy and legislative requirements. Manage the allocation, maintenance and replacement of vehicles in the MRC fleet.
Information Services	Provide information technology support in maintaining software and hardware. Ensure systems are updated and backed up.
Property Services	Manage the maintenance of buildings and workshops utilised by MRC employees. Control the number, authorisation and distribution of keys and passes to access MRC sites, buildings and infrastructure.
Financial Services	Process payments for creditors and payroll and reconcile purchasing cards.
Governance & Assets	Oversee the insurance premiums for MRC and insurance claims; and manage the financial delegation of employees.
Client Services	Receive client queries and complaints, record them and direct them to MWS to be addressed.
Human Resources	In accordance with MRC policy and legislative requirements; provide guidance and administrative support in the recruitment, retention and discipline of employees and administer the employee training matrix and remuneration packages.
Enterprise Risk and Strategic Review	Work Place Health and Safety (WHS) resides under Enterprise Risk and Strategic Review and the representatives ensure that water treatment operations are performed in a safe manner and undertaken according to MRC policy and legislative requirements.

3. WATER TREATMENT PLANT

3.1 Asset Class Drivers

WTPs draw raw water from respective sources and treat the water through the addition of chemicals to produce safe drinking water which is released into the water network. A detailed description of the operation of WTPs can be found in the DWQMP (Appendix 6).

WTPs are the key assets for water treatment and need to be managed to ensure continuity of supply of safe drinking water. Demand for drinking water is the main driver for WTPs.

3.1.1 Key Risk Drivers

Detailed risk assessments have been completed in relation to water treatment plants and are provided in Appendix 6 and Appendix 8. The key risks which have been identified as driving factors for the management of WTPs include:

- Raw water harvesting infrastructure and pump stations
  - Lack of or poor maintenance
  - Exposure to toxic green-blue algae
  - Water quality declines due to heavy rainfall or salt water intrusion
  - Incident or injury from high pressure water, electrocution and using lifting equipment
- WTP
  - Insufficient water produced to meet demand
  - Lack of or poor maintenance
  - Loss of supply due to failure of key component in treatment process
  - Incident or injury from working over water, with chemicals and in confined spaces

3.2 Condition Assessment

At Nebo Road WTP an informal condition assessment is currently in progress and has been ongoing since 2012. An engineering contractor is employed on site to identify any items requiring maintenance and rectification. Once identified the works are quoted, planned and scheduled for completion.

A condition assessment was completed at Sarina WTP in 2012 by consultants City Water Technology. The outcomes and recommendations were outlined in a report issued in September 2012.

A condition assessment was completed at Bloomsbury WTP by consultants City Water Technology. The outcomes and recommendations were outlined in a report issued in May 2012.

3.2.1 Asset Capacity

Current demand requirements are being met by the existing water treatment plants, however Sarina WTP is meeting the demand with the assistance of the bores supply located within the scheme. The details of the current water treatment plants are provided in Table 7 to Table 11.

Table 7 Infrastructure Details for Nebo Road WTP – Dumbleton Weir

Infrastructure	Aspect	Detail
Dumbleton Weir	Depth (m)	Approx. 14
Dumbleton Weir Offtake Structure	Intake levels from base of structure (m)	1 (top): 7.75
		2: 5.5

Infrastructure	Aspect	Detail
		3: 3.25
		4 (bottom): 1
Dumbleton Weir Pumping Station	No. pumps	4 Capriati VSD pumps
	Pump Model	HSC 400-300-435
	Capacity (L/s)	465 @ 40m head
	Control	Via SCADA at Nebo Road WTP
Raw Water Mains	No.	2 (old & new)
	Diameter (mm)	Old: 525
		New: 600
	Max. Flow Rate (L/s)	815 L/s
	Min. Flow Rate (L/s)	350 L/s

Table 8 Infrastructure Details for Nebo Road WTP – Bores

Bore	Year	Turbine	Depth (m)	Diameter (mm)	Pump capacity (L/s)*	Motor	Screen Mesh Size (mm)	Casing Diameter (mm)
Bore 1	1980 (Re-Dev 1996) (Pump Replace 1998)	Everflow 3 stage turbine type 180RH	21.34	122	Approx. 20	22 kW CMG Frame 180 m	3.96	188
Bore 2	1980 (Re-Dev 1996)	Everflow 2 stage turbine type 180RH	17.6^	154	Approx. 10	22 kW TECO Frame	3.86	210
Bore 3	1980 (Re-Dev 1996)	Everflow 3 stage turbine type 180RH	22.26	122	Approx. 32	18.5 kW TECO Frame 160 L	3.96	300
Bore 4	DE-COMMISSIONED IN 2014							
Bore 5	1984	Everflow 2 stage turbine type 180RH	13.1	122	Approx. 20	18.5 kW TECO Frame 160 L	1.52	255
Bore 6	1984 (Re-Dev 1996) (Pump Replace 1998)	Everflow 3 stage turbine type 180RM	15.09	122	Approx. 26	22 kW CMG Frame 180 m	2.03	185

Bore	Year	Turbine	Depth (m)	Diameter (mm)	Pump capacity (L/s)*	Motor	Screen Mesh Size (mm)	Casing Diameter (mm)
Bore 7	1984 (Re-Dev 1996) (Pump Replace 1991)	Everflow 3 stage turbine type 180RH	14.99	122	Approx. 30	22 kW CMG Frame 180 m	3.8	200
Bore 8	1984 (Pump Replace 1992)	Everflow 2 stage turbine type 180RH	13.41	154	Approx. 0	18.5 kW TECO Frame 160 L	1.52	255
Walkerston Bore 1 - Peak Down Hwy	Not in service	NA	15	250	18	NA	NA	NA
Walkerston Bore 2 - Peak Down Hwy	Not in service	NA	15	250	18	NA	NA	NA
Walkerston Bore 3 - Weigard Rd	Not in service	NA	15	250	18	NA	NA	NA

*** Current flow rate based on pump tests completed Nov-14 and flow meters at Bore Pumps. This flow rate does not reflect aquifer capacity only current pump performance as of Nov-14.**

^ This depth is only of column depth and not total depth.

Table 9 Infrastructure Details for Nebo Road WTP – Treatment

Infrastructure	Aspect	Detail
River Water Dosing Tank	Capacity (kL)	520
Clarifiers	No.	2
	Dimensions (m)	17.55 x 17.55 x 5 Each clarifier
	Max. Flow Rate (L/s)	694
	Surface loading rate (m/h)	2.3 – 4.2
Filters	No.	12
Filter Media	Filter coal: effective size (mm)	1.0 – 1.2 anthracite
	Filter coal: depth (mm)	500
	Filter sand: effective size (mm)	0.45 – 0.55
	Filter sand: depth (mm)	300
	Coarse sand: size (mm)	8 – 16 mesh ASTM

Infrastructure	Aspect	Detail
	Coarse sand: depth (mm)	100
	Fine gravel: size(mm)	3 – 6
	Fine gravel: depth (mm)	100
	Coarse gravel: size(mm)	6 – 12
	Coarse gravel: depth (mm)	100
Delay Tank	Volume (m^3)	85.4
	Dimensions (m)	2.0 x 8.9 x 4.8
Filtered Water Tank	Capacity (ML)	0.9
Balance Tanks	No.	3
	Capacity (ML)	2.15
		2.15
		4.5
High Lift Pump Station	No. pumps	6
	Capacity (L/s)	630
		130
		130
		240
		370
		350
Aeration Tower	Type	Spray aeration basin
Relift Tank	Capacity (L)	8000
Aerated Bore Water Pumps	Capacity (L/s)	380
Coagulant Dosing System	Chemical	Aluminium chlorohydrate (ACH)
	Dosing pump type	Iwaki LK Series
	No. pumps	2
	Pump capacity (L/s)	7.2
Alkali Dosing System	Chemical	Caustic
	Storage Tank	40 m^3 MDPE
	Dosing pump type	Digital Diaphragm Metering Pumps
	No. pumps	3 dosing points, 2 pumps each
	Dosing pump type	River water: Grundfos DNE-375-10AR digital metering pump
		Clear water: Grundfos DNE-375-10AR digital metering pump
		Bore water: Grundfos DNE-150-4AR digital metering pump
	Pump capacity	River water: 375 L/h @ 4 bar
		Clear water: 375 L/h @ 4 bar
		Bore water: 150 L/h @ 4 bar
$KMnO_4$ Dosing System	Batch Tanks	2 x 10 kL
	No. pumps	4
	Dosing pump type	River water: 2 x Iwaki LK Series
		Bore water: 2 x Grundfos DME 375-10AR
	Pump capacity	Iwaki: 10 L/s

Infrastructure	Aspect	Detail
		Grundfos: 375 L/h @ 10 bar
PAC Dosing System	Dosing pump type	Sepex motor driven progressive cavity with Dunfoss VSD
	No. pumps	2 (duty/standby)
	Pump capacity (L/s)	3300 (max) up to 10% slurry strength
	Low range dose rate	100 kg/h at 2% slurry
	High range dose rate	>100 kg/h at 2% - 10% slurry
Polyelectrolyte Dosing System	Chemical	
	Dosing pump type	Iwaki LK Series
	No. pumps	6
	Pump capacity (L/s)	3.3
Chlorine Dosing System - Treated Water	Chemical	Chlorine gas
	Dose Rate (mg/L)	1.88 (4 year average)
	No. chlorinators	2 (duty/standby)
	Chlorinator capacity (kg/h)	10
	Type	2 x bulk drums (duty/standby) on beam scales with vacuum delivery system
	Dosing arrangements	Flow paced with residual trim from online analyser
	Alarms (all auto dialler enabled)	Low low residual 0.5 mg/L
		Low residual 0.7 mg/L
		High residual 1.75 mg/L
		High high residual 2.00 mg/L
	Auto shut-off arrangements	Chlorine drum room leak alarm
		Chlorinator room leak alarm
Chlorine Dosing System - Bore Water	Chemical	Chlorine gas
	Dose Rate (mg/L)	0.5 - 1.5
	No. chlorinators	1
	Chlorinator capacity (kg/h)	1
	Type	Same as treated water
	Dosing arrangements	Flow paced
	Alarms	Same as treated water
	Auto shut-off arrangements	Same as treated water
Fluoride Dosing System	Chemical	Sodium Silicofluoride
	System	ProMinent Bulk Bag
	Dose Rate (mg/L)	0.5 – 0.8
	Hopper capacity (L)	750
	Intermediate hopper capacity (L)	225
	Solution Tank Material	POLY
	Dosing pump type	ProMinent DULCO
	No. Pumps	2 (duty/standby)
	Pump capacity (L/h)	4,202

Table 10 Infrastructure Details for Sarina WTP – Source Water

Infrastructure	Aspect	Detail
Middle Creek Dam	Type	Rolled earth and rockfill embankment
	Length (m)	130
	Height (m)	26
	Width (m)	6
	Full supply level (m)	134
	Capacity (ML)	1284
Middle Creek Dam Outlet	Type	450 mm cast iron valve
Plane Creek Weir	Type	Concrete
	Length (m)	30 - 40
Plane Creek Weir Pump Station	No. pumps	2
	Capacity	30 L/s each

Table 11 Infrastructure Details for Sarina WTP – Treatment

Infrastructure	Aspect	Detail
Alkali Dosing System	Chemical	Lime
	Product name	Limil
	Storage capacity (L)	2500
	Dosing pump type	Positive Displacement
	No. pumps	1
	Capacity (L/h)	54
Coagulant Dosing System	Chemical	ACH
	Storage tanks	2 x 1000 L
	Dosing pump type	Positive Displacement
	No. pumps	1
	Capacity (L/h)	4.7
	Dosage (mg/L)	0.7 – 12.6
Bentonite Dosing System	Product name	Trugel 100
	Dosing pump type	Positive Displacement
	No. pumps	1
	Capacity (L/h)	54
	Dosage (mg/L)	12 or 24
Polymer Dosing System	Chemical	Nalco 3266
	Dosing pump type	Diaphragm
	No. pumps	1
	Capacity (L/h)	2.2
PAC Dosing System	Product name	Anticarb PS 1000
	Dosing pump type	Positive Displacement

Infrastructure	Aspect	Detail
	No. pumps	2
	Capacity (L/h)	24
		66
	Dosage (mg/L)	1 or 3
Sedimentation Tank	Type	UC-C unimix vertical flow
	No.	1
	Diameter (m)	11.5
	Centre Well Diameter (m)	4.572
	Depth (m)	3
	Surface loading rate (m/h)	1.46
Filters	No.	2 (can be duty/standby)
	Diameter (m)	3.05 each
	Surface (m^2)	7.32 each
	Media	Sand and gravel
Clear Water Tank	Diameter (m)	9
	Depth (m)	2.10
	Capacity (kL)	133
	Type	Ground level
Fluoride Dosing System	Chemical	Sodium Fluoride (NaF)
	System	ProMinent Saturator
	Dosing pump type	Diaphragm Prominent
	Capacity (L/h)	4.7
Chlorine Dosing System	Chemical	Chlorine gas
	Storage	2 x 70 kg gas cylinders (duty/standby)
	Alarms	Chlorine room leak alarm (auto-shut off)
	Average Dose Rate (mg/L)	1.6
	No. chlorinators	2 (vacuum delivery)
	Chlorinator capacity (kg/h)	1
Treated Water Pumps	No. pumps	2
	Capacity	45.2 L/s each

Table 12 Infrastructure Details for Bloomsbury WTP – Source Water

Infrastructure	Aspect	Detail
Spear Bore	No. pumps	1
	Diameter (mm)	150
	Depth(m)	5
	Capacity (L/s)	3.3

Table 13 Infrastructure Details for Bloomsbury WTP – Treatment

Infrastructure	Aspect	Detail
Raw Water Tank	Capacity (ML)	0.027
	Type	Permacrete
Chlorine Dosing System	Chemical	Sodium hypochlorite
	No. Dosing Pumps	2 (duty/standby)
	Storage Vat (L)	200
	Dosing arrangement	Fixed
	Alarms	Low storage level
		High/Low chlorine residual
	Auto shut-off arrangements	None
Filters	No.	2
	Media	DMI 65 catalytic media
Clear Water Tanks	No.	2
	Type	Permacrete
	Capacity (kL)	Tank 1: 13.64
		Tank 2: 22.73
Bloomsbury Pump Station	No. pumps	4
	Capacity (L/s)	0.5 each

Table 14: Infrastructure Details for Marian WTP – Source Water

Infrastructure	Aspect	Detail
Raw Water	Source	Pioneer River approximately 50 m upstream Marian Weir
	No. pumps	2 (inclined bore pumps)
	Pump Model	Grundfos SP215-1
	Diameter (mm)	DN250
	Depth(m)	3 Weir Crest RL 32, Intake Approx RL 29
	Capacity (L/s)	50.5 (4 ML/day)

Table 15 : Infrastructure Details for Marian WTP -- Treatment

Infrastructure	Aspect	Detail
Raw Water Tank	Capacity (kL)	270
	Type	Concrete
PAC Dosing System	Dosing pump type	Dosing Screw conveyor
	No. pumps	2 (duty/standby)
	Pump capacity (L/s)	3300 (max) up to 10% slurry strength
	Dose rate	9.0 -10.9 kg/h
	Slurry Ejector	ProMinent
	No	2 (duty/standby)
	Capacity (L/hr)	2600
Coagulant Dosing System	Chemical	Aluminium chlorohydrate (ACH)
	Dosing pump type	Grundfos Ceramic Valve
	No. pumps	2
	Pump capacity (L/s)	17 mL/hour
	Tank Capacity (kL)	10
	Tank Type	Linear Low Density Polyethylene LLDPE
Alkali Dosing System	Chemical	Caustic
	Product name	Sodium hydroxide as NaOH
	Storage capacity (L)	10,000
	Dosing pump type	Grundfos Positive Displacement
	No. pumps	3 (1Pre, 1 Post and 1 common)
	Capacity (mL/h)	17 at 7 bar.
Polyelectrolyte Dosing System	Chemical	Polyacrylamide
	Tank number and Type	2 ProMinent, Grade 304 SS
	Tank Capacity (L)	500
	Dosing pump type	Grundfos PVDF Dosing Head
	No. pumps	5 (flocculation, filter, sludge thickener and geobag with 1 common)
	Pump capacity (mL/h)	30 a 4 bar
$KMnO_4$ Dosing System	Batch Tanks	2 x 1.8 kL
	No. pumps	2
	Pump Capacity (mL/h)	Grundfos DDA 30-4AR-PV 30 at 4 bar.
Fluoride dosing System	Chemical	Sodium Fluoride (NaF)

Infrastructure	Aspect	Detail
	System	ProMinent Saturator
	Tank Type and Capacity (L)	ProMinent Polyethylene 1000
	Dosing pump type	Diaphragm Prominent
	Capacity (L/h)	11.3
Settler/Clarifier	No.	2
	Type	Inclined Plate
	Detention time (min)	48
	Capacity (ML/day)	4.4
Filters	No.	2
	Media	Graded Sand/Gravel
	Capacity (ML/day)	4
Clear Water Tanks	No.	1
	Type	Concrete
	Capacity (kL)	390
Filtered Water Pump Station	No. pumps	2 (duty/standby)
	Capacity (L/s)	60 at 8 metres head
Wash Water Tank	No.	1
	Type	Concrete
	Capacity (kL)	285
Waste Chemical Storage Tank	No.	1
	Type	Concrete
	Capacity (kL)	20
	Waste Chemical Pump Type	Grundfos submersible
	Pump Capacity (L/s)	4 at 6.5 metres head
Supernatant Balance Tank	No.	1
	Type	Polyethylene
	Capacity (kL)	36.65

3.2.2 Asset Capability / Performance

The Nebo Road WTP and Bloomsbury WTP are currently performing within their design capabilities efficiently and under optimisation.

The Sarina WTP is currently performing within its capability; however components of the WTP are in need of replacement and these are preventing the WTP operating under optimised efficiency. These components include filter media, blowers and compressors and electrical aspects.

3.2.3 Key Gaps

The key gaps identified regarding the WTPs include:

- Balance tanks at the Nebo Road WTP require a condition assessment and cleaning to be undertaken.
- A definitive decision and plan on the future of Sarina WTP and water supply scheme.
- Asset data register for Nebo Road WTP and Sarina WTP require uploading to Assetic.
- Condition assessment of the two Dumbleton raw water pipelines.
- Dumbleton RWPS and Mains between Dumbleton RWPS and Nebo Road WTP require development of an asset data register consistent with the WTPs asset data registers and uploaded to Assetic.
- Preventative maintenance program for the Dumbleton RWPS, Nebo Road HLPS and Nebo Road bores.
- No generator at Dumbleton RWPS.
- Identify critical spares for water treatment plants, RWPS and Nebo Road bores. The Nebo Road WTP Separator requires a spare gear box.
- Review of chemicals maintenance and handling procedures required.

3.3 Overview of Key Strategies

3.3.1 Planning Strategy

Strategic planning reports have been developed for Mackay (Appendix 11) and Marian and Mirani (Appendix 10). The Mackay Water Strategy is scheduled to be reviewed in FY2014/15 as per the RMIP. A strategic planning report is under development for Sarina while the rural scheme of Bloomsbury has no strategic planning report due to its small size.

The Mackay Water Strategy is to be reviewed and updated in FY15/16 and there is currently a project for the Nebo Road Bores to determine the long term capacity requirements of the bores and development of options to ensure the required capacity is achieved. Also, there is a current planning project on the Nebo Road High Lift Pumps to understand long term capacity requirements and develop options to upgrade pumps to achieve the required capacity.

3.3.2 Operational Strategy

The operational strategy for WTPs is to operate in the most economic and efficient manner possible to meet Client Service Standards and legislative requirements.

3.3.3 Maintenance Strategy

The programmed maintenance strategy for critical components of WTPs is detailed in the Asset Maintenance Schedule (Appendix 16) and involves:

- service agreements with external contractors who attend the sites at a scheduled frequency based on the asset supplier/service contractor recommendations,
- routine tasks performed by WTP operators with support from MWS networks staff as part of operational duties, and
- Shaft driven bore pumps >= 22 kW will be proactively maintained and submersible pumps will be run to failure.

Reactive maintenance will be performed on non-critical components of WTPs as required and works undertaken will be assessed as needed at the time.

Any critical spares required for the water treatment plants are captured in the Critical Spares Register (Appendix 17) and stocks are maintained on site at the WTPs.

3.3.4 Renewals Strategy

The renewal strategy for WTPs is taken to include the items detailed in section 3.3.1 and replacements identified from performing the tasks detailed in 3.3.3.

3.4 Asset Risk Management & Improvement Program

The asset risk management and improvement program (RMIP) compiled for all MWS assets including the water treatment plants has been provided in Appendix 12. In addition to the asset RMIP the DWQMP RMIP (Appendix 6) contains applicable actions for this asset category.

4. SMALL TREATMENT FACILITY

4.1 Asset Class Drivers

Small treatment facilities draw raw water from bores and treat the water through the addition of chlorine to produce safe drinking water which is released into the water network. A detailed description of the operation of Small treatment facilities can be found in the DWQMP (Appendix 6).

Small treatment facilities are the key assets for water treatment in small rural towns and need to be managed to ensure continuity of supply of safe drinking water. Demand for drinking water is the main driver for small treatment facilities.

4.1.1 Key Principles, Risk and Drivers

Detailed risk assessments have been completed in relation to the small treatment facilities and are provided in Appendix 6 and Appendix 8. The key risks which have been identified as driving factors for the management of small treatment facilities are associated include:

- Working alone in a remote area
- Incident or injury from working with chemicals
- Lack of or poor maintenance
- Loss of supply

4.2 Condition Assessment

4.2.1 Asset Capacity

Current demand requirements are being met by the existing small treatment facilities except for at Marian and Mirani. The constraint at Marian and Mirani is the groundwater allocation which is not enough for the current demand. The details of the small treatment facilities are provided in Table 14.

Table 16 Infrastructure Details for Small Treatment Facilities

Infrastructure	Aspect	Detail
Eton Water Supply Scheme		
Bores	No.	4
	Diameter (mm)	Bore 1 & 2: Unserviceable
		Bore 3 & 4: 200
	Depth (m)	Bore 1 & 2: 28
		Bore 3 & 4: 16.3
	Capacity (L/s)	Bore 3: 8 fixed speed
		Bore 4: 12.78 variable speed
	Pump type	Bore 3: Grundfos SP 46-7 submersible
		Bore 4: Grundfos submersible
	Casing	Concrete capping Developed and screened

Infrastructure	Aspect	Detail
Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump	2 x Grundfos
	Capacity (L/h)	6.5
	Storage Vat (L)	500
	Chemical Concentration (%)	11
	Dosing arrangement	Duty / standby
	Alarms	Pump failure Pump fault Comms failure Chlorine high level Chlorine low level
	Auto shut-off arrangements	None
Marian Water Supply Scheme : Stand-by Groundwater Scheme		
Bores	Year	1977
	No.	2
	Operating philosophy	Duty/standby
	Casing diameter (mm)	203
	Depth (m)	24.4
	Capacity (L/s)	18
	Casing type	Steel
Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump	2 x Grundfos Alldos Smart Digital
	Capacity (L/h)	7.5
	Storage Vat (L)	500
	Chemical Concentration (%)	11
	Dosing arrangement	Fixed speed operator manual input setpoint
	Alarms	Pump failure Comms failure
	Auto shut-off arrangements	None
Mirani Water Supply Scheme		
Walz Lane Bores	No.	3
	Diameter (mm)	203
	Depth (m)	Bore 1: 24.4 Bore 2: 20.5 Bore 3: 20.4
	Casing	Sealed & capped

Infrastructure	Aspect	Detail
	Casing Diameter (mm)	250
	Casing Type	Steel
	Capacity	Bore 1: 14 L/s decommissioned in 2002
		Bore 2: 14 L/s decommissioned in 2002
		Bore 3: 6 L/s @ 65 m head
Victoria St Bore	No.	1 (Not in use)
	Depth (m)	29.5
	Capacity (L/s)	12
Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump	1 x Alldos
	Capacity (L/h)	2.99
	Storage Vat (L)	100
	Chemical Concentration (%)	11
	Dosing arrangement	Fixed speed operator manual input setpoint
	Alarms	Comms failure
	Auto shut-off arrangements	None
Finch Hatton Water Supply Scheme		
Cattle Creek Pumping Station	No. pumps	2 (Emergency use only)
	Capacity (L/s)	8 each
Bore	Year	1968
	No.	1
	Depth (m)	21.6
	Screen size (mm)	150
	Casing diameter (mm)	250
	Casing type	Steel
	No. pumps	1
	Power (kW)	5.5
	Pump Capacity (L/s)	6
Raw water rising main	Type	AC
	Diameter (mm)	150
Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump	1 x Alldos
	Capacity (L/h)	2.99
	Storage Vat (L)	100
	Chemical	11

Infrastructure	Aspect	Detail
	Concentration (%)	
	Dosing arrangement	Fixed
	Alarms	Comms failure
	Auto shut-off arrangements	None
Gargett Water Supply Scheme		
Cattle Creek Bores	No.	3 (2 duty/standby, 1 permanent standby)
	Year	Bore 1: 1998
		Bore 2: 1998
		Bore 3: 1999
	Depth (m)	Bore 1: 11.5
		Bore 2: 11.5
		Bore 3: 9.8
	Diameter (mm)	Bore 1: 219
		Bore 2: 219
		Bore 3: 219
	Capacity	Bore 1: 6 L/s @ 81 m head
		Bore 2: 6 L/s @ 81 m head
		Bore 3: standby use only
	Casing Type	Steel for each bore
Mackay/Eungella Road Bore	Year	1999
	No.	1 (emergency use only)
	Diameter (mm)	219
	Depth (m)	9.8
	Pump Capacity	2.4 L/s @ 80 m head
	Casing Type	Steel
Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump	1 (Alldos)
	Capacity (L/h)	2.99
	Storage Vat (L)	100
	Chemical Concentration (%)	11
	Dosing arrangement	Fixed
	Alarms	Pump failure Comms failure
	Auto shut-off arrangements	None
Sarina Water Supply Scheme		
Bally Keel Bore	No. pumps	1

Infrastructure	Aspect	Detail
	Depth (m)	25.6
	Capacity	7.8 L/s @ 76.8 m head
Bally Keel Bore - Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump type	Diaphragm Iwaki
	Capacity (L/h)	4.7
	Storage Vat (L)	100
	Chemical Concentration (%)	10
	Dosing arrangement	Flow paced
	Alarms	None
	Auto shut-off arrangements	None
Davis Gully (Armstrong Beach) Bore	No. pumps	1
	Depth (m)	40
	Capacity	18.6 L/s @ 79 m head
Armstrong Beach Balance Tank - Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump type	Diaphragm Iwaki
	Capacity (L/h)	4.7
	Storage Vat (L)	100
	Chemical Concentration (%)	10
	Dosing arrangement	Fixed
	Alarms	None
	Auto shut-off arrangements	None
Marwood Bores	No. pumps	5
	Depth (m)	Bore 1: 17.3
		Bore 2: 21.6
		Bore 3: 21.3
		Bore 4: 16.8
		Bore 5: 24.2
	Capacity (L/s)	Bore 1: 3.2
		Bore 2: 16.5
		Bore 3: 5.9
		Bore 4: 5.6
		Bore 5: 1.4 (unservicable)
	Diameter (mm)	Bore 1: 320
		Bore 2: 203
		Bore 3: 280

Infrastructure	Aspect	Detail
		Bore 4: 250
		Bore 5: 200
Marwood Bores Reservoir	Capacity (ML)	0.25
	Elevation	Ground level
	Roof structure	Concrete
Marwood Bores – Fluoride Dosing System	Chemical	Sodium Fluoride
	Dosing system type	Saturator
	Dosing pump type	Diaphragm Prominent
	Capacity (L/h)	4.7
Alligator Creek Balance Tank & Pump Station - Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump type	2 x Grundfos pump (duty/standby)
	Capacity	60 L/h max set to 5 L/h
	Storage Vat (L)	300
	Chemical Concentration (%)	10
	Dosing arrangement	Feedback trim control
	Alarms	High/Low chlorine residual
	Auto shut-off arrangements	None
Sarina Bores	No. pumps	2
	Depth (m)	Bore 1: 12.5
		Bore 2: 11.9
	Capacity	Bore 1: 13.8 L/s @ 101 m head
		Bore 2: 11.2 L/s @ 109.2 m head
Sarina Bores - Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump type	Diaphragm
	Capacity (L/h)	5.7
	Storage Vat (L)	200
	Chemical Concentration (%)	10
	Dosing arrangement	Flow paced
	Alarms	None
	Auto shut-off arrangements	None
Koumala Water Supply Scheme		
Bores	No. pumps	2 x Grundfos
	Depth (m)	Bore 1: 21.8
		Bore 2: 21.95

Infrastructure	Aspect	Detail
	Diameter (mm)	Bore 1: 200
		Bore 2: 200
	Capacity (L/s)	7.5 each
Chlorine Dosing System	Chemical	Sodium hypochlorite
	Dosing pump type	Diaphragm Alldos
	Capacity (L/h)	5.7
	Storage Vat (L)	60
	Chemical Concentration (%)	10
	Dosing arrangement	Fixed
	Alarms	None
	Auto shut-off arrangements	None
Calen Water Supply Scheme		
Bores	No. pumps	2
	Diameter (mm)	200 each
	Depth (m)	20 each
	Capacity (L/s)	7.7 each
	Casing	Concrete capping Developed and screened
Softener	Type	Ion exchange - addition of sodium - removal of magnesium & calcium
Chlorine Dosing System	Chemical	Chlorine gas
	Dose Rate (mg/L)	1
	No. chlorinators	1
	Chlorinator capacity (kg/h)	0.04
	Dosing arrangement	Fixed
	Alarms	None
	Auto shut-off arrangements	None
Midge Point Water Supply Scheme		
Crystal Brook Bore Pumps	No. pumps	5 (9 bores, only 5 with pumps)
	Depth (m)	15 each
	Diameter (mm)	300 each
	Casings	Concrete capping with heavy duty gatic lid Developed and screened
	Power (kW)	3 pumps @ 15

Infrastructure	Aspect	Detail
		2 pumps @ 45
	Capacity (L/s)	38 each
Chlorine Dosing System	Chemical	Chlorine gas
	No. Chlorinators	1
	Chlorinator capacity (kg/h)	2
	Storage	4 x 70 kg cylinder
	Dose Rate (mg/L)	2
	Dosing arrangement	Flow paced
	Alarms	None
	Auto shut-off arrangements	None
Kelsey Creek Balance Tank	Capacity (ML)	1.18
	Elevation	Ground level
	Roof structure	Concrete
High Lift Pump Station Kelsey Creek	No. pumps	2 (Duty/Standby) only one can operate at a time
	Capacity (L/s)	120

4.2.2 Asset Capability / Performance

The small treatment facilities capability and performance is currently meeting the supply scheme needs.

4.2.3 Key Gaps

The key gap identified regarding the small treatment facilities is that there is low confidence in the bore details as the historical information of construction is not available.

4.3 Overview of Key Strategies

4.3.1 Planning Strategy

Strategic planning reports have been developed or are under development as described in section 3.3.1; however the small rural schemes including; Koumala, Eton, Finch Hatton, Gargett, Calen and Midge Point, have no strategic planning reports due to their small size.

There are currently no key strategic planning projects for small treatment facilities.

4.3.2 Operational Strategy

The operational strategy for small treatment facilities is to operate in the most economic and efficient manner possible to meet Client Service Standards and legislative requirements.

4.3.3 Maintenance Strategy

The programmed maintenance strategy for critical components of small treatment facilities is detailed in the Asset Maintenance Schedule (Appendix 16) and involves routine tasks

performed by WTP operators with support from MWS networks staff as part of operational duties.

Reactive maintenance will be performed on non-critical components of small treatment facilities as required and works undertaken will be assessed as needed at the time.

Any critical spares required for the small treatment facilities are captured in the Critical Spares Register (Appendix 17) and stocks are maintained in stores at the Paget Depot.

4.3.4 Renewals Strategy

The renewal strategy for treatment facilities is line with strategic planning outcomes detailed in section 4.3.1 and replacements identified from performing the tasks detailed in 4.3.3.

4.4 Asset Risk Management & Improvement Program

The asset RMIP compiled for all MWS assets including the small treatment facilities has been provided in Appendix 12. In addition to the asset RMIP the DWQMP RMIP (Appendix 6) contains applicable actions for this asset category.

5. GLOSSARY

Term	Definition
Asset class	Grouping of assets of a similar nature and use in an entity's operations (AASB 166.37).
Asset condition assessment	The process of continuous or periodic inspection, assessment, measurement and interpretation of the resultant data to indicate the condition of a specific asset so as to determine the need for some preventative or remedial action.
Asset management	The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner.
Assets	Future economic benefits controlled by the entity as a result of past transactions or other past events (AAS27.12). Property, plant and equipment including infrastructure and other assets (such as furniture and fittings) with benefits expected to last more than 12 month.
Component	An individual part of an asset which contributes to the composition of the whole and can be separated from or attached to an asset or a system.
Heritage asset	An asset with historic, artistic, scientific, technological, geographical or environmental qualities that is held and maintained principally for its contribution to knowledge and culture and this purpose is central to the objectives of the entity holding it.
Infrastructure assets	Physical assets of the entity or of another entity that contribute to meeting the public's need for access to major economic and social facilities and services, eg. roads, drainage, footpaths and cycleways. These are typically large, interconnected networks or portfolios of composite assets The components of these assets may be separately maintained, renewed or replaced individually so that the required level and standard of service from the network of assets is continuously sustained. Generally the components and hence the assets have long lives. They are fixed in place and are often have no market value.
Level of service	The defined service quality for a particular service against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental, acceptability and cost).
Planned Maintenance	Repair work that is identified and managed through a maintenance management system (MMS). MMS activities include inspection, assessing the condition against failure/breakdown criteria/experience, prioritising scheduling, actioning the work and reporting what was done to develop a maintenance history and improve maintenance and service delivery performance.
Reactive maintenance	Unplanned repair work that carried out in response to service requests and management/supervisory directions.

Term	Definition
Risk management	The application of a formal process to the range of possible values relating to key factors associated with a risk in order to determine the resultant ranges of outcomes and their probability of occurrence.
Useful life	Either: (a) the period over which an asset is expected to be available for use by an entity, or (b) the number of production or similar units expected to be obtained from the asset by the entity. It is estimated or expected time between placing the asset into service and removing it from service, or the estimated period of time over which the future economic benefits embodied in a depreciable asset, are expected to be consumed by the council. It is the same as the economic life.

6. REFERENCES

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